

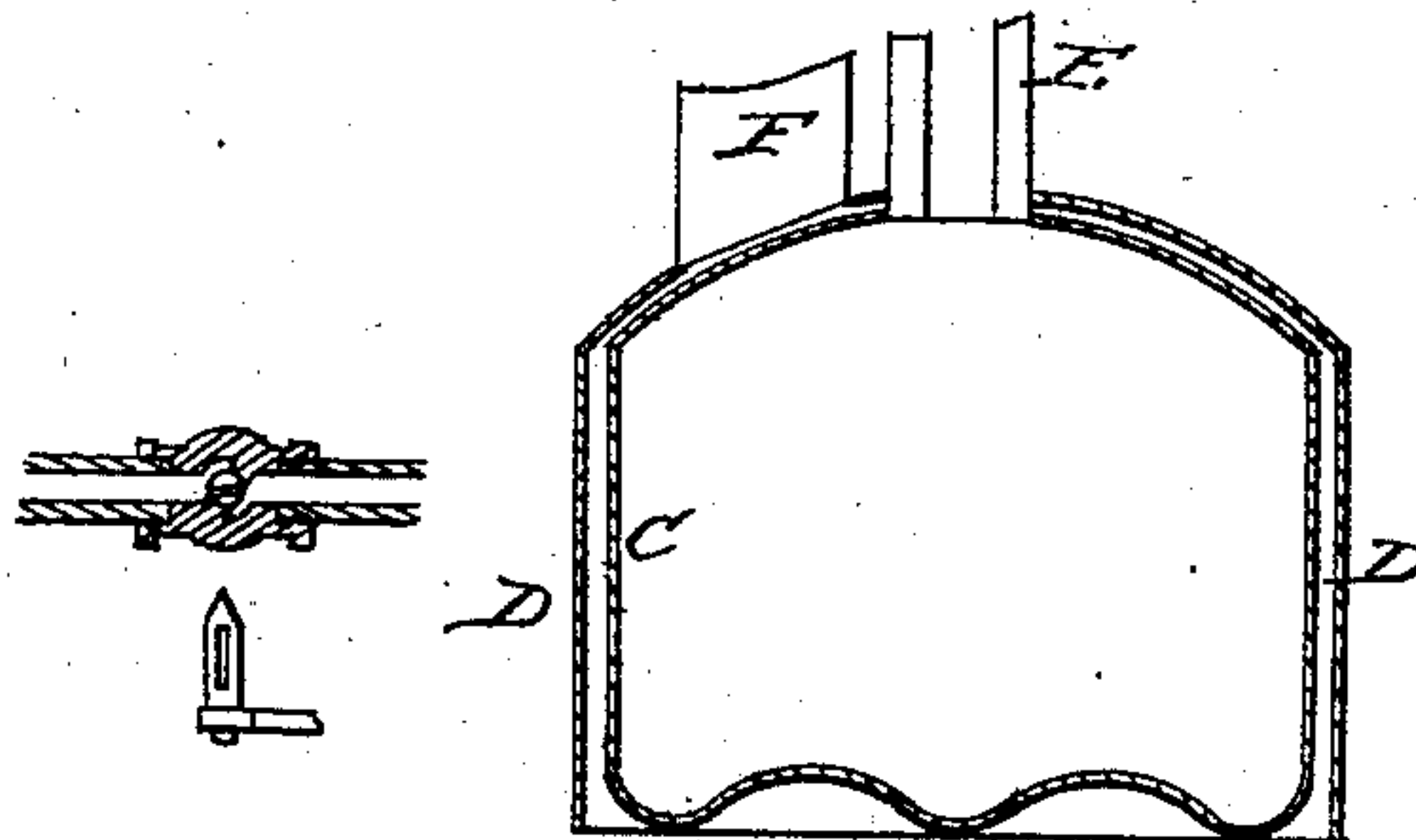
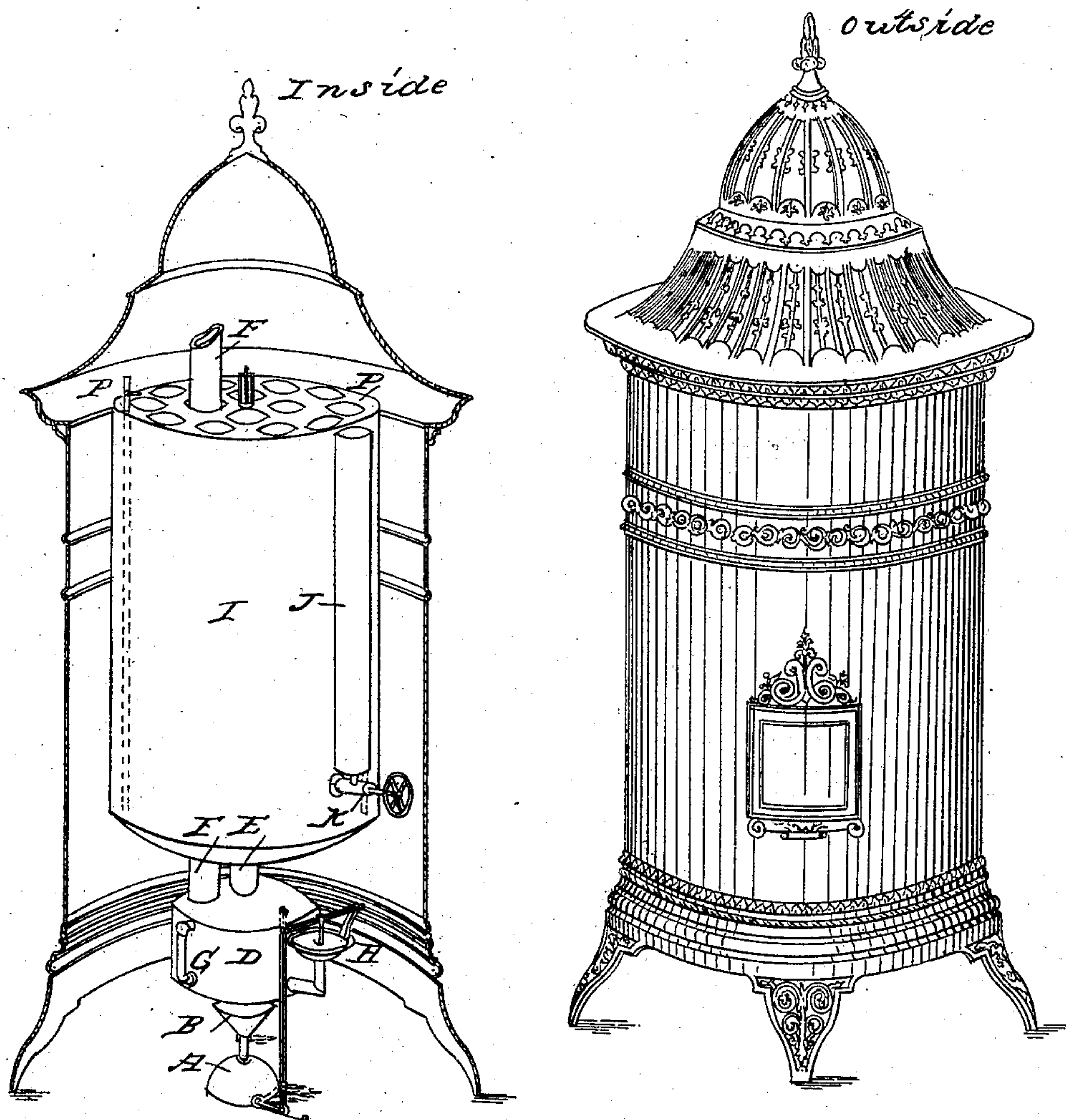
HOLT & GERROULD.

2 Sheets—Sheet 1.

Steam Heater.

No. 22,289.

Patented Dec. 14, 1858.



Witnesses:
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Inventors
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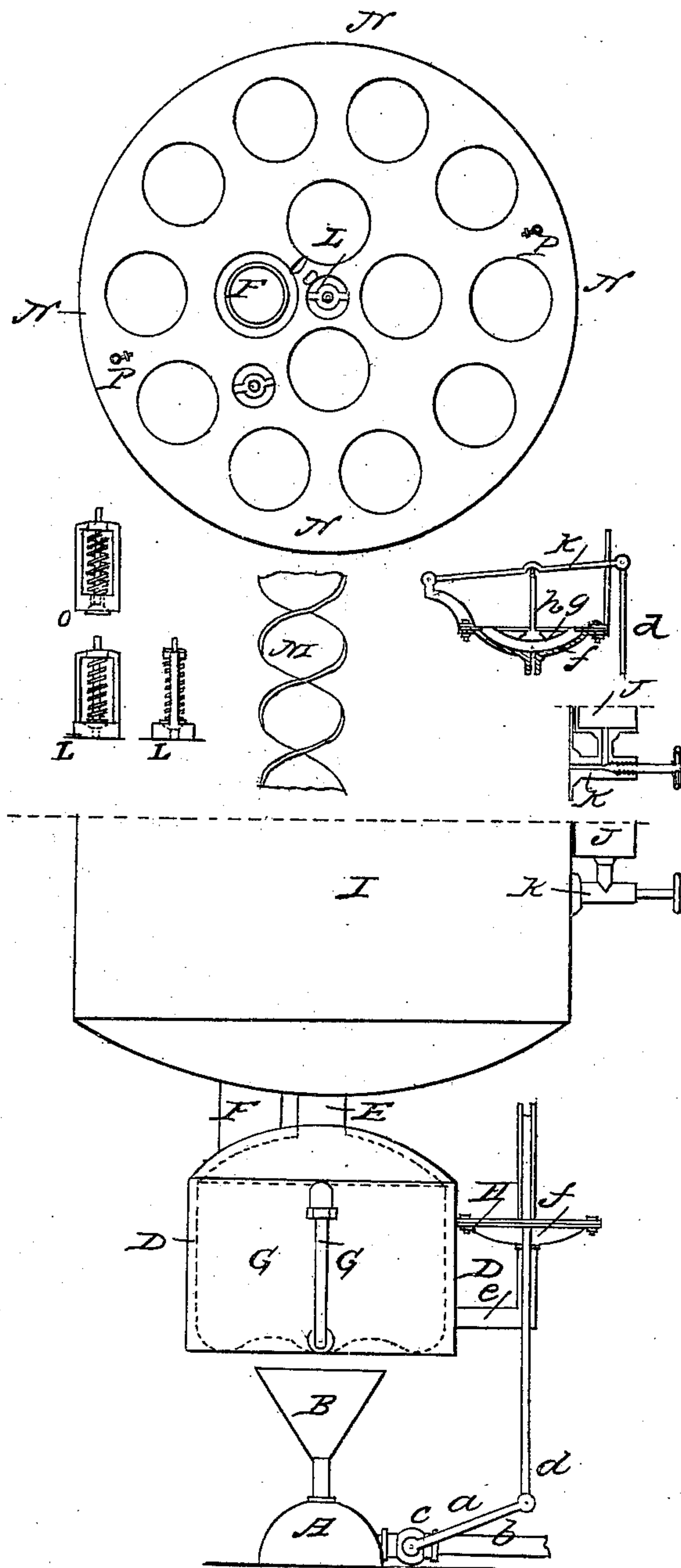
HOLT & GERROULD.

Steam Heater.

2 Sheets—Sheet 2.

No. 22,289.

Patented Dec. 14, 1858.



Witnesses:
Wm. A. Carter
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Inventor:
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UNITED STATES PATENT OFFICE.

JOHN HENRY HOLT AND JOSIAH H. GEROULD, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN STEAM-RADIATORS.

Specification forming part of Letters Patent No. 22,289, dated December 14, 1858.

To all whom it may concern:

Be it known that we, JOHN HENRY HOLT and JOSIAH H. GEROULD, both of the city of Chicago, in the county of Cook, in the State of Illinois, have invented a new and Improved Condensing Steam Caloric-Radiator; and we do hereby declare that the following is a full and exact description thereof.

The nature of our invention consists in constructing a steam heating apparatus for raising the temperature of any given apartment, the *modus operandi* of which is as follows: The steam being generated in the boiler (marked in the accompanying drawing C) is conveyed into an air-tight radiating-cylinder I, which cylinder is perforated by several open tubes passing through its entire length. The steam condenses upon the inner surface of the cylinder and upon that surface of the tubes which is inside of the cylinder. Upon such condensation a large amount of caloric is evolved, which is radiated from the outside of the cylinder and by the open surfaces of the several tubes. To increase the radiation of the tubes each of them is fitted with a spiral radiator running the entire length of the tube. The currents of air passing through the spiral radiators of the tubes, as well as those coming in contact with the outer surface of the cylinder, become heated and pass off into the general circulation. Thus a supply of heated air is continually diffused through the apartment. The steam on condensation is conducted by the inner surface of the cylinder and tubes down to the bottom of the cylinder, which being concave on the inside drains the distilled water back through the conducting-pipe into the boiler, to be again converted into steam, which will be again condensed, so on *ad infinitum*, the same water being used over and over again. The small quantity of water which it may be necessary from time to time to add to that in the boiler in consequence of loss by escape of steam, leakage, or otherwise is supplied by the reservoir J, which is fixed on the side of the cylinder. By turning a little wheel which is attached to a stop-cock the water flows from the reservoir into the cylinder and from thence down into the boiler. The cylinder is also fitted with a safety-valve to provide for any extraordinary pressure of steam from the inside of the cyl-

inder, also a vacuum-valve to obviate the possibility of a collapse, and also air-cocks which are to be opened when steam is first generated, so as to permit the escape of air from the cylinder, and are to be closed again as soon as the air has been expelled by the steam. The steam in the boiler is generated by means of a flame from common coal-gas after it has passed through a wire-gauze. That flame being produced, principally, by the combustion of hydrogen evolves a much greater amount of heat from a given volume of gas than is produced by any ordinary gas-burner. The disagreeable odor of the noxious vapor which arises from burning coal-gas in this mode is obviated by a hood D, which collects and draws in all the obnoxious vapors as they are emitted, and by means of a conducting-pipe E from the top of the hood they are carried up through one of the tubes of the cylinder and from thence into a flue or any other convenient channel. The boiler has a corrugated bottom, so that a greater heating-surface may be presented to the action of the flame. The boiler is also provided with a gas-regulator which controls the supply of gas to the burner in the following manner: A vessel of any suitable material is shaped like a common saucer, as at *f*. On the outer edge thereof is a horizontal flange projecting about half an inch. A corresponding flange is made to be fitted to the one attached to the saucer-shaped portion. A circular piece of rubber cloth, called a "diaphragm," *g*, is fixed so that the edge thereof is held between the two flanges. The diaphragm covers the inside of the bowl and must be large enough to fall to and rest upon the bottom thereof. The edge of the diaphragm is then bolted fast between the two flanges, which are screwed tightly together. A stem or diaphragm-standard *h* rests upon and is attached to the center of the diaphragm. A pipe *e*, leading from the boiler below the level of the water, is introduced through the bottom of the bowl, and when a sufficient amount of steam-pressure is applied to the boiler it forces enough water into the bowl under the diaphragm to raise the standard *h*, which lifts the lever *k*, which, being connected with another lever *a*, acts upon the gas-stop cock *c*, closing it in proportion to the amount of pressure under the dia-

phragm, and thus regulating the supply of gas by the degree of steam-pressure in the boiler. The boiler is also fitted with a glass water-gage G. This is a small glass tube connected with the top and the bottom of the boiler above and below the water-level, so that the pressure of steam from above operating upon the pressure of water from below may produce a true water-level. The level will at all times indicate the quantity of water in the boiler.

To enable others skilled in the art to make and use our invention, we will proceed to describe the construction and operation thereof.

Take a gas-burner of any of the known forms and fix it in a perpendicular position into a standard, which may be composed of any weighty material. The gas-pipe is introduced into the lower part of the standard horizontally, so that the pipe and burner connect at a right angle with each other. The standard of the burner and gas-pipe affixed is shown at A in the accompanying drawing. The only object of the standard is to keep the burner and gas-pipe steadily in their appropriate positions. A gauze-wire burner, as shown in the accompanying drawing at B, is made to fit closely over and around the aforesaid gas-burner. The gauze-wire burner consists of an inverted cone of tin or any other suitable metal, the base being of fine wire-gauze. At the apex of the cone is an aperture through which the gas-burner is inserted. The gas is lighted upon the upper surface of the wire-gauze burner after passing through the wire-gauze base. The flame on the upper surface of the wire-gauze burner B is applied to a small boiler. (Shown in the accompanying drawing at C.)

The boiler C may be constructed of any suitable metal, as tin, sheet-iron, or copper. The latter is preferable. It is made with a corrugated bottom, as shown also in the accompanying drawing. The boiler is fitted with a glass water-gage, a gas-regulator, and a vapor-hood, all of which are hereinafter more particularly described.

The boiler C is connected by means of a pipe, as shown in the accompanying drawing at E, with a steam-radiating cylinder. The upper edge of the pipe enters the steam-cylinder at the lowest part of the base thereof.

The steam radiating-cylinder, as shown in the accompanying drawing at I, should be made of sheet-iron, but may be of any other metal. It is cylindrical in form, with a bottom concave on the inside. It should be as nearly air-tight as possible. The cylinder is perforated by tubes open at each end which run through its entire length. The top of the cylinder is shown in the accompanying drawing at N, perforated by the upper edges of the several tubes. The cylinder is fitted with a safety-valve, a vacuum-valve, air-cocks, and a reservoir. The safety-valve is shown in the accompanying drawing at L.

It consists of a valve-base, constituting valve-seat, and two posts or standards, with a bar passing over the top through which the valve-rod passes. It acts as a guide. Around the stem or rod of valve is a spiral spring that acts upon the valve, shutting it as soon as the opening pressure is relieved. The base of the safety-valve rests over an aperture in the cylinder, which may be made at any point which is subject to the unobstructed action of the steam and is to be so arranged that the valves can be opened only by pressure from within the cylinder.

The vacuum-valve O is an apparatus similar in character and construction to the safety-valve, but operating in an opposite direction and so that the valve can be opened by outward pressure only.

The air-cocks are shown in the accompanying drawing at P. They are placed on the upper surface of the cylinder and are attached to small tubes on the inside of the cylinder running nearly to the bottom thereof and open at the lower ends.

The reservoir is shown by the annexed drawing at J. It consists of a vessel to contain a supply of water, and is attached to the radiating-cylinder. It has a stop-cock at the bottom, which on being opened admits the water from the reservoir into the radiating-cylinder. The handle of the stop-cock is a small metallic wheel, as shown at K, which being turned opens the stop-cock.

The spiral radiator, as shown in the annexed drawing at M, consists of a sheet-iron spiral plate of such circumference that it fits closely and readily into one of the tubes of the radiating-cylinder and is the same length as the tube. One of these radiators is fitted to each of the tubes except the one through which the chimney of the hood is passed.

The glass water-gage hereinbefore referred to is shown in the accompanying drawing at G. It consists of a small glass tube connected with the bottom and the top of the boiler—that is, above and below the water-level. The tube is graduated to show the level of the water in the boiler and is fixed in a plate of white-metal in some conspicuous place where it may be readily observed.

The gas-regulator is shown by the accompanying drawing at H. It may be made of any suitable material formed into a saucer-shaped vessel having on the upper edge a horizontal flange projecting about half an inch. A corresponding flange is made to fit closely, so as to be screwed down to the first-named flange. A circular piece of rubber cloth is inserted, called the "diaphragm," g, the edge of which is placed between the two flanges, which are then screwed tightly together, and thus the diaphragm is held securely in its place. The diaphragm must be large enough to fall into and fit and rest upon the bottom of the saucer-shaped vessel. A stem or diaphragm-standard h rests upon

and is attached to the center of the diaphragm. A pipe *e*, leading from the boiler below the water-level, is introduced through the bottom of the saucer-shaped vessel or bowl. A sufficient amount of steam-pressure in the boiler will force water up the pipe *e* into the bowl *f*, and thus raise the diaphragm, and with it the diaphragm-standard *h*. The upper end of the standard acts upon and lifts the lever *K'*, which is connected with the lever *a*, attached to the gas-cock, hereinafter described.

The hood for collecting offensive vapor arising from the combustion of coal-gas in this form is shown by the accompanying drawing at *D*. It may be made of sheet-iron or any other suitable metal and riveted or properly seamed by some means other than solder, in order to resist the intense heat to which it will be necessarily submitted. It consists of a covering which may correspond in form to the side and top of the boiler. The lower edge of the hood may be parallel with the bottom of the boiler. The hood may rest on standards attached to the side of the boiler, and may be of such a size as to leave a space of about half an inch between the boiler and the inner surface of the hood. A conducting-pipe, as shown in the accompanying drawing at *F*, is inserted into the top of the hood, and running up through the steam-cylinder may afterward be carried into a flue

or any other convenient channel. The hood and pipe may be made of any suitable material and in any convenient form.

The gas-cock *c* is made like an ordinary stop-cock, except that the hole through the plug is a slit, long and very narrow, so that a slight rise and fall of the diaphragm will open or close, and thus govern the flow of the gas.

What we claim as our invention, and desire to secure by Letters Patent, is—

The combination of the wire-gauze burner *B* and its vapor-hood *D*, applied to the self-acting boiler *C* above described, connected, as above described, with the steam-condensing cylinder *I* and its reservoir *J*, air-cocks, and safety and vacuum valves, and its tubes and radiators *M*, with their ends open in the apartment to be heated, and all of which are above particularly described, and governed by the gas-regulator *H*, as above described, which combination produces a new and improved self-acting and self-regulating apparatus for raising the temperature of any given apartment in which it may be set up by radiation from surfaces heated by condensation of steam generated by the flame of combustible gas.

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Witnesses:

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