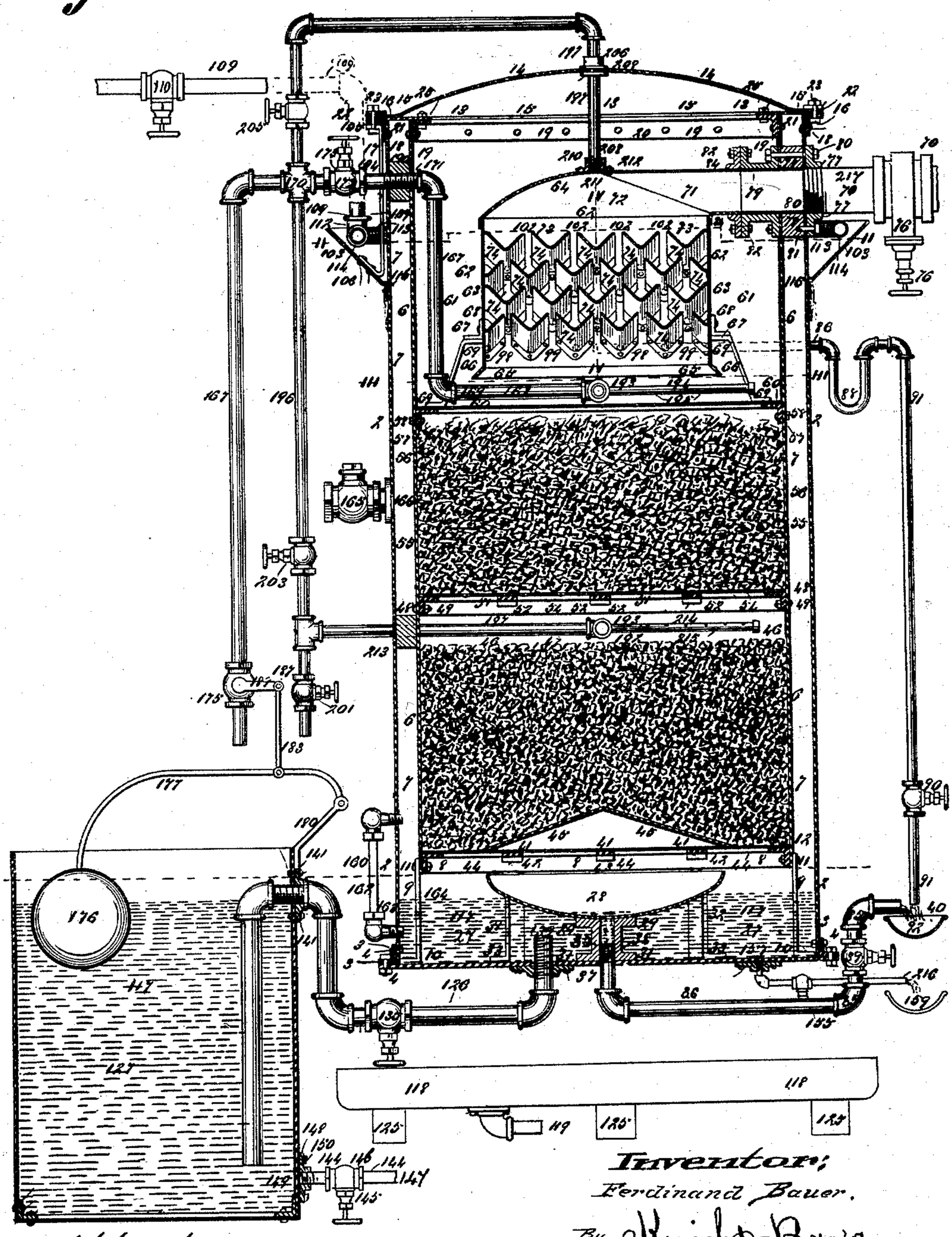
(No Model.) 2 Sheets—Sheet 1.

F. BAUER.

COMBINED STEAM CONDENSER, OIL EXTRACTOR, AND FEED WATER HEATER.

No. 456,464. Patented July 21, 1891.

Fig. I.



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Charles Pickles.
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Inventor;
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By Knight Bro's.
Atty's.

(No Model.) 2 Sheets—Sheet 2.

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Fig. II.

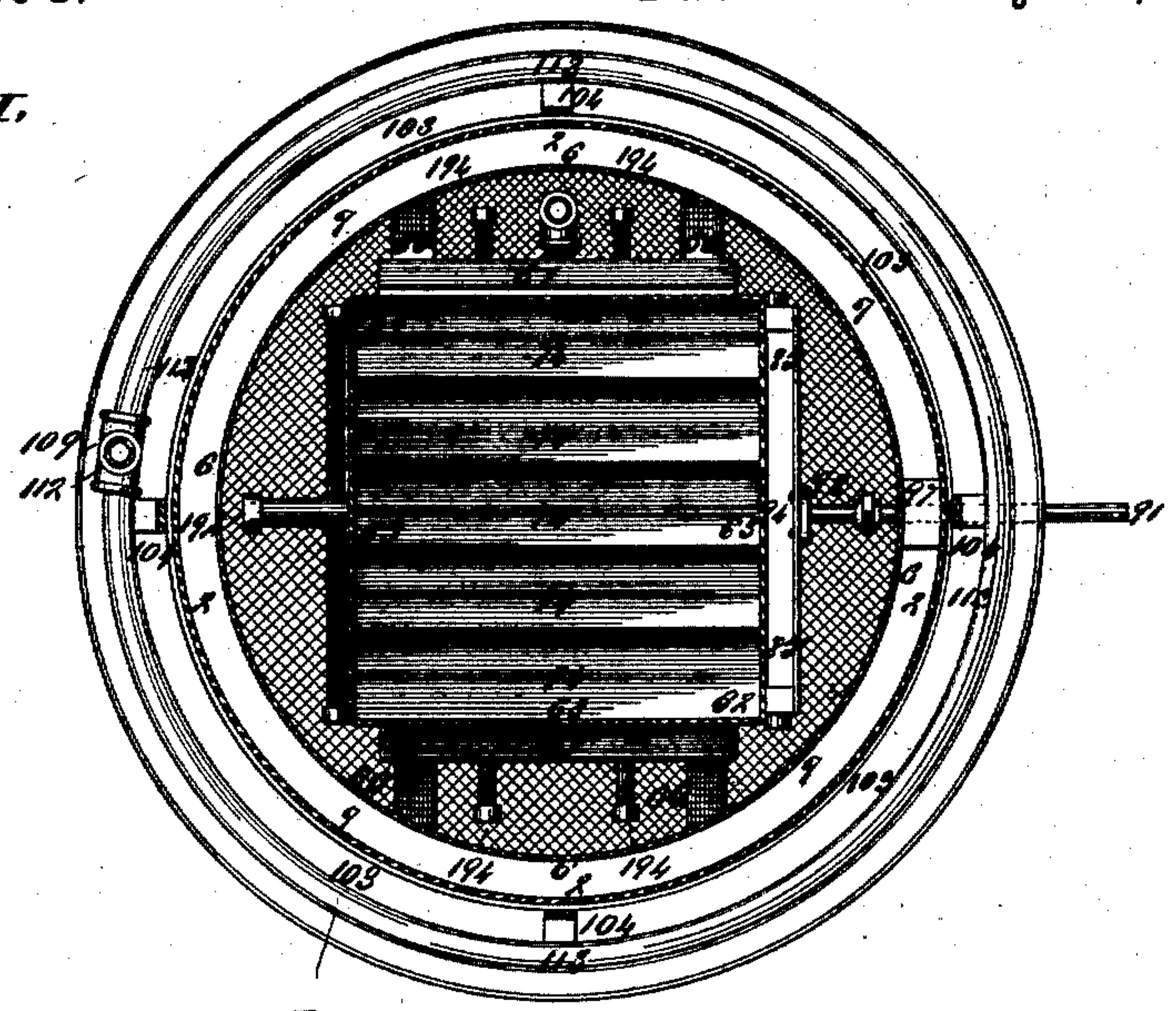


Fig. III.

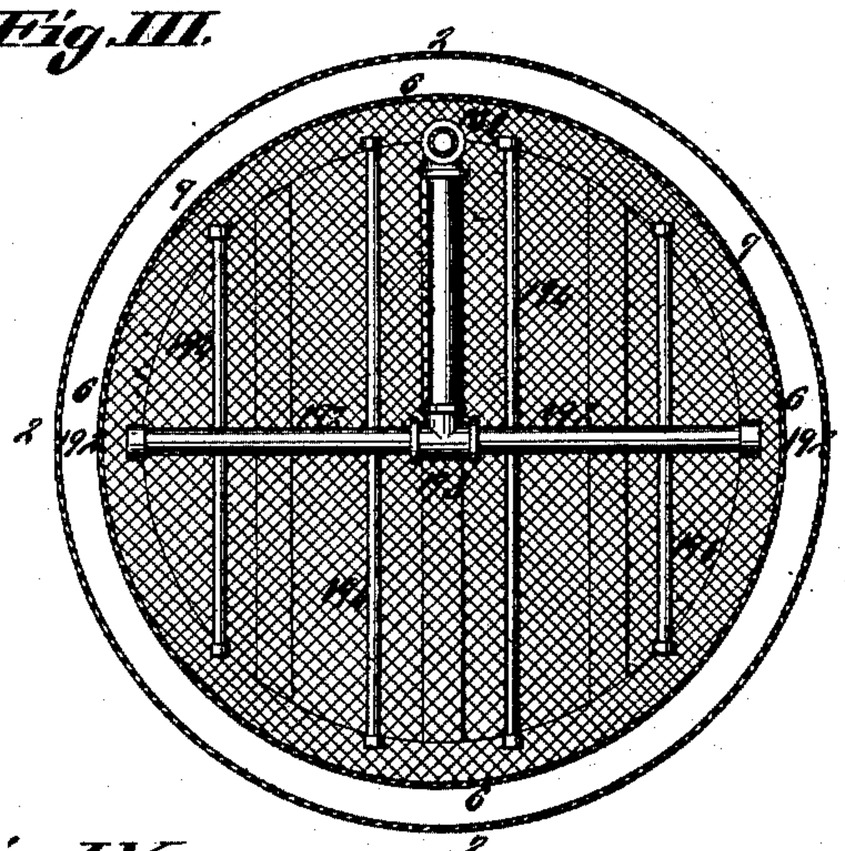


Fig. V.

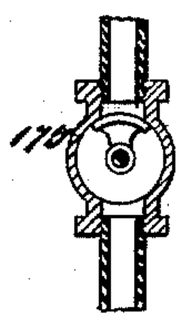


Fig. VI.

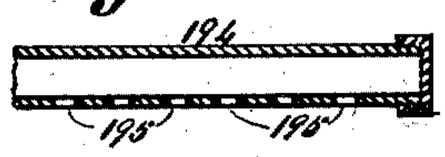


Fig. VII.

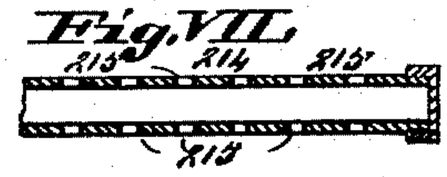
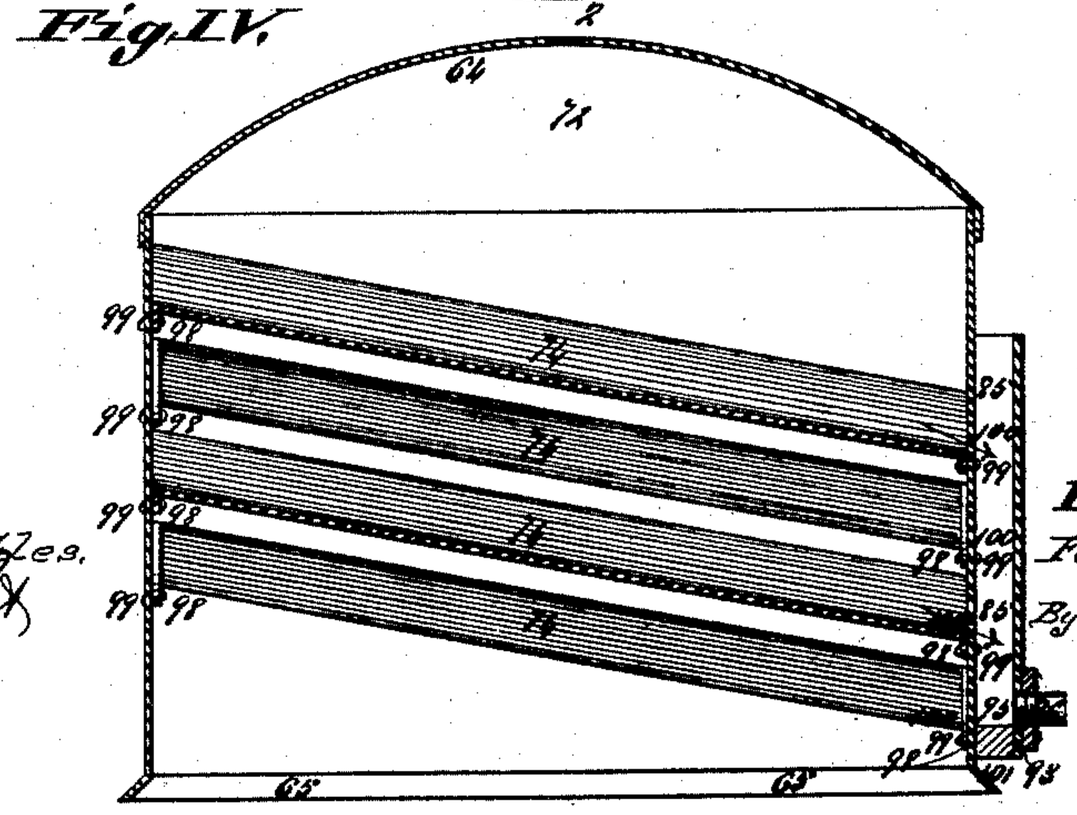


Fig. IV.



Attest;
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By Knight Bro's.
Attys.

UNITED STATES PATENT OFFICE.

FERDINAND BAUER, OF ST. LOUIS, MISSOURI.

COMBINED STEAM-CONDENSER, OIL-EXTRACTOR, AND FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 456,464, dated July 21, 1891.

Application filed November 21, 1890. Serial No. 372,220. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND BAUER, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Combined Steam-Condensers, Oil-Extractors, and Feed-Water Heaters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to devices for the combined condensation of exhaust-steam, the extraction of oil and grease taint from the same, and the utilization of the warmed product from the cold-spray condensing-water as feed for the boiler; and the invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a vertical plan section view of the device and shows the oil-drip traps, filters, &c. Fig. II is an enlarged horizontal section taken on line II II, Fig. I, and shows the oil-drip traps, a detail of the drain-pipe from said traps, and details of the live steam and flushing pipes. Fig. III is an enlarged horizontal section taken on line III III, Fig. I, and shows the live-steam and flushing pipes. Fig. IV is an enlarged vertical section taken on line IV IV, Fig. I, and shows a longitudinal view of the oil-drip traps and the catch-sink into which they drip. Fig. V is an enlarged vertical section of the governor-valve, which is operated by the floating ball in the pure-water tank, the valve being closed. Fig. VI is an enlarged detail section of one of the upper flush-pipes having vent-perforations on its lower side, and Fig. VII is an enlarged detail section of the lower flush-pipe having vent perforations both above and below.

Referring to the drawings, 1 represents the base-plate of the outer main metal cylinder of the apparatus, which may be supported by any suitable means where said apparatus is to be located.

2 represents the vertical outer cylindric incasement, whose base fits within the angle circle-iron 3, secured to the base-plate and to the base of said incasement 2 by bolts 4.

6 represents the inner cylinder, which is of sufficiently-reduced diameter to that of the outer one to provide an annular condensing-chamber 7 between said cylinders. The said inner cylinder, as also the inverted angle circle-iron 8, is supported at a suitable distance above the base-plate 1 by the legs 9, whose foot-flanges 10 rest on said base-plate, and whose tops are secured to the base of said inner cylinder and to the lower flange of said inverted angle-circle iron by the screw-nutted bolts 11, passing through said legs, the inner cylinder 6, and the angle-iron 8.

13 represents the circle-plate, which surmounts both cylinders 2 and 6, and also the condensing-chamber 7, and 14 is the surmounting-dome, whose horizontal circular peripheral flange 15 sits and fits tightly on the upper surface of said circle-plate 13.

16 represents the circle angle-iron that fits around the outside of the upper edge of the cylindric incasement 2, to which it is secured by the screw-nut bolts 17, which bolts are seated and screw-tightened in the perforations 18 in said angle-iron and in said upper edge of the cylinder 2.

19 represents the circle angle-iron that fits around inside of the upper edge of the inner cylinder 6, to which it is secured, the plate 13 being secured to angle-iron 19 by bolts 25.

22 represents the circle washer-collar that is seated on the upper surface of the flange 15 of the dome 14, and 23 are screw-nut bolts passing through the plate 22 in said flange 15, the plate 13, and the angle-iron 16, so as to effect a steam-tight joint. All the other joints to the apparatus already described, as are those yet to be described in this specification, are also made steam-tight.

27 represents the condensed-water tank at the base of the apparatus within the cylinder 2.

28 represents the catch-basin, which rests and is secured on the upper flange 29 of the broad-flanged **I**-pipe 30, whose lower foot-flanges 31 rest on the basement-plate 1, within the condensed-water tank 27. The legs 32, whose flanged feet 33 rest on said base-plate, also support said catch-basin, with which basin they may be cast integral, or they may be securely attached by any suitable means.

36 is a drain-pipe having its end screwed into the threaded interior of the **I**-pipe 30, leading from the basin 28, and being provided with a valve 39 for governing the discharge from said catch-basin 28, that it drains. The

said drain-pipe discharges into the sink 40, from which it may be conveyed to other devices foreign to this invention for the condensation of the waste-oil product, or when it is not required to utilize the same it may be conveyed by the customary drain-pipes to the sewer. The final functions of said catch-basin in eliminating the last trace or vestige of oil from the resultant water product of the condensed steam, will hereinafter be described in due course.

41 represents tie-joists that cross-tie from one upper flange on one side to the other of the circle angle-iron 8, to the lower flange of which angle-iron the flanges 42 of said tie-joists are secured. The said tie-joists are placed at intervening positions so as to divide up their bearing capacity.

44 represents a perforated or screen circular floor that rests on said joists and on the upper flanges of said circle angle-iron, and 45 is a water-tight and steam-proof cone that rests on and is located over the center of said screen-floor, and thus sheds the water of condensation that filters onto it around clear of the catch-basin.

46 represents the filtrant that rests on said screen-floor and on said cone within said inner cylinder in the lower filtrant-chamber 47, room being provided above the filtrant in said chamber for the location of the lower flushing and live-steam pipe that will be described in due course with its operative connections.

48 represents a circle angle-iron that is secured about one-third way up the inner cylinder 6 to its inner side by the screw-nut bolts 49.

51 represents tie-joists, arranged at intervening positions, that cross-tie from one upper flange from one side to the other of the circle angle-iron 48, to the lower flanges of which angle-iron the flanges 52 of said tie-joists are secured.

54 represents a perforated or screen circular floor that rests on said joists and on the upper flanges of said circle angle-iron. On said screen-floor within said inner cylinder rests the filtrant 55 within the upper filtrant-chamber 56. The filtrant used in both filtrant-chambers may be pulverized coke or any other suitable material.

57 represents a circle angle-iron that is located at a suitable distance above the circle angle-iron 48 to allow sufficient room for the said upper filtrant-chamber. The said circle angle-iron is secured inside and to the inner side of the inner cylinder by the screw-nut bolts 58.

60 represents the circular perforate or upper screen-floor that rests on the upper flange of the circle angle-iron 57, and which constitutes both the perforate ceiling of the upper filtrant-chamber and the floor of the oil-trap and flushing-chamber 61.

62 represents the square centrally-located bottomless oil-trap box, which is inclosed laterally and is surmounted, respectively, by the sheet-metal sides 63 and dome 64. The said box is provided with flaring bottom edges 65, and is elevated sufficiently above the upper screen-floor on the angle-turned legs 66 to allow the free passage of the exhaust-steam.

67 represents longitudinally-straight angle-iron strips, whose perforate upper flanges are secured by screw-bolts or rivets 68 to the sheet-metal sides.

The angle-turned legs 66 have obtuse-angled head and foot terminal flanges 69 at, respectively, the top and bottom. The said head-flanges of said legs rest under and against the lower flanges of the angle-iron strips 67, and the foot-flanges rest on the upper screen-floor 60 and sufficiently surmounting the upper flanges of the circle angle-iron 57 to sustain a firm foothold without any undue pressure on the indirectly-supported portion of said upper screen-floor. The said legs support said oil-trap box at a sufficient height above the screen-floor not only for the free passage of the exhaust-steam, but also to allow the location of the upper flushing and live-steam pipe, hereinafter described in due course, when its connecting parts are introduced.

70 represents the joint-pipe sections of the exhaust-steam-supply pipe 217, that connects with the exhaust from the engine at the reception end of said pipe, and, *via* a flanged connecting joint-pipe 71, with the dome 64 and steam-dome chamber 72 above the multipartite system 73 of angle-trough oil and grease traps 74 within the trap-box 62, the pipe 217 being provided with a valve 76. The screw-threaded end of the steam-exhaust-pipe joint that connects with the apparatus engages with the screw inner-threaded flange-collar 77 to effect a steam-tight joint at the entrance of the steam-exhaust within the apparatus. The exhaust-steam then passes through the parting-block 78 in the annulus that forms the condensing-chamber 7, and through the I-pipe 79 to the aforesaid flanged connecting joint-pipe 71, that supplies said exhaust-steam to the steam-dome chamber 72 above the oil and grease traps. The screw-nut bolts 80 pass through the flanges of said collar 77, the corresponding flanges of the I-pipe 79, the two cylinders 2 and 6, and the parting-block 78, and bind the parts firmly together, and the screw-nut bolts 82 secure the collar 84 and pipe 71 to the I-pipe 79, and thus firmly steady the summit of the oil and grease-trap box 62.

85 represents the drip-reservoir, into which the oil and grease traps drip, and 91 is the drain-pipe, having the seal-trap 38 and valve 90, which drain-pipe carries the oil-drip 92 from the reservoir 85 and discharges it into the sink 40, from which said oil-drip may be conveyed by any suitable means to an oil-condensing apparatus outside the limits of

this invention; or, if it is not desired to utilize the same, it may be carried by any usual form of drain-pipes to the sewer.

It will be understood that the globe-valves 76 and 90 respectively control the flow of, in the first case, the exhaust-steam supply into the apparatus, and, in the second place, the oil-drip from the oil-drip reservoir 85.

93 represents a screw-threaded perforate collar that is secured to the front wall of the reservoir 85 near its base, an open port 95 through which registers with the perforation through said collar. The end of the drain-pipe 91 is screw-seated within said perforate collar, and said drain-pipe passes through the inner and outer cylinders of the apparatus and through the parting-block 97 between said cylinders.

The multipartite system of drain-traps is formed by four (more or less) surmounting tiers of the aforesaid angle-troughs, which are preferably made of sheet metal and are provided with angle-flanges 98 at their ends, through which and through the sheet-metal side walls of the oil-trap box, against which said angle-troughs fit, the rivets 99 are inserted and fastened, so as to make tight joints of said flanged ends to said side walls. The said angle-troughs are set on an incline running downward toward the oil-drip reservoir 85, and open ports 100 through the wall on that side at the lower points of said angle-troughs allow the passage of the oil-drip (that has been trapped by said troughs) into the reservoir 85. The parting-block or bottom 101 of said reservoir between its two walls may be made of iron or of any other suitable material.

The angle-trough oil-traps are placed a slight distance apart in their tiers, so as to allow open ports 102 between them for the forced descent of the exhaust-steam, and the troughs or traps are so placed that in each underlying tier their angle concaves present themselves beneath the open steam-ports of the surmounting tier, so as to catch the passing steam and extract succeeding portions of its taint of oil, the capillary affinity that the oil has to the metal surface of the traps attracting it thereto, as will be more definitely explained in the operative description.

103 represents the circular flaring cold-water-drip trough that is secured at bottom to the outside of the outer cylinder, and whose inclined upwardly-flaring sides are firmly held by four (more or less) hanger-hooks 104, the upper right-angle perforated flanges 105 of which hangers are securely held by the heads of the bolts 23, while their foot flanges or hooks 106 are secured to the flaring trough 103, the latter being thus firmly held from sagging outward.

109 represents a cold-water-supply pipe, which runs to and takes its supply from any cold-water reservoir or hydrant, the water from which is preferably filtered, and the supply is governed by the globe-valve 110. The said supply-pipe connects *via* the three-way or inverted-T-joint pipe 112 with the circular cold-water-drip pipe 113, which it holds suspended within the circular flaring cold-water-drip trough 103. Perforations 114 in the bottom of said circular pipe allow the escape of the cold water into said circular flaring trough, through the bottom of which said cold water percolates *via* the perforations 116 in immediate contact with the outer surface of the outer cylinder or incasement 2 of the apparatus all around the same, so as to rapidly condense the exhaust-steam which is continuously being forced into the annulus between the two cylinders 2 and 6, and the water of condensation 117 falls by its own gravity into the condensed-water tank 27 in the bottom of the apparatus. In the meantime the cold water, as it drips down the outside of the outer cylinder, becomes heated from the heat imparted by the condensing steam, so that by the time it drips from the base of the apparatus into the feed-water reservoir 118 it is sufficiently heated to be utilized advantageously for feeding the boiler from which the exhaust-steam *via* the engine has been provided, to which boiler it is conveyed by the feed-water-supply pipe 119. The said feed-water reservoir may be supported on bed-blocks 125 beneath the apparatus, which apparatus is itself supported by any suitable means.

126 represents the siphon discharge-pipe to the apparatus, which carries the purified condensed water from the basement tank 27 within the apparatus to the large metal reservoir-tank 127, the said pipe 126 being provided with a valve 125.

The end of the pipe 126 engages in the perforate screw of the collar 138 and passes up through the bottom of the tank 27 for a sufficient distance above said bottom to avoid the drawing of settlings from the bottom of the tank, and the said pipe being secured at its upper bend in the side of the tank 127 by means of a threaded collar 141. A discharge-pipe 147, when its valve 146 is open, carries the purified water of condensation from the tank 127 to the refrigeratory for its manufacture into ice, or wherever else it is required to be used.

216 is the sediment-drain pipe, having a valve 155. The normal position of the valve 155 when the apparatus is in operation is closed; but when it is being flushed out and cleansed then said globe-valve is opened and the washings then run through said drain-pipe into the sink 159, from which it passes by usual drain-pipes to the sewer.

160 represents the gage for indicating the height of water in the tank and its purity from oil taint or otherwise.

165 represents an escape-valve of usual construction, which is screw-seated within the port 166 in the outer cylinder, which port is normally closed by the valve, preventing the waste of steam from the annulus, ex-

cept when the steam-pressure approaches the danger point, when the safety-valve opens and allows its escape until said pressure is reduced within safety bounds, when it closes again.

167 represents the supplemental live-steam-supply pipe, whose recipient end connects directly with the boiler and discharges into the apparatus, so as to increase the volume of steam in said apparatus when the supply of the water of condensation from the exhaust-steam is not sufficient for the requirements of the ice manufacture or other purposes to which it has to be applied. The said supplemental live-steam-supply pipe is provided with a four-way coupling 170, globe-valve 173, and the cock-joint 174, in which works the ball cock-valve 175, that is actuated by the floating ball 176, which rises and falls with the changing level of the water in the reservoir 127. The said floating ball hangs pendent from the pivotal hanger-bail rod 177, whose end is pivoted to the fixed arm 180. The said arm 180 may be made integral with and form an extension-arm from the collar 141, and thus is secured to the side of the tank by the same screw-bolts 142 as is the collar. The lower end of the link 183 is secured to the bail-rod 177, its upper end being secured to the actuating-lever 189 of the valve 175. Thus it will be seen when the water lowers in the tank 127 the cock 175 is automatically opened, so as to allow free entrance of live steam direct from the boiler through the live-steam pipes 167, so as to increase the amount of the water of condensation that the apparatus produces to keep pace with the requirements of the ice or other factory in which the apparatus is used. A screw-threaded portion 171 of said pipe 167, where it enters the apparatus through the outer and inner cylinders 2 and 6, engages in and is thus firmly held by an internally-threaded parting-block 190, arranged between said cylinders.

192 represents the two sections of a transverse distributing-pipe, which sections connect with the union three-way or T-joint pipe 193, which union-pipe also connects with the horizontal joint-pipe 168 of the live-steam-supply pipe 167.

194 represents the sections of the discharge-pipes, which are secured by union-screw connections with the sections of the distributing-pipe 192. The said pipes 194 are provided with perforations 195 on the lower side, through which the live steam is forced into the apparatus to make up the deficit, when such occurs, of exhaust-steam for the production of the water of condensation.

196 represents the flushing-pipe for cleansing the apparatus, whose sections are secured in the coupling 170, valve-joint 200, in which works the globe-valve 201, the union globe-valve joint 202, in which works the globe-valve 203, the union globe-valve joint 204, the globe-valve 205, that works therein, and the four-way or cross-union pipe-joint 170, which latter also forms a union-joint for the live-steam-supply pipe. The surmounting entrance to said flushing-pipe is effected through the center of the dome by one of the sections 197 of the pipe, which has a union-joint with the flanged collar 206, which with the washer 207 beneath the dome are securely attached thereto, the lower end of the section 197 being screwed into a collar 210, secured to the dome-cover of the oil and grease trap box 62. The pipe 196 has lower branch 198, which passes through the outer and inner cylinders and the perforate parting-block 213 at a point on line with near the upper level of the lower filtrant-chamber 47 beneath the screen-floor of the surmounting filtrant-chamber. The pipe 196 is provided with a valve 205 above the coupling 170 and a valve 203 below said coupling. When the inner end of the inserted joint 193 of said middle branch of the flushing-pipe reaches the middle of the apparatus, it is union-jointed to a similar three-way or T-joint pipe to that used in a like position of the live-steam pipe, and, having similar functions, it is alike numbered 193; also, two similar sections, and therefore with them alike numbered 192, of a like distributing-pipe as that of said upper system are alike jointed into said T-union-joint pipe.

214 represents a system of sectional jet-discharge pipes that have union connections with said central distributing-pipe. The said sectional discharge-pipes 214 are alike located in relation to and connection with said distributing-pipe as are those of said upper system; but, unlike them, those of this lower system are preferably provided with jet-perforations 215 above as well as below. The reception end of said flushing-pipe runs to and connects with the hydrant or any other suitable water-supply. By this construction the results attained are, first, the extraction of the taint of oil and grease that always accompanies exhaust-steam from the engine and without said extraction makes the water of condensation therefrom unsuitable for the manufacture of ice and many other purposes; second, the economic condensation of the steam; third, the filtration of both the steam and condensed water, and, fourth, the utilization of the water that has effected the condensation of the steam as feed-water for the boiler that generates said steam.

The operation of the device is as follows: The globe-valve 76 in the exhaust-steam-supply pipe is opened, and the exhaust-steam then forces its way into the oil and grease trap box 62, through which the steam is forced past the system of oil-traps 74, and as it runs the gauntlet of said succeeding series of traps the oil and grease taint in said exhaust-steam is nearly all trapped thereby, as the oil has a capillary attraction to the warm metal troughs, down which it runs into the oil-drip reservoir 85, from which it is conveyed by the drain-pipe 91 to the sink 92, from which sink it may be conveyed to an oil-condensing appa-

ratus beyond the limits of this invention or by drainage to the sewer. The steam is then forced downward in succession through the open ports 102, between said oil-traps, in and through the flaring bottomless trap-box, through the screen-floor of the oil-trap chamber and the upper filtrant-chamber 56, through the screen-floor of said chamber and the lower filtrant-chamber 47, and sliding over the water and steam proof cone 45, that covers the catch-basin 28, into the condensed-water-tank chamber, the water product of the condensed purified steam gravitating in the tank and the uncondensed steam rising by its rarity and by the propulsion of the succeeding forced steam-supply upward through the condensing-chamber provided by the annulus between the two cylinders 2 and 6. The residue of said steam is there quickly condensed by the cooling effect of the cold water dripping from the trough 103. Thus while the cold-water drip, as it passes down the outside of the outer cylinder, cools and condenses the exhaust-steam in the annulus or condensing-chamber 7 it is itself rapidly heated by the caloric given out by the condensing steam, so that the apparatus also exercises the functions of a feed-water heater, and the hot water, after reaching said reservoir 118, is conveyed in said heated condition by the feed-water-supply pipe 119 direct to the boiler.

It is sometimes found that the exhaust-steam is surcharged with an unusually large amount of oil and grease taint, so that there is in such unusual cases a possibility that the oil may not quite all be trapped in the system of catch-troughs 74. In such case the slight remaining taint of oil will gradually gather and swim on the surface of the condensed water in the tank 27, but, being on the surface, will not be carried by the siphon-pipe into the pure-water reservoir, for the inlet to said pipe is both beneath the surface water on the one hand, and above the sediment on the other hand. When sufficient of the oil and grease taint has gathered on the surface of the water in said tank, it is plainly distinguishable by an inspection of the gage 160. When the operator finds that in course of time sufficient oil has gathered on the surface of the water to make it expedient to remove it, he closes or partially closes the globe-valve 135, so as to check the flow of water from the tank, and allows the water to rise therein until the floating oil flows over the edges into the catch-basin 28, from which it is conveyed by the drain-pipe 36 into the sink 40, from which it is conveyed as stated above, either for utilization or to the sewer. When the floating oil is all run into the catch-basin, the globe-valve 135 is again reopened to allow the flow of the pure condensed water into the reservoir 127. When the supply of said pure water is not sufficiently adequate for the purpose of the ice-factory or other purposes to which it may be applied, said water in consequence lowers in the reservoir 127, and the floating ball 176, as it descends, opens the valve 175, which opens the supply of live steam direct from the boiler *via* the supplemental live-steam-supply pipe 167 and *via* the system of perforate pipes 194 into the apparatus, so as to sufficiently supplement the exhaust-steam supply. When the said supply is again fully equal to the requirements of the factory, &c., the rising again of the surface of the water in the reservoir 127 elevates the floating ball 176, and thus closes the cock 175 and shuts off the supplemental supply of live steam until that recourse is again required. Another branch pipe from said pipe system 167 may communicate with a filtered-water reservoir, so as to utilize a supply of said water when the supply of both the exhaust and live steam is inadequate to the extended requirements of the ice-factory, &c.

When it is desired to cleanse the apparatus itself, the globe-valve 146 is closed to prevent the subsidence of the water in the reservoir 127, and thus consequently prevent the opening of the cock 175. The globe-valve 76 of the steam-exhaust pipe, if preferred, may also be closed unless there be no other vent for the escape of the exhaust-steam, in which case it may be left open, as it will not interfere with the cleansing of the apparatus. The globe-valve 135 in the siphon discharge-pipe is also closed. Then the globe-valve 39 of the drain-pipe 36 from the catch-basin 28, the globe-valve 155 of the drain-pipe 216, and the globe-valve 90 of the drain-pipe 91 are respectively opened to allow the free discharge of the flushing-water into the sinks 40 and 159 and from said sinks to the sewer. The globe-valves 201, 203, and 205 of the flushing-pipe which connects with the hydrant should then be opened, as also may be opened the globe-valve 173 of the live-steam pipe, which has a joint connection just above said valve. It will thus be seen that by the system of flushing and spray pipes, whose effective projectile force is divided over all parts of the apparatus, the same can soon be cleansed and ready to again resume work.

When it is desired to cleanse only the oil-trap-box system and the upper part of the apparatus, as in consequence of the light gravity of oil, said parts get foul in less time than the lower portions of the apparatus. Then the lower drainage globe-valves are all closed, as is also the discharge globe-valve 135, and the globe-valves of the flushing-pipes being all opened, the lower parts of the apparatus remain in a flooded quiescent state, while the drain-pipe 91 discharges the washings of the upper section of the apparatus into the sink 40, from which it is conveyed to the sewer.

I claim as my invention—

1. The combination, with a steam-condenser, of a series of staggered oil and grease trough-shaped traps 74, the external reservoir into which said traps discharge, and the dis-

charge-pipe that conveys the trapped oil and grease from the condenser, substantially as and for the purpose set forth.

2. The combination of the exhaust-steam-supply pipe, the oil and grease trap box 62, the inclined oil and grease trap troughs in said box, the external reservoir into which said traps discharge, and the discharge-pipe 91, that drains said reservoir, substantially as and for the purpose set forth.

3. The combination of the casing having a water-chamber therein, the exhaust-steam-supply pipe, the oil and grease trap bottomless box, into which the exhaust-steam is forced, arranged above said water-chamber, the multipartite surmounting and underlying tiers of angle-shaped inclined oil and grease trap troughs in said trap-box, and the reservoir independent of said water-chamber, into which said troughs discharge, the said troughs being arranged in their tiers in staggered positions above each other and provided with intervening steam-vents, through which the steam is forced in staggered currents while passing through said traps, substantially as and for the purpose set forth.

4. The combination of the inner and outer cylinders of the condensing apparatus having an annulus that forms a condensing-chamber between said cylinders, the base-plate beneath said cylinders, the dome that covers said cylinders, the exhaust-steam-supply pipe 217, that enters within said cylinders, the cold-water-supply pipe 109, and the circular cold-water-drip pipe 113, having perforations 114, through which the water drips and runs down the outer cylinder to condense the steam in the annulus between said cylinders, substantially as and for the purpose set forth.

5. The combination of the inner and outer cylinders of the condensing apparatus, having a condensing-annulus between said cylinders, the base-plate that underlies and the dome that surmounts said cylinders and said annulus, the exhaust-steam-supply pipe 217, the cold-water-supply pipe 109, the circular cold-water-drip pipe 113, having perforations 114, through which the water drips, the valve 110, that governs said cold-water supply, and the circular cold-water-drip trough, provided with perforate discharge-vents 116, by which drip-trough and vents the cold water is conducted to and discharged around the outside of said outer cylinder in contact therewith, substantially as and for the purpose set forth.

6. The combination of the double-walled dome-covered cylindric incasement of the apparatus, provided with a condensing-annulus between its cylinders, the exhaust-steam-supply pipe 217, the valve that governs the supply of steam through said pipe, the bottomless dome-covered oil and grease trap box 62, the legs 66, that support said box, the multipartite system of surmounting and underlying tiers of staggered, angular, upwardly-flaring, and longitudinally-inclined oil and grease trap troughs, the reservoir 85, into which said troughs discharge, the drain-pipe 91, that carries the discharge from said reservoir, the valve 90 in said drain-pipe, and the sink 40, into which said drain-pipe discharges, substantially as and for the purpose set forth.

7. The combination of the double-walled incasement of the apparatus, having a condensing-annulus between its walls, the exhaust-steam-supply pipe 217, the multipartite system of staggered upwardly-flaring longitudinally-inclined oil and grease trap troughs, the reservoir into which said troughs discharge, the upper screen-floor 60, and the oil and grease trap chamber 61 above said floor, inclosed within said inner cylindric wall, substantially as and for the purpose set forth.

8. The combination of the double-walled inclosed cylindric incasement of the apparatus, having a condensing-annulus between its cylindric walls, the exhaust-steam-supply pipe, the multipartite system of staggered upwardly-flaring oil and grease trap troughs provided with a forced steam-staggered track between said troughs, the angle-iron 57, fastened to the inner side of the inner cylindric incasement, the screen-floor 60, that rests on said angle-iron, the angle-iron 48, fastened to the inside of said cylinder, the tie-joists 51, the screen-floor 54, that rests on said angle-iron and joists, making the perforate floor to the upper filtrant-chamber 56, and the filtrant 55 in said chamber, substantially as and for the purpose set forth.

9. The combination of the double-walled inclosed cylindric incasement of the apparatus, having a condensing-annulus between its cylindric walls, the exhaust-steam-supply pipe, the multipartite system of staggered upwardly-flaring inclined oil and grease trap troughs, the perforate screen-floors 60 and 54, the angle-iron and the joist-supports of said floors, the angle-iron 8, secured to the inside of the base of the inner cylinder, the tie-joists 41, the screen-floor 44, that rests on said angle-iron 8 and on said tie-joists, making the perforate floor to the lower filtrant-chamber 47, and the filtrant 46 in said chamber, substantially as and for the purpose set forth.

10. The combination of the double-walled inclosed incasement of the apparatus, having a condensing-chamber between its walls, the exhaust-steam-supply pipes, means, substantially as described, for producing a cold-water drip down the outside of the outer casing for effecting the condensation of the steam in said chamber, the upper and lower filters, the perforate floors of said filters, the condensed water-tank 27 at the base of the apparatus, the oil and grease catch basin 28 in said tank, the drain-pipe 34 from said basin, and the cone 45, that sheds the descending water and steam clear of said catch-basin, substantially as and for the purpose set forth.

11. The combination of the double-walled incasement of the apparatus, having a condensing-chamber between its walls, the legs 9, that support the inner wall, the exhaust-

steam-supply pipe, the multipartite system of staggered upwardly-flaring inclined oil and grease trap troughs for the trapping of oil and grease in the steam, the upper and lower filters, the perforate screen-floors of said filters, the condensed-water tank 27, the siphonic discharge-pipe 126, and the purified condensed-water reservoir 127, substantially as and for the purpose set forth.

12. The combination of the double-walled inclosed incasement of the apparatus, having a condensing-annulus between its walls, a steam-supply pipe, the condensed-water and sedimentary tank 27 at the base of the apparatus, the sediment-drain pipe 216, the valve 155, that governs said discharge, and the sink 159, into which said drain-pipe discharges, substantially as and for the purpose set forth.

13. The combination of the double-walled incasement of the apparatus, having a condensing-chamber between its walls, a steam-supply pipe, the angular, upwardly-flaring, and staggered oil and grease trap troughs, the filter beneath said traps, the condensed-water and sedimentary tank 27, and the gage-indicator 160, that indicates the depth of water in the tank and its freedom or otherwise from oil and grease taint, substantially as and for the purpose set forth.

14. The combination of the double-walled incasement of the apparatus, having a condensing-chamber between its walls, a steam-supply pipe, the safety escape-valve 165, the angular upwardly-flaring inclined oil and grease trap troughs, the filter beneath said troughs, the condensed-water and sedimentary tank 27, the siphonic discharge-pipe 126, the globe-valve that governs said discharge, the pure-condensed-water reservoir 127, into which said pipe discharges, and the ultimate combined discharge and supply pipe 147, that carries the discharge from said reservoir and conveys it to the point where it is to be used, substantially as and for the purpose set forth.

15. The combination of the double-walled incasement of the apparatus, having a condensing-chamber between said walls, a steam-supply pipe, the angular upwardly-flaring inclined oil and grease trap troughs, the filter beneath said troughs, the condensed-water and sedimentary tank 27, the cold-water-supply pipe 109, the globe-valve 110, that governs said cold-water supply, the circular cold-water-drip pipe 113, having perforations 114, through which the water drips around near the top of the outer cylinder, the angular circular cold-water-drip trough 103, having perforations 116, said circular drip-pipe being housed within said drip-trough, the said cold-water drip running down outside the outer cylinder 2 of the apparatus to condense the steam in the annulus 7 and store the heat received therefrom, the hot-feed-water reservoir 118, into which said drip descends, and the feed-water-supply pipe 125, that conveys the hot water to the boiler to utilize the same, substantially as and for the purpose set forth.

16. The combination of the double-walled incasement of the steam-condensing apparatus, having a condensing-chamber between said walls, the exhaust-steam-supply pipe that utilizes the exhaust-steam from the engine, the upwardly-flaring inclined oil and grease trap troughs, the filter beneath said traps, the combined condensed-water and sedimentary tank 27, the siphonic discharge-pipe 126, the purified-condensed-water reservoir 127, into which said pipe discharges, the supplemental live-steam-supply pipe 167, that connects direct with the boiler, the cock in said pipe, the floating ball 176, the pivoted hanger-bail 177, from which said ball hangs pendent, the pivoted link-rod 183, and the actuating-lever 189, arranged to automatically open the cock 175, and thus take on a supply of live steam or filtered water as subsidiary to that of the exhaust-steam, substantially as and for the purpose set forth.

17. The combination of the double-wall incasement of the steam-condensing apparatus, having a condensing-chamber between said walls, the exhaust-steam-supply pipe 217, the valve 76, that governs the exhaust-steam supply in said pipe, the live-steam-supply pipe 167, the float-actuated cock 175, that automatically governs the supply of live steam, the multipartite-angle upwardly-flaring inclined oil and grease traps 74, the two-story filter, the condensed-water and sedimentary tank 27, and the flushing-pipe 196, substantially as and for the purpose set forth.

18. The combination of the double-wall incasement of the steam-condensing apparatus, having a condensing-chamber between said walls, the oil and grease traps 74, the reservoir 85, the drain-pipe 91, the two-story filter, the condensed-water and sedimentary tank 27, the catch-basin 28, the drain-pipes 34 and 216, the pure-condensed-water tank 127, the siphonic discharge-pipe 126, the exhaust-steam pipe 217, the valve 76 in said pipe, the live-steam pipe 167, the float-actuated cock 175, that governs the supply of live steam, the transverse distributing-pipe 192, and the perforated jet-pipes 194, into and through which the live steam is forced, substantially as and for the purpose set forth.

19. The combination of the double-wall incasement of the steam-condensing apparatus, having a condensing-chamber between said walls, the oil and grease traps 74, the two-story filter, the filtrant in said filter, the condensed-water and sedimentary tank 27, the exhaust-steam-supply pipe, the live-steam-supply pipe, the drain-pipes 34, 91, and 216, the sinks 40 and 159, into which said drain-pipes discharge, the flushing-water pipe 196, the transverse distributing-pipe 192, and the perforated jet-pipes 214, through which said flushing-pipe discharges its flushing-water, substantially as and for the purpose set forth.

20. The combination of the double-wall incasement of the steam-condensing apparatus, having a condensing-chamber between said

walls, the oil and grease traps 74, the two-story filter, the condensed-water and sedimentary tank, the drain-pipes 34, 91 and 216, the exhaust-steam pipe, the live-steam pipe, the water-flushing pipe 196, and the valves 201, 203, and 205 in said pipe, that respectively govern the supply and discharge of the flushing-water in and from the various branches of said pipe through the dome 64 to cleanse the oil and grease traps 74, *via* the live-steam distributing and discharge jet-pipes 194 to cleanse the upper filter, and *via* the flushing-water distributing and discharge jet pipes 214, to cleanse the lower filter and base of the apparatus, substantially as and for the purpose set forth.

FERDINAND BAUER.

In presence of—
BENJN. A. KNIGHT,
SAML. KNIGHT.