

F. Ortlieb,
Steam-Boiler Condenser.

2 Sheets-Sheet 1.

No 60,042.

Patented Nov. 27, 1866.

Fig. 1.

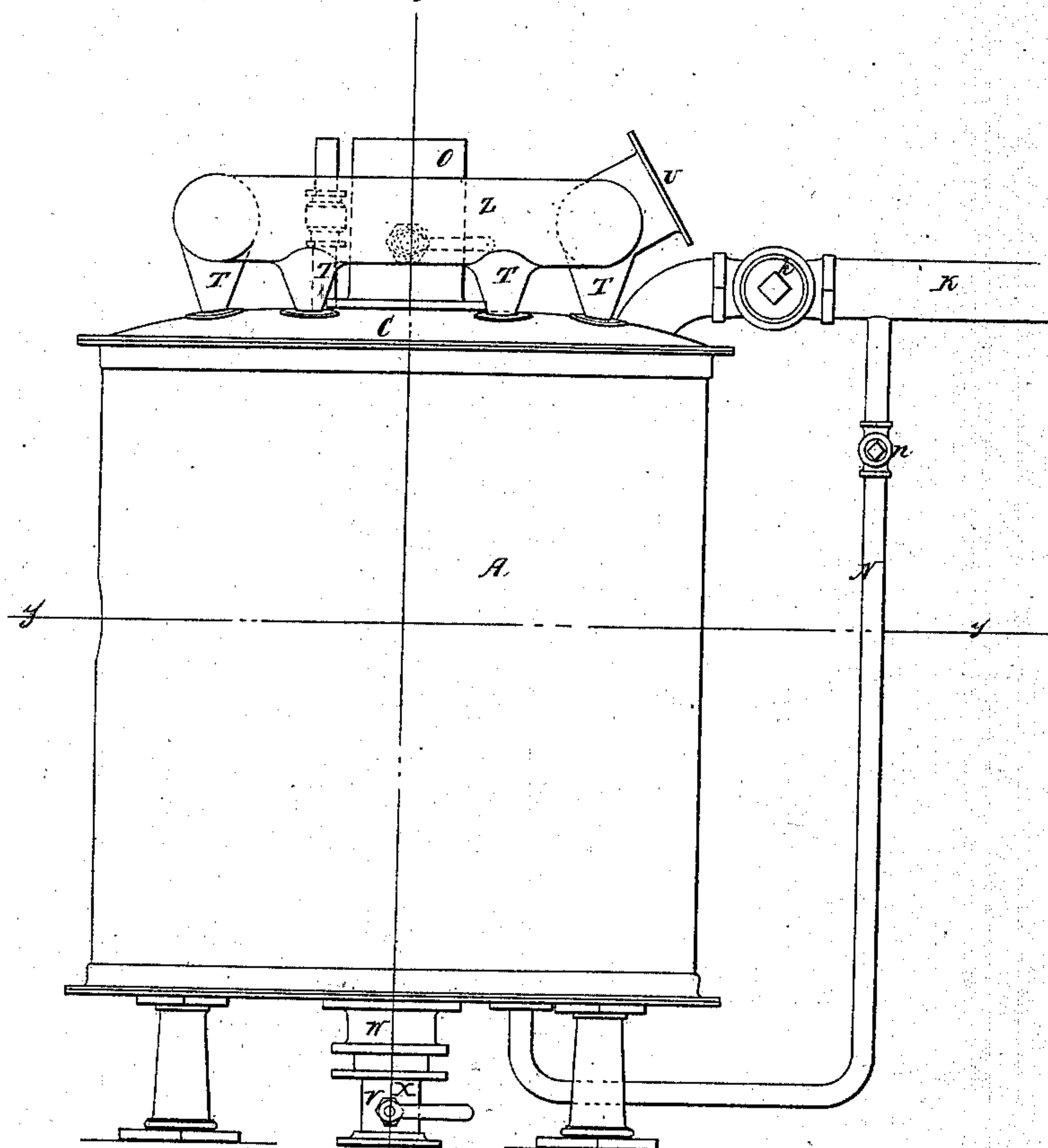
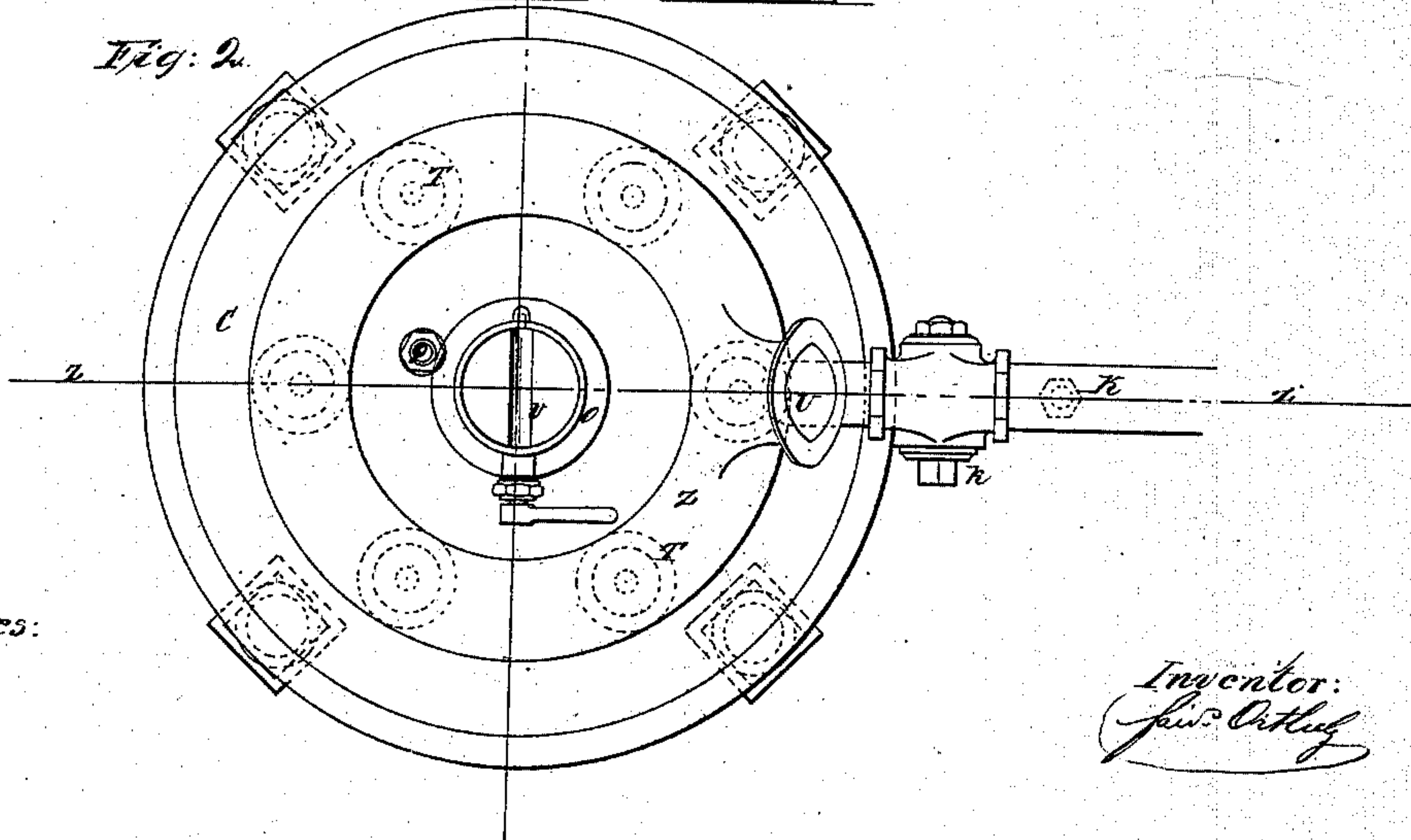


Fig. 2.



Witnesses:

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Inventor:
F. Ortlieb

2 Sheets-Sheet 2.

F. Ortlieb,
Steam-Boiler Condenser.

N^o 60,042.

Patented Nov. 27, 1860.

Fig: 3.

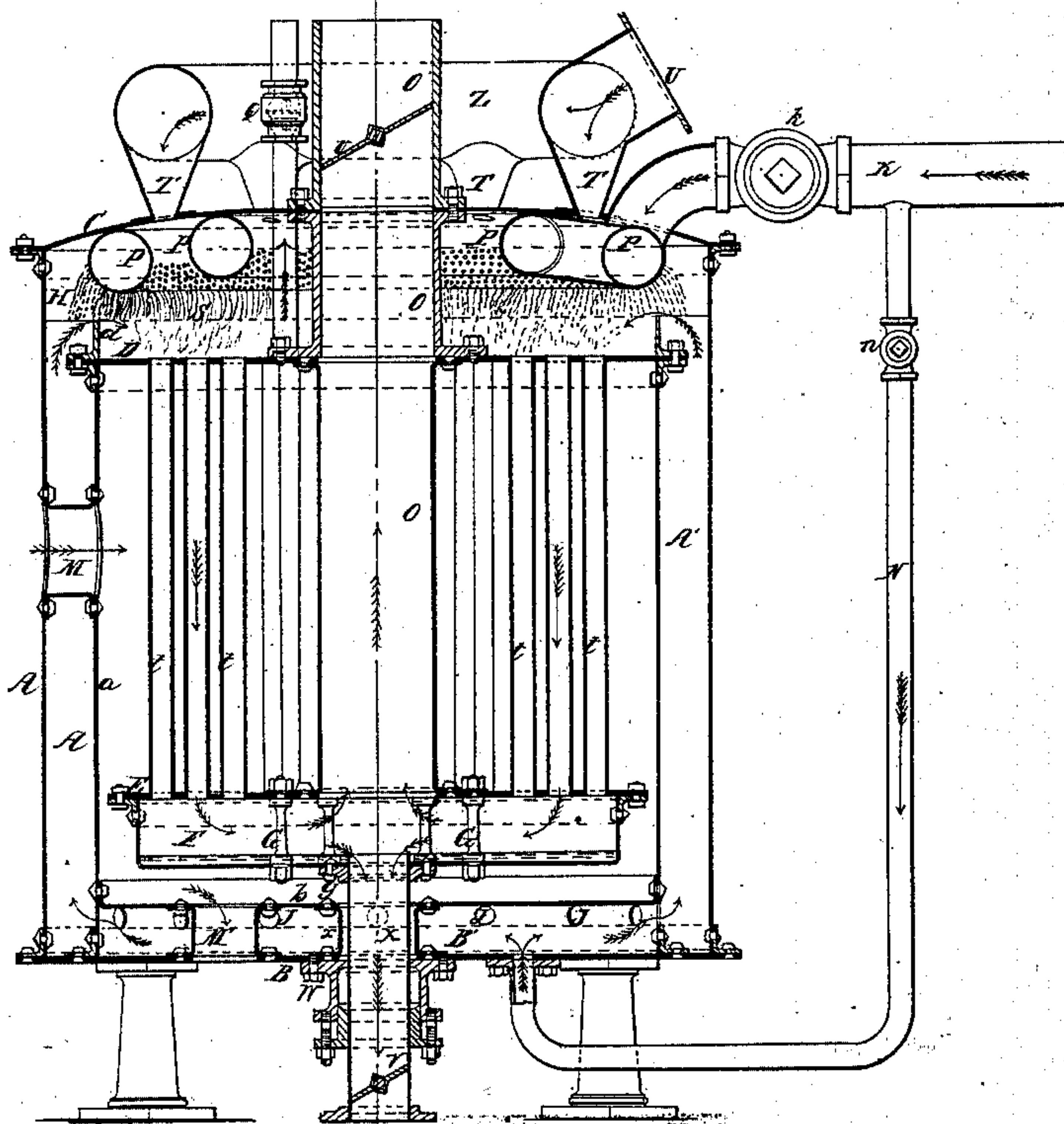
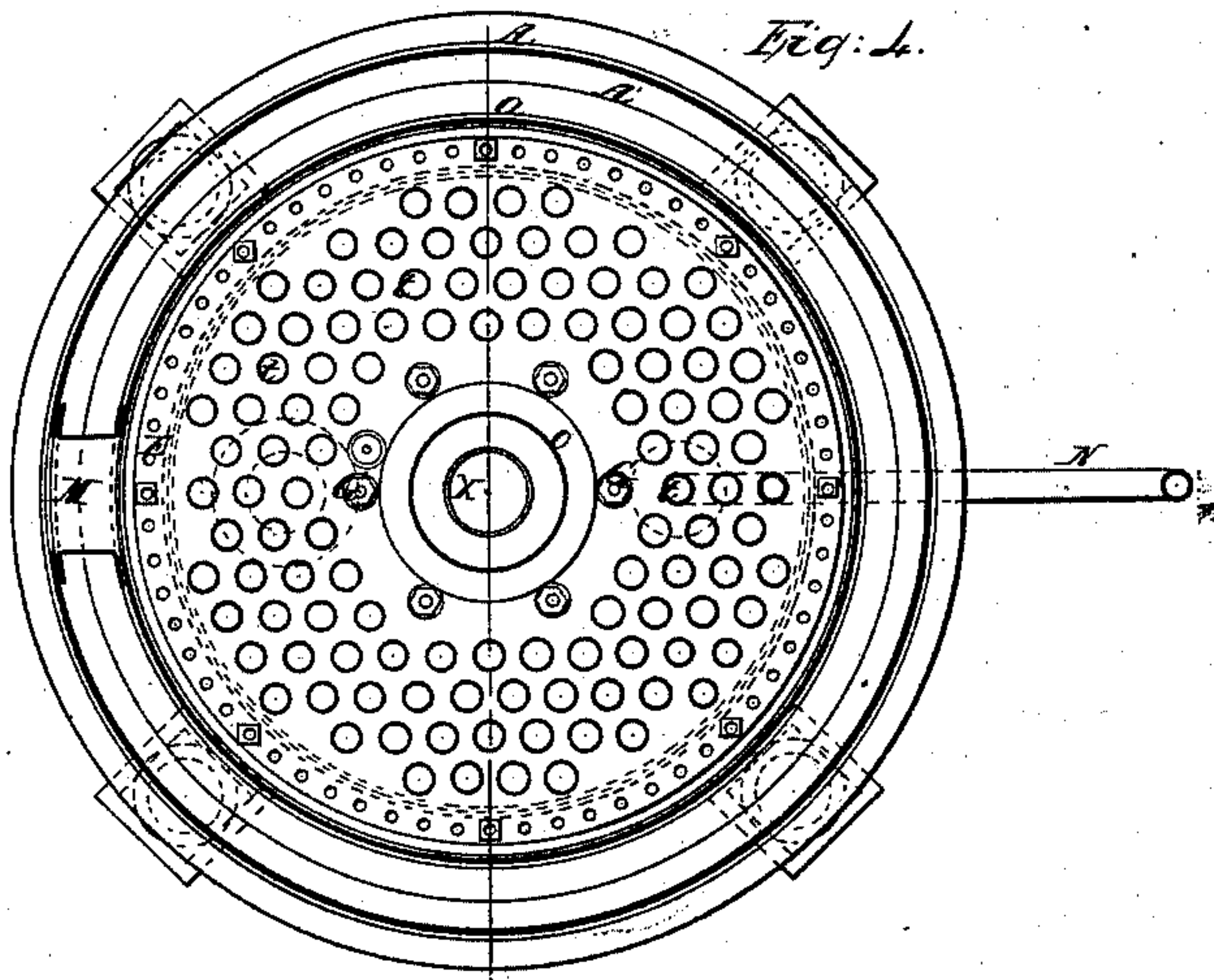


Fig: 4.



Witnesses:
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United States Patent Office.

IMPROVEMENT IN SURFACE CONDENSERS.

FREDERICK ORTLIEB, OF WILLIAMSBURG, NEW YORK.

Letters Patent No. 60,042, dated November 27, 1866.

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, FREDERICK ORTLIEB, of Williamsburg, in the county of Kings, and State of New York, have invented certain new and useful improvements in Surface 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 in which—

Figure 1 represents an outside elevation of a condenser constructed according to my invention.

Figure 2, a plan of the same.

Figure 3, a vertical section thereof, taken as indicated by the line *z z* in fig. 2; and

Figure 4, a horizontal section at the line *y y* in fig. 1.

Like letters refer to like parts in all the figures.

My invention relates to surface condensers, the advantages of which in steam engines are well known. It however has more immediate reference to that description of surface condensers which use air and water combined. In such condensers it has before been proposed, by means of a blower at top, to pass air around the pipes which conduct the water into the air chamber of the condenser. Such condensers, too, have been made double, with a centre pipe, and tubes surrounding it, to act in combination with a wire-gauze top, and chamber beneath, and furthermore, with an air chamber or column, provided with valves above and below, working in opposite directions, to discharge alternately any escaping air. But in such previous construction and mode of operation practice has demonstrated that, among other defects, instead of the spray action which it was designed to give the water within the tubes, the water and air have been so brought in contact within the central pipe, they being first forced downward together into a lower receiving chamber, that from thence, instead of the blast distributing the water as purposed, the water, by its superior density, collected in the lower receiving chamber, and in course of time filled not only the central pipe but also the surrounding tubes, to the exclusion of air and all spray action within the tubes. Another conspicuous defect was the arrangement of a check-valve in reversed position near the foot of the air column, thereby preventing the escape of heated air and other gases which, in telling upon the condenser, detracted from the power of the engine. To obviate these and other defects is the object of my invention, which consists, firstly, in a direct downward application of the water in a spray or mist and air combined within the tubes that effect surface condensation, by employing a perforated pipe, or, preferably, series of such, within a chamber at the top, in combination with an exterior blow-pipe, provided with tuyeres or nozzles opening into said chamber, and serving to make the blast act upon the water as it issues in a spray from the perforated pipes, and causes the air and water to be projected through a reticulated surface or screen—the water by its subdivision in the shape of mist—direct downwardly within the tubes. And my invention further consists in the use of a delivery pipe, in direct communication with the water-receiving chamber at the bottom of the tubes and passing downwards through a stuffing-box, to provide for the general expansion of the interior portion of the condenser, which, by this construction, is suspended from above. Likewise my invention consists in the arrangement of a double bottom to the condenser, provided with openings communicating with an exterior hollow jacket, and having attached to it a circulating water-pipe, for action in combination with a spray supply to the condenser at top, said hollow base also serving to stiffen the bottom of the condenser. And my invention finally consists in the application of one or more automatic valves, communicating by pipe with the condenser through its upper tube sheet, to allow of the discharge of heated air and accumulated gases, and to afford relief at commencement of the blower's action.

For the information of others whom it may concern, I will now proceed to describe my invention, with reference to the accompanying drawing, in which—

A represents the outer and *a* the inner shell of the condenser, leaving a water space, *A'*, between them, and which is shown as open at the top, where it communicates with a chamber H, and by openings J, with a hollow base, *B'*, made up of inner and outer plates *B b*. C is the top or crown plate of the condenser. These and other parts are firmly united in the usual manner by angle-irons, bolts, and rivets, and the whole structure made to rest on pedestals, or otherwise suitably supported. D is the upper tube sheet, which has mounted on it a ring, *d*, of angle-iron, and between which and angle-iron surrounding the upper part of the shell *a* said tube sheet is bolted and made to form an air-tight joint. Upon the ring *d* is arranged a screen, S. E is the lower tube sheet, similarly or otherwise suitably secured and supported, but of less diameter than the inner

shell *a* of the outer water jacket. *O* is a central discharge air-pipe, extending by sectional construction from the lower tube sheet *E* up through the body of the condenser, screen *S*, and crown sheet *C*, where it may be provided with a valve *v*. *t* are the tubes connecting the upper and lower sheets *D* and *E*. These tubes *t* and that portion of the central air-pipe *O* which they surround, and which, by the connection of its extension with the crown sheet, assists in supporting the tubes and receiving chamber *F*, are of a homogeneous nature, so as to expand and contract alike, thereby obviating undue strain or derangement. To the lower tube sheet *E*, and below it, is secured by surrounding angle-iron and rivets or bolts, also by stiffening or stay-bolts *G*, a receiving-chamber *F*, which has an opening in its bottom at the centre that is provided on the outside with a circular flange, *g*, rivetted to said chamber, and that has screwed into it a downward or outboard delivery pipe, *X*. This delivery pipe is extended to pass through a sleeve, *x*, in the hollow base *B'*, and through a stuffing-box *W*, connected therewith, and is provided with a regulating valve, *V*, to adjust the discharge of water from said pipe. By this construction and arrangement the tubular body of the condenser, with the portion of the air discharge pipe *O* passing therethrough, receiving chamber *F*, and water delivery pipe *X*, are all, as it were, suspended from above, and, by means of the stuffing-box *W*, every facility given in a straight line or course for that contraction and expansion of the tubular body which is so apt to strain and injure these parts, or disturb their joints and impair the vacuum in the condenser. *M* is a flanged pipe or sleeve, fitted within the water jacket *A'*, preferably near the top of the condenser, and through which the exhaust steam is admitted to the condenser, from whence, when condensed, it escapes by a flanged pipe or sleeve, *M'*, in or through the base *B'*. By thus introducing the steam above and allowing it to escape below, or so keeping at a distance apart the inlet and outlet, the pumps for returning the condensed steam to the boiler are prevented from being filled with steam to interfere with their operation. In the upper chamber *H* are arranged any number or series of circular perforated pipes *P*, through which water flows from a supply pipe *K*, provided with a regulating cock *k*. The water is sprinkled or scattered as spray or rain from these perforated pipes *P* on to the screen *S*, and is projected therethrough and into the tubes *t* by air issuing from a series of nozzles or tuyeres *T* opening into the upper chamber *H*, and which are connected with a circular pipe *z* that has air blown into it from a main pipe *U* by a fan or other suitable blower. The water or spray thus projected by the blast through the screen *S* is subdivided or made to form a sort of mist, having air combined with it, and, entering the tubes *t* with force in a downwardly direction, moistens their inside surfaces as effectually as if the tubes were filled with water. This mist, after being driven through the tubes, falls into the receiving chamber *F*, where its watery particles, then partially heated by the action of the exhaust steam on the outsides of the tubes, will settle at the bottom and escape down the delivery pipe *X*, while the heated air contained in it will naturally ascend and pass off up the discharge pipe *O*. Thus it will be seen that choking of the tubes with water, as in previous hydro-atmospheric condensers, is avoided. *N* is an outside circulating pipe, provided with a regulating cock *n*, and connecting the hollow base *B'* with an outside water supply, say with the main pipe *K*. This pipe, by its cock *n*, serves to circulate, in an adjustable manner, water, first through the hollow base *B'*, from thence through the openings *J*, and upward through the water jacket *A'*, until reaching the top of the angle-iron *d*, where it overflows on to the screen, and passing or being projected through which, it descends by the tubes into the receiving chamber *F*, and finally escapes by the delivery pipe *X*. In this way may a constant circulation, at a uniform temperature, be kept up throughout the whole envelope of the condenser, and such, acting in concert with the spray supply at the top and through the tubes, combines to make most effective the condenser generally. Projecting from the upper tube sheet *D*, and communicating with the inside of the condenser, is an automatic valve *Q*, or there may be more of such pipes and valves, the object of which is to prevent "back pressure" in the condenser, arising either from the expansion of air or accumulation of gases, and one important office of which is to give relief while starting the engine and before the blower has attained its full effective force or speed.

By this, my improved hydro-atmospheric condenser, high-pressure engines may be converted into condensing ones in localities where there is a scarcity of water, air being effectually used in connection with the water. The steam may be condensed by it into hot water at a temperature of 180°, and without using much if any more water than would otherwise be necessary to supply the boiler of such high-pressure engine. The condensed steam or hot water may be passed through a super-heater before returning it to the boiler, and by establishing but a partial vacuum, the usual cumbersome air and circulating pumps are considerably reduced without affecting or destroying the beneficial effect of surface condensation in keeping up a regular supply of distilled feed water, to the preservation and safety of the boiler, and, if properly applied, economizing both power and fuel.

Having thus described my invention, and inasmuch as there is some similarity in its general construction and function to that of J. P. F. Datrichy, patented August 30, 1864, I hereby disclaim that particular invention.

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

1. In hydro-atmospheric condensers, I claim the use of air and water combined, when the same is introduced to the body of the condenser in the form of spray or mist injected directly downwards, in contradistinction to an upward injection through the condensing tubes which form said body, substantially as specified.
2. The combination of the condensing tubes *t*, air discharge pipe *O*, and receiving chamber *F*, with its delivery pipe *X*, said pipes *O* and *X* being arranged so as to effectually separate the air and water after the same have been injected or passed through the tubes, essentially as herein set forth.
3. The combination of the upper chamber *H*, blast nozzles or tuyeres *T*, perforated pipe or pipes *P*, and screen *S*, with the condensing tubes *t*, arranged for action together, substantially as specified.
4. The receiving chamber *F*, with its delivery pipe *X*, arranged to pass through a stuffing-box *W*, in combination with the tubes *t* and air pipe *O*, suspended from above, essentially as and for the purpose or purposes herein set forth.

5. The combination, with devices, for producing a spray action of air and water combined at the top of the condenser, and downwardly through the tubes thereof, of a water base B', hollow jacket A', and circulating pipe N, substantially as specified.

6. In combination with a surface condenser, the arrangement, at or near the top thereof, of one or more automatic relief or escape valves Q, operating essentially as shown and described.

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Witnesses:

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G. W. REED.