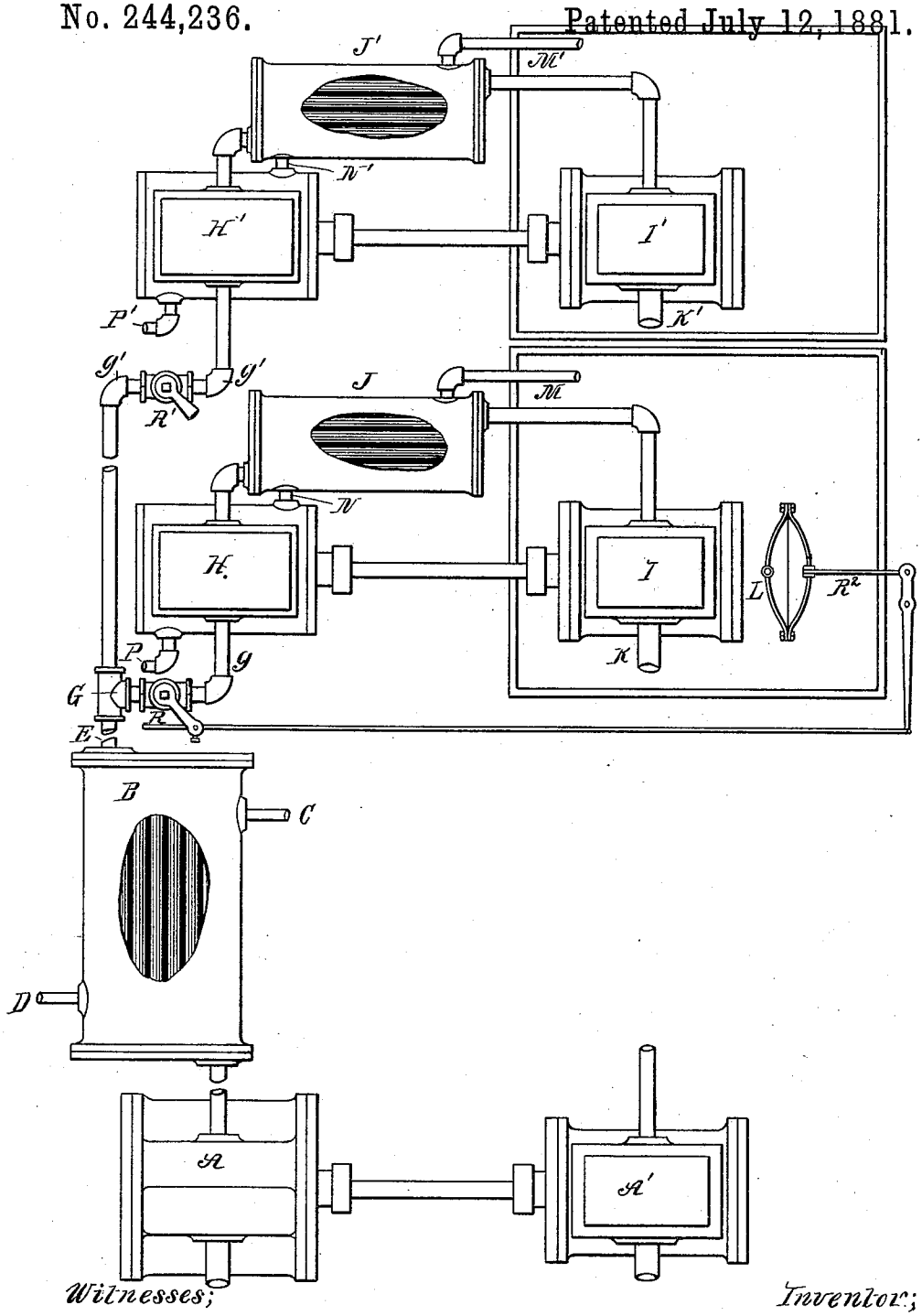
(No Model.)

E. HILL.

SYSTEM OR METHOD OF SUPPLYING DYNAMIC REFRIGERATION AND MACHINERY FOR THE SAME.

No. 244,236. Patented July 12, 1881.



Witnesses;

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UNITED STATES PATENT OFFICE.

EBENEZER HILL, OF SOUTH NORWALK, CONNECTICUT.

SYSTEM OR METHOD OF SUPPLYING DYNAMIC REFRIGERATION AND MACHINERY FOR THE SAME.

SPECIFICATION forming part of Letters Patent No. 244,236, dated July 12, 1881.

Application filed May 16, 1881. (No model.)

To all whom it may concern:

Be it known that I, EBENEZER HILL, of South Norwalk, in the county of Fairfield and State of Connecticut, have invented a new and useful Improved System or Method of Supplying Dynamic Refrigeration and Machinery for the Same, of which the following is a specification.

The object of this invention is to furnish an economical and simple apparatus for dynamic refrigeration for hotels, markets, dwelling-houses, &c.; and the invention consists, first, in combining any number of air-compressors and air-expanding engines connected with chill-rooms with a central or main air-compressing engine and suitable intermediate connections and valves so organized that apartments connected with the source of supply may be furnished with cold air from the central or main engine, as will hereinafter appear; and, second, the invention further consists in combining with said apparatus intermediate cooling, absorbing, and radiating chambers in such a manner that the warm air from the chill-rooms will assist in cooling the air in its passage to said rooms or apartments to be cooled, as will hereinafter appear.

The accompanying drawing represents a plan or outline of an apparatus adapted to supply two apartments or chill-rooms, and illustrates the manner by which any additional number may be cooled.

At A is represented the central or main air-compressing engine, which may be constructed in any of the well-known or approved styles of such machines, and which may be operated by a steam-engine, as at A′, directly connected, as shown, or by any other suitable motor. This main compressor ought preferably to be located in a part of the city or district to be cooled where large quantities of water, either salt or fresh, can be cheaply obtained for cooling the air during and after compression.

At B is represented an air-cooler connected to the discharge side of the compressor A, and it consists of a large tank filled with tubes, similar to a surface-condenser, and having an inlet-pipe, as at C, admitting cold water, and a discharging-pipe at D for the water to be carried off from the tank B. The air under compression, after being cooled in the cooler at B, is carried by a pipe at E to the district where it is to be used, as in a street-main for gas or water; or the pipe may be carried overhead, as most convenient. From said main pipe distributing branches, as at G and G′, lead off the air to the suction side of small compressors, as at H and H′, or as many as may be required, and the amount of air so admitted to them is regulated by a throttle-valve, as at R and R′, which may be an ordinary cock with a hand-lever, as shown; or it may be an automatic throttle-valve arranged to operate from a thermostat, as at R^2, in the chill-room at L, and connected therewith, so that the temperature of the room may be kept at a certain determined degree. These compressors at H and H′ are each operated by an air-engine, as at I and I′, either in the chill-room, as at L and L′, or in a cold-air room connected with the chill-room. Here it may be observed that this second compression constitutes what is termed "serial compression"—a process which has many advantages in compressing air, as is now well understood among engineers. After this second compression the air is conducted through the coolers at J and J′, which are also constructed with tubes, as shown, like surface-condensers, and from them the air passes to the expanding-engines at I and I′, where it performs the work required to effect the second stage of compression, as already mentioned. After such work the air is expanded to atmospheric pressure through the exhaust-pipes at L and L′, and is exceedingly cold; but at the same time it has done the work of the second compression by driving the compressors at H and H′, instead of being an idle element in expanding pipes, as ordinarily done when cold air is employed for refrigeration. As this discharge of air is continuous, the chill-rooms will soon become surcharged, and therefore a means of escape is afforded through an outlet-pipe at M and M′ from each room to the coolers at J and J′, where the partially-warmed current of air passes through the tubes or around them in the said coolers and imparts its cold to the air passing from the small compressors at H and H′ or on its way to the expanding-engines. This escaping cool

air may be still further utilized by passing it from the coolers J and J′ through pipes at N and N′ to jacketed spaces around the small compressing-engines, whence it escapes to the outside through the outlet-pipes at P and P′, and thus it performs the office usually required of cold water in the coolers after compression, and if the apparatus is properly proportioned it will leave the jackets quite warm.

From such an arrangement of the parts it will be apparent that the throttle valves or cocks at R and R′ control the supply of air to the small compressors, and hence they regulate the speed and the degree of cold; and as there are no other cocks to be manipulated, these machines may easily be set in motion by persons not at all familiar with machinery, as the cocks only require to be opened and closed, according to the degree of cold required in the chill-rooms.

All the complex apparatus of the air-compressing will be conducted at the central station by the engineers in charge, who may from time to time inspect the smaller machines and keep them in order when required.

Only two chill rooms or apartments to be cooled are here represented; but any number and of any size, from the small preserving-chest in a dwelling or market to the largest room required for storage, may be connected to the main pipe leading from the central station, where any required size of engines may be erected, and in duplicate for the prime supply; and in place of the cumbrous ice-receptacles now required the entire space may be used as preserving-spaces; and the circulation of the air will also be a source of health and comfort, and as conveniently supplied as water and gas are at present.

By means of thermostats controlling the cocks or valves in the branch pipes, a supply of fresh air, and at any temperature, could easily be furnished to school-rooms, halls, churches, theaters, &c.

I therefore claim—

1. A system or method of supplying dynamic refrigeration by first compressing the air at a central station, there cooling it, and then conducting it through a main and branches to small compressors which are operated by expanding-engines driven by the same air first compressed, and which, after performing the work of the second compression, escapes into rooms or apartments to be cooled, and then flows from the said rooms or apartments, according to the pressure or supply, to the chill-rooms.

2. In a system of dynamic refrigeration, the combination of any required number of air-compressors and their motors connected with independent chill-rooms with a central or prime compressor which supplies the power to operate them, as hereinbefore set forth.

3. The combination of an air-compressor performing initial compression with smaller compressors and their motors connected with independent chill-rooms and an intermediate valve or valves for controlling the supply, as hereinbefore set forth.

4. The combination of a primary compressor with one or more secondary compressors and their motors, connected with independent or separate chill-rooms, and with an intermediate cooler or coolers, through which cold water is circulated to cool the air of the initial compression, as hereinbefore set forth.

5. The combination of a cooler or coolers with a chill room or rooms and suitable connections for cooling compressed air by the partially-warmed air passing from a surcharged chill-room, as hereinbefore set forth.

6. The combination of a primary compressor, a secondary compressor driven by an expanding-engine which is driven by compressed air after secondary compression, a chill-room, and an outlet-pipe through which the air from the chill-room escapes, as hereinbefore set forth.

7. An air-compressor having a jacket, in combination with a chill-room and a pipe to conduct the partially-warm air from the chill-room to said jacket to assist in cooling the air from the compressor, as hereinbefore set forth.

8. In combination with a chill-room and its compressor, a thermostat to control the amount of cold air entering the room.

In witness whereof I have hereunto subscribed my name and affixed my seal in the presence of two subscribing witnesses.

EBENEZER HILL. [L. S.]

Witnesses:

EUGENE N. ELIOT,

E. C. PERKINS.