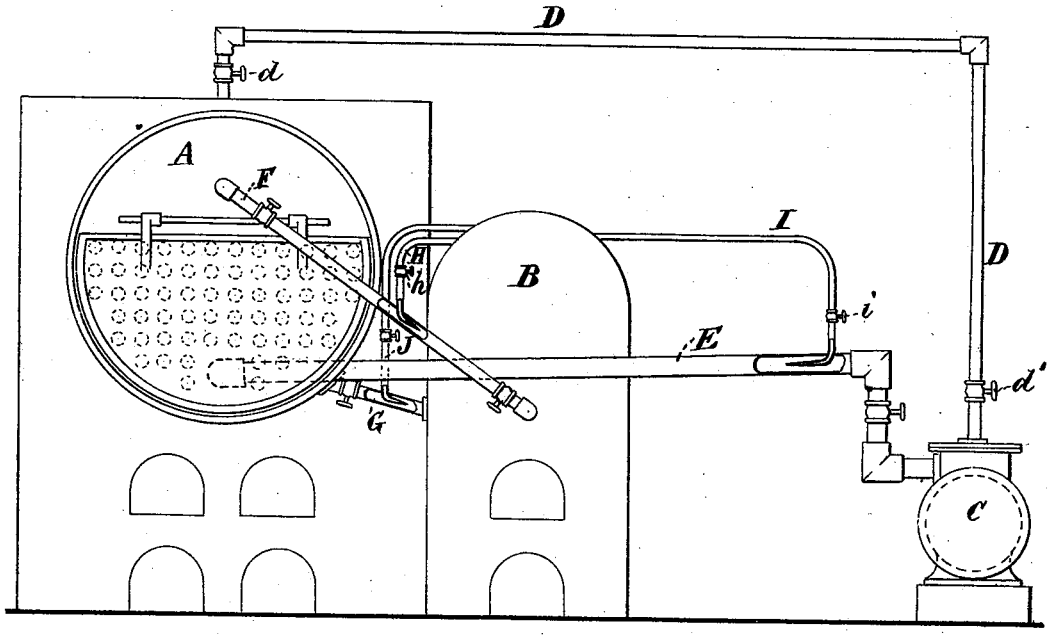
(No Model.)

H. T. LITCHFIELD.

UTILIZING EXHAUST STEAM.

No. 261,163. Patented July 18, 1882.



Witnesses
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UNITED STATES PATENT OFFICE.

HARVEY T. LITCHFIELD, OF HULL, ASSIGNOR OF ONE-HALF TO DAVID RENSHAW, OF COHASSET, MASSACHUSETTS.

UTILIZING EXHAUST-STEAM.

SPECIFICATION forming part of Letters Patent No. 261,163, dated July 18, 1882.

Application filed September 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, HARVEY T. LITCHFIELD, of Hull, in the county of Plymouth and State of Massachusetts, have invented a new and useful improvement in the process of utilizing exhaust-steam and also of controlling the pressure of and utilizing the surplus steam, of which the following is a specification.

My invention has for its object the utilization of exhaust-steam and the utilization of the surplus steam produced in various processes of utilizing exhaust.

The invention consists in returning the exhaust-steam of an engine into the water-body of an ordinary steam-boiler by means of jets of steam issuing from a supplemental boiler at extraordinary high pressure, and in providing means for returning the surplus steam and water accruing in the ordinary boiler or its equivalent to the high-pressure boiler or its equivalent, the accruing water being caused by radiation from said boiler when affected by the greater coolness of the atmosphere. The exhaust, after being used, throws off its heat and causes more or less water to accrue in the boiler.

Referring to the accompanying drawing, A is an ordinary boiler communicating with engine C by the steam-pipe D.

E is the exhaust-pipe leading from engine C to the water-body of boiler A.

B is a supplemental boiler intended for carrying extraordinary high pressure, and is constructed with a specific view to this object.

I is a jet-pipe leading from boiler B into exhaust-pipe E.

F is a pipe connecting the steam-room of boiler A with the water-body of boiler B, which pipe is furnished with suitable valves and jet-pipe H, leading from boiler B.

G is a pipe connecting the water-bodies of boilers A and B, furnished with suitable valves, and a jet-pipe, J, leading from boiler B. The pipe G has the effect of keeping the water at the desired height in the working-boiler for conducting off the surplus water caused by radiation in passing through the steam-pipe and through the engine, there doing its work, and then passing to the boiler through the exhaust-pipe to the boiler from which it emanated, the radiation from the outer surface of the boiler causing water to accrue in said boiler, it being evident that the external surfaces of the boiler and its connections are largely exposed to the atmosphere, which is much colder than the steam in the boiler.

The operation is as follows: Steam is raised in boiler A to the pressure required for working the engine, and in boiler B to such greater pressure as may be found necessary for the return of the exhaust from the engine C into the water-body of boiler A. Valve *i* in pipe I is then opened, also valves *d* and *d'* in pipe D, starting the engine C, when the exhaust-steam, entering pipe E, is taken up by the jet issuing from jet-pipe I, and by it is carried into the water-body of boiler A. The fires under boiler A are now banked if no other work is being done save that by the engine C. An increasing pressure will now become apparent on boiler A, and the valve *h* on jet-pipe H is opened, and the valves on pipe F thus return the surplus steam in boiler A into the water-body of boiler B.

If it should be found desirable for any purpose to have communication between the water-bodies of boilers A and B, it can be effected by means of the jet-pipe J, leading from the boiler B into the pipe G, connecting the water-bodies of the two boilers.

What I claim is—

1. In combination with a high-pressure steam-generator and a generator of lower pressure, the pipe F, leading from the steam-space of the low-pressure boiler to the water-space of the high-pressure boiler, the high-pressure steam-jet pipe H for forcing the steam from the low to the high pressure boiler, the exhaust-steam pipe E, leading into the water-space of the low-pressure boiler, the jet-pipe J, and the pipe G, all operating together in the manner set forth.

2. The method herein shown of controlling the pressure in boilers, arranged and operating as described, for utilizing exhaust-steam

by conducting the surplus steam from the steam-space of the low-pressure boiler to the water-body of the high-pressure boiler, and also conducting the surplus water from the water-body of the low-pressure boiler to the water-body of the high-pressure boiler by means of jets of very high pressure.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARVEY T. LITCHFIELD.

Witnesses:

JOS. H. ADAMS,

E. PLANTA.