Feb. 14, 1933. E. A. RUSSELL 1,897,215

VAPOR REGULATOR AND MEANS FOR SUPPORTING SAME

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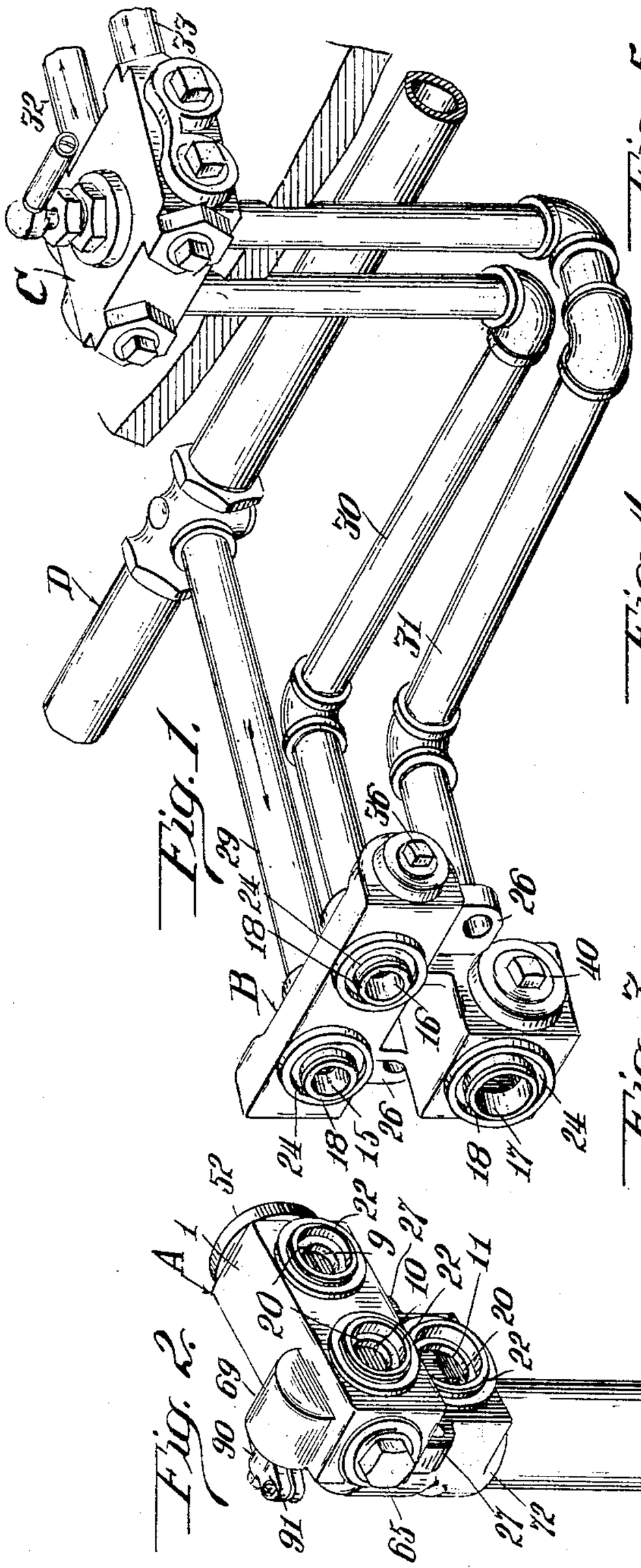

Fig. 1.

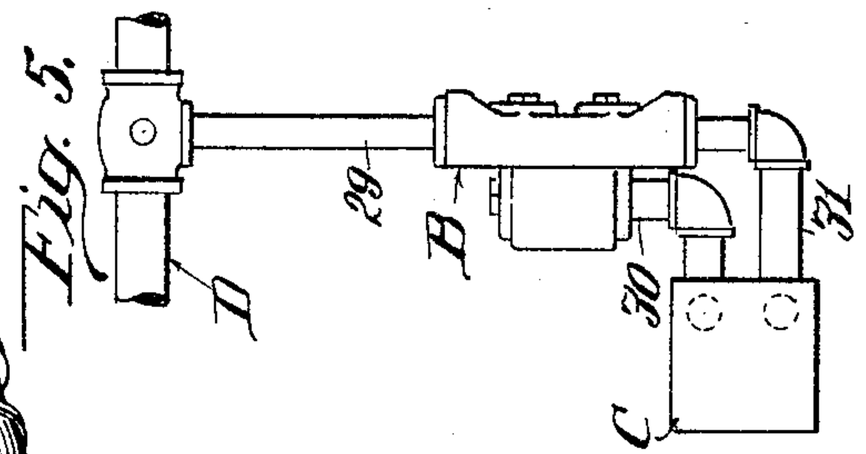

Fig. 5.

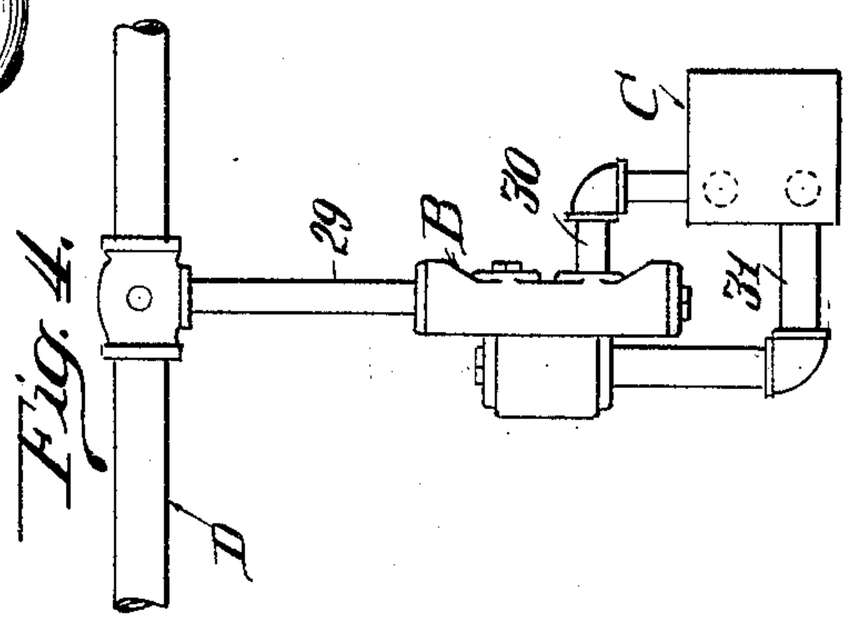

Fig. 4.

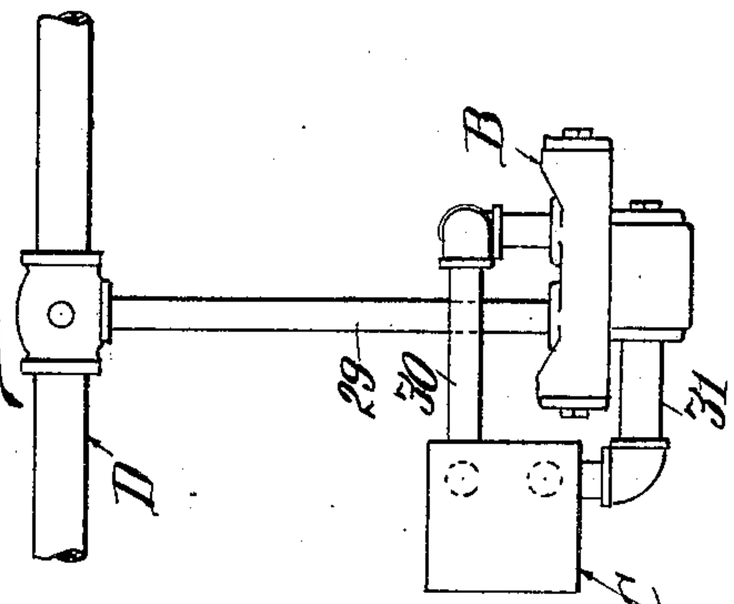

Fig. 3.

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Fig. 6.

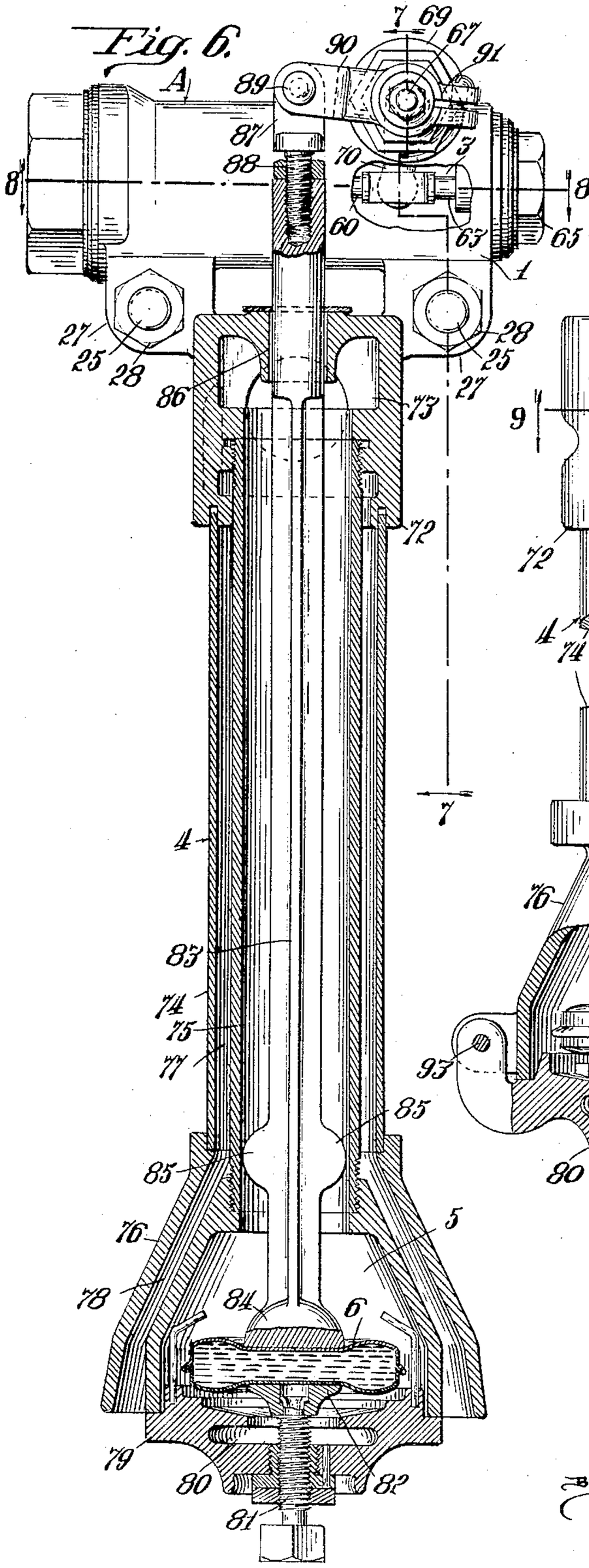

Fig. 7.

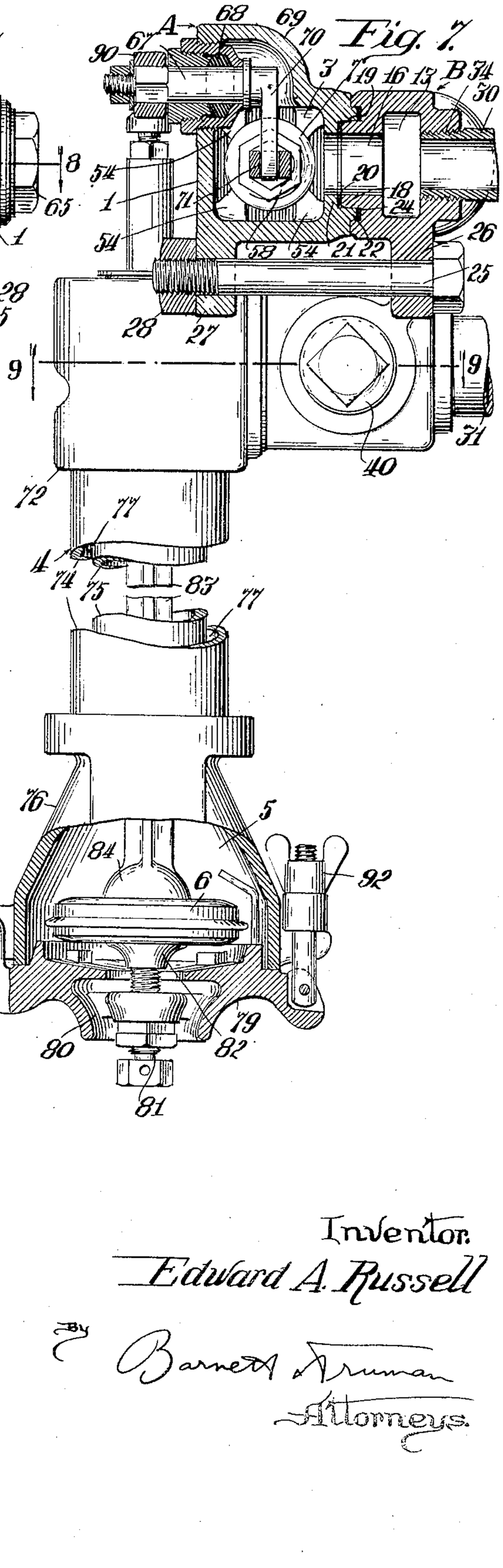

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Fig. 9.

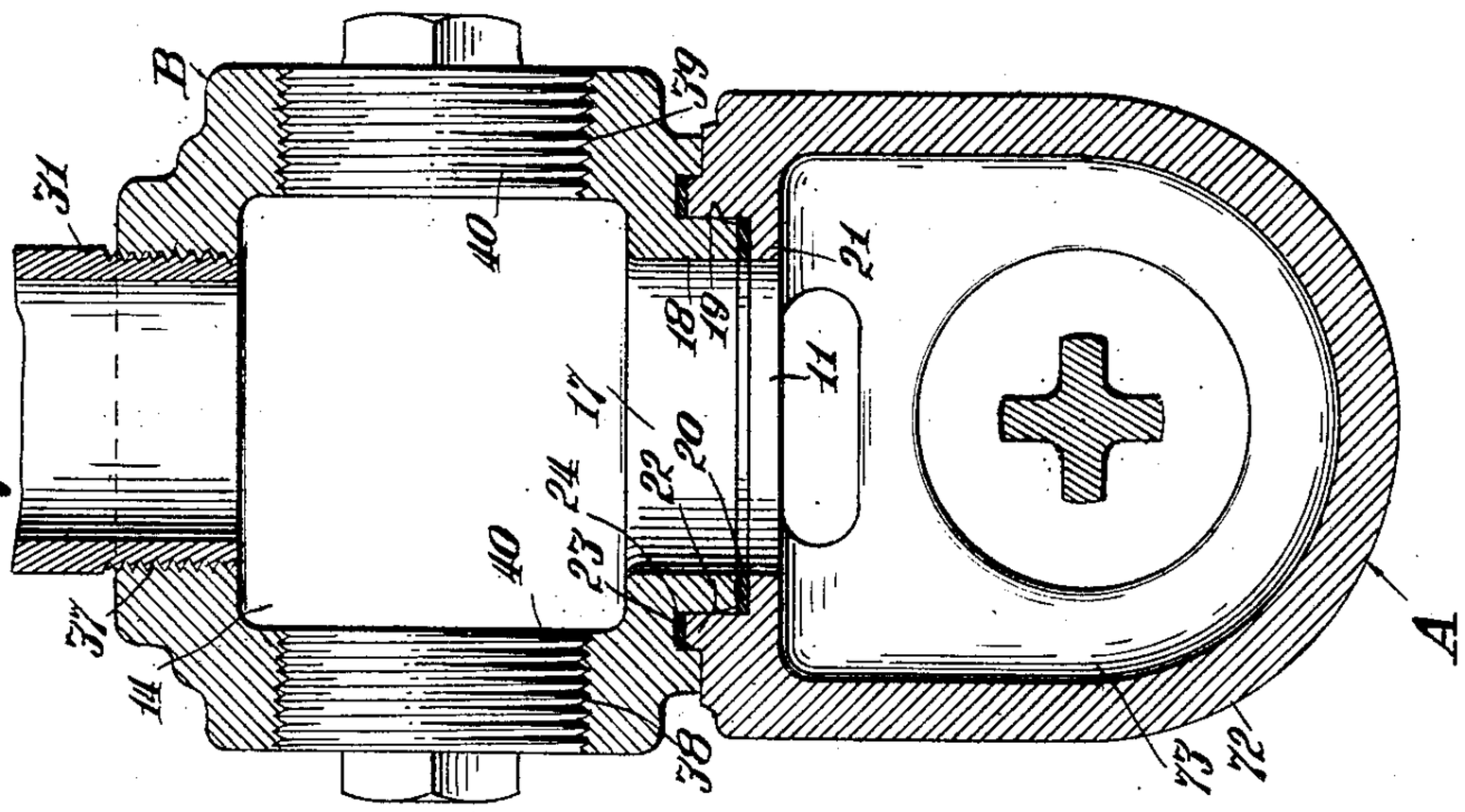
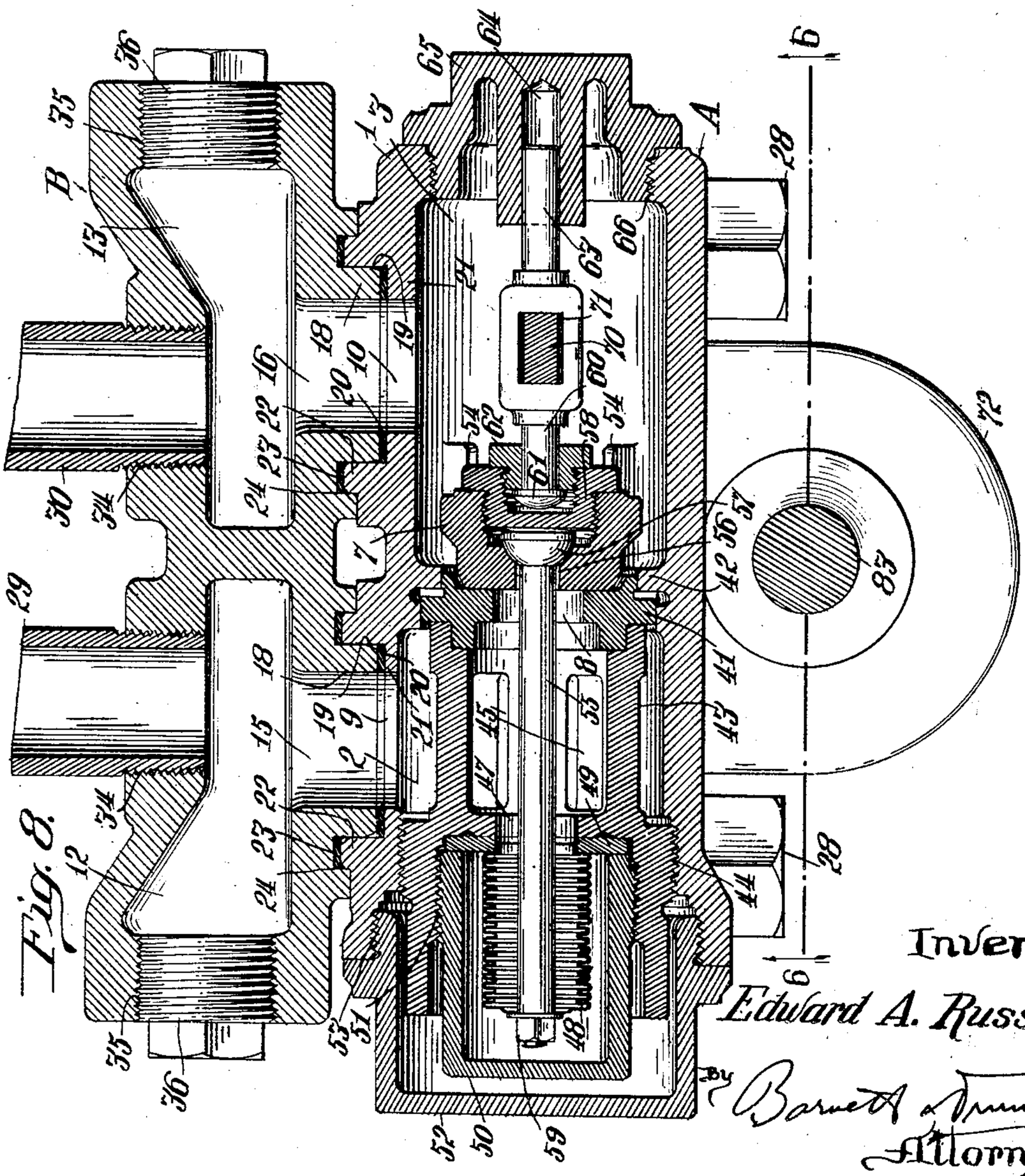


Fig. 8.



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Patented Feb. 14, 1933 1,897,215

UNITED STATES PATENT OFFICE

EDWARD A. RUSSELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO VAPOR CAR HEATING COMPANY, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF NEW YORK

VAPOR REGULATOR AND MEANS FOR SUPPORTING SAME

Application filed April 3, 1931. Serial No. 527,456.

This invention relates to certain new and useful improvements in a vapor regulator and means for supporting same. In steam or vapor heating systems for railway cars, a vapor regulator is customarily used for controlling the supply of steam to the radiators of the heating system. This regulator embodies a thermostatically operated valve, past which the steam must flow from the source of supply to the radiating system. This valve is controlled by a thermostatic element housed in a chamber to which steam flows from the radiators, when the radiators are completely filled with steam. The expansion of this thermostatic element closes the valve to cut off further flow of steam to the radiators.

It is sometimes desirable or necessary to remove the vapor regulator for purposes of replacement or repair, and since there are at least three separate pipe connections leading to the regulator, this is ordinarily a rather laborious process. According to the present invention, a supporting member or block is provided with which the pipe connections are permanently made, and the vapor regulator unit is easily detachable from this supporting member. The improved supporting member is provided with a plurality of pipe fitting connections so that the member may be mounted in almost any desired position and conveniently connected with pipes leading from a variety of different directions.

The general object of this invention is to provide an improved vapor regulator and means for supporting same, such as briefly described hereinabove and disclosed more in detail in the specifications which follow.

Another object is to provide an improved means for detachably supporting and providing fluid connections with a vapor regulator.

Another object is to provide improved means for supporting a vapor regulator and providing fluid connections therewith, said means being provided with universal pipe connections so that it may be mounted in a plurality of different positions.

Other objects and advantages of this invention will be more apparent from the following detailed description of one approved form of apparatus embodying the principles of this invention.

In the accompanying drawings:

Fig. 1 is a perspective view of the improved supporting member and the distributing pipe connections therewith.

Fig. 2 is a perspective view of the improved vapor regulator. While the vapor regulator shown in Fig. 2 has been detached from the supporting member shown in Fig. 1, the regulator and supporting member are shown in sufficiently contiguous positions to make apparent the cooperating connections therebetween.

Figs. 3, 4 and 5 are three substantially diagrammatic views showing alternative positions in which the regulator supporting member can be mounted.

Fig. 6 is a vertical section through the vapor regulator, the view being taken substantially on the line 6—6 of Fig. 8.

Fig. 7 is a side elevation of the vapor regulator, parts being broken away, and the upper portion being shown in vertical section, taken substantially on the line 7—7 of Fig. 6.

Fig. 8 is a horizontal section, on a larger scale, taken substantially on the line 8—8 of Fig. 6.

Fig. 9 is a horizontal section taken substantially on the line 9—9 of Fig. 7.

The improved vapor regulator is indicated generally at A, the supporting member at B, while C indicates the distributing valve for controlling the flow of steam or vapor through the radiator, and D indicates the main train pipe through which steam is supplied from the locomotive or other source.

The improved vapor regulator will be hereinafter described more in detail, but for the present it will be sufficient to state that this regulator comprises a head 1, in which are formed an inlet chamber 2 and an outlet chamber 3. A housing 4 depending from the head 1, has a return chamber 5 in its lower portion, in which is mounted the thermostatic element 6. A valve 7 controls the passage 8 leading from inlet chamber 2 to outlet chamber 3. Inlet port 9 and outlet

port 10 lead respectively into the inlet and outlet chambers 2 and 3, and a return port 11 leads through certain passages to the return chamber 5. The ports 9, 10 and 11 are all positioned adjacent one another in one side of the head 1, so as to conveniently make connection with corresponding ports in the supporting member B, as hereinafter described. In the general operation of this vapor regulator, steam enters inlet chamber 2 through port 9 from the source of supply, then passes through passage 8 into outlet chamber 3, and through outlet port 10 and suitable connections to and through the radiator. The return from the radiator connects with port 11, and when the radiator has become filled with steam or vapor, this steam flowing into return chamber 5 will expand the thermostatic element 6 and through suitable connections, hereinafter described, move the valve 7 to close the passage 8 and cut off the further flow of steam to the radiators.

The supporting member B may conveniently be made as a single casting formed with the entirely separated inlet and outlet chambers 12 and 13, respectively, and return chamber 14. Ports 15, 16 and 17 lead respectively into the chambers 12, 13 and 14, and these ports are all formed in one face of the casting and are adapted to mate respectively with the ports 9, 10 and 11 of the vapor regulator, when the regulator A is connected with and supported from the member B, as shown in Figs. 6 to 9 inclusive. Each of the ports 15, 16 and 17 is provided with a projecting cylindrical nipple 18 adapted to project into the cylindrical passage 19 of the corresponding port in head 1 of the vapor regulator and seat against a gasket 20 positioned against an annular shoulder 21 surrounding this port. A similar annular nipple 22, of larger diameter, is formed on the port of the regulator and seats against a gasket 23 at the bottom of an annular channel 24 surrounding the port in supporting member B. In this manner, a doubly sealed steam-tight joint is formed around each steam passage between supporting member B and regulator A, when the members are joined, as shown in Figs. 6 to 9 inclusive. The members A and B may be secured together in any suitable manner. As here shown, bolts 25 extend through ears 26 formed on supporting member B, and ears 27 formed on head 1 of the regulator A, and the members A and B are forced tightly together to establish the steam-tight connections by screwing the nuts 28 on the threaded ends of bolts 25. It will be apparent that by simply removing the two bolts 25, the vapor regulator A can be removed as a unit from the supporting member without disturbing any of the pipe fittings, hereinafter described.

Steam from main train pipe D flows through inlet pipe 29 into chamber 12 of supporting member B and thence through the valved passage of the vapor regulator and back into chamber 13 of member B. From chamber 13, the steam flows through supply pipe 30 to the distributing valve C. Steam, condensate or other fluids are returned from valve C through return pipe 31 to chamber 14 of supporting member B, and thence through ports 17 and 11 into and through return chamber 5 of the vapor regulator. The distributing valve C is of the usual type, and when in open position the steam entering the valve from pipe 30 will flow through the radiating loop, indicated by pipe connections 32 and 33, and thence back from the valve C through pipe 31. When valve C is in closed position, steam will be shunted directly from pipe 30 to pipe 31 and the radiating loop will be cut off from the source of steam supply.

Threaded passages 34 lead through the rear walls of chambers 12 and 13 in member B, and similar threaded passages 35 lead through the end walls of casting B into these chambers 12 and 13. As shown in Figs. 1, 7 and 8, the pipes 29 and 30 are connected into the threaded openings 34 in the rear of casting B, and the openings 35 in the ends of the casting are closed by screw plugs 36. Similarly, a threaded passage 37 leads into the rear of chamber 14 and similar threaded passages 38 and 39 lead through the two end walls of this chamber. As shown in Figs. 1, 7 and 9, the return pipe 31 is threaded into opening 37 and the two alternative openings 38 and 39 are closed by screw plugs 40. It will now be apparent that the distributing pipes 29, 30 and 31 may be alternatively connected with any one of the threaded openings leading into chambers 12, 13 and 14, the openings not so used being closed by the screw plugs 36 and 40. In this way the supporting member B may be mounted in a plurality of different positions with respect to the connecting pipes, as illustrated by the examples shown in Figs. 1, 3, 4 and 5. If desired, means may be provided for supporting the member B directly from the frame-work or body of the car, or the supporting member B may be carried directly by the pipes with which it is connected. In any case, the supporting member B remains permanently in place on the car, but the vapor regulator A may be easily removed and replaced without in any way disturbing the supporting member B or the pipe-fittings connected therewith.

The improved vapor regulator A will now be described more in detail. A valve-seat ring 41, in which is formed the steam passage 8, is seated against an annular shoulder 42 formed between chambers 2 and 3, by means of the hollow cylindrical cage 43, which is screwed at 44, into the open end of chamber 2. Cage 43 is provided with a plurality of passages 45 to permit the free flow

of steam therethrough. The end of cage 43 opposite valve passage 8 is formed with opening 47, and a flexible corrugated metallic diaphragm or bellows 48 is secured at its inner end to an annular plate 49, which is held against the outer end of cage 43 by means of a bonnet 50, screwed into the cage at 51. An outer bonnet 52, screwed into the head 1 at 53 closes the opening in this end of the regulator.

The valve 7 is positioned within the low pressure outlet chamber 3, and is adapted to seat against ring 41 to close the steam passage 8. Valve 7 is movable toward or from its seat between the guide ribs 54. A valve stem 55 projects through an opening 56 formed in valve 7, and is provided with an enlarged hemispherical head 57, which bears against a correspondingly spherically curved seat in the valve member. A plug 58 is screwed into the opening in valve 7 above the head 57, so as to seal the passage and prevent the flow of steam through the valve member. At the same time, a certain limited rocking adjustment is permitted between valve stem 55 and valve 7. The valve stem 55 projects through the valve passage 8 and through the aligned opening 47 in the opposite end of cage 43, thence through the flexible bellows 48, and the outer end of this bellows is sealed to the valve stem in any suitable manner, as indicated at 59.

It will now be apparent that this flexible bellows 48 forms a portion of the enclosing wall of relatively high pressure inlet chamber 2. The bonnets 50 and 52 are suitably perforated, so that atmospheric pressure will exist in the space outside of bellows 48, and it will be apparent that the higher pressure existing in chamber 2 will tend to expand this bellows and pull valve stem 55 toward the left (Fig. 8), thus moving valve 7 to closed position against the seat 41. On the other hand, the higher pressure existing in chamber 2 tends to open valve 7, this being partially resisted by the substantially atmospheric pressure existing in outlet chamber 3. By properly proportioning the diameters of steam passage 8 and expansible bellows 48, the relative pressures exerted on valve 7 tending to move same respectively toward and from closed position, may be so varied that a pressure differential of any desired magnitude may be provided, tending to either open or close the valve. This pressure differential exerted on valve 7 will be constant, regardless of any variations in pressure of the steam supply with which chamber 2 is in communication. In the example here shown, the parts are so designed and proportioned that there will be a constant fluid pressure differential tending to open valve 7. It will be apparent, however, that the parts can be so designed that this constant pressure differential will tend to hold the valve closed.

In order to positively move the valve 7 in opposition to the pressure differential thus established, a valve stem 60 is positioned in the outlet chamber 3, this valve stem having a head 61 on one end and projecting through a nut 62 screwed into an opening in nut 58, previously described. The opposite end 63 of valve stem 60 is guided in a passage 64 formed in the bonnet or plug 65, screwed at 66, into the opening in the end of chamber 3. A rock-shaft 67 is journaled in a stuffing box 68 mounted in an upper extension 69 of the chamber 3. A crank arm 70 formed on the inner end of rock shaft 67 projects down through a slot 71, formed in an intermediate portion of valve stem 60. It will now be apparent that as the rock shaft 67 is oscillated in one direction or the other, it will, through crank arm 70, reciprocate valve stem 60 and thereby move valve 7 toward or from its seat.

A downwardly projecting extension 72 of the head 1 encloses a chamber 73, into which the return port 11 leads. An outer tube 74 and a concentric inner tube 75 extend downwardly from member 72 to a bell-shaped casting 76 in which thermostat chamber 5 is formed. The inner tube 75 is threaded at its upper and lower ends so as to support the lower casting 76 from the upper casting 72, and the outer tube 74 fits recesses in the respective upper and lower members so as to be held in coaxial relation with inner tube 75 with an annular space 77 therebetween. The condensate flowing in from the heating system through port 11 drains down through the annular space 77 and out through drain passages 78 formed in the lower casting 76. The greater portion of the returned steam or hot gases flow down through the inner tube 75 into thermostat chamber 5. A closure member 79 is removably secured to the lower end of housing 76 so as to substantially close the thermostat chamber 5, except for a restricted outlet passage 80, through which condensate may drain and excess gases flow out. An adjusting screw 81 mounted in said closure member 79 carries at its upper end a head or rest 82, upon which is supported the expansible thermostatic disc 6. An operating rod 83, which extends up vertically through the inner tube 75, is formed at its lower end with a head 84 which rests upon the upper wall of thermostatic disc 6. A plurality of rounded projections 85 are formed on the respective sides of rod 83, so as to loosely guide and center this rod for its vertical movement through inner tube 75, without materially interfering with the flow of fluid through tube 75 into chamber 5. The upper end of operating rod 83 projects through a slide bearing 86, formed in the top of housing 72, and a pivot-eye 87 adjustably mounted by screw 88 in the

upper end of rod 83 is pivoted at 89 to the outer end of a crank arm 90 clamped at 91 on the outer end of rock shaft 67. It will now be apparent that when the thermostatic disc 6 expands, the operating rod 83 will be moved vertically upward, thus through crank arm 90 oscillating rock shaft 67, which will, through crank arm 70 and stem 60, move valve 7 against its seat 41 to close the stem passage 8.

Before the radiating system has become filled with steam, the pressure differential exerted by the higher pressure steam in chamber 2, serves to open valve 7 and permit steam to flow through passage 8 into chamber 3 and thence into and through the radiators. When the radiating system has become filled with steam, so that excess steam flows back through the passages hereinabove described, and into thermostat chamber 5, the thermostat 6 will be heated and will expand thereby lifting rod 83 and through the connections previously described, moving valve 7 to closed position so as to cut off the further flow of steam from chamber 2 into chamber 3. As the steam condenses, thermostatic disc 6 will cool off and contract, thus permitting the pressure differential to again open valve 7 and admit additional steam to the radiating system.

While the steam or vapor in the radiating system is intended to operate at substantially atmospheric pressure, there may be considerable variation in the pressure of the steam supplied from train pipe D into and through the inlet chamber 2. However, by means of the compensating bellows 48 and associated parts, as already described, only a substantially constant pressure differential tending to move valve 7 in one direction will always be effective, regardless of any changes in the absolute pressure of the steam in chamber 2. This pressure differential, which may be a relatively small force, is all that must be opposed by the thermostatic disc in its valve closing operation, so that this disc need not be very powerful.

It will be noted that this improved vapor regulator is very simple, the parts are all very accessible, and when once given a proper initial adjustment, needs no further adjustment even though the steam pressures in the system may vary considerably. By simply unfastening the thumb-nut 92 and swinging the closure 79 downwardy about its pivot 93, the thermostatic disc 6 may easily re removed and replaced. The entire vapor regulator assembly can be removed as a unit by simply removing the nuts 28 on bolts 25. All of the parts of the valve mechanism in head 1 are accessible by removing the end bonnets 50, 52 and 65. The supporting member B is a very simple casting which needs no further attention when once mounted in proper position and may be left permanently in place. The alternative pipe connections provided in this casting permit the supporting member to be mounted in a plurality of alternative positions and permit the connecting piping to be led away in a variety of different directions.

The compensating or balancing feature of the vapor regulator herein disclosed is claimed in the copending application of Edward A. Russell, Serial No. 567,891, filed October 9, 1931, which forms a continuation in part of the present application.

I claim:

1. A supporting member adapted to support and make fluid distributing connections with a vapor regulator, said member being formed with inlet, outlet and return chambers, ports in one wall of said member communicating respectively with said chambers and adapted to register with similar ports in the regulator when the regulator is connected with and supported from the member, there being threaded openings leading into the chambers with which the respective distributing pipes are connected.

2. A supporting member adapted to support and make fluid distributing connections with a vapor regulator, said member being formed with inlet, outlet and return chambers, ports in one wall of said member communicating respectively with said chambers and adapted to register with similar ports in the regulator when the regulator is connected with and supported from the member, there being a plurality of threaded openings leading into more than one side of each chamber with which distributing pipes may be alternatively connected, and plugs for closing the openings with which no pipes are connected.

3. Means for connecting a vapor regulator with the distributing pipes of a vapor heating system, comprising a supporting member with which said distributing pipes are connected and provided with ports communicating with said pipes respectively, said vapor regulator having ports corresponding to the ports in said supporting member, and means for detachably securing said regulator to said supporting member with said corresponding ports in register with each other.

4. Means for connecting a vapor regulator with the distributing pipes of a vapor heating system, comprising a supporting member with which said distributing pipes have permanent threaded connections and which are provided with ports communicating with said pipes respectively, said vapor regulator having ports corresponding to the ports in said supporting member and means for detachably securing said regulator to said supporting member with said corresponding ports in register with each other.

5. Means for connecting a vapor regulator with the distributing pipes of a vapor heat-

ing system, comprising a supporting member with which said distributing pipes are connected and provided with ports communicating with said pipes respectively, said vapor regulator having ports corresponding to the ports in said supporting member, and means for detachably securing said regulator to said supporting member with said corresponding ports in register with each other, said regulator and supporting member being formed around said ports with inter-engaging nipples and recesses into which said nipples fit to provide steam tight joints.

6. Means for connecting a vapor regulator with the supply pipes and return pipe of a vapor heating system, comprising a supporting member to which said supply pipes and said return pipe have threaded connections and which is formed with ports communicating with said pipes respectively, said vapor regulator having ports adapted to register with the ports of said support respectively, and means for detachably securing said regulator to said supporting member, said regulator and support being provided with meeting faces formed around said ports with inter-engaging nipples and recesses into which said nipples fit to provide steam-tight joints at these places.

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