(No Model.)

J. A. BONNELL.

APPARATUS FOR OPERATING SIGNALS.

No. 341,397. Patented May 4, 1886.

Fig. 2

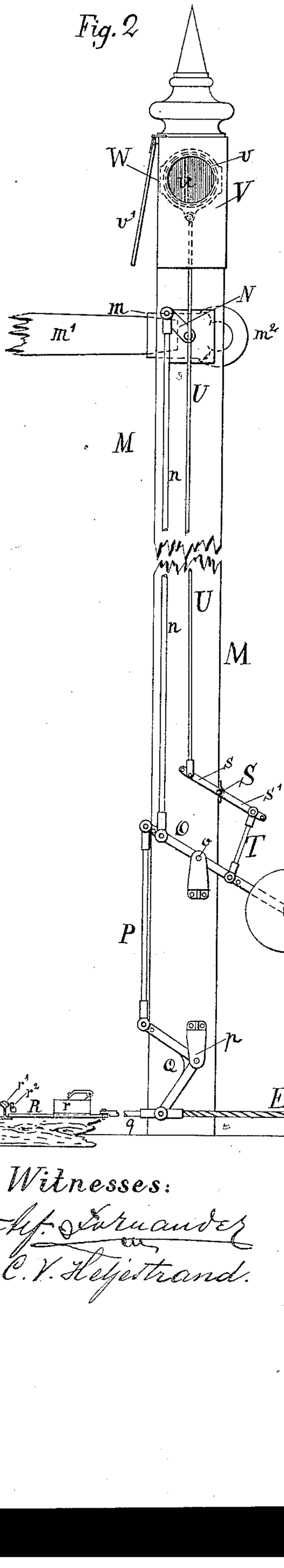

Fig. 1

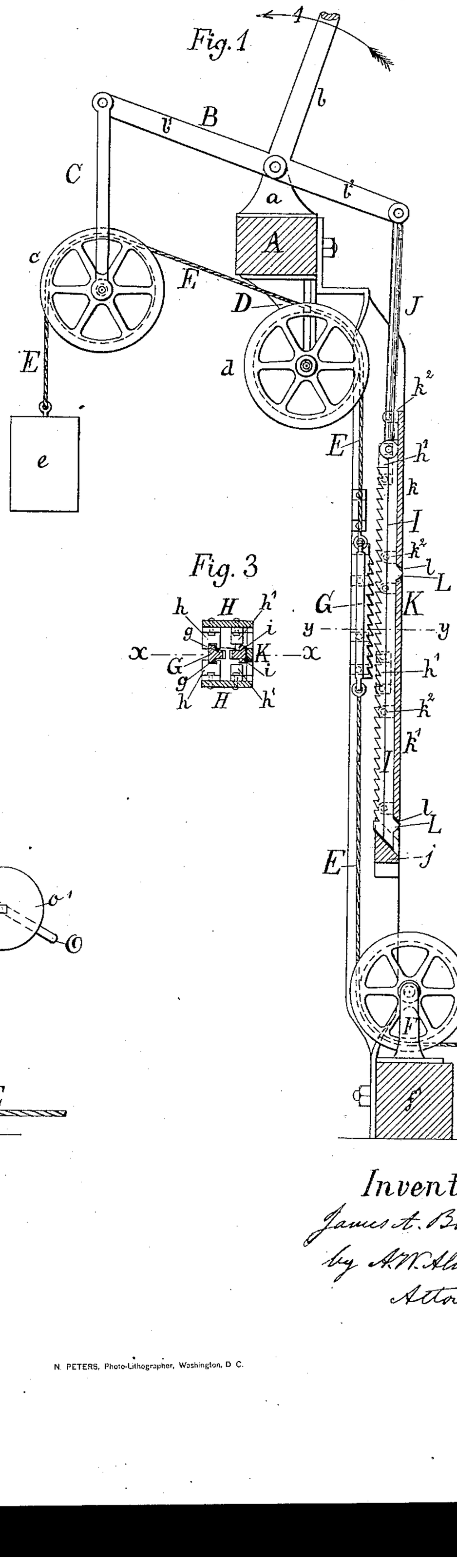

Fig. 3

Witnesses:

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR OPERATING SIGNALS.

SPECIFICATION forming part of Letters Patent No. 341,397, dated May 4, 1886.

Application filed January 5, 1885. Serial No. 152,234. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. BONNELL, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Operating Railway-Signals, of which the following is a specification.

The object of my invention is to provide an improvement in the construction of apparatus whereby the three different railway-signals—form, color, and sound—may be operated simultaneously by a single movement of only one lever, and the positions of the form and color signals—that is, of the semaphore and colored lights—shall be absolutely positive, and thus never liable to be misunderstood.

The invention comprises the construction, in combination with the semaphore signal-cord and its operating-lever, of the compensator, which acts, independently of the said lever, to take up the slack of the said cord, but is operated automatically by the movement of the said lever to change the signal; also, in combination with the signal-cord and operating-lever, the construction and combination of details whereby the semaphore or form signal and an illuminable glass or color signal, arranged separately, are connected together to move simultaneously with different length of throw, the semaphore, when "off," disappearing totally within the signal-post, while the colored glass drops below the light. The form, color, and sound signals are operated by one common signal-cord and hand-lever.

In the accompanying drawings, Figure 1 represents in side elevation the construction of the compensator and the means of forming connection between the same and the hand-lever for operating the signal-cord, the rack-frame being sectioned on the line *x x* of Fig. 3, and all the parts being in the normal position, which corresponds with the signals when indicating "danger." Fig. 2 represents in side elevation a torpedo-signal device and a signal-post provided with semaphore and colored-glass disks, and showing how the three signals are connected to be operated simultaneously by the same signal-cord, all the signals being "on," or in position to indicate "danger." Fig. 3 is a cross-section on the line *y y* of Fig. 1.

To a bracket, *a*, upon a suitable beam, A, in the signal-house, is fulcrumed a lever, B, of the first class, at right angles to which, and formed in one piece therewith, is the handle *b*, by which it is operated. The lever B is fulcrumed at its junction with the handle *b*, as shown in Fig. 1, in such a manner that the leverage of the arm b' is larger than the leverage of the other arm, b^2. From the free end of the lever-arm b' is suspended, by a pivotal jaw, a double link, C, through whose lower end is mounted, in lugs or other suitable bearings, the shaft of a rope pulley, *c*, by which and a pulley, *d*, (journaled in bearings in a bracket, D, secured to and underneath the beam A,) the signal-cord E is supported. The end of the said cord pendent from the pulley *c* is provided with a weight, *e*, by which the cord is kept taut. From the pulley *d* the cord E runs down vertically to and around another pulley, *f*, which is journaled in brackets F upon a floor-beam, f', or other beam, arranged lower than the beam A. The cord E then runs along the ground and railway-track to the signal-posts and torpedo-slides, the connection being made by straight or bell-crank levers to leave the cord parallel with or at an angle to the direction in which it leaves the pulley *f*, according as location may require.

A part of the vertical portion of the cord E, between the pulleys *d* and *f*, is formed of a rack, G, having downward-pointing ratchet-teeth, and said rack is provided with ribs *g*, lateral to its face, by which ribs it is fitted to slide vertically in grooves formed in stationary guide-cleats *h*, which are secured oppositely, as shown in Fig. 3, to the inside of two opposite iron plates, H, bolted through suitable flanges at their upper and lower ends to the beams A f', respectively. Face to face with the rack G, but with its ratchet-teeth pointing upward, is another and much longer rack, I, having ribs *i*, like those of the rack G, by which it is allowed to slide between (but prevented from lateral displacement by) cleats h', secured oppositely to each other on the inside of the plates H.

The upper end of the rack I is connected to the free end of the short arm b^2 of the lever B by means of a link, J, and pivotal jaws at the ends of said link. The lower end of the rack

I is cut off at an incline in the direction shown in the drawings, which at the end of its downward travel acts against a similarly-inclined stop, *j*, which is secured between the plates H H, and which causes the rack I at the end of its downward throw to withdraw from gear with the rack G.

The plates H H are secured together by a vertical back-strip, K, formed of two bars, *k k'*, having laterally-opposite lugs k^2 bolted to the plates H H, the said plates and bars forming what I call the "rack-frame," or the frame in which the racks G and I are arranged to slide.

By inclined cuts through the back strip, K, or off the ends of the bars *k k'*, are formed pockets *l* to receive (when the rack I reaches the end of its downward movement) correspondingly-formed rounded or V-shaped projections L formed or attached upon the back of the rack I. The distance from the point-line of the teeth of the rack I to the point of the projections L is the same or slightly less than the distance between the bottom line of the teeth of the rack G, and the inner surface of the back K. Consequently when the lever-handle *b* is moved in the direction of arrow 1, the rack I, as it rises, will (impelled by the inclines of the stop *j* and pockets L') swing forward against the rack G and engage its teeth, with which it will keep in contact so long as the projections L on the upward movement are out of the pockets L', and after having engaged the rack G it will necessarily lift the latter with it, and thereby pull the signal-cord E, which is attached to the said rack G.

When the handle *b* has been moved in the direction of arrow 1 to the end of its throw, (the handle being arranged in an ordinary segmental-notched bar, which, as old and very usual, is not shown in the drawings,) the signal-cord has been pulled sufficiently to withdraw the torpedo-slide from the rail, the colored-glass disks from the light, and to swing the semaphore in a vertical position within the signal-post and entirely out of sight, or, as it is termed, to bring the signals "off." When the handle *b* is drawn back again in the position shown in Fig. 1, it has lost its grip upon the rack G, which allows the predominating weight of the signal-post (as will be presently described) again to put all the signals on—that is, bring them in position to indicate "danger," while the less heavy weight *e*, on the pendent end of the cord E, takes up the slack of the cord, however the latter may gradually stretch, so as to always keep it taut, thus avoiding the danger of any lost movement in the throw of the lever.

M is one of the signal-posts, made, preferably, of two planks secured together by interposed boards, or otherwise, so as to leave between them a space sufficiently large for receiving therein the semaphore *m*, and completely concealing the latter when in the vertical position. The blade or arm *m'* of the semaphore *m* is secured in a socketed casting having journals, by which the semaphore is fulcrumed to the post M, the said casting being weighted at m^2 to evenly counterbalance the arm *m'*, and a crank, N, being secured (at an angle of about forty-five degrees to the center line of the arm *m'*) to one of the journals, which latter, for that purpose, extends a distance through the side of the post. A rod, *n*, connects by pivotal jaws at both of its ends, the crank N with a lever, O, which is fulcrumed at *o* by a lug or bracket, to the post M, and whose other end is provided with a slidable weight, *o'*, secured upon it by a set-screw. This is the weight, above referred to, by which the signals are moved back in their normal position (indicating "danger") as soon as the hand-lever *b* and rack I are brought in the position shown in Fig. 1. A rod, P, connects by pivotal jaws at its ends the lever O with the upper arm of a bell-crank lever, Q, which is pivoted by a lug or bracket, *p*, to the post M, and whose lower arm is connected by pivotal jaws to the signal-cord E, and to a rod, *g*, connected directly or indirectly (according to location of the track) with the torpedo-slide R. This latter, sliding through a feed-box, *r*, carries a torpedo to one of the rails *r'* of the track into position to be exploded by the impact of a hammer-lever, r^2, (fulcrumed at the side of the rail,) when the said lever is forced down upon it by the first passing wheel of an approaching train; (but the construction of the torpedo-signal device being a separate invention, I make it the subject of a separate patent application.)

In bearings at the back of the post M, above the lever O, is mounted a shaft, S, to each end of which, at opposite sides of the post, is rigidly secured a crank, *s*, one of which cranks has, rearward of the post, an extension, *s'*, with which it forms a straight lever of the first class. This, by a rod or link, T, having pivotal jaws at its ends, is connected to the lever O at a point between the fulcrum *o* and the weight *o'*, so that the lever *s s'* will move always in the same direction as the lever O. The said levers are provided with several holes, as shown in the drawings, so that the pivoting-points of the jaws may be moved nearer to or farther from the fulcra, to so adjust their leverage that the end of the crank *s* will move a longer distance than the end of the crank N, for the purpose as will presently appear. To the cranks *s*, at each side of the post M, is connected by a pivotal jaw a rod, U, whose upper end is similarly connected to a sliding frame, W, carrying the colored-glass disk *u*, which, by the upward movement of the cranks *s* and the rod *n*, is pushed up to cover the lens-opening *v* in a lamp-casing, V, secured on the top of the post M. The required distance of travel of the disk *u* is larger than the required distance of travel of the crank N in swinging the semaphore a quarter of a turn; hence the necessity of the extra lever *s s'* and the ad-

justability of the leverage of the same and of the lever O. A lamp is inserted on top of the post through the door *v'* into the center of the casing V, and the colored disks *u* are arranged to slide within the casing V, between the lens-cover openings *v* and the light, the colored disks toward the approaching train being red, indicating "danger," and the colored disks toward the attendant in the signal-house being blue, simply (by its distinction from the white light) to show him that the danger-signal on the opposite side is up, as it must be when the blue and red disks are moved simultaneously.

The construction of the lamp-casing V and the arrangement of the lamp and colored disks therein being a separate invention, I reserve for a separate patent application.

I am aware that form and color signals have previously been operated simultaneously by arranging a clored disk directly upon that end of the semaphore where I place the counterweight m^2, and placing the lamp at the back of the post, so that the light will be in juxtaposition to the colored disk when the semaphore is horizontal, thereby indicating "danger," and when the semaphore is dropped at an incline enough to raise the colored disk above the light to indicate "all clear;" but as by that construction the semaphore-blade is always exposed to view, and when the working-parts are worn a little its position when it should be entirely horizontal quite often, in consequence of such wear, is more or less inclined, such a signal is dangerous, as being very apt to mislead and cause serious accidents.

It will be seen that by my present system the signal is always kept positive. When the semaphore is seen at all it indicates "danger," and so does the colored disk covering the lens-opening *v*, and when the way is all clear the semaphore is entirely concealed from view within the post, and when it is so concealed the colored disk is also sunk from view below the lens-opening *v*.

As the withdrawal of all the signals is done by a pull of the cord E, and the replacing is done by the weight *o'*, which also pulls on the cord E, it is evident that the said connection E never needs to be rigid, but only flexible, and is preferably made of a light wire rope. The connection *q* between the bell-crank lever Q and the torpedo-slide R must, however, be rigid, as the slide is moved outward by a pushing movement, and the rod Q, in order to be light, is therefore preferably made of a tube or tubes, which, when the distance between the end connections is considerable, are supported to move upon rollers.

Referring again to Fig. 1, it will be seen that the pulley *c*, supporting the counter-weighted end of the cord E, is suspended by the link C from the arm *b'* of the lever B. This is done for the purpose of utilizing the weight *e* for another function in addition to that of taking up the slack of the cord—that is, to counterbalance the iron rack I and link J, acting by the leverage b^2, on the same fulcrum as the arm *b'*, thereby lessening the resistance and facilitating the work of the operator when he moves the lever-handle *b* in the direction of raising the rack I, to cause it to engage with the rack G to signal "all clear."

I am aware that a signal-cord having applied to it a constant force acting to keep it taut and a clutching device attached to the said cord have been connected with the operating-lever and arranged to engage, by raising the said lever, another clutching device to withdraw the signals, the lowering of the lever replacing the signals, such a device being shown in the English Patent 3,548 of 1878.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the signal cord E, provided with a weight, *e*, to keep it taut, and a toothed sliding rack, G, with the operating-lever *b* b^2, the toothed sliding rack I, facing the rack G and connected to said lever, the said rack I having inclined or curved rises L, and the guide-frame H H K, provided with the inclined guides and stops *j l*, causing the rack I to engage the rack G when moved in one direction and to release and withdraw from it when moved in the opposite direction, substantially as specified.

2. The combination of the signal-post M, having light-box V, the semaphore *m*, pivoted within the post and having crank N, the lever O, weighted at one end and connected from the other end to the signal-cord and by rod *n* to the crank N, the color-signal *u*, fitted to slide in the box V, and having attached to it the rod U, and the lever *s s'*, connected at one end to the rod U and at the other end, by link T, to the lever O, between the fulcrum *o* and weight *o'*, all substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 1st day of October, 1884.

JAMES A. BONNELL.

Witnesses:
A. W. ALMQVIST,
C. V. HELJESTRAND.