

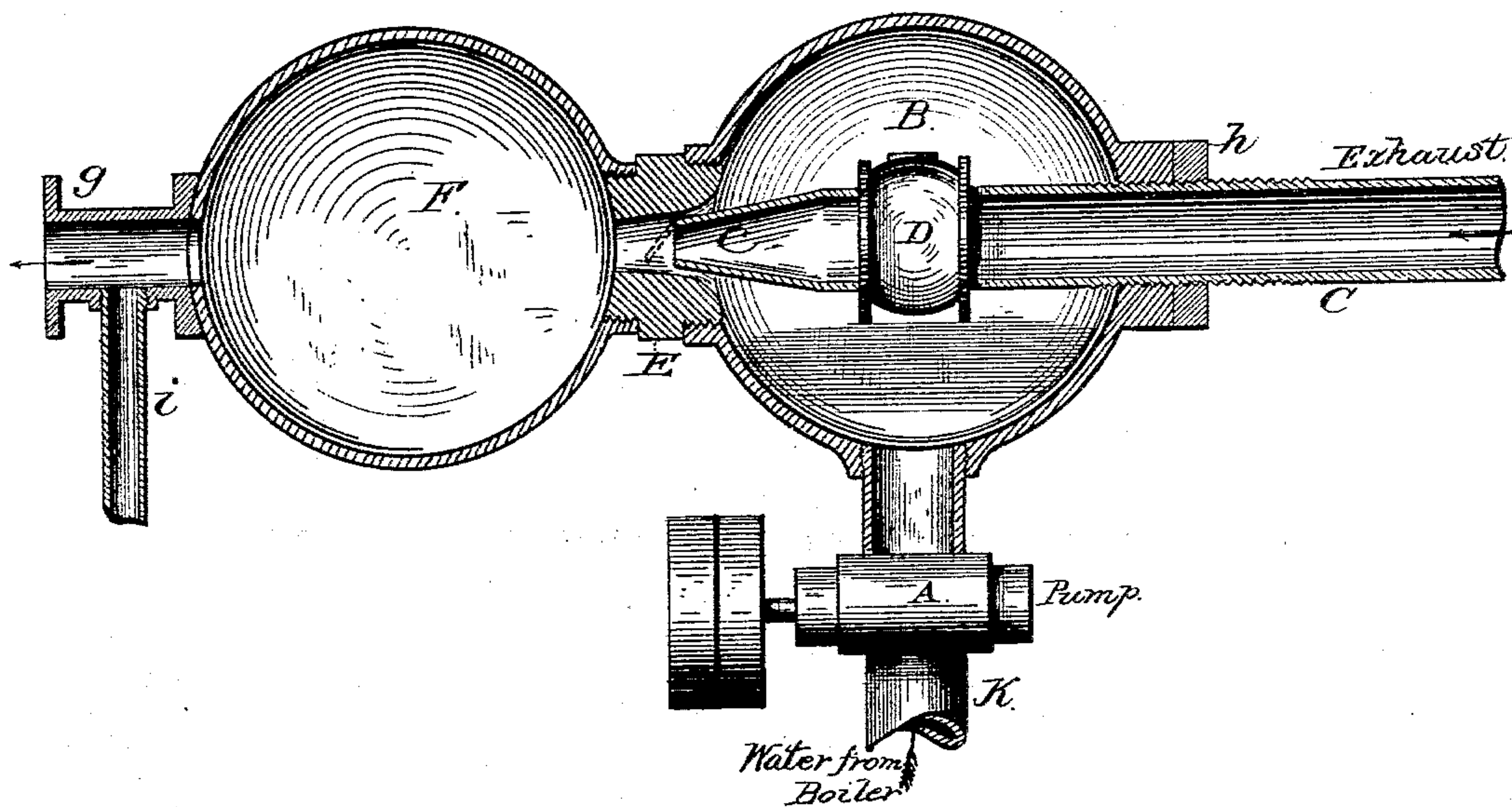
(No Model.)

D. RENSHAW.  
UTILIZING EXHAUST STEAM

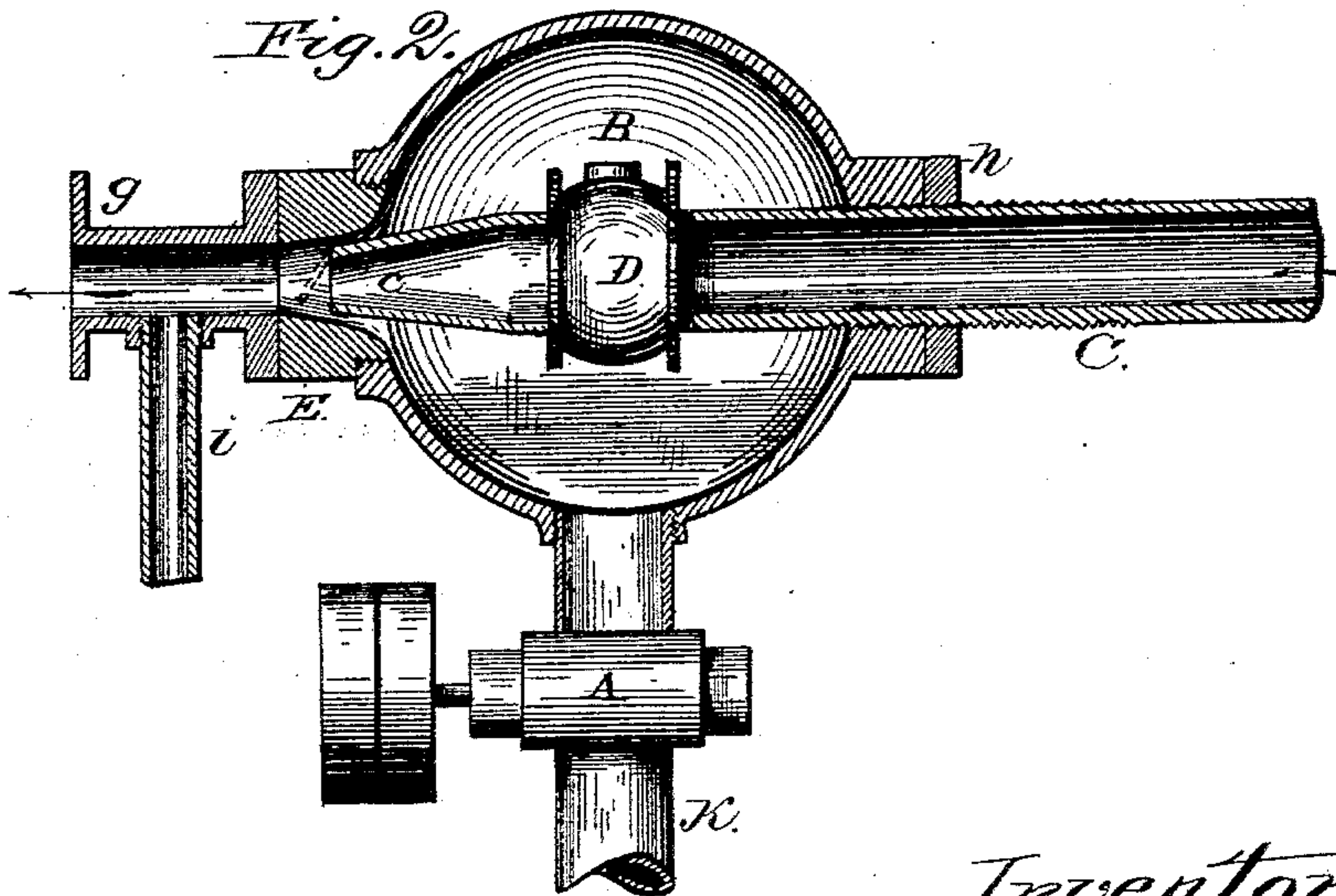
No. 300,506.

Patented June 17, 1884.

*Fig. 1.*



*Fig. 2.*



Attest  
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# UNITED STATES PATENT OFFICE.

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## UTILIZING EXHAUST-STEAM.

SPECIFICATION forming part of Letters Patent No. 300,506, dated June 17, 1884.

Application filed December 17, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, DAVID RENSHAW, of Braintree, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Utilization of Exhaust-Steam from Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention has relation to a new and useful means of returning the exhaust of engines to a boiler under pressure, by which means the exhaust-steam heretofore wasted in the atmosphere is utilized, and also the exhaust-steam which has been partially utilized by means of condensers, heaters, feeders, &c., is made wholly available by returning the entire volume into a working-boiler.

To this end my invention consists in arranging suitable vessels or receivers for holding a given quantity of boiler-water in communication with the boiler and under like or greater pressure when in operation, and at the same time interposing a suitable pump (rotary preferred) between said vessel and the boiler, by which the water is kept in continuous circulation from the boiler to the vessel, the pump serving at the same time to prevent its return. The said pump is adapted to be worked by positive or external means, so that forced circulation is produced when required for maintaining circulation, which is essential to the proper operation of my process.

The invention further consists in providing the exhaust-steam pipe with a back-pressure or check or other suitable valve at or near its delivery-nozzle, for the purpose of preventing the said pipe or nozzle from filling with a solid body of water (from sudden shocks caused by the reaction consequent upon the change or stoppage of the current, or from any other cause) until circulation is fully established. The vessel or vessels with the attachments suitably constructed are adapted to be supplied to the trade commercially and independently of the boiler. They are therefore detachable and removable, and are designed to be applied to any kind of boiler.

The drawings hereunto annexed illustrate one means of carrying my invention into effect, and also a modified form of the same.

Figure 1 shows two vessels, B and F, suitably connected and provided with the necessary fittings. It also shows the pump at the receiving-pipe leading from the boiler. Figure 2 shows a modified form having only one vessel, which may be provided at its eduction end with an overflow-pipe.

The same letters indicate like parts in each of the figures.

A is the pump, and B the receiving-vessel; C, the exhaust-pipe leading into the chamber B to near its center. Preferably I locate a suitable back-pressure valve, D, on the end of the exhaust-pipe and attach to the latter a nozzle, *c*, although the valve may be placed on the end of the nozzle, as shown in dotted lines, with good results, for the smaller the quantity of water in the exhaust-pipe the less will be the resistance to the exhaust of the steam into and through the vessel when the current is established or temporarily broken. It is evident, however, that the valve may be placed on the pipe outside the vessel; but I prefer to locate it within for the reasons stated. By means of an outer neck, E, I connect a second vessel, F, for greater certainty of action; but the apparatus will work well with a single chamber.

K is the eduction-pipe from the boiler and induction-pipe to the pump A and vessel B. The pump A is provided with a fast-and-loose pulley for external operation.

*h* is a lock-nut or stuffing-box for securing the exhaust-pipe from the engine in position in the vessel B, and *g* a fitting for connection with the boiler.

*i* is an overflow-pipe, for the purpose of letting off the flow of steam and water until the velocity and momentum of the current is established. It sometimes, however, happens that when the current is changed a backlash or reaction of the water takes place, which if continued would destroy the working of the apparatus. To overcome this difficulty, a suitable valve is provided in the exhaust-pipe, as above described, to prevent the shock from affecting the free exhaust of the engine, and the pump is designed to instantly restore the current by its positive action in forcing the



water out of the boiler and into the vessel, and through it to the boiler again, carrying with it the exhaust of the engine.

It will be readily seen that all these parts are detachable, and may readily be replaced by others without sacrificing the whole apparatus.

Prominent among the advantages of my present invention, and particularly distinguishing it from my former Patent No. 258,932, of June 6, 1882, is the result obtained by locating the exhaust-pipe within the water-space and surrounded by the latter, instead of, as in the patent cited, placing the water-jet within the exhaust-pipe and surrounded by said exhaust. In the latter instance, the pumped water-jet entering the exhaust-pipe must, moreover, substantially fill the entire pipe with water before solidifying in column for entrance.

What I claim is—

1. The process herein described of utilizing the exhaust of engines, consisting of first taking water from a boiler under pressure by positive means, forcing it into a receiving-vessel larger than the supply-pipe, bringing the said water into contact with the exhaust-steam, and then forcing the mingled product into a boiler under equal pressure, or into the boiler from which they were taken, substantially as set forth.

2. The process herein described, consisting in taking water from a boiler under pressure, forcing the same into a receiving-vessel of larger area than the supply-pipe, then bringing the exhaust of the engine in contact with

said water-jet at the point of its greatest velocity, thereby forcing it into a boiler under pressure, or into the boiler from which it was taken, as set forth.

3. The combination, in an apparatus for utilizing the exhaust of engines, of a pump interposed between a receiving-vessel at its induction end and the boiler, with the said receiving-vessel and the exhaust-pipe, substantially as shown and described.

4. The combination, in an apparatus for utilizing the exhaust of engines, which consists of the receiving-vessel, the pump located as described, and the exhaust-pipe provided with the back-pressure or check valve, the latter being located within said vessel, for the purpose set forth.

5. The combination, in an apparatus for utilizing the exhaust of engines, consisting of a vessel such as described, the exhaust-pipe extending into said vessel, and provided with a check-valve and nozzle, as and for the purpose set forth.

6. The combination, in an apparatus for utilizing the exhaust of engines, of the receiving-vessel B, exhaust-pipe C, provided with a suitable check-valve, the vessel F, and overflow-pipe i, with suitable operating mechanism, as set forth.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

DAVID RENSHAW.

Witnesses:

B. F. MORSELL,  
EUGENE D. CARUSI.