Jan. 2, 1923.

1,440,673

H. G. GEISSINGER.

HEATING SYSTEM.

ORIGINAL FILED SEPT. 9, 1918.

5 SHEETS-SHEET 1

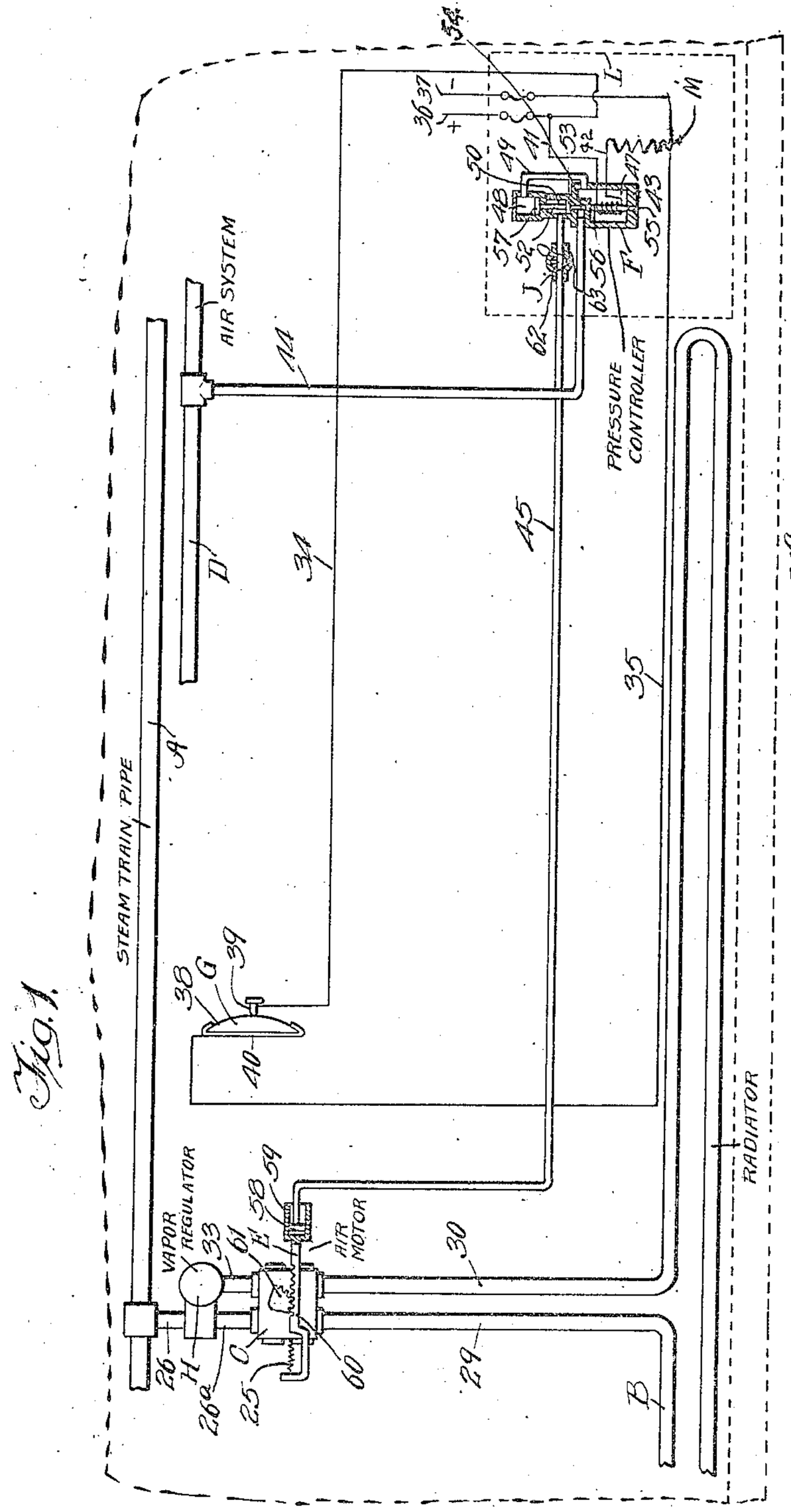

Fig. 1.

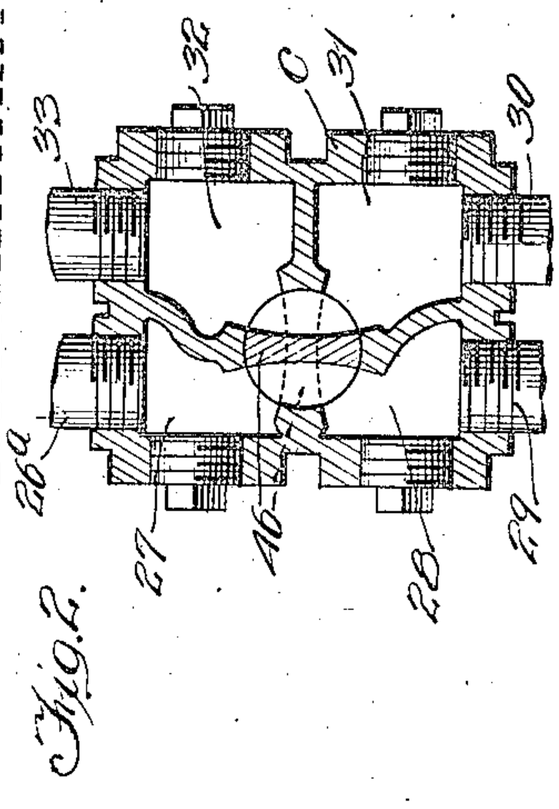

Fig. 2.

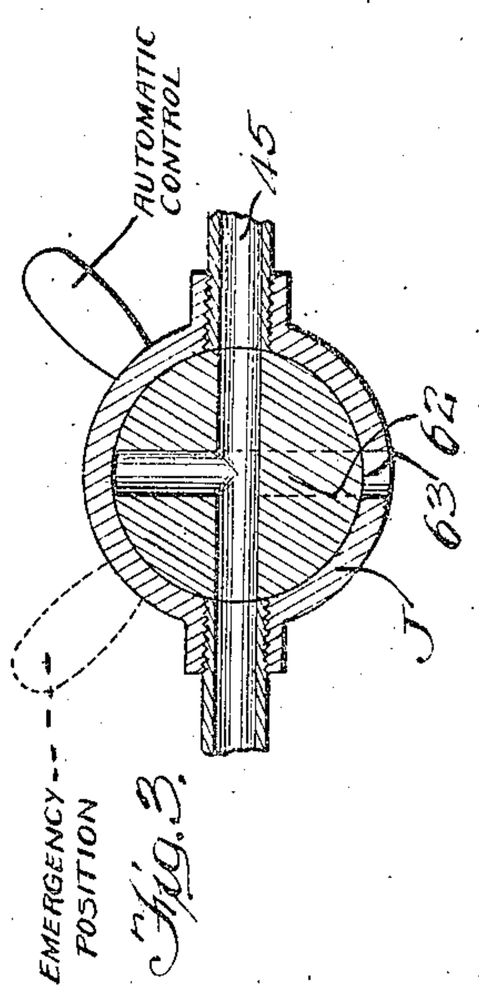

Fig. 3.

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5 SHEETS-SHEET 2

Fig. 4.

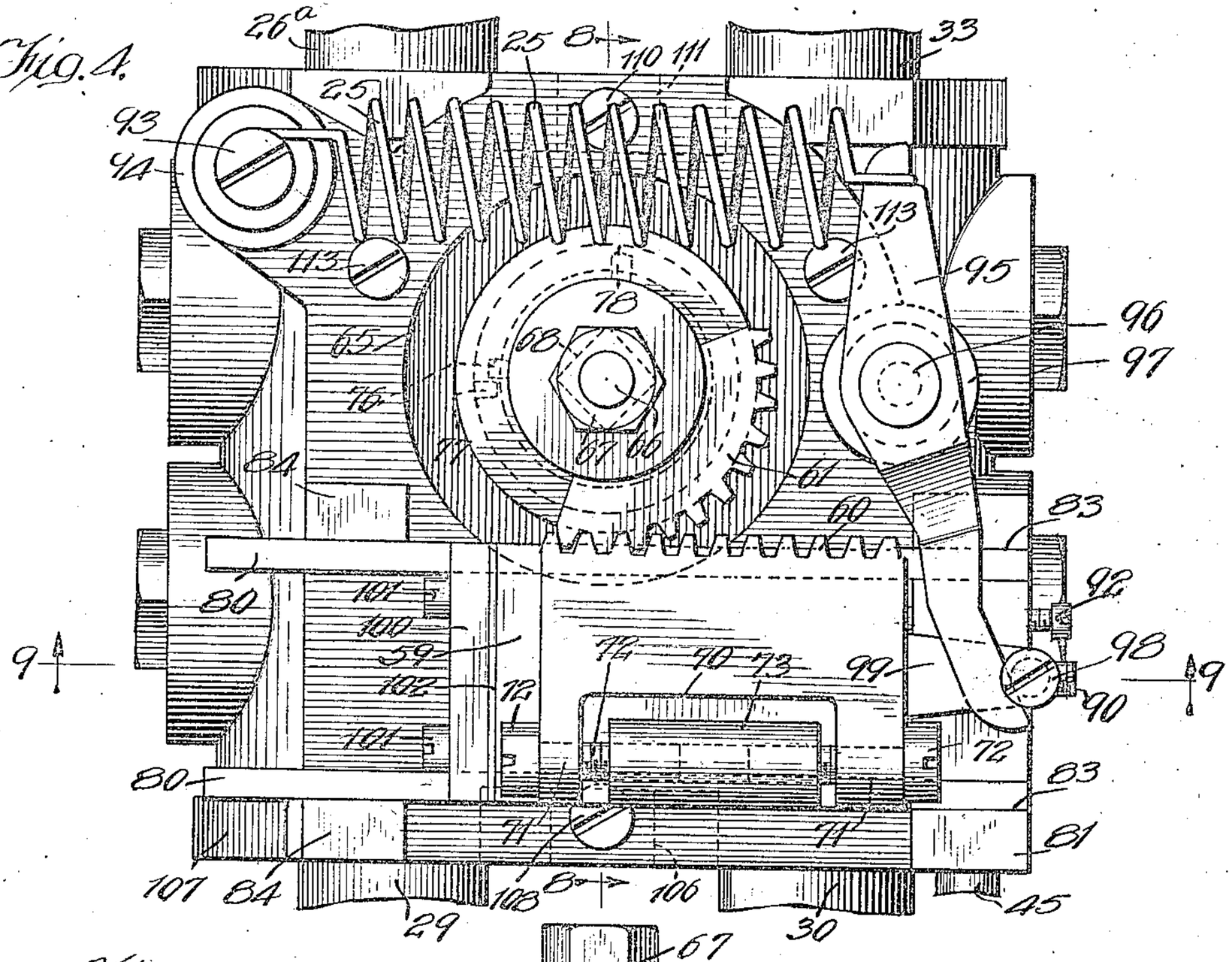
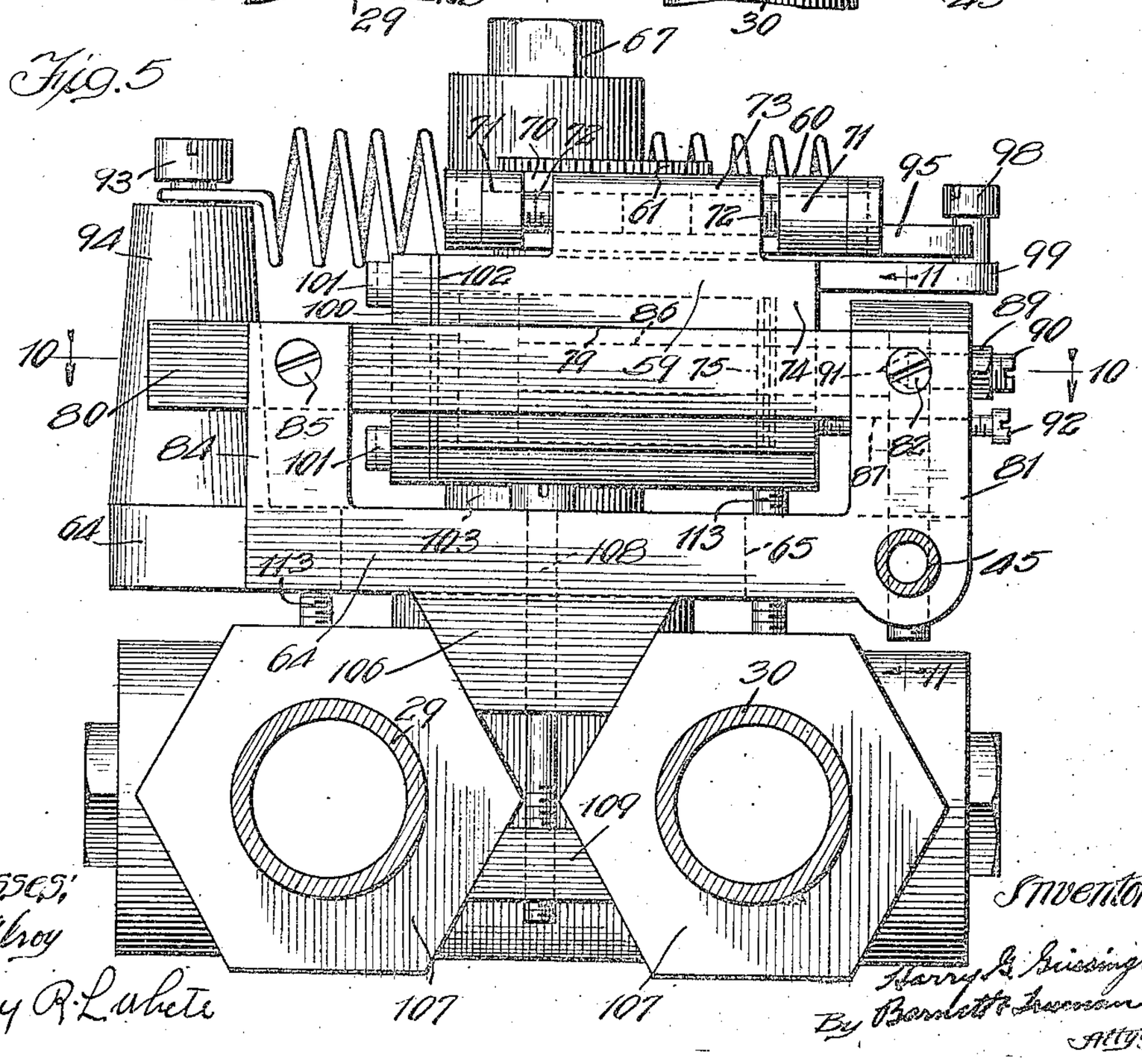


Fig. 5.



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5 SHEETS-SHEET 3

Fig. 6.

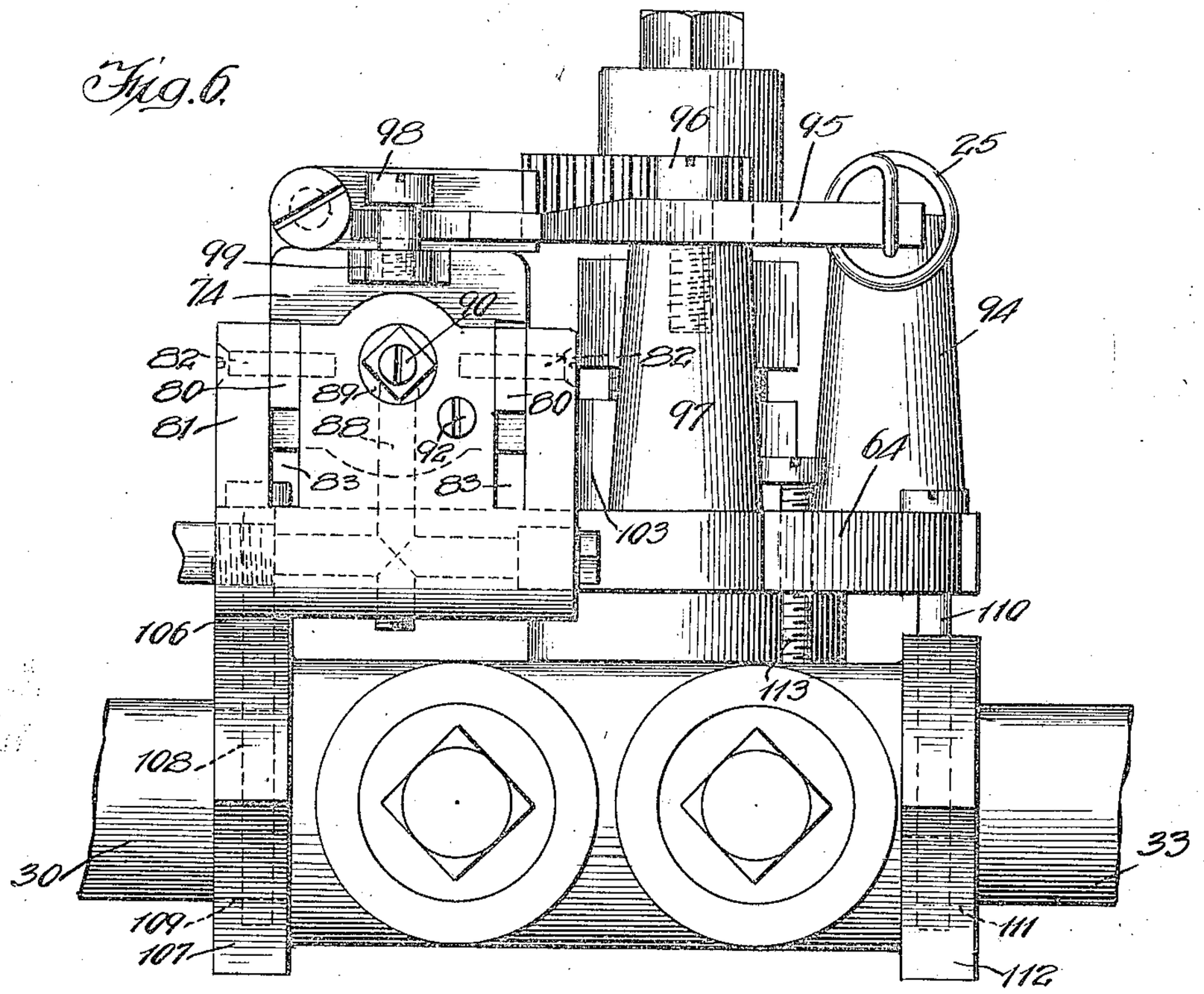
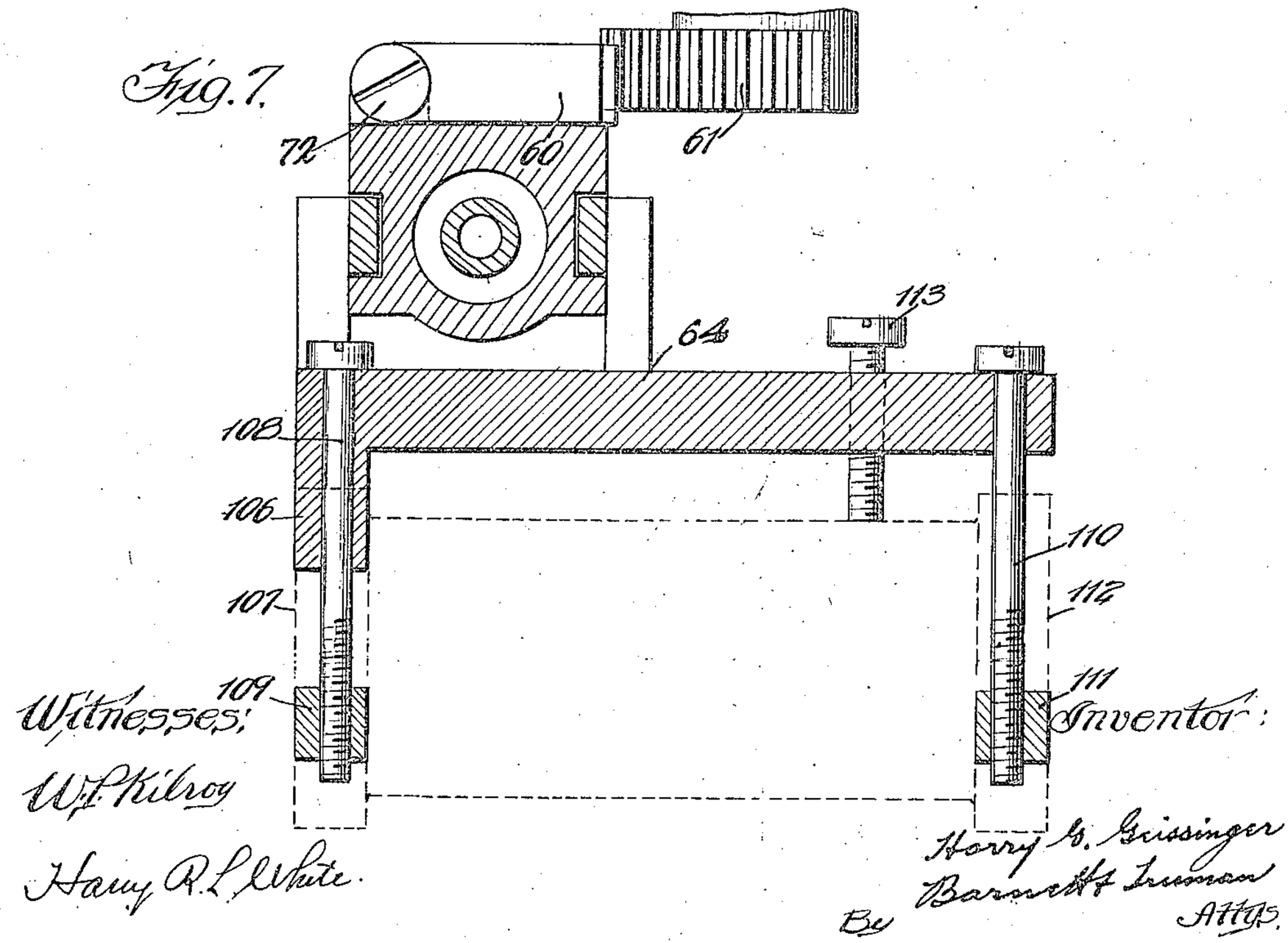


Fig. 7.



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HEATING SYSTEM.
ORIGINAL FILED SEPT. 9, 1918.

5 SHEETS-SHEET 4

Fig. 8.

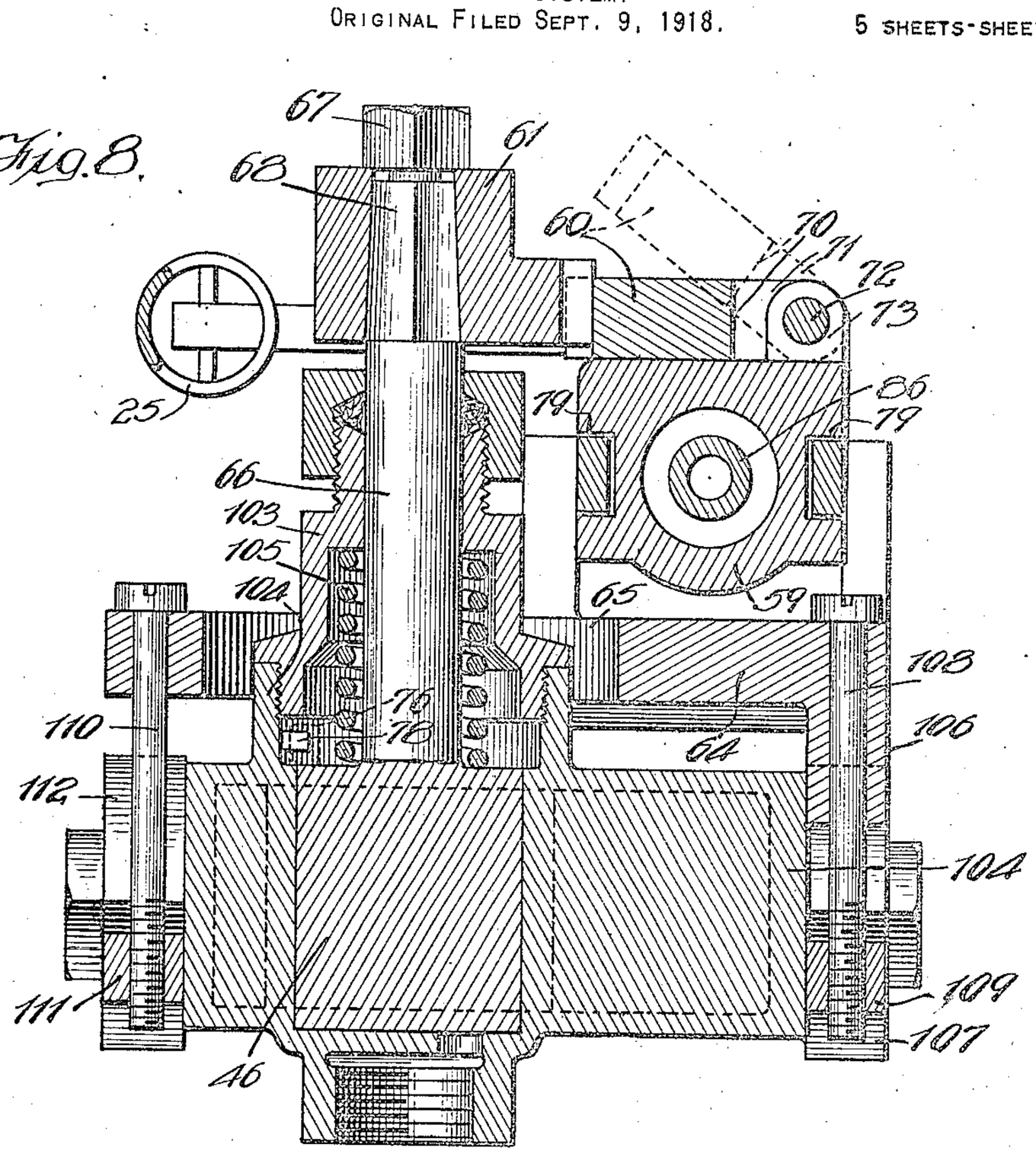
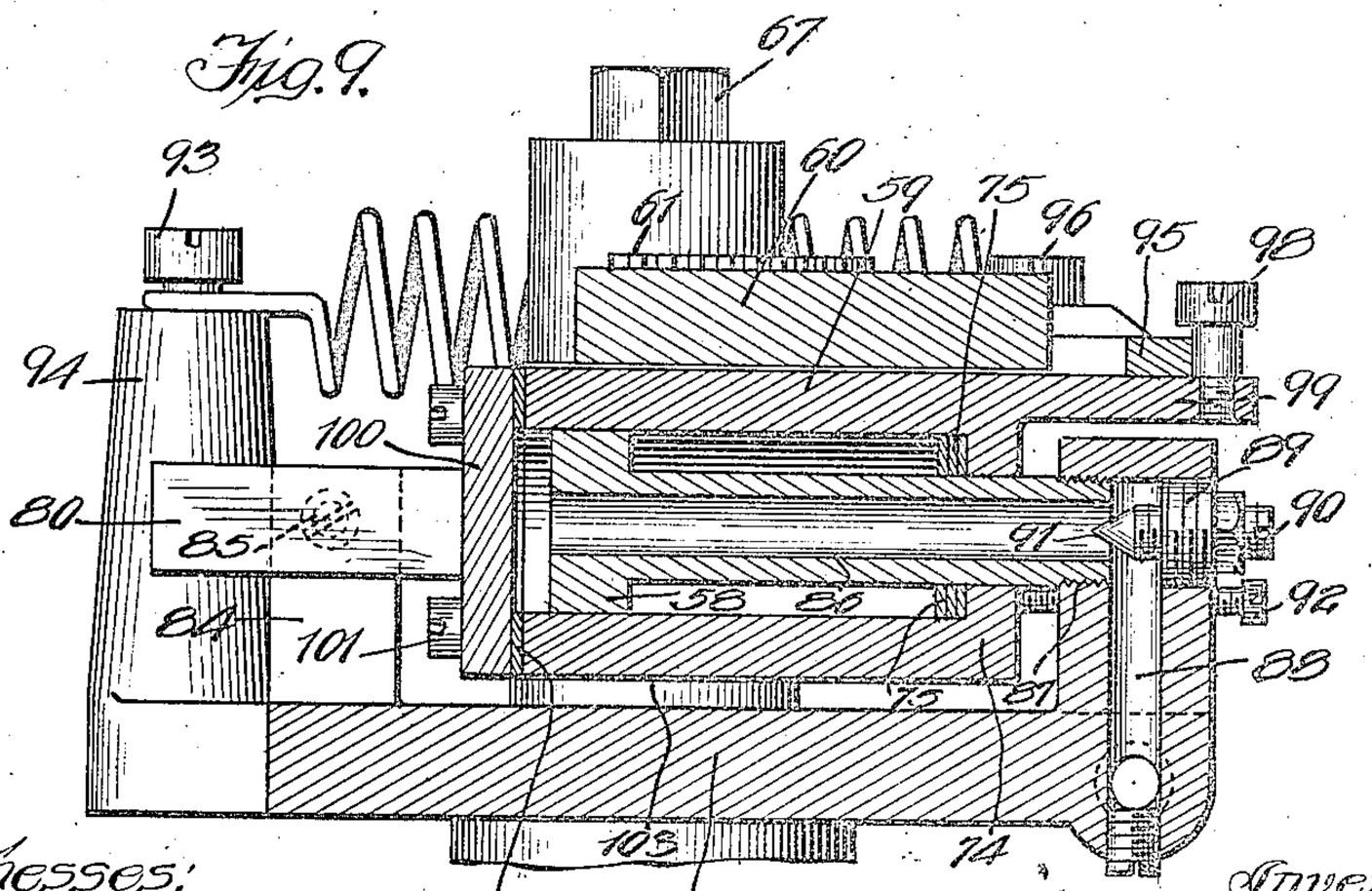


Fig. 9.



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ORIGINAL FILED SEPT. 9, 1918.

5 SHEETS-SHEET 5

Fig. 10.

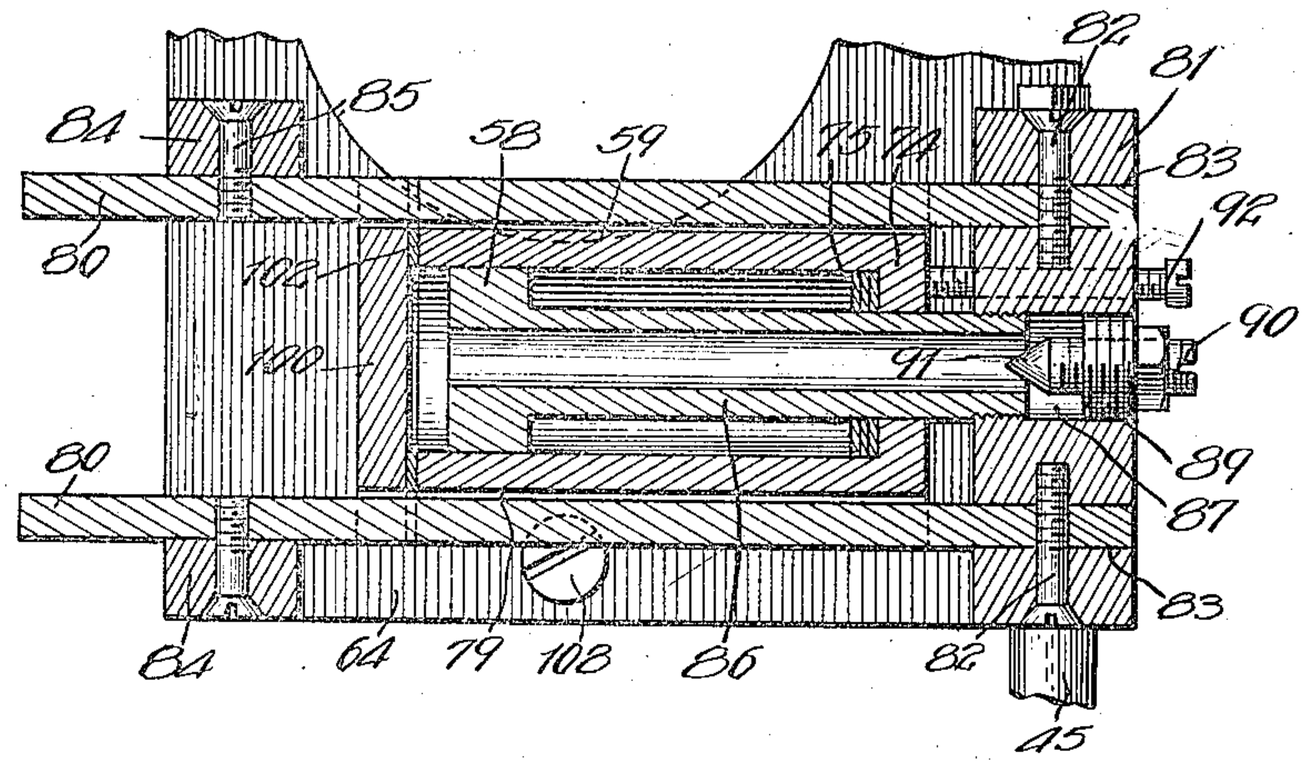


Fig. 11.

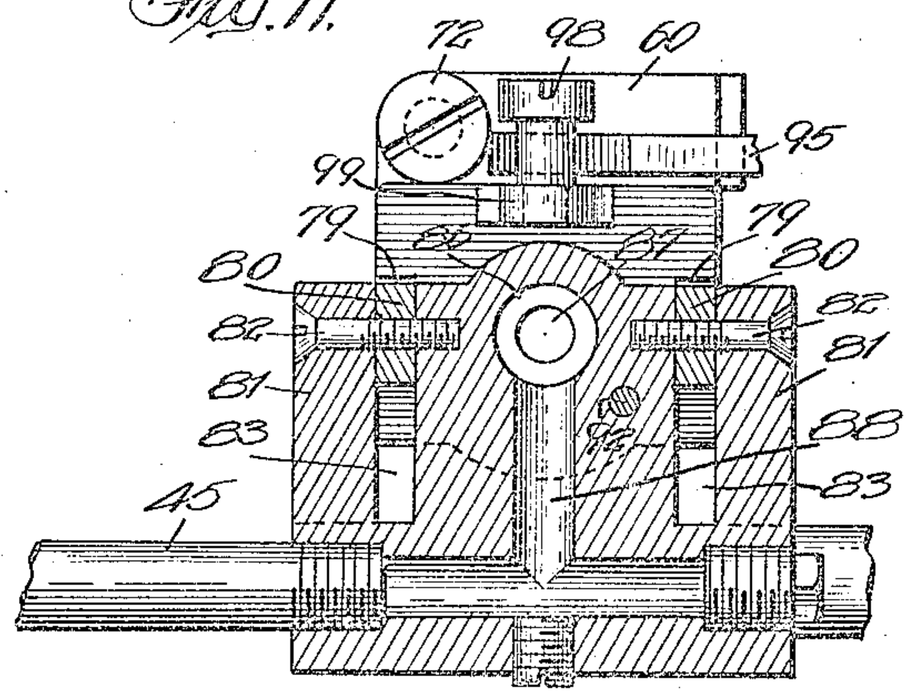
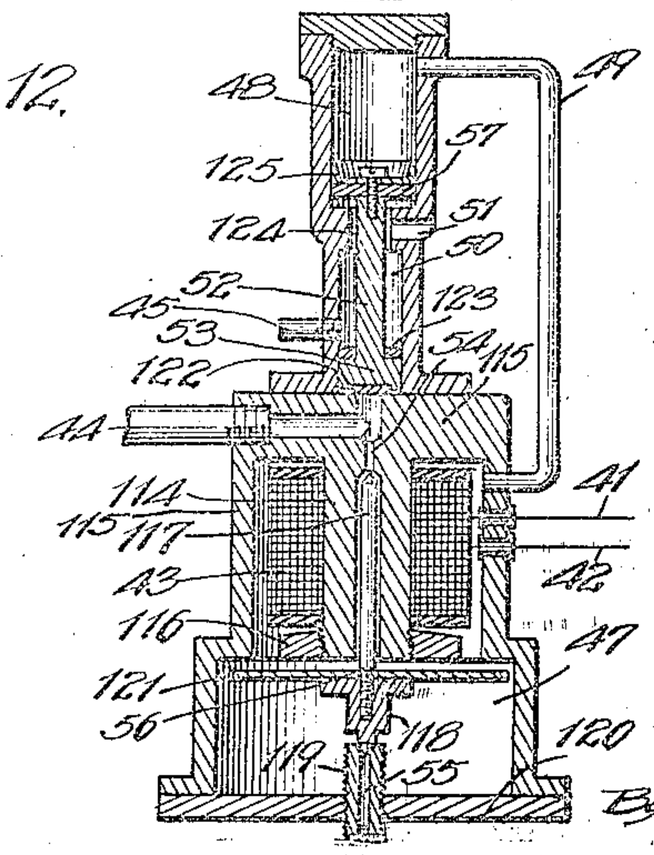


Fig. 12.



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Patented Jan. 2, 1923. 1,440,673

UNITED STATES PATENT OFFICE.

HARRY G. GEISSINGER, OF NEW YORK, N. Y., ASSIGNOR TO VAPOR CAR HEATING COMPANY, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF NEW YORK.

HEATING SYSTEM.

Application filed September 9, 1918, Serial No. 253,322. Renewed August 21, 1922. Serial No. 583,434.

To all whom it may concern:

Be it known that I, HARRY G. GEISSINGER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Heating Systems, of which the following is a specification.

My invention relates to a heating system for railway cars and more particularly to a low pressure steam or vapor system, although, in its broader aspects, the invention is not limited in its application to a heating system of this particular type.

The construction herein described is a modification of or improvement on the apparatus described and claimed in my copending application Serial No. 253,321 filed September 9, 1918 (patented as No. 1,404,359, January 24th, 1922).

The invention consists of the novel and improved constructions, arrangements and devices, to be hereinafter described and claimed, for carrying out certain objects and purposes which are very desirable for the proper regulation of the temperature of an apartment, more particularly a railway car. Among these objects are the following:

To provide an arrangement whereby the radiator valve is normally open so that in case any part of the controlling mechanism does not function, or does not function properly, through failure of the actuating electric current or air pressure, or otherwise, the supply of heating medium will not be shut off. While overheating is undesirable whether a car be occupied or standing in the yard, it is better that the car be overheated than deprived entirely of its heat at the risk of freezing of water pipes and other inconveniences.

To provide for the convenient manual regulation of the regulator valve, when, for any reason, the automatic regulation fails to function properly.

To provide a motor, preferably a fluid pressure motor to be operated by air from the compressed air system of the car, for shifting the radiator valve under the control of a thermostatic device within the car, together with certain arrangements for adjustably attaching said motor to the casing of the radiator valve and for furnishing an adjustment of the connections between the motor and valve so that this part of the mechanism will operate properly; the capacity for adjustment in these respects being highly desirable if not indispensable for the successful operation of the apparatus under working conditions.

To construct the air motor and, generally, the air system of the apparatus so that there will be no leakage of air therefrom at any point.

To provide a suitable electrically actuated mechanism to which current may be supplied, for example, from the lighting system of the car, for governing the application of air pressure to the motor of the radiator valve under the control of a thermostatic mechanism located in the car.

Other incidental objects of the invention will appear from the following description of the preferred embodiment of the invention illustrated in the drawings appended hereto. In these drawings

Fig. 1 is a diagrammatic view illustrating the system as a whole.

Fig. 2 is a sectional plan of the radiator valve.

Fig. 3 is a sectional plan of the emergency cock for relieving the air motor of pressure when necessary.

Fig. 4 is a plan view of the radiator valve with the operating motor secured thereto.

Fig. 5 is a view, in elevation, of the valve and motor showing the radiator pipes and air inlet pipes in section.

Fig. 6 is a side view of the parts shown in the preceding two figures.

Fig. 7 is a fragmentary view, somewhat diagrammatic in character, corresponding to the view of Fig. 6, to illustrate the adjustable attachment of the motor to the casing of the radiator valve.

Fig. 8 is a sectional view on line 8—8 of Fig. 4.

Fig. 9 is a fragmentary sectional view on line 9—9 of Fig. 4.

Fig. 10 is a fragmentary sectional plan on line 10—10 of Fig. 5.

Fig. 11 is a sectional view on line 11—11 of Fig. 5, and

Fig. 12 is a longitudinal sectional view of the electro-magnetic valve mechanism for controlling the fluid pressure to the radiator valve motor.

Like characters of reference designate like parts in the several figures of the drawings.

Referring first to Fig. 1, which shows the

general organization of the apparatus, A designates the steam train pipe of a railway car, B one of the radiators of the car, C a four-way valve arranged between the train pipe and radiator for controlling the flow of medium to and from the radiator, D one of the pipes of the air system of the car, E a compressed air-actuated motor for operating the radiator valve, F an electro-magnetically operated air valve for governing the air pressure admitted to the air motor, and G a thermostat located at a suitable place in the apartment of the car for controlling the current to the magnet of the air valve F. The heating system shown for the purpose of illustrating a typical embodiment of my invention is a low pressure steam, or vapor, system provided with a vapor regulator H, such as shown in the patent to Gold, No. 1,077,525, dated Nov. 4, 1913, arranged between the radiator valve C and the steam train pipe A which operates to prevent the introduction into the radiator of more steam than can be condensed therein. J is a three-way emergency cock for manually relieving the air motor E of pressure when it becomes necessary or desirable to operate the radiator valve by hand. Emergency cock J and the electro-magnetic air valve F are preferably arranged in a cabinet at one end of the car indicated in outline at L.

Before proceeding to describe in detail the construction of the various instrumentalities composing the preferred embodiment of my invention shown in the drawings I will briefly outline the operation of the apparatus in connection with the diagram, Fig. 1. The four-way valve C normally stands open, as shown in Fig. 2. It is held in this position by a spring 25. Steam from the train pipe A passes through pipe 26, 26ª and vapor regulator into chamber 27 of the four-way valve, thence to chamber 28 of the four-way valve and into the inlet pipe 29 of the radiator B. The medium passes out of the radiator through outlet pipe 30, valve chambers 31 and 32 and discharge pipe 33 which leads to the thermostat chamber of the vapor regulator this chamber being open to the atmosphere. The construction of the latter is familiar and need not be described in detail. It will be understood that when steam reaches the thermostat of the vapor regulator the valve of the regulator is throttled down so as to limit inflow. By this means waste of steam from the radiator, which is open at its discharge end, is prevented the medium being circulated through the radiator at a pressure not substantially above atmospheric pressure.

The thermostat G is adapted to make and break a normally closed electric circuit 34, 35 which is connected by leads 36, 37 with a source of supply of electric current. For example, the circuit may be a shunt from the electric lighting system of the car. The thermostat is set to break circuit 34, 35 at a rise of temperature to a given point. For example, if the thermostat is employed for maintaining a proper heat in the car during periods of occupancy it may be set to break the circuit when the temperature of the car reaches 70° Fahrenheit. The thermostat is shown as consisting of an arc member 38 which is adapted to bear against the contact 39 and a chord member 40 of greater expansibility than the arc member. The deformation of the structure 38, 40, due to rise of temperature, causes member 38 to draw away from contact 39. For all temperatures under the temperature for which the thermostat is set member 38 bears upon contact 39 so as to maintain circuit 34, 35 closed.

Fig. 1, therefore, shows the car at a temperature below seventy degrees. The radiator valve is open and the radiator is receiving steam to the extent permitted by the action of the vapor regulator H. When the temperature in the apartment of the car rises to 70° Fahrenheit, or such other temperature as the thermostat may be set for, the circuit 34, 35 is broken and current flows through a shunt circuit 41, 42 in which is arranged a resistance M and the actuating magnet 43 of the air valve F. The resistance of circuit 41, 42 is greater than the resistance of circuit 34, 35 so that when the latter is closed there will not be sufficient current passing through magnet 43 to effect a change in the position of the air controller F. With circuit 34, 35 broken, magnet 43 will be energized so that air taken from air system D is directed through pipes 44, 45 to the air motor E which is thereby actuated to close the radiator valve, moving the valve member 46 thereof from the full line position (Fig. 2) to the dotted line position. Steam now passes from the chamber 27 of the radiator valve to chamber 32 and thence back to the thermostat of the vapor regulator. The radiator is cut out and the steam inflow short circuited, just enough steam passing through the vapor regulator to keep the same warm.

The magnet 43 of the air controller F is located in a chamber 47 to which pipe 44 leads and which is connected with a piston valve cylinder 48 by the by-pass 49. Between cylinder 48 and chamber 47 is a cylinder 50 of smaller diameter than cylinder 48 which has a port 51 leading to the outside atmosphere. Pipe 45 leads from cylinder 50. A double piston valve 52 is arranged to operate in the differential cylinders 48, 50. The lower piston 53 of this valve closes a port 54 between the magnet chamber 47 and cylinder 50. The magnet chamber has an exhaust port 55 in the bottom and a double valve 56, which is the armature of magnet 43, normally closes port 55 but is raised, when the

magnet is energized, to open this port and close port 54. When the magnet is deenergized, that is to say, when the temperature is below that at which thermostat G is set to operate, air pressure from pipe 44 is applied to the upper or larger piston 57 of the double valve 52 so that the port 54 is closed. When the magnet is energized, due to the breaking of circuit 34, 35 by the thermostat G, valve 56 is moved to open exhaust port 55 and to close port 54. Pressure is relieved from the cylinder 48, the double valve 52 is raised and air pressure passes from pipe 44 through port 54 and cylinder 50 into pipe 45 and thence to the air motor. The latter consists of a stationary piston 58 and a movable cylinder 59, the cylinder carrying a rack 60 which meshes with a sector gear 61 on the revoluble valve member 46 of the four-way valve. The parts are shown in a much simplified and purely diagrammatic manner in Fig. 1, being more completely illustrated in the other figures which will be referred to hereafter. The movement of the rack closes the valve member 46, putting spring 25 under tension.

With this arrangement it will be observed that the radiator valve is normally held open by spring 25. Therefore if the controlling mechanism stops functioning, due, for example, to the failure of the lighting system of the car, or lack of air pressure in the air system, the car will not be deprived of its heat. As a railway passenger car contains water pipes, tanks, and other fixtures containing water it is decidedly preferable to have the car overheated rather than run the risk of freezing water pipes and fixtures through lack of proper heat in the car. In case, however, such failure of the control mechanism occurs during periods of occupancy it may be desirable, in order to prevent discomfort to the passengers, to provide for the manual operation of the radiator valve C and this has been done by certain arrangements which will be described in connection with the description of the detailed construction of the valve operating motor. In case the control apparatus should fail to function properly to relieve the air pressure in the radiator valve motor when the radiator ought to be receiving steam, the motor can be relieved of pressure by turning revoluble valve member 62 of three-way cock J from the full line position designated "automatic control" (Fig. 3) to the dotted line position designated "emergency position". Accumulated air pressure in cylinder 59 of the motor can then find exit through the exhaust port 62 and cock 63 which, in this position, shuts off the supply of air to the air motor.

I will next describe the preferred construction of fluid pressure or air motor E shown in Figs. 4 to 11, inclusive. The operative parts of the motor are supported upon a base 64 which is adjustably clamped to the four-way valve C by means which will be hereinafter described. The base of the motor is formed with a circular opening 65 through which projects the stem 66 of the revoluble valve member 46 of the four-way valve. The sector gear 61 is secured to the stem 66 of the valve by a nut 67, the end of stem 66 being tapered and square in cross section as indicated at 68. The rack 60 which meshes therewith is recessed at 70 to provide lugs 71 through which extend, loosely, adjusting and pivot screws 72 that screw into a lug 73 on the cylinder 59. The rack can pivot upon screws 72 so that when necessary to disconnect the motor from the valve this may be done by turning back the rack as indicated in dotted lines in Fig. 8. The longitudinal adjustment of the rack on the cylinder, which can be accomplished by screwing the adjusting screws 72 in and out, is primarily for the purpose of positioning the rack on the cylinder and with respect to the sector gear so that at the outstroke of the cylinder the head 74 of the cylinder, with its packing 75 (Figs. 9 and 10) will be brought to bear against the piston 58 just before the valve reaches the limit of its movements as fixed by certain stops with which valves of this type are provided. These stops are indicated in Figs. 4 and 8. 76 is a movable stop associated with the revoluble valve member 46 of the valve and 77, 78 are fixed stops on the valve casing. As the valve member is revolved by forward movement of cylinder 59 stop 76 approaches the fixed stop 78. In order to insure the proper seating of the packing 75 against the stationary piston 58 such seating should take place before stop 76 meets the stop 78 (valves of this type being provided with stops because they are ordinarily manipulated by hand) and this relation of the parts is made possible by a longitudinal adjustment of the rack on the cylinder. The cylinder is formed with grooves 79 for guiding it on guide strips 80 which are secured at one end to an upright support 81 by means of screws 82, the support being formed with slots 83 to receive the guide strips, and at the other end to a pair of spaced uprights 84 by means of the screws 85. The piston 58 has a hollow stem 86 which is screwed into a bore 87 in the support 81. This bore connects with a duct 88 to which leads the air pipe 45. The bore 87 is closed by a plug 89 through which extends an adjustable pointed screw plug 90 the pointed extremity 91 of which projects into the orifice of the stem 86 of the piston. By adjusting the plug 90 the velocity of the air entering the motor may be varied so as to make the action of the motor slower or more rapid, as may be desired. A stop screw 92 extends through

the support 81 to provide an adjustable abutment for the cylinder 59 on its back stroke.

The back stroke of the cylinder is brought about, when the cylinder is relieved of pressure, by means of the spring 25. The spring is attached at one end to a stud 93 on an upright member 94 projecting from the base 64 of the motor and at the other end engages one extremity of the lever 95 which is pivoted on a stud 96 fixed to a projection 97 on the base of the motor. The other extremity of the lever bears against a stud 98 on a lug 99 formed on the cylinder 59. The forward head 100 of the cylinder at the forward end thereof is secured to the cylinder by screws 101, a packing 102 being interposed between the head and cylinder so as to prevent any leakage of air.

The radiator valve C is a four-way valve of a construction commonly used in connection with vapor car heating systems, the sector gear 61 taking the place of the usual handle. The stem 66 of the revoluble valve member 46 extends through a bonnet 103 on the casing 104 of the valve, a spiral spring 105 being interposed between the top of the bonnet and the valve member.

The air motor, as above described, is adjustably secured to the top of the four-way valve as follows: Depending from the front edge of the base 64 of the motor is a lug 106 to fit the space between the hexagonal bosses 107 into which the radiator inlet and outlet pipes 29, 30 are tapped. A screw 108 passes through the base and lug 106 and has a threaded engagement with a nut 109 which is designed to fit against the under diagonal face of the bosses. By this means the motor may be clamped more or less rigidly to the valve casing. Another bolt 110 passes through the opposite edge of the base and engages a nut 111 which bears against the lower diagonal faces of a pair of hexagonal bosses 112, 112 into which the pipes 26ª and 33 are tapped. On this side of the base there is no lug to bear against the upper diagonal faces of the bosses, such as lug 106 on the front side of the device, so that by tightening bolt 110 the base of the motor may be shifted to raise or lower the rack 69 with respect to the sector gear on the valve stem 66 of the four-way valve, as best shown in Fig. 7, this adjustment being necessary in view of the fact that these valves are castings and exact uniformity of construction and contour of parts cannot be counted upon. In order to accurately and rigidly position the motor with respect to the four-way valve casing, two set screws 113 are threaded through the base of the motor so as to bear against the top of the valve casing.

I do not make specific claim herein to the construction of the four way valve and its operating motor shown in Figs. 5 to 11 inclusive, as this subject matter is claimed by itself in a copending application filed as a division hereof November 23, 1918, Serial No. 263,841.

The preferred construction of the thermostatically operated controller for governing the pressure to the valve motor is shown in Fig. 12. The magnet 43 is arranged on a core 114 which forms part of the casing 115 defining what has been termed the magnet chamber 47. The lower end of the core has secured thereto a pole piece 116. The valve structure 56 comprises an upper valve member 117 to control port 54, a lower valve member 118 to control the exhaust port 55 formed in a plug 119 arranged in the base 120 of the casing 115, and a disc 121 arranged directly under the pole piece 116, the disc constituting the armature of magnet 43. The valve 53 has set into its face a resilient disc 122 adapted to close the opening at the upper end of port 54. On the other side of valve 53 is a packing 123 adapted to close the gland 124 through which the stem of the double valve structure 52 passes when the latter is in its upper position. The upper valve member 57 of the double valve is provided with a packing 125 to prevent any escape of air at this place.

While I have described my invention in a preferred embodiment it will be understood that modifications might be made without departure from the principles of the invention. I wish it to be understood, therefore, that the invention is not to be considered as limited to the constructions, arrangements and devices shown and described, the scope of the invention being defined by the claims appended hereto.

I claim:

1. In combination with a railway car having a steam train pipe, compressed air system and a source of supply of electric current, a radiator located in the car having a valve to control the supply of heating medium thereto, an air motor supplied from said compressed air system for moving the valve to one position, manually operated means for moving the valve, an electro-magnetically actuated controlling device for governing the air pressure supplied to the motor, thermostatic means in the car for controlling the current to the magnet of said air controlled device, and an emergency valve for relieving the motor of air pressure so as to permit the valve to be moved to another position.

2. In combination with a railway car having a steam train pipe, compressed air system and a source of supply of electric current, a radiator located in the car having a valve to control the circulation of heating medium thereto, manually operated means for moving the valve, an air motor supplied

from said compressed air system for closing said valve, a spring for opening the valve, a valve adapted when in one position to admit air to the air motor and in another position to relieve the motor of air pressure, an electro-magnetically actuated valve for controlling the position of said air valve, and a thermostatic device which, at a rise of temperature in the car to a predetermined point, causes the energization of said magnet.

3. In combination with a railway car having a steam train pipe, compressed air system and a source of supply of electric current, a radiator located in the car having a valve to control the supply of heating medium thereto, an air motor supplied from said compressed air system for closing said valve, a spring for opening the valve, an electro-magnetically actuated controlling device which, when its magnet is energized, allows the air pressure to act on the motor, a normally closed circuit through said magnet, and a circuit breaking thermostat having a normally closed circuit which the thermostat breaks, at a rise of temperature in the car to a given point and which is of less resistance than and in parallel relation with the circuit through said magnet.

4. In combination with a railway car having a steam train pipe, compressed air system and source of electric current, a radiating coil in the car, a vapor regulator which operates to maintain the medium in the radiating coil at a pressure not substantially in excess of atmospheric pressure, a four-way valve interposed between the vapor regulator and the inlet and outlet ends of the radiating coil which, in one position of its valve member, directs steam from the vapor regulator into the radiating coil and returns medium from the radiating coil to the thermostat of the regulator, and in the other position closes the radiator and short circuits steam to the thermostat of the vapor regulator, a spring to open said valve, an air motor to close the same, an electro-magnetically actuated controlling device which, when its magnet is energized, causes air pressure to be applied to the motor, an electric circuit through said magnet, a circuit breaking theremostat having a normally closed circuit including said source of electric current, which the thermostat breaks on a rise of temperature in the car to a given point; the thermostat circuit being of less resistance than and in parallel relation with the circuit through said magnet whereby the breaking of the thermostat circuit energizes the magnet.

5. In combination with a railway car, a radiator, a source of supply of heating medium, a source of supply of air under pressure and a source of supply of electric current, a valve which normally stands open to admit heating medium to the radiator, an air motor to close the valve, an air valve to govern the supply of air pressure to the motor, a circuit breaking thermostat in a normally closed circuit with a source of supply of electric current adapted to break its circuit at a rise of temperature to a given point, and means actuated by the breaking of said circuit for operating said air valve to admit air to the motor.

6. In combination with a railway car, a radiator, a source of supply of heating medium, a source of supply of air under pressure and a source of supply of electric current, a valve which normally stands open to admit heating medium to the radiator, an air motor to close the valve, an air valve to govern the supply of air pressure to the motor, a circuit breaking thermostat in a normally closed circuit with a source of supply of electric current adapted to break its circuit at a rise of temperature to a given point, and an electromagnet energized when said circuit is broken for operating said air valve to admit air to the motor.

7. In combination with a railway car, a radiator, a source of supply of heating medium, a source of supply of air under pressure and a source of supply of electric current, a valve which normally stands open to admit heating medium to the radiator, an air motor to close the valve, an air valve adapted to be moved to and held in its operative position for admitting air to said motor, a circuit breaking thermostat in a normally closed circuit with the source of supply of electric current adapted to break its circuit at a rise of temperature to a given point, and means actuated by the breaking of said circuit for operating said air valve to admit air to the motor.

8. In combination with a railway car, a radiator, a source of supply of heating medium, a source of supply of air under pressure and a source of supply of electric current, a valve which normally stands open to admit heating medium to the radiator, an air motor to close the valve, an air valve to govern the supply of air pressure to the motor, a circuit breaking thermostat in a normally closed circuit with the source of supply of electric current adapted to break its circuit at a rise of temperature to a given point, and a magnet in a circuit of greater resistance than and in parallel with the thermostat circuit which when energized causes said air valve to be opened to admit air to the motor.

9. In combination with a railway car, a radiator, a source of supply of heating medium, a source of supply of air under pressure and a source of supply of electric current, a valve which normally stands open to admit heating medium to the radiator, an

air motor to close the valve, an air valve to govern the supply of air pressure to the motor, a circuit breaking thermostat in a normally closed circuit with the source of supply of electric current adapted to break its circuit at a rise of temperature to a given point, a magnet in a circuit of greater resistance than and in parallel with the thermostat circuit which, when energized, causes said air valve to be opened to admit air to the motor, and an emergency valve for relieving the motor of pressure.

10. In combination with a railway car, a radiator, a source of supply of heating medium, a source of supply of air under pressure and a source of supply of electric current, a valve to admit heating medium to the radiator, a spring for holding said valve open, an air motor to close the valve, an air valve to govern the supply of air pressure to the motor, a circuit breaking thermostat in a normally closed circuit with the source of supply of electric current adapted to break its circuit at a rise of temperature to a given point, and a magnet in a circuit of greater resistance than and in parallel with the thermostat circuit which, when energized, causes said air valve to be opened to admit air to the motor.

11. In combination with a railway car, a radiator and a source of supply of heating medium, a valve which normally stands open to admit heating medium to the radiator, a motor to operate the valve, manually operated means for moving the valve, mechanism comprising a thermostat, actuated at a rise of temperature to a given point, for actuating said motor to close said valve, and means for disconnecting the motor from the radiator valve so as to permit the valve to be operated manually.

12. In a heating system for a railway car, the combination of a radiator, a valve which normally stands open for admitting heating medium to the radiator, a fluid pressure actuated motor to close said radiator valve, and a controlling device for governing the application of motive fluid to the motor comprising a circuit breaking thermostat having a closed circuit broken by the thermostat at a rise of temperature to a given point.

13. In a heating system for a railway car, the combination of a radiator, a valve which normally stands open for admitting heating medium to the radiator, a fluid pressure actuated motor to close said radiator valve, a valve to control the flow of motive fluid to the motor, a circuit breaking thermostat having a closed circuit broken by the thermostat at a rise of temperature to a given point, and an electromagnet energized when said circuit is broken for opening the valve governing the flow of motive fluid to the motor.

14. In a heating system for a railway car, the combination of a radiator, a valve which normally stands open for admitting heating medium to the radiator, a fluid pressure actuated motor to close said radiator valve, a valve to control the flow of motive fluid to the motor, a circuit breaking thermostat having a closed circuit broken by the thermostat at a rise of temperature to a given point, and an electromagnet in a circuit of greater resistance than and in parallel with the thermostat circuit adapted when energized to open the valve governing the flow of motive fluid to the motor.

15. In a heating system for a railway car, the combination of a radiator, a valve which normally stands open for admitting heating medium to the radiator, manually operated means for moving the valve, a fluid pressure actuated motor to close said radiator valve, a valve to control the flow of motive fluid to the motor, a circuit breaking thermostat having a closed circuit broken by the thermostat at a rise of temperature to a given point, an electro-magnet in a circuit of greater resistance than and in parallel with the thermostat circuit adapted when energized to open the valve governing the flow of motive fluid to the motor, and a manually operated emergency valve between said last named valve and the motor for relieving the motor of pressure.

16. In mechanism for controlling the flow of heating medium to a radiator, the combination of a normally open radiator valve, a circuit breaking thermostat in a normally closed electric circuit, and an electrically operated device in a shunt from the aforesaid circuit of greater resistance than said circuit which, when energized, causes said radiator valve to be closed.

17. In a heating system, the combination of a radiator, a valve to govern the introduction of heating medium to the radiator, a fluid pressure motor to operate the valve, and means for controlling the application of motive fluid to the motor comprising a valve which is itself moved by fluid pressure, an electro-magnetically operated valve for controlling the application of pressure to said last named valve, and a circuit making and breaking thermostat the operation of which controls the energization of the magnet.

18. In a heating system, the combination of a radiator, a valve to govern the introduction of heating medium to the radiator, a fluid pressure motor to operate the valve, and means for controlling the application of motive fluid to the motor comprising a double piston valve, an electro-magnetically actuated valve which, in accordance with its position, causes the application of pressure fluid to one end or the other of said double piston valve and brings about the relief of pressure from the other end thereof, and a circuit making and breaking

thermostat the operation of which controls the energization of the magnet.

19. In a heating system, the combination of a radiator, a valve to govern the introduction of heating medium to the radiator, a fluid pressure motor to operate the valve, and means for controlling the application of motive fluid to the motor comprising a valve chamber communicating with the outside atmosphere, a pipe leading from the same to the motor, a valve chamber of larger diameter, a double piston valve arranged in said valve chambers, a magnet chamber having an exhaust port to the outside atmosphere, a port leading to the smaller valve chamber adapted to be closed by said double valve, a port adapted to be connected with a source of supply of fluid under pressure, a pipe connecting the magnet chamber with the smaller valve chamber, a magnet in said magnet chamber, an armature for the magnet and two valves associated with the armature, one of which closes the port through which the pressure fluid enters the magnet chamber when the armature is attracted to the magnet, the other of which closes the exhaust port from the magnet chamber when the magnet is deenergized, and thermostatic means for energizing and deenergizing said magnet.

20. In mechanism for controlling the flow of heating medium to a radiator, the combination of a radiator valve, a circuit breaking thermostat and an electrically actuated apparatus for controlling the movements of the valve arranged in a circuit parallel with the thermostat circuit and of greater resistance than the thermostat circuit whereby said apparatus is actuated only when the thermostat circuit is broken.

21. In a heating apparatus, a heating element and an electrically actuated device governing the operating of said heating element, and a circuit breaking thermostat arranged in a circuit of less resistance than and in parallel with the circuit of said electrically actuated device whereby said thermostat controls the operation of said device.

22. In a steam heating apparatus, a radiator and an electrically actuated device for governing the introduction of steam to said radiator, and a circuit breaking thermostat arranged in a circuit of less resistance than and in parallel with the circuit of said electrically actuated device whereby the thermostat controls the operation of said device.

23. In a heating apparatus, a radiator, a radiator valve, a motor to operate said valve, an electrically actuated device to control said motor, and a circuit breaking thermostat arranged in a circuit of less resistance than and in parallel with the circuit of said electrically actuated device whereby the thermostat controls the operation of said device.

24. In a heating apparatus, a heating element and means for controlling the operation thereof comprising a circuit breaking thermostat and an electrically actuated device arranged in a circuit of greater resistance than and in parallel with the thermostat circuit.

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