(No Model.) 2 Sheets—Sheet 1.

I. A. TIMMIS & S. C. C. CURRIE.

RAILWAY SIGNAL.

No. 326,068. Patented Sept. 8, 1885.

FIG. 1.

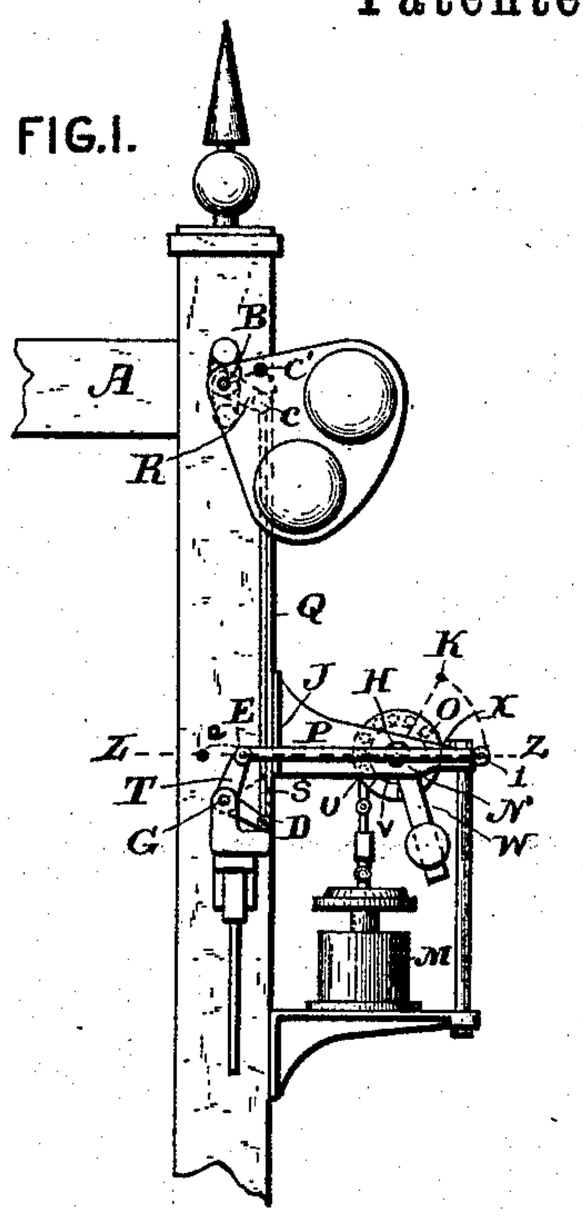


FIG. 2.

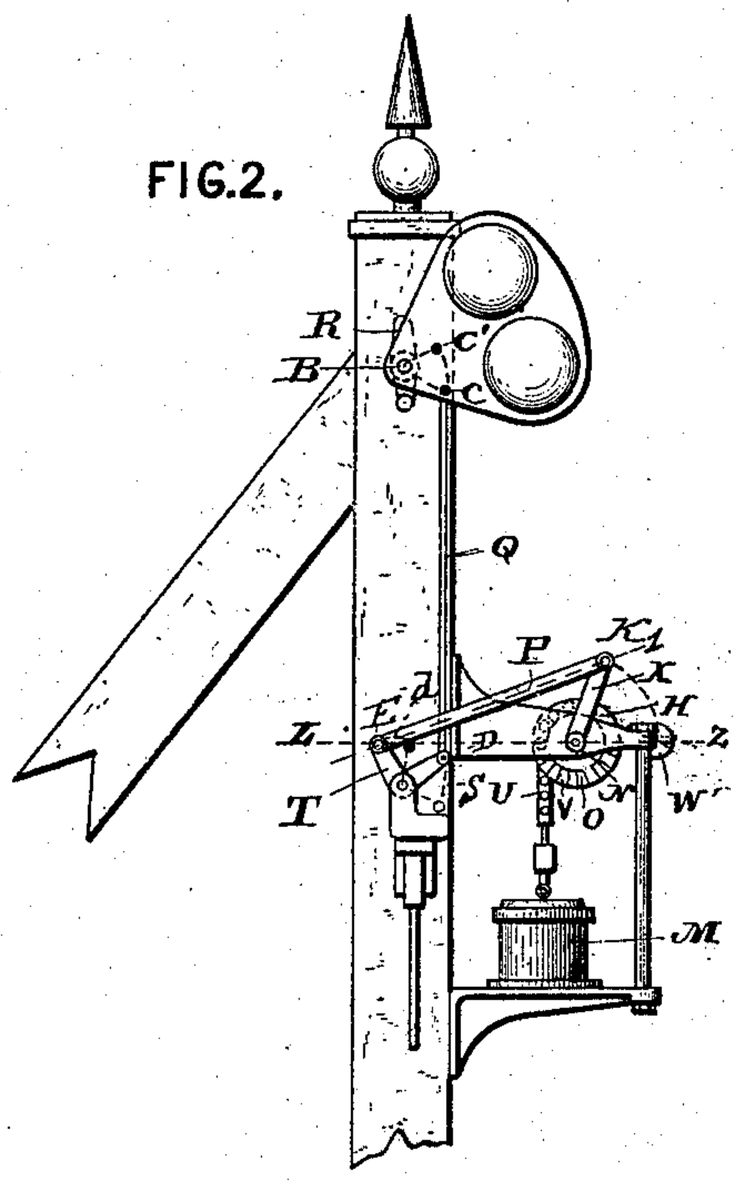
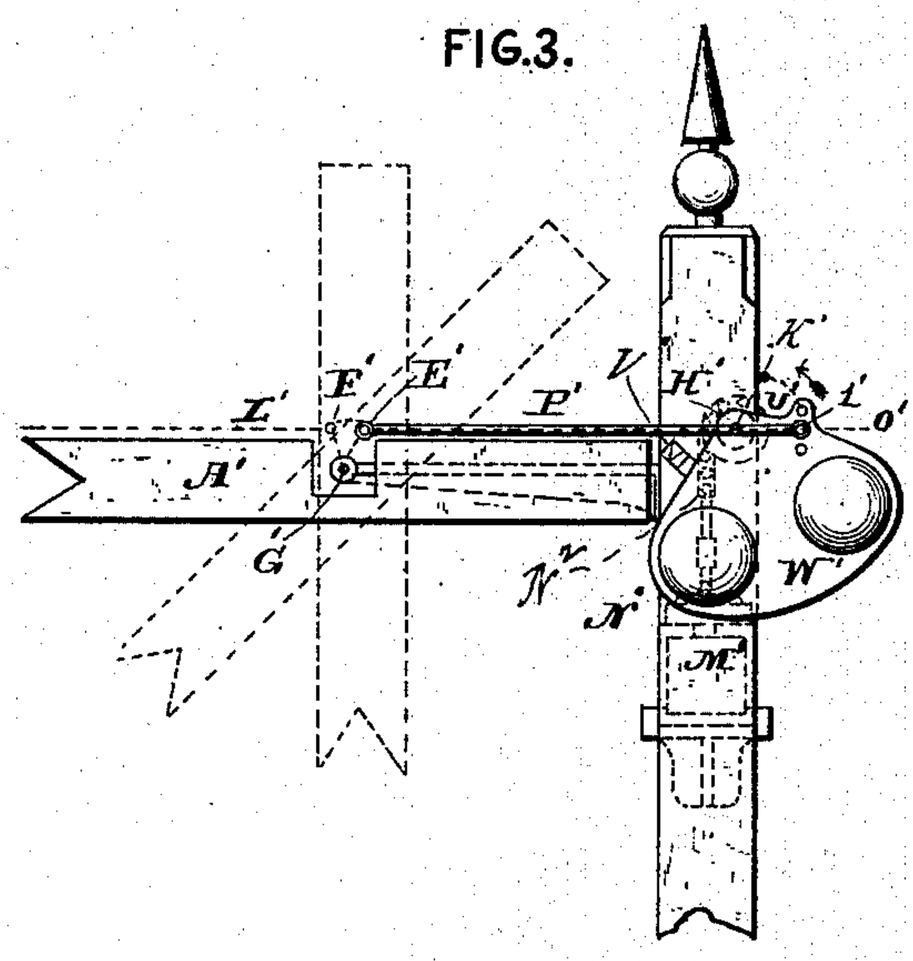


FIG. 3.



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(No Model.) 2 Sheets—Sheet 2.

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FIG. 4.

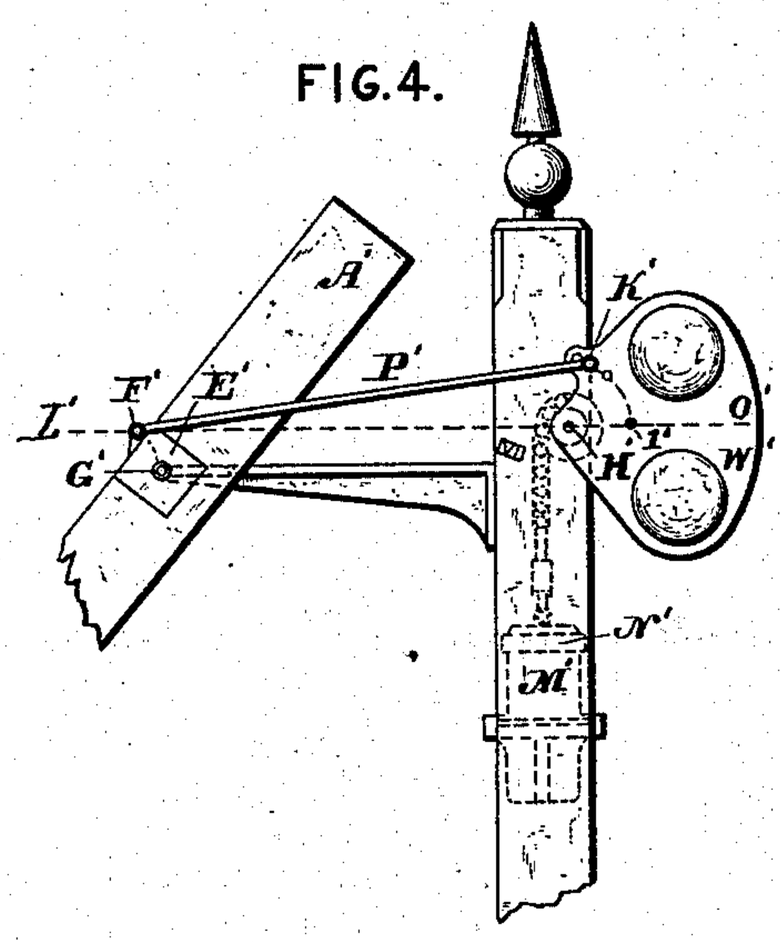


FIG. 5.

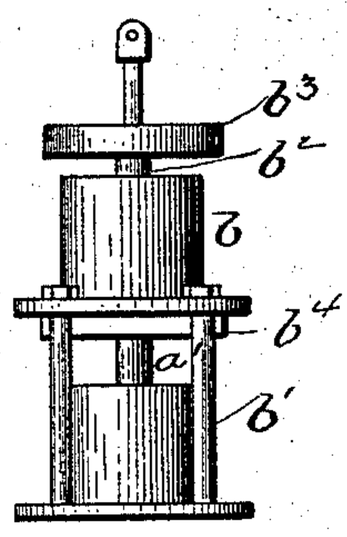
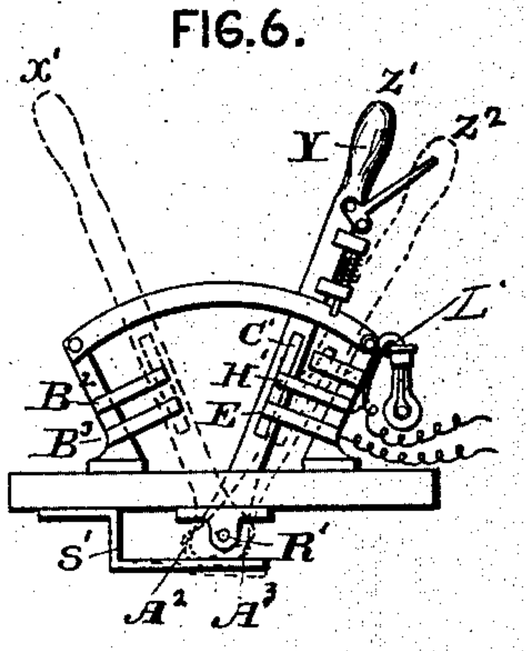


FIG. 6.



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UNITED STATES PATENT OFFICE.

ILLIUS AUGUSTUS TIMMIS AND STANLEY C. C. CURRIE, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 326,068, dated September 8, 1885.

Application filed March 15, 1884. (No model.) Patented in England December 12, 1883, No. 5,718; in France February 29, 1884, No. 148,128; in Belgium March 6, 1884, No. 64,388, and in Italy March 31, 1884, No. 16,581.

To all whom it may concern:

Be it known that we, ILLIUS AUGUSTUS TIMMIS and STANLEY CHARLES CUTHBERT CURRIE, subjects of the Queen of Great Britain, residing at London, in the county of Middlesex, England, have invented certain new and useful Improvements in the Means for Working and Locking and Interlocking Railway Signals and Points; (said invention having been patented in England in 1883, and numbered 5,718; in France February 29, 1884, No. 148,128; in Belgium March 6, 1884, No. 64,388, and in Italy March 31, 1884, No. 16,581;) and we do hereby declare the following to be a full, clear, and exact description of the invention, 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 herewith.

Figure 1 is a side elevation of a semaphore-signal embodying my improvements therein, the signal-arm being represented at horizontal or indicating "danger." Fig. 2 is a similar view with the signal-arm down. Figs. 3 and 4 are like views, respectively, of modified forms of signals. Fig. 5 is a side view of a compound electro-magnet. Fig. 6 is a side view of a switch lever and frame provided with devices for regulating the strength of the electric current.

The objects of this invention are to provide means whereby railway-signals, of whatever description, semaphore or otherwise, can be worked by electro-magnets and safely, simply, and economically locked and interlocked with points.

With these objects in view we take ordinary signal-posts and signal-arms and we pull the signal-arms down free, "line clear," by means of an electro-magnet. Where signals are made to show three positions, "danger," "caution," and "line clear," we use a double magnet. One part of the magnet pulls the signal-arm to "caution," and the other part pulls it to a position signifying "line clear." The three positions may be exhibited at any suitable angles; but we have shown the old "horizontal," "forty-five degrees," and "vertical" as illustrating, respectively, "danger," "caution," and "line clear." We not only pull the arms down "caution" or "line clear," but we hold them down by the armature of the electro-magnet remaining in contact (or practically in contact) with its bobbin, and when they are in contact the maximum current is reduced from five or ten ampères (or whatever other ampère current is used) to a very much less current. As a rule, we find two ampères more than sufficient to hold the armature and bobbin together and to keep the signals lowered. By this means the expenditure of electricity is so reduced that in working with low electro-motive-force magnets and accumulator batteries the electrical horse-power used per signal per twenty-four hours is not more than .02. The normal position of every signal is thus as it should be at "danger," and the signals, (whether semaphore or ground lamps, or of any other form,) are pulled down, to "caution" or "line clear" and held down by a continuous current of electricity, and if there is any break in the current the signals go to "danger" automatically and are locked automatically without the aid of catches, springs, or extra magnets. The rail-treadles, which are used in station to station signaling, break and make the current as required, and so do the receiving and transmitting instruments in the signal-boxes.

The second part of this invention relates to the automatic locking of the signal-arms (or ground-lamps, &c.) when at "danger," without the aid of catches, springs, extra magnets, &c., thus simplifying and perfecting the working of railway-signals.

The accompanying drawings illustrate how our invention is carried out.

Figure 1 represents the signal-arm A at "danger" fixed on the spindle B and actuated by the crank R, which is connected with the bell-crank T by the rod Q at C and D. The bell-crank T revolves upon the center G and the center E. The other extremity of the bell-crank is on the line L Z. This center E is connected to the center 1 by the rod P, and the center 1 is connected to the spindle by the lever-arm X, which is fastened to and revolves with the spindle N. The spindle N is supported by the bracket J, and on it and revolving with it are the lever-arm X and disk O. This

disk may be replaced by a bell-crank or other arrangement. There is a chain or wire or rope U fastened to the disk O and wound partially round it, and the other end of the chain or wire or rope is fastened to the magnet M, and is actuated by it. (Of course it may be actuated by any other means, manual, pneumatic, or otherwise.) The three centers E, H, and I are, it will be noted, in the line L Z.

In order to lower the signal-arm A the center *c* of the crank R has to describe the arc *c c'*, and the centers D and E of the bell-crank T describe the arcs *a* and *s*, respectively; but this cannot be done as long as the three centers E H 1 are in the line L Z, because the center E is attached to the center 1 by the rod P. In order, then, to lower the signal-arm the center 1 of the lever-arm X must be raised above the line L Z and made to describe the arc 1 K, (see Fig. 1,) and this is done by the chain or rope U revolving the disk O and bringing the lever-arm X and rod P and bell-crank T into the positions shown in Fig. 2. It is then evident that as long as the centers E H and 1 are in the line L Z it is impossible by any pull of the rod Q on the center D to move the bell-crank T, and thus the signal-arm A, when it is brought to a position of "danger," as shown in Fig. 1, by the weighted lever W, is automatically locked by mechanical means without the aid of any catches or electrical methods. We prefer to allow the weighted lever to fall rather below the position shown in Fig. 1, and this is regulated by the stop V, in which case the center 1 falls somewhat below the line L Z, and any pull on the center D of the bell-crank T pulls the weighted lever W still more firmly against the stop V and increases the efficiency of the locking of the signal-arm A at "danger."

Figs. 3 and 4 show a different form of signal, in which the arm A' is balanced in the center G', and thus any accidental weight, such as an accumulalion of snow on the arm, does not disturb it or tend to depress it.

Referring to the drawings, Fig. 3, the arm A', pivot G', center E', rod P', center 1', spectacles W', stop V', disk U', spindle H', bobbin M', and armature N', are parts of the signal-post and magnet and fittings.

When a maximum or "lowering" current of electricity is passed through the magnet, it causes the armature N' to be attracted to the bobbin M'. The disk U' revolves by means of the chain, (or wire or rope,) which is partly wound round it. The disk U' is fixed to the spindle H', and on the opposite side of the post is fixed, in the same spindle H', the spectacles W', which carry the pin 1'. Then, on the disk revolving in the direction of the arrow the spectacles rise, and the pin 1' describes the arc 1' K', which carries with it the rod P'; but the rod P' is attached to the center E', and this center is thus caused to traverse the arc E' F', and the arm then assumes the position shown in Fig. 4. On the current being broken, either accidentally or otherwise, the armature is released, and the weight of the spectacles brings the arm back to the horizontal position; and it must be especially pointed out that when the spectacles have fallen back to their normal position and the arm is horizontal, Fig. 3, the three centers E', H', and 1' are in one straight line L' O', and therefore the arm is locked and cannot possibly be moved until the spectacles are raised by the armature N' being attracted and moves toward the bobbin M'.

On referring to Fig. 3, it will be seen that the arm can be made to assume three positions (two positions being indicated by dotted lines)—*i. e.*, 1, horizontal position, indicating "danger;" 2, angle of forty-five degrees, indicating "go ahead cautiously;" 3, vertical position, indicating "line clear." The last two positions are obtained by the use of the double magnet, Fig. 5, which takes the place on the post of the single magnet, Figs. 3 and 4, by means of which the arm can be brought to position No. 2 and held there firmly, or to position No. 3 and held there. The double magnet consists of two suction-bobbins, *b b'*, in separate electrical circuits. The upper bobbin, *b*, has a suction-core, b^2, to which is attached an armature, b^3, connected to the chain N^2. The base-plate b^4 of the bobbin *b* is arranged as an armature to the lower bobbin, *b'*, and has a suction-core appendage, *a'*, which enters the center of the bobbin *b'*. When, therefore, the first bobbin is energized by its current, it draws down the armature b^3 and causes the signal-arm A' to assume the second position, indicating "go ahead, caution." If, then, the second bobbin is energized, the upper bobbin, with its attachments, is drawn down and the signal-arm A' brought to the third position, indicating "line clear." The arm is allowed to fall back to "danger" in the same manner as before described, and is there mechanically locked without the aid of catches, spring, or extra magnet.

We would specially point out here, having described the way the signals are worked by the magnets by a continuous current which is used at its maximum to lower the signals, that when the armature and bobbin of the magnets come together a resistance is switched in which reduces the "lowering" to the "retaining" current, any suitable kind of resistances may be used; but we find a small incandescent lamp to answer the purpose well. This incandescent lamp (or other resistance) may be switched in, in a very great number of ways; but we generally use the arrangement shown in Fig. 6. The lever Y is pivoted on the pin R', and it is held back at X or forward at Z' by the spring S', acting against the surfaces A^2 and A^3. When the lever Y is back, there is no current running through the magnet, and hence the signal is locked; but the contact-pieces B^2 B^3, Fig. 6, are connected by the strip C', and the current is enabled to go through other signals; and, on the other hand, when the lever Y goes to Z' or Z^2, B^2 B^3 are

disconnected; but when it is forward at Z^2 the maximum lowering current is running and the signalman has to hold it there till he is signaled or apprised that the conditions "line clear" or "caution" are produced. When the signal-arm is lowered, the maximum or lowering current runs through the contact-piece L′, and as soon as it is lowered the signalman lets go the lever, and it assumes the position Z′ and is held there by the spring S′. The current then runs through the contact-piece H′, and in this circuit there is the resistance before mentioned, which reduces the lowering-current to the retaining-current. This retaining-current holds the signals down at a minimum of cost, and this reduction of current is one main feature in our invention.

Having described the way in which the electric current is used to lower signals, arms, lamps, &c., and to hold them down, and how the lever Y, Fig. 6, controls both the lowering and retaining currents, and also the breaking of the current by being put back to X′, Fig. 6, and having described how the signal-arm goes to "danger" when the current is broken, and is automatically locked there, we would point out that in our system of station-to-station signaling the continuous maximum current and the reduced current are of immense value when worked in conjunction with rail-treadles and transmitting and receiving instruments in the cabins, as a thorough and complete control is established over all signals by two or more signalmen at different cabins, acting in conjunction with passing trains.

The various details are capable of an almost infinite variety of arrangement of parts; but

We claim—

1. In an electric railway-signal, the combination, with a movable signal and lever-arms attached to the same and so connected together that in a certain position of the signal their pivotal connections will be in alignment and the signal thereby locked, of an electro-magnet whose armature is connected to the said levers and so arranged, substantially as described, that when attracted by the magnet the alignment of the levers will be broken and the signal moved, as set forth.

2. In a railway-signal, the combination, with a movable signal and an electro-magnet whose armature is attached to and adapted to revolve a shaft, of a rod attached at one end to the signal and at the other to a crank upon said shaft, whereby when the armature is released the said rod will assume a position of alignment with the crank, and thereby lock the signal against accidental movement, substantially as described.

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