

(No Model.)

J. F. FETTERS.
STEAM CONDENSER.

No. 480,572.

Patented Aug. 9, 1892.

Fig. 1.

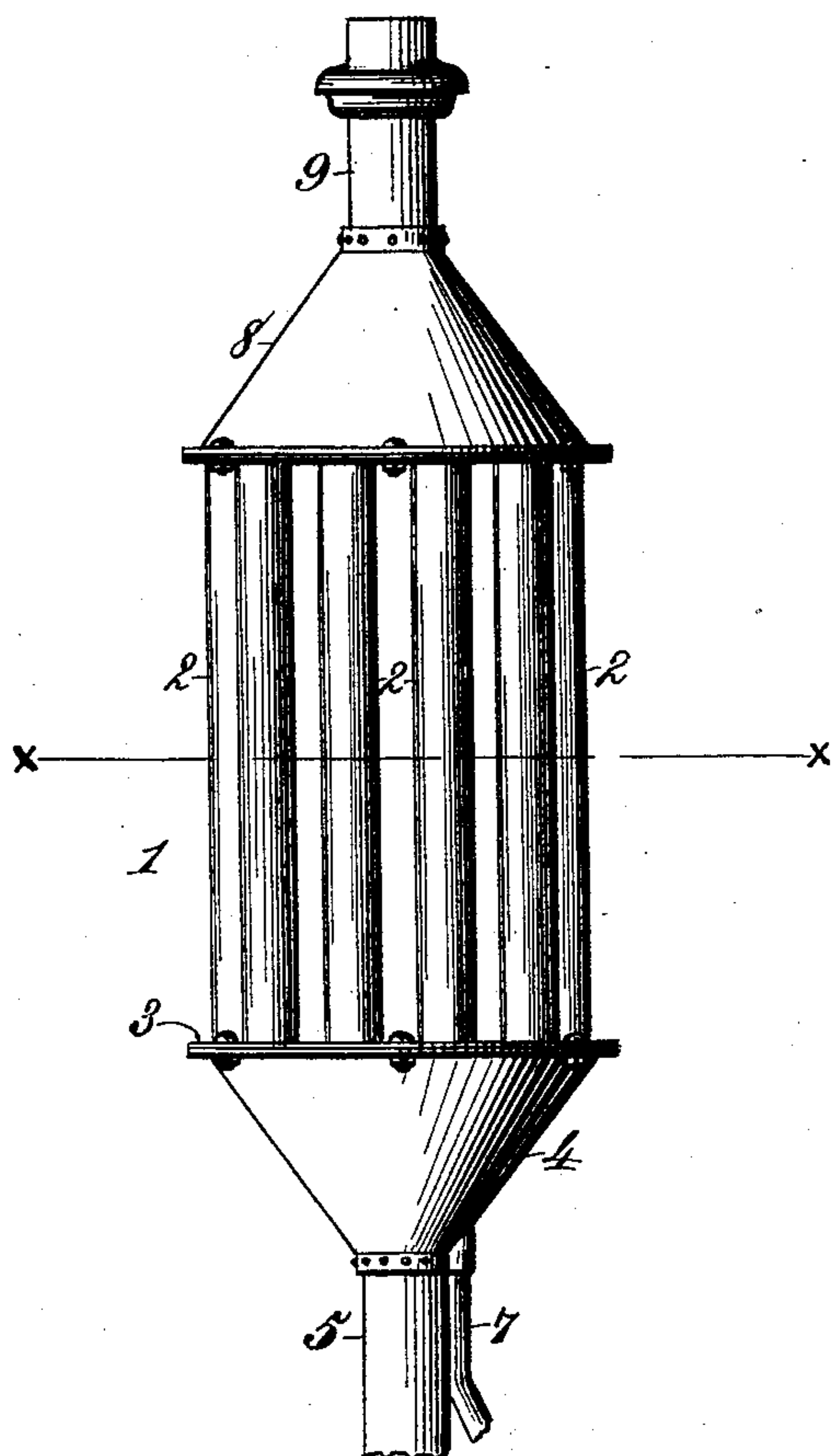


Fig. 2.

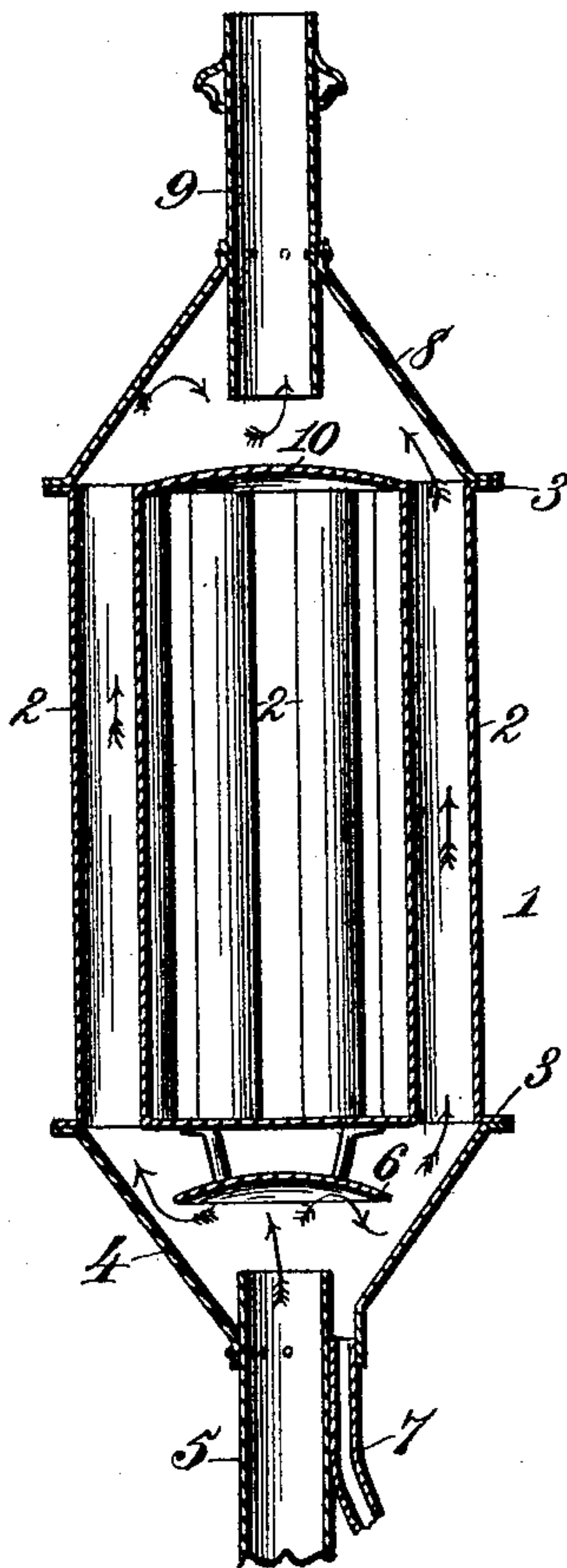


Fig. 3.

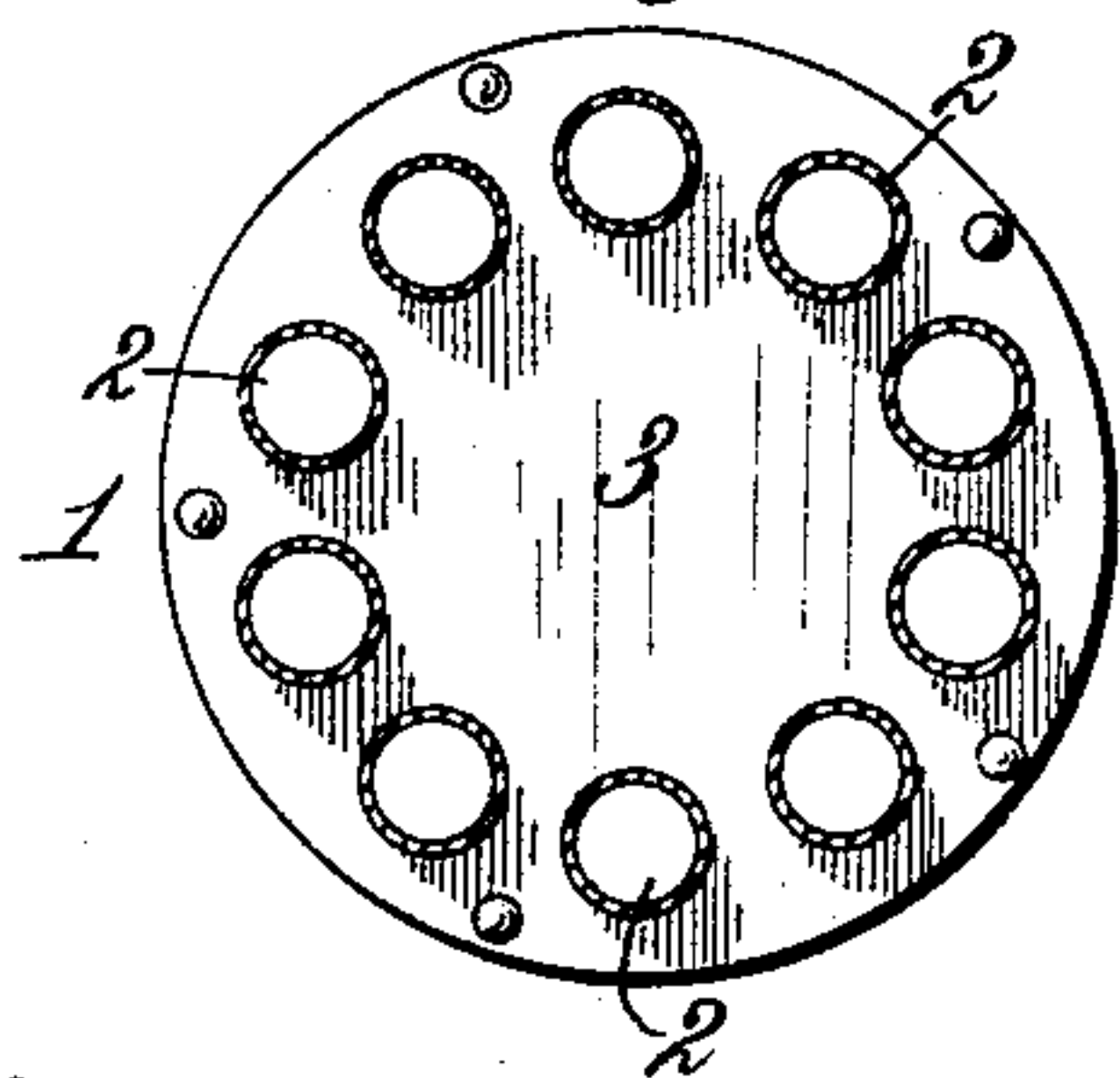
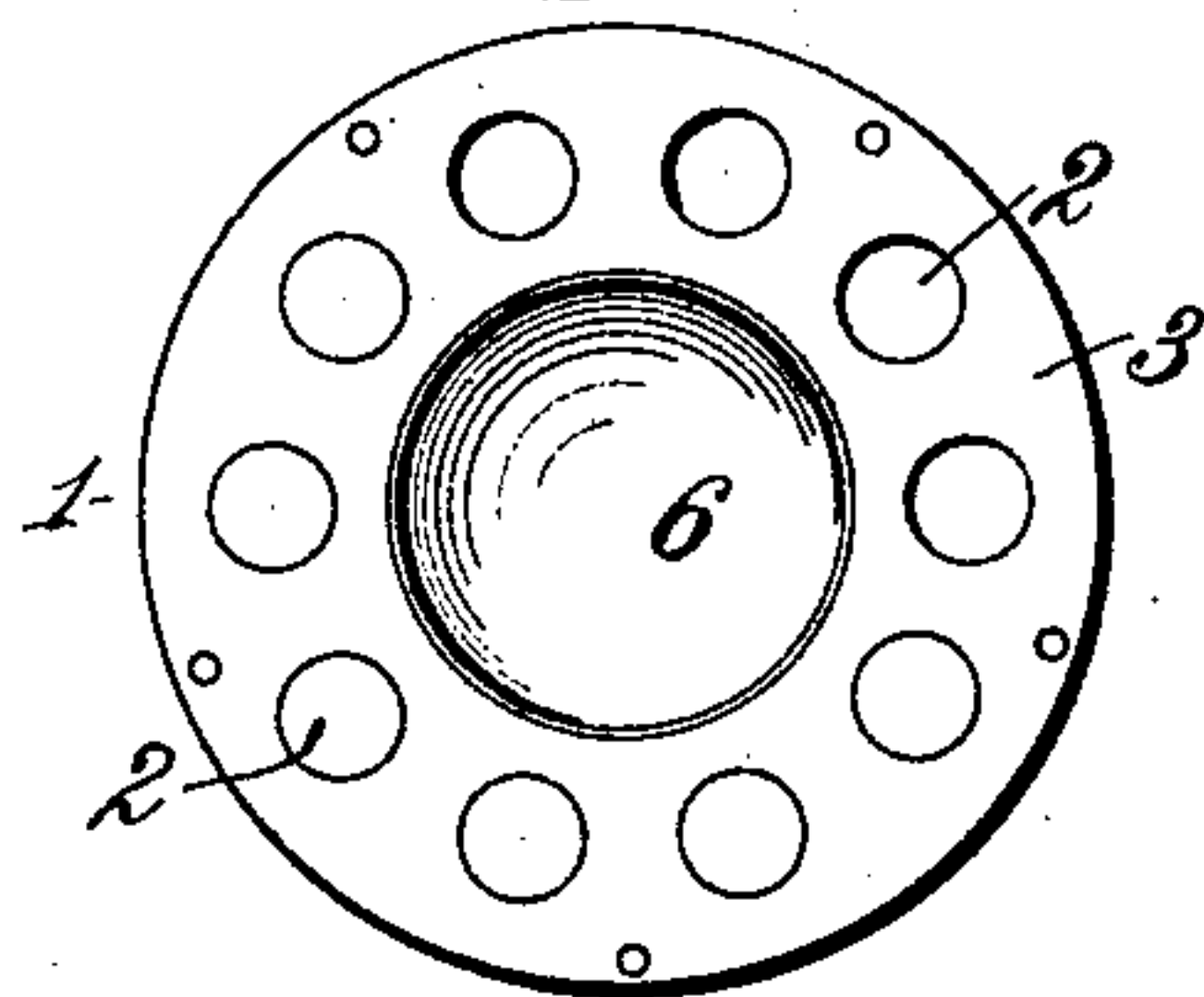


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH F. FETTERS, OF DAYTON, OHIO.

STEAM-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 480,572, dated August 9, 1892.

Application filed April 21, 1892. Serial No. 430,099. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH F. FETTERS, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented new and useful Improvements in Steam-Condensers, of which the following is a specification.

The purpose I have in view in this invention is to provide simple and comparatively inexpensive means whereby the exhaust-steam from engines may be condensed either wholly or in great part to enable the water of condensation to be returned to the boiler or otherwise disposed of in such manner that the condensed spray shall not be showered upon those passing in proximity to the mill.

Another and important purpose which I have in view is to prevent the constant puff of the escaping steam, which is usually turned into the open air through a pipe emerging from the roof or from the vertical wall. The constant sound of this steam, its immediate condensation in cold weather into heavy white clouds, the showers of spray therefrom, which in windy weather are widely distributed and rapidly frozen at low temperature, forming dangerous places for passers-by, as well as for horses not "sharp-shod," and the liability that these suddenly and intermittently formed clouds of condensed steam and the deep shadows cast thereby may and do seriously frighten horses passing the mill or engine-house all constitute urgent reasons for the removal of the cause of said objections.

It is the purpose of my invention to provide means for accomplishing this end which shall be of such moderate cost and simple form that all users of steam shall be easily able to obtain my condenser and attach and use the same without the necessity of employing skilled labor, which shall be capable of use with any and all engines of the high-pressure type, and by which the larger part, if not the whole, of the steam shall be condensed and the water of condensation collected and suitably disposed of and whereby the intermittent jet of exhaust-steam shall be broken up, dissipated, and mingled within the condensation-chamber in such manner that the percentage of uncondensed steam which actually passes through and escapes from the condenser will be so small that it will be

either absorbed by the atmosphere at once or will produce no perceptible effect, the constantly-repeated jet being converted into a more or less uniform flow without noise, without any perceptible formation and spraying of the water of condensation, and without the formation of clouds of condensed moisture, which are materially noticeable even in the coldest weather.

My invention consists, to the purposes specified, in the novel features of construction and new combinations of parts hereinafter fully explained, and then definitely and particularly pointed out in the claims which form part of this specification.

To enable others skilled in the art to understand and to make, construct, and use my said invention, I will proceed to describe the same in detail, reference being made to the accompanying drawings, in which—

Figure 1 is a side elevation of a steam-condenser constructed in accordance with my invention. Fig. 2 is a central vertical section of the apparatus shown in Fig. 1. Fig. 3 is a horizontal section taken upon the line xx , Fig. 1. Fig. 4 is a bottom plan view of the lower end of the condenser, the truncated cap being removed.

The reference-numeral 1 in said drawings indicates the body portion of the condenser, which consists of a series or group of straight tubes 2 of a suitable length, which will be increased or diminished in proportion to the size of the engine and the volume of exhaust-steam. These pipes or tubes are parallel, and their ends penetrate heads 3, which are of any suitable form, according to the formation of the group of tubes 2. As shown, the latter are arranged substantially in a circle, sufficient intervals being allowed to permit the free circulation of air and an unobstructed surface contact of the same with the pipes 2, which are composed of sheet metal or some material which has the power of readily conducting heat.

Upon each head 3 is mounted a closed cap, preferably having the form of a truncated cone and being imperforate, save as respects the inlet and outlet openings. In the truncated end of the lower cap 4 is inserted the steam-pipe 5, which forms an inlet to the cap. Its end extends into the truncated end of the

cap 4 for a short distance, so that its open or exit end lies above the lowest part of the chamber inclosed by the cap. From the construction of the parts it will be seen that the steam-pipe 5 is substantially central as regards the circular group of condensing-tubes 2, the lower open ends of which have communication with the chamber inclosed by the cap 5, said ends being in a higher plane than the exit end of the steam-pipe 5. Hanging from the lower head 3 of the condenser is a deflector 6, consisting of a plate having a substantially concave lower face, which is arranged above the exit end of the steam-pipe 5 and between the latter and the lower head 3. The deflector is preferably substantially of circular form with its central portion coincident with the axes of the steam-pipe 5 and the condenser-body 1, or nearly so, its diameter being such that an annular passage is provided between its edge and the inner surface of the cap 4. In the lowest portion of the chamber inclosed by the cap 4 and close beside the steam-pipe 5 is arranged a small tube 7, which carries off the water of condensation, conducting it to the eaves-trough, spout, or other suitable point, but preferably to any suitable reservoir, whence it may be returned to the boiler of the engine.

Upon the upper cap 3 of the condenser is mounted a cap 8, having the form of a truncated cone, or substantially so, like the lower cap. Entering the upper truncated end of said cap is a steam-discharge pipe 9, the lower open end of which passes down in the chamber inclosed by the cap 8 and lying between the truncated end of the cap and the top of the condenser, which is provided with an upwardly-convexed surface 10, its center substantially coincident with the axes of the condenser and the outlet-pipe 9, from which center it slopes gently on all sides to the open upper ends of the tubes 2.

The condenser may be placed at any point, and, subject to the condition that the arrangement enables the water to pass off by gravity through the pipe 7, it may be in other positions than the vertical.

Its operation is as follows: The exhaust-steam flowing through the pipe 5 at each escape through the exhaust-valve is projected from the open end of the steam-pipe 5 into the chamber inclosed by the lower cap 4 and is driven against the concave face of the deflector 6, by which its direct course is arrested and the current is turned back, or partly so, and then curves around the edge of the deflector 6, passing between the same and the cap 4 and entering the pipes 2. In flowing through these pipes, which are exposed to the air and wind which may pass between the same and over their surfaces, most, if not all, of the steam is condensed and the water of condensation runs back into the lower cap 4 and into the discharge-pipe 7. As the remainder or uncondensed part of the steam enters the upper cap 8 some fur-

ther condensation will take place and the uncondensed residue will follow the inclined wall of the truncated cone 8 until it flows into the annular pocket surrounding the entering end of the outlet-pipe 9. Here it is compelled to turn again upon the direct course and flow back a short distance in order to enter the end of the outlet-pipe. These repeated bafflings of the current, together with the interruption of the direct flow and the expansion consequent upon the sudden condensation of so large a volume of the exhaust-steam, deprives the uncondensed residue of the steam of all force, wholly breaks up the intermittent discharge, or practically so, and causes the small inconsequential volume of steam still retaining the form of vapor to flow with substantial uniformity, without noise, and with such small degree of condensation that it is practically invisible and imperceptible.

It is evident that I may make almost every possible variation in the arrangement of the pipes 2 of the condenser without departure from my invention. They may be placed in a single rank and in a right line and in rectangular or other polygonal form. The essential conditions of the construction are that the direct current of the steam be baffled or broken up and turned partly or entirely back upon itself before entering the condensing-tubes, in order to give time for expansion and to retard the speed of the current to enable a more complete condensation to take place in the tubes 2. It is desirable, also, to provide for a second arrest or baffling of the uncondensed residue of the steam after leaving the tubes 2, in order to wholly or practically break up the intermittent jet of discharge to permit a further condensation in the second or upper cap and a full expansion of the small uncondensed residue of steam.

What I claim is—

1. A steam-condenser for steam-engines, comprising a series of condensing-tubes exposed to the atmosphere, inlet and outlet chambers inclosed by end caps into which said tubes open, inlet and outlet pipes projecting into said chambers, and a stationary deflector-plate suspended between the open ends of the condensing-pipes and the inlet-pipe to baffle and break the direct current of steam escape, substantially as described.

2. In a steam-condenser, the combination, with a series of tubes separated to allow the free passage of the atmosphere, of inlet and outlet chambers inclosed by end caps into which said tubes open, an inlet-pipe entering and projecting within the inlet-chamber above the lowest point thereof, a discharge-pipe for the water of condensation, a deflector in the inlet-chamber between the open end of the inlet-pipe and the receiving ends of the condensing-pipes, and an outlet-pipe entering the outlet-chamber and having its open end projecting within the same to form a pocket around said pipe, whereby the uncondensed residue of the steam will be a second time

baffled after emerging from the condensing-tubes, substantially as described.

3. In a steam-condenser, the combination, with a series of pipes exposed to the atmosphere and having their ends opening through heads, of caps mounted thereon and having the form, substantially, of truncated cones, an inlet and outlet pipe entering the lower and upper caps, respectively, and projecting above and below the truncated ends of said caps, in which they lie, a discharge-pipe leading directly from the lowest point of the inlet-chamber, and a stationary concave deflector-plate arranged in said chamber between the open

end of the inlet-pipe and the condensing-tubes, leaving an annular passage between its edge and the conical wall for the passage of steam, whereby the exhaust-steam is baffled and its direct current broken up before entering the condensing-tubes, substantially as described. 15 20

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

JOSEPH F. FETTERS. [L. s.]

Witnesses:

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GRAFTON C. KENNEDY.