J. H. MILLS.

System of Steam and Water Piping for Buildings.

No. 145,962. Patented Dec. 30, 1873.

Fig. 2.

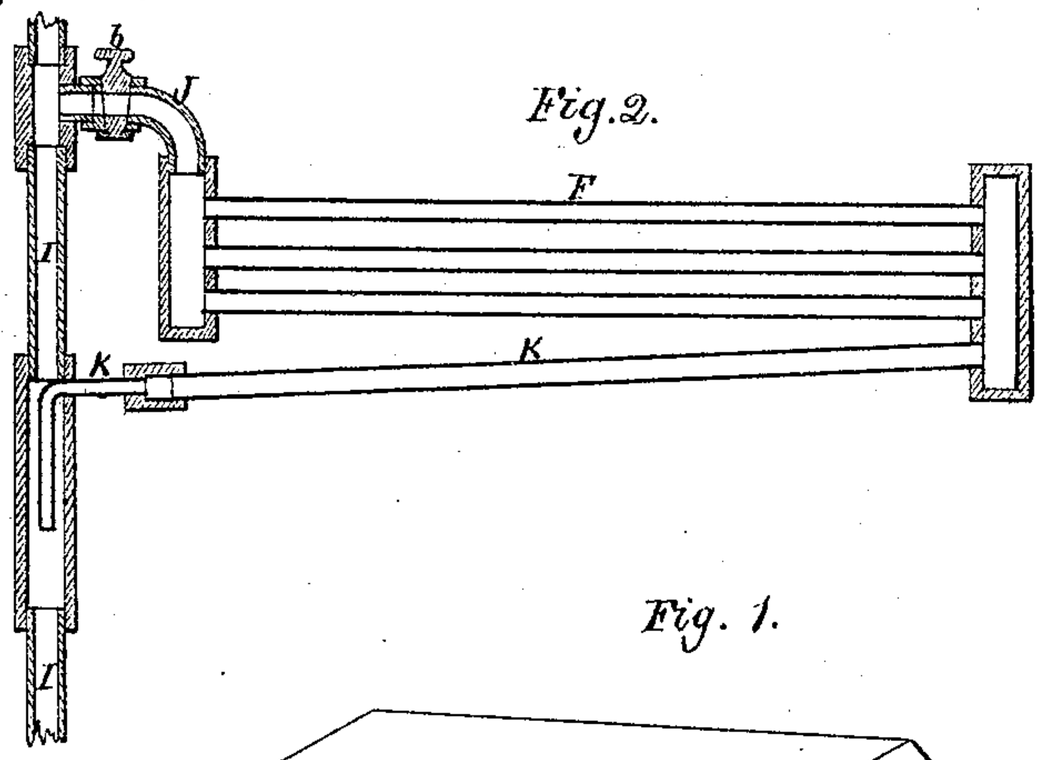
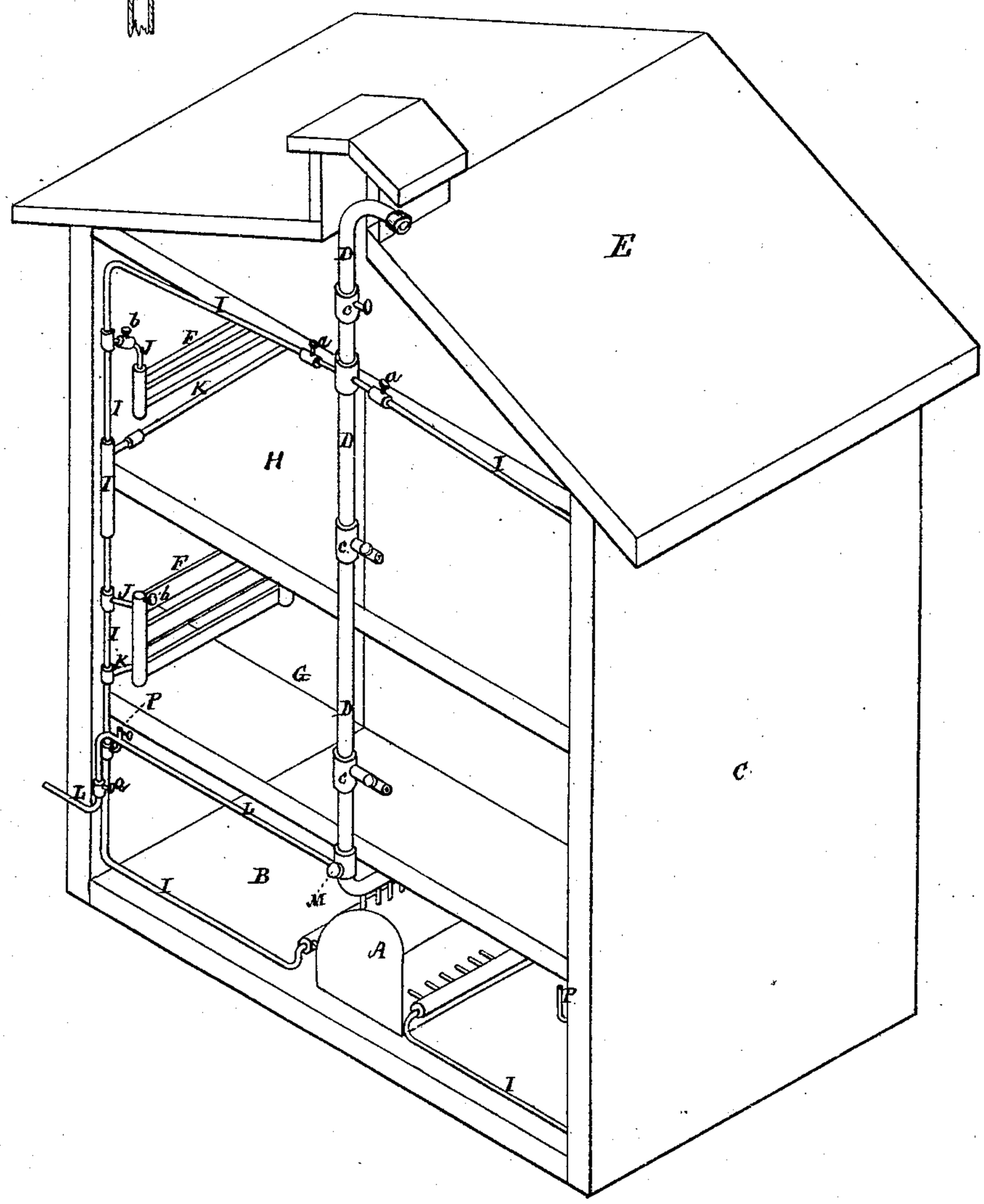


Fig. 1.



Witnesses,
A. Lorell
H. E. Boardman.

John H. Mills.
F. Curtis. Att'y.

UNITED STATES PATENT OFFICE.

JOHN H. MILLS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN SYSTEM OF STEAM AND WATER PIPING FOR BUILDINGS.

Specification forming part of Letters Patent No. **145,962**, dated December 30, 1873; application filed April 19, 1873.

To all whom it may concern:

Be it known that I, JOHN H. MILLS, of Boston, Suffolk county, Massachusetts, have invented an Improved System of Steam and Water Piping for Public Buildings and Private Residences, of which the following is a specification:

Of the different methods employed in piping, they all seem resolved, in present practice, to running the main supply-pipes from the boiler or generator around near the wall, suspended to the lower floor-timbers, from whence the risers or supplies are taken upward to feed the radiators or coils, a separate line of pipe being also returned to the generator, into which such radiators discharge their condense-water, the air being first allowed to escape into the room before such radiators will receive the steam. There are many difficulties attending heating by steam under these conditions, since the whole operation is attempted against natural laws. The three elements brought into juxtaposition — water, steam, and air—will not work harmoniously together until their relative specific gravities are duly considered and provided for. Under my system no conflict is possible, since the steam, being allowed to ascend through one or more vertical mains to the top of the structure, and from thence distributed downward, is always on the top of more dense and heavier elements, which are then not impeded in their passage from the radiators or in their return to the generator, the air being allowed to escape at a proper valve placed above the water-line, as shown. It will also be plain to those at all conversant with the operation of steam-heating, that once having conducted the steam to the highest point, and arranged for the escape of the air at the lowest, but above the water-line, the question of circulation through the pipes and radiators would be no longer, as now, a doubtful one.

Another advantage incident to my arrangement is the use on the coils and radiators of but one valve instead of two, both of which must, under the present system, be opened or closed together or the radiators will fill with water, causing much trouble and annoyance. There being but one valve (the supply) under my system, the radiator can never fill, as it is always open at the bottom for the full discharge of condense-water. When closed, no steam, under my system, will enter upward through the small inverted inside drip-pipe, because the radiator, under the operation of condensation, soon fills with such air as remains or works into the supply-pipes, and such radiators remain neutral, while the circulation goes on through the supply and returns the same as ever. Under the present system even the pipes themselves, in the upper and remote stories, will not fill or circulate until the radiators attached to such are vented of their contained air.

Elaborate experiments have demonstrated the fact that steam is a very powerful agent to extinguish fires, and that a given amount of water converted into steam possesses many hundred times the power for this purpose that it has in its original condition; while it is safe to say that much more property is ordinarily injured by the effects of water than by the fire itself. Therefore, as steam does not injure the building or its contents, I prefer to use this subtile and efficient agent by arranging outlets on the main supply, with proper valves tapped for hose-connections on each floor, so that, should the fire occur in any out-of-the-way places, the application of steam would be easy, certain, and effective. In case of fire outside or around the building, water would be preferable, and, for its instant application, I provide, as before stated, by making communications in the basement with the street-main to my vertical stand-pipe, first shutting off the steam from the generator, and closing the distributing-valves at the top of the building, when all is ready for a full and free supply, either inside or at the roof, as may be desired.

The drawings accompanying this specification represent, in Figure 1, a sectional view of a building, of several stories or floors, embodying my system of steam and water service, while Fig. 2 is a section, on an enlarged scale, of a portion of the down pipe and the drip-pipe of the radiator, to be hereinafter explained.

In the drawings, A denotes a steam-generator, of any suitable character, placed in the cellar or basement B of the structure C, while departing from such generator is a main sup-

ply-pipe or conduit, D, which rises vertically through the building to the extreme top, and, in fact, extends through the roof E, in order that, when desirable, water may be discharged upon the latter, either directly or by means of hose attached to the conduit. A steam-radiator, F, is placed in each of the two stories G H of the structure, while a pipe, I, extends from the upper part of the main supply-pipe D horizontally or slightly descending to the side or other wall, thence directly downward to the extreme lower part of the basement or cellar B, in which the generator is placed, and discharges into such generator, a branch pipe, J, extending from the drop-pipe I to and communicating with each radiator at the upper part thereof, while the outlet or escape pipe K of such radiator, leading from the bottom thereof for the carrying off of condense-water, connects with and discharges into said drop-pipe I, as shown in the drawings. This discharge or condense-water pipe K of the radiator, or "drip"-pipe, as I term it, is of about one-half the area of the supply or inlet pipe, for the reason that, as the relative volume of steam to water is as 1700 to 1, the area of the supply and drip pipes should differ in a ratio of 2 to 1, in order that the radiators may not be equally balanced. In this manner, one valve controls and regulates the amount of steam admitted to the radiator. L, in the accompanying drawings, represents a conduit, which enters the structure A through the basement wall or foundation, or the sidewalks or other convenient point, and connects and communicates with the main supply-pipe D at a point immediately above the generator, a cock or valve, Q, being placed in such pipe D between the steam-supply pipe D and the water-source, while a valve, M, is placed in the supply-pipe D between the water-conduit L and the generator A. A valve, *a*, is also to be placed in each down pipe I, departing from the main supply-pipe D near to its junction with the latter, and a valve, *b*, is also to be attached to each radiator near the inlet-pipe or the pipe itself, as shown in Fig. 1, to govern the amount of steam admitted to such radiator. As the steam is admitted to the top of the radiator, and passes downward, no other valve is necessary, as both the steam, air, and water of condensation travel in the same direction, the two latter descending directly to the cellar or basement B of the structure in which the generator is situated. At a point on the down or return piping I, below the first radiator and above the water-line of the boiler—as, for instance, at P—within the basement B, I provide a valve, designed to permit escape of air. This valve, when the apparatus is put in operation, is left open, so that the air expelled from the piping and the several radiators by the advancing steam shall find vent at the point P. The air will have been discharged when the steam begins to blow through the discharge-pipe P, at which time the valve should be closed.

I am thus enabled to provide one common vent for all the air that may happen to be in piping and radiators; and, furthermore, to locate this vent at a point where the foul air and noxious gases can be got rid of without inconvenience to the occupants of the building. Heretofore it has been usual to provide each radiator with a vent, and the air has thus been discharged directly into the room or rooms to be heated. The advantage of my venting arrangement, which is rendered practicable by my system of steam-piping, is therefore apparent.

A common globe-valve, operated by hand, may be used, or an automatic valve may be employed, the valve remaining open when the cool air passes out, but expanding by heat so as to close when brought in contact with the steam that follows the air.

C represents a suitable coupling, attached to the main supply-pipe D in each story or division of the structure, to which hose may be attached in case of fire, or through which water or steam may be discharged directly into the apartment or division without the intervention of hose.

The operation of the above-described method is as follows: If heating of the structure or any of its divisions or departments is to be done, each valve *a* is to be opened and each valve *c* closed, and the valve M opened, which allows steam under pressure from the generator or boiler A to pass directly upward through the main supply-pipe D, until it reaches the pipe I, down which it descends until it reaches the branch pipe J of each radiator, when it will enter each radiator whose valve is open, and after parting with its heat is condensed and reconverted into water, such condense-water flowing through the outlet or drip pipe K into the pipe I, and directly down the latter, without hinderance or check, to the basement B, where it discharges into the generator A. The air which enters the radiator through the various joints of the pipes also passes from the radiator with the condense-water down the pipe I, and is discharged at the valve P, thus, without care or labor on the part of the janitor or attendant, excluding such air from the apartments, which heretofore has, of necessity, been allowed to enter such apartments, with disagreeable, and in many cases injurious, results, especially in school-rooms.

In the event of fire in any portion of the structure, (in which event the steam will not be needed for heating purposes,) the valves *a a* and M are to be closed, and the valves *c c* and Q opened, which admits water, under pressure, to flow through the conduit L into the main supply-pipe D, from whence it may be taken through any of the coupling attachments *c* and discharged upon the fire, either directly into the apartment or by means of hose attached to such coupling. If fire takes place in the interior of the structure, I prefer to employ steam to extinguish it, for the reason that

steam permeates remote places where water cannot be delivered, and does not injure merchandise. Therefore, to extinguish fires in the interior of the structure, I close the valves Q *a a* and open the valves M *c c*, which envelops each apartment and its contents in a dense vapor, which is a certain agent in extinguishing fire, and yet results in no injury to merchandise. In this manner I am enabled to discharge steam into any one or all of the apartments by means of the valves *c*.

I claim—

1. The herein-described mode of steam-heating, by conducting the steam from the boiler directly and without distribution to or above the highest point of the building, and thence supplying it downward to the heating devices in the different stories of the building to be heated, substantially in the manner shown and set forth.

2. A system of steam-heating, comprising the combination of supply-piping conveying the whole of the steam without distribution to the highest point of the building to be heated with branch piping conveying downward from such highest point the steam-supply to the different radiators or coils, said branch piping serving at one and at the same time to supply steam to and conduct the water of condensation from the radiators or coils, substantially as herein shown and described.

3. The combination, with the main supply-piping and return branch piping of a steam-heating system, organized and operating as herein described, of a water-service pipe and system of valves, whereby said main piping can, when occasion demands, be isolated completely from the boiler and branch piping and thrown into communication with the water-service pipe, substantially as and for the purposes shown and set forth.

4. The combination, with the main supply-piping and return branch piping, and radiators connected therewith, operating together as described, of an air vent or valve, located on the return branch piping at a point between the first or lowest radiator and the water-line of the boiler, and constituting the vent for the air driven forward through the piping, and from the several radiators, by the advancing steam, as shown and set forth.

JOHN H. MILLS.

Witnesses:
H. M. PERRY,
W. E. BOARDMAN.