No. 628,796.

Patented July 11, 1899.

W. A. & B. S. H. HARRIS.

TRAIN SIGNALING DEVICE.

(Application filed Aug. 26, 1898.)

(No Model.)

3 Sheets—Sheet 1.

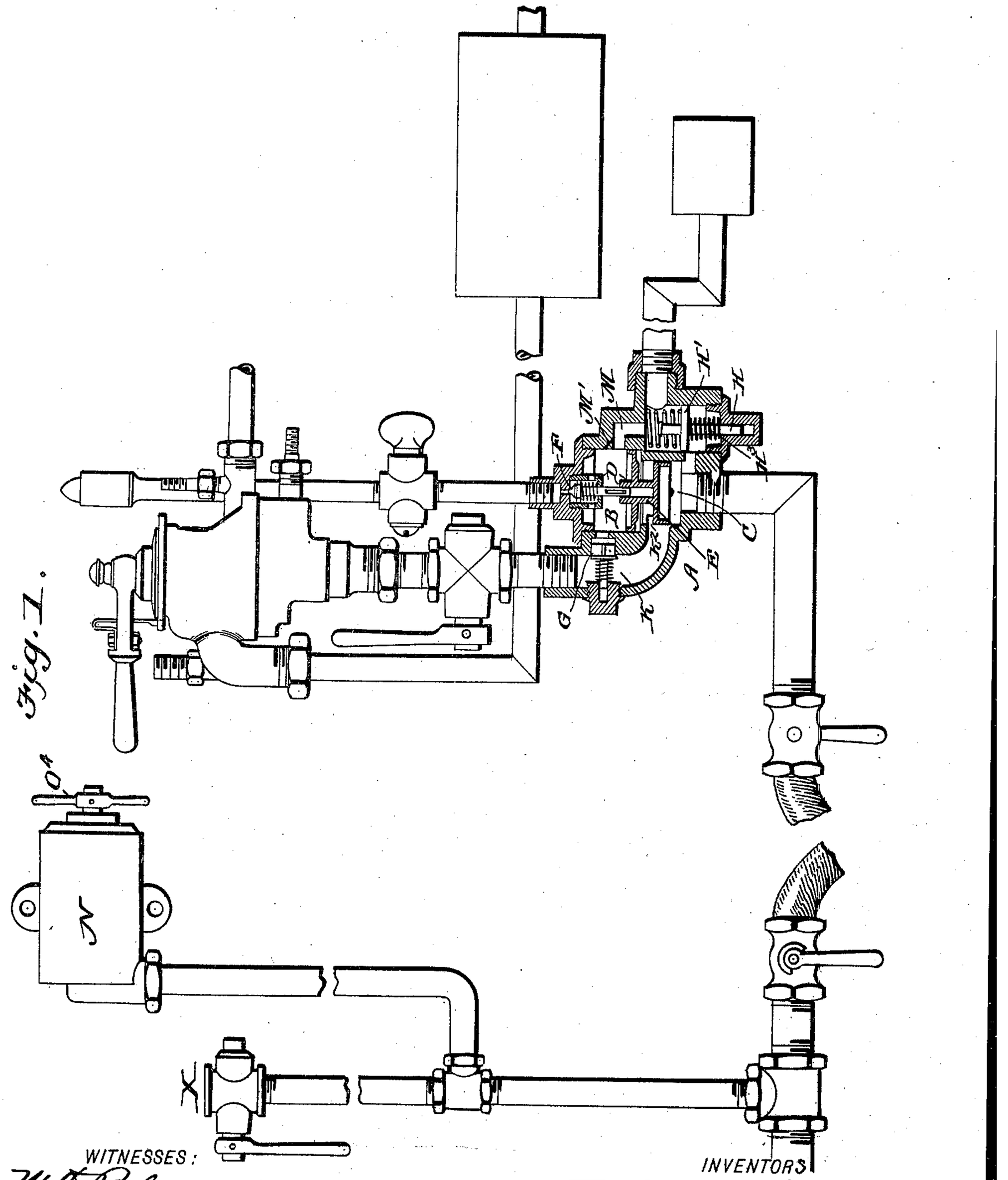


Fig. 1.

WITNESSES:

W. D. Blondell.

P. B. Turpin.

INVENTORS

W. A. Harris.

B. S. H. Harris.

BY Munn & Co.

ATTORNEYS.

No. 628,796. Patented July 11, 1899.

W. A. & B. S. H. HARRIS.

TRAIN SIGNALING DEVICE.

(Application filed Aug. 26, 1898.)

(No Model.) 3 Sheets—Sheet 2.

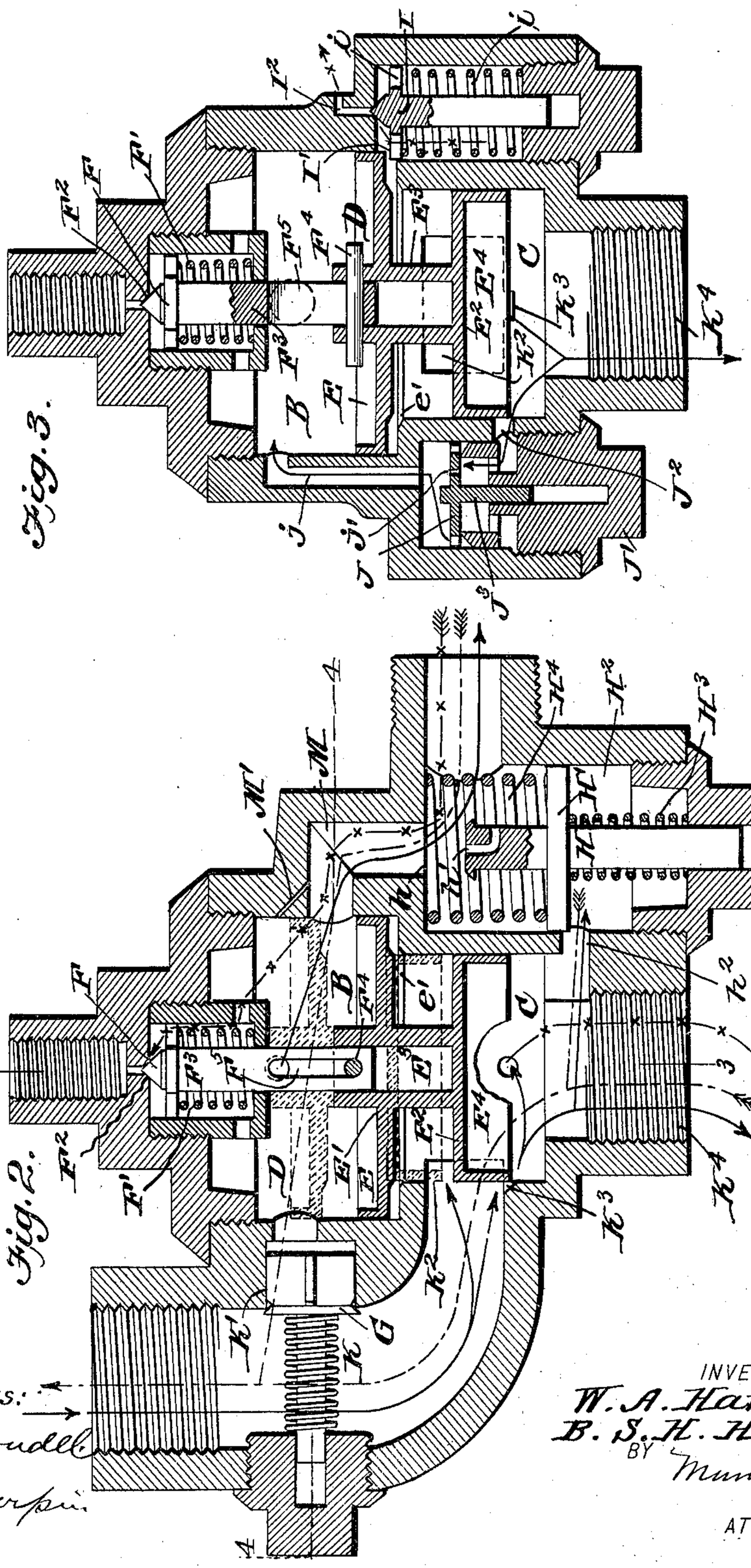


Fig. 3.

Fig. 2.

WITNESSES:
M. D. Blondell
P. B. Turpin

INVENTORS
W. A. Harris.
B. S. H. Harris.
BY Munn & Co.
ATTORNEYS.

No. 628,796. Patented July 11, 1899.

W. A. & B. S. H. HARRIS.

TRAIN SIGNALING DEVICE.

(Application filed Aug. 26, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 4.

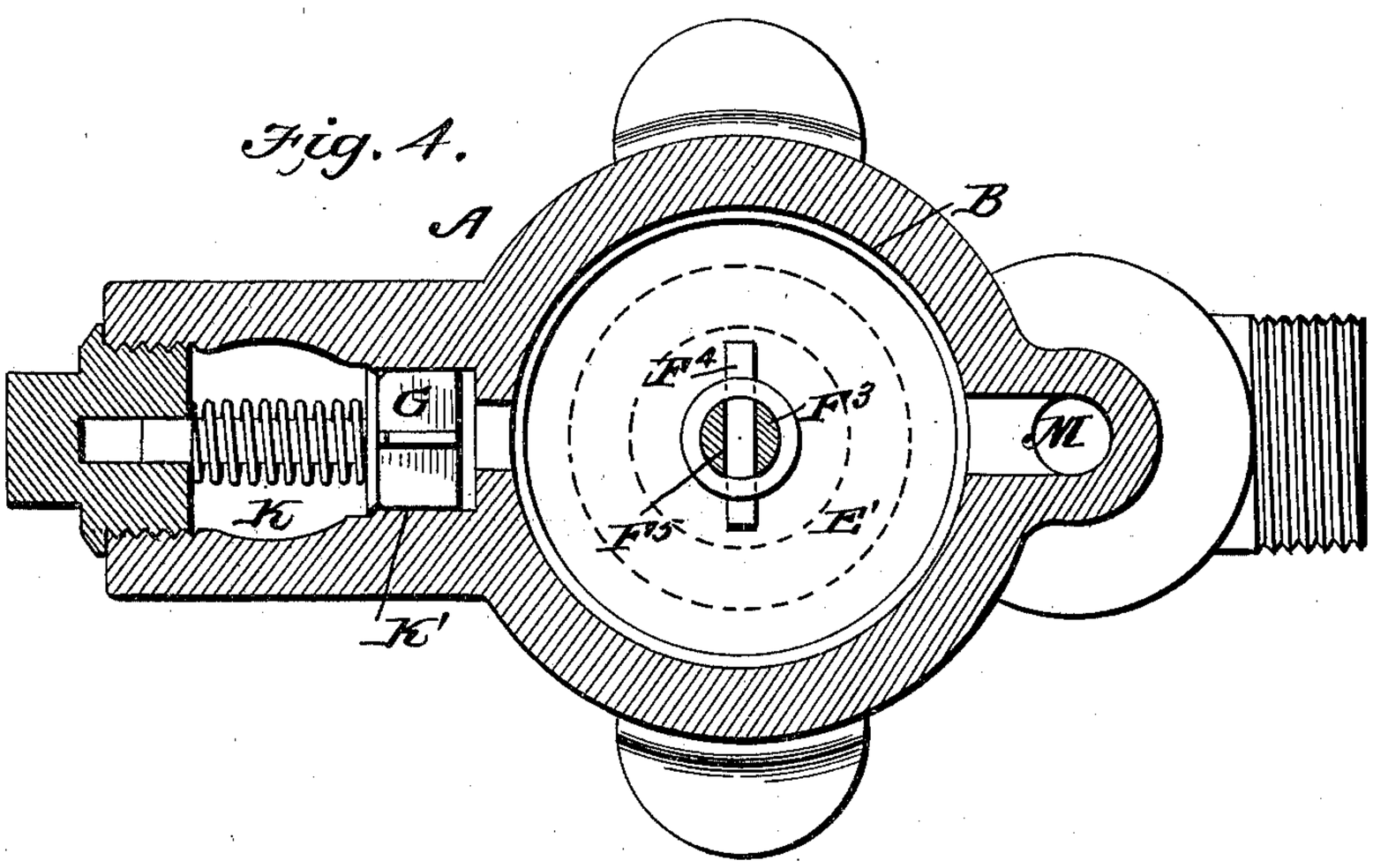


Fig. 5.

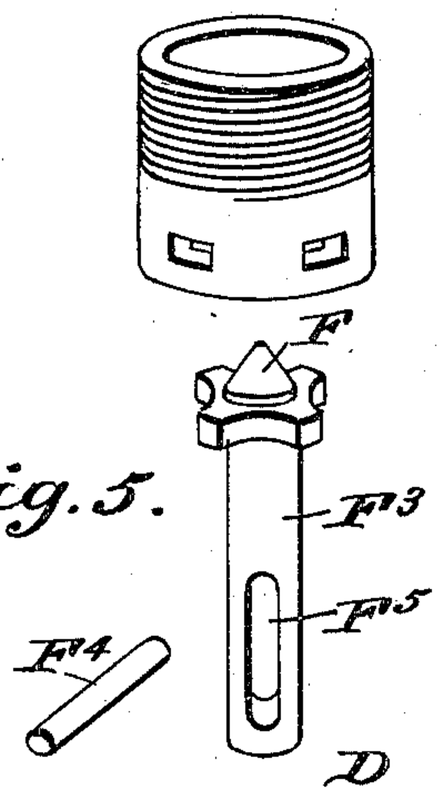


Fig. 6

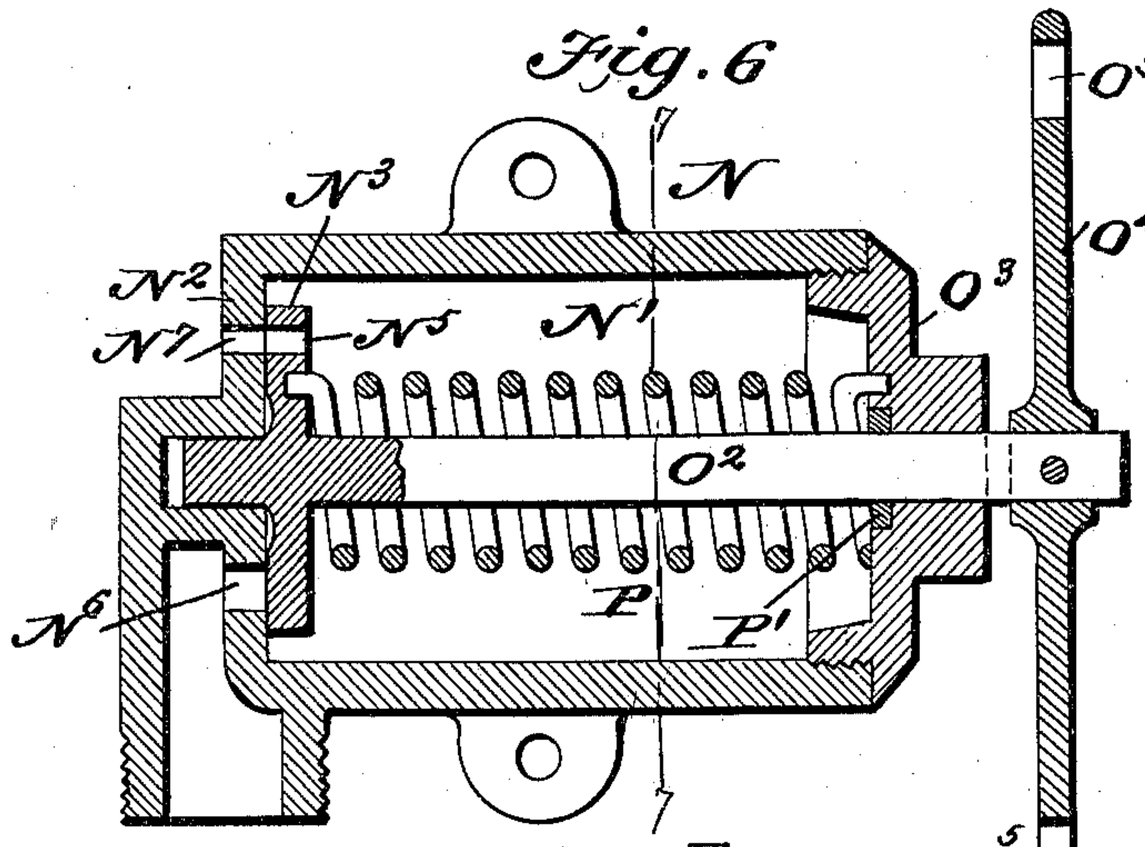


Fig. 7.

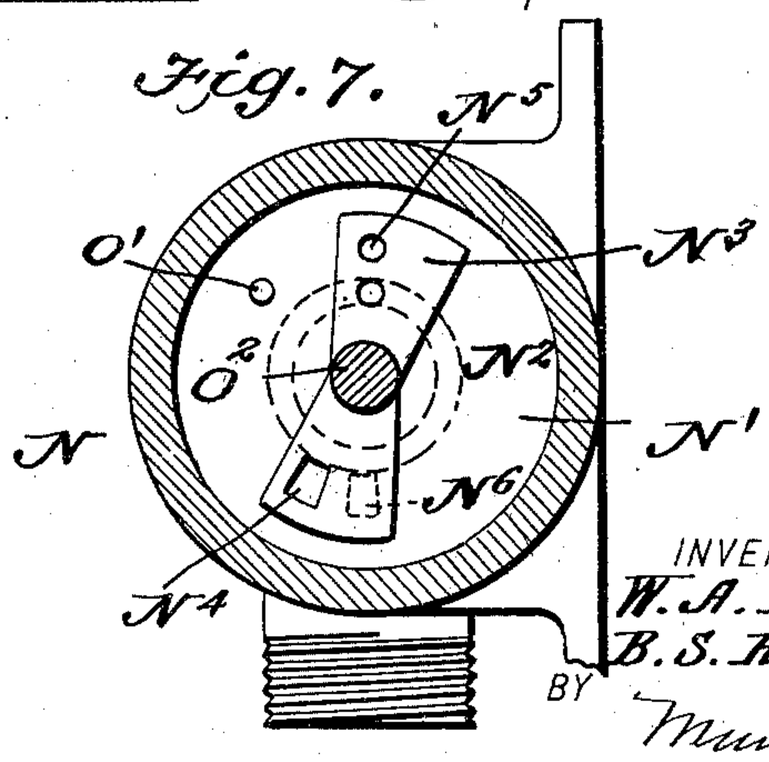
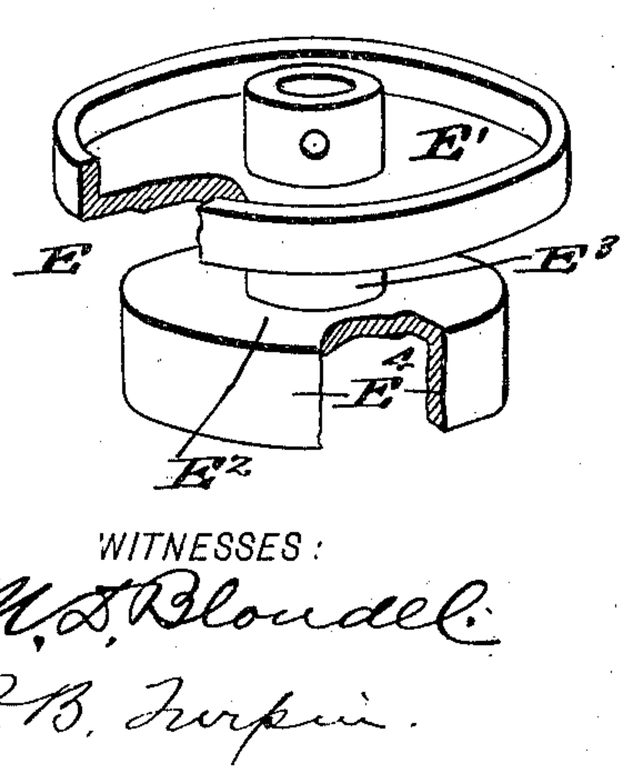


Fig. 5.



WITNESSES:

M. L. Blondell.

R. B. Turpin.

INVENTORS

W. A. Harris.

B. S. H. Harris.

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM A. HARRIS AND BENJAMIN S. H. HARRIS, OF GREENVILLE, SOUTH CAROLINA, ASSIGNORS OF ONE-FIFTH TO OSCAR E. HUGHES, OF SAME PLACE.

TRAIN SIGNALING DEVICE.

SPECIFICATION forming part of Letters Patent No. 628,796, dated July 11, 1899.

Application filed August 26, 1898. Serial No. 689,598. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM A. HARRIS and BENJAMIN S. H. HARRIS, citizens of the United States, and residents of Greenville, in the county of Greenville and State of South Carolina, have invented a new and useful Improvement in Train Signaling Devices, of which the following is a specification.

This invention is an improvement in signaling devices for railway-trains employing automatically-operated fluid-pressure brakes wherein the brakes are held released by pressure in the brake-pipe and are set by a proper diminution of pressure in said pipe.

The object of the invention is to provide simple constructions whereby to sound a signal to the engineer by a slight reduction of pressure in the train-pipe without necessitating the use of a separate signal-pipe paralleling the brake-pipe by placing a signaling device in direct connection with the train-pipe between the engineer's valve and the train-line, such signaling device forming a part of the train-pipe and permitting the transmission of signals from any car by a slight reduction of pressure in the train-pipe by the operation of the conductor's discharge-valve, such slight reduction being insufficient to set the brakes.

The invention consists in certain novel constructions and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a general elevation in the nature of a diagram, showing the improved device and the parts connected thereto. Fig. 2 is an enlarged section of the signaling device. Fig. 3 is a detail section on about line 3 3, Fig. 2. Fig. 4 is a cross-sectional view on about line 4 4 of Fig. 2. Fig. 5 is a detail perspective view, part in section, of the several parts of the main valve detached. Fig. 6 is a longitudinal section of the improved conductor-signaling valve, and Fig. 7 is a cross-section taken on about line 7 7 of Fig. 6.

In carrying out our invention we employ a suitable casing A, having a chamber for the main valve, which chamber is preferably made with the cylinders B and C of different diameters, the cylinder B being larger than the cylinder C, and a valve-seat e' being provided at the juncture of said cylinder.

The main valve D is composed of the whistle-valve F and the body E, the latter having the heads E′ E^2, operating, respectively, in the cylinders B and C and connected by the stem E^3.

The whistle-valve F is pressed by spring F′ to its seat F^2 and has its stem F^3 slidably connected with the body E, preferably by means of the pin F^4, sliding in the slot F^5 in the stem F^3, so the body of the valve may move up from the position shown in Fig. 2 without affecting the whistle-valve, but cannot move down without opening such valve and sounding the signal.

The head E^2 has the flange or rim E^4 of sufficient length to operate in connection with certain lateral ports opening through the cylinder C, as presently described.

In connection with the main valve D we prefer to provide what for convenience of reference we term the "stop-valve" G, the "check-valve" J, the "escape-valve" I, and the "equalizing-valve" H.

The stop-valve G controls a port K′, leading from the passage or line K into the cylinder B above the head E′. The line-passage K opens at K^2 into the cylinder C. The opening or port K^2 is of considerable area both laterally and in the direction of length of the cylinder C and preferably has a slight downward extension K^3 toward the coupling K^4 for the train-pipe. This permits the air to pass from passage K^2 into the cylinder C below the head E^2 at all times; but when the valve is lowered by reduction of pressure in the train-pipe to cause the sounding of the signal the downward extension K^3 is almost but hardly closed. When the valve E is lowered, its head E′ moves onto the seat e' and at the same time engages upon the portion I′ of the escape-valve I and lowers such valve to open the escape-port I^2 to permit the escape of air from above the seat e'—that is to say, from between said seat e' and the valve E—and prevents the repetition of the sounding of the whistle by the vibration of the air in the train-line, as will be more fully described in the description of the general operation of the apparatus. The valve I is normally pressed

to its seat by the spring *i* bearing beneath the flange *i'*.

The check-valve J seats on the upper edge of the nut J', which is chambered for the passage of the air from the cylinder C at J^2, the valve being adapted to permit the passage of the air when the valve is raised. This valve seats by gravity, is guided by its stem J^3, and controls the by-pass *j* in communication with the upper portion of the cylinder B. The valve J is leaky, being preferably perforated at *j'* to permit the limited passage of air at all times when the port J^2 is unobstructed.

The equalizing-valve H has a piston H', which operates in a cylinder H^2 alongside the lower cylinder C, and the valve is pressed in opposite directions by the springs H^3 and H^4 bearing on opposite sides of the piston H'.

The valve H seats at *h* and is provided with a contracted leak-passage *h'*, which permits the gradual filling of the signal-reservoir and prevents such reservoir from filling too rapidly, as will be presently described. A port h^2 connects the cylinder C with the cylinder H^2 and operates to permit the passage of pressure to seat the valve H when pressure below the piston H' overbalances that above the same, as is the case in charging the train-line.

The valve H controls the passage M, which opens into the cylinder B, and a contracted passage M' leads from the upper portion of the said cylinder and intersects the passage M, it being understood that the several leak-passages, in addition to their other functions, operate to preserve the desired balance or equalization of pressure.

In Figs. 2 and 3 we have traced the passage of the air in charging the train-line and connections thereof by a straight line (thus, ————) through our signal device, the same line showing the passage of the air in charging the relative parts of our device all simultaneously. In Fig. 2 we have shown by a long and short dash-line (thus, —— — —— — ——) how the air passes through and from the relative parts of our device when the engineer applies the brakes. We have also shown in Fig. 2 a dash and cross line (thus, ——X——X——X——) showing the movement and passage of the air which follows the reduction of air made in the train-line with the conductor's discharge-valve and causes the whistle to blow, and we will now proceed to a description of the operation of the construction, as shown and before described.

As will be seen from Fig. 1, in the charging of the main valve with compressed air through our device the main valve is held normally suspended by the combination of devices before described, so as to keep it a certain distance from its seat *e'*—in practice about one-sixteenth of an inch. Now when the air is turned in, as before described, it acts against the under side of the head E' of the main valve, thereby lifting it automatically to open the port K^2 to accommodate the flow of air through to the train-line and relative parts of signal device. While the train-pipe line is being charged, it will be seen that the air finds its way into the signal-reservoir through port J^2 through the chambers of nut J', lifting the light gravity-check J off of its seat, passing by the perforated edge of valve J on through the port *j* into the reservoir, as shown by the solid line, when engineer's brake and equalizing-valve are in running position. It will be well to note here that when the engineer's valve is in running position the flow of air to the signal-reservoir is limited through a small port or opening. In the full release of brakes after they have been set the engineer's valve is put in what is known as the "full-release" position, communicating fully with the main reservoir and train-line. This is done to quickly restore the pressure in train-line and auxiliary reservoirs. To operate when this full release is made, we have provided in our device an equalizing-valve H, which is actuated by air through port h^2 into its lower chamber, driving the valve up against its seat *h*, so the air must pass through the small port *h*, to the signal-reservoir. This is done to prevent the said reservoir from filling more rapidly than the train and causing the whistle to blow at the instant the engineer's valve is turned in running position. The spring H^4 is so set that the valve never moves up to its seat *h* when transmitting signals in a natural way—viz., the reduction of air in train-line made by the conductor or other employee by the use of the car discharge or conductor's discharge-valve. The air finds its way to the signal-reservoir in the course already described fast enough to reëstablish the pressure in transmitting signals; but in the full release of brakes we found it filled too quickly and have provided the equalizing-valve H to govern the flow, as described, and the springs actuating the equalizing-valve are so set as to prevent the said valve from closing on seat *h*, except in the full release of the engineer's valve. We now come to the application of brakes by what is known as the "service-stop," by which is meant a slow reduction of air from the train-line through engineer's brake-valve. It should be understood that no application of the engineer's brake-valve will cause our signal to sound, because the air is taken from all parts equally, with the exception of weight of valve E, which the air must necessarily lift to flow out through port k^2, and the check G, which is but a trifle and amounts to nothing in air-brake practice.

We now come to the emergency application of the brakes by the engineer, by which is meant putting the brake on with all its power instantly. This application of the brakes does not necessitate emptying the train-line, but is fully accomplished by making a quick reduction of ten to fifteen pounds of air from the train-line. This puts the triple valves in action first next to the engine and they work

automatically throughout the train in the well-known manner. No matter if there be ten or fifty cars, as soon as the engineer has made the reduction desired he puts his valve on lap, which is done in most cases before all the triples have worked, if it be a very long train. However, if there were only one left to work after the engineer has lapped his valve, if there was not some mechanical arrangement to prevent it, it would cause the signal-whistle to blow unnaturally, because the action of that triple would lower the pressure in train-line; but we have so arranged our valve-casing and valve that when this quick reduction is made the air rushing from the train-line drives the valve D up to the fullest extent, or, as indicated by dotted lines, moving above the passage M, leading to the signal-reservoir or partly so, leaving a sufficient pressure in the said reservoir to hold the valve in said position for a few seconds only. The equalizing-valve H lets any pressure in excess of a sufficient amount to hold the valve D up escape into the train-line by the pressure in reservoir driving-valve H down against spring H^3, opening port h^2, which spring H^3 is set to only resist a sufficient pressure to blow the whistle and hold up this valve D, the same strength of spring answering for both purposes. The valve D is held in this position till air equalizes through the small hole M′ made in the casing, and thence through passage M, lifting check G and emptying into the train-line. The brakes may also be set by the conductor's brake-valve, which is suitably located in every passenger-car equipped with air-brakes. When the brakes are set by this valve X, it causes the whistle to blow a little longer than a usual length of time, the pressure equalizing to a certain extent by valve H moving down and opening port h^2 to the signal-reservoir. In the regular transmission of signals this valve H never passes down by the port h^2 except when the brakes are set by a conductor's brake-valve, as described, or a car or cars are added to the train and air-coupled, when it will pass down by the port h^2 and equalize air, as described, and in both instances blow the whistle, which is not objectionable, but desirable, as it indicates to the engineer that the air has been coupled or the brake applied.

In using our signal device any practical discharge-valve may be used by the trainman, if done carefully, so as not to set the brakes; but we prefer the car discharge-valve N, (shown in Figs. 1, 6, and 7,) which consists of a suitable size chamber N′ with a cap N^2, the said chamber being turned out in the bottom and having a rotary valve N^3 fitted thereon and having openings N^4 and N^5 registering with ports N^6 and N^7. When the valve is standing in a normal position, port N^5 is registered with port N^7, which communicates the chamber A with the atmosphere. When the valve is turned until it strikes the stop-pin O′, it communicates the air from train-line to chamber N′ through ports N^4 N^6. In the meantime it closes the atmosphere connection N^5 N^7. As the chamber fills the reduction of pressure causes the whistle to blow, and the size of chamber N′ is such that you cannot set the brakes with this valve. The valve-stem O^2 extends through the cap O^3 and has a lever or handle O^4, to which the operating-cord is fastened in holes O^5. The valve N^3 is held to its seat and is actuated by the spring P. In the cap O^3 is a recess, and fitted therein is a rubber packing P′ to keep the air from escaping by the stem of the valve.

We will now describe the operation of our valve in transmitting signals. When a reduction of air is made in the train rear or back of signal device accidentally by coupling on more cars, setting the brakes by conductor's brake-valve, or in the natural way by using the car discharge-valve N, it will cause the valve E to travel down to its seat *e*′. This valve E, Fig. 2, pushes down the valve I, Fig. 2, which opens the small hole I^2 to the atmosphere, thereby emptying the chamber of valve I and the cavity formed by the valve E, taking its seat *e*′. The purpose of this arrangement just described is to prevent a double sound of the whistle by a single reduction and to give us the length of whistle sound desired without having to set the brakes to get it. A small reduction of the air in the train-line will bring valve E, Fig. 1, to its seat *e*′, and at the same time it closes the small port J^2, that leads to the signal-reservoir, and moves down the valve I, which opens the hole I^2, as described, and brings down with it the valve F by compressing the spring F′, which opens up communication through the small port to the whistle, which causes it to sound as the air passes out to the atmosphere. It will be noticed that while the valve D is in whistling position the pressure from engineer's valve has but very little tendency to move the valve E either up or down, and, furthermore, while it is in whistling position the pressure in the signal-reservoir above head E′ is operating against a larger area than the pressure in the train-line is. The air must therefore escape from the signal-reservoir through the whistle until a sufficient amount is discharged to give the train-line the advantage, when the valve E will move up in its normal position and all parts equalize, as hereinbefore described. We have a small hole *j*′, shown in check-valve J, to supply any leakage that might be in the train-line; but it will not affect the operation of the whistle.

It is evident from the foregoing that the valve E is useful in operating the whistle by a slight reduction in the train-pipe, permits the setting of the brakes without operating the signal, and also permits the charging of the train-pipe without affecting the signaling devices. In other words, our valve E is a

signaling-valve, a feeding-valve, and an emergency-valve, combining the three functions in a single device.

The valve E is regarded as a feed-valve, because it must move up to accommodate the flow of air to the train; as an emergency-valve, because in the emergency application of the brakes the valve E is forced up by the gush of air from the train-line into the position shown in dotted lines, Fig. 2, being held in that position by the pressure in the reservoir a few seconds only till the air can equalize, as before described, and as a whistle-valve, because it serves to actuate the valve F, which opens communication from the reservoir to whistle.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. An apparatus substantially as described comprising the main-valve body having pistons of different diameters rigidly connected whereby they move in unison, the casing having cylinders receiving said pistons and the whistle or signal valve connected with the outer side of the larger piston and arranged for operation by the main-valve body, substantially as set forth.

2. An apparatus substantially as described comprising the casing having the cylinders of different diameters, the main-valve body having pistons of different diameters operating in said cylinders and rigidly connected whereby they move in unison, the whistle-valve and a sliding connection between the outer side of the larger piston of said main-valve body and whistle-valve, substantially as set forth.

3. In an apparatus substantially as described, the combination of the casing, the main-valve body, the whistle-valve slidably connected with the main valve whereby the main-valve body when moved in one direction will correspondingly operate the whistle-valve and may move in the opposite direction independently of the whistle-valve, the port of the whistle-valve being in direct communication with the chamber in which the outer piston of the main-valve body operates whereby the pressure admitted to said chamber will operate the valve to open the whistle-port and will then operate to sound the whistle, substantially as set forth.

4. An apparatus substantially as described comprising the casing having cylinders of different diameters, a valve-seat between said cylinders, and a vent adjacent to such seat, the main-valve body having pistons operating in such cylinders, an escape-valve controlling the vent and arranged for operation by the main-valve body, and the whistle or signal valve arranged for operation by the said valve-body, substantially as set forth.

5. The combination of the casing having cylinders of different diameters, the valve-seat between the same and the vent adjacent to said valve-seat, the main valve having pistons of different diameters operating in said cylinders, the larger piston seating on the valve-seat, the escape-valve controlling said vent and arranged to be engaged and positively operated in one direction by the main valve and a spring for operating the escape-valve in the opposite direction, substantially as set forth.

6. In an apparatus substantially as described, the combination of the casing having cylinders, a valve-seat between the same, and a vent adjacent to said seat, the main valve having pistons operating in said cylinders and the escape-valve controlling said vent and arranged for operation by the main valve, substantially as set forth.

7. An apparatus substantially as described comprising the casing having cylinders of different diameters, the main valve having pistons of different diameters operating in said cylinders and spaced apart and means whereby pressure may be admitted between and on the opposite sides of said pistons, such pistons being rigidly connected whereby they move in unison and the whistle-valve slidably connected with the outer side of the larger piston of the main valve, substantially as set forth.

8. The combination of the air-brake pipe and the engineer's valve, the conductor's release-valve arranged in the train-line, the main valve having a whistle-valve and a body portion connected with the whistle-valve and movable in one direction with and in the opposite direction independently of the whistle-valve, and connections whereby a limited reduction of pressure in the train-line will operate the main-valve body portion to open the whistle-valve and whereby the charging of the system and setting of the brakes may be effected without sounding such whistle, the whistle-valve and the main valve being in direct communication whereby the pressure admitted to the main valve to open the whistle-valve may subsequently operate the whistle, substantially as set forth.

9. In an apparatus substantially as described the combination of the casing, the main valve having pistons of different diameters spaced apart and rigidly connected for movement in unison and means controlling the pressure against the outer sides of and between said pistons and the whistle-valve slidably connected with the outer side of the larger piston of said valve, substantially as set forth.

10. In an apparatus substantially as described, the combination of the casing having cylinders of different diameters and a by-pass opening into the larger cylinder near its upper end and having a port leading into the lower cylinder, a stop-valve in said by-pass, the whistle-valve, and the main valve having its body portion provided with pistons of different diameters operating in the said cylinders, the smaller piston being arranged to control the port of the by-pass, substantially as described.

11. The combination of the casing, the signaling-reservoir connected therewith, the equalizing-valve controlling the connection between the signaling-reservoir and the casing and having a piston arranged to be acted on by pressure in the latter and the signaling devices, substantially as set forth.

12. In an apparatus substantially as described, the combination of the casing, the signaling devices, the signal-reservoir and the balanced equalizing-valve having a piston arranged to be acted on by the pressure in the casing, substantially as set forth.

13. The combination with the casing having the signaling devices and the signaling-reservoir connected with such casing of the equalizing-valve having a contracted opening permitting the limited passage of pressure to the said reservoir when the equalizing-valve is closed, substantially as set forth.

14. The combination of the casing having a joint for connection with the signaling-reservoir, an equalizer-valve controlling the passage of pressure to such joint and having a contracted passage or opening in said valve, a piston on the valve arranged for operation by pressure in the casing and spring devices balancing the said equalizing-valve, substantially as set forth.

15. The combination of the casing having the cylinder for the main valve and the passage leading therefrom to connect with the signaling-reservoir and a contracted opening intersecting said passage and opening into the cylinder above the said passage, and the equalizing-valve controlling said passage and arranged for operation by pressure from the casing, such equalizing-valve having a contracted opening to permit the limited passage of pressure when the valve is closed, substantially as set forth.

16. In an apparatus substantially as described, the combination of the casing having upper and lower cylinders of different diameters, the passsage or line for connection with the engineer's valve having a port opening into the lower cylinder and a port leading into the upper cylinder and a check controlling the latter port, the main valve having the body provided with pistons of different diameters and the whistle-valve having an actuating-spring and slidably connected with the body of the main valve, substantially as set forth.

17. In an apparatus substantially as described, the combination of the casing having cylinders B and C, a cylinder H^2, a passage M and ports h^2, the main valve having the whistle-valve and the valve-body provided with pistons fitting the cylinders B and C and slidably connected with the whistle-valve, and the equalizing-valve having opening h', the piston H' operating in the cylinder H^2 and the springs for actuating the said equalizing-valve, substantially as set forth.

18. In an apparatus substantially as described, the combination of the casing having the signaling-valve having the valve-body, the equalizing-valve and connections for controlling the feed of pressure to the signaling-reservoir, the release-valve by which to avoid the repeated sounding of the signal, and the check-valve by which to control the passage of pressure to the upper side of the valve-body, all substantially as set forth.

19. The combination of the casing having the whistle-port and the cylinders of different diameters and the main valve having a whistle-valve fitted to the whistle-port, a spring for normally seating such valve and the main-valve body having pistons of different diameters and fitted to the cylinders of the casing and devices by which the said whistle-valve and valve-body are slidably connected, substantially as set forth.

20. In an apparatus substantially as described, the combination with the train-line and a device connected therewith and adapted to sound a signal on a slight reduction of pressure in the train, of a car discharge-valve, having a chamber provided with ports communicating with the train-line and with the atmosphere and a rotarily-movable valve controlling such ports whereby the port to the atmosphere may be closed and that to the train-line opened to permit a filling of the chamber, the port leading to the atmosphere opening when that communicating with the train-line is closed, substantially as set forth.

21. In a train signaling apparatus, the combination of the casing, the main valve having a body and a whistle-valve slidably connected with the outer side of the body whereby the latter will open the whistle-valve when moved in one direction and may be moved in the other direction independently of the whistle-valve and connections whereby a reduction of pressure in the train-pipe will move the valve-body to open the whistle-valve, and other variations in pressure will operate the valve-body in the opposite direction, the whistle-valve and the outer side of the valve-body being in communication whereby the pressure admitted to the main-valve body to operate the whistle-valve may subsequently sound the whistle, substantially as set forth.

WILLIAM A. HARRIS.
BENJAMIN S. H. HARRIS.

Witnesses to the signature of William A. Harris:
H. J. HAYNSWORTH,
D. U. JACOB.

Witnesses to the signature of Benjamin S. H. Harris:
SOLON C. KEMON,
PERRY B. TURPIN.