W. L. BUNKER & S. LINDO.

MEANS FOR TREATING THE EXHAUST STEAM OF PISTON STEAM ENGINES.

APPLICATION FILED SEPT. 16, 1910.

1,002,804. Patented Sept. 5, 1911.

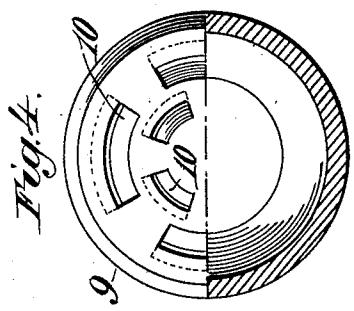

Fig. 4.

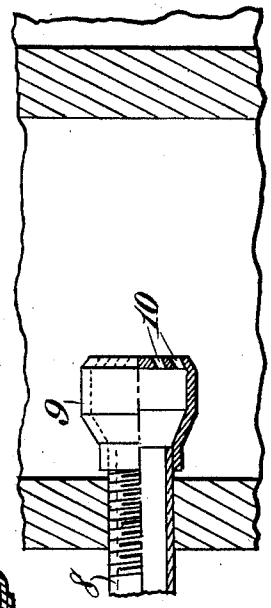

Fig. 3.

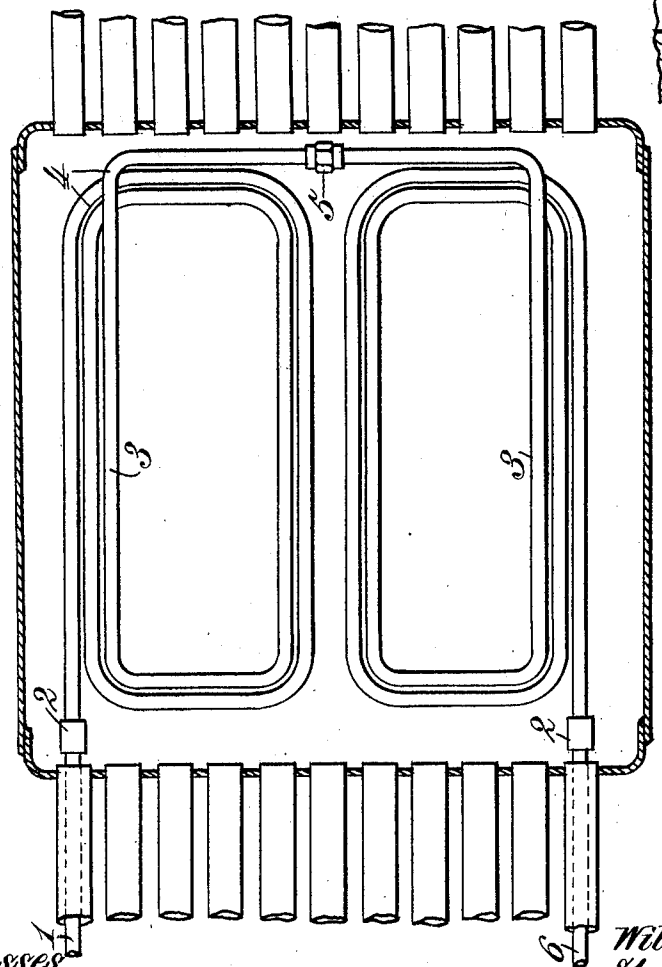

Fig. 1.

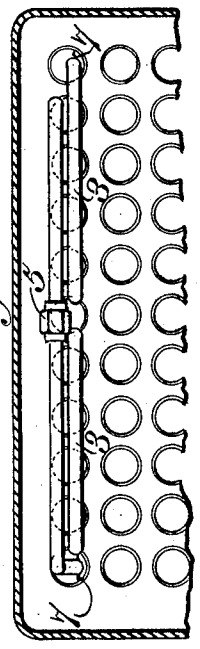

Fig. 2.

Witnesses.
Robert Everitt.

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By James L. Norris Atty.

UNITED STATES PATENT OFFICE.

WILLIAM L. BUNKER, OF SAN FRANCISCO, AND STEPHEN LINDO, OF BERKELEY, CALIFORNIA.

MEANS FOR TREATING THE EXHAUST-STEAM OF PISTON STEAM-ENGINES.

1,002,804. Specification of Letters Patent. **Patented Sept. 5, 1911.**

Application filed September 16, 1910. Serial No. 582,373.

To all whom it may concern:

Be it known that we, WILLIAM L. BUNKER and STEPHEN LINDO, both citizens of the United States of America, residing, respectively, in the city of San Francisco, in the State of California, and in the city of Berkeley, State of California, have invented new and useful Improvements in Means for Treating the Exhaust-Steam of Piston Steam-Engines, of which the following is a specification.

This invention relates to improvements in means for treating the exhaust steam of piston steam engines and its primary object is to provide a simple, efficient, and inexpensive arrangement to provide for the evaporation of the moisture in escaping exhaust steam and to prevent the condensation of such exhaust steam by efficiently heating the exhaust passages and pipes. In furtherance of this object, the invention includes a means for adding heat to ordinary or saturated steam and a means or device for efficiently utilizing the heat thus added in the evaporation of the moisture in the exhaust steam and in the heating of the exhaust passages and pipes.

An embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a plan view showing a steam superheater which forms an element of the invention as applied to the combustion chamber of a Scotch boiler. Fig. 2 is a sectional view through the said combustion chamber showing the superheating coil in end elevation. Fig. 3 is a view, partly in longitudinal section and partly in side elevation, showing the arrangement of the nozzle for mixing the superheated steam with the escaping exhaust steam. Fig. 4 is a view, partly in cross section and partly in front elevation of the nozzle aforesaid.

Similar characters of reference designate corresponding parts throughout the several views.

The steam which is utilized in the treatment of the escaping exhaust steam is conducted by a pipe 1 from the boiler. The pipe 1 is disposed in a boiler tube and is joined by a suitable wrought iron coupling 2 to a superheating coil 3. The latter, which is preferably composed of charcoal iron pipe having the short bends 4 therein, is suitably disposed in the combustion chamber of the boiler furnace and, for convenience of assemblage and disassemblage, is preferably made in sections which are connected by a suitable wrought iron coupling 5. The steam which passes into the superheating coil from the pipe 1 is heated in the combustion chamber and passes from said coil through a pipe 6 which is also joined to said coil by a suitable coupling 2. Said pipe 6 passes through an adjacent boiler tube and is preferably made of iron or other suitable metal capable of withstanding severe heat. In connection with the pipes 1 and 2 it is preferred to employ copper wear strips 7 which fit within the boiler tubes and prevent such undue wear as would be consequent to the chafing of the tubes against the pipes.

The pipe 6 is provided with a threaded nipple 8 (Fig. 3) which is fitted in the exhaust chamber of the engine cylinder and has upon its inner end a discharge nozzle 9. The nozzle 9 is made of tool steel or other suitable material, and is of special construction to secure an efficient mixing of the superheated steam and the escaping exhaust steam. The nozzle 9 has a flat front wall which is provided with annularly disposed slots 10 having a combined area approximately equal to the area of the pipe 8. The slots 10 incline forwardly and inwardly toward a common center whereby the jets of steam discharged therefrom will be broken up by impact with one another and will be prevented from impinging against the adjacent walls of the exhaust chamber or steam pipes. The walls of each slot 10 have a relatively slight outward flare whereby the superheated steam increases in temperature as it escapes and a more efficient mixing effect is had.

Having fully described our invention, we claim:

1. An apparatus of the type set forth which comprises the combination with a combustion chamber, the exhaust chamber of a steam engine, and a steam supply pipe of a steam superheating means disposed in the combustion chamber and connected to the supply pipe to receive steam therefrom, a pipe for conducting the superheated steam from the superheating means, and a nozzle fitted to the end of said last named pipe and disposed in the exhaust chamber, the nozzle being constructed to promote the

mixing of the superheated steam escaping therefrom with the exhaust steam in said exhaust chamber.

2. An apparatus of the type set forth which comprises the combination with a combustion chamber, the exhaust chamber of a steam engine, and a steam supply pipe of a steam superheating means disposed in the combustion chamber and connected to the supply pipe to receive steam therefrom, a pipe for conducting the superheated steam from the superheating means, and a nozzle fitted to the end of said last named pipe and disposed in the exhaust chamber, the nozzle being constructed to promote the mixing of the superheated steam escaping therefrom with the exhaust steam in said exhaust chamber, the nozzle having its front wall provided with a plurality of slotted openings having a combined area approximately equal to the area of the pipe by which the nozzle is carried, the openings disposed substantially on an arc and, as regards one another, tapering toward a common center.

3. An apparatus of the type set forth which comprises the combination with a combustion chamber, the exhaust chamber of a steam engine, and a steam supply pipe of a steam superheating means disposed in the combustion chamber and connected to the supply pipe to receive steam therefrom, a pipe for conducting the superheated steam from the superheating means, and a nozzle fitted to the end of said last named pipe and disposed in the exhaust chamber, the nozzle being constructed to promote the mixing of the superheated steam escaping therefrom with the exhaust steam in said exhaust chamber, the nozzle having its front wall provided with a plurality of slotted openings having a combined area approximately equal to the area of the pipe by which the nozzle is carried, the openings disposed substantially on an arc and, as regards one another, tapering toward a common center, each opening having its walls arranged on a slight outward flare.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

WILLIAM L. BUNKER.
STEPHEN LINDO.

Witnesses:
M. F. PROSSER,
ARTHUR G. SMITH.