

No. 740,859.

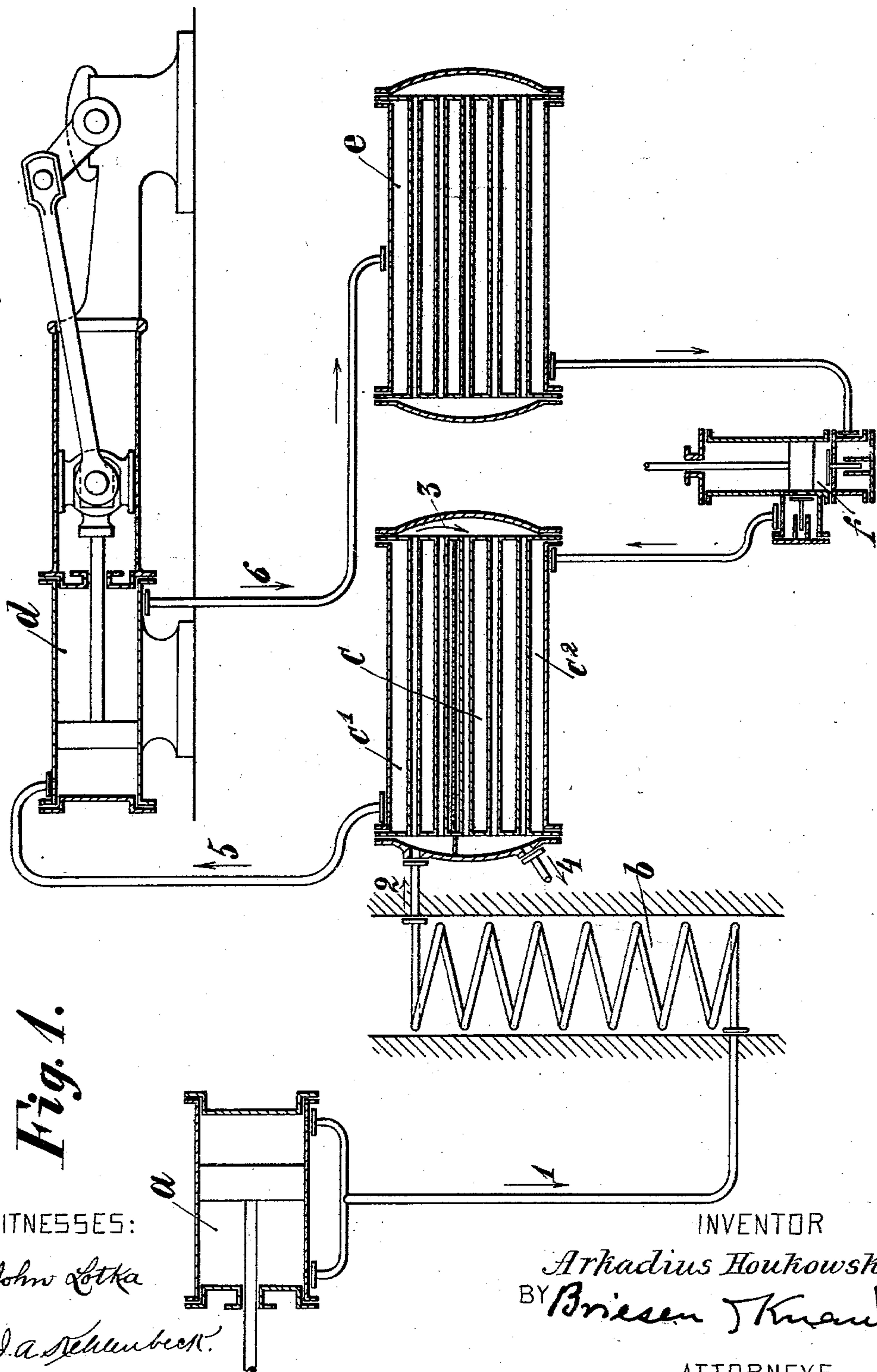
PATENTED OCT. 6, 1903.

A. HOUKOWSKY.
PROCESS OF SUPERHEATING THE DRIVING MEDIUMS OF
COLD VAPOR ENGINES.

NO MODEL.

APPLICATION FILED MAR. 10, 1903.

2 SHEETS—SHEET 1.



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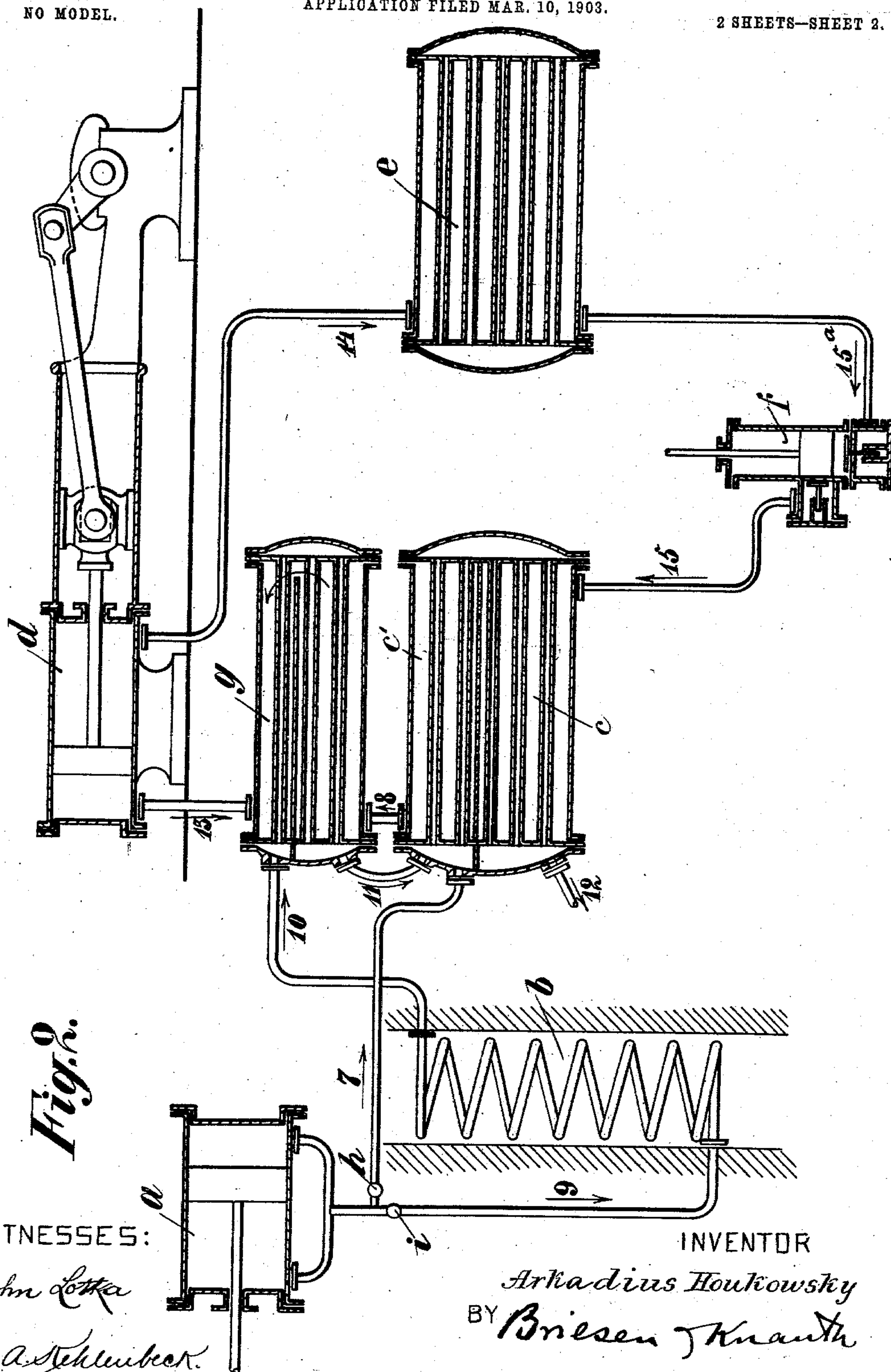
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NO MODEL.



WITNESSES:

John Latta
J. A. Stehmbach.

INVENTOR

Arkadius Houkowsky
BY Briesen Knauth

ATTORNEYS

UNITED STATES - PATENT OFFICE.

ARKADIUS HOUKOWSKY, OF BERLIN, GERMANY.

PROCESS OF SUPERHEATING THE DRIVING MEDIUMS OF COLD-VAPOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 740,859, dated October 6, 1903.

Application filed March 10, 1903. Serial No. 147,072. (No model.)

To all whom it may concern:

Be it known that I, ARKADIUS HOUKOWSKY, a subject of the Emperor of Russia, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Processes of Superheating the Driving Mediums of Cold-Vapor Engines, of which the following is a specification.

My present invention relates to cold-vapor engines, and has for its object to insure an efficient superheating of the cold vapor which is employed as the driving medium of such engines. This cold vapor is produced from a liquid having a low boiling-point by the waste heat of the exhaust of a steam-engine or the like. It is advisable to produce as perfect a vacuum as possible on the exhaust side of a steam-engine and on the other hand to give the live medium of the cold-vapor engine (that is, the cold vapor) as high an initial pressure as possible, and therefore the exhaust of the steam-engine is generally caused to generate dry saturated cold vapor or very slightly superheated cold vapor. To superheat this cold vapor, it is exposed to the action of combustion-gases from the boiler-furnace or other suitable source. In the cold-vapor generator heated by the exhaust-steam saturated or wet cold vapor is produced, which is then superheated in a separate apparatus (a superheater) exposed to the combustion-gases. The objection to this arrangement is that it cannot be relied upon to operate with the requisite degree of safety unless the superheater is given very great strength.

According to my present invention the heat contained in the combustion-gases is not utilized directly for superheating the cold vapor, but indirectly through the medium of the exhaust-steam. For this purpose the entire amount of the available exhaust-steam or a portion of such steam is first conducted into a superheater heated by the combustion-gases from the boiler-furnace, and in this superheater the exhaust-steam is heated at a constant pressure, and simultaneously any condensation-water that the exhaust-steam may contain will be converted into steam. The pressure of the exhaust-steam, or rather the vacuum, of course is not affected by this increase in the temperature of the exhaust-

steam, for the reason that the exhaust-steam can freely pass from the generator (the steam-cylinder) through the superheater to the air-pump, and the degree of vacuum depends on the subsequent condensation of the exhaust-steam and upon the withdrawal of the air by the pump. This hot and superheated exhaust-steam can be utilized for the production of the cold vapor or the superheating thereof, or for both purposes. The superheating of the cold vapor may take place in a separate superheater, or the production and the superheating of the cold vapor may be carried out in one and the same tubular apparatus of suitable construction. Since a relatively high temperature can be given to the exhaust-steam by means of the combustion-gases, it becomes possible to employ in the vaporizer relatively large differences of temperature between the exhaust-steam and the liquid from which the cold vapor is to be generated. The heating-surface of the vaporizer may therefore be relatively small. On the other hand, there is secured a very important advantage in that the apparatus containing the liquid or the cold vapors produced therefrom comes in contact with steam of a pressure not exceeding atmospheric pressure. Hence this apparatus may be constructed with a very high degree of safety.

To more fully explain my invention, I will now proceed to describe two manners of carrying it out, referring to the accompanying drawings, in which—

Figure 1 is a diagrammatic section showing a plant embodying my invention, and Fig. 2 is a similar view of another arrangement.

In Fig. 1, *a* indicates the cylinder of a steam-engine from which the exhaust passes through a pipe, as indicated by the arrow 1, to a superheater, preferably in the nature of a coil *b*, which is located in a conduit or channel through which the heating-gases pass. These gases generally are the combustion-gases coming from the boiler-furnace. The exhaust having been superheated passes, as indicated by the arrow 2, into a tubular vaporizer *c*, which by means of a partition at the left-hand portion is divided into an upper section *c'* and a lower section *c''*. The superheated exhaust-steam therefore first passes through the tubes

of the upper section c' and then downward, as indicated by the arrow 3, to reach the tubes of the lower section c^2 , finally passing out through the outlet 4 to the atmosphere or to the air-pump. f indicates a pump which feeds the liquid from which the cold vapor is to be produced into the lower part c^2 of the vaporizer. Here the liquid is vaporized by the waste steam, and the vapor is superheated in the upper section c' of the vaporizer c . This superheated cold vapor passes, as indicated by the arrow 5, to the cylinder d of the cold-vapor engine. From this cylinder the cold vapor exhausts, as indicated by the arrow 6, to the condenser e , of any suitable construction, from which the liquid is drawn into the pump f , which therefore keeps up a circulation of the cold vapor and of the liquid from which it is produced.

In Fig. 2 I superheat only a portion of the exhaust-steam. This portion, the amount of which is controlled by the position of the valve i , passes to the superheater b , as indicated by the arrow 9, and then travels, as indicated by the arrow 10, to the superheater g of the cold vapor. The waste steam after passing through the superheater g travels through a pipe 11 to the upper section c' of the vaporizer c . Into this upper section is also introduced that portion of the exhaust-steam which travels direct from the cylinder a through a pipe 7 without being superheated. A valve h is provided to regulate the relative amount of this portion of the exhaust-steam. The steam then flows through the vaporizer in substantially the same manner as described with reference to Fig. 1 and passes from the outlet 12 either to the atmosphere or to an air-pump. The liquid to be vaporized is fed by the pump f through a pipe 15 and first becomes vaporized and then

superheated, the superheating taking place partly in the upper section c' of the vaporizer, but chiefly in the superheater g , which is connected with the upper section of the vaporizer by a pipe 8. 13 designates the pipe for conveying the cold vapor from the superheater g to the cylinder d of the cold-vapor engine. The exhaust of said engine passes through the pipe 14 to the condenser e , from which it returns in liquid form to the pump f through the pipe 15^a.

Instead of conducting the superheated steam from the superheater g to the upper section of the vaporizer c , as by the pipe 11, I may allow the steam to pass from the superheater g either directly to the atmosphere or to the air-pump. In this case only the portion of the steam which flows through the pipe 7 would reach the vaporizer c .

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

1. The herein-described process of superheating the driving medium of cold-vapor engines, which consists in superheating exhaust-steam and causing the said superheated exhaust-steam to give off heat to the cold vapor so as to superheat the latter.

2. The process of superheating the driving medium of cold-vapor engines, which consists in superheating exhaust-steam, and causing such superheated steam to give off heat to first produce cold vapor and then superheat such cold vapor.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARKADIUS HOUKOWSKY.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.