No. 692,378. Patented Feb. 4, 1902.

# J. W. STANSFIELD.

## FEED WATER HEATER AND CONDENSER.

(Application filed Aug. 8, 1901.)

(No Model.) 3 Sheets—Sheet I.

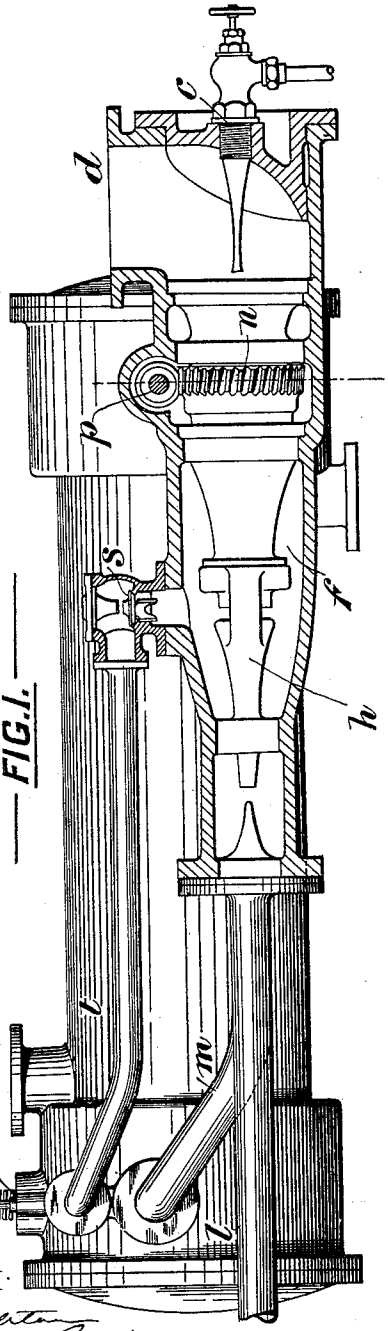



FIG. 1.

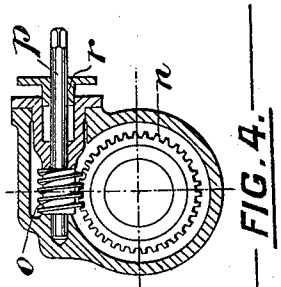



FIG. 4.

Attest:
Edw. L. Reed.

Inventor
John William Stansfield
by Ellis Spear
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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## FEED WATER HEATER AND CONDENSER.

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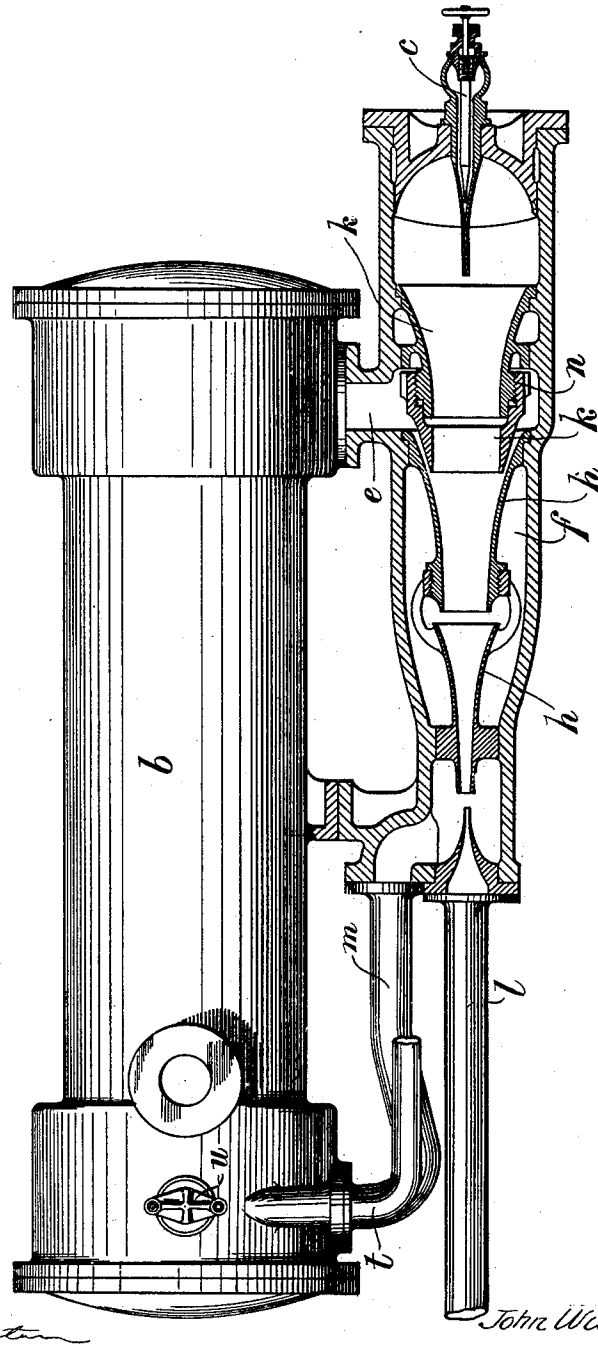



FIG. 2.

Attest:
Edw. L. Reed.

Inventor.
John William Stansfield
by. Ellis Spear.
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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## FEED WATER HEATER AND CONDENSER.

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(No Model.) 3 Sheets—Sheet 3.

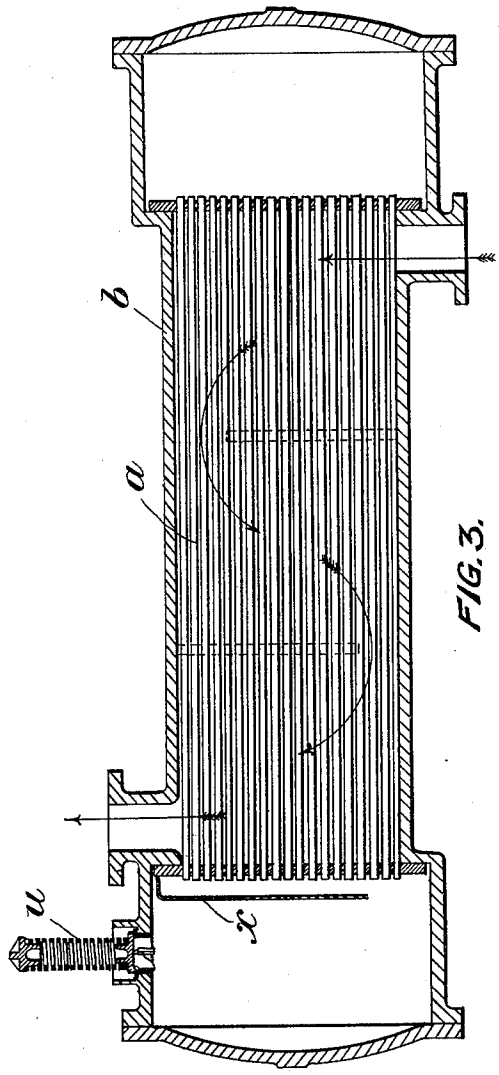



FIG. 3.

Attest:
Edw. L. Reed.

Inventor
John William Stansfield
by Ellis Spear
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

JOHN WILLIAM STANSFIELD, OF HARTLEPOOL, ENGLAND.

## FEED-WATER HEATER AND CONDENSER.

SPECIFICATION forming part of Letters Patent No. 692,378, dated February 4, 1902.

Application filed August 8, 1901. Serial No. 71,353. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN WILLIAM STANSFIELD, engineer, a subject of the King of Great Britain and Ireland, residing at 21 Charles street, Hartlepool, in the county of Durham, England, have invented certain new and useful Improvements in Connection with Feed-Water Heaters and Condensers, (for which I have made application for Letters Patent in Great Britain, No. 995, bearing date January 15, 1901,) of which the following is a specification.

This invention relates to improvements in connection with feed-water heaters and condensers, the object being to arrange a combination form of apparatus which will admit of the entire utilization of the exhaust-steam for a return feeding to the boiler.

In the accompanying drawings, Figure 1 is a sectional elevation of my apparatus attached to an ordinary cooler or condenser. Fig. 2 is a sectional plan of the same. Fig. 3 is a sectional elevation of the cooler or condenser chamber I prefer to employ, and Fig. 4 is a sectional end elevation of the adjustable cone.

In carrying my invention into effect in one convenient manner I employ an exhaust-steam injector, through which I pass the exhaust-steam, and I cause this exhaust-steam to mix with the water obtained by condensation of such exhaust-steam that has passed through the condenser or cooler, and at the outlet portion of the apparatus the current is divided up, a portion of the water going to feed the boiler, while the other portion is sent through the condenser-tubes under pressure, which enables it to be delivered into contact with the incoming exhaust-steam with considerable velocity at the inner end of the apparatus.

In making my improved combination apparatus I employ as a cooling medium cold water, which may be circulated around or through a battery of tubes *a*, mounted in an ordinary casing *b*, or the cooling medium may be cold air employed either around or through the tubes, depending upon the manner in which the water from condensation passes through the apparatus. I arrange a small nozzle *c* at the outer end of the injector-casing to admit of cold water being added to compensate for leakage and for starting the apparatus.

I make my injector-casing in one convenient manner with a branch *d* at the upper end to receive the exhaust-steam, another branch *e* near the nozzle-entrance to be connected to the cooler-chamber *b*, while the mixing-chamber *f* I provide with an ordinary cone *h* or other like fitting. The area between the mouth of this cone and steam-nozzle *k* I contract, so as to enable the pressure to be absorbed in producing velocity in the water entering the mixing-cone from *e*, and at the lower end of my casing I contract the area, so that one part of the water is carried through the branch *l* to the boiler, while the other part is delivered to another branch *m*, which communicates to the lower end of the cooler-chamber, from which the mixture of water and steam then travels through the cooling-pipes *a*.

I provide for an adjustment in the area between the mixing and steam cones, as shown in detail in Fig. 4. Upon the outside of the cone-nozzle *k* I form or secure a toothed ring or worm-wheel *n*, into which works a worm or thread *o*, the worm-spindle *p* being actuated from the outer end of the stuffing-box gland *r*. By this method of adjustment I can vary the speed and quantity of water which is delivered into the mixing-chamber to suit any requirement. Instead of employing a worm and worm-wheel I may arrange bevel or other ordinary gearing or appliances for raising and lowering the cone or nozzles.

I fit an overflow-valve *s* on the injector-casing near the end of the mixing-cone to allow steam to pass direct through the pipe *t* to the cooler for starting the condenser.

I provide an air-escape valve *u* on the top of the inlet end of the cooler to prevent excessive pressure and to allow any accumulating air to be blown out.

I prefer to fit a baffle-plate *x* over the ends of the tubes, so disposed as to prevent the passage into the tubes of air, oil, or impurities which may be on the surface of the water.

I make the size of the steam-inlet proportional to the speed of steam required when the condenser is working at its full capacity, and I adjust the water-entrance area to suit

the working pressure desired within the cooler.

I do not limit the application of my improved arrangement of injector, feed-supply, and condenser to apparatus in which exhaust-steam only is employed; but I modify the size of the fittings and branches to suit live steam and also to suit the quantity of water which is to be delivered or dealt with. I sometimes assist the feed to the boiler by the employment of a jet of live steam when delivering against a high boiler-pressure, and I modify the form of casing for the condenser to suit the type of surface employed and to suit the cooling medium to be used in connection with such condenser.

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

1. In a condenser and feed-water-supply apparatus in combination, an injector provided with an adjustable cone for regulating the water-inlet, an outlet branch for connection to the end of the cooler and another outlet branch leading to the boiler feed-supply substantially as described.

2. In a condenser in combination, an injector having a cold-water starting branch or nozzle a water-supply inlet from the cooler-chamber and a water-supply outlet or delivery to the end of the same chamber, with an additional outlet or delivery branch for hot condensed water to boiler, substantially as described.

3. In a condenser in combination a cooling-chamber, an injector having an inlet for exhaust-steam, an inlet for water from the cooler, two outlets for water to the cooler one being an overflow provided with a non-return valve, and a free delivery-outlet for water at the end of the injector substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN WILLIAM STANSFIELD.

Witnesses:

MATTHEW HARRISON,

W. R. HARRISON.