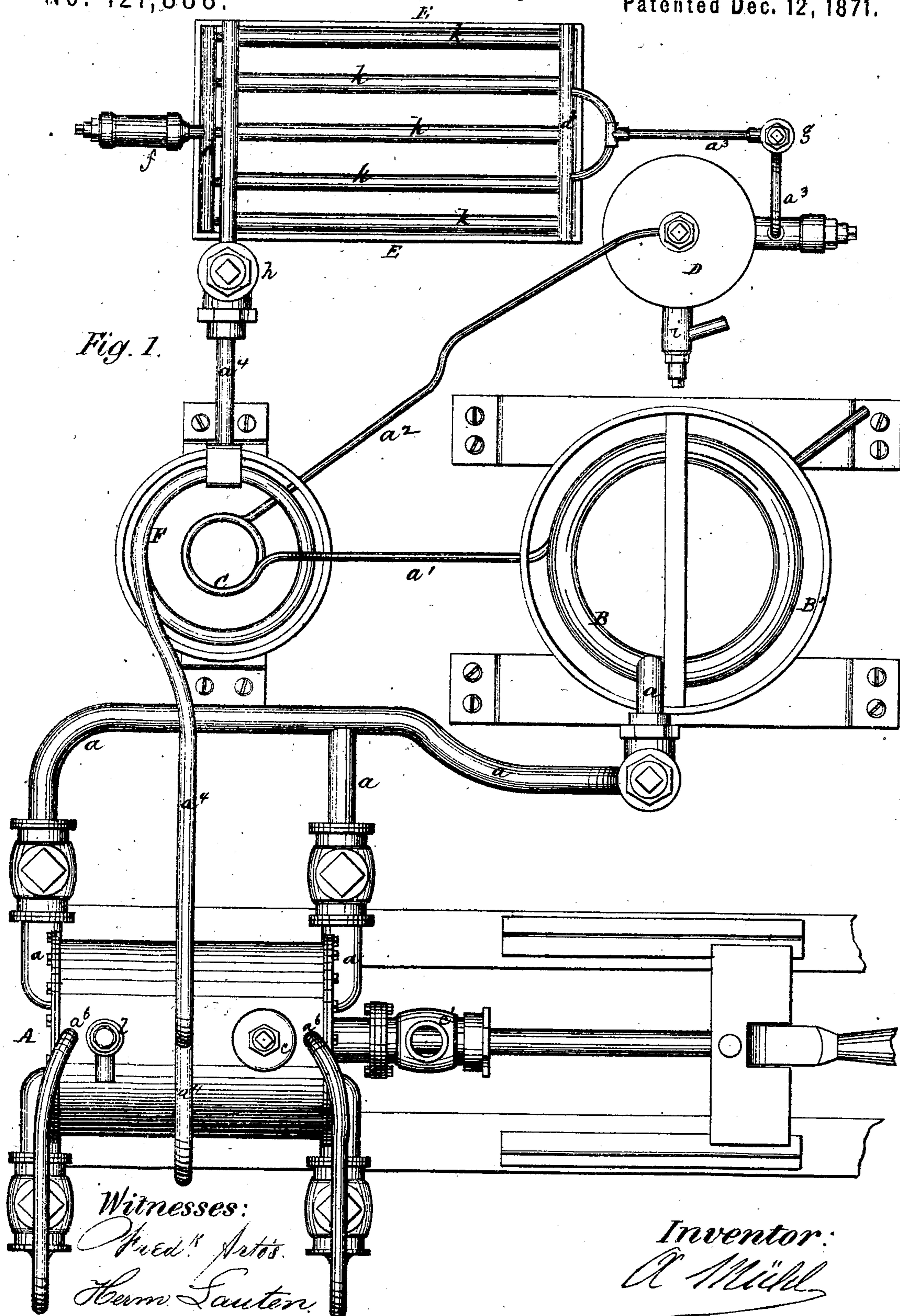


ANDREW MÜHL. Improvement in Ice Machines.

No. 121,888.

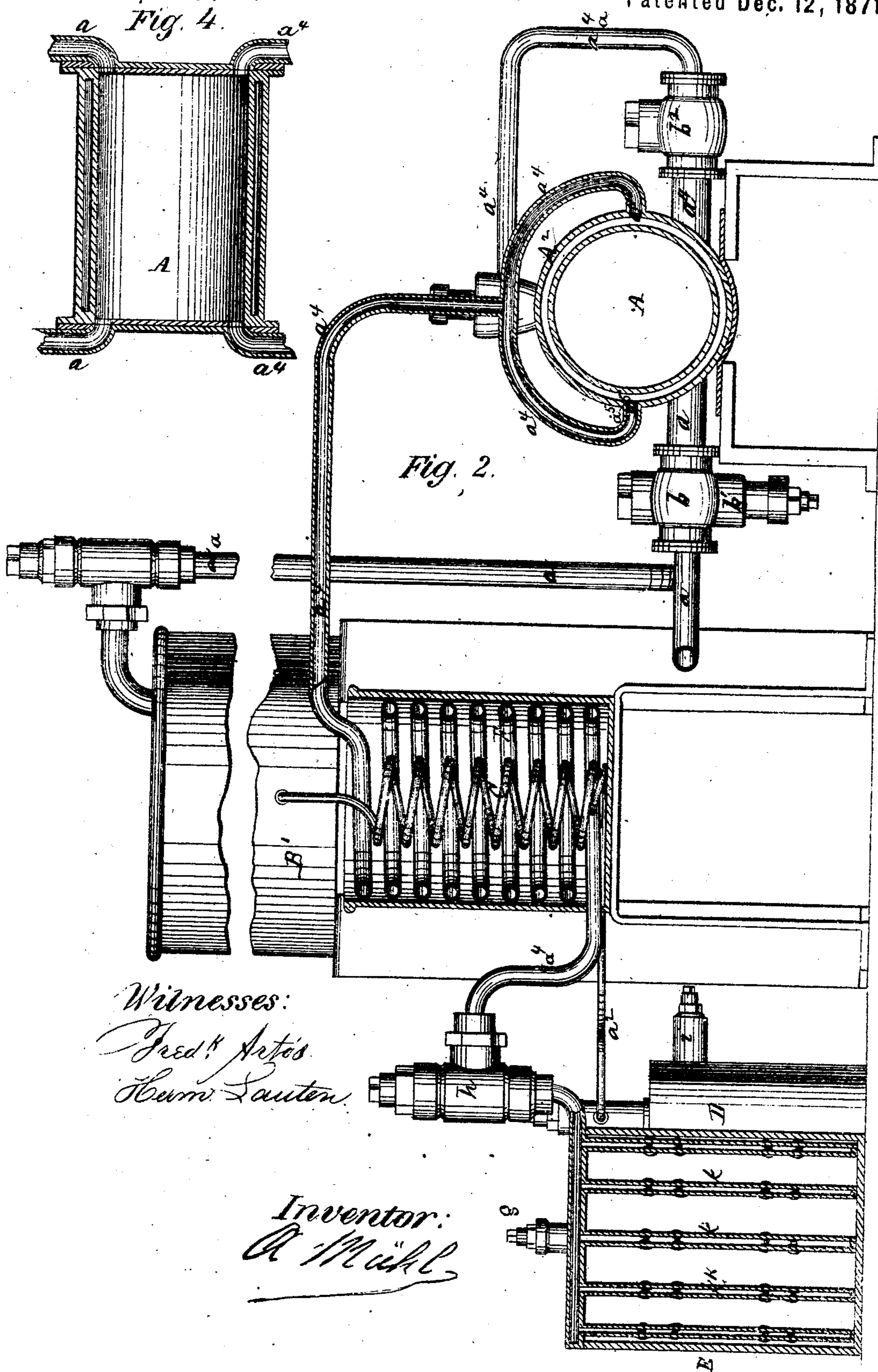
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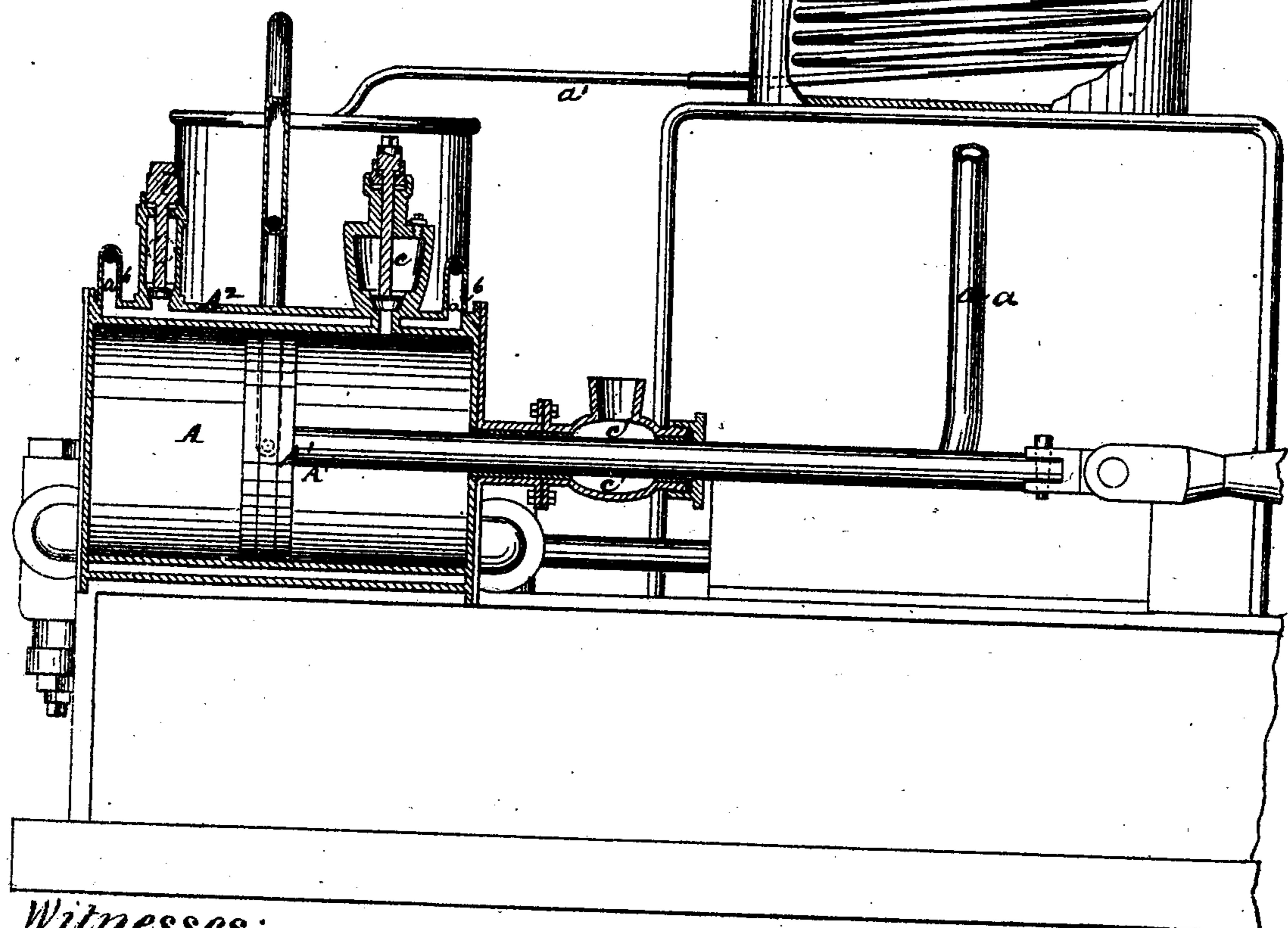
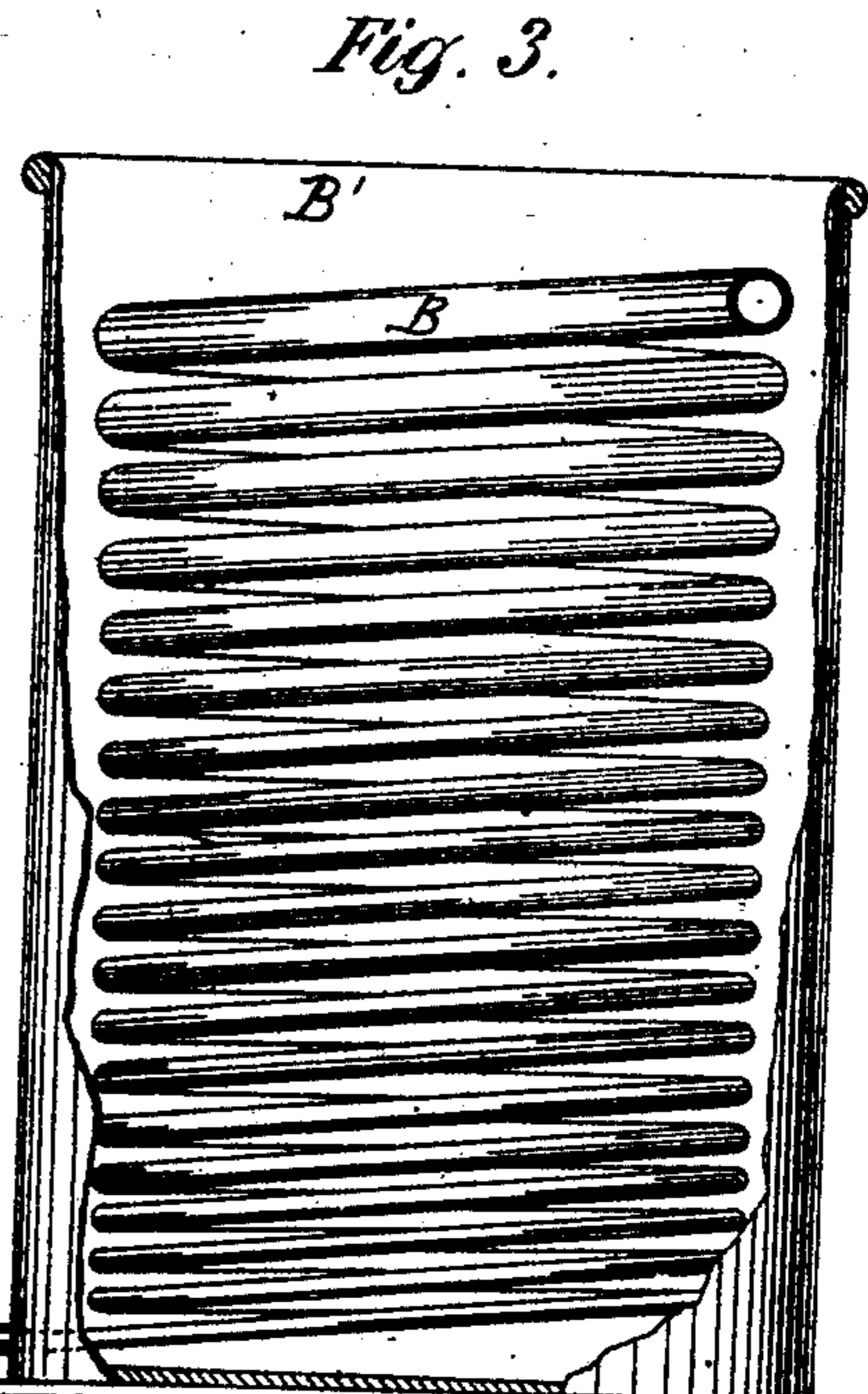
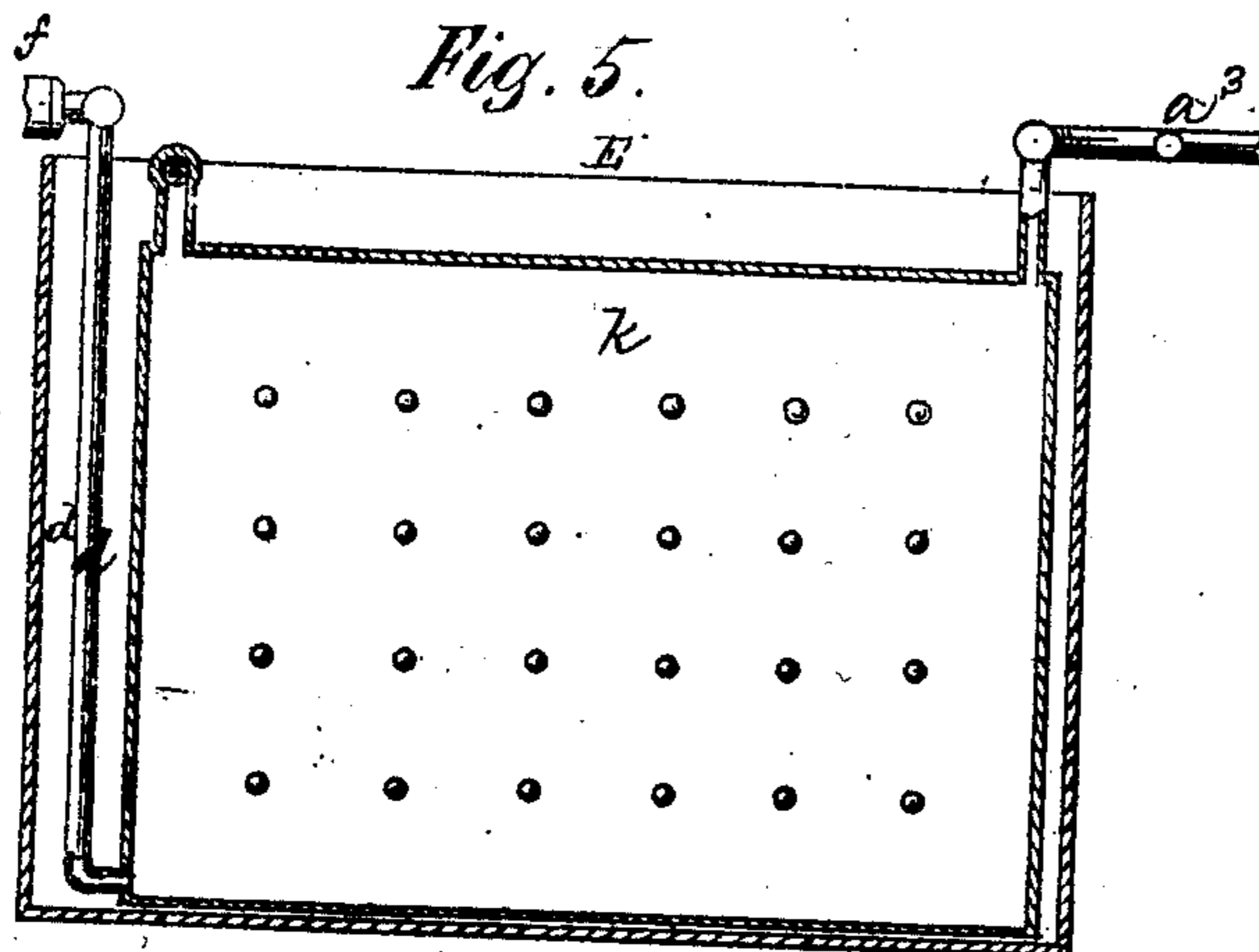
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ANDREW MÜHL.

Improvement in Ice Machines.

No. 121,888.

Patented Dec. 12, 1871.



Witnesses:
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UNITED STATES PATENT OFFICE.

ANDREW MÜHL, OF WACO, TEXAS.

IMPROVEMENT IN ICE-MACHINES.

Specification forming part of Letters Patent No. 121,888, dated December 12, 1871.

To all whom it may concern:

Be it known that I, ANDREW MÜHL, of Waco, in the county of McLennan and State of Texas, have invented certain new and useful Improvements in Apparatus for Making Ice and for refrigerating substances, of which the following is a specification:

My invention relates to ice-making machinery in which ether or other volatile substance which liquefies at a very low degree—below the freezing point of water—is the freezing agent; and it relates especially to those machines in which the ether, when vaporized, is reconverted into liquid by condensation or pressure. I can use as the freezing agent methylic ether, chloride of methyl, and like fluids which become liquid at a temperature of about half an atmosphere; but in the machine I find that methyli-chlohydric ether or methylamine can be used to better advantage, as they condense at quite as low a degree as those first named, and require less pressure in order to be liquefied. Other fluids known and used by others in ice-making machinery may, however, be employed with my apparatus, if desired.

My invention is particularly directed to the construction of the various parts of the apparatus, whereby the reversion of the ether into liquid before it reaches the freezing-vessel or chamber is better assured; the apparatus is enabled to work with less expenditure of power, and various defects in the pump, freezing-vessel, and other portions of the apparatus which have heretofore impeded the successful operation of the machine are removed.

In the accompanying drawing I have represented the manner in which my invention is or may be carried into effect.

Figure 1 is a plan view of the whole apparatus. Fig. 2 is a sectional elevation, the line of section being transversely through the middle of the pump. Fig. 3 is a sectional elevation of the apparatus, the line of section coinciding with the longitudinal axis of the pump. Fig. 4 is a longitudinal central section of the pump-cylinder detached. Fig. 5 is a longitudinal vertical central section of the freezing-vessel.

The general organization of the machine will be understood by reference to Figs. 1 and 2, and may be explained in a few words, after which I will set forth in detail the improvements in which my invention consists.

A is the double-acting pump, from which the ether, in the form of vapor, is forced through pipe a into the liquefactor, consisting, in this instance, of the two worms B C connected by a pipe, a^1 . From the liquefactor the ether, now converted into liquid, passes through the pipes a^2 and a^3 into the hollow partitions and walls k of the freezing-vessel E. Being then reconverted into vapor by absorbing the heat of the article or substance to be frozen, it passes from the freezing-vessel, through pipe a^4 and a worm, F, surrounding the worm C, back into the pump to again make the circuit of the apparatus. So far as the pump is concerned, it may be a pump of ordinary or suitable construction. In the drawing it is represented as consisting of a cylinder, A, Fig. 4, and piston A^1 , the cylinder being provided at each end with inlet-pipes a^4 and outlet-pipes a , so as to be double-acting. The inlet-pipes are provided with poppet or self-acting suction-valves b^2 , and the outlet-pipes with similar exhaust-valves b . Connecting with each of the valve-chambers of the latter valves is a trap, b^1 , closed at its lower part by a suitable stop-cock or valve, into which any glycerine, acid, or other liquid impurities that may happen to be discharged from the pump will gather, and whence they may be blown out or drawn off from time to time by opening the cock of the trap. These traps, thus located at the point where the vapor leaves the pump, are very necessary to the successful continuous operation of the machine, as they receive at the start impurities which would otherwise pass through the pipes and impede and clog the working of the apparatus.

It is indispensable to properly lubricate the cylinder, piston, and piston-rod; otherwise they soon become heated, sticky, and finally inoperative. I have discovered that glycerine is the only lubricant that can be used successfully with the pump, as the ether will decompose any other lubricant, which is, of course, fatal to the working of the pump. I therefore provide an oil-cup, c , with a nozzle opening into the interior of the cylinder and a valve for regulating the flow of the glycerine into the cylinder. From time to time, at such intervals as seem necessary, the valve is opened and a small quantity of the glycerine is allowed to escape into the cylinder. I also surround the piston-rod for a portion of its length with a cup, c' , also filled with glycerine,

through which the rod plays, a stuffing-box being fitted on each side of the cup to prevent undue escape of the lubricant in either direction. For a packing in the stuffing-boxes I employ pure rubber, as any other substance suitable for packing is affected injuriously by the ether. In order to prevent the cylinder from heating, and thus to enable it to operate under the best conditions, and continuously, I cool it from the exterior by surrounding it with a jacket, A^2 , so as to form around it an annular chamber, which is kept filled with the return ether, which, although in the form of vapor, is still cold enough to maintain the cylinder at a low temperature. To this end the return-pipe a^4 from the freezing-vessel opens into the jacket, as shown at a^5 , and the ether thus discharged into the jacket passes out therefrom at a^6 through the pipes connecting with the suction-valves b^2 . Thus the vapor, in returning to the pump, passes around the exterior of the cylinder and cools it before entering it through the valves b^2 .

The ether from the pump passes to the worm B, which serves to condense it. This worm is made of pipes of gradually-decreasing diameter or section in order to more perfectly condense the ether, as seen in Fig. 3; but this feature need not be here further described, as it is made the subject of separate Letters Patent issued to me November 28, 1871. In order to still further assure condensation I conduct the ether when it reaches the bottom or smallest part of the worm through the pipe a^1 into a second worm, C, which is surrounded by a worm, F, of larger dimensions, the latter worm receiving the return ether from the freezing-vessel on its way to the pump. This return ether, although in the form of vapor, is nevertheless possessed of considerable cold, and serves to still more perfectly condense the ether in the interior coil by cooling the water in the tank which surrounds both coils. The effect of this arrangement is that I am enabled to obtain perfect condensation with much less pressure and power than would otherwise be needed; for instance, when this additional condenser is employed, the pressure need not exceed forty or forty-five pounds to the square inch, while without it the pressure must be as high as sixty or sixty-five pounds and sometimes seventy pounds.

It is manifest that this feature of my invention may be applied in different ways, the principle consisting in using the return-ether vapor to reduce the temperature of the water which surrounds the condensing-worm or liquefactor, and I do not therefore limit myself to the precise arrangement described.

From the second worm the ether passes in liquid form through the pipe a^2 into the reservoir D, from which the pressure forces it through pipe a^3 into the hollow metallic walls and partitions of the freezing-vessel. This vessel does not require particular description, save in one respect.

During the continuous working of the machine impurities carried by the ether, such as glycerine, alcohol, acetic acid, and other foreign mat-

ters, are deposited in the bottoms or lower parts of the hollow walls and partitions, and if allowed to remain there seriously impede the operation of the machine, as they prevent the freezing of the water at the bottom of the cans placed in the compartments of the freezing-vessel, and the acid is, moreover, a great absorbent of ether. In order, therefore, to remove these foreign matters, I connect each wall and partition at the bottom with a pipe, d , communicating with a common blow-off cock or valve, f .

In order to get rid of the liquid I proceed as follows: I first close the cock g on pipe a^3 ; then exhaust the gas as completely as possible from the freezing-vessel, by means of the pump, in order to exhaust the ether from the liquid; then close the cock h on pipe a^4 and then open the cock g to let on pressure, which will have the effect to expel the liquid in the partitions of the freezing-vessel through the pipes d and blow-off cock or valves f , which of course is opened for the purpose. When the liquid has been expelled the cock f is closed, the cock h opened, and the ice-making process can proceed.

This cleansing operation need not occupy more than two minutes, and does not require the stoppage of the machine.

The various pipes of the apparatus are of course provided with cocks at proper points for regulating the flow of the ether and other purposes. The reservoir D is also provided with an air-cock, i , to allow escape of any air that may be contained in the machine at the start. A valve, l , on a pipe opening into the cylinder is intended to close said pipe when the same is not connected with the source from which the supply of ether is received in the first instance.

An apparatus constructed as described is simple, most effective in its operation, and comparatively inexpensive. The successful working of every ice-machine of the class to which this belongs depends upon the certainty and completeness with which condensation is effected, and to the absence of all foreign matters which tend to reduce the ether or impair its freezing properties or prevent it from acting properly upon the water to be frozen or the substance to be refrigerated, and these conditions I believe are realized in my apparatus. In a machine which I now have in operation, with a pump of six inches diameter and ten inches stroke, I produce fifteen hundred pounds of ice per day, with a pressure not exceeding forty-five pounds to the square inch, and the machine will work continuously night and day without stoppage.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The mode herein described of cooling the pump-cylinder by causing the return ether to surround it before entering the interior of the said cylinder, substantially in the manner shown and set forth.

2. In ice-making machinery such as specified the use of glycerine to lubricate the pump-cylinder and piston-rod, substantially as shown and set forth.

3. The combination, with the pump and pipe or pipes leading therefrom to the condenser, of the exhaust-valves and traps connected with said valves for receiving and carrying off the impurities discharged with the gas or vapor from the pump, substantially as shown and set forth.

4. The use of the return-ether vapor to more effectually cool and hasten the condensation of the ether passing from the pump to the freezing-vessel, substantially as herein shown and set forth.

5. The combination of the pump, the two condensing-worms, (one surrounded by a worm through which the return ether passes,) the reservoir, and the freezing-vessels, said parts being

arranged and connected together for joint operation, substantially as shown and set forth.

6. The freezing-vessel connected with the pump, as described, in combination with the system of pipes and cocks or valves whereby the liquid and other impurities which collect in its hollow partitions and walls may be discharged therefrom, substantially as shown and set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

A. MÜHL.

Witnesses:

M. BAILEY,

C. B. NOTTINGHAM.

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