No. 816,046. PATENTED MAR. 27, 1906.

J. A. SERRELL.

TEMPERATURE REGULATING APPARATUS.

APPLICATION FILED JUNE 6, 1905.

4 SHEETS—SHEET 1.

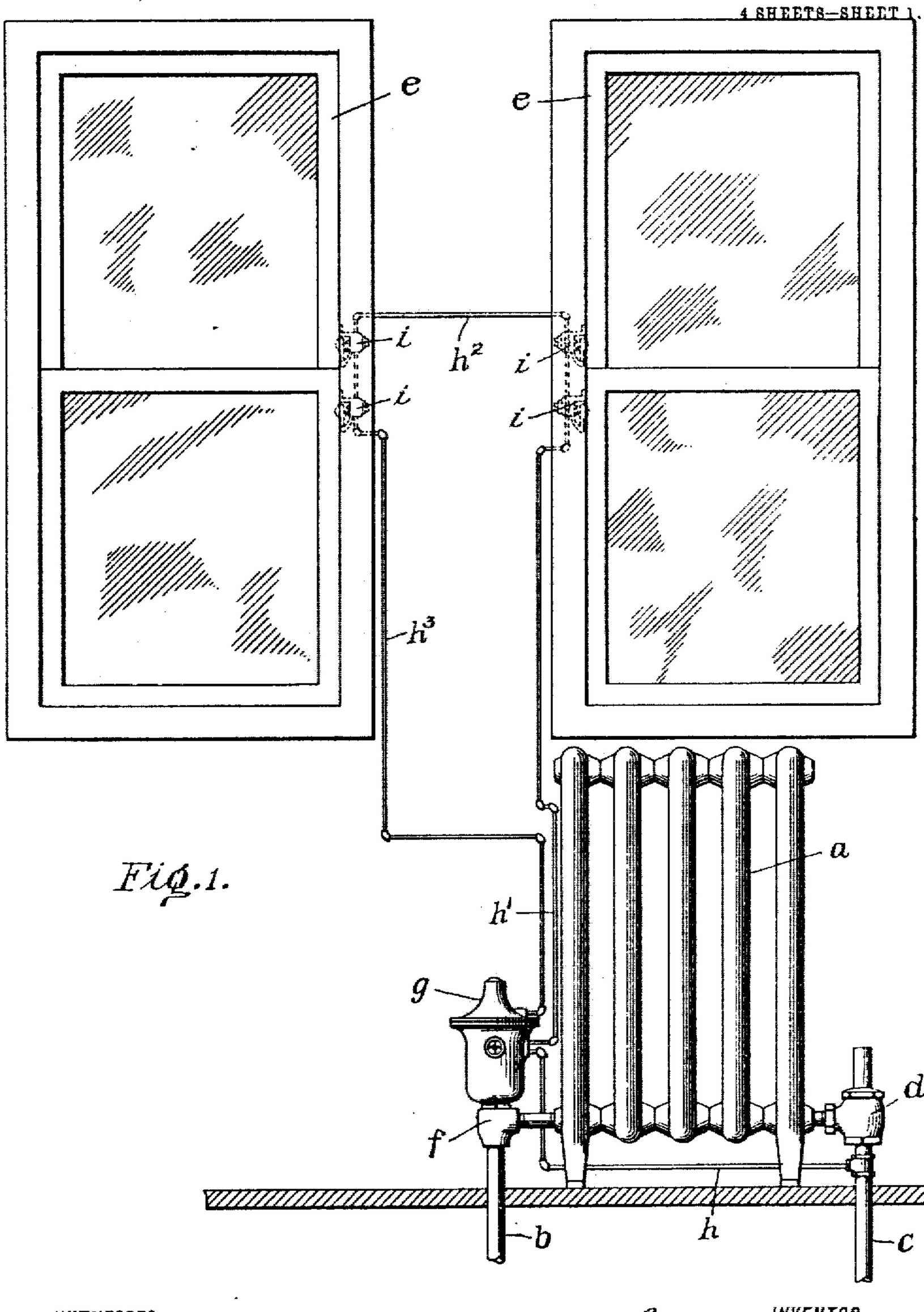


Fig. 1.

WITNESSES:
D. Webster, Jr.
P. M. Kelly

INVENTOR
John A. Serrell
BY
Munn & Co.
ATTORNEY.

No. 816,046. PATENTED MAR. 27, 1906.

J. A. SERRELL.

TEMPERATURE REGULATING APPARATUS.

APPLICATION FILED JUNE 6, 1905.

4 SHEETS—SHEET 2.

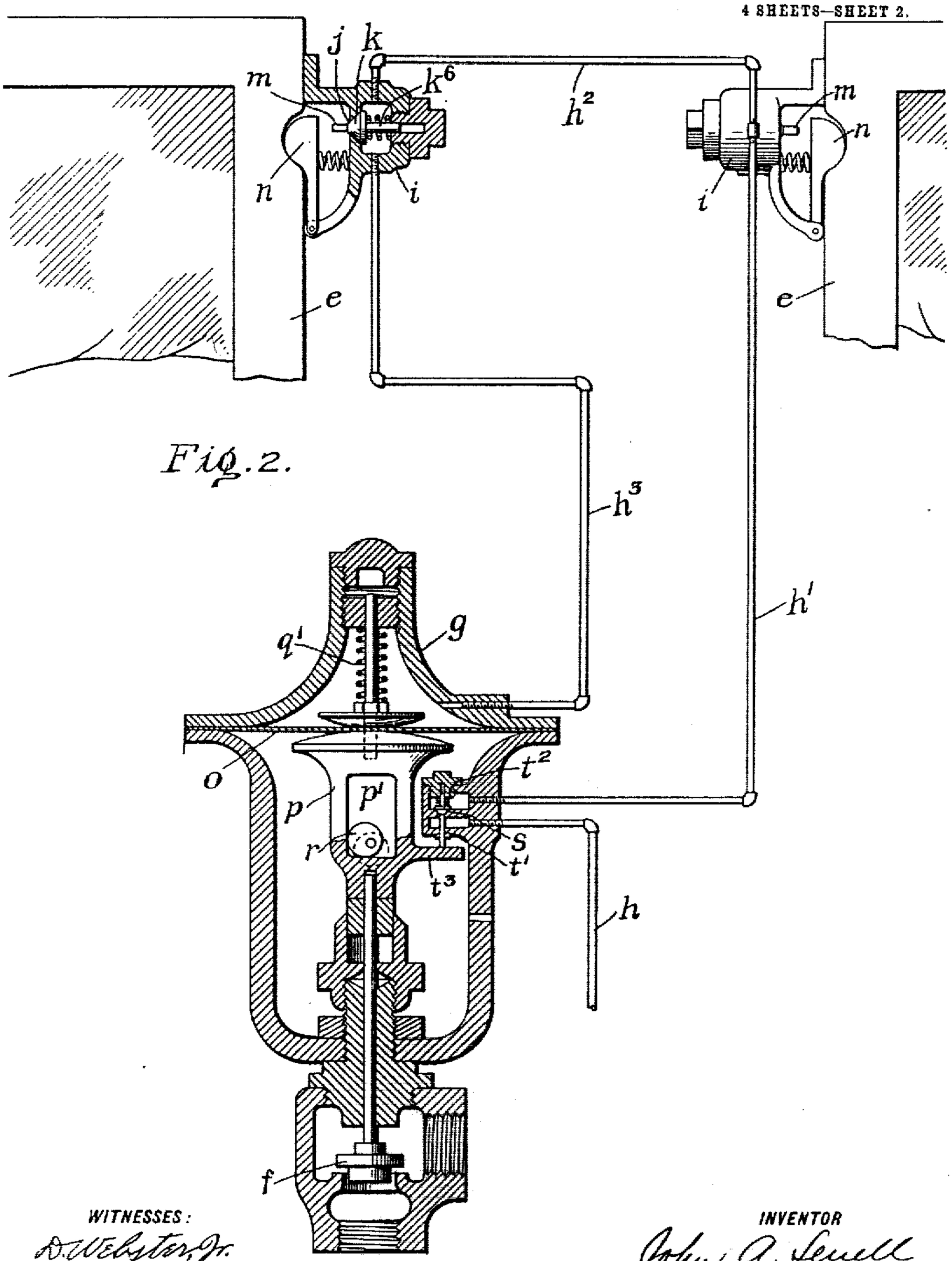


Fig. 2.

WITNESSES:

D. Webster, Jr.

R. M. Kelly.

INVENTOR

John A. Serrell

BY

Munn & Co

ATTORNEY.

No. 816,046. PATENTED MAR. 27, 1906.

J. A. SERRELL.

TEMPERATURE REGULATING APPARATUS.

APPLICATION FILED JUNE 5, 1905.

4 SHEETS—SHEET 3.

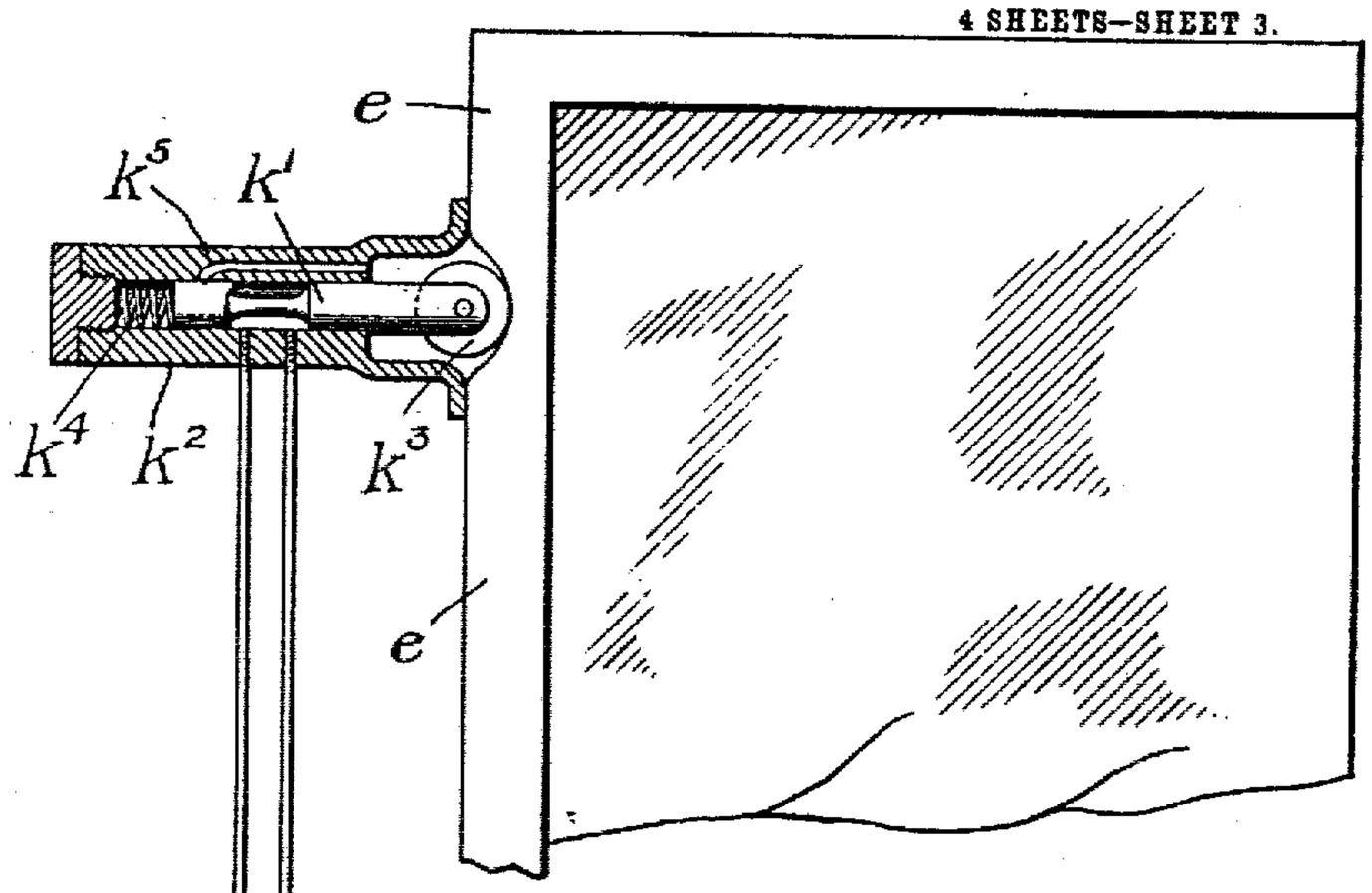
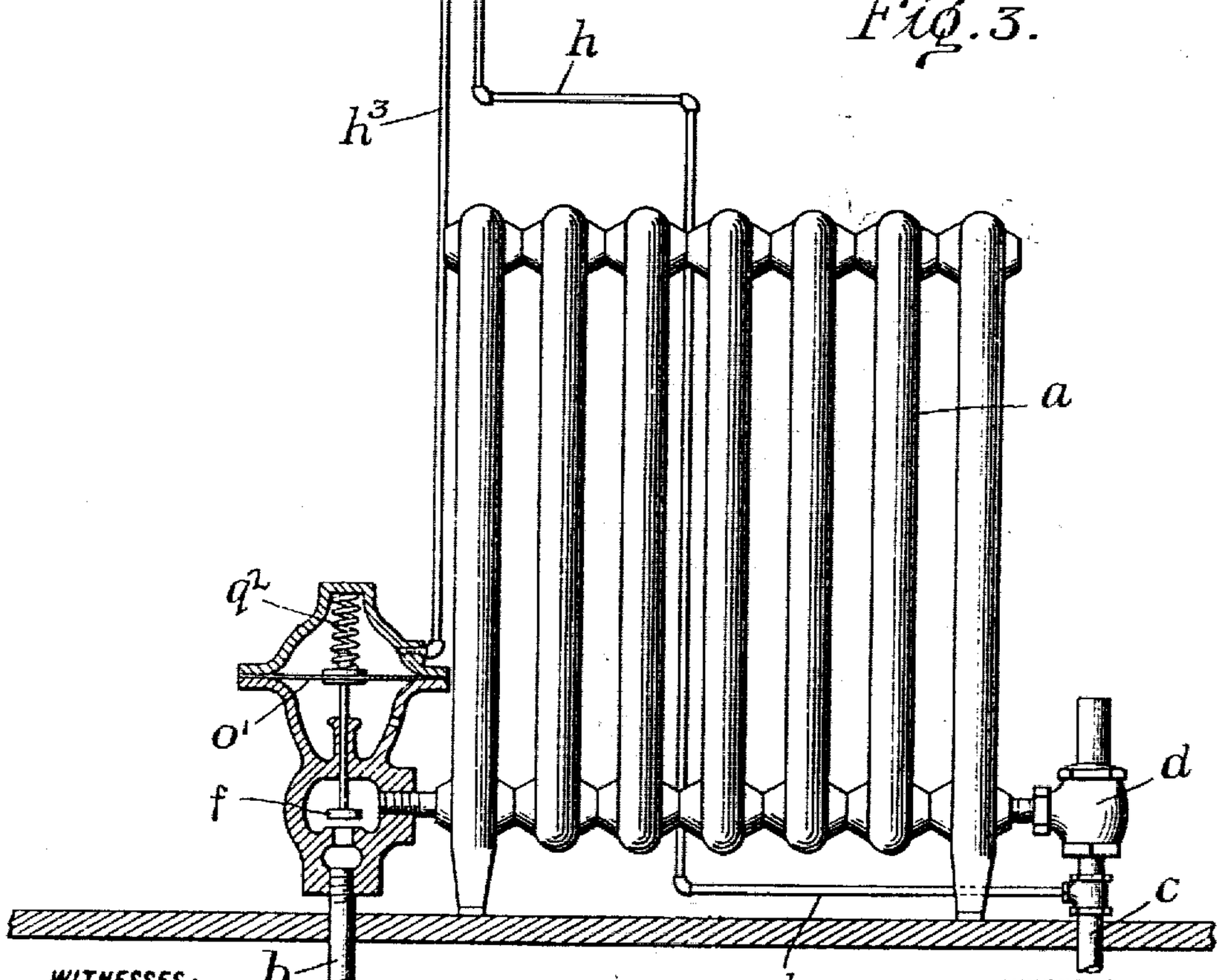


Fig. 3.



WITNESSES:
D. Webster, Jr.
A. M. Kelly.

INVENTOR
John A. Serrell
BY
Munn & Co
ATTORNEY.

No. 816,046. PATENTED MAR. 27, 1906.

J. A. SERRELL.

TEMPERATURE REGULATING APPARATUS.

APPLICATION FILED JUNE 6, 1905.

4 SHEETS—SHEET 4.

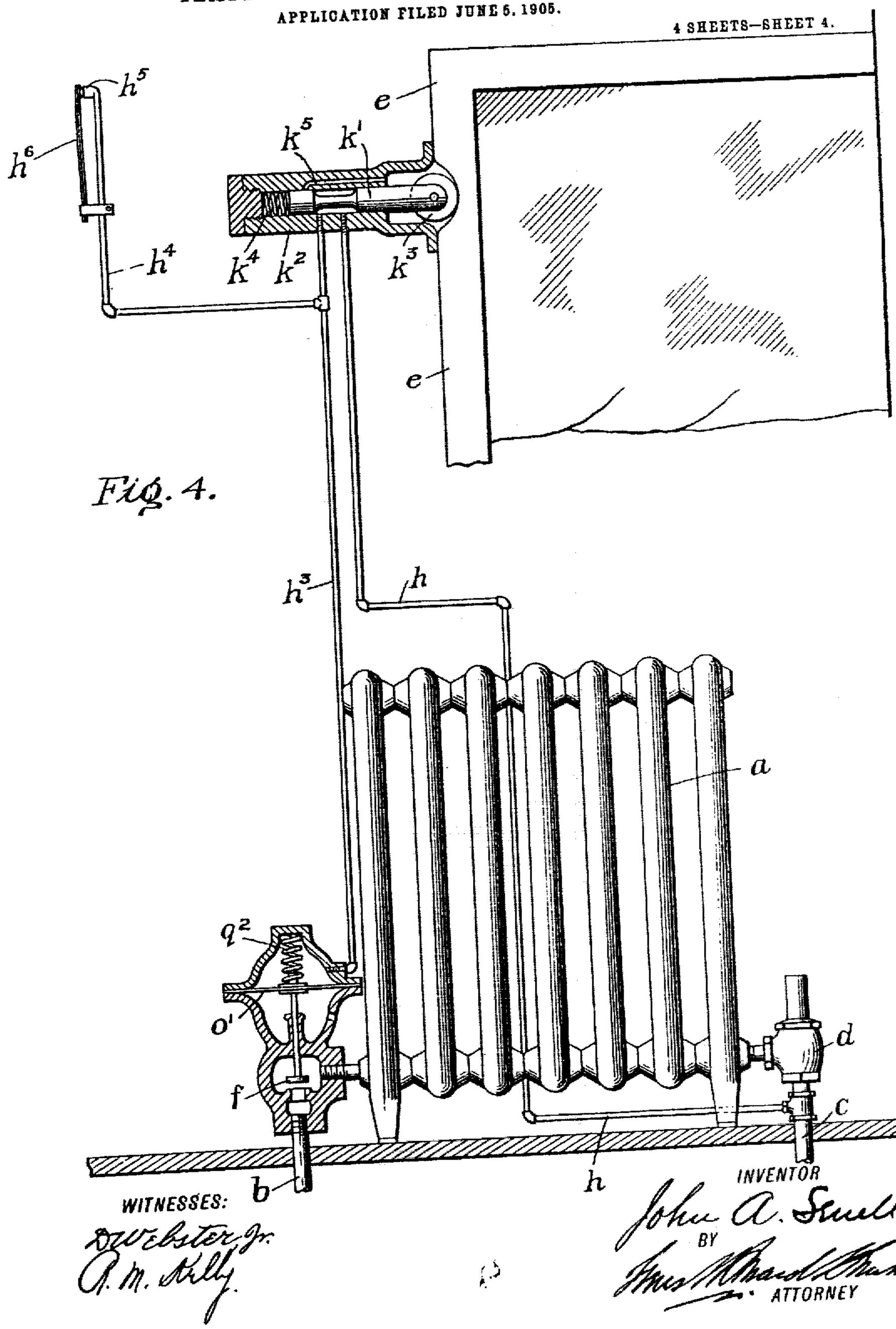


Fig. 4.

WITNESSES:

O. Webster Jr.

A. M. Kelly.

INVENTOR

John A. Serrell

BY

Munn & Co.

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN A. SERRELL, OF BAYONNE, NEW JERSEY, ASSIGNOR TO WARREN WEBSTER AND COMPANY, A CORPORATION OF NEW JERSEY.

TEMPERATURE-REGULATING APPARATUS.

No. 816,046. Specification of Letters Patent. Patented March 27, 1906.

Application filed June 5, 1905. Serial No. 263,773.

To all whom it may concern:

Be it known that I, JOHN A. SERRELL, of Bayonne, county of Hudson, and State of New Jersey, have invented an Improvement in Temperature-Regulating Apparatus, of which the following is a specification.

It is the object of my invention to automatically control the flow of a temperature-changing medium—such as steam, hot water, or a refrigerating agent—by the movement of a door or window-sash, by which the air, of which the temperature has been changed, is allowed to escape from the apartment. The object of thus controlling the flow of the temperature-changing medium is to prevent waste by shutting off the temperature-changing medium when the user of the apparatus prefers to open doors, windows, or outlets to allow the heated or cooled air to escape instead of closing off the supply of the steam or temperature-changing medium.

My invention may be applied as well to the control of a refrigerating medium as to a heating medium; but its most interesting application is to steam-heating systems, and therefore I have illustrated this application of it in the drawings.

In steam-heating systems the amount of heat transmitted by radiation is in proportion to the difference in the temperatures of the steam and the external air in contact with the radiator, and consequently when a door or window is opened not only is the heat of the escaping warm air lost, but the admission of cold air to contact with the radiator produces more rapid condensation and consequent waste of heat, since at such time a reduction and not an increase of heat transmission is desired. Under such cases the waste may be very great, as the amount of heat transmitted through a radiating-surface exposed to a strong draft of air at exterior temperatures may exceed three times the transmission under the normal temperature that should be retained in the apartment.

For the regulation of heating systems the invention is applicable as well to indirect as to direct systems.

In carrying out my invention I employ an inclosed space, such as a radiator or refrigerating coil, through which the temperature-changing medium passes—be it steam, hot water, or a refrigerating fluid—to change by heat transmission the temperature of the apartment under the control of a suitable valve, and this valve is controlled automatically at will by the movement of a door, window-sash, or the like whenever the same is opened to allow the heated or refrigerated air to escape from the apartment and the exterior air to enter. In the preferred construction the controlling-valve for the temperature-changing medium is operated by a fluid-pressure motor, which is in turn controlled by the sash or door controlled devices. Many methods are known for controlling motor-valves, and I do not mean to limit my invention to any one of such known methods, as the invention comprehends, broadly, the automatic control at will by the opening of a door, window, or other outlet of the supply, discharge, or circulation of the temperature-changing medium.

In applying my invention to a system of steam-heating in which the air and water of condensation are drawn into the returns by a partial vacuum or lower pressure maintained therein this partial vacuum or lower pressure may be economically utilized as the motive force for operating the motor connected with the supply-valve. This action of this suction on the motor may be controlled by the sash or door controlled devices in various ways. It may be conveniently controlled by a sash or door controlled valve in the branch suction-pipe from the return to the motor, acting to open communication to the motor or to open a vent and relieve the suction, and I have shown this application of my invention in the drawings.

It is also an object of my invention to enable the controlling-valve of the temperature-changing medium to be operated from any one of a series of windows or doors and when the invention is so applied to a vacuum system of steam-heating to prevent by auxiliary valve devices the loss of suction or partial vacuum in the return when the vent in the branch suction-pipe to the motor is open.

It is also an object of my invention to enable the controlling-valve of the temperature-changing medium to be operated by hand at will to close said valve independently of the operation of the sash or door controlled devices.

In the drawings, Figure 1 is a side elevation of a steam-radiator and one form of my controlling devices arranged to be operated from either of two windows. Fig 2 is an enlarged view of part of the same with one of the motor-controlling valves and the heat-controlling valve and its motor in vertical section. Fig. 3 is a side elevation of a radiator with the controlling devices arranged to be operated from a single window, the motor-controlling valve and the heat-controlling valve and its motor being in vertical section; and Fig. 4 is a view similar to Fig. 3, showing the air-outlet-controlled devices combined with an auxiliary temperature-regulating device controlled by the temperature of the apartment.

a is the radiating apparatus in which the heating medium is to be controlled. As shown, it is an ordinary steam-radiator having its inlet connected with the supply-pipe *b* and its outlet with the return-pipe *c*, in which a lower pressure or partial vacuum is created by suitable exhausting apparatus. The return-outlet is controlled by a suitable automatic valve *d*.

e e are the windows or doors by which the apparatus is to be controlled.

f is the supply-valve, which, as shown, is connected with a fluid-pressure motor *g*, which is operated by the partial vacuum in the return *c* under the control of valve devices controlled by the doors or window-sash.

h h' h² h³ represent a branch pipe leading from the return *c* to the motor-chamber of the motor *g*, and interposed in this branch pipe are the sash or door controlled valves. These valves are intended to open or close the passage through the suction-pipe to the motor and may be of any convenient form. As shown, they are constructed as follows: *i* is a suitable casing forming the valve-body interposed in the pipe *h h' h² h³*. When the motor is to be controlled by any one of a series of window-sashes or doors, as in Fig. 2, there is a controlling-valve for each, and they are connected up with the sections of the pipe *h h' h² h³* in series. In Fig. 1 I have shown a controlling-valve for both the upper and lower sashes of each window. From the valve-body *i* there is an outlet *j* to the atmosphere which is controlled by a valve *k*, normally closed on its seat by a spring k^6. On the valve *k* there is an extension *m*, adapted to be struck by a movable piece or lever *n*, arranged to be operated by the window-sash or door, so that when the latter is opened the valve *k* will be pressed back off its seat, opening the outlet *j* and breaking the partial vacuum in the motor. When the windows and doors are closed, all of the outlets *j* will be closed, and a partial vacuum will exist in the return *c* and through the pipe *h h' h² h³* to the motor, and the supply-valve *f* will be opened by atmospheric pressure on the motor-diaphragm. When, however, any of the controlling doors or windows is opened, it will operate the lever or part *n* to open the corresponding valve *k* and relieve the vacuum in the motor and permit the supply-valve to close.

My invention is not limited to any particular form of motor device for operating the supply-valve; but the form shown in Fig. 2 is especially adapted for the purpose. *o* is a motor-diaphragm which is connected with the valve-stem by a connecting-frame *p* and is depressed by a spring *q'* to close the valve *f*. I prefer to use the connecting-frame *p* for the purpose of enabling the valve *f* to be closed at will independently of the operation of the motor. For this purpose I have shown an eccentric *r*, having its spindle journaled in the motor-casing and acting in the frame *p* to depress it and close the valve *f*. The eccentric acts in an enlarged opening *p'* of the frame, so that while it is effective for closing the valve *f* it cannot be used to open it, as the movement in the opposite direction will produce no motion in the frame or valve, which can therefore be opened only by the motor.

The opening of any one of the valves *k* would, unless means are employed to prevent it, result in a loss of partial vacuum in the return-pipe *c*, which in an extensive system might be serious. To prevent this, I interpose the valve *s* in the branch suction-pipe. This valve acts to restrict the passage-way through the branch suction-pipe when any of the controlling-valves *k* is opened. It operates with the supply-valve *f*. In the construction shown *t'* is a valve-casing having two sides divided by a web and communicating, respectively, with the section *h* and section *h'* of the branch suction-pipe. In this web is a small port controlled by the valve *s*, the latter being normally closed toward its seat by a spring t^2, but without ever entirely closing the port. A projection t^3 on the frame *p* acts on the stem of the valve *s* and fully opens the valve when the frame *p* is elevated—*i. e.*, when the supply-valve *f* is open. It results that when steam is turned on and all of the controlling-valves *k* are closed the valve *s* will be fully open; but when the supply-valve *f* is closed and the frame *p* is lowered the valve *s* will close down to restrict the passage through the branch suction-pipe, and thus prevent the partial vacuum from being destroyed. It will be noted that this partial closure of the valve *s* will remain until the valve *f* has again opened and the projection t^3 lifts the valve. Therefore after the valves *k* have closed the exhaustion of air from the motor-chamber will be gradual and there will be a slow opening of the supply-valve, while the closing action will be quick.

In Fig. 3 I have shown the apparatus applied to a single window or door. In this case the restricting-valve *s* is not necessary, as the sash or door controlled valve *k'* may be operated to close the branch *h* to the return when the branch h^3 to the motor is opened to the atmosphere. In this construction the valve *k'* is of the piston type, projecting through the valve-casing k^2 and carrying a roller k^3 on its end, which engages a notch in the sash, the valve being projected by a spring k^4. The branch pipe *h* from the return *c* opens into a valve-chamber, from which the pipe h^3 leads to the motor. k^5 is a port to the atmosphere controlled by the piston-valve *k'*. When the window is closed and the piston-valve is projected, the port k^5 is closed and the pipes *h* and h^3 are in communication with the motor; but when the window is opened the piston-valve is pushed back and closes the port to the pipe *h*, while opening the port k^5 to the pipe h^3 and permitting the partial vacuum in the motor to be relieved. In Fig. 3 I have shown a simple fluid-pressure motor having a diaphragm *o'* connected with the stem of the supply-valve and depressed by a spring q^2.

It is desirable in many cases that the window-controlled devices should be combined with a controlling device controlled by the temperature of the apartment, and such an arrangement is shown in Fig. 4, in which h^4 is a vent-pipe from the pipe h^3 to the motor, having its vent h^5 controlled by a thermostat h^6. When the temperature of the apartment does not exceed normal, the vent h^5 is closed; but when the temperature rises above normal the expansion of the thermostat h^6 will open the vent and break the suction in the motor and close the valve even when the window-controlled valve is not operated. Any suitable form of auxiliary temperature-controlling device controlled by the temperature of the apartment may be used in lieu of that shown and may be operatively connected with the motor in any convenient manner.

While I have shown the motor operated by suction, it is apparent that it may be operated by compressed air or any other motor fluid.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, and means automatically controlled at will by the movement of a door or window-sash to control said valve.

2. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, and means automatically controlled at will by the movement of a door or window-sash to control the flow of motor fluid to said motor.

3. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a motor-valve for controlling the passage of said medium, and means controlled at will by the movement of a window-sash or door to operate said motor-valve.

4. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, and a valve automatically controlled at will by the movement of a door or window-sash, to control the flow of motor fluid to said motor.

5. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, a motor-fluid pipe leading to said motor, and a valve in said motor-fluid pipe automatically controlled at will by the movement of a door or window-sash, to control the flow of motor fluid to said motor.

6. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, a motor-fluid pipe leading to said motor, and having a vent, and a valve automatically controlled at will by the movement of a door or window-sash to control said vent and the flow of motor fluid through said pipe to the motor.

7. A temperature-regulating apparatus, consisting of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, a motor-fluid pipe leading to said motor, valves automatically controlled at will by the movement of a sash or door arranged in series in said motor-fluid pipe to control the flow of motor fluid to the motor, whereby said motor and the valve operated thereby will be controlled by the opening of any door or window in the series.

8. A temperature-regulating apparatus, consisting of a radiator, a valve to control the flow of heating medium in said radiator, and valve-actuating devices operatively connected with said valve and automatically controlled at will by the movement of a window-sash or door.

9. In temperature-regulating apparatus, the combination of a radiator, a valve to control the flow of heating medium in said radia-

tor, a fluid-pressure motor operatively connected with said valve, hand-operated devices to close said valve independently of the operation of the fluid-pressure motor, and means automatically controlled at will by the movement of a door or window-sash to control the operation of said fluid-pressure motor.

10. A temperature-regulating apparatus consisting of a radiator, a valve to control the flow of heating medium in said radiator, valve-actuating devices operatively connected with said valve, and automatically controlled at will by the movement of a door or window-sash, and hand-operated devices to close said valve at will independently of the operation of the sash or door controlled valve-actuating devices.

11. In a temperature-regulating device, the combination of a radiator, a valve to control the flow of heating medium in said radiator, a fluid-pressure motor operatively connected with said valve, a motor-fluid pipe leading to said motor, a series of controlling-valves arranged in series in said pipe and each automatically controlled at will by the movement of a door or window-sash to control the flow of motor fluid to the motor, and a restricting-valve in said motor-fluid pipe controlled by the radiator-valve, to restrict the passage-way through said motor-fluid pipe when any of said sash-controlled valves is opened.

12. In a temperature-regulating device, the combination of a radiator, having a motor-controlled supply-valve, and an automatically-controlled outlet, a return from said radiator in which a partial vacuum is created, a branch from said return-pipe leading to the motor-controlled supply-valve, and a valve in said branch automatically controlled at will by the movement of a window-sash or door to control the suction through said branch to the motor-controlled supply-valve.

13. In a temperature-regulating apparatus the combination of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, means automatically controlled at will by the movement of a door or window-sash to control said valve, and thermostatic devices controlled by the temperature of the apartment also controlling said valve independently of the means controlled at will.

14. In a temperature-regulating apparatus, the combination of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, means automatically controlled at will by the movement of a door or window-sash to control the flow of motor fluid to said motor, and means controlled by a thermostat within the apartment to control the flow of said motor fluid independently of the means controlled at will.

15. In a temperature-regulating apparatus, the combination of an inclosed space through which the temperature-changing medium passes, a valve to control the passage of said medium, a fluid-pressure motor operatively connected with said valve, and means automatically controlled at will by the movement of a door or window-sash to control the flow of motor fluid to said motor, said motor being provided with a thermostatically-controlled vent controlled by the temperature of the apartment.

In testimony of which invention I hereunto set my hand.

JOHN A. SERRELL.

Witnesses:
WM. M. TREADWELL,
HOWARD NEWMAN.