(No Model.) 4 Sheets—Sheet 1.

A. W. DOW & T. R. GRIFFITH.

ELECTRICAL LIMITING TIME INTERVAL CLAMP OR BRAKE.

No. 512,687. Patented Jan. 16, 1894.

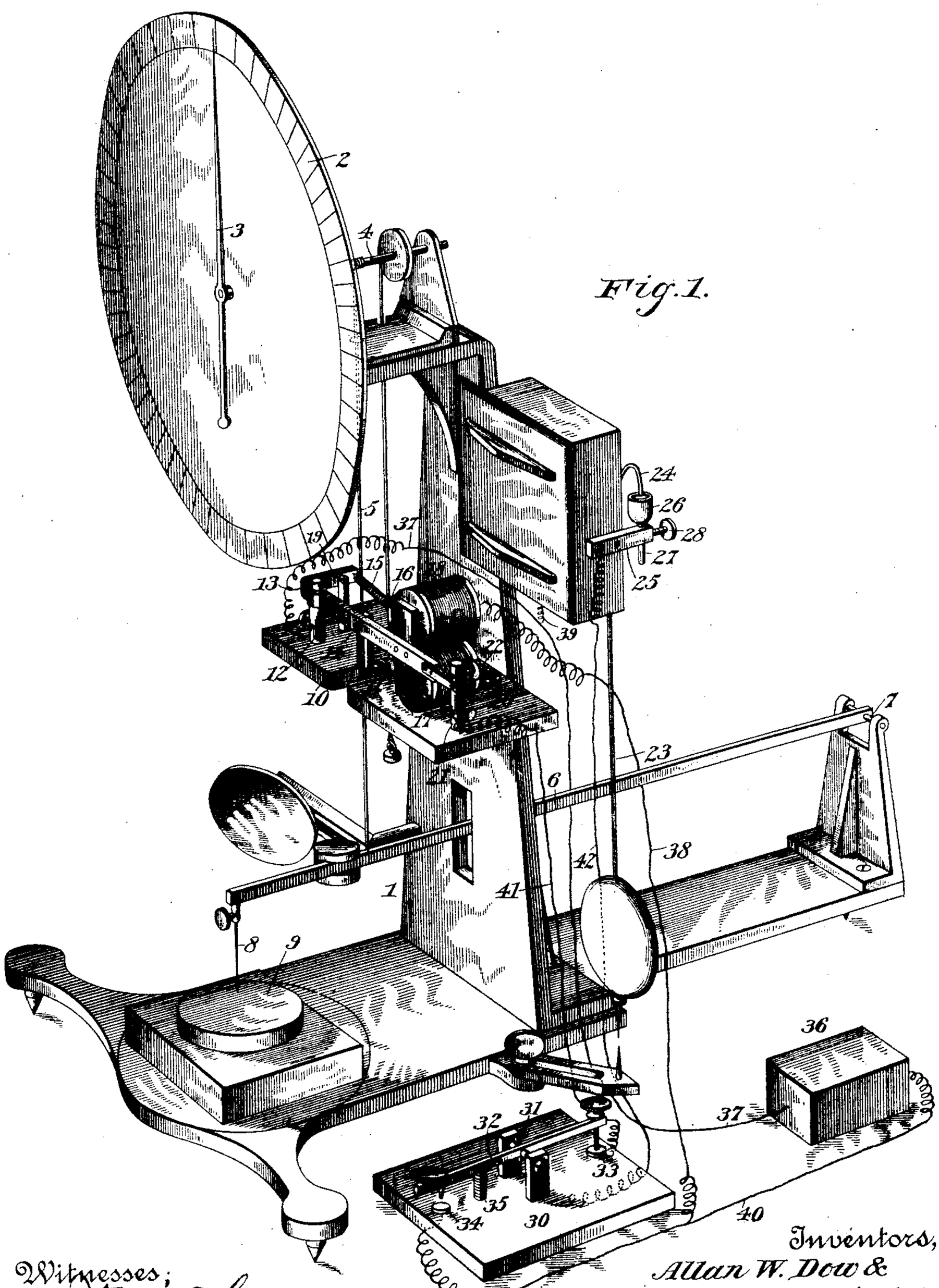

Fig. 1.

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ELECTRICAL LIMITING TIME INTERVAL CLAMP OR BRAKE.

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Fig. 2.

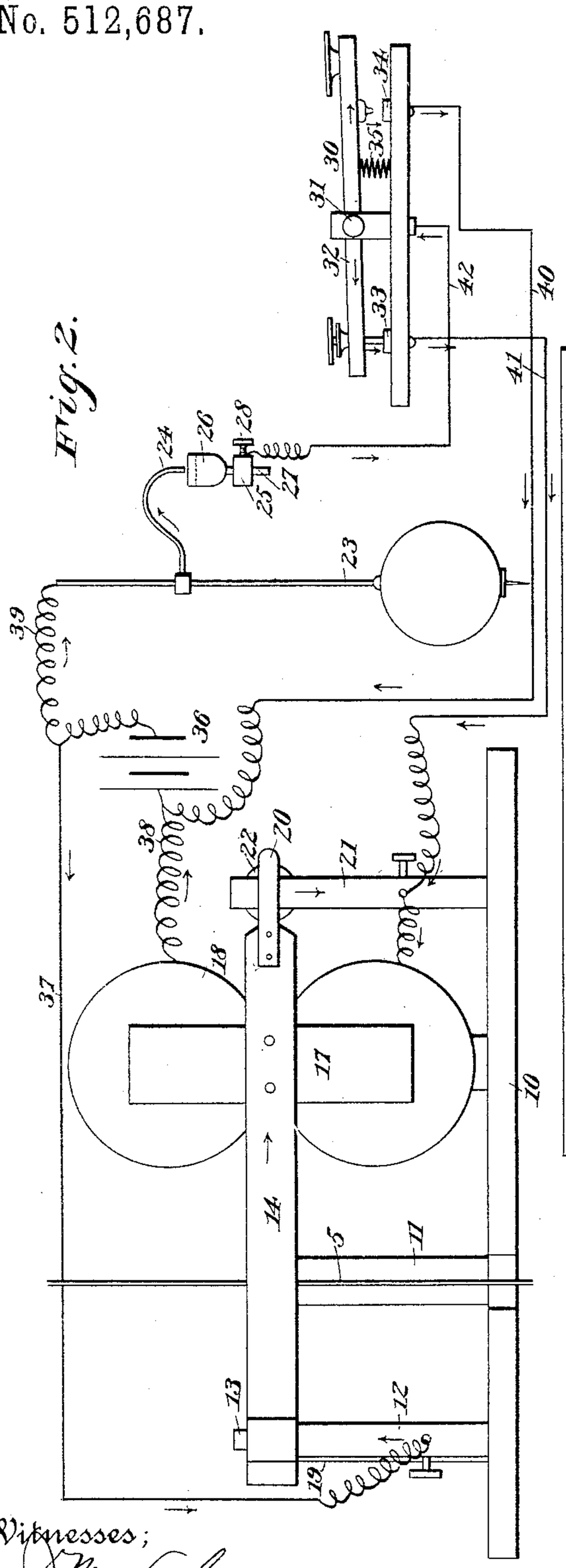
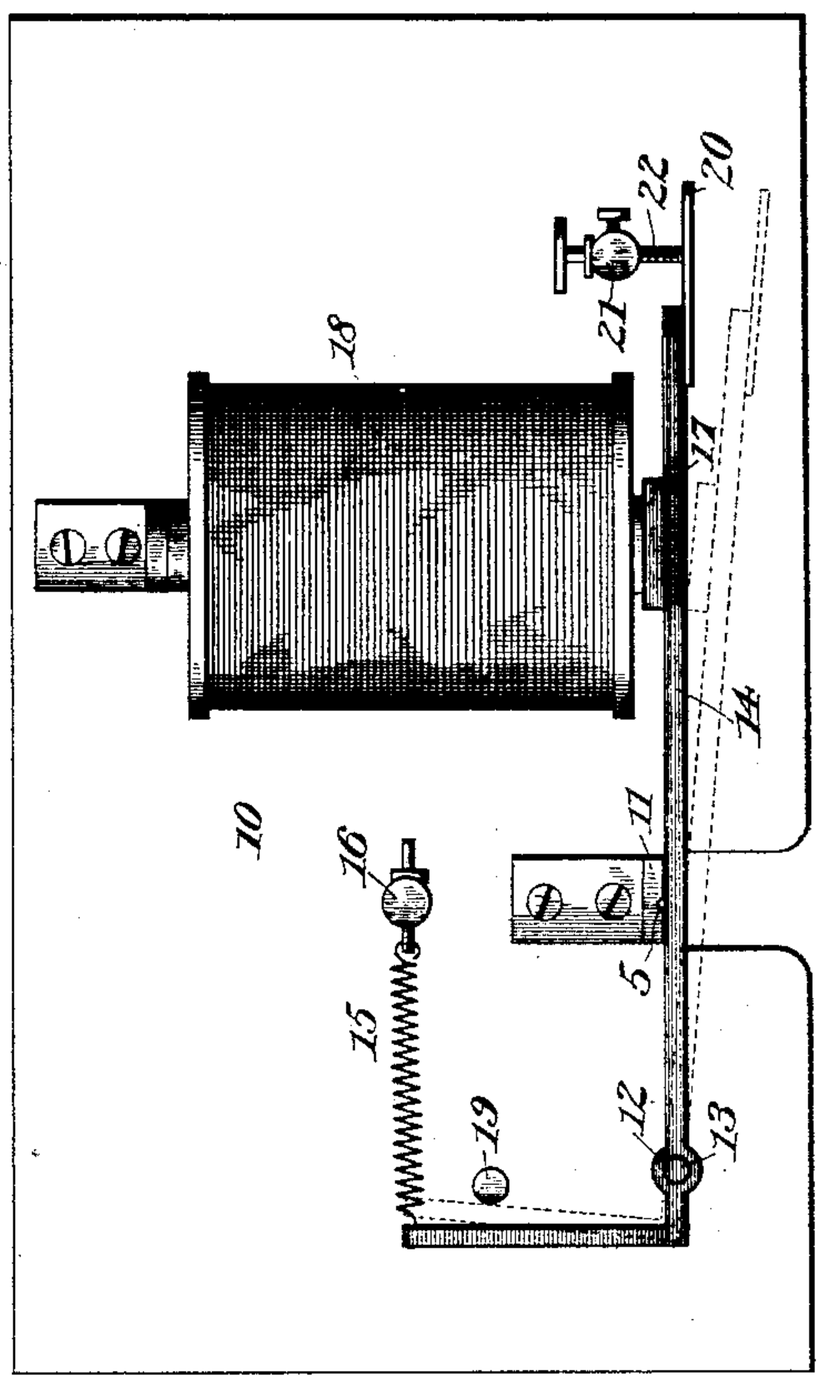


Fig. 3.



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ELECTRICAL LIMITING TIME INTERVAL CLAMP OR BRAKE.

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Fig. 6.

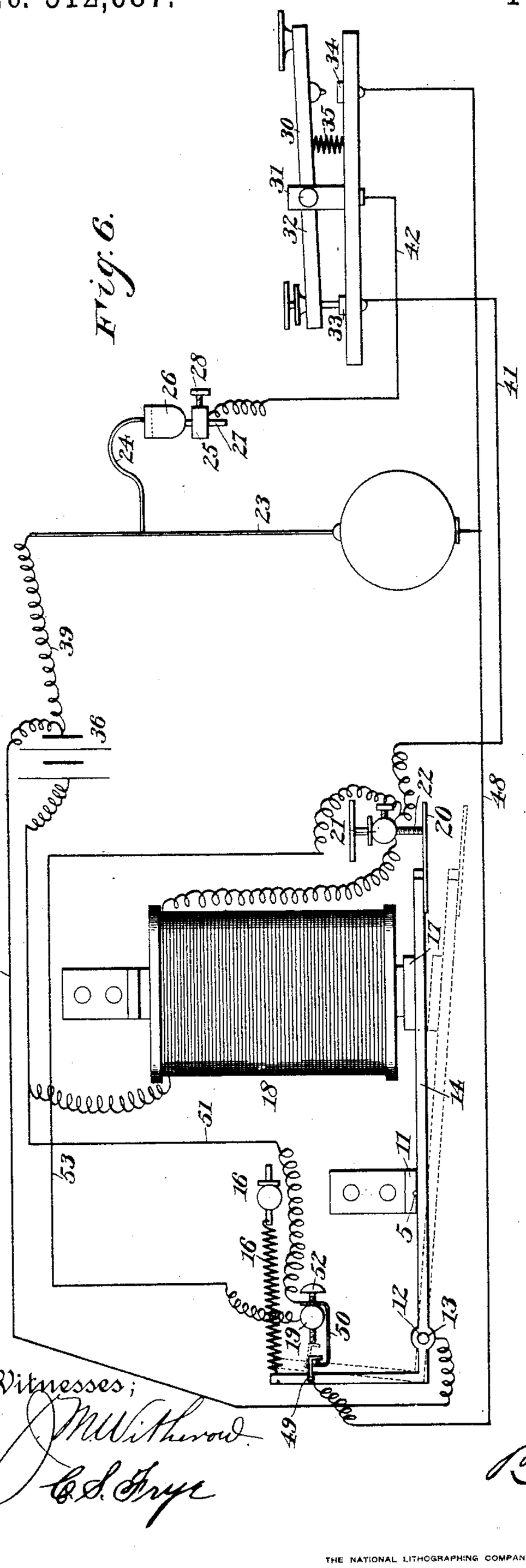
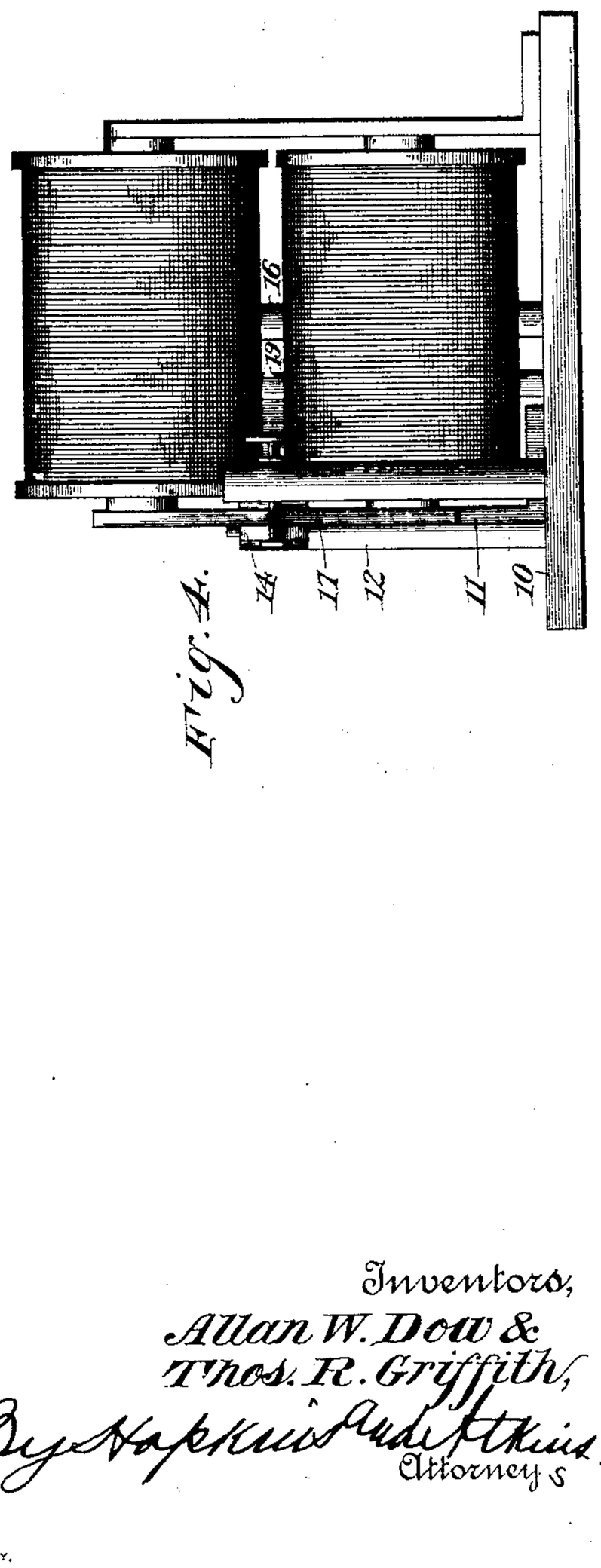


Fig. 4.



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ELECTRICAL LIMITING TIME INTERVAL CLAMP OR BRAKE.

No. 512,687. Patented Jan. 16, 1894.

Fig. 7.

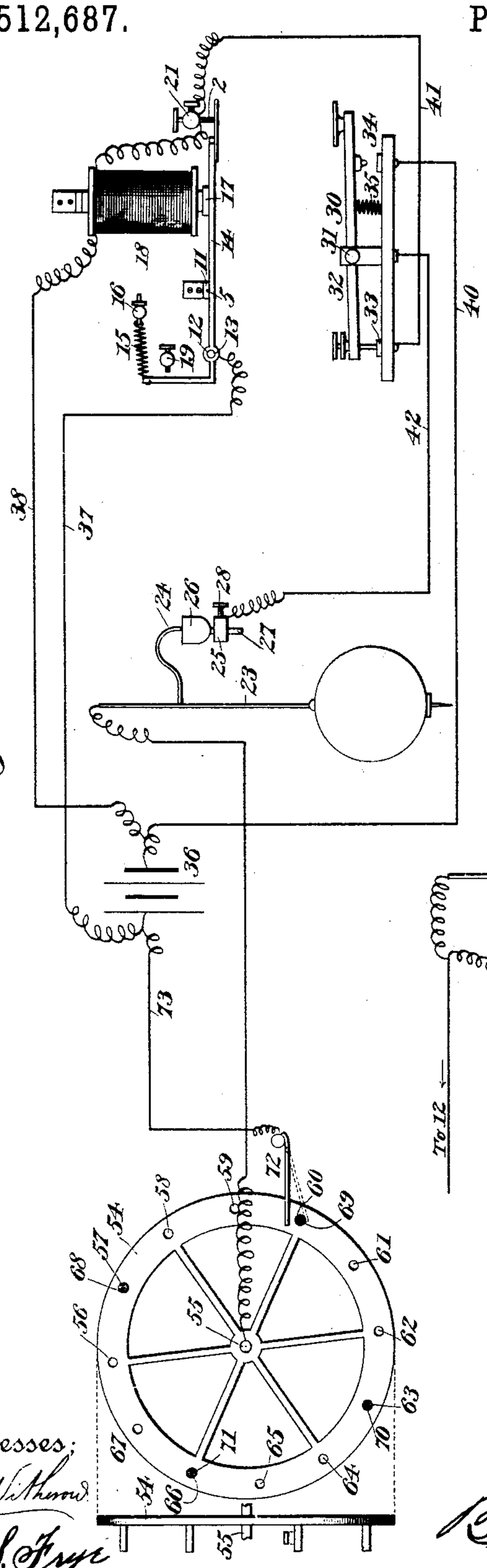
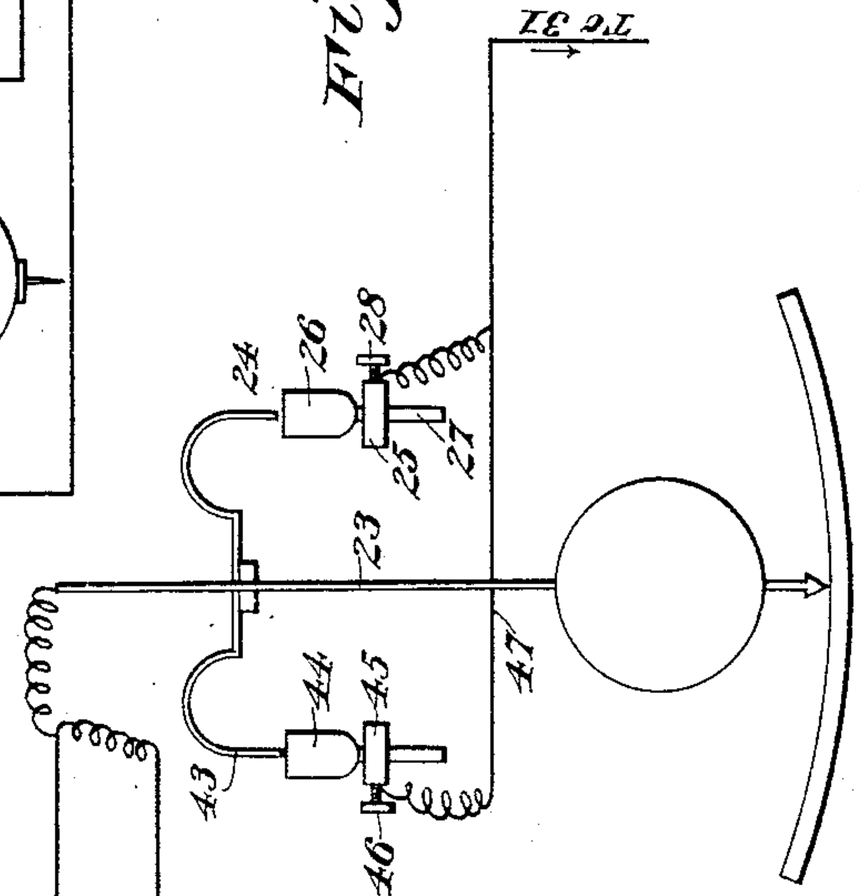


Fig. 5.



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ELECTRICAL LIMITING TIME-INTERVAL CLAMP OR BRAKE.

SPECIFICATION forming part of Letters Patent No. 512,687, dated January 16, 1894.

Application filed December 27, 1892. Serial No. 456,491. (No model.)

To all whom it may concern:

Be it known that we, ALLAN W. DOW, residing in the city of New York, county of New York, and THOMAS R. GRIFFITH, residing in the city of Brooklyn, county of Kings, State of New York, have invented an Electrical Limiting Time-Interval Clamp or Brake, of which the following is a specification, reference being had to the accompanying drawings.

The object of our invention is to produce an apparatus designed to open a clamp; to hold it open during any desired interval of time; and to close the clamp at the end of the interval.

We contemplate the application of this apparatus to any known device, such as a clamp, brake, and the like, where a clamping action, or release thereof, for a definite interval of time is required. A specific application, however, is made to a machine for determining viscosity, invented by H. C. Bowen. See Patent No. 494,974, issued April 14, 1893.

In the accompanying drawings, Figure 1 is a perspective view of the Bowen machine, showing the application of our invention in its simplest form. Fig. 2 is a diagrammatical side elevation of that form of our apparatus. Fig. 3 is a top plan view of a portion of the same; and Fig. 4 an end view thereof. Fig. 5 is a diagrammatical view in end elevation of a modified form of pendulum and contact mercury cup. Fig. 6 is a diagrammatical view showing our invention as designed to render the measurement of certain intervals of time automatic. Fig. 7 is a similar view, showing mechanism for rendering automatic the measurement of greater intervals of time than those designed to be measured by the apparatus shown in Fig. 6.

In Fig. 1 of the drawings we have, as above stated, illustrated the application of our apparatus in its simplest form to a Bowen machine. The apparatus illustrated in Figs. 5, 6, and 7 are equally applicable to the same machine, and are not to be regarded as modifications of our invention, but as amplifications thereof.

Referring to the numerals upon Fig. 1 of the drawings, 1 indicates a frame of a Bowen machine, upon which is carried a measuring dial 2, with pointer 3 that is connected to an axle 4. A thread 5 is fastened at one end to the axle 4 and at its other end to the free end of a ponderable lever arm 6, that is preferably pivoted, as at 7, to the frame. The lever-arm carries upon its extremity a penetrator 8, that, by the weight of the lever-arm, may be caused to penetrate a mass of liquid, or semi-liquid, indicated at 9. The vertical movement of the lever-arm is communicated by the thread to the pointer, by which it is indicated upon the dial in degrees of rotary motion. In this manner, by comparison, the relative viscosity of the mass at 9 may be determined.

The mechanism above described constitutes no part of our invention, but serves to illustrate a special application of it.

In operating the machine above described, and in making comparison of its results, the distance of the movement of the lever-arm,—or which is the same thing, of the thread—must be taken for a given interval of time. In its application to this machine our invention is designed to operatively connect a clamp adapted to control the movement of the thread with a suitable time keeper, or time measuring apparatus, so that it is automatically clamped, released, and clamped again during a definite interval of time, mechanically determined by the time-keeper.

Referring to Figs. 1, 2, 3, and 4 of the drawings, 10 indicates a horizontal platform carried upon the frame 1, and which carries a perpendicular post 11 in close proximity to the vertical thread 5. 12 indicates a binding-post fixed upon the platform and terminating at its upper end in a reduced neck or spindle 13, upon which is pivotally supported a clamping-lever 14. This lever, although it may be of any suitable construction and arrangement, and carried in any suitable manner, is designed to clamp against the post 11 for example, and grip between it and the post the thread 5. It may be conveniently formed in the shape of a bell-crank lever, and have attached to its short arm a spring 15 that is fastened at its other end to a spring 16 projecting from the top of the platform. Upon its long arm, preferably near its extremity, is secured an armature 17 that is within the field

of an electro-magnet 18. The tendency of the spring 15, as illustrated, is to keep the armature separated from the magnet; but that tendency is limited by a stop-pin 19 projecting from the top of the platform in the path of the short arm of the lever. Upon its extremity the lever 14 preferably carries a thin spring contact-plate 20 which is designed to make contact with a binding-post 21 through a set-screw 22 for example, said post and screw constituting a contact making binding post.

As above stated, we employ any suitable time-measuring apparatus, as for example a pendulum 23, which may be adjusted to swing a desired interval. It carries a contact-arm 24, preferably made of wire, and curved as illustrated.

25 indicates a bracket support upon the side of the time-keeper. A mercury-cup 26, whose stem 27 passes through the support, is vertically adjustable thereon by means of a set-screw 28. The bracket-support is insulated from the time-keeper.

30 indicates a three-point connection key, of any ordinary construction, having a fulcrum 31 carrying a key-lever 32, and contact-points 33 and 34.

35 indicates a spring located between the base of the key and the key-lever, tending to make a constant contact at the point 33.

36 indicates a suitable source of electricity, as for example a battery.

The apparatus is wired as follows: A wire 37 connects the battery with the binding-post 12. A wire 38 connects it with the coils of the magnet. A wire 39 connects it with the time-keeper. A wire 40 connects it with the key-point 34. A wire 41 connects the remaining end of the coils of the magnet with the key-point 33, through the post 21. A wire 42 connects the mercury-cup 26 with the key-fulcrum 31.

In operation, suppose the lever 14 to be clamping the thread 5, and the time-keeper to be in operation, the current will, under these conditions, pass from the battery 36 to the binding-post 12, through the lever 14 to the binding-post 21, by way of contact between contact plate 20 and screw 22 to and through the magnet back to the battery. This clamping is irrespective of the movement of the pendulum so long as the key 32 is not pressed down to make connection at 34. To have the lever 14 release the thread for an interval of two swings of the pendulum—that is to say, from the time the pendulum reaches the extremity of one swing to the time of its return to the same position, the operation is as follows: The contact arm 24 having been adjusted so as to dip its end into the mercury-cup 26 each time it makes a complete stroke backward and forward, the key 32 is, while the arm 24 is out of the mercury in the cup, pressed down to make connection at 34. The lever continues to clamp the thread until the contact-arm 24 touches the mercury, when the current is short circuited by passing from the battery to pendulum through arm 24 to mercury in cup 26, thence to key, out through point 34 to battery. Upon the interruption of the current through the coils of the magnet, the armature 17 is released, the lever 14 yields to the tension of the spring 15, and the thread 5 is released. At the same time connection is broken between the plate 20 and the screw 22. As soon as the arm 24 has left the mercury, the operator releases the key 32, which, swinging back to its former position, breaks at 34, and makes connection at 33. With the next swing of the pendulum, which brings the arm 24 in contact with mercury in cup 26, a current flows from the battery to pendulum by way of arm 24 through the mercury to key fulcrum 31, out through point 33, and by way of post 21 through the coils of the magnet to the battery. The magnet becoming thereby remagnetized attracts its armature 17 and clamps the lever 14 upon the thread 5 against the post 11. At the same time it makes connection between the plate 20 and the screw 22, which, restoring the conditions named in the beginning, causes the clamp to remain closed until the key 32 is again pressed down, when the operation may be repeated as before. To secure the release of the thread for a greater number of seconds than may be provided for in one complete swing of the pendulum, the key 32 should be held down to make contact at 34 until the pendulum is on the swing of the last second of the required interval. To render the apparatus operative for an interval less than 0.5 of a second, we connect the binding posts 12 and 21, thus making a continuous circuit from battery by way of 12 to 21 through the coils of the magnet back to battery. Then raise the mercury-cup 26 until, when the pendulum is swinging normally, the arm 24 will be in contact with the mercury in the cup during the desired interval. Then, while the arm 24 is out of the mercury, press and hold the key 32 to make connection at 34. Upon the return of the pendulum and the contact of the arm 24 with the mercury in the cup, the current will be short-circuited, as above described, so long as the arm 24 maintains contact with the mercury. During that interval the magnet, being demagnetized, will release the lever 14, as above described, and permit the movement of the thread 5. After the lever 14 has been again attracted by breaking of contact between the arm 24 and the mercury, the operator again releases the key, breaking connection at 34.

To obtain any interval of release of the thread, except those previously described, greater than 0.5 second, the following conditions are required: A pendulum which can be regulated by any known method, so that the single swing may be any interval of time between 0.5 and 0.75 of a second, is provided, as illustrated in Fig. 5 with a second contact-arm 43 that is adapted to dip by the vibration of the pendulum into a second mercury-cup

44 carried upon a bracket-arm 45, and adjustable by means of a set-screw 46. 47 indicates a wire by which it is connected with the other mercury-cup and with the wire 42, thereby bringing it into operative relations with the apparatus above described. For any interval of release of the thread, ranging from 0.5 to 0.75 of a second, the mercury cups 26 and 44 should be adjusted so that their respective arms 24 and 43, just touch the mercury at the end of each swing of the pendulum. To obtain the release for the desired interval of time the pendulum is regulated to beat the desired interval, and the apparatus is worked as described for the release of the thread at the end of the double swing of pendulum, except that in this case the release will be made before the close of the single swing, or next contact of the arm 24 with the cup 26.

For securing any interval of release over one second, the operation is as follows: The number of seconds released is divided by the smallest number that will give a quotient between 0.5 and 0.75 of a second. By regulating the pendulum so that its swing shall equal the fraction of a second represented by the quotient found, and by holding the key 32 down during a number of swings equal to the divisor, the release will be for the desired interval. For example a release of 8.1 seconds is required. Eleven is the lowest number that will divide 8.1, giving a quotient (0.737) between 0.5 and 0.75. Therefore for a release of 8.1 seconds, the pendulum would be regulated so that one swing would equal 0.737 second, and as eleven swings of such a pendulum would equal 8.1 seconds, the key 32 should be pressed down and held until just before the end of the eleventh swing from the time of release of the thread. For the release of the thread for any interval from 0.75 to one second, regulate the pendulum so that it will beat 0.75 of a second. Both mercury cups are used and connected, as shown in Fig. 5. One mercury-cup, say 44 should be adjusted so that the arm 43 will just connect with the mercury in 44 at the extreme end of its normal swing. The other cup 26 should be raised so that the arm 24 will make the connection with it the fraction of a second before the end of a swing, which, added to 0.75, will equal the desired interval. The arrangement of the other parts is the same as in obtaining an interval, ranging from 0.5 to 0.75 of a second, as above described. Care must be taken in this instance to press the key down to form a contact at 34, after the arm 43 has left the mercury in the cup 44, so that the next connection will be made between the arm 24 and the mercury in cup 26, and that the key is not released after the arm 24 has left cup 26.

If it be found undesirable or inconvenient, on account of lack of time, or other reason, to allow the key 32 to spring back to contact with the point 33 between the releasing and clamping of lever 14, an appliance may be introduced, as illustrated in Fig. 6, by which the lever 14 will, after being released, automatically clamp at the next contact of arm 24 with mercury-cup 26, or arm 43 with mercury-cup 44 (see Fig. 5) whether the key 32 is in contact with 33 or 34. This is obtained by running a wire 48 from point 34 to a contact point 49 which is fastened to but insulated from the lever 14, preferably in its short arm. This point is, when the lever 14 is clamping, and not otherwise, in contact with a spring-plate 50, fastened to but insulated from the post 19. From the spring-plate 50 a wire 51 runs to the battery 36, thereby rendering it possible to short-circuit the current only when the lever 14 is clamping. When the lever 14 is not clamping the point 49 will be in contact with a screw 52 in the post 19, as illustrated in dotted lines in Fig. 6 of the drawings. At the next contact of the arm 24 or 43 with the cup 26 or 44, while contact is made with the key 32 and point 34, the current will flow from battery 36 with the arm 24 or 43 and cup 26 or 44, as it may happen, to the key 32, and thence through the point 34 to the contact point 49 to the post 19, and by way of wire 53 to post 21, and thence through the coils of the magnet to the battery. It should be observed in this connection that the wire communicates only with the plate 50, and that the post 19 is equally insulated from the wire and from that plate.

All the connections not otherwise specified are as illustrated in Figs. 1 and 2 of the drawings. By this appliance all that is necessary is to press the key 32 to make contact at 34, and the apparatus will release and clamp automatically for the stated interval. After the lever 14 has clamped release the key 32.

To make the apparatus clamp automatically at the end of any interval of time greater than the double swing of the pendulum, the device illustrated in Fig. 7 of the drawings, may be applied to the time-keeper.

Referring to the mechanism illustrated in Fig. 7 of the drawings, 54 indicates any wheel of the time-keeper, or in connection therewith. For the purposes of this description, let it represent a wheel on the axle 55 of a seconds hand of a clock. The numbers 56 to 67, inclusive, indicate holes, into which metal pins 68 to 71, inclusive, can be inserted and removed at will. 72 indicates a spring, lever, or any known device that is adapted, as the wheel 54 revolves, to make contact successively with the pins 68, &c., or as many of them as shall be in place. In Fig. 7 the wheel 54 is pictured as having twelve holes, and has been described as making one revolution a minute; hence a hole will pass the spring or lever 72 every five seconds. If the pendulum of the clock has a half second swing, each pin should remain in contact with lever 72 for an interval of time between one and two seconds, so as to insure at least one contact of the arm 24 with mercury in cup 26; while the lever 72 and pin 68, for example, are in contact. The wire connection is the same in Fig. 1, ex-

cept that instead of a wire direct from the pendulum 23, which forms a part of the clock works direct to the battery 36, a wire 73 is run from the battery to the spring 72, thus making it impossible for a current to flow through the pendulum, except the spring 72 and one of the pins 68, &c., be in contact.

This apparatus is worked as follows: Suppose a release of fifteen seconds' time is required, four pins, 68, 69, 70 and 71 may be used. Each pin will come in contact with spring 72 every fifteen seconds. Now by pressing the key 32 to contact at 34, and holding it until a pin 68, for example, comes in contact with and releases the spring 72. While the lever 32 and the point 34 are in contact, the first contact of the arm 24 with the mercury-cup 26, during the passage of pin 68 over spring 72, will cause the current to be short circuited, as described with reference to Figs. 1 and 2. Then upon releasing the key 32, and allowing it to come in contact with the point 33, the apparatus will not clamp until the first contact of arm 24 with the mercury in cup 26 while the pin 69 is passing over lever 72. The current from battery 36 to pendulum 23 being restored on the contact of pin 68 with lever 72, the apparatus will clamp as described under descriptions 1 and 2. These pins may be placed on any wheel of a clock, and at any distance from each other on any such wheel. In this way any desired interval of time can be obtained between the contact of one pin with the spring 72 and the contact thereof of the next pin. If, in Figs. 1 and 2, the wires to points 33 and 34 be reversed; that is, the wire to 33 run to 34, and the wire to 34 run to 33, the action of the apparatus will be the reverse of that already described. In the former case the armature 17 with the lever 14 was attracted and held; in this case it would be released and remain so. Thus, if desirable, the clamp might be placed on the opposite side of the lever 14 from that illustrated in the drawings, and the spring 15 would hold the clamp closed, the magnet acting to produce the interval of release.

We do not desire to limit ourselves in any particular to the details of construction herein shown and described, because they may be varied in many respects without departing from the scope of our invention. For instance any suitable mechanism might be substituted for the spring contact plate 20 and its screw 22 on the post 21. The clamp may be located at any point on the lever 14. The location of the fulcrum and of the contact plate 20, with respect to the lever, may be varied indefinitely, or the several parts may be replaced by any device that will cause the current to flow through the magnet while the lever is clamping, and break the circuit on release of the lever. This also applies to the connection between the spring plates 49 and 50 and 49 and 52. The lever 14 may be either simple or compound, or may transmit its motion and power by any known device to any desired point. Instead of the time-measuring apparatus shown and the contact arms 24 and the mercury-cup 26, or their duplicates, any suitable device may be employed.

What we claim is—

1. The combination with a clamp or brake and time-keeper, of electrically-actuated mechanism operatively connected with each for controlling the clamp during definite intervals of time, substantially as described.

2. The combination with a frame and ponderable lever-arm carrying a penetrator, a thread connected at one end with the lever-arm, and at the other end with an indicator, of a clamp adapted to control the movement of the thread, a time-keeper, and electrically-actuated mechanism operatively connected with the clamp and with the time-keeper, whereby the clamp may be controlled for definite intervals of time, substantially as and for the purpose specified.

3. The combination with a clamp and electro-magnet adapted to actuate the same, a source of electrical supply wired to the clamp and to the coils of the magnet, a key, wired to the coils of the magnet and to the battery, whereby an electric current may be passed through or around the magnet to operate the clamp, substantially as set forth.

4. The combination with a clamp, electro-magnet, and source of electrical supply, the latter being connected with the clamp and with the coils of the magnet, a key, connected with the coils of the magnet, a time-keeper, a wire connecting the fulcrum of the key with the source of electrical supply through the time-keeper, and an intermittent contact making mechanism, actuated by the time-keeper to pass current through the wire, substantially as and for the purpose specified.

5. The combination with a clamp electro-magnet, and source of electrical supply, the latter connected with the clamp and with the coils of the magnet, of a contact making binding-post in the path of the clamp adapted to make and break contact therewith, a key connected with the coils of the magnet and with the battery through an intermittent contact making time mechanism, substantially as and for the purpose specified.

6. The combination with a spring-actuated clamp, an electro-magnet and source of electrical supply, the latter being wired to the clamp and to the magnet, a key connected with the coils of the magnet and with the source of electrical supply through a wire, of time mechanism provided with double contact arms adapted to intermittently make and break contact through the wire, substantially as and for the purpose specified.

7. The combination with a clamp, electro-magnet, and source of electrical supply, the latter communicating with the coils of the magnet and with the clamp, a key connected with the coils of the magnet and with the battery, of a wire connecting the fulcrum of the

key-lever with the battery through intermittent time contact-making mechanism, a clock-wheel provided with removable pins, and a spring-lever adapted to make connection with the pins at regular intervals of the rotation of the wheel, substantially as and for the purpose specified.

In testimony of all which we have hereunto subscribed our names.

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