

No. 674,891.

Patented May 28, 1901.

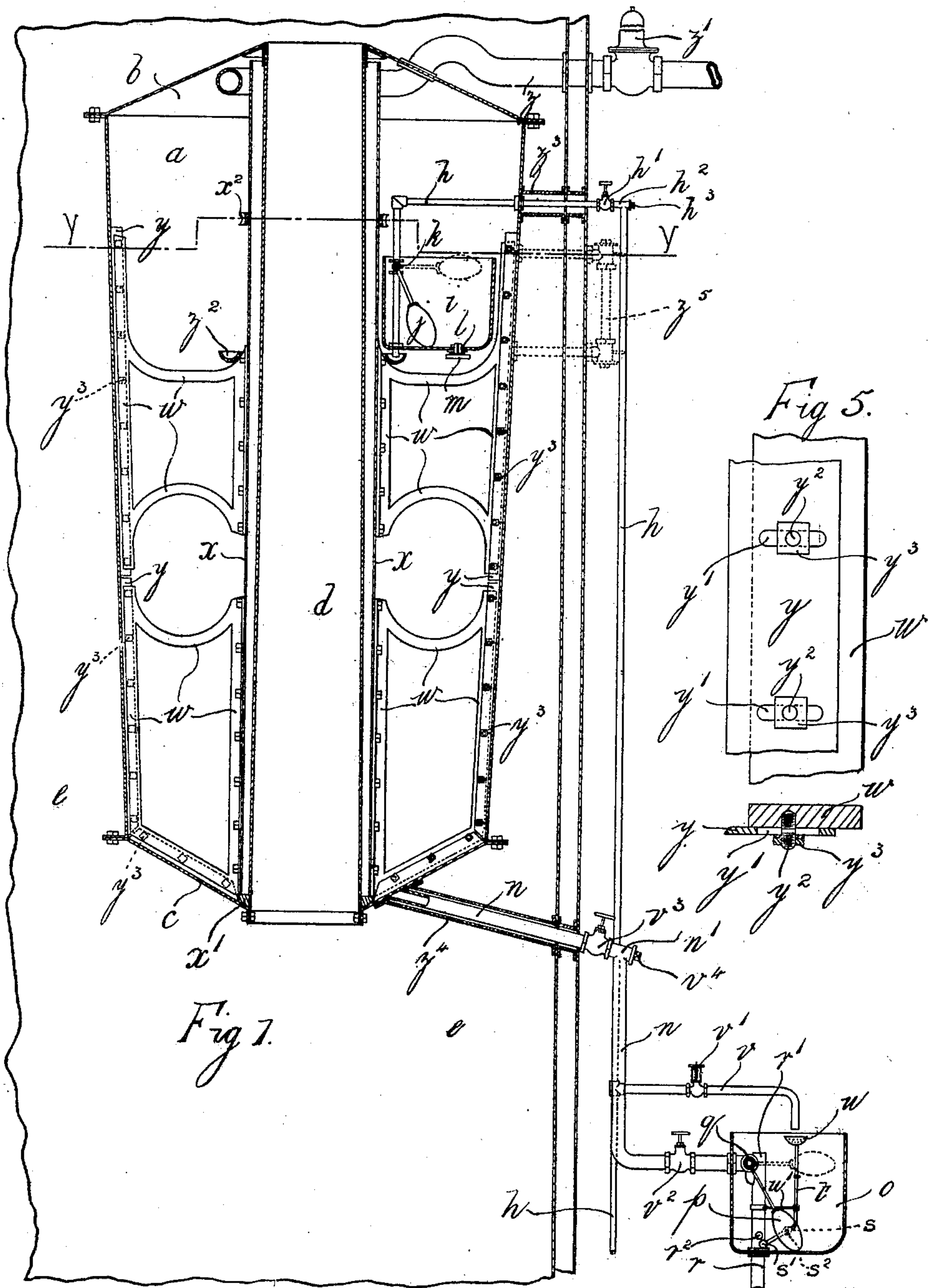
D. McK. WATSON.

APPARATUS FOR EVAPORATING SEA WATER.

(No Model.)

(Application filed Feb. 28, 1901.)

3 Sheets—Sheet 1.



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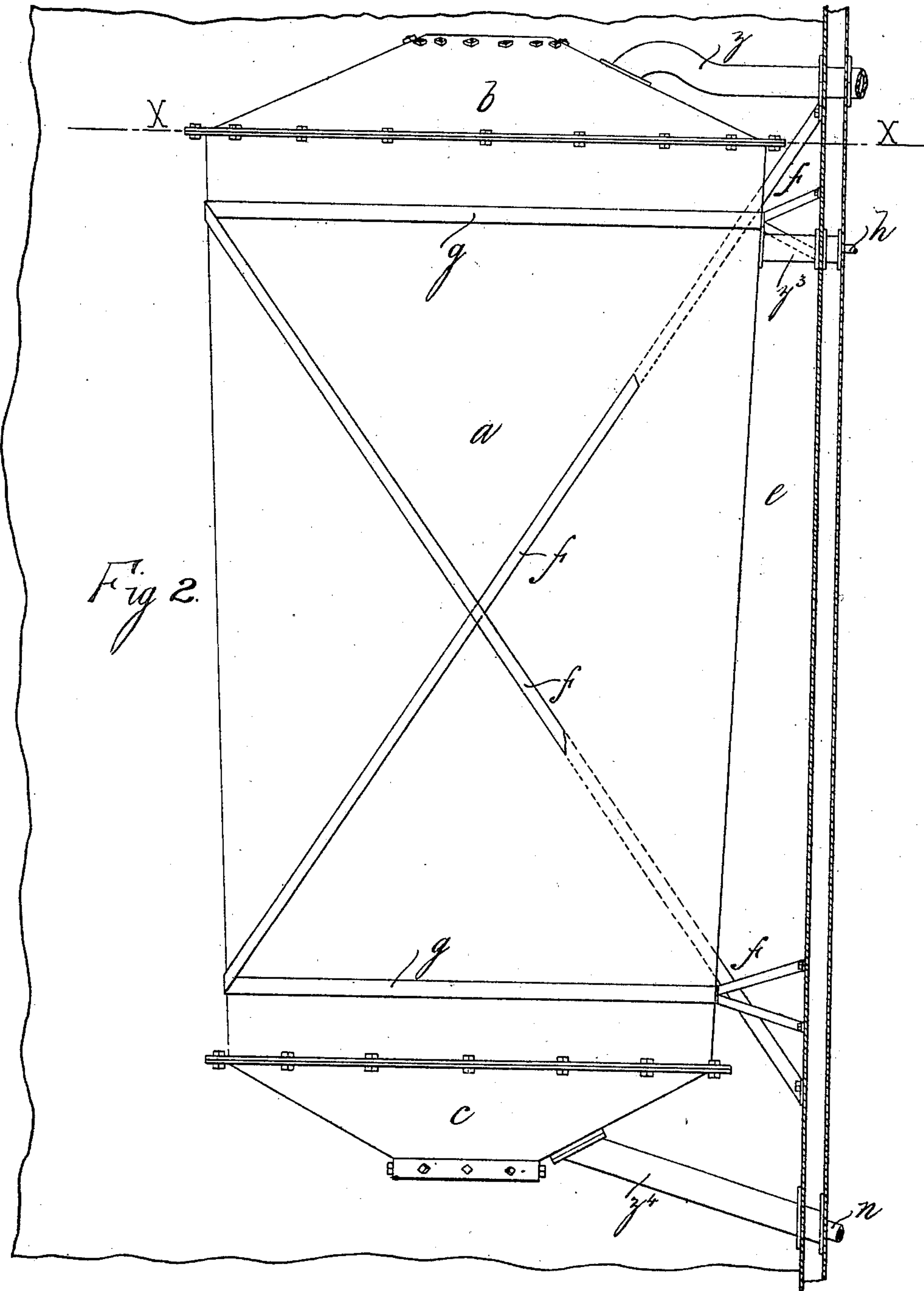
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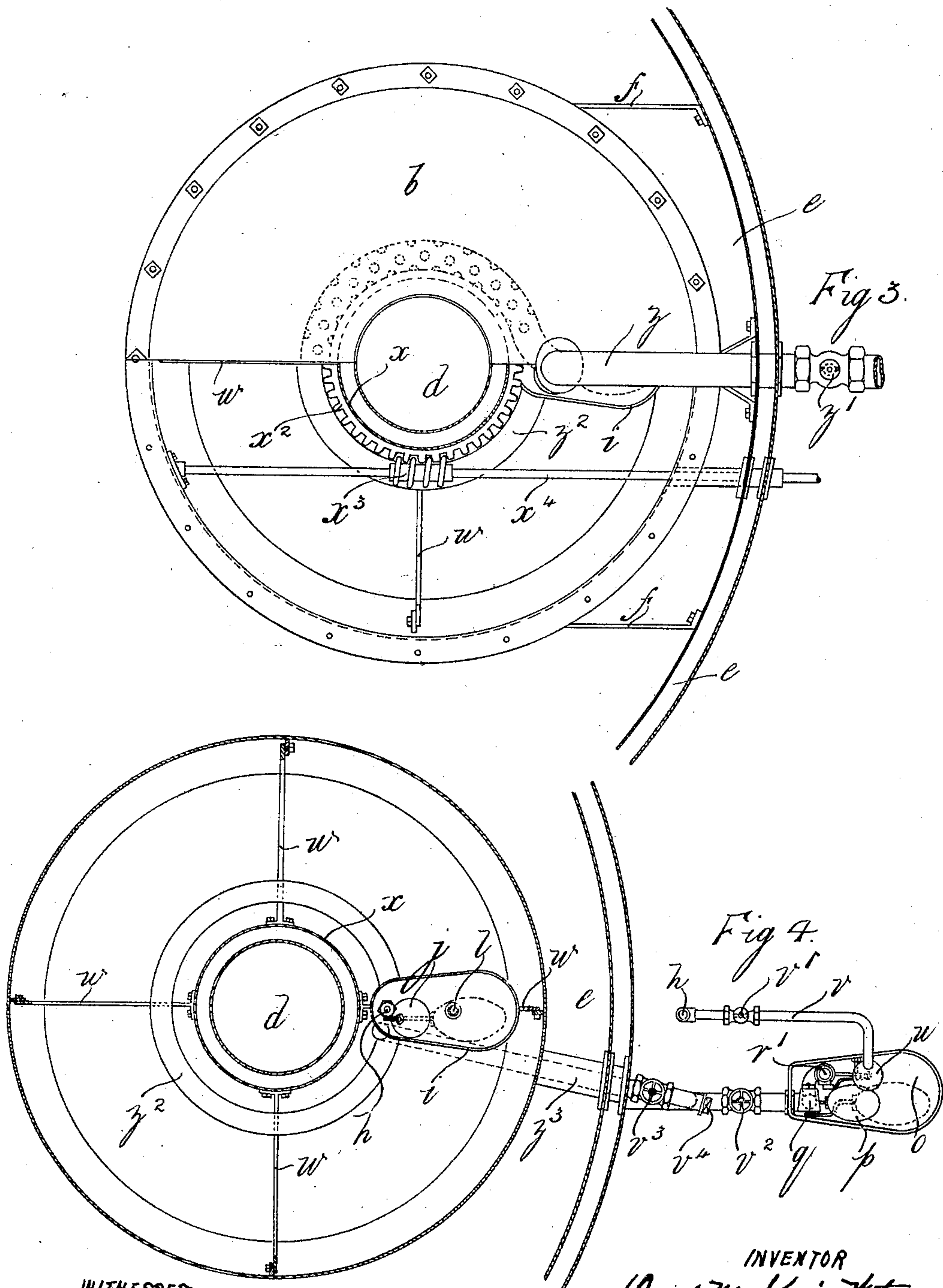
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UNITED STATES PATENT OFFICE.

DANIEL MCKENZIE WATSON, OF LEITH, SCOTLAND.

APPARATUS FOR EVAPORATING SEA-WATER.

SPECIFICATION forming part of Letters Patent No. 674,891, dated May 28, 1901.

Application filed February 28, 1901. Serial No. 49,256. (No model.)

To all whom it may concern:

Be it known that I, DANIEL MCKENZIE WATSON, marine engineer, a subject of the King of Great Britain, residing at 33 Albany street, Leith, in the county of Mid-Lothian, Scotland, have invented certain new and useful Improvements in Apparatus for Evaporating Sea-Water, (application made in Great Britain on the 12th of June, 1900, No. 10,658,) of which the following is a specification.

This invention comprises an apparatus to be used as an evaporator of sea-water to be reduced to fresh water for feeding the boilers on steamships; and the invention has special reference to the construction of and arrangements connected with such apparatus whereby it can be placed in the funnel of the ship to be heated by the waste gases escaping from the boiler-furnaces.

It is essentially necessary in connection with the proper working of the apparatus that the feed-water be automatically shut off when the evaporator is charged to a certain level or high-water mark, and also when the water is run down, whether by drainage or evaporation, to what may be termed the "low-water mark" that the feed-water shall be automatically turned on again. It is also essential that provision be made to prevent scalding on the shell of the apparatus, the effect of which is well known. Under my invention means are provided for automatically controlling the supply of feed-water and also for preventing the formation of scale or incrustation on the interior surface of the evaporator.

My improved apparatus is clearly illustrated in the accompanying drawings.

Figure 1 is a vertical section of the evaporator as it appears when fitted in the funnel of the steamer. Fig. 2 is a side elevation of the apparatus as it appears when in the funnel, which latter is shown in section. Fig. 3 is a half horizontal section and half-plan of the apparatus. The section is taken on the line X X, Fig. 2. Fig. 4 is a horizontal section taken on the line Y Y, Fig. 1. Fig. 5 is a detail side view and section showing part of a scraper and scraper-blade.

The apparatus consists of a boiler or evaporator *a*, which is preferably made of a tapered or conical shape, as shown at Fig. 1, and has a removable conical cover *b* and a conical bot-

tom *c*. Fitted in the center of the evaporator is an open-ended preferably tapered flue-tube *d*, which serves to increase the heating-surface. The evaporator is securely fastened in place within the funnel *e* of the steamer by means of stays *f* and rings *g*. It will be seen that the body of the evaporator tapers from the top toward the bottom, whereas the flue-tube *d* tapers from the bottom toward the top. The feed-water pipe *h* passes through the side of the evaporator and down through the ball-lever chamber *i*, in which is situated a ball-lever *j*, which works a cock *k* on the feed-water pipe. This chamber is open at the top and has an outlet *l* at the bottom, which can be closed by means of a float-valve *m*.

The evaporator is provided with a drain or scum pipe *n*, which leads to a chamber *o*, in which is a ball-lever *p*, working a cock *q* on the end of the drain-pipe. The end of the drain-pipe communicates with a vertical waste-pipe *r*, which is open at its upper end at *r'* and is provided with a valve-opening *r''*. This opening can be closed by means of a disk *s'* on the end of a lever *s*, which latter is fulcrumed at *s''* to the side of the chamber. This lever can be operated by means of a vertically-working rod *t* jointed to it and whose upper end is provided with a cup *u*.

u' is a guide-bracket for the rod *t*. It is secured to the pipe *r*.

v is a branch pipe extending from the feed-pipe *h* and which is provided with a spring-loaded valve *v'*, capable of opening at a certain pressure.

v'' is a valve on the drain-pipe.

v''' is a second valve on the drain-pipe.

v'''' is a screw-plug screwed into the branch *n'* of the drain-pipe.

The feed-water pipe *h* is provided with a valve *h'*, a branch *h''*, and a screw-plug *h'''* in the end of the branch.

In order to prevent scalding in the evaporator, scrapers *w* are provided. There may be any desired number of scrapers; but by preference I use four sets. These scrapers are secured to and project out radially from a revoluble tube *x*, which is fitted around the flue-tube *d* and bears at its lower end on a bearing-ring *x'*. At its upper end is a worm-wheel *x''*, which can be revolved by means of a worm *x'''* on a shaft *x''''*, extending across the

evaporator and out to the outside of the funnel. This shaft x^4 works in suitable bearings and can be driven by means of clockwork mechanism, an electric or other motor, or by
 5 or from the main engine or an auxiliary engine. Each scraper has removably secured to it a blade y . Each blade is provided with slots y' , (see Fig. 5,) through which studs y^2 can be passed, and the blades can be adjusted and clamped in position by means of the
 10 nuts y^3 .

z is the steam-outlet pipe. This pipe is perforated at its inner end, as shown in dotted lines, Fig. 3, and it is preferably provided with
 15 a safety-valve z' .

z^2 is a circular gutter fitted on top of the scrapers.

z^3 z^4 are casings fitted around the pipes h n to prevent them being burned.

20 If desired, there may be fitted, in conjunction with the evaporator, an ordinary form of water-gage, as indicated in dotted lines at z^5 .

With this apparatus the feed-water, which may be sea-water, is pumped through the pipe
 25 h into the evaporator. When the water rises up to the float-valve m , it closes this valve against its seat, and when it rises up to the top of the chamber i it overflows into the chamber and fills it up, with the result that
 30 the ball-lever j is raised and the cock k closed. The closing of the cock shuts off the feed-water. When the water evaporates down below the level of the bottom of the chamber i , the float-valve m opens, whereupon the water in
 35 the chamber runs out and the float j sinks and in sinking again opens the cock k for a further supply of the feed-water. The feed-water supply to the evaporator is in this manner efficiently controlled and regulated.

40 The valves v^3 and v^2 on the scum-pipe are usually kept open to a slight extent, so as to allow the scum to drain off through the pipe r . When the feed-water supply to the evaporator is cut off by the action of the ball-cock
 45 j k , the pressure of water in the pipe h accumulates, owing to the continued pumping, until the pressure forces open the valve v' , whereupon the feed-water rushes out through the end of the pipe v and impinges on the
 50 cup u , forcing it downward and causing the disk s' to rise and close the opening r^2 . The water now rapidly rises in the chamber o and lifts up the float p , so as to shut the cock q and close the scum-pipe. As the water
 55 continues to rise it eventually overflows the upper end of the waste-pipe r and runs away. When the feed-water is again turned on by the automatic action of the cock k , the valve v' closes, and thereupon water ceases to im-
 60 pinge on the cup u , with the results that the disk s' , which is sufficiently heavy to overcome the weight of the cup and its rod t , falls down again into the position shown at Fig. 1 and opens the passage r^2 , whereupon the wa-
 65 ter in the chamber o drains away and the ball p again falls and opens the scum-pipe.

Whenever necessary, the plugs h^3 v^4 can be

removed for the purpose of cleaning the parts of the pipes h n subjected to the heat.

The shaft x^4 is kept slowly revolving, so
 70 that the scrapers w constantly agitate the water in the evaporator and scrape the interior surface thereof.

If desired, the scum-chamber o may be situated in the engine-room, so that the engineer
 75 can observe the evaporator feeding and scumming at any time.

The steam drawn off by the pipe z may be recondensed for the purpose of supplying
 80 fresh feed-water to the boilers, or it may be made to do duty in the engines, or it may be diverted into the funnel, so as to give an induced draft. The apparatus can therefore serve as either an evaporator, a steam-gen-
 85 erator, or a draft-inducer.

As the apparatus is fitted in the funnel and heated by the waste gases it constitutes a very cheap and economical means for evaporating water.

As will be seen, the evaporator is automatic
 90 in feeding and scumming and is self-cleaning.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An apparatus for evaporating sea-water
 95 consisting of a boiler which is placed in the funnel of a steamer and heated by the waste gases passing therethrough said boiler being tapered from the top toward the bottom and having a central flue-tube which tapers from
 100 the bottom toward the top and provided with means for supplying water to it, means for drawing off scum from it, means for conducting away the steam and means for scraping the interior of the boiler-shell, substantially
 105 as described.

2. An apparatus for evaporating sea-water having in combination a boiler placed in the
 110 funnel of a steamer and heated by the waste gases passing through the funnel, means for supplying water to the boiler, means for automatically controlling this water-supply, means for drawing off the scum from the
 115 boiler, means for drawing off the steam from the boiler and means for scraping the interior of the boiler-shell, substantially as described.

3. An apparatus for evaporating sea-water having in combination a boiler placed in the
 120 funnel of a steamer and heated by the waste gases passing through the funnel, means for supplying water to the boiler, means for automatically controlling this water-supply, means for drawing off the scum from the
 125 boiler, means for drawing off the steam from the boiler, a rotating tube within the boiler, arms projecting out radially from the tube, scrapers fitted at the ends of the arms and means for revolving the tube, substantially
 130 as described.

4. An apparatus for evaporating sea-water consisting of a boiler placed in the funnel of
 a steamer and heated by the waste gases passing through, said boiler being tapered from

the top toward the bottom and having a central flue-tube which tapers from the bottom toward the top, a water-supply pipe to the boiler having a cock, a chamber located within
 5 the boiler, open on its upper side, an automatic valve at the bottom of the chamber, a float within the chamber arranged to actuate said cock, means for drawing off scum from the boiler, and means for drawing off steam
 10 from the boiler, substantially as described.

5. An apparatus for evaporating sea-water consisting of a boiler placed in the funnel of a steamer and heated by the waste gases passing therethrough, said boiler being tapered
 15 from the top toward the bottom and having a central flue-tube which tapers from the bottom toward the top, a water-supply pipe to the boiler having a cock, means for automatically controlling the water-supply, means for
 20 automatically allowing the feed-water to escape at such times as the water is cut off from the boiler, means for drawing off steam from the boiler, and means for scraping the interior of the boiler-shell, substantially as de-
 25 scribed.

6. An apparatus for evaporating sea-water consisting of a boiler placed in the funnel of a steamer and heated by the waste gases passing therethrough, said boiler being tapered
 30 from the top toward the bottom and having a central flue-tube which tapers from the bottom toward the top, a water-supply pipe to the boiler having a cock, means for automatically controlling the water-supply through
 35 said pipe, a branch connected with the water-

pipe, an automatic spring-valve on the branch, a chamber, a waste-pipe in the chamber, a cup at the upper end of the chamber on which the water from the branch can impinge; a lever
 40 connected to the spindle, and a disk on the lever for opening the outlet from the chamber and means for drawing off steam from the boiler, substantially as described.

7. An apparatus for evaporating sea-water having in combination a boiler which is placed
 45 in the funnel of a steamer and heated by the waste gases passing through the funnel, a tapered shell made on the boiler, a conic bottom made on the boiler, a removable conic cover made on the boiler, a central flue-tube
 50 secured in the bottom and in the cover, a concentric tube arranged around the flue-tube, scrapers secured to this concentric tube, a bearing at the bottom of the boiler on which the tube works, a worm-wheel on the tube, a
 55 worm whose teeth mesh with the teeth of the worm-wheel, a worm-shaft carrying the worm and passing out through the boiler and the funnel, means for actuating the worm-shaft, means for supplying water to the boiler, means
 60 for controlling the water-supply to the boiler and means for drawing off the steam from the boiler, substantially as described.

Signed at Glasgow, Scotland, this 5th day of February, 1901.

DANIEL McKENZIE WATSON.

Witnesses:

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 WM. GALL.