(No Model.)

2 Sheets—Sheet 1.

A. G. CUMMINGS.

SIGNAL APPARATUS.

No. 272,122. Patented Feb. 13, 1883.

Fig. 1.

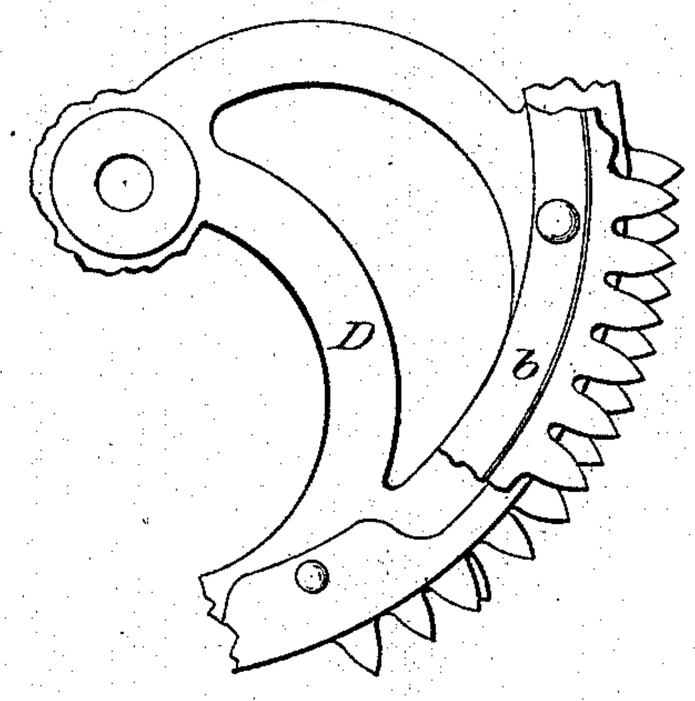


Fig. 2.

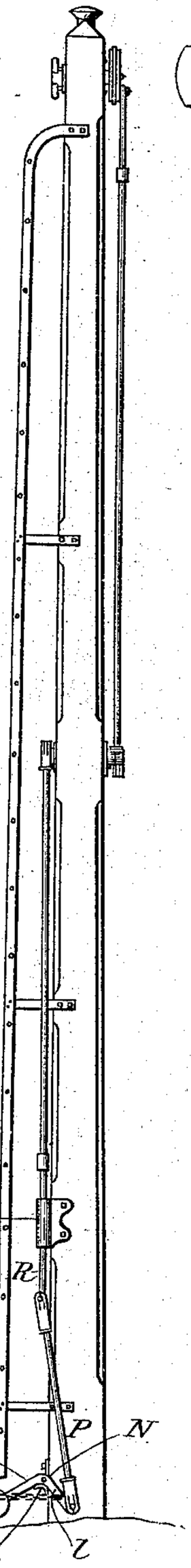


Fig. 3.

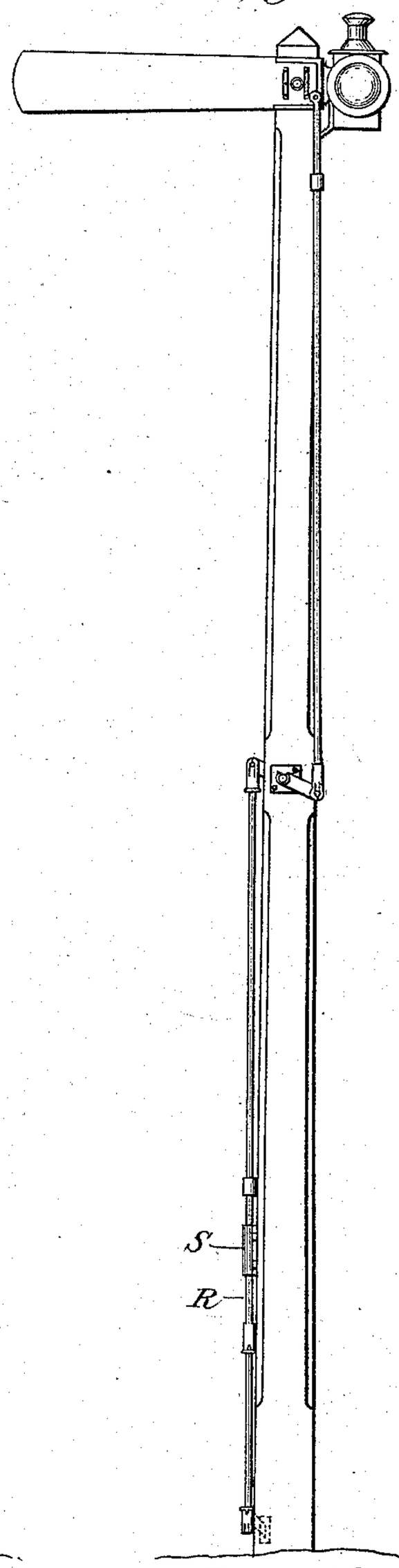


Fig. 4.

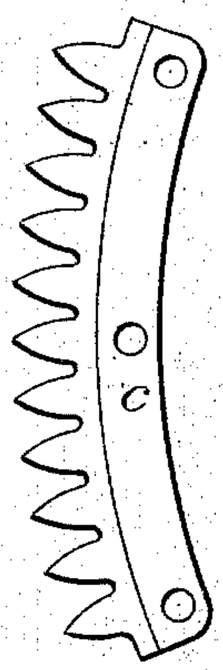
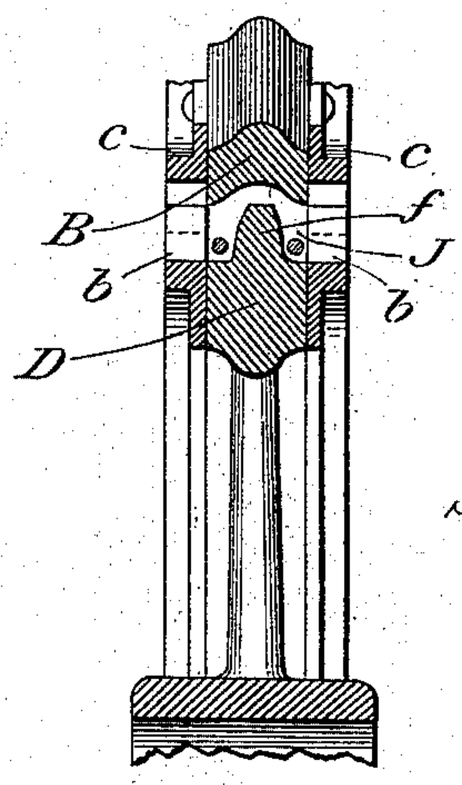


Fig. 5.



Witnesses:
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Ed. Schurmann

Inventor.
Albert G. Cummings

(No Model.)

2 Sheets—Sheet 2.

A. G. CUMMINGS.

SIGNAL APPARATUS.

No. 272,122. Patented Feb. 13, 1883.

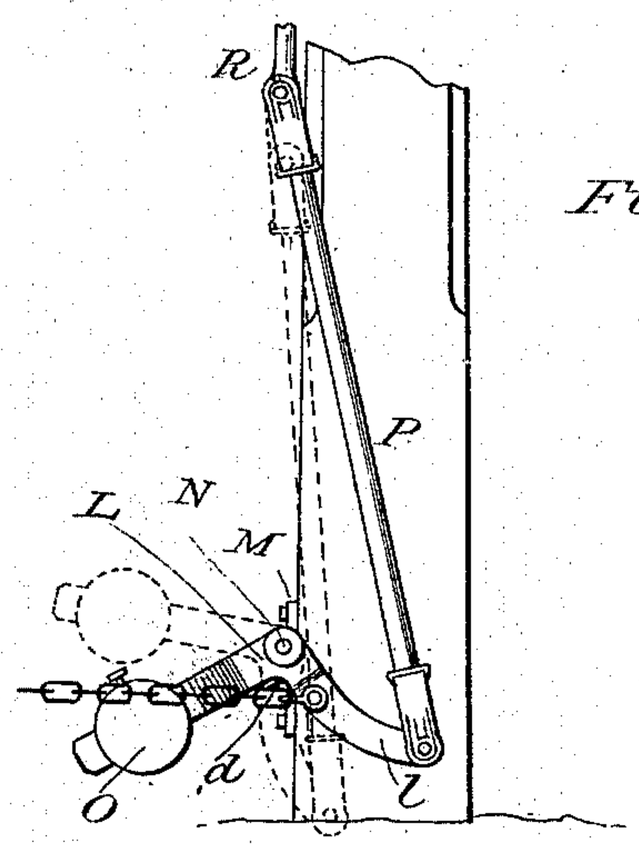
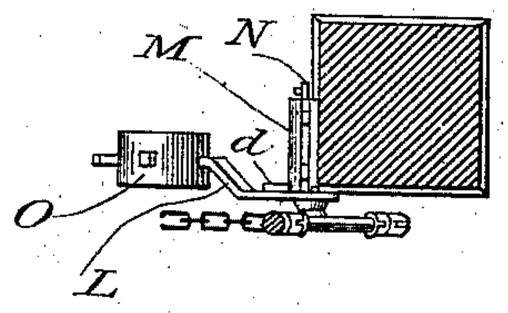


Fig. 6.

Fig. 7.



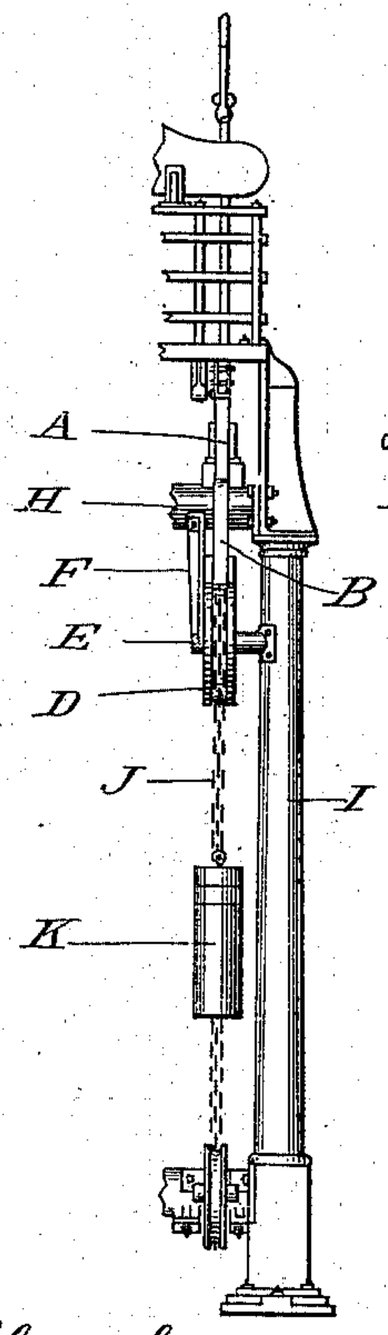


Fig. 8.

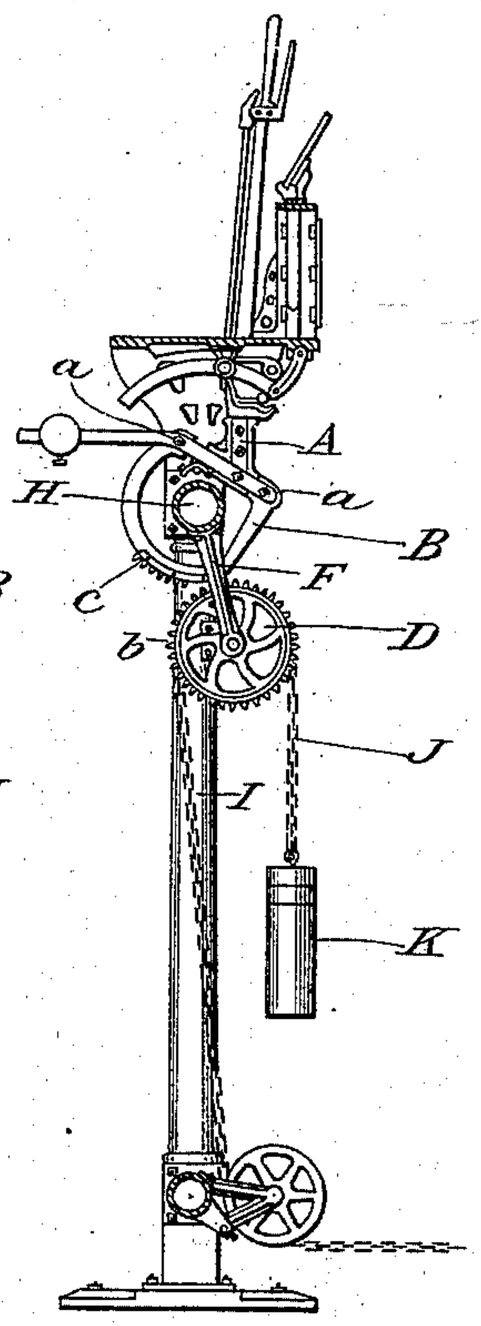


Fig. 9.

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UNITED STATES PATENT OFFICE.

ALBERT G. CUMMINGS, OF HARRISBURG, ASSIGNOR TO THE PENNSYLVANIA STEEL COMPANY, OF STEELTON, PENNSYLVANIA.

SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 272,122, dated February 13, 1883.

Application filed September 7, 1882. (No model.)

To all whom it may concern:

Be it known that I, ALBERT G. CUMMINGS, of Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented certain new and useful Improvements in Signal Apparatus; 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 of reference marked thereon, which form a part of this specification.

The object of my invention is to operate signals by means of levers placed at considerable distance from said signals, and in the apparatus for operating said signals to provide for variations of the length of the wires used for connections. The employment of wires as connections between signals and the levers for operating the same has always been attended with difficulties from the tendency of the wires to stretch, and also from the variations of lengths due to changes of temperature, all of which have tended to make the operation of the signals uncertain and unreliable.

My improvement consists of two features: first, the manner of pulling the wire-connections by the movement of a hand-lever which in its normal position is free of engagement with the wire connection, the said wire connection being always taut; second, the manner of producing diminishing movements of the signal.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side view of a portion of the sprocket-wheel with segments of actuating-gear attached. Fig. 2 is a side elevation of signal-post with attachments for operating a semaphore-signal. Fig. 3 is a front elevation of the same. Fig. 4 is a plan of segment C. Fig. 5 is a cross-section of sprocket-wheel D and yoke B, with gears *b* and *c* intermeshed. Fig. 6 is an enlarged side elevation of a section of post with signal-operating attachments. Fig. 7 is a cross-section and plan of the same. Fig. 8 is a front elevation of a lever-frame with compensating device attached. Fig. 9 is a cross-section of apparatus and side elevation of the same.

In Figs. 8 and 9 my improvement is shown attached to an interlocking apparatus, same as described in my Patent No. 226,499; but it is obvious that my invention may also be attached to a switch-lever whenever it is desired to operate a signal in connection with a switch, or to a lever which may be used to operate a lock for securing a switch. In an interlocking apparatus such as described in my said Patent No. 226,499 a girt, H, that is part of the frame of the apparatus, serves as a support and a fulcrum for the hand-levers A. In such apparatus a number of hand-levers, as may be required to operate the several switches, &c., are arranged side by side on the same fulcrum.

Upon the lower part of the hand-lever A, I attach a yoke, B, which is of such form as to avoid striking the girt H. The yoke B may be of any shape to avoid coming in contact with the girt, it being essential only that a portion of the yoke attachment shall be concentric with the pivot of the hand-lever.

On the portion of the yoke attachment B that is concentric to the pivot of the hand-lever there is a short segment of a strong gear, C, which I prefer to make of steel casting, and secure by suitable rivets. The segment C has gear-teeth, whose bearing-faces meet and form a sharp-faced tooth instead of a flat-faced tooth, such as are in common gearing. For the extra length of tooth thus formed provision is made by giving additional depth to the space between the base of the teeth on the gear with which it meshes.

By means of a hanger, F, bearing-box G, and pivot E, I suspend very close to the front end of the segment *c* a sprocket-wheel, D, which has on the side a gear, *b*, with teeth similar to the segment *c* already described. When the lever A is moved from its normal position, in which it appears in Fig. 9, such a movement swings the yoke attachment B forward and brings the segment *c* into mesh with the gear *b;* but otherwise the segment *c* has no engagement with the gear.

An open chain, J, hangs on the sprocket-wheel D, the links fitting close upon the sprockets *f*, Figs. 5, 7, and 8. One end of the chain J is attached to the wire connection by which the signal is operated, and on the opposite end of the chain J a weight, K, is suspended. At

the signal-post the wire connection is attached (by means of a chain when necessary to pass over sheaves) to the short curved arm *l* of a bell-crank lever, L, that is pivoted on a plate, M, by means of an axle, N, which journals in the plate M. (See Figs. 6 and 7.) The plate M is provided at its lower end with a lug, *d*, on which the long end of the bell-crank lever L rests, and by which the downward movement of said lever is limited. On the lever L, I place a sufficiently-heavy weight, O, to overcome the friction of dragging the whole length of the wire connection and to raise the weight K. At the extreme end of the short arm *l* of the lever L, I attach the signal-rod R by means of a connection-rod, P, forming in effect an inverted toggle-lever arrangement. The signal-rod R passes through the guiding-plate S and is divided into two parts by a compensating-lever.

The operation of my improvement is as follows, viz: When the hand-lever A is standing in its normal position the segment *c* is withdrawn from any contact with the gear *b*, and consequently the wheel D is left free to rotate, and the signal will remain in its normal position, (which will generally be understood as indicating "danger,") and any elongation of the wire connection will be taken up by the descent of the weight K, while any contraction of the wire connection will simply raise the weight, the strain on the wire connection at all times being sufficient to keep the wire stretched taut. When the signal is to be operated the hand-lever A will be drawn backward, which movement advances the yoke attachment B forward and brings the segment *c* into mesh with the gear *b*, and rotates the wheel D, and thus pulls the wire connection the required distance and gives movement to the bell-crank lever L at the signal-post. As the bell-crank lever L is moved the weight O is lifted and the position of the lever *l* and the connection-rod P changed from that indicated by the full lines to the nearly-vertical position indicated by the dotted lines in Fig. 6, and the signal-rod R is pulled down by that movement and the position of the signal changed to indicate "safety." By the return of the hand-lever A to its normal position the weight K is raised, the connection slackened, and the weight O falls until the bell-crank lever L rests on the stop *d* of the plate M, and the signal thus restored to the position indicating "danger." Should the wire connection break while the signal is being operated, the signal will at once (by the action of the weight O) go to the position indicating "danger," and in case of any difficulty it will be impossible to give the signal the position indicating "safety" when that of "danger" should be given.

Inasmuch as the amount of movement that a long line of wire can be made to convey will (from various causes) always be variable to some extent, it is desirable to operate the signal by some device that, notwithstanding such variable movements, will always give the signal the change of position required. In my improvement this object is secured by the arrangement of the lever *l* and the connection-rod P, producing a diminishing movement of the signal-rod. It will be noticed that as the lower part of the connection-rod P approaches the axis of the lever *l* its downward movement, and consequently its action on the signal, has almost ceased when it arrives at the position stated; also, that further movement in the same direction will not affect the signal until the end of the lever *l* has passed to a considerable distance beyond the dead-center of its movement. It is by means of the action on a dead-center that any slight variation in the connection does not cause a noticeable difference in the position of the signal, and as the greatest movement of the signal is effected at the commencement of the stroke and the movement diminishes toward the end of the stroke, it follows that if an elongation of the connection has prevented the full amount of movement of the bell-crank lever L the signal will nevertheless have made such a change of position that the character or intent of the signal will be unmistakable. If the signal-rod were made in one piece, without a compensating-lever, as shown, then an upward movement would be required to make the signal indicate "safety," to effect which the bell-crank lever L would require to be made in a different form or attach the connection from the hand-lever in a different manner. Preferably I would make the bell-crank lever L with three arms, and to the arm extending below the pivot attach the connection to the hand-lever. On the arm extending horizontally place the weight O, and to the arm extending above the pivot attach the signal-rod R or the connection-rod P. Thus the arm above the pivot would have the same functions as the lever *l*, above described, and would with the connection-rod P form a toggle-lever arrangement (not inverted) that would give the diminishing movement before mentioned, and such an arrangement would thus be an equivalent to the arrangement I have shown.

By this improvement I can operate a signal at a given distance with less power exerted on the hand-lever than other arrangements require. This gain arises from the fact that whereas, owing to the uncertain amount of movement that long wire connections will convey, in other signal arrangements it has been necessary to have a considerable surplus of movement, with devices at the signal to allow such surplus, and to effect by the hand-lever a long movement of the connection, necessarily increasing the leverage against the operator, in my improvement I utilize at the signal all the movement of the connection, and therefore require to effect by the action of the hand-lever but one-half or two-thirds of the customary movement of the connection. Therefore I can reduce the leverage and power required in the proportion mentioned.

Owing to the sharp form given to the face

of the teeth in the segment *c* and the gear *b*, there can be no catching of the teeth one on the other, as would be the case if the teeth were of the ordinary flat-faced form, and it requires only the slightest movement of the hand-lever A to bring the segment *c* into engagement with the gear *b*. Thus an effective movement of the wire connection is produced with a lever of ordinary convenient length.

It is obvious that the amount of movement given to the wire connection will always be according to the radius of the yoke attachment B, and to obtain a greater movement of the wire connection requires simply to have the yoke attachment B made of a greater radius, and vice versa.

It is also obvious that by making the signal-rod stiff enough to avoid lateral deflections the guide S and the connection-rod P may be dispensed with, and the end of the signal-rod attached directly to the end of the lever *l*, which will be equivalent to the plan I have shown and considered preferable.

It is also obvious the wheel D may be made of a form to receive a round linked pitch-chain, or grooved for a wire rope or any other flexible portion of the wire-connection, either of which would be equivalent to the form of wheel I have shown.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a hand-lever of interlocking apparatus, of a yoke attachment, B, provided with the fixed segment *c*, substantially as and for the purpose specified.

2. The combination, with a hand-lever of interlocking apparatus, of a yoke attachment, B, gears *b* and *c*, and wheel D, substantially as and for the purpose specified.

3. Segment *c*, rigidly attached to hand-lever A of a signal apparatus, and concentric to the axis of said hand-lever, in combination with chain-wheel D, substantially as and for the purpose specified.

4. Segment *c*, rigidly attached to hand-lever A of a signal apparatus, and concentric to the axis of said hand-lever, substantially as and for the purpose specified.

5. In combination with the wire connection of a switch and signal mechanism, the intermeshing gears *b* and *c*, having sharp-faced teeth operating a wire connection compensator, as and for the purpose specified.

6. The combination, with the signal and its rod, of lever *l* pivoted in such relation to the same that a diminishing movement of signal is secured, substantially as and for the purpose specified.

7. The bell-crank lever L, in combination with the pivoted connection P and sliding rod R, pivoted in such relation to the signal and connection that a diminishing movement of the signal is secured, substantially as and for the purpose specified.

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Witnesses:
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