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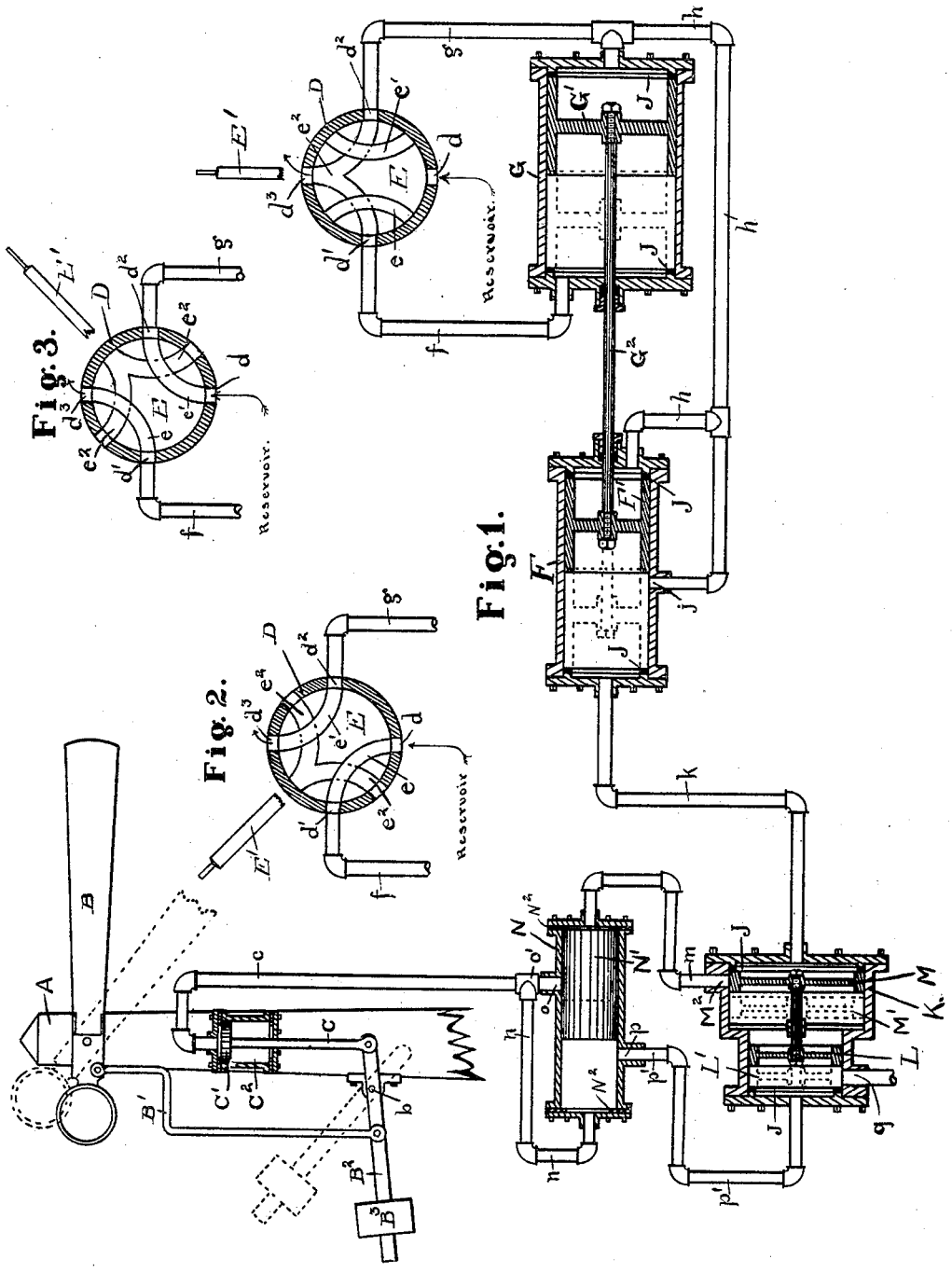
J. H. McCARTNEY.

SIGNAL.

(Application filed May 4, 1896. Renewed Mar. 22, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SIGNAL.

SPECIFICATION forming part of Letters Patent No. 649,523, dated May 15, 1900.

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To all whom it may concern:

Be it known that I, JAMES H. McCARTNEY, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Signals; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-letters marked thereon.

My present invention has for its object to improve the construction and operation of devices operated by fluid under pressure, such as pneumatic railway-signals, by means of which the signals or devices may be more quickly and positively operated than is the case with devices now in use, and one portion of my invention consists in the provision of means for suddenly increasing the pressure of the fluid in the main or pipe when it is desired to operate the signals or similar devices in one direction to above the pressure in the fluid reservoir or tank and in positively and quickly exhausting the fluid from the pipes or conduits to cause the operation of the signal in the opposite direction, whereby the reduction in pressure due to the friction of the fluid in the small pipes or conduits necessarily employed is overcome and this without the necessity of maintaining a large amount of fluid under high pressure. This feature of providing for the quick action of pneumatic devices as signals is particularly desirable in connection with such a switch and signal apparatus as is contained in Letters Patent No. 513,231, granted January 23, 1894, in which the controlling devices for the signals are located at one point—say a railway-crossing—and the signals or actuated devices are located some distance up the track—say several hundred yards—as the pipes or conduits for the fluid are necessarily small on the ground of economy of construction and the resistance to the fluid is necessarily great.

To these and other ends the invention consists in certain improvements hereinafter described, the novel features being pointed out in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a diagrammatic sectional view illustrating a railway-signal, as a semaphore, and its operating mechanism and connections with the controlling devices; Fig. 2, a diagrammatic view of the controlling-valve in position to operate the signals to "danger" or normal position; Fig. 3, a similar view showing the valve moved to the position for actuating the signal to "safety."

Similar reference-letters in the several figures indicate similar parts.

The signal shown, which indicates but a type of a device actuated by fluid under pressure, embodies a post or support A, to the upper end of which is pivoted a semaphore-arm B, connected by a link B′ with a lever B^2, pivoted at *b* and having a weight B^3 on one end, while the other end is connected to a rod C, having a piston-head C′ thereon operating in a cylinder C^2, with which communicates a pipe *c*. The weight B^3 normally holds the signal-arm B in the position of "danger" shown when there is no pressure in the pipe; but when fluid under pressure is admitted to the pipe *c* the piston will be moved and the signal turned to safety position. As in all devices of this class the signals are normally at "danger" and are moved to safety position by suitable operating devices. As this invention is particularly adapted for use in connection with such signal devices as are shown in the Dodgson patent before referred to, the means I have shown for controlling the signals is such a double valve as is contained in said patent and as shown herein diagrammatically in the drawings and embodying a casing D, having a port or opening *d*, connected with a reservoir or other source of supply of fluid, preferably air under pressure. Said valve-casing is also provided with a port or passage *d*′ on one side and a port or passage d^2 on the other side, d^3 indicating an exhaust port or passage. The plug-valve E, operating in this casing, is provided with a handle E′ and contains passages *e* and *e*′ (shown in full lines) and also other exhaust-passages e^2, (indicated in dotted lines,) and adapted to open communication directly or indirectly between the ports *d*′

and d^2 or suitable pipes connected therewith and the exhaust-port d^3. I regard it as desirable, though not essential, that the controlling-valve be provided with the exhaust-passages e^2 in order that the pipes f and g may be open to the air, so that the signal may be operated quickly.

Located preferably near the valve or the tower containing it are two cylinders F and G, arranged in line, the former having within it an operating-piston F′ and the latter an operating-piston G′, both connected to a piston-rod G^2. Both of these cylinders are provided at opposite ends with suitable buffer-rings J, of leather or other suitable material, so as to cushion and prevent the pistons from striking the ends of the cylinder, and the piston G′ and its cylinder are larger than the piston F′ and its cylinder.

f indicates a pipe or conduit leading from the port d' of the valve-casing D to the inner end of the cylinder G, and g a pipe or conduit leading from the port d^2 of the valve to the outer end of the cylinder G, and h a pipe connecting with g and leading to the inner end of the cylinder F and also to a port j, located in the side of the cylinder F and preferably at a shorter distance from the outer end thereof than the length of the piston-head F′, so that when said piston is moved to the left it will effectually cover said port j. The piston-head G′ operates as an engine for actuating the air-forcing piston F′, and the controlling-valve E serves not only as a means for controlling the supply and exhaust to and from the piston, but as well to govern the supply and exhaust directly from the pipe or conduit k. To the outer end of the cylinder F is connected a pipe k, leading to the signal to be operated and which, as stated, is located some distance from the controlling-valve E.

K indicates a casing having two chambers or cylinders of different area in which operate pistons L and M, the latter in the larger chamber M′ and the former in the smaller chamber L′. The pipe k communicates with the outer end of the cylinder M′, and in the side of said cylinder is a port M^2, connected by a pipe m with the end of the cylindrical valve-casing N, in which operates a movable piston or auxiliary valve N′, adapted to move freely from end to end of the cylinder and to engage packing N^2 at the ends, said packing forming not only a buffer for the valve N′, which moves freely, but also preventing the passage of air around the piston when in contact therewith. The opposite end of the valve-casing N is connected by a pipe n with the pipe c, leading to the signal-cylinder, and in the side of the cylinder N is a port o, connected by a pipe o' with the pipe c.

p indicates a port in the cylinder N in the same position relative to the left end of the cylinder that the port o is relative to the right end, and p' is a pipe connecting said port p with the end of the smaller cylinder L′ in the valve-casing K.

q indicates an exhaust-port in the side of the cylinder L′, with which the piston L cooperates, as will be described.

In Fig. 1 the various operating parts are shown in their normal position, with the signal set at "danger," the air from the pipes f and g having been permitted to exhaust through the aperture d^3 in the valve-casing. When now it is desired to set the signal to "safety," as to permit the passage of a train, the valve is moved to the position shown in Fig. 3, causing the air or other fluid under pressure to pass from the supply-port d to port d^2, pipe g to the right-hand end of cylinders G and F, and also into the cylinder F to the left of the piston. The greater pressure on the piston G′ will cause the immediate movement of the pistons F′ and G′ to the left, forcing the air contained in the pipe k and the cylinders toward the signal, moving the connected pistons L and M to the left, closing the port q, and, as soon as the piston M has passed beyond the port M^2 in the casing K, admitting pressure through the pipe m to the end of the valve-casing N, driving the valve N′ to the left, and allowing the air to enter the signal-cylinder through the port o and pipes o' and c, throwing the semaphore-arm down to safety position, indicating a clear track, the parts being then in the position shown in dotted lines in Fig. 1 and the operation having been rapidly accomplished, notwithstanding the small area of the pipe k, by reason of the increased pressure brought to bear on the fluid therein by the piston G′ of large area. When it is desired to return the signal to "danger," the valve E is moved to the position shown in Fig. 2, admitting fluid to the pipe f and permitting the exhaust of the fluid from the pipe g. As soon as the valve is turned to this position pressure is admitted to the left end of the cylinder G, causing the rapid movement of the pistons G′ and F′ to the right, the right-hand ends of said cylinders being open to the air through pipes g and h. The backward movement of the pistons is assisted somewhat by the pressure of the fluid in the pipe k from the signal; but the large area of the piston G′ causes a rapid movement of the piston-rod H and a tendency to create a vacuum in the pipe k, causing the signal to be operated quickly. After the piston F′ has passed from over the port j the air from the pipe k is exhausted through pipes h and g. As soon as the pressure is reduced in the pipes k and m the valve N will return to the position in full lines in Fig. 1 and the differential pistons L M will move to the position shown in full lines, cutting off communication with the pipe m and opening the port q to the external air, permitting the exhaust of the fluid from the signal-cylinder and the return of the signal-arm to normal or danger position. After

the signal has been returned to normal position the valve E is preferably returned to the position shown in Fig. 1, with the pressure entirely cut off. This feature of hastening the movement of the distant semaphores or signals by amplifying the pressure for a short space of time to cause their operation in one direction and in creating instantaneously a partial vacuum or suction to operate the signals in the opposite direction is particularly desirable in devices of this general description and constitutes one of the leading features of my invention.

In order that the apparatus may act promptly, it is preferred that the cubic capacity of the cylinder G shall be about equal to the capacity of the pipe *k* between it and the semaphore and also that the cubic capacity of the cylinder G shall be greater than that of F.

It will be understood that instead of employing the differential valves L M and the auxiliary valve N′ at the signal either one could be dispensed with and the other relied upon to open communication with the air when the pressure is cut off or diminished in pipe *k*, or both of these could be dispensed with and the signal actuated directly, as in the Dodgson patent before referred to, and also that the pipe *k* could be continued and two or more signals operated from it, if desired; but I prefer both of the valves shown for the reason that one is a check on the other and it is not necessary to exhaust the air from the semaphore-cylinder *c* to the controlling-valve E each time the signal is to be operated.

I claim as my invention—

1. The combination with a cylinder, a piston operating therein, and an operated device, as a signal, of a reservoir for fluid under pressure, two cylinders of different areas and connected pistons operating therein, a pipe connection between said signal-cylinder and the cylinder having the smaller area, and valve devices and pipe connections for admitting fluid from the reservoir to either side of the piston having the larger area, substantially as described.

2. The combination with an operated device, as a signal, actuated by an increase and decrease of fluid-pressure, and a pipe or conduit leading thereto, of a reservoir for fluid under pressure, two cylinders of different areas and connected pistons operating therein, a pipe or conduit between the smaller cylinder and the operated signal, a passage between one end of the larger cylinder and the opposite end of the smaller cylinder having a port controlled by the smaller piston, a passage between one end of the larger cylinder and the corresponding end of the smaller cylinder, and valve devices and passages for admitting fluid from the reservoir to the opposite sides of the larger piston alternately, substantially as described.

3. The combination with a signal controlled by fluid-pressure, and a pipe or conduit leading thereto, of a reservoir for fluid under pressure, a cylinder, a fluid-forcing piston operating therein, a controlling-valve and passages between the reservoir, cylinder and conduit controlled by said valve for admitting fluid under pressure from the reservoir to the conduit and to one side of the piston, substantially as described.

4. The combination with a signal controlled by fluid-pressure, and a pipe or conduit leading thereto, of a reservoir for fluid under pressure, the cylinders F, G, the former having port *j*, pistons F′, G′, the passages *f*, *g*, *h*, and the valve controlling pipes *f* and *g*, substantially as described.

5. The combination with a reservoir for fluid under pressure, cylinders F and G, connected pistons F′ and G′ pipes *f*, *g* and *h* and the controlling-valve between the reservoir and pipes *f* and *g*, of the pipe or conduit *k*, a signal having a cylinder connected to the pipe *k*, and automatic valve devices between the pipe *k* and cylinder, actuated by fluid-pressure to admit fluid to the signal-cylinder or open the said cylinder to the air, substantially as described.

6. The combination with the signal having the cylinder, the movable piston therein and the pipe *c*, of the pipe *k*, the differential valve having the exhaust-port and the auxiliary valve actuated by fluid-pressure, both said differential and auxiliary valves being located between the pipes *k* and *c*, substantially as described.

7. The combination with the signal having the cylinder, the movable piston therein and the pipe *c*, of the pipe *k*, the differential cylinders having the ports M^2 and *q*, the pistons L and M therein, the auxiliary-valve casing having ports *o* and *p*, the valve N′, and the passages *m*, *n*, *o*′, and pipe *p*′ arranged and operating substantially as described.

8. The combination with a signal-piston, a cylinder in which it operates and a fluid-conduit leading thereto, of a reservoir for fluid under pressure, an engine for positively forcing fluid into the conduit and exhausting it therefrom, a single valve for admitting fluid from the reservoir to the engine to operate it positively in opposite directions and passages also controlled by said valve for governing the supply and exhaust of fluid directly to and from the conduit, substantially as described.

9. The combination with an operated device as a signal, having a cylinder and a movable piston therein, and a conduit leading to said signal-cylinder, of a reservoir for fluid under pressure, a fluid-forcing device or engine connected to the conduit, and a single valve for governing the supply and exhaust to and from the engine and to and from the conduit, substantially as described.

10. The combination with a signal controlled by fluid-pressure, and a pipe or conduit leading thereto, of a reservoir for fluid

under pressure, two cylinders of different areas and connected pistons operating therein, a pipe connection between the signal and the cylinder having the smaller area, and valve devices and pipe connections for admitting fluid from the reservoir to either side of the piston having the larger area and valve devices operating to close communication between the reservoir and conduit, substantially as described.

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