No. 647,025. Patented Apr. 10, 1900.

A. G. PAUL.

HEATING SYSTEM.

(Application filed July 6, 1897.)

(No Model.)

Fig. 1,

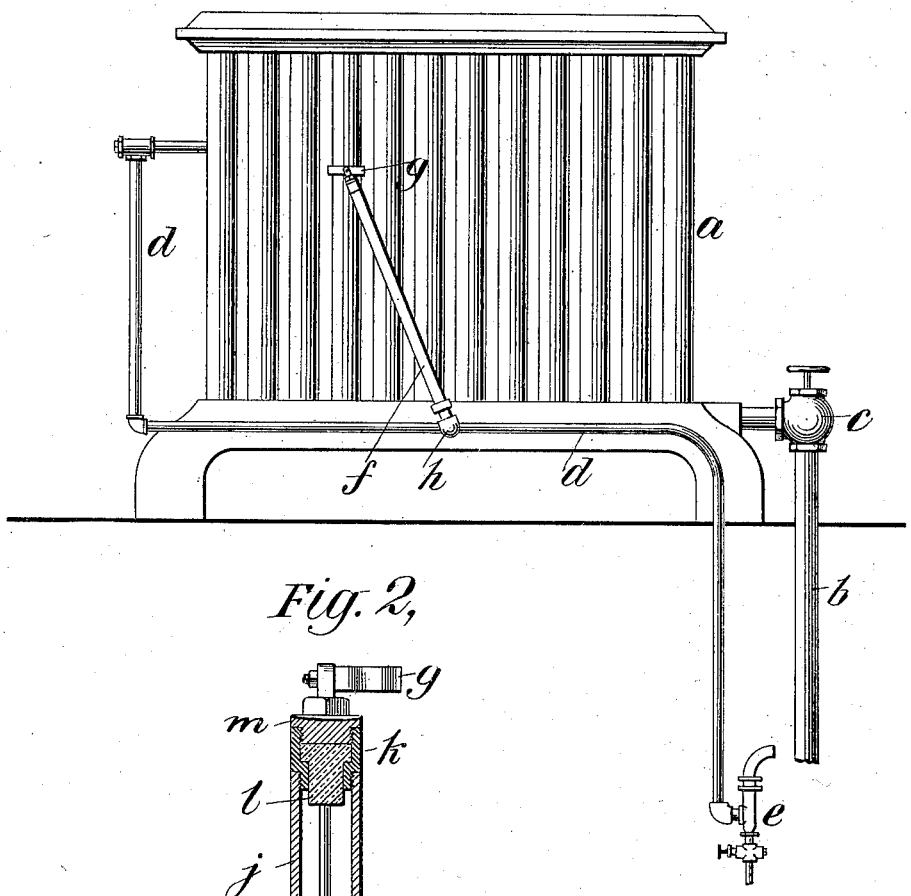
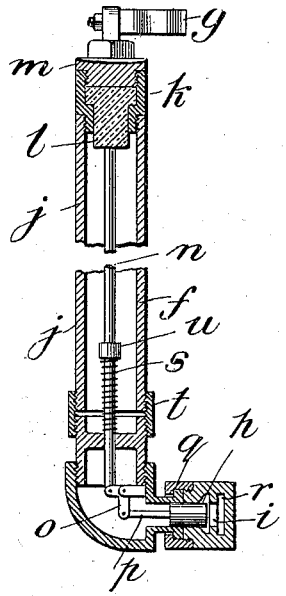


Fig. 2,



WITNESSES:

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HEATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 647,025, dated April 10, 1900.

Application filed July 6, 1897. Serial No. 643,528. (No model.)

To all whom it may concern:

Be it known that I, ANDREW G. PAUL, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Heating Systems, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, which form a part hereof.

This invention relates to heating systems in which a pipe or passage is provided for the escape of the air from the heater or radiator or system, and it is especially applicable to a system such as that shown in the drawings of United States Letters Patent to Skiffington, No. 464,946, of December 8, 1891, wherein there is an air-pipe additional to the supply and return pipe or pipes and an exhauster connected with the air-pipe.

The object of the invention is to automatically control the escape of the air from the radiator or heater or system by means of the heat given off therefrom or from any selected part thereof, and thereby to regulate the part or extent of the radiator or heater or system from which the air shall be discharged and which shall thereby be brought into operation and made efficient in the work of heating and in this way to regulate or adjust the amount of heat furnished by the system.

This invention consists, broadly, in the combination, with a heater or radiator and the other necessary parts of such a system, of a pipe or passage adapted to permit the escape of air from the radiator or heater or system when the heating-vehicle is admitted to the system, and a thermostat adapted to be placed against some part of the heater or radiator or system, so as to be operated by the heat given off from that part and to thereby control the air-pipe and prevent any more of the heater or radiator or system from being brought into operation and adapted to be removed from such position when desired, so as to permit the entire heater or radiator or system to be brought into operation.

The invention also consists in so constructing and arranging the thermostat that it can be placed against or in contact with different parts of the heater or radiator or system, whereby the air-pipe can be closed when the heating agent has reached any predetermined part of the heater or radiator or system and heated that part to the desired temperature.

The invention also consists of certain other features of construction and combinations of parts hereinafter described and claimed.

The invention is fully illustrated in the accompanying drawings, in which—

Figure 1 shows a radiator with my improvement applied thereto; and Fig. 2 is a detailed sectional view of the thermostat, showing its connection with the air-pipe.

Similar letters indicate similar parts in both figures.

Referring to the drawings, *a* is an ordinary radiator.

b is a pipe serving at the same time as the supply-pipe and the return-pipe, the radiator being connected up on the single-pipe system.

c is an ordinary valve on the pipe *b*.

d is an air-pipe connected with the upper part of the heater, and *e* is an exhauster at the outer end of the air-pipe. I prefer to use a jet of steam or water as the exhausting device.

f is a thermostat provided with a catch or clip *g* at its upper end adapted to be slipped upon any one of the tubes of the radiator, by means of which the upper end of the thermostat can be fastened in position against any tube of the radiator.

h is a valve in the air-pipe controlling the same and adapted to be operated by the thermostatic device, *i* being an opening in the air-pipe adapted to be closed by the plunger or valve *h*.

The construction of the thermostat can be greatly varied. In the particular form shown *j* is a tube. *k* is a socket screwed into the upper end of this tube and adapted to receive and hold in place the expanding member *l*. This expanding member can be made of any suitable expansible substance, such as a composition of vulcanized rubber and refractory material. The upper end of the member *l* is enlarged, and this enlargement bears against a shoulder in the socket *k*. A screw-cap *m* bears against the upper end of the member *l*. By these means the expanding member *l* is held in place.

n is a rod fastened to the lower end of the member *l*. The rod is connected by the bell-

crank lever *o* with the valve-stem *p* of the valve *h*.

s is a spring adapted to lift the rod *n*, so as to open or assist in opening the valve *h* when the member *l* contracts. This spring bears against a projection *u* on the rod *n* and against a projecting collar or bridge on the inside of the tube *j*.

t is a union on the tube *j* by which that tube can be lengthened or shortened and the throw of the valve thereby determined. The tube *j* is connected with the air-pipe *d* by the swivel-joint *q*, which can be made in any suitable way and which enables the tube *j* to be turned or swung in either direction upon the air-pipe, whereby the upper end of the tube containing the expanding member can be brought opposite any tube of the radiator and fastened in such position by the clip *g*. The clip *g* is also connected to the upper end of the tube by a swivel-joint, so that it can turn and assume, for example, such a position as is shown in Fig. 1 and be readily slipped onto any of the tubes, no matter at what angle the tube *j* may be inclined. If desired, the upper end of the tube *j* can be swung entirely away from the radiator-tubes, so that the expanding member will not be in contact with any one of them.

The air-pipe *d* is divided at the valve *h* into two passages by the diaphragm *r*, and in this diaphragm there is a discharge opening or port *i*, adapted to be closed by the valve *h*. The passage on one side of the diaphragm leads from the radiator to the valve. The passage on the other side leads from the valve to the exhauster. It will be understood that the construction of this valve in the air-pipe can be greatly varied.

The operation of my device is as follows: When the system is started and the steam or other heating agent is admitted to the radiator, the air with which the radiator is full passes out through the air-pipe. When an exhauster is used, the decreased pressure produced thereby in the air-pipe causes the air to flow into the air-pipe. When no exhauster is used, the discharge of the air is dependent upon the pressure on the supply side. The amount of steam that can enter the radiator is dependent upon the amount of air that escapes therefrom. If the operator wishes to put into operation only three tubes of the radiator, he turns the tube *j* so as to bring its upper end opposite the third tube and secures it in that position by means of the clip. When the steam reaches the third tube, that tube is heated, and this heat is imparted to the expanding member of the thermostat which expands and closes the valve in the air-pipe. No more air can escape. Hence no steam can enter the radiator beyond the third tube. In this way the heat given from by the radiator operates the thermostat and through it closes the air-pipe.

In the form shown in the drawings the number of tubes brought into operation can be controlled and regulated as desired. The thermostat is adapted to be placed directly against any one of the tubes. It will be readily understood that the thermostat might be so arranged as to be placed near to the tube instead of against it or in actual contact with it. By putting the expanding member in the upper part of the tube, and thereby bringing it as near as possible to the source of heat, its efficiency is increased. It will be apparent that the thermostat can be swung entirely away from the tubes of the radiator if the entire radiator is to be put into operation, and also that the thermostat could be so arranged as to be capable of being placed against some one part of the radiator—for example, the middle part—so as to bring only half of the radiator into operation or to be moved entirely away from the radiator when the entire radiator is to be used.

One advantage of my invention is that the work of the heater or radiator is automatically controlled by means of the heat given off therefrom. When the heat reaches the desired point, the air-pipe is shut off and the further escape of air prevented until the temperature falls. This is accomplished without any extra or special piping. With this system the valves in the supply-pipe could be dispensed with, especially where the heating agent is being supplied at atmospheric pressure or less.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a heater or radiator, of an air-pipe for removing air therefrom, a valve controlling said air-pipe, and a thermostat adapted to be placed against some part of the heater or radiator, and to be expanded by the heat from the same, and to be moved away from the heater or radiator when desired, means connecting the thermostat with the valve whereby when the thermostat is expanded or contracted the valve is operated, substantially as set forth.

2. The combination with a heater or radiator, of an air-pipe for removing air therefrom, a valve controlling said air-pipe, and a thermostat adapted to be placed against different parts of the heater or radiator, and to be expanded by the heat from the same, means connecting the thermostat with the valve whereby when the thermostat is expanded the valve is closed, and when the thermostat is contracted the valve is opened, substantially as set forth.

3. The combination with a heater or radiator, of an air-pipe for removing air therefrom additional to the supply and return pipe or pipes and an exhauster connected with the air-pipe, a valve controlling said air-pipe, and a thermostat adapted to be placed against different parts of the heater or radiator, and to be expanded by the heat from the same, means connecting the thermostat with the valve whereby when the thermostat is expanded the valve is closed, and when the ther-

mostat is contracted the valve is opened, substantially as set forth.

4. The combination with a heater or radiator, of an air-pipe for removing air therefrom, an exhauster connected with the air-pipe, a valve in said air-pipe, a thermostat consisting of an expanding member adapted to be placed against different parts of the heater or radiator, and a connecting device connecting the expanding member with the valve in the air-pipe, and a catch to hold the thermostat in whatever place it may be put, substantially as set forth.

5. The combination with a heater or radiator, of an air-pipe for removing air therefrom, additional to the supply and return pipe or pipes, a valve in the air-pipe, a thermostat adapted to be placed against different parts of the radiator or heater, and connected with the valve in the air-pipe by a swivel-joint, substantially as set forth.

6. The combination with a heater or radiator, of the air-pipe *d*, the exhauster *e*, the valve *h*, the clip *g*, and the thermostat *f*, comprising the tube *j*, the expanding member *l*, the rod *n*, the spring *s*, the bell-crank lever *o*, the valve-stem *p*, and the swivel-joint *q*, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDREW G. PAUL.

Witnesses:
HERBERT A. RHOADES,
THOS. W. ANDREW.