Jan. 2, 1923.

1,440,702.

E. A. RUSSELL ET AL.

HEATING SYSTEM FOR RAILWAY CARS.

FILED JULY 21, 1921.

4 SHEETS—SHEET 1.

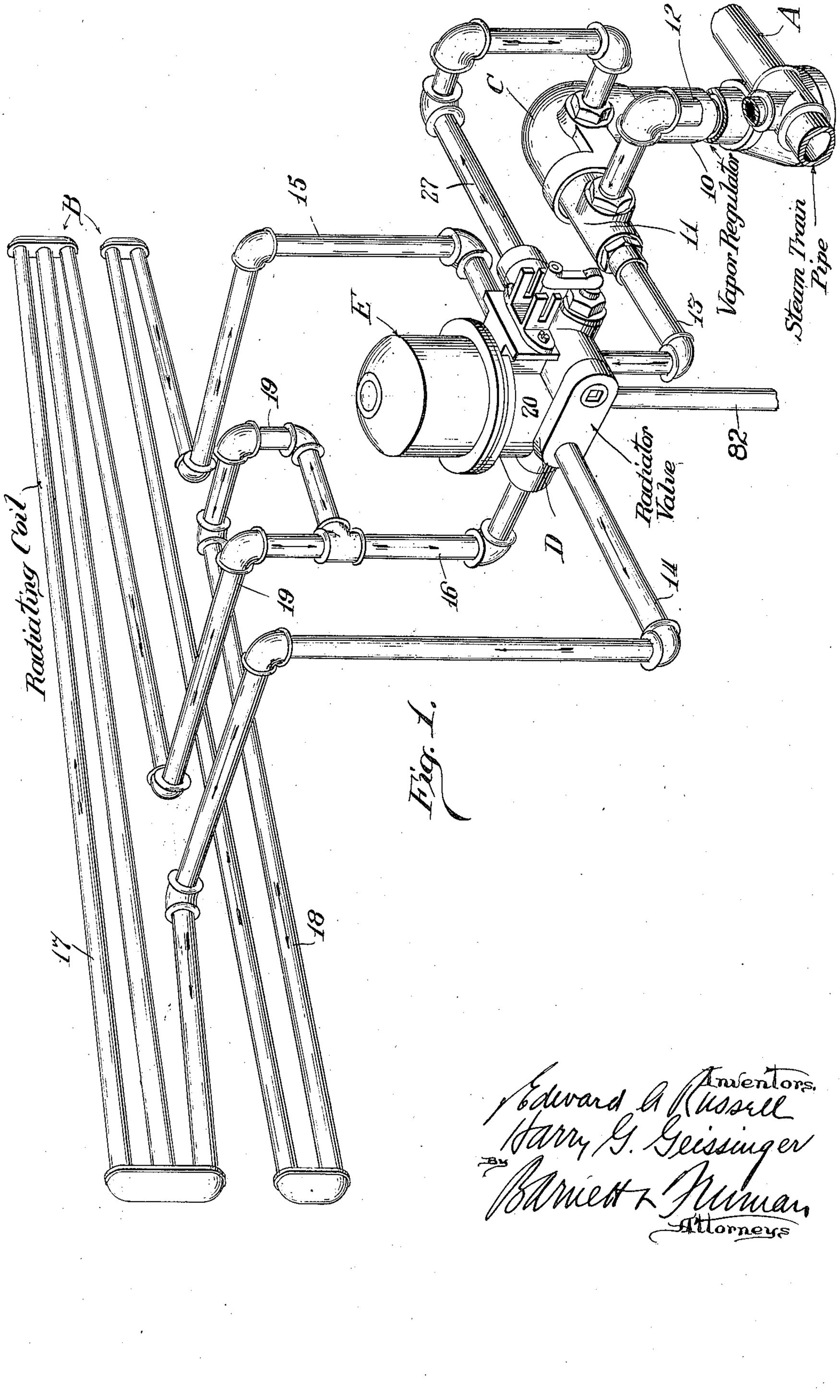

Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

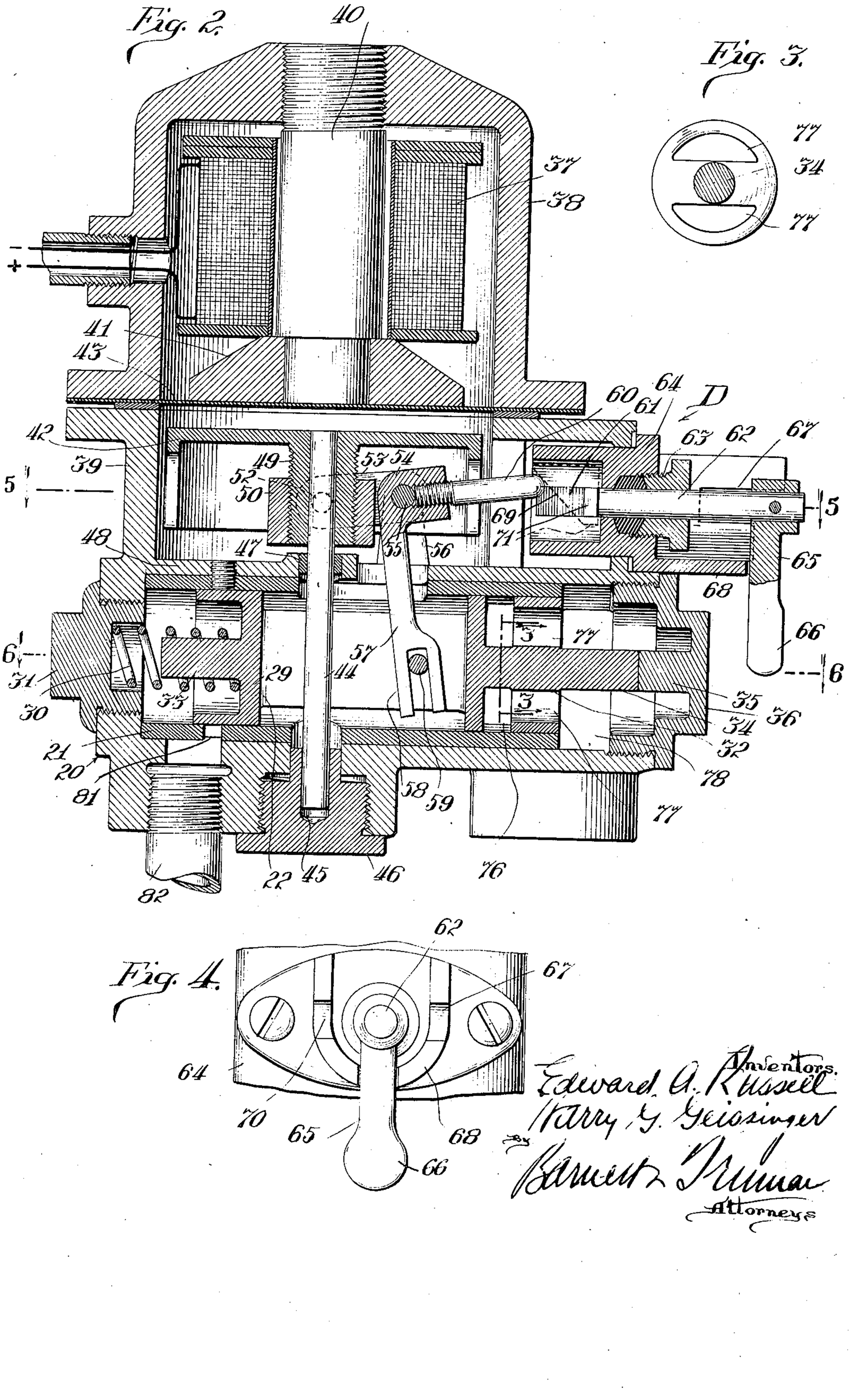

Fig. 3.

Fig. 4.

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4 SHEETS—SHEET 3.

Fig. 5.

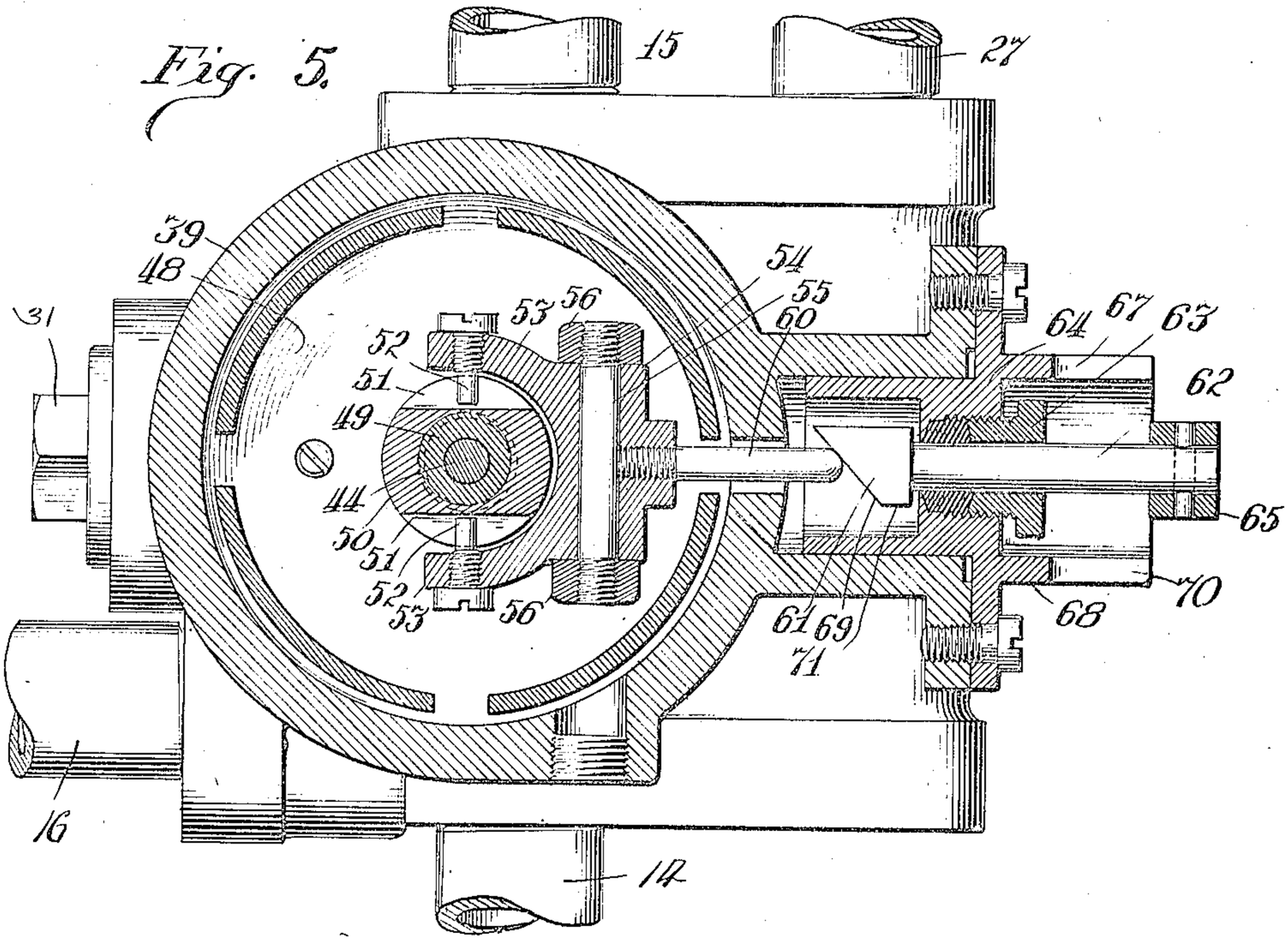
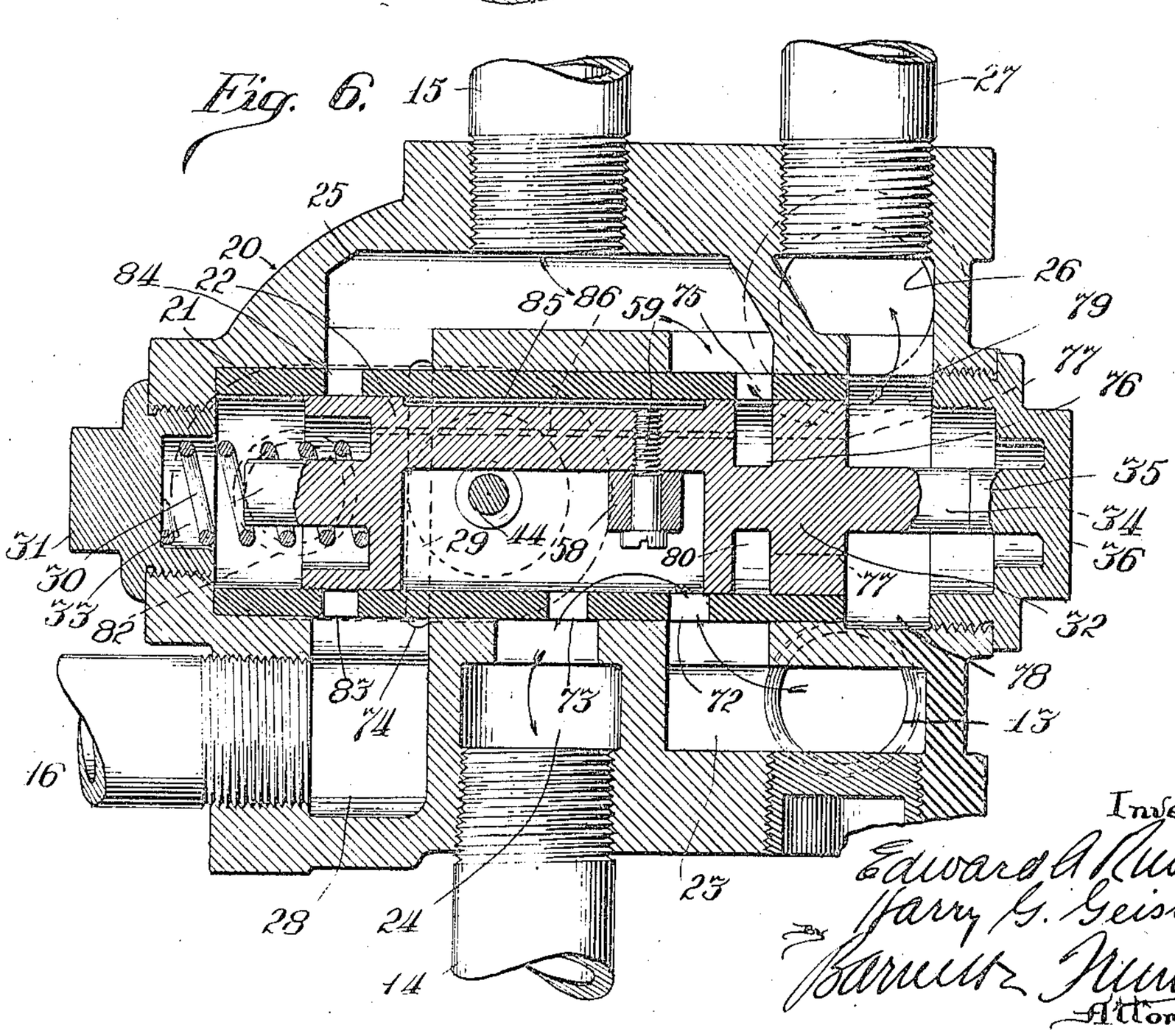


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 7.

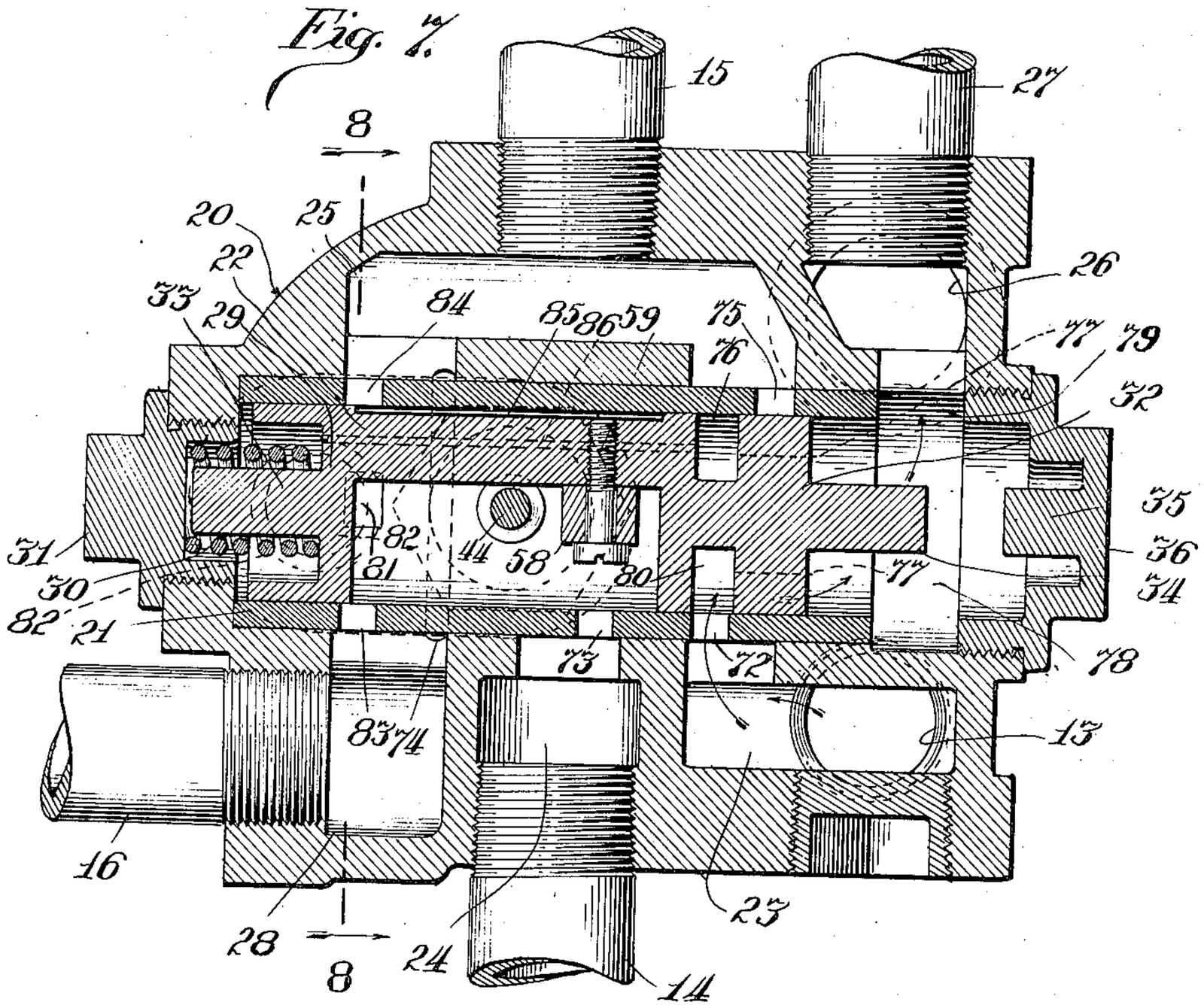
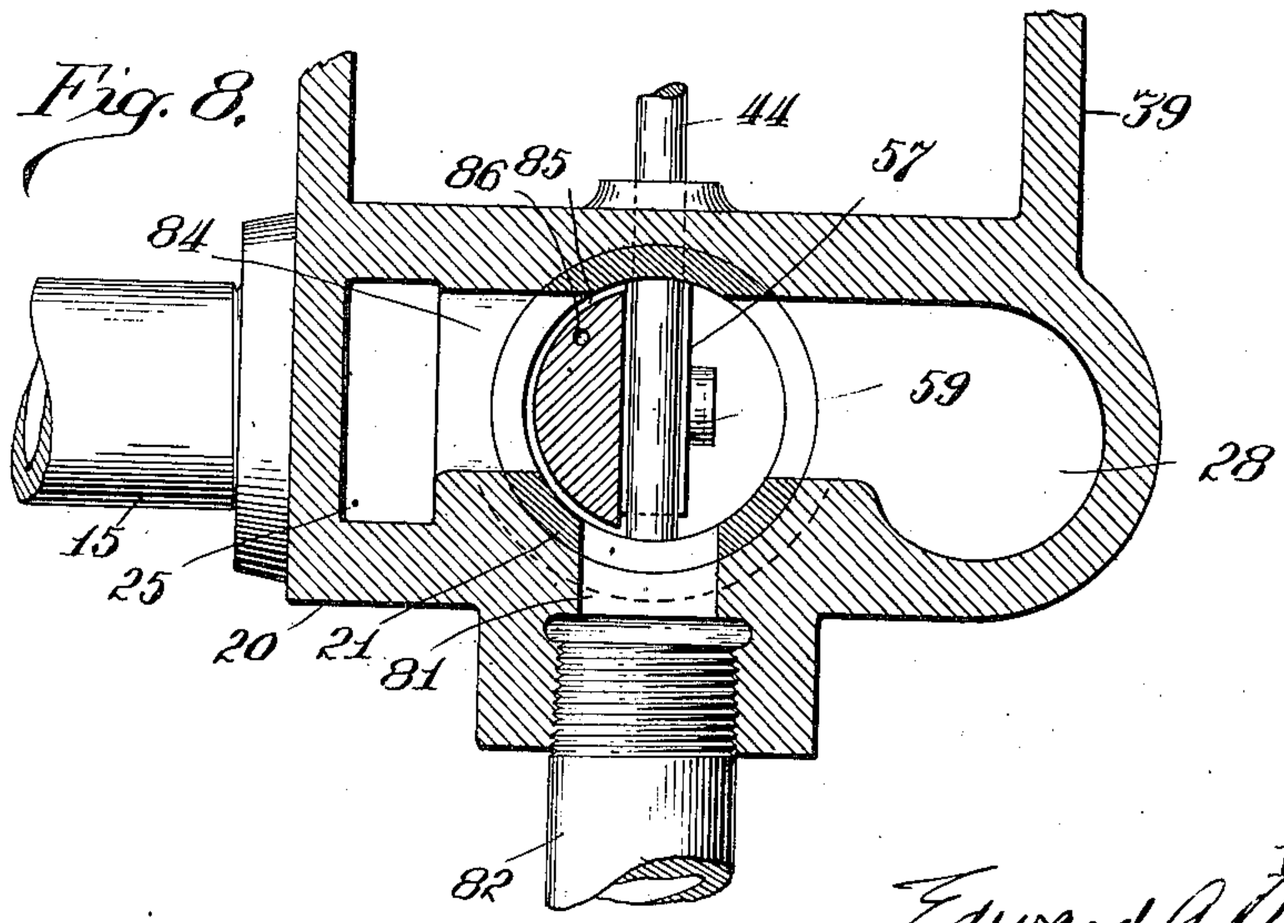


Fig. 8.



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Patented Jan. 2, 1923. 1,440,702

UNITED STATES PATENT OFFICE.

EDWARD A. RUSSELL, OF CHICAGO, ILLINOIS, AND HARRY G. GEISSINGER, OF DETROIT, MICHIGAN, ASSIGNORS TO VAPOR CAR HEATING COMPANY, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF NEW YORK.

HEATING SYSTEM FOR RAILWAY CARS.

Original application filed March 1, 1920, Serial No. 363,339. Divided and this application filed July 21, 1921. Serial No. 486,481.

To all whom it may concern:

Be it known that we, EDWARD A. RUSSELL and HARRY G. GEISSINGER, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, and Detroit, in the county of Wayne and State of Michigan, respectively, have invented certain new and useful Improvements in Heating Systems for Railway Cars, of which the following is a specification.

Our invention relates to a heating system for railway cars, and particularly to a steam heating system of the low pressure type in which the medium is circulated through the heating coil or coils, or other form of radiator, at a pressure not substantially above atmospheric pressure.

One of the objects of the invention is to provide a construction of the radiating coil, and of its controlling valve, whereby water of condensation is withdrawn from the coil at a point intermediate its ends without affecting the continued circulation of the steam through the entire length of the coil; the advantage of this arrangement being that the radiator is more quickly filled with steam when the system is first put into operation and its radiation surfaces are utilized to the maximum extent during such operation.

A further object is to provide a new and improved valve and operating motor therefor for controlling the circulation of the medium through the radiating coil.

A further object is to provide novel means whereby the valve, in case of emergency, may be operated manually.

The invention consists of the new and improved constructions, arrangements and devices to be hereinafter described and claimed, for carrying out the above stated objects and such other incidental objects as will be referred to in the following description of the preferred embodiment of our invention illustrated in the drawings appended hereto.

In the drawings,

Fig. 1 is a view, in perspective, of the heating system.

Fig. 2 is a vertical sectional view of the radiator valve and motor for operating the same.

Fig. 3 is a detail sectional view on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary end elevation of the radiator valve showing the device for manually operating the valve.

Fig. 5 is a sectional plan on line 5—5 of Fig. 2.

Fig. 6 is a sectional view on line 6—6 of Fig. 2.

Fig. 7 is a plan view also on line 6—6 of Fig. 2, but showing the valve in the position which it takes when closing the inlet end of the radiating coil, and

Fig. 8 is a sectional view on line 8—8 of Fig. 7.

Referring first to Fig. 1, A designates the steam train pipe, B the radiating coil located within the car, and C a vapor regulator of common type, the function of which is to maintain the steam circulating through the radiator at substantially atmospheric pressure, the vapor regulator comprising an outlet pipe 10 for medium discharging from the radiator in which is located a thermostatic member that operates a valve located at 11 for controlling the introduction of steam into the radiator. D is a controlling device or radiator valve adapted to be opened and closed by an electric motor E. This valve, when in open position, admits steam, reduced in pressure by a vapor regulator C, to the radiating coil B, and directs the medium discharging from the coil to the discharge pipe 10 of the vapor regulator. In the closed position of the valve steam is shut off from the radiator and is short circuited directly to the outlet pipe of the vapor regulator. At the same time a drainage port is exposed through which the water in the radiating coil may discharge, this port having been closed when the valve was in what has been termed somewhat arbitrarily its open position. The numerals 12, 13 designate a supply pipe leading from the train pipe A to valve E between the sections of which is interposed the portion of the vapor regulator in which the reducing valve 11 is located. 14 designates the

inlet end of the radiating coil and 15 the return end of the same. 16 is a pipe leading to the controlling device D from coil B at a point intermediate the ends of the coil, the function of this pipe being to provide an outlet for water of condensation collecting in the portion of the coil in advance of the place tapped by this pipe. The coil B is composed of two sections 17, 18 connected by a pipe 19 with which pipe 16 is connected.

The other figures of the drawings illustrate the construction of the controlling device D and the parts associated therewith.

The controlling device D is constructed as follows: 20 is a casing provided with a bushing 21 in which is arranged a valve 22 of the sliding or piston type. The casing is formed with a chamber 23 to which leads a section 13 of the supply pipe; a chamber 24 with which the inlet end 14 of the radiator communicates; a chamber 25 with which the return end 15 of the radiating coil communicates; a chamber 26 from which a pipe 27 leads to the discharge pipe 10 of the vapor regulator; and a chamber 28 with which the water drainage pipe 16 communicates. The valve 22 is formed with a head 29 against which bears a coiled spring 30 seated in a plug 31 screwed into the end of casing 20 and at the other end with a head 32, the heads 29 and 32 being formed with bosses 33, 34, the latter aligning with a boss 35 on a screw plug 36, to limit the sliding movement of the valve.

The valve normally stands in the open position as shown in Figs. 2 and 6, being held in that position by the weight of parts to be described and by the action of spring 30, the use of the spring being however, optional. The valve is moved to the closed position shown in Fig. 7 by operation of an electro-magnet 37 arranged in a casing 38 mounted on a web or extension 39 of the valve casing 20. The core of the magnet is shown at 40 and its pole piece at 41. The armature 42 of the magnet is located within a chamber formed by the extension 39. Preferably a thin sheet of non-magnetic metal 43 is interposed between the magnet casing 38 and the extension 39 of valve casing 20 so as to intervene between pole piece 41 of the magnet and the magnet armature 42. The magnet armature is secured to a stem 44, the lower end of which is slidable in a bore 45 formed in a plug 46 screwed into the bottom of casing 20. The upper end of the stem is guided in a bushing 47 arranged in the upper web 48 of the valve casing. The armature is formed with a threaded hub 49 on which is arranged a collar 50 formed with slots 51, 51 to receive the ends of studs 52, 52, fixed in the forked extremities 53 of a bell crank 54 pivotally mounted on a short shaft 55 (Fig. 5) supported by lugs 56, 56 upwardly projecting from the web 48 of the valve casing. The depending arm 57 of bell crank 54 is formed with a fork 58 adapted to engage a stud 59 on the valve 22.

When magnet 37 is energized to raise its armature valve 22 is moved from the position shown in Figs. 2 and 6 to that shown in Fig. 7.

In case of disarrangement of the electrical apparatus for operating valve 22 the valve will stand in its open position so that the radiator will be supplied with heating medium. For such emergency the controlling device is provided with means for manually operating the valve. This device is constructed as follows: 60 is a short rod screwed into the bell crank 54 near its fulcrum. This rod is adapted to be engaged by a wedge 61 on a short shaft 62 journaled in a stuffing box 63 arranged in a housing 64 secured to the upper or extension portion 39 of valve casing 20. Shaft 62 is provided with a handle 65 preferably weighted at 66 to keep the handle in a vertical position. In this position the wedge, as shown in the full lines in Figs. 2 and 5, does not interfere with the rocking movements of the bell crank 54 through operation of the magnet 37 and its armature. By turning the handle 65 to the right (Fig. 4) until it reaches a horizontal position, the wedge 61 will be made to overhang the end of rod 60 on the bell crank, as shown in the dotted lines in Fig. 2. The shaft 62 may then be pushed inwardly, handle 65 passing into a notch 67 formed in a flange 68 on housing 64. The engagement of the inclined surface 69 of wedge member 61 with the end of rod 60 rocks the bell crank 64 so as to move the valve from its open position (Figs. 2 and 6) to its closed position (Fig. 7). To move the valve back to its open position the wedge member 61 is withdrawn from rod 60, by pulling handle 65 and shaft 62 outwardly. The weight of the armature, assisted by the force of spring 30, will return the valve to its open position but in case the valve should stick for any reason handle 65 may be turned to the left (Fig. 4) until it registers with a slot 70, and then pushed inwardly to force the wedge member 61, now in inverted position, against rod 60 and positively rock the bell crank to move the valve to its normal position. When the valve is manually closed it is locked in the closed position by the engagement of surface 71 on the wedge member with rod 60.

The arrangement of the ports controlled by valve 22 will be best described in connection with a description of the flow of heating medium through the apparatus for different positions of the valve. Assuming first that the valve is in the position shown in Figs. 2 and 6, steam from the train pipe

A, and the resultant water of condensation will take the following course through the apparatus: From train pipe A steam passes through supply pipe section 12, passes reducing valve 11 of vapor regulator C and enters chamber 23 of controller D through pipe section 13. From chamber 23 the steam passes through a port 72 in bushing 21 into the space between the heads 29, 32 of valve 22, then through a port 73 into chamber 24 and the inlet end 14 of radiating coil B. The steam flows through the coil carrying with it accumulated water of condensation until reaching the pipe 16. The water flows downwardly through pipe 16 into chamber 28 of the controller and from there passes into chamber 25 through a duct 74 formed in the casing 20 under and around bushing 21. From chamber 25 the water passes through a port 75 in the bushing and through ports 76 and 77 (Fig. 3) formed in valve 22 into a space 78 between the head 32 of the valve and plug 35, and from here through port 79, through chamber 26 and pipe 27 to the discharge pipe 10 of the vapor regulator C. The duct 74 is so arranged as to provide a water seal preventing the escape of steam from coil B along the course just described. The steam from radiator section 17 passes through pipe 19 into radiator section 18 and then through the return pipe 15 into chamber 25 and thence, either in the form of steam or water of condensation, to the vapor regulator. If the medium is in the form of steam the vapor regulator is actuated to throttle inflow in the known manner.

When the valve 22 is closed, that is to say, in the position shown in Fig. 7, its head 32 blocks communication between ports 72 and 73 so that steam cannot flow into the radiating coil from pipe 13. Steam now flows from chamber 23 through port 72 in the bushing 21 and through ports 80, 77 (Fig. 3) into space 78 and then to the discharge pipe 10 of the vapor regulator through pipe 27. The vapor regulator will operate to throttle the flow of steam over this course except in quantities just sufficient to keep the vapor regulator warm. When in this position the valve permits water of condensation to drain from the radiating coil B. From the inlet end of the coil water drains down through pipe 14, chamber 24, port 73 and into a drainage port 81 (Fig. 8) which is formed in the bottom of the valve casing and is covered by the head 29 of the valve when in its open position but uncovered when the valve stands in the position shown in Fig. 7. This port communicates with a drip pipe 82 screwed into the bottom of the casing, as shown in Fig. 8. Water from pipe 16 flows into chamber 28 and through a port 83 (covered by the head 29 of the valve when the valve is in the other position) and thence to the drip pipe 82 through port 81. Water from the return pipe 15 of the radiator flows from chamber 25 through a port 84, corresponding to port 83 and through a duct 85 formed between the valve and its bushing to the drainage port 81 and drip pipe 82. In order to facilitate the movements of valve 22 it is formed with a longitudinally extending air vent 86.

The importance of providing for the discharge of water of condensation from the radiating coil at a point intermediate the ends of the coil will be recognized when it is considered that the radiating coil used for heating a railway car is often of considerable length, the coil usually extending from end to end of the car and consisting of several lengths of pipe. These pipes are ordinarily arranged so that they slope toward the inlet and return pipes of the coil but the slope is necessarily slight and may be counteracted by uneven position of the car on the track. It often happens, therefore, that water is trapped in the pipe coils of the heating system while the car is standing in the yard or elsewhere with the steam turned off. When the heating system is put into operation the incoming steam is compelled to force the water ahead of it to the outlet. Until the steam reaches the thermostat of the vapor regulator full train pipe pressure will be exerted against the water that may collect in the pipes. But it is quite possible for the steam to flow over a certain amount of water lying in the bottom of the pipes, or it may even be forced through the water so as to reach the vapor regulator and actuate the thermostat to reduce the pressure of the incoming steam. When this condition occurs the system will be in operation with only a part of its radiating surface active. For these reasons it is highly desirable in a vapor system to have an arrangement, such as is provided by our invention, for removing the water of condensation from the coil at a point intermediate its ends. Moreover, with the arrangements described, when the system has been put out of operation the coil has three outlets for water so that the chance for water to trap in the coil is considerably diminished.

This application is a division of our copending application filed March 1, 1920, Serial No. 363,339.

We claim:

1. In a steam heating system for a railway car, the combination of a radiating coil and a device for controlling the supply of steam thereto with which both ends of the coil are connected and which provides additionally an outlet for water of condensation from said coil at a point intermediate the ends thereof that is open while the coil is receiving steam.

2. In a steam heating system for a rail-

way car, the combination of a radiating coil and a device for controlling the supply of steam thereto which provides outlets for water of condensation from said coil at two separate places along the same that are open while the coil is receiving steam.

3. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve an outlet for water of condensation from said coil at a place intermediate the ends thereof.

4. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve outlets for water of condensation from said coil at two places along the same.

5. In a steam heating system for a railway car, the combination of a radiating coil and a device for controlling the supply of steam thereto which communicates with and provides an outlet for water of condensation from said coil at a point intermediate the ends thereof, and means whereby the steam circulated through said coil is maintained at a pressure not substantially in excess of atmospheric pressure.

6. In a steam heating system for a railway car, the combination of a radiating coil and a device for controlling the supply of steam thereto which communicates with and provides outlets for water of condensation from said coil at two separate places along the same, and means whereby the steam circulated through said coil is maintained at a pressure not in excess of atmospheric pressure.

7. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve an outlet for water of condensation from said coil at a place intermediate the ends thereof, a pressure reducing valve in advance of the first mentioned valve, and a thermostat subject to influence of the medium outflowing from said coil for governing said pressure reducing valve.

8. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve outlets for water of condensation from said coil at two places along the same, a pressure reducing valve in advance of the first named valve, and a thermostat subject to the influence of medium outflowing from said coil for governing the operation of said pressure reducing valve.

9. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve an outlet for water of condensation from said coil at a place intermediate the ends thereof, and a motor for operating said valve.

10. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve outlets for water of condensation from said coil at two places along the same, and a motor for operating said valve.

11. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve outlets for water of condensation from said coil at a place intermediate the ends thereof, a motor for operating said valve, and manually operable means for setting said valve to open or closed position.

12. In a steam heating system for a railway car, the combination of a radiating coil and a controlling device comprising a valve which in one position opens and in another position closes the inlet end of the coil, said controlling device communicating with and providing in both positions of said valve outlets for water of condensation from said coil at two places along the same, a motor for operating said valve, and manually operable means for setting said valve to open or closed position.

13. In a steam heating system for a railway car, the combination of a supply pipe, a radiating coil, a vapor regulator, a controlling device comprising a casing having a drainage outlet, a valve which in the open position admits steam to the coil and directs the medium from the coil to the vapor regulator and in closed position shuts off steam from the coil and puts the coil in communication with the drainage outlet, and a pipe leading from said coil intermediate its ends, said controlling device having a duct with

which said pipe communicates formed so as to permit the outflow of water from the pipe while preventing the outflow therefrom of steam.

14. In a steam heating system for a railway car, the combination of a supply pipe, a radiating coil, a vapor regulator, a controlling device comprising a casing having a drainage outlet, a valve which in the open position admits steam to the coil and directs the medium from the coil to the vapor regulator and in closed position shuts off steam from the coil and puts the coil in communication with the drainage outlet, and a pipe leading from said coil intermediate its ends, said casing being formed with a water duct below and around the valve which provides a passageway for water from said pipe to the vapor regulator.

15. In a steam heating system for a railway car, the combination of a supply pipe, a radiating coil, a vapor regulator, a pipe leading from the coil intermediate its ends and a controlling device comprising a casing formed with a valve chamber, chambers in communication with the supply pipe, inlet end of the coil, discharge pipe of the vapor regulator, outlet end of the coil and the aforesaid pipe, respectively, a duct connecting the last mentioned two chambers, a drainage port, and a valve which in one position puts into communication the supply pipe chamber with the inlet chamber and the outlet chamber with the vapor regulator chamber, closing said drainage port, and in another position closes the inlet end of the radiator, opens the drainage port and puts the supply pipe chamber into communication with the vapor regulator chamber.

16. In a steam heating system for a railway car, the combination of a supply pipe, a radiating coil, a vapor regulator, a controlling device comprising a casing having chambers communicating with the supply pipe, inlet end of the coil, return end of the coil and discharge pipe of the vapor regulator, respectively, and formed with a drainage outlet; and a valve which in one position puts the supply pipe in communication with the inlet end of the radiator and the return end of the radiator in communication with the vapor regulator, closing said drainage outlet, and in another position closes the inlet end of the radiator, opens the drainage outlet and directs steam from the supply pipe immediately to the vapor regulator.

17. In a steam heating system for a railway car, the combination of a supply pipe, a radiating coil, a vapor regulator, a controlling device comprising a casing having chambers communicating with the supply pipe, inlet end of the coil, return end of the coil and discharge pipe of the vapor regulator, respectively, and formed with a drainage outlet; a valve which in one position puts the supply pipe in communication with the inlet end of the radiator and the return end of the radiator in communication with the vapor regulator, closing said drainage outlet, and in another position closes the inlet end of the radiator, opens the drainage outlet and directs steam from the supply pipe immediately to the vapor regulator, and a motor to move said valve to the second named position.

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