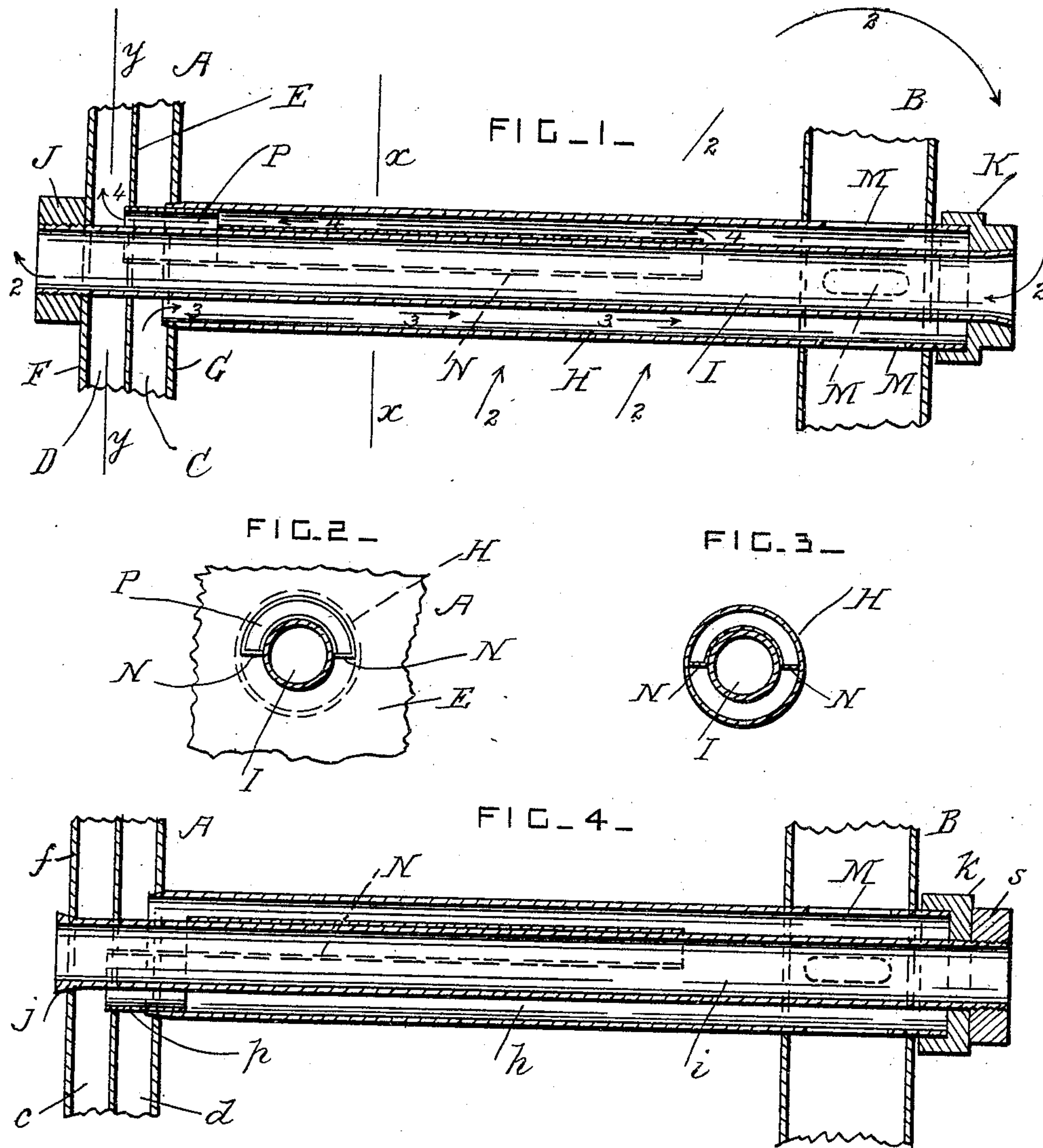


H. O. KEFERSTEIN.  
BOILER.  
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920,479.

Patented May 4, 1909.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

HANS O. KEFERSTEIN, OF NEW ORLEANS, LOUISIANA.

## BOILER.

No. 920,470.

Specification of Letters Patent.

Patented May 4, 1909.

Original application filed May 6, 1907, Serial No. 372,011. Divided and this application filed January 11, 1909.  
Serial No. 471,727.

*To all whom it may concern:*

Be it known that I, HANS O. KEFERSTEIN, a subject of the Emperor of Germany, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This application is a division of the application filed on May 6, 1907, Serial Number 372,011.

This invention relates to boilers provided with water and fire tubes combined; and it consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a longitudinal section through a water and fire tube and portions of the headers. Figs. 2 and 3 are cross-sections taken on the lines  $y-y$  and  $x-x$  respectively. Fig. 4 is a longitudinal section similar to Fig. 1, but shows modifications.

A is a header at one end of a boiler furnace, and B is a header at its other end. The fire-grate is arranged between these headers and below the water and fire tubes. The header A is divided into two chambers C and D by a vertical partition-plate E, arranged between its side plates F and G. The chamber C is for water, and the chamber D is for steam. The chamber in the header B is a single chamber and is used for both water and steam.

H is the water and steam tube which is supported mainly by the side plate G of the header A and by the side plates of the header B. This tube is secured in openings in the said side plates by expanding it, or in any other approved manner which will form tight joints.

I is the fire-tube which is supported mainly by the side plate F of the header A and by the water-tube H. One end portion of the fire-tube I is provided with a nut J, or any other approved collar or projection which bears against the side plate F and prevents the tube from sliding endwise. A cap K is secured on the other ends of the tubes H and I from the nut J, so as to close one end of the water-tube. This cap is connected to the

said tubes in any approved manner which will form tight joints.

The water-tube H has one or more lateral holes M which place it in constant and free communication with the chamber of the header B. A partition N is arranged in the middle portion of the tube H and in its end portion next to the header A to force the water to circulate along the fire-tube. This partition extends across the annular space between the tubes H and I, and its middle part is preferably curved so as to rest on the tube I, but the partition may be supported in any other approved way.

A connecting-piece P is formed on or secured to one end portion of the water-tube H, and it connects the steam space of the said tube with the steam chamber D of the header A. The connecting-piece is preferably arranged on the upper side of the tube H, and it and the fire-tube I are secured in a hole in the partition plate E, but it is not necessary that an absolutely water-tight joint be formed at this point.

The water space of the tube H is constantly in communication with the water chamber C. This chamber is kept filled with water to a point above the level of the highest water-tube, and the tubes are arranged in rows one above the other. The fire on the grate heats the lower sides of the tubes H, and the products of combustion pass in the direction of the arrows 2 upwardly between the tubes H, thence over the header B, and through the fire-tubes I to the smoke-stack. The water in the chamber C passes into the lower parts of the tubes H in the direction of the arrows 3 and is converted into steam in the said tubes. The steam thus generated passes in the direction of the arrows 4 through the connecting-piece P into the steam chamber D. Water and steam can also pass between the chamber of the header B and the tubes H. The steam and water chambers of the headers are connected to suitable steam delivery pipes and feed-water pipes, in any approved way.

In the modification shown in Fig. 4, the positions of the water and steam chambers  $c$  and  $d$  are transposed; and the connecting-piece  $p$  is arranged at the lower side of the water-tube  $h$ . A conical collar  $j$  is provided on the fire-tube  $i$  instead of a nut, for engaging with the side plate  $f$ . A nut  $s$  is screwed



on one end portion of the fire-tube *i* for holding the cap *k* in place, and for drawing the collar *j* against the plate *f*.

What I claim is:

- 5 1. The combination, with a header provided with a steam chamber and a water chamber arranged side by side, and a second header having a single chamber for both steam and water; of a fire-tube having its end  
10 portions projecting through the said headers, a water and steam tube encircling the said fire-tube and provided with an opening connecting it with the said single chamber, said water and steam tube having its upper part  
15 connected with the said steam chamber and its lower part connected with the said water chamber, and means for closing the end of the said water and steam tube which projects through the said second header.
- 20 2. The combination, with a header provided with a steam chamber and a water chamber arranged side by side, and a second

header having a single chamber for both steam and water; of a fire-tube having its end portions projecting through the said headers, 25 a water and steam tube encircling the said fire-tube and provided with an opening connecting it with the said single chamber, said water and steam tube having its upper part connected with the said steam chamber and 30 its lower part connected with the said water chamber, a longitudinal partition arranged in the annular space between the said tubes at their middle portion and at their end portions nearest the first said header, and 35 means for closing the end of the said water and steam tube which projects through the said second header.

In testimony whereof I have affixed my signature in the presence of two witnesses. 40

HANS O. KEFERSTEIN.

Witnesses:

R. McCLECKEY,  
L. RIGAUD.