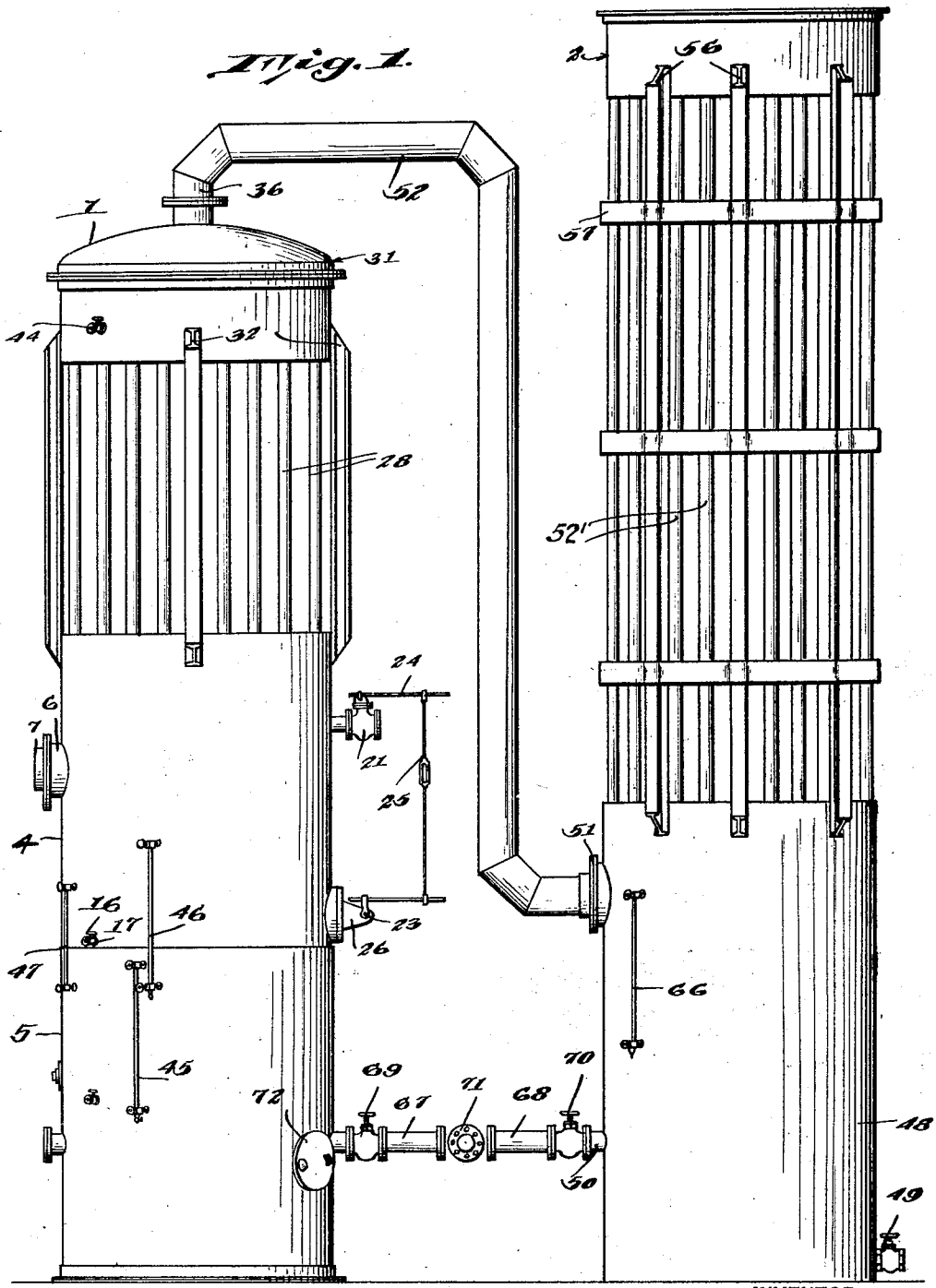
Sept. 1, 1931. M. H. KOTZEBUE 1,821,840

COMBINED FEED WATER HEATER AND STEAM CONDENSER

Filed July 23, 1930 3 Sheets-Sheet 1

Fig. 1.



WITNESS

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COMBINED FEED WATER HEATER AND STEAM CONDENSER

Filed July 23, 1930 3 Sheets-Sheet 2

Fig. 2.

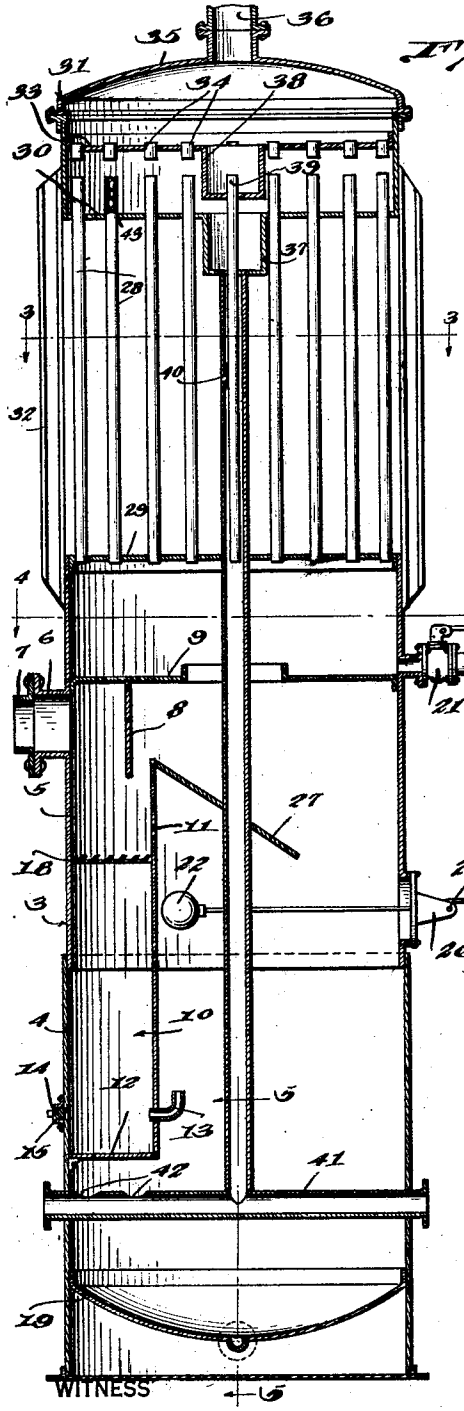


Fig. 3.

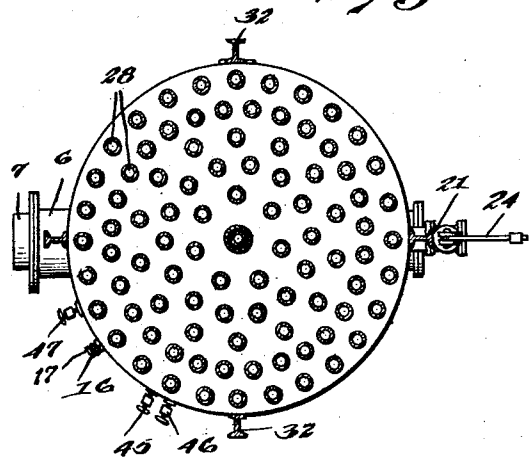
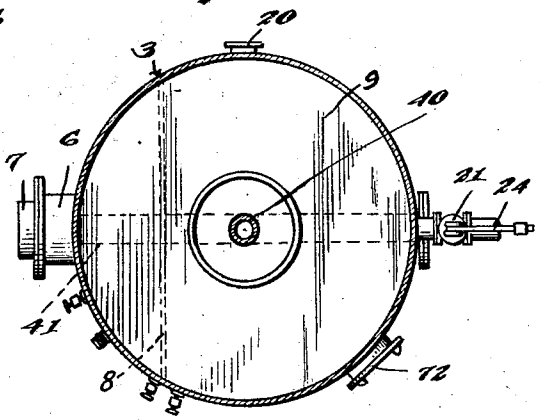


Fig. 4.



WITNESS

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COMBINED FEED WATER HEATER AND STEAM CONDENSER

Filed July 23, 1930 3 Sheets-Sheet 3

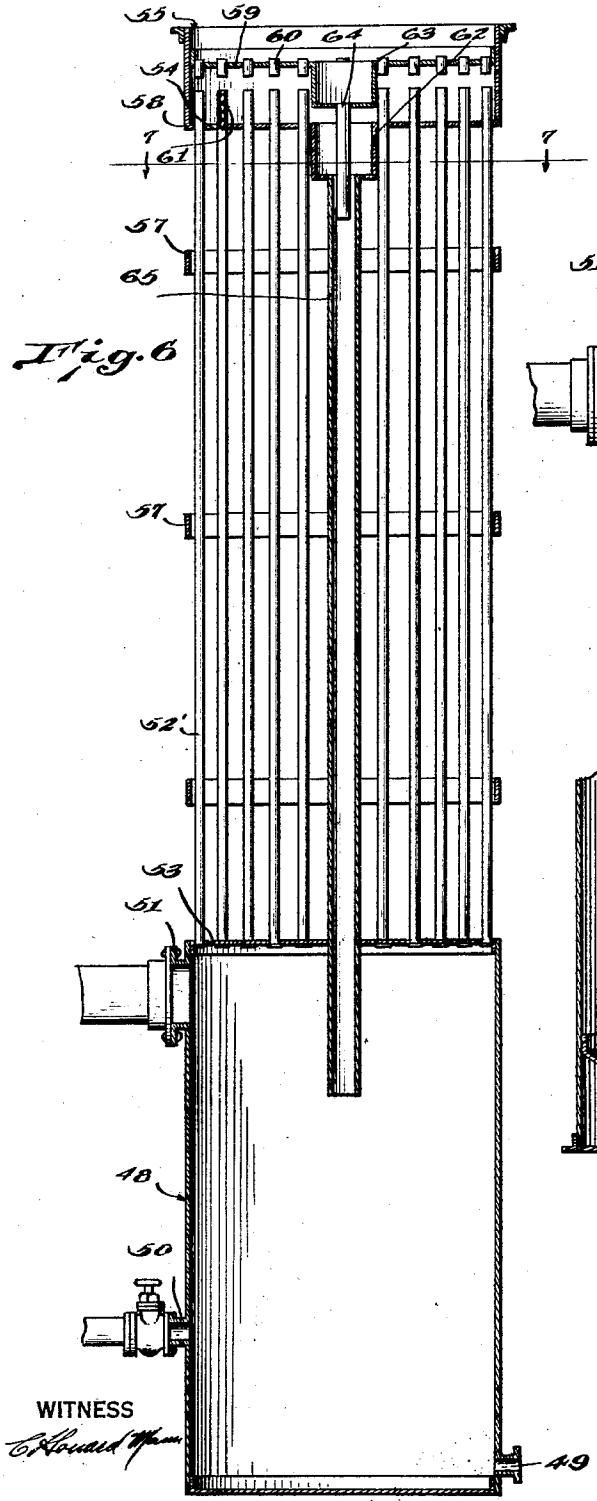


Fig. 6

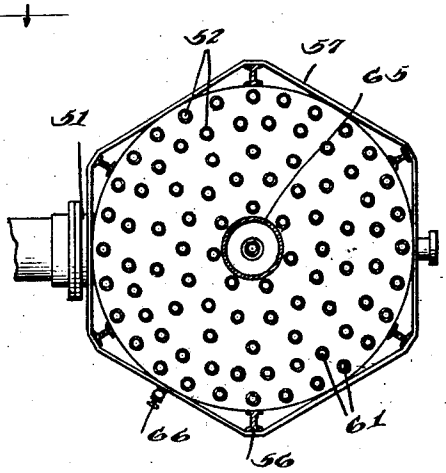


Fig. 7

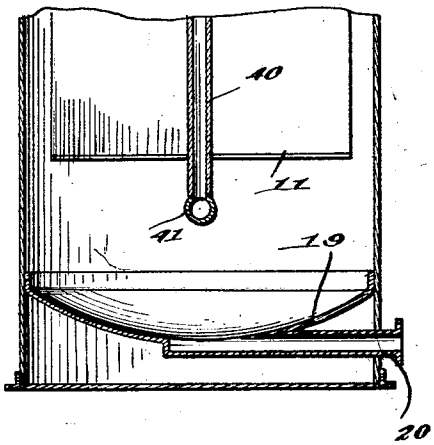


Fig. 5.

WITNESS

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Patented Sept. 1, 1931

1,821,840

UNITED STATES PATENT OFFICE

MEINHARD H. KOTZEBUE, OF TULSA, OKLAHOMA

COMBINED FEED WATER HEATER AND STEAM CONDENSER

Application filed July 23, 1930. Serial No. 470,172.

My invention relates to a means for heating feed water for use in boilers and for condensing steam exhausted from power means supplied by said boiler more particularly to a feed water heater and steam condenser for special use in oil field work in connection with drilling operations, and it consists in the combinations, constructions and arrangements herein shown and described.

In oil field operations it is often very difficult to obtain water in sufficient quantities for use in steam plants utilized in operating pumps and the like. Because of this fact numerous attempts have been made to recover the water in the steam exhausted from the pumps and other machinery. Devices formerly used to achieve this function however, have been extremely complicated and consequently expensive in original cost and operation. It is, therefore, a purpose of my invention to provide a means for recovering the steam exhausted from machines operated by steam for further use in the boiler in which the steam is generated with an apparatus which is of simple construction and easy to operate with a consequent economy of original operating cost.

A still further object of my invention is to provide a device of the type described which will purify the water by removing from the same oil contained in said water because of its use in lubrication in machinery and oil and other foreign matter present in the water through other causes.

A still further object of my invention is to provide a device of the type described which has few parts, does not get out of order easily and is simple to manufacture.

Other objects and advantages will appear as the specification proceeds and the invention will be more particularly defined in the appended claims.

My invention is illustrated in the accompanying drawings forming a part of this application, in which:

Figure 1 is an elevational view of my invention;

Figure 2 is a sectional view through a portion of my invention, parts thereof being shown in elevation for clearness of illustration;

Figures 3 and 4 are sectional views on lines 3—3 and 4—4 respectively of Figure 2;

Figure 5 is a sectional detail view on line 5—5 of Figure 2;

Figure 6 is a sectional view of another portion of my invention with parts thereof shown in elevation for clearness of illustration; and

Figure 7 is a sectional view, on line 7—7 of Figure 6.

My invention comprises two units, one of which is termed the primary unit and designated by numeral 1, and the other of which I term the secondary unit and indicate by numeral 2. I shall first describe the primary unit.

Referring to Figure 2 it will be observed that this unit consists of a tank or casing 3 which may be constructed integrally or formed in sections 4 and 5, as clearly shown in Figure 1. This tank is equipped with an exhaust inlet 6 which by means of pipes 7 is connected to the exhaust of the machinery or other equipment operated by steam from the boiler. Situated adjacent this exhaust inlet 6 and immediately before the same is a baffle plate 8 which may be mounted in any suitable fashion before the inlet 6 but is shown as suspended from a pan 9 which is placed immediately above the inlet 6 and above a compartment 10 provided for a purpose that will be described later on in the specification. This baffle plate 8 extends downwardly a short distance below the inlet 6 to project within the oil and other foreign matter receiving compartment 10 positioned immediately below and adjacent the inlet 6.

The compartment 10 is formed by a wall 11 situated in spaced relation to the wall of the tank 3 and also in spaced relation to the baffle 8 and a bottom 12 formed at the lower extremity of the wall 11. It is equipped with a water inlet 13 projecting into the wall 11 thereof and a water blow off vent 14 provided with a plug 15 and an oil and other foreign matter blow off vent 16 equipped with a valve 17. At its upper portion it carries a perforated baffle 18, which baffle prevents ac-

cumulation of sediment, etc., in the compartment 10 which cannot be passed through the blow offs.

The lower portion of the tank 3 is adapted for the reception of the condensed water for use in the boiler by means of a water proof bottom 19 positioned therein. This bottom 19 is equipped with a conventional drain 20 which may be utilized to drain off the water when the system is not in use.

For the admission of make-up water to the tank 3 at the beginning of the operation, the aalve 21 is provided which valve may be of the whistle type or of any other conventional construction. This valve is positioned immediately above the pan 9 which pan as will later be shown is adapted to heat the make-up water. The pan is apertured at the center for the passage of steam therethrough in a manner later to be described.

The valve is actuated by a float 22 positioned in the tank 3 at the water level which float 22 is pivotally mounted in the wall of the tank 5 as shown at 23 and connected to the operating lever 24 by an adjustable connecting rod 25. The pivot mounting frame 26 may be removed from the wall of the tank 3 for disassembly.

To protect the float from mud and mud-forming matter contained in the exhaust steam passing between the baffle 8 and the wall 11 and thereabove an additional baffle 27 is mounted on the wall 11 to project above said float. It can easily be seen that any foreign matter tending to fall down upon the float will strike this baffle 27 to be carried off to one side of the float.

For lowering the temperature of the steam for condensing the same a plurality of steam pipes 28 are positioned on the top of the tank and in communication with the interior thereof. These steam pipes 28 are mounted between the top 29 of the tank 3 and the bottom 30 of the member 31 of my apparatus which I call a mist extractor. They are placed in spaced relation and exposed to the atmosphere to radiate heat from within. The mist extractor 31 is supported on the tank 3 by means of I-beams 32 which may be secured to the tank and the mist extractor by any suitable means. This mist extractor is constructed in a manner similar to the mist extractor disclosed in my United States Patent No. 1,695,192, issued Dec. 11, 1928, and comprises the lower floor 30 through which the steam pipes 28 project, an upper partition wall 33 in which a series of chimneys 34 are positioned immediately above the respective steam pipes 28 and a top or cover 35 having a steam outlet 36 to the atmosphere or to other condensing mechanism. The floors 30 and 33 are further provided with drains 37 and 38 respectively, through which the water contained in the mist extractor flows downwardly through the steam pipe 39 in drain 38 and pipe 40 in drain 37. This pipe 40 connects to the pipe 41 which comprises the feed water outlet for connection to the feed means leading to the boiler. The pipe 41 it will be observed is provided with apertures 42 which permit the water in the tank 3 therein to be carried to the boiler for use.

The steam pipes 28 are equipped for a distance of about six inches of their length at the top thereof on their interiors with strips of twisted metal 43 which strips of twisted metal impart to the upwardly flowing stream an outwardly whirling motion for an operation soon to appear.

The mist extractor is also provided with a blow-off 44 which blow-off may be utilized for extracting drinking water, etc., therefrom.

Suitable gages 45, 46 and 47 are positioned on the outside of the tank 3 for indicating the water and the oil levels respectively.

From the foregoing description, the use and operation of this portion of my mechanism is easily understood. The steam from the machinery or other means operated from the boiler passes through the inlet 6 to engage the baffle 8. The lubricant and other foreign matter because of its weight falls on the baffle 18 and passes into the compartment 10 for subsequent disposal through the blow-off 16. The steam then passes between baffle 8 and wall 11 through the aperture in pan 9 into steam pipes 28. Any mud or mud-forming materials contained in said steam falling downwardly after passage over the wall 11 will be shunted, by the baffle 27 beyond the float 22 without disturbing the functions thereof.

The steam rising upwardly in the steam pipes 28 is engaged by the twisted strips of metal to pass from the tops of said steam pipes in an outwardly-moving whirl. At this point the steam encounters a dead space and thereafter deposits the droplets of water formed therein by whirling them clear of the tubes. The steam particles being lighter than the liquid particles are not whirled to such a distance so that the greater part of them pass through the chimneys 34 to be discharged through the outlet 36. Some of the steam in the space above the plate 33 will be condensed by contact with the air cooled outer wall and top wall 35 and the condensate will collect on the plate 33. The deposits of liquid on plates 30 and 33 pass through the drains 37 and 38 and through pipes 39 and 40 and pipe 41 to be conducted therefrom to the boiler for use.

During the passage of the steam about and through the aperture of the pan 9 the make-up water is heated before it flows through the aperture therein to fall into the lower portion of the tank 3. The float of course controls the admission of this make-up water as needed.

Attention is now directed to Figures 1, 6 and 7 wherein is disclosed the secondary unit of my invention. This secondary unit operates upon the same principle as the primary unit with the exception that it is not equipped with make-up water supply means or means for extracting lubricant and other foreign matter from the water.

It consists of a tank 48 having a drain 49, a feed water outlet 50 in which the feed water is conducted to the boiler and an exhaust inlet 51 similar to the exhaust inlet 6 of my primary structure. This exhaust inlet 51 is connected in my assembly to the outlet 36 of the mist extractor of the primary unit by means of a pipe 52. It is in this tank 48 that the feed water is collected after the condensation thereof for utilization in the boiler.

For cooling the steam admitted into tank 48 through inlet 51 for subsequent use in the boiler a system of steam pipes 52′ are positioned above the tank 48 and in communication therewith. These pipes 52′ are supported by the top 53 of the tank 48 and the bottom 54 of the mist extractor 55. They are placed in spaced relation and exposed to the atmosphere for purposes of radiating heat from the steam within.

The mist extractor 55 is supported as in the primary unit by means of beams 56 cooperating therewith and with the tank 48. These beams are secured about the tank 48 and mist extractor 55 by means of bands or girdles 57 which bands or girdles may be constructed of any convenient material, and in any fashion. It is obvious that other fasteners could well be used.

The mist extractor 55 is of a construction similar to the mist extractor 31 and has similar floor walls 58 and 59 with the ends of the pipes 52′ projecting through the wall 58 and chimneys 60 in the wall 59. Suitably spirally-twisted pieces of metal 61 are positioned in the pipes 52′ as in the primary unit to give the ascending steam a whirling motion. The floors 58 and 59 are also equipped with drains 62 and 63 communicating with pipe 64 in the case of drain 63 and with pipe 65 in the case of drains 62 and 63 for draining the contained liquid from the floors back into the tank 48 for use in the boiler. In this unit no cover is provided for the mist extractor, the same being open at the top and exposed to the atmosphere for release of air and any uncondensed steam.

The tank 48 is equipped with a gage 66 similar in construction to the gages on the tank of the other unit for determining the water level therewithin.

The operation of this portion of the device is easily understood, being similar to the operation of the preceding unit. The steam comes in the inlet 51 passes upwardly through the pipes 52′ to be cooled and is then whirled from the upper ends of the pipes into the lower chamber of the mist extractor. The heavier particles being whirled farther than the light ones are deposited on the plate and then descend into the tank while the air passes upwardly through the chimneys 60. Any particles of condensate which are carried through the chimneys 60 may fall down upon the plate 59 to pass through the drain 63 therein, pipes 64 and 65 and back into the tank while the air passes off into the atmosphere. The water in the tank 48 may then be utilized for the boiler water.

The two units are interconnected by pipes 67 and 68 having valves 69 and 70 respectively positioned in the lines for controlling flow of water from the respective units. These pipes 67 and 68 communicate with a pipe 71 which conducts the water to the boiler by way of pumps or other suitable apparatus utilized in the feed water system for introducing water into said boiler.

The tank 3 is fitted with a man-hole 72 to allow entry therein for cleaning purposes. A similar man-hole not shown may be used in tank 48 to enable workmen to clean the same.

It will be observed that the unit 2 is of greater height than unit 1, thereby assuring rising of the steam therein from unit 1 and diffusion of the air coming from the top thereof into the atmosphere.

It is thus seen that I have provided a means for recovering the steam utilized in the operation of machinery for subsequent use in the boiler that supplies the power for the operation of said machinery which frees said steam from lubricant and other foreign matter contained therein and recovers said steam for use as boiler water by a simple and effective apparatus.

I claim:

1. In combination with a steam power plant or the like, a tank adapted for the reception of exhaust steam from said power plant, vertically positioned steam pipes mounted on the top of said tank and exposed to the atmosphere for radiating the heat from said steam, means positioned at the top of said steam pipes for condensing the steam comprising a casing having a lower chamber and an upper chamber, chimneys positioned above said steam pipes in the wall between said chambers, said chambers being adapted to condense the steam therein, and means conducting said condensed steam from said chambers to the tank for subsequent use in the boiler of said steam power plant.

2. In combination with a steam power plant, means for removing from said steam lubricant and other impurities, means for cooling said steam and condensing the same for use in the boiler of the steam power plant, and means communicating with said condensing means for further condensing said steam for use in the boiler comprising a tank adapted for the reception of steam exhausted from

said first mentioned means, and a condenser including a system of piping positioned on the top of said tank for cooling the steam, and means for returning said condensed steam to the tank for use in the boiler, said condensing means being exposed to the atmosphere and having means for the release of uncondensed steam therefrom.

3. In combination with a steam power plant or the like, a tank adapted for the reception of steam exhausted from said steam power plant, a condenser comprising vertically positioned pipes opening into an upper header mounted on the top of said tank for condensing said steam, a conduit for conducting said condensed steam from the condenser to said tank for reception and use in the boiler, beams connected to said tank for supporting said condenser thereabove, and means for securing said beams in rigid position.

4. In combination with a steam power plant or the like, a tank adapted for the reception of exhaust steam from said power plant, steam pipes mounted on said tank and exposed to the atmosphere for radiating heat from said steam, means associated with said steam pipes for condensing the steam comprising a casing having lower and upper chambers, and means conducting said condensed steam from said chambers to the tank for subsequent use in the boiler of said steam power plant.

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