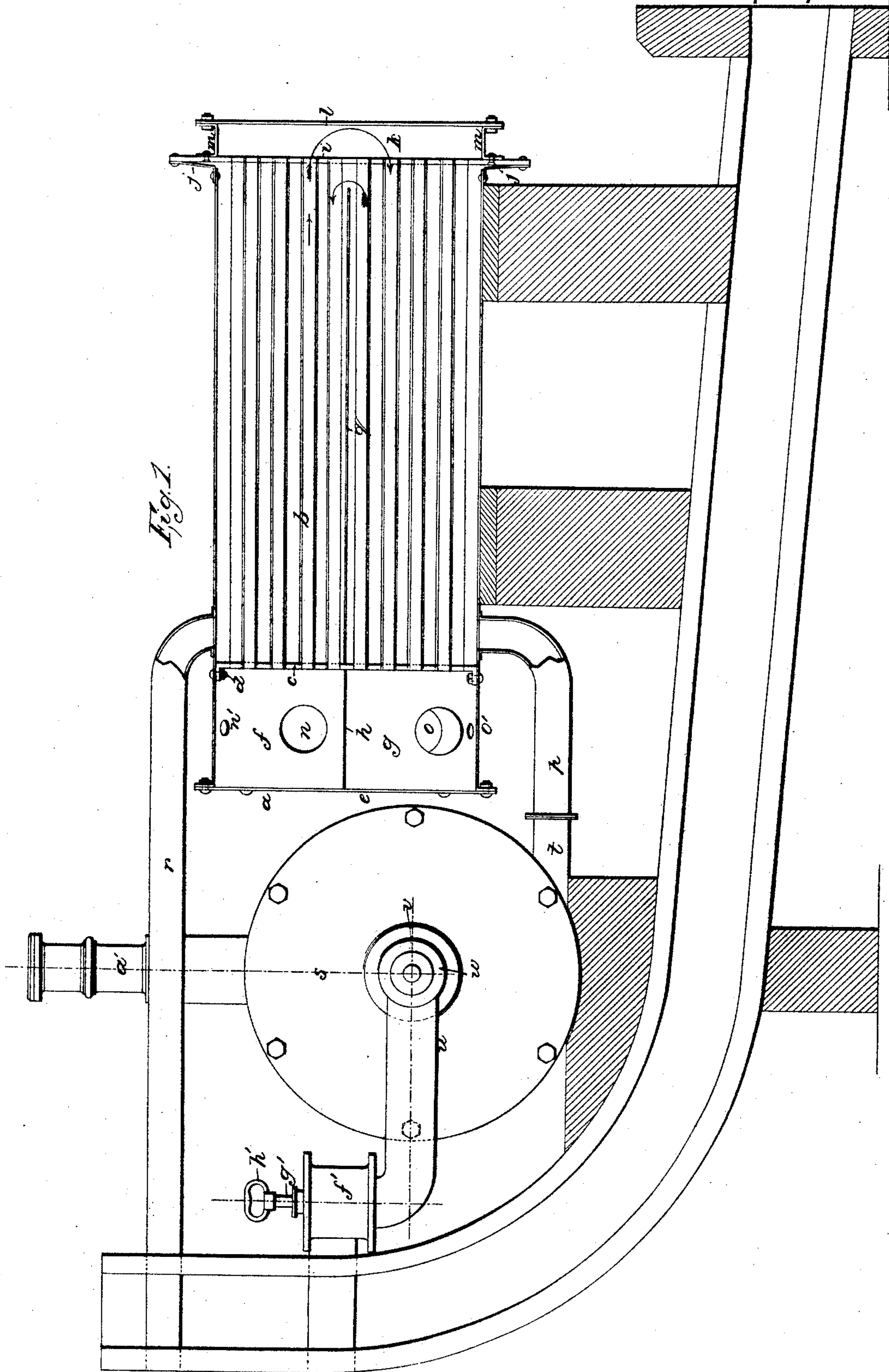


J. ERICSSON.

Steam Engine.

No. 6,255.

Patented Apr. 3, 1849.



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Steam Engine.

2 Sheets—Sheet 2.

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Fig. 2.^{xx}

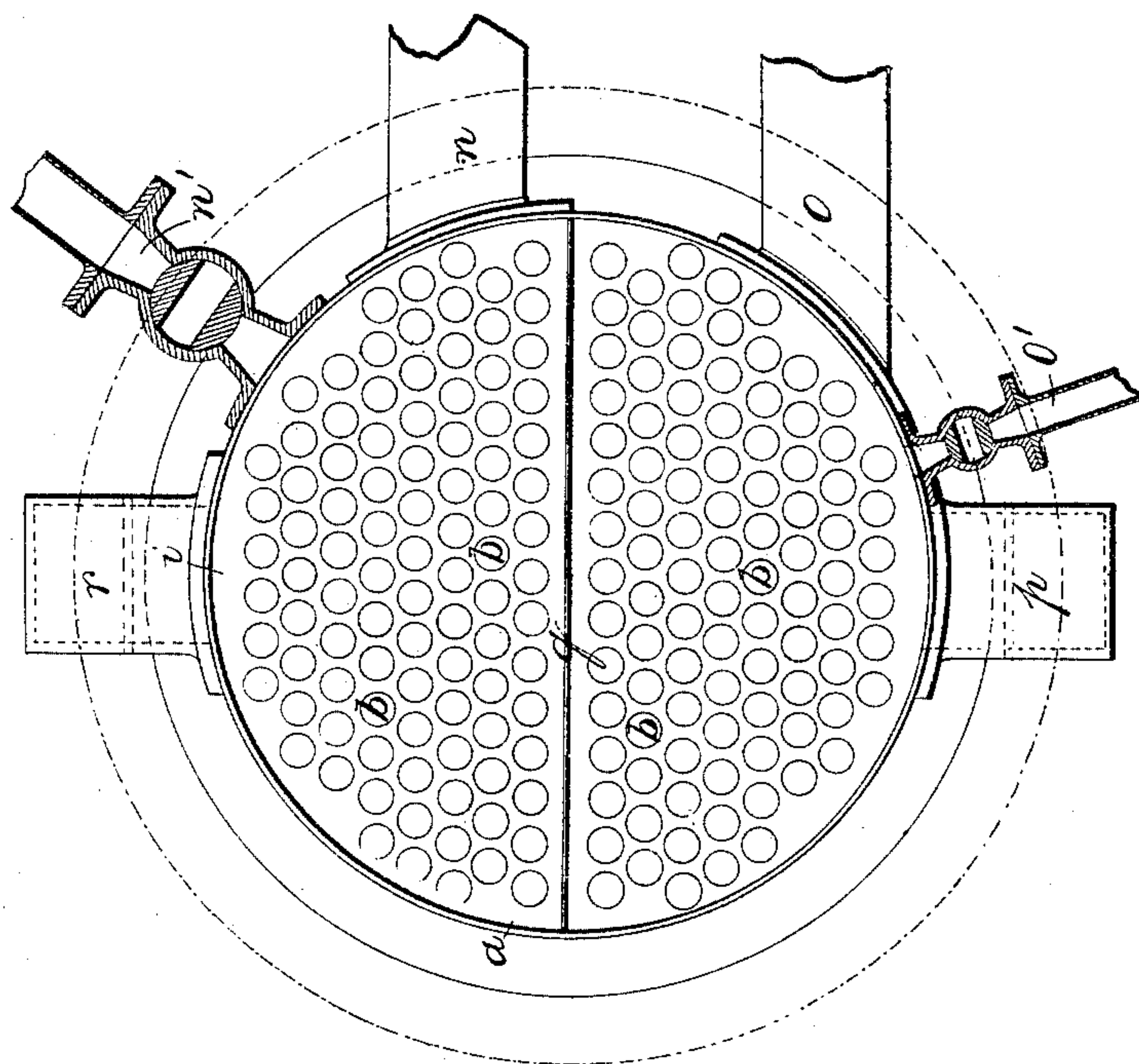
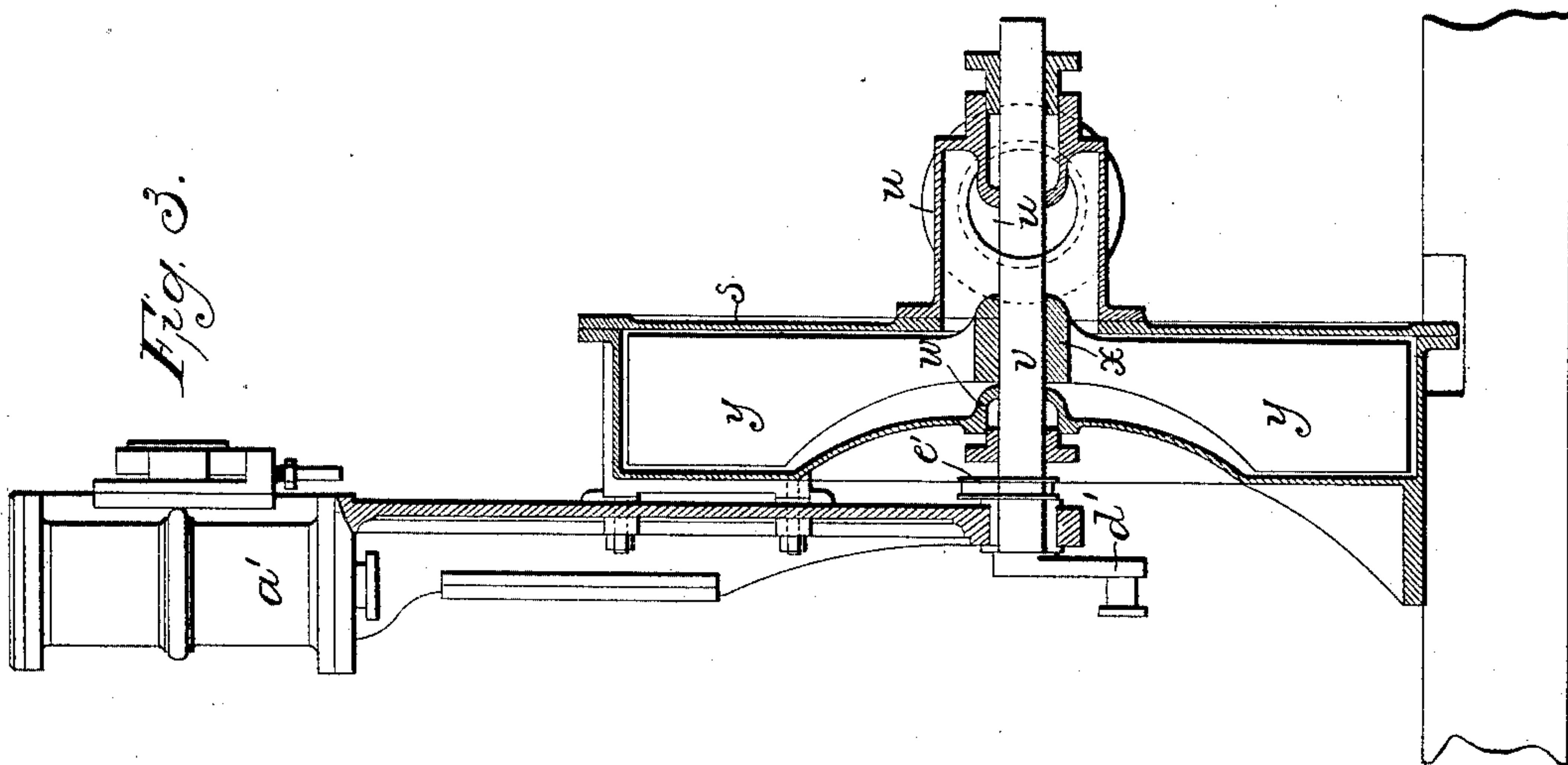


Fig. 3.



UNITED STATES PATENT OFFICE.

JOHN ERICSSON, OF NEW YORK, N. Y.

EMPLOYMENT OF AN AUXILIARY ENGINE IN COMBINATION WITH THE CONDENSER-PUMP.

Specification forming part of Letters Patent No. 6,255, dated April 3, 1849.

To all whom it may concern:

Be it known that I, JOHN ERICSSON, of the city, county, and State of New York, have invented a Fresh-Water Apparatus for Steam Ships, Boats, and other Vessels Propelled by Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a longitudinal vertical section; Fig. 2, a cross-section of the condenser, taken at the line X X of Fig. 1; and Fig. 3, a cross-section of the pumping part of the apparatus and the auxiliary engine by which it is operated.

The same letters indicate like parts in all the figures.

The object of my invention is to condense the steam without admixture with the condensing-water, that the water produced by the condensation may be carried back to the boiler to prevent the evil consequences arising from the use of water that contains in solution or suspension mineral or other solid matter, and to condense the steam which escapes from the safety-valve, and also for the production of fresh water for any other use.

In my fresh-water apparatus I use a tubular condenser, through the tubes of which the steam passes and is condensed by the cooling influence of a current of cold water taken from the outside of the vessel or ship and made to pass outside of the tubes; and to this end the first part of my invention consists in combining the condenser of a steam-engine for the propelling of a ship or vessel with a pump which receives the condensing-water from outside the ship or other vessel and causes it to pass through the condenser, the said pump being operated, irrespective of the engine that propels the vessel, by means of an auxiliary engine, whereby the amount of condensation can be regulated independently of the working of the engine that propels the vessel.

The second part of my invention consists in connecting the condenser with the boiler or boilers, or any part thereof, in addition to its or their connection with the exhaust of

the engine when the pump which carries the condensing-water through the condenser is operated by an auxiliary engine, by means of which double connection not only is the steam that escapes from the safety-valve condensed to be carried back to the boiler, but the boiler or boilers may be used to distill and produce fresh water for any purpose desired when the engine is not employed for propelling the vessel; and the last part of my invention consists in connecting the tubes of the condenser with the cylinder or outer case thereof by connecting one or both of the diaphragms, to which the ends of the tubes are secured, with the outer cylinder or case by means of a ring and flange or the equivalent thereof, so that the said ring or flange may bend to adapt itself to the unequal contraction and expansion of the tubes and cylinder or outer case of the condenser.

In the accompanying drawings, *a* represents a horizontal cylinder, within which are arranged a series of small parallel tubes *b*. One end of the said tubes is secured, in the usual way or any other desired and appropriate manner, to a diaphragm *c*, which has a turned flange through which rivets or bolts *d* pass to secure it to the cylinder *a*, and within such distance of the head as to leave a sufficient space between it and the head *e* of the cylinder for two chambers *f* and *g*, these two chambers being separated by a horizontal diaphragm or partition *h*. The other ends of the tubes are in like manner secured to another diaphragm *i* at the other end, which said diaphragm, instead of being bolted directly to the end of the cylinder, in the usual way, is bolted to a ring *j* near its outer periphery, the inner periphery thereof being provided with a turned flange bolted to the end of the cylinder; but instead of this the end of the cylinder may be made with a flange corresponding in size and form with this ring and the diaphragm bolted to its outer periphery. The said ring or flange should be slightly conical or bent, that the diaphragm may be at some distance from the end of the cylinder, that it may move in and out to adapt itself to the unequal contraction and expansion of the tubes and cylinder by reason of the passage of the steam through the tubes and the water for the condensation through the cylinder. A chamber

k is formed at this end of the cylinder by means of a head l , secured to the diaphragm by means of a double-flanged ring m and screw-bolts, that it may be removed to give access to the tubes.

The upper chamber f at the end of the cylinder first described communicates by means of a pipe n , in any desired manner, with the exhaust-pipe of the engine, and by another pipe n' also with the escape-pipe of the boiler, and these connections should be governed by appropriate cocks or valves, so that either can be closed or opened at pleasure. Either of these connections being opened, the steam passes into the chamber f , thence through the range of tubes above the diaphragm or partition h to the chamber k at the other end, and thence back through the lower range of tubes to the lower chamber g , which communicates by means of the pipe o with the air-pump and supply-pumps of the engine, or, this connection being closed, by means of a pipe o' , with any desired recipient with which the pipe o' may be connected. The direction of the passage of the steam and the water produced by its condensation through the tubes is indicated by the red arrows.

The steam in passing through the tubes is condensed by the cooling influence of a constant current of cold water which passes outside of the tubes, and which travels in a direction the reverse of the current of steam, as indicated by the black arrows, so that the steam as it parts with its caloric is constantly approaching a cooler medium. The water for the condensation is forced into the cylinder a near the diaphragm c through a pipe p , and passes around the lower half of the series of tubes until it strikes the other diaphragm i ; thence it passes up around the end of a horizontal position plate q on the same plane p , which plate q extends from the diaphragm c to within a short distance of the other diaphragm i , and from this the water passes around all the upper half of the tubes to the first, where it escapes at the top through a pipe r , that discharges through the side of the vessel above the water-line.

The water for the condensation is impelled through the condenser by a rotating pump, the case s of which is provided with a tangential pipe t , at the lower part connected with the pipe p by the condenser; and this case is also provided with another pipe u , which extends from the center thereof to and through the side of the vessel, and so far down as to be always below the water-line, that the water may flow through it to the inside of the pump-case. To the center of this case is adapted a shaft v , the journals of which run in appropriate boxes $w w$ in the case, and provided with stuffing-boxes to prevent the escape of water, and on this shaft is a hub x with four arms or vanes y accurately fitted to the case, and yet to rotate without touching it. By the rotation of these arms or vanes the

water is drawn in near the center and by centrifugal force carried out through the tangential pipe t to and through the condenser, and the required rotation of the pump is given by an engine a' , secured to the casing of the rotary pump, as represented in the drawings, and the connecting-rod b' , which is jointed in the usual manner to the cross-head c' , takes hold of a crank d' on the shaft of the pump, the said shaft being in the usual manner provided with an eccentric e' for working the valves of the engine a' , which are not represented, as they may be on any of the known plans. The water-supply pump, which receives the water from outside the vessel, and which is for that purpose below the water-line, is provided with a valve f' , the stem g' of which passes through stuffing-boxes and has a handle h' , by means of which the pipe can be closed at pleasure when it becomes necessary to give access to the inside of the pump.

From the foregoing it will be seen that by means of the auxiliary engine which operates the pump a constant current of cold water is carried through the condenser independently of the working of the propelling-engine of the vessel, and as a necessary consequence the more the propelling-engine labors by reason of head-winds or rough water the more perfect will be the condensation and the vacuum thereby produced, thus increasing the power of the propelling-engine when power is the most needed, whereas if the current of cold water were dependent on the working of the propelling-engine the sum of the mass of water passing through the condenser would be exactly in proportion to the motion of the engine, and therefore the condensation and vacuum would be decreased in the ratio of the decreased motion of the propelling-engine. It will also be seen that by reason of the working of the pump which impels the water for the condensation by means of an auxiliary engine and the double connection of the condenser with the waste-pipe of the boiler or boilers and with the exhaust of the propelling-engine whenever the safety-valve is opened the steam issuing therefrom, instead of being wasted, will be carried through the condenser and condensed, to be returned to the boiler, thus avoiding the necessity of a separate supply of water to make up for the waste by the escape of steam from the safety-valve, and that when the propelling-engine is at rest the condenser can be used for the distillation and production of fresh water for any desired purpose on board ship, for the condenser is thus, when desired, rendered entirely independent of the propelling-engine.

By passing the current of steam in a direction the reverse of the current of condensing-water the greatest amount of caloric is extracted with the least amount of water. The condensing-water in its passage through the condenser never reaches the point of evapo-

ration, and therefore mineral and other matter held in solution will not be deposited to incrust the apparatus, and by insuring a constant and rapid current of water around the tubes the danger of unequal contraction and expansion is reduced to the smallest amount, and so small as to prevent all injurious effects by the mode above described of connecting one of the diaphragms, to which one end of the tubes are attached, with the cylinder by means of the conical or bent ring or flange.

Although I have described the use of a rotary pump operated by a reciprocating engine for impelling the condensing-water through the condenser, I do not wish to confine myself to the use either of a rotary pump or a reciprocating engine for this purpose, as a rotary engine may be substituted for the reciprocating and a reciprocating pump for the rotary; but I have described and represented this arrangement as the one which I have successfully essayed and deem the best. Nor do I wish to confine myself to the position or construction of the condenser and its connections, as these may be vari-

ously modified so long as the principle of my invention or any essential part thereof is preserved.

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

1. The combination of the condenser of a steam-engine for the propelling of a ship or other vessel with a pump that receives the condensing-water from outside of the vessel and causes it to pass through the condenser when the said pump is operated by an auxiliary engine, substantially as herein described.

2. The double connection of the condenser—that is, with the exhaust of the propelling-engine and with the boiler—substantially as described, when the said condenser is combined with a pump that receives the condensing-water from outside of the vessel and is impelled by an auxiliary engine, substantially as described.

J. ERICSSON.

Witnesses:

JAMES OTIS SARGENT,
JOHN O. SARGENT.