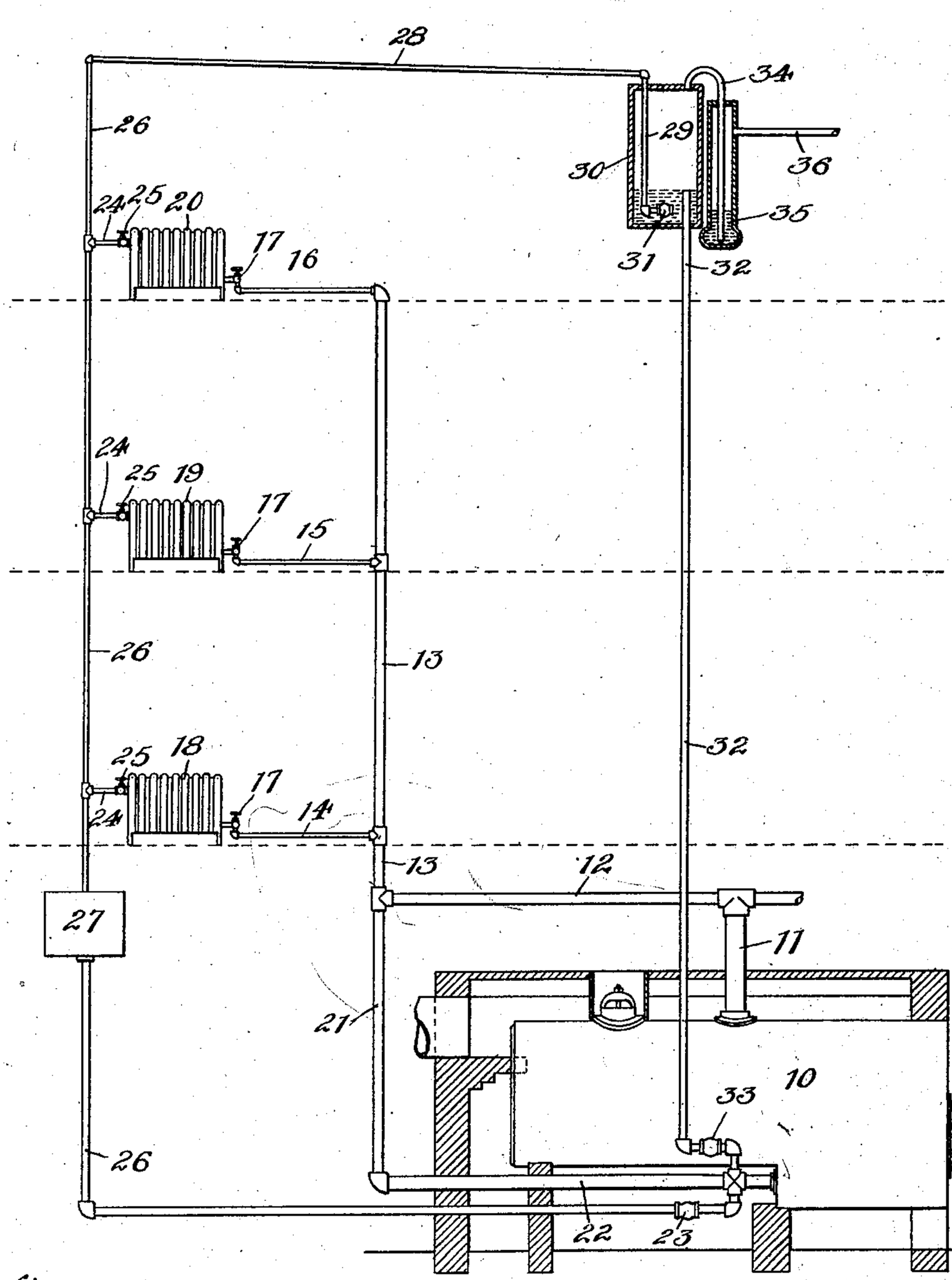
No. 741,548. PATENTED OCT. 13, 1903.

G. H. REYNOLDS.

VACUUM HEATING SYSTEM.

APPLICATION FILED DEC. 15, 1902.

NO MODEL.



Witnesses:
Wm. Geiger
H. W. Munday,

Inventor:
George H. Reynolds.

By Munday, Evarts & Adcock.
Attorneys

No. 741,548. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF CHICAGO, ILLINOIS, ASSIGNOR OF FIFTY-ONE ONE-HUNDREDTHS TO ROBERT A. BOWER AND CHARLES B. COON, OF CHICAGO, ILLINOIS.

VACUUM HEATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 741,548, dated October 13, 1903.

Application filed December 15, 1902. Serial No. 135,204. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Vacuum Heating Systems, of which the following is a specification.

This invention relates to an improvement in apparatus for steam-heating.

In the so-called "vacuum" or "low-pressure" steam-heating systems (wherein the radiators and their connecting-pipes are first emptied of air by the incoming steam and kept thereafter closed against the external atmosphere, so that low steam-pressures and the consequent lower temperature may be maintained in the radiators with due circulation through them from the boiler) considerable difficulty has been experienced on account of the water of condensation which accumulates in the air-pipes and sometimes in the radiators and is by the vacuum often drawn from one radiator to another or into the steam-pipes, thus interfering with the necessary circulation.

It is the object of the present invention to overcome this difficulty by the means described and shown in the following description and the accompanying drawing, forming a part of this specification, said drawing being an elevation, partly in section, of a heating system containing said invention.

In the said drawing, 10 indicates the ordinary steam-boiler; 11, the main steam-eduction pipe leading to the usual steam-distributing pipe 12, connected to riser 13, of which there may be any number, according as the radiators are to be multiplied. For convenience of illustration only a single riser is shown for supplying a series of radiators one above another. From this riser at intervals are led the radiator supply-pipes 14 15 16, each furnished with a shut-off or valve 17 and each leading to its radiator, respectively, 18 19 20. The lower end of the riser 13 is carried downward by an extension 21 and joined to the water-supply pipe 22, which leads into the boiler at a point below the water-line in said boiler.

From each of the radiators 18 19 20 is an escape-pipe 24, provided with a shut-off cock 25 and leading to the air-escape riser 26. The lower end of this escape-riser 26 is connected through a check-valve 23 to the boiler below the water-line. An enlargement of this escape-pipe constituting a reservoir 27 is shown for holding any temporary excess of water of condensation. This reservoir 27 should be located above the water-line of the boiler. The upper end of the escape-riser 26 is connected by a pipe 28 to the descending pipe 29, which terminates in the sealed chamber 30, located above the water-line of the boiler. The exit of pipe 29 is furnished with a check-valve 31, which permits flow of fluid or liquid from the pipe into the chamber 30, but prevents flow in the opposite direction. From the interior of the chamber 30, at a point above the exit-pipe 29, leads an overflow-pipe 32 down to the boiler below the water-line and through a check-valve, as at 33, opening toward the boiler. From the upper portion of said chamber 30 an escape-pipe 34 leads from the interior of the chamber down into a mercury seal 35, the lower end of the pipe 34 being submerged in mercury. The upper end of the mercury seal above the body of mercury is connected to the open air, a pipe 36 serving to carry the escape out of doors.

The operation is as follows: Steam being generated in the boiler flows through pipes 11 12 13 to the supply-pipes 14 15 16 and to such of the radiators 18 19 20 as may have the valve 17 open to receive it. Any water of condensation in these parts will flow down through pipe 21 to the boiler. The air in the radiator is driven out by the incoming steam through valve 25 and pipe 24 to the escape-riser 26, and any condensation of steam in the vertical parts of said riser 26 flows down to reservoir 27, and so through check-valve 23 to the boiler below the water-line. Any air and uncondensed steam that rises through the riser 26 passes by pipe 28 to the pipe 29 and through check-valve 31 to the interior of chamber 30 below the level of the water of condensation in said chamber, which is kept at a constant level by the overflow-pipe 32, leading down through check-valve 33 to the boiler below the water-line. The air or gases

in chamber 30, if the presence therein is above atmosphere, pass by pipe 34 through the mercury seal 35 and ascending through the mercury escape to the outer air by way of pipe 36. Now if from any cause the temperature in the radiators is lowered, either from cutting off the steam-supply therefrom or from lowering of the boiler-pressure, the tension in the radiators and in the pipes 26 28 29 and chamber 30 is lessened and may become a partial vacuum or fall below atmospheric tension, in which case the mercury seal prevents inflow of air to chamber 30 and the check-valve 31 prevents inflow from said chamber to the pipes and the radiator. It will be seen that in no case can the water of condensation collect at any point where it will interfere with the circulation or where because of the partial vacuum in the radiator or pipes it would be forced into such place as will interfere with a free circulation from the boiler of steam outward and of water back to the boiler again.

What I claim is—

1. The combination of a steam-boiler, a steam-eduction stand-pipe leading therefrom, a series of radiators connected at one side to said steam-eduction pipe, and at the other side to an air-escape pipe, said air-escape pipe, connection from the lower end of the air-escape pipe and the steam-eduction stand-pipe to the boiler below the water-line therein, connection from the air-escape pipe through a check-valve to the lower part of a sealed chamber located above the water-line of the boiler, said sealed chamber, connection from said chamber at a point above its lower part by a pipe to the boiler below the water-line, and means for permitting air to escape from said chamber to the atmosphere and preventing its return, substantially as specified.

2. The combination of a steam-boiler, a steam-eduction stand-pipe leading therefrom, a series of radiators connected at one side to said steam-eduction pipe, and at the other side to an air-escape pipe, said air-escape pipe, connection from the lower end of the air-escape pipe and the steam-eduction stand-pipe to the boiler below the water-line therein, connection from the air-escape pipe through a check-valve to the lower part of a sealed chamber located above the water-line of the boiler, said sealed chamber, connection from said chamber at a point above its lower part by a pipe to the boiler below the water-line, and means for permitting air to escape from said chamber to the atmosphere and preventing its return, said means consisting of a mercury seal, substantially as specified.

3. The combination of a steam-boiler, a steam-eduction stand-pipe leading therefrom, a series of radiators connected at one side to said steam-eduction pipe, and at the other side to an air-escape pipe, said air-escape pipe, connection from the lower end of the air-escape pipe and the steam-eduction stand-pipe to the boiler below the water-line therein, connection from the air-escape pipe through a check-valve to the lower part of a sealed chamber located above the water-line of the boiler, said sealed chamber, connection from said chamber at a point above its lower part by a pipe to the boiler below the water-line, means for permitting air to escape from said chamber to the atmosphere and preventing its return, and a reservoir in the lower part of said air-escape pipe, substantially as specified.

GEORGE H. REYNOLDS.

Witnesses:
H. M. MUNDAY,
WM. A. GEIGER.