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C. C. PECK.

HOT WATER CIRCULATING SYSTEM.

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FIG. 1.

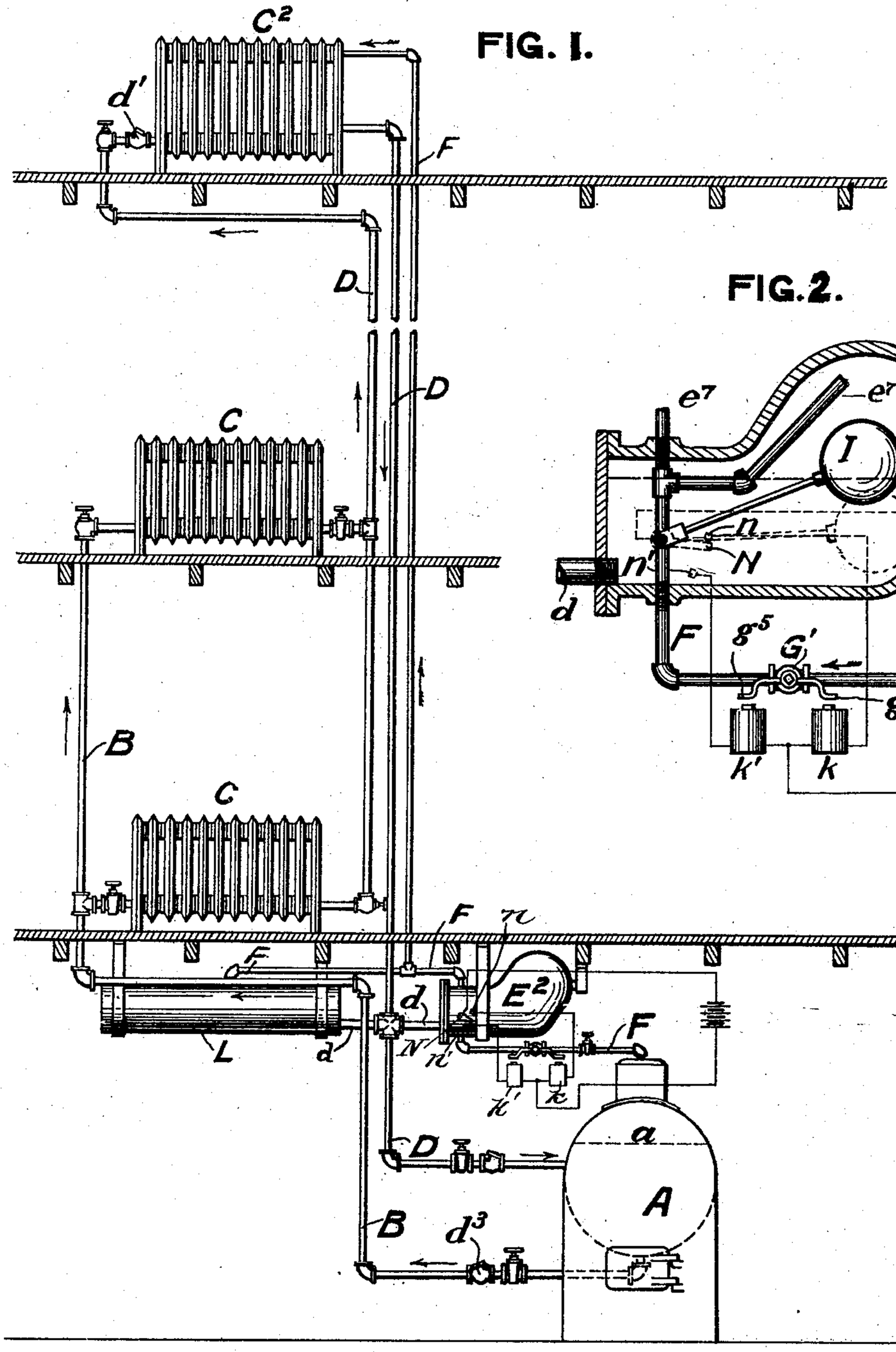

FIG. 2.

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HOT-WATER-CIRCULATING SYSTEM.

No. 842,907. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed October 31, 1904. Serial No. 230,882.

To all whom it may concern:

Be it known that I, CASSIUS CARROLL PECK, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Hot-Water-Circulating System, of which the following is a specification sufficient to enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hot-water heating circuits, and consists of both steam and water heating apparatus so arranged and operated as to effect a positive and rapid circulation of the heat-vehicle through the heating-circuit in an automatic manner, as hereinafter described.

The objects sought and attained are the advantages which result from mechanically-forced circulation of water through a heating-circuit as distinguished from a natural, or gravity, circulation, and effecting the circulation automatically without employment of working mechanism which requires personal attention, such as would be needed for pumps, injectors, or other power-moved mechanism, and practically without waste of steam, water, or heat from the system.

The invention is applicable and adapted to nearly all situations where a hot-water heating-circuit is suitable.

This application refers to suitable mechanism for carrying out the system of circulating hot water which is further shown and described in my concurrent application for patent on method, Serial No. 218,730, filed July 29, 1904.

In the accompanying drawings like parts in the figures are represented by the same letters. Feathered arrows indicate the direction of steam circulation, and unfeathered arrows indicate the flow of water.

Figure 1 is a vertical elevation showing the several parts of my heating system in operative relation, the floors of the building being shown in cross-section. Fig. 2 is a vertical central cross-section of the circulation-regulator shown in Fig. 1, but on a larger scale.

In Fig. 1, A indicates a steam-boiler, which may be of any ordinary design, broken line *a* denoting the water-level in the boiler. B is the hot-water-supply pipe which conveys water from boiler A to radiators C. D is the return-pipe from water-radiators C. F is a pipe supplying steam from boiler A to the steam-space of circulation-regulator E^2 to water-storage and steam-condensing chamber L, here shown as a cylinder, but typifying any convenient form of combined water-receiver and steam-condensing surface, and to radiator C^2.

G′, Fig. 2, is a steam-stop valve in steam-supply pipe F and is operated by the magnets *k k′*, which are energized by an electric circuit having contact-points *n n′*, electric connection being made and broken by rise and fall of float I, operating, through its attached lever, the connected exterior lever N, which touches contact-point *n* at the highest point of its stroke and point *n′* at the lowest point of its stroke.

The operation of the system is as follows: When steam-pressure is first formed in boiler A sufficiently above pressure of the atmosphere, it forces water out through the circuit-supply pipe B into radiators C, return-pipe D, and condensing-radiator C^2, from which it flows equally into regulator E^2 and cylinder L through pipe *d*. The check-valve shown in pipe D opens toward the boiler and prevents escape of water from the boiler. Water will flow through the heating system as described until it has sufficiently filled cylinder L and regulator E^2 to raise float I to the position shown in Fig. 2, where exterior arm N makes electrical connection with contact-point *n*, and thus energizes magnet *k*, which draws valve-lever g^4 into contact with said magnet and opens steam-valve G′. This admits steam direct from the boiler to steam-space in the regulator-chamber *e* above water-line *w* and to the corresponding steam-space in cylinder L and also to the upper part of radiator C^2, thus equalizing steam-pressure in the boiler with that in the said three steam-water receptacles, under which condition the circuit-water will flow by gravity from the regulator, cylinder, and connecting water-pipes into the boiler until float I has sunk so low that exterior arm N touches contact-point *n′*, thus energizing magnet *k′* and drawing valve-lever g^5 into contact therewith, which movement of said lever closes steam-valve G′. Steam from the boiler being in this way shut off, condensation immediately commences in steam-space *e* of regulator E^2 and in the steam-space of cylinder L and the portion of radiator C^2 above the connection with return-pipe D, thus removing steam-pressure and tending to create more or less vacuum in the steam-space. This allows steam-pressure in the boiler to again force water through the circuit, as previously de-

scribed, and so on in endless cycle. Water is prevented from returning to the boiler by the outwardly-opening check-valve d^3. Check-valve d' is not required, except when the return connection of radiator C^2 is elevated considerably above the supply connection and even then may be dispensed with. For controlling the circulation of water through radiators C a single valve on either the supply or the return branch pipe will answer; but when it is desired to arrange for cutting out a radiator from the system to provide for any needful repairs a valve is connected into both the branch supply and the branch return, as shown. A stop-valve is best provided in pipe F near the boiler, as shown, to allow of shutting off steam from the system whenever desirable, and the supply-pipes and the return-pipes of the system usually have stop-valves, as also shown, for cutting off communication with the boiler when for any reason it is desirable to do so. Regulator E^2 and cylinder L are set on a proper level with respect to each other, so the water-level in each shall correspond and be suitable for operating float I.

The water capacity of cylinder L or equivalent steam-water chamber will determine the frequency of opening and closing steam-supply valve G', and one of the principal objects of this chamber is to reduce the number of intermittent discharges for a given amount of water circulation in order to make the flow of water through the system as continuous as practicable and provide for minimum wear on the moving parts of the regulator, the proportions of conducting-pipes being such as to effect quick discharge of water from cylinder L. The special purpose of radiator C^2 is to provide a considerable amount of steam-condensing surface wherewith to induce by rapid condensation of steam as much circulation of water through the heating-circuit as may be desired. In case a relatively large amount of steam-condensing surface is embodied in the design of chamber L the condensing-radiator C^2 can be dispensed with or used as a water-filled radiator. Also it will be seen that while usually most convenient to locate regulator E^2 and cylinder L near the point of heat-supply they may be otherwise placed, as at the top or intermediately between the top and bottom of the heating-circuit, without materially affecting the operation of the parts or of the system as a whole, such location being essentially a matter of convenience.

I do not confine myself to the exact arrangement or construction of parts shown in the drawings, as these may be variously departed from without altering the essential features of my invention as herein described, the system being adapted not only to heating buildings, but to almost every situation where hot-water circulation is suitable and varying local conditions require differing disposition and proportions of apparatus.

The principal advantages of this system are that no more radiation is required than in case of low-pressure steam-heating, while supply-pipes and return-pipes may be even smaller and can be run without reference to level; radiators, as C, can be kept at any desired temperature by closing or opening more or less either one or both of the radiator valves; there is no trouble from air-pockets, and operation of the system is noiseless and automatic. In case steam-pressure falls in the boiler so as to be inadequate for forcing circulation to the highest point in the heating-circuit—as, for instance, over night—the circulation will automatically start in the morning as soon as sufficient steam-pressure exists to counterbalance the weight of a column of water reaching from the boiler to the top of the heating-circuit.

It will be seen that chamber L is a radiator and that its radiant heat can and, in fact, usually should be utilized for heating air in warming a building, C^2 being a secondary radiator supplying additional radiating-surface to expedite condensation of steam, and thereby increase the volume of water which can be circulated in a given time, while at the same time it is utilized as efficient heating-surface.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a hot-water heating system, a steam-generator, a circuit of pipes connected with the water-space of said generator, means of preventing flow in one direction in said circuit, a chamber in said circuit, a steam-supply from the generator to the chamber, means for intermittently opening and closing said steam-supply in correspondence with the change from one water-level to another water-level in said chamber, whereby water is circulated through the circuit, and means of condensing steam admitted to said chamber.

2. In a hot-water-circulating system, a steam-generator, a circuit of pipes connected with the water-space of said generator, means for preventing flow in one direction in said circuit, a chamber in said circuit, a steam-supply from the generator to the chamber, means for intermittently opening and closing said steam-supply in correspondence with the change from one water-level to another water-level in said chamber, whereby water is circulated through the circuit, and means of condensing within the heating-circuit steam admitted to said chamber.

3. In a hot-water heating system, the combination of the steam-generator, a circuit of pipes containing a radiator connected with the steam-space in said generator, means for preventing flow in one direction in said circuit, a steam-supply from the generator to the radiator, means for intermittently open-

ing and closing said steam-supply in correspondence with the change from one water-level to another water-level in said radiator, whereby water is circulated through the circuit.

4. In a hot-water-circulating system, the combination of the steam-generator, a water-chamber, a supply-pipe for said chamber connected into the return-pipe of the heating-circuit, an extension of said return-pipe to the water-space of the steam-generator, means of preventing outflow from the generator through said return-pipe, a steam connection from said generator to said chamber, and a float for intermittently opening said steam connection when the water in said chamber rises to a predetermined level, and for closing said connection when the water falls to a predetermined level, whereby water is circulated through the circuit.

5. In a hot-water-circulating system, the combination of the steam-generator, a radiator, a supply-pipe for said radiator connected to the water-space of said generator, a return-pipe from said radiator to the generator, means for preventing the flow in one direction in the circuit of said supply and return pipes, a steam connection from said generator to said radiator, and means for intermittently opening said steam connection when the water in said radiator rises to a predetermined level, and for closing said connection when the water falls to a predetermined level, whereby water is circulated through the circuit.

6. In a hot-water heating-circuit, the combination of a steam-boiler, a circuit of supply and return pipes and radiators connected thereto, a check-valve in the supply-pipe set to prevent flow of water therein to the boiler, a check-valve in the return-pipe of the circuit set to prevent flow of water therein from the boiler, a circulation-regulator having a combined steam and water chamber, an independent radiator having its lower portion connected with the water-space of the regulator, steam connection between the steam-space of the boiler and the steam-space of the regulator and of the radiator, a valve in said steam connection and means for automatically operating said valve by change of water-level in the regulator so as simultaneously and suddenly to admit steam-pressure to the regulator and to the radiator when the water rises to a predetermined level in the regulator, and suddenly to close said valve when the water-level sinks to a predetermined point in the regulator, for the purpose set forth.

7. In a hot-water-circulating system, a circuit of pipes and radiators, a steam-generator having its water-space connected to the supply and to the return of the heating-circuit, in combination with a water-circulating regulator having a combined steam and water chamber connected with the steam-supply and with the water-return, a steam-radiator in the heating-circuit through which all water of the circuit flows, a steam connection between the regulator and the steam-radiator, a valve in the steam-supply pipe to the regulator and the radiator and mechanism for operating the valve, said mechanism being adapted to be actuated by a change of water-level in the regulator, as and for the purpose specified.

8. In a hot-water heating system, the combination of a steam-generator having a water-space and a steam-space, a pipe-circuit in communication therewith, a combined steam and water radiator in the return of the circuit, a circulation-regulator constructed with a combined steam and water chamber, a water-storage chamber, said regulator and said water-storage chamber being connected with the return of the circuit, a steam connection from the steam-generator to the steam-space of said radiator, to said regulator, and to said water-storage chamber, a valve in said connection, and mechanism for operating the valve actuated by change of water-level in the regulator, causing steam and water to be alternately admitted to the regulator, to the radiator, and to the storage-chamber, whereby the water-storage chamber is filled and emptied of both water and steam synchronously with the regulator, for the object specified.

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Witnesses:
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WILLIAM W. WHITMORE.