No. 807,645. PATENTED DEC. 19, 1905.

S. D. STROHM.

RAILWAY SIGNALING.

APPLICATION FILED AUG. 29, 1891.

3 SHEETS—SHEET 1.

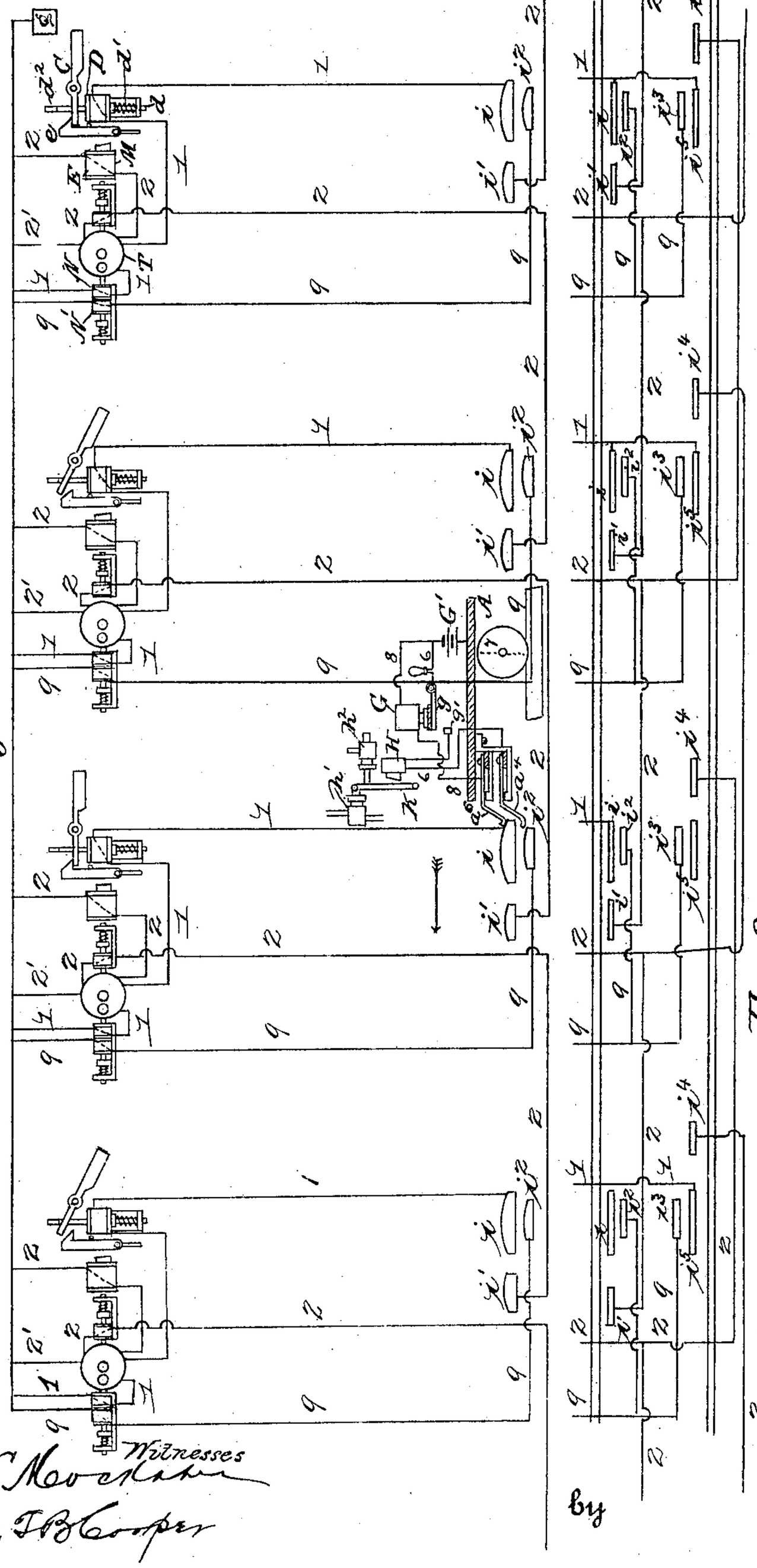

Fig. 1

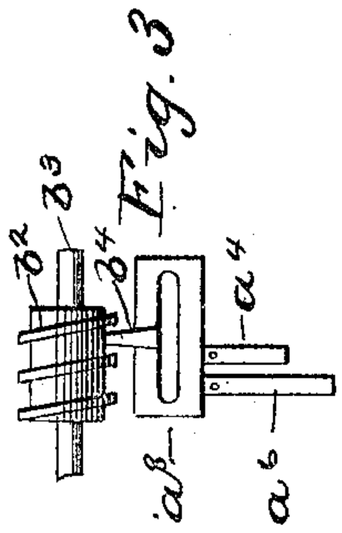

Fig. 3

Fig. 2

Witnesses

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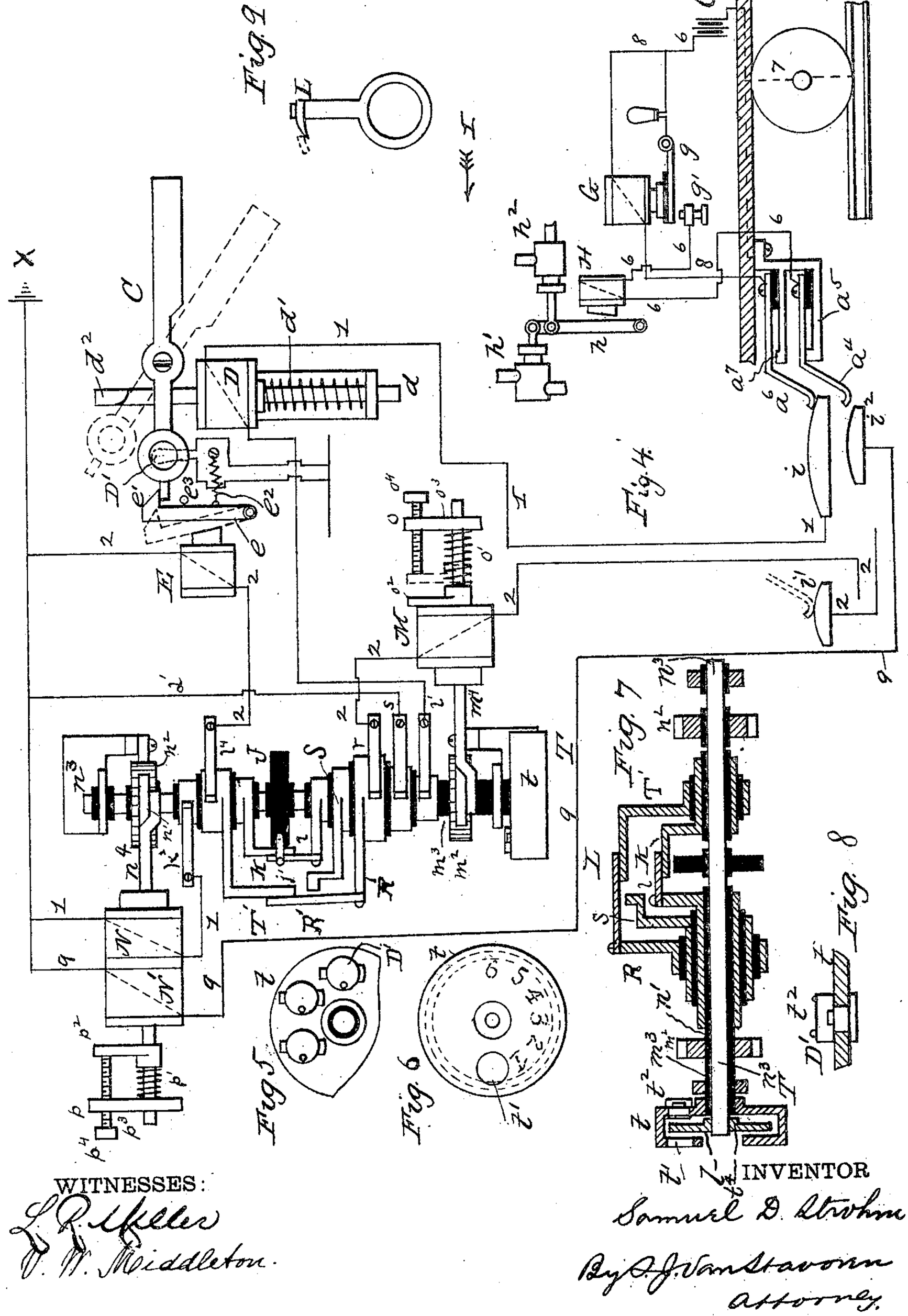
3 SHEETS—SHEET 2.



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APPLICATION FILED AUG. 29, 1891. 3 SHEETS—SHEET 3.

Fig. 11

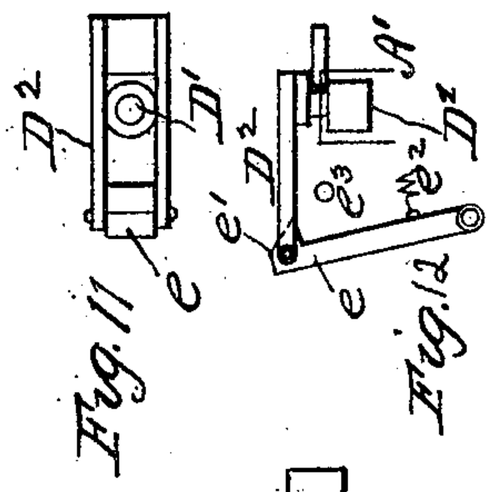

Fig. 12

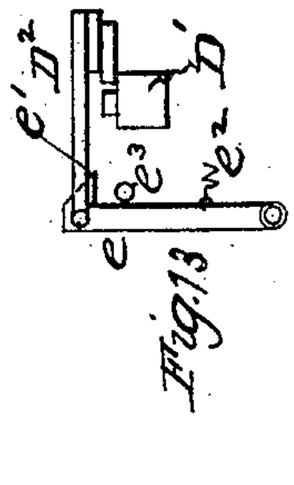

Fig. 13

Fig. 10

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UNITED STATES PATENT OFFICE.

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RAILWAY SIGNALING.

No. 807,645. Specification of Letters Patent. Patented Dec. 19, 1905.

Application filed August 29, 1891. Serial No. 404,149.

To all whom it may concern:

Be it known that I, SAMUEL D. STROHM, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Railway Signaling; 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.

This invention has relation to railway signaling and to means for controlling the operation of trains along the line, having reference more especially to systems of that type in which semaphore-signals at stations or places along the line are actuated to be set to danger and safety positions by a passing train; and it has for its object the provision of electromagnetic devices for setting the semaphore to danger position and electrically-controlled devices for locking the semaphore in such position until said locking devices are released, whereupon the semaphore will move to safety position, all of said electromagnetic devices for actuating the semaphore being operated by a passing train in either its forward or backward movement.

This invention has for its further object the provision of means for preventing the semaphore's moving to safety position until all the trains or engines entering a block or section controlled by the semaphore have passed off of or out of the same and means whereby the last train going out of a block or section will cause the semaphore to be set to safety position in either direction of travel of the engine or train.

This invention has for its still further object to provide the semaphore-stations with an annunciator independent of the semaphore for indicating to the engineer the number of trains or engines on the track ahead when arriving at a station in either direction of the travel of his train or engine at which the semaphore shows a danger signal.

This invention has for its still further object the provision of means whereby the movements of the trains both in starting and stopping are automatically controlled by the varying conditions of the line, so as to provide additional security against collisions, &c.

My invention consists in the novel constructions, combinations, and arrangements of parts hereinafter described and claimed.

Referring to the accompanying drawings, Figure 1 is a diagrammatic view of a line of railway, showing a car and a number of semaphore and annunciator stations at points on said railway, electromagnetic actuating appurtenances, circuit connections, and contact-plates, all constructed and arranged according to my invention; Fig. 2, a plan view of the rails and contact-plates; Fig. 3, a detail view of a part of the engine appurtenances, illustrating means for shifting contact-brushes on the engine as the direction of motion is changed; Fig. 4, a diagrammatic view illustrating, on a larger scale than Fig. 1, the engine equipment and the electromagnetic and mechanical devices at a semaphore-station, including a semaphore, a contact making and breaking device, an annunciator, and the circuits leading from said semaphore-station to the contact-plates alongside the track; Fig. 5, an elevation of part of the annuciator; Fig. 6, a similar view of the opposite face of same; Fig. 7, a longitudinal sectional view of the circuit-breaker device for the semaphore-actuating mechanism and of the annunciator, which is mounted on the shaft of said circuit-breaking device; Fig. 8, a detail sectional view of part of the annunciator; Fig. 9, a detail in elevation of a part of the circuit-breaker; Fig. 10, a view similar to Fig. 4, showing means for lighting and extinguishing a light at the semaphore-stations; Figs. 11, 12, and 13, detail views of the same.

In the several figures of the drawings like reference letters and numerals indicate corresponding parts.

A designates part of an engine body or frame, on which are mounted the several parts of the engine equipment and the brushes for contacting with the plates alongside the track. Upon the engine is mounted a magnet G, having an armature-lever g, a stop or contact g' for said lever, a second magnet H, having an armature-lever h, controlling the power-regulating or supply valve h' and the air-brake valve h^2, where the engine is run by steam-power and controlled by an air-brake, as in Fig. 4, or the electric switch when the engine is operated by an electromotor, as shown in the detail view Fig. 10. The engine carries a source of electric energy G', arranged in a closed circuit 6 6, through armature-lever g when the latter is not attracted by magnet G, to stop g', to magnet H, to brush a^4, to contact a^5 when said brush and contact are closed and from contact a^5 to the frame of the engine, with which the other pole of battery G' is in circuit, as shown.

Another circuit 8 8 leads from battery G′ through magnet G, so that the magnet G will normally attract its armature and hold it in the position shown in Fig. 4. One side of said circuit 6 6 has a ground connection 7 with the rails through the frame, axle, and wheels of the engine. Magnet G is in a shunt or branch 8 from one side of circuit 6 6, having brush a^6 and contact-plate a^7, the latter of which is in circuit with the ground 7.

Contact-plates i and i^2 are arranged alongside the track and are formed with curved upper surfaces, so that as the brushes a^4 and a^6 meet these contact-plates they will be lifted and separate from the contacts a^5 a^7. A circuit 1 leads from the contact-plate i to the semaphore-actuating solenoid D and a circuit 9 from plate i^2 to the circuit-breaker solenoid N′.

A contact-plate i' is arranged in front of the plate i, and a circuit 2 leads from the plate i' to the circuit-restoring solenoid M of a semaphore-station in rear of the station to which the circuits 1 and 9 lead.

The semaphore consists of the usual pivoted blade C, having on its rear end a disk of colored glass, which when the semaphore is in its horizontal position, indicating danger, stands in front of a light D′. The semaphore is operated to pull it to its horizontal position, indicating danger, by means of a solenoid D in the circuit 1, said solenoid having a core d, which has a finger d^2 on its upper end, that engages the rear end of the semaphore-blade, and a spring d', that forces the core d upwardly when the solenoid is deënergized.

A magnet E is arranged back of the rear end of the semaphore-blade and is provided with an armature-lever e, which has a tooth on its upper end that engages the end of the semaphore-blade and serves to hold the same in its elevated position while the magnet E is inactive. The magnet E is in the circuit 2, which leads to ground at one end and at the other passes through the circuit-breaker and the contact-restoring solenoid M to the contact-plate i'.

The circuit-breaker (best shown in Figs. 4 and 7) is constructed and arranged as follows: The circuit-breaker consists of a shaft carrying a number of contact-fingers and revolved in one direction by means of a ratchet-wheel and dog, the latter being attached to a solenoid-core, which is common to two solenoids, and a hollow shaft which turns on the first-named shaft and carries a number of contact-fingers and is revolved in one direction by means of a dog carried on a solenoid-core, the solenoid for the last-named core being on opposite side of the shaft from the other solenoids, but having its dog and ratchet so arranged that the hollow shaft will follow the movement of the solid shaft.

n^3 designates the solid shaft above referred to, and n^2 the ratchet-wheel on the same, with which engages a dog n', that is carried on a solenoid-core n^4, which is common to two solenoids N N′. The core n^4 is mounted in a suitable frame p^3 and has a retracting-spring p' and a stop-bar p^2, that contacts with an adjustable stop p^4 in frame p^3. A hollow shaft m^3, of insulating material, is mounted and turns on the shaft n^3 and carries a ratchet-wheel m^2, that is operated by a dog m' on a solenoid-core m^4 of a solenoid M, the dog and ratchet-wheel being so constructed and arranged that the movement of the solenoid-core m^4 will turn the hollow shaft in the same direction as the solid shaft n^3 is turned by ratchet n^2 and dog n'. The core m^4 is mounted in a frame o^3 and has a retracting-spring o' and a stop-bar o^2, that contacts with an adjustable stop o^4 in the frame o^3.

The shaft n^3 carries electrically-insulated contact-fingers T′ and k and a disk J of insulating material, that has a metallic contact-pin j'', with which the finger k is in constant contact. The contact-fingers T′ and k have collars, upon which bear brushes k^2 and t^4, connected, respectively, to circuits 1 and 2, the former circuit leading to the solenoid N and the latter to magnet E.

The shaft m^3 carries three contact-fingers R, S, and l, and each of these fingers has a collar with which a brush contacts, the collar of finger R having a brush r connected to line 2, leading to solenoid M, the collar of finger S having a brush s connected to line 2′, leading to ground at X, and the collar of finger l having a brush l' connected to line 1, leading to the semaphore-solenoid D. The finger l is adapted to contact with the pin j'' on disk J and through said pin establish electrical connection with finger k, and the finger R has a spring-tongue R′, which is adapted to contact with the finger T′, when said finger and tongue are in alinement; but which when the said finger and tongue are out of alinement will bear inwardly and contact with the finger S. The finger T′ has a beveled tooth on its outer end, which when said finger comes into line with the tongue R′ raises the latter up out of contact with finger S.

The circuits of the contact-breaker and the semaphore are as follows: A line 1 leads from contact-plate i to solenoid D, to brush l', to contact-finger l, to pin j'', to contact-finger k, to brush k^2, to solenoid N, to ground X. A line 9 leads from contact-plate i^2 to solenoid N, to ground X. A line 2 leads from contact-plate i' (which is alongside the track, but at the opposite end of a block or section to the plates i i^2) to solenoid M, to brush r, to finger R, to spring-tongue R′, and when R′ is in contact with S from finger S to brush s and thence to ground X, or when tongue R′ is in contact with finger T′ from finger T′ and brush t^4 to magnet E and thence to ground X.

The shafts n^3 m^3 carry in addition to the parts above described the annunciator T for

indicating to an engineer on a passing train how many if any engines or trains are on the section or block ahead in case the semaphore is in danger position when the train passes a station. Such annunciator is composed of a disk t, having an opening t' in its face and on the rear side a number of lamps t^2 t^2, which are arranged, as shown, to swing or maintain their vertical position as the disk t rotates, and are opposite to the opening t'. The disk t is hollow, and within it is arranged a glass or other transparent flat disk t^4, having numbers thereon in line with the opening t'. The hollow disk or case t is mounted on the hollow shaft m^3, while the flat disk t^4 is mounted on the solid shaft n^3. As the shaft n^3 is stepped to open circuit the disk t^3 is correspondingly stepped to show a number through the opening t', which indicates the number of the train passing the station and indicates to the engineer the number of trains on the block, and as the shaft m^3 is stepped by trains going off the block the disk t moves therewith and shows the next lower number.

In Fig. 10 and in the detail views Figs. 11, 12, and 13 I have shown means for lighting and extinguishing a lamp D', which is arranged behind the disk on the rear end of the semaphore-blade. In these figures an electric lamp-lighting device A' is arranged in the circuit 1 1 and an extinguisher D^2 for the lamp D' is carried by the armature-lever e. When the solenoid D is energized by a train reaching a station-contact i and the semaphore is thereby set to "danger," the current through line 1 1 operates the lighting device A' to light the lamp D'. As a train passes out of a station-section the brush a^6, contacting with plate i', finds ground through line 2 2, energizes the magnet E, which attracts its armature e, and allows the semaphore-blade to drop to the safety position. (Shown in dotted lines in Fig. 10 of the drawings.) The movement of armature e draws the extinguisher D^2 over the lamp and extinguishes the light.

Operation: A train approaching the contact-plate i of station 1, Fig. 1 in the direction of the arrow, if the track ahead is clear will find the circuit-breaker at that station closed and the semaphore-blade down, indicating "safety." As soon as brush a^6 contacts with plate i the circuit 1 1 is closed and solenoid D energized, its core is pulled down, and the semaphore is set to danger position, in which it is held by the catch e' on armature-lever e. At the same time solenoid N is energized and its core drawn in, and when the finger a^6 has passed over the plate i, the circuit 1 1 being thereby broken and the core being forced forward by the spring p', the shaft n^3 will be stepped the distance of one tooth of ratchet-wheel n^2, by which movement the fingers k l will be separated, breaking circuit of line 1 1 at that point, and at the same time the fingers T' and tongue R' will be separated, breaking the circuit 2 2 and leaving the magnet E deënergized, so that lever e will continue to hold the semaphore at danger position. When the finger T' is moved from under the tongue R', as just described, the tongue will spring inwardly and contact with finger S, and thus establish circuit for line 2 2' through magnet M from plate i'' at the far end of the block to ground X. When a following train reaches plate i before ground has been restored by the passing off of the first train over plate i'', its contact-finger a^6 finds no ground through station-circuit 1 1, engine-magnet G ceases to be active, its armature drops on contact g' to put magnet H into circuit through line 6 6 and tongue g with the battery on the car. Magnet H thereupon attracts its armature h and shuts off the power-supply and applies the brakes to stop the train. As soon, however, as brush a^4 contacts with plate i^2 a ground for station-circuit 9 9 is found by way of brush a^4, engine-circuit 6 6, stop g', armature g, battery on car, and thence through 7 to ground, and as the station-circuit 9' 9 passes through solenoid N' to ground the solenoid N' will be energized and the members of the circuit-breaker stepped further apart. The brush a^6 of each successive engine passing out of the block or section and contacting with plate i' finds ground through line 2 2 for restoring or reëstablishing the circuit-breaker circuits and setting the semaphore to "safety." When an engine having passed a semaphore-station reverses its direction and starts back over the track, the semaphores, circuit-breakers, and annunciators which have been successively set to "danger" and restored to "safety" as the train progressed are now operated in the same manner by the engine traveling in the reverse direction—that is to say, the engine sets the semaphore in front to "danger" and restores to "safety" the semaphore in its rear in the following manner: At each semaphore-station a set of contact-plates i^3 i^4 i^5 are arranged which are duplicates of the plates i i' i^2, the plate i^4 being, however, arranged in the rear of the plates i^3 i^5, as shown. The frame a^8, which carries the brushes a^4 a^6, of which there are two sets, one on each side of the engine, is movable from side to side and has a tongue b^4, that engages with a worm b^2 on an axle b^3 of the engine, so that accordingly as the engine changes its direction the brushes will be moved to one side or the other and will contact with the plates i i' i^2 or with the plates i^3 i^4 i^5, and the semaphores, circuit-breakers, and annunciators will be operated as before, but for an engine traveling in the opposite direction to the arrow in Fig. 1.

Having described my invention, I claim—

1. The combination of a semaphore, an annunciator and actuating mechanism controlled by a leading train to set the semaphore to danger position and lock it in said position, and

for separately actuating the annunciator by following trains, and means whereby said semaphore and annunciator are restored to normal position when the last train of the following trains passes off the block controlled by said devices, substantially as set forth.

2. The combination of a semaphore and its actuating mechanism, an annunciator and its actuating mechanism, said actuating mechanisms being arranged to operate together when the semaphore is set to danger and safety positions, the semaphore-actuating mechanism being idle or inoperative while in danger position, and its annunciator mechanism operative at all times by a passing train in either its forward or backward motion, substantially as set forth.

3. The combination of a semaphore, electromagnetic devices including a circuit-breaker, an annunciator controlled by said devices and operating when said circuit-breaker is opened, substantially as set forth.

4. The combination of a semaphore, electrically-controlled actuating devices for said semaphore, an annunciator, electromagnetic devices for the annunciator separate from the semaphore-actuating devices, circuit connections and contact-plates therefor controlled by a passing train, substantially as set forth.

5. The combination of a station-semaphore electromagnetic actuating devices, two separate series of contact-plates and circuit connections, an engine or motor-car having shifting or movable contact devices for contact with plates and automatically controlled by the forward and backward motions of the engine or car, substantially as set forth.

6. The combination of a semaphore *c*, solenoid-actuating core *d*, for setting the semaphore to danger position, a locking armature-lever *e* for holding the semaphore in danger position, an electromagnet for said locking armature-lever, and circuit connections, substantially as set forth.

7. An engine having a closed circuit including magnetic appurtenances and a ground connection and contact-brush, and an open shunt-circuit including magnetic devices, a contact-brush and ground connections, substantially as set forth.

8. An engine or car having a normally closed circuit including ground connections and a contact-brush for opening such closed circuit, and an open shunt therefrom including a contact-brush and ground connections, substantially as set forth.

9. An engine or motor-car having a closed circuit including electromagnetic devices, a contact-brush and a contact-stop for said brush, an open shunt-circuit including electromagnetic devices, a contact-brush and a contact-stop for said brush in combination with contact-plates along the line of way for vibrating or raising said brushes from said contact-stops, substantially as set forth.

10. An engine or motor-car having a normally closed circuit including electromagnetic devices, a vibrating contact-brush and a ground connection, an open shunt-circuit including electromagnetic devices controlling the power-controlling devices for the engine or motor-car, and a vibrating contact-brush and a ground connection, substantially as set forth.

11. An engine or motor-car having a normally closed circuit including an electromagnet and a source of electric supply, a shunt-circuit, a vibrating contact-brush, contact point or points for said brush for opening and closing said closed circuit, substantially as set forth.

12. An engine or motor-car having a normally closed circuit including an electromagnet, a source of electric supply, a shunt-circuit having contact point or points, a vibrating brush for contact with said point or points for opening and closing said closed circuit, and power-controlling devices for the engine or motor-car controlled by said magnet, substantially as set forth.

13. A railway having station electromagnetic devices, circuit connections and contact-plates, an engine or motor-car having a closed circuit including a source of electric supply, an electromagnet and contact point or points, a vibrating contact-brush for opening said closed circuit as the brush contacts with the plates at the stations and power-controlling devices under the control of said magnet, substantially as set forth.

14. An engine or motor-car having a closed battery or electric circuit, a power-controlling device with magnetic appurtenances, a resistance in said battery or electric circuit controlling the switch of a separate or shunt circuit, including the power-controlling magnetic appurtenances for stopping the engine or train when said battery or generator circuit is in a non-working condition, substantially as set forth.

15. A railway-station-signal circuit-breaker having a shaft n', a non-conductor cylinder or disk having a conductor-strip k mounted on said shaft, contact-brushes k', k^2 for said cylinder or disk, ratchet-wheels on said shaft engaging with armatures of electromagnets M, N, for alternately rotating step by step the shaft n, and circuit connections for said magnets and contact-brushes, substantially as set forth.

16. A railway having station electromagnetic appurtenances in partial circuits, track-contacts therefor, an engine or car, power-controlling devices thereon, a normally closed electric circuit on said car, an electromagnet included in said circuit, an armature for said magnet, connections between said armature and the power-controlling devices, and a contact device included in said circuit and adapted to coact with the track-contacts.

17. A railway having station electromagnetic appurtenances in partial circuits, track-contacts at the respective stations included in circuits for predetermined forward and rearward stations, an engine or car, power-controlling devices thereon, a normally closed electric circuit on said car, an electromagnet included in said circuit, an armature for said magnet, connections between said armature and the power-controlling devices, and a contact device included in said circuit and adapted to coact with the track-contacts.

18. An engine or car having a normally closed electric circuit, means for opening such closed circuit, an open shunt-circuit therefrom, and means for closing said shunt-circuit, in combination with power-controlling devices on the engine or car, and electromagnetic appurtenances controlled by said circuits to operate said power-controlling devices, substantially as described.

19. An engine or motor-car having a closed electric circuit including an electromagnetic device, means for opening said circuit, an open shunt-circuit including an electromagnetic device, and means for closing said shunt-circuit, in combination with devices along the line of way for operating the said opening and closing means for the respective circuits substantally as described.

20. In an engine or motor-car, having a normally closed electric circuit including an electromagnetic device, means for opening said circuit, an open shunt-circuit including an electromagnetic device, power-controlling devices on the engine or car under the influence of said electromagnetic device, and means for closing said shunt-circuit, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL D. STROHM.

Witnesses:
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R. W. VAN STAVOREN.