

J. F. DEEMS.
STEAM CONTROLLING APPARATUS.
APPLICATION FILED DEC. 2, 1912.

1,065,347.

Patented June 24, 1913.

3 SHEETS—SHEET 1.

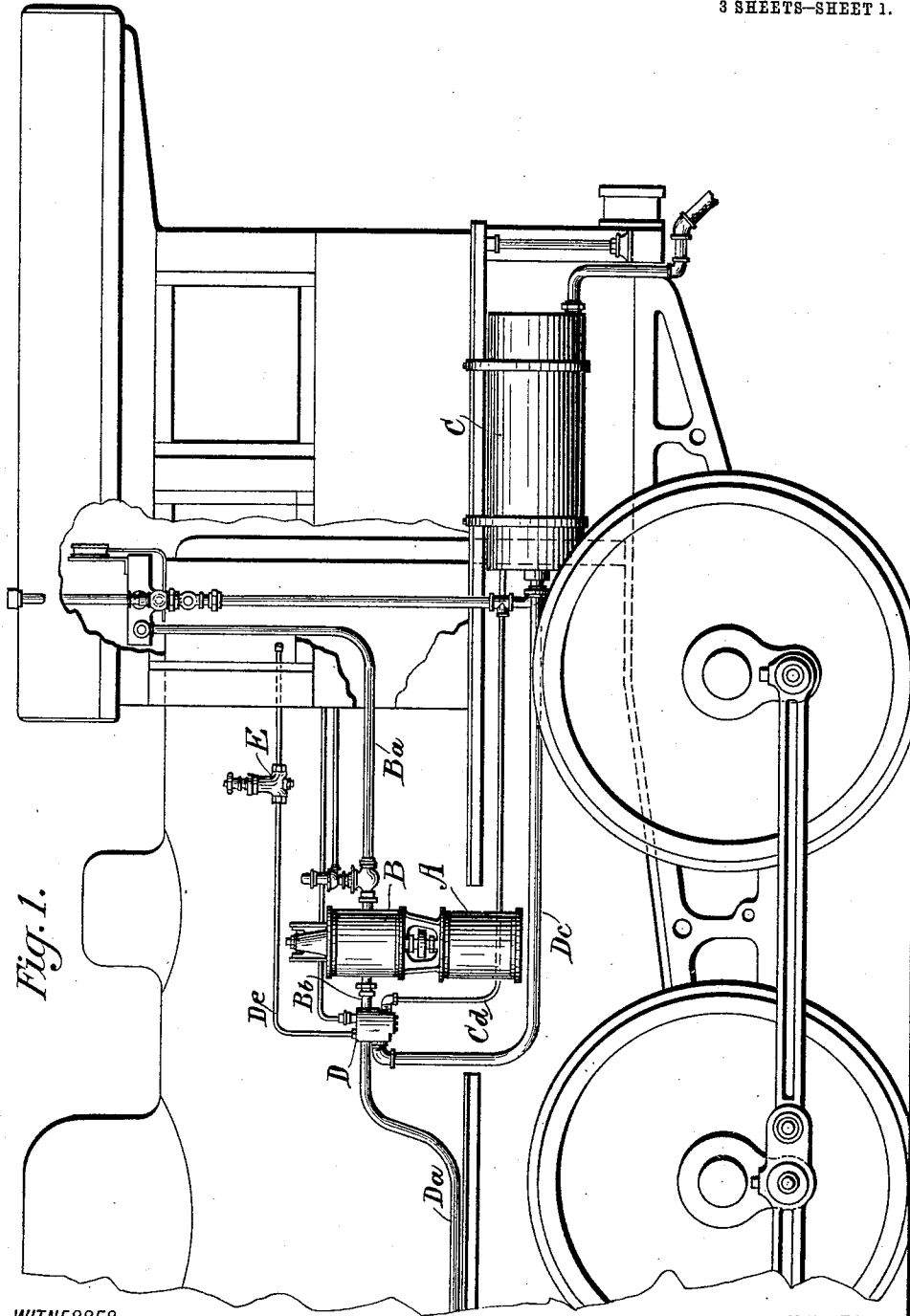


Fig. 1.

WITNESSES

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3 SHEETS--SHEET 2.



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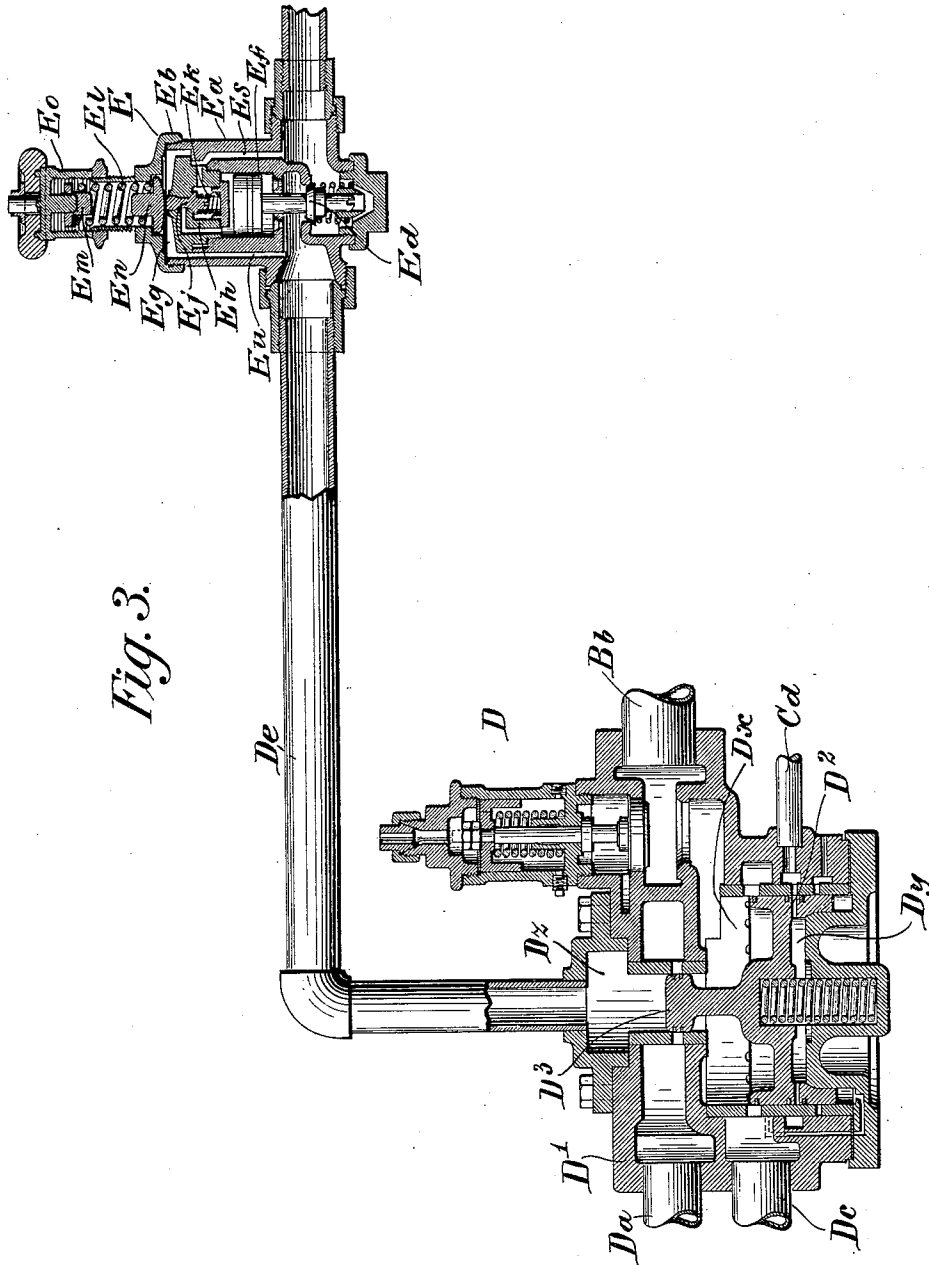


Fig. 3.

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UNITED STATES PATENT OFFICE.

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STEAM-CONTROLLING APPARATUS.

1,065,347.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN F. DEEMS, a citizen of the United States of America, residing in the city of Burlington, in the county of Des Moines, in the State of Iowa, have invented certain new and useful improvements in Steam-Controlling Apparatus, of which the following is a specification.

The invention relates to apparatus for controlling steam and particularly to such as is used on a locomotive whereby the steam exhausted from the engine operating the air pump may be employed for heating and various other purposes.

Heretofore an apparatus comprising a casing having a differential piston therein and a storage tank for receiving the exhaust steam has been constructed so that, due to variations in pressure of the exhaust steam and the steam in the storage tank, the steam exhausted from the air pump during each stroke of the piston thereof will be automatically separated or diverted so that during one portion of the stroke the exhaust steam will flow to the heating system or tank while during another part of the stroke the exhaust steam will flow to the atmosphere dependent upon the position of the differential piston within the casing.

One object of the present invention is to provide such a construction with means whereby the movement or position of the differential piston within the casing is under the control of the engineer or operator.

Another object of the invention is to connect the casing containing the differential piston with the boiler so that steam from the boiler can flow through a reducing valve to the interior of the casing and to a position in which it can press against a member connected to the differential piston or against a portion thereof to assist in the control of the movement or action of said piston.

As showing a specific embodiment of the invention, reference is made to the drawings forming a part of this specification, in which—

Figure 1 shows a partial view of a locomotive provided with an air pump A operated by the direct acting engine B, with a storage tank C and with a device D for regulating the flow of steam exhausted from the air pump engine to either the atmosphere or to the storage tank C dependent upon the

pressure of the steam exhausted from the air pump upon the pressure of the steam in the storage tank and upon the pressure of the steam which flows past the reducing valve E. Fig. 2 is an enlarged view showing the air pump A and engine B therefor, the casing D' of the steam controlling device D partially broken away, the storage tank C and the reducing valve E, all operatively connected together. Fig. 3 is a view showing partially in section the casing D' of the steam controlling device D, the differential piston D² therein and the means comprising the reducing valve E which permits steam to flow from the boiler to the casing and enter the latter at a predetermined reduced pressure.

The air pump engine B is supplied with steam through the pipe B^a and exhausts through the pipe B^b directly into the casing D' of the steam controlling device D. The exhaust steam entering the steam controlling device D is permitted to flow directly to the atmosphere through the normal outlet or pipe D^a or to the storage tank C through the pipe or conducting means D^c dependent upon the position of the differential piston D² shown in section in Fig. 3.

From an inspection of the figure last mentioned it will be noted that the piston D² divides the interior of the casing D' into an upper main compartment D^x and a lower main compartment D^y located on opposite sides of the piston D². The piston D² is also provided with a small plunger member or portion D³ which enters a third or small chamber D^z which is also within the casing. The pipe B^b conducts the exhaust steam from the pump to the upper chamber D^x, and the pipes D^a and D^c conduct the steam from the upper chamber to either the atmosphere or to the storage tank dependent upon the position of the piston D² within the casing D', as has previously been stated. A pipe C^a extends from the storage tank C back to the casing D' and serves as a conduit whereby the pressure within the lower chamber D^y will be the same as that within the storage tank C when the piston D² is in the position shown in Fig. 3. Thus the lower side of the piston when in this position is subjected to the same pressure as that of the steam within the storage reservoir. The steam controlling device D also comprises the pipe D^e which conducts steam from the

boiler to the interior of the small chamber D². This pipe has provided therein the valve E which reduces the steam flowing from the boiler point past the valve to a uniform and desired pressure. It will thus be apparent that the plunger D³ on the differential piston D² will always be subjected to a predetermined pressure dependent upon the adjustment of the pressure regulator or reducing valve E. This valve E comprises the main body E^a, the cap of the main body E^b, the main valve E^c, the piston E^d thereof, the diaphragm E^e, the controlling valve E^f and the controlling valve spring E^g, the latter two of which are located within the controlling valve chamber E^h. The inlet port to the controlling valve chamber is indicated by Eⁱ, and E^j designates the port leading from the diaphragm chamber. At the top of the valve there is an adjusting spring E^k resting at one end on the seat E^l which engages the diaphragm E^e, and at the other end on the seat E^m which is connected to the internally threaded adjustable cap Eⁿ. It will be observed that this cap may be adjusted by the engineer or operator as desired to control the pressure of the steam delivered past the steam reducing valve E just described, and that the pressure of the steam thus delivered is independent of the pressure of the steam within the boiler.

From an inspection of the drawings and from the description above given it will be apparent that the position or operation of the differential piston D² within the casing D¹ is dependent upon the pressure of the steam within the upper main compartment D^x, of the steam within the lower main compartment D^y and of the steam within the small compartment D^z. As, however, the reducing valve E comprises the spring E^k whose tension can be varied by the engineer adjusting the cap Eⁿ, the pressure of the steam within the chamber D^x can be controlled as desired, and consequently the position or operation of the differential piston is made dependent upon the adjustment of the reduction valve as well as upon the pressure of the exhaust steam flowing through the casing D¹ and the pressure of the steam within the storage tank or steam receiving means C.

It is apparent that any suitable form of reducing valve other than that shown may be utilized and also that the improvements herein set forth are not limited to the precise construction and arrangement shown and described, as they may be embodied in various forms and modifications without departing from the spirit and scope of the invention.

I claim:

1. In a locomotive, the combination with the boiler, of an air pump operated by a direct acting engine, a storage tank for re-

ceiving steam exhausted from the air pump engine, and a device for automatically controlling the flow of steam from said engine to the atmosphere or to the storage tank, said device being connected to the air pump and storage tank and comprising a differential piston which is subjected on one side to said exhaust steam and on the other side to the pressure of the steam in the tank and also comprising means for conducting steam from the boiler to a position where it can act upon a member on the differential piston so as to assist in controlling the position of the latter, said last mentioned means being provided with a valve for reducing to a predetermined pressure the steam that flows past the valve.

2. In a steam heating apparatus the combination with an air pump having a direct acting engine, of a casing with a differential piston therein for controlling the flow of steam to the atmosphere or to a storage tank, of the storage tank above referred to and steam conducting means comprising a regulating valve which reduces to a constant pressure the steam that flows past the regulating valve, the casing being provided with an inlet for receiving the steam exhausted from the air pump engine, with an outlet that permits steam to escape to the atmosphere, with an outlet through which steam passes on its way through a conduit leading to the storage tank, with an opening through which steam can pass to the interior thereof after it has flowed through a conduit leading from the storage tank to the casing so as to subject one face of the differential piston to the pressure of steam in the storage chamber, the other face of the piston being directly engaged by steam exhausted from the air pump engine as it flows through the steam controlling device, and with an opening through which steam from the steam conducting means which comprises the pressure regulating valve can flow after it has passed said regulating valve to a position where said steam can engage a portion of the differential piston.

3. The combination of means for diverting the flow of steam and means comprising a pressure regulating valve connected thereto, said steam diverting means comprising a casing having a differential piston therein, said casing being provided with an inlet and two outlet openings through and from one of which the steam can flow dependent upon the position of the differential piston, a return opening and an opening for permitting the steam to enter the interior of the casing after it has passed the reducing or regulating valve, the differential piston being arranged so that the steam entering the casing through the inlet opening can directly engage one face of the differential piston prior to its escape from one of

the outlet openings, the return opening being arranged so that steam can flow into the chamber and engage the other side of the differential piston, the differential piston also being provided with a portion movable therewith and directly engaged by the steam which is permitted to enter the casing after it has passed the reducing valve.

4. The combination with an air pump which delivers its exhaust steam to a steam controlling device, of said steam controlling device comprising a differential piston for regulating the flow of steam from either a normal outlet or to a conduit leading to a steam receiving means, and said steam receiving means, said device comprising a reducing valve for supplying steam to the interior thereof after passing the reducing valve, said differential piston being subjected on one side to the exhaust steam flowing through the controlling device and on the other side to the pressure of steam in the receiving means, said piston being also subject to the pressure of the steam which is supplied to the interior of the device after passing the reducing valve.

5. The combination of an air pump engine, a storage tank, means for controlling the flow of steam exhausted from the air pump engine to either the atmosphere or to the storage tank and means comprising a reducing valve for conducting steam from any suitable source of supply to the steam controlling means, said steam controlling means comprising a casing having therein a differential piston which divides the interior of the casing into an upper chamber and a lower chamber, said casing being connected by a pipe or conduit to the air pump engine so that steam can be supplied from the latter to the interior of the upper chamber, said casing also being provided with another pipe or conduit leading from the interior of the upper chamber to the storage tank, a third pipe or conduit leading from the storage tank to the interior of the lower chamber, the differential piston also being provided with a small plunger provided above the same in a chamber for receiving steam from the means comprising the reducing

valve, the parts being so constructed and arranged that the steam which enters the casing after it has passed the reducing means, the steam which is flowing from the air pump engine and the steam which is within the reservoir or storage tank can operate on the differential piston whereby the latter can regulate the flow of steam directly to the atmosphere or to the storage tank.

6. A steam controlling device comprising in combination a casing having therein a differential piston which divides the interior of the casing into an upper main compartment and a lower main compartment on opposite sides of the piston, said piston also being provided with a portion or member which is engaged by a yielding medium, the casing being provided with an inlet opening leading to the upper main chamber, with two outlet openings leading from said main upper chamber, with a return opening leading to the lower main chamber and having connected thereto means adjustable from the exterior of the casing for regulating the pressure of the yielding medium against the portion or member engaged thereby.

7. A steam controlling device comprising in combination a casing having a differential piston which divides the interior of the casing into upper and lower chambers on opposite sides of the piston, the piston also being provided with a portion or member which enters a third or small chamber also within the casing, said casing provided with one inlet and two outlet openings leading respectively to and from the upper chamber, with a return opening leading to the interior of the lower chamber, and means for conducting steam to the interior of the third or small chamber, said means comprising a pressure regulating valve adjustable from the exterior to regulate the pressure of steam delivered past the same.

This specification signed and witnessed this 23d day of November, A. D. 1912.

JOHN F. DEEMS.

Signed in the presence of—

G. McGRANN,
EDWIN A. PACKARD.