No. 881,552.

PATENTED MAR. 10, 1908.

F. B. COREY.

EMERGENCY BRAKE.

APPLICATION FILED MAR. 21, 1903.

2 SHEETS—SHEET 1.

Fig. 2.

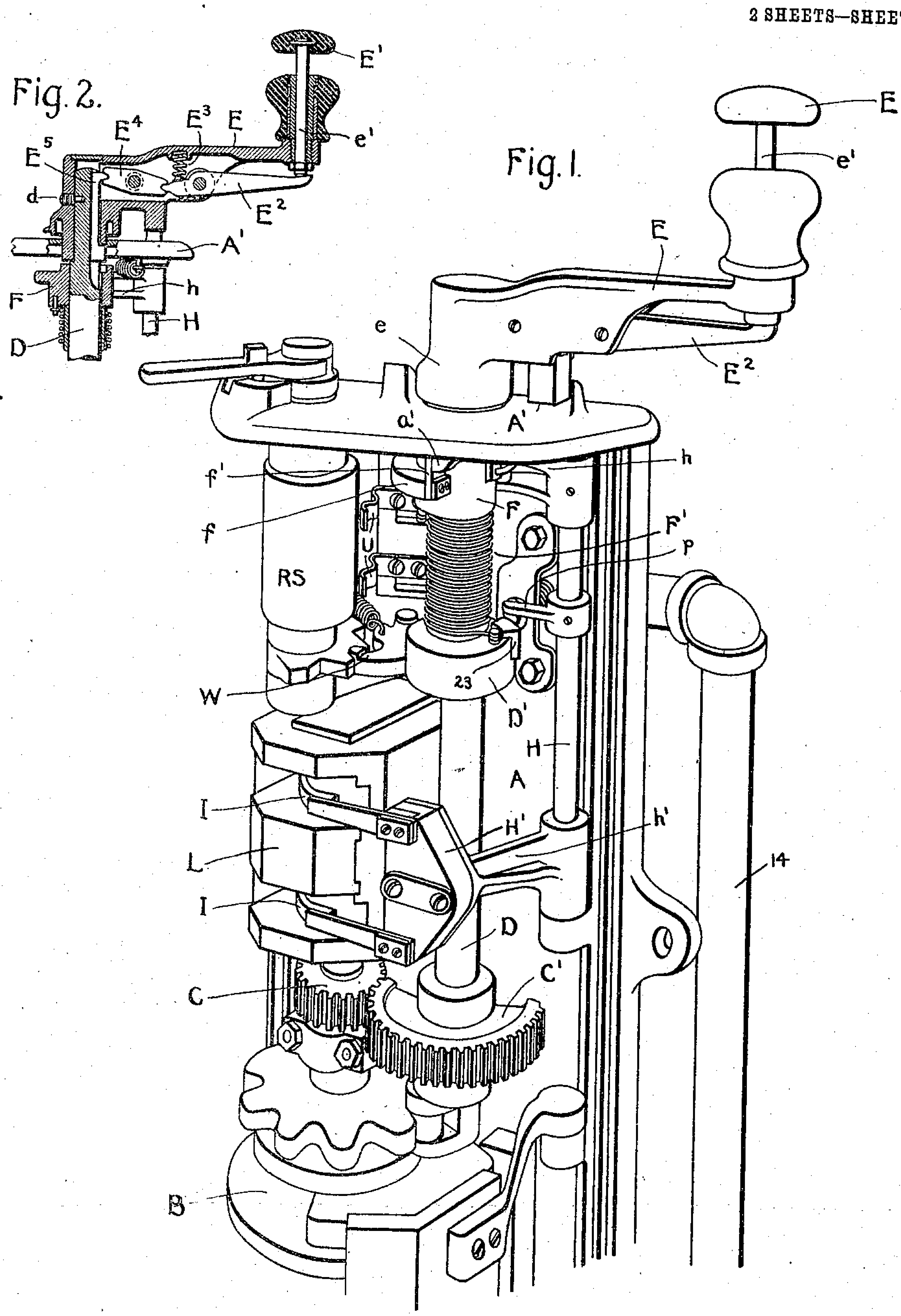

Fig. 1.

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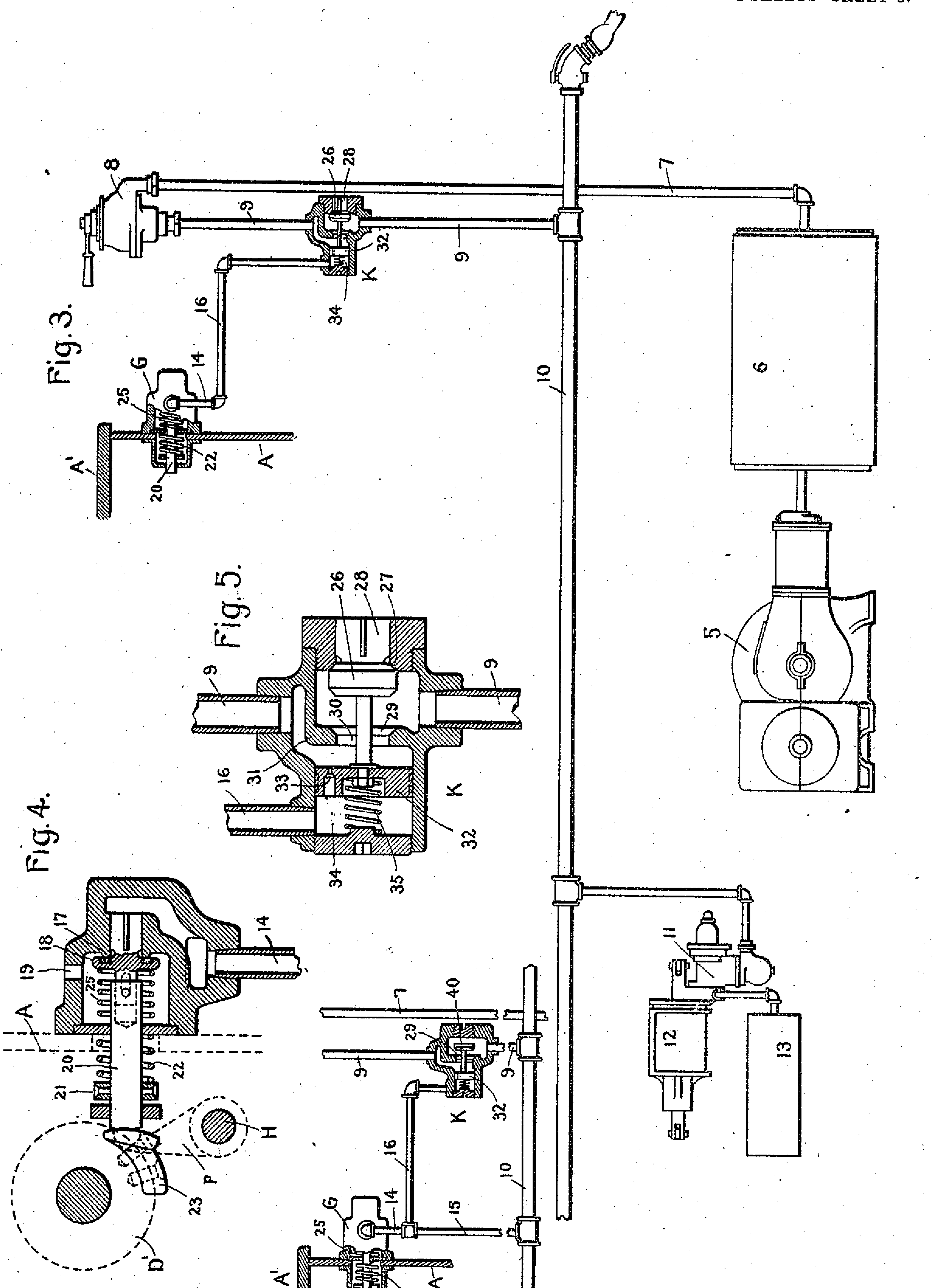

Witnesses
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UNITED STATES PATENT OFFICE.

FRED B. COREY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

EMERGENCY-BRAKE.

No. 881,552. Specification of Letters Patent. Patented March 10, 1908.

Application filed March 21, 1903. Serial No. 148,902.

To all whom it may concern:

Be it known that I, FRED B. COREY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Emergency-Brakes, of which the following is a specification.

My present invention relates to improvements in means for automatically controlling motors and power-actuated brakes in case of an emergency and is intended for use especially in connection with electrically-propelled vehicles or trains employing a braking system actuated by fluid pressure.

In one of its aspects the present invention may be considered as an improvement on the emergency apparatus disclosed in patent No. 655,389 granted August 8, 1900 on an application filed by F. E. Case. Said emergency apparatus consists of means for automatically opening the motor circuit when the motorman releases the controller handle in any operative position of said handle and the present invention contemplates a simple and novel arrangement of parts constituting emergency air brake mechanism adapted to operate in conjunction with said apparatus.

In a further aspect the present invention comprises means for preventing the feeding of compressed fluid from the source of supply in an "automatic" air brake system through the engineer's valve to the train pipe while the train pipe is being exhausted by reason of the operation of the emergency valve.

The present invention in its various aspects and as to its novel features of construction and detail will be more fully understood from the following description, while its scope will be pointed out in the appended claims.

In the accompanying drawings which illustrate the preferred embodiment of my invention, Figure 1 is a perspective view of a controller in which my improved form of emergency brake-controlling valve is mounted, the front cover of said controller being removed; Fig. 2 is a section through the operating handle of the controller, showing the actuating mechanism for the cut-out switch and emergency valve; Fig. 3 is a diagrammatic representation of an "automatic" air-brake system, showing the relative location of and the connections between the engineer's valve, the train-pipe and the emergency valve which is operatively connected to the controller-actuating mechanism; Fig. 4 is a section through the emergency valve, showing diagrammatically the actuating mechanism for said valve; Fig. 5 is a section through the preferred form of valve adapted to close the pipe leading from the train-pipe to the engineer's valve; and Fig. 6 is a modified form of connections for the system shown in Fig. 3.

Referring now to the drawings, A indicates the back of a controller casing upon which the working parts of the controller are supported. The main controller cylinder B carries the usual contact segments and is geared by cog-wheels C, C′ to the shaft D which runs up into the hub *e* of the operating handle E. The hub is rotatable in an opening in the cap-plate A′ A′ of the casing and is fastened to the shaft D by means of a set-screw *d*. Rotatably mounted on the shaft D is a sleeve F maintained yieldingly in its normal position by the helical spring F′ which is connected at one end to the sleeve and at the other to the shaft, preferably by means of a collar D′ secured to said shaft. The sleeve F carries a cam *f* and a lug *f′*, the latter serving as a stop by abutting against a stationary lug *a′* on the under side of said cap-plate. The sleeve F controls the operation of a main cut-out switch, indicated by I, and is capable of being connected with the shaft D whenever the operating handle E is in its "off" position and is adapted to be rotated with said shaft so long as pressure is maintained on the broad knob E′ on which the palm of the motorman's hand is adapted to rest while the controlling handle is being operated. Immediately upon releasing the pressure on the knob E′, that is when the motorman removes his hand from the controlling handle, either designedly or accidentally, and when the controlling handle is in any position other than the "off" position, the spring F′ will rotate the sleeve F to cause the motor-circuit to be broken at the cut-out switch.

Connected with the knob E′ is a pin *e′* which rests upon the long arm of the lever E^2 fulcrumed on the operating handle E (see Fig. 2). The spring E^3 bears on the short arm of the lever and keeps the pin and knob normally raised. A toothed rocker E^4 also is fulcrumed on the operating handle and engages with the short arm of the lever E^2.

The other end of the rocker E^4 engages with a lug on a bolt E^5 slidable in a key-way in the shaft D and adapted to enter a notch in the upper end of the sleeve F and lock said sleeve to the shaft. This will occur when the knob E′ is depressed, provided the controller is in the "off" position.

Adjacent to the shaft D within the controller is a rock-shaft H which carries the arm *h*. The arm *h* bears against the cam *f* in such a manner that the said shaft H is rocked by a movement of said cam. At some convenient point on the shaft is an arm *h*′ which carries a block of insulation H′ on which are mounted two connected spring-contact fingers which coöperate with stationary contacts and form therewith the double-pole cut-out switch I above referred to. The said switch is normally maintained open by means of a spring (not shown) and the rock-shaft H is operated to close said switch against the action of said spring.

In order to promptly extinguish the arc which forms on the separation of the contacts of the cut-out switch a blow-out magnet is provided, preferably a flat coil fitting into a central compartment in a box L of fiber or other insulating material. The reversing-switch shown in this controller has stationary contact fingers U and a rotatable cylinder RS eccentrically mounted on its operating shaft. The said reversing-switch cylinder carries the customary bridging contact segments. An interlock W of any desired construction is arranged between the reversing-switch and the shaft D.

The specific construction of the working parts of the motor-controller herein shown and described forms no part of my present invention and is not herein claimed, since it forms the subject-matter of a co-pending application of F. E. Case, Serial No. 75,488, filed September 16, 1901, and is merely illustrated and described here to more clearly show how my invention may be applied to the type of controller commonly employed as a master-controller in systems of train-control. It will be readily understood that the invention is not limited in its application to any specific motor-controller.

In the operation of air-brake systems it is customary either to exhaust the train-pipe to atmosphere, as in the so-called "automatic" systems, or to connect the said train-pipe to a source of compressed-fluid supply, as in the so-called "straight" air systems, in order to apply the brakes. In illustrating my invention as applied to an electrically-propelled vehicle I have chosen to illustrate the connections for an "automatic" system, but it will be clearly understood that without departing from the spirit and scope of my invention the device may be applied to the "straight" air systems.

Referring now to Fig. 3 which illustrates diagrammatically an "automatic" air-brake system equipped with an emergency valve adapted to be operated from a motor-controller, 5 indicates a motor-driven fluid-compressor; 6 a reservoir for receiving the compressed fluid from said compressor; 7 a connecting pipe leading to the engineer's valve 8; and 9 a connecting pipe leading from the engineer's valve to the train-pipe 10. The brake cylinder 12 is connected to the auxiliary reservoir 13 and also to the train-pipe through the customary triple-valve 11 of the "automatic" system. Operatively connected with the controlling handle in a manner to be hereinafter described is an emergency valve the casing G of which may be connected directly to the train-pipe 10 by means of the pipe 15 as shown in Fig. 6, or it may be connected through the pipe 16 to the casing K so as to operate a relay valve located in the pipe 9 as shown in Fig. 3. The main function of this emergency valve is to cause the train-pipe to be exhausted and thereby apply the brakes independent of the operation of the engineer's valve 8 whenever the controlling handle is released in certain of its positions by the operator. The specific construction of this emergency valve and the actuating mechanism therefor is shown in Figs. 1 and 4.

Mounted on the back A of the controller casing is a valve casing G having a valve seat 17 on which rests a spring-pressed valve 18. This valve is adapted to control the communication between the train-pipe 10 and the atmosphere through the exhaust port 19 and also to control the operation of the valve in pipe 9 or it may control the operation of a relay valve in a manner to be hereinafter described. Mounted on the valve spindle 20 is a collar 21 against which the spring 22 acts to tend to open the valve 18. This tendency to open the valve 18 is resisted when the controlling handle is in its "off" position by the cam 23 carried by the collar D′ and when said handle is in its operative positions, that is in positions other than that corresponding to the "off" position of the controller or other predetermined inoperative position, by means of the arm *p* mounted on the rock-shaft H. This arm *p* rests against the end of the spindle 20 so long as the controlling handle is in any of its operative positions and pressure is maintained upon the knob E′ by the motorman or operator. The valve spindle 20 is formed of two telescoping parts to allow certain amount of relative movement between the end of the valve spindle which coacts with both the cam 23 and the arm *p* and the part of the valve spindle which is attached rigidly to the valve. This movement is taken up by the spring 25 which is weaker than the spring 22 and operates to retain the valve 18 upon its seat 17 while the spindle 20 is passing from engagement with the cam 23 to engagement with the arm p during the operation of the controller.

When the motorman places his hand upon the operating handle E he depresses the push-pin e' and forces the bolt E^5 down into the slot in the sleeve F. The rotation of the handle operates first to close the cut-out switch I and then to control the motor-circuits by means of the cylinder B. If at any time the motorman removes his hand from the operating handle the sleeve is unlocked and the spring instantly turns the sleeve backward until the lug f' strikes the stop a' in which position the cam f allows the arm h to move so that the circuit-closing or cut-out switch is thrown open by its actuating spring. Simultaneously with the operation of said cut-out switch, which is opened whenever the pressure is removed from the knob E′, as above described, the arm p carried by the rock-shaft H is thrown away from the valve spindle 20 and the emergency valve 18 is raised from its seat 17 by means of the spring 22 which overpowers the spring 25. The train-pipe is thus caused to be exhausted to atmosphere and the brakes are applied. In order to close said valve 18 and to release the brakes, the operating handle E is returned to its initial or "off" position thereby bringing the cam 23 carried by the collar D′ into engagement with the valve spindle 20.

Instead of connecting the emergency valve directly to the train-pipe as above described it may be connected to the equalizing reservoir otherwise known as the brake-valve reservoir or supplementary reservoir of the Westinghouse "automatic" system. This will have the effect of reducing the pressure in said equalizing reservoir when the emergency valve is operated and thereby exhaust the train-pipe through the customary exhaust port in the engineer's valve.

In the best known type of "automatic" air-brake systems the engineer's valve is provided with a large and a small port which are respectively called into play in the "quick-release" and "slow-release" or "running" positions of the engineer's valve. In the "quick-release" position the source of compressed-fluid is connected through the large opening to the train-pipe thereby quickly operating the triple valve to recharge the auxiliary brake reservoir and release the brakes quickly. In the "running" position the compressed-fluid is gradually admitted to the train-pipes from the source of compressed-fluid supply, and this position of the engineer's valve is its normal running position, so that compressed-fluid is slowly supplied to the train-pipe to take care of any leaking and to maintain the pressure in said pipe at a predetermined amount. Now if by frequent application of the brakes, or for any other reason, the pressure in the auxiliary reservoir becomes materially reduced so that a considerable reduction of pressure in the train-pipe is necessary in order to cause the triple valve to operate to apply the brakes, it may happen that the air from the high-pressure source of supply will flow into the train-pipe through the port in the engineer's valve substantially as fast as it is exhausted from the train-pipe to atmosphere at the relatively low pressure of the train-pipe, thereby preventing the brakes from being applied when the emergency valve is operated. Furthermore, it may happen that either intentionally or accidentally the engineer's valve is in its "quick-release" position at the time the emergency valve is operated, thereby allowing the compressed-fluid to be fed to the train-pipe as fast as it is exhausted through the emergency valve and thus prevent the operation of the triple valve. To obviate these difficulties I may employ a relay valve operating in the casing K which is designed to be placed in the connecting-pipe leading from the train-pipe to the engineer's valve. The specific construction of one form of this valve is illustrated in Fig. 5, 26 indicating said valve, which is adapted to rest normally against the seat 27 and control the exhaust port 28. This valve 26 is also adapted to rest on the seat 29 and control an opening 30 in the diaphragm 31. Attached to said valve 26 is a piston 32 which is of slightly larger diameter than the valve. The piston 32 has a small opening 33 passing therethrough, the said opening being adapted to admit compressed-fluid from the train-pipe into the chamber 34 in which the piston 32 operates. The said chamber 34 is connected with the casing G of the emergency valve through the pipes 16 and 14. The valve 26 is normally maintained on its seat 27 by means of the fluid pressure within the chamber 34, assisted by the spring 35. Now if the motorman releases the knob E′, thus operating the cut-out switch and the valve 18, the chamber 34 is exhausted to atmosphere through the pipes 16 and 14 and exhaust port 19. The piston 32 will thereby be forced to the left by the pressure of the fluid within the train-pipe and the valve 26 will be forced onto its seat 29, thus exhausting the train-pipe directly to atmosphere through the exhaust port 28 and closing the passageway from the engineer's valve to the train-pipe. The compressed-fluid is thereby prevented from flowing through the port of the engineer's valve into the train-pipe and the pressure in said train-pipe is reduced sufficiently to allow the triple valve to be operated by the compressed-fluid in the auxiliary reservoir when the emergency valve is operated. As soon as the controlling-handle is turned to the "off" or other predetermined position and the valve 18 is closed the air that flows through the engineer's valve will pass through the small port 33 in the piston 32 and raise the pressure in the chamber 34, thereby equalizing the pressure on both sides of the piston 32, and allow the spring 35 to operate the valve 26 to close the exhaust port 28 and open the communication between the engineer's valve and the train-pipe.

In the modified form of connections shown in Fig. 6, the train-pipe 10 is exhausted directly to atmosphere through the pipe 15 and the exhaust port 19, when the emergency valve in the controller casing is operated. The valve 40 in the pipe 9, shown as a single-seated valve, has merely the function of closing the communication between the train-pipe and the engineer's valve while the train-pipe is being exhausted through the exhaust port 19, and is operated from the said emergency valve in the same manner as above described with reference to valve 26 in the modification shown in Fig. 3.

It will be understood that the controlling handle herein referred to is not necessarily the operating handle for the motor-controller but may be the operating handle for the customary engineer's valve of the air-brake system or any other handle adapted for the purpose.

I aim to cover in the claims hereto appended all modifications both of the system and of the apparatus herein disclosed which do not involve a departure from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In combination, a controller having a revoluble shaft, a power-actuated brake, a brake controlling device, a member loosely mounted on said shaft and arranged to coöperate with said brake controlling device to cause the brakes to be applied in the normal position of the said member and to release the brakes and maintain them released in the running positions of the controller when the said member is locked to the controller shaft for rotation therewith, means for locking said member to said shaft, said means being arranged to unlock the said member from the shaft upon release of the controller handle, and means for returning said member to the normal position.

2. In combination, a controller having a revoluble shaft, a power-actuated brake, a brake controlling device, a member loosely mounted on said shaft and arranged to coöperate with said brake controlling device to cause the brakes to be applied in the normal position of the said member and to release the brakes and maintain them released in the running positions of the controller when the said member is locked to the controller shaft for rotation therewith, means for locking said member to said shaft, said means being arranged to unlock the said member from the shaft upon release of the controller handle, means for returning said member to the normal position, and a projection on said shaft arranged to coöperate with said brake controlling device to release the brakes in the "off" position of the controller.

3. In combination, a controller having a revoluble shaft, a power-actuated brake, a brake controlling device tending normally to apply the brakes, a cam loosely mounted on said shaft, said cam being normally out of engagement with said brake controlling device and arranged to engage with said brake controlling device in the running positions of the controller when locked to the controller shaft, means for locking said cam to said shaft, said means being arranged to unlock said cam from the shaft upon release of the controller handle, and a spring for returning the cam to its normal position.

4. In combination, a controller having a revoluble shaft, a power-actuated brake, a brake controlling device tending normally to apply the brakes, a cam loosely mounted on said shaft, said cam being normally out of engagement with said brake controlling device and arranged to engage with said brake controlling device in the running positions of the controller when locked to the controller shaft, means for locking said cam to said shaft, said means being arranged to unlock said cam from the shaft upon release of the controller handle, a spring for returning the cam to its normal position, and a projection on the controller shaft arranged to engage the brake controlling device when the controller is in its "off" position.

5. In combination, a controller having a revoluble shaft, a power-actuated brake, a brake valve tending to apply the brakes, a sleeve loose on said shaft and having a cam arranged to engage said valve to release the brakes and maintain them released in the running positions of the controller when the sleeve is locked to the controller shaft and to release the valve in the normal position of the sleeve, means for locking said sleeve to said shaft, said means being arranged to unlock the sleeve from the shaft upon release of the controller handle, and a spring tending to maintain said sleeve in its normal position.

6. In combination, a controller having a revoluble shaft, a power-actuated brake, a brake valve tending to apply the brakes, a sleeve loose on said shaft and having a cam arranged to engage said valve to release the brakes and maintain them released in the running positions of the controller when the sleeve is locked to the controller shaft and to release the valve in the normal position of the sleeve, means for locking said sleeve to said shaft, said means being arranged to unlock the sleeve from the shaft upon release of the controller handle, a spring tending to maintain said sleeve in its normal position, and a cam or projection on said shaft arranged to

engage said valve and release the brakes when the controller is in its "off" position.

7. In combination, a controller having a revoluble shaft, a power-actuated brake, a spring actuated valve for causing said brake to be applied, a sleeve loose on said shaft and having a cam which is normally out of engagement with said valve, means for locking said sleeve to said shaft to bring said cam into engagement with said valve upon turning the controller handle, said means being arranged to unlock said sleeve from the shaft upon release of the controller handle, and a spring tending to return said sleeve to its normal position.

8. In combination, a controller having a revoluble shaft, a power-actuated brake, a spring actuated valve for causing said brake to be applied, a sleeve loose on said shaft and having a cam which is normally out of engagement with said valve, means for locking said sleeve to said shaft to bring said cam into engagement with said valve upon turning the controller handle, said means being arranged to unlock said sleeve from the shaft upon release of the controller handle, a spring tending to return said sleeve to its normal position, and a projection on said shaft arranged to engage said valve when the controller handle is in its "off" position.

9. In an "automatic" air-brake system, means independent of the engineer's valve for exhausting the train-pipe and at the same time closing the communication between said train-pipe and the engineer's valve.

10. In an "automatic" air-brake system, an engineer's valve, a train-pipe, and a valve adapted to open an exhaust port leading from said train-pipe and at the same time close communication between the engineer's valve and said train-pipe.

11. In an "automatic" air-brake system, a controlling handle, and means for causing the train-pipe to be exhausted to apply the brake and for causing the communication between the train-pipe and the engineer's valve to be closed when said controlling handle is released by the operator.

12. In an "automatic" air-brake system, a controlling handle, means for causing the train-pipe to be exhausted to apply the brake and for causing the communication between the train-pipe and the engineer's valve to be closed when said controlling handle is released by the operator, and means for causing the brake to be released and the communication between the engineer's valve and the train-pipe to be opened when the said handle is moved into a certain predetermined position.

13. In combination with an "automatic" air-brake system, a motor-controller, an operating handle for said controller, and means independent of the engineer's valve of said air-brake system and controlled from the operating handle of said controller for causing the train-pipe to be exhausted and for causing at the same time the communication between the train-pipe and the engineer's valve to be closed.

14. In an electrically-propelled vehicle, an "automatic" air-brake system, a motor-controller, an operating handle for said controller, and a valve independent of the engineer's valve of the air-brake system and controlled from said operating handle adapted to exhaust the train-pipe of the said air-brake system and at the same time close the communication between the train-pipe and the engineer's valve.

15. In an electrically-propelled vehicle, an "automatic" air-brake system, a motor-controller, an operating handle for said controller, a relay valve located between the engineer's valve of the air-brake system and the train-pipe and adapted to exhaust said train-pipe and at the same time close the communication between the engineer's valve and said train-pipe, and a valve operatively connected with said controlling handle for controlling the operation of said relay valve.

16. In combination with an "automatic" air-brake system, a motor-controller, an operating handle for said controller, a relay valve located between the engineer's valve of the air-brake system and the train-pipe and adapted to exhaust said train-pipe and at the same time close the communication between said engineer's valve and the train-pipe, a controlling valve adapted to be operated to cause said relay valve to operate to apply the brakes when the controlling handle is released in any of its operative positions, and means for operating said controlling valve to cause the brakes to be released when the operating handle is returned to its initial or "off" position.

17. In an air-brake system, a controlling handle, and means for causing the proper variation in train-pipe pressure to apply the brake and for causing the communication between the train-pipe and the engineer's valve to be closed when said controlling handle is released by the operator.

18. In an air-brake system, a controlling handle, means for causing the proper variation in train-pipe pressure to apply the brake and for causing the communication between the train-pipe and the engineer's valve to be closed when said controlling handle is released by the operator, and means for causing the brake to be released and the communication between the engineer's valve and the train-pipe to be opened when the said handle is moved into a certain predetermined position.

19. In combination with an air-brake system, a motor controller, an operating handle for said controller, and means inde-

pendent of the engineer's valve of said air-brake system and controlled from the operating handle of said controller for causing the proper variation in train-pipe pressure to apply the breaks and for causing at the same time the communication between the train-pipe and the engineer's valve to be closed.

20. In an electrically propelled vehicle, an air-brake system, a motor controller, an operating handle for said controller, and a valve independent of the engineer's valve of the air-brake system and controlled from said operating handle adapted to cause the proper variation in train-pipe pressure to apply the brake and at the same time close the communication between the train-pipe and the engineer's valve.

21. In an air-brake system, in combination with a motor controller, means actuated upon the release of the controller handle by the motorman and adapted to cause the proper variation of train pipe-pressure to apply the brake and to disconnect the train-pipe from the motorman's valve

In witness whereof, I have hereunto set my hand this 19th day of March, 1903.

FRED B. COREY.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.