(No Model.)

J. T. HAYDEN.

AIR PUMP GOVERNOR.

No. 513,106. Patented Jan. 23, 1894.

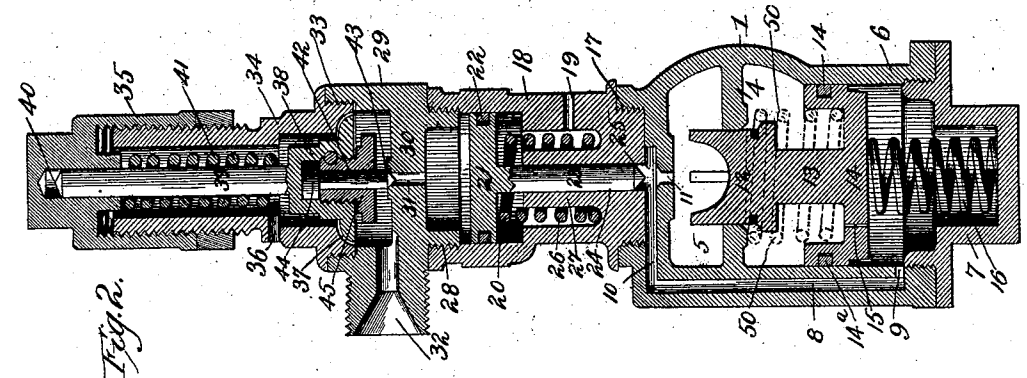

Fig. 2.

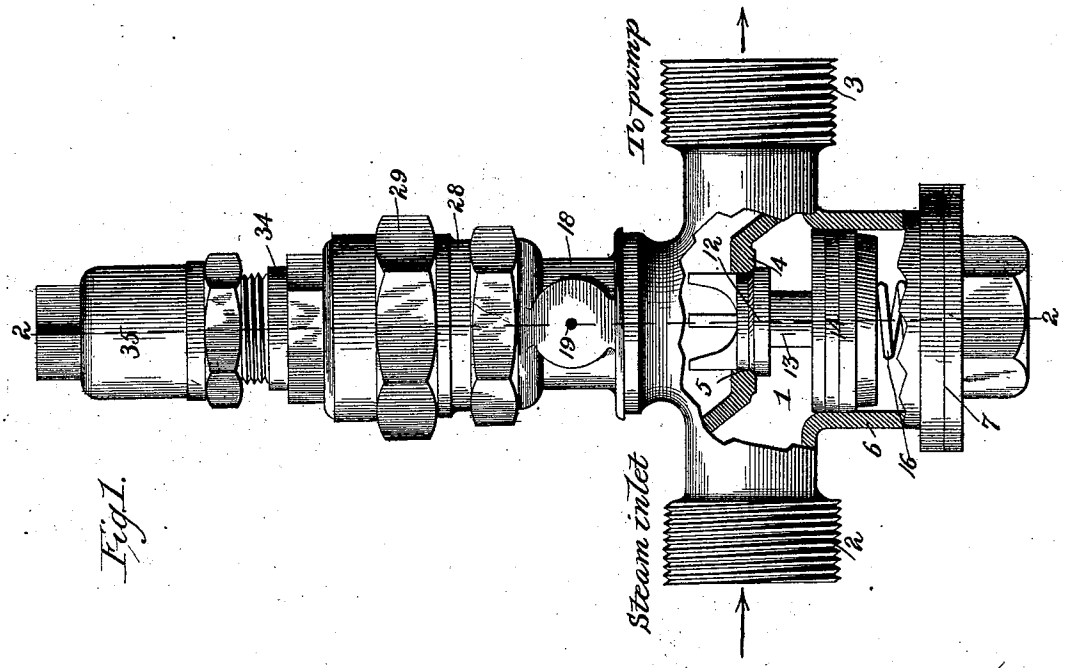

Fig. 1.

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AIR-PUMP GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 513,106, dated January 23, 1894.

Application filed July 22, 1893. Serial No. 481,196. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. HAYDEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Pump Governors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to appliances, known as governors, for automatically arresting the action of air condensers or pumps when such pumps have compressed the air to a predetermined extent, and for automatically starting the pump when the compression of air falls below a predetermined limit; such governors being applicable to the air-brake equipments of rail-way trains and of other vehicles, and also for air compressing or condensing service generally.

The primary objects of my invention are to produce an air-pump governor which shall be simple and durable in its construction and positive and reliable in its action, and which also shall not be liable to derangement of its operative parts. Furthermore to produce an air-pump governor which shall be so constructed that, in the remote contingency of disablement, certain parts of the governor can be readily removed so as to enable the compression-system to continue in operation without impediment by a disabled governor.

To the above purposes, my invention consists in certain peculiar and novel features of construction and arrangement, as hereinafter described and claimed.

The more precise nature of my invention will be better understood when described with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of an air-pump governor embodying my invention; the lower part of the casing being partly broken away to more clearly show the construction of the steam-valve and its seat. Fig. 2 is a transverse vertical section, of the air-pump governor, taken on the line 2—2 of Fig. 1.

In the said drawings 1 designates the shell or casing for the steam-valve of the governor, this shell or casing being preferably (although not necessarily) somewhat globular in form, and being formed at one side with an inlet-nipple 2 and at its opposite side with an outlet-nipple 3. These inlet and outlet nipples are shown as externally screw-threaded, to receive the usual coupling nuts or glands, but they may be of any other desired form, as circumstances may suggest; the inlet nipple 2 communicating with a source of steam supply and the outlet-nipple 3 communicating with the steam-chest of an air-pump.

Within the shell or casing 1 is formed a transverse diaphragm or partition 4 having a central opening or valve-seat 5 and so placed that steam entering through the inlet-coupling 2 must pass through the opening or valve-seat 5 before it can pass to the outlet-coupling 3. The bottom of this casing or shell 1 is formed with a straight downward extending neck 6 the lower end of which is usually closed by a removable cap or plug 7; said cap being shown as screw-threaded into the lower end of the neck. As will appear from the ensuing description of the governor, this removable cap performs an important function in the governor, and I therefore desire it to be understood that the cap may either be screwed into the neck of the casing 1, or that it may surround said neck, or that it may in any suitable manner tightly but removably close an opening in the bottom of the casing.

In one side of the casing 1 is formed a vertical passage or channel 8 the lower end of which communicates, by a short lateral port 9, with the interior of the casing at a point below the diaphragm 4. The upper end of this vertical channel communicates, by a lateral passage or channel 10, and a short vertical port 11, both formed in the top of the casing, with the interior of the casing at a point above the diaphragm 4; the purposes of these channels 8, and 10 and ports 9 and 11 being hereinafter fully explained.

12 designates the steam valve which is of such form and dimensions as, at times, to close the opening or valve seat 5 in the diaphragm 4; the lower margin of the opening 5 being dressed or beveled to form a tight seat for said valve. From the under side of this valve 12 depends a short stem 13 the lower end of which carries a piston 14 which is of greater

diameter than the steam-valve 12 and of such form as to fit closely, but movably, in the neck 6 of the casing 1; the piston being preferably provided with a packing 14^a, as shown, to insure tightness. Moreover, the piston 14 is also formed with a leak passage or channel 15 extending vertically through its body and of comparatively slight diameter; the purpose of this leak-passage being also hereinafter fully explained. A spiral spring 16 is shown in dotted lines as located in the neck 6 and as resting upon the cap 7, this spring tending, by upward pressure against the under side of the piston 14, to raise the valve 12 into closed position.

The top of the casing 1 is formed with an internally screw-threaded opening 17 into which fits the externally screw-threaded lower end of a piston-casing 18; this casing 18 being preferably of tubular form, as shown, and extending vertically upward from the top of the valve-casing 1. At one side this piston-casing 18 is formed with an air-outlet or vent opening 19, and at its upper end, said casing is formed with a piston-chamber 20 within which fits, movably, a piston 21; said piston being preferably provided with a packing 22. From the under side of the piston 21 extends downwardly a stem 23 which is vertically movable in a channel 24 leading vertically downward from the piston-chamber 20 and opening at its lower end into the transverse channel 10 of the valve-casing 1, in precise axial alignment with and above the short vertical channel 11 of said casing 1. The lower extremity of the stem 23 is tapered to form a needle-shaped piston-valve 25 which, when the piston 21 is depressed, finds its seat in the upper end of the short vertical port 11, just referred to. A spiral spring 26 rests upon the bottom of the cylinder-casing 18 and surrounds an internal vertical boss 27, rising from the bottom of the casing (and having the channel 24 formed centrally through it); the spring 26 tending, by upward pressure against the under side of the piston 21, to raise said piston and thus to open its piston-valve 25, for a purpose also to be hereinafter explained.

Into an internally screw-threaded opening 28, at the top or upper end of the piston-casing 18 is fitted the externally screw-threaded and open lower end of a gage-valve casing 29 which is formed with an internal diaphragm or partition 30 having a short vertical channel 31 extending therethrough. At a point above the diaphragm or partition 30 is an air-inlet opening 32 formed laterally through one side of the gage-valve casing 29, and assuming externally the form of a nipple which is to be suitably coupled either to the engineer's air-valve (in the casing of rail-way-train service) or to the train pipe, or to the main reservoir; or, in other situations, to any receptacle for compressed air.

Into the internally screw-threaded upper end 33 of the gage-valve casing 29 is fitted the externally screw-threaded lower end of a gage-spring casing 34, which is preferably of tubular form as shown, rising vertically from the gage-valve casing 29, and externally screw-threaded to receive an internally screw-threaded regulating-cap 35. At one side, near its lower end, the casing 34 is shown as formed with a small lateral outlet or vent opening 36, and the lower end of said casing is cupped or concaved to form a seat 37 for the gage-valve piston 38 which works in a chamber in the upper part of the casing 29. From the gage-valve piston 38 extends upwardly a guide-stem 39 the upper end of which enters a guide recess or socket 40 in the top of the regulating-cap 35, and which is surrounded by a spiral gage-spring 41; said spring being interposed between the top of the cap 35 and the upper side of the piston 38.

From the under side of the gage-valve piston 38 depends the stem 42 of the gage-valve 43; this valve being of the needle type, formed by tapering the lower end of the stem, and finding its seat in the upper end of the short vertical channel 31 before referred to. The stem 42 is shown as having at its upper end a head 44 which enters a recess in the under side of the piston 38 and which is retained in said recess by a plug 45 screwed into the under side of the piston; this construction being, however, of minor importance, although it has the advantage of rendering the gage-valve 43 detachable from its piston.

The operation of the above-described pump-governor is as follows—assuming the air-pump to be in operation, and the air-pressure to be below the predetermined limit (say, seventy-five pounds to the square inch). Such being assumed as the initial working condition, the gage-spring 41 (which is also assumed to be set at say seventy-five pounds) will hold the gage-valve 43 down in its seat, closing the upper end of the channel 31, as shown in Fig. 2, so as to prevent the passage of compressed air therethrough. The spring 26 will, in this event, also retain the piston 21 in elevated position, so as to hold the needle-valve 25 open or out of its seat, as also shown in Fig. 2; thus leaving the short vertical channel 11 open. With the valves 43 and 25 in the position just described the steam-valve 12 will also be open or unseated from the opening 5 in the partition 4 as shown in Fig. 2; the steam at such time flowing freely through the valve-casing 1 and to the pump, and this being the normal working condition of the governor, during the operation of the air-pump. A certain portion of the steam will, meantime flow through the leak-passage 15 of the steam-valve piston 14 and will fill the space below said piston, and will also fill the vertical channels 8 and lateral channels 9 and 10 and passing through the channel 11 will enter the space above the diaphragm or piston 4. As the air-pump continues to operate, it will gradually raise the air-pressure up to the predetermined limit (in this instance, say, seventy-five pounds) and thereupon the compressed air, pressing

upward beneath the piston 38, will raise said piston against its spring 41 (the vent 36 permitting the dead air above the piston to escape) and will open or unseat the gage-valve 43. The compressed air will then be free to flow through the channel 31, and acting upon the piston 21, will force said piston downward against its spring 26, seating the valve 25 in the upper end of the channel 11, and cutting off steam from said channel, the vent-opening 19 permitting the escape of dead air from beneath the piston 21, during the descent of said piston. When the needle-valve 25 is closed, the imprisoned steam in the chamber below the piston 14 and in the passages 8, 9, and 10, reinforced by the steam which continues to flow through the leak-passage 15, quickly equalizes the steam pressure upon the upper side of said piston 14, and thereupon the steam-pressure beneath the steam-valve 12 (acting in conjunction with the spring 16) serves to seat the steam-valve 12 in the opening 5 of the partition 4; thus cutting off steam from the air-pump and so stopping the action of said pump. When, by reason of application of the air-brakes, or from any other sufficient expenditure of the compressed air, the air-pressure again falls below the predetermined limit, the gage-spring 41 will close the gage-valve 43, and the spring 26 will open the piston-valve 25. The steam will now instantly enter the passage 11, and being exhausted through the outlet-nipple 3, to the pump, the superior steam-pressure upon the upper side of the piston 14 will depress said piston and open or unseat the piston-valve 12 so as to permit the steam to flow through the valve casing 1, from the inlet nipple 2 and through the outlet-nipple 3, and thus to again start the pump. The subsequent operations of the governor will be repetitions of those just described.

It is to be observed that by turning the screw-cap 35 in one or the opposite direction, the pressure of the gage-spring 41 upon the piston 38 of the gage-valve 43 can be increased or diminished, so as to correspondingly increase or decrease the limit of air-pressure necessary to raise or open the gage-valve. It is also to be further, and particularly, observed that, in the event of any derangement of the steam-valve and its piston, such valve and piston can be readily removed bodily from the governor, after simply unscrewing the bottom cap 7. This is an important advantage inasmuch as the steam will flow freely to the air-pump after the steam-valve and its piston have been removed and the bottom cap replaced, so that the air-system can be temporarily operated without the governor; the disablement of the governor thus in no way disabling the entire air-system, as heretofore, especially in air-brake systems of railway trains.

I would still further observe that, inasmuch as it is the steam-pressure which primarily raises and lowers the steam-valve piston 14, to seat and unseat the steam-valve, the spring 16 may be dispensed with, if desired. However, for the sake of certainty, it is usually preferable to use the spring 16 to assist the steam in raising the piston 14; and if desired a similar spring 50 (shown in dotted lines in Fig. 2) may also be used to assist the steam in depressing the piston 14; the spring 50 being interposed between the upper side of the piston and the under side of the partition 4 and surrounding the stem 13 of the steam-valve.

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

1. An air-pump governor, comprising a steam-valve casing having a transverse partition provided with a valve-opening and dividing the interior of the casing into a piston-chamber below the partition and a steam-discharge chamber above said partition, a steam-valve having its seat in the lower side of the valve-opening, a piston connected rigidly with the valve and of greater diameter than said valve, and also provided with a leak channel, and a by-pass establishing communication between the piston-chamber and the discharge-chamber, the piston being exposed both above and below to steam-pressure within the piston-chamber, substantially as set forth.

2. An air-pump governor, comprising a steam-valve casing located at the lower end of the governor and having a removable cap for closing its bottom, a removable steam-valve working in said valve-casing, and air-controlled valve-mechanism wholly separate, both operatively and structurally, from the steam-valve, and located above the steam-valve casing and operating to vary the steam-pressure upon the steam-valve, substantially as set forth.

3. An air-pump governor, comprising a steam-valve casing located at the lower end of the governor and having a steam-valve working in said valve-casing and carrying a piston of greater diameter than the steam-valve, steam-channels establishing steam-communication with the valve-chamber above and below the steam-valve and piston respectively, and air-controlled mechanism located above the steam-valve casing and operating to open and close the steam-channels, so as to vary the steam-pressure upon the steam-valve and its piston, substantially as set forth.

4. An air-pump governor, comprising a steam-valve casing forming the lower end of the governor and also provided with a transverse partition having a valve-opening, steam inlet and outlet openings, and steam passages establishing steam communication between the upper and lower parts of the valve-chamber a steam-valve working in said valve-chamber and carrying a piston provided with a leak-channel and of greater diameter than the steam-valve, and air-controlled valve-mechanism located above the steam-valve casing and operating to open and close the

steam-channels of said valve-casing so as to vary the steam-pressure upon the steam-valve and its piston, substantially as set forth.

5. An air-pump governor, comprising a steam-valve casing forming the lower end of the governor and provided with lateral steam channels establishing communication between the upper and lower parts of the steam-valve chamber, a steam-valve working in said valve-chamber and carrying a piston of greater diameter than the steam-valve, an air controlled piston working in a chamber located above the steam-valve casing and carrying a valve for opening and closing the steam-channels of the steam-valve casing, an air-controlled gage-valve piston working in a chamber located above the air-piston chamber and carrying a gage-valve for opening and closing a port leading to the chamber of said air-piston, and a gage-spring pressing upon the gage-valve, substantially as set forth.

6. An air-pump governor, comprising a steam-valve casing forming the lower end of the governor and provided with lateral steam-channels establishing communication between the upper and lower parts of the steam-valve chamber, a spring-pressed steam-valve working in said valve-chamber and carrying a piston of greater diameter than the steam-valve, an air-controlled piston working in a chamber located above the steam-valve casing and carrying a valve for opening and closing the steam-channels of the steam-valve casing, an air-controlled gage-valve piston working in a chamber located above the air-piston chamber and carrying a gage-valve for opening and closing a port leading to the air-piston chamber, an air-inlet opening below said gage-piston and above the gage-valve port, a gage-spring located above the gage-valve piston and pressing thereon, and an adjustable screw-cap pressing upon said gage-spring, substantially as set forth.

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