No. 632,506. Patented Sept. 5, 1899.

W. E. ALLINGTON.

HEATING AND VENTILATING OR REFRIGERATING APPARATUS AND SYSTEM.

(Application filed Oct. 17, 1898.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

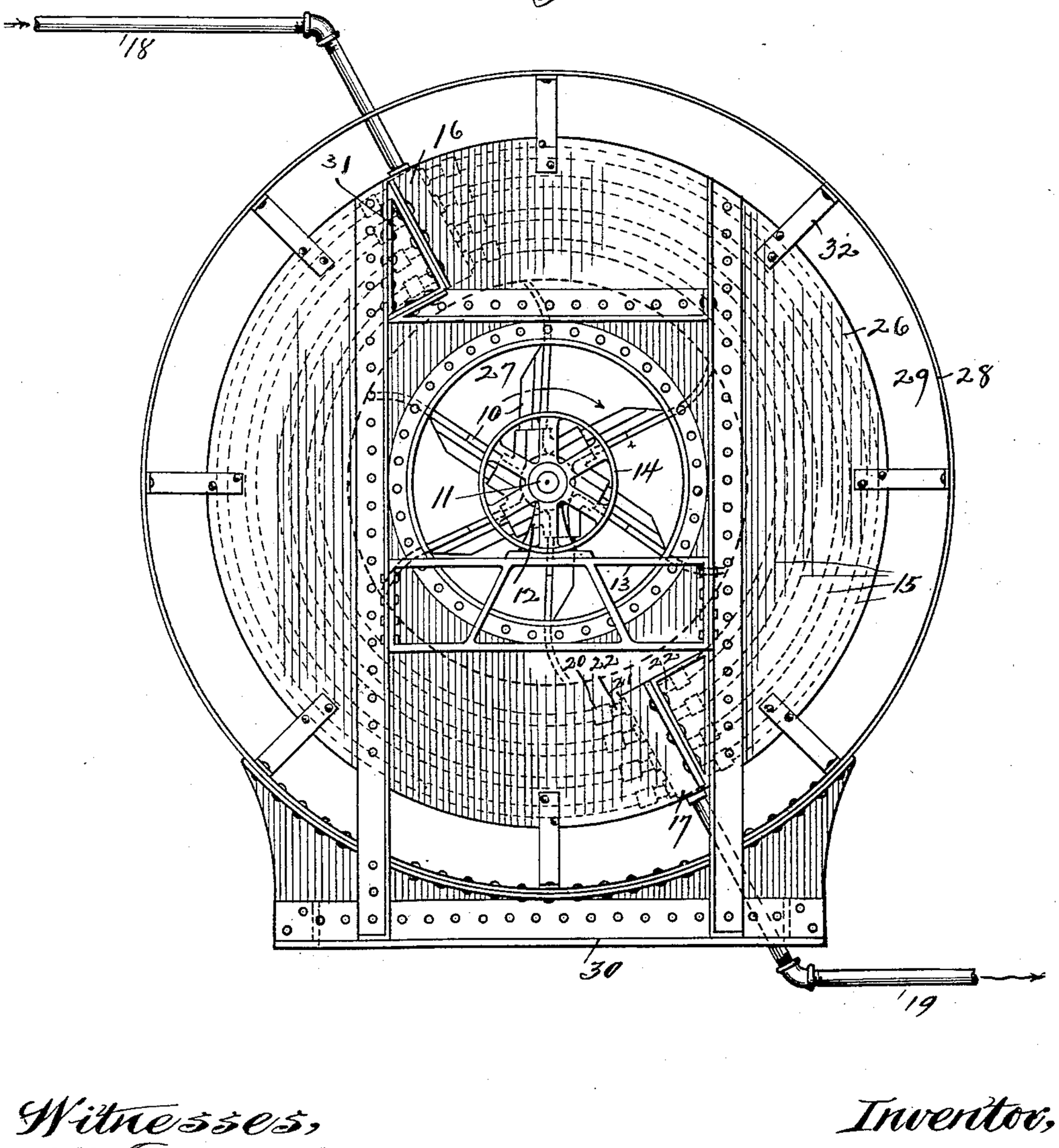

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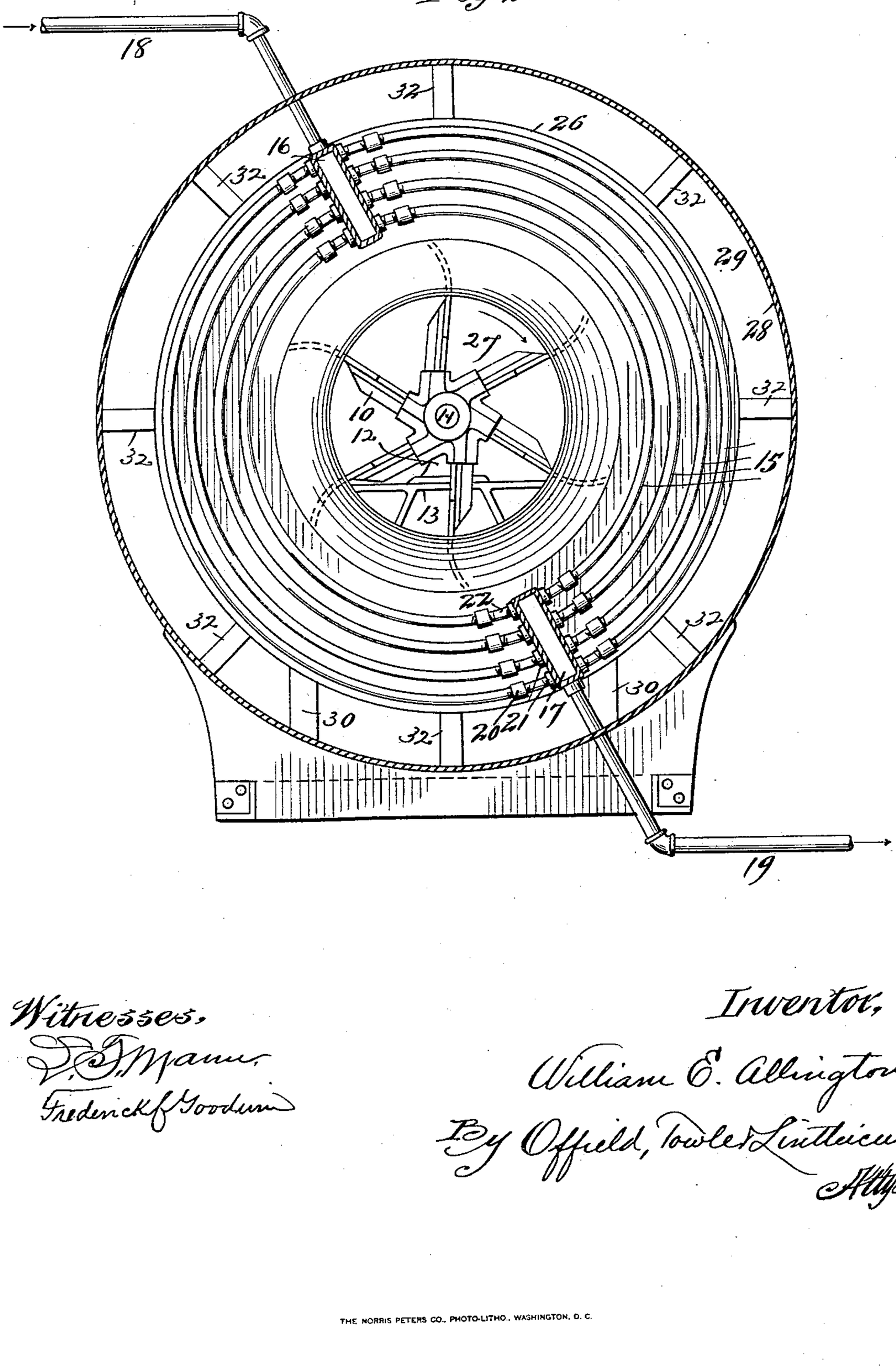
Fig. 2.



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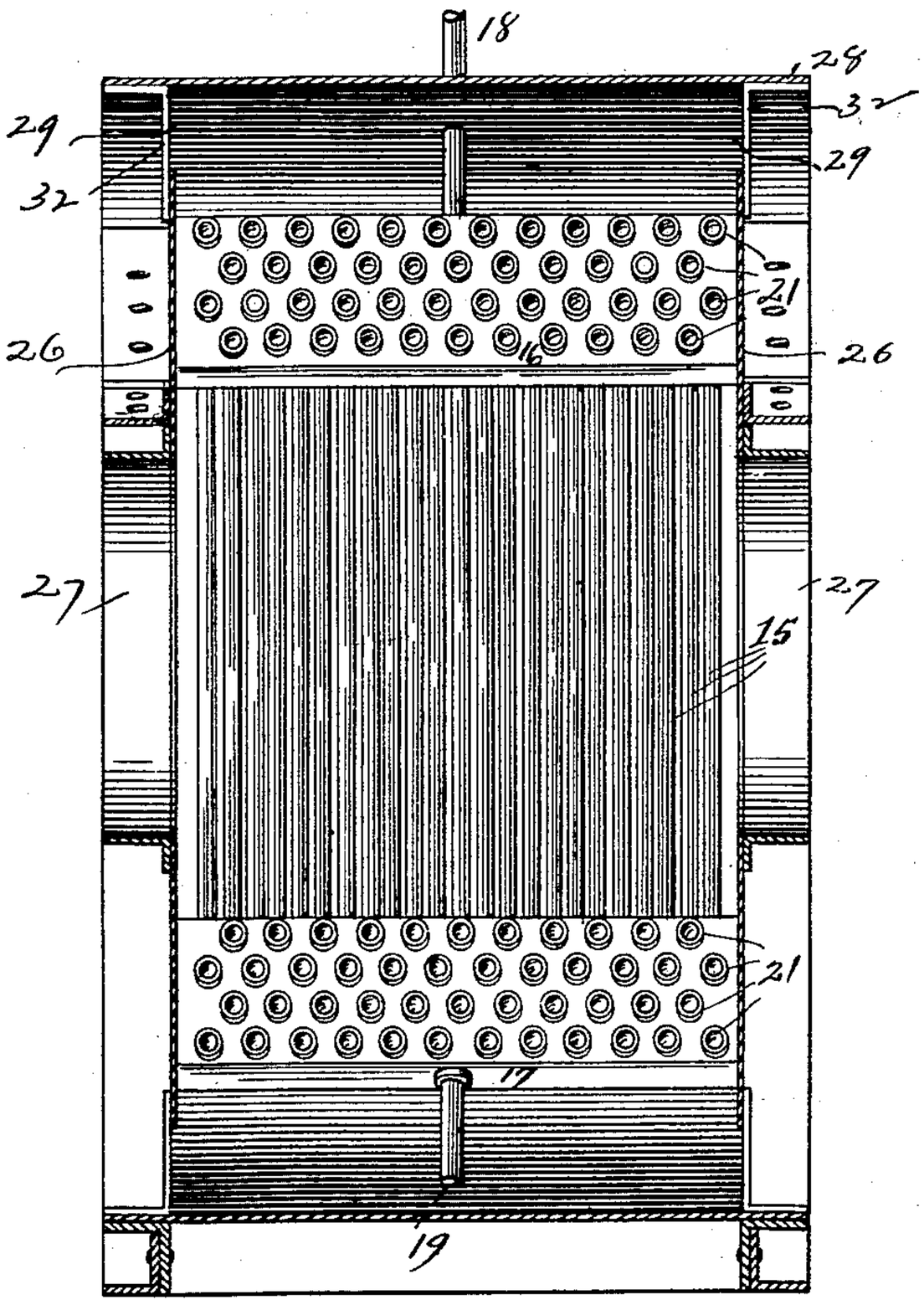
(No Model.) 5 Sheets—Sheet 3.

Fig. 3.



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(No Model.) 5 Sheets—Sheet 4.

Fig. 4.

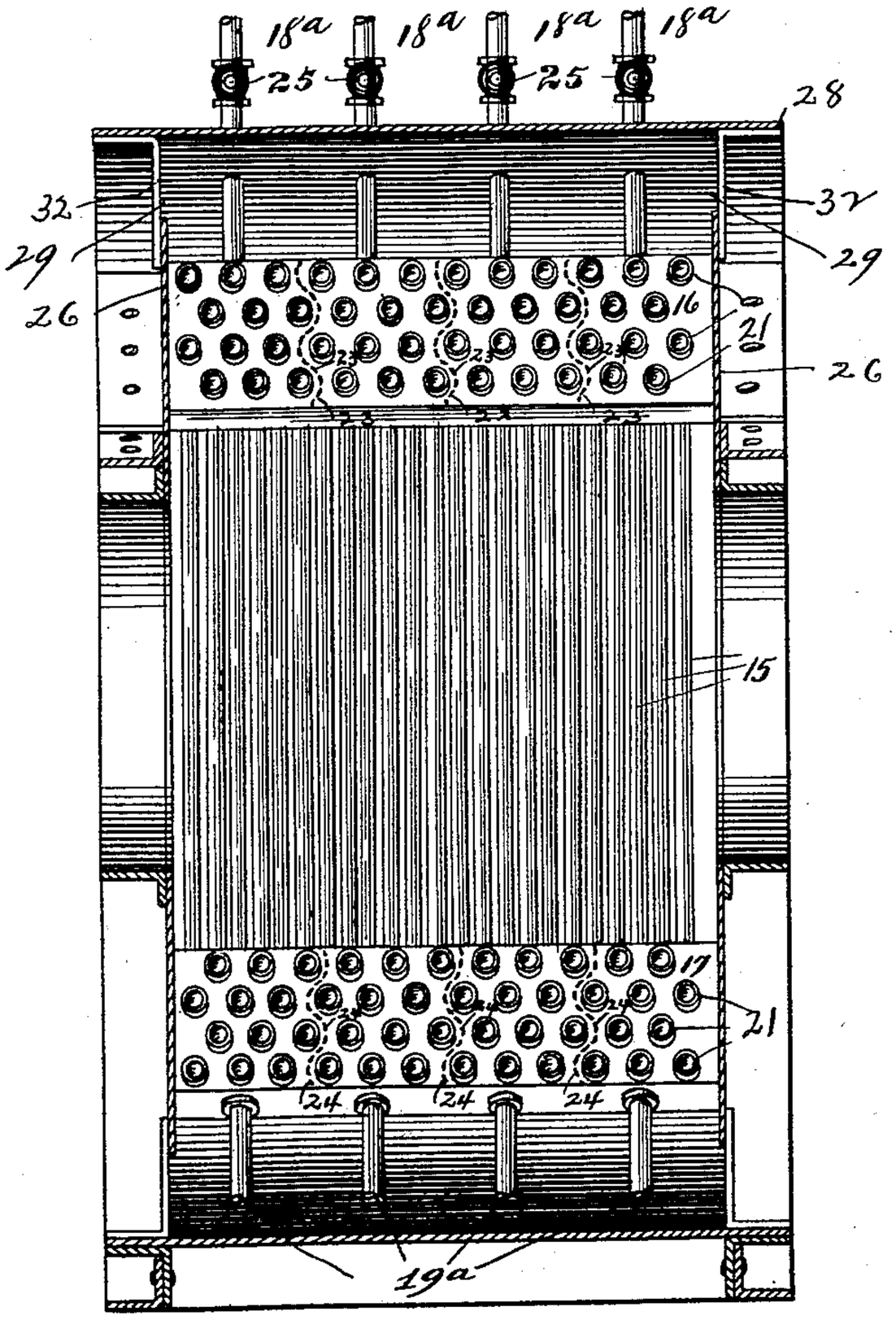

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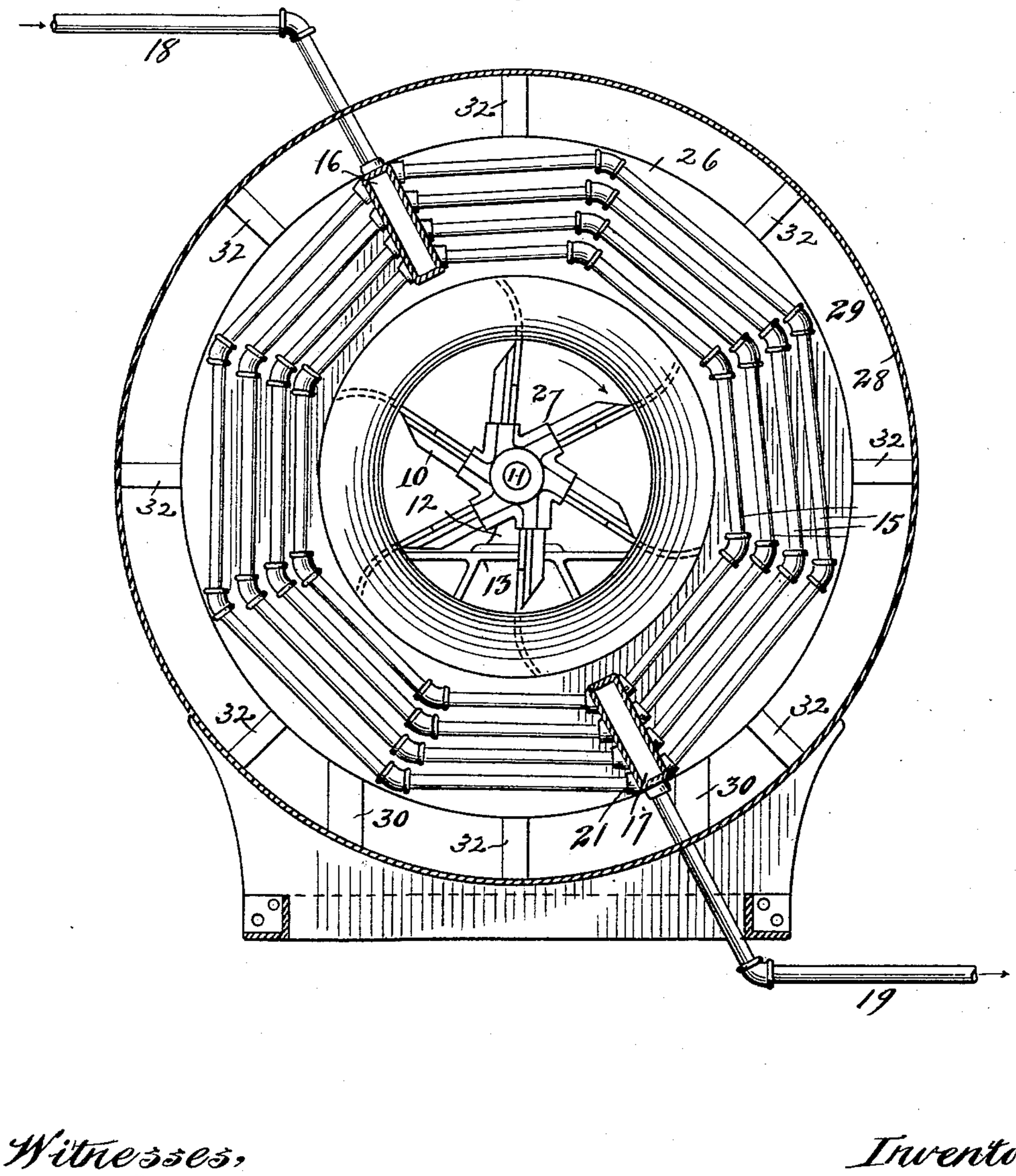
Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM E. ALLINGTON, OF SAGINAW, MICHIGAN.

HEATING AND VENTILATING OR REFRIGERATING APPARATUS AND SYSTEM.

SPECIFICATION forming part of Letters Patent No. 632,506, dated September 5, 1899.

Application filed October 17, 1898. Serial No. 693,728. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. ALLINGTON, of Saginaw, East Side, in the county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Heating and Ventilating or Refrigerating Apparatus and Systems, of which the following is a specification.

My invention relates to heating and ventilating or refrigerating apparatus and systems in which rotary fans are employed for introducing and delivering the air-currents to be warmed, moved, or cooled.

It has been the practice to construct separated heaters of steam-pipes and inclosing them in suitable cases, with rotary fans attached for either drawing or blowing the air-currents through the pipes and heater-case, and in these devices the currents are usually blown across the pipes, so that only one-half, or thereabout, of the entire heating-surface is presented to and comes in contact with the air-blast, and therefore an extra amount of pipe has been necessary to compensate for the lack of effective heating-surface. This is also true with this class of refrigerating apparatus. The space occupied by the old systems with separated fans and heaters often makes it difficult to find sufficient room for installation. It has also been proposed to inclose the fan in a casing having a single tangential outlet in its peripheral portion, the casing being of greater diameter than the fan and the heating-pipes occupying the space thus formed between the fan and the periphery of the casing. This construction is also open to the objection that only a portion of the heating-surface of the pipes is exposed to the air-currents, except at the point of discharge, so that full efficiency of the heating-surface provided by said pipes is not effectively utilized.

The object of my invention is to secure in one apparatus occupying little or no more space than has heretofore been occupied by the fans alone a complete device, including fan, heater-coils, and headers, so arranged as to give full effect to all the heating-surface employed, certain and positive circulation to the heating or refrigerating fluid which passes through the pipes, high efficiency in delivering the air-currents from the fan through the heater-coils, economy in space occupied, as well as material and labor of construction, and also facility of automatic regulation.

To these ends my invention consists in the matters and things which I shall hereinafter describe, and then particularly point out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of an apparatus of the character described embodying my invention in one form. Fig. 2 is a similar view, the casing and headers or manifolds being shown in section and the remainder of the apparatus in elevation. Fig. 3 is a vertical sectional view through the casing, the fan and one-half of the pipes being omitted. Fig. 4 is a view similar to Fig. 3, illustrating a modified form of my invention; and Fig. 5 is a view similar to Fig. 2, illustrating a modification of the construction shown in said figure.

In the said drawings, 10 indicates a rotary fan which may be driven from any suitable source of power, it being shown in the present instance as mounted on a shaft 11, arranged to rotate in bearings 12 on suitable supporting-brackets 13 and provided with a pulley 14, by means of which it may be driven by a belt from any suitable motor.

15 indicates the pipes through which the heating or refrigerating fluid is passed. These pipes are arranged concentrically to the axis of the fan, and the innermost pipes are in close proximity to the periphery of the fan. I employ a plurality of pipes entirely surrounding the fan and lying radially outward therefrom, said pipes being suitably connected to a source of supply of the heating or refrigerating fluid and being provided with suitable discharge connections.

In practice I prefer in an apparatus of ordinary size to divide the pipes into two sections or groups, which sections or groups are located on opposite sides of an imaginary plane passing through the axis of the heater and dividing the same diametrically into two equal parts, as shown in Fig. 2, the pipes being bent into semicircular form and the pipes of the two groups being staggered, as shown in Fig. 3. In larger apparatus I may find it advisable to build up the pipes in polygonal form, as indicated in Fig. 5 of the drawings;

but the number of sides of the polygon is obviously immaterial, and I regard both the polygonal and circular forms as within the scope of my invention. As a means for providing a connection for the pipes to their supply and discharge I prefer to employ an inlet or supply manifold or header 16 and a similar outlet or discharge manifold or header 17. These headers are preferably located diametrically opposite each other, the former being connected with the supply-pipe 18 and the latter with the outlet or discharge pipe 19. The pipes 15 are preferably connected to these manifolds or headers in the following manner: The pipes have the usual right-hand threads at their ends, and these ends receive an ordinary pipe-coupling 20, having right-hand threads at each end. The apertures of the receiving-coils 21 of the headers are provided with left-hand threads throughout, and nipples 22 are introduced between the headers and couplings, said nipples having right-hand threads at one end and left-hand threads at the other.

I prefer the particular location of the manifolds or headers shown for the reason that with this location the polygonal and circular arrangements of the pipes are made interchangeable, so that in construction one joint of thread on each pipe may be saved. It will be understood of course that when the polygonal form of construction is employed the pipes screw directly into the headers, as indicated in Fig. 5.

In the construction shown in Figs. 1, 2, and 3 each of the headers or manifolds has a single continuous fluid-space, so that all of the pipes are equally and simultaneously supplied.

In Fig. 4 I have shown a modification in which I employ divided or partitioned manifolds or a plurality of separate manifolds, each having a separate supply or outlet pipe. In the particular construction shown in said figure the upper manifold or header 16 is provided with a plurality of partitions 23 and the lower manifold or header 17 is provided with a corresponding plurality of partitions 24. Each of the separate divisions thus formed is provided with a separate supply-pipe 18^a or outlet-pipe 19^a, and these pipes are provided with controlling-valves 25, so that the fluid may be admitted to any section of the supply-header and to the corresponding group of pipes. In this manner any desired portion less than the whole of the plurality of pipes may be employed at one time. It is obvious that instead of thus connecting the groups of pipes in parallel they may be similarly connected in series, if desired, and suitable thermostatic devices, such as are well known and require no detail description here, may be employed for controlling the valves, and consequently the cutting in or out of the several groups or sections of pipe.

In connection with the fan and heater I prefer to employ a fan-casing surrounding and inclosing both fan and heater, although under certain conditions said casing may be omitted. The casing is in the general form of the section of a cylinder concentric with the axis of the fan. This casing consists of two flat annular side pieces 26, having central inlet-openings 27 and extending thence outward to the outer rows of pipes, and an outer cylindrical inclosing ring 28, located some distance outward beyond the pipes, between which and the side pieces 26 are lateral discharge-openings 29, annular in form and located at the margins of the side pieces outwardly beyond the pipes. The casing may be supported by a suitable metallic framework 30, which also carries the brackets 13 for the bearings 12 of the fan-shaft, and this frame also carries brackets 31, which support the manifolds or headers. The inclosing ring 28 and side pieces 26 of the casing are preferably connected by brackets 32, located at intervals, as shown. It is obvious, however, that instead of thus providing a substantially continuous annular discharge-opening at each side of the casing the side pieces may be continued directly to the inclosing ring and suitable openings may be provided in the marginal portions of the side pieces.

The form of casing shown is particularly adapted for use in large rooms with practically no subdivisions—as, for example, in the case where factories or the like are to be heated.

In operating the device the fan-wheel is rotated by any suitable motor, either directly or indirectly connected thereto in any approved manner. The centrifugal force developed by the rotation of the fan-wheel causes the air between its blades to flow radially outward, and thereby pass through the spaces between the pipes, while the angular velocity given to the air-currents by the rotation of the fan-wheel further causes the air-currents while passing through the spaces between the pipes to also travel lengthwise of the pipes. Furthermore, since the air-currents escape through lateral openings at the periphery of the case in lines substantially parallel with the axis of the fan-shaft lateral direction is also given to the air-currents by reason of their traveling toward the point of least resistance at the sides of the casing where they are to escape from the casing. These several movements imparted to the air-currents cause them to come into contact with practically all of the external surface of each individual pipe of the heater. The proximity of the inner coils to the periphery of the fan-wheel results in high efficiency in utilizing the centrifugal force and angular velocity imparted to the air-currents for the purpose of delivering them through the spaces between the pipes and out of the apparatus into the rooms to be warmed or cooled. The lateral peripheral discharge through the annular space around each side of the apparatus is a fur-

ther factor in giving high efficiency to the fan-wheel in this particular form of my invention owing to the free outlet for the delivery of the air with practically no resistance.

By reason of the construction and mode of operation described the non-effective heating-surface found in apparatus employing a separated fan and heater or refrigerator-coil is absent from a structure made in accordance with my invention, and I am therefore enabled to dispense with a considerable amount of pipe without any diminution in the heating or refrigerating effect, or, in other words, a smaller total linear amount of piping will produce the same heating effect or the same amount a greater effect. The advantages due to the reduction in the space occupied—superior compactness and the self-contained nature of the structure—are obvious, while the arrangement of the pipes gives a certain and positive circulation of the heating or refrigerating fluid through the apparatus.

In the form of apparatus illustrated in Fig. 3 it is designed that the full capacity of the apparatus, so far as the heating or refrigerating pipes are concerned, shall be always employed, the heating effect being varied by controlling the speed of the fan and the consequent delivery of air to the pipes. In the style of apparatus shown in Fig. 4 the apparatus is further controllable by varying the number of pipes or groups of pipes through which the heating or refrigerating fluid is passed, so that the full capacity of the fan-wheel may be employed for delivering a fixed volume of air, and the temperature may be controlled by cutting out or in the several pipes or groups of pipes as they are required for reducing or raising the temperature. It is further obvious, as hereinbefore pointed out, that this cutting in or out may be effected automatically by suitable thermostatic regulating mechanism, of which numerous forms are well known and well adapted for application to this apparatus, or it may be effected by hand, if desired.

It is obvious that various modifications in the details of construction hereinbefore set forth may be made without departing from the principle of my invention. For instance, while I have employed the term "concentric" as descriptive of the relation of the pipes to the fan-wheel I include in such term not only the circular arrangement of pipes shown and described, but also the polygonal arrangement set forth. Moreover, while I have referred to a "divided or partitioned manifold" I wish it understood that I consider to be included in that phrase a manifold built up of a plurality of sections or a plurality of separate manifolds. I therefore do not wish to be understood as limiting myself strictly to the precise details hereinbefore set forth.

I claim—

1. In an apparatus of the character described, a rotary fan-wheel, a plurality of heating-pipes surrounding said fan-wheel, and a casing for said wheel and pipes comprising an air-space lying outward beyond the outermost pipes, said casing being provided with a substantially continuous lateral outlet communicating with said space and located between the outermost pipes and the inclosing peripheral wall of the casing, substantially as described.

2. In an apparatus of the character described, a rotary fan-wheel, a plurality of pipes surrounding said fan-wheel, and a casing for said wheel and pipes having central inlet-openings opposite the fan, lateral portions inclosing the sides of the pipes, and a peripheral inclosing portion located some distance outward beyond the outermost pipes, whereby there are formed substantially continuous lateral outlets at the margins of the sides of the casing, said outlets being located outward beyond the outermost pipes, substantially as described.

3. In an apparatus of the character described, the combination, with a rotary fan-wheel, of a plurality of pipes arranged in close proximity to the periphery of the fan-wheel and practically surrounding and substantially concentric therewith, and a casing surrounding and inclosing the fan-wheel and pipes, said casing having central lateral air-inlets extending radially a distance beyond the outermost pipes to form an annular air-space lying radially outward beyond said pipes and provided with annular air-outlets at the margins of its sides beyond said pipes, substantially as described.

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