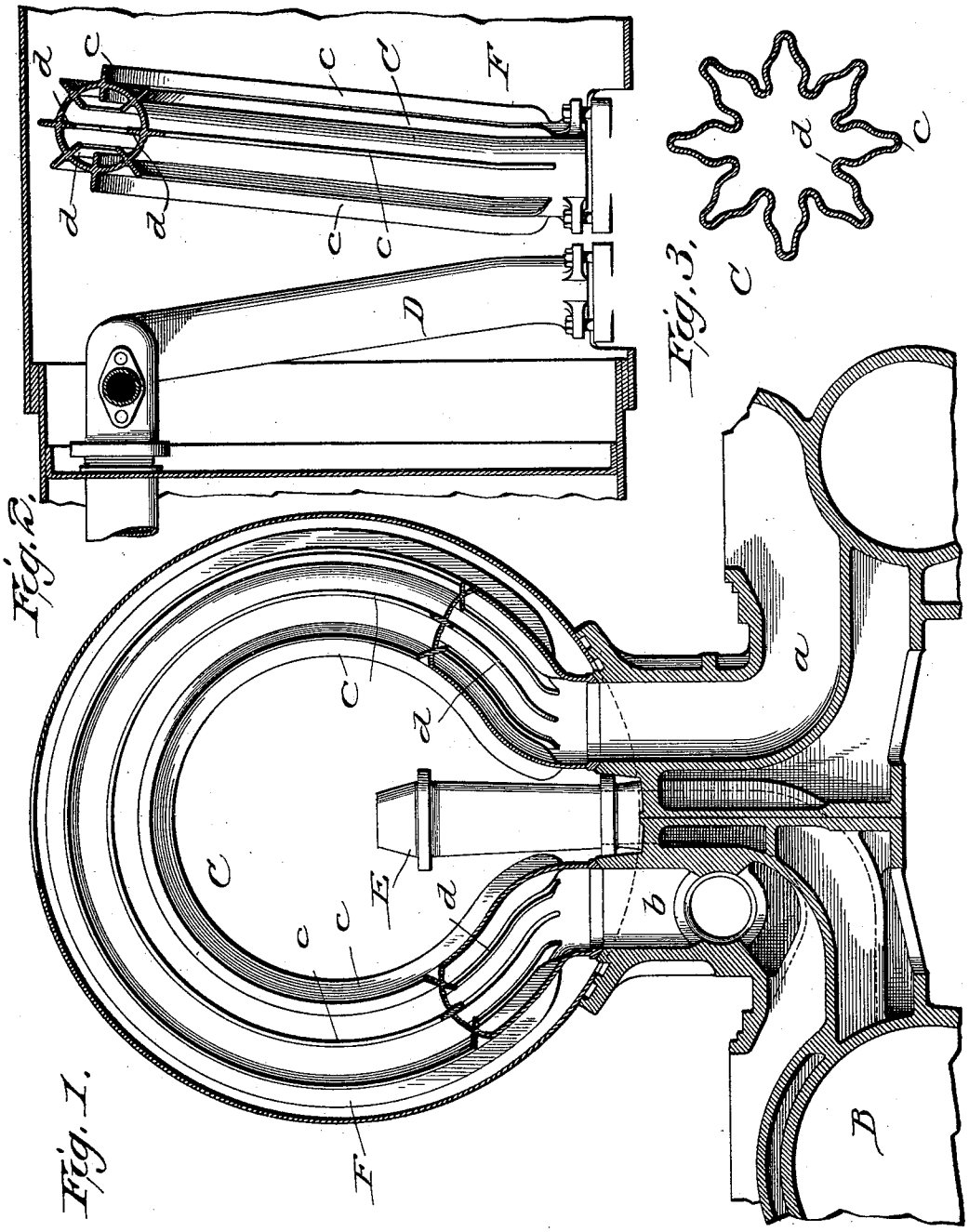
(No Model.)

A. J. PITKIN.

COMPOUND ENGINE.

No. 592,823. Patented Nov. 2, 1897.



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UNITED STATES PATENT OFFICE.

ALBERT J. PITKIN, OF SCHENECTADY, NEW YORK.

COMPOUND ENGINE.

SPECIFICATION forming part of Letters Patent No. 592,823, dated November 2, 1897.

Application filed February 15, 1897. Serial No. 623,392. (No model.)

To all whom it may concern:

Be it known that I, ALBERT J. PITKIN, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Compound Engines, of which the following is a specification.

My invention relates to compound locomotive-engines in which the high and low pressure cylinders are connected by a receiver-pipe located in the smoke-box of the locomotive. In all such locomotive-engines as heretofore constructed condensation of steam occurs in the high-pressure cylinder, which is carried over into the low-pressure cylinder, thereby occasioning a loss of power. This condensed steam is not reëvaporated in any receiver-pipe heretofore used with which I am familiar, although it is a fact that the temperature of the gases in the smoke-box of a locomotive is very much higher than that of the steam passing through the receiver.

The object of my invention is to prevent the passage of the condensed steam from the high-pressure to the low-pressure cylinder, and thus prevent the corresponding loss of power. I therefore so construct the receiver-pipe that it shall most efficiently gather the high temperature of the gases in the smoke-box and convey this high temperature to the interior of the receiver-pipe, so that the condensed steam which passes from the high-pressure cylinder may be arrested and evaporated and raised to a high temperature, so that when it enters the low-pressure cylinder it may operate with the greatest efficiency.

The best way now known to me of carrying out my invention is to provide the receiver-pipe with a number of projections on the outside to collect the heat from the smoke-box and corresponding projections on the inside to convey the heat thus accumulated to the steam passing through the pipe. Preferably these projections are arranged in the form of longitudinal parallel ribs both on the inside and the outside of the receiver-pipe, as by this arrangement not only is the heat most efficiently collected and conveyed, but no obstruction is offered to the free passage of steam through the pipes, and a large surface is presented for the radiation of heat to cause the evaporation of the condensed steam.

I am aware that in Dean's patent, No. 459,779, of September 22, 1891, a receiver-pipe is shown in which annular or transverse projections are arranged on the outside of the receiver-pipe; but the Dean patent only claims that this construction will raise the temperature of the steam contained in the receiver-pipe, and thus increase the effectiveness of the low-pressure cylinder. The construction is such as to raise the temperature of the steam to some extent, but by no means to such an extent as to cause the evaporation of the condensed steam passing from the high-pressure cylinder. The ribs in the Dean patent expose a greater surface to the action of the gases in the smoke-box; but the interior arrangement of the receiver is not such as to arrest the passage of condensed steam to the low-pressure cylinder.

I am aware, of course, that pipes for radiators, boiler-tubes, &c., have been constructed with projections on the inside and on the outside. These have been known for many years to those constructing and operating compound locomotive-engines; but prior to my invention such tubes or pipes have never been utilized to overcome the very serious objections incident to all receiver-pipes in use prior to my invention, and it was not until I perfected my invention that I discovered that the efficiency of the low-pressure cylinder could be so largely increased by arresting the passage of the condensed steam in the manner above stated.

In the accompanying drawings, Figure 1 shows a transverse section through a part of a compound locomotive-engine with my improvements applied. Fig. 2 is a detail view showing especially the connection of the live-steam pipe with the high-pressure cylinder, and also the connection of the receiver-pipe with this cylinder. Fig. 3 shows a transverse section of a modified form of receiver-pipe.

The high-pressure cylinder A and the low-pressure cylinder B are mounted in any suitable way and are connected by passages *a b* with the receiver-pipe C. The live-steam pipe D is connected with the high-pressure cylinder, as shown in Fig. 2, and the exhaust E is connected with the low-pressure cylinder in the usual way.

The receiver-pipe C is arranged within the

shell F of the smoke-box, as usual, and this pipe is of the usual construction, except that it is provided with a series of longitudinal ribs *c* on the outside and a series of longitudinal ribs *d* on the inside. These ribs extend from end to end of the receiver-pipe. They are arranged, preferably, radially, as indicated in Fig. 2, and the ribs on the outside preferably aline with those on the inside. It will be understood, however, that so far as the broad features of my invention are concerned other forms of projections may be employed, the essential broad feature of my invention being the use of projections both on the inside and on the outside of the receiver-pipe, so arranged and constructed as to convey a sufficient amount of heat from the smoke-box to the interior of the receiver-pipe to evaporate the condensed steam. The curved shape of the receiver-pipe, as shown in Fig. 3, causes the condensed steam from the high-pressure cylinder to impinge against the surfaces of the interior projections *d*, and thus a quicker evaporation is effected.

I claim as my invention—

1. The combination with the high and low pressure cylinders of a compound locomotive-engine, of the smoke-box and the curved receiver-pipe for conveying exhaust-steam from the high-pressure to the low-pressure cylinder, provided with projections both on the inside and outside to convey the high temperature of the gases in the smoke-box to the interior of the receiver-pipe and cause the evaporation of steam condensed in the high-pressure cylinder.

2. The combination of the high and low pressure cylinders, the smoke-box, and the curved receiver-pipe formed with a series of curved longitudinal ribs on its interior.

3. The combination of the high and low pressure cylinders, the smoke-box, and the curved receiver-pipe formed with a series of curved longitudinal ribs both on its interior and exterior.

4. The combination of the high and low pressure cylinders, the smoke-box, the curved receiver-pipe, and a series of curved ribs arranged longitudinally on the interior of the receiver-pipe and also on the exterior thereof, whereby the steam condensed in the high-pressure cylinder is made to impinge upon the surfaces of the ribs and to be rapidly evaporated thereby.

In testimony whereof I have hereunto subscribed my name.

ALBERT J. PITKIN.

Witnesses:

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