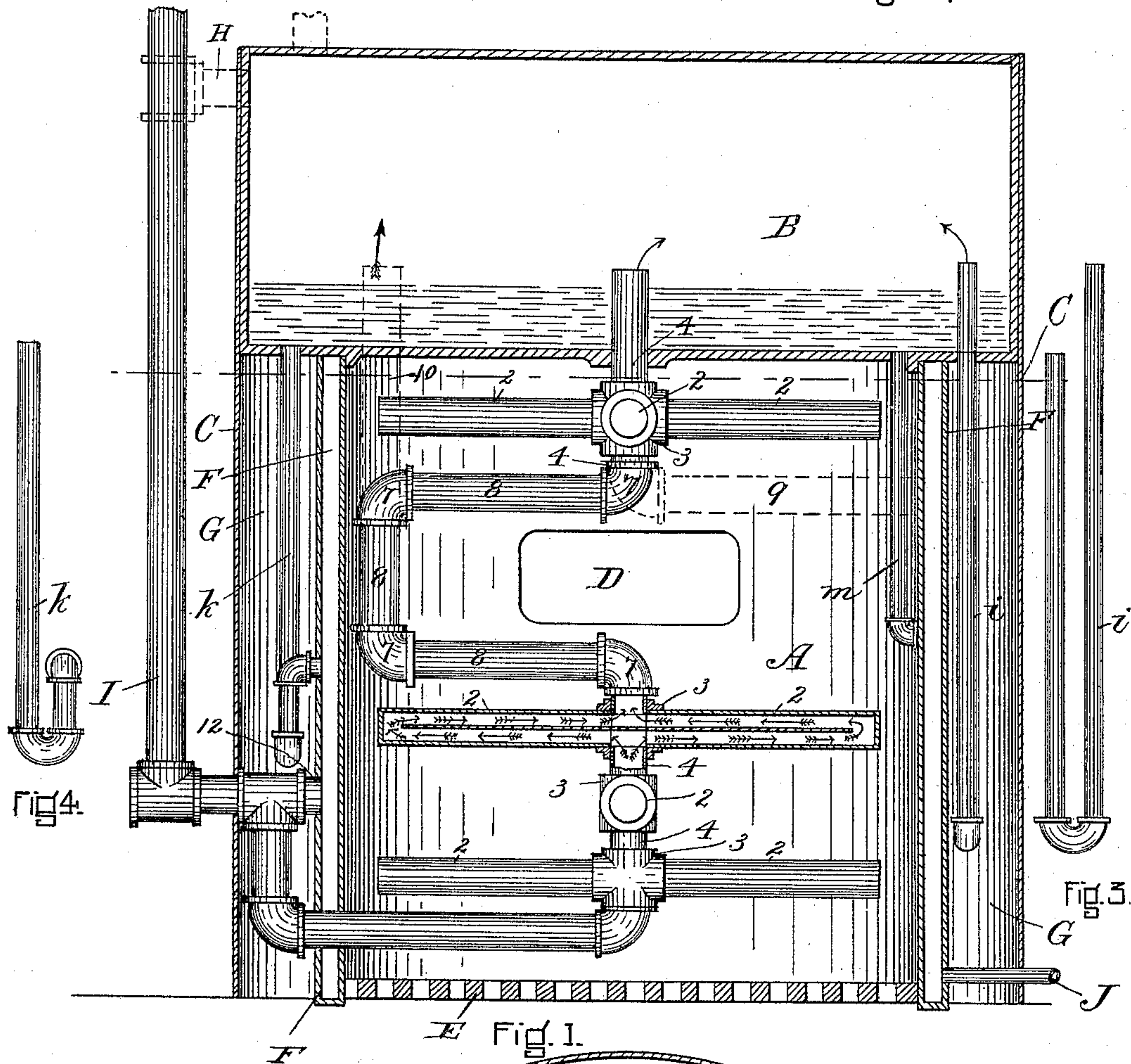


(No Model.)

C. A. SAWIN.
HEATING APPARATUS.

No. 408,263.

Patented Aug. 6, 1889.



WITNESSES.

Chas. Spaulding
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CHARLES A. SAWIN, OF WALTHAM, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO HERSCHEL A. BACON, OF SAME PLACE.

HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 408,263, dated August 6, 1889.

Application filed February 26, 1889. Serial No. 301,194. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. SAWIN, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain
5 new and useful Improvements in Steam or Hot-Water Heating Apparatus, of which the following is a specification.

This invention relates to systems of steam or hot-water heating; and it has for its object
10 to provide improved means for heating the return-water in its passage from the radiators to the heating receptacle or receptacles.

The invention consists in the improvements which I will now proceed to describe and
15 claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a vertical section of the furnace, water-reservoir, and connecting-pipes. Fig. 2 represents
20 a horizontal section along line $x x$ of Fig. 1. Figs. 3 and 4 represent details of the piping shown in Fig. 1.

The same letters of reference indicate the same parts in all the figures.

25 The drawings show the improvements applied to a system of steam heating, and I shall fully describe its operation in connection with such a system, for it is evident that no essential or important changes would be
30 necessary to adapt the same to a system of hot-water heating.

In the drawings, A represents the combustion-chamber or fire-box of a steam-heating apparatus, and B the steam receptacle or
35 dome, (which in a water-heating system would be a water-receptacle.)

D represents the door through which fuel is introduced into the fire-box A upon the fire-grate E. Directly connected with the
40 reservoir B and surrounding the fire-box A is the water-leg F, and between the said water-leg and the outer jacket C is the hollow cylindrical chamber G, through which the products of combustion pass from the fire-
45 box to the chimney.

Connected with the upper part of the reservoir B is the feed-pipe H for conducting steam from the chamber to the radiators, and I represents the return-pipe which returns the
50 water condensed in the radiators from the

steam to the heating apparatus. J is the blow-off pipe.

The features thus far described are common in steam-heating apparatus.

In carrying out my invention I provide a
55 water-heating conduit of improved construction, which I will now proceed to describe. Said conduit is located in the fire-box and connected to the return-pipe at its lower portion and to the dome or reservoir B at its upper
60 portion, the return-water being conducted by the conduit from the return-pipe through the fire-box. The conduit is composed of a system of pipes, each of which is of such
65 small diameter that it cannot contain a sufficient bulk of cold or comparatively cold water to absorb enough heat from the fuel lying
against it to deaden the combustion of such fuel. Said pipes comprise a series of horizontal
70 pipes 2, which are closed at their outer ends and are secured at their inner ends to couplings 3, and short vertical pipes 4, connecting said couplings and the horizontal pipes supported thereby in a vertical series, the vertical
75 pipes being connected to the couplings by screw-threads, or in any other suitable way which will permit the couplings and the horizontal pipes thereon to be turned and
80 extend horizontally across the fire-box in any desired direction, so that the horizontal pipes may be parallel or set at any desired angles
85 relatively to each other. In some cases it is desirable to have each pair of horizontal pipes at right angles with the next pair. In other cases it may be better to arrange the
90 horizontal pipes like the treads of spiral stairs, and in still other cases it may be preferable to make the horizontal pipes parallel or in line with each other vertically. The horizontal
95 pipes are subdivided by horizontal partitions or diaphragms 5, which extend nearly to the outer ends of the pipes and through the horizontal portions of the couplings connecting said pipes, said diaphragms
100 being separated from the closed outer ends of the horizontal pipes by spaces which permit water to flow around the outer ends of the diaphragms. It will be seen, therefore, that the water entering the horizontal pipes 2 through the vertical pipes 4 is subdivided and passes

outwardly in the horizontal pipes under the diaphragms or partitions thereof, and around the outer ends of said partitions, and then inwardly over said partitions to coupling 3
5 and to the next vertical pipe 4, as shown by the arrows in Fig. 1.

The conduit is located so that a considerable portion of it is in the fuel-space of the fire-box, such portion being embedded in the
10 burning fuel. In case the conduit is continued above the fuel-space it should be connected with the portion in said space by elbows 7 and pipes 8, constituting an offset conduit, avoiding the door D, the vertical
15 pipes 4 and horizontal pipes 2 of the conduit at the upper portion of the combustion-chamber being connected to said offset conduit if desired.

It will be observed that the described construction enables the conduit to be adjusted
20 or fitted to fire-boxes of various sizes and shapes and of various kinds or construction and to conduct small streams of water through the fire-box, said streams being so
25 small that the fuel in contact with the conduit will not be deadened, while the conduit is so extended through the fire-box as to subject the water to a large extent of heated surface.

I do not limit myself to the connection of the upper portion of the conduit to the lower portion thereof. If desired, the upper portion of the conduit may be connected by a
30 horizontal pipe 9 with the water-leg F, in which case the offset conduit should be connected with the dome or receptacle B by a vertical pipe 10, as shown in dotted lines in Fig. 1.

The last-described arrangement will be effective in causing a circulation of water in
40 small streams through the upper portion of the fire-box, although said water will pass from the water-leg into the conduit instead of passing from the return-pipe. The lower portion of the conduit is preferably connected
45 with the return-pipe, although I do not limit myself to this connection and may connect the conduit only with the water-leg or only with the dome or receptacle B. If desired, the return-pipe may be connected with the
50 water-leg by a branch 12, as indicated by dotted lines in Fig. 1, so that a part of the return-water will enter the water-leg.

The conduit may be used with a single-pipe system or with a two-pipe system.

To utilize the heat in the hollow cylindrical chamber G, I may provide return-pipes *i*, as
55 shown in Fig. 1, and more particularly in Fig. 3, consisting of a pipe *i'*, extending downwardly from the lower part of the steam-dome into the chamber G and upwardly from
60 said chamber into the upper part of the steam-dome. These return circulating-pipes may be one or as many as the chamber G will accommodate. I may connect the blow-off
65 with one of the pipes *i*.

Instead of pipes, as *i*, connecting with the upper and lower portion of the steam-dome,

I may provide pipes, as *k*, Figs. 1 and 4, each consisting of a shorter vertical leg and a longer vertical leg connected by an elbow at
70 their lower ends. The shorter leg is connected by an elbow to the water-leg F and the longer leg terminates in the steam-dome B. The water is thus circulated through the return-pipes *k*, being exposed to the heat of
75 the chamber G, as in the case of pipes *i*. I may use one or more of these pipes, either alone or in connection with pipes like *i*. I may provide pipes, as *m*, located in the combustion-chamber and terminating above in
80 the steam-dome, and connected below with the water-leg F, so that the water passing through the pipes *m* will be exposed to the heat in the combustion-chamber.

It is desirable to use a series of pipes *k*, or
85 a series of pipes *m*, or both series, and to connect some of the pipes of the series to the water-leg at lower points than the others to secure a circulation of water through said
90 pipes, for if all were connected at the same height the circulation would be sluggish or entirely lacking. I find that water will flow downwardly from the dome B through the longest pipe—*i. e.*, the one having the lowest
95 connection with the water-leg—and upwardly through the other pipes.

When the improvements are applied to a system of hot-water heating, the pipes, conduit, and chamber B would, as is evident, be
100 entirely filled with water in circulation through the same.

The conduit can be adapted to any form of boiler for generating steam, or to any hot-water heater.

My invention is not limited to a series or
105 plurality of horizontal partitioned pipes 2, as in small heaters one horizontal pipe may be used with good results; neither do I limit myself to the connection of the horizontal pipes to the vertical pipes, so that the horizontal pipes project in opposite directions
110 from the vertical pipe. Fig. 5 shows a modification in which a horizontal pipe 2 is connected to a vertical pipe, so that it projects from one side only of the latter. In this case
115 the entire volume of water passing through the vertical pipe will pass through the one horizontal pipe, instead of being divided and flowing in opposite directions through two oppositely-projecting horizontal pipes or sections.
120

It is obvious that this improvement may be used with gas as a fuel, the flame being directed against the pipes of the conduit.

I claim—

1. In a steam-generating or hot-water circulating apparatus, the combination of the
125 fire-box or furnace, a hot-water or steam receptacle adjoining the same, a conduit or receptacle for return-water, a series of substantially horizontal pipes of small diameter internally subdivided into lower and upper flues or passages by horizontal diaphragms, a series
130 of vertical pipe sections or couplings, also of

small diameter, connecting the horizontal pipes, the said horizontal pipes and the connections between them being located in the fire-box and constituting a conduit for the passage of small streams of water through the fire-box, and pipes connecting the lower and upper ends of said conduit, respectively, with the return-water conduit or receptacle and the hot-water or steam receptacle, as set forth.

2. In a steam or hot-water heating apparatus, the combination, with the fire-box or furnace and the steam or water circulating system, including a return-pipe I, and a receptacle B, located over the fire-box, of a water-conduit extending from said return-pipe to the receptacle B through the fire-box, said

conduit consisting of a series of horizontal pipes 2, internally subdivided by horizontal partitions or diaphragms 5, and coupling or connecting pipe-sections adjustably connecting said pipes 2 with each other and with the said return-pipe and receptacle, whereby the pipes 2 may be adjusted or set at various angles, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 18th day of February, A. D. 1889.

CHARLES A. SAWIN.

Witnesses:

C. F. BROWN,
H. A. BACON.