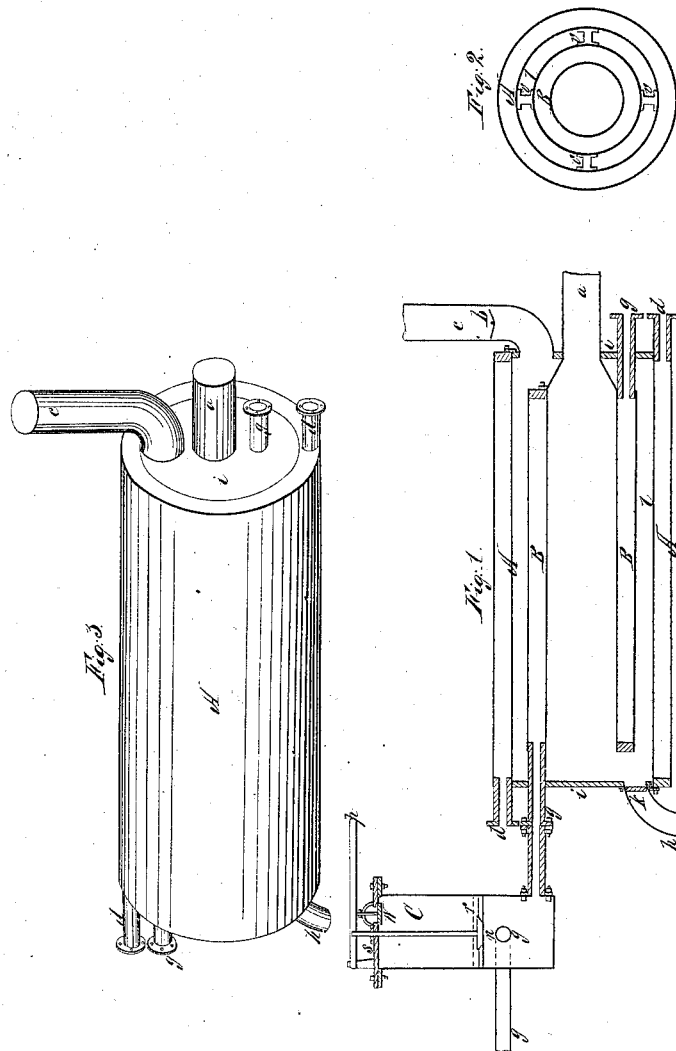


Z. C. Robbins,
Steam-Boiler Condenser.

N^o 3,796.

Patented Oct. 16, 1844.



UNITED STATES PATENT OFFICE.

ZENAS C. ROBBINS, OF ST. LOUIS, MISSOURI.

HEATER OF STEAM-BOILERS FOR HEATING THE AIR FOR FURNACES AND THE SUPPLY-WATER FOR BOILERS BY ESCAPE-STEAM.

Specification of Letters Patent No. 3,796, dated October 16, 1844.

To all whom it may concern:

Be it known that I, ZENAS C. ROBBINS, of St. Louis and State of Missouri, have invented an improved combined air and water heater to be connected to the water-supply pipe of steam-boilers and a pipe for conveying air to the furnace of the same for the purpose of heating the said air and water by the waste steam from the engine which said boilers supply with steam.

My improved combined heater is composed of two annular formed cylinders designated by the letters A and B in the accompanying drawings—the one is placed within and concentric with the other, so as to leave an annular space between them. Each cylinder is formed of two casings with a space between them, through which space in one of the cylinders, the water for the supply of steam boilers is to pass, and the air for supplying the furnaces of the same, through the space between the casings of the other. The water and air are heated in their passage through my improved combined heater by the waste steam escaping from the steam engine through the pipe *a* into the space within the inner casing of the cylinder B, passing through the same, and returning through the annular space *l* between the cylinders A and B, and escaping into the atmosphere through the pipe *c* when my improved combined heater is used in connection with a high pressure or non-condensing engine, and into the condenser, when it is in connection with a condensing engine.

In the accompanying drawings Figure 1 is a vertical section through the center of my improved combined heater from front to rear. Fig. 2 is a vertical cross section through my improved combined heater. Fig. 3 is a perspective elevation of improved combined heater.

The same letters of reference are used in all the figures.

A is the outer annular cylinder, B is the inner annular cylinder of my improved

combined heater; *a* is the pipe through which the steam escapes from the steam engine, into the improved combined heater. *b* is a double valve placed in the steam pipe *c* through which the steam escapes from the improved combined heater. The valve in the escape steam pipe *c*, may be used to advantage when my improved combined heater is in connection with a high pressure engine, producing as it will a partial vacuum in the heater from the quantity of steam that will be condensed by the air and water surfaces of the heater. *d d* are flanges by which the air pipe leading to the furnace of steam boilers is connected with the space between the casings of the cylinder A. *g* is the water supply pipe connecting with the cylinder B. *h* is the pipe through which the water of condensation is removed from the improved combined heater. *k* is a valve in the pipe *h* opening outward; *i i* are the heads closing up the space within the inner casing of the cylinder A at both ends; *l* is the annular space between the two cylinders A and B; *v v v v* are brackets placed between the annular cylinders A and B to keep them in their positions.

Having thus fully described my invention and explained the operations of the various parts thereof, what I claim as new therein and desire to secure by Letters Patent, is—

The combination and arrangement of the air water and steam chambers of my improved combined heater, in such a manner that the waste steam from a steam engine shall heat the supply of water while passing through the heater on its way to the boiler, furnishing said engine with steam, and the air required for combustion in the furnace of said boiler, in its passage through another portion of my improved combined heater, as herein described.

ZENAS C. ROBBINS,

Witnesses:

JNO. ADDISON,
RICHARD KEY WATTS,