

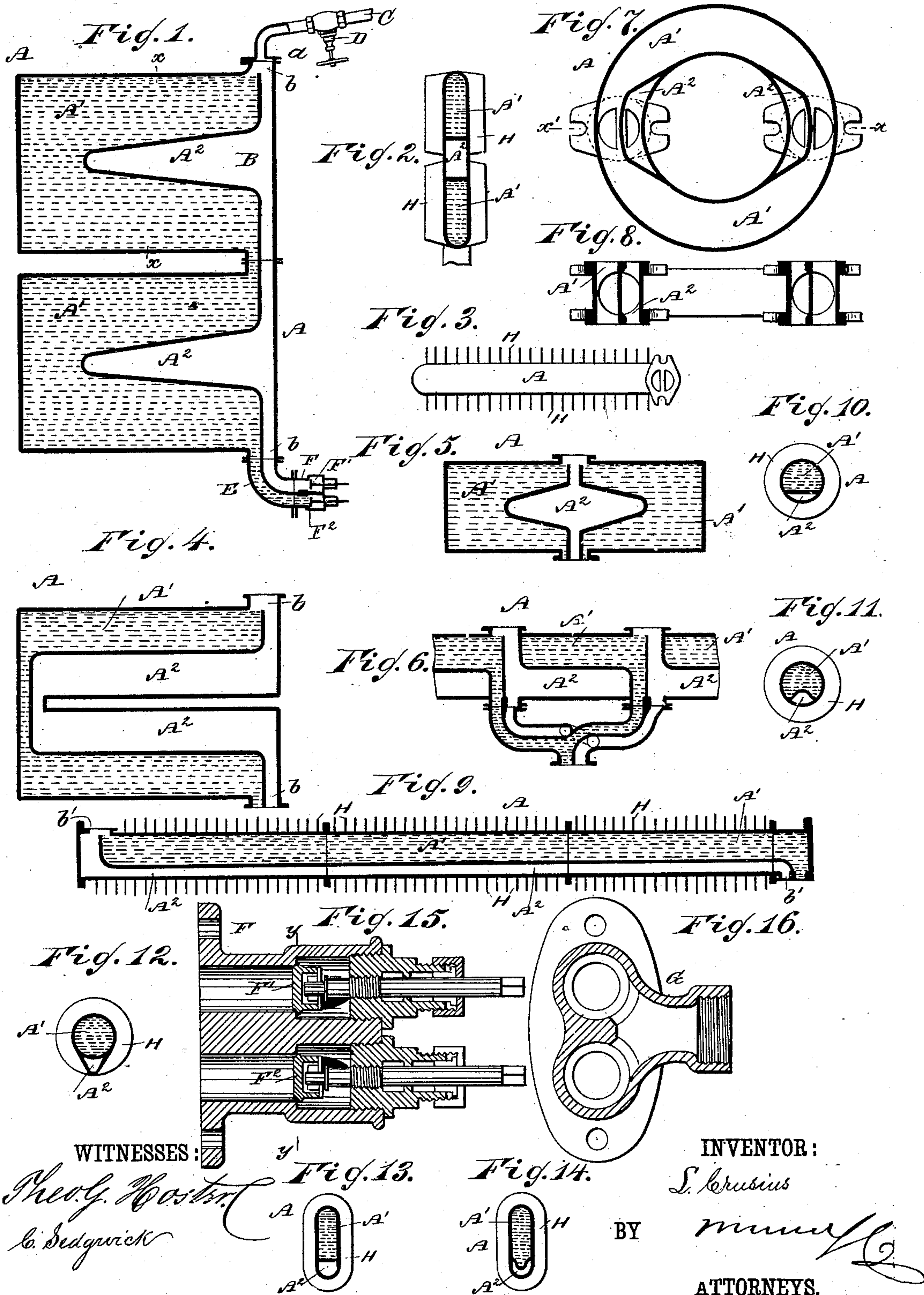
(No Model.)

L. CRUSIUS.

# STEAM AND WATER HEAT RADIATING APPARATUS.

No. 279,721.

Patented June 19, 1883.





# UNITED STATES PATENT OFFICE.

LUDWIG CRUSIUS, OF KAISERSLAUTERN, BAVARIA, GERMANY.

## STEAM AND WATER HEAT RADIATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 279,721, dated June 19, 1883.

Application filed December 29, 1882. (No model.)

*To all, whom it may concern:*

Be it known that I, LUDWIG CRUSIUS, of Kaiserslautern, Bavaria, Germany, have invented a new and Improved Steam and Water Heat Radiating Apparatus, of which the following is a full, clear, and exact description.

Heretofore hot-water or steam heating have been used quite extensively. The defect of the former is mainly that it requires a considerable time to raise the temperature of the water sufficiently to enable it to heat the room, which heat is, however, retained for a long time in the water, and thus prevents the rapid falling of the temperature in the room. On the other hand, by means of steam a room can be heated very rapidly; but as soon as the steam is turned off the temperature falls and the room is cooled very rapidly, and thus requires the heat to be turned on after a short time, thus making it almost impossible to give the room a uniform temperature.

The object of my invention is to provide a new and improved steam and water heat radiating apparatus, which combines the advantages of both steam and water heating, and which at the same time is devoid of the above-described defects.

The invention consists in a radiator or tube constructed with a partition which divides the radiator into two compartments, of which one is for steam and the other for water, which compartments have a common inlet-cock and separate outlet-cocks, whereby if all the cocks are open the apparatus will operate as an ordinary steam-radiator; but if the cock of the water-compartment is closed the water of condensation accumulates in the said compartment, and is heated by the steam in the adjoining compartment. The steam in one compartment heats the room very rapidly, and the heated water in the other compartment retains the heat and prevents the rapid falling off of the temperature.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal sectional elevation of two sections, placed one above the other, of my improved steam and water heat radiating apparatus. Fig. 2 is a cross-sectional elevation of the same on the line  $x x$ , Fig. 1. Fig.

3 is a plan view of one of the sections. Fig. 4 is a longitudinal sectional elevation of a modification of the same. Figs. 5 and 6 are longitudinal elevations of other modifications. Fig. 7 is a modification showing a horizontal sectional view of a section of a ring-shaped or cylindrical radiator. Fig. 8 is a cross-sectional elevation of the same on the line  $x' x'$ , Fig. 7. Fig. 9 is a modification showing a longitudinal sectional elevation of a pipe-shaped radiator of my improved construction. Fig. 10 is a cross-sectional elevation of the same. Figs. 11, 12, 13, and 14 are cross-sectional elevations of modifications of the same. Fig. 15 is a longitudinal sectional elevation of the double cock used with my improved radiator. Fig. 16 is a cross-sectional elevation of the same on the line  $y y$ , Fig. 15.

A cast-iron radiator-box, A, is provided with a partition, B, which divides the box A into two compartments, A' and A<sup>2</sup>, and the said partition B is preferably so constructed that it has a very large radiating or heating surface—that is to say, it is bulged out, corrugated, curved, or provided with ribs, as may be desired. A greater or less number of the above-described boxes or radiators A are combined, according to the size of the room that is to be heated or the desired size of the heater. To simplify matters I will describe the apparatus shown in Fig. 1, which consists of two sections A. Each section A is provided at its top and bottom with a neck,  $b$ , as shown, and the edges of the partitions B extend to the edges of the necks, except in the case of the uppermost section A, in which the upper edge of the partition B terminates a short distance below the neck  $b$ , as is shown in Figs. 1 and 4. The necks  $b$  of the other sections are bolted and screwed together, so that the walls of the sections A and the partitions B will form water and steam proof joints. To the upper neck  $b$  of the uppermost section A a steam-inlet pipe, C, is secured, which is provided with a valve, D, and to the bottom neck  $b$  of the lowest section a double elbow, E, is attached—that is, an elbow with two passages—and to the lower end of the elbow E a double cock, F, is attached, which is provided with two valves, F' and F<sup>2</sup>, one for each passage or channel of the elbow E, the two passages in the cock F terminating in a neck, G, to which the pipe



leading to the condensation-water receiver is secured. If desired, the double-cock F may be screwed directly to the neck *b* of the bottom section A; but the construction shown and described above is preferred; or two separate cocks may be used instead of a double cock. If the valves D, F', and F<sup>2</sup>, are opened, the radiator will operate the same as any ordinary steam-heater radiator—that is, the steam enters through the pipe C, passes through the compartments A' A<sup>2</sup>, through the double outlet-cock F, and to the condensation-water receiver. If the valve F<sup>2</sup> of the compartments A' is closed, the steam in the several connected compartments A' will condense and will accumulate as water in the bottom of the same, and will gradually fill the said compartments, and will then flow over the upper edge of the uppermost partition B into the compartments A<sup>2</sup> and down through the same and through the double cock F to the condensation-water receiver. The water in the said compartments A' being in contact with the surface of the partition B, which partition is heated by the live steam in the compartments A<sup>2</sup>, the said water will be heated by the steam that is turned on to enter the compartments A<sup>2</sup>. The steam in the compartments A<sup>2</sup> will thus heat a room very rapidly, and if the steam is turned off, the radiator will not cool immediately, as the hot water in the compartment A<sup>2</sup> retains the heat for a long time, which heat is radiated by the walls of the sections A; and thus by means of my improved radiator I combine the advantages of steam heating with those of hot-water heating, and can easily regulate the temperature of a room as may be desired.

I have described only the devices shown in Figs. 1, 2, and 3; but the device may be modified in different ways without changing the operation, the main features of the invention being retained in all, which are as follows: a partition dividing the radiator into a steam and water compartment, which compartments communicate with each other at the single inlet-cock opening into both compartments, and each compartment having a separate outlet-cock, the inlet and outlet cocks not being shown in the drawings of the modifications. For instance, in the modification shown in Fig. 4 the two inner compartments, A<sup>2</sup>, for receiving the steam, are surrounded by the water, the sections being formed somewhat differently from those shown in Fig. 1. In the modification shown in Fig. 5 a steam-compartment, A<sup>2</sup>, is formed between two water-compartments, A'. In the modification shown in Fig. 6 a series of sections are united, each containing a water-compartment and a steam-compartment, the several water-compartments and the several

steam-compartments being connected by means of cross-pipes, whereby a very large radiating-surface is obtained. In the modifications shown in Figs. 7 and 8 a series of rings constructed like those shown are placed above each other and united, and in this case an annular water-compartment, A', containing two steam-compartments, A<sup>2</sup>, at opposite sides of the ring, is formed. In the modification shown in Figs. 9 to 14, inclusive, the radiator is formed of a series of pipes each provided with a partition, dividing the pipes into a water-compartment, A', and a steam-compartment, A<sup>2</sup>. The pipes may be cylindrical in cross-section, oblong, square, or of any other suitable shape, and the transverse partition may be straight or curved, as may be required. The end sections are provided with necks *b' b'*, as shown; but the middle sections are simply provided with a transverse partition, so that any number of intermediate sections may be united between the end sections, provided with the necks *b'*, to form a heating-tube of the desired length. If desired, the tube radiator-box may be provided with ribs H, as shown in Figs. 2, 3, and 9 to 14, for the purpose of increasing the radiating-surface. It will be seen that in all cases I provide a radiator box, tube, or other vessel or receptacle which is provided with a partition which divides it into two compartments—one for steam and one for water—which compartments are so connected at the steam-inlet pipe that the steam can pass into both compartments and the condensation-water flow from one compartment into the other after one compartment has been filled, and that each compartment has a separate outlet-cock.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A radiator provided with a partition dividing it into a steam and a water compartment, which compartments communicate with each other, as set forth, and having one inlet-cock opening into both compartments, and each compartment having a separate outlet-cock, substantially as described, and for the purpose set forth.

2. The combination, with the radiator A, provided with the partition B, dividing the radiator into the hot-water compartment A' and the steam-compartment A<sup>2</sup>, of the inlet-cock D, leading into both compartments, the elbow E, and the double cock F, substantially as described, and for the purpose set forth.

LUDWIG CRUSIUS.

Witnesses:

GEORG PFAFF,  
JULIUS BENDER.