No. 636,858.

Patented Nov. 14, 1899.

J. SHOUREK.

AIR BRAKE.

(No Model.)

(Application filed Dec. 7, 1898.)

9 Sheets—Sheet 1.

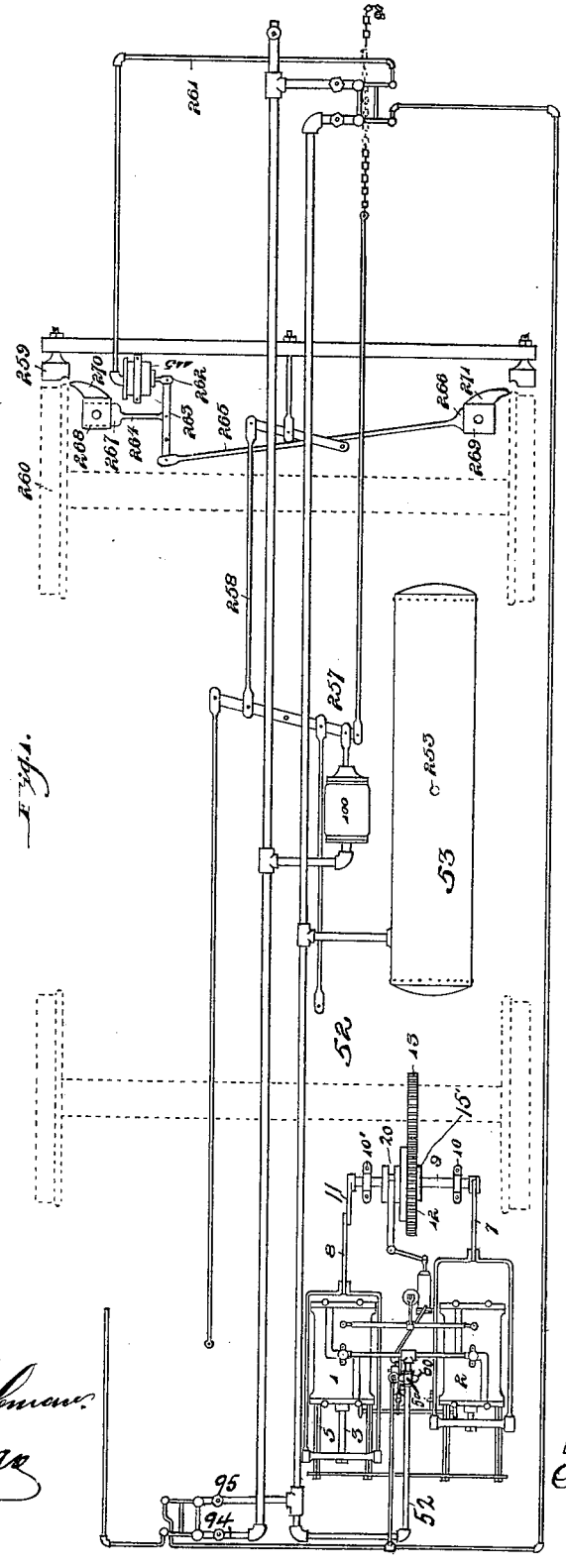

Fig. 1.

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No. 636,858. Patented Nov. 14, 1899.

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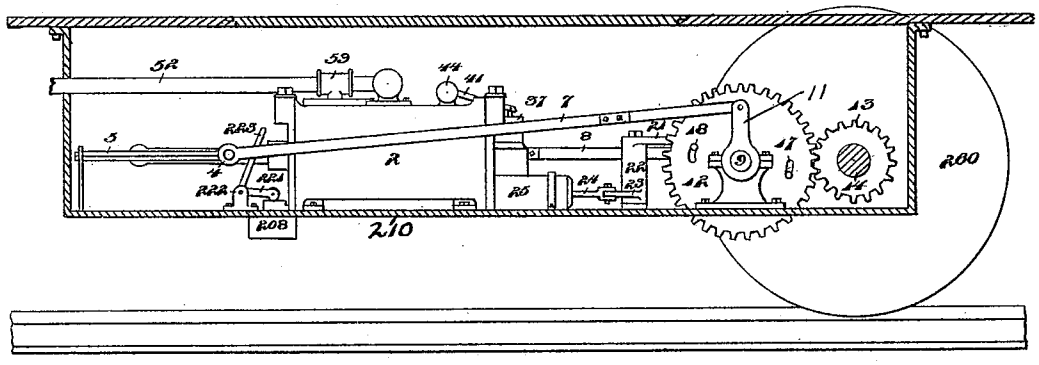
(No Model.) 9 Sheets—Sheet 2.

Fig. 2.



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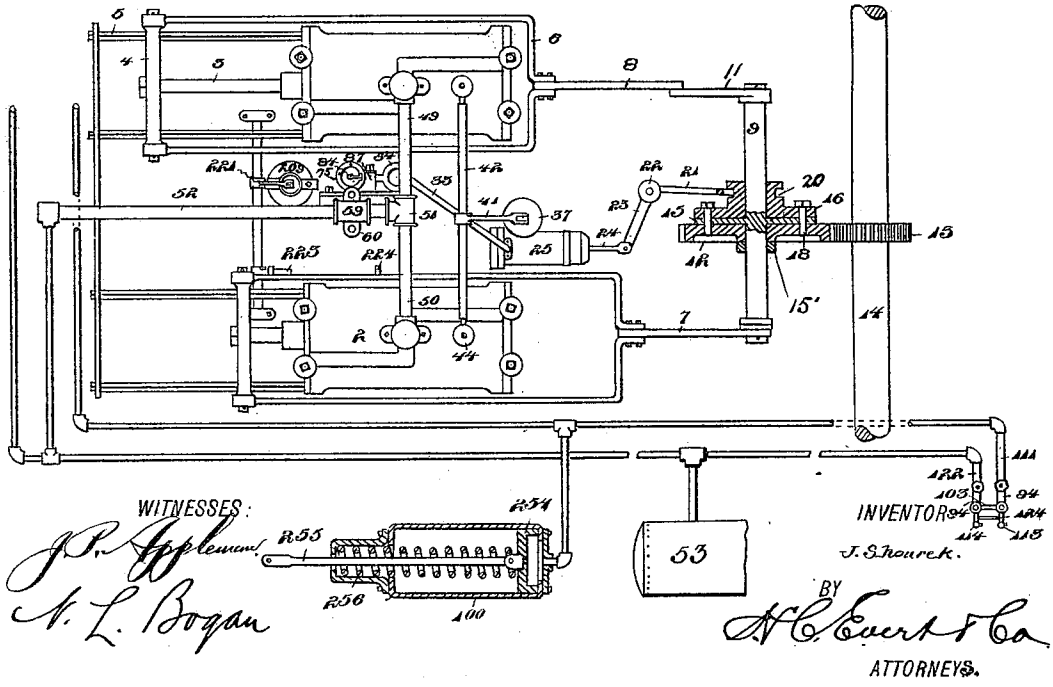


No. 636,858. Patented Nov. 14, 1899.

J. SHOUREK.

AIR BRAKE.

(No Model.) (Application filed Dec. 7, 1898.)

9 Sheets—Sheet 3.

Fig. 4.

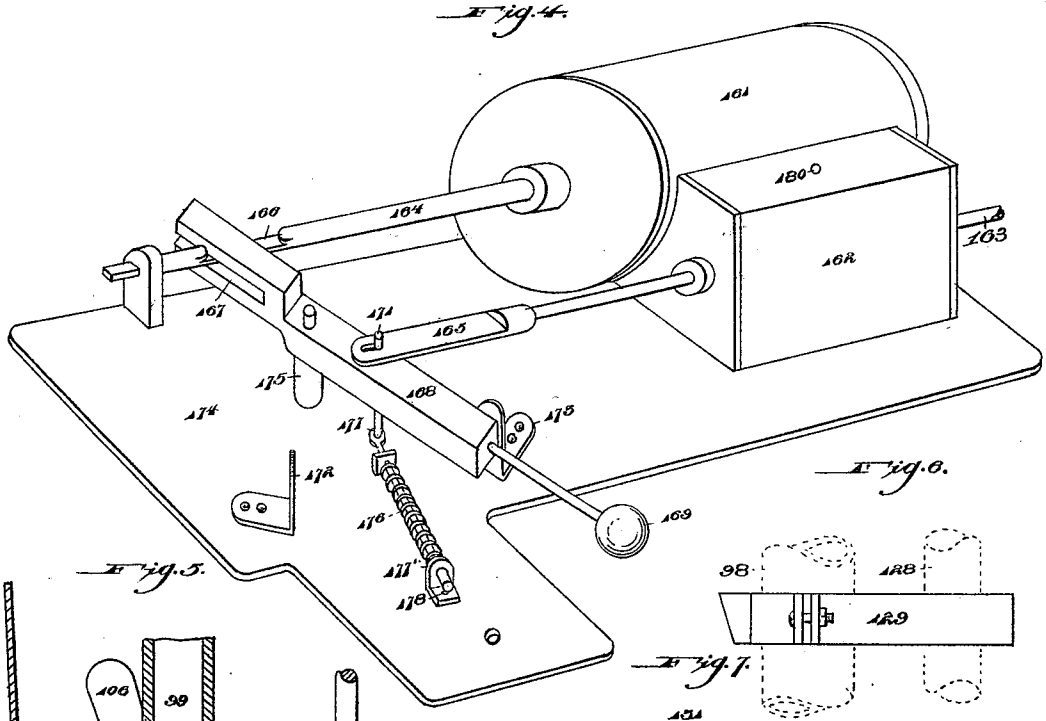
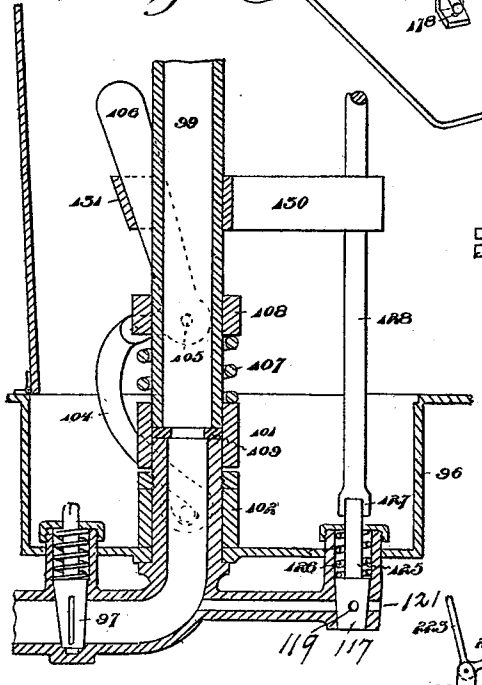


Fig. 6.

Fig. 5.



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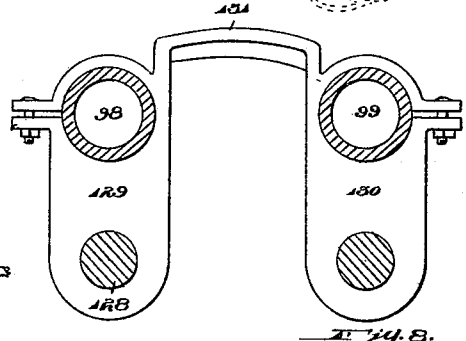

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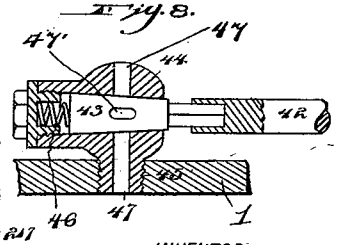
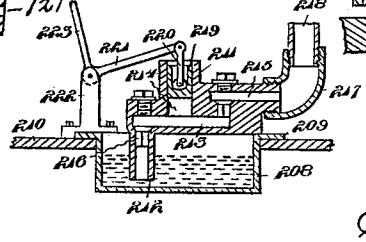


Fig. 9.



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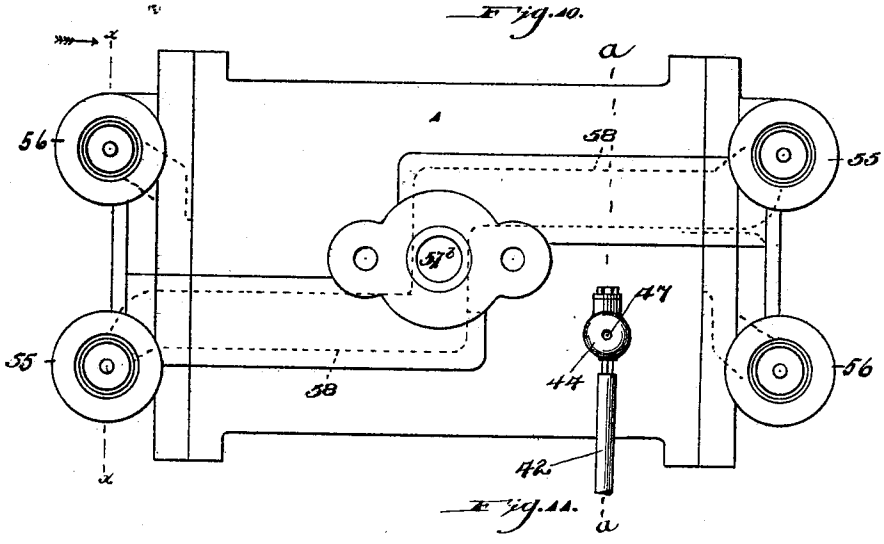
(No Model.) (Application filed Dec. 7, 1898.)

9 Sheets—Sheet 4.

F ig. 10.



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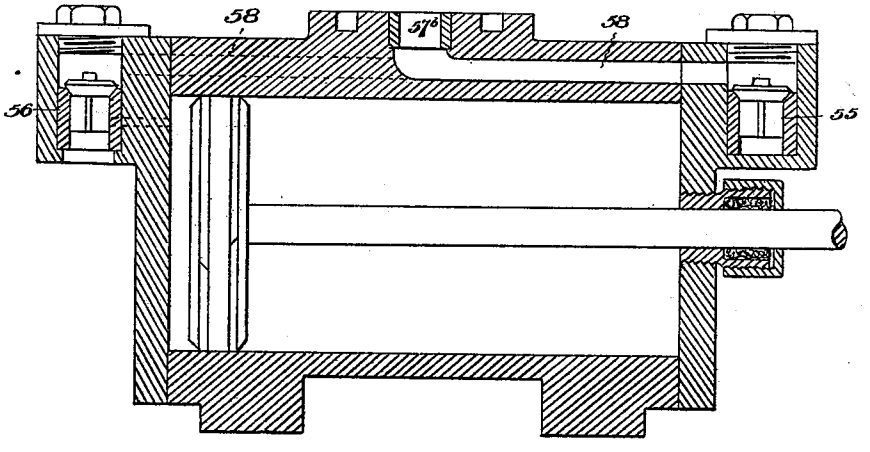

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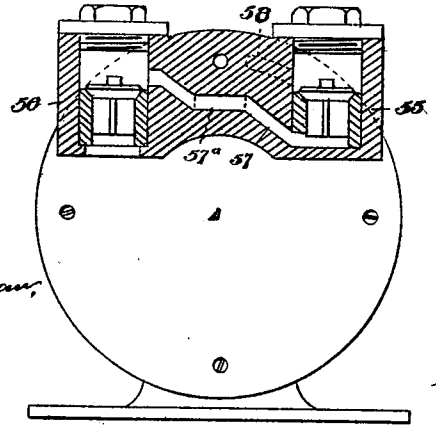

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(Application filed Dec. 7, 1898.)

(No Model.) 9 Sheets—Sheet 5.

Fig. 13.

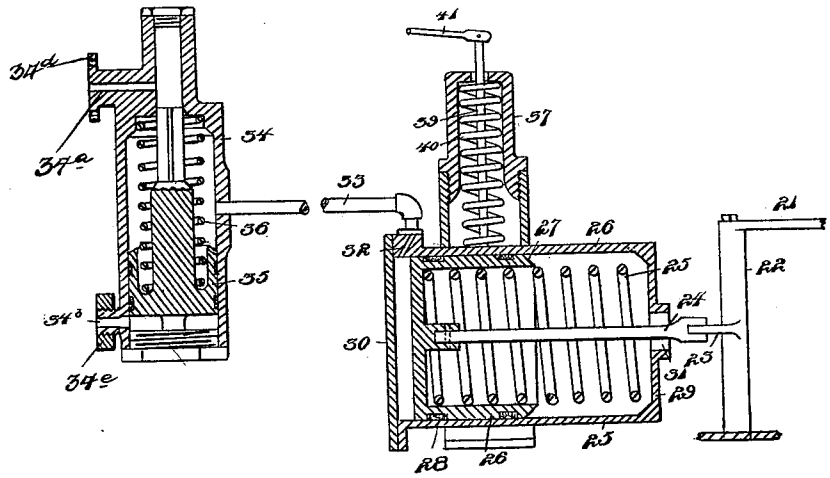

Fig. 14.

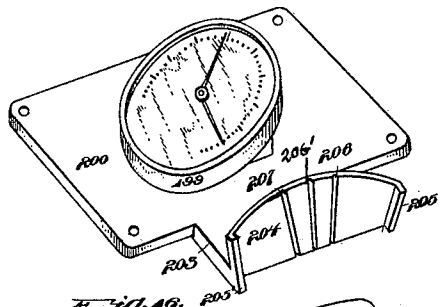

Fig. 15.

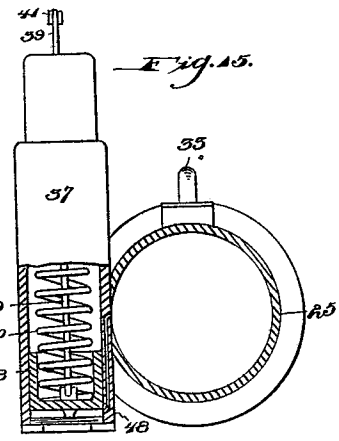

Fig. 16.

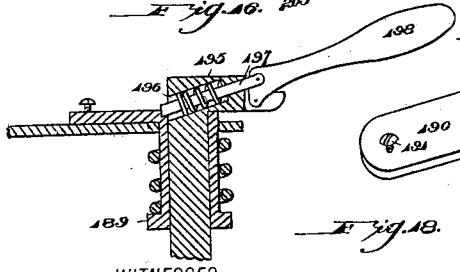

Fig. 17.

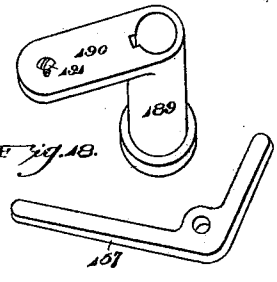

Fig. 18.

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No. 636,858. Patented Nov. 14, 1899.

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(No Model.) (Application filed Dec. 7, 1898.) 9 Sheets—Sheet 6.

Fig. 19.

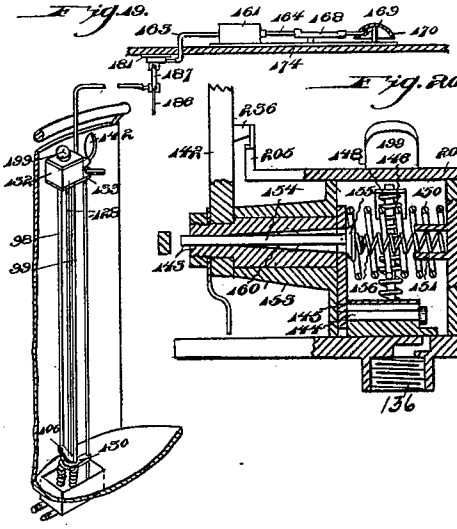


Fig. 20.

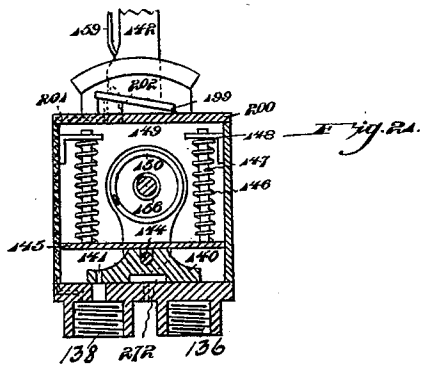
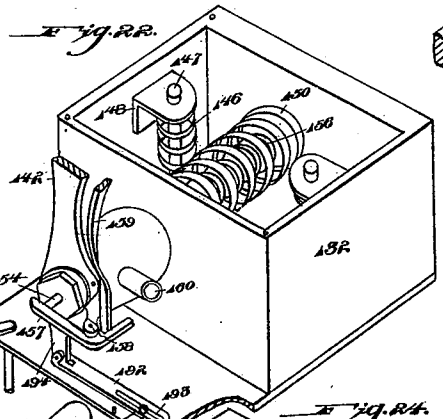


Fig. 21.

Fig. 22.



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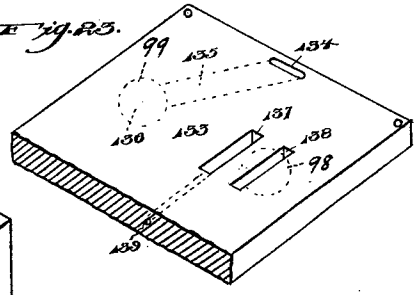

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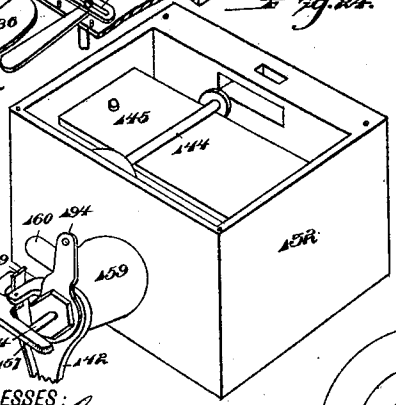

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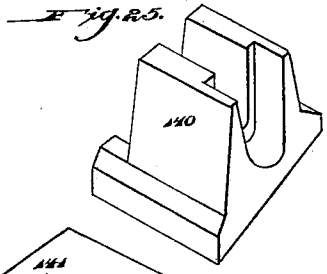

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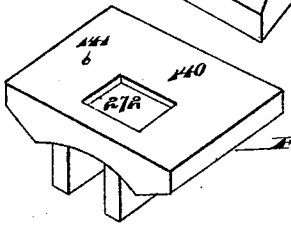

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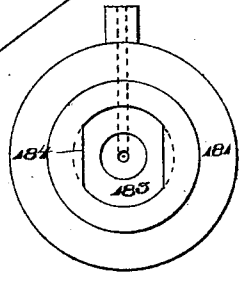

WITNESSES:

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No. 636,858. Patented Nov. 14, 1899.

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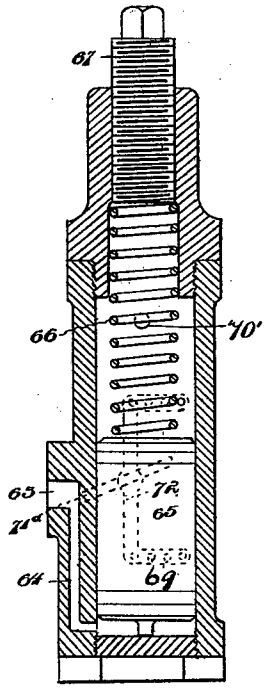
(Application filed Dec. 7, 1898.)

(No Model.) 9 Sheets—Sheet 7.

Fig. 28.



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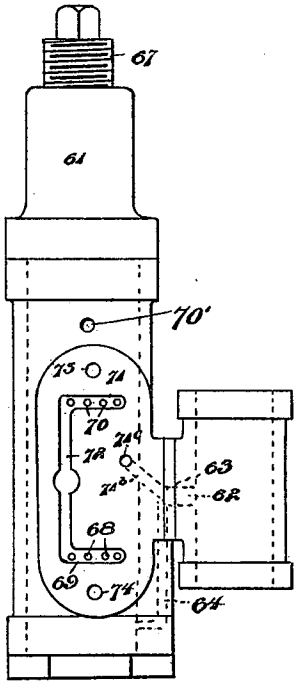

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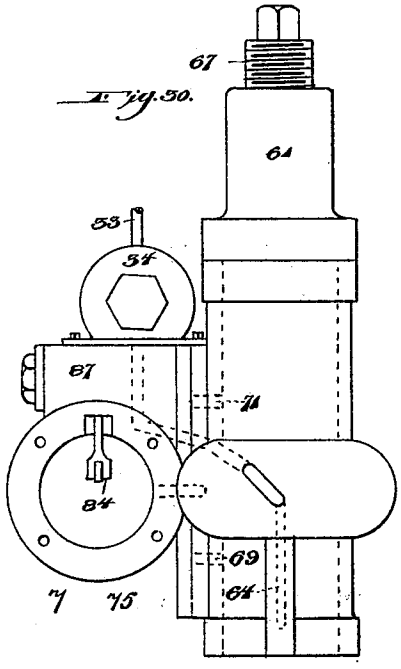

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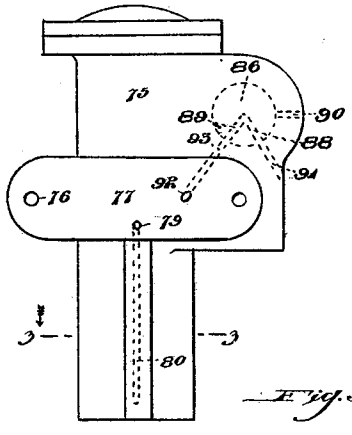

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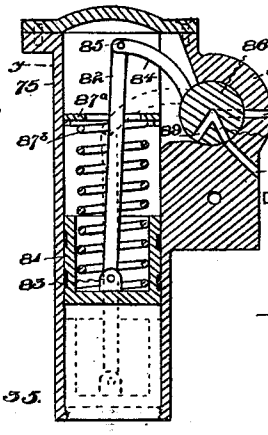

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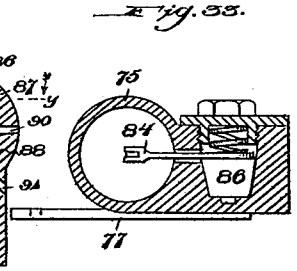

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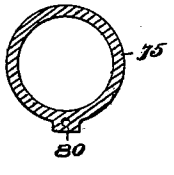
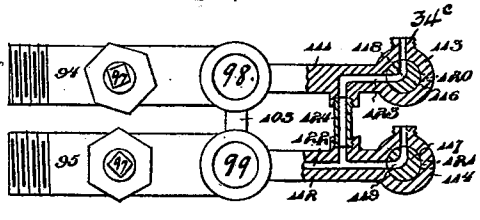


Fig. 35.



WITNESSES

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No. 636,858. Patented Nov. 14, 1899.

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(Application filed Dec. 7, 1898.)

(No Model.) 9 Sheets—Sheet 8.

Fig. 36.

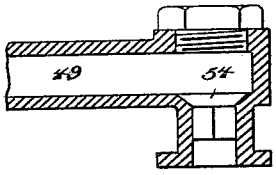
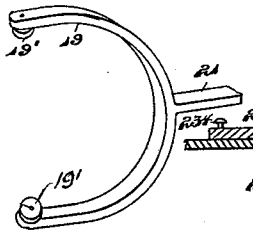


Fig. 37.



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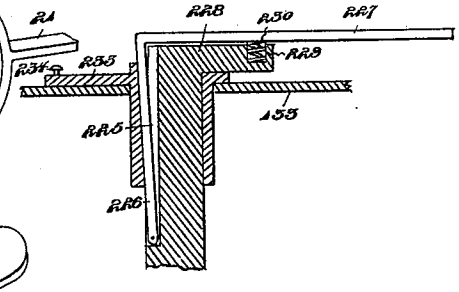

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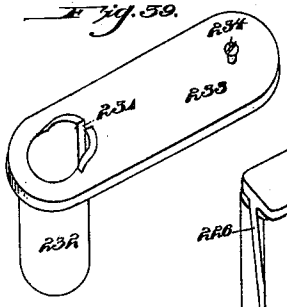

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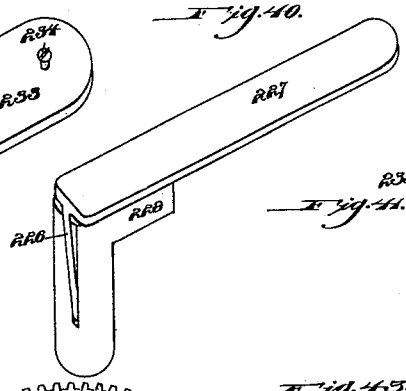


Fig. 41.

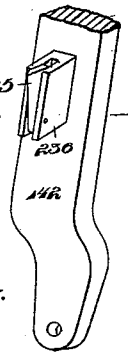
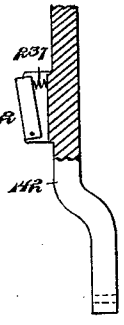


Fig. 41R.



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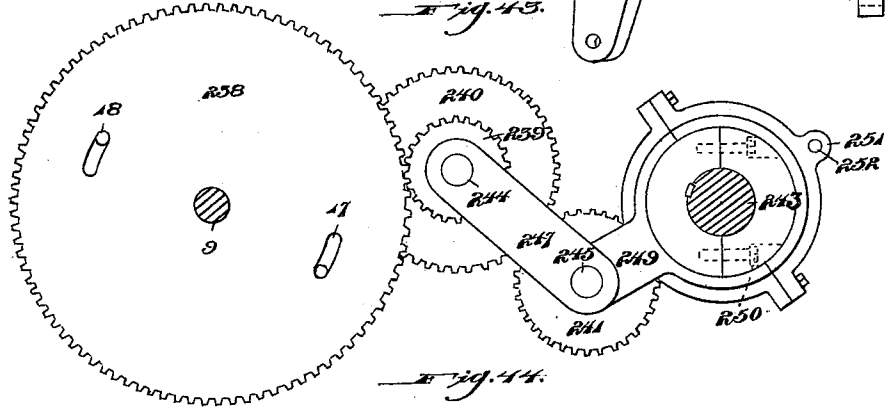

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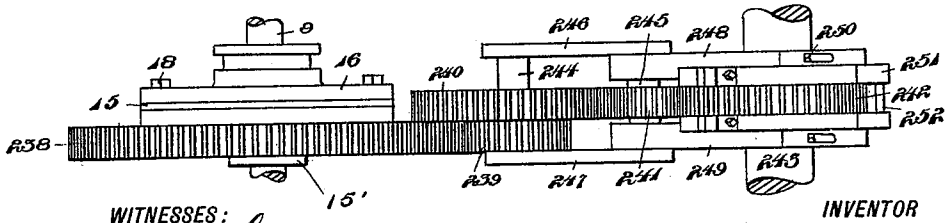

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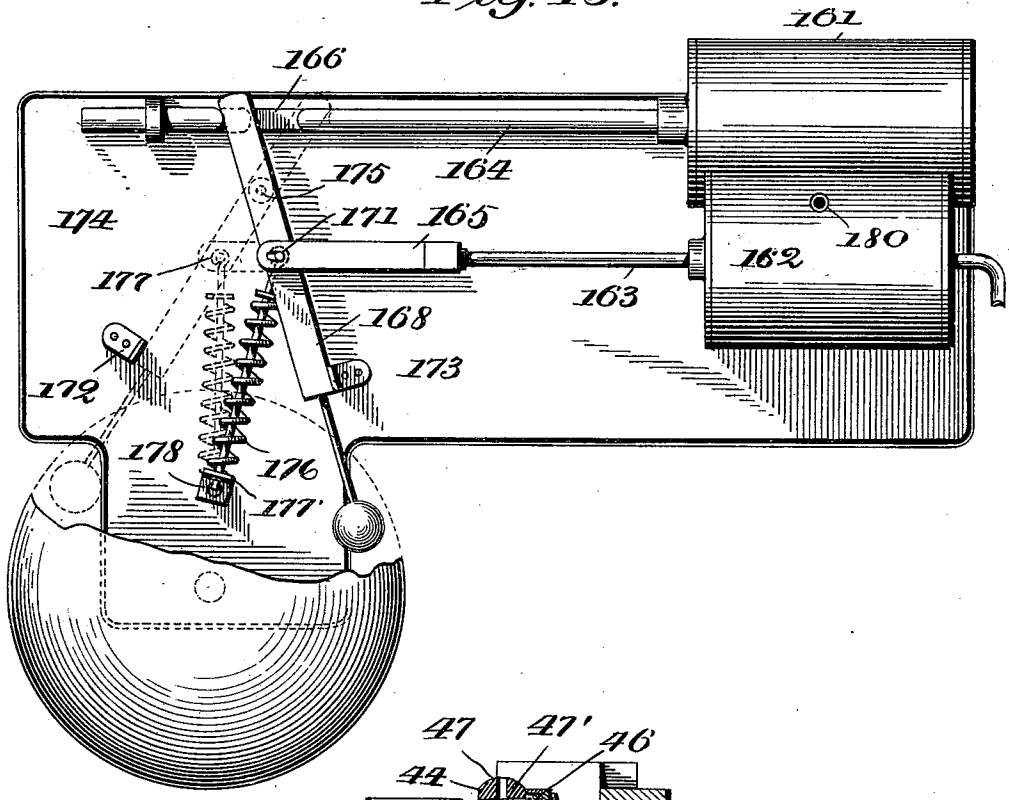
AIR BRAKE.

(No Model.) (Application filed Dec. 7, 1898.)

9 Sheets—Sheet 9.

Fig. 45.



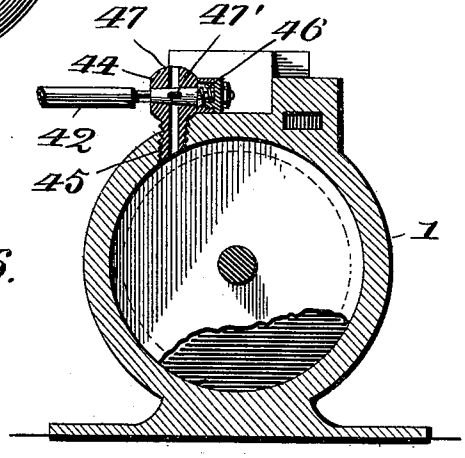


Fig. 46.

Witnesses

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N. L. Bogan

Inventor:

J. Shourek

By McEwen & Co.

Attorneys

UNITED STATES PATENT OFFICE.

JOHN SHOUREK, OF PITTSBURG, PENNSYLVANIA.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 636,858, dated November 14, 1899.

Application filed December 7, 1898. Serial No. 698,530. (No model.)

To all whom it may concern:

Be it known that I, JOHN SHOUREK, a citizen of the United States of America, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Air-Brakes, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain new and useful improvements in air-brakes.

My invention is particularly adapted for use upon street-cars.

One object of my invention is to construct a brake of this character whereby a gradual or emergency stop may be accomplished by the same operating-lever.

A further object of my invention is to provide means whereby the alarm-gong which is used on street-cars may also be sounded by the use of air and the device also operated by the same lever used for applying the brakes.

A still further object of my invention resides in the removable air-chamber and the brake-valve casing, which may be attached in position at either end of the car.

A still further object of my invention resides in the clutch mechanism for discontinuing the compression of air when the requisite pressure is obtained.

A still further object of my invention resides in the automatic means for operating the clutch mechanism for discontinuing the operation of the air-pumps when the predetermined pressure of air is stored in the reservoir.

A still further object of my invention is to construct a brake of this description which may be operated from either the axle of the car-truck or direct from the propelling-motor of the car.

A still further object of my invention consists in providing my improved brake with a sanding device which can be operated by the brake-levers or independently thereof.

A still further object of my invention lies in the automatic means whereby the pumps are again set in motion when the pressure of air in the reservoir has been reduced below the predetermined pressure.

A still further object of my invention lies in the independent means for connecting the clutch mechanism to operate the pumps and to release the clutch mechanism to discontinue the use of the pumps.

My invention finally consists in the novel arrangement and combination of parts hereinafter more fully described, and particularly pointed out in the claims.

In describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, wherein like numerals of reference indicate corresponding parts throughout the several views thereof, and in which—

Figure 1 is a top plan view of my improved brake. Fig. 2 is a side view of a portion of my improved brake, showing the clutch mechanism for discontinuing and continuing the operation of the air-pumps or compression-cylinders. Fig. 3 is a top plan view of my improved brake, showing a portion of the connecting-pipes, the brake-cylinder, and the clutch mechanism in section. Fig. 4 is a perspective view of the operating means for the alarm. Fig. 5 shows the connecting means to allow of the adjustment of the operating mechanism for the brake at the front and rear platforms of the car. Fig. 6 is a side view of the supporting-brace for the pipes connecting the air-cylinder, brake-cylinder, and air-reservoir and also the independent rods for operating the sanding device and clutch mechanism. Fig. 7 is a top plan view of the supporting-brace, showing the connecting-pipes and rods for operating the clutch mechanism and sanding device in section. Fig. 8 is a vertical sectional view of one of the exhaust-valves which is mounted in the compression-cylinder or air-pump. Fig. 9 is a vertical sectional view of my improved lubricating device. Fig. 10 is a top plan view of one of the compression-cylinders and air-pumps, showing in dotted lines the air-ports arranged therein. Fig. 11 is a vertical sectional view of one of the air-compression cylinders and air-pumps. Fig. 12 is a cross-sectional view taken on the line x x, Fig. 10, showing the air-ports arranged therein. Fig. 13 is a vertical sectional view of the clutch-operating cylinder and throw-off cylinder. Fig. 14 is a perspective view of the top plate of the brake-casing and the air-chamber with gage mounted thereon. Fig. 15 is a cross-

sectional view of the clutch-operating cylinder having secured thereto the cylinder for operating the exhaust-valve. Fig. 16 is a vertical sectional view of the sand-operating mechanism partly broken away. Fig. 17 is a perspective view of the sleeve which is adapted to surround the upper portion of the sand-operating shaft. Fig. 18 is a perspective view of the operating-arm for the bell. Fig. 19 is a perspective view, partly in section, showing the connecting-pipes for the brake, brake-operating lever, operating means for the bell, and sanding device as attached to the car. Fig. 20 is a vertical sectional view of the air-chamber and brake-valve casing, showing the valve mechanism also in section. Fig. 21 is a cross-sectional view of the brake-valve casing and air-chamber, showing the operating mechanism therein. Fig. 22 is a perspective view of the brake-valve casing and air-chamber with the top removed, showing the operating mechanism arranged therein, the brake-lever, sand-operating device, and clutch-operating device arranged on the extending portion of the lower plate. Fig. 23 is a perspective view of the chamber of the brake-valve casing and air-chamber. Fig. 24 is an inverted perspective view of the brake-valve casing and air-chamber. Fig. 25 is a perspective view of the brake-valve. Fig. 26 is an inverted perspective view of the brake-valve. Fig. 27 is a top plan view of the connecting means for securing the pipes together for connecting the bell to the air-chamber and brake-valve casing. Fig. 27ª is a perspective view of a portion of the operating mechanism, showing the fastening means for connecting the air-pipes to the bell. Fig. 28 is a longitudinal sectional view of the regulating valve-cylinder, showing the air-ports and air-passages in full and dotted lines. Fig. 29 is a side view of the regulating valve-cylinder, showing the air-ports and secured to the collar which is secured on the feed-pipe. Fig. 30 is a top plan view of the regulating valve-cylinder and its connections. Fig. 31 is a side view of the actuating valve-cylinder for the clutch mechanism. Fig. 32 is a vertical sectional view of the actuating valve-cylinder. Fig. 33 is a cross-sectional view on the line $y\ y$, Fig. 32. Fig. 34 is a cross-sectional view taken on the line $z\ z$, Fig. 31. Fig. 35 is a top plan view, partly in section, showing the connecting-pipes arranged underneath the car to which the pipes which are connected to the air-chamber and air-reservoir and brake-cylinder are connected with. Fig. 36 is a longitudinal sectional view of one of the discharge-pipes which is secured to the air pump or cylinder, showing the check-valve arranged therein. Fig. 37 is a perspective view of the clutch, showing the friction-rollers mounted thereon. Fig. 38 is a vertical sectional view of a modified form of sand-operating device for the sand-cylinder. Fig. 39 is a perspective view of the collar thereof. Fig. 40 is a perspective view of the handle thereof. Fig. 41 is a perspective view of a portion of the brake-lever, showing the spring for securing the same in the position desired. Fig. 42 is a side view, partly in section, of a portion of the brake-lever. Fig. 43 is a modified form of the gear mechanism for operating the pumps or compression-cylinders. Fig. 44 is a top plan view thereof. Fig. 45 is a top plan view of the gong-ringing device, showing in full and dotted lines a portion of the operating mechanism. Fig. 46 is a cross-sectional view of the pump or compression-cylinder, showing the arrangement of the exhaust-valve, taken on the line $a\ a$, Fig. 10.

Referring to the drawings by reference-numerals, 1 and 2 indicate the air-pumps or compression-cylinders, having the piston-rods 3 operating therein. The outer end of the piston-rod is connected to the cross-head 4, which operates upon the guides 5. These guides are suitably secured at one end to the lower side of the air-pumps or compression-cylinders. The outer ends of the cross-head 4 are suitably secured to the yoke 6, to which the connecting-rods 7 and 8 are attached. The rod 8 is connected to a crank on the shaft 9, which is supported by the keepers 10 10′, secured to the underneath portion of the car-body, or the mechanism may be secured in any desirable manner. The opposite ends of the shaft 9 are attached to cranks 11, the outer ends thereof being connected to the rods 7 and 8, this construction enabling the alternate operation of the pistons within the air-pumps or compression-cylinders.

Mounted upon the shaft 9 is a gear-wheel 12, which is adapted to mesh with a smaller gear-wheel 13, mounted on the car-axle 14. The shaft 9 has formed integral therewith the stop-plate 15 to arrest the one-side movement of the gear-wheel 12 and also to arrest the movement of the pin clutch-plate 16, which is slidably mounted on the shaft 9. The movement of the gear-wheel 17 in the other direction is limited or controlled by the stop or pin 15′, arranged on the shaft 9. The gear-wheel 12 and stop-plate 15 are provided with a pair of slots, the slots in the gear-wheel being shown at 17, and are adapted to have operate therein the clutch-pins 18, which are carried by the pin clutch-plate 16. The clutch-plate 16 is operated by means of the yoke 19, carrying on its ends a pair of friction-rollers 19′, which engage the sleeve or barrel formed on the pin clutch-plate 16, as at 20.

The yoke 19 is formed on the end of the crank-arm 21, that is integral with the rock-shaft 22, supported from the car-frame in any desired manner. The bearing has also formed integral therewith the crank-arm 23, which is attached to the piston-rod 24, having a spring 25 arranged thereon within the clutch-controlling cylinder 26, the one end of the piston-rod being suitably connected to a cup-shaped piston 27, having a series of packing-rings 28 arranged on the periphery thereof.

29 and 30 indicate the cylinder-heads, the head 29 being apertured, as at 31, to allow of

the operation of the piston-rod therethrough. Formed in one end of the clutch-controlling cylinder is the inclined air-port 32, which coincides with the one end of the connecting-pipe 33, which is adapted to connect together the clutch-controlling cylinder 26 and the throw-off cylinder 34. The throw-off cylinder is provided with a cup-shaped piston 35, having the resistance-spring 36 mounted thereon.

The throw-off cylinder 34 is connected by the union 34^a, which is provided with the outwardly-extending flange 34^d, to the actuating valve-cylinder 75, so that the opening in the union 34^a registers with the port 91 of the cylinder 75, the flange 34^d being provided with an opening to receive suitable fastening means. The throw-off cylinder 34 and its union 34^b are connected to the union 34^c, Fig. 35, by the screw-threaded collar 34^e.

Suitably connected to the clutch-controlling cylinder 26 is the exhaust-cylinder 37, having arranged therein the cup-shaped piston 38, which is connected to the piston-rod 39, having a tension-spring 40 mounted thereon. The free end of the piston-rod 39 is connected by the inclined rod 41 to the operating-rod 42 for the exhaust-valves 43. The valves 43 are each mounted in the casing 44, the lower end thereof extending downwardly, as at 45, and is exteriorly screw-threaded to allow of the securing of the same in the upper part of the air-pumps or compresion-cylinders, each of which is provided with a screw-threaded opening to receive the downwardly-extending end 45.

46 indicates a tension-spring arranged in the casing 44 and against the valves 43.

47 indicates an air-discharge outlet formed in the casing 44 for the discharge of the air from the pumps or compression-cylinders. This opening 47 at its inner end registers with the interior of the pumps or cylinders and at its outer end opens into the atmosphere, and 47′ indicates the exhaust port or opening in the valve 43, which when the valve is operated registers with the opening 47 and allows of the exhaust to pass from the cylinders or pumps to the atmosphere.

48 indicates an air-inlet port which connects the clutch-controlling cylinder to the cylinder 37.

The pumps or compression-cylinders 1 and 2 are connected together by means of the discharge-pipes 49 and 50, having the common union 51 for securing the pipes together and to allow of connecting the inlet-pipe 52 to allow of the flow of air into the air-reservoir 53. The pipes 49 and 50 are provided at the inlet to the pumps or compression-cylinders with the check-valve 54. (Shown in detail in longitudinal section in Fig. 36 of the drawings.)

The cylinders 1 and 2 are provided at each end with discharge-valves 55 and also with inlet-valves 56, which serve to admit the air thereto on both the forward and backward movement of the pistons. These inlet-valves are arranged to connect with each other by the air-passage 57, having the inlet-opening 57^a for the admission of air to the cylinder connected thereto, and also connected to the outlet-opening 57^b for the discharge of air from the cylinder in the outlet-port 58, which is connected to the pipes 49 50.

Mounted upon the pipe 52 is the collar 59, having an outward extension 60 for securing thereto the regulating-cylinder 61. The collar 59 is formed with the outlet-port 62, which coincides with the outlet-opening formed in the pipe 52. (Not shown.) The outlet-port 62 is adapted to mesh with the inlet-port 63 of the regulating-cylinder 61. The inlet-port 63 is connected to the air-passage 64, formed in the regulating-cylinder, and which extends downwardly to almost the bottom of the cylinder and opens directly beneath the piston 65.

66 indicates a tension-spring arranged in the cylinder 61, and is operated by a set-screw 67.

Formed in the one side of the cylinder 61 is a series of outlet-ports 68, arranged in the vertical groove 69, and directly above the series of outlet-ports 68 are arranged a series of exhaust-ports 70 in a smaller groove 71, and also provided with the exhaust-port 70′, which opens into the atmosphere. The grooves 69 and 71 are connected together by the horizontal groove 72.

91^a indicates an inlet-port for the air-passage 71^b, and 71^c the outlet-ports therefor.

73 and 74 indicate a pair of recesses by which the actuating valve-cylinder 75 is secured thereto by means of a pair of screws operating through the apertures 76, formed in the supporting portion 77 of the cylinder 75.

The actuating valve-cylinder 75 is provided with an air-inlet port 79, which coincides with the outlet-port 72 of the cylinder 61, and the inlet-port 79 connects with the downwardly-extending air-passage 80, which opens into the lower part of the actuating valve-cylinder 75 directly beneath the cup-shaped piston 81. The cup-shaped piston 81 is pivotally connected to the one end of the piston-rod 82, as at 83, and the opposite end of the piston-rod 82 is pivotally connected to the one end of the lever-arm 84, as at 85. The opposite end of the lever-arm 84 is connected to the cut-off valve 86, arranged in the extending portion 87 of the actuating valve-cylinder 75. The actuating valve-cylinder is provided with a stop-plate 87^a to arrest the outward movement of the spring 87^b, which is arranged in the actuating valve-cylinder 75, or, in other words, is adapted to compress the spring between the said plate and the piston.

The cut-off 86 is provided with the outlet-ports 88 and 89, the port 88 being adapted to coincide with the exhaust-port 90, formed in the extending portion of the valve actuating-cylinder, and the port 89 is adapted to coincide with the outlet-opening 91, which connects with the inlet-opening 34^a of the throw-

off cylinder 34. The inlet-port 92 for the air-passage 93 is adapted to connect with the outlet-port 89, formed in the cut-off 86. The inlet-port 92 is adapted to connect with the outlet-port 71ᶜ of the regulating-cylinder 61.

Arranged beneath the floor and connected to the air-reservoir and brake-cylinder are a pair of pipes 94 95, which protrude upwardly from the platform of the car and are supported by the pan 96, which is suitably supported by the floor of the car in any desirable manner. This arrangement of pipes or connections is made at each end of the car, so as to permit the brake being operated from either end thereof, the pipes 94 95 being closed at the one end when the brake is being operated from the opposite end of the car by means of the plugs 97. On the union of the pipes are secured the pipes 98 99, which connect with the air-chamber and brake-valve casing, air-reservoir, and brake-cylinder 100. The brake-cylinder may be of any desirable construction, supported from underneath the car-body in any manner. The pipes 98 99, which complete the connection between the reservoir, brake-cylinder, air-chamber, and brake-valve casing are provided on their lower ends with collars 101, which are adapted to rest on the collars 102, provided on the pipes 94 and 95.

103 indicates a cross-piece or pin, which is adapted to be arranged between the pipes 94 and 95, or which may be formed integral therewith, and which is adapted to be engaged by the swing-hook 104, which is fulcrumed at 105 and operated by the handle 106. When this handle is in a vertical position, the swing-hook 104 will be in firm engagement with the rod or pin 103, and when it is desired to remove the pipes 98 99, together with the air-chamber and brake-valve casing and its connections, the handle 106 is moved to a horizontal position, thus lowering the swing-hook 104 and permitting its disengagement from the rod 103. The swing-hook 104 is normally in engagement with the rod 103 by the spring 107 operating between the collar 108, to which the handle 106 is fulcrumed, and the collar 101. For obtaining the air-tight joint between the pipes 94 98 and 95 99 I provide washers 109 of any desirable material, which are arranged between the pipes, as shown.

Formed integral with the pipes 94 95 are the extensions 111 112, having the enlarged ends 113 114 formed with the unions, by which the throw-off cylinder 34 and the sand-operating cylinders 115 are connected thereto.

116 and 117 indicate conical valves arranged in the enlarged ends 113 114, and are provided with the two-way ports 118 119.

120 121 indicate the exhaust-openings formed in the enlarged ends 113 114.

The extension 112 is provided with an air-passage 122, adapted to communicate with the air-reservoir pipe 95. The extension 111 is provided with the air-passage 123, which only extends as far as the connecting-pipe 124, which connects the extensions 111 112 together.

The valves 116 117 are provided with the upward extensions 125, having the tension-springs 126 surrounding the same, and the extensions 125 are adapted to be removably secured to the bifurcated ends 127 of the operating-rods 128 therefor.

The pipes 98 99 and the operating-rods 128 are held in their desired position by means of the braces or supports 129 130, which are secured together by means of the bracket 131. The bracket 131 also acts as a stop for the handle 106.

The pipes 98 99 connect with the air-chamber and brake-valve casing, which is composed of a box 132, and the base-plate or bottom 133 thereof is provided with an opening 134, which communicates by the air-passage 135 with the port 136, which the pipe 99 engages. The plate 133 is also provided with the openings 137 138, the latter of which is the controlling-port for the brake-cylinder 100 and the former of which communicates with the exhaust-port 139.

140 indicates the operating-valve, having the port 141 to register with the opening 138, which connects with the brake-cylinder. This port is used when a graduating stop is desired.

The valve 140 is operated by the lever 142, which is connected to the valve-stem 143, carrying the crank 144, to engage the valve. The valve rests upon the plate 133 and is cushioned by the plate 145, which retains the valve in position by means of the spring 146. Thus as the valve is shifted these springs are compressed, and the pins 147, upon which the springs are mounted, are permitted to operate through the brackets 148, attached to one side of the air-chamber 149, as shown.

The valve-stem is retained in position by means of the stiff tension-spring 150, which abuts against the inner end of the valve-stem and is carried upon the sleeve 151, protruding inwardly through the closing-plug 152 of the air-chamber 149.

The valve-stem 143 operates within the tubular projecting portion 153 of the air-chamber and brake-valve casing, and the valve-stem is centrally bored to receive the valve-stem 154 and has the valve 155 secured on its inner end, which is adapted to close the inner end of the bore and is retained in position by means of the tension-spring 156, that abuts against the same and is held within the sleeve 151.

The valve-stem 154 is operated by means of the lever 157, which is pivotally secured to the operating-lever 142, as at 158. The lever 157 is operated by the upward extension 159.

The central bore of the valve-stem 143, which receives the valve-stem 154, communicates with the tube 160, which is connected with the gong-ringing device located on the top of the car or at any other desired point.

The gong-ringing mechanism comprises the

cylinder 161 and the air-chest 162, having the air-inlet pipe 163 connecting therewith, the cylinder 161 having an ordinary double-acting piston operating therein, which is connected to the piston-rod 164, and the chest 162 an ordinary slide-valve, which is connected to the stem 165. The piston-rod 164 is provided with the cut-away or the reduced portion 166, upon which engages the bifurcated end 167 of the lever 168. The lever 168 carries on its inner end the tapper 169 for the gong 170. (See Fig. 19.) The piston-rod 165 also engages on the lever 168 by means of the pin 171, and the lever is controlled as to the limits of its movement by means of the stops 172 173, arranged on the base-plate 174. The base-plate 174 is adapted to have the gong-sounding mechanism mounted thereon. The lever 168 is pivotally secured to the bearing 175, mounted on the base-plate, and it is assisted in its movement by the spring 176, arranged on the rod 176′, the one end thereof being secured to the lever at 177 and the opposite end operating through the plate 177′, which is secured to the base-plate, as at 178.

180 indicates the exhaust for the cylinder and air-chest.

The connections between the air-inlet pipe 163 and the tube 160 to allow of the passage of air from the brake-valve casing to the air-chest of the gong-ringing mechanism, as shown in Figs. 27 and 27ª of the drawings, consist of the coupling 160ª, which is connected to one end of the tube 160 and to the pipe 160ᵇ. This pipe 160ᵇ has the coupler 182′ and the oblong fastening-plate 182, which is formed integral with the coupler slidably mounted thereon, which is adapted to be seated in the disk 181, (which is mounted at both ends of the car,) this disk being provided with the opening 183 and the flange 184.

When the plate 182 of the coupling 182′ and the end of the pipe 160ᵇ are seated in the recess or opening 183 and given a quarter-turn, the plate 182 will engage the flange 184 and be held in position by means of the coiled resistance-spring 182ᵇ, mounted on the pipe 160ᵇ, as well as by means of the handle or lever 186, which is fulcrumed at 186ª, being moved to a vertical position, (see dotted lines, Fig. 27ª,) where it is retained by the links 187, these links being pivotally connected to the handle 186 and the coupling 182′.

Mounted on the extending portion of the plate 133 is the crank or handle 188, operating the clutch mechanism independently of the brake-operating lever. This crank or handle is connected to the upper end of the rod 128, which is connected to the valve 117.

In Fig. 16 of the drawings I have shown means for operating the sanding device or sand-cylinder independently of the brake-lever, and also by the use of the connection of the same with the brake-lever. This mechanism consists of a collar 189, which is adapted to operate through the slot formed in the extension of the plate 133, and is formed integral at its upper end with the extension 190, having the securing-pin 191 mounted thereon. The extension 190 is connected by means of the pin 191 to the sliding lever 192 by means of the pin operating through the elongated slot 193 formed therein. The opposite end of the sliding lever 193 is pivotally secured to the downward extension 194, which is connected to the brake-lever 142. The rod 128 for operating the valve 116 is adapted to operate through the collar 189, and is bent at right angles on its upper end, as at 195. (See Fig. 16.) This extension 195 is formed with the cut-away portion 196, having the rod 197 operating therein, the one end thereof being pivotally secured to the handle 198, and the opposite end adapted to operate in the recess formed on the inner end of the extension 190, which locks the rod to the collar 189.

When it is desired to operate the sanding device by means of the brake-lever 142, when the same is moved it will force the sliding lever 192 outward, bringing it into contact with the pin 191, thereby turning the rod 128, which is connected to the valve 116. When it is desired to operate the sanding device independently, the handle 198 is forced downwardly, which will bring the rod 198 out of engagement with the recess formed in the collar, and the rod 128, which operates the valve, can therefore be turned independently of the brake-lever.

199 indicates a double gage, which is mounted on the top plate 200 of the air-chamber and reservoir and brake-valve casing. This gage is adapted to indicate the amount of pressure in the brake-cylinder as well as in the air-chamber and is connected by the port 201, which is arranged in the bottom side and top plate of the brake-valve casing, as shown in dotted lines in Fig. 21, which connects with the pipe connecting the brake-cylinder, as shown, and which is also connected by the port 202 (shown in dotted lines) in the top plate of the air-chamber and brake-valve casing for indicating the pressure of air in the air-chamber.

The top plate 200 of the brake-valve casing is formed with an outward extension 203, (shown in Fig. 14,) which is bent at right angles, as at 204, having the stops 205 and 205′ arranged on the portion 204 at its end to arrest the movement of the brake-lever.

206 is a groove or any desirable indicating-mark which shows the point where the brake-lever should stop for obtaining a graduating stop of the brake, and 207 is a similar groove or indicating-mark to show the point where the brake-lever should stop for the graduating exhaust or the graduating stop of slow release of the brake.

206′ is a groove or any desirable indicating-mark for indicating by the position of the brake-lever that the brakes are applied to allow of a slow movement of the vehicle—that is, not a complete stop, but for applying the

brakes to prevent a rapid movement of the car down an incline.

The stop 205 is to arrest the movement of the brake-lever, which when it abuts against the same is the position of the brake-lever for the emergency stop of the brake, and the stop 205′ is to arrest the movement of the brake-lever, which when it abuts against the same is the position of the brake-lever for the rapid release of the brakes.

My improved lubricating device consists of a pan 208, which is secured, as at 209, to the casing 210, in which a portion of the operating mechanism is inclosed. The lubricant is stored in the pan 208. Mounted upon a portion of the pan is the casing 211, having the downwardly-projecting discharge-pipe 212, which is connected by the passage 213 to the piston-chamber 214 and outlet-passage 215. The discharge-pipe 212 and outlet-passage 215 have check-valves 216 suitably arranged therein. The outlet-passage 215 is connected by the elbow 217 to the feed-pipe 218. This feed-pipe is suitably connected to a series of perforated pipes (not shown) arranged upon the parts of the mechanism for the lubrication thereof. These pipes are perforated, and the lubricant as it passes therethrough will drip through the perforations and lubricate the different parts of the mechanism within the casing 210.

The lubricating device is operated by the piston 219, operating in the piston-chamber 214, which is connected to the piston-rod 220. The piston is pivotally connected to the lever-arm 221, which is connected to a rock-shaft supported in bearings 222, as shown. 223 indicates the operating-lever, which is connected to the rock-shaft. The lever 223 is operated by means of the lugs 224, formed on the one side of one of the yokes 6 by these lugs coming in contact therewith on the backward-and-forward movement thereof.

In Figs. 38, 39, and 40 I have shown a modified form of device for independently operating the sand-cylinders, and which consists of forming in the upper part of the rod 128 the elongated groove 225, which has pivotally secured therein the downwardly-extending portion 226 of the operating-handle 227 therefor. The upper end of the rod 128 is bent at right angles, as at 228, and has a recess 229 formed therein, which is adapted to receive the tension-spring 230, which abuts against the handle 227 and secures the downwardly-projecting portion 226 in the groove 231, formed in the collar 232, in which the rod 128 is inserted. The collar 232 is formed with the extension 233, having an engaging pin 234 mounted thereon, which is adapted to connect with the sliding lever 192. When it is desired to operate the sanding device independently of the brake-lever, the handle 227 is forced downwardly, which will bring the downwardly-projecting portion 226 out of engagement with the groove 231, formed in the collar, and the rod 128, which operates the valve, can therefore be turned independently of the brake-lever.

In Figs. 41 and 42 of the drawings I have shown a fastening-plate 235, which is pivotally secured at one end in the bifurcated extension 236, formed integral on the inner face of the brake-lever, the opposite end of the fastening-plate being secured to the spring 237, which is arranged in the bifurcated extension, as shown. This fastening-plate 235 is adapted to secure the brake-lever in the desired groove formed on the upwardly-extending portion of the top plate of the air-chamber and brake-valve casing when a graduating-stop (graduating-exhaust) is desired, all for the purpose of securing the brake-lever in its normal position. This is not an essential feature of my invention, as other means may be devised to obtain this result.

In Figs. 43 and 44 of the drawings I have shown a modified form of gear mechanism operating the pumps or compression-cylinders. This mechanism is adapted to prevent the jolt of the same throwing the gear-wheels out of contact with the gear-wheel operating the yokes for the cylinders. This gear mechanism consists of a larger gear-wheel 238 of the same construction and mounted in the same manner as the gear-wheel 12, heretofore referred to. This gear-wheel is adapted to mesh with the smaller gear-wheel 239, formed integral with one side of the gear-wheel 240. The gear-wheel 240 is adapted to mesh with the gear-wheel 241, which meshes with the gear-wheel 242, mounted upon the axle 243 of the car-truck. The gear-wheels 239 and 240 are mounted upon the shaft 244 and the gear-wheel 241 upon the shaft 245. The shaft 244 is pivotally connected to the one end of the supports 246 247, the opposite end of the supports being pivotally connected to the shaft 245. The shaft 245 is supported by the hangers 248 249 at one end thereof, the opposite end of the hangers being mounted upon the axle 243, as shown. The hanger is adapted to be secured to the axle 243 by being made of two sections, which are secured together by means of the screw 250. Arranged between the hangers 248 249 and the gear-wheel 242 are the collars 251, which are secured together by means of the pin 252. They are rigidly secured to the shaft to keep the gear-wheel 242 in the desired position.

253 indicates a safety-valve mounted on the air-reservoir.

The operation of my improved brake is as follows: The spring 66 in the regulating-cylinder 61 is set to the desired tension by means of the set-screw 67. When the car is moving, the revolution of the axles thereof carrying the gear-wheel 13, which meshes with the gear-wheel 12, will revolve the shaft 9, upon which the gear-wheel 12 is mounted and to the cranks 11 of which the rods 7 and 8 are connected. The revolution of the shaft upon which the gear-wheel 12 is mounted will move the yokes 6 alternately, thereby operating the pistons

in the air-pumps, and compress the air. The air will discharge from the air-pumps or compression-cylinders, through the pipes 49 50, into the pipe 52, which is connected by suitable pipe connections to the reservoir. While the air is passing into the reservoir through the pipe 52 a portion will pass through the outlet 62 of the collar 59 and into the port 63, formed in the regulating-cylinder 61. The air will then pass downwardly through the air-passage 64 and be discharged near the bottom of the regulating-cylinder 61, directly beneath the piston 65. When the pressure of the air overcomes the tension of the spring 66, it will force the piston 65 upwardly, thereby opening the outlet-port 68, which connects, through passages 72, with the inlet-port 79 of the valve-actuating cylinder 75. The air after it enters the actuating-cylinder 75 through the inlet-ports 79 will pass downwardly through the passage 80 and will discharge into the actuating-cylinder 75, directly beneath the piston 81, which will force the same upwardly and carry the piston-rod, which is attached to the piston 81, therewith. As the piston-rod is moved in the outward direction it will turn the valve or cut-off 86 by means of the lever-rod 84, which is connected to the valve or cut-off. When the cut-off is turned by means of the lever 84, it will bring the port 88, formed therein, in alinement with the air-passage 93, and the port 89, which is arranged in the cut-off, in alinement with the port 91, which registers with the inlet-opening in union 34^a of the throw-off cylinder 34. At the same time the air will pass through the inlet 71^a into the cylinder 61, through the air-passage 71^b, and be discharged through the outlet 71^c into the opening or inlet-port 92, formed in the actuating valve-cylinder. The air will then pass out through the outlet-port 91 of the actuating valve-cylinder and into the port of union 34^a in the throw-off cylinder 34. It will then pass downwardly into the throw-off cylinder 34 and be discharged therefrom through the pipe 33, which connects with the clutch-operating cylinder, then pass downwardly through the inclined air-passage 32, arranged in the clutch-operating cylinder, and thence against the piston 27, which will force the same outwardly, carrying the piston-rod therewith, which is connected to the rod 23. As the crank-arm is forced outward by this motion of the piston it will rock the shaft 22 and crank-arm 21, to which the clutch is connected, in an outward direction, and as the same moves in the outward direction it will move the clutch-pin plate, to which the clutch-pins are attached, out of engagement with the gear-wheel 12. This will discontinue the operation of the pumps until the amount of pressure is reduced. When the pressure of air has been reduced in the air-reservoir, the pressure upon the piston in the regulating-cylinder, valve-actuating cylinder, throw-off cylinder, and the clutch-operating cylinder will also be reduced, for example, backward through the port 32 of the clutch-operating cylinder into the connection 33, and from there into the throw-off cylinder, thence through the opening in the union 34^a into the port 91 of the valve-actuating cylinder, through the ports in the valve 86, (see dotted lines, Fig. 32,) and exhaust to the atmosphere through the port 90 of the valve-actuating cylinder. The tension of the spring 87^b in the valve-actuating cylinder 75 being greater than the reduced pressure of the air the piston 81 is forced downwardly, thereby expelling the air through the passage 80 outward through the port 79 into the grooves 69, 71, and 72, through the port 90, thence into the regulating-cylinder, and then exhausted therefrom through the exhaust-port 70′ into the atmosphere. When the piston 81 resumes its normal position, it moves the valve 86 to the position shown in dotted lines to allow for the exhaust from the throw-off and clutch-operating cylinders, as heretofore stated. On the backward movement of the piston-rod in the clutch-operating cylinder caused by the tension of the spring 25 arranged thereon operating against the piston 27 and the exhaust heretofore referred to it will draw the crank-arm 23 therewith, rocking the shaft 22, causing the crank-arm 21 to operate the yoke, thereby causing the clutch-plate to which the clutch-pins are attached to engage the gear-wheel 12, which, meshing with the gear-wheel 13, will again set in operation the pumps or compression-cylinders. As the piston 27 is moved outwardly in the clutch-operating cylinder a portion of the air contained therein will be discharged therefrom through the air passage or port 48, which opens in the exhaust-cylinder directly beneath the piston 38 contained therein. This will force the same up, elevating the rod 41, which will turn the rod 42, to which the valves 43 are connected, and allow for an exhaust from the air-pumps or compression-cylinders.

When it is desired to use the brake for a graduating-stop, the brake-lever is moved to the notch 206, formed on the extension of the top plate of the brake-valve casing or air-chamber, which will move the valve 140 and bring the port-hole 141, which is formed in the valve 140, in alinement with the opening 138, which is formed in the bottom plate of the brake-valve casing or air-chamber. The air which has been received in the air-chamber and brake-valve casing by means of the pipe 95, port 136, passage 135, and port 134, which is connected to the reservoir, will immediately pass through the port 141 and downwardly through port 138, pipe 98, and the pipe 94 to the brake-cylinder and come into contact with the piston 254 thereof, thereby forcing the piston 254 and its piston-rod 255 outwardly and compressing the tension-spring 256, which is mounted on the piston-rod. The outward movement of the piston-rod 255, which is pivotally connected to the lever 257, will force the lever 257 outwardly,

pull the rod 258, to which the lever 257 is connected, inwardly, and bring the brake-shoes 259 by their connections into contact with the tread of the wheel 260, thereby stopping the car.

When it is desired to use the brake for an emergency stop, the brake-lever is moved to one side until it abuts against the stop 205, formed on the extension of the top plate of the brake-valve casing and air-chamber, which will allow the air contained in the chamber to pass rapidly down through the opening 138 and through the pipe connecting the brake-cylinder with the air-chamber and against the piston contained in the brake-cylinder. The exhaust for the graduating-stop, as well as the emergency-stop, is obtained by moving the brake-lever for the exhaust to the notch 207 and for a quick release to the stop 206, which will bring the opening 272 over the opening 137 and allow the air to exhaust through the pipe which connects the brake-cylinder up through the opening 138, then through the opening 137, and out through the exhaust 139. At the time of applying the emergency-stop the sand-cylinder is operated by means of a sliding rod 192, which connects with the pin 191, arranged on the collar 189, and which movement will turn the rod 128, which will open the valve 116 and allow the air to pass from the reservoir through pipes and passages 95, 122, 124, 123, 118, and 261 into the sand-operating cylinder 115, which will force the piston-rod 262 outwardly, carrying the lever 263 with it, to which is attached the connecting-rods 264 265, having the closed plates 266 267 formed integral with their free ends and which operate in the sand-receptacles 268 269. The outer operation of the closure-plates 266 267 will open the sand-receptacle and allow the sand to discharge therefrom through the discharge-pipes 270 271 on the rail. When the brake-lever is moved for the exhaust, it will cause the parts that operate the sanding device to resume their closed position.

The gong-ringing mechanism is operated by the lever 159, which is pivoted to the brake-lever and which will operate the bell-crank levers to force the valve from its seat at the end of the bore arranged in the valve-stem 143, allowing the air to pass into the bore and thence outwardly through the tube 160, which connects the air-inlet pipe 163. (See Fig. 19.) The air-inlet pipe is connected to the air-chest 162, and the air which is fed thereto by the pipe 163 is carried into the cylinder 161, operating the piston, which is contained therein and is connected to the piston-rod, and as the piston-rod 164 operates will move the lever-rod 168, which carries the tapper 169, which will bring the same into contact with the gong. At the same time the resistance-spring 176, which is connected to the lever-rod 168, will be given a spring-actuated movement—that is, when the piston-rod reciprocates it will compress and expand the spring and which will force the tapper against the sides of the bell, thereby sounding it. The air as it enters the clutch-operating cylinder 26 will pass down through the air-passage 48 and in the exhaust-cylinder 37. The pressure of the air upon the piston 38 will elevate the same, carrying the piston-rod therewith, to which the inclined rod 41 is connected. The elevating of this end of the rod will serve to cause the same to partially turn the rod or shaft 42 by reason of the one end of the rod 41 being connected thereto, thus operating the valves 43, connected to the ends of the rod 42, so as to bring the openings in the valves in a registering engagement with the discharge-openings 47, thereby exhausting the air from the compression-cylinders.

It will be observed that as the gear-wheel 12 is loosely mounted upon the shaft 9 the operation of the pumps will only take place when the clutch-pins are forced through the stop-plate 15 and connect with the gear-wheel 12.

160′ is an outlet-opening in the valve-stem of the brake-valve.

When it is desired to discontinue the compression of air, the motorman by turning the handle 188 will turn the rod 128, thereby opening the valve or cut-off 117, and the air will pass through the pipe connections, as shown, to the throw-off cylinder 34 into the union 34^b, forcing up the piston 35, and allow the air to pass through the throw-off cylinder 34, through the pipe connections 33 into the clutch-controlling cylinder 25, and the air operating against the piston 26 will force the same outward, thereby moving up the crank-arm 23 and operating the crank-arm 21, so that it will operate the yoke which is connected to the clutch-pin plate and release the pins carried by the plate from their engagement with the gear-wheel, thereby discontinuing the operation of the pumps.

It will be noted that various changes may be made in the details of construction without departing from the general spirit of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an air-brake a brake-valve casing having an air-chamber arranged therein, said casing provided with inlet and outlet ports, a brake-valve operating in said casing, a cushioning-plate arranged in said casing for said brake-valve, a tubular extension formed integral with one side of said casing, a valve-stem for said brake-valve operating in said extension, a valve-stem operating in the bore formed in the valve-stem of the brake-valve casing, a valve closing said bore and connected to said valve-stem, a brake-lever operating said brake-valve, and means for operating said valve closing the bore in the valve-stem of the brake-valve, substantially as shown and described.

2. In an air-brake a brake-valve casing hav-

ing an air-chamber arranged therein, said casing provided with inlet and outlet ports, a valve-stem operating in the bore of the above-mentioned valve-stem having a valve on its inner end adapted to close the said bore, an air-reservoir, a pipe connecting said air-chamber and said air-reservoir, a brake-cylinder, a pipe connecting said casing and said brake-cylinder, a tubular extension formed integral with one side of said casing, a brake-valve operating in said casing having the stem thereof which is centrally bored operating in said tubular extension, and a brake-lever connected to said brake-valve stem for operating said valve, substantially as shown and described.

3. In an air-brake a brake-valve casing having an air-chamber arranged therein, said casing provided with inlet and outlet ports, an air-reservoir, a pipe connecting said air-chamber and said air-reservoir, a brake-cylinder, a pipe connecting said casing and said brake-cylinder, a tubular extension formed integral with one side of said casing, a brake-valve operating in said casing and having the stem thereof operating in said tubular extension, a valve-stem operating in the bore formed in the valve-stem of the brake-valve, a valve formed integral with the valve-stem which operates in the valve-stem of the brake-valve adapted to close the bore formed in the valve-stem of the brake-valve, a brake-lever connected to the valve-stem of the brake-valve, a lever pivotally connected to the brake-lever adapted to operate the valve-stem in the bore of the valve-stem of the brake-valve, and means for operating said lever, substantially as shown and described.

4. In an air-brake a pair of pumps or compression-cylinders, pistons operating therein, piston-rods connected to said pistons, cross-heads connected to said piston-rods, guides suitably connected to said pumps or cylinders for the said cross-heads, a yoke connected to said cross-heads, crank-arms connected to said yokes, an operating-shaft connected to said crank-arms, a stop-plate formed integral with said shaft, a gear-wheel mounted on said shaft, a clutch-plate also mounted on said shaft carrying pins adapted to pass through said stop-plate and engage the said gear-wheel and means adapted to connect and to disconnect the said clutch-plate with the said gear-wheel and said stop-plate to continue or discontinue the operation of the pumps or compression-cylinders, substantially as shown and described.

5. In an air-brake a pair of pumps or compression-cylinders, pistons operating therein, piston-rods connected to the said pistons, cross-heads connected to the said piston-rods, guides suitably connected to said pumps or compression-cylinders for the said cross-heads, a yoke connected to said cross-heads, operating means for the said pumps connected to the said yoke, a discharge-pipe connected to said pumps, inlet and outlet valves arranged at the ends of said pumps, a feed-pipe connected to said discharge-pipe, a reservoir connected to the said feed-pipe, a collar connected to the said feed-pipe having an outlet-port arranged therein, a regulating-cylinder connected to said collar having an inlet-port adapted to register with the outlet-port thereof, and means connected to the said regulating-cylinder for discontinuing the operation of the operating means for the pumps or compression-cylinders, substantially as set forth.

6. In an air-brake a pair of pumps or compression-cylinders, operating means therefor, a discharge-pipe connected to said pumps, check-valves arranged therein, a feed-pipe connected to said discharge-pipe, a reservoir connected to said feed-pipe, a collar mounted on said feed-pipe having the outlet-port arranged therein, a regulating-cylinder connected to said collar having an inlet-port adapted to coincide with the outlet-port of the collar, said regulating-cylinder provided with a series of inlet and outlet ports, a valve-actuating cylinder having an inlet-port adapted to be connected to said regulating-cylinder, a valve having suitable air-ports arranged in the said actuating-cylinder and means connected to said valve-actuating cylinder for discontinuing the operation of the operating means for the pumps, substantially as shown and described.

7. In an air-brake a pair of pumps or compression-cylinders, operating means therefor, a discharge-pipe connected to said pumps, check-valves arranged therein, a feed-pipe connected to said discharge-pipe, a reservoir connected to said feed-pipe, a collar mounted on said feed-pipe having an outlet-port arranged therein, a regulating-cylinder connected to said collar having an inlet-port adapted to coincide with the outlet-port of the collar, said regulating-cylinder provided with a series of inlet and outlet ports, a valve-actuating cylinder, said actuating-cylinder provided with outlet-ports, a valve having suitable air-ports arranged in the said actuating-cylinder, a throw-off cylinder connected to said valve-actuating cylinder having the inlet-port adapted to coincide with the outlet-port of the valve-actuating cylinder and means connected to said throw-off cylinder for discontinuing the operation of the operating means for the pumps, substantially as shown and described.

8. In an air-brake a pair of pumps or compression-cylinders, operating means therefor, a discharge-pipe connected to said pumps, check-valves arranged therein, a feed-pipe connected to said discharge-pipe, a reservoir connected to said feed-pipe, a collar mounted on said feed-pipe having an outlet-port arranged therein, a regulating-cylinder connected to said collar having an inlet-port adapted to coincide with the outlet-port of the collar, said regulating-cylinder provided with a series of inlet and outlet ports, a valve-

actuating cylinder having an inlet-port adapted to be connected to said regulating-cylinder, said actuating-cylinder provided with an outlet-port, a valve having suitable air-ports arranged in the said actuating-cylinder, a throw-off cylinder connected to said valve-actuating cylinder having an inlet-port adapted to coincide with the outlet-port of the valve-actuating cylinder, said throw-off cylinder having outlet-ports, a clutch-operating cylinder having inlet-ports, a pipe connecting said outlet-port of the throw-off cylinder with the inlet-port of the clutch-operating cylinder, and means connected to said clutch-operating cylinder for discontinuing the operation of the operating means for the pumps, substantially as shown and described.

9. In an air-brake a pair of pumps or compression-cylinders, operating means therefor, a discharge-pipe connected to said pumps, check-valves arranged therein, a feed-pipe connected to said discharge-pipe, a reservoir connected to said feed-pipe, a collar mounted on said feed-pipe having an outlet-port arranged therein, a regulating-cylinder connected to said collar having an inlet-port adapted to coincide with the outlet-port of the collar, said regulating-cylinder provided with a series of inlet and outlet ports, a valve-actuating cylinder, said actuating-cylinder provided with an outlet-port, a valve having suitable air-ports arranged in the said actuating-cylinder, a throw-off cylinder connected to said valve-actuating cylinder having an inlet-port adapted to coincide with the outlet-port of the valve-actuating cylinder, said throw-off cylinder having an outlet-port, a clutch-operating cylinder having an inlet-port, a pipe connecting said outlet-port of the throw-off cylinder with the inlet-port of the clutch-operating cylinder, a piston operating in said clutch-operating cylinder, a piston-rod connected to said piston, a lever connected to the free end of said piston-rod, a bearing connected to the opposite end of said lever, a lever connected to said bearing and first-named lever, a clutch formed on the free end of said last-named lever, and means operated by said clutch for discontinuing the operation of the operating means for the pumps, substantially as shown and described.

10. In an air-brake a regulating-cylinder provided with an inlet-port in one side thereof connected to a downwardly-extending air-passage opening into the cylinder near the bottom thereof, a piston operating in said cylinder, a tension-spring arranged in said cylinder, a set-screw operating in said cylinder for said tension-spring, the opposite side of said cylinder provided with outlets and exhaust-ports, said cylinder being provided also with the inlet-port 71^a, the air-passage 71^b and the outlet 71^c, substantially as shown and described and for the purposes set forth.

11. In an air-brake a valve-actuating cylinder provided with an inlet-port in one side thereof connected to a downwardly-extending air-passage opening into the cylinder near the bottom thereof and the inlet-port 92 connected to the upwardly-inclined air-passage 93, a piston operating in said cylinder, a piston-rod pivotally connected thereto, a spring arranged on said rod, a stop-plate arranged in said cylinder for said spring, an enlarged portion formed integral with one side of said cylinder having outlet-ports arranged therein, a valve having two ports arranged in said enlarged portion, and a lever connected to said valve and said piston-rod for operating the said valve, substantially as shown and described and for the purposes set forth.

12. In an air-brake a pair of air-pumps or compression-cylinders, operating means therefor, feed and discharge pipes connected to said pumps, a regulating-cylinder connected to said feed-pipe, a valve-actuating cylinder connected to said regulating-cylinder, a throw-off cylinder connected to said valve-cylinder, a clutch-operating cylinder connected to said throw-off cylinder, a piston operating in said clutch-operating cylinder, a piston-rod connected to said piston, and means connected to said piston-rod for discontinuing the operating means for the pumps when said piston-rod is operated, substantially as shown and described.

13. In an air-brake a pair of air-pumps or compression-cylinders, operating means therefor, feed and discharge pipes connected to said pumps, a regulating-cylinder connected to said feed-pipe, a valve-actuating cylinder connected to said regulating-cylinder, a throw-off cylinder connected to said valve-actuating cylinder, a clutch-operating cylinder connected to said throw-off cylinder, a piston operating in said clutch-operating cylinder, a piston-rod connected to said piston, an exhaust-cylinder connected to said clutch-operating cylinder, a piston operating in said exhaust-cylinder, a piston-rod connected to said piston, a lever-rod connected to the outer end of said piston-rod, a rod connected to said lever, exhaust-valves connected to said rod and mounted in the said pumps, and means connected to the said piston-rod which operates in the clutch-operating cylinder for discontinuing the operating means for the pumps when the said piston-rod is operated, substantially as shown and described.

14. In an air-brake a pair of pumps or compression-cylinders, pistons operating therein, check-valves arranged in the said cylinders suitably connected to inlet-passages to admit air to the said cylinders on both the forward and backward movements of the pistons, piston-rods connected to the said pistons, cross-heads connected to the said piston-rods, guides suitably connected to the said pumps or cylinders for the said cross-heads, a yoke connected to the said cross-heads, crank-arms connected to the said yoke, an operating-shaft connected to said crank-arms, a stop-plate formed integral with said shaft, a gear-wheel mounted on said shaft, a clutch-plate

carrying pins adapted to engage the said stop-plate and gear-wheel, and means for operating the said clutch-plate to engage and disengage the said gear-wheel and stop-plate to continue and discontinue the operation of the pumps or cylinders, substantially as set forth.

15. In an air-brake a brake-valve casing having an air-chamber arranged therein, said casing provided with inlet and outlet ports, an air-reservoir, a pipe connecting said air-chamber and said air-reservoir, a brake-cylinder, a pipe connecting said brake-cylinder and said casing, a tubular extension formed integral with one side of said casing, a brake-valve operating in said casing and having the stem thereof operating in said tubular extension, said valve-stem provided with a suitable outlet and a bore arranged at the center thereof, a valve-stem operating in said bore, a valve formed integral with the valve-stem which operates in the valve-stem of the brake-valve, said valve adapted to close the bore formed in the valve-stem of the brake-valve, an outlet-tube formed integral with said tubular extension, a gong-ringing mechanism adapted to connect with said outlet-tube, a brake-lever connected to the valve-stem of the brake-valve, a lever pivotally connected to the brake-lever adapted to operate the valve-stem in the bore of the valve-stem of the brake-valve, and means for operating said lever to allow of the passage of air from the air-chamber in the bore of the valve-stem of the brake-valve and to be discharged therefrom through the outlet-tube formed integral with the tubular extension when the brake-lever is operated, substantially as shown and described.

16. In an air-brake a brake-valve casing having an extension or projection formed integral with the bottom thereof, a handle suitably connected to the said projection or extension, a rod connected to the said handle, a reservoir, a throw-off cylinder, connections between the reservoir and throw-off cylinder, a clutch-controlling cylinder suitably connected to the said throw-off cylinder, a pair of pumps or compression-cylinders, means connected to the said clutch-operating cylinder for operating the said pumps, and a cut-off or valve arranged in the said connections operated by the said rod for discontinuing the operation of the pumps, substantially as described.

17. In an air-brake a brake-valve casing having an extension or projection formed integral with the bottom thereof, a handle suitably connected to said projection or extension, a rod connected to the said handle, a sand-cylinder, an air-reservoir, connections between the said sand-cylinder and air-reservoir, a valve suitably arranged or mounted in the said connections and operated by the said rod for operating the said cylinder, substantially as described.

18. In an air-brake a brake-valve casing, an air-chamber arranged therein, said casing provided with inlet and outlet ports, a tubular extension formed integral with one side of said casing, a valve operating in said air-chamber having the valve-stem thereof operating in said tubular extension, an extension formed integral with the top of said casing which is bent at right angles having a series of indicating-grooves formed thereon, cushioning-plate for said valve arranged in said air-chamber, resistance-springs for said cushioning-plate arranged in said air-chamber, resistance-springs for said valve-stem, said valve-stem provided with a central bore, a valve-stem operating in said central bore, a valve formed integral with one end of said valve-stem adapted to close said bore, resistance-springs for said valve, a brake-lever secured to the valve-stem of the brake-valve for operating the same, a lever pivotally secured to said brake-lever for operating the valve-stem in the bore of the valve-stem of the brake-valve, and suitable operating means for said lever, substantially as shown and described.

19. In a brake-lever a sand-operating device consisting of a collar having an extension formed on the upper end, a rod operating through said collar the upper end thereof bent at right angles, an operating-handle provided with a downward extension said downward extension pivotally secured in the groove formed on the upper portion of the rod, a spring arranged in said rod, said collar provided with a groove adapted to receive the downwardly-extending portion of the handle which is held in engagement therewith by means of the spring, a sand-cylinder, a sand-receptacle, connection between said sand-cylinder and said receptacle, connection between said cylinder and the air-reservoir, a valve mounted in said connections between the sand-cylinder and reservoir, an extension formed integral with said valve adapted to connect with said rod, whereby said rod and extension are operated by said handle, substantially as shown and described.

20. In an air-brake, an operating-shaft, a clutch-plate operating thereon having outwardly-extending pins connected thereto, a stop-plate rigidly secured to said shaft and provided with apertures adapted to receive the said pins, a gear-wheel mounted on the said shaft adapted to be engaged by the said pins for operating the said shaft, means for limiting the lateral movement of the said gear-wheel, a clutch-operating cylinder, connections between the cylinder and clutch-plate, a piston operating in the said cylinder, and means connected to the said cylinder for operating the said piston thereby operating the clutch-plate to discontinue or continue the operating of the said shaft, substantially as described.

21. In an air-brake, a pipe 94 connected to the brake-cylinder, a pipe 95 connected to the air-reservoir, collars arranged on said pipes, a pipe 98 connecting said pipe 94 with the air-chamber, a pipe 99 connecting said pipe 95

with the air-chamber, a washer mounted on the pipes 98 99, a pin arranged between the pipes 98 99, collars arranged on the pipes 98 99, a slidable collar 108 arranged on the pipes 98 99, a spring mounted on the pipes 98 99 between the collars arranged thereon, a swing-hook pivoted to said collar 108, a handle fulcrumed to said collar 108 adapted to operate the swing-hook and bring the same into engagement with said pin thereby coupling the pipes, substantially as shown and described.

22. In an air-brake a brake-valve casing having a tubular extension formed integral with one side thereof, a brake-valve operating in the said casing, a valve-stem connected to the said brake-valve and operating in the said tubular extension, the said valve-stem being centrally bored, a coil resistance-spring arranged in the said casing and operating against the said valve-stem, a valve-stem operating within the said bore of the brake-valve stem, a valve connected to the one end of said valve-stem for closing the said bore, a coil resistance-spring operating against the said last-named valve, means for supporting the said springs, and a spring-actuated plate operating against the said brake-valve, substantially as set forth.

23. In an air-brake a brake-valve casing having a tubular extension formed integral with one side thereof, a brake-valve operating in the said casing, a valve-stem connected to the said brake-valve and operating in the said tubular extension, said valve-stem being centrally bored, a coil resistance-spring arranged in the said casing and operating against the said valve-stem, a valve-stem operating in the said bore of the brake-valve stem, a valve connected to the one end of the said valve-stem for closing the said bore, a coiled resistance-spring operating against the said valve, a spring-actuated plate operating against the said brake-valve, and a brake-lever adapted to operate the said brake-valve stem for operating the said brake-valve, substantially as set forth.

24. In an air-brake a brake-valve casing having a tubular extension formed integral with one side thereof, a brake-valve operating in the said casing, a valve-stem connected to the said brake-valve and operating in the said tubular extension, said valve-stem being centrally bored, a coil resistance-spring arranged in the said casing and operating against the said valve-stem, a valve-stem operating in the said bore of the brake-valve stem, a valve connected to one end of the said valve-stem for closing the said bore, a coiled resistance-spring operating against the said valve, a spring-actuated plate operating against the said brake-valve, a brake-lever adapted to operate the said brake-valve stem for operating the said brake-valve, and means for operating the valve-stem arranged in the bore of the brake-valve casing thereby operating the valve and opening the bore in the said brake-valve stem, substantially as set forth.

25. In an air-brake, a brake-valve casing having a tubular extension formed integral with one side thereof, a brake-valve operating in the said casing, a valve-stem connected to the said brake-valve and operating in the said tubular extension, said valve-stem being centrally bored, a coil resistance-spring arranged in the said casing and operating against the said valve-stem, a valve-stem operating in the said bore of the brake-valve stem, a valve connected to one end of the said valve-stem for closing the said bore, a coiled resistance-spring operating against the said valve, a spring-actuated plate operating against the said brake-valve, a brake-lever adapted to operate the said brake-valve stem for operating the said brake-valve, means for operating the valve-stem arranged in the bore of the brake-valve stem thereby operating the valve closing the bore in the said brake-valve stem, inlet and exhaust ports arranged in the bottom of said brake-valve casing, an air-reservoir, pipe connections between the said brake-valve casing and the said reservoir, a brake-cylinder, pipe connections between the said cylinder and said brake-valve casing, substantially as set forth.

26. In an air-brake a brake-valve casing having a tubular extension formed integral with one side thereof, a brake-valve operating in the said casing, a valve-stem connected to the said brake-valve and operating in the said tubular extension, said valve-stem being centrally bored, a coil resistance-spring arranged in the said casing and operating against the said valve-stem, a valve-stem operating in the said bore of the brake-valve stem, a valve connected to one end of the said valve-stem for closing the said bore, a coiled resistance-spring operating against the said valve, a spring-actuated cushioning-plate operating against the said brake-valve, a brake-lever adapted to operate the said brake-valve stem for operating the said brake-valve, a crank-lever adapted to operate the said valve-stem arranged in the bore of the said brake-valve stem, said brake-valve stem provided with an outlet registering with the bore in the center thereof, a hollow tube connected to the said tubular extension which is suitably apertured at that point which registers with the outlet in the brake-valve stem, said tube adapted to be connected to a suitable gong mechanism to allow of the operation of the same when the valve-stem which is arranged in the bore of the brake-valve stem is operated, substantially as set forth.

27. In an air-brake a clutch-controlling cylinder, a cylinder 37 suitably connected thereto, said cylinder 37 provided with an air-inlet port registering with the outlet-port formed in the clutch-controlling cylinder, a piston operating in the said cylinder 37, a piston-rod connected to the said cylinder having a coil-

spring mounted thereon, a rod 41 connected to the upper end of said piston-rod, an operating-rod connected to the said rod 41, a pair of pumps or compression-cylinders, exhaust-valves 43 suitably arranged in the said pumps or compression-cylinders, said valves suitably connected to the said operating-rod to allow the operation of the same for exhausting the air from the air-pumps or compression-cylinders, substantially as set forth.

28. In an air-brake a brake-valve casing, the bottom thereof provided with an air-passage for connecting the same to the air-reservoir, said bottom being also provided with an air-port 138 communicating with the brake-cylinder and with an exhaust-port for relieving the said brake-cylinder of air, a brake-valve arranged in the said casing having a port adapted to register with the air-port 138 for obtaining a slow release of the brake, an outward extension formed integral with the top of said casing having a portion thereof bent at right angles, stops arranged at each side of said right-angle portion, and the said right-angle portion also provided with means for indicating the desired position of the brake-valve, substantially as set forth.

29. In an air-brake a pair of pumps or compression-cylinders, a valve-casing mounted in the top thereof, said casing provided with a discharge-opening registering at one end with the interior of the said pump or compression-cylinder and at its opposite end opening into the atmosphere, an exhaust-valve mounted in the said casing provided with an opening adapted to register with the said discharge-opening when the valve is operated for exhausting the air from the pumps or compression-cylinders, an exhaust-cylinder, a piston operating therein, connections between the said piston and said exhaust-valves, and means connected to the said cylinder for operating said piston thereby operating the exhaust-valves, substantially as set forth.

30. In an air-brake, a pair of pumps or compression-cylinders, a valve-casing mounted in the top thereof, said casing provided with a discharge-opening registering at one end with the interior of the said pump or compression-cylinder and at its opposite end opening into the atmosphere, an exhaust-valve mounted in the said casing provided with an opening adapted to register with the said discharge-opening when the valve is operated for exhausting the air from the pumps or compression-cylinders, an exhaust-cylinder, a piston operating therein, connections between said piston and said exhaust-valves, a clutch-operating cylinder suitably connected to the said exhaust-cylinder, and means connected to the said clutch-operating cylinder for operating the said piston in the exhaust-cylinder thereby operating the said exhaust-valves, substantially as set forth.

31. In an air-brake, a pair of pumps or compression-cylinders, operating means therefor, a valve-casing suitably mounted in the said pumps or compression-cylinders, said casing provided with a discharge-opening registering at one end with the interior of the said pump or compression-cylinder and at its opposite end opening into the atmosphere, an exhaust-valve mounted in the said casing provided with an opening adapted to register with the said discharge-opening when the valve is operated for exhausting the air from the pumps or compression-cylinders, an exhaust-cylinder, a piston operating therein, connections between the said piston and said exhaust-valves, a clutch-operating cylinder, and means connected to the said clutch-operating cylinder operating the said piston in the said exhaust-cylinder thereby operating the said valves and for discontinuing and continuing the operation of the operating means for the pumps or compression-cylinders, substantially as set forth.

32. In an air-brake, a pair of pumps or compression-cylinders, an air-reservoir, connections between the reservoir and pumps or cylinders, a regulating-cylinder suitably connected to said connections, a valve-actuating cylinder suitably connected to said regulating-cylinder, a throw-off cylinder suitably connected to said valve-actuating cylinder, a clutch-operating cylinder suitably connected to said throw-off cylinder, a piston operating in said clutch-operating cylinder operated by pressure through the cylinders from the reservoir, means connected to the said piston and operated thereby for continuing and discontinuing the operation of the pumps or cylinders, means arranged in the valve-actuating cylinder for exhausting the back pressure from the clutch-operating and throw-off cylinders, and means arranged in the regulating-cylinder for exhausting the back pressure from the valve-actuating cylinder, substantially as set forth.

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

JOHN SHOUREK.

Witnesses:
N. L. BOGAN,
WILLIAM E. MINOR.