(No Model.) 2 Sheets—Sheet 1.

J. WAYLAND.

RAILWAY SIGNAL.

No. 532,930. Patented Jan. 22, 1895.

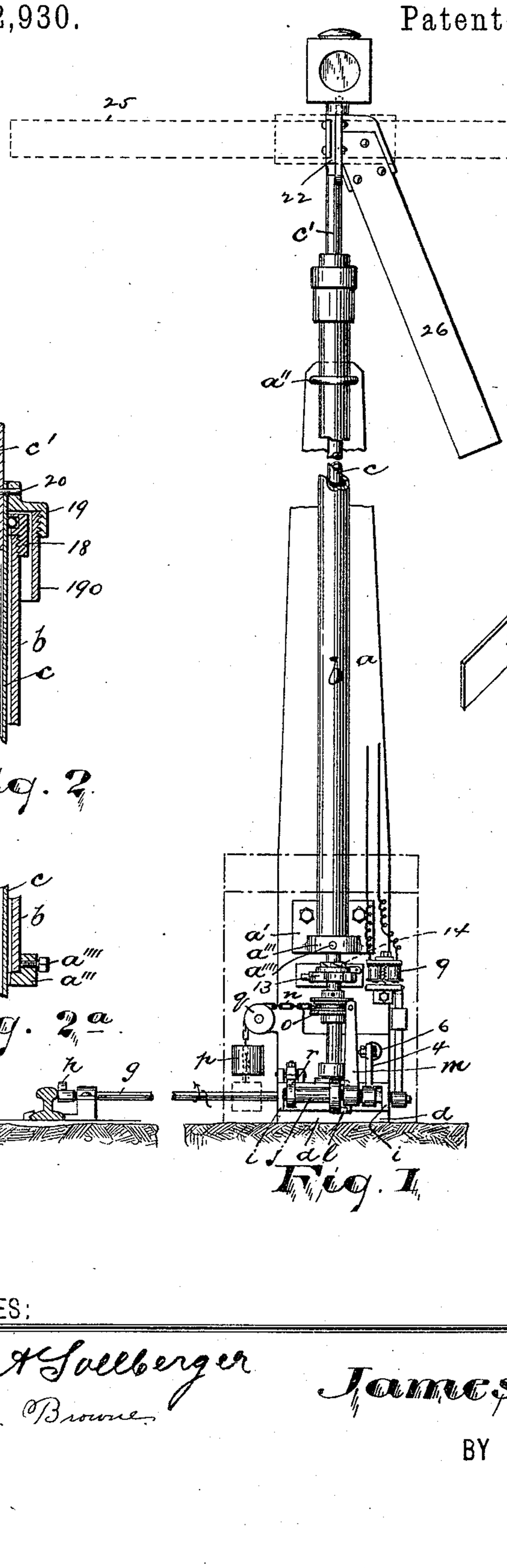

Fig. 1.

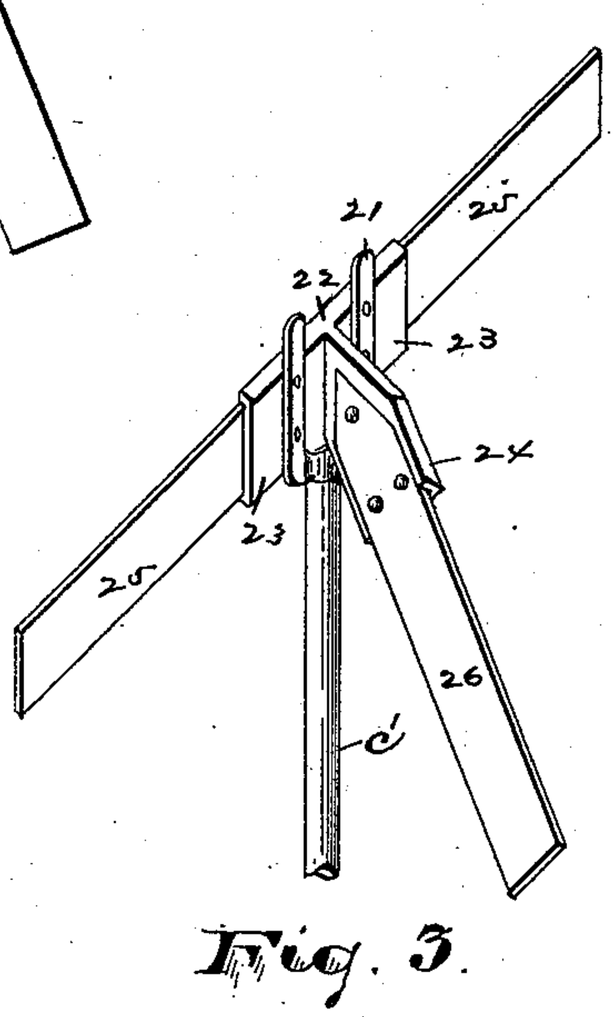

Fig. 3.

Fig. 2.

Fig. 2a.

Fig. 1.

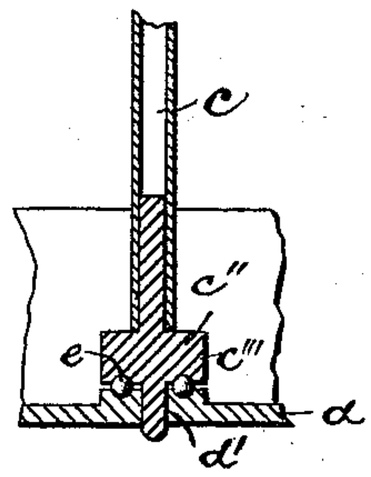

Fig. 4.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

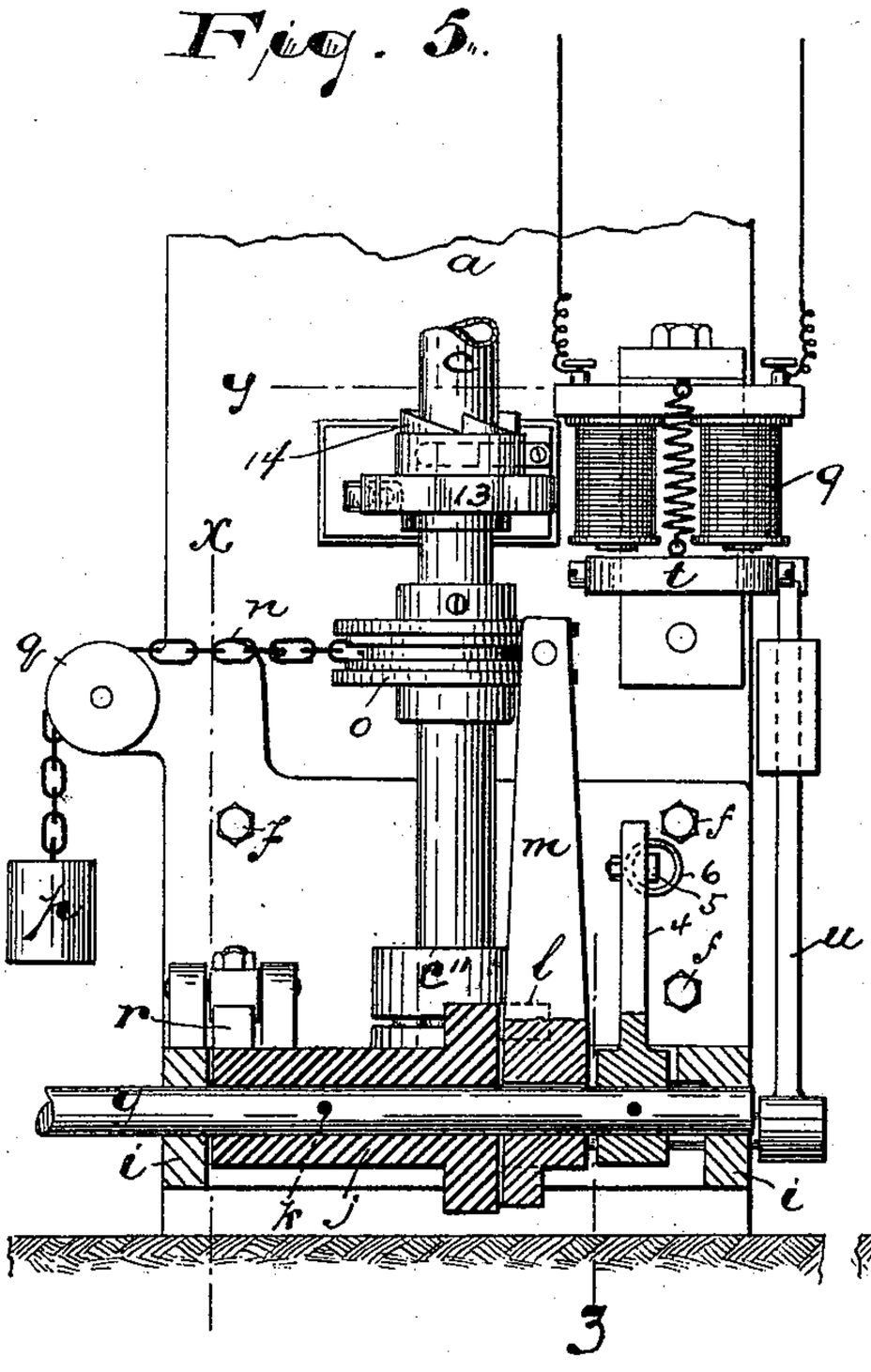
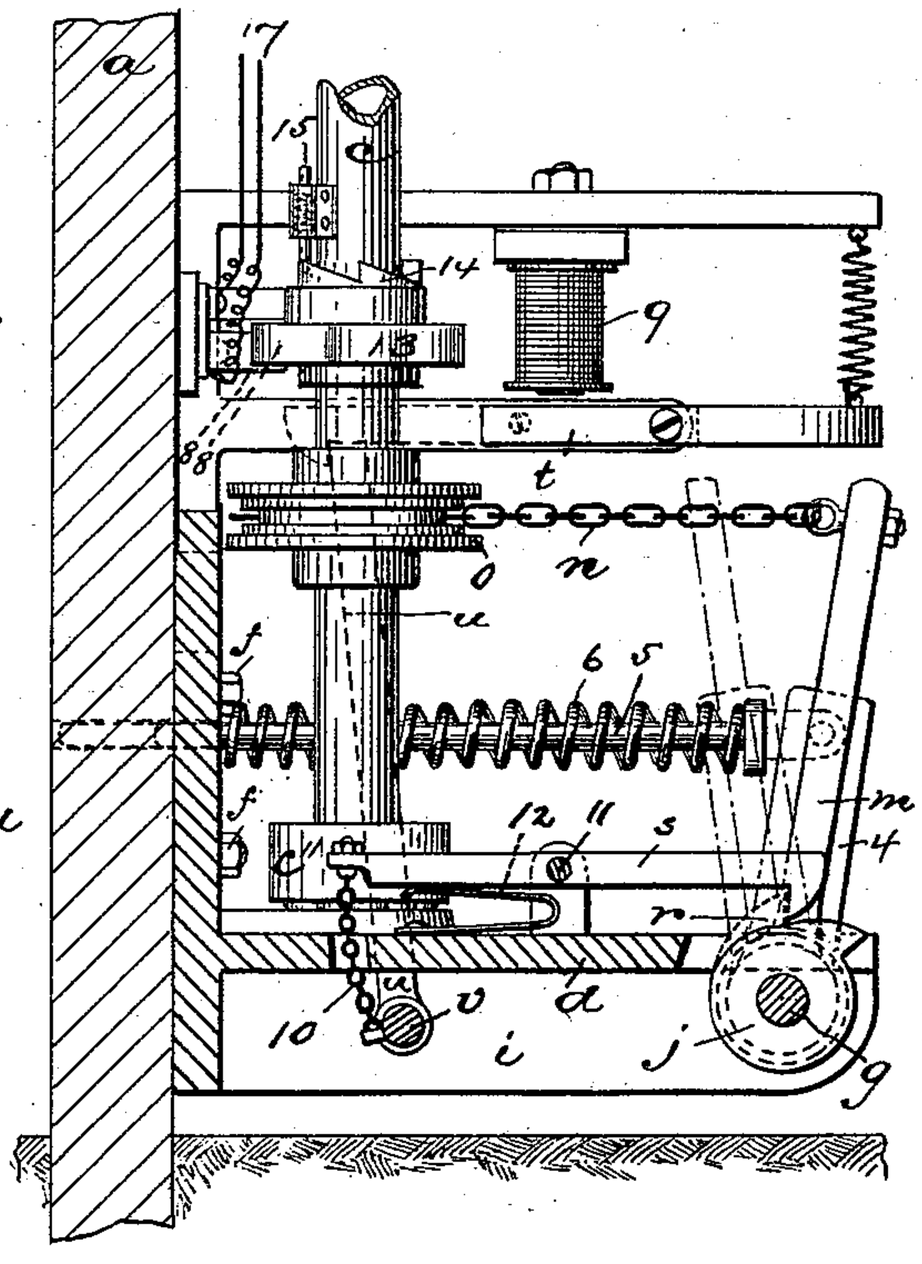


Fig. 6.



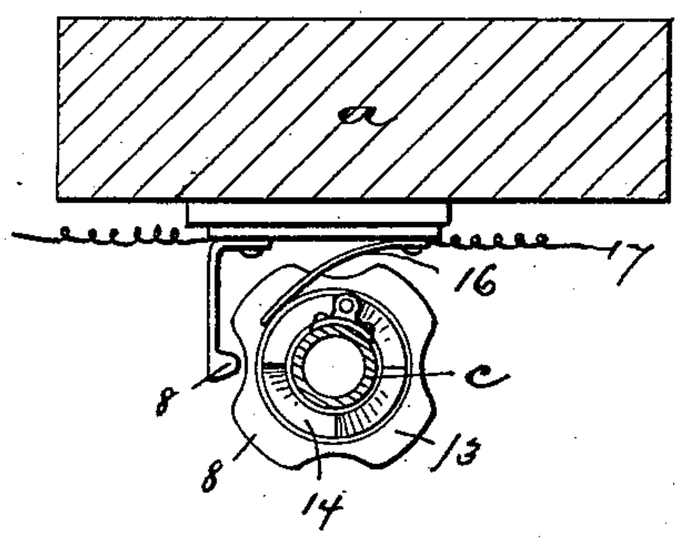


Fig. 7.

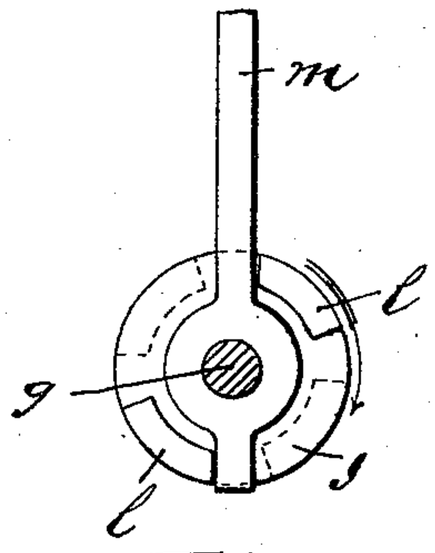


Fig 8.

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UNITED STATES PATENT OFFICE.

JAMES WAYLAND, OF NEWARK, NEW JERSEY.

RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 532,930, dated January 22, 1895.

Application filed May 23, 1894. Serial No. 512,179. (No model.)

To all whom it may concern:

Be it known that I, JAMES WAYLAND, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Railway-Signals; and I 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, and to letters and figures of reference marked thereon, which form a part of this specification.

The objects of this invention are to avoid the objections inherent in that class of signals operable vertically, by gravity or otherwise; to avoid the necessity of providing means to overcome the additional load to be carried when the signal is covered with snow, ice, sleet, or the like; to avoid the interference and obstruction due to such load; to enable the device to be more certainly and easily operated at the passing of a train, and to be less easily obstructed or interfered with in its operations by extraneous matters other than those related to the atmospheric elements; to more certainly protect the mechanism from the weather; to provide a device that will indicate with greater clearness and certainty the condition of the road with respect to previous trains; to reduce the cost of construction, and to secure other advantages and results, some of which will be referred to in connection with the description of the working parts.

Heretofore, in automatic railway signals, the working parts have been so exposed to the weather as that, when in winter, the rain or sleet fell upon them, it easily and quickly entered the joints and, freezing, prevented or greatly obstructed one part from operating upon the other, thus rendering the system inoperative and misleading, in that, while the signal would indicate a clear road, said road would, in fact, be in a dangerous condition.

In my improvement the working parts are protected so that the water cannot flow between the working parts, and the objections above indicated are avoided.

The automatic semaphores heretofore in ordinary use, oscillating in vertical planes at the sides of posts or standards, were particularly liable to be thus obstructed by ice. Because of the vertical movement of the semaphore, I have found it difficult to prevent the objectionable inflow of water to the joints and I have thus dispensed with such an operation of parts and have conceived and produced an automatic signal, the semaphore arms of which, operate in a horizontal plane, under indirect power of the passing train stored in a spring, which, at the proper time, gives up its power to effect an oscillation of the signal carrier, the direct force of the train being ineffective in immediately turning the signal arms horizontally.

I am aware that horizontally operative arms, one arranged in a danger-indicating position and the other indicating a safe track or way, have been suggested, but the joints of the working parts have been more or less exposed to inflowing water or sleet, and thus open to the objections above stated. In the present device, I have devised the parts so that the water, running down the signal blade support, instead of entering the joints, is thrown from said support and away from the said working parts. Again, in the horizontally operative signals, and especially where the signals are made large so as to be seen from a long distance and are thus, arranged upon heavy, long and strong metallic supports, so that, when necessary, they may be raised high over buildings, &c., such as would otherwise obstruct the view from the engine, particularly at curves of the road, they have been constructed in connection with operating means so that great power will be required to operate them, and, as a result, such signals have not been automatic in the sense herein employed, to wit, being capable of repeated operation to and from danger indicating positions by the mechanical power derived alone from the passing train.

In my invention I not only operate the heavy signal horizontally, in both directions, automatically and by train power alone, but this is accomplished by an indirect expenditure of power; that is to say, the power of the train is not transmitted positively to the signals to produce the desired horizontal movements, but such power is received by a spring and afterward dealt out to produce the effective results and thus the great concussions due to

direct connection with the tread at the track and their ruinous effect on the signal mechanism are avoided. To enable this heavy mass of iron or metal to be moved with but a comparatively small expenditure of power, such as can be easily stored in a spring, I have devised bearings such as are entirely novel in railway signals and particularly in horizontally oscillating signals. These bearings greatly facilitate the turning of the signals from danger-indicating positions to safety and, indeed, without them, the automatic operations would be apparently impossible in connection with the weighty signals with which my present improvements are particularly employed.

Again, I have found it desirable, when employing a night signal, to provide means for allowing the ready removal of the lamp. To provide such means without increasing the cost of the device, and at the same time provide means for firmly holding the semaphore blade carrier to the signal supporting shaft I have provided a construction hereinafter described. I have also provided means whereby the height of the signals may be raised or lowered to suit various positions on and conditions of the road without rendering it necessary to change the adjustment of the horizontally operative signal shaft.

The invention consists in the improved railway signal and in the arrangements and combinations of parts, all substantially as will be hereinafter set forth and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the views, Figure 1 is an elevation of the improved signal showing its relation to the track, the latter being indicated in cross section. Fig. 2 is a central vertical section, showing, in detail, the relation of a certain semaphore-carrying shaft to its co-operating parts at what I shall herein term the upper bearing. Fig. 2^a is a sectional detail of a certain socketed bracket. Fig. 3 is a perspective detail showing the improved semaphore. Fig. 4 is a central detail showing what I will hereinafter refer to as the lower bearing for the semaphore-carrying shaft. Fig. 5 is a detail elevation showing the relation of the semaphore-carrying shaft with the devices for controlling its movements in connection with the moving train. Fig. 6 is a detail section taken at line x. Fig. 7 is a horizontal detail section taken at line y; and Fig. 8 is a sectional detail taken at line z, showing the construction of a certain clutch.

In said drawings, a, indicates a post or fixture of any suitable kind adapted to hold the semaphore supports in proper vertical position. To said post is secured, toward the bottom, a bracket, a', shown in Fig. 2^a and toward the top a staple or loop, a'', the ends of which are held to the posts by nuts or other means in any suitable manner. The bracket, a', is provided with a projecting socketed bearing, a''', into which the lower end of the tubular casing, b, is seated and held by a set screw, a'''', so that it cannot be raised from its bearings or otherwise disturbed. The bracket is vertically perforated to allow the passage of the semaphore shaft, c.

Extending up parallel with the post, a, at one side thereof, is arranged within the casing, b, the semaphore shaft, c, which is preferably in sections, the lower section being tubular as indicated in Figs. 2 and 4 and the upper section, c', carrying the semaphore, being vertically and telescopically adjustable in its relation to the said tubular section, as will be understood upon reference to Fig. 2, so that the signals at the upper ends of the same may be increased or diminished in altitude, without changing the adjustment of parts, as circumstances may require. The casing, b, being immovable at its lower end, may extend through the top of a box as indicated in outline in Fig. 1, the joint at the passage being made close so as to be impervious to water and thus prevent the clogging of the working parts by the freezing of said water. At the top of said casing, the same is also protected by a cap having an apron which hangs down below the upper end of the casing so that moisture cannot enter, as hereinafter more particularly referred to. Thus the working parts of the device are protected fully from ice clogging, without any increase of friction due to the cap.

The lower end of the tubular section rests upon a carriage, c'', consisting of a flanged bar, the upper end of which is driven or otherwise secured in the tube and the lower end enters a hole, d', in a base plate or lower bearing, d, so that any lateral displacement is prevented. The flange c''', Fig. 4, is annularly grooved on the under side in correspondence with a similar groove in the upper face of the base plate and in the grooves are arranged balls, e, which take the weight of the carriage and allow a very easy rotation of the shaft, c, on its end. The base plate may be fastened upon the post by bolts, f. To turn said shaft on its end, to bring the semaphore either to its "danger" indicating position, or to a position indicating "safety," or a clear way for the train, I have provided suitable mechanisms to accomplish the desired results which are under the control of the passing train.

The mechanisms which I have selected for the purposes of this case and which, under most conditions, I prefer, are shown in Figs. 1, 5, 6, 7 and 8, where, g, indicates a horizontal shaft extending from the track, where it is provided with a tread lever, h, to the post where it finds bearings in the flanges i, i, of the base plate, d. On said shaft g, at said base plate, is arranged a clutch, j, fixed by set screw, k, or other means. Said clutch is provided with teeth or clutching projections, l, l, which engage a lever, m, loosely arranged on said shaft g. At the outer or projecting end

of said lever the same is provided with a chain or flexible connection, *n*, which is secured to a pulley or segment, *o*, by a pin or other means, and, after passing over a pulley or sheave, *q*, is provided with a weight, *p*. On said shaft *g*, is also fixed a lever 4, at the projecting end of which is a spring carrying rod, 5, and its spring 6, the latter being so disposed as to be compressed when said shaft *g*, is turned, the power of the moving train being thus stored in said spring. The spring, 12, serves to raise the weighted lever to its elevated position in engagement with the armature catch. When the train engaging the tread lever *h*, oscillates the shaft, *g*, it throws the clutch from clutching relation to the loose lever, *m*, so that the latter is free to be operated upon by the weight *p*, which said weight draws on the flexible connection, *n*, turns the semaphore and the latter is brought to its danger indicating position. The lever, *m*, of course is drawn by the weight at the same time. The clutch, at its end opposite that having the clutching projections, is provided with an eccentric catch projection, *r*, shown in Fig. 6 more clearly. When the shaft *g*, arrives at the end of its oscillating stroke, due to the depression of the rail tread, the said catch projection, *r*, is caught by a catch lever *s*, by means of which the said shaft is firmly held in place until the said catch is released by the passage of a train from the block. Upon such passage of the train out of the block, a contact of terminals 8, 8, Fig. 7, of an electric circuit, is made, which causes magnetization of the electro-magnet, 9, arranged adjacent to the semaphore carrying shaft. The said magnet thus attracts an armature catch, *t*, which in turn is disengaged from a weighted lever *u*, carried by a shaft *v*, so that said lever is free to gravitate pivotally and turn said shaft *v*, in its bearings in the flanges *i*. The falling of the weight is with considerable force, and sufficient to temporarily overcome the force of the spring 6, in which power from the train is stored as before indicated. The shaft *v*, is connected by a chain or flexible connection, 10, with the lever catch, *s*, which latter engages and holds the catch, *r*, of the clutch, so that the said lever catch *s*, is turned against the power of the spring 12, on its pivot or fulcrum 11 and the hooked end raised from said catch *r*, when the said chain is wound on said shaft because of the turning of the latter.

To secure a contact of terminals, at the passing of the train from one block into another, I have loosely arranged on the shaft *c*, a circuit wheel 13, Fig. 7, adapted to be engaged by one of the terminals, 8, as it is turned by the power of the passing train and, immediately after such engagement, to be again disengaged or thrown from electrical contact, where it lies normally until another passage of the train and another oscillation of the shaft carrying the signal and said wheel. To secure such contact and break alternately, I have made the wheel concavous or recessed on four of its sides, so that there will be a disengagement with the terminal, 8, at each quarter turn of the wheel and the end of each oscillation of the shaft.

The circuit wheel, 13, is provided on the upper side with a ratchet wheel, 14, which is engaged by a spring pawl 15, on the shaft, *c*, by means of which last the oscillating movement of said shaft is converted into intermitting rotary movement of the circuit wheel. A contact spring, 16, Fig. 7, constantly in contact with the circuit wheel transmits the electric fluid from the circuit wire, 17, as will be evident. The arrangement of the circuit wires and battery is the same as is common in this line of electrical signaling and a full illustration of the same is not deemed necessary.

At the upper bearings for the shaft *c*, the tubular casing, *b*, is provided with a head 18, Fig. 2, which is provided on the interior with an annular groove in which balls are arranged which bear inwardly on the shaft *c*, so that the latter may turn thereon without material friction. The end of the said tubular section, *b*, is protected by a cap, 19, which is fastened upon the shaft *c*, as shown or in any other manner suitable, the apron, 190, of which hangs down so that no water or moisture can enter said tubular casing. Said apron is out of contact with said tubular shaft to prevent friction, as will be understood. The cap 19, may be held to the shaft *c*, by the same pin 20, which holds the section *c'*, to the tubular section of said shaft, or otherwise, as convenience dictates.

I am aware that caps attached to a shaft so as to move therewith have been employed in connection with semaphores having pivotal connections with said shafts above said caps, so that the joints were fully exposed to the weather and were thus constantly liable, in winter, to be clogged with ice and rendered inoperative. I am also aware that horizontally oscillating shafts carrying signaling blades at the tops, movable therewith, have extended through cap-like parts corresponding with the cap, 18, in this case, but said oscillating signal shafts formed exposed joints with the adjacent or co-operating parts liable to fill with down-flowing water, freeze and become inoperative. In my improvement the cap for shedding the water is imperviously arranged upon an oscillating signal carrying shaft, as distinguished from a longitudinally movable signal working shaft, and no joints at all are open to gravitating water. Thus all danger of freezing is avoided, and the frequent attention now required in winter is rendered unnecessary.

At the upper end of the section, *c'*, the same is provided with a flat fork, 21, against which is bolted a semaphore holder 22, of cast iron and having horizontal holding arms, 23, and a downwardly turned arm, 24, each of which is provided with shallow grooves to receive the semaphore blades 25, 26. The blade 26,

is disposed in a plane substantially at right angles to that of the blade or blades 25, so that when one is presented, flatwise to the view of the engineer the latter will be presented edgewise and will not be seen.

The coloring of the downwardly extending blade is distinct from that of the horizontal blade or blades and thus the horizontal blade or blades, indicating danger, are distinguished both in color and position from the downwardly extending blade, indicating safety and the passing engineer will be more likely to recognize or comprehend the indication than he would were the blades all of one color as in prior devices of which I am aware.

Heretofore in my prior devices, the spring that served as the motor for the semaphore blade, also served to return the weighted lever that released the catch which held the motor spring compressed and as a result, should the co-operating armature catch fail to engage the weighted lever to hold the same in its elevated position, said weighted lever would fall back and the spring would be without tension sufficient to elevate said weight and thus the weight was in danger of not being caught and the signal was to an extent uncertain.

I have, in the present case, employed the spring, 12, which is dissociated from the spring, 6, by which the semaphore blades are carried and this said spring, 12, is of sufficient power to raise the weighted lever positively in caught relation to the armature catch. After the weighted lever has fallen and wound up flexible connection, 10, of the shaft, *v*, so as to unhook the catch lever, *s*, from the catch, *r*, which holds the motor spring, 6, compressed, said motor spring acts on the catch, *r*, the latter turns out of the way and the lever, *s*, drops so that the connection, 10, becomes taut under the power of the spring, 12, and the weighted catch lever is raised, as above, all independent of the semaphore shaft.

The operation of the device is substantially as follows: Upon the passage of a train and the depression of the tread lever, the shaft *g*, is turned in its bearings *i*, and with it the clutch, *j*, the teeth of which become disengaged from the lever *m*, and allow the weight, *p*, to draw upon the pulley, quadrant or segment, *o*, and turn the signal a quarter of a circle and bring the horizontal danger colored blade to the distinct view of the engineer and the depending and safety-colored blade away from such view. The movement of the shaft, *g*, also turns the lever arm 4, and compresses the spring 6 and the catch, *s*, acted upon by the spring 12, enters into holding relation to the catch projection *r*, of the clutch so that the said parts are held during the passage of the train over the block forward of said signal. Arriving at the next signal at the forward end of said forward block, the train engages its tread, turns its shaft *g*, and shaft, *c*, and with the last, its circuit wheel, 13, causing a contact of terminals 8, 8, of the electric circuit connecting with the electro-magnet, 9, of the signal at the rear of said forward block. The said electro-magnet is thus magnetized, attracts its armature catch, *t*, and releases the weighted lever, *u*, and turns the shaft, *v*, causing a winding of the chain, 10, on said shaft, a releasing of the catch, *s*, from the clutch catch so that the spring 6 is allowed to act to force the lever 4, shaft *g*, clutch *j*, lever *m*, weight *p*, connection *n*, shaft *c*, semaphore blades, and tread *h*, all to the initial safety positions.

Having thus described the invention, what I claim as new is—

1. The improved railway signal, in which is combined the vertically disposed horizontally oscillating shaft carrying safety and danger indicating signals at their upper ends arranged at right angles to one another, a track tread adapted to be operated by the passing train and to transmit power to a power storing spring, said spring serving as a reservoir for such power and means connecting said spring and shaft, and means to which the energy stored by the passing train is transmitted converting the power stored in said spring into horizontal movement of said signal-carrying shaft and returning the signal to an initial position, substantially as set forth.

2. In a railway signaling device, the combination with the tread-lever and means for transmitting power from the same, of a vertically extending signal having signal blades at right angles to one another, and at its lower extremity turning horizontally on rolls, a catch, and a spring and weight and connections with said transmitting means and signal, the weight serving to turn the signal on said rolls in one direction, the catch to hold the energy temporarily stored in the spring, and the spring serving to raise said weight and turn said shaft in the opposite direction when the catch is released, and means for releasing said catch, substantially as set forth.

3. In a railway signaling device, the combination with the vertical signal shaft, of a weight connected with said shaft and adapted to turn the same in one direction, the connection, *n*, arranged on pulley, *q*, and converting the gravitation movement of the weight into horizontal motion at said shaft, and a spring adapted to receive tension from an extraneous source of power, and to expend the same in raising said weight and turning said shaft in a reverse direction, and a catch and connections extending a distance from the signal and serving to hold the stored power until released, as set forth.

4. The improved railway signal, in which is combined with a signal post, a raised bracket fixed thereto and a tubular casing resting at its lower end on said bracket and also fixed to said post, a semaphore shaft arranged in said casing and at its upper end carrying safety and danger indicating signals, and at

its lower end provided with a flange resting on ball bearings at the foot of said post, said shaft at its lower part being provided with means actuated and controlled by the passing train and giving horizontal oscillation to said shaft and bringing the danger indicating signals to safety indicating positions and vice versa, as set forth.

5. In a railway signal, the combination with a tread lever, shaft, *g*, and clutch, of a lever, *m*, loosely arranged on said shaft, a connection, *n*, weight, *p*, and a pulley, *o*, arranged on the signal shaft and operated by said connection and said signal shaft, all arranged and adapted to operate, substantially as set forth.

6. In a railway signaling device, the combination with the vertical and horizontally movable signal shaft carrying danger and safety indicating signals disposed at right angles one to the other, of a motor connected with said shaft and adapted to turn the same horizontally in one direction, another motor receiving motive force from the passing train and expending the same in supplying the first said motor with motive force and in turning the shaft in the opposite direction, and a catch and connections extending a distance from the signal and adapted to be operated automatically by the passing train to release said catch and allow the second motor to expend its force in supplying the first with energy, substantially as set forth.

7. The improved railway signal herein described, in which is combined a post, *a*, a tubular casing, *b*, rigidly secured thereto the lower end of said casing being elevated to allow the shaft operating means to be arranged beneath, a horizontally oscillating shaft, *c*, extending through said casing, the upper end having signaling devices to indicate danger and safety, a cap arranged on said shaft, *c*, below said signaling means and overhanging the upper end of said casing, a flanged carriage secured to the lower end of said shaft and seated on balls, said balls, and automatic mechanisms, connecting with said shaft below the casing and bracket for oscillating said shaft, substantially as set forth.

8. The improved railway signal, in which is combined, a post, *a*, a tubular casing, *b*, secured to said post, a signaling shaft *c*, extending through said casing, a flanged bar, *c''*, fastened to the lower end of said shaft, below the said tubular casing and having on the under side of the flange an annular groove in which balls may work, and at the lower end working in a hole in the base plate, said base plate and balls and means automatically operating said shaft on said balls to turn the signals to danger and safety under the power of the passing train.

9. The improved railway signal, herein described, in which is combined a post, *a*, a tubular casing fixed thereto, said casing providing antifriction bearings at the upper end to prevent lateral movement of the signal shaft, said signal shaft consisting of a tubular lower section extending through said casing and an upper section arranged telescopically therein, the upper section carrying the signaling blades, and the lower tubular section resting on a flanged bar, the upper end of which above the flange enters said tubular shaft and the lower end a hole or recess in the base plate, balls interposed beneath the flange and said base plates, said base plates and motors indirectly transmitting power from the passing train to said shaft to oscillate the same horizontally and turn the signals from danger to safety indicating positions and oppositely, substantially as set forth.

10. In a railway signal, the combination with the fixed casing, a sectional oscillating signal-carrying shaft, the sections of which are telescopically arranged, of a cap secured to said oscillating shaft the curtain of which depends below the upper end of the casing, the cap and sections being united by the one pin or fastening means, substantially as set forth.

11. The improved railway signal in which is combined with the track and tread, *h*, arranged thereat, of a shaft, *g*, operated by said tread, a clutch, *j*, fixed to said shaft, an arm, *m*, loosely arranged on said shaft and engaged by said clutch, a weighted connection, *n*, fastened to said arm and extending into engagement with a pulley, *o*, of the said shaft, *c*, said signal shaft, a spring 6, and lever, 4, arranged on the shaft with the clutch and a catch for holding the clutch and means for releasing said catch substantially as set forth.

12. In a railway signal, the combination with the tread *h*, and connecting shaft, *g*, of a clutch *j*, fixed to said shaft and adapted to hold the signaling mechanisms in safety indicating position, said clutch being provided with a catch projection, *r*, adapted to engage a cooperating catch in its danger position and to be held thereat and said cooperating catch, all arranged and operating substantially as set forth.

13. In a railway signal, the combination with the tread *h*, and shaft *g*, of a clutch *j*, fixed to said shaft and having catch projection, *r*, means for operating the signal held by said clutch and a catch lever, *s*, shaft *v*, weighted lever, *u*, connection 10, spring 12, and electrically controlled means engaging said weighted lever, said parts being arranged and combined substantially as set forth.

14. In a railway signal, the combination with the horizontally oscillating shaft carrying danger and safety indicating blades disposed at right angles one to the other, and an automatic motor turning said shaft on its end in one direction, another motor for turning the shaft in the reverse direction and supplying the first said motor with power, connections with the track whereby power is conveyed from the passing train to the last said motor, a catch for holding power in the last said motor temporarily and catch releasing means extending a distance from the signal

and operated by the passing train, all said parts being arranged and operating substantially as set forth.

15. In a railway signal, an oscillating signal carrying shaft, a weight connected to and turning said shaft to its danger indicating position at the passing of the train, means for holding said shaft in its safety indicating position, and means for releasing said holding means to allow the shaft, *e*, to turn from its safety to its danger indicating position at the passing of the train, all combined substantially as set forth.

16. In a railway signal, the combination with a signal shaft, and a motor for turning the same, connections with the railway track whereby the power of the passing train is transmitted to the said motor, a catch for holding the transmitted power stored in said motor, a gravitative weight, the downward operative impulse of which releases said catch, and a spring independent of the signal shaft and its motor, for raising said weight, substantially as set forth.

17. In a railway signal, the combination with the vertical oscillating and signal carrying shaft, having a segment or pulley *o*, of a shaft, *g*, adapted to be turned by the power of the passing train and having an arm or lever, 4, a spring 6, adapted to be compressed by said arm and to store power, a catch for holding said shaft in its turned position and said spring in its compressed condition, a clutch *j*, lever *m*, connection *n*, adapted to engage said pulley *o*, and a weight and means for throwing said catch from holding engagement, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 16th day of May, 1894.

JAMES WAYLAND.

Witnesses:
CHARLES H. PELL,
LOUISA BROWNE.