J. L. SPARKS & E. R. EDDINS.

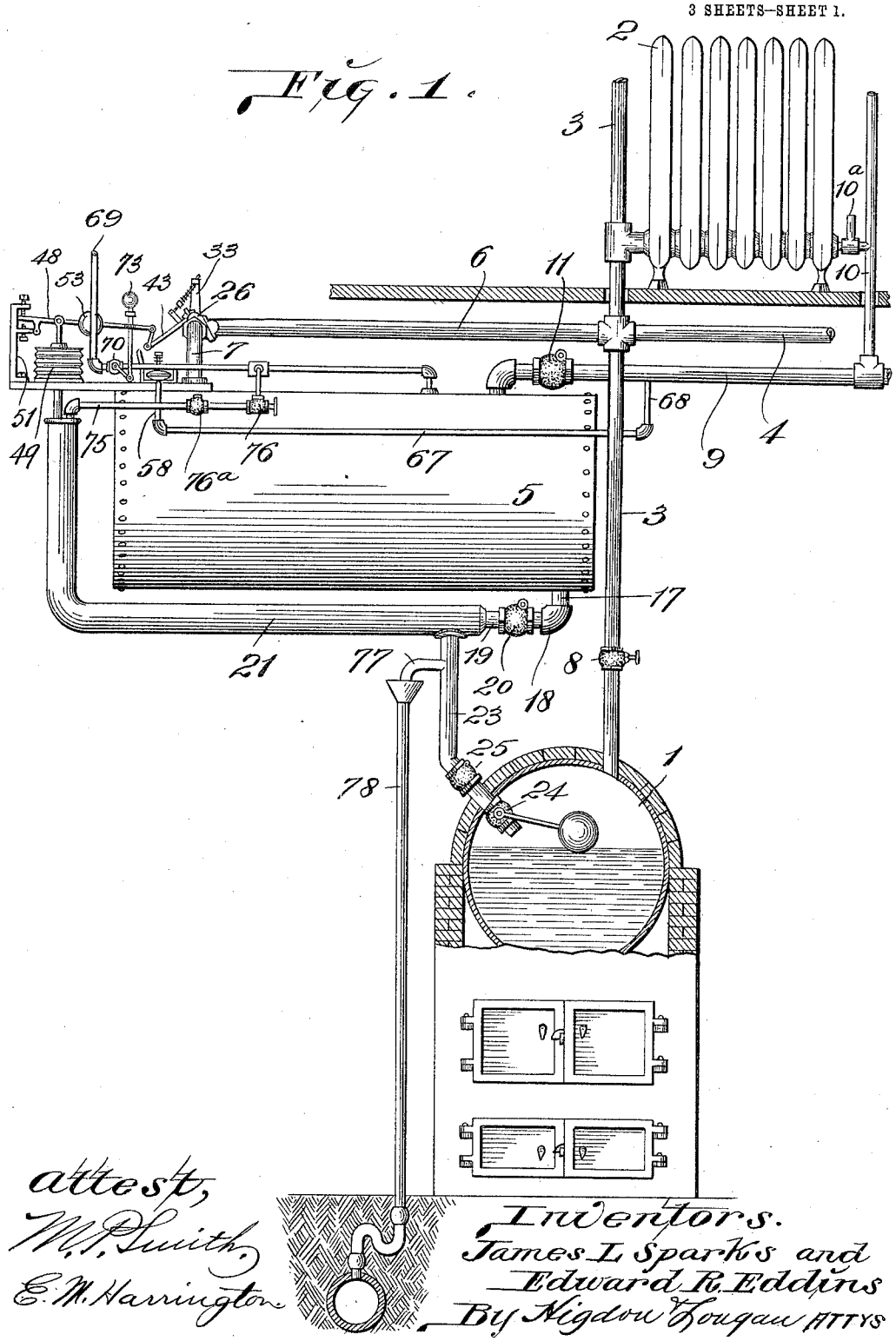
STEAM HEATING SYSTEM.

APPLICATION FILED AUG. 19, 1907. RENEWED FEB. 14, 1910.

1,067,769. Patented July 15, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



Attest,
W. P. Smith.
E. M. Harrington.

Inventors.
James L. Sparks and
Edward R. Eddins
By Nigdon & Dougan Attys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. L. SPARKS & E. R. EDDINS.

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3 SHEETS—SHEET 2.

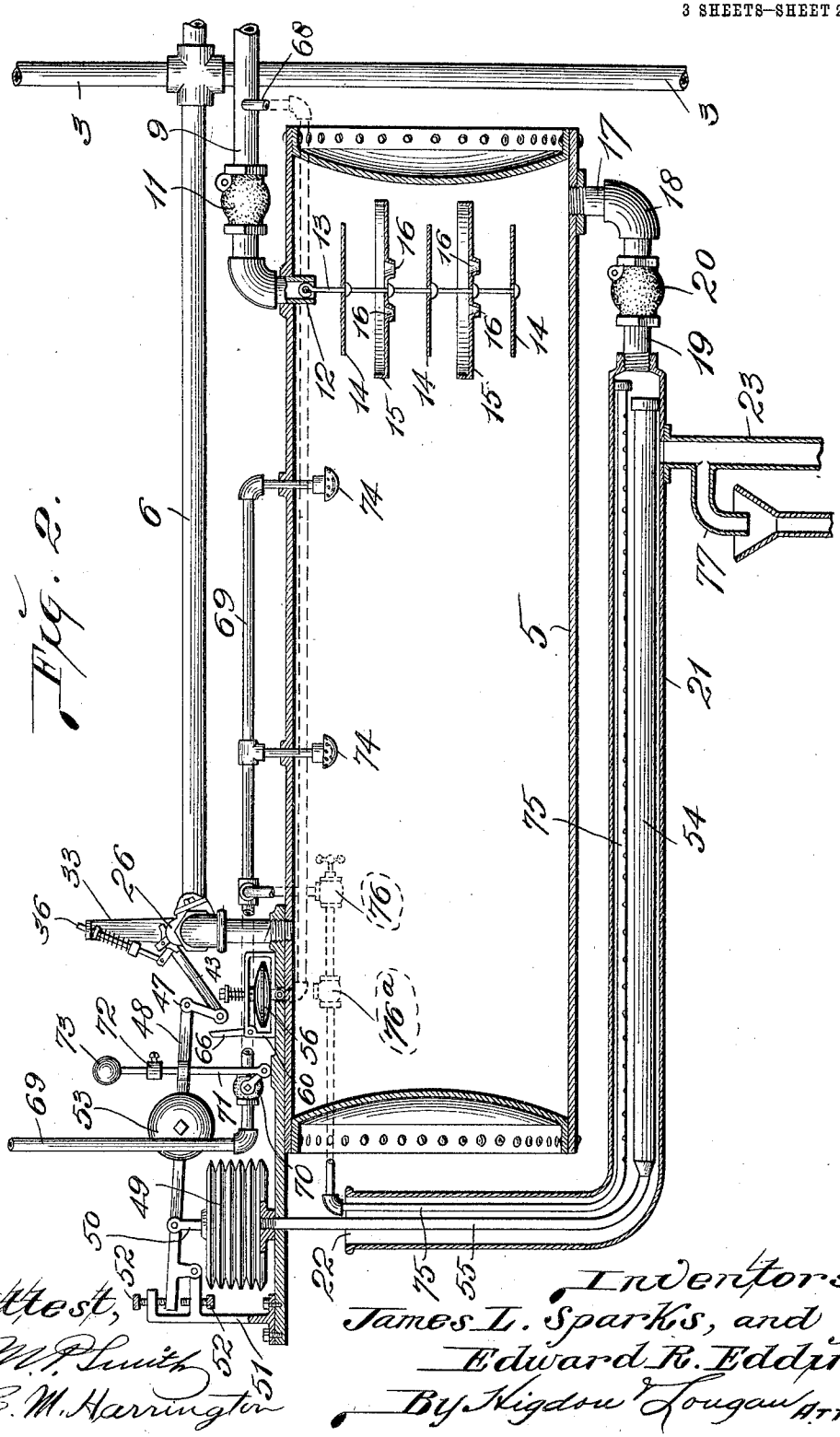


Fig. 2.

Witnesses,
W. P. Smith
E. M. Harrington

Inventors.
James L. Sparks, and
Edward R. Eddins,
By Kigdon & Lougan Attys

J. L. SPARKS & E. R. EDDINS.

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3 SHEETS—SHEET 3.

Fig. 3.

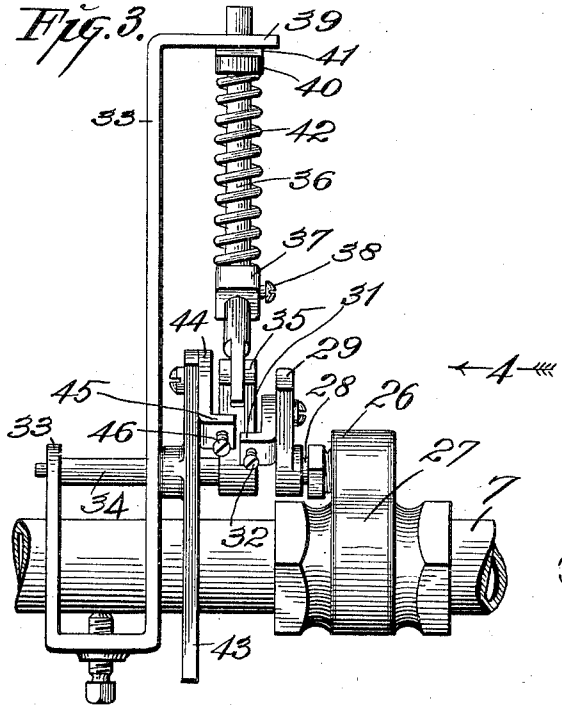


Fig. 4.

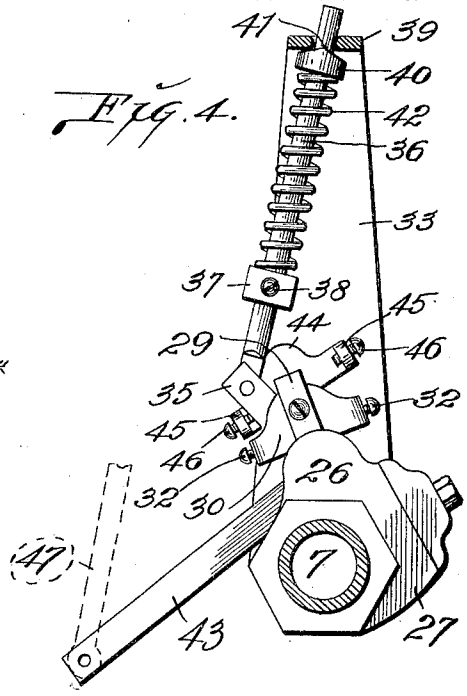
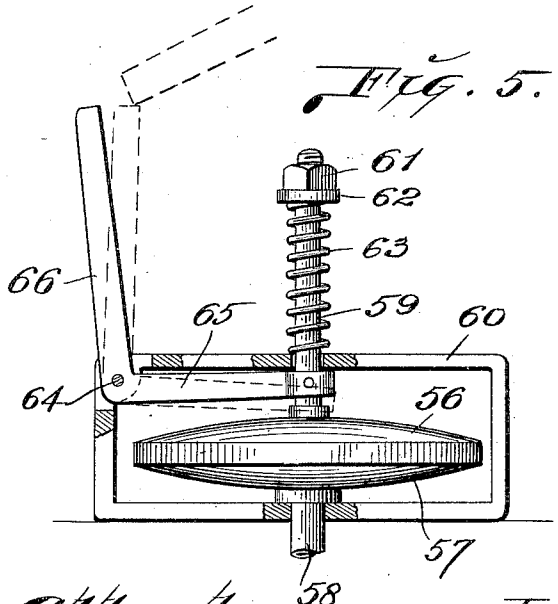


Fig. 5.



Attest,

M. P. Smith.

E. M. Harrington.

Inventors,

James L. Sparks, and

Edward R. Eddins.

By Wigdon & Longan. Attys.

UNITED STATES PATENT OFFICE.

JAMES L. SPARKS AND EDWARD R. EDDINS, OF ST. LOUIS, MISSOURI, ASSIGNORS TO AUTOMATIC VACUUM PUMP COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

STEAM-HEATING SYSTEM.

1,067,769. Specification of Letters Patent. Patented July 15, 1913.

Application filed August 19, 1907, Serial No. 389,291. Renewed February 14, 1910. Serial No. 543,746.

To all whom it may concern:

Be it known that we, JAMES L. SPARKS and EDWARD R. EDDINS, both citizens of the United States, and residents of St. Louis, Missouri, have invented certain new and useful Improvements in Steam-Heating Systems, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to a new and useful improvement in steam heating systems, of which the following is a full, clear and exact description, reference being had to the accompanying drawings which form a part thereof.

Our invention has relation to improvements in heating systems, and consists in the novel arrangement and combination of parts more fully hereinafter set forth in the specifications and pointed out in the claim.

Our invention especially relates to steam heating systems wherein steam from any suitable source is used as a heating medium, and also acts as an agent for producing a vacuum for drawing off the air and water of condensation from the radiators employed in the system, thus permitting the heating medium to circulate freely therethrough.

Another object of our invention is the utilization or saving of the water of condensation in the system, and a still further object is the automatic regulation or control of the vacuum, thereby regulating the supply of steam for producing of a vacuum sufficient to exhaust the air and water of condensation from the radiators as may be required.

In the accompanying drawings Figure 1 is a diagrammatic view of a heating system with parts in section, showing the application of one form of our invention; Fig. 2 is a vertical section taken longitudinally through the vacuum tank; Fig. 3 is a side elevation of a device which we employ to automatically cut off the heating medium fed to the vacuum tank; Fig. 4 is an end elevation taken looking in the direction of the arrow indicated in Fig. 3; and Fig. 5 is a side elevation with parts in section of a device which we employ for preventing the opening of the automatic cut-off valve when there is a partial or sufficient vacuum in the system.

Referring to the drawings: 1 indicates a steam boiler which may be of any suitable design or construction, or in place of the boiler 1 what is known as an open heater may be employed. 2 indicates a radiator which may be likewise of any design or construction, and represents one radiator of the system.

3 indicates a pipe by means of which the steam or the heating medium is supplied from the boiler 1 to the radiator 2 in the usual manner. 4 indicates a pipe for supplying the heating medium to the remaining radiators of the system.

5 indicates a vacuum tank. 6 indicates a supply pipe for said vacuum tank, one end of which is connected to the pipe 3 and is in communication with the boiler 1. The other end of said pipe 6 is connected with the pipe 7, one end of which pipe 7 is connected to the vacuum tank 5. Located in the pipe 3 is a valve 8 for admitting and cutting off the heating medium to the system. The vacuum tank 5 is in communication with the boiler 1 through the pipes 3, 6 and 7, forming a passage for the heating medium from the boiler 1 into the vacuum tank 5.

9 indicates a pipe through which the exhausted air and water of condensation from the radiators passes from said radiators into the vacuum tank 5. The said pipe 9 is connected to the radiator 2 by means of a pipe 10, and located in the pipe 9 is a check valve 11, permitting the passage of the exhausted air and water of condensation into the vacuum tank only, and preventing steam from passing into the pipe 9.

10^a indicates a thermostatic valve of any preferred construction to prevent the passage of steam from the radiators into the pipe 10. Secured to the nipple 12, passing through the shell of the tank 5 is a pivoted rod 13, and secured to said rod 13 is a series of plates 14 and pans 15, the latter of which are provided with a series of openings 16 near their centers, the function of which will be hereinafter more fully described. Secured to the bottom of the vacuum tank 5 is a pipe 17, and applied to said pipe 17 is an L 18, and secured to the L 18 is a pipe 19, and located in the pipe 19 is the check valve 20, which permits the

escape of the steam, exhausted air and water of condensation from the vacuum tank 5, and prevents the ingress of air into said tank. Secured to the pipe 19 is a casing 21, provided with an open mouth 22, and secured to said casing and in communication therewith is a pipe 23, which pipe is also in communication with the interior of the boiler 1 by means of a float valve 24. Located in the pipe 23 is a check valve 25 to prevent the escape of steam from the boiler.

The water of condensation from the vacuum tank 5 passes into the boiler 1 through the pipe 23. The passage of the heating medium to the vacuum tank 5 is automatically controlled by means of a quick-acting valve 26, which quick-acting valve is located between the source of supply of the heating medium, which in this case is the boiler 1, and the vacuum tank, the details of construction and operation of which we will now proceed to describe: The body 27 of the valve is connected to the pipe 7 in any suitable manner. 28 indicates the valve stem and secured to the valve stem 28 is the valve lever 29, and secured to the valve lever 29 is a plate 30, provided with tappets 31, and mounted in said tappets 31 are adjusting screws 32, to regulate the travel of the valve. Mounted on the pipe 7 are supporting arms 33, and journaled in said supporting arms 33 is a shaft 34. Mounted on the shaft 34 is a pivoted arm 35, pivoted to the upper end of which is a shaft 36 and mounted on said shaft 36 is an adjustable collar 37. The said collar 37 may be held in any desired adjustment by means of a screw 38. One of the arms 33 is provided with a horizontal arm 39, in which is located the upper end of the shaft 36, and mounted on said shaft 36 below the arm 39 is a collar 40, provided with a knife edge 41 bearing against the under side of the arm 39. Mounted on said shaft 36, between the collars 37 and 40, is a spiral spring 42. Mounted on the shaft 34 is a pivoted lever 43 carrying a plate 44 and tappets 45, the said tappets carrying adjusting screws 46. The tappets 45, and consequently the adjusting screws 46, lie in the path of travel of the pivoted arm 35, and by means of the pivoted lever 43 the pivoted arm 35 may be rocked or rotated on the shaft 34. In other words, the pivoted arm 35 is actuated primarily by the lever 43, by which motion is imparted to the plate 44 and the screws 46 of the tappets 45 act directly against the pivoted arm 35, and through the agency of the arm 35 motion is transmitted to the valve stem 28. The valve carried by the valve stem 28 stands positively open or closed. When the valve is open the lever 43 is depressed, as shown in Figs. 3 and 4. When the valve is closed, the lever 43 is elevated, and during the operation of elevating the lever 43 the spring 42 is compressed, the said spring receiving its maximum compression when the shaft 36 and the pivoted arm 35 are in alinement, and when said levers pass out of alinement, as the lever 43 is elevated, the expansion of the spring 42 imparts its force to the valve stem 28 through the tappets 31 carried by the plate 30 and the valve lever 29, thereby closing the valve. By depressing the lever 43 the same operation opens the valve. It will be seen from this that the power stored in the spring 42 by the same being compressed either by elevating or depressing the lever 43 the valve is either opened or closed, by the expansive force of the spring. The pivoted lever 43 is pivotally secured to the link 47, and said link 47 is pivotally secured to an arm 48 carried by the metal bellows 49. The arm 48 is adapted to be operated by the expansion and contraction of the metal bellows 49. The arm 48 is carried by the metal bellows 49 by being pivotally secured to a standard 50, secured to the metal bellows. The arm 48 is pivotally secured to a stationary standard 51, the up and down movement of said arm being regulated by means of the adjusting screws 52. Mounted on the arm 48 is a counterbalancing weight 53.

54 indicates an elastic fluid container which should be located in the path of the heating medium, one end of said container being closed and the other end of said container secured to a pipe 55, one end of said pipe 55 being in communication with the metal bellows 49. In other words, the elastic fluid container 54 is in communication with the metal bellows 49 by means of the pipe 55. The elastic fluid container 54 is located inside the casing 21.

In instances where there is a vacuum in the system and it is not necessary for the apparatus to continue in operation, we make use of a regulating device, which prevents the arm 43 from completing its downward stroke, and consequently prevents the admission of the heating medium into the vacuum tank 5. This device is illustrated in Fig. 5, and consists of two metal diaphragms 56 and 57, properly secured together so as to form a contractive and expansive bellows, the diaphragm 57 being rigidly fixed to a pipe 58, and the diaphragm 56 rigidly fixed to a shaft 59, the shaft 59 being mounted in the housing 60. The upper end of the shaft 59 is screw threaded, and carries a nut 61 and a washer 62, and located on said shaft 59 between the washer 62 and the top of the housing 60 is a spiral spring 63.

64 indicates a pivoted lever, the same being pivoted in the housing 60 and provided with arms 65 and 66, the arm 65 being mounted on the lower end of the shaft 59.

The arm 66 is adapted to travel in the path of the lever 43, that is to say when the diaphragms 57 and 56 are contracted, or compressed, the arm 66 is brought or projected in the path of the lever 43, thereby preventing same from completely finishing its downward stroke. The pipe 58 is connected to a pipe 67, and said pipe 67 is connected to a pipe 68 in communication with the pipe 9. In other words, the regulating device hereinbefore just described and the pipe 9 are in communication through the pipes 68, 67 and 58, the pipe 68 being tapped into the pipe 9 at a point beyond the check valve 11.

By increasing or decreasing the tension of the spring 63 by means of the nut 61, we are enabled to regulate the amount of vacuum formed in the system. This feature we have found to be very efficacious, as there is no use of our apparatus continuing in operation when the proper amount of vacuum is formed in the system.

In order to facilitate condensation of the heating medium passed into the vacuum tank, we employ an automatically operative water supply. This water supplying apparatus or device consists of a water supply pipe 69 and located in this pipe is an ordinary stop cock 70. Secured to the lever thereof is an arm 71, said arm passing through the lever 48 and is movable therein. Mounted on said arm 71 is an adjustable collar 72, also a gravity weight 73, which closes the valve after it has been opened by the expansion of the metal bellows 49.

After the heating medium has passed into the vacuum tank 5 and has discharged the air and water of condensation therefrom, and has also passed on in contact with the fluid container 54, thereby heating the elastic fluid contained therein, and expanding the metal bellows 49, the heating medium is cut off and the water is turned on simultaneously, a part of the water from the supply pipe 69 being admitted to the vacuum tank 5, by means of the spraying nozzles 74, and a part admitted to the perforated pipe 75, provided with a check valve 76ª, by means of the throttle valve 76, that portion of the water going into the vacuum tank facilitating the condensation of steam and that portion passing into the pipe 75 cooling, and consequently contracting, the elastic fluid in the container, thereby increasing or decreasing the period of time in the operation of the apparatus. We have found out by experience that the use of the water supply is not necessary, as the water only increases the capacity of the apparatus. The overflow of water, after having performed its purpose, passes out through a pipe 77 through the down pipe 78 into a sewer or other receptacle.

The operation of our improved apparatus is as follows: The steam heating medium is admitted to the system by means of the valve 8, located in the pipe 3, and when the heating medium is admitted to the system a portion of the same passes into the vacuum tank 5 through the pipes 6 and 7, assuming, of course, that the quick-acting valve in the pipe 7 is open. When the heating medium passes into said vacuum tank the air and whatever water of condensation that is in the same are forced out through the discharge opening in the bottom of the vacuum tank, said water of condensation passing down through the pipe 23 into the boiler by its own gravity. The heating medium then passes into the casing 21 which surrounds the elastic fluid container 54, in which instance the fluid contained in the container will be heated, and consequently expanded, and cause the metal bellows 49 to expand, which operation will elevate the lever arm 43 and cause the quick-acting valve to close. The steam passing through the casing 21 and out through the open mouth 22 creates a draft or suction in said casing and around the elastic fluid container 54, and then when the heating medium is cut off the draft continues, the cool air being supplied through the pipe 77, which will facilitate the cooling off and the consequent contraction of the elastic fluid container and the elastic fluid contained therein. The steam admitted to the vacuum tank 5 will condense and produce a vacuum therein, the formation of which vacuum will permit the air contained in the radiators to expand into the vacuum tank. The water of condensation from the radiators will be received on the plates 14 and pans 15 suspended inside the vacuum tank, which serve to spread the water and retard its flow, thus assisting in the condensation of the steam inside the vacuum tank 5. The condensation may be further facilitated by means of the water passing through the spraying nozzles 74, located on the inside of the vacuum tank. At the same time that water is admitted through the spraying nozzles 74 into the vacuum tank 5, water is also admitted into the perforated pipe 75 to cool off or reduce the temperature of the elastic fluid container 54 and the fluid contained therein.

The quick-acting valve located in the pipe 7 between the vacuum tank and the source of the heating medium is caused to operate periodically from the expansion and contraction of the elastic fluid, and the frequency of such periodical operations may be determined and regulated.

When the operation of our apparatus has created a sufficient vacuum in the system as to permit the free circulation of steam through the radiators, the arm 66 will prevent the lever arm 43 from making its completed downward stroke, and consequently

will prevent the admission of the heating medium in the vacuum tank 5. Thus our apparatus will only continue in its periodic operation when there is not the required vacuum in the system.

We have found out by actual test of our invention that the water supply is not necessary, as the steam in the vacuum tank will condense by the air coming in contact with the shell of said vacuum tank, and the air coming in contact with the elastic fluid container will cool and sufficiently contract the fluid therein as to operate the valve controlling the passage of the heating medium into the vacuum tank, although by using a water supply the capacity of the apparatus is increased. The water supply is automatically turned on every time the vacuum tank is full of steam, in case water is used, and remains on until the elastic fluid in the container contracts sufficiently to allow the gravity weight 73 to close the valve, the time of contraction being regulated by the amount of water passing through the perforated pipe 75, said amount of water being regulated by the throttle valve 76.

Our application may be used for other purposes except for creating a vacuum to draw off the air and water of condensation in a steam heating system, this application being an improvement on the invention disclosed in our application filed April 5, 1907, Serial No. 366,628.

We claim:

In a vacuum producing means, a tank, a pipe in communication with the tank and connected with a source of heating-medium supply, a valve in said pipe, a vacuum pipe leading from the tank, a check valve in said vacuum pipe, a tubular, open-topped casing connected with the tank, a container for an elastic fluid located in the casing, and means operable by the elastic fluid and connected with said valve to automatically control the admission of heating medium to the tank.

In testimony whereof, we have signed our names to this specification, in presence of two subscribing witnesses.

JAMES L. SPARKS.
EDWARD R. EDDINS.

Witnesses:
EDWARD E. LONGAN,
E. L. WALLACE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."