

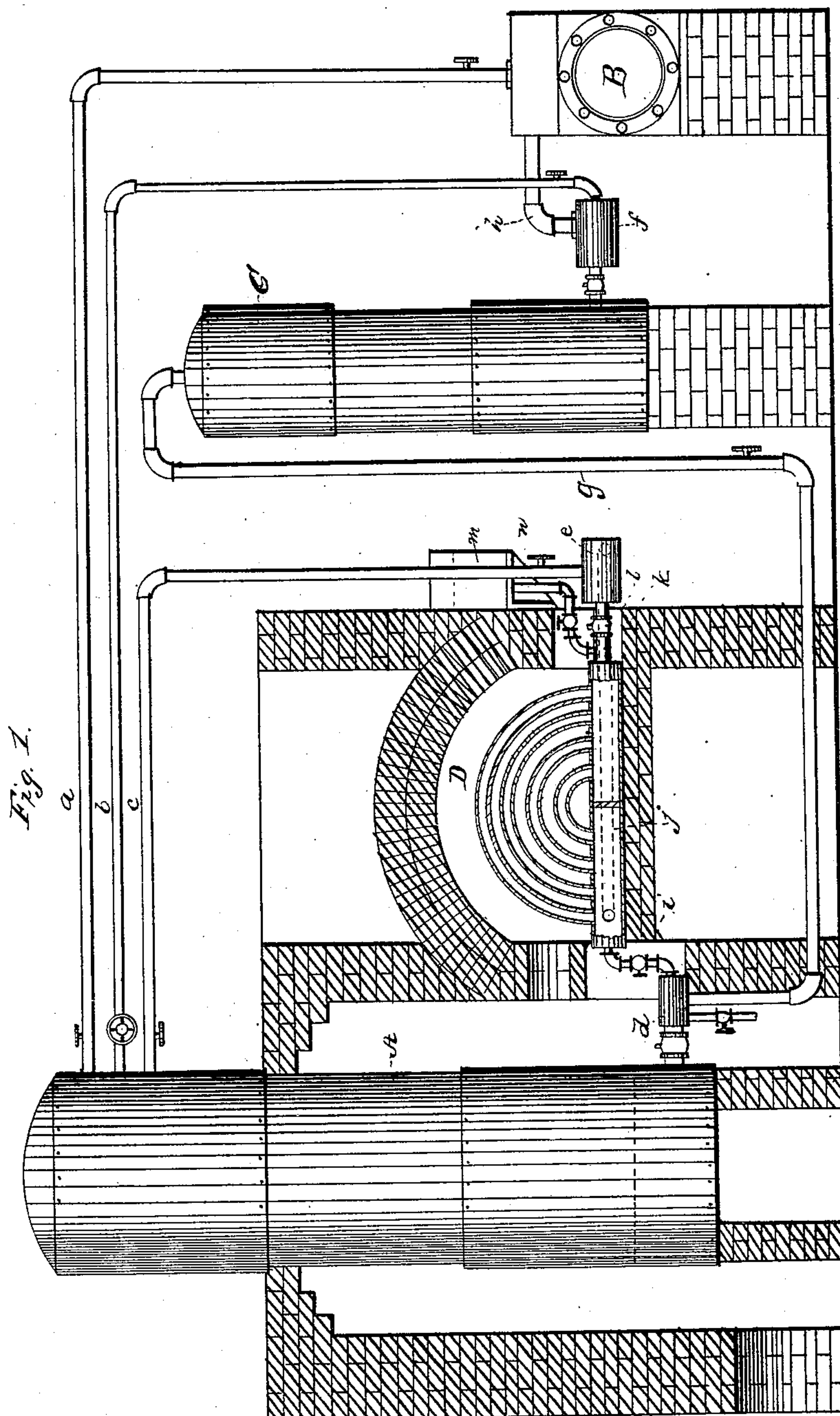
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3 Sheets—Sheet 1.

D. RENSHAW.  
UTILIZING EXHAUST STEAM.

No. 282,773.

Patented Aug. 7, 1883.



WITNESSES

Chas. R. Burr

W. E. Bowen

INVENTOR

David Renshaw  
per O. E. Duffy  
Attorney

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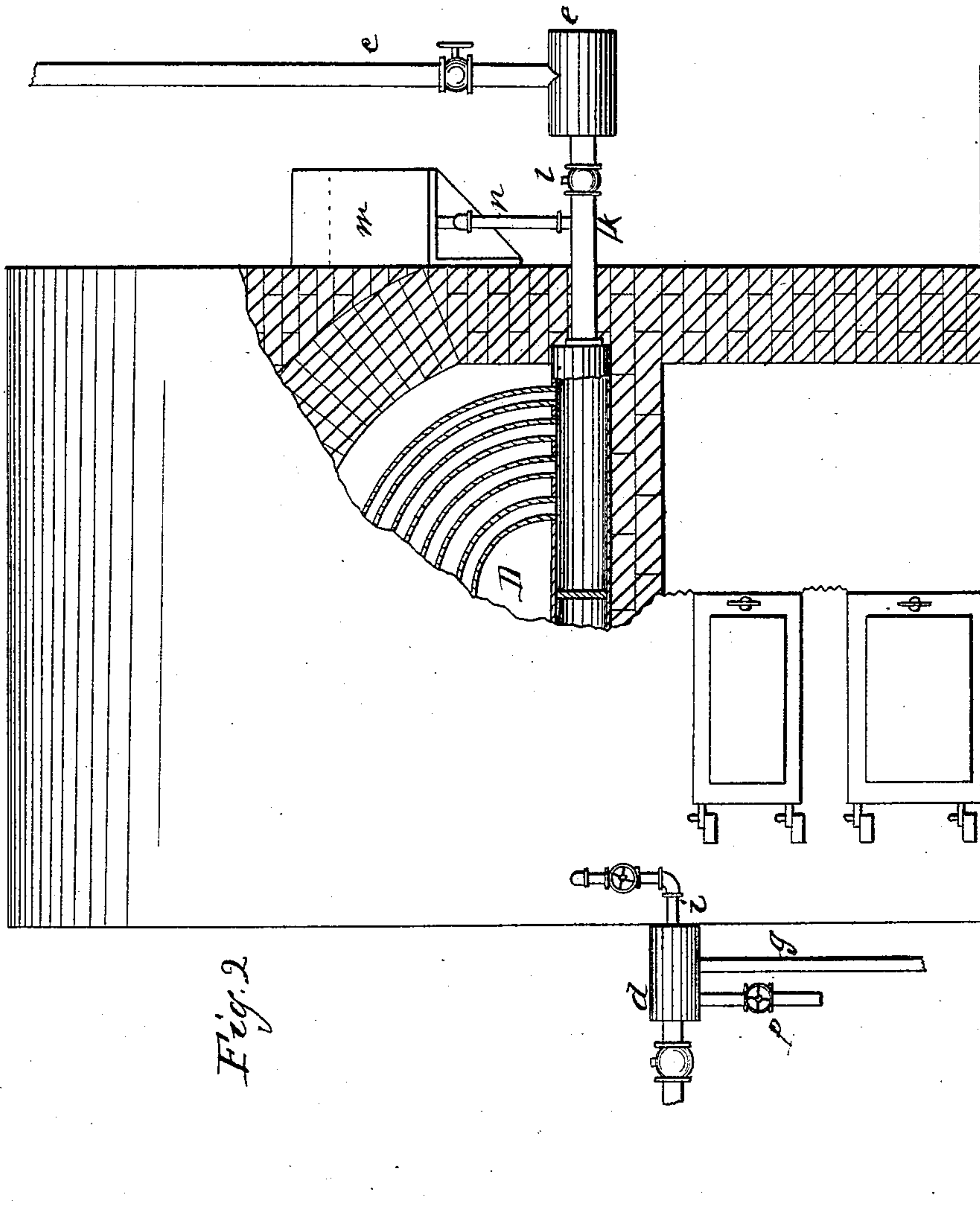


Fig. 2

WITNESSES

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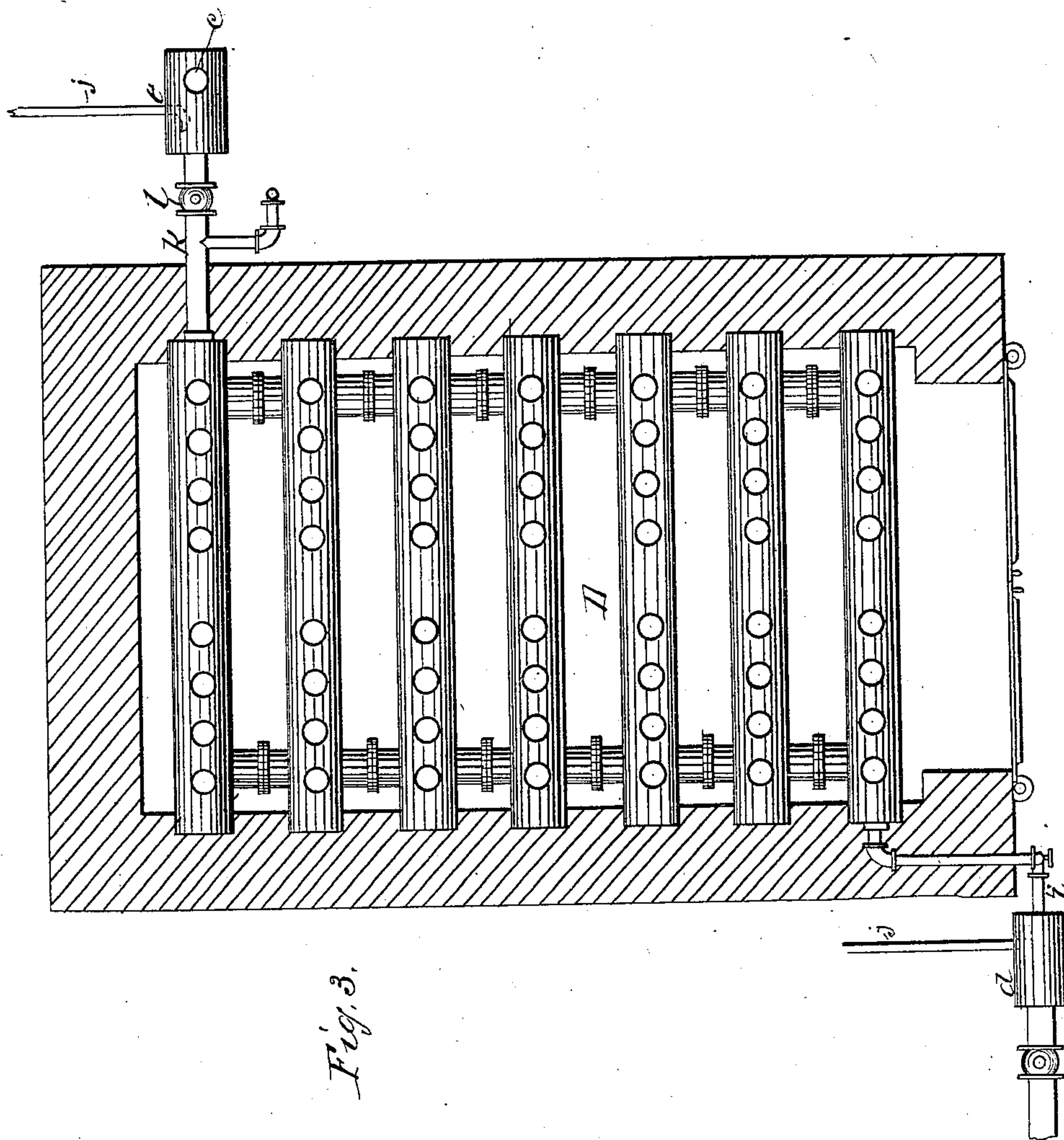
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*Fig. 3.*

WITNESSES

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# UNITED STATES PATENT OFFICE.

DAVID RENSHAW, OF BRAINTREE, MASSACHUSETTS.

## UTILIZING EXHAUST-STEAM.

SPECIFICATION forming part of Letters Patent No. 252,773, dated August 7, 1883.

Application filed January 6, 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 Means and Process for Utilizing Exhaust-Steam; 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 relates to the class of patents granted to me for utilizing the exhaust of engines, and has for its object the economy of fuel and water, cheapness in construction, and simplicity in arrangement, greatly lessening the first cost.

Heretofore the patents granted to me for utilizing exhaust were more or less complicated and expensive. My present object is to simplify the construction, lessen the cost thereof, and enable me to return the exhaust to the main receiver with less expenditure of heat.

To this end my invention consists in the process hereinafter described, taking from the main reservoir working-steam for the engine, also steam for taking off the exhaust, and compressing the same; also for supplying the superheater with steam in which a higher pressure is maintained, and which pressure forces the compressed steam into the main receiver, from which all the steam originally emanated.

The drawings hereto annexed show one form of carrying my invention into effect, as it is obvious that many constructions within wide range may be employed for carrying out this process, and which it is thought unnecessary to illustrate in this application.

Figure 1 of the drawings shows a side elevation of the various portions of the apparatus with an end sectional view of a superheater. The superheater will form the subject of a separate application. Fig. 2 shows a front elevation with a portion of the walls broken away for the purpose of more clearly illustrating the rear section of the superheater with its pipe-connections. Fig. 3 is a top plan view of the same.

A shows the main receiver, and B the engine; C, the compressing-cylinder, and D the super-

heater. *a b c* are the live-steam-supply pipes to the engine, to the compressing-cylinder, and superheater, respectively. *d e f* are injectors to the compressor, superheater, and receiver. *g* is a pipe forming communication between the compressing-cylinder and the injector *d*, and *h* the exhaust-pipe from the engine to the injector *f*. The letter *i* denotes the superheated-steam-supply pipe to injector *d*, and *j* is the pipe from the front section of the superheater to the injector *e*. *k* is the pipe connecting superheater D and injector *e*, upon which pipe I locate a check-valve, *l*, which prevents back-pressure from the superheater. *m* is a small water-vessel, having a pipe, *n*, leading from it to injector *e*, for the purpose of supplying a small quantity of water to the superheater for increasing the pressure in the superheater when the apparatus is started for operation. *p* is the overflow-pipe. All these pipes are provided with suitable valves of ordinary construction. The setting of the superheater may be of the ordinary kind; but preferably I place the furnace in front and the superheater behind the bridge-wall. In this way the fierce heat of the furnace fails to come in direct contact with its walls, and therefore less liable to burn; and, furthermore, the cold air entering at the door when open is prevented from striking directly upon it. More or less of the heat is brought in contact with the main receiver for the purpose of utilizing it and assisting in making good the loss of heat by radiation. When it is desired to cut off entirely the heat from the receiver A, a go-by flue is provided.

The operation is as follows: Steam being raised in the receiver A, communication is opened with the back section of the superheater through pipe *c* and the injector *e*, and a small quantity of water from vessel *m* is also introduced simultaneously with the steam to injector *e*, by the expansion of which water in the superheater a greater pressure is obtained than that of the receiver. Check-valve *l* now being closed to the back-pressure of the superheater, and valves on injector *d* and pipe *i* being opened, steam from the superheater rushes into and through the injector to the water-space of receiver A, and also from the front of the superheater through pipe *j* to the injector *e*, carrying with it steam from the receiver A



into the back section of the superheater, thus forming a current of great velocity, at the same time maintaining an excessive pressure in the superheater. The engine is now started  
5 and communication opened between the receiver A and injector *f*, by which means the exhaust is carried into the cylinder C and compressed to or near an equal pressure with said receiver A. Communication is now opened  
10 between compressing-cylinder C and injector *d*, and by means of the latter and the higher pressure of the superheater the steam in the compressor is forced into the water body of receiver A, from which it may be again utilized. The process is constantly carried on  
15 and constantly repeated while the engine is in operation.

Having thus described my invention, what I claim as new, and desire to secure by Letters  
20 Patent, is—

1. The process herein described of utilizing the exhaust of engines, consisting of first raising steam to an excessive pressure, then maintaining said pressure by passing live steam  
25 through a superheater to an injector, then

forcing, by means of said superheated-steam jet, a mixture of live and exhaust steam into the vessel from which all the steam was originally taken, as described.

2. The process herein described of utilizing  
30 the exhaust of engines, consisting of first raising steam in a superheater supplied with live steam and water to an excessive pressure over that of the receiver, then forcing by a jet of superheated steam a mixture of exhaust and  
35 live steam through an injector common to both into the original vessel.

3. The combination, in an apparatus for utilizing the exhaust of engines, consisting of the receiver, the superheater, and the live  
40 and exhaust steam compressing cylinder, with intermediate mechanism of injectors and pipe-connections, as described.

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

DAVID RENSHAW.

Witnesses:

B. F. MORSELL,  
EUGENE D. CARUSI.