No. 645,790. Patented Mar. 20, 1900.

C. F. CONOVER.

APPARATUS FOR PRODUCING DISTILLED WATER.

(Application filed Aug. 10, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1a

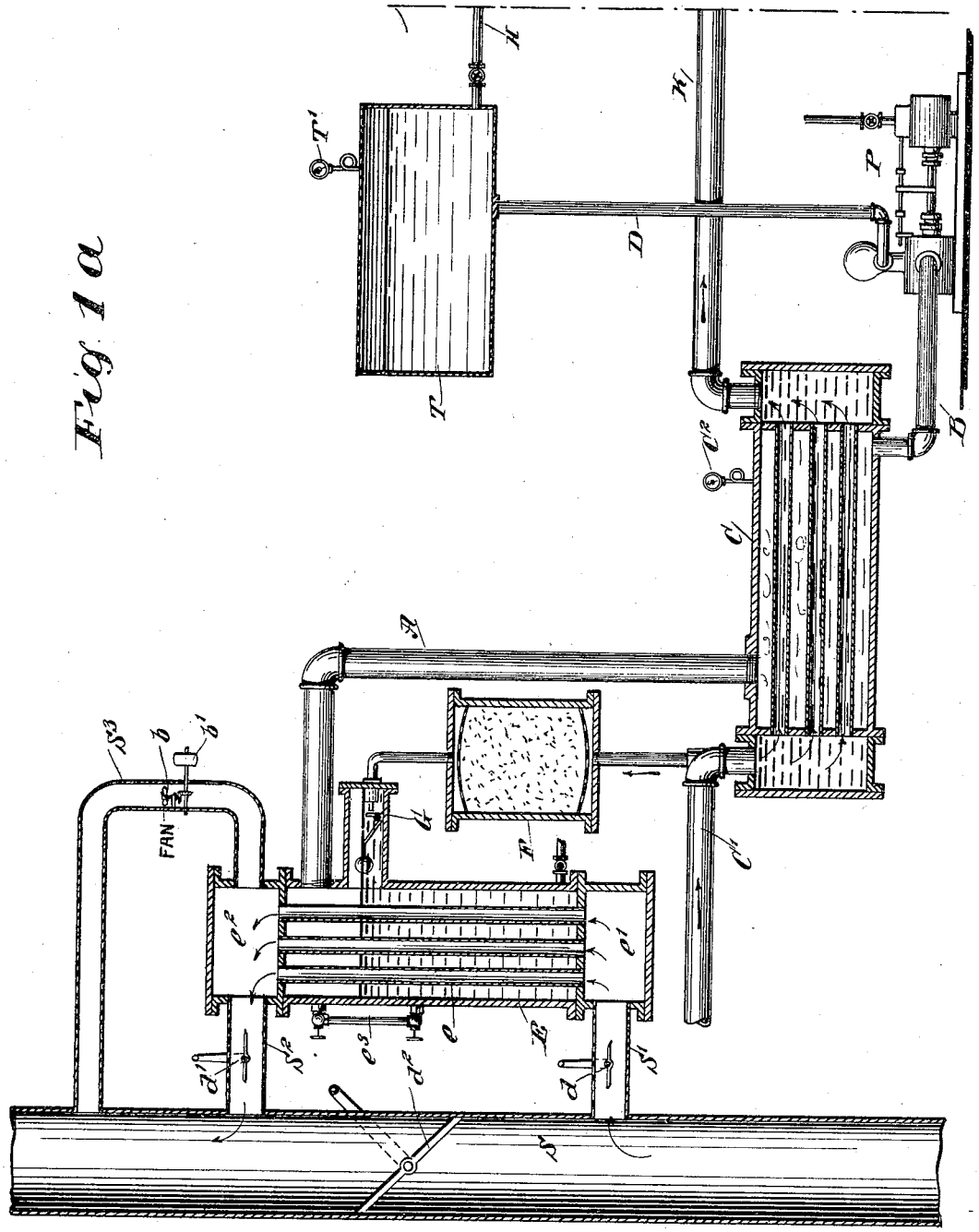

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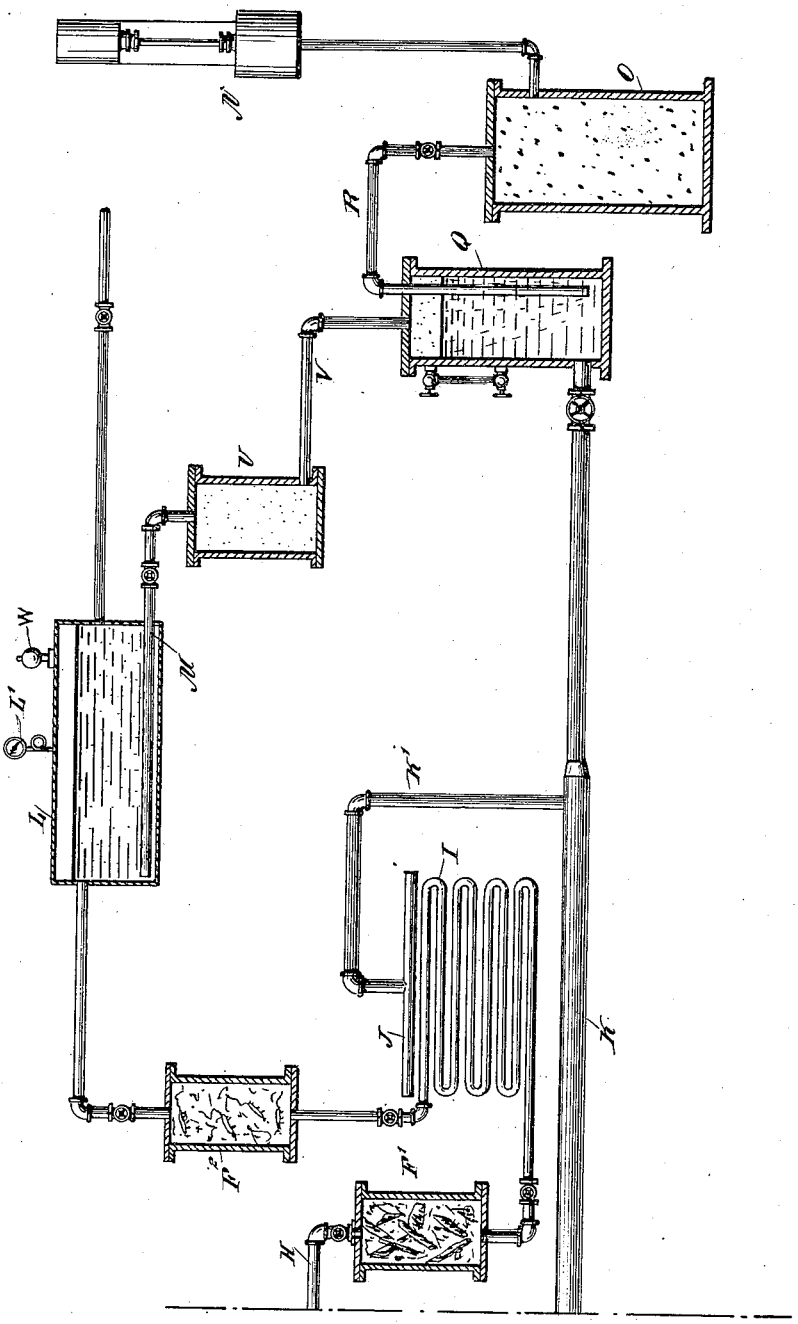
Fig. 1 6



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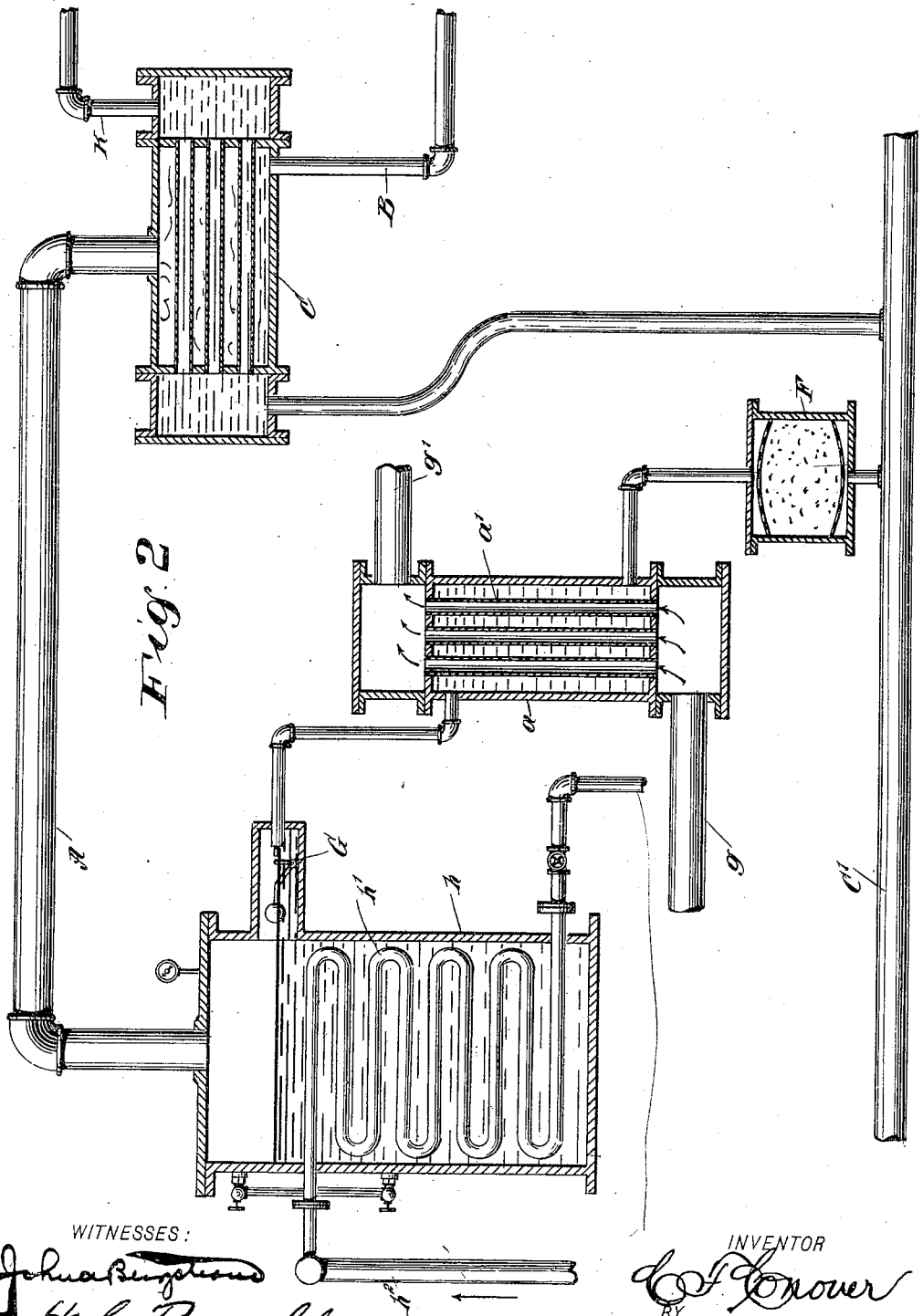

Fig. 2

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APPARATUS FOR PRODUCING DISTILLED WATER.

SPECIFICATION forming part of Letters Patent No. 645,790, dated March 20, 1900.

Application filed August 10, 1899. Serial No. 726,800. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. CONOVER, of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Apparatus for Producing Distilled Water, of which the following is a full, clear, and exact description.

My invention relates to an improvement in devices used for producing distilled water and in the manner of connecting the various parts of said mechanism together to produce this result.

The invention consists of a system of treating water by which it is evaporated and then condensed and purified so as to produce pure water.

My invention comprises the novel features which will be described hereinafter and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1^a is a diagram showing the parts in section and illustrating the means used for evaporating and condensing water. Fig. 1^b is a continuation of the same mechanism, showing the parts by which the water is further cooled, filtered, and aerated; and Fig. 2 shows a mechanism similar in many respects to the mechanism shown in Fig. 1^a, but designed for using the heat from a different source.

One object sought to be accomplished by my invention is to utilize waste sources of heat for the evaporation of water and then to condense the water so as to form chemically-pure or distilled water.

As shown in Fig. 1^a, the water is evaporated from the waste heat of a stack or flue carrying gases away from a furnace of any character—as, for instance, a boiler-furnace. The stack S is provided with a damper d^2, by means of which the free flow of the gas through the stack may be impeded when desired. Above and below this chamber two pipes S^2 and S′ are connected therewith and provided with regulating-dampers d' and d, by which the flow of gases through said pipes may be controlled. These two pipes connect, respectively, with the chambers formed in the upper and lower ends of the evaporator E, the lower pipe S′ discharging into the chamber e' and the upper pipe S^2 conducting the gases from the chamber e^2 into the stack. Any form of surface evaporator may be employed for this purpose.

The evaporator herein shown consists of a cylinder having double heads at each end, forming the two chambers e' and e^2. The inner heads at each end are connected by pipes e, through which the gases pass in their course, acting upon the water which is contained in the cylinder E. For convenience in determining the level of the water in the evaporator it is shown as provided with a gage-glass e^3. The water is introduced into the evaporator through a valve G, which performs the office of a governor, the same having a float attached which will close it when the water rises above a certain level and which will open it when the water falls below the same level. The feed-water pipe, which is connected with the valve G, has a sand filter F connected with the same, so that the water before reaching the evaporator is all filtered. The feed-pipe may be connected with any convenient source of water-supply and may, if a sufficiently-pure water is used for that purpose, be connected with the pipe C′, as herein shown, through which the water for condensing purposes is drawn.

The upper chamber e^2 of the evaporator may be connected with the stack S by a pipe S^3, in which is placed a fan b to assist the draft, the fan being operated by means of a pulley b' outside of said pipe, the pulley being turned by any suitable motor.

At the upper portion of the central chamber of the evaporator is connected a pipe A, through which the watery vapors are drawn off to the condenser C. The condenser C is of the ordinary form of surface condenser, the same being herein shown as being constructed similar to the evaporator E. The condensing water, which is delivered through the pipe C′ to one end of this condenser, flows through the pipes in the same and the watery vapors occupy the space in the central chamber around said pipes.

The central chamber is connected by a pipe B with a vacuum-pump P, by means of which the water of condensation and any air which

may be drawn from the water are drawn off and forced into a storage-tank T by means of the delivery-pipe D, leading from the pump. For convenience the condenser C is shown as being provided with a vacuum-gage C^2, by means of which the amount of vacuum may be known at any time, and the tank T is provided with a pressure-gage T'. The pipe K, leading from one end of the condenser, carries the water of condensation away from the same. A pipe H is connected with the storage-tank T' and carries the water which has been condensed to a filter F', which is filled with vegetable charcoal. The water after passing through this filter is conducted through a coil I, above which is placed a perforated pipe J, which is supplied with water by means of a pipe K', connecting the same with the supply-pipe K. This spray keeps the coil I covered with a film of water and thoroughly cools the condensed water. The condensed water after leaving the coil I passes through a filter F^2, which is filled with animal charcoal, and is then conducted to a tank L, which forms a storage-tank and through which air is forced upward through the water so as to aerate it.

An air-compressor N is provided as a part of my system and delivers compressed air to a tank O, from which it is drawn by means of a pipe R, which passes downward within a scrubbing-tank Q, which is nearly filled with water from the reduced end of the pipe K. The pipe R discharges its air near the bottom of the tank, and the air is thus forced to rise through the water and is thus cleansed of its dirt and injurious gases. The air is drawn from the scrubber through a pipe V to a storage-tank U, from which it is drawn by means of a pipe M, which passes into the water-storage tank L and lies close along the bottom thereof, the part of said pipe which lies within the tank being provided with fine perforations, by means of which small jets of air are discharged into and rise through the water in the tank, thus permitting it to absorb a certain portion of air.

A blow-off valve W may be connected with the tank, so that the air-pressure within may not rise above a desired point. This valve would be set to blow off at such a point as desired, and will thus prevent an undue accumulation of pressure in the tank. The tank may also be provided with a pressure-gage L'.

The mechanism shown in Fig. 2 is essentially the same as that shown in Fig. 1ª, but is designed for using the waste heat from a different source. The evaporator *h* has a coil of pipe *h'* within the same, said evaporator consisting of a plain tank. The coil *h'* in this case is designed for connection with the pipe h^2, through which ammonia-gas is conducted immediately after its compression, and is designed for absorbing the heat of compression from the ammonia. The water which is conducted to this tank may be taken directly from any ordinary source of supply or may be passed first through a heater *a*, which, as herein shown, is a heater similar to the evaporator E (shown in Fig. 1ª) and is designed for receiving the exhaust-steam from an engine, the same being delivered through the pipe *g* and conducted away through a pipe *g'*, the steam passing in the meanwhile through the pipes *a'* of the heater. This will heat the water before its introduction into the evaporator. Where it is possible to use such a heater before introducing the water to the evaporator, it will be found desirable, as it will increase the capacity of the same.

The vapor from the evaporator is conducted through a pipe A to a condenser C, which is in all respects similar to the condenser shown in Fig. 1ª. The filter F, the supply-pipe G, and the two pipes B and A are also similar to similarly-lettered pipes shown in Fig. 1ª. It is evident that the waste heat from any source may be utilized in this manner to evaporate water, the same being possible by reason of the fact that the vacuum-pump lowers the pressure upon the water, and thus causes it to boil or vaporize at much lower temperature than where it is subjected to the ordinary atmospheric pressure.

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

1. In an apparatus for the purpose described, an evaporator adapted to utilize waste sources of heat, a feed-water pipe with which said evaporator is connected, a condenser also connected to said feed-water pipe and connected to the evaporator, filtering devices connected with said condenser, a storage-tank connected with said filtering devices, an air-compressor adapted to discharge air into said storage-tank, a scrubbing-tank interposed between the latter and said air-compressor, a cooling-coil interposed between the storage-tank and condenser, and a feed-water pipe leading from said condenser and supplying water to the scrubbing-tank, the said pipe having a branch pipe on which is a perforated pipe adapted to spray the cooling-coil, as set forth.

2. In an apparatus for producing distilled water, an evaporator, a connection therefrom to a suitable heat-supply, a condenser having a vapor-pipe connection with the evaporator, a storage-tank arranged to receive the condensed water from the condenser and provided with an aerating-pipe, a cooling-coil, interposed between the tank and the condenser, a water-supply pipe, connected to one end of the condenser and leading the condensing water therefrom to an air-washer, said latter pipe being provided with a branch which carries a spraying-pipe for the coil, and an air-washer serving to wash the air before it is supplied to the aforesaid aerating-pipe, substantially as described.

3. An improved apparatus for distilling water by the utilization of waste sources of

heat, consisting of an evaporator having upper and lower chambers provided with pipes adapted to be connected to a smoke-stack or the like, a condenser having a vapor-pipe connection with one end of the evaporator, a storage-tank arranged to receive the condensed water from the condenser and provided with an aerating-pipe, a cooling-coil interposed between the tank and the condenser, a water-supply pipe connected to one end of the condenser, and leading the condensing water therefrom to an air-washer, said pipe being provided with a branch, a spraying-pipe on said branch and extending over the cooling-coil, and an air-washer, serving to wash the air before it is supplied to the aforesaid aerating-pipe, substantially as described.

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