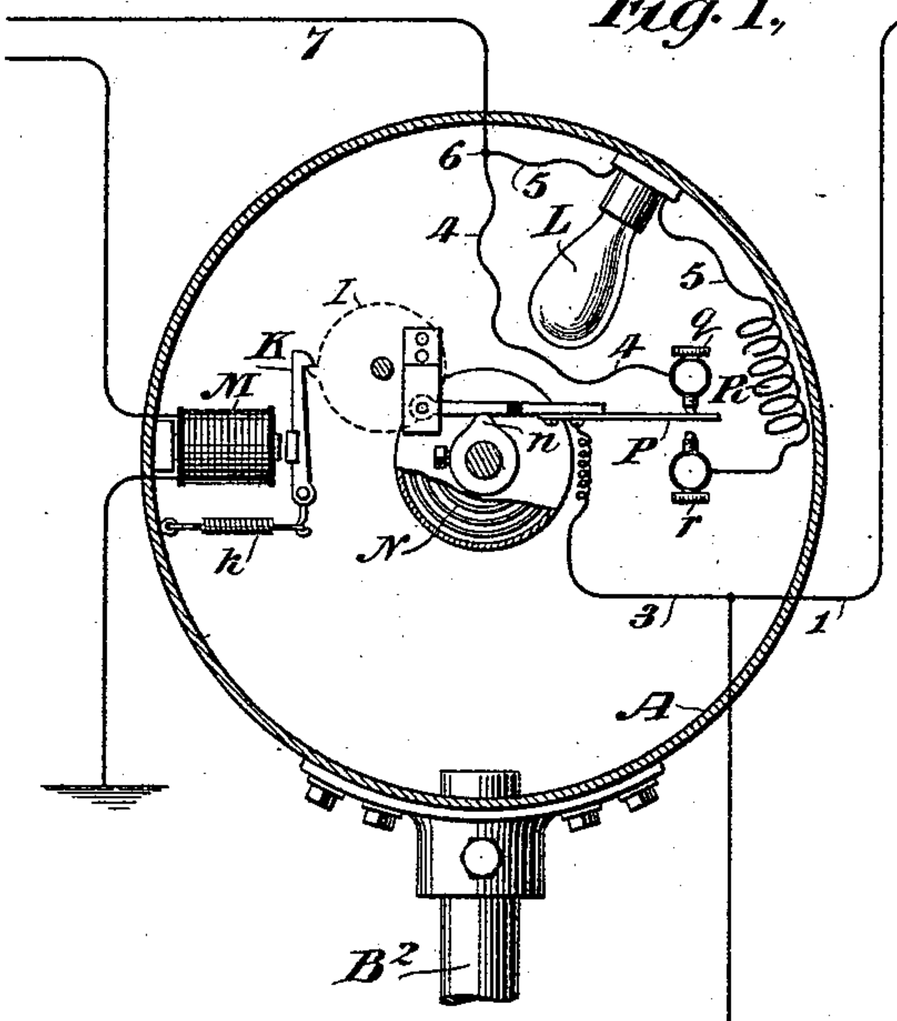
(No Model.) 3 Sheets—Sheet 1.

M. CORRINGTON.

RAILWAY SIGNALING SYSTEM.

No. 528,593. Patented Nov. 6, 1894.

Fig. 1.



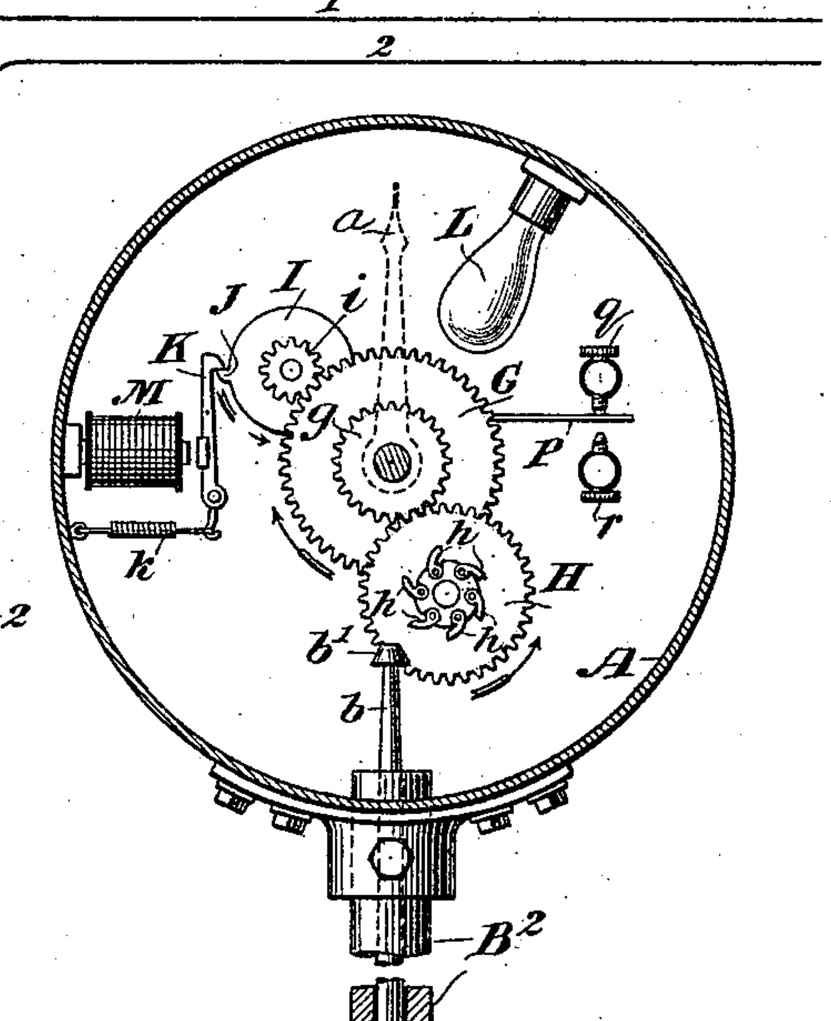


Fig. 4.

Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
Murray Corrington
By his Attorneys
Pope & Rogers

(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

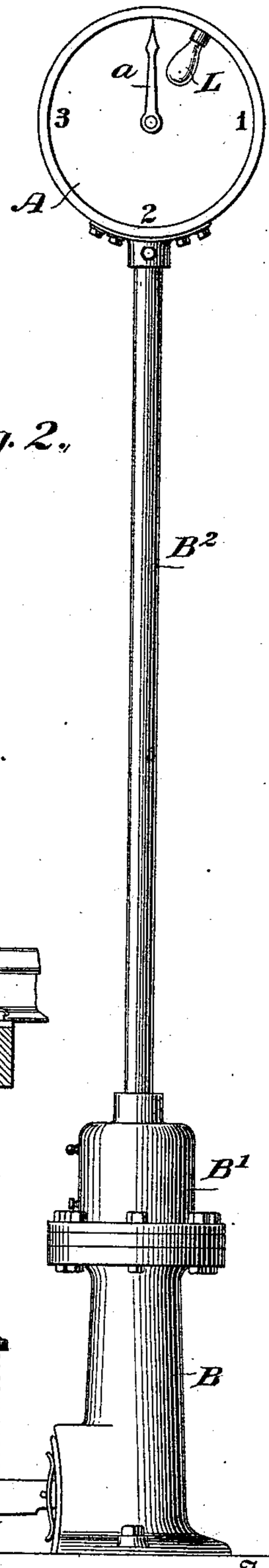
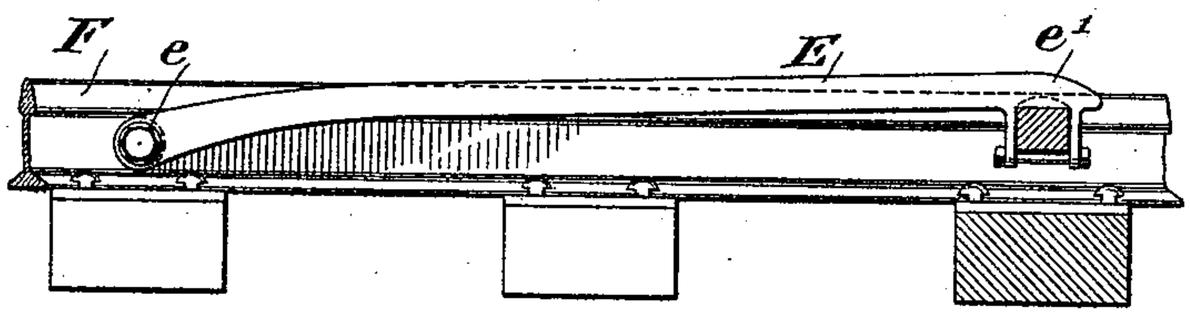


Fig. 3.



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C. E. Ashley
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Murray Corrington
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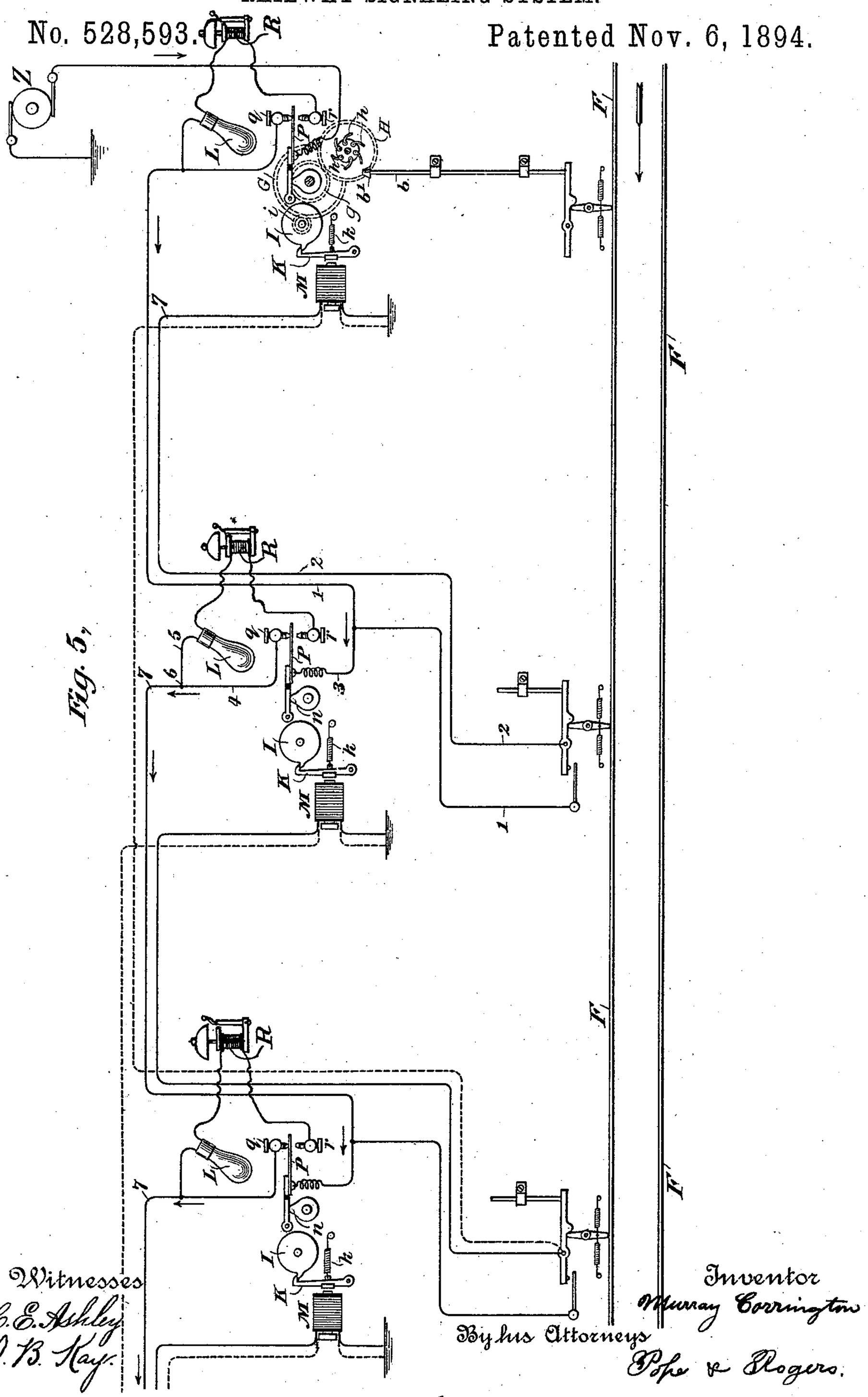

Fig. 5.

Witnesses
C. E. Ashley
J. B. Kay.

Inventor
Murray Corrington
By his Attorneys
Pope & Rogers.

UNITED STATES PATENT OFFICE.

MURRAY CORRINGTON, OF NEW YORK, N. Y.

RAILWAY SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 528,593, dated November 6, 1894.

Application filed December 3, 1891. Renewed July 14, 1894. Serial No. 517,612. (No model.)

To all whom it may concern:

Be it known that I, MURRAY CORRINGTON, a citizen of the United States of America, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Railway Signaling Systems, of which the following is a specification.

My invention relates to an organization of signaling apparatus commonly termed the "block system," the essential feature of which consists in the arbitrary division of the line of a railway into a series of successive sections, of convenient length, according to the necessities of the traffic, at the entrance to and exit from which sections, signaling points are established, such sections being technically termed "blocks." The fundamental principle governing the operation of such a "block system" is that all trains passing in succession in the same direction along the railway shall be so controlled or directed by the indications of the signals exhibited at or near the entrance to each block, that only a single train, or a determinate number of successive trains, as the case may be, shall be permitted to be within the limits of any one section at the same time. When only a single train is permitted within a section, the system is known as an "absolute block system." When two or more trains are permitted to be within the same section at the same time, the system is known as the "permissive block system." Ordinarily, in a block system, a train on entering a section causes a signal to be exhibited at or near the entrance thereof, which indicates its presence within that section, an operation which is termed "setting the danger signal." When the train in question passes out of the opposite end of the section, it reverses the danger signal at the entrance, causing the same automatically to return to its normal position, which is termed "returning the signal to safety." In practice, however, it may frequently happen that it is not desirable to reverse a given danger signal at the entrance of a section, until the train which caused it to be exhibited has passed through two, three, or even more succeeding sections. In such case the organization whereby this plan is carried into effect is known as an "overlapped system."

My invention embraces all the essential features characteristic of each of these three systems, *i. e.*, the "absolute block," the "permissive block" and the "overlapped" system, and is capable of being utilized in connection with, or applied to either, without modification, other than the addition of an independent conducting wire for each additional overlapped block section of a series.

My apparatus may be employed as an "absolute" block for one class of trains, as for instance, passenger trains, and as a "permissive" block for other classes of trains, as freight or merchandise trains.

When operated under normal conditions my apparatus is automatic in its action, but it is nevertheless capable of being operated manually, when required.

In the accompanying drawings I have shown one organization of apparatus suitable for carrying my invention into effect.

In the drawings, Figure 1 is an elevation, partly in section, of a signaling apparatus embodying my invention. Fig. 2 is a side elevation of a signal, signal-post and track-instrument. Fig. 3 is a front elevation of a portion of a track-instrument. Fig. 4 is a detail view, on an enlarged scale, of the apparatus for releasing or reversing a distant signal, and Fig. 5 is a diagram exemplifying the mode of operation of a series of signals according to my invention.

The signal, signal-post and track-instrument illustrated in Figs. 2 and 3, and more in detail in Figs. 1 and 4, is placed in a conspicuous position at or near the entrance of each block or section, at such a height as to be in plain sight of the engine-driver of an approaching train, when about to enter upon the block.

The complete apparatus consists of six principal parts, viz: the visual or other indicator for "absolute block;" the visual indicator for "permissive block;" the track-instrument; the mechanism for controlling and effecting the indications of the respective indicators; the apparatus for reversing one signal by the operation of exhibiting another, or as a sequence of such operation, and the electric illuminator for lighting the visual indicators during the period of occupancy of the block by a train.

In the drawings, A represents a case or box, preferably having a circular face, which is affixed to the top of a suitable post or standard B′ extending upward from a hollow pedestal B which is firmly fixed upon a suitable foundation near the line of the track. The standard B is likewise hollow, to permit the passage of a rod *b*, which has a vertical movement within it, and rests loosely upon the outer end of a rigid lever D, which is mounted upon a fulcrum *d* in a position preferably at right-angles to the track. To the opposite end of the lever D is attached a treadle E, consisting of a rigid bar, lying parallel to and alongside of one of the rails F of the track, one of its ends being pivoted to the rail, or in a fixed relation thereto, as shown at *e*, while the other end is normally raised a little above the top of the rail, as seen at *e′*.

It will be understood, without further detailed explanation, that the weight or impact of each successive wheel of a passing train, will depress the treadle E to the level of the top of the rail, and therefore tend to raise the rod *b* vertically through a corresponding distance. The lever D and treadle E return to their normal position after the passage of each wheel of the train, by reason of the recoil of the spring D′, but the vertical rod *b*, not being fastened in any way to the lever D, tends to return by the action of gravity alone.

I remark that the lever E is not an essential feature of my invention, since it is obvious that the end of the lever D itself may be placed in such proximity to the rail as to be depressed by the direct impact of the wheels of the passing train, but I prefer to employ the lever E in the manner shown in the drawings, in order to avoid the sudden blows and shocks with which the wheels would otherwise strike against the end of the lever D.

In order to carry out the mode of operation contemplated in my invention, I apply to the rod *b* a suitable retarding device, which, although not in the least interfering with the free upward motion of said rod, acts to delay its return, under the action of gravity, to its normal position. Various retarding devices may be applied to effect this purpose, such devices being well-known in the art to which my invention relates. I prefer to use, and have shown in the drawings, a piston C moving air-tight, or nearly so, in a cylindrical chamber formed within the pedestal of the standard B. When the piston C is forced upward, air may be freely admitted beneath it by means of a valve; but the egress of the air, to permit the gradual descent of the piston may be made to take place through a small opening and may be easily regulated to occupy any length of time required for the longest train to pass a given point. As the particular form of retarding device used is wholly immaterial, so far as relates to the subject-matter of my invention, a more detailed description of this portion of the apparatus is deemed unnecessary.

Upon the face of the case or box A I place a visual signal, capable of giving two or more distinct indications of different signification; the number of such distinct indications being equal to the maximum number of trains which are to be permitted to occupy the corresponding block section at one and the same time. The form and construction of this visual signal may be varied. I usually prefer, for the sake of simplicity, to construct it as shown in Fig. 2, in the shape of a large circular dial, divided into the required number of equal spaces, and provided with a conspicuous movable index *a*, capable of pointing to either one of the numbered spaces, but if preferred, a semaphore arm, or group of arms might be moved in the same way to give corresponding indications, readily distinguishable from one another. The particular dial shown in the drawings is designed to give three such distinct indications, and thus may serve to give information of the presence, in the corresponding block, of a number of trains not exceeding three.

In the form of indicator shown, the normal position of the index *a* when no trains are on the section, is at zero, as shown in Fig. 2. Each successive train, entering the section, causes the index to advance one division while each train passing out of the section, in like manner, causes it to retrograde one division, so that the position of the index at all times indicates the number of trains actually occupying the block. The mechanism by which this result is effected will now be explained. Fixed upon the same axis with the index *a* are a toothed wheel G and a pinion *g*. The teeth of this pinion engage with another toothed wheel H, upon the axis of which is fixed a pinion fitted with movable pivoted pawls *h h h* instead of rigid teeth. A shouldered projection *b′* fixed upon the upper end of the rod *b*, engages with one of these pawls whenever the rod descends, and thus causes the wheels H and pinion *g* to turn through a determinate distance, but whenever the rod is raised the projection *b′* pushes the pawl aside, and passes by it without imparting movement to the axis upon which it is fixed.

In constructing the apparatus for practical operation, it may be found desirable to omit one of these pawls, to the end that in case the releasing mechanism should become accidentally disarranged, and not perform its function, and thus fail to indicate the exit of a train or trains from the section, the rod B will nevertheless be permitted to descend, after the prescribed number of trains has entered the section, and thus the risk of the dial mechanism being turned forward until it is broken will be avoided. The wheel G engages with a pinion *i* upon the axis of which is a wheel I, having a detent J upon its periphery, adapted to engage with a shoul-

der formed upon the end of a pivoted lever K which lever is movable in one direction by the attractive force of an electromagnet M, and in the other by a retracting spring *k*. A coiled spring N is affixed to the axis of the index *a*, the office of which is to effect the retrograde movement of said index in the manner hereinafter explained.

The release or reversal of the action of the signal, or in other words, the production of the retrograde movement of the index *a*, is preferably effected through the agency of electricity. As it is very desirable that such release or reversal, in the case of any given signal, should in no case take place until the train leaving the section shall have passed completely under the protection of the signal at the entrance of the next section in the series, I have provided that the releasing impulse shall only be transmitted after the entire train has passed the signaling point. The apparatus by which this is effected is best seen in Fig. 4. S is a switch or contact-lever made in two parts *s* and *s'* and hinged at its center (where it is pivoted to the standard *u*,) in such a manner that when the enlargement b^2 of the rod *b* passes upward, it pushes the roller aside, the spring *t* yielding to the pressure, and produces no effect, but when it passes downward (the hinged joint being now rigid,) the spring *t'* yields, and the end *s'* of the lever S is brought into contact with the plate *v*, completing the circuit of the wires 1 and 2, and transmitting an electrical impulse back to effect the retrograde movement of the signal at the entrance of the preceding section. It will be understood, therefore, that it is not possible to change the indication of any signal, in respect to the number of trains which have entered the corresponding block section, nor to reverse or alter the indication of the preceding signal, until the entire train has passed any given signaling point. The rod *b* is raised by the impact of the first wheel of the train, and the retarding device hereinbefore referred to acts to prevent its return far enough to operate the mechanism of the signal, before it is raised again by another wheel of the train. This action is repeated until every wheel in the train has passed, after which the rod slowly descends, and actuates the signal, as well as the reversing apparatus of the signal last passed, as hereinbefore explained. If for any reason, it should be deemed preferable, that the preceding signal in the series should be released or reversed at the instant that the first wheels of the train pass out of the block section, it will be evident that this may be accomplished by inverting the position of the lever S, or in other words, turning it upside down, and thus effecting the electric contact during the upward instead of the downward movement of the projection *b* upon the rod B.

The apparatus thus far described constitutes a "permissive" block system, by which an engineer on arriving at the entrance of a section, is informed by the signal of the number of trains which are occupying the block in advance, and is thereby enabled to govern himself accordingly. For the information of the engineers of such trains as may be running under an "absolute" block system, I may also make use of an additional signaling device. An electric conductor 7, carrying a constant current, divides at 6 into two branches 5 and 4, an electro-magnetic coil R being included in the former branch, which may be availed of to operate any well-known form of alarm or visual signal. The branches 4 and 5 terminate in contact-points *q* and *r*, between which plays a contact-arm P, connected with the circuit-wire 3. A cam *n* is fixed upon the axis of the index *a*, in such position that it will maintain the contact-arm P in contact with stop *q*, whenever the index stands at zero, and thus divert the current from the branch 5 containing the coil R, but which in any other position of the index *a*, will permit the arm to touch the stop *r*, thus bringing the coil R into the circuit. Any well-known form of visual, audible or other signal whatsoever may be actuated by the coil R, either by direct or by inductive or other indirect action. An illuminating device L, which may be an ordinary incandescent electric lamp, is placed in the same branch of the circuit with the coil R, and will in such case necessarily continue to be lighted so long as any trains whatever are on the section guarded by it. Hence it will be understood that the lamp L, when taken by itself, constitutes an "absolute" signal, and at the same time serves to render plainly visible at night the indications of the dial and index which constitute the "permissive" signal.

In case the engine-driver of a train having orders to run under the absolute system should fail to see, or from any other cause should disobey the danger signal and enter upon an occupied block, such signal at the entrance of that block cannot be reversed nor returned to safety, by reason of the exit of a preceding train from the block, and so exhibit an erroneous signal to a succeeding train, and permit it to enter the occupied section with the understanding that such section is clear, while as a matter of fact the second train is still occupying it; but, on the contrary, the arrangement of the mechanism is such that the system will in such case at once convert itself into a "permissive block," for the protection of the train which has disobeyed the signal, as well as for the proper information of the train which follows it. So, also, if trains are running under "permissive" orders, allowing, for instance, four trains within a section at the same time, and a fifth train should enter wrongly, the system at once becomes an extended "permissive" system, for the protection of this train, and the proper information of the following ones.

It is an invariable characteristic of the operation of the whole system, whether trains

be running under "absolute" or "permissive" orders, that the signal at the entrance of a section can in no case be returned to "safety," so long as any train whatever remains within that section.

I provide for the manual control of the signals, in case of accident or emergency, by means of the hand-switches shown in Figs. 1 and 4. The switch *w* serves to interrupt the circuit and to thus prevent the transmission of a releasing or reversing impulse back to the last signaling point, while the switch *y*, on the other hand, may be employed for the purpose of transmitting such reversing or releasing impulse, by closing the circuit as required.

The theoretical diagram, Fig. 5, serves to show the relation of the several signals of a series to each other, the trains being assumed to pass along the track F F in the direction indicated by the arrow. The current for actuating a whole series of signals may be supplied from a single common generator or source of electricity as shown at Z, which may be either a dynamo-electric machine as indicated in the drawings, or a battery of sufficient capacity, or it may be supplied from a local battery or dynamo at each station. One terminal of the main generator Z may be put to earth, as shown in the figure, or a return wire may be substituted for the earth in a manner well understood among those skilled in the art. The current from this generator flows constantly through each apparatus of the series, as indicated by the arrows, being diverted to and from any one of the block signals as hereinbefore explained, without necessarily interrupting its flow. The impulses required for releasing or reversing the signals may by preference be derived from the same circuit, though a separate generator may be used if desirable with equally effective results.

The dotted lines in Fig. 5 indicate the manner in which the circuits may be connected so as to effect the overlapping of the blocks, which is sometimes deemed advantageous in practice. The releasing impulse, in such case, is transmitted, not from the next succeeding signaling point, but from the second, third, or any other, as required. The operation in such case will be readily understood by the aid of the drawings without further explanation.

The construction of the various parts of my apparatus may be widely varied without departing from the spirit of the invention.

I claim as my invention:—

1. In a railway signaling system, the combination, substantially as set forth, of a visual signal consisting of an index capable of moving by advance or by retrograde movements over successive intervals of a spaced dial: mechanism whereby an advance movement of said index over one space of said dial is automatically imparted by the passage of each of one or more trains beyond a signaling point at the entrance of a signal section; retracting mechanism, which by its recoil, constantly tends to impart to said index a retrograde movement over said dial; and an escapement automatically released by the passage of each of one or more trains beyond a signaling point at the exit of said signal section; which escapement, whenever actuated, permits said index to retrograde over one interval of said spaced dial.

2. In a railway signaling system, the combination, substantially as set forth, of a treadle actuated by the impact of a moving train; a rod which is raised by a connection with said treadle, but is restored to its normal position by the action of an independent retracting device, a retarding device capable of acting upon said rod only during its return movement, a visual index capable of moving by advance or by retrograde movements over successive intervals of a spaced dial; and mechanism whereby an advance movement of said index over one space of said dial is imparted by each return movement of said raised rod.

3. In a railway signaling system, the combination, substantially as set forth, of a spaced dial, a visual index capable of moving by advance or by retrograde steps over the intervals of said dial; a rod deriving its motion from the impact of a moving train, whereby successive advance movements are imparted to said index; a spring which is wound by the advance movement of said index; a detent which acts to prevent the recoil of said spring, and a device actuated from a distant signaling point, whereby said detent may be withdrawn to permit a retrograde movement to be imparted to the index by the recoil of said spring.

4. In a railway signaling system, the combination, substantially as set forth, of a spaced dial; a visual index capable of moving by advance or by retrograde steps over the intervals of said dial; a rod deriving its motion from the impact of a moving train, whereby successive advance movements are imparted to said index; a spring which is wound by the advance movement of said index, a detent which acts to prevent the recoil of said spring; an electro-magnet, included in a circuit extending from a distant signaling point; and a circuit-closer for actuating said electro-magnet and withdrawing said detent, the action of which is controlled by the retrograde movement of the visual signaling apparatus at said distant signaling point.

5. In a railway signaling system, the combination, substantially as set forth, of a spaced dial; a visual index capable of moving by advance or by retrograde steps over the intervals of said dial; an electric contact-switch, which is held in one position by the index of said dial when at its zero point, but in another position at all other points in the revolution of said index, an electrically actuated signal, included in a branch of a normally closed

electric circuit, which branch is cut out when said index and contact switch are in the normal or zero position, but which is included in said electric circuit when said index and switch are out of the normal position.

6. In a railway signaling system, the combination, substantially as set forth, of a signal comprising a spaced dial and a visual index moving by advance or by retrograde steps over the intervals of said dial; an electric contact-switch, which is held in one position when the index of said dial is at its zero point, but in another position at all other points in the revolution of said index, and an illuminating device which is energized by an electric current whenever said switch is in any other than the normal or zero position, whereby said visual signal is illuminated whenever its index is out of the position of zero.

7. In a railway signaling system, the combination, substantially as set forth, of a rod deriving a longitudinal motion from the impact of a moving train, a shoulder or angular projection upon said rod, and a wheel provided with a succession of hinged pawls upon its periphery, which engage with said shoulder when the rod is moving in one direction but not when it is moving in the opposite direction, and a visual index moved by said wheel.

8. In a railway signaling system, the combination of an electric switch, shifting apparatus for operating said switch to make or break a circuit, a signal operating circuit opened or closed by said switch, and a train actuated mechanism for mechanically imparting a determinate advance movement successively to said shifting apparatus by the automatic action of each of one or more trains in passing beyond a signaling point.

9. In a railway signaling system, the combination of a spaced dial, a pointer moving over the same, and a train actuated mechanism for mechanically imparting to said pointer a determinate advance movement successively by the automatic action of each of one or more trains in passing beyond a signaling point.

In testimony whereof I have hereunto subscribed my name this 28th day of November, A. D. 1891.

MURRAY CORRINGTON.

Witnesses:
EDWARD H. ROGERS,
CAROLINE E. DAVIDSON.