W. V. MOAK.

THREE POSITION SIGNAL.

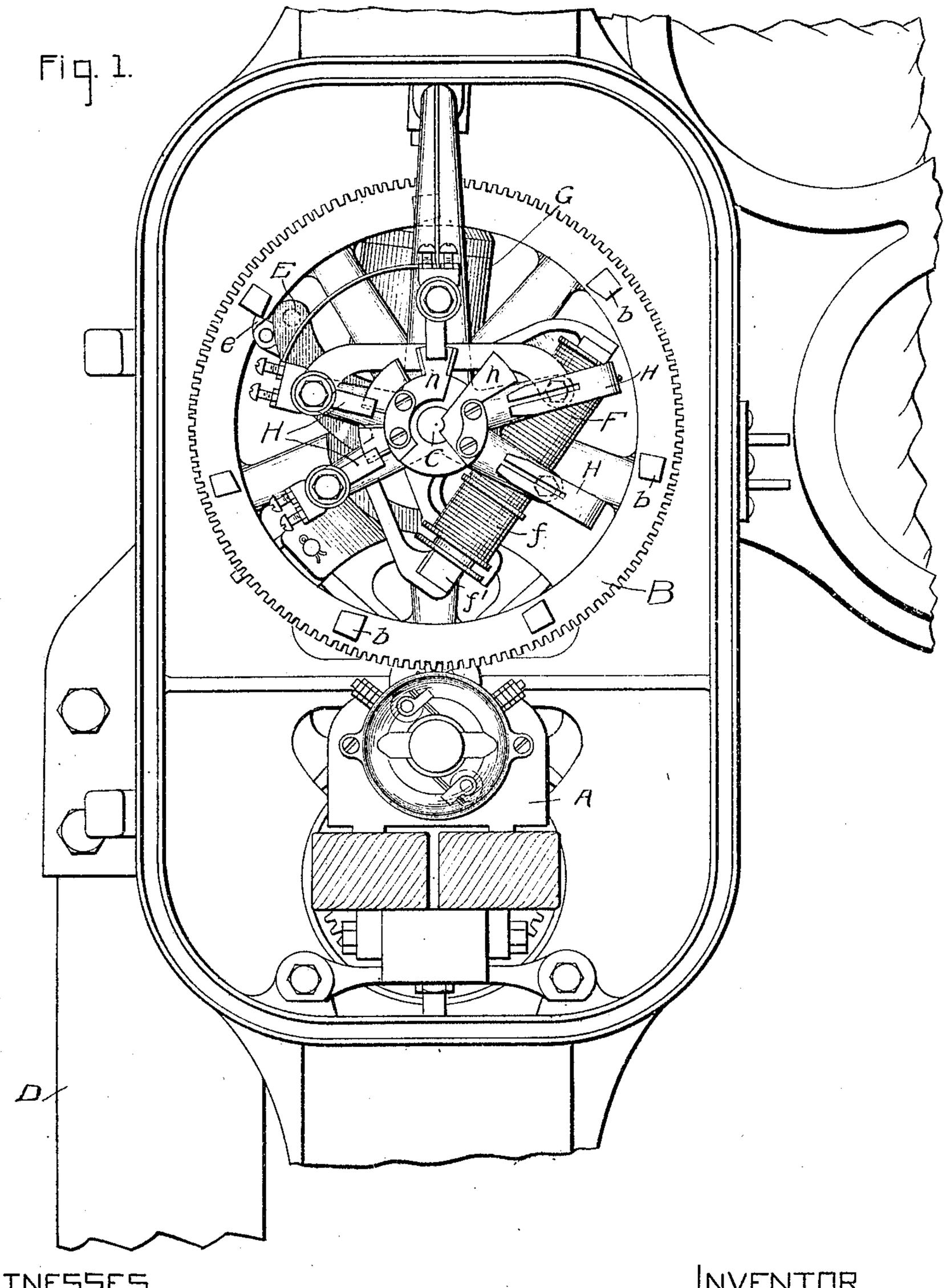
APPLICATION FILED SEPT. 25, 1908.

919,450.

Patented Apr. 27, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

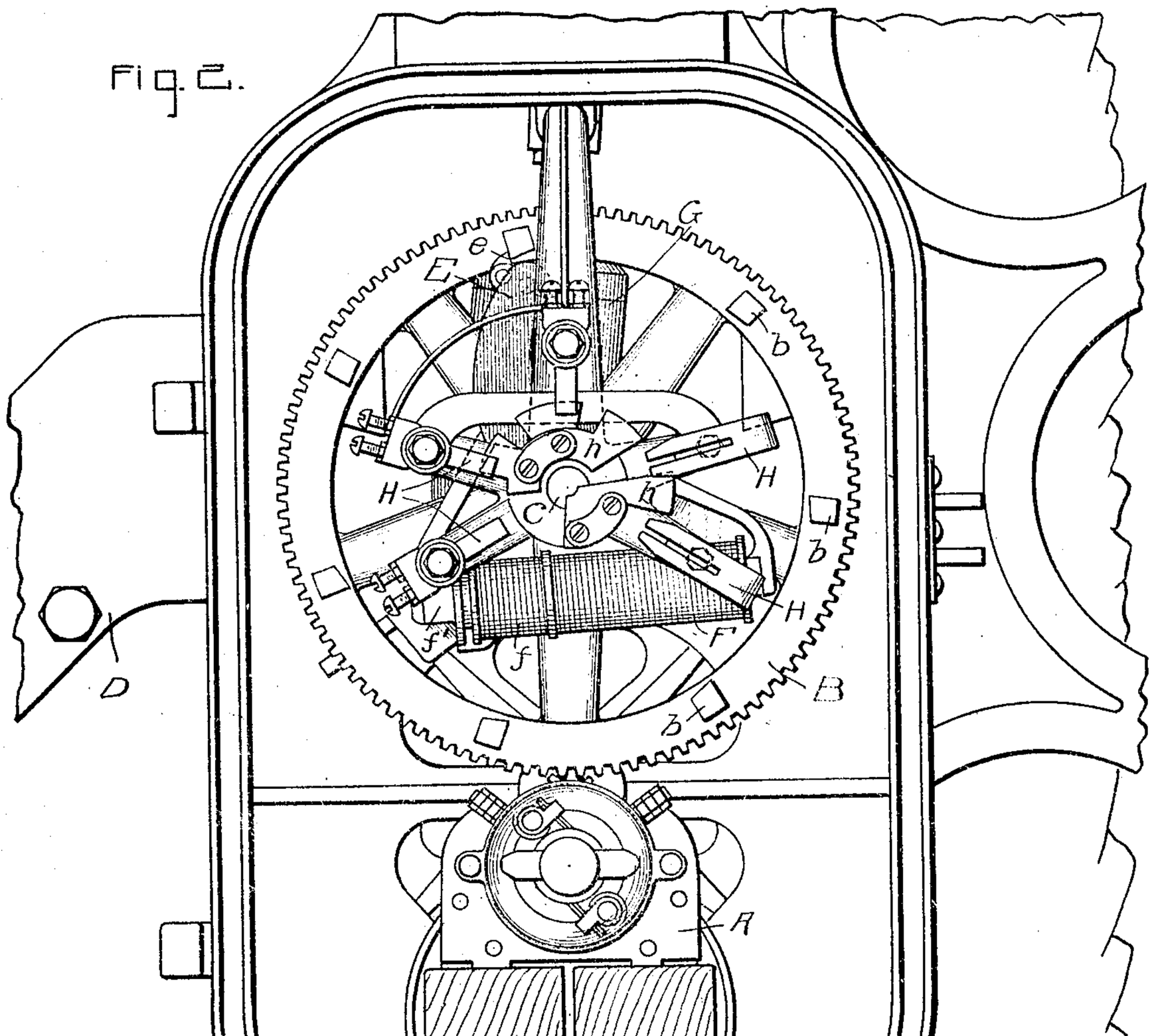
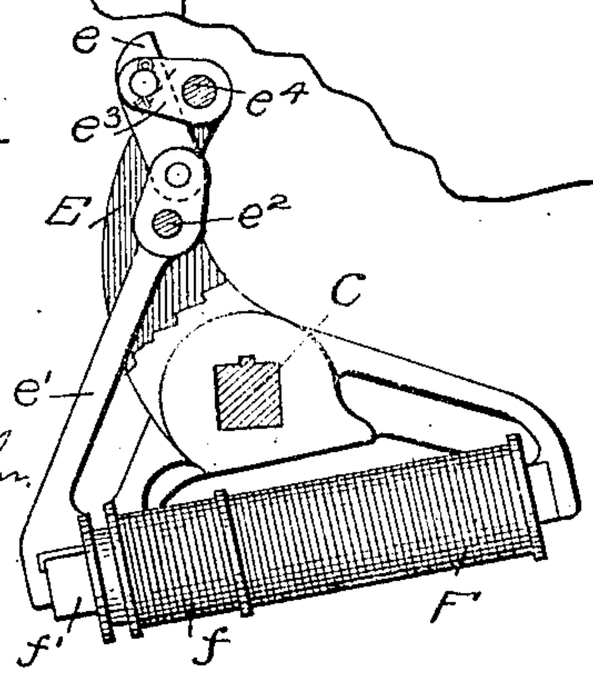


Fig. 4.



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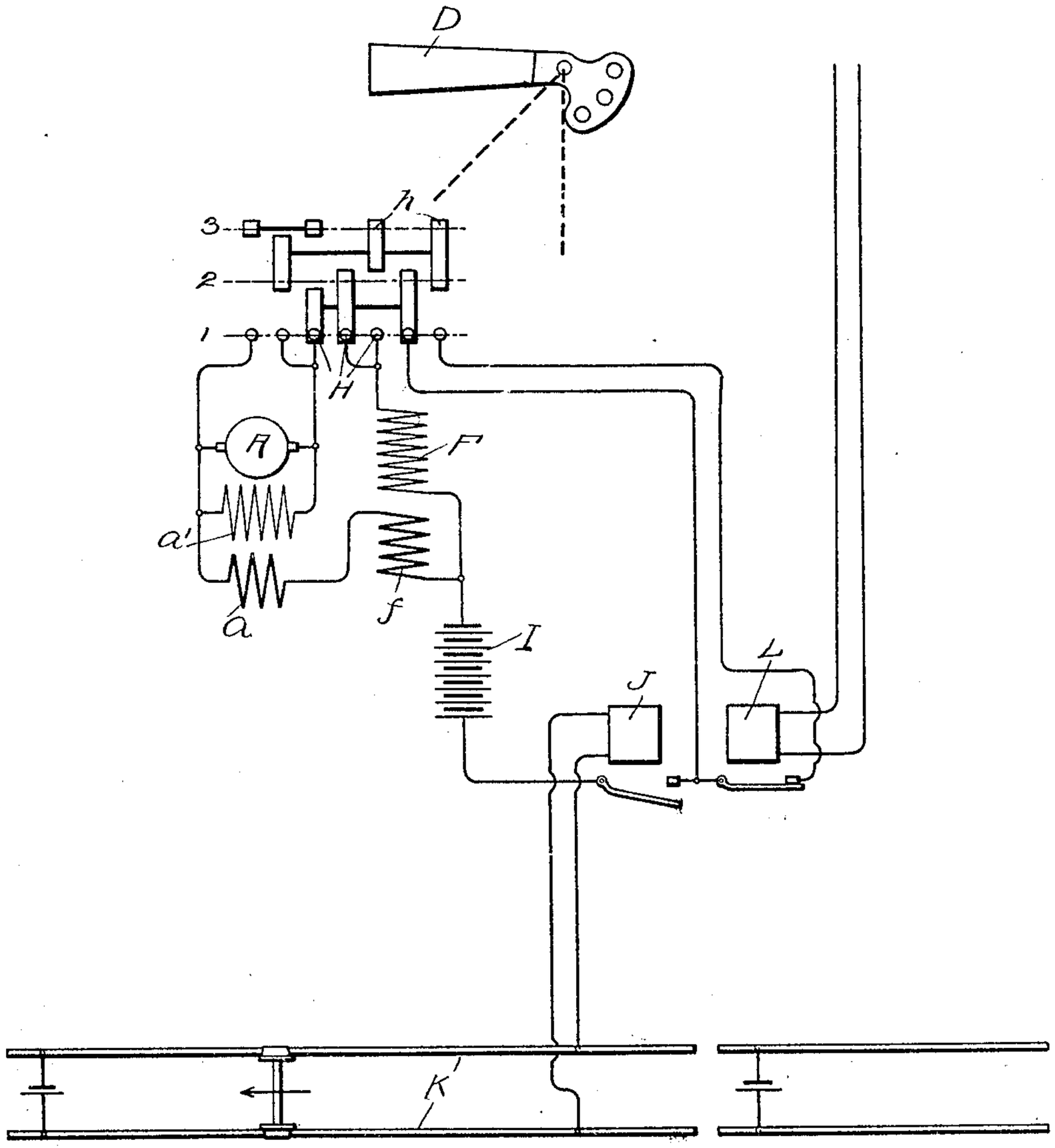
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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THREE-POSITION SIGNAL.

No. 919,450. Specification of Letters Patent. Patented April 27, 1909.

Application filed September 25, 1908. Serial No. 454,805.

To all whom it may concern:

Be it known that I, WILLIAM V. MOAK, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Three-Position Signals, of which the following is a specification.

My invention relates to three-position semaphore signals, and its object is to produce a signal of this character, which is reliable, simple and efficient.

Three-position signals are well known in the art, but those which have been in commercial use heretofore, so far as I am aware, have employed separate magnet coils for clutching the motor to the semaphore arm to drive it, and for holding the semaphore arm at clear and caution positions. There is another type of signal in which a single magnet performs the function of clutching the motor to the arm, and of holding the arm in position after the motor circuit has been opened; but this type of signal has not heretofore been well adapted to three-position operation for the following reasons. It is desirable that a signal should be able to return from clear to caution position, and stop there, without first going to danger position, so that the clutch or slot magnet should be able to release the semaphore arm at clear position and stop it when it has reached caution position. If the arm is permitted to fall rapidly from clear position by gravity, the amount of power required to stop the signal at caution position is much greater than that required to hold the signal in clear or caution position, so that it has heretofore been necessary either to make the clutch or slot magnet much stronger than is necessary for holding the signal in position, which wastes power, or to make the movement of the signal from clear to danger quite slow, at least while moving through caution position, which is sometimes objectionable from an operating standpoint.

By my invention I am enabled to make the retardation of the signal, when moving by gravity, no greater than in the usual two-position signal, and at the same time to avoid any increase in the amount of current consumed by the slot magnet when holding the signal at clear or caution. I accomplish this by providing means for momentarily increasing the strength of the slot magnet above normal for stopping the arm before it reaches danger position in moving from clear to caution.

It has been often customary heretofore to provide the slot magnets for signals with auxiliary coils which are connected in series with the motor circuit, so as to make the slot magnets stronger while the motor is driving the semaphore arm. I utilize this same arrangement, to increase momentarily the strength of the slot magnet to catch the signal at caution, by so spacing the stops, which are engaged by the catch controlled by the slot magnet, that in dropping from clear to caution position the semaphore arm passes slightly beyond caution position, so that the motor circuit is momentarily closed. This results, first, in strengthening the slot magnet above normal, so as to enable it to stop the signal, and secondly in energizing the motor to cause it to make the few revolutions necessary for returning the arm to caution position. Since three-position signals are ordinarily operated with 45° displacement between caution and each of the other two positions, a rotary slot mechanism with seven stops is well adapted for giving the desired result. In dropping back from one stop to the next, in moving from clear to caution, the semaphore arm moves through approximately 51½°,—that is, 6½° beyond caution position; and this movement is sufficient to close the motor circuit with the results above described.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 shows an elevation of a signal mechanism for a three-position signal arranged in accordance with my invention, the semaphore arm being shown at clear position; Fig. 2 shows a similar view with the semaphore arm in caution position; Fig. 3 is a diagram of circuit connections; and Fig. 4 is a detail view of the slot mechanism.

In the drawings, A represents an electric motor, which drives through suitable speed-reducing gearing a gear wheel B, which serves as a driving member for the semaphore arm, and is loosely mounted on the shaft C, to which the semaphore arm D is secured. This drive-wheel is provided with a series of pins or stops *b*, which are evenly

spaced, and, in the arrangement shown, seven in number.

E represents an arm which is fast to the semaphore shaft C, and which carries a slot or clutch mechanism comprising a pawl or catch e, adapted to be moved into and out of the path of the stops b on the drive-wheel.

The construction of the slot mechanism is best shown in Fig. 4. F represents the main winding of the slot magnet, which is provided with auxiliary coils f, which are connected in the motor circuit. The armature f^1 is carried at the end of a lever e^1 pivoted on the arm E at e^2. The short arm of the lever e^1 is pivotally connected to one end of the pawl or catch e, which is supported on a link e^3 pivoted at e^4 on the arm E. As long as the slot magnets are energized, the catch e is held in the position shown. If the slot magnets are deënergized, the pressure of the catch e on the pins b rocks the lever e^1, so as to move the armature f^1 away from the magnet poles, and to permit the withdrawal of catch e from the path of the pins b. G is the usual dashpot. H represents fixed contacts which engage contact segments h on the semaphore shaft and control the circuits of the motor and clutch magnets.

Since the pins b are seven in number, and equally spaced, they are separated by an arc of about $51\frac{1}{2}°$. Therefore, if the signal stands in clear position, as shown in Fig. 1, and the slot magnet is deënergized, the signal arm must move $51\frac{1}{2}°$ to bring the catch e into engagement with the next pin or stop b. The contacts H and h are so arranged that the motor circuit is closed when the semaphore arm has moved approximately or a little over 45°, so that both the motor and the series slot coils will be energized when the catch e engages the next pin b, so that the strength of the slot magnet will be increased above normal, and the motor will operate sufficiently to return the drive-wheel a few degrees, so as to break the motor circuit and leave the semaphore arm in caution position, as shown in Fig. 2. If the signal is to pass from clear to danger position, the slot magnet is, of course, not energized when caution position is reached, so that the catch e simply slides over one pin b without resistance. In order to prevent a hammering of the armature f^1 on the poles of the slot magnet, when the catch e passes over a pin in this manner, the inner surfaces of the pins b are beveled, as shown, so that though the outward movement of the armature f^1 is rapid, the return movement is much slower. The outer face of the pawl e, sliding along the inner surface of the pin which it is passing, allows the armature f^1 to return gently against the poles of the slot magnet.

A suitable arrangement of the control circuits for the signal is shown in Fig. 3. The motor A is shown provided with a main series field a and an auxiliary shunt field a^1, which is used only for electric braking on reaching clear position. The main shunt and auxiliary series windings of the slot magnet are indicated by F and f, respectively. In order to make the diagram plain, the stationary contacts H and movable contact segments h are shown developed on a plane surface. The positions of the tacts for the different positions of the signal are indicated in dotted lines, which for danger, caution and clear positions, are numbered 1, 2 and 3, respectively. I represents the battery for supplying current to the motor and slot magnet. J represents the track relay connected to the rails K of a block. L represents the line relay controlled by the signal of the block in advance.

With a train in the block, as indicated in the diagram, the track relay J is deënergized, and the signal stands at danger. When the train passes into the next block, deënergizing the line relay L and energizing the track relay J, a circuit is closed from the upper terminal of battery I, through the series slot winding f, series field a, motor armature A, contacts H, and armature of track relay J, to the lower terminal of the battery. The circuit of the main slot winding F is also closed across the battery through the contacts H and armature of track relay J. The motor consequently starts and drives the signal toward caution position. When caution position is reached, the motor circuit is opened, while the main slot winding F remains energized to hold the signal at caution. When the train proceeds out of the block in advance, the line relay L is again energized and the motor circuit is again closed through the armatures of the track relay and line relay in series. In moving from caution to clear position, the circuit of the main slot winding F is also shifted, so as to make it include the armature of the line relay L. When clear position is reached, the motor is disconnected from the battery, and its armature is short-circuited, so that the motor acts as an electric brake to stop the signal. Now, if a train, after having left the block in advance, should back into it again, so that the semaphore arm D should return from clear to caution position, the line relay L is deenergized, opening the circuit of the main slot winding F. This circuit is again closed through the contacts H and armature of track relay J, before reaching caution position. The catch carried by the semaphore arm does not, however, engage a stop on the drive-wheel until the semaphore arm has passed a few degrees beyond caution position, so that the motor circuit is again closed. The series slot winding f is thus fully ener-

gized at the time the signal is stopped, and the motor makes a few revolutions to return the arm to caution position, when the motor circuit is again opened by the contacts H.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A three-position semaphore signal, comprising an electric motor, a driving member driven by the motor, a semaphore arm, means for clutching said member to said arm to drive it from danger to caution and to clear and to hold said arm at caution or at clear and for unclutching said arm to permit it to move from clear to caution and to danger, an electromagnet controlling said means, and means for increasing the strength of said electromagnet above normal for stopping said arm before it reaches danger position in moving from clear to caution.

2. A three-position semaphore signal, comprising an electric motor, a driving member driven by the motor, a semaphore arm, means for clutching said member to said arm to drive it from danger to caution and to clear and to hold said arm at caution or at clear and for unclutching said arm to permit it to move from clear to caution and to danger, an electromagnet controlling said means, a winding on said electromagnet which is deënergized when the arm is being held at clear or caution, and contacts and connections arranged to energize said winding to strengthen said magnet to stop said arm before it reaches danger position in moving from clear to caution.

3. A three-position semaphore signal, comprising an electric motor, a rotary driving member driven by the motor, a semaphore arm, a series of stops and a catch movable into and out of engagement with said stops, said stops and catch moving one with said driving member and the other with said semaphore arm, an electromagnet controlling said catch, and means for increasing the strength of said electromagnet above normal for stopping said arm before it reaches danger position in moving from clear to caution position.

4. A three-position semaphore signal, comprising an electric motor, a rotary driving member driven by the motor, a semaphore arm, a series of stops and a catch movable into and out of engagement with said stops, said stops and catch moving one with said driving member and the other with said semaphore arm, an electromagnet controlling said catch, a winding on said electromagnet which is deënergized when the arm is being held at clear or caution, and contacts and connections arranged to energize said winding to strengthen said magnet to stop said arm before it reaches danger position in moving from clear to caution.

5. A three-position semaphore signal, comprising an electric motor, a rotary driving member driven by said motor, a semaphore arm, a series of stops and a catch movable into and out of engagement with said stops, said stops and catch moving one with said driving member and the other with said semaphore arm, an electromagnet controlling said catch and having a plurality of windings one of which is in series with the motor, and contacts for closing the motor circuit when said arm has moved approximately forty-five degrees in passing from clear to caution, said stops being separated by more than forty-five degrees but less than ninety, whereby the arm in moving from clear to caution passes beyond caution position and the motor circuit is closed to strengthen said electromagnet for stopping the arm and to energize the motor for returning the arm to caution position.

6. A three-position semaphore signal, comprising an electric motor, a rotary driving member driven by the motor, a semaphore arm, a series of stops substantially evenly spaced and seven in number and a catch movable into and out of engagement with said stops successively, said stops and catch moving one with said member and the other with said arm, an electromagnet controlling said catch and having a plurality of windings, one of which is in series with said motor, and contacts for closing the motor circuit when said arm has moved approximately forty-five degrees in passing from clear to caution.

In witness whereof, I have hereunto set my hand this 24th day of September, 1908.

WILLIAM V. MOAK.

Witnesses:

BENJAMIN B. HULL,

MARGARET E. WOOLLEY.