

M. J. McDONNELL.
SPEED INDICATOR.

APPLICATION FILED APR. 8, 1905.

4 SHEETS—SHEET 1.

Fig. 1.

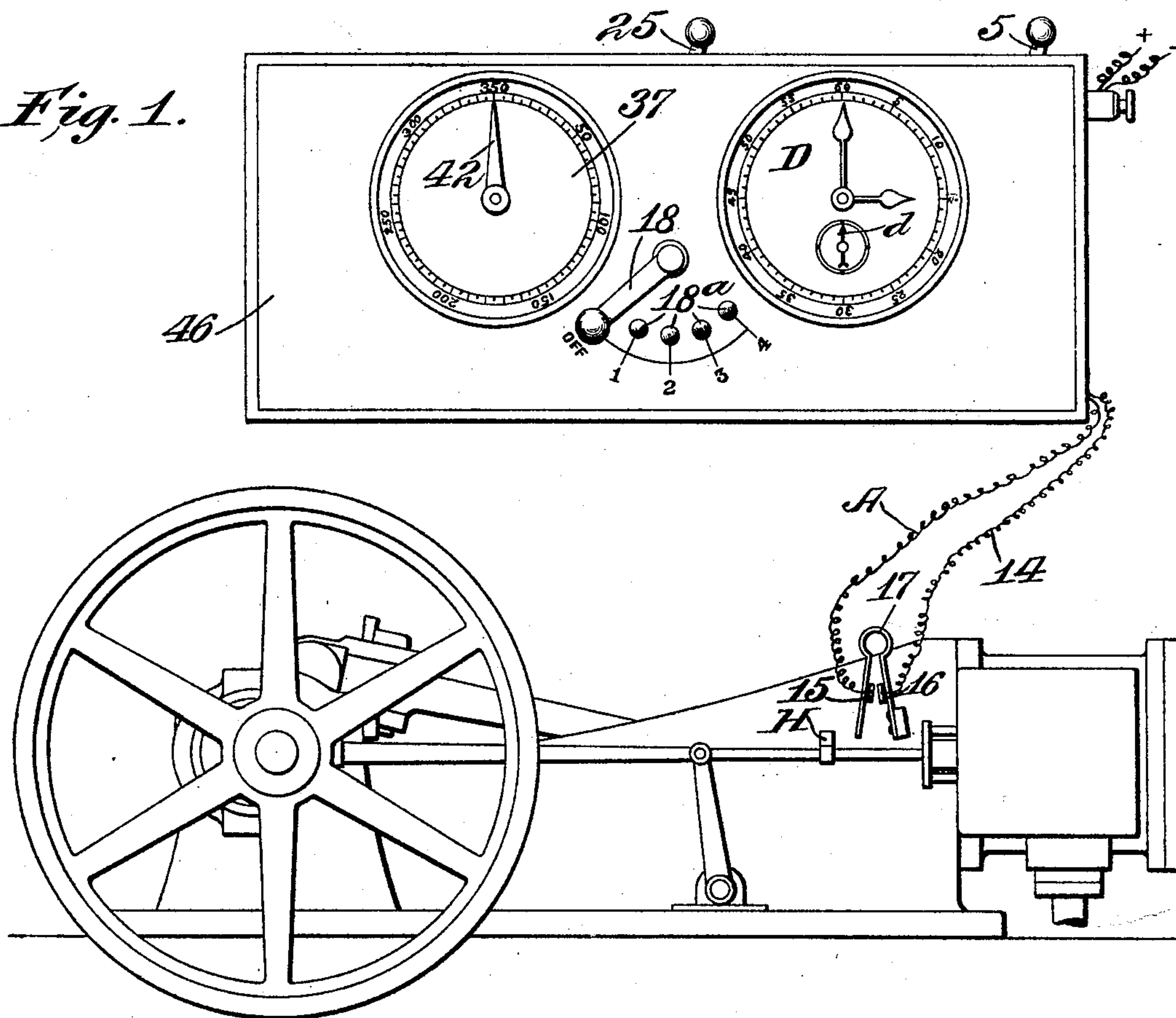
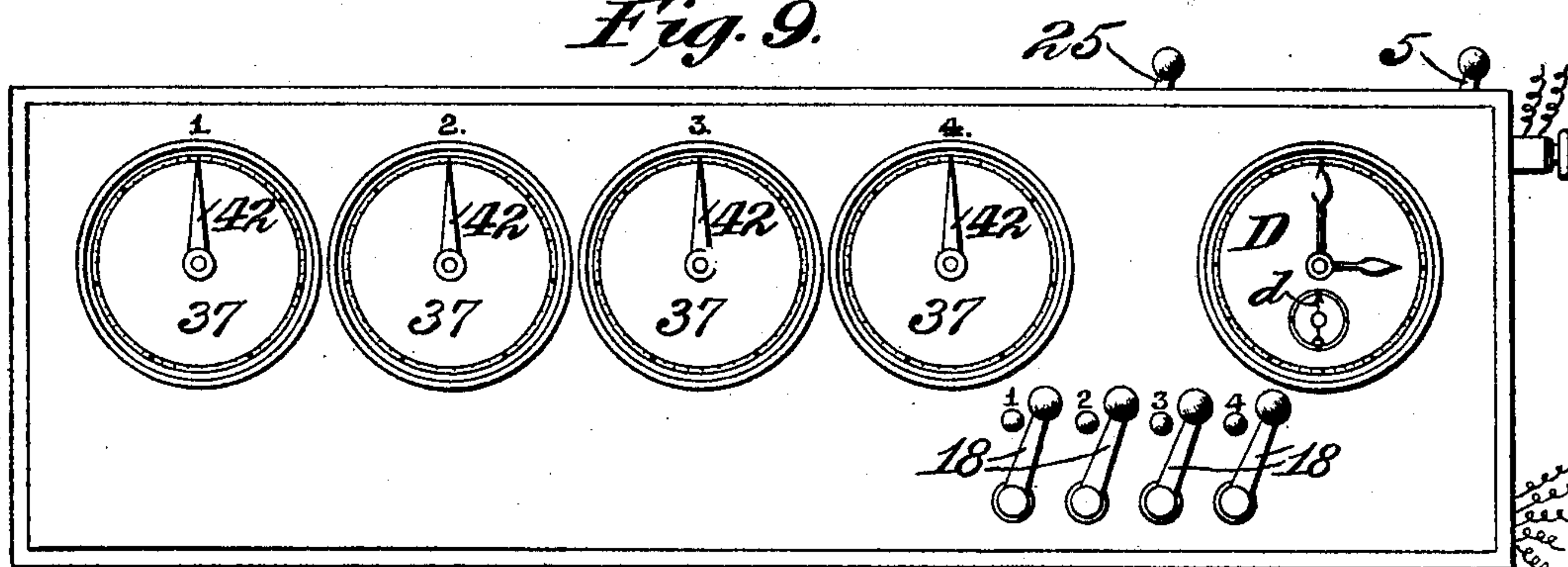


Fig. 9.



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Inventor:

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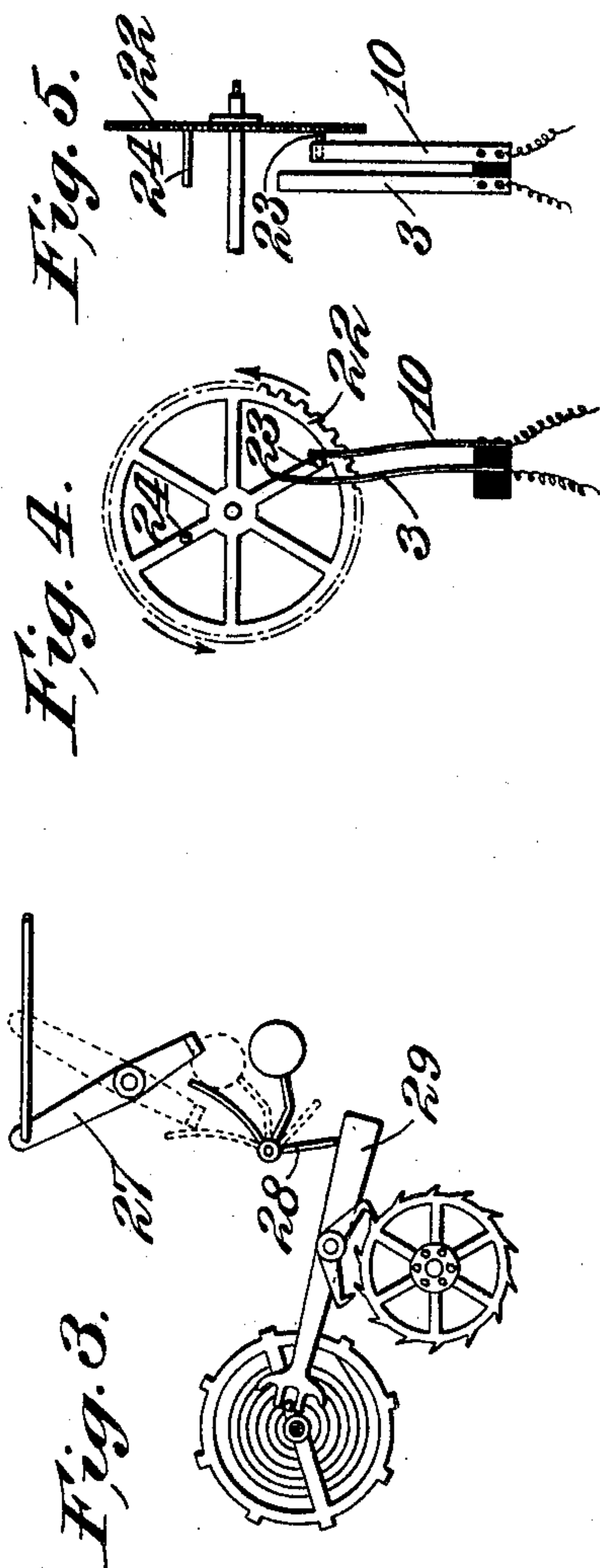
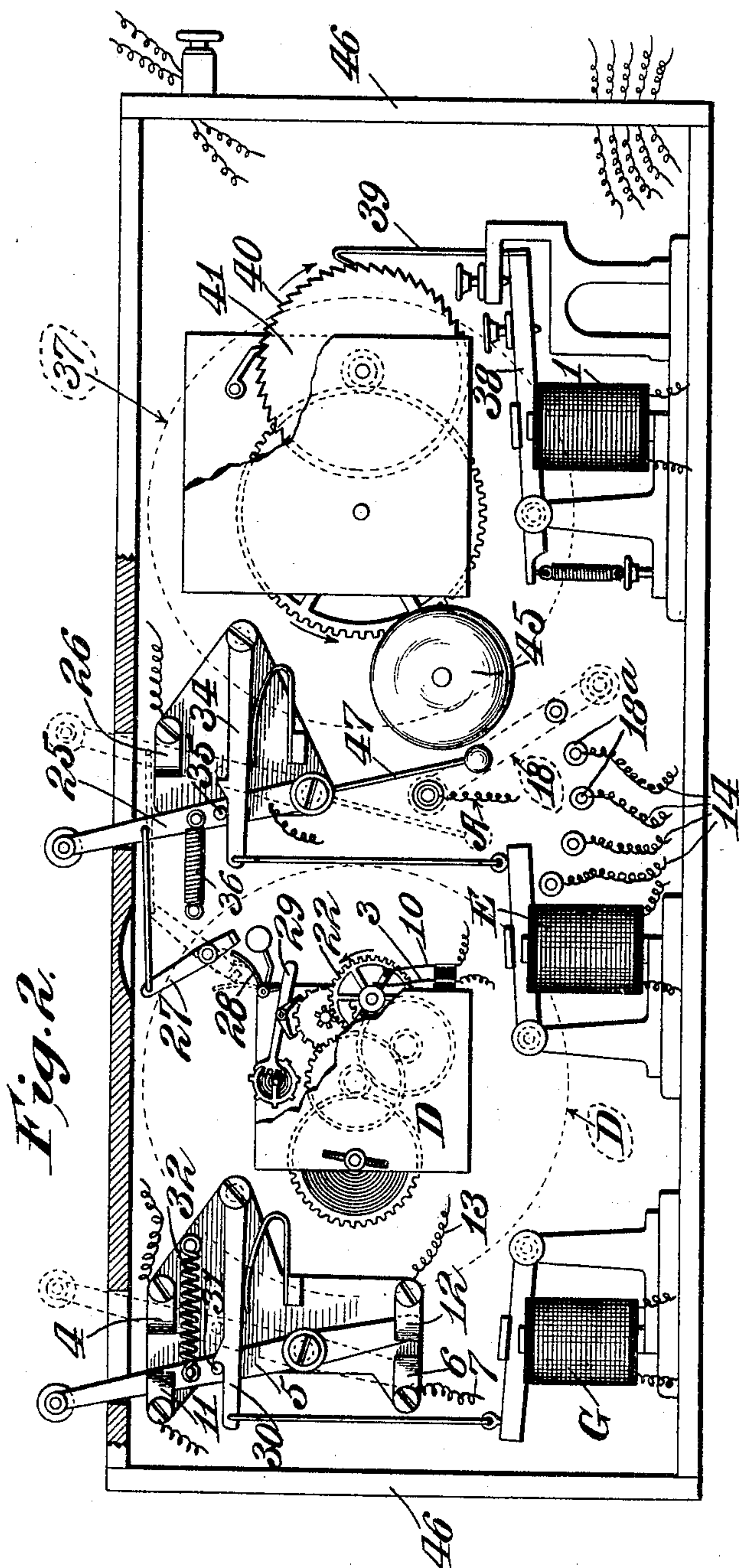
No. 795,361.

PATENTED JULY 25, 1905.

M. J. McDONNELL.
SPEED INDICATOR.

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4 SHEETS—SHEET 2.



Witnesses:

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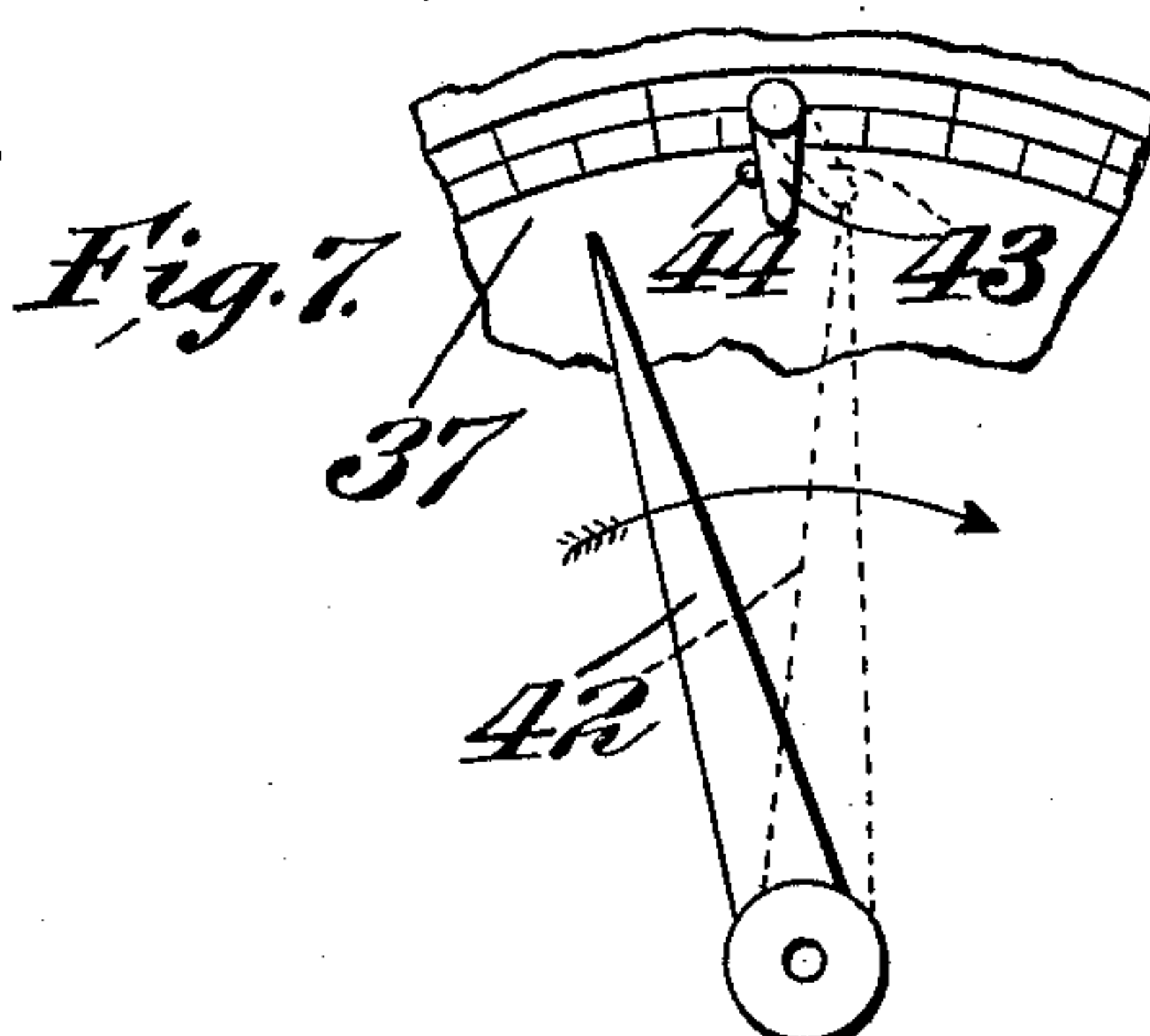
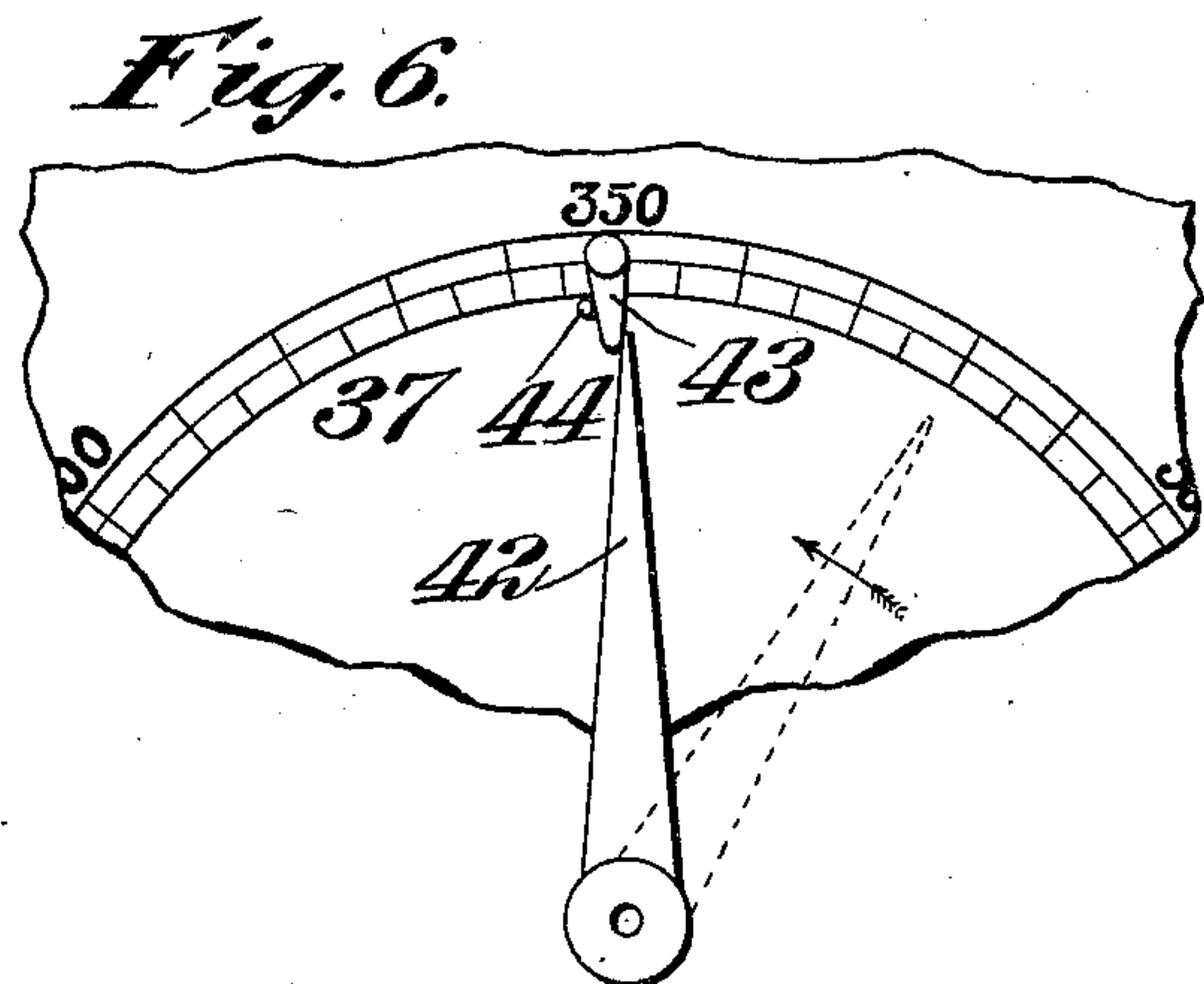
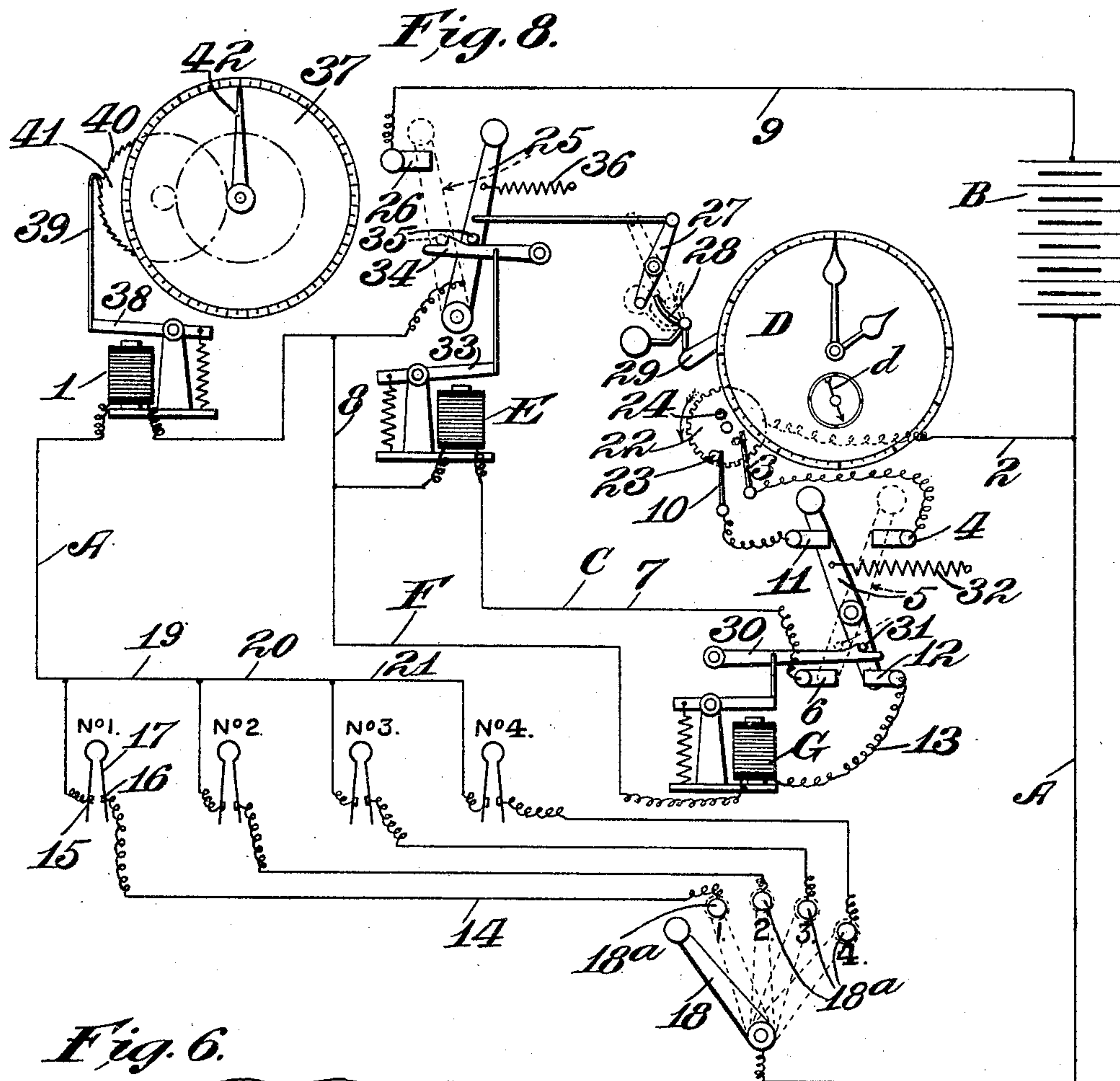
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4 SHEETS—SHEET 3.



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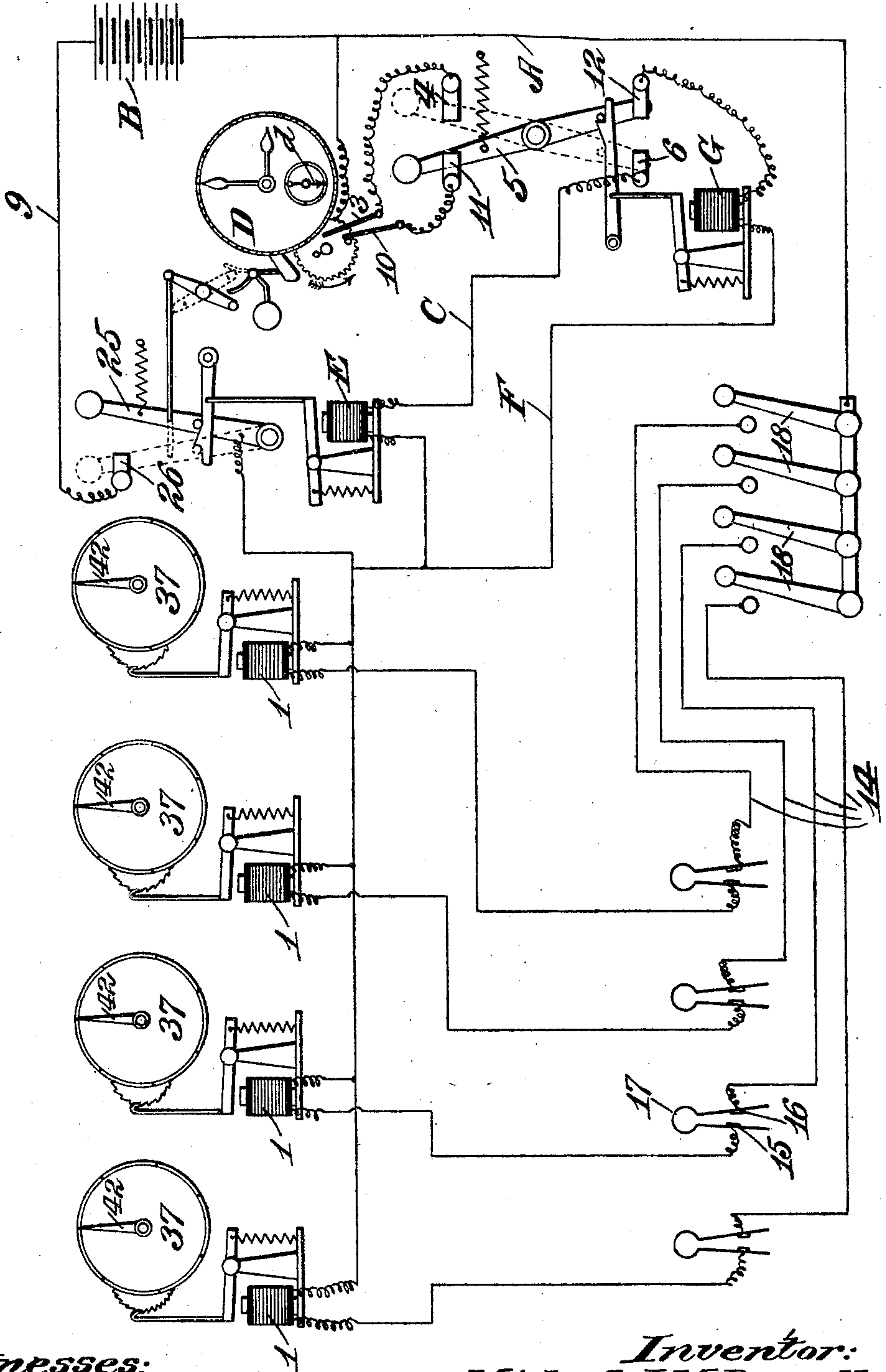
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4 SHEETS—SHEET 4.

Fig. 10.



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UNITED STATES PATENT OFFICE.

MICHAEL J. McDONNELL, OF ST. LOUIS, MISSOURI.

SPEED-INDICATOR.

No. 795,361.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed April 8, 1905. Serial No. 254,503.

To all whom it may concern:

Be it known that I, MICHAEL J. McDONNELL, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Speed-Indicators, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view in elevation of an indicator constructed in accordance with my invention and illustrated as being applied to a reciprocatory engine. Fig. 2 is a view in elevation of the mechanism within the indicator-casing. Fig. 3 is a detail view of the escapement and starting and stopping mechanism for the time-motor and clock. Fig. 4 is a view in elevation of the circuit-closing wheel and two of the terminals of one of the circuits. Fig. 5 is an edge view of the wheel, two pairs of terminals being shown in elevation. Fig. 6 is a fragmentary view of one of the indicator-dials, the indicator-hand being shown at zero. Fig. 7 is a similar view with the indicator-hand in a position prior to engaging the stop at zero, said hand being shown in dotted lines as about to pass the stop. Fig. 8 is a diagrammatical view of the circuits and the mechanism utilized in my invention. Fig. 9 is a modified form of the indicator, and Fig. 10 is a diagrammatical view of the arrangement of circuits used in connection with an indicator similar to the one illustrated in Fig. 9.

This invention relates to an indicator for indicating the pulsations of a motor, and it is particularly designed to indicate the number of revolutions of a shaft or the reciprocations of a piston during a given time.

The invention is also applicable to steam-locomotives whereby the speed of the train may be ascertained; but in order to illustrate one application of the invention I have shown it as applied to a steam-engine of the reciprocatory type.

The circuit designated by the reference-letter A is the indicator-circuit and is energized from a battery or other source of electrical energy B. The circuit A is provided for the purpose of conducting the current to the indicator-motor 1. The circuit C receives its source of energy from the battery B, through the conductor 2, through a part of the time-indicator or clock D, through a contact 3 to a switch-contact 4, through the switch-lever 5

to the switch-contact 6, through the conductor 7, thence through the motor E, through the wire 8, when it is shunted into the circuit A, and back to the source of energy B, through the conductor 9 of the circuit A. A third circuit (designated by the reference-letter F) is energized from the battery B, through the wire 2, through a contact 10, through a switch-contact 11, through the switch-lever 5, through a switch-contact 12, through the conductor 13, thence through the motor G, through the wire 8, thence through a switch-lever in the circuit through the wire 9 back to the battery B.

The circuit A is provided with a circuit-closer and breaker in the path of the conductor 14, which closer and breaker is illustrated as two resiliently-connected contacts 15 and 16, insulated by the spring element 17. A switch 18 is also provided for the circuit, which is movable onto and off a contact 18^a.

In a plant where it would be desirable to know the pulsations or number of movements of the actuating element of a motor—for example, its piston—a single conductor 14 is employed; but where a plurality of motors are to be tested a corresponding number of additional conductors similar to the one 14 may be shunted into the primary circuit A by the shunts 19, 20, and 21, the number of shunts being proportionate to the number of motors.

In actual practice the test is usually made for the period of one minute, and the present apparatus is arranged to make the test for this period, and to this end the clock D is provided with a circuit-closing wheel 22, having contact-pins 23 and 24 thereon, the pin 23 closing the contacts for the circuit F, while the pin 24 closes the contacts 3 of the circuit C, it being understood that the conductor 2 is connected to the wheel 22 in any well-known manner. Suppose it is desired to register the reciprocations of a motor such as is illustrated in Fig. 1 and assuming that the motor is in that part of the circuit A including the first contact 18^a, the switch 5 will be thrown into a position indicated in full lines in Fig. 8. The switch 25 will then be thrown into engagement with the contact 26, so as to cause the circuit A to be completed when the contacts 15 and 16 meet, and in moving the lever 25 into engagement with the contact 26 the clock-starting mechanism, comprising the pivoted lever 27 and the weighted lever 28, will be actuated, so that the depending portion of the lever 28 will be lifted from the escape-

ment-lever 29 of the clock mechanism D, so as to permit a free swing of the lever 29, in which event the clock mechanism will be started. The clock-gearing will continue to actuate in the usual manner until the pin 23 comes in contact with the contacts 10, so that the current will flow from the battery B through the wheel 22 and through the circuit F, causing the armature of the motor G to move downwardly, at the same time pulling the latch 30 out of engagement with the pin 31 on the lever 5, so that the spring 32 will move the lever out of engagement with the contacts 11 and 12 and move it into engagement with the contacts 4 and 6, so that the circuit F will be broken and the circuit C will be closed as soon as the pin 24 comes in contact with the contact 3. The closing of the circuit C will energize the coil of the motor E to pull down the armature 33, which is connected to the latch 34 in engagement with the pin 35 on the lever 25, and as soon as the latch 34 is pulled out of engagement with the pin 35 on the lever 25 the spring 36 will pull the lever 25 off the contact 26 and break the circuit A. It is to be assumed, of course, that the indicator designated by the reference-numeral 37 is being actuated during the whole time that the wheel 22 is making a half-revolution. This will follow owing to the fact that each time the projection H engages the circuit-closer comprising the elements 17 and the contacts 15 and 16 the circuit A is closed and the motor 1 is energized, so as to pull down the armature 38, so that the hooked projection 39 thereon will engage with the ratchets 40 of the wheel 41. It is contemplated to arrange the ratchet 40 so that each time it is actuated by the motor 1 the indicator-pointer 42 will move one space over the dial of the indicator 37. Thus it will be seen that when the parts are in their operative positions the first thing that is necessary is to move the lever 5 in the position shown in full lines in Fig. 8 and that at the proper time the circuit G will be closed, which will usually be when the seconds-hand *d* of the clock D is on the half-minute. At the precise instant that the pin 23 contacts with the contact 10 the lever 5 will be automatically thrown into position shown in dotted lines in Fig. 8, so as to break the circuit F, during which time the clock mechanism will continue to operate and the indicator-motor 1 will operate each time that the circuit A is closed and broken. The operations of the clock and the indicator will continue until the pin 24 contacts with the contacts 3, so as to close the circuit C, and thereby break the circuit A in the manner heretofore described. In order to determine the number of movements made by the actuating part of the motor, it will only be necessary to refer to the dial of the indicator 37. In high-speed motors it is possible that the number of revolutions of the actuating part will exceed the

number of divisions on the dial of the indicator. In this event the pointer will have described more than a complete circle. It is the purpose of the invention to provide for permitting this and also to provide a stop whereby when the indicator-pointer is turned back it will stop at the proper place. To this end I have provided at the zero-point a pivoted stop 43, having a free movement away from the zero-point, but prevented from a rearward swing by a projection 44, so that the pointer may easily pass by the stop when moving in a forward direction, but will have its movement limited in a rearward direction. If a second, third, or fourth motor, or, indeed, any one of a series is to be tested, it is only necessary to move the switch-lever 18 onto the desired contact of a particular shunt-circuit, in which event the pulsations of the motor will be indicated on the dial.

In the modified form illustrated in Figs. 9 and 10 a separate indicator is shown for each motor, in this particular instance there being four in the series. The operations of the mechanisms are identical with the operations of the mechanisms described in the preferred form, the difference in the arrangement being that separate levers 18 are used, one for each indicator-circuit conductor 14.

The preferred form of the appurtenances for the indicator-casing is illustrated in Fig. 2. However, I do not wish it to be understood that I limit myself to the details of construction shown. However, attention is directed to the fact that the starting and stopping lever 28 for the clock mechanism is arranged so that when the clock mechanism is stopped the balance-spring controlling the escapement-lever is under tension. The advantage of this is that as soon as the pressure is relieved from the escapement-lever the tendency of the balance-spring to relieve the tension thereon will cause the escapement-lever to rise and the starting of the clock mechanism will be insured.

Another detail to which attention is called and which I find of advantage is that I provide an audible signal, illustrated as a bell 45, within the casing 46, so that when the circuit A is broken the bell will receive a blow from a tappet 47 on the lever 25, so that the sounding of the audible signal will indicate that the test has ceased.

Attention is directed to the fact that the device would be operative with the circuit through 3 and 4 if connected directly to the circuit at 7; but in such a case the switch 25 would have to be held for a short time until the pin 24 passed clear of the contact 3. However, by including the pin 23 with the other accessories the entire device will be automatic, and to start the same it will only be necessary to close the switch 18. While the device might be used without the inclusion of the pin 23 and its other accessories, I prefer to employ

the automatic arrangement, so as to insure absolute accuracy as to timing and indicating speed.

From the foregoing description it will be apparent that the indicator may be utilized for determining the number of movements of many different bodies or elements having a succession of regular movements, and while I have described it as being particularly applicable to use on motors a test may be made of other moving bodies having regular reciprocatory or rotary movements. I therefore do not desire to limit myself to the application of this device to any particular machine or part of a machine, but reserve the right to apply it wherever it is applicable.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a device for registering the pulsations of motors, the combination with an indicator-circuit and an indicator in the path thereof, of a source of energy for the circuit, a time mechanism, a circuit therefor in multiple with the indicator-circuit, means controlled by the time mechanism for automatically making and breaking the time-mechanism circuit, and means in the indicator-circuit for momentarily closing the indicator-circuit during each pulsation of the motor; substantially as described.

2. In a speed-indicator for registering the number of pulsations of a motor, the combination with a circuit and its source of energy, of an indicator mechanism in said circuit, a circuit closer and breaker 15 in said circuit for intermittently making and breaking the circuit, a clock mechanism, a circuit therefor, and means operable by the clock mechanism for breaking the first-named circuit; substantially as described.

3. The combination with an indicator-circuit, of an indicator mechanism therefor, means for intermittently making and breaking the circuit, a second circuit, means for automatically closing the second circuit, means for automatically breaking the second circuit, and means within the second circuit for breaking the first-named circuit when the second circuit is closed; substantially as described.

4. The combination with an indicator-circuit, an indicator mechanism therein, a source of energy for the circuit, a switch in the circuit, means for intermittently breaking and making the circuit, a time mechanism, means for stopping the time mechanism when the switch is open, and means for automatically opening the switch; substantially as described.

5. The combination with an indicator and an electromotor for actuating the indicator, of a circuit for said motor and having a source of energy, a switch in the circuit, a clock mechanism, electrically-operated devices coöperating with the clock to cause the switch to break the first-mentioned circuit, and means coöper-

ating with said switch to stop the clock mechanism when said switch is open; substantially as described.

6. The combination with a circuit, of an indicator mechanism therein, a switch in said circuit, a motor for permitting the opening of said switch, a source of energy for said motor including a circuit, a motor in the second-mentioned circuit, a switch controlled by said motor for making and breaking the second-mentioned circuit, and a third circuit for controlling the second-mentioned motor; substantially as described.

7. The combination with a circuit, of an indicator in said circuit, a switch for automatically breaking the circuit, a motor, a latch operable by the motor and for normally holding the switch in a closed position, a circuit for said motor, and means for automatically closing said last-mentioned circuit; substantially as described.

8. The combination with a circuit, of an indicator in said circuit, a switch for automatically breaking the circuit, a motor, a latch operable by the motor and for normally holding the switch in a closed position, a circuit for said motor, and a time mechanism for normally closing said last-mentioned circuit; substantially as described.

9. The combination with a circuit, a source of energy therefor, a motor in said circuit, a switch for breaking said circuit, means for intermittently making and breaking said circuit, a latch for holding the switch in a closed position, means for operating the latch to permit the switch to move to an open position, a clock mechanism for controlling said means, and a stop mechanism coöperating with the switch for stopping the clock mechanism when the switch is open; substantially as described.

10. The combination with an indicator mechanism, of a circuit therefor, means for intermittently making and breaking said circuit, a switch 25 movable onto and off the contact 26, a latch for normally holding said switch on the contact 26, means for moving said switch off the contact 26 when the latch is released, means for releasing said latch, a clock mechanism having electrical connection with said means, and a clock-stopping mechanism connected to the latch 25 to stop the clock mechanism when the switch 25 is off the contact 26; substantially as described.

11. The combination with a circuit, of a source of energy for said circuit, an indicator mechanism in said circuit, means for breaking said circuit, a plurality of shunts connected to said circuit, a switch 18 for throwing in one of the shunts in circuit with the circuit, means in each shunt for intermittently making and breaking the circuit, a clock mechanism, and means coöperating with the switch for stopping the clock mechanism when the circuit is broken; substantially as described.

12. The combination with a primary circuit

and its source of energy, of an indicator mechanism for actuation by said circuit, means for intermittently making and breaking said circuit, a switch for breaking said circuit, a motor for normally preventing movement of the switch, a secondary circuit for actuating the motor, and a clock-actuated switch for closing the secondary circuit; substantially as described.

13. In an indicator for registering the pulsations of a motor, the combination with a primary circuit, a source of energy for said circuit, an indicator in said circuit, means comprising the member 15 for intermittently making and breaking said circuit, a switch remote from said means and for breaking the circuit, a clock mechanism, and means for stopping the clock mechanism when the switch is open; substantially as described.

14. The combination with a primary circuit, a source of energy for said circuit, an indicator in said circuit, means for intermittently making and breaking said circuit, a switch remote from said means and for breaking the circuit, a clock mechanism, and means actuated by the switch for engagement with the escapement-lever to stop the clock when the switch is open, said means in its closing position engaging the escapement-lever to hold the balance-spring of the clock under tension, whereby the release of the stopping means will permit the spring to impart an initial

movement to the escapement-lever to start the clock; substantially as described.

15. The combination with a circuit, an indicator therein, a source of energy for the circuit, means for making and breaking the circuit, a second means for breaking the circuit comprising a switch, means for automatically opening the switch, and an audible signal for indicating when the switch is open; substantially as described.

16. In a device for indicating the speed of motors, the combination with an indicator, of means for actuating the indicator, a clock mechanism for governing the duration of the time the indicator may be actuated, means controlled by the clock for engagement with the escapement-lever to stop the clock, said means in its closing position engaging the escapement-lever to hold the balance-spring of the clock under tension whereby the release of the stopping means will permit the spring to impart an initial movement to the escapement-lever to start the clock; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 5th day of April, 1905.

MICHAEL J. McDONNELL.

Witnesses:

B. F. FUNK,

GEORGE BAKEWELL.