

(No Model.)

2 Sheets—Sheet 1.

R. M. SCHOTZKO.

APPARATUS FOR RETURNING EXHAUST STEAM TO BOILERS AND
HEATING FEED WATER.

No. 512,993.

Patented Jan. 16, 1894.

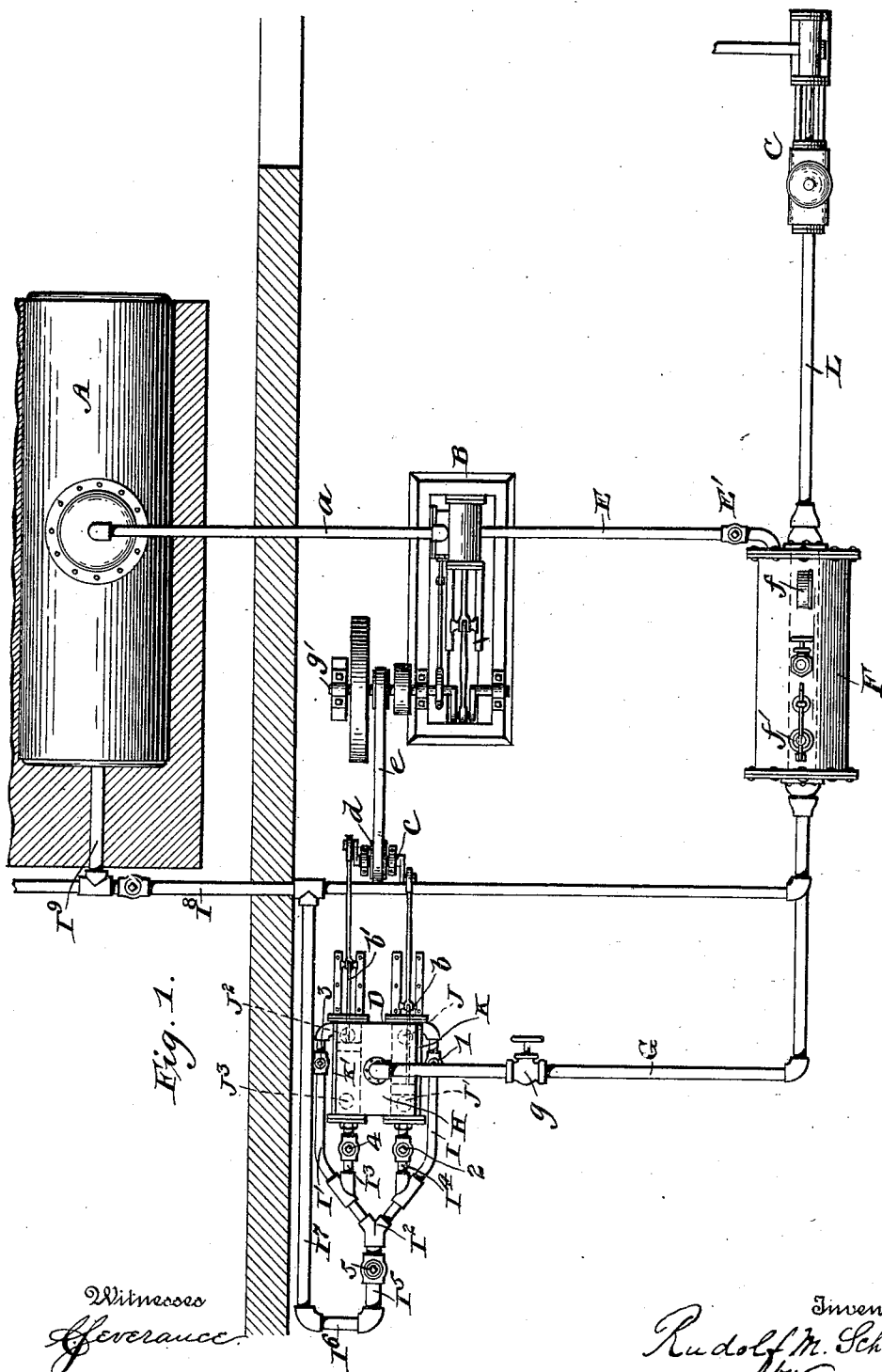


Fig. 1.

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Fig. 2.

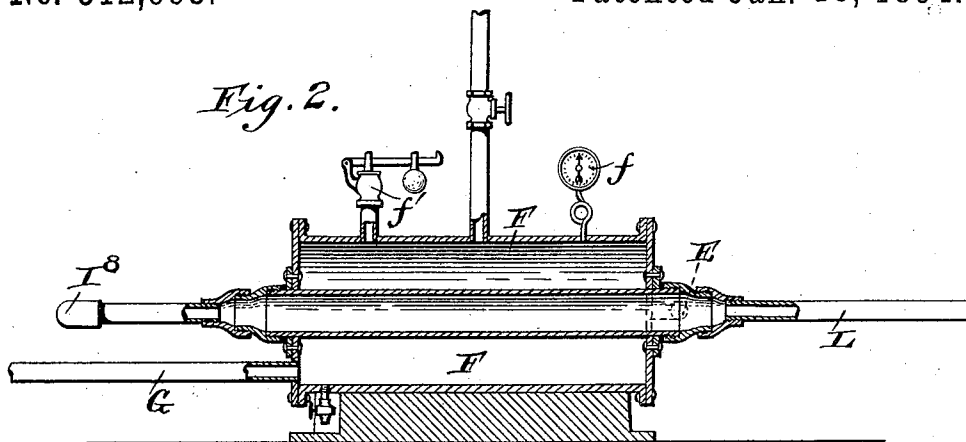


Fig. 3.

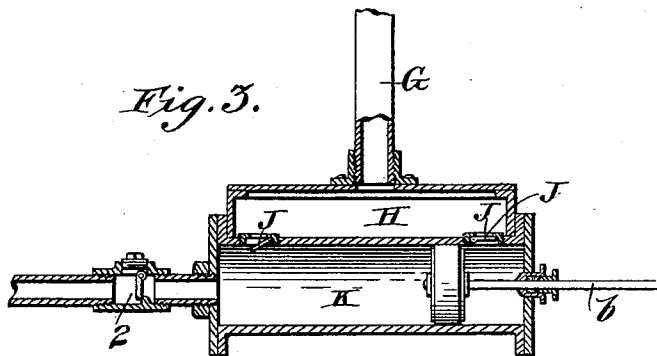
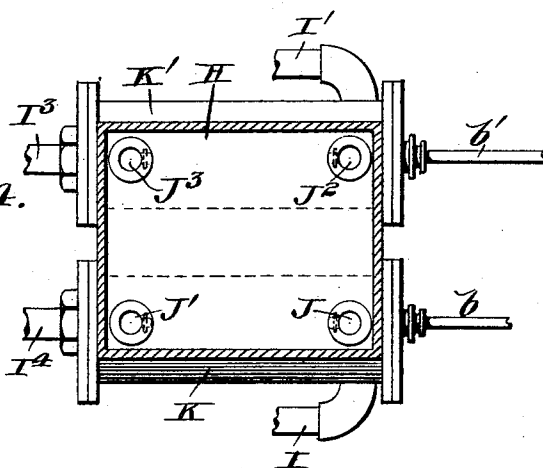


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

RUDOLF M. SCHOTZKO, OF TACOMA, WASHINGTON.

APPARATUS FOR RETURNING EXHAUST-STEAM TO BOILERS AND HEATING FEED-WATER.

SPECIFICATION forming part of Letters Patent No. 512,993, dated January 16, 1894.

Application filed April 13, 1893. Serial No. 470,241. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF M. SCHOTZKO, a citizen of the United States, residing at Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Apparatus for Returning Exhaust-Steam to Boilers and Heating Feed-Water; 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.

My invention relates to means for returning exhaust steam to boilers, and also a combination of such means with the feed water supply of steam boilers; and its objects are, first, to save the exhaust steam and return it to the boiler for use as live steam after it has been re-heated in the boiler to the original temperature,—and, second, to utilize the heat of the exhaust steam on its way back to the boiler for heating the feed water from a pump or force supplying apparatus.

My invention consists, first, in an auxiliary duplex steam pump, in combination with an exhaust steam pipe of a main engine and the discharging end of the water supply pipe of a steam boiler; and second, it consists in a duplex steam pump, in combination with an exhaust steam pipe of a main engine, a steam reservoir around a portion of the supply pipe of the feed water forcing apparatus, and the boiler, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a top view of a main steam engine, boiler, and a water supplying apparatus of ordinary construction, showing my improvements interposed between the same and connected therewith. Fig. 2 is a vertical longitudinal section of the means for heating feed water on its return with the exhaust steam to the boiler. Fig. 3 is a vertical section through one of the cylinders and the steam chest of the auxiliary duplex steam pump, and Fig. 4 is a horizontal section of the duplex steam pump on a line just above the gate valves.

A in the drawings is the main steam generating boiler; B the main engine connected to the boiler by live steam pipe *a*; C a steam

pump or other forcing feed water supplying apparatus for the boiler.

D is a duplex, auxiliary steam pumping apparatus connected to the steam engine by an exhaust steam pipe E and by means of a steam storing reservoir F and pipe G leading into the steam chest H of the duplex steam pump D, and with the boiler by means of pipes I, I', I², I³, I⁴, I⁵, I⁶, I⁷, I⁸, I⁹. The pipe E is provided with a gate or check valve E', the pipe G with a cut off valve *g*, the pipes I, I', I², I⁴, I⁵, and I⁸ with check valves 1, 2, 3, 4, 5. The valves J, J', J², J³ of the duplex steam pump open downward into the steam cylinders K K', and each of the cylinders discharges alternately at its forward and rear ends; the forward discharge of cylinder K being into pipe I and the rear discharge into pipe I⁴, while the forward discharge of cylinder K' is into pipe I' and the rear discharge into pipe I⁵. The discharge from both cylinders flows into pipe I⁵, and thence along pipes I⁶, I⁷, I⁸, I⁹ into the boiler A to be reheated. The piston rods *b b'* of the duplex steam cylinders K K' may be connected to a duplex crank *c*, on the shaft of which may be a pulley *d* from which a belt *e* may pass and connect the duplex steam pump with the power shaft *g'* of the main engine; or the duplex steam pump may be worked by a small duplex engine independently of the main engine, but it is preferable to take a small amount of live steam power from the main engine boiler; or a portion of the exhaust steam from the reservoir might be made to operate an independent auxiliary duplex engine.

It is evident that as the operation of the duplex steam pump continuously forces the steam, the respective check valves operate in the usual manner of such valves, to prevent the back flow of the steam into the said pump. It is always necessary in order to insure the entrance of the steam from the duplex pump into the boiler to connect the steam return pipe with the water supply pipe of the boiler, and thereby unite the power of the water supplying apparatus with that of the duplex pump and thus have the water and steam injected together into the boiler.

If it is desirable, and I believe it will be

found so, to heat the feed water on its passage to the boiler, the feed pipe L may be passed through the exhaust steam storing reservoir, and the portion within the reservoir may be enlarged, or have its heating surface increased by corrugating it spirally. Under this construction the water pipe will be connected with the branches I⁷ I⁸ I⁹ of the exhaust steam pipe leading to the boiler beyond the duplex steam pump.

The reservoir will be provided with an ordinary steam gage *f* and safety valve *f'*; and in the pipe E leading into the reservoir F and the pipe G leading into the duplex steam pump, the cocks E' *g*, are provided so that the steam may be cut off entirely from both the reservoir and the duplex steam pump and all back pressure avoided as occasion may require.

By my invention a very great saving in waste of steam usually exhausted into the atmosphere, will be effected; and, in addition, feed water may be heated on its way to the boiler and finally, with the exhaust steam, forced into the boiler, by the duplex pump, and thus economy in fuel and water be effected.

What I claim as my invention is—

1. The relative arrangement and combina-

tion of the exhaust pipe of the main engine, the exhaust steam receiver, the feed water supply pipe leading to the boiler, the feed water supply pipe passed through the receiver, the duplex pump in operative connection with the exhaust steam receiver and the feed water pipe, and suitable means for connecting the duplex pump with an engine for operating it, substantially as described.

2. The duplex steam pump having a single steam chest, two cylinders, two pistons and four gate valves opening downward into the cylinders and four valve-controlled discharge pipes leading out of the cylinders, in combination with a steam engine for operating the duplex pump, a steam boiler, a main steam engine, an exhaust steam receiver with connections leading out to the suction pipe of duplex pump, feed water supply pipe leading to the boiler, and connections therewith leading from the discharge pipe of said duplex pump, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

RUDOLF M. SCHOTZKO.

Witnesses:

E. T. FENWICK,

C. CALVERT HINES.