Oct. 11, 1927. 1,645,481

F. G. GRELL

CONDENSING APPARATUS

Filed Aug. 6, 1926 2 Sheets-Sheet 1

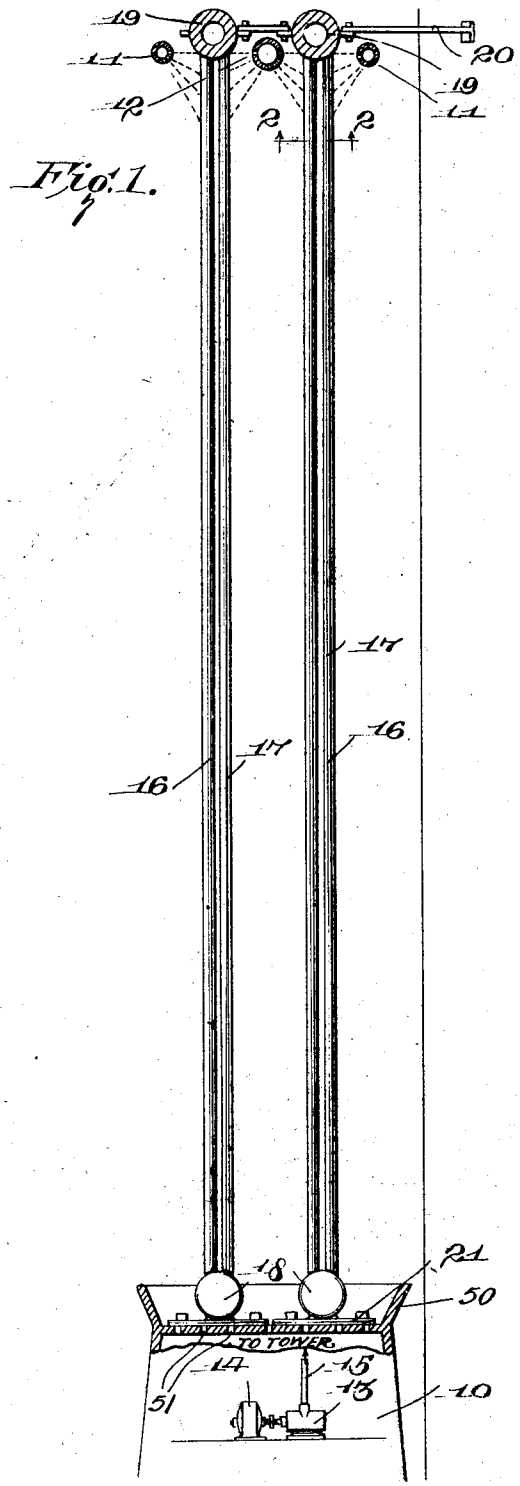


Fig. 1.

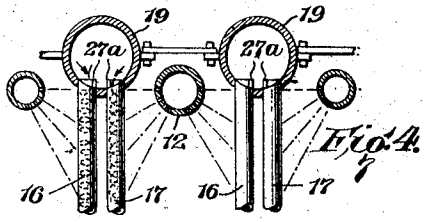


Fig. 4.

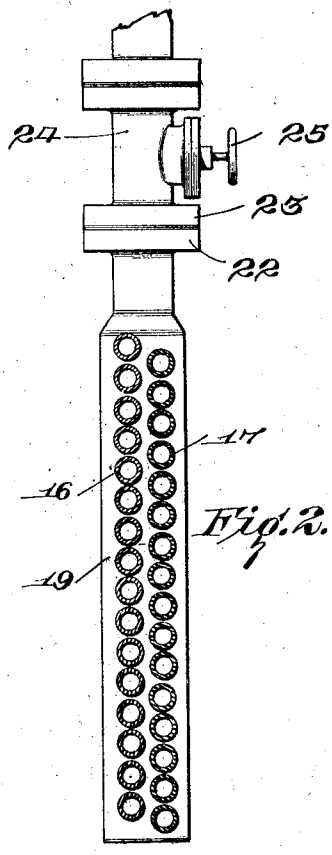


Fig. 2.

INVENTOR

Alfred G. Grell

BY Munn & Co.

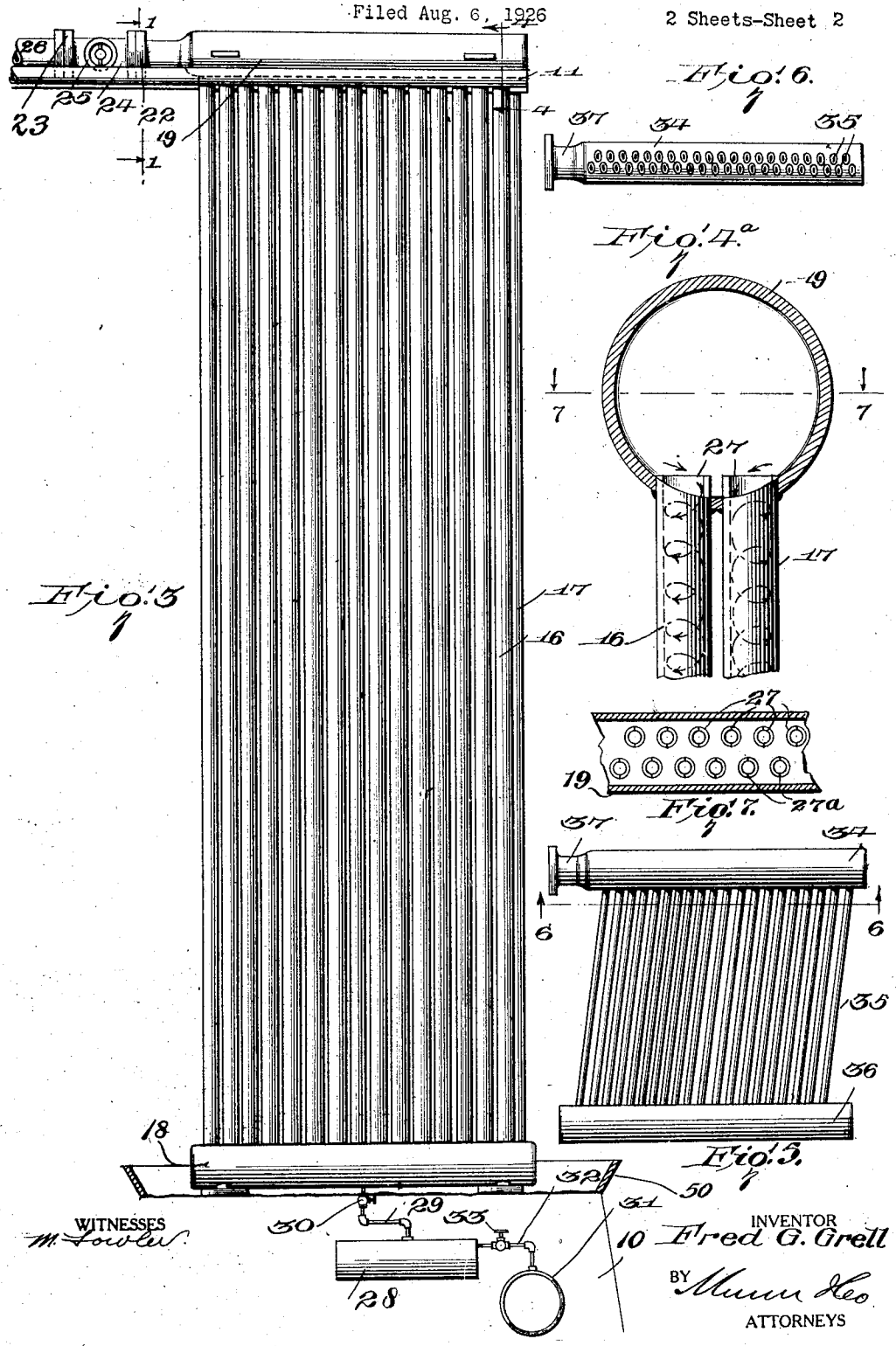
ATTORNEYS

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CONDENSING APPARATUS

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UNITED STATES PATENT OFFICE.

FRED G. GRELL, OF SAN ANTONIO, TEXAS.

CONDENSING APPARATUS.

Application filed August 6, 1926. Serial No. 127,666.

This invention relates to a condensing apparatus and has for its object the provision of a device for efficiently and rapidly cooling hot gases and while not confined to any particular use is intended more especially for cooling and condensing ammonia gas.

Another object of the invention is the provision of a condenser having a plurality of vertically disposed tubes upon which is sprayed water in fine streams so that a thin film of the water will travel downwardly over the surface of the tubes and evaporate, thus aiding in a rapid cooling of the tubes for condensation purposes.

A further object of the invention is the provision of a condenser including a plurality of vertically disposed or inclined tubes opening at their upper end into headers, with the upper ends of the pipes having a portion thereof projecting into the headers so that when the gases are forced into the headers they will be baffled by the projecting portions thereby causing the gases to assume a spiral or whirling path downwardly through the tubes and thus come into more intimate contact with the inner walls of said tubes.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications which shall define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is an end elevation partly in section, the section being taken along the line 1—1 of Figure 3.

Figure 2 is a horizontal section taken along the line 2—2 of Figure 1.

Figure 3 is a side elevation of the condenser.

Figure 4 is a vertical section taken along the line 4—4 of Figure 3.

Fig. 4ª is a cross sectional view of the header 19.

Figure 5 is a modified form of the condenser.

Figure 6 is a horizontal section of the modified form taken along the line 6—6 of Figure 5.

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 4ª.

Referring more particularly to the drawings, 10 designates a base member adapted to form a receptacle to collect water which is sprayed from the perforated pipes 11 and 12. A pump 13 driven by a motor 14 is connected with the tank 10 for forcing the water collected by said tank through a pipe 15 to a tower (not shown). Rows of vertical pipes 16 and 17 are connected with headers 18 at their lower ends and to headers 19 at their upper ends. Any form of supporting bracket 20 may be provided for securing the headers in predetermined spaced relation. The headers 18 are secured as shown by the plates 21 to the top of the tank 10.

The members 11 and 12 consist of pipes having a series of spaced perforations so disposed along sides of the pipes that fine sprays of water are directed against the pipes 16 and 17 at an acute angle to form a thin film on the pipes which travels downwardly over the surface of said pipes. These films gain momentum as they descend and thereby assist in dissipating the heat from the pipes 16 and 17.

The upper headers 19 shown in Figure 2 are each provided with a flange 22 to which is connected a flange 23 of a valve casing 24. The valve is controlled by a stem 25. The valve in the casing controls the flow of gases to the headers 19 and likewise to the series of rows of pipes 16 and 17. An inlet pipe 26 is connected to the valve casing 24 and is adapted to convey the hot gases or vapors to the headers.

The upper ends of the vertical pipes 16 and 17, as shown in Figure 4, extend upwardly through openings in the headers 19 and have a portion 27 extending beyond the inner wall of the header so that when the incoming gases are moving longitudinally along the header they will strike these projections and be forced through a spiral path as indicated in dotted lines. By this construction the gases are forced into close contact with the inner walls of the pipes 16 and 17 so that they are spread out over a large

surface in order to readily dissipate the heat from the same and through the walls of the pipes.

It will be noted that pipes 16 and 17 project above the inner wall of the headers 19 with substantially one-half of the projecting end cut-away so that the incoming gases moving longitudinally of the pipes will strike the projected portion and since the inner ends 27ª of the projected portions are considerably higher than the outer ends and further since these projected portions are disposed along the curved bottom inner face of the headers 19 the incoming gases when striking said projections will be turned from a direct path longitudinally of the headers and will assume a spiral path when moving through the pipes 16 and 17.

Each of the lower headers 18 is connected by means of a pipe 29 to a separator 28. A valve 30 controls the flow of condensed fluids in the pipe. A reservoir 31 is connected by means of a pipe 32 to the upper end of the separator 28. The valve 33 controls communication of the flow of fluids through the pipe 32.

In the modified form shown in Figure 5 an upper header 34 is provided and is connected by a plurality of rows of tubes 35 with a lower header 36. The tubes are disposed at an acute angle to the vertical and are elliptical in cross section as shown in Figure 6. The upper ends of these tubes have a portion projecting into the upper header 34 in the manner similar to the projection of the tubes 16 and 17 in the header 19. The outer ends 37 of the headers 34 are adapted to be connected with a pipe which leads to a source of gases or vapors for supplying the headers with the necessary fluids to be cooled or condensed.

A flange 50 is provided on top of the tank 10 in order to collect the water which flows down the exterior of the pipes 11 and 12. Openings 51 are arranged in the top 21 of the tank to permit the water which has been collected to pass to the tank 10. This water as has been explained is returned by the pump 13 through a pipe 15 to a tower (not shown) which is connected with the pipes 11 and 12.

The operation of my device is as follows:

The vapors or gases to be condensed or cooled which may be normally under a predetermined pressure, are admitted from pipe 26 past valve 25 and into the headers 19. Passing longitudinally of the said headers the gases impinge against the lips or projections 27 and are caused to take a path spiral in shape downwardly and contact over the inner walls of the pipes 16 and 17 or 35.

The cooling water from a tower (not shown) is released and permitted to flow through the perforated pipes or nozzles 11 or 12, the perforations being so positioned that they will direct fine sprays of water against the sides and adjacent the upper ends of the pipes 16 and 17 or 35. This water is sprayed on in such a manner that a thin film will travel downwardly over the pipes and as the said film descends it will increase its speed and thereby more rapidly dissipate the heat from the gases which are in contact with the inner walls of the vertical pipes. This water is then collected at the lower ends of the pipes and is then returned to the tower by means of a pump 13. The condensed gases are discharged past valve 30 to pipe 29 and into the separator 28 whence they are collected in the container 31.

What I claim is:

1. A condensing apparatus comprising upper and lower headers, spaced pipes connecting the upper and lower headers, each of the pipes having a portion projecting into the upper header to cause gases passing through the header to assume a spiral path when passing through said pipes.

2. A condensing apparatus comprising upper and lower headers, spaced pipes connecting the upper and lower headers, each of the pipes having a portion projecting into the upper header to cause gases passing through the header to assume a spiral path when passing through said pipes, nozzles located adjacent the upper end and on opposite sides of each series of rows of pipes for spraying a film of water onto said pipes.

3. A condensing apparatus comprising upper and lower headers, spaced pipes connecting the upper and lower headers, each of the pipes having a portion projecting into the upper header to cause gases passing through the header to assume a spiral path when passing through said pipes, nozzles located adjacent the upper end and on opposite sides of each series of rows of pipes for spraying a film of water onto said pipes, a separator connected with the lower header, and a reservoir connected with the upper end of each separator.

4. A condensing apparatus comprising upper and lower headers, spaced pipes connecting the upper and lower headers, each of the pipes having a portion projecting into the upper header to cause gases passing through the header to assume a spiral path when passing through said pipes, perforated pipes located adjacent the upper end and on opposite sides of the rows of pipes and having perforations so formed that they will direct fine sprays of cooling fluid onto the vertical pipes for producing a descending film on said pipes.

5. A condensing apparatus comprising upper and lower headers, spaced pipes connecting the upper and lower headers, means associated with each pipe where connected to an upper header to cause the gases passing

through the said header to assume a spiral path through said pipes.

6. A condensing apparatus comprising upper and lower headers, spaced pipes connecting the upper and lower headers, means associated with each pipe where connected to an upper header to cause the gases passing through the said header to assume a spiral path through said pipes, perforated pipes disposed adjacent the upper header and adapted to spray the cooling fluid in a thin film downwardly over the pipes.

FRED G. GRELL.