No. 815,031. PATENTED MAR. 13, 1906.

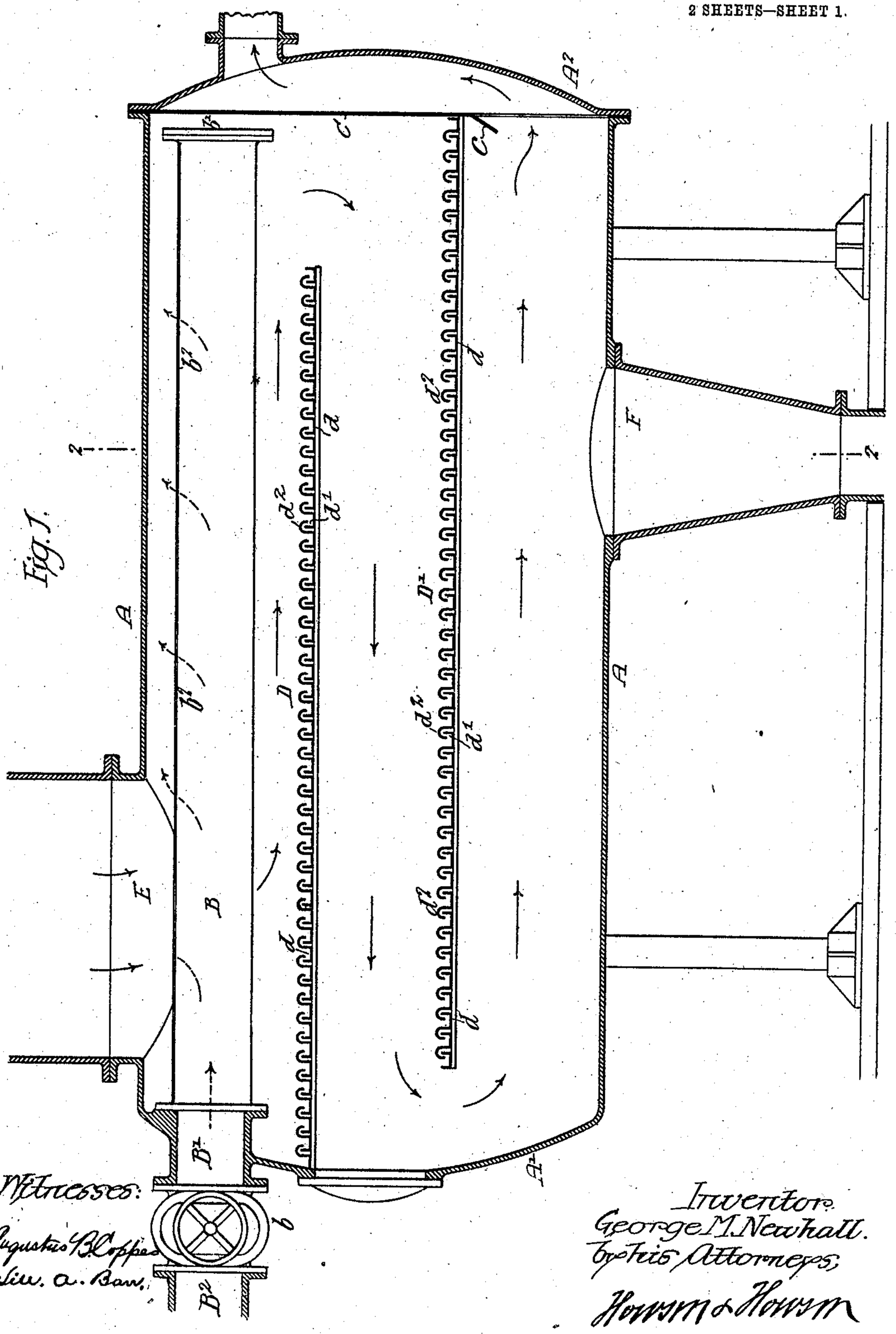
G. M. NEWHALL.

CONDENSER.

APPLICATION FILED MAR. 1, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

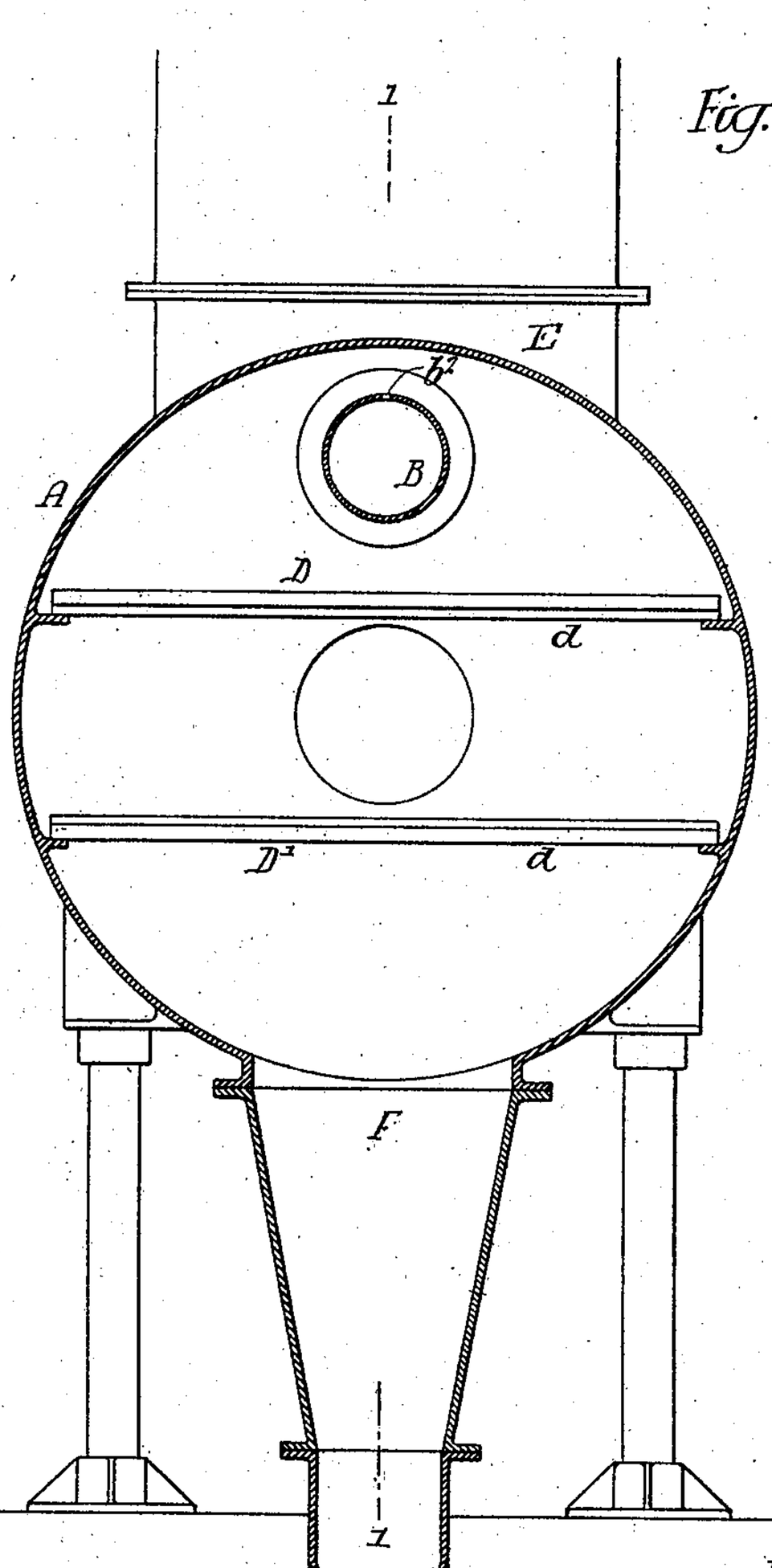


Fig. 3.

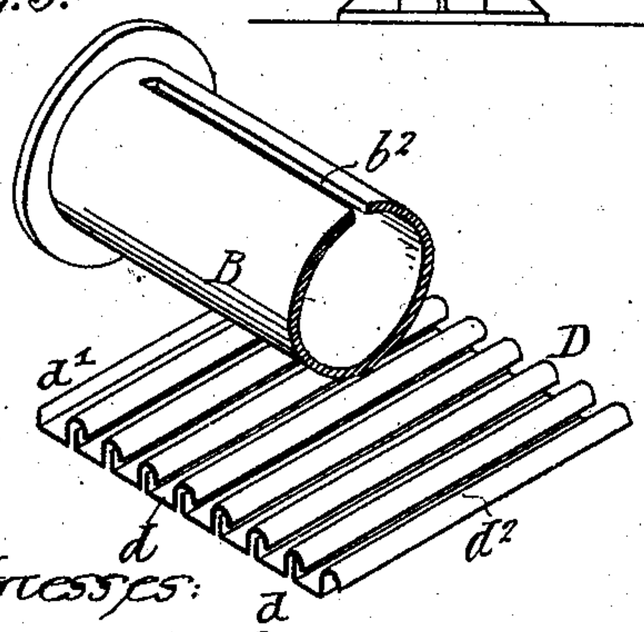
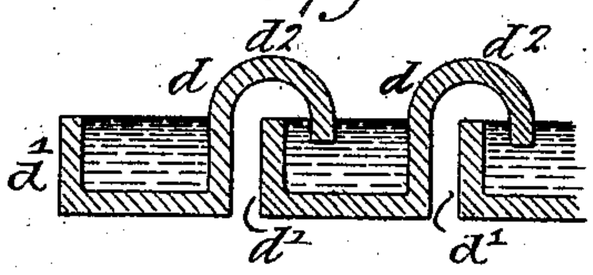


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE M. NEWHALL, OF PHILADELPHIA, PENNSYLVANIA.

CONDENSER.

No. 815,031. Specification of Letters Patent. Patented March 13, 1906.

Application filed March 1, 1905. Serial No. 247,973.

To all whom it may concern:

Be it known that I, GEORGE M. NEWHALL, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Condensers, of which the following is a specification.

My invention relates to certain improvements in condensers for condensing the exhaust-steam from engines and pumps and vapor from a vaporizing apparatus.

The main object of my invention is to provide a condenser of the horizontal type with means whereby the vapor is caused to travel through numerous sheets of water in its passage through the apparatus, so that said vapor will be condensed.

A further object of the invention is to arrange the parts so as to secure the cooling of the gases escaping from the air-pump.

The invention relates, further, to other details, which will be fully described hereinafter.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of my improved condenser on the line 1 1, Fig. 2. Fig. 2 is a transverse sectional view on the line 2 2, Fig. 1. Fig. 3 is a detailed perspective view showing the condensing-water inlet and the series of troughs mounted under the inlet, and Fig. 4 is an enlarged sectional view showing the detailed construction of the troughs.

A is the casing of the condenser. In the present instance this condenser is made cylindrical and provided with an integral head A′ at one end and a detachable head A^2 at the opposite end.

Mounted between the detachable head A^2 and the body A of the condenser is a diaphragm C, of copper or other suitable material. This diaphragm extends in a solid sheet to a point below the lower line of troughs, which will be described hereinafter, and has a flange turned at *c*, so as to throw the water inward from the diaphragm.

B is an inlet-pipe for the condensing water. This pipe extends practically the full length of the condenser and has a flange at each end. The pipe B communicates with a passage B′ in the head A′, which in turn communicates with a supply-pipe B^2.

b is a valve for regulating the flow of water to the pipe B. The pipe is closed at the inner end by a cap *b*′.

In the upper portion of the pipe B is a longitudinal slot b^2, which allows the condensing water to flow from the pipe in a continuous film, flowing over the outer surface of the pipe onto the troughs below, as described hereinafter.

D D′ are two longitudinal deflectors. Each deflector is made up of a series of troughs *d*. (Shown in the detailed view Fig. 4.) The upper deflector D extends from the head A′ to a short distance from the diaphragm C and the deflector D′ extends from the diaphragm C to a point a short distance from the head A′.

E is an inlet for vapor.

F is an outlet which communicates with the hot-well when a dry system is used or with a pump when the condenser is used in the wet system.

It will be seen that the passage of the vapor through the condenser is, as shown by full arrows, first over the deflector D, then around its edge and returning back in the space between the two deflectors, and then passing under the lower deflector to the outlet. Thus the vapor travels in the present instance three times the length of the condenser. More than two deflectors may be used in some instances, in which case the travel would be increased. Each deflector, as before remarked, is made up of a series of trough-shaped sections *d*, each section having a low flange *d*′ and a high flange d^2, which is curved over the low flange of the adjoining section, the end of this flange extending below the upper edge of the low flange, so as to form a trap for the water and so that the water flowing from the pipe B will fall into the troughs *d* of the deflector D, and as the water acccumulates in these troughs it will flow over the edge of the low flange *d*′ of each trough and drop into the troughs *d* of the deflector D′, repeating the same operation, and finally falling onto the bottom of the condenser, thus forming thin sheets or curtains of water through which the vapor must pass before it can escape from the condenser. Consequently a nearly complete condensation of the exhaust-steam or other vapor takes place before it reaches the outlet to the air-pumps.

By making the condenser horizontal and setting it level the feed-water will flow uniformly the full length of the pipe B, whether a large or small quantity of water is used. Consequently there is a proper distribution of the condensing liquid throughout the whole of the cylinder. The vapors entering

the condenser from above will come in contact with the falling water shower, as well as the internal film flow of water on the inner surface of the condenser. This film is caused by the play of water against the inner surface of the cylinder as it escapes from the pipe B. The water as it falls onto the upper deflector D is in a dancing commotion, which assists in the condensation of the vapors, which must travel horizontally, as indicated by the arrows. This is repeated when the water passes from the lower deflector and at the bottom of the cylinder. If any vapor escapes after traveling through the passages, it will finally be collected along with any non-condensable gases as it passes out the end and beyond the reach of the water shower and back of the copper diaphragm C.

The cooling is of much advantage to the air-pump. The reason of the cooling is that the water falling through the lower plate near the copper diaphragm has come almost directly from the water-supply pipe at the top, having only been stopped by one deflector, whereas most of the water will have passed through two deflectors, and consequently become much more heated.

While I have shown the casing of the condenser in the form of a cylinder longitudinally arranged, it may be made in any form desired so long as one or more horizontal deflectors are used with a water-supply pipe mounted above them.

I claim as my invention—

1. The combination in a condenser, of a casing, a horizontal deflector made up of a series of trapped troughs spaced apart so that water will overflow from each trough in a thin sheet, a water-supply pipe above the deflector arranged to discharge water onto said deflector, said casing having an inlet and an outlet for vapor, substantially as described.

2. The combination in a condenser, of a casing, two horizontal deflectors, one mounted above the other, each deflector made up of a series of trapped troughs so that water will overflow from the troughs and fall in a thin sheet, a water-supply pipe above the upper deflector and arranged to discharge water to said deflector, the water in the upper deflector discharging onto the lower deflector, said casing having an inlet and an outlet for the vapor to be condensed.

3. The combination in a condenser, of a casing having an inlet for vapor and an outlet, a water-supply pipe at the upper end of the condenser, and two deflectors, each made up of a series of trapped troughs spaced apart so that water will overflow from each trough in a thin sheet, one deflector stopping short of one end of the casing and the other deflector stopping short of the other end of the casing and one mounted below the other to form a circuitous passage for the vapor, so that the said vapor will pass through sheets of water escaping from the water-supply pipe and passing through the deflectors, substantially as described.

4. The combination in a condenser, of a casing having an inlet for vapor and an outlet, and having two deflectors, one mounted below the other, one deflector stopping short of one end of the casing and the other stopping short of the other end of the casing, each deflector being made up of a series of spaced troughs, each trough having a trap so that the water as it escapes from the supply-pipe will fall onto the first deflector and pass through the first deflector onto the second deflector and pass through the second deflector to the bottom of the casing, the traps preventing the vapor passing through the deflectors so that it must follow a circuitous passage and pass through the sheets of water, substantially as described.

5. The combination in a condenser, of a casing having an inlet for vapor and an outlet, a horizontal supply-pipe in the upper portion of the condenser, said pipe having a longitudinal slot in its upper portion so that the water must fill the pipe and overflow through the slot and over the outer surface of the pipe, and two deflectors, one mounted under the other, each deflector composed of a series of spaced troughs, substantially as described.

6. The combination in a condenser, of a longitudinally-arranged cylinder having a head at each end, an inlet for vapor at the upper end of the cylinder near one end, and an outlet, a water-supply pipe extending nearly the full length of the cylinder and having a slot in its upper surface, two deflectors, one arranged above the other, the upper deflector terminating a short distance from the end opposite the inlet end for the vapor, the other terminating a short distance from the other end, each deflector being made up of a series of spaced and trapped troughs so that the condensing water will pass from the supply-pipe in a thin film and pass through each deflector in thin sheets while the vapor will pass over the first deflector and return between it and the second deflector, and finally pass out under the second deflector, substantially as described.

7. The combination in a condenser, of a longitudinal casing having a head at each end, a diaphragm at one end of the casing terminating a short distance from the bottom of the condenser forming a space between the head and the diaphragm, an outlet in the head which may be connected to a vacuum-pump, a supply-pipe for the condensing water situated in the upper portion of the condenser, and a deflector between said supply-pipe and the lower edge of the diaphragm, said deflector being perforated for the passage of condensing water, substantially as described.

8. The combination in a condenser, of a

cylindrical casing, an inlet at the upper end for vapor and a hot-well connection in the lower portion of the casing, a vacuum-pump connection in one head of the condenser, a longitudinally-arranged water-supply pipe open throughout its length so as to allow a film of water to escape from the pipe, two deflectors, one mounted above the other and each deflector made up of a series of trapped troughs, substantially as described.

9. The combination in a condenser, of a casing, an inlet for vapor at the upper end of the casing, a connection to the hot-well at the lower end of the casing, at outlet-passage at one end of the condenser arranged to be connected to the vacuum-pump, a supply-pipe for the condensing water, two deflectors, one mounted below the other and arranged so that the vapor will travel in a circuitous path, a diaphragm at the outlet end of the casing, said diaphragm extending to a point below the lower deflector, substantially as described.

10. A deflector for horizontal condensers consisting of a series of trapped troughs spaced apart so that as the water overflows from the troughs it will fall in thin sheets, substantially as described.

11. The combination in a condenser, of an inlet for vapor, an outlet, a supply-pipe for condensing water situated in the upper portion of the casing, two deflectors, one mounted below the other, one terminating a short distance from one end of the casing and the other terminating a short distance from the opposite end of the casing, each deflector being made up of a series of transversely-arranged troughs, the troughs being spaced apart and each trough having a low flange on one side and a high flange on the other side which is curved and overlaps the lower flange of the adjoining trough so as to form a trap whereby the water, as it passes from the supply-pipe at the upper end of the casing, will pass into the troughs of the upper deflector and pass from this deflector in a series of thin transverse sheets to the troughs of the lower deflector and will escape from these troughs in a series of transverse films to the lower portion of the cylinder, so that the vapor as it passes through the condenser must pass through a number of films of water, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE M. NEWHALL.

Witnesses:

WILLIAM E. BRADLEY,

JOS. H. KLEIN.