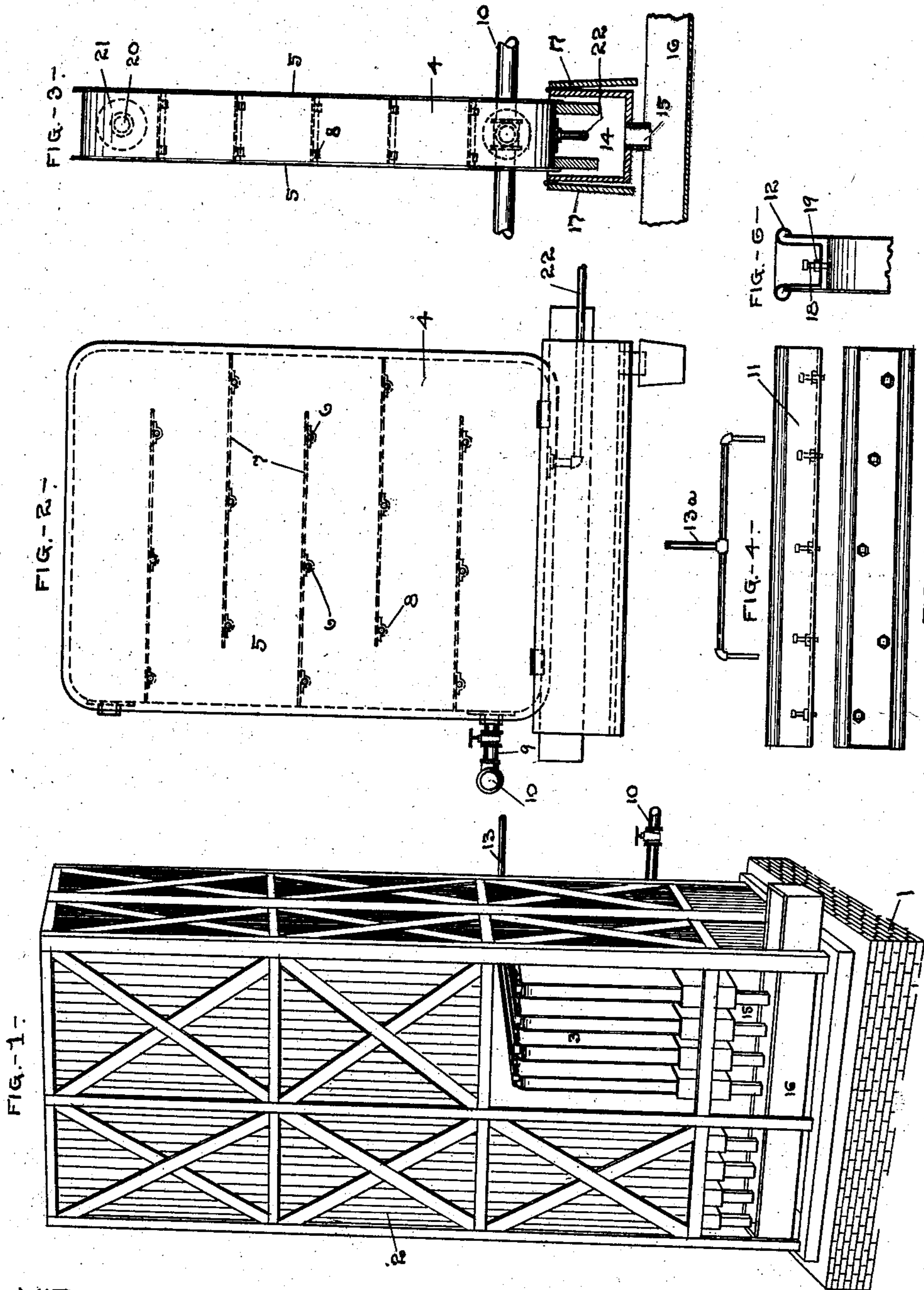


No. 827,114.

PATENTED JULY 31, 1906.

A. PENNELL.
STEAM CONDENSER.
APPLICATION FILED APR. 1, 1905.



WITNESSES:-

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ARTHUR PENNELL, OF KANSAS CITY, MISSOURI.

STEAM-CONDENSER.

No. 827,114.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed April 1, 1905. Serial No. 253,245.

To all whom it may concern:

Be it known that I, ARTHUR PENNELL, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Steam-Condensers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to a steam-condenser of a class known as surface condensers, and more particularly to a class known as "saturating air-surface condensers for exhausting steam," and has for its object to provide a device of the class described which is especially suitable for and economical in the liquefying of steam for ice-making purposes.

One of the principal objects of my invention is to provide a means of dispelling the non-condensable gases from the condensing-steam to allow the condensation-water to pass off free of these gases in order to eliminate the core in the ice cake.

A further object is to provide means for collecting the carbonate scale in the circulating water in order that the latter may be suited for boiler-feed.

A further object is to provide a device which will reduce the water consumption.

Further objects of my invention are to provide improved details of structure which will presently be fully described, and pointed out in the claims, reference being had to the accompanying drawings, forming part of the specification, in which like reference-numerals refer to like parts throughout the several views, and in which—

Figure 1 is a perspective view of a casing and well, part of the casing being broken away to show a series of flasks in position. Fig. 2 is a detail view, in side elevation, of one of the flasks with its lower gutter. Fig. 3 is an end view of Fig. 2. Fig. 4 is a longitudinal vertical section of a distributing-gutter which is posited on the top of each flask, showing the branch feed-pipe. Fig. 5 is a top plan view of Fig. 4. Fig. 6 is an end view of a portion of the flask shown in Fig. 3, the gutter in Figs. 4 and 5 being in vertical section.

Referring more in detail to the parts, 1 is a

suitable foundation upon which is mounted a casing 2, open at the top and having open panels on two of its opposite sides, as shown in Fig. 1. Suitably mounted in casing 2 is a series of flasks 3, each composed of a rectangular frame 4, which is preferably of channel-iron with the channel facing outwardly and the corners curved, as shown. The sides 5 of the flask are preferably of sheet-steel and riveted to the side flanges of the channel-iron frame. Within the flasks are stay-bolts 6 for sustaining the sides 5 against internal or external collapse. Stays 6 are set a suitable distance apart and are arranged longitudinally in rows. Upon stays 6 are posited baffle-plates 7, consisting, preferably, of strips of galvanized steel, which are fastened by straps 8 to two or more of said stays. One end of each of said baffle-plates is flush with one end of the flask, while the other end of the plates is a short distance from the opposite end of the flask, this arrangement alternating throughout the height of the flask to provide a tortuous course for the steam, which enters through a pipe 9 at one of the lower corners of the flask, said pipes 9 being branches of a main pipe 10, which conducts the exhaust-steam from the engine.

Above the flasks and between the flanges of the channel-iron frame is a gutter 11, having curved edges 12, which extend over the channel-iron frame and pass downwardly, impinging against the outer surface of the sides 5. Extending over the flasks are branch pipes 13^a of a header 13, through which the circulating water is fed to gutters 11, filling said gutters and flowing over the curved edges 12 and descending as a continuous thin sheet over the sides 5. Below each flask is slung a gutter 14, which is considerably longer than the flask and droops toward one end, so as to cause the circulating water which flows from the sides of the flask to flow toward the outlet 15, through which it escapes to a main trough 16, leading to the circulating-tank. Along the upper edges of gutter 14 are hinged gates 17, which are normally lowered, but which can be raised to rest against the sides of the flask during cleaning to guide falling scale clear of the gutters. While gutters 11 may be rigidly secured in frame 4, I prefer same to be carried by set-screws 18, which project through perforations in the bottoms of the gutters and are threaded in nuts 19, which are rigidly secured to said gutters, with the perforations in

the nuts registering with the perforations in the gutters. With such a construction and by having the set-screws arranged on both sides of and in the center of the bottom of gutters 11 the same may be leveled both longitudinally and transversely. In the end of each flask near one of the upper corners is an opening 20 for the escape of the non-condensable gases liberated from the steam, and 21 is a pipe-flange secured to the end of said flask around opening 20. 22 is a pipe conducting the water of condensation from the flasks to the hot-well.

In the operation of my device the cooling-water is pumped from a suitable circulating-tank through the header 13, from which it escapes through the branch pipes to the gutters above the flasks. When these gutters are filled, the water runs over the curved sides and down onto the sides of the flasks in a thin sheet to the troughs 14. This sheet of water is considerably warmer than the normal atmosphere and vaporizes into the air between the flasks, tending to saturate such air with the water-vapor at its own temperature. Such warmed saturated air being considerably lighter than the normal atmosphere, an upward current ensues, which draws a fresh supply of normal air upward into contact with the warm wet surface of the flasks. This atmospheric vaporizing action carries off the heat from the outer surface of the water-film as fast as the inner surface of the film can absorb it from the metal with which it is in contact, thus carrying off from dissipation into the atmosphere the heat evolved by the steam condensing inside of the flasks. The exhaust-steam entering the flask at the lower corner through the branch pipes is forced through the zigzag course formed by the interior baffle-plates, condensing as it travels by transmitting its latent heat through the sides of the flask to the descending film of water and reaches the outlet 20 as little more than non-condensable gases that were entrained in it. These gases escape through said outlet, while the water of condensation descends to the bottom of the flask and escapes through the pipes 22 and is carried to the hot-well. The circulating water escaping from troughs 14 to the main trough is returned to the circulating-tank, from whence it is again pumped to the gutters 11. The duty of the water-film is thus reduced to transmitting the heat from the metal surface on one side to the passing current of air on its other side by the vaporization of its own substance, the current of circulating water being reduced to that which will keep the entire surface of the flask entirely covered, the same water being used over and over again indefinitely, so long as the amount vaporized into the air is con-

stantly made good from some external source. The foregoing holds good for all gases which, like steam, condense below atmospheric pressure and carry an appreciable amount of non-condensable gases entrained. For gases usually condensed considerably above atmospheric pressure—such as carbon dioxide, ammonia, &c.—requiring a strong vessel to withstand their internal pressure and which do not carry non-condensable gases to any appreciable extent, the channel-iron forming the frame of the flask may be replaced by bar-steel and additional stay-bolts inserted to brace the sides against external collapse.

While I have specifically described my invention, I do not wish to be understood as limiting myself to the exact details of structure herein shown and described, inasmuch as the same may be varied without departing from the spirit of my invention.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a device of the class described, a flask for receiving the steam, a gutter above said flask adapted to deliver a sheet of water to the sides of said flask, and means for leveling said gutters.

2. In a device of the class described, a flask for receiving the steam, a gutter supported on said flask having perforations in its bottom, threaded nuts secured to the bottom of said gutter, with their openings registering with the perforations therein, and set-screws extending through said perforations and having a threaded connection with said nuts, substantially as set forth.

3. In a device of the class described, a flask for receiving the steam, comprising a channeled frame and sheet-metal sides, a gutter supported within the channel at the top of the flask, means for leveling said gutter, and curved edges on said gutter extending over the sides of the flask and inwardly to contact with said sides, substantially as set forth.

4. In a device of the class described, a flask for receiving the steam, means for feeding water to the sides of said flask, a gutter beneath said flask, and side plates hinged to said gutter, substantially as set forth.

5. A device of the class described comprising a series of flasks, means for feeding a cooling fluid to the sides of said flasks, gutters beneath each of said flasks, and a main gutter beneath a portion of each of said flask-gutters, for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR PENNELL.

Witnesses:

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E. E. CARPENTER.