

(No Model.)

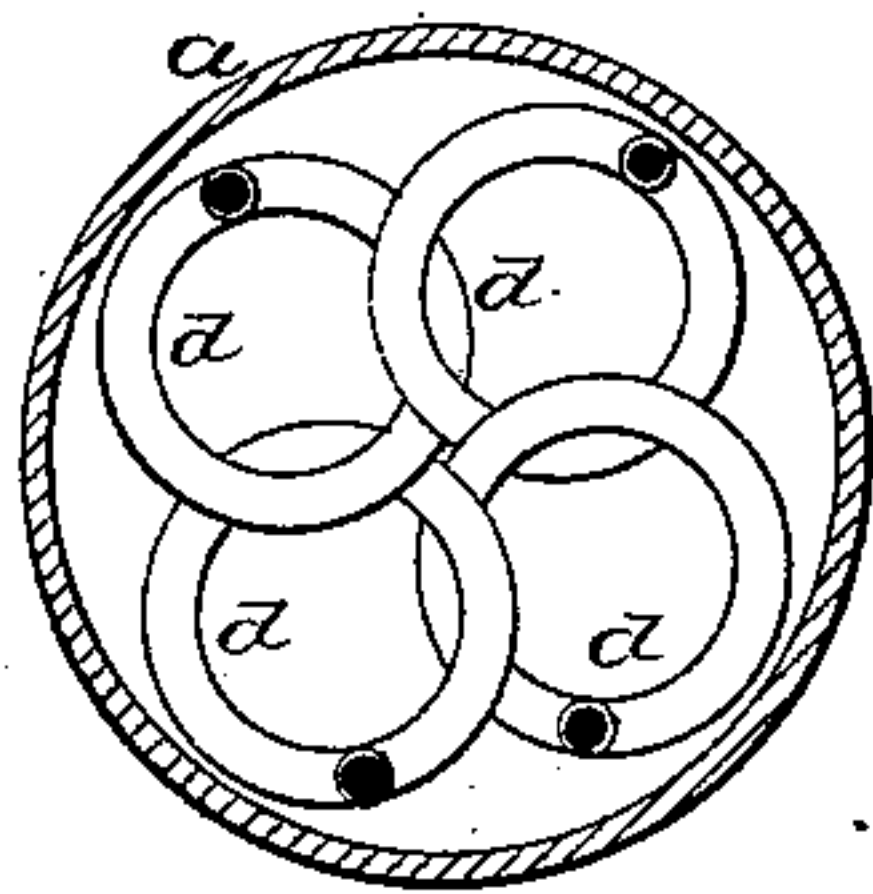
2 Sheets—Sheet 1.

J. KIRKALDY.  
HEATING FEED WATER.

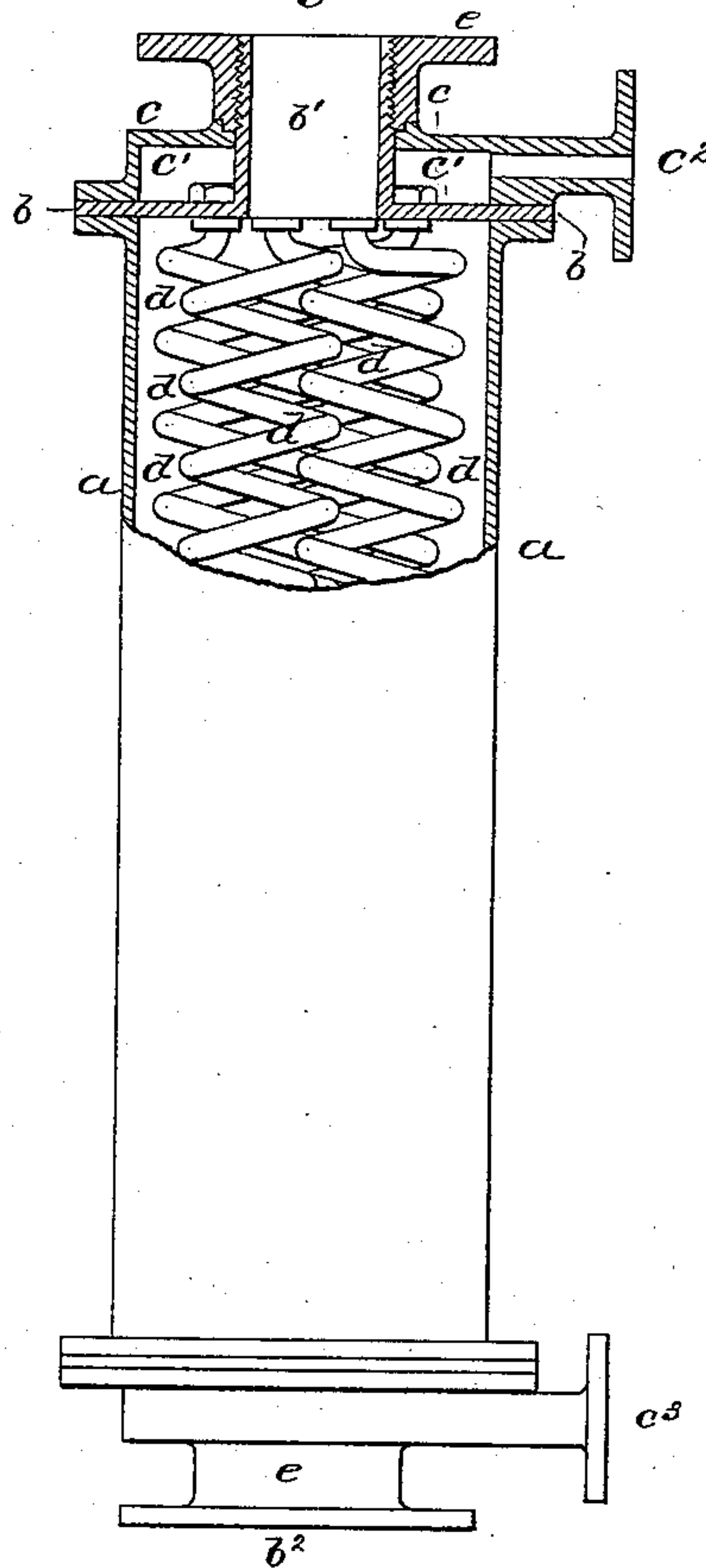
No. 324,120.

Patented Aug. 11, 1885.

*Fig. 2.*



*Fig. 1.*



WITNESSES

*Ed. A. Newman.*  
*Al. C. Newman.*

INVENTOR

*John Kirkaldy.*

By *his* Attorneys

*Baldwin, Hopkins & Weston.*

(No Model.)

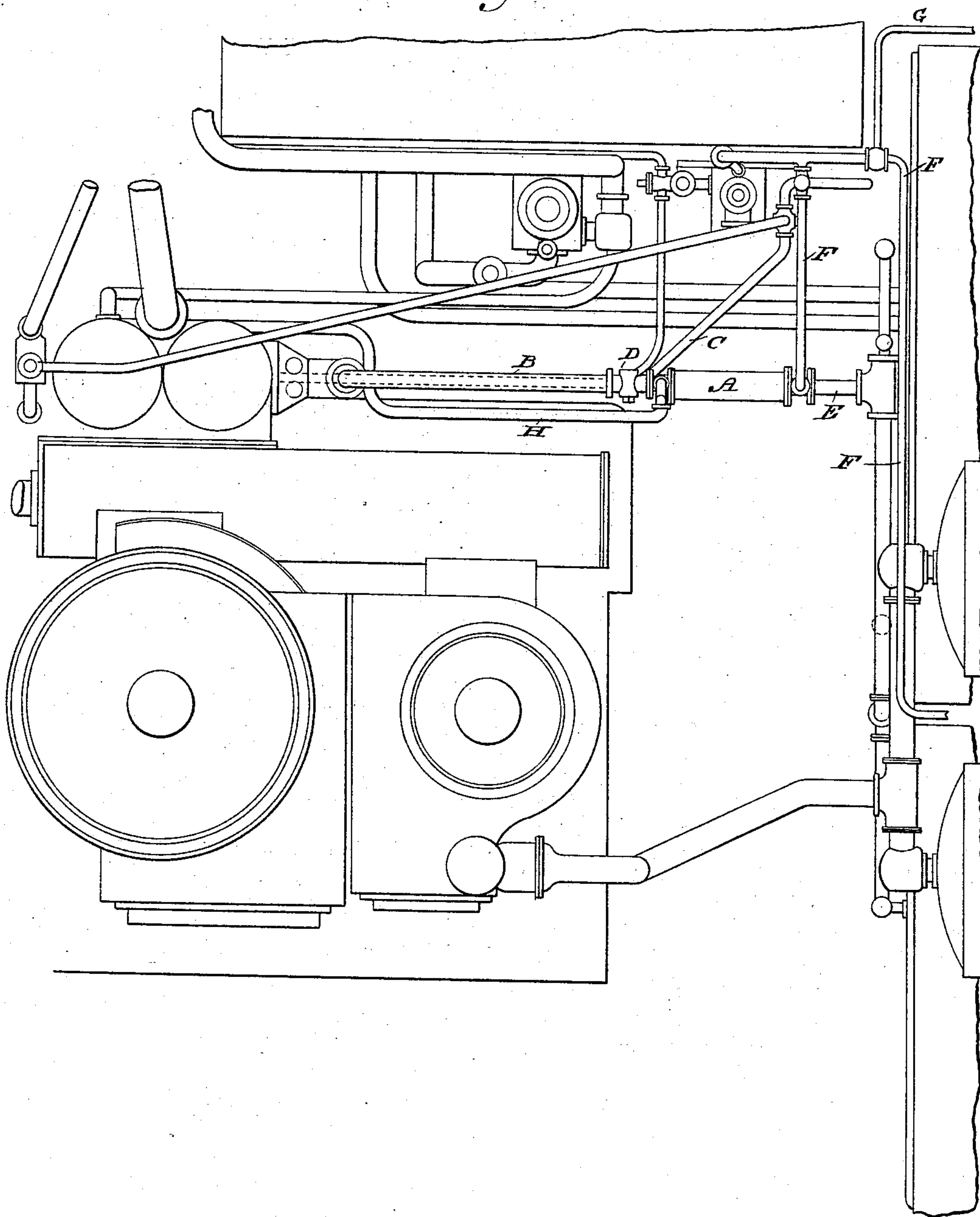
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*Fig. 3.*



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*Al. C. Newman.*

INVENTOR

*John Kirkaldy.*

By his Attorneys

*Geldwin, Hopkins & Peyton.*



# UNITED STATES PATENT OFFICE.

JOHN KIRKALDY, OF WEST INDIA DOCK ROAD POPLAR, COUNTY OF MIDDLESEX, ENGLAND.

## HEATING FEED-WATER.

SPECIFICATION forming part of Letters Patent No. 324,120, dated August 11, 1885.

Application filed November 4, 1884. (No model.) Patented in England August 13, 1884, No. 11,241, and September 19, 1884, No. 12,618; in France August 21, 1884, No. 163,869; in Belgium August 21, 1884, No. 66,083; in New South Wales December 30, 1884, and in Italy December 31, 1884, No. 195.

*To all whom it may concern:*

Be it known that I, JOHN KIRKALDY, a subject of the Queen of Great Britain, residing at 40 West India Dock Road Poplar, in the county of Middlesex, England, engineer, have invented certain new and useful Improvements in Apparatus for Heating Feed-Water for Steam-Boilers, (for which I have secured Letters Patent in Great Britain, No. 11,241, dated August 13, 1884, and No. 12,618, dated September 19, 1884; in France, No. 163,869, dated August 21, 1884; in Belgium, No. 66,083, dated August 21, 1884; in Italy, No. 195, dated December 31, 1884, and in New South Wales, dated December 30, 1884,) of which the following is a specification.

According to this invention, I construct apparatus for heating feed-water for steam-boilers in the improved manner hereinafter described, and also in such manner that the feed-water in its passage from the feed-pump to the boilers is brought into contact with pipes heated by steam drawn directly from the boilers, so that the feed-water before it enters the boilers may be heated nearly to the temperature of the water already in the boiler, while any water produced by the condensation of the steam may be allowed to flow back into a well or tank, to be returned to the boilers by the feed-pump of the engine. I also construct the apparatus in such manner that the feed-water can be thus heated not only at the time when the engines are running, but also at any time when the boilers are being filled with water from a pump worked by a separate donkey-engine.

Figure 1 is an elevation, partly in section, and Fig. 2 is a transverse section, of the apparatus in which the heating of the feed-water is effected. Fig. 3 shows the apparatus applied to the feed-water pipe of the boilers of a marine steam-engine.

In Figs. 1 and 2, *a* is a cylindrical casing. It is closed at each end by an inner cover, *b*, which has a cylindrical neck, *b'*, projecting outward from its center. On the exterior of each cover *b* is an outer cover, *c*, arched so as to form an inclosed chamber, *c'*, between itself and the cover *b*. The chamber *c'* at one end

communicates with the corresponding chamber *c'* at the other end by coiled tubes *d*, the ends of which are fixed into the end covers, *b*. The tubular coils are alternately right and left handed, as shown, so that by interlocking they may be contained in a smaller space. The necks *b'* pass through the cover *c*, and each neck has a screw-thread cut on its end, onto which a flanged nut, *e*, is made to screw, as shown at Fig. 1. The nut bears upon the exterior of the cover *c* and forms a tight joint between it and the neck *b'*. Steam is admitted to one of the chambers *c'* by a pipe-connection at *c<sup>2</sup>*, and water produced by the condensation of the steam in the pipes *d* passes off from the other chamber *c'* by another pipe-connection at *c<sup>3</sup>* to a hot well or tank, to be pumped back from thence by the feed-pumps of the engine into the boilers. The feed-water enters the apparatus at *b<sup>2</sup>* at one end of the apparatus by a pipe or cock secured to the flange of the nut *e* at that end of the apparatus, and passes away to the boiler through another pipe secured to the flange of the nut *e* at the opposite end of the apparatus. In place of steam being passed through the tubes and the feed-water through the casing, the operation might be reversed and the steam be passed through the casing and the feed-water through the tubes. The steam used for heating the feed-water might also be exhaust-steam from a steam-engine instead of steam drawn direct from the steam-boiler. In the case of marine engines, where a small donkey-engine is also used for performing various kinds of work on board the ship—such as pumping the bilge, and also occasionally for supplying the boilers with feed-water at times when the main engines are not running—I admit the feed-water to the apparatus through a three-way cock having two inlets, one open to the feed-pipe from the feed-pumps of the main engine, and the other open to a feed-pipe from a pump worked by the donkey-engine; or instead of the three-way cock two separate cocks, on on each feed-pipe, might be used, so that in either case water may be supplied to the boilers from the pump worked by the donkey-engine and shut off from the feed-pump of the main engine, or may be opened from the



feed-pump of the main and shut off from the donkey-engine. In all cases any feed-water supplied to the boiler must of necessity be passed through the feed-heater and be there-  
 5 by highly heated before it enters the boilers. In a similar manner I provide for admitting steam through the connection at  $c^2$ , either from the boilers of the main engine or from the boiler of the donkey-engine. Either a  
 10 three-way cock is connected to the connection  $c^2$ , and one of its inlets connected by a steam-pipe with the main boilers, and its other inlet by a pipe to the boiler of the donkey-engine, or I use two separate cocks, one on each pipe.  
 15 In Fig. 3, which shows the apparatus applied to a marine steam-engine, A is the feed-heater; B, the feed-pipe from the main engine; C, the feed-pipe from the donkey-engine; D, a three-way cock at the junction of  
 20 the pipes; E, the feed-pipe passing from the heater to the main boilers; F, a steam-pipe passing from the main boilers to the donkey-engine and to one end of the feed-heater; G, a steam-pipe leading from the boiler of the  
 25 donkey-engine into the steam-pipe F. H is a pipe leading from the opposite end of the feed-heater to the hot-well of the main engines to convey to it any water produced by the condensation of steam in the tubular coils of the  
 30 heater.

Having now described my invention and the manner in which the same is to be performed, I would state that I am aware that attempts  
 35 have before been made to heat the feed-water for the boilers of steam-engines on its pas-

sage from the feed-pump to the boilers by bringing the feed-water into contact with pipes through which the exhaust-steam from the steam-engine has been allowed to pass; but by such an arrangement the feed-water could not  
 40 be heated to anything approaching the same temperature, as the water in the boiler and the boiler would still be subjected to injurious strains from unequal heating and cooling. To such means of heating the feed-water  
 45 I lay no claim.

What I claim is—

1. The combination of a casing,  $a$ , with end covers,  $b$ , each having a tubular neck,  $b'$ , extending outward from it, and with hollow or  
 50 dish covers  $c$ , forming annular chambers  $c'$  surrounding these necks, and with nuts  $e$ , screwing onto the ends of the tubular necks to form tight joints between the tubular necks and the covers  $c$ , and with coiled pipes  $d$  pass-  
 55 ing from one annular chamber  $c'$  to the other, and with an inlet or outlet from each chamber, substantially as described.

2. The combination of the casing  $a$ , tubular necks  $b'$ , covers  $c$ , flanged nuts  $e$ , coiled pipes  
 60  $d$ , and three-way cock D, with two inlet waterways by which feed-water can be supplied to the casing  $a$ , and so to the steam-boilers, either from the feed-pump of the engines or from a pump worked by a separate donkey-engine.

JOHN KIRKALDY.

Witnesses:

J. WATT,

T. J. OSMAN.

Both of 17 Gracechurch St., London.