No. 809,306. PATENTED JAN. 9, 1906.

F. S. LAMSON.

AIR HEATING SYSTEM.

APPLICATION FILED MAR. 27, 1903. RENEWED JUNE 7, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

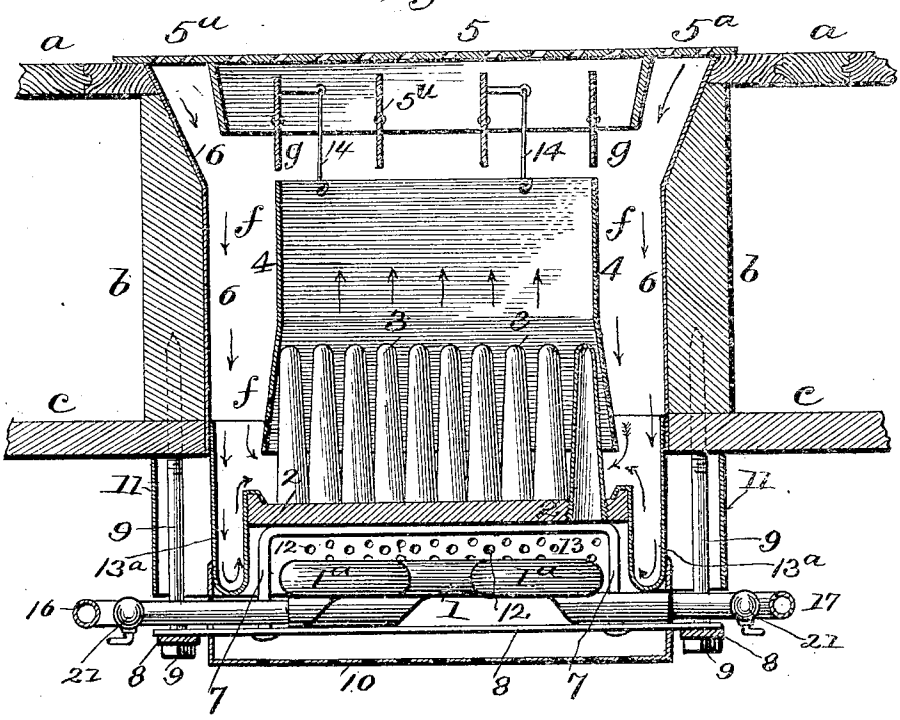


Fig. 2.

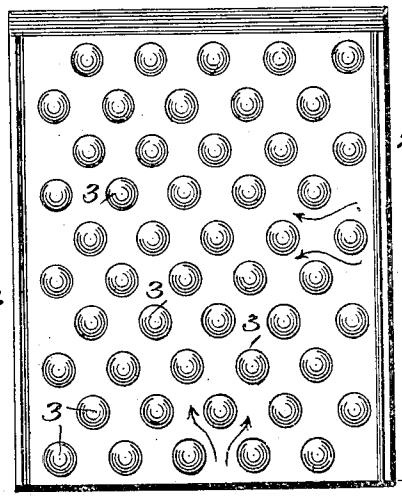


Fig. 3.

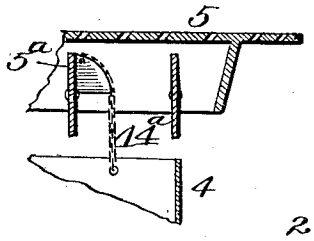
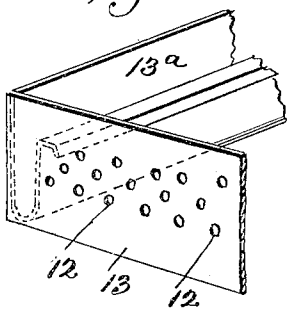


Fig. 4.



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3 SHEETS—SHEET 2.

Fig. 5.

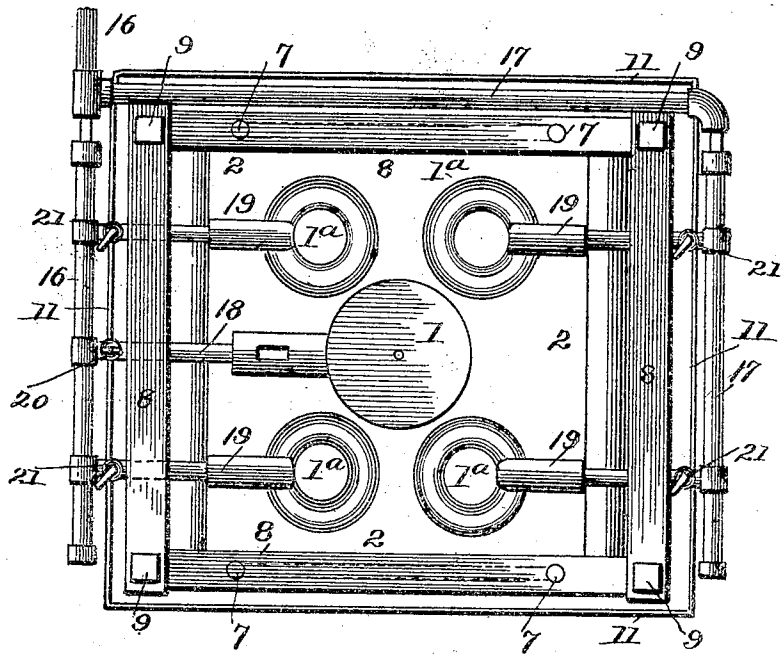


Fig. 6.

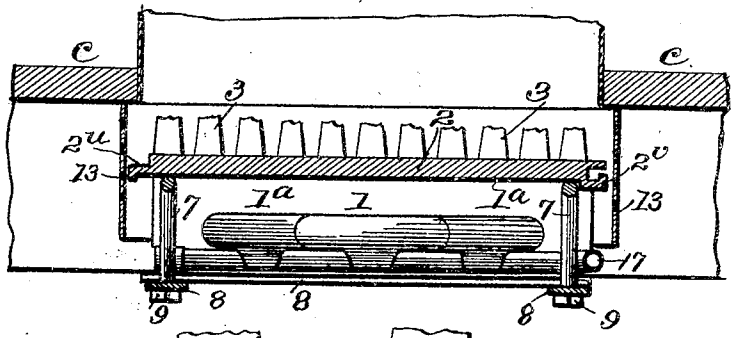
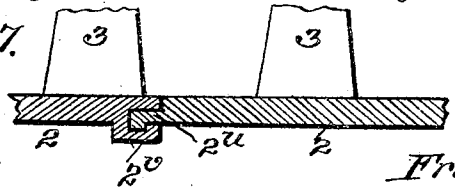


Fig. 7.



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3 SHEETS—SHEET 3.

Fig. 9

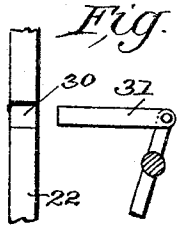


Fig. 8

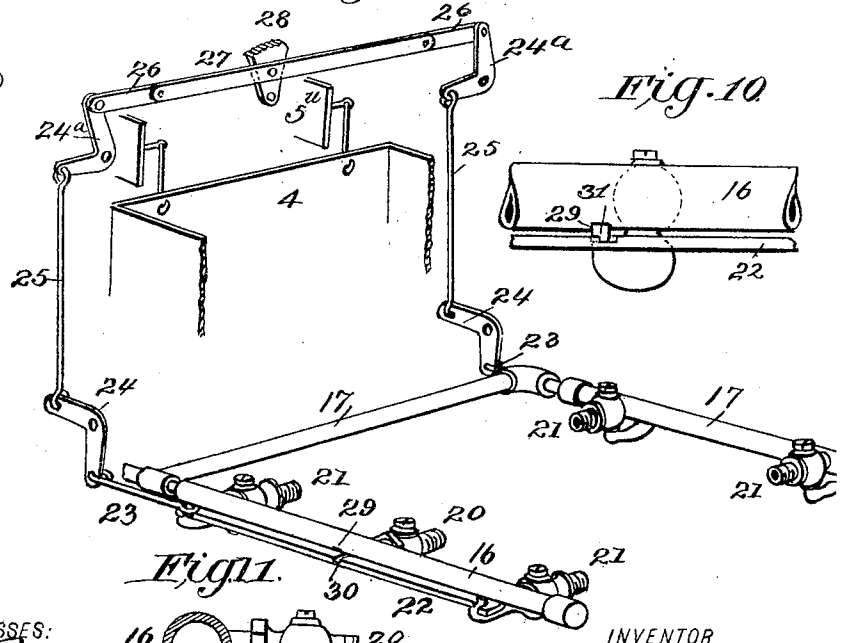
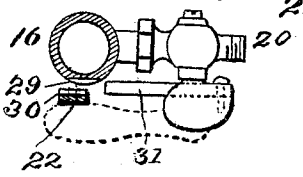


Fig. 10

Fig. 11.



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UNITED STATES PATENT OFFICE.

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AIR-HEATING SYSTEM.

No. 809,306. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed March 27, 1903. Renewed June 7, 1905. Serial No. 264,167.

To all whom it may concern:

Be it known that I, FRANKLIN S. LAMSON, a citizen of the United States, residing at Washington, in the District of Columbia, have invented a new and Improved Air-Heating System, of which the following is a specification.

My invention relates to a system embodied in improved apparatus for heating air.

The invention is applied in various ways or under various adaptations and modifications of form, arrangement, and combination of parts, as hereinafter set forth.

The special objects of my invention are, first, to provide an effective and economical heat receiving and radiating medium; second, to so regulate the supply of fresh air to and retard its movement from the radiator as to enable it to receive the desired temperature before escaping from the heater; third, to superheat both the mixed gas and air in the burner before combustion and the air furnished exterior to the flame; fourth, automatically to regulate the amount of gas to be used and the amount of air to be heated by the opening and closing of the register when so desired; fifth, to provide for the ingress of cool air and egress of heated air through the one register-plate; sixth, to provide a continuing flame with moderate heat when the register is closed, from which flame additional burners may be automatically lighted upon the opening of the register, which additional burners will be automatically extinguished by the closing of the register; seventh, to provide means for preventing the opening of the register, causing opening of burners and escape of gas when the lighting-flame is not burning; eighth, to so inclose the heating system as to conserve and utilize the full amount of the heating power of the fuel used.

In the accompanying drawings, (three sheets,) Figure 1 is a vertical section illustrating the most important application of my invention for heating rooms or apartments. Fig. 2 is a plan view of my improved heating device or heater-plate. Fig. 3 is a detail section illustrating a modification in the connection of a vertically-adjustable jacket with a register. Fig. 4 is a detail perspective illustrating a casing surrounding the heating device. Fig. 5 is a bottom plan view of the apparatus shown in Fig. 1, the bottom casing being detached. Fig. 6 is a vertical section of the lower portion of the apparatus shown in Fig. 1, the plane of section being at right angles to that of Fig. 1. Fig. 7 is a detail section illustrating the detachable connection of two heating devices or heater-plates. Fig. 8 is a perspective view illustrating the apparatus connected with a register whereby gas may be admitted to or cut off from the burners employed in connection with my heating device and the air-supply simultaneously increased or decreased. Figs. 9, 10, and 11 are different views illustrating the means for locking the levers of the valves or stop-cocks of the several burners except the lighting-flame burner.

In carrying out my invention one of the most important applications of it which I have made is for heating air to be conveyed into halls or apartments in one or more upper stories, although the room or space in which the apparatus is located may also be heated at the same time to a greater or less degree, according to conditions. I will therefore first describe the special form of the apparatus for this purpose, referring particularly at the outset to Figs. 1 to 7, also Figs. 8 to 11. Throughout the description of this and other forms of the invention numerals will be used to indicate parts of the apparatus proper and lower-case letters to indicate portions of the adjacent structural portions of a building.

In the heating of rooms for human occupancy the end sought is air of comfortable temperature, of good quality, and economically produced and conveyed. To receive the heat produced by one or more blue-flame gas-burners 1 1[a], (see Figs. 1, 5, 6,) I place just above the flame from such burner or burners a metal heat receiving and radiating plate 2, (see Figs. 1 and 2,) which is of a size and thickness and form adapted to the amount and degree of heat desired. In order to increase the radiating-surface of such plate 2, its upper surface is provided with vertical radiating-cones 3 (which may be solid; but in their preferred form they are hollow and open at the bottom, as shown, to receive the heated air from the burners) to further heat the air in its upward passage. These radiat-

ing-cones 3 are placed in "staggered" rows, (see Fig. 2,) so that the air to be heated shall as it passes in from the side across and above the plate 2 and from row to row impinge against or pass near the heated cones and receive the heat from them. In brief, the lateral course of the air among the cones 3 is necessarily a tortuous one, as indicated by arrows in Fig. 2, so that it is heated to a higher degree without serious hindrance to its progress. In order that the air to be heated shall not pass in too rapidly and also rise too quickly, and thus fail to receive and economically utilize the heat needed, I surround the sides of the space above the radiator or system of cones with a sheet-metal jacket 4. (See Fig. 1.) This jacket is practically a form of sleeve arranged vertically, open at the upper and lower ends, and preferably flared at the bottom, as shown. It serves to partially confine and retard the upward movement of the air being heated until it shall have received the desired temperature. The air to be heated passes beneath the lower edge or edges of this jacket, and in some cases over the upper end of the jacket; but in all cases it is adapted to retard the movement of the air sufficiently to enable it to receive the temperature desired. The sides of the jacket may be of various widths and set at different angles with relation to the radiator-plate, adapted to the conditions and the results to be obtained.

As illustrated in Figs. 1 and 3, the jacket 4 extends upward nearly to a register-box 5, set horizontally in the floor *a* of the story above that in which the apparatus is located. Joists *b* are shown arranged between the said floor *a* and the ceiling *c* of the apartment, room, or other inclosure below. A sheet-metal casing 6 extends down from the register 5 and serves the double purpose of protecting the joists and forming the outer side of an air-conduit *f*.

The radiator or heater plate 2 is supported at its ends upon brackets or upwardly-bent rods 7, rigidly attached to a rectangular frame 8, (see Figs. 1 and 5,) which is hung from the ceiling *c* by lag-screws 9. Within this frame 8 is arranged a pan-like casing 10, (see Fig. 1,) which mainly incloses the burners 1 1^a on the under side of the heater-plate. The casing is provided with a series of openings for admission of a due quantity of air to support combustion. The number and size of said openings are so proportioned to the burners as to regulate the quantity of air supplied, so that the burners will become heated to redness and superheat both the mixed gas and air within the burners and the air supplied exteriorly to the latter. Such regulation may be effected by a device commonly used for controlling draft, the same consisting of a centrally-pivoted plate having a series of openings. For escape of vitiated air or unconsumed gases of combustion I provide openings at 12 (see Figs. 1 and 4) in the end plates 13, forming part of the side inclosure of the burners 1 1^a. The other two sides of such inclosure are partly formed by trough-like plates 13^a, the same being placed within and touching the said side 6 and having a return-bend whose edge is bent laterally and downward to adapt it to fit and hang upon the rib on the side of the radiator-plate 2. The bend of the plates 13^a extends below the said plate 2, as shown in Fig. 1. By means of this construction and arrangement the plates 13^a may be raised and removed vertically to permit the vertical removal of the heater-plate 2 through the opening in the floor above.

11 is a vertical ornamental casing inclosing the devices between the ceiling and the gas-supply-pipe level, having perforations for air supply and escape similar in size and position to 12 in end casings 13. The register 5 is extended, as indicated at 5^a, and perforated for passage of air. Cool air from the apartment above floor *a* may descend at these points 5^a and following down the side of casing 6 enter the pendent bends of the jacket 13^a, and thus become heated to a good degree before passing laterally beneath the jacket 4 and over the radiator 2. This course is indicated by arrows, as is also that of another portion of the volume of air which descends through parts 5^a of the register 5 and passes directly beneath the jacket 4 without entering the heating-jacket 13^a. The air so heated is further and principally heated by the cone-plate 2 and, mingled with the other heated air, ascends through the suspended jacket 4 and register 5 into the room above. I thus form an air-heating system or apparatus which combines extreme economy in the use of fuel energy, practically no heat being wasted, while the use of the blue-flame burner and the regulation of air-supply produces perfect combustion, and thereby avoids the usual odor attending the use of a gas-heater.

The jacket 4 is shown suspended in Figs. 1 and 3 directly from the pivoted leaves 5^u of the register 5. In Fig. 1 links 14 connect the jacket with short rigid arms of certain leaves, and in Fig. 3 chains 14^a are attached to quadrants forming a rigid attachment of the leaves. In either case the jacket 4 is obviously adjusted higher or lower, according as the register-leaves are opened or closed, the raised position being the one assumed when free access of air to the heater 2 is to be permitted along with free passage of heated air upward through the register.

Provision is made for extending the radiator-plate by constructing the edges of the same with tenon and socket 2^u and 2^v, respectively. (See Figs. 6, 7.) The tenon 2^u and socket 2^v are adapted to interlock. The attachment is made by sliding the tenon laterally into the socket. Their shoulders then

abut, so as to form a good joint. By thus connecting two or more radiator-plates and extending the other coacting parts correspondingly the system may be extended as required for different situations.

As shown in Figs. 1, 5, and 6, gas is supplied to the burners by the main pipe 16 and branch 17, which are directly connected with the burners by supplemental branches 18 and 19, having stop-cocks 20 and 21. The levers of each pair of stop-cocks 21 (see Fig. 8) are detachably connected by a rod or bar 22, and each of the two bars is connected by a detachable link 23 with an elbow or crank lever 24. The latter are further connected by rods or links 25 with other elbow-levers 24^a and these by links 26 and bar 27 with the foot-lever 28, by which the register-leaves 5^u are opened and closed. The upper elbow-levers 24^a are necessarily arranged in vertical planes at right angles to the lower ones, 24. It is apparent that by this mechanism the register and stop-cocks are opened or closed and the jacket 4 raised or lowered simultaneously by operating the register-lever 28. The burners 1^a are so arranged with relation to the central one, 1, as to be lighted from it. The opening and closing mechanism of burners 1^a not being directly connected with the valve or stop-cock 20 of the central burner 1, the latter continues to burn when the others are extinguished and may be thus left in readiness to relight burners 1^a when gas is again turned on the latter. In order to prevent accident, by opening the register-lever 28 and turning on the gas when the central burner 1 is not in use a double provision for safety is made. At a point opposite the valve of burner 1 the gas-pipe 16 and link 22 (see Figs 8 to 11) are provided with notches 29 and 30, respectively, which when in coincidence, as in Fig. 8, form an opening adapted to receive a bolt or latch 31, Figs. 9 and 11, that is pivoted to the flat thumb-piece of the valve of said burner 1. This bolt 31 is shot whenever the burner is turned out, and entering the coincident notches 29 30 it locks the bar 22 so that the valves of burners 1^a cannot be again opened until the valve 1 shall have been first opened. In Fig. 10 the notches 29 and 30 are shown out of coincidence, which prevents entrance of the latch 31, which can only enter when the register is closed. By detaching links 23 the register can also be opened and closed without affecting the burners 1^a. When the central burner 1 is alone in use, the moderate heat therefrom passes through space *g* and up through the openings on one side of the register-box, while fresh air will pass down through the openings on the other side. Thus a necessary circulation is maintained. Since the opening of the register at once increases the heat furnished to the radiator-plate, a corresponding increase of the fresh-air supply must be made to prevent overheating the air, and this is provided for by the automatic adjustment of the jacket 4.

The downward movement of fresh air between interior and exterior jackets, Fig. 1, operates to prevent the heat passing from the hot-air flue to surrounding woodwork. The lower inclosing connections from the side edges of the radiator-plate to the lower side edges of the second inclosing jacket pass down about two inches below the plate and curve out and up to meet the second jacket, as shown, so that the fresh air in the space receives the heat radiated sidewise from the burners below the plate. The burner-inclosing pans beneath the plates are made of bright metal to prevent loss of heat by radiation downward, the whole forming a heating system in which practically the entire fuel energy is conveyed to the air without loss.

The system is thus sufficiently illustrated to show its wide application and practical adaptation for efficient and economical heating.

What I claim is—

1. In an air-heating system, the combination with a register, of a jacket which is open at top and bottom, and arranged beneath the register-box, the upper edge of which jacket is spaced down from the lower part of such register-box, thereby forming a passage *g*, through which the air can pass in either direction, substantially as shown and described.

2. In an air-heating system, the combination with a register, and a jacket spaced down from the register-box, of an inclosing jacket 6 which is spaced from its interior jacket, thereby forming an air-passage between the two which communicates at the top of the inner jacket with the air-passage therein, substantially as shown and described.

3. In an air-heating system, the combination with a register, of an air-conducting jacket spaced below it, a heater arranged below said jacket and spaced therefrom, and an inclosing jacket spaced from the first-named one, substantially as shown and described.

4. In an air-heating system, the combination with a register, of an air-conducting jacket 4 arranged below it and adapted for vertical adjustment, whereby it serves to regulate the passage of air between the register and jacket, substantially as shown and described.

5. In an air-heating system, the combination with a register, and an air-conducting jacket arranged below it and adapted for vertical adjustment, of an inclosing jacket 6, spaced from the inner jacket, substantially as shown and described.

6. In an air-heating system, the combination with a register, of an air-conducting jacket arranged below it and adapted for ver-

tical adjustment, and means for adjusting it, substantially as shown and described.

7. In an air-heating system, the combination with a register, of an air-conducting jacket arranged below it and adapted for vertical adjustment, and connecting devices which suspend the jacket from the pivoted leaves of the said register, substantially as shown and described.

8. In an air-heating system, the combination with a register, a vertically-adjustable jacket 4 arranged below, and means for adjusting it, of an inclosing fixed jacket 6, spaced from jacket 4, substantially as shown and described.

9. In an air-heating system, the combination with a heater-plate, of a jacket arranged over said plate and adapted for vertical adjustment, whereby it may serve to control access of air to the plate, substantially as shown and described.

10. The combination with a heater-plate, and a vertically-adjustable jacket arranged directly over it, of an inclosing jacket 6, spaced from the first one to form an air-passage, and connected at its lower end with said plate, substantially as shown and described.

11. The combination with a heater-plate, and a vertically-adjustable jacket arranged directly over it, of an inclosing jacket 6, spaced from the first one to form an air-passage, and having a trough-like extension 13^a descending below said plate and returning to connect therewith, substantially as shown and described.

12. The combination with a heater-plate, and the fixed jacket 6, of the downward trough-like extension of the jacket, 13^a, which is arranged loosely within the lower portion of said jacket, and is removable vertically therefrom, substantially as shown and described.

13. In an air-heating system, the combination with a heater-plate, and a vertically-adjustable jacket arranged over it, of a register arranged over said jacket and spaced therefrom, substantially as shown and described.

14. In an air-heating system, the combination with a heater-plate, and a vertically-adjustable jacket 4 over it, of a register spaced above, and an inclosing jacket 6 spaced from, said jacket 4, substantially as shown and described.

15. In an air-heating system, the combination with a heater-plate, of a jacket which is open at top and bottom and arranged above the plate, and adapted for vertical adjustment, and means for adjusting it, substantially as shown and described.

16. In an air-heating system, the combination with a heater-plate, and a register having pivoted leaves, of a vertically-adjustable jacket arranged between the plate and register, and open at each end, and means connecting the jacket with the register-leaves, whereby the adjustment of the latter in opening and closing correspondingly adjusts the jacket higher or lower and thus regulates the admission of air to the heater-plate, substantially as shown and described.

17. In an air-heating system, the combination with a heater-plate and a register having pivoted leaves, of a vertically-adjustable jacket 4, and connecting devices which suspend the jacket from the leaves of the register, whereby simultaneous adjustment of register and jacket is secured, substantially as shown and described.

18. In an air-heating system, the combination with a heater-plate, burners arranged beneath the same, and a jacket which is open at each end and adapted for vertical adjustment, of means for opening and closing the burners, and adjusting the jacket, for simultaneously regulating supply of gas and air, substantially as shown and described.

19. In an air-heating system, the combination with a heater-plate, burners arranged beneath the same, a vertically-adjustable jacket which is open at each end and arranged above said plate, of a register, and means connecting the operative parts of the register with said jacket and the burners, whereby the register and stop-cocks are opened and closed and the jacket adjusted simultaneously, substantially as shown and described.

20. In an air-heating system, the combination with a heater-plate, and a register having pivoted leaves and an operative lever, of a vertically-adjustable jacket 4 and connecting devices which suspend the jacket from the register-leaves, and burners provided with stop-cocks whose operative levers are connected by link-and-lever mechanism with the operative lever of the register, whereby simultaneous adjustment of register, jacket and burners is secured, substantially as shown and described.

21. In an air-heating system, the combination, with a heater-plate, a vertically-adjustable jacket 4 over said plate, burners beneath the plate provided with stop-cocks 21 having levers, and a register-bar 27 having a pivoted operating-lever 28, of bars 23 having hooks which connect them detachably with the stop-cock levers, and means comprising pivoted levers 24, 24^a, 25 and 26, which serve to connect the said register-bar with the hook-bars 23, substantially as described.

22. In an air-heating system, the combination with a heater-plate, a burner beneath the same, a movable bar detachably connected with the stop-cock of said burner, and means for operating said bar, of a second burner arranged contiguous to the first so that one may light from the other, and a de-

vice attached to such second burner and adapted to engage with and lock the operative bar of the first-named one, the turning out of the flame of the second burner thereby preventing the opening of the first burner until the second one is relighted, substantially as shown and described.

23. In an air-heating system, the combination with a heater-plate, and a fixed bar, a series of burners arranged beneath the plate, detachable bars connecting the stop-cocks of said burners, and means for operating said bars, of another burner arranged contiguous to each of said series, and a movable bolt or bolts connected with the stop-cock lever of the last-named burner, the fixed and one or more movable bars being provided with notches which coincide when a movable notched bar is adjusted for closing the cocks, and thus form a socket adapted to receive the said bolt, substantially as shown and described.

24. In an air-heating system, the combination with a heater-plate, a fixed bar, a register provided with a pivoted lever, and detachable bars connecting the stop-cock levers of a series of burners, of another burner arranged adjacent to one or more of said series, and having a locking-bolt adapted to engage notches in the fixed and movable bars, and link-and-lever mechanism operatively connecting the movable bars with the register-lever, substantially as shown and described.

25. In an air-heating system, the combination with a register having an open-work side extension of its plate, of a jacket 4 arranged below whose upper edge is separated from the register-box, whereby an opening *g* is formed between them for the passage of air through the said side extension when the register is closed, substantially as shown and described.

26. The combination with a register having an open-work side extension, and a heater arranged below, of a jacket whose upper edge is separated from the register-box, whereby an opening between them is provided for passage of heated air when the register is closed, substantially as shown and described.

27. The combination with a register having an open-work side extension, a heater arranged below, and a jacket whose upper edge is separated from the register-box, of an inclosing jacket 6, substantially as shown and described.

28. The combination with a register having an open-work side extension, a heater arranged below, and an inclosing jacket 6, of a jacket 4 arranged between the heater and the register, and whose upper and lower edges, respectively, are separated from the said register and the said heater, substantially as shown and described.

29. In an air-heating system, the combination with a horizontal heater-plate having a series of vertical cones, of a vertically-movable jacket inclosing the upper portion of the cones, but separated from the heater-plate proper, a register arranged above the jacket and provided with pivoted leaves which are operatively connected with the jacket, a fixed jacket arranged exterior to the register-box and separated from the movable jacket by a narrow space, and having a downward trough-like extension projecting below the heater-plate and opposite the burners, and a perforated casing arranged beneath the burners and serving to inclose the same, substantially as shown and described.

30. The combination with the heater-plate, burners and perforated casing, of jacket 4 adapted for vertical adjustment, substantially as shown and described.

31. In an air-heating system, the combination with the heater-plate provided with upwardly-projecting cones, of the jacket 4, made vertically adjustable, and its lower end adapted to inclose the cones more or less according to the adjustment, substantially as described.

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Witnesses:
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