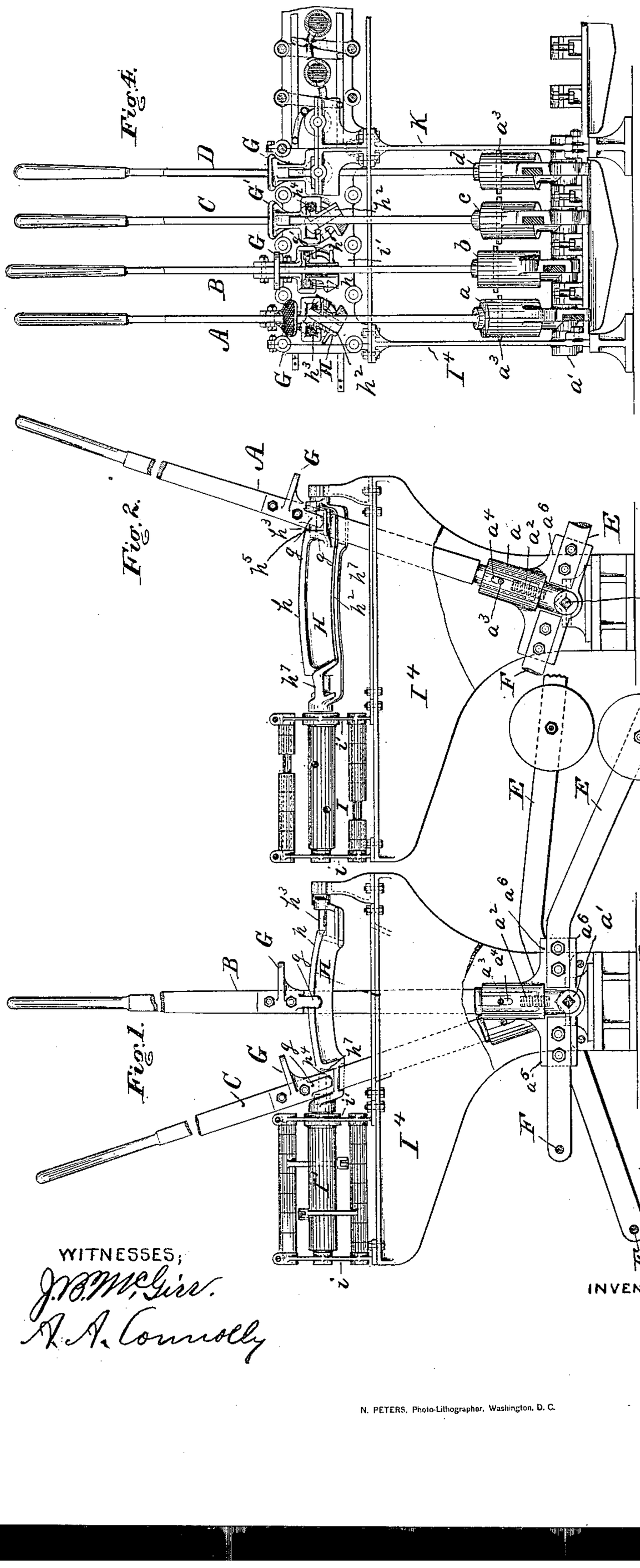
(No Model.) 3 Sheets—Sheet 1.

F. S. GUERBER.

INTERLOCKING APPARATUS FOR SWITCHES, SIGNALS, &c.

No. 362,889. Patented May 10, 1887.



WITNESSES;
J. B. McGirr.
R. A. Connolly

INVENTOR, Frederick S. Guerber
By Connolly Bro's,
Attorneys

(No Model.) 3 Sheets—Sheet 2.

F. S. GUERBER.

INTERLOCKING APPARATUS FOR SWITCHES, SIGNALS, &c.

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Fig. 5.

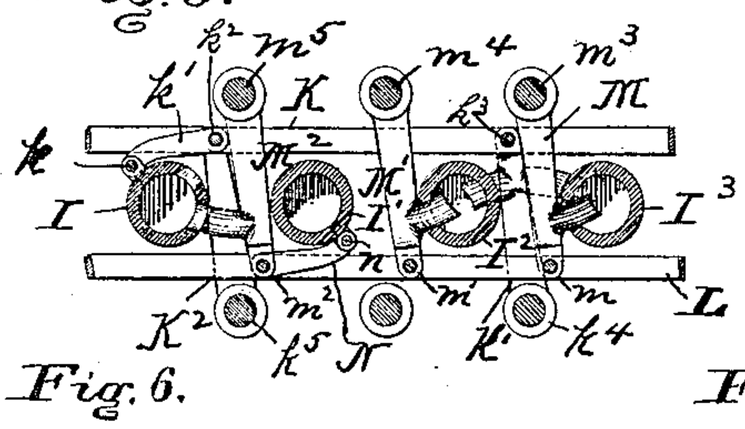


Fig. 6.

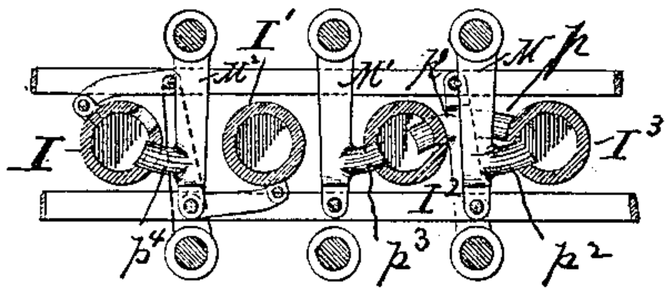


Fig. 7.

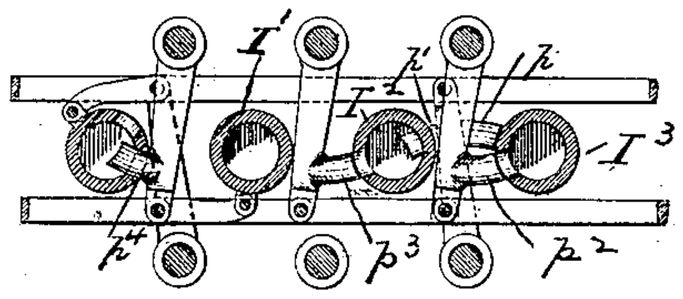


Fig. 8.

Fig. 9.

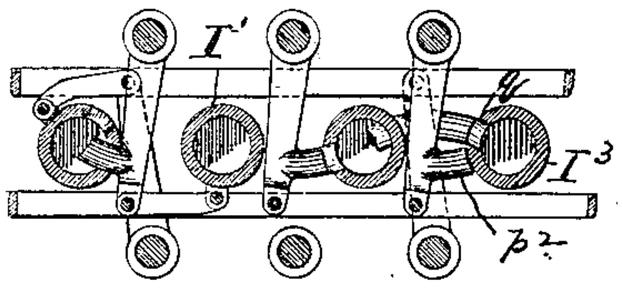


Fig. 10.

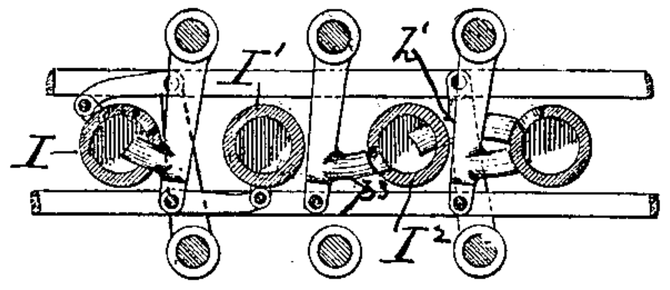


Fig. 11.

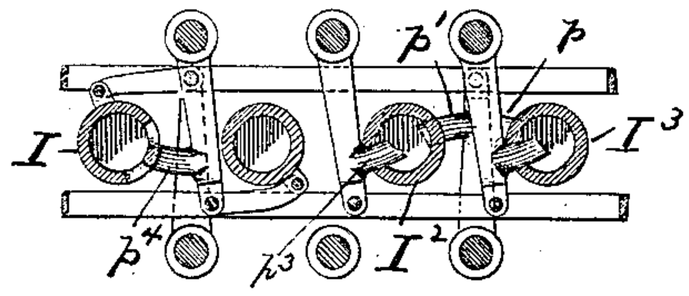


Fig. 12.

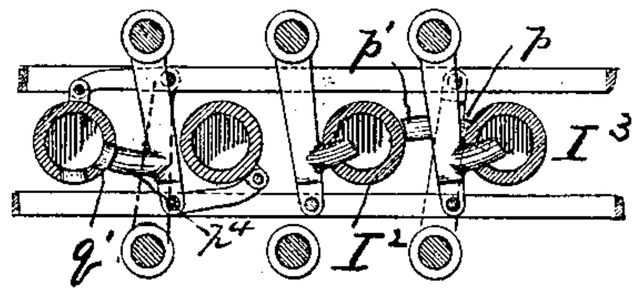


Fig. 13.

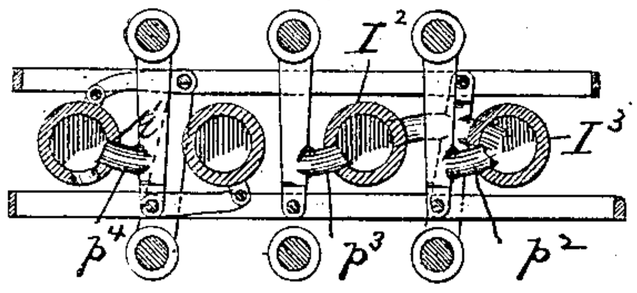


Fig. 14.

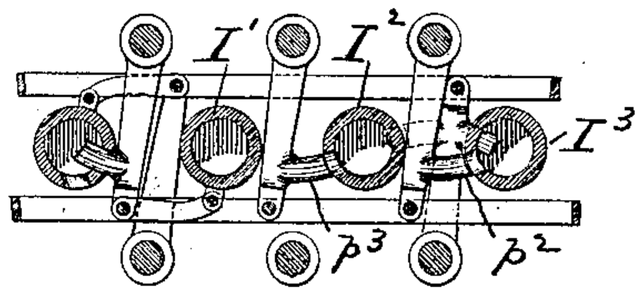
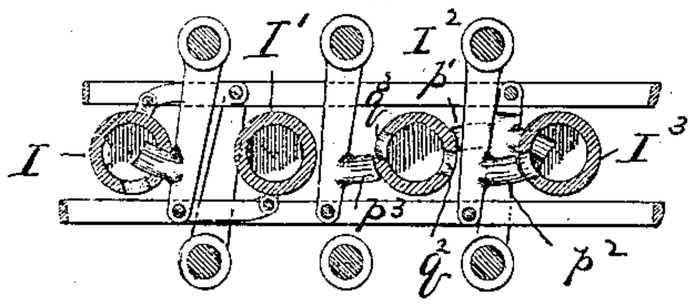
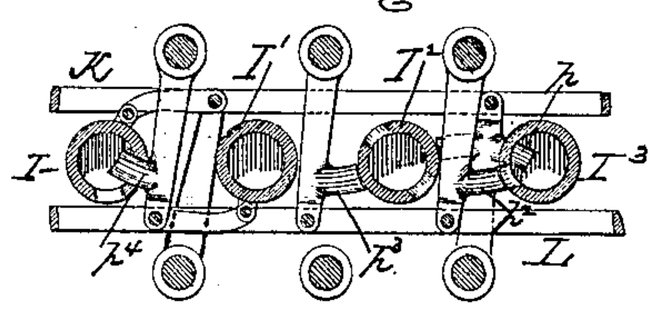


Fig. 15.





WITNESSES;

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(No Model.) 3 Sheets—Sheet 3.

F. S. GUERBER.

INTERLOCKING APPARATUS FOR SWITCHES, SIGNALS, &c.

No. 362,889. Patented May 10, 1887.

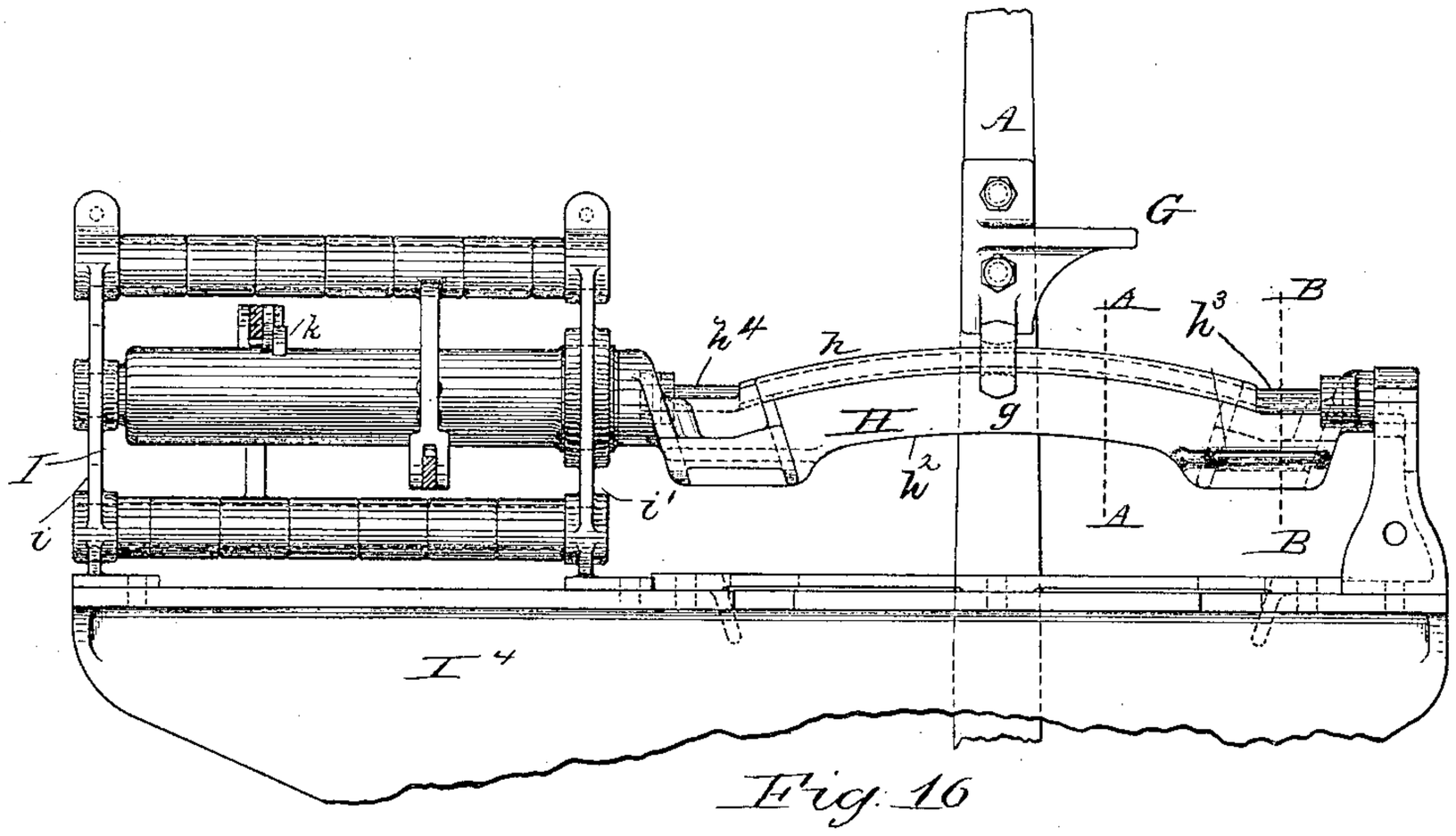

Fig. 16

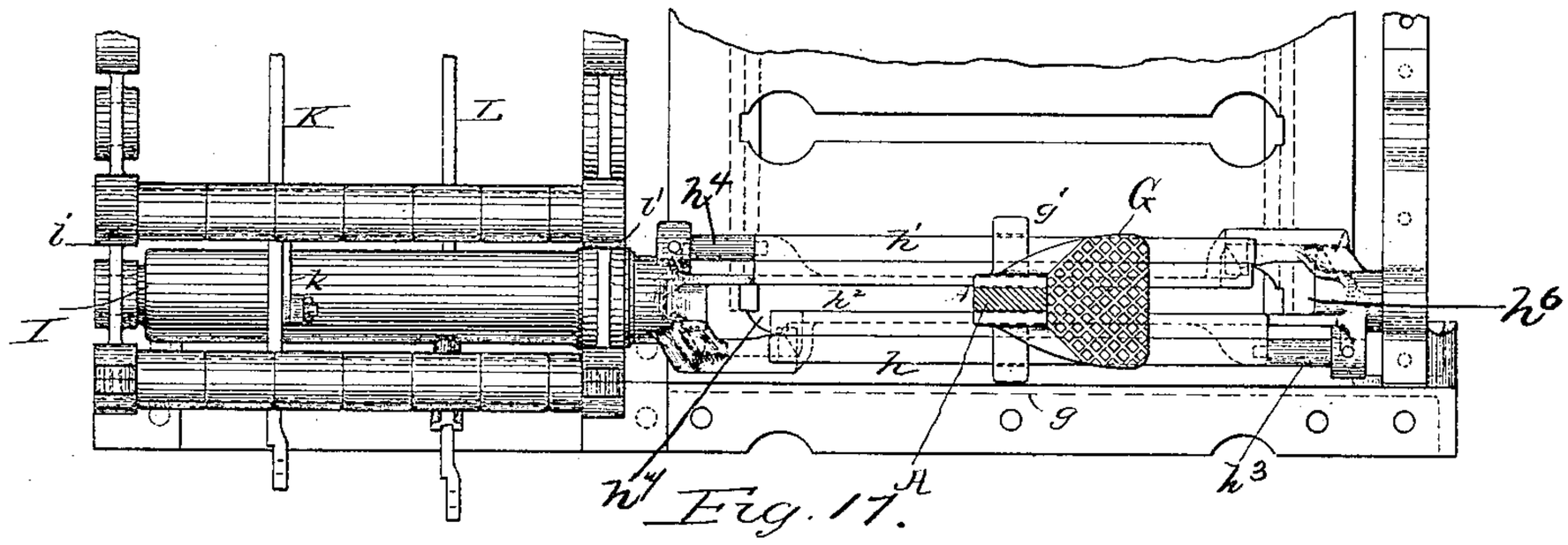

Fig. 17.

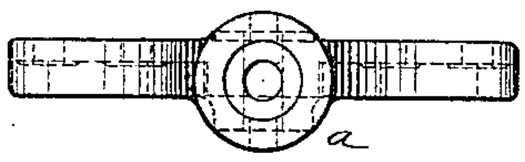

Fig. 18

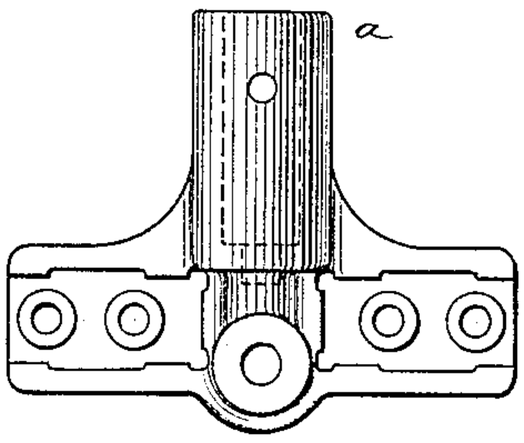

Fig 18½

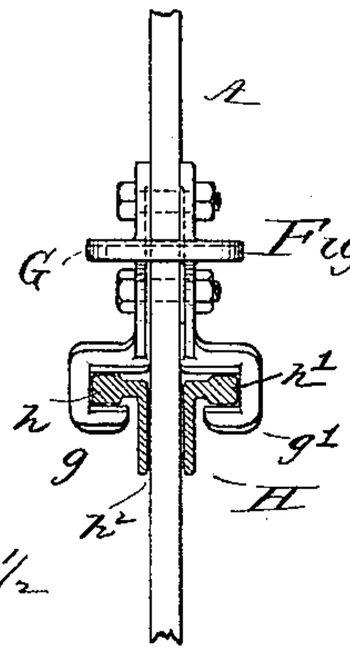

Fig 19

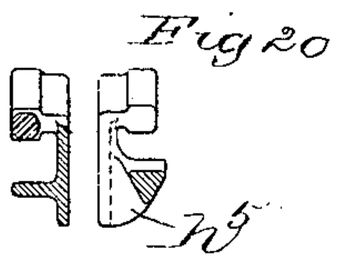

Fig 20

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UNITED STATES PATENT OFFICE.

FREDERICK S. GUERBER, OF ALLENTOWN, PENNSYLVANIA.

INTERLOCKING APPARATUS FOR SWITCHES, SIGNALS, &c.

SPECIFICATION forming part of Letters Patent No. 362,889, dated May 10, 1887.

Application filed April 30, 1886. Serial No. 200,715. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK S. GUERBER, a citizen of the United States, residing at Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Interlocking Apparatus for Switches, Signals, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a side elevation showing two levers and two positions thereof. Fig. 2 is a side elevation showing only one lever and one position thereof. Fig. 3 is a plan partly in section. Fig. 4 is a front elevation partly in section. Figs. 5 to 15, inclusive, are diagrams showing locking-cylinders, links, and dogs and dog-bars in their various positions. Fig. 16 is a side view, enlarged, showing the rockers and locking cylinders. Fig. 17 is a plan view of the same. Figs. 18 and 18½ are respectively top and side views of the lever-connection. Figs. 19 and 20 are sectional views on lines A A and B B, respectively, of Fig. 16.

My invention has reference to interlocking apparatus for switches and signals, in which two or more switches and signals may be moved by a single operator from a given point—as from a signal-tower—and in which such switches and signals, when duly adjusted or set, may be locked. Such apparatus are also constructed in such manner that the display of a safety-signal for the passage of a train can be effected only when the switch pertaining to such signal has been properly set for such movement, and, conversely, when all signals which ought at the same time to indicate "danger" make such indication.

My improvements have for their object to simplify the construction, reduce the expense of manufacture, and at the same time increase the efficiency of such apparatus.

My improvements consist in the peculiar construction and combinations of parts, hereinafter fully described and claimed.

In such apparatus as my improvements pertain to the movements of the switch and signal connections are effected through the medium of levers manually operated by a switchman or operator, and the number of levers employed will be dependent upon the number of switches and signals or connections therefor, and such numbers will therefore vary according to circumstances; but as the apparatus may be operated with a few levers, and as an increase in the number thereof does not alter the principle of the invention, I have confined the illustration of my invention to a four-lever apparatus, which exhibits my improvements, and shall confine my description, for the sake of brevity and conciseness, thereto.

Referring to the accompanying drawings, A B C D indicate the four levers of the apparatus, all of which are alike in construction. Each of said levers consists of a rigid bar, the upper end of which terminates in or is provided with a handle to be grasped by the operator in moving the same, and the lower end of said bar fits in a socket, the several sockets being shown at *a*, *b*, *c*, and *d*. Each socket is a hollow cylindrical or tubular section fitted on a pintle or shaft, a', whereby it can be vibrated in a vertical plane, and it contains a spiral push-spring, a^2, the upper end of which enters a socket in the lower end of the lever-bar and tends to raise the latter or communicate an upward vertical movement thereto. In each socket are lateral pins a^3, which enter vertical slots a^4 in the lever-bars and limit their vertical movement. Each socket has an external lug or projection, a^5, affording means for attachment for a connection at F between the lever and the signal or switch to be moved thereby, and, if desired, there may be on each socket another projection, a^6, for a weighted arm, E, or counter-balance. Each lever has a step, G, securely attached to it, the purpose of such step being to afford means for securing end-thrust of the lever-bar in its socket initial or precedent to the vibratory or swinging movement of the lever in either direction, forward or reverse. Each step has two pendent fingers or hooks, $g\,g'$, one on either side, which embrace or hook over the side flanges, $h\,h'$, of a slotted segmental rocker, H. There is one such rocker for each lever, and each rocker is connected with or forms a prolongation of a locking-cylinder. One such cylinder pertains directly to each lever, though there often is a relation between each lever and other cylinders, as hereinafter described.

The cylinders thus pertaining to the respective levers A B C D are designated I I′ I² I³, respectively, and they are all mounted in such manner that they can be rocked or partially rotated on their longitudinal axes, having bearings in uprights *i i′*, attached to a frame or support, I⁴, in which the levers A B C D are pivoted.

Each lever may be oscillated or swung in a vertical plane toward and from the ends of its cylinder, and in performing such movement traverses a vertical central longitudinal slot, *h*², in its rocker H. The slots *h*² extend the entire length of the rockers, but the side flanges, *h h′*, do not, and hence, when a lever reaches the end of its rocker-slot, its fingers or hooks *g g′* move out of engagement with said flanges; but at one end and on one side of each rocker is an eccentric finger or wrist-pin, *h*³, and on the opposite end and other side is another like pin, *h*⁴. The fingers *g g′* alternately engage with said pins—that is, when a lever is in the backward position of the lever A in Fig. 2 its finger is in engagement with pin *h*³, so that a vertical or end thrust of said lever will oscillate the rocker H in one direction, while when a lever is in the forward position occupied by lever C in Fig. 1 such end-thrust will oscillate the rocker in a contrary direction. Such end-thrust in one direction is effected by the the switchman depressing the step by his foot, while the reverse movement or upward thrust results from the reaction or pressure of the socket-spring. The movement of the rocker produces an oscillation of the cylinder to which it is attached, with other results hereinafter mentioned.

Assume, for example, a lever is in the position of lever A in Fig. 2. Such lever is now locked or held against vibratory movement, as it is not in alignment with the slot in its rocker, the latter being in its normal position, with the walls of its slot at an angle of or about thirty degrees, while the sides of the lever-bar are vertical, the edge of said bar being opposed by a shoulder, *h*⁵, on its rocker. Now, end-thrust imparted to the lever-bar by pressure applied to its step will oscillate the rocker, bringing its slot into alignment with the lever, so that the latter may, when vibrated, traverse or move through said slot, the latter being of just sufficient width for the purpose. As the lever is passing through the slot its fingers *g g′* are in engagement with the flanges *h h′* of the rocker, so that neither the latter nor its cylinder, with which it is rigidly connected, can be oscillated, or oscillation of a rocker or cylinder cannot occur until the particular lever thereof is out of its rocker-slot or has attained the limit of its vibratory movement in either direction. When it attains such limit it is in a wide space or chamber, *h*⁶, at one end, or a similar space, *h*⁷, at the other end of the rocker, the width of such spaces affording room for the rocker to oscillate and to assume at one end of the stroke the position for the rocker pertaining to lever C in Fig. 1, and at the other end of the stroke the position pertaining to lever A in Figs. 2 and 4.

In moving a lever, say, from the position shown at C in Fig. 1 to the position shown at A in Fig. 2, the various steps and operations are, briefly, as follows: The lever C is first depressed through the medium of force exerted on the step G, thus compressing the spring *a*² in the socket *c* and imparting an initial rocking movement to the locking-cylinder I². The hooks *g g′* engage with the side flanges, *h h′*, of the rocker H, and thus, during the movement of the lever, the spring *a*² is kept under tension. At the end of the throw the hooks and flanges become disengaged and the spring *a*² extends the lever C upward, the hook *g* engages with the wrist-pin *h*³, and this upward movement of the lever C rocks the locking-cylinder still further in the direction of its initial movement.

Cylinder I has a radial lug, *k*, which has a link-connection, *k′*, with a horizontal bar, K, sustained on two links, K′ K², pivoted to said bar at *k*² *k*³, and having their fulcra or pivots at *k*⁴ *k*⁵. Parallel with bar K is another bar, L, sustained upon links M M′ M², which are connected pivotally to said bar at their lower extremities, *m m′ m*², and have their fulcra at their upper ends, *m*³ *m*⁴ *m*⁵.

The bar L is connected by a pivoted link, N, with a radial projection, *n*, on cylinder I′. When cylinder I is oscillated bar K swings on its links or communicates a pendulous movement to the latter, and when cylinder I′ is oscillated bar L is moved in a similar manner or communicates a swinging motion to its links.

The three cylinders I I² I³ have radial openings, as shown, cylinder I having two openings close together and in alignment, cylinder I³ having two similar openings, both on the same side of the cylinder, but not in alignment, and cylinder I² having two such openings diametrically opposite one another and not in alignment. Cylinder I′ is devoid of any such opening.

The several links K′ M M′ M² have curved laterally-projecting pins or dogs *p p′ p² p³ p⁴*, which are adapted and designed to enter, under certain conditions, the openings in the adjacent or opposing sides of the cylinders, then preventing the oscillation or movement of the latter, and, under certain other conditions, to rest against the solid sides of said cylinders, then not impeding or preventing the oscillation of the latter, but preventing the movement of the bars K or L.

The lever A may be regarded as the switch-lever, lever B as lock-lever, lever C as main-track-signal lever, and lever D branch-track-signal lever.

The engagement of the link pins or dogs with the cylinders in the various conditions or

use or position of the said levers is fully illustrated in Figs. 5 to 15, inclusive, of the drawings, and occurs as follows:

Fig. 5 shows positions of various cylinders and appurtenant parts pertaining to said levers when the latter are all in their forward position, at which time the switch supposed to be connected is set for the main line, but is unlocked, and the signals are at "danger."

Fig. 6 shows changed position of cylinder I′, due to depression of lever B while in its forward position, cylinder I being locked by dog p^4, and dogs p^2 and p^3 being partially withdrawn from engagement with cylinders I^3 I^2.

Fig. 7 shows position due to upward movement of lever B in its back position, the throw or vibration of said lever having effected the movement of the lock, thereby locking the switch, and the upward movement of the lever at the end of its throw having completed the oscillation of cylinder I′, resulting in the complete disengagement of dogs p^2 and p^3 from cylinders I^3 and I^2, respectively.

Fig. 8 shows position due to depression of lever D in its forward position, resulting in the oscillation of cylinder I^3, thereby bringing opening q away from opposition to dog p^2 and opposing the solid side of said cylinder to the end of the said dog, thus effecting the locking of cylinder I′.

Fig. 9 shows position due to upward movement of lever D in its back position after vibration from its forward position, such vibration having effected the clearing of main-line signal or setting to safety of latter. Main line is then cleared for the passage of a train and branch blocked. Now, to clear branch line the movements described of levers B and D must be reversed until parts are restored to positions shown in Fig. 5. Cylinder I^3 has completed its movement, still opposing its solid side to dogs p and p^2, cylinders I and I′ continuing locked.

Starting from Fig. 5, Fig. 10 shows position due to the depression of lever A in its forward position, which results in a partial movement of cylinder I, which impels dog p into engagement with cylinder I^3 and partially retires dog p' from engagement with cylinder I^2, also opposing the solid side of cylinder I to dog p^4.

Fig. 11 shows the position due to the upward movement of lever A after completion of its vibratory backward movement or throw, which throw has effected the movement of the switch from the main-line to the branch-line position, cylinder I having completed its movement, presenting opening q' to dog p^4, the engagement of dog p with cylinder I^3 being complete and the withdrawal of dog p' from cylinder I^2 being also complete.

Fig. 12 shows the movement due to the depression of lever B, dog p^4 having entered opening q' in cylinder I, and dogs p^3 and p^2 having partially withdrawn from cylinders I^2 and I^3, respectively.

Fig. 13 shows position due to upward movement of lever B in its back position, the throw or vibration of said lever having effected the movement of the lock, thereby locking the switch in its reverse position, and the upward movement of the lever at the end of its throw having completed the oscillation of cylinder I′, resulting in the complete disengagement of dogs p^2 and p^3 from cylinders I^3 and I^2, respectively.

Fig. 14 shows position due to depression of lever C in its forward position, resulting in the oscillation of cylinder I^2, thereby bringing openings q^2 and q^3 away from opposition to dogs p' and p^3, respectively, and opposing the solid side of said cylinder to the ends of said dogs, thereby effecting the locking of cylinders I and I′.

Fig. 15 shows position due to upward movement of lever C in its back position after vibration from its forward position, such vibration having effected the clearing of branch-line signal or setting to "safety" of the latter. The branch line is thus cleared for the passage of the train and the main line blocked.

It will be noted as a characteristic feature of my invention that all the movements for accomplishing the locking of the various parts result from the endwise movements of the levers themselves, and hence I dispense with the lever attachments or catch-rods heretofore employed, through the medium of which a "preliminary locking" is effected before a lever is moved at all, and the final locking is accomplished after the movement of the levers.

The endwise downward movement of any one of my levers effects a preliminary locking and produces a condition whereby the lever may be vibrated or thrown, the subsequent upward movement of said lever completing the locking and producing a condition in which the lever cannot be thrown again until it receives a downthrust.

Dispensing with the mentioned lever attachments or catch-rods effects a saving in construction, and the provision of steps permits a switchman or operator to use his feet and utilize the weight of his body in operating the apparatus.

It will be further noted as characteristic of my invention that the movement of a rocker is an oscillation on its longitudinal axis, that the locking-cylinders have a like movement, and that said rockers and their cylinders respectively are rigidly connected; hence each rocker and its cylinder may be a single casting, and the link-connections heretofore provided are dispensed with, my improved construction as to these features being promotive of simplicity of construction, economy of manufacture, durability, and certainty of action.

What I claim as my invention is—

1. In an interlocking switch and signal apparatus, the combination of a series of locking-cylinders, a series of dogs which engage

with said cylinders, a series of rockers connected with said cylinders, and a series of levers constructed and adapted for endwise movements, whereby end-thrust of the levers oscillates the cylinders and effects the locking and unlocking of the parts, substantially as shown and described.

2. The combination, with levers constructed and adapted for endwise and vibratory movement, of rockers having an oscillating movement on their longitudinal axes and slotted for the passage of said levers, cylinders connected axially with said rockers, bars having link-connections, and dogs, whereby initial end-thrust of said levers in one direction produces a partial oscillation in one direction of said rockers and cylinders with a preliminary locking and end-thrust of said levers in the reverse direction after their throw or vibratory movements effects a completion of the movement of said rockers and cylinders and the final locking or unlocking of the parts, substantially as shown and described.

3. The combination, with a rocker, locking-cylinder, dog-bars, and dogs connected therewith, of a lever constructed and adapted for endwise movement and having a spring whereby pressure on said lever produces a movement of the rocker and cylinder in one direction and a preliminary locking, and the reaction of the spring effects a reverse movement of such lever, rocker, and cylinder, substantially as shown and described.

4. In an interlocking switch and signal apparatus, the combination of a rocker with a lever constructed and adapted to be moved longitudinally or to have end-thrust, whereby endwise movement of said lever will move said rocker, substantially as shown and described.

5. In an interlocking switch and signal apparatus, the combination, with an oscillating rocker and a locking-cylinder movable therewith, of a lever constructed and adapted for endwise movement and to be vibrated or thrown, whereby end-thrust of such lever produces a locking operation before and after its throw, substantially as set forth.

6. In an interlocking switch and signal apparatus, a series of oscillating cylinders having openings, swinging bars connected with said cylinders, and links having dogs adapted and designed to engage with the openings in said cylinders, substantially as shown and described.

7. For an interlocking switch and signal apparatus, a rocker oscillating on its longitudinal axis, in combination with a lever capable of two movements, one of said movements oscillating the rocker without operating the other connections of the lever, while the other movement of the lever operates said other connections, the rocker being meanwhile rigidly held, substantially as shown and described.

8. In an interlocking switch and signal apparatus, a pivoted or fulcrumed lever composed of two sections or parts, one of which is movable on the other, whereby the lever is capable of two independent movements, substantially as shown and described.

9. In an interlocking apparatus, the combination of a vibrating lever having two lateral hooks or fingers with an oscillating rocker having lateral recesses or chambers at each end and having wrists and side flanges with which said lever hooks or fingers engage, whereby said rocker is oscillated at either end of the throw of the lever by a vertical movement of said hooks or fingers and said rocker is prevented from oscillating when the lever is in any position between the ends of its throw, substantially as shown and described.

10. In an interlocking apparatus, the combination, with oscillating locking-cylinders, of swinging links connected thereto and moved thereby and dogs which engage with said cylinders, substantially as shown and described.

11. In an interlocking apparatus, the combination, with an oscillating cylinder having one or more openings in its side, of a swinging link or links having projections or dogs adapted and designed to enter said openings and produce interlocking, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 23d day of March, 1886.

FREDERICK S. GUERBER.

Witnesses:
M. D. CONNOLLY,
R. DALE SPARHAWK.