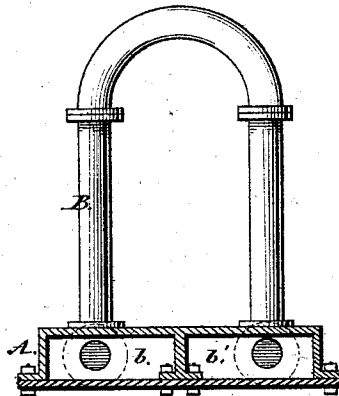


**R. BERRYMAN.**  
**Steam-Radiators.**

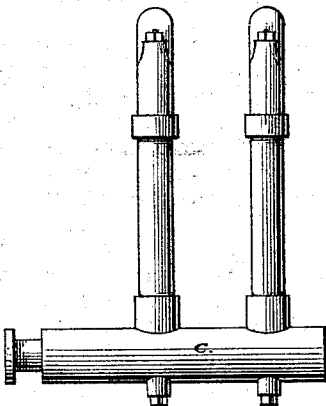
No. 135,758.

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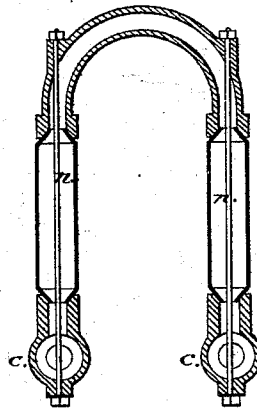
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

ROBERT BERRYMAN, OF HARTFORD, CONNECTICUT.

## IMPROVEMENT IN STEAM-RADIATORS.

Specification forming part of Letters Patent No. **135,758**, dated February 11, 1873.

*To all whom it may concern:*

Be it known that I, R. BERRYMAN, of Hartford, county of Hartford, State of Connecticut, have invented certain Improvements in Radiators, of which the following is a specification:

My improved radiator consists of bent pipes formed partly of cast and partly of malleable metal, and communicating with independent tubes or chambers.

There may be one or more series of pipes, B, each of which consists of the bent or curved cast-metal section and of two straight sections of malleable metal, and each pipe communicates with two chambers, *b b'*, of a case, A, one chamber communicating with the exhaust-pipe of a steam-engine, with a flue, or pump, or blowing-engine, and the other with a pipe which conducts away the gas or fluid which has passed through the radiator. Flanges may be cast on the curved sections and brazed or spun on the others, so that when the tubes are wholly of malleable metal—such as copper or brass—they are bent to the form shown in Fig. 1, and the opposite ends are expanded in holes in a plate, *b*, which forms the top of a casing, A, containing two chambers, *c d*, each tube communicating with both chambers. Although but a single series of tubes may be employed, two, three, or more series may be arranged, one outside the other, as shown, so as to obtain an extended heating-surface within a very limited space. From the case A extend flanged necks *d' d'*, to which are connected pipes, one communicating with the exhaust of a steam-engine, with a flue, or with a pump or blowing-engine, and the other conducting away the gas or fluid after it has passed through the radiator.

By the use of continuous bent tubes the escape of water or steam, which sometimes occurs where there are numerous joints, is wholly prevented, rendering the heater peculiarly serviceable where a dry heat, free from moisture, is essential. When, however, this is not required, the expense of bent metal tubes may be avoided by forming the tubes in sections, the curved portion being cast of the desired

form, and the straight sections being of malleable metal.

Flanges may be cast on the curved section and brazed on the others, so that the whole may be bolted together and to the casing A, as shown in Fig. 1; or two pipes, *c c*, may be substituted for the casing, and the edges of necks on the pipes and the ends of the curved sections may be beveled to receive the beveled ends of the straight sections, the whole being secured by screw-bolts *n n*, as shown in Figs. 2 and 3.

Greater rigidity and a more extended heating-surface may be imparted to the cast-metal sections by making them of the sectional form shown in Fig. 5, the same end being attained by corrugating the thin malleable-metal sections, as shown in Fig. 4.

Tubes made thus in sections, while they will transmit heat as freely throughout almost the entire length as those made wholly of malleable metal, are much less expensive to manufacture, and are much more readily secured to or detached from the casing A or tubes *c c*; but, whatever may be the construction or mode of securing the tubes, it will be seen that the thin metal of which they are mostly made affords a medium for the rapid transmission of heat, while it effectually withstands the internal pressure to which radiators heated by steam or hot water are subject.

### *Claim.*

The combination, with independent chambers, of one or more series of tubes, each communicating with both chambers, and each consisting of a section of cast metal and sections of thin malleable metal, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT BERRYMAN.

Witnesses:

CHARLES E. FOSTER,  
EDM. F. BROWN.