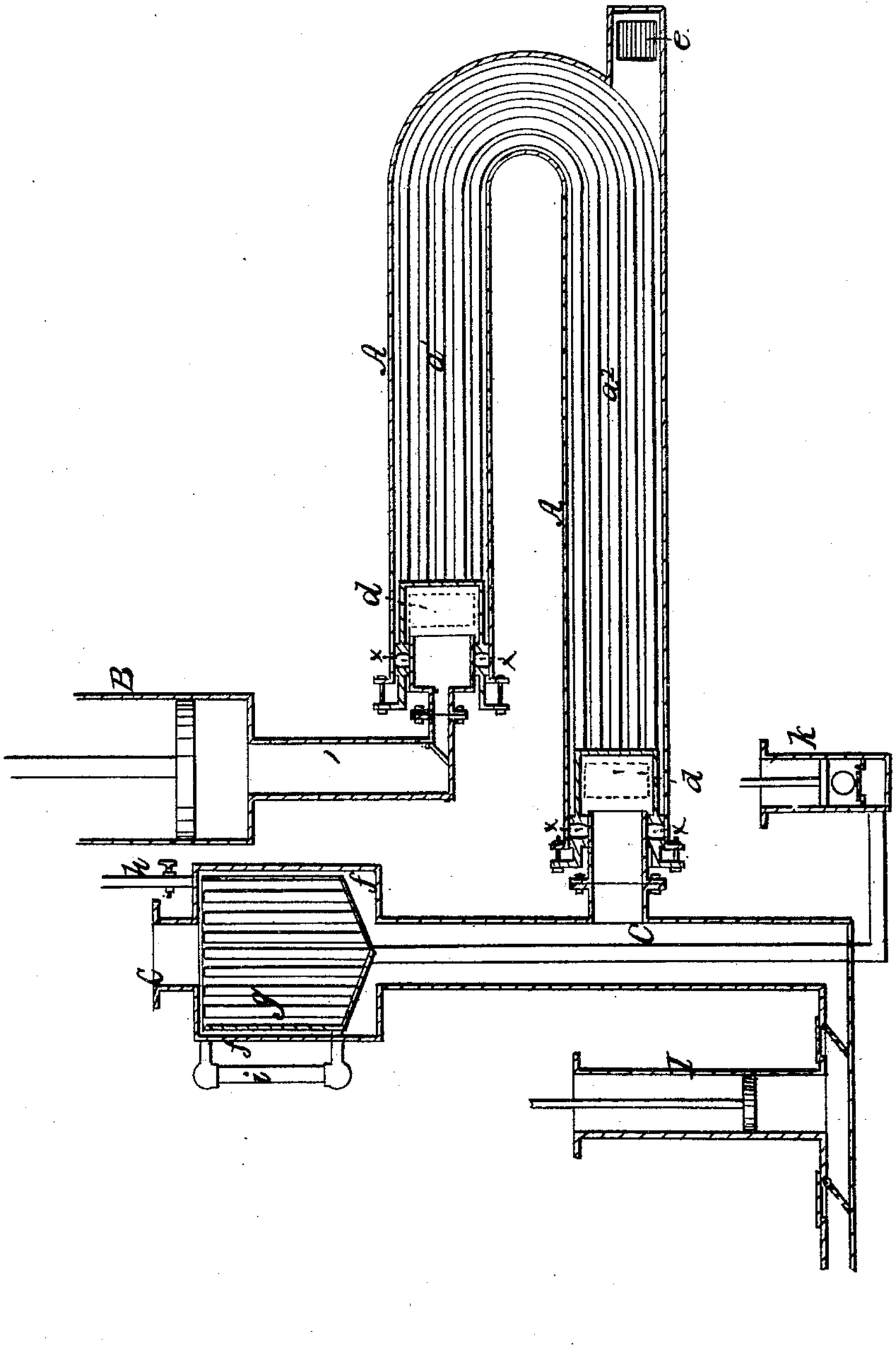
B. CRAWFORD.

CONDENSER.

No. 10,179. Patented Nov. 1, 1853.



UNITED STATES PATENT OFFICE.

BENJAMIN CRAWFORD, OF PITTSBURGH, PENNSYLVANIA.

CONDENSER FOR STEAM-ENGINES.

Specification of Letters Patent No. 10,179, dated November 1, 1853.

To all whom it may concern:

Be it known that I, BENJAMIN CRAWFORD, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Condensers for Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, which forms part of this specification and which represents a longitudinal vertical section of my improved condenser.

The condenser represented in the accompanying drawing is designed to be applied to a marine engine, and consists of a series of bent tubes situated within a water channel or case (A). The upper limbs (a') of the series of tubes communicate at their ends with the air pump (B) of the engine while the lower limbs (a^2) of the series of tubes communicate with the escape pipe (C) leading from the exhaust valve of the engine. The position of this condenser in the vessel is below the water level, and the tubes run in the direction of the length of the ship, with their extremities facing the bow, or their position may be in any other suitable direction. Openings (d) are made in the front extremities of the two limbs of the water jacket or case, and a similar opening (e) in the opposite, or back end of the case; these openings form inlet and outlet passages for the water through the condenser, and they may be connected with the water outside by pipes passing through the bilge of the vessel, so that a constant current of water will be forced through the jacket and among the tubes for the purpose of condensing the steam or vapor entering the tubes from the engine; the outlet opening (e) may be made below the lower series of tubes (a^2,) near their back end so that any shells or other obstructions, entering through the inlets (d,) will be prevented from collecting in the lower part of the bend or elbow of the case, and will be readily washed out through the discharge opening or outlet by the force of the current which the forward motion of the vessel will induce through the case.

The escape pipe (C,) which conveys the steam from the engine to the condenser, connects with an intervening chamber (f,) that contains an evaporator (g,) within it. The steam in passing from the engine to the condenser passes through tubes in the evaporator and around the sides and edges thereof for the purpose of communicating heat to the water to distil it from the salt. The object of this evaporator is to supply as much distilled vapor free from saline or other extraneous matter as is wasted by the leakage or escape of steam in the working of the engine; salt water is let into the evaporator through a branch or cock (h,). The tubes in the evaporator project above the surface of the water, so that the brine may not overflow through them. A glass gage (i,) is connected by a branch with the evaporator near its bottom, and with the intervening chamber (f,) at its top; this gage serves to indicate the quantity and condition of the water in the evaporator, so that it may appear on inspecting it, when the brine requires to be drawn off and the evaporator replenished with water; the former may be effected by means of a brine pump (k,) and pipe ( ) passing through the escape pipe (C,). The steam as it escapes from the engine to the condenser strikes upon the surface of the water in the evaporator and thereby induces immediate evaporation, which is further assisted or increased by the passage of steam through the tubes and down the outside of the evaporator. The steam after thus parting with a portion of its surplus heat to the surface of the water mixes with the vapor rising therefrom and both pass off down the escape pipe (C,) to the lower limbs (a^2) of the series of tubes where it enters and becomes instantaneously reduced in temperature by the cold that exists at the mouth of the tubes from the constant influx of water through the inlet passage (d,) of the water case; the steam passes along to the rear of the lower limbs (a,^{2}) of the tubes, and ascends to the upper limbs (a') and passes on toward the open extremity of the same, but is fully condensed before reaching it, and the steam in passing back along the upper limbs of the tubes is brought into contact with surfaces gradually cooler as it approaches the upper inlet (d,) at which the cold water enters, effectual condensation is insured whereby the escape of any vapor to the air pump (B,) is avoided; the temperature of the condenser will be lowest at the ends of the tubes. The condensed water falls from the tubes into the lower part of the escape pipe (C,) and is drawn off by a feed pump (I,) to supply the boiler.

By the use of the evaporator a supply of distilled water is kept up to the boiler which is thereby preserved from crusting, and the many other inconveniences attached to the use of saline and earthy water; but in river and land engines the evaporator may if desired be dispensed with, and in stationary engines the current through the water case of the condenser may be produced by a natural fall of water, or by means of a force pump, or in any other suitable manner. The case of the condensing tubes and the passage pipes are united by means of a flexible joint or stuffing box to permit the free expansion and contraction of the apparatus, and allow it to be twisted, without danger of fracture, by the working of the vessel.

What I claim as my improvement in condensers and desire to secure by Letters Patent, is—

1. The arrangement of the tubes or passages in the condenser with the inlet and outlet openings in the case, substantially as specified, so that, a current of cold water is caused to flow around both ends of the tubes whereby the condenser is prevented from undue heating and the tubes kept coolest at both ends and warmest at the middle whereby the great bulk of the heat is transferred to the condensing water, near the point at which it is discharged from the case.

2. Constructing the case of the condenser with stuffed or other equivalent joints to render it flexible and thereby prevent fracture.

In testimony whereof, I have hereunto subscribed my name.

BENJ. CRAWFORD.

Witnesses:
P. H. WATSON,
PETER HANNAY.