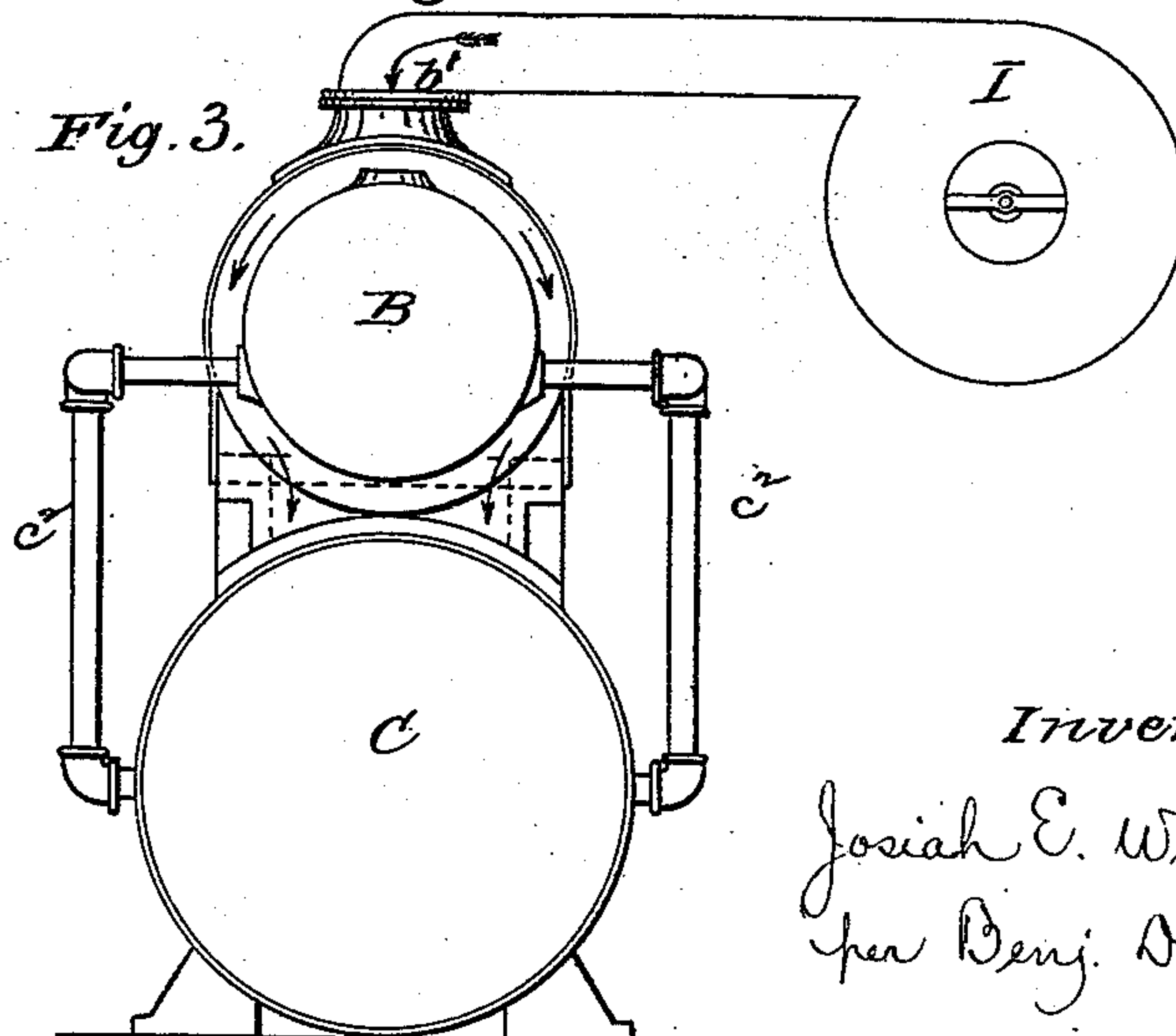
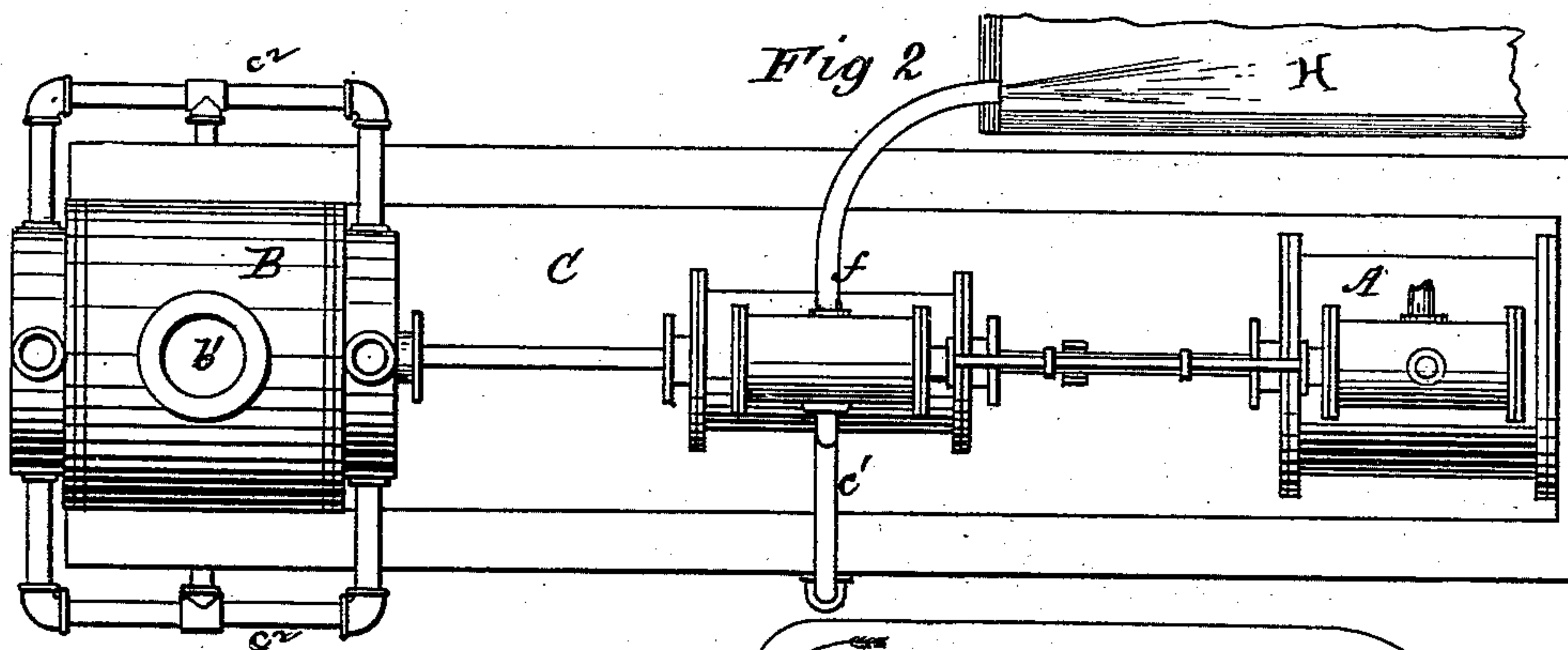
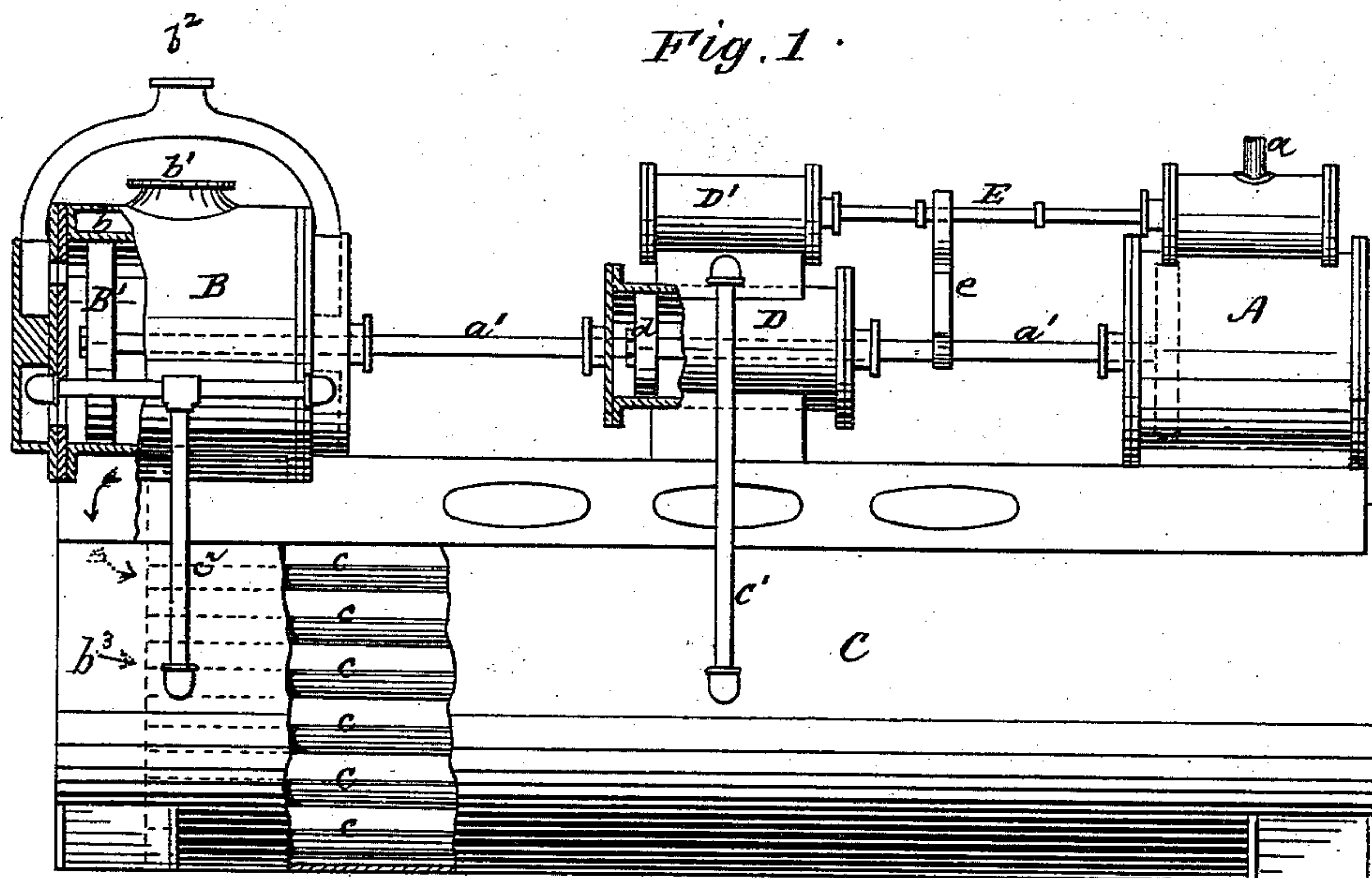


J. E. WINANTS.  
Refrigerating Apparatus.

No. 212,164.

Patented Feb. 11, 1879.



Witnesses:  
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Atty



# UNITED STATES PATENT OFFICE.

JOSIAH E. WINANTS, OF WILMINGTON, NORTH CAROLINA.

## IMPROVEMENT IN REFRIGERATING APPARATUS.

Specification forming part of Letters Patent No. **212,164**, dated February 11, 1879; application filed July 19, 1878.

*To all whom it may concern:*

Be it known that I, JOSIAH E. WINANTS, of Wilmington, North Carolina, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification:

This invention relates to that class of ice-machines wherein the cooling is produced by the compression and expansion of air or other similar elastic gases, from which the heat or caloric evolved by the compression has been eliminated and carried away by a blast of air or current of water, or the two combined, passed around or through the vessel containing the said air while in a compressed state, and is designed more especially as an improvement upon that form of apparatus described in Letters Patent No. 173,198, granted to me February 8, 1876.

It is well known that in machines of this class the pump which acts to compress the air or gas is usually driven by a crank and connection receiving motion from an engine or other suitable motor. This construction and arrangement of parts, while acting effectively to a certain extent, has been found defective by reason of the great amount of friction involved, consequent upon the large power required to effect the requisite compression of the air or gas, and this class of machines has consequently failed to come into general use.

The object, therefore, of this invention is to obviate this and other objections, and at the same time to produce a machine which shall be effective in use and cheap in construction; and to this end it consists in the combination, with a steam-engine, a compression-pump, and an auxiliary engine arranged in one and the same line, of a compressed-air receiver, a cooling-chamber, and mechanism for forcing a current of air or water, or both, around the compression-pump and through the compressed-air receiver, with suitable pipes and connections, whereby the air is compressed, the heat evolved by compression is eliminated and carried away, and the cooled air expanded intermittently in the cooling-chamber, as will more fully hereinafter appear.

Referring to the drawings, forming a part of this specification, Figure 1 is a side elevation of my improved refrigerating and cool-

ing apparatus, with the casing of the compression-pump and compressed-air receiver, and a part of the secondary or auxiliary engine-cylinder, broken away to more fully illustrate the same. Fig. 2 is a plan view, and Fig. 3 an end view, of the same.

Similar letters of reference indicate corresponding parts in all the figures.

A is a steam-engine, which receives steam from a suitable boiler through the pipe *a*, and B is the compression-pump for compressing the air or gas; and both engine and pump may be of any ordinary or suitable construction. These two members are shown in the drawings as mounted upon the compressed-air receiver C, which is formed as a close vessel, and is designed to hold the compressed air or gas.

*cc* are a series of tubes passing through the said compressed-air receiver, and *b* is a chamber surrounding the compressing-pump. I is a blower or other suitable mechanism, by means of which a current of air or water, or both, is caused to pass through the said chamber and tubes around the compression-pump B, and through the compressed-air receiver C, the chamber B being connected with the space *b*<sup>3</sup> of compressed-air receiver C, as is shown in Fig. 1 of the drawings.

The parts thus described differ in no appreciable manner from those heretofore employed, and need no further explanation in this connection.

D is a cylinder placed between the steam-engine A and compression-pump B, and connects its piston *d* with the piston-rod *a'*, which also carries the piston working in the steam-cylinder, as also the plunger of the compression-pump. D' is a chest in which is operated a suitable slide or rotary valve similar to that employed in the ordinary donkey-engine, (but it may be of any preferred form,) and is connected by the rod E with the valve of the steam-cylinder. This rod and valves are operated by an arm, *e*, carried by the piston-rod *a'*, and encircling at its upper end the valve-rod E, so that as the pistons of the steam and auxiliary engines are actuated the proper motion is communicated to the valves.

*c*<sup>1</sup> is a pipe leading from the compressed-air receiver C to the valve-chest of the auxiliary



air-engine, and  $f$  is the exhaust through which the compressed air, after acting upon the piston, in the auxiliary engine is intermittently and suddenly expanded into the cooling-chamber H.

From this it will be seen that when steam is admitted through the pipe  $a$  to the cylinder A the piston of the same is actuated, which, in turn, through the rod  $a'$ , operates the plunger B' of the compression-pump B, thereby compressing the air which is received into the pump from the pipe  $b^2$  into the compression-receptacle C, through the pipe  $c^2$ , where, after the air has been compressed and cooled sufficiently, it is then caused to pass through the pipe  $c^1$  to the cylinder D, when, acting on the piston  $d$ , it assists the engine A in further compressions. The compressed air is thus utilized in assisting the steam-cylinder, and, after having caused the piston to complete its work, is exhausted and expanded into the cooling-chamber H suddenly, instead of in a continuous stream, as heretofore, which latter method has not been found so effective in cooling.

By this combination of parts it will be readily seen that I avoid the use of all cranks and connections, reducing the friction to the minimum, and applying the power in the most efficient and economical manner, at the same time causing the air which is to be used as the re-

frigerant to aid in keeping up the requisite supply of compressed air, relieving the steam-cylinder and its piston from a portion of its work, and at the same time expanding the air in the cooling-chamber at such time and in such quantities as are productive of the best results.

Having thus described one means of carrying my invention into use, I desire it to be understood that I do not limit myself to the exact construction of parts shown in the drawings, as it is obvious that other arrangements may be employed equally effective.

Having thus described my invention, what I claim is—

The combination, with a steam-engine, a compression-pump, and an auxiliary engine, arranged in line, as described, of a compressed-air receiver, a cooling-chamber, mechanism for forcing a current of air or water, or both, around the compression-pump and through the compressed-air receiver, and suitable connecting-pipes, whereby the air is compressed, cooled, and intermittently expanded into the cooling-chamber, essentially as set forth.

Signed at Washington, D. C., this 19th day of July, 1878.

JOSIAH E. WINANTS.

Witnesses:

E. P. DURFEE,  
D. J. NEFF.