No. 870,457. PATENTED NOV. 5, 1907.

H. NARANJO.

HEATING OR REFRIGERATING APPARATUS.

APPLICATION FILED MAR. 15, 1907.

2 SHEETS—SHEET 1.

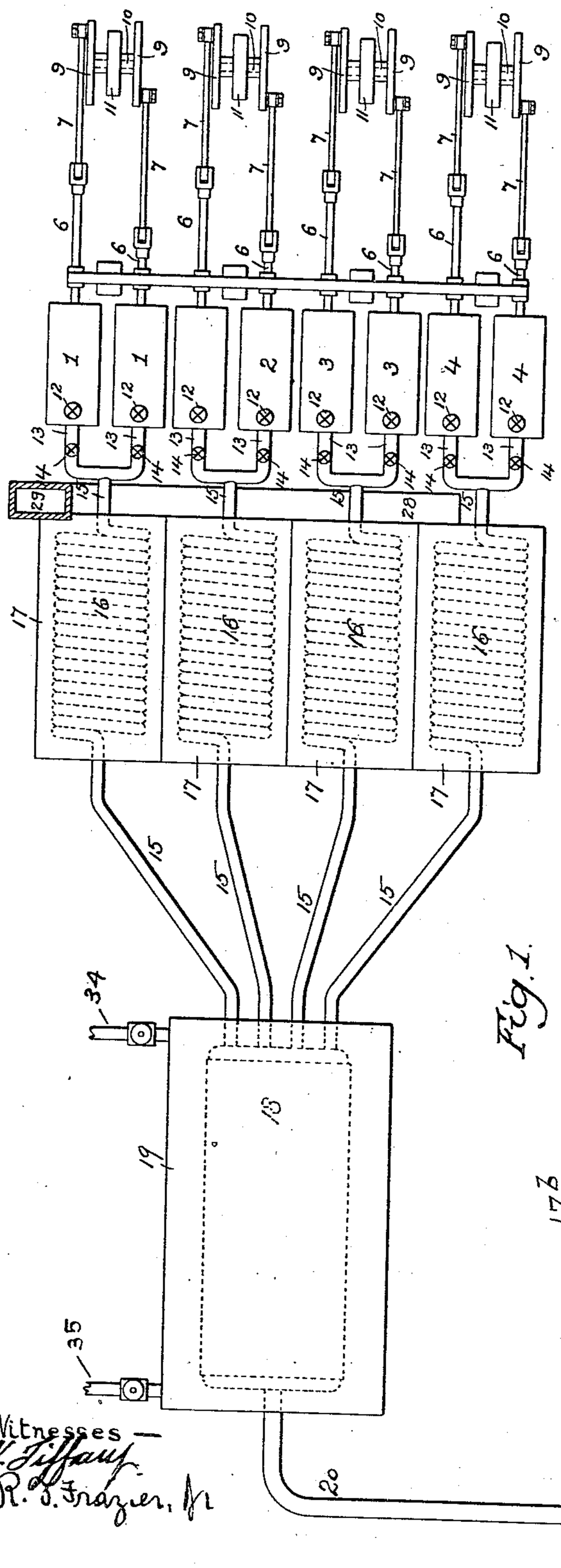

Fig. 1.

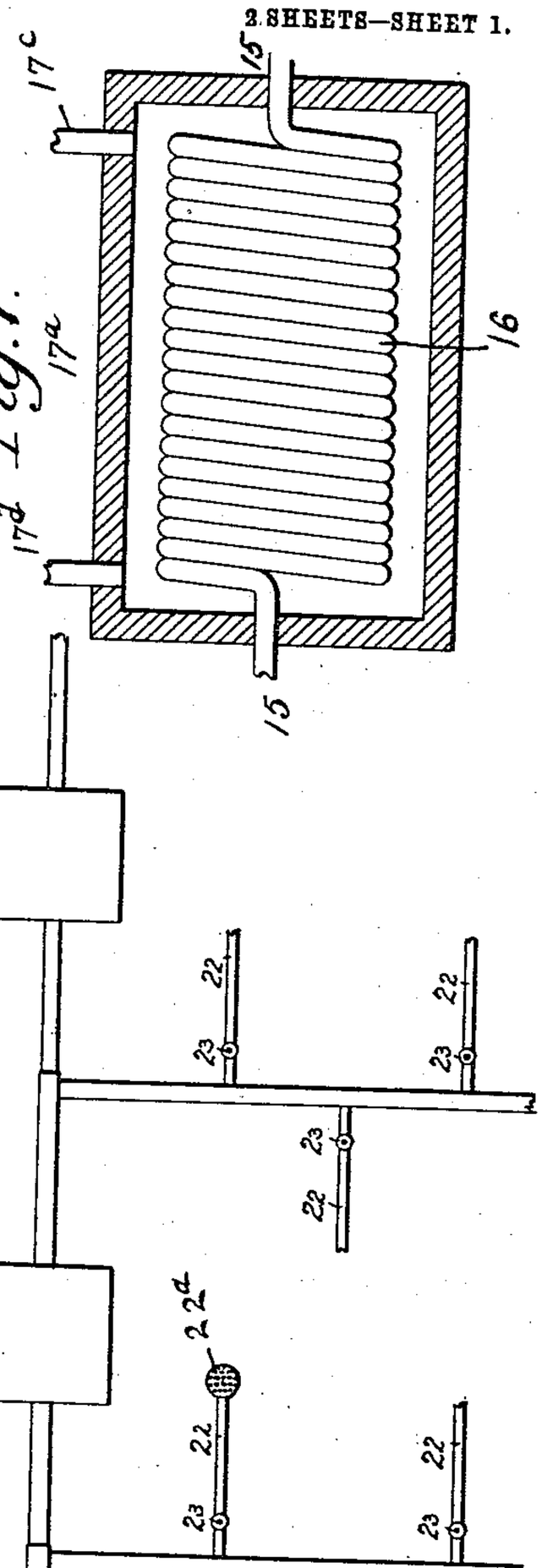

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

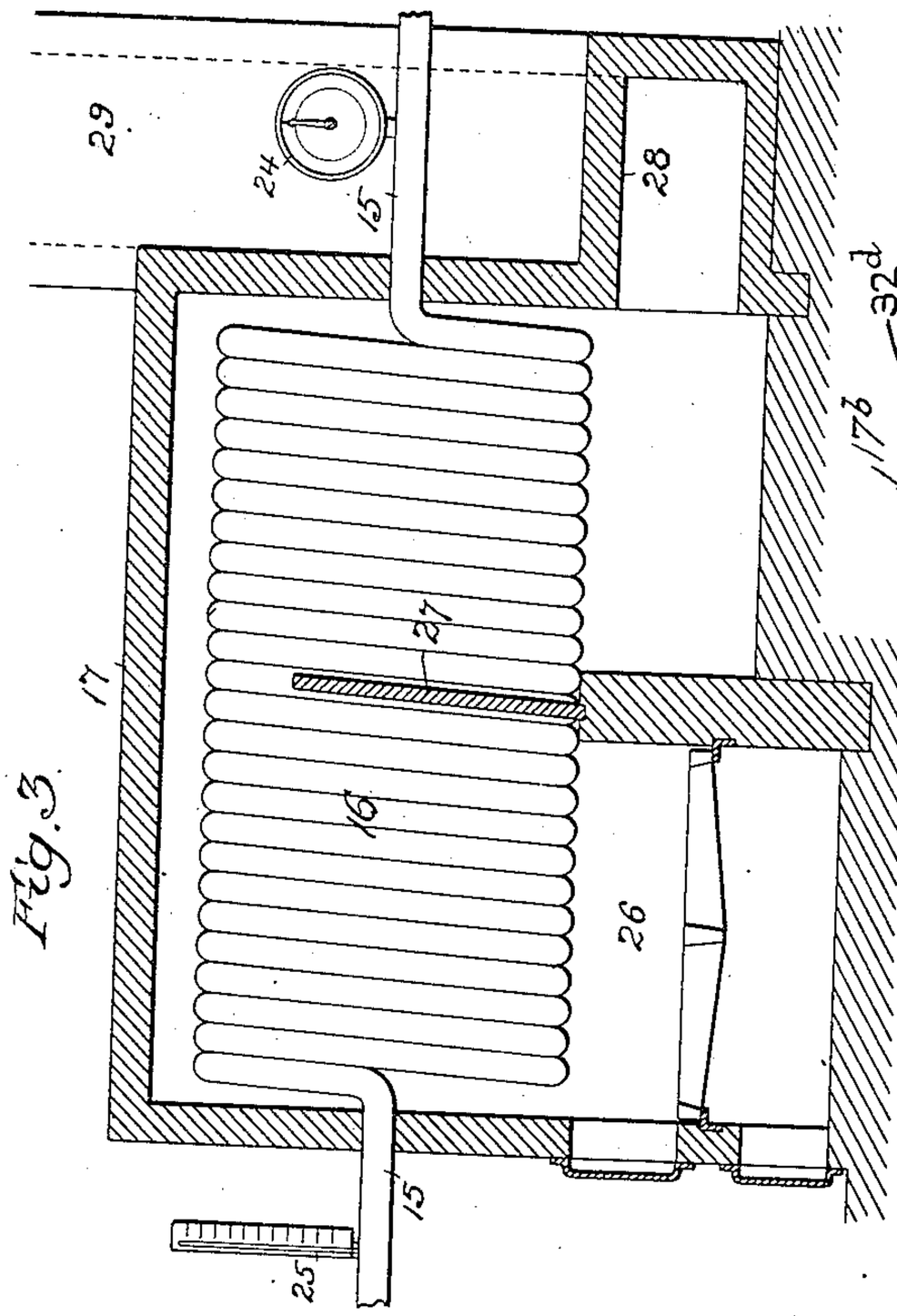


Fig. 6.

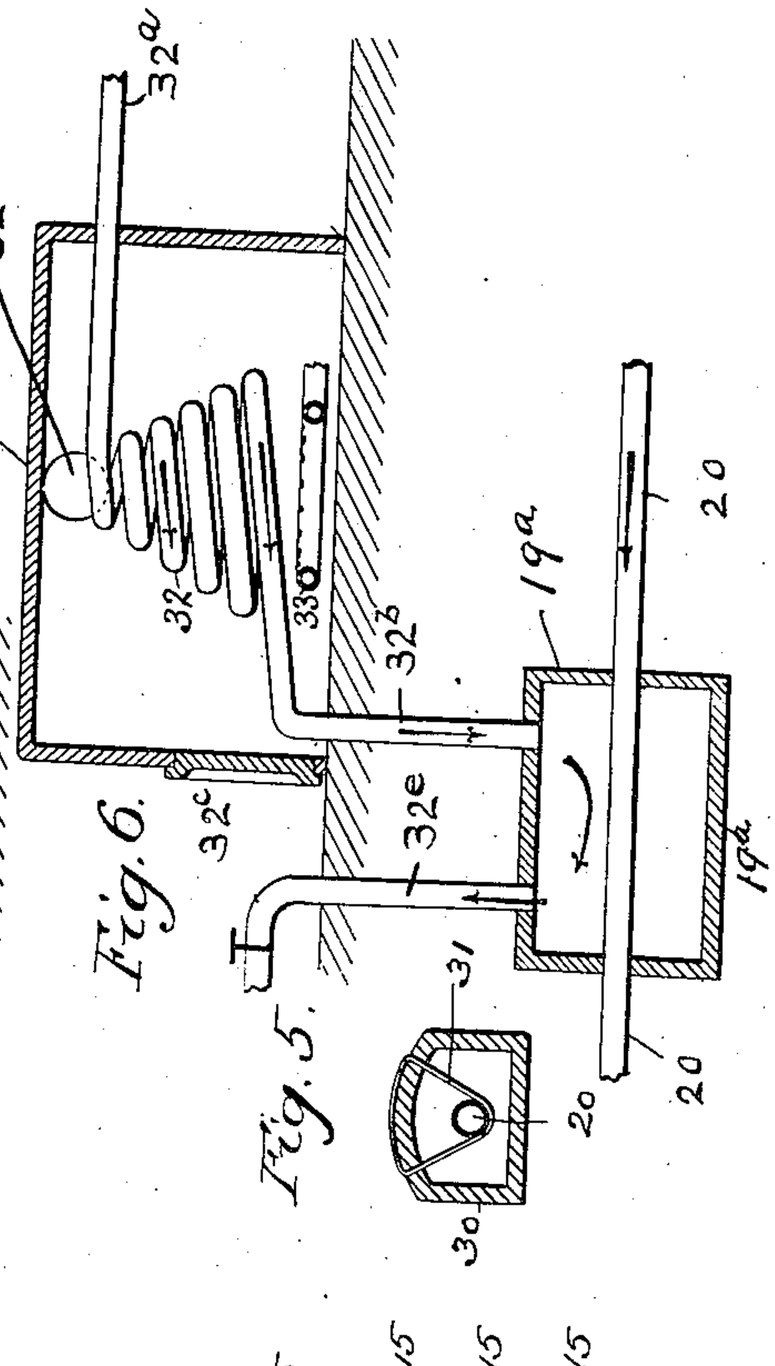


Fig. 5.

Fig. 2.

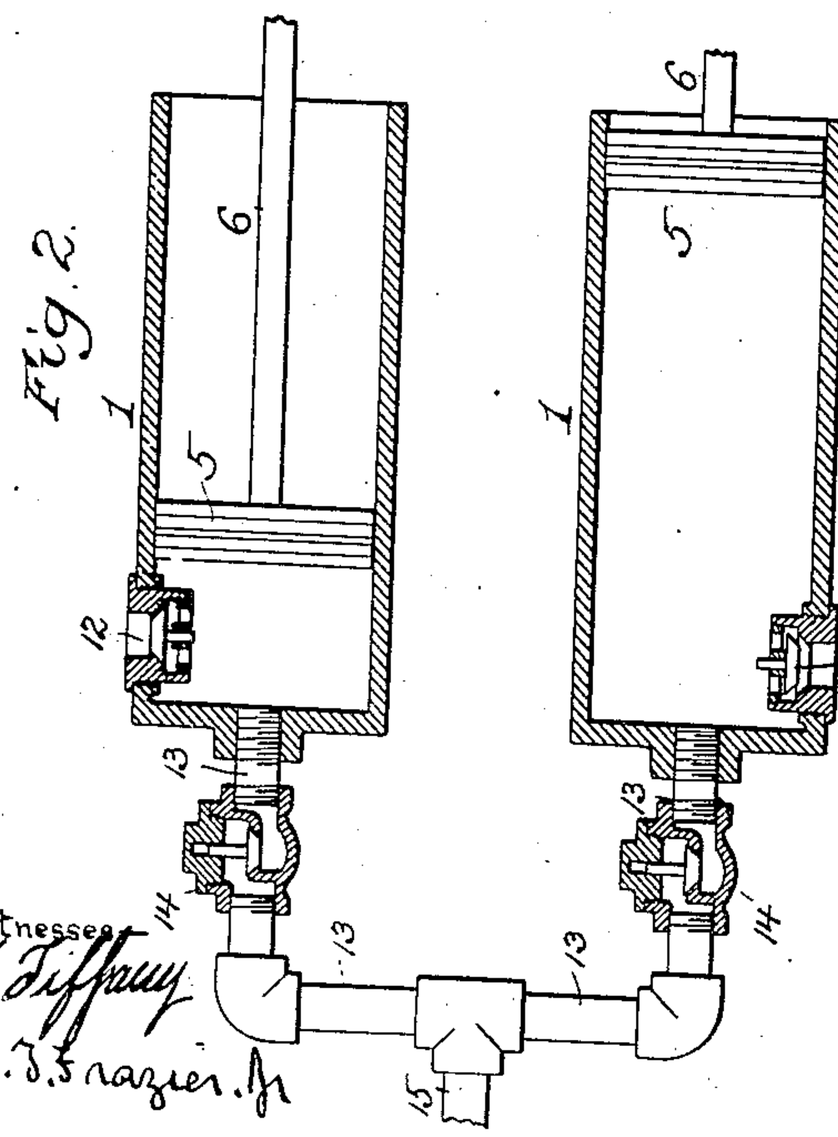
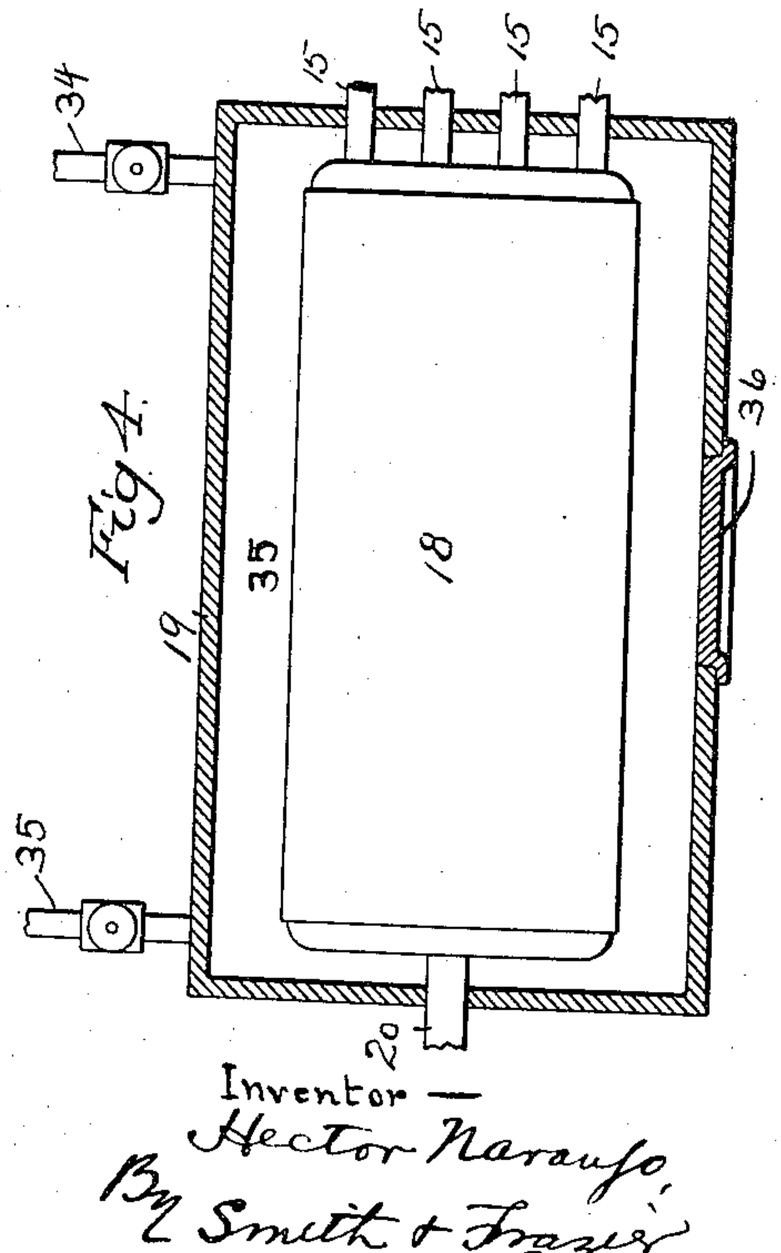


Fig. 4.



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UNITED STATES PATENT OFFICE.

HECTOR NARANJO, OF ALAJUELA, COSTA RICA

HEATING OR REFRIGERATING APPARATUS.

No. 870,457. Specification of Letters Patent. Patented Nov. 5, 1907

Application filed March 15, 1907. Serial No. 362,510.

To all whom it may concern:

Be it known that I, HECTOR NARANJO, a citizen of the Republic of Costa Rica, Central America, residing at Alajuela, in said country, have invented certain new and useful Improvements in Heating or Refrigerating Apparatus, of which the following is a specification.

My invention relates to apparatus for creating, maintaining and regulating atmospheric temperature in buildings, rooms and other places, more especially designed for heat systems, whether applied to the heating of a single structure or building or to a system having a central plant from which the heat is distributed to a group of buildings or structures as, for example, in towns and cities; my invention relates more particularly to the embodiment of a central station at which the heating medium is brought to a proper temperature and from which the said medium is distributed to the points desired; and finally, the invention relates to, and includes, the adaptation of the apparatus, forming an embodiment of the invention, to refrigerating as well as heating. In the specification and claims, therefore, I wish it distinctly understood that wherever the terms "heating" or "refrigerating" or "cooling" are used they are not to be taken for words of limitation, as these are interchangeable and merely relative terms, the main function of the apparatus being based upon the principle of well recognized heat exchangers, in which temperature of one medium is altered or changed, that is, either raised or lowered by the influence of another medium thereupon.

The object of my invention is to provide an apparatus, of the kind above indicated, which shall be simple in construction and effective in operation, and susceptible of adaptation to the heating of a single unit, such as a single building, or to a group of such units constituting a defined portion of a town or city, or the whole of such town or city, as conditions may warrant; to provide such an apparatus as will be economical in construction and operation, durable in use and comparatively easy to install; and one which, with the least changes in existing heating systems in old buildings, may be applied to the latter as readily as to new buildings or constructions; and, further, to provide such an apparatus, in the operation of which the temperature of the heating or cooling medium may be controlled and regulated at will; and, finally, to so improve heating systems of this class that their adoption for practical use may be insured.

With these general objects in view, my invention consists in the novel construction of apparatus, and in the novel arrangement of parts constituting the system, with the details thereof, as hereinafter described, with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the drawings, Figure 1 is a plan view of one embodiment of my invention; Fig. 2 is a longitudinal section, with certain parts in elevation, of a pair of the air pumps forming a part of my invention; Fig. 3 is a vertical sectional elevation of one of the heat exchangers or furnaces; Fig. 4 is a sectional plan view of a supplementary exchanger forming one element of the system; Fig. 5 is a vertical cross section of the conduit inclosing the air distributing pipe; Fig. 6 is an enlarged sectional detail of an individual reheater, as a modification; and Fig. 7 is a sectional detail of a modified form of initial heat exchanger.

Referring to the drawings, in which the same or like characters relate to the same or corresponding parts in all the views, I will first describe the invention as embodied in a system, wherein a central initial heat exchanging plant is designed to heat or cool the air and distribute the latter through the system of pipes or conduits to the various buildings or structures comprising the group or groups in the town or city; and, at the proper point I will designate the separate elements which may be utilized in connection with the single unit, the latter meaning a single building or structure. With special reference to Fig. 1, the numerals 1, 2, 3, and 4, indicate a series of pumps or compressors, preferably connected in pairs and of the single acting reciprocating type, or of any other suitable type, rotary or reciprocating. The piston 5 (see Fig. 2) of each pump is driven by any suitable means, as by a crank disk 9, connected by a rod 7 with the piston rod 6 of each piston, and mounted on a suitable shaft 10 driven from any suitable source of power through a pulley 11. The crank pins on the disk are located about 180 degrees apart to insure alternate action of the pumps in drawing in the air and compressing the same. Each pump is provided with an inwardly opening inlet valve 12 located near the discharge end of the pump cylinder, and closed by the pressure of the compressed air on the active stroke of the piston. A discharge pipe 13 leads from the closed end of the cylinder to a common discharge pipe 15; interposed in the branches of each cylinder is an outwardly opening check-valve 14 of common type closing against the pressure from the discharge pipe 15 and opening under the force of the compressed air as it is being driven from the respective cylinders by the pistons 5.

In the common discharge pipe 15 of each pair of pumps is formed a helical coil 16, inclosed in a heating chamber or furnace 17 provided with an ordinary grate 26, from which latter the products of combustion pass upwardly around the said coil 16 and are directed by a suitable baffle plate 27 from below, around and above said coil, thence downwardly through a smoke passage or flue 28, extending horizontally along the rear of each of the heating chambers and discharge into a chimney

29. Any form of heating apparatus may be used, the furnace being illustrated as a simple example, and, of course, either a gas or coal, or other fuel furnace may be used, according to the local conditions.

Interposed in the pipe 15 between the initial chamber or exchanger and the pump is a manometer 24 for determining the pressure of the air passing through pipe 15, while on the other side of coil 16 is the thermometer 25 for indicating the temperature of the air in the pipe 15, through which the said air passes toward the distributing system.

While, in some cases, it may be sufficient to direct the air from the initial heating chamber or exchanger to the point of delivery, it is advantageous, because of the better control and regulation of the temperature of the air, to lead the same through a supplemental or auxiliary heating chamber or exchanger, a single one of such chambers being sufficient to receive the discharge from a plurality of initial heating chambers or exchangers. Such a supplemental or auxiliary chamber is indicated by numeral 19, which designates the inclosing casing surrounding a cylinder 18, the latter receiving the air from the pipes 15 at one end, from all of the heating chambers or exchangers, and discharging it into the main distributing pipe 20 at the other end. An annular space 35 surrounds the cylinder 18 which may communicate through valved pipes 34 and 35 with any suitable source of liquid supply, such, for example, as a hot water supply where the heated air is to be maintained at a sufficient temperature for heating purposes, or with a refrigerating liquid supply where the air is to be cooled. Under some conditions, a cooling agent in solid form may be desirable, in which instance the same may be introduced into the space 35 and the supply replenished, from time to time, through an opening in the side of the chamber 19, closed by manhole plate 36.

The main distributing pipe or conduit 20 leads from the central plant, as above described, towards the points in direction desired, as, for example, along different streets of a town or city from which extend branch supply pipes 21. From each of the latter extend branch pipes 22 into the room or building that is to be served with the temperature controlling medium, controlling valves 23 being suitably placed in said pipes as indicated. The main conduit or pipe 20 and the branch supply pipes 22 are located in ditches below the surface of the ground and, preferably, suspended within an inclosing nonconducting casing 30 of tile, terra cotta or the like, by means of straps 31. The space surrounding the said conduits or conveying pipes may, if desired, be filled with a nonconducting material, but ordinarily the air space will be sufficient. It will be noted that the main pipe 20 tapers from the central plant towards points farthest therefrom, so that, as the supply is drawn from points intermediate those farther away and the central plant, the capacity of the main supply pipe is reduced, thus diminishing, to some extent the tendency of expansion of the air as the volume decreases at the distant points.

The branch pipes 22 are intended to be connected to the hot air ducts in the building or structure, which are supplied with any suitable form of damper or valves of common type, and, forming no part of the present invention, are not shown in the drawings. Sometimes it may be desirable to distribute the air in buildings or rooms in fine streams, in which case a rose jet 22^a may be attached to the discharge pipe.

In some instances, where the refrigerating effect is especially desired, I employ, in lieu of the heating chamber or exchanger 17, a cooling chamber 17^a inclosing the coil 16 and supplied by a suitable pipe 17^c with a refrigerating liquid which circulates around the coil 16 and passes out through the pipe 17^d to its source for refrigeration and return to said chamber. In cases where the hot air is to be delivered to points of great distance from the central plant, I preferably employ reheating devices, located at suitable intervals, so arranged as to maintain a better control of the temperature of hot air, as shown in Figs. 1 and 6. In these figures, 17^b indicates a housing in the area way, or in a convenient point, near the house or building, and provided with a door 32^c and an escape opening 32^d for products of combustion. This housing, it will be noted, is above ground and incloses a coil pipe 32 to which water is supplied by pipe 32^a from the usual water supply system, the delivery 32^b of said coil passing below the ground and passing into a heat exchanging chamber 19^a surrounding the conduit or pipe 20. A discharge pipe 32^e leads from the opposite end of said chamber and terminates in a discharge slightly above the ground and below the inlet pipe 32^a. The water circulating through the coil 32 is heated by a suitable gas burner 33, the products of combustion of which pass out through the opening 32^d. These reheaters, or auxiliary heaters, serve to maintain the temperature of air at the desired point, and are especially useful in very cold climates; moreover, their use makes it possible for individual users to heat the air to different points, as some users may wish to have a temperature for example, 65 degrees and others at 70 degrees, and so on.

While I have shown and described the central plant as embodying pairs of single acting pumps, my invention is not limited thereto, as a double acting pump may be utilized instead of two single acting as shown, or it may even be possible to use one single acting pump; so, also, may different kinds of air compressors be substituted for the reciprocating pumps, taken here simply as a convenient example. Again, a plurality of initial heating chambers may give place to a single such chamber, and a plurality of supplementary heating chambers be substituted for a single one, though the latter, for economical reasons, is preferable, and similar conditions apply to the reheating chambers and the refrigerating or cooling chambers. It is also to be noted that my invention is capable of application not only to buildings, mines, and other places, but to ships, and especially so when fruits or other perishable goods are transported, the drying or heating and refrigerating effects being utilized, as desired.

It is further obvious that various changes may be made in the details of the construction, without departing from the spirit and scope of my invention, as disclosed in the specification and set forth in the claims.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a heating apparatus, the combination with means for compressing air, of means for distributing the said air to the place of use, comprising a main conduit and one or more branch conduits leading therefrom, an initial heat exchanger at a central station for receiving the compressed

air from the compressing means, a supplementary heat exchanger under control of the central station and arranged to receive the air from said initial heat exchanger on its way to the distributing system, and to discharge the said air directly into the main conduit, substantially as described.

2. In a heating apparatus, the combination with means for compressing air, comprising a plurality of air compressing devices, of means for distributing said air to the place of use, and a heat exchanger, comprising a plurality of heat exchangers located between the compressing means and said place of use for imparting the desired temperature thereto and all communicating with the main distributing conduit of the system, substantially as described.

3. In a heating apparatus, the combination with means for compressing air, comprising a plurality of air compressing devices, of means for distributing said air to the place of use, and a heat exchanger, comprising a plurality of initial heat exchangers located between the compressing means and said place of use for imparting the desired temperature thereto, and a supplementary heat exchanger arranged to receive the air from all of said initial heat exchangers on the way to the distributing system, substantially as described.

4. In a heating apparatus, the combination with means for compressing air, comprising a plurality of air compressing devices, of means for distributing said air to the place of use, and a heat exchanger, comprising a plurality of initial heat exchangers located between the compressing means and said place of use for imparting the desired temperature thereto, and a supplementary heat exchanger arranged to receive the air from all of said initial exchangers on its way to the distributing system, said distributing system comprising a main conduit with suitable branch conduits leading to the points of delivery, substantially as described.

5. In a heating apparatus, the combination with an air compressing means, of a distributing system connected therewith comprising one or more conduits arranged to distribute the air to the place or places of use, a heat exchanging means comprising a plurality of heat exchangers interposed between the compressing means and distributing system, a conduit connecting said heat exchangers with the distributing system, and one or more individual reheaters located in the distributing system near the place or places of use, substantially as described.

6. In a heating apparatus, the combination with an air compressing means, of the distributing system connected therewith comprising a main conduit and one or more branch conduits arranged to distribute the air to the place or places of use, a heat exchanging means interposed between the compressing means and distributing system, comprising an initial heat exchanger for receiving the air from the compressing means, and a supplementary heat exchanger connected to said initial heat exchanger and to the main conduit, and one or more individual reheaters located in the distributing system near the place or places of use, comprising a heater supplied with a fluid medium, and a casing surrounding the conduit through which said fluid medium circulates, substantially as described.

7. In a heating apparatus, the combination with an air compressing means of the distributing system connected therewith comprising a main conduit and one or more branch conduits arranged to distribute the air to the place or places of use, and heat exchanging means interposed between the compressing means and distributing system, comprising an initial heat exchanger for receiving the air from the compressing means, and a supplementary heat exchanger connected to said initial heat exchanger and to the main conduit, and one or more individual reheaters located in the distributing system near the place or places of use, comprising a heater above the surface of the ground supplied with a fluid medium, and a casing surrounding the conduit through which said fluid circulates, substantially as described.

8. In a heating apparatus, the combination with air compressing means comprising a plurality of air compressing devices, of an initial heat exchanger comprising a plurality of heat exchanging units receiving air from said compressing devices at a central station, one or more supplementary heat exchangers under control of the central station receiving the air from said initial heat exchanger, a distributing system connected thereto for distributing the said air from the same, and a conduit connecting said supplementary heat exchanger or exchangers with the distributing system, substantially as described.

9. In a heating apparatus, the combination with air compressing means, comprising a plurality of air compressing devices, of an initial heat exchanger comprising a plurality of heat exchanging units receiving air from said compressing devices at a central station, one or more supplementary heat exchangers receiving the air from said initial heat exchanger, a distributing system connected thereto for distributing the said air from the same, and one or more reheating devices located in said distributing system near the place or places of use as substantially described.

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

HECTOR NARANJO.

Witnesses:
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R. T. FRAZIER.