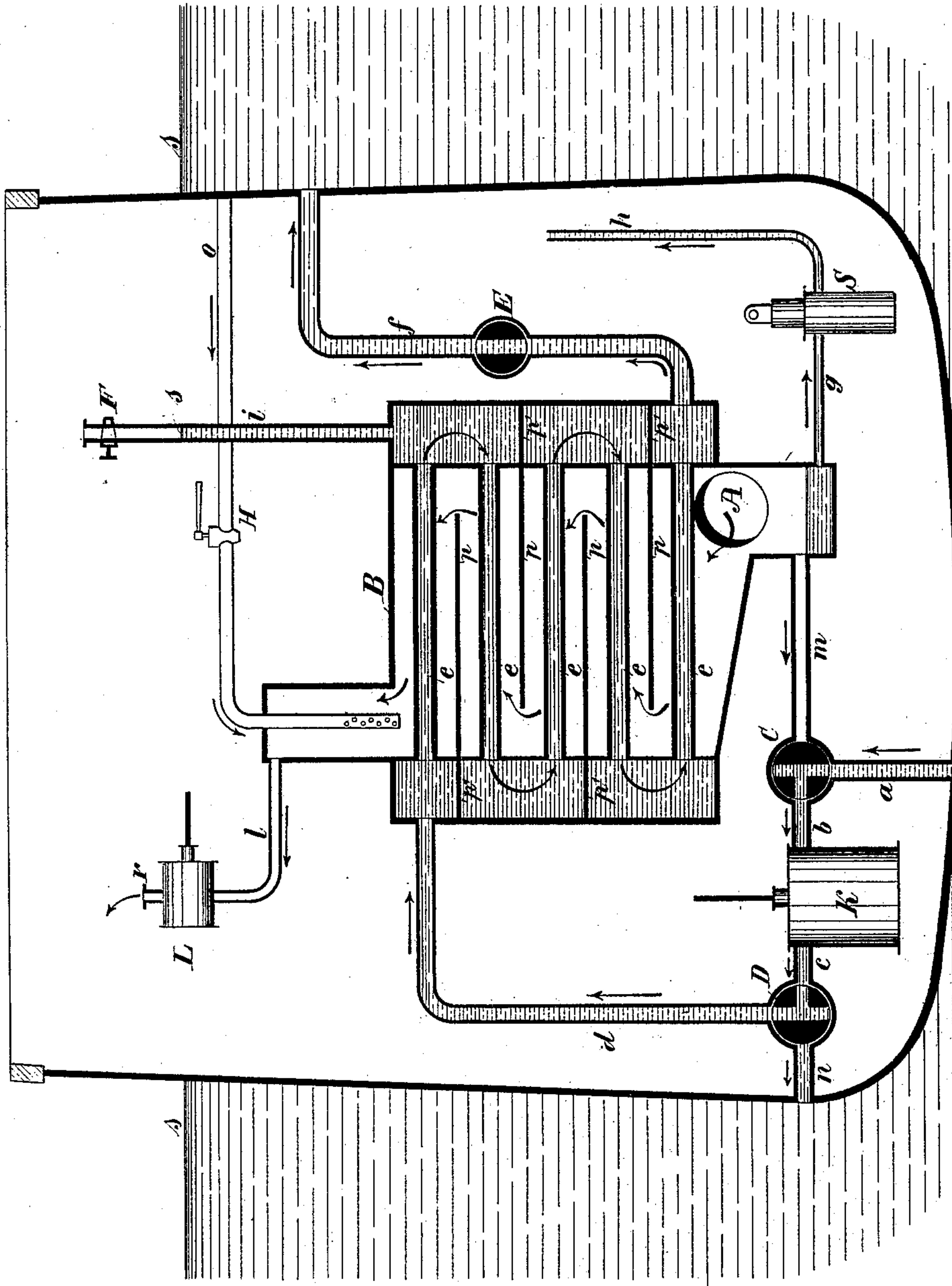


(No Model.)

F. J. WEISS.
SURFACE CONDENSER.

No. 387,473.

Patented Aug. 7, 1888.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANZ JOSEPH WEISS, OF BASLE, SWITZERLAND, ASSIGNOR OF THREE-TENTHS TO AUGUST BURCKHARDT, OF SAME PLACE.

SURFACE-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 387,473, dated August 7, 1888.

Application filed January 26, 1888. Serial No. 261,971. (No model.)

To all whom it may concern:

Be it known that I, FRANZ JOSEPH WEISS, of the city of Basle, in the Canton of Basle and Republic of Switzerland, have invented a certain new and useful Improvement in the Arrangement of Surface-Condensers of Sea-Going Steamers, of which the following is a specification, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

This invention relates to an improved arrangement of surface-condensers for use on sea-going vessels.

The air or hot-water pumps in surface-condensers as heretofore used on sea-going vessels, and serving the purpose of removing from the condenser air and water together, would require, theoretically, a size only so much larger than that of the feed-pumps as is necessary for removing from the condenser, together with the water of condensation, the air entering the said condenser at permeable places. According to former practice the said air or hot-water pumps were made many times larger (often twenty to thirty or forty times as large as the feed-pumps) in order to allow surface-condensers in case of "fouling" to be worked with "injection" likewise, in which case the air or hot-water pump would have to remove from the condenser not only the mass of water of condensation increased by the injection-water, but also the air which had been absorbed by the said injection-water, which of course will require a considerable size or capacity of air-pump. During the normal operation of the condenser—that is to say, in its action as surface-condenser—the air-pump being made by far too large, and not finding a sufficient quantity of air in the condenser, will suck or draw off without any use a great quantity of steam and force the latter into the atmospheric air, which will require a certain amount of labor—that is to say, about as much labor as would be necessary for compressing to the tension of the outside atmospheric air the same quantity of air having the lower tension of the condenser. This labor and the quantity of fuel required for overcoming the same are simply lost or wasted, since the sucking off of the steam from the condenser is of

no use and merely an evil, to be considered inevitable with condensers of this kind as heretofore arranged. This lost labor can neither be reduced or done away with during the action of the condenser as surface-condenser by allowing the air-pumps to make fewer strokes, since, for well-known reasons, these large air-pumps are always coupled with the main engine, so that they will make the same number of strokes as the latter, although they would be required to make fewer strokes in operation for surface-condensation than they would for injection-condensation. At the present time, by reason of the experience gathered with regard to the construction and operation of surface-condensers, it seldom happens that it becomes a necessity to work the said condensers as injection-condensers likewise. The possibility of still being able to do the latter in exceptional cases is therefore bought, in the arrangement as heretofore, at the cost of an air or hot-water pump by far too large for the regular or normal operation—that is, surface-condensation—said pump sucking off during the regular operation a useless quantity of steam, for the compression of which labor, and consequently fuel, is wasted in a useless manner.

The present invention comprises a novel arrangement of the condenser and its pumps, which will likewise render it possible, if required, to allow of operating the surface-condenser as injection-condenser, but with the difference that neither in the one nor in the other case is labor, and consequently fuel, wasted, and that the pumps in either case will have to perform the exact amount of work required, while, moreover, the whole pumping installation can be made smaller, and therefore the engine-room, generally so very narrow, will be less crowded.

The novel arrangement of such surface-condensers is essentially as follows: The feed-pump is always made sufficiently large to be able to remove all the water of condensation from the condenser. If, now, the feed-pump is arranged low enough, so that the water from the condenser will by its own gravity run into the said pump, the latter can then assume that part of the duty or work of the

former large hot-water pump which relates to the removal of the water from the condenser, so that the feed-pump, being so arranged, can force the water directly into the steam-boiler.

5 To do the other part of the work performed by the former air or hot-water pump—that is to say, the work of removing the air from the condenser—a dry vacuum-pump is provided, which will draw the air from the upper part
10 of the condenser. By these means the large air or hot-water pump heretofore employed is entirely done away with, and its office is assumed by a dry vacuum-pump and a feed-pump acting together.

15 In such exceptional cases of emergency where it becomes a necessity that the surface-condenser of this novel kind should perform the work of an injection-condenser, it will only be necessary to provide the cold-water
20 pump, which may be a common piston-pump, with a three-way cock, so that by reason of the proper position given to the latter the said cold-water pump will draw the injection-water from the condenser and force it out of
25 the ship, while in surface-condensation the said pump is serving the purpose of forcing the cooling-water through the cooling-pipes of the condenser. This cold-water pump must likewise be arranged so low that the wa-
30 ter from the condenser flows into it by its own gravity, the dry vacuum-pump continuing to remove the air from the condenser, so that all the cold-water pump has to do is to remove the water. The injection-water is drawn au-
35 tomatically into the condenser by the latter itself, which is always arranged low enough to perform this part of the work. The said dry vacuum-pump can for three reasons be
40 made much smaller than the air or hot-water pump heretofore employed—that is to say, first, because it has to remove from the con- denser the air only and not the water; second, because by reason thereof it can be run at a
45 higher speed; third, as the air and hot water are removed separately, the condenser will allow of being constructed as counter-stream condenser, (the steam to be condensed flowing in a direction opposite to that of the cooling-
50 water,) which will again reduce the working capacity required for the air-pump.

It is evident that the employment of the former hot-water pump, which will draw air and water mixed together from the condenser, rendered it impossible to make use of such
55 counter-stream principle in operating with injection.

The said dry vacuum-pump, of comparatively small dimensions and high speed, is arranged as an independent steam air-pump,
60 which is driven by a small steam-engine whose speed is therefore independent of the speed of the main steam-engine. The engineer has thus the full control over this vacuum-pump and can let it run with just the speed required—that is to say, slow when the condenser is act-
55 ing as a surface-condenser, in which case the said vacuum-pump has only to remove from

the condenser the air having entered the same at permeable places, and quicker when the condenser is acting as an injection-condenser, 70 in which case the vacuum-pump has to remove, besides the aforesaid air, the air absorbed by the injection-water. In this way the waste of the working power and fuel which has heretofore taken place in operating sur-
75 face-condensers by means of the large hot-water pumps is obviated, while, on the other hand, the same result—that is to say, the same vacuum within the condenser—is nevertheless attained, although with the advantage that by
80 far less labor or working power than heretofore has been spent in attaining that result.

The accompanying drawing is intended to illustrate an installation of surface-condensation arranged in accordance with the pres-
85 ent invention, as above described.

The exhaust-steam to be condensed enters the condenser B from the main engine at A, near the bottom, so that the counter-stream principle will be used in surface-condensa-
90 tion as well as in injection-condensation. Suppose as shown in the drawing, the condenser to be acting as a surface-condenser. The cold-water pump K will in such a case draw in through the pipes *a* and *b* water
95 from the outside and force the same through the pipes *c* and *d* into the upper part of the series of cooling-pipes of the condenser. The plates *p'* will cause the cooling-water to flow zigzag-like in a downward and opposite direc-
100 tion to that of the steam, rising on the outside of the cooling-pipes through the latter. The heated cooling-water will leave the condenser near the bottom and return to the outside again through the pipe *f*. The pipe *i*, open
105 at its top and rising from the highest point of the series of cooling-pipes beyond the water-level *s s s* of the steamer, serves for removing the air from the cooling-pipes, so that no air-
110 bubbles can form within the latter. The feed-pump S draws the condensed water through the pipe *g* from the lower part of the condenser and forces the same through pipe *h* into the
115 boilers—that is, together with the fresh sea-water, which, by means of the proper position of the cock H, is allowed to enter the condenser through pipe *o* as additional charge, to
120 make up for the losses of water or steam, which cannot be avoided during the continued circulation of the mass of water originally fed to the boilers.

The dry vacuum-pump L will draw the air through the pipe *l* from the upper part of the condenser and force the same into the at-
125 mosphere through pipe *r*. The gaseous mixture—that is to say, the air and steam drawn off by this dry vacuum-pump—practically consists nearly of air only, because it is sucked off at the upper or the coolest part of the condenser,
130 where there can be but little steam, it being evident that the quantity of steam contained in a cold mixture of air and steam can be but small.

p indicates plates inserted to compel the steam

entering at A to flow zigzag-like around and between the cooling-pipes in a direction opposite to that of the water descending within the said pipes.

5 Now, if it should happen that the condenser before described should have to do the work of an injection-condenser, it will then be necessary only to connect the sucking-conduit of the cold-water pump K with the lower part of
10 the condenser and the forcing-conduit of the said pump K with outside (which in the arrangement shown in the drawings would be effected by turning both the cocks C and D through a quarter of a revolution to the right)
15 to open the cock H and to close the two cocks F and E. In lieu of the said two cocks F and E, automatic back-pressure valves opening toward the outside or in an upward direction may be applied. Injection-water is now drawn
20 into the condenser through the pipe *o*, open toward the outside below the water-level, flows over the plates *p* in a direction opposite to that of the steam to be condensed, (on the counter-stream principle,) and upon having done its
25 work, and arriving in a warm state in the lower part of the condenser, is thence sucked off through the pipes *m* and *b* by means of the water-pump K, and forced to the outside through the pipe *n*.

30 The vacuum-pump L continues its work steadily all the time, but with a somewhat increased speed, and removes the air from the condenser. The feed-pump S likewise continues its work exactly the same as before in
35 surface-condensation. The suction-pipe *g* of the said pump S, entering the condenser at a somewhat lower level than the suction-pipe *m* of the water-pump K, will always find a sufficient quantity of water within the condenser,
40 and even if, by reason of partly closing the injection-cock H, less injection-water than the water-pump K might be able to remove should enter the condenser.

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

1. The combination, with a condenser, B, for sea-vessels, of the cold-water pump K, the pipes *a b m*, connected, respectively, with the outside of the vessel, the pump, and the steam-
50 space of the condenser, the three-way valve or cock C at the junction of said pipes, and the pipes *c d n*, containing the three-way cock or valve D, and connected, respectively, with the pump, the water-space of the condenser, and
55 the outside of the vessel, substantially as described.

2. The combination, with a condenser, B, for sea-vessels, of the cold-water pump K, the pipes *a b m*, containing the three-way cock or
60 valve C, and connected, respectively, with the outside of the vessel, the pump, and the steam-space of the condenser, the pipes *c d n*, containing the three-way cock or valve D, and connected, respectively, with the pump, the water-
65 space of the condenser, and the outside of the vessel, and the fresh sea-water pipe *o*, containing the cock or valve H and entering the top of the condenser, substantially as described.

3. In surface-condensers on sea going ves-
70 sels, the combination of the condenser B, the pump K, the system of pipes *a b m*, having the three-way cock or valve C, arranged between the condenser, the pump, and the outside board, the system of pipes *c n d*, having the three-way
75 cock or valve D, arranged between the pump, the condenser, and the outside board, and the pipe *f*, having the cock or valve E, arranged between the condenser and outside board, the air-discharge cock or valve F, and the injection
80 cock or valve H, arranged between condenser and outside board, substantially as and for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two sub-
85 scribing witnesses.

FRANZ JOSEPH WEISS.

Witnesses:

GEORGE GIFFORD,
CHS. A. RICHTER.