(No Model.) 3 Sheets—Sheet 1.

H. F. PARSONS.

AUTOMATIC BLOCK SIGNALING SYSTEM AND APPARATUS FOR RAILWAYS.

No. 396,421. Patented Jan. 22, 1889.

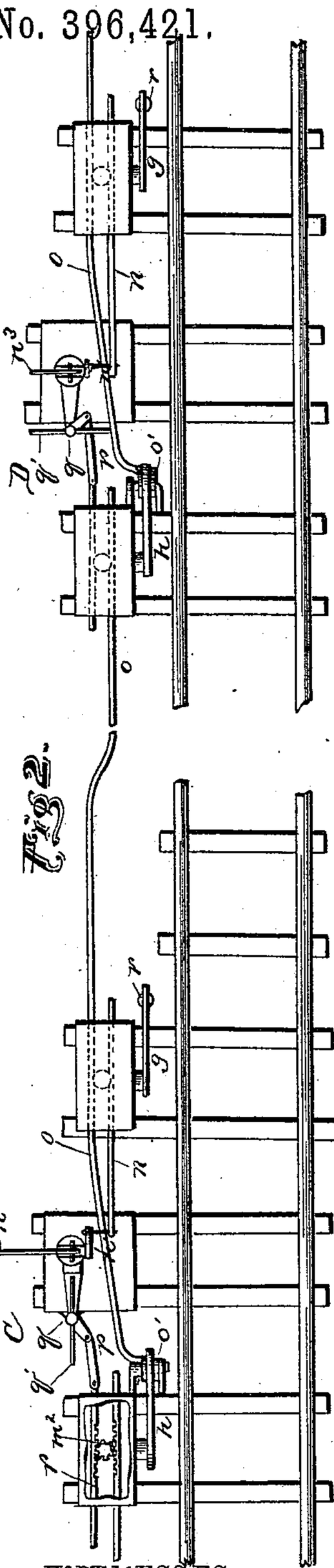

Fig. 2.

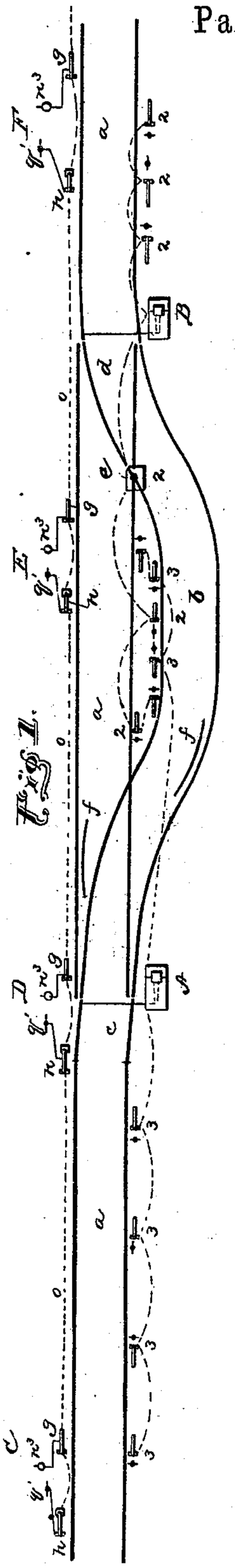

Fig. 1.

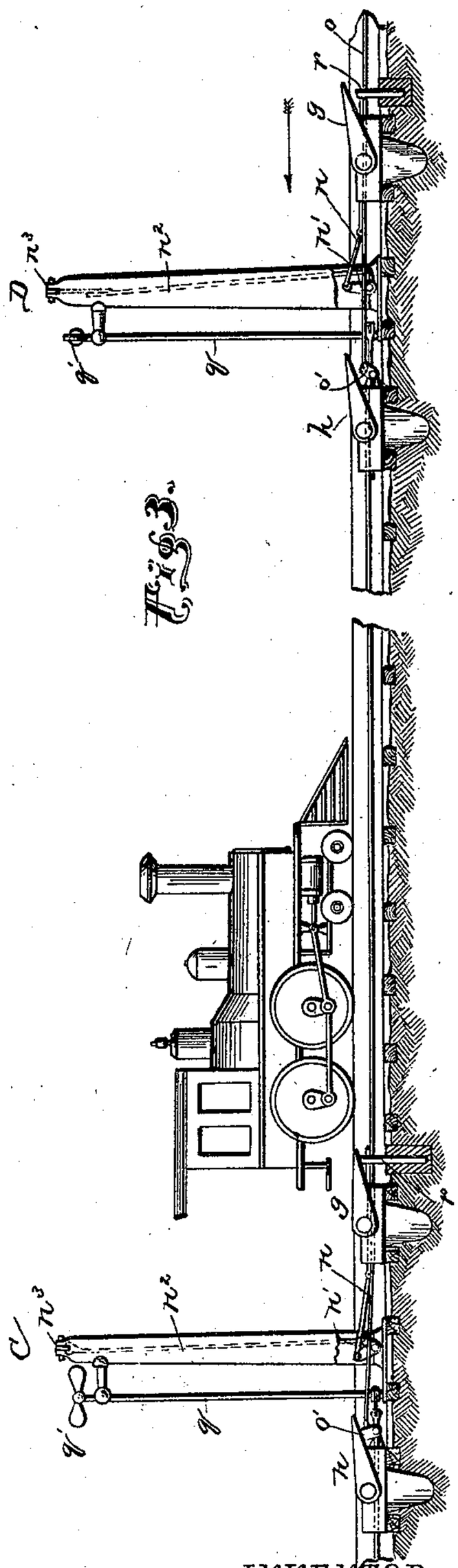

Fig. 3.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

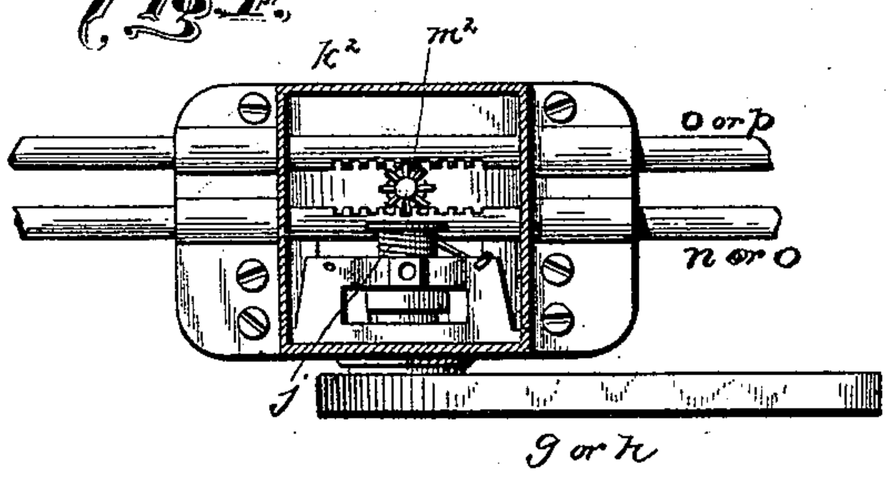


Fig. 5.

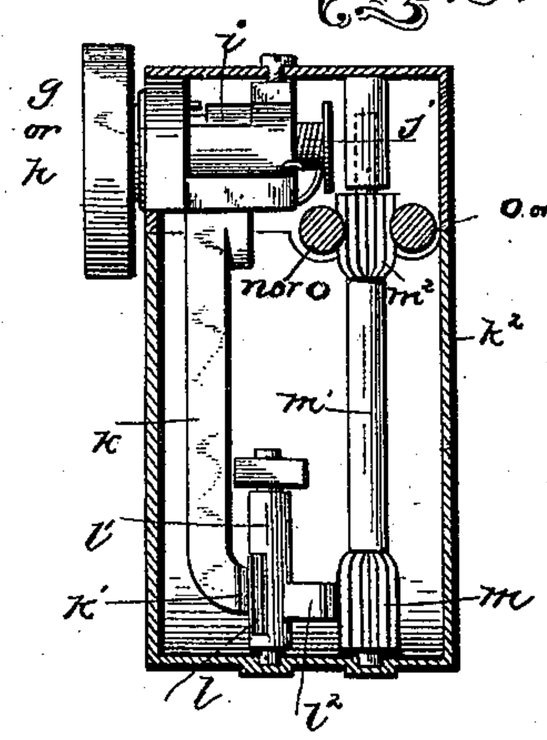
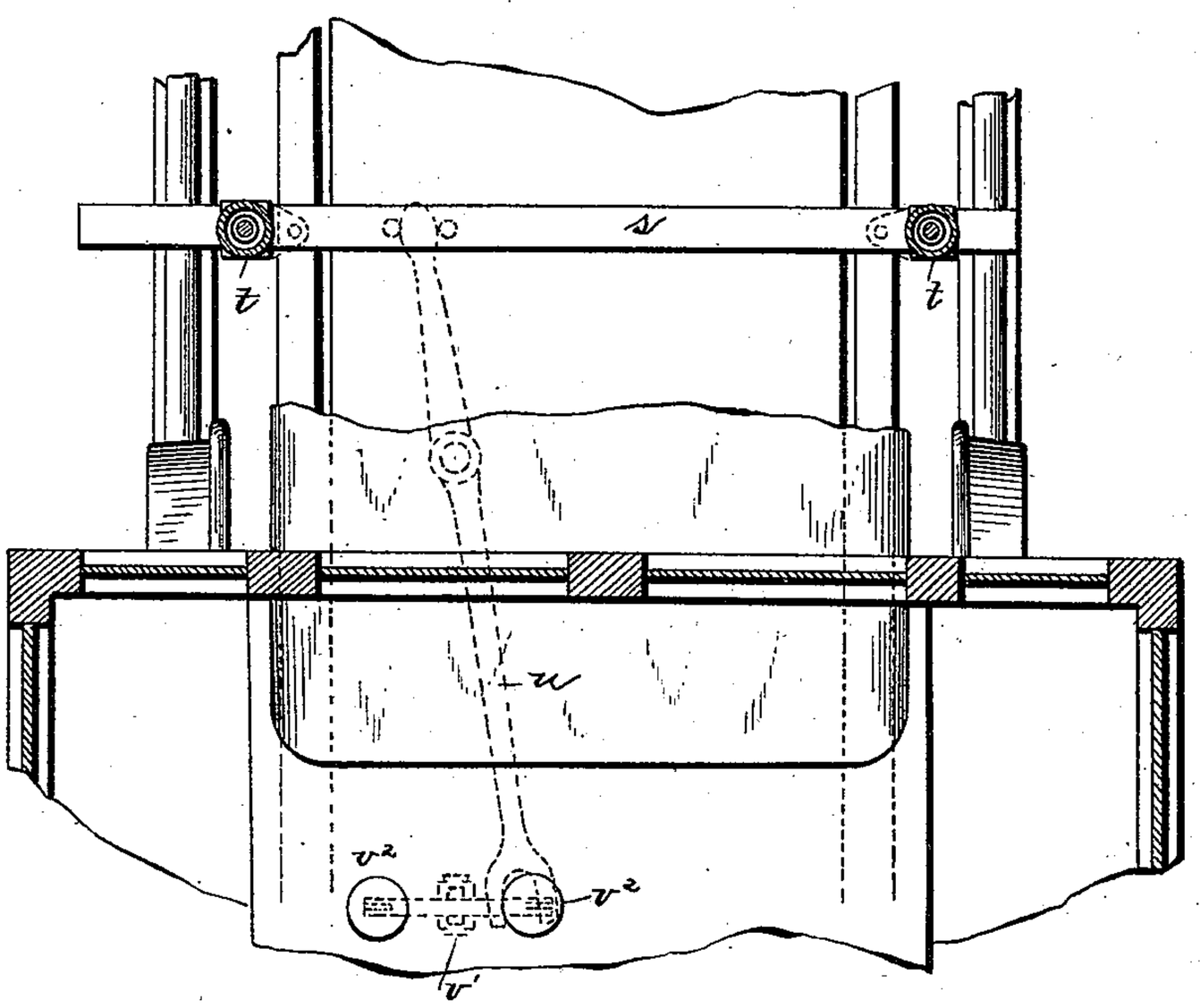


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

H. F. PARSONS.

AUTOMATIC BLOCK SIGNALING SYSTEM AND APPARATUS FOR RAILWAYS.

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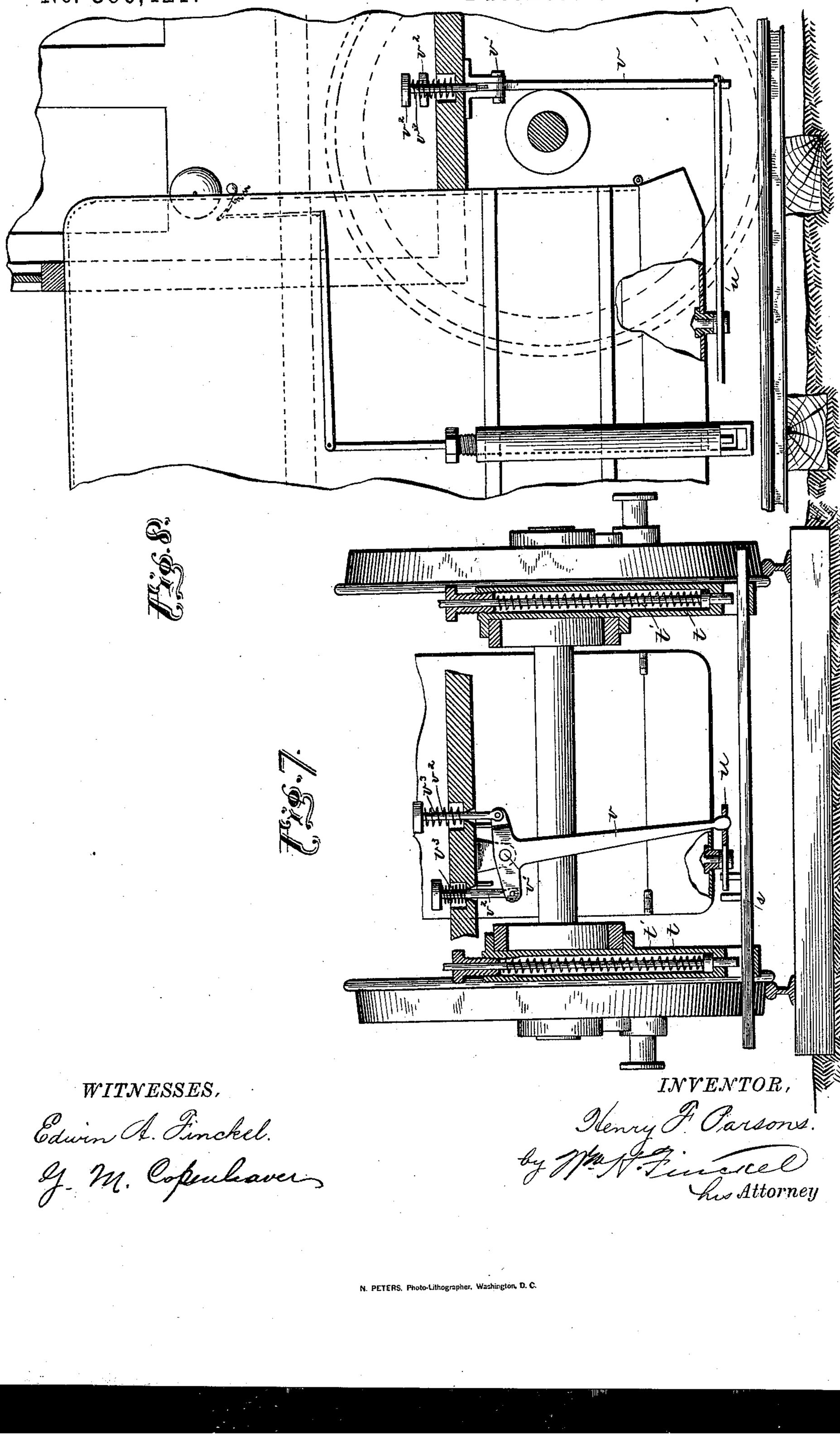

Fig. 2.

Fig. 1.

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UNITED STATES PATENT OFFICE.

HENRY F. PARSONS, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PARSONS BLOCK, SWITCH AND FROG COMPANY, OF SAME PLACE.

AUTOMATIC BLOCK-SIGNALING SYSTEM AND APPARATUS FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 396,421, dated January 22, 1889.

Application filed April 23, 1888. Serial No. 271,510. (No model.)

To all whom it may concern:

Be it known that I, HENRY F. PARSONS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Automatic Block-Signaling Systems and Apparatus for Railways, of which the following is a full, clear, and exact description.

In systems of block-signaling heretofore used on railways the apparatus employed has been quite complicated and, moreover, has required constant vigilance on the part of attendants in order to secure the desired results. Thus not only is the first cost of apparatus very heavy, but the pay of trained attendants or operators has added to the cost. Automatic systems have been devised, but so far have attained only imperfect and unsatisfactory results. An automatic system of block-signaling very obviously has many advantages; but the problem to be solved has been to get automaticity with simple apparatus.

Now, my invention relates to an automatic block-signaling system, and its aim has been and is to reduce the parts of the apparatus to a minimum and at the same time make all the movements positive.

While my system depends in some measure upon the engineer's senses of sight and hearing, yet my invention contemplates and comprehends the automatic setting of the air-brakes of a train when the engine reaches a point of danger, thus avoiding dependence on the engineer's exercising his senses mentioned.

The invention consists of a block-signaling system in which the signal at the entrance to each of the blocks in the system is operated by or from a train or engine passing into that block to indicate to following trains the fact of that block being occupied, and also a device is set which will arrest a following train when it reaches that signal, and also, at the same time, a signal in advance is operated to show to trains approaching in the opposite direction that the block is occupied, and by this operation the advance signal is put in condition to be operated reversely when it is reached by the advancing train, the signal at the block last vacated also being reversed to thereby indicate that that block is clear. If two trains be on the same track and going in opposite directions, the engineers will be guided by the displayed signals, and that engineer who does not have the right of way will reverse upon discovering his danger and back out of the block past the next signal, and in doing so will block the signal between himself and the train approaching from the other direction, so as to automatically arrest the said train until he can make a siding, and in making this siding he will release the block mechanism, so as to permit the other train to move on.

The principle of the invention is thus briefly outlined, and I will now proceed to explain one mode in which I have contemplated applying that principle, and finally will point out particularly and distinctly claim my invention.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is a diagram illustrating four blocks and an interposed siding. Fig. 2 is a plan view, on a larger scale, of the signals at each end of a block. Fig. 3 is a side elevation of parts shown in Fig. 2, with a locomotive in outline. Fig. 4 is a plan view of the operating-lever with the top of the casing in section. Fig. 5 is an elevation of the same with the box broken away. Fig. 6 is a plan view of part of a locomotive, outlining the lever-operating mechanism on the locomotive. Fig. 7 is a sectional end elevation of the same, and Fig. 8 is a sectional side elevation.

In Fig. 1, *a* is the main track; *b*, a siding; *c* and *d*, switches at opposite ends of said siding. *e* is a frog, preferably of the construction set forth in my concurrent application, Serial No. 217,509, for Letters Patent, entitled "Continuous rail-frog for railways." *f f* are guard-rails. A B are combined signal-towers and switch-stands for use in connection with the siding. The series of signals designated 2 are connected with the tower B, and the series of signals designated 3 are connected with the tower A. The tower-signals A B are

operated, respectively, in connection with stands for the switches *c* and *d*.

The signal-towers A B, together with the series of switch-signals and the peculiar operating mechanism connected therewith, form the subject of my concurrent application, Serial No. 271,508, entitled "Railway switch and signals." The operating-levers for these switch-signals are the same as those illustrated in Figs. 4 and 5 herein, and inasmuch as these operating-levers are foundation elements in the present invention, I will now proceed to describe so much of the same as will be necessary to render clear the operation of my block-signaling system, that is dependent thereupon.

For the sake of clearness the system will be described as composed of four signal-stations, which are designated C, D, E, and F. Each station comprises two levers, *g* and *h*, with their appurtenances, such as shown in Figs. 4 and 5, and inasmuch as these two levers are the same in each station, a description of the levers of one station (station C) will suffice for all.

If the ordinary visual signals be employed, the lever *g* will be connected to the drop target or board of its own station, while the lever *h* will be connected to the rotary target, and the lever *g* will be constructed to block the lever *h* of its own station and to operate the rotary target of the station next ahead—that is to say, the operation of any of the levers *g* will block the lever *h* of its station, so as to arrest any train in the rear, will at the same time place the drop-signal in position to indicate to following trains that the block ahead is occupied, and will also operate the rotary target at the station next ahead (station D) to give the same signal to a train approaching in the opposite direction, and in doing so will put the lever *h* of station D in position to be operated by the engineer when he reaches it to reverse the signal at station D and release the lever *h* at said station C. These capabilities of the levers *g* and *h* will appear from the following description of their construction and appurtenances. All the levers *g* and *h* are made on one pattern, and may be used as either rights or lefts, the only change necessary being in the arrangement of the springs. Each lever is affixed to a shaft, *i*. A bar, *k*, is suspended loosely from the shaft *i*, and has a loose or clutch connection with the lever, as by means of a slot and pin, so that it will be actuated by the rocking of the shaft in one direction; but the shaft may rock in the opposite direction without affecting the bar *k*. This shaft is provided with a spring, *j*, which holds the lever in operative position and returns it to that position when accidentally reversed, as will presently appear. The lower free end of the bar *k* is provided with cogs *k'*, which mesh with teeth or cogs *l* on one portion of a shaft, *l'*, while the opposite portion of said shaft is provided with a toothed segment, l^2, which segment in turn meshes with a pinion, *m*, on one end of a shaft, *m'*, the other end of shaft *m'* having a pinion, m^2. The shafts *l'* and *m'* are provided with suitable bearings and the whole incased in a water-tight box, k^2, the preferred form of which is described in my application, Serial No. 271,508, before mentioned.

A rod, *n*, having a toothed rack engaging the pinion m^2, is arranged in the box of the lever *g*, and extends thence to a cranked rock-shaft, *n'*, which in turn is connected by rod n^2 with the drop signal or target n^3. Instead of this, the lever *g* may carry its own signal, as provided for in my said application, Serial No. 271,508. A second rod, *o*, also having a toothed rack engaged by the pinion m^2, is passed through the box of the lever *g* and extends in one direction toward the lever *h* of its own station, and is connected to a pivoted block, *o'*, which is arranged in the same vertical plane as the lever *h*, and beneath said lever and said rod *o* extends in the other direction to the lever *h* of the station next ahead, and is provided there with a toothed rack to be engaged by a pinion, m^2, of the lever *h* of that said advance station. The pinion m^2 of the lever *h* engages a toothed rack on a bar, *p*, which bar *p* is connected by a crank with the shaft *q* of the rotary signal *q'*, so that when said rod *o* is moved longitudinally it rotates the pinion m^2, and through it operates the rotary signal.

To prevent the too great descent of the levers *g*, any suitable stop mechanism, *r*, may be employed. I have indicated a post sunk in the earth beneath the said levers at a convenient point. The levers *g* and *h* are loosely jointed to the bars *k* for two purposes: first, to permit the springs *j* to bring the levers in operative position without actuating the gearing, and, second, to provide for accidental overturning of the levers without affecting the gearing, and this latter purpose will be more clearly understood by the statement that should the lever *g* of station D in Fig. 3 be struck by a train moving in the direction of the arrow it would simply turn over without any movement of the gearing, and after the train had passed the springs would return it.

When the levers are in the position indicated in station D of Fig. 3, their relation to the bars *k* is such that immediately upon a downward pressure being applied to either of said levers they will act upon their respective bars, and through them upon the gearing, and so move the rods in appropriate directions. The mechanism on the locomotive used for operating these levers, and through them the signal apparatus, consists of a horizontal bar, *s*, suspended in hangers *t*, which are supported on the engine-frame. This bar has a free longitudinal movement crosswise of the engine and also has a limited vertical movement. This vertical movement is under restraint of springs *t'*, which are set to resist the power necessary to depress the levers, but which yield under an excessive pressure—for exam-

ple, when the said bar *s* comes in contact with the lever *h*, blocked by the block *o'*; and in this latter case the vertical movement of the bar consequent upon contact with such a blocked lever will be made to work a suitable connection with any alarm mechanism—such as a gong in the engineer's cab—or it may be made to connect with the engineer's valve of an air-brake system to set the air-brakes, and thus bring the train automatically to a standstill.

The bar *s* is given a lateral movement in the direction of its length, so as to engage the levers *g* or *h* by means of a lever, *u*, which lever is pivoted to the under side, say, of the fire-box and is loosely connected to the bar *s* by one end and connected by its other end to a rocking lever, *v*, which in turn is pivoted at *v'* to the bottom of the floor of the cab, and has upright rods v^2 v^2 extending up through the floor of the cab and provided with pedals, whereby the engineer may use his feet in operating the lever *v*, and through it the lever *u*, and through the lever *u* the said bar *s*, to move the bar *s* laterally one way or the other. Springs v^3 may be interposed between the floor and the pedals to normally hold the bar *s* in a central or inoperative position.

The operation will be understood from the foregoing description; but in order to avoid any mistake in reference thereto such operation is here summarized: When the track is clear, all of the signal-stations will have their levers *g* raised and in the position indicated in Fig. 3, station D, and their levers *h* depressed, in which position the rotary target will stand parallel to the track, as at station C, to indicate "safety," and the drop-target will be down for a similar indication. If a train be started toward station C, the rotary target at that station will be turned at right angles to the track by the station-master to indicate "danger," and when station C is reached the lever *h* at that station will be depressed and thereby the rotary signal be changed to "safety." The train then passing on to lever *g* of station C, it will depress that lever and thereby operate (raise) the drop-signal n^3 of said station C, and by the same movement will raise the block *o'* in said station C, and thereby lock the lever *h*, and also at the same time, through rod *o* and connection *p* in the lever *h* of station D, operate the rotary signal of said station D to show at that station (which may be a mile or more ahead) to any train approaching that station from the opposite direction that the block between stations D and C is occupied. When the train has reached station D, it depresses lever *h* of that station, thereby changing the rotary signal at station D, and at the same time operating the rod *o* in the rear, so as to reset the lever *g*—that is to say, raise it, lower the drop-target, and also remove the block *o'* from lever *h* in station C, thus preparing station C for the next train in the rear.

It will be understood that the relative proximity of the levers *g* and *h* may be varied from that shown in the drawings. Indeed, the levers *g* may be a train-length distant from the levers *h* of their respective stations.

In operating my block-signaling system in connection with the siding and switches and the system of signals peculiar to the latter there is no necessarily immediate connection between the block-signal system and the switch-signal system; but there is co-operation between them to the extent hereinbefore indicated—that is to say, when trains going in opposite directions are arrested by danger-signals or the blocking of one of the signal-stations, then the train which lacks the right of way will back down past the signal-station next to the switch and lock that station against the further advance of the other train, and then proceed to operate the switch through one of the levers 2, and so go on to the siding. After the siding is made, then the train on the siding may restore or open the main track again by the operation of another one of these levers 2, it being remembered that before going onto the siding that train will have unlocked the blocked-signal station.

It may be observed here that this signaling system operates positively in its locking of the entered block against a train in the rear and its setting of the danger-signal in advance to warn a train approaching from that direction.

In accordance with the scheme of operating the switches set forth in my concurrent application, Serial No. 271,508, before mentioned, the train on the siding can get back onto the main track either by backing off the siding or going forward, the series of switch-levers 2 and 3 admitting of the operation of the switches at either end of the siding by a train on the siding.

Of course the train on the main track will be guided in its movements by the signals displayed on the siding when a train is on the siding.

I have shown toothed gearing as the transmitting medium between the levers and the rods for operating the signals; but my invention comprehends any and all of the well-known mechanical substitutes for toothed gearing for this purpose; hence in using the term "gearing" in the claims, as well as in the specification herein, I wish to be understood as including such substitutes. So, also, I have shown only one form of apparatus on the locomotive for operating the levers; but I do not limit my invention to the employment of that single form.

The rods (particularly rods *o*) are arranged so that their work is done by a pull on the rods rather than by pushing them, and hence I am enabled to employ rods instead of tubes, as has heretofore been necessary where the movement is transmitted by pushing instead of pulling. The blocks *o'* are pushed into position; but the distance between these blocks and the levers *g* is comparatively slight and

a rod may be used in some cases, or a section of tubing may be coupled to the rod and interposed between the lever *g* and the block.

What I claim is—

1. In a block-signaling system for railways, the combination of a series of signal-stations arranged along the track at suitable intervals, each comprising an entrance-signal connected with a lever to be operated by or from the locomotive, and a second signal connected with an independent lever adapted to be similarly operated, the second lever being provided with a blocking mechanism for the entrance-lever, and also with connections with the entrance-lever of the station in advance, substantially as described.

2. In a block-signaling system for railways, the combination of a number of signal-stations arranged alongside the track, each comprising two levers independently geared to individual signal-targets at its own station and respectively independently geared to the target-operating levers of the stations next adjoining on both sides, substantially as described.

3. In a block-signaling system for railways, a number of signal-stations arranged alongside the track, and each comprising two levers, *g* and *h*, connected to independent signals, the levers *g* and *h* of adjacent stations being connected for co-operation, and a blocking mechanism for the station in the rear being also included in this connection and operable by it, substantially as described.

4. In a block-signaling system for railways, a number of signal-stations arranged alongside the track and comprising the combination of levers *g* and *h* and signals n^3 and q' at each station, toothed rack-bars *n* and *p*, respectively geared to the levers *g* and *h* and signals n^3 and q' of their own station, a pivoted block, o', beneath each lever *h*, and a toothed rack-bar, *o*, geared to the lever *g* and coupled to block o' of one station and geared to lever *h* of the station in advance, substantially as described.

5. In an automatic block-signaling system for railways, a number of signal-stations arranged alongside the road, and each comprising signals and entrance and exit levers therefor and blocking devices for the entrance-levers, with connections between the levers and signals of adjacent stations on both sides, combined with a bar on the locomotive movable laterally to engage the levers and depress them to operate the signals and block an entrance-lever in the rear, and also yielding vertically by contact with an immovable obstacle—such as one of the blocked levers—to arrest the attention of the engineer, substantially as described.

In testimony whereof I have hereunto set my hand this 21st day of April, A. D. 1888.

HENRY F. PARSONS.

Witnesses:
JAS. MCG. SMITH,
ROBT. L. REDFIELD.