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Electric Railway Signals.

No. 139,376. Patented May 27, 1873.

Fig. 1

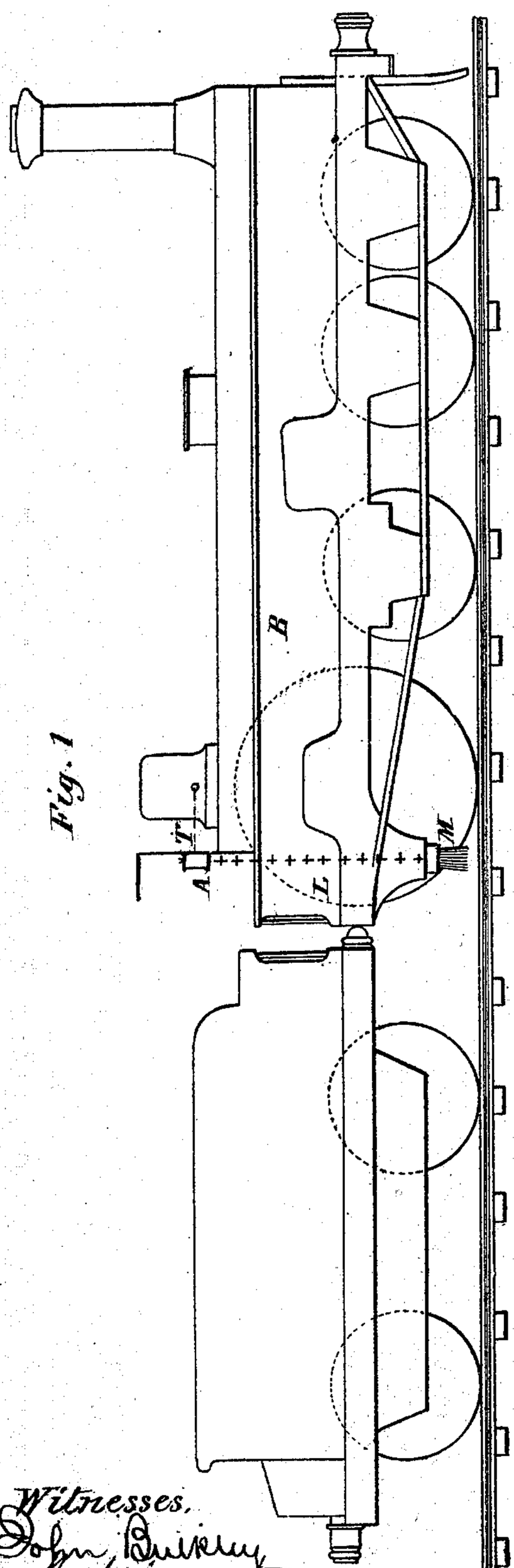


Fig. 8.

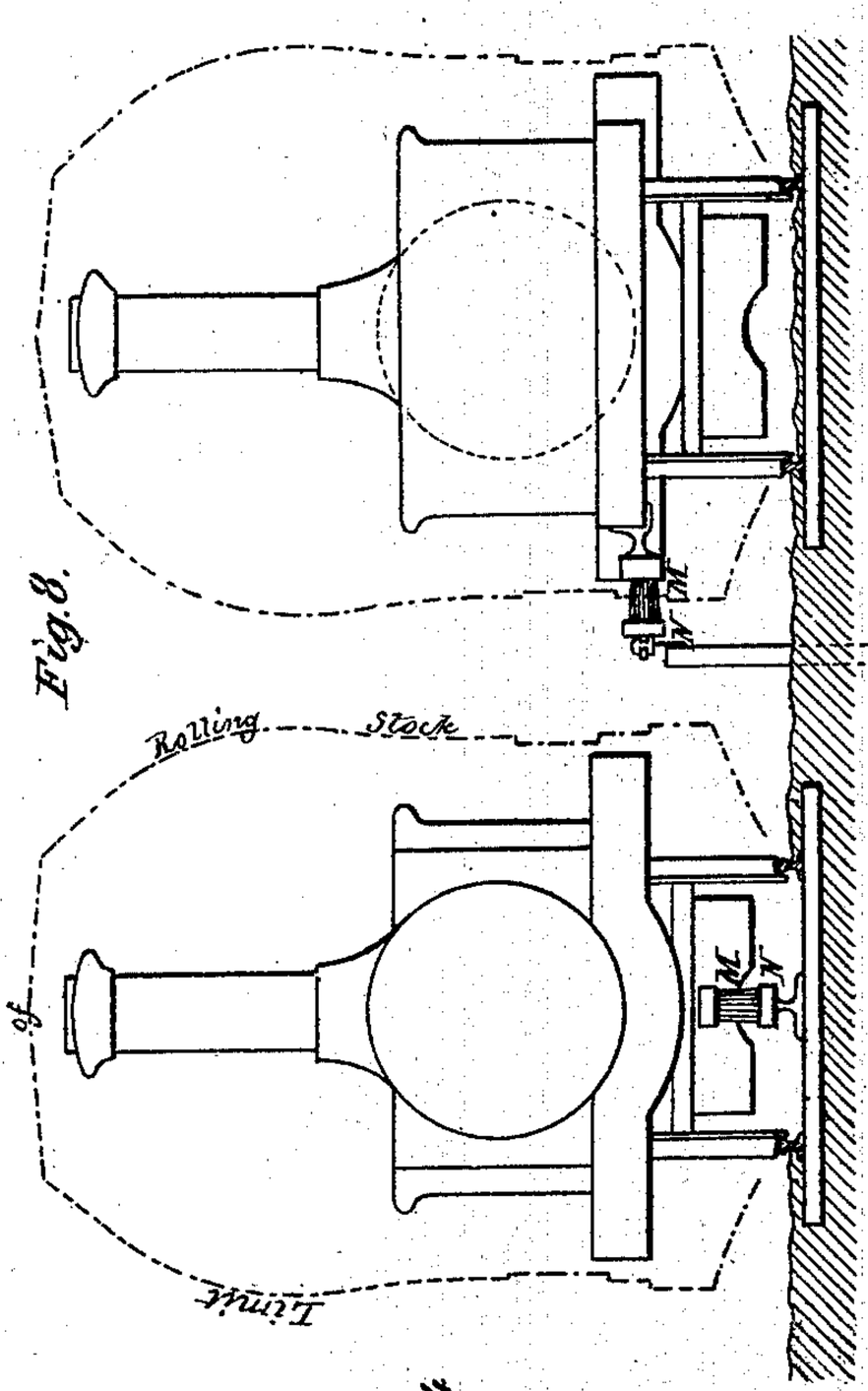
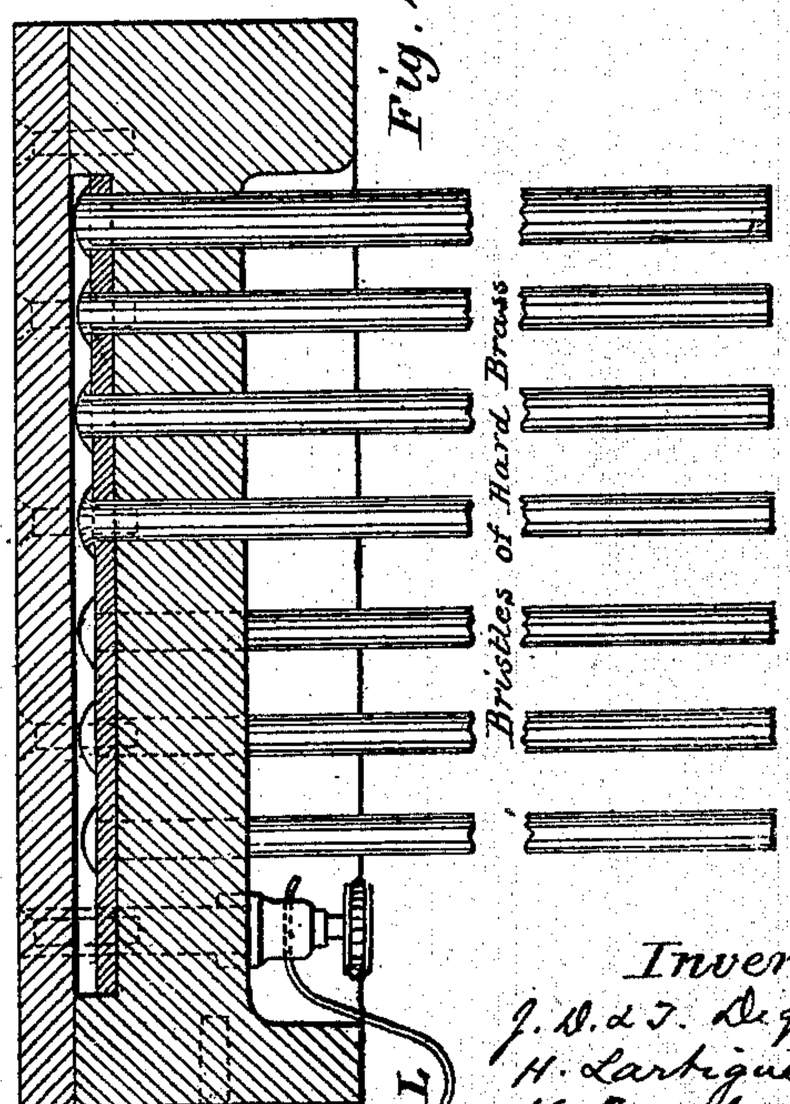


Fig. 4



Witnesses.
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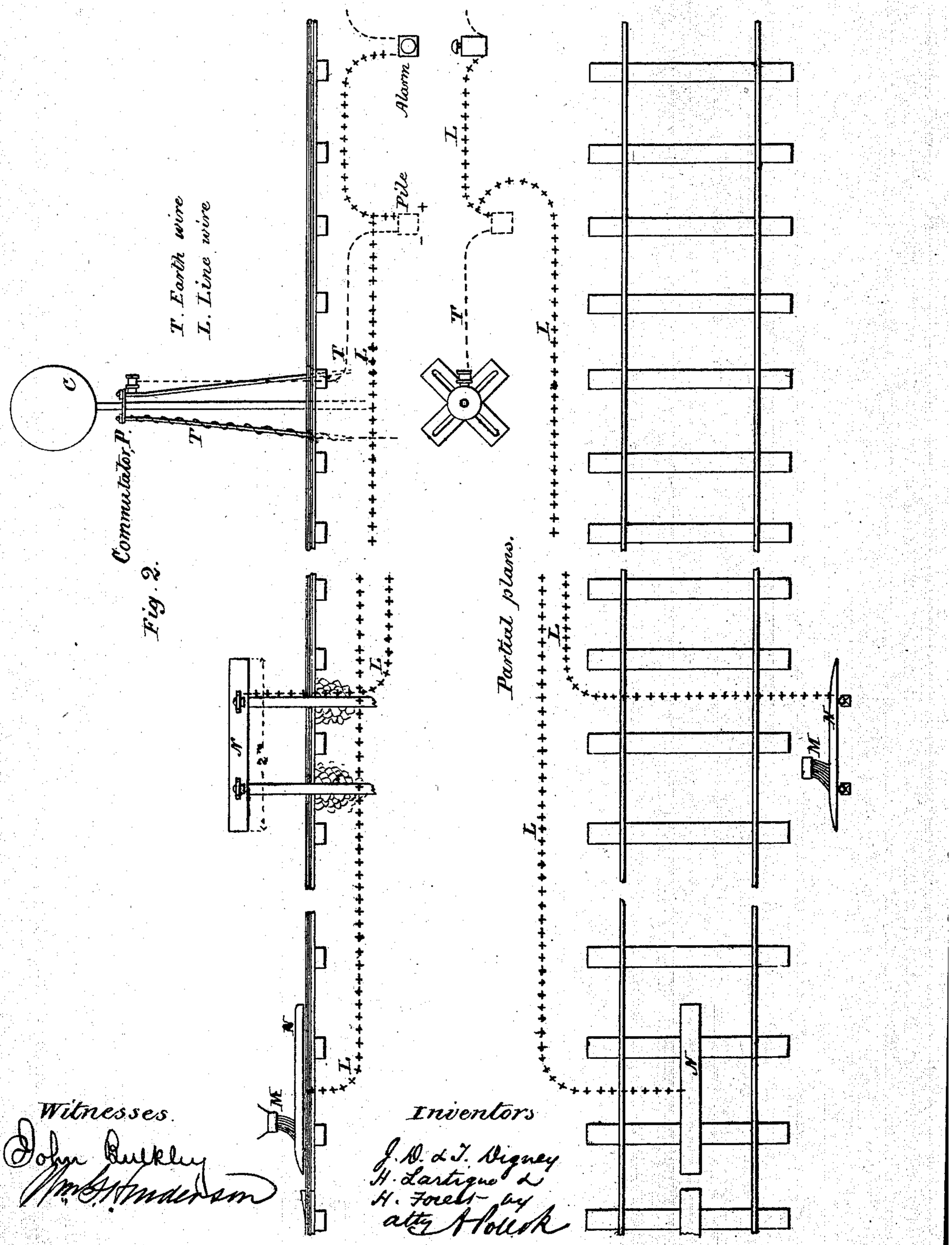
No. 139,376. Patented May 27, 1873.



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Electric Railway Signals.

No. 139,376. Patented May 27, 1873.

Fig. 3.

half size

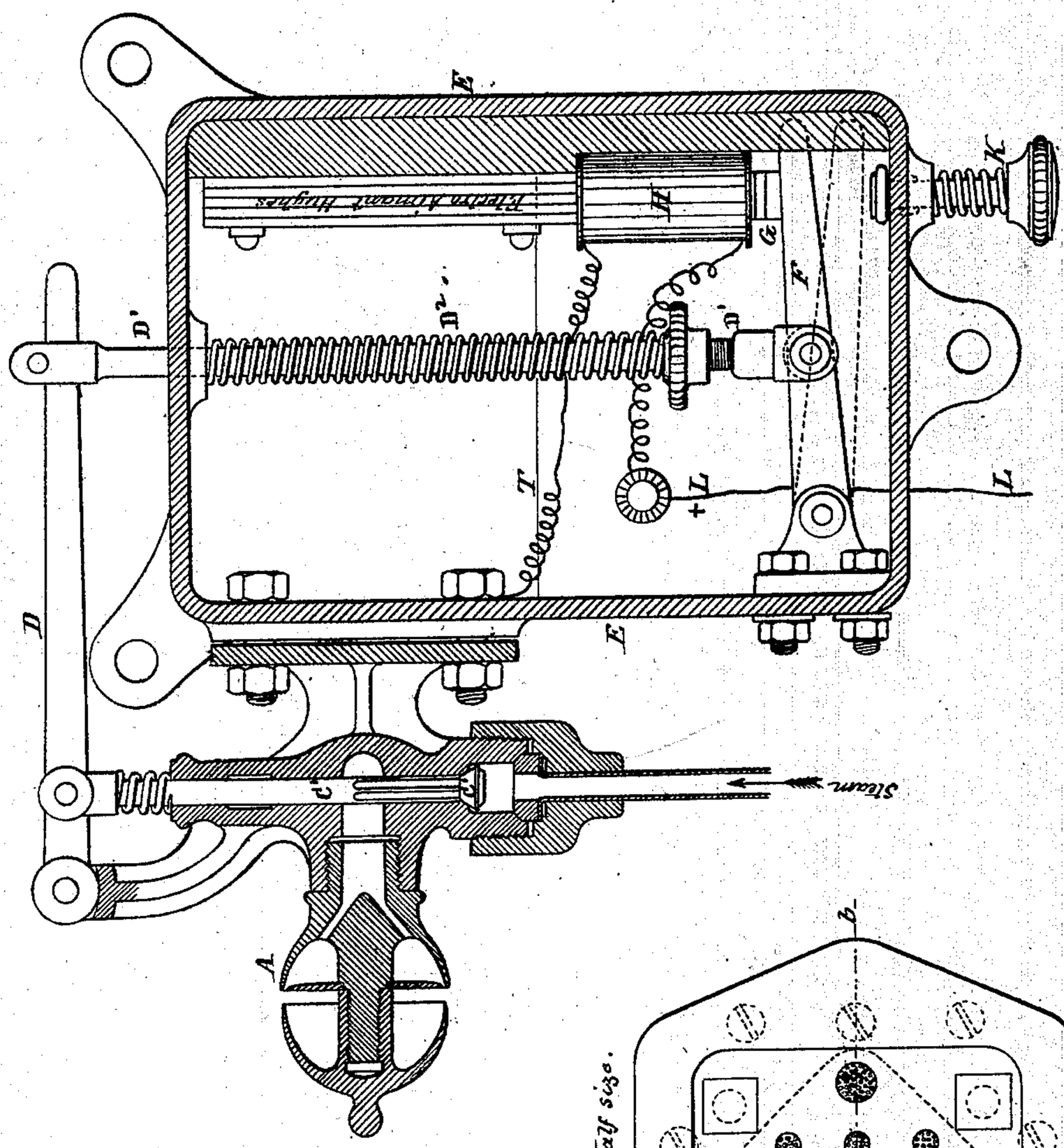
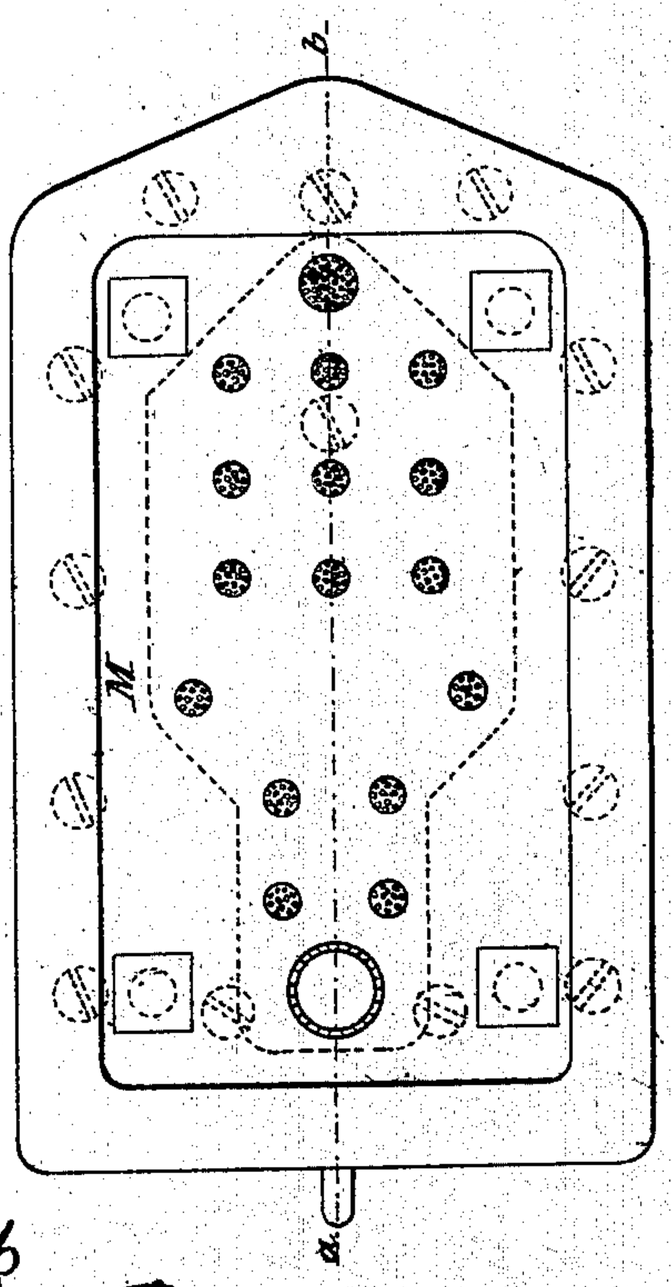


Fig. 5.

Bottom view; Half size.



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Electric Railway Signals.

No. 139,376. Patented May 27, 1873.

Fig. 6.

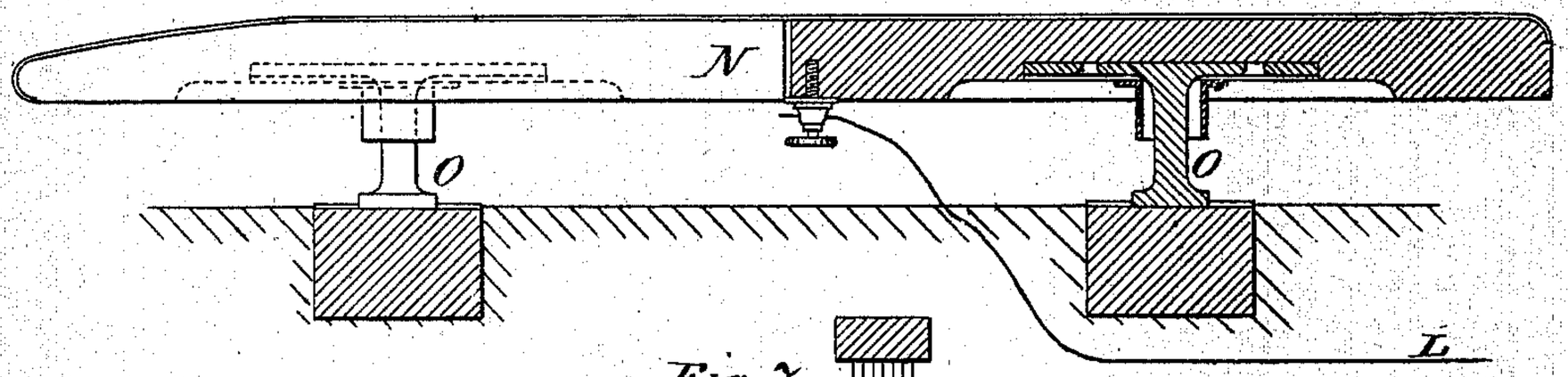


Fig. 7.

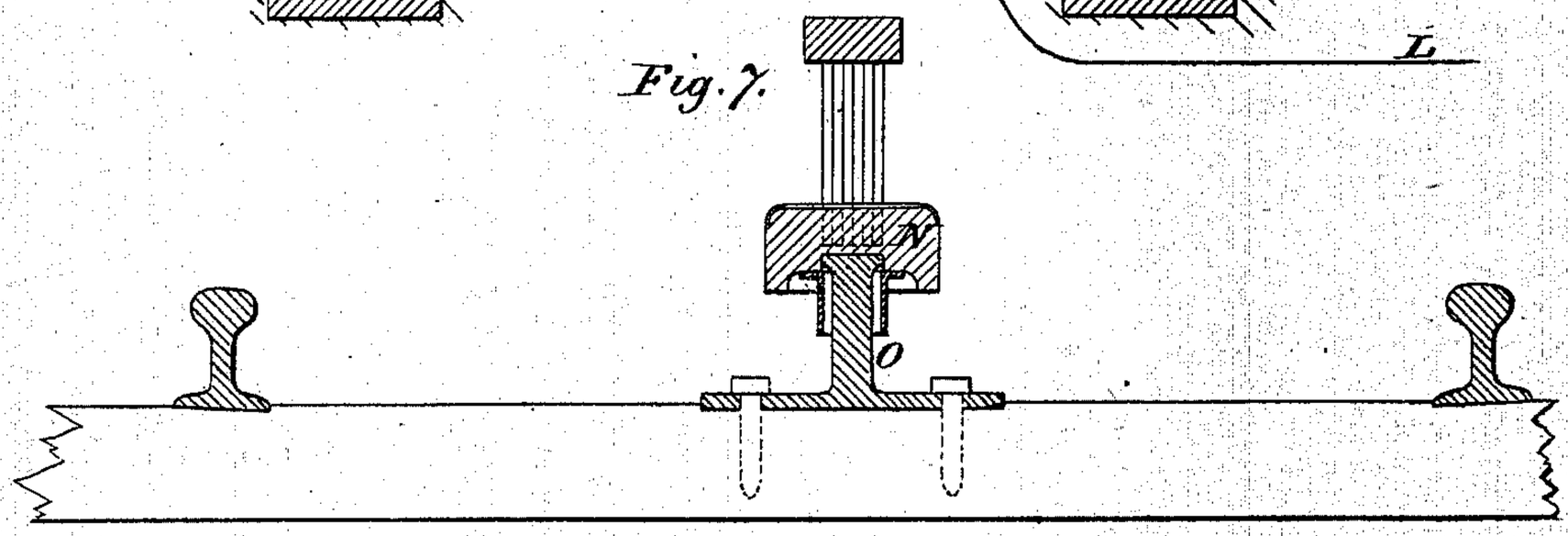
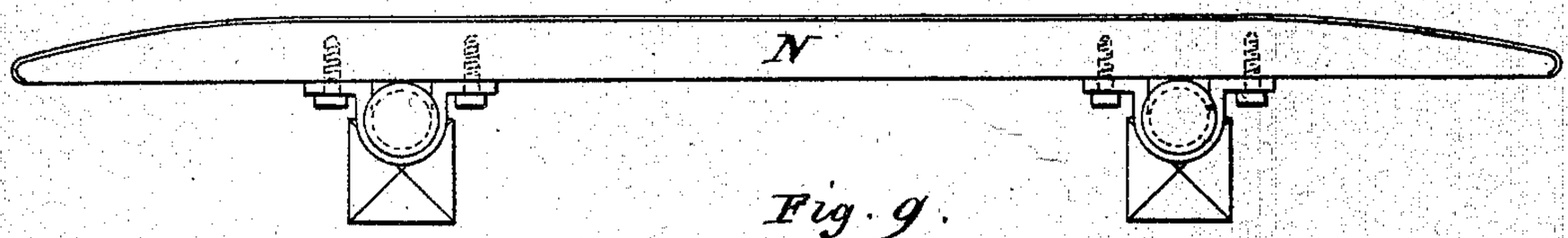
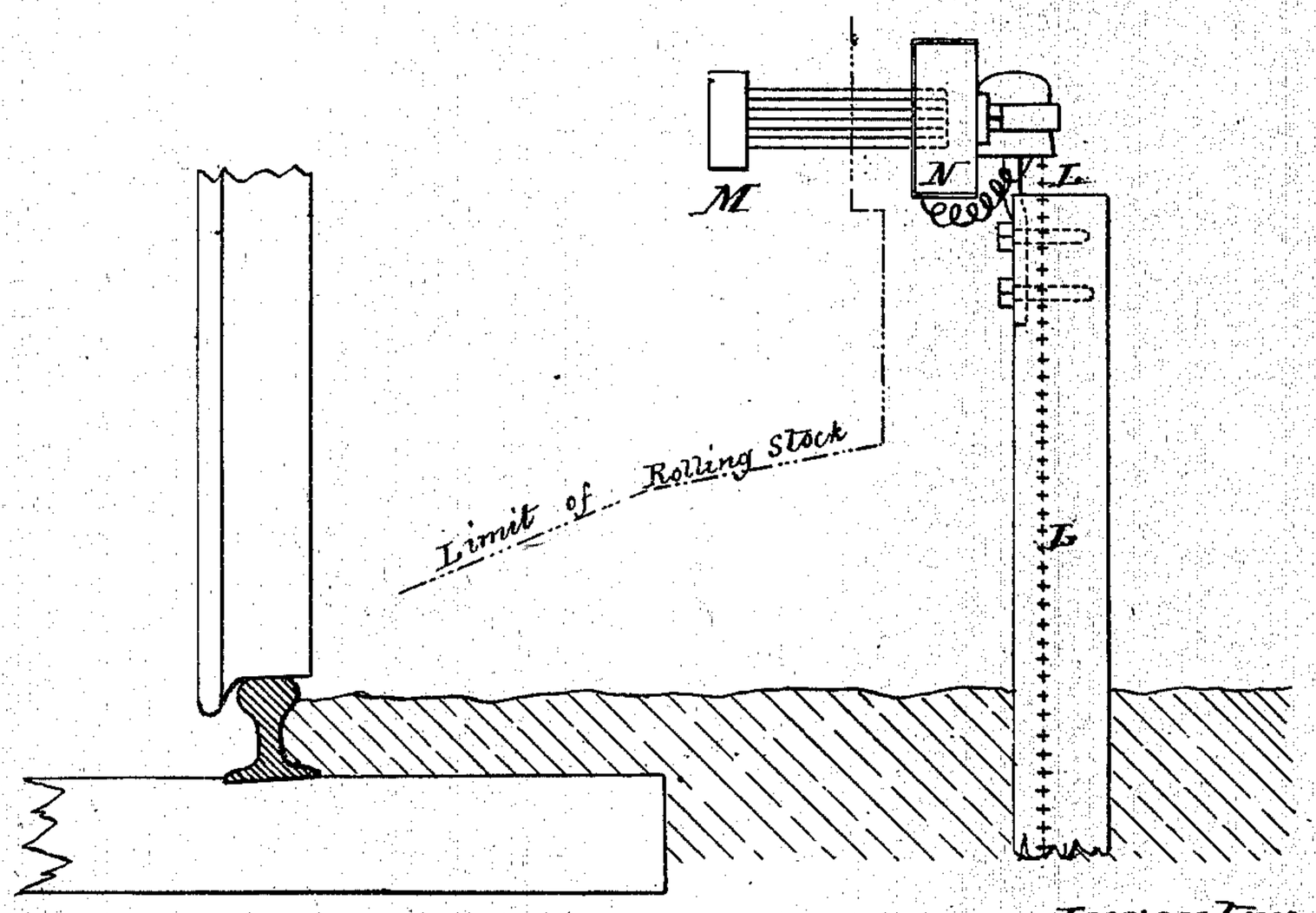


Fig. 9.





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UNITED STATES PATENT OFFICE.

JEAN D. DIGNEY, THEODORE DIGNEY, HENRY LARTIGUE, AND HENRY FOREST, OF PARIS, FRANCE.

IMPROVEMENT IN ELECTRIC RAILWAY SIGNALS.

Specification forming part of Letters Patent No. **139,376**, dated May 27, 1873; application filed March 20, 1873.

To all whom it may concern:

Be it known that we, JEAN DIDIER DIGNEY, THEODORE DIGNEY, HENRY LARTIGUE, and HENRY FOREST, all of Paris, in the Republic of France, have invented certain new and useful Improvements in Electro-Magnetic Signals for use on Railways, and for other purposes, of which the following is a specification:

The safe running of railway trains depends especially upon the observation of prescribed signals, and it is of especial importance to multiply the guarantees which should be possessed by those apparatuses designed to effect this result, and to secure attention or observation of signals. Signal disks or plates placed on the railway, so as to be seen from a distance, have been made the subject of numerous experiments and improvements; but in spite of all the care taken to secure their proper arrangement, and to control their proper operation, they are of little or no avail if, for any reason, they should not at the proper moment be seen.

Apart from the liability of the engineer to fail, by reason of accidental and but momentary inattention, to see them, there are several other causes which may prevent their being perceived, even though the engineer be on his guard: First, in case of thick fog, especially during the day; second, in case of falling snow, especially when the flakes are driven in the face of the observer; third, in case of a heavy rain with gusts of wind; fourth, in case of extinction of the signal-light during the night. With a view of obviating these difficulties numerous attempts have been made to combine with the sight-signal an acoustic signal to forewarn the engineer.

During the past fifteen or twenty years it has been successively attempted to employ alarm-bells actuated by pedals or movable counter-rails, explosive compounds, or cartridges discharged automatically, and even automatic whistles, the valves of which were opened by means of a rigid obstacle presented by the closed signal. These different apparatuses, when practically tested, have not, however, been capable of resisting the violent shocks which are produced when rigid obstacles are met by devices attached to the train, and moving therewith at a velocity which often reaches and even exceeds the rate of one hundred kilometers (62.+ miles) per hour, and, therefore, after short trials they have been necessarily abandoned.

In consequence of comparatively recent accidents due to one or more of the causes abovenamed we have been led to seek to remedy these difficulties, and for this purpose have finally devised a new apparatus, which after eight months of consecutive trial and test has been adopted on the Northern Railway of France, as being perfectly successful and entirely adapted to secure the object for which it has been designed.

The accompanying drawing represents the manner in which we have carried our invention into effect.

We make use of a steam-whistle, A, Figure 1, placed on the locomotive B, and caused to sound when the locomotive arrives at a determinate distance from the signal-disk C, Fig. 2, whatever may be the rate of speed at which the engine is moving. The apparatus is composed of a bronze alarm-whistle, A, Fig. 3, operated by a lever, D, and in communication with the boiler. It is carried by a metallic box, E, fixed to a locomotive. This box itself incloses a second lever, F, about parallel with the whistle-lever D, to which it is connected by an upright connecting-rod, D^1. This lever is acted upon by a stiff spring, D^2, which tends to lower it, and consequently to so move the whistle-lever and plunger-valve C′ connected with the same as to open the valves to permit steam to pass to the whistle. But the lever F also carries at its free end an armature, G, of soft iron in contact with an electro-magnet, H, of the Hughes kind, composed, as is well known, of a permanent horseshoe-magnet, the branches of which are opposite to cylinders of soft iron wound with helices of silk-covered wire. These cylinders become the poles of the magnet, and their attraction counterbalances the action of the spring. If an electric current be passed in a certain direction through the helices of the electro-magnet the attraction ceases for the moment, the lever drops, and the whistle sounds and continues to sound until the engineer, by pressing a button, K, whose stem pro-

jects into the lower part of the box just under the lever, checks the whistle, raising, by means of the button, the lever to its normal position—that is to say, into contact with the electro-magnet.

The electrical action is produced in the following manner: The wire of the helix is connected at one end with the body of the locomotive, and thence, through the intermediary of the wheels and rails, with the earth. The other end is prolonged by a wire, which, descending beneath the locomotive, communicates with a metallic brush, M, or "movable contact," Fig. 1, insulated and fixed in such position that its bristles shall extend some centimeters below any projecting part of the locomotive which may lie in the same path. This brush is shown on a scale of half size, in plan and section, in Figs. 4 and 5 of the drawings. On the railway track, and at the wished-for distance from the signal-disk, Figs. 2, 6, and 7, is placed a device, N, which we shall call the "fixed contact," composed of a wooden strip placed longitudinally between the rails upon a metal support, O, at such height that it will not be touched by any part of the rolling-stock moving above it. This wooden strip, covered by a coating of some insulating material, carries a strip of copper, which, through the intermediary of a conducting-wire, is placed in communication with the positive pole of a pile. The negative pole of the latter is connected to a commutator, P, Fig. 2, which places it in communication with the earth when the signal-disk is turned to signal the train to stop; and, on the other hand, insulates it during the time the signal-disk is not in use, or is not so turned as to be seen from the approaching train.

Many signals now in use are already provided with this commutator, which is used to effect the operation of an alarm-bell. As the wire of this alarm-bell and that of the fixed contact are both connected with the positive pole of the same pile, it will be seen that the introduction and use of our apparatus will require no addition to or modification of the present signal, whatever may be its special arrangement. Upon the passage of the locomotive over the line the brush M will rub forcibly against the fixed contact. If the signal is placed to indicate that the road is clear, there will be no effect produced. But if the signal is placed to warn the engineer to stop, the copper plate will be brought into communication with a source of electricity, and, upon passage of the locomotive, the contact of the metallic brush M with the copper plate completes the circuit, and through the intermediary of the helices of the electro-magnet, the body of the locomotive, and the wheels the whistle will at once be caused to sound.

The apparatus shown and described has never failed to act during the whole time it has been in use, and under all the tests to which it has been subjected, even when the locomotive has been urged to a speed of one hundred and ten kilometers per hour, and even when the copper plate has been covered with a thick layer of ballast. In this latter instance the metallic brush at once scattered the ballast, and no difficulty was experienced in establishing and maintaining contact. This extreme test proves that no obstacle to the successful working of the apparatus will be presented by accumulation of snow on the track. On the other hand, the apparatus has never been unduly disturbed or impaired in its operation by the violent shocks to which it is necessarily subjected during the movement of the locomotive, this being due to the simplicity of its arrangement, which admits of a solid and durable construction and fitting together of the parts. As it is of very small dimensions and occupies but little room it can be located on any part of the engine, and it requires no care or attention from the engineer to keep it in order. The metallic brushes which have been in constant use on the Northern Railway of France during the past eight months show scarcely any signs of wear, although they have been subjected to use under conditions much more unfavorable than in practice are generally likely to arise.

The arrangement of the fixed contact which we have described is that which is in use on the Northern Railway of France, where all the signals are provided with electrical alarm-bells. For those lines where these alarms are not found, it will be sufficient to locate near the signal a pile whose positive pole will be in communication with the copper plate, while its negative pole will be connected to a commutator placed on the signal, and arranged to complete the circuit when the signal is turned to warn the train to stop.

We have usually placed the fixed contact between the rails and in the center of the track, and this arrangement is preferable for those lines where the fall of snow is usually slight. But in regions where the snow-fall is more abundant and continuous, the fixed contact may be placed outside of the rails and at any convenient height above the ground alongside of the track, as indicated in Figs. 2, 8, and 9, and in such position that it will be out of the way of the most projecting or prominent parts of the rolling-stock. The brush or movable contact should, in this case, be arranged on the side of the locomotive in such manner that it will make contact with the fixed contact when the locomotive is passing the latter.

It might at first sight be supposed that by reason of the extremely brief duration of the contact no result could with certainty be produced. Our first trials of the apparatus were made with a fixed contact four and one-fifth meters in length, calculated to permit the passage of the current during one-fourth or one-fifth of a second, even when the engine was moving at the highest speed. Subsequent experience demonstated that a certain result is insured with a length of only two meters, which length of fixed contact we have since adopted.

If desired the apparatus may be operated without having recourse to the signal-disk.

The fixed contact can be placed at a considerable distance from the point, the approach of the train to which it is desired should be notified to the engineer, and by establishing between this point and the fixed contact an electric wire the engineer can be forewarned at any desired distance.

Our invention is also susceptible of other applications—for instance, when an engineer backs his train into the depot or into car-sheds, in which buffers are arranged at the end of the track, the whistle may be arranged to signal the moment when the coach or car in advance comes in proximity to the buffer. The engineer then will stop backing, and there can thus be avoided a frequent cause of damage to the rolling-stock, one which is the occasion of much expense.

On vessels communication can be established by this means between the officer of the deck and the engineer in those cases in which the latter may happen to be called away for the moment from his post.

In mines it can be used to signal from the most remote galleries the engineer at mouth of the shaft; and in a factory or large manufacturing establishment, the engineer can be thus signaled from any point in the building. The valve operated by the levers and electro-magnet need not necessarily be used with a whistle. The same arrangement of levers and electro-magnet without the whistle can be arranged to open or close a steam-valve, a safety-valve, a stop-cock for liquid or gas, the operator being at any distance from the valve or other device to be moved.

Having described our invention and the manner in which it is or may be carried into effect, what we claim, and desire to secure by Letters Patent, is—

1. The combination, with the movable contact, of the automatic steam-whistle alarm apparatus, constructed and arranged as herein shown and described, said parts being carried by the locomotive, and designed to operate in connection with a fixed contact on the track or road over which the locomotive runs, under the conditions and in the manner herein shown described.

2. The combination of the electro-magnet, the two levers, their connecting-rod and spring, and the steam-admission valve, the same being arranged together and operated substantially in the manner and for the purposes shown and set forth.

In testimony whereof we have signed our names to this specification before two subscribing witnesses.

JEAN DIDIER DIGNEY.
THEODORE DIGNEY.
HENRY LARTIGUE.
HENRY FOREST.

Witnesses:
EMILE BARRAULT,
RUY VINCK.