

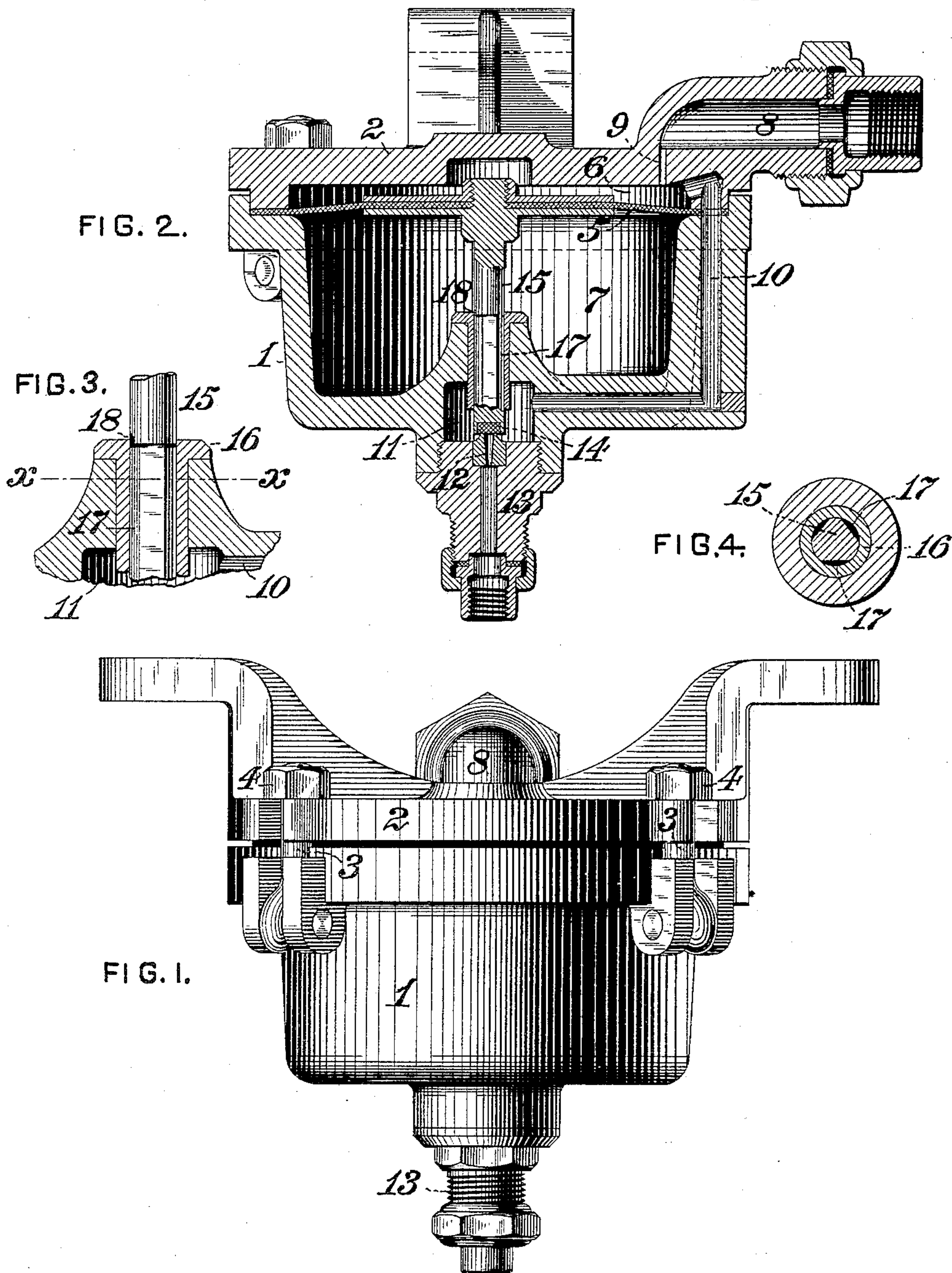
(No Model.)

T. W. WELSH, F. L. CLARK & F. MOORE.

FLUID PRESSURE SIGNALING VALVE.

No. 435,783.

Patented Sept. 2, 1890.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE SIGNALING-VALVE.

SPECIFICATION forming part of Letters Patent No. 435,783, dated September 2, 1890.

Application filed September 3, 1889. Serial No. 322,902. (No model.)

To all whom it may concern:

Be it known that we, THOMAS W. WELSH, of Pittsburg, FRANCIS L. CLARK, of Leet township, and FRANK MOORE, of Pittsburg, in the county of Allegheny and State of Pennsylvania, citizens of the United States, have invented or discovered a certain new and useful Improvement in Fluid-Pressure Signaling-Valves, of which improvement the following is a specification.

Our invention relates to and is an improvement upon signaling apparatus of the class set forth in Letters Patent of the United States No. 180,179, granted and issued to George Westinghouse, Jr., July 25, 1876, in which signals are communicated to and given at a desired point by and coincidently with the institution of a difference of pressure upon opposite sides of a movable abutment working in a casing which communicates with a line of pipe extending from the point of preliminary actuation to that of final operation.

The object of our invention is to effect a simplification and economy of construction by the provision of a signaling-valve mechanism which will not only embody in its own structure such characteristic features, but also enable the independent reservoir heretofore employed to be dispensed with, and which in operation will permit any desired number of signals to be given without liability to failure from exhaustion of supply-pressure or to the objection of giving more than a single signal indication as the result of each preliminary actuation by an operator.

To this end our invention, generally stated, consists in the combination of a movable abutment actuated by difference of pressure on its opposite sides, a discharge-valve moved by said abutment, and a casing having passages adapted to transmit pressure to the abutment from a signaling-line in such manner as to effect a rapid opening and comparatively slow closure of the discharge-valve.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a view in elevation of a signaling-valve mechanism embodying our invention; Fig. 2, a ver-

tical central section through the same at right angles to the plane of Fig. 1; Fig. 3, a vertical section, on an enlarged scale, through the valve-stem bushing with the stem in elevation; and Fig. 4, a horizontal section through the valve-stem and bushing at the line $x x$ of Fig. 3.

In the practice of our invention we provide a chamber or casing 1, which is of substantially cylindrical form, having an integral bottom plate and closed at top by a removable head 2, which is held in position by a series of bolts 3 and nuts 4. The casing 1 is divided by a movable abutment 5, which is preferably, as shown, a flexible diaphragm secured peripherally between the body of the casing and the head into two compartments 6 and 7, the upper of which 6 is of comparatively small volume relatively to the lower 7. A signaling-pipe connection or nozzle 8 is formed upon the head 2 for attachment to an ordinary line of signaling-pipe extending to the farthest location from which signals are to be communicated, as in train-service the last car of a train, the casing 1 being mounted upon the locomotive-engine hauling the train, and the signaling-line being provided at proper intervals, as on each car of the train, with an actuating-valve for effecting the reduction of pressure in the line which causes a signal to be given. The signaling-pipe connection communicates with the smaller compartment 6 of the casing by a supply-passage 9, which is of comparatively small diameter relatively to the connection 8, and the compartment 6 communicates by a passage 10, formed in the wall of the casing 1, with a valve-chamber 11, located centrally in the bottom plate thereof and communicating by a discharge-passage 12, of smaller diameter than the supply-passage 9, with a discharge connection or nozzle 13, which is adapted to be attached to a pipe leading to a signal-indicating device, which is ordinarily a whistle located at some convenient point near the casing. The discharge-passage 12 is controlled by a discharge-valve 14, fitted to seat truly upon the upper end of the passage and fixed upon a valve-stem 15, which passes freely

through a bushing 16, fixed centrally in the bottom plate of the casing 1 above the valve-chamber 11, and is connected at its upper end to the center of the abutment 5. The stem 15 is provided with a series of longitudinal grooves or recesses 17 upon that portion of its periphery which passes through and below the bushing 16, except for a short distance—as, say, one-sixteenth of an inch or thereabout—below the top of the bushing, through which distance its cylindrical periphery fits accurately within a corresponding bore in the bushing 16 during such period as the discharge-valve 14 is seated and closes the discharge-passage 12. The combined transverse sectional area of the recesses 17 is greater than that of the supply-passage 9, which latter is, as before stated, of greater transverse sectional area than the discharge-passage 12. A small charging-groove 18 is formed in the periphery of the closely-fitting portion of the valve-stem above the series of longitudinal recesses 17, said groove 18 permitting the compartment 7 to be charged with fluid under pressure from the signaling-pipe connection 8 and passages 9 and 10 by leakage of fluid through it during the period in which the valve 14 is seated. We ordinarily in practice adopt the equivalent construction of making the fit of the portion of the valve-stem above the recesses 17 sufficiently free in the bushing 16 to enable the compartment 7 to be charged by leakage through the minute space between the stem and bushing, this space affording an avenue corresponding in function with the charging-groove 18, which is in such case dispensed with; but is here illustrated as more clearly explanatory. It will further be obvious that the charging-groove might be formed in the bore of the bushing 16, if preferred.

In operation fluid under pressure, which is ordinarily compressed air, passes from the signaling-pipe through the connection 8 and supply-passage 9 into the compartment 6, charging the same, and through the passage 10, the lateral grooves of the valve-stem 15 and the charging-groove 18 into the compartment 7, charging the same to a pressure equal to that in the compartment 6, and thus instituting an equilibrium of pressure upon opposite sides of the abutment 5. Upon a reduction of pressure in the signaling-line connected to the nozzle 8, effected by opening any one of the series of actuating-valves which afford a discharge from said line, the then greater pressure in the compartment 7 raises the abutment 5 and coincidentally unseats the connected discharge-valve 14, whereupon fluid under pressure is discharged preliminarily from the signaling-line and the smaller compartment 6 through the passage 10, and secondarily from the larger compartment 7 through the peripheral grooves 17 of the valve-stem into the discharge-passage 13, and thence to the whistle or other signal-indicating device, causing a single signal indication to be

given by the same. Upon the restoration of pressure in the signaling-line and nozzle 8, the abutment 5 is forced downwardly, seating the discharge-valve, and the compartment 7 is recharged through the recesses 17 and charging-groove 18, reinstating the normal equilibrium of pressure on opposite sides of the abutment 5 in readiness for another signal to be given. The provision of the peripheral grooves and charging-groove, or equivalent freely-fitting portion on the valve-stem, effects a quick opening and comparatively slow closure of the discharge-valve, which consequently remains open for a short period after the actuating-valve, which reduces pressure in the signaling-line, has been closed in normal operation. Such quick opening is attained by reason of the fact that during the preliminary movement of the abutment and stem a free discharge is permitted from the upper side of the abutment, while the discharge admissible from its lower side, being only that which could take place through the small charging-groove, is so inconsiderable as to have practically no effect in retarding the upward movement of the abutment effected by reduction of pressure on its upper side. On the other hand, the downward movement of the abutment by which the discharge-valve is closed is comparatively slow, for the reason that by the difference of volume of the compartments 6 and 7 and the small transverse areas of the supply and discharge passages the fluid passing out of the compartment 7 cannot freely escape through the discharge-passage, but is partially expended in the equalization of pressure between the compartments 6 and 7, which equalization involves a period of time sufficient to cause a comparatively slow closure of the discharge-valve. The slow closure, or, in other words, the period of opening of the discharge-valve after the closure of the actuating-valve in the signaling-line, allows sufficient time for the equalization of pressure in said line, and thus obviates the objection which has been heretofore experienced of a reopening of the discharge-valve and the consequent effectuation of another and undesired signal indication by the institution of a slight difference of pressure on opposite sides of the abutment, occasioned by an equalization of pressure in the signaling-line, after the discharge-valve has been closed. The transverse area of the passage 10 and of the peripheral recesses 17 of the valve-stem being greater than that of the supply-passage 9 and discharge-passage 12, fluid passing out of the compartment 7 during the preliminary downward movement of the abutment cannot freely escape through the discharge-valve, and the equalization of the pressure in the two compartments and signaling-line after each signal indication enables the same to be given in any desired number and succession without liability to exhaustion of fluid-pressure.

The method of operating signals for the

practice of which the apparatus herein is designed and is desirably applicable is not claimed as of our present invention, the same constituting the subject-matter of a divisional application filed by us February 7, 1890, Serial No. 339,670.

We claim as our invention and desire to secure by Letters Patent—

1. In a fluid-pressure signaling mechanism, the combination of a chamber or casing, a fluid-pressure-supply pipe opening directly thereinto, a movable abutment fitted to work in the casing, a pipe leading from the casing to a signal-indicating device, and a discharge-valve connected directly to the movable abutment and controlling communication between the fluid-pressure-supply pipe and the signal-indicating-device pipe, substantially as set forth.

2. In a fluid-pressure signaling apparatus, the combination of a movable abutment subject to fluid-pressure from a signaling-line, a discharge-valve positively connected to and movable with said abutment and controlling a pipe leading to a signal-indicating device, and a casing inclosing the abutment and discharge-valve and provided with passages adapted to transmit fluid under pressure from the pressure-supplying pipe to the signal-indicating-device pipe, substantially as set forth.

3. In a fluid-pressure signaling apparatus, the combination of a movable abutment subject to fluid-pressure on its opposite sides, a discharge-valve positively connected to and movable with said abutment and controlling communication between a pressure-supplying line and a pipe leading to a signal-indicating device, and a casing inclosing the abutment and discharge-valve provided with a series of passages communicating with both sides of the abutment and adapted to effect rapid opening of the discharge-valve by admitting of free discharge of pressure from one side of the abutment without retardation by discharge from the opposite side and comparatively slow closure of the discharge-valve by admitting of a gradual equalization of pressure on both sides of the abutment during closing movement, substantially as set forth.

4. In a fluid-pressure signaling-valve mechanism, the combination of a chamber or casing, a movable abutment dividing said casing into two compartments, a signaling-pipe connection communicating with one of the compartments of the casing, a valve-chamber communicating with said passage and compartment, a valve controlling communication between said chamber and a pipe leading to a signal-indicating device, and a stem coupling said valve to the movable abutment and provided with a small passage for charging the other compartment of the casing from the signaling-pipe connection when the discharge-valve is closed and with a larger passage for discharging pressure from the latter compartment to the former and to the signal-indicating device when the discharge-valve is open, substantially as set forth.

5. In a fluid-pressure signaling-valve mechanism, the combination of a chamber or casing, a movable abutment dividing said casing into compartments of comparatively small and large volume, respectively, a signaling-pipe connection communicating by a supply-passage of reduced transverse area with the smaller compartment, a valve-chamber communicating with said passage and compartment, a valve controlling communication between said chamber and a discharge-passage which is of smaller transverse area than the supply-passage and leads to a signal-indicating device, and a stem coupling said valve to the movable abutment and provided with a small charging-groove at and adjacent to its line of contact with the wall of the larger compartment when the delivery-valve is seated, and a series of peripheral grooves of greater aggregate sectional area than the supply-passage and extending from the larger compartment to the valve-chamber when the delivery-valve is unseated, substantially as set forth.

In testimony whereof we have hereunto set our hands.

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Witnesses:

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