

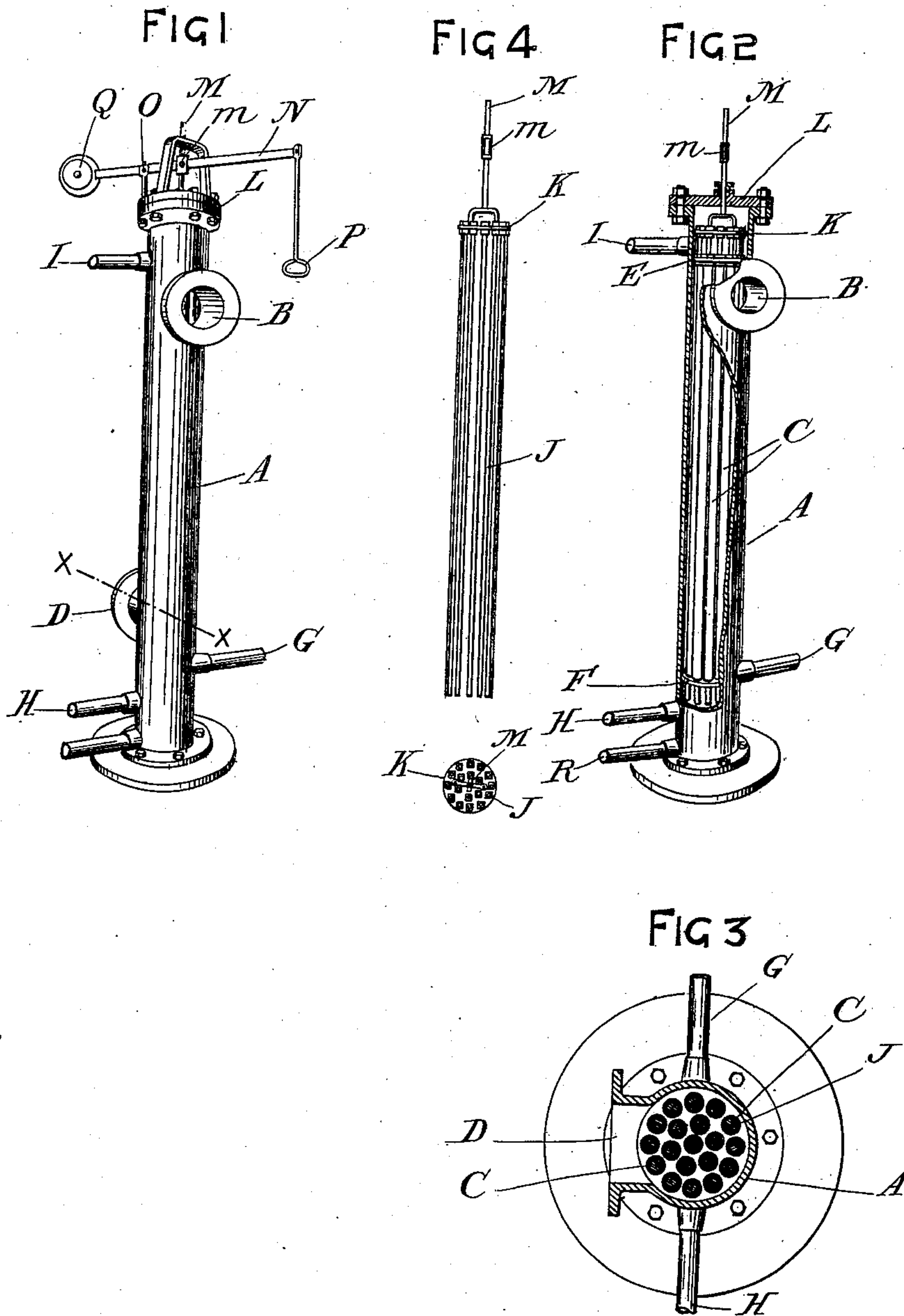
No. 690,729.

Patented Jan. 7, 1902.

C. P. HORTON.
TUBULAR CONDENSER AND WATER HEATER.

(Application filed Aug. 15, 1901.)

(No Model.)



WITNESSES,
Charles Bosworth Kettley
Thomas John Rowe.

INVENTOR,
Charles Philip Horton

UNITED STATES PATENT OFFICE.

CHARLES PHILIP HORTON, OF BIRMINGHAM, ENGLAND.

TUBULAR CONDENSER AND WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 690,729, dated January 7, 1902.

Application filed August 15, 1901. Serial No. 72,111. (No model.)

To all whom it may concern:

Be it known that I, CHARLES PHILIP HORTON, engineer, a subject of His Majesty the King of Great Britain and Ireland, Emperor of India, residing at Foundry road, Winson Green, Birmingham, England, have invented certain new and useful Improvements in Tubular Condensers and Water-Heaters, of which the following is a specification.

10 This invention has reference to those steam-condensers for steam-engines and for other purposes and to feed-water heaters and other water-heaters provided with water-circulating tubes along which the water flows, the exhaust or live steam being on the outside. Heretofore considerable trouble has been experienced with these tubular condensers and water-heaters through the incrustation and accumulation of mud inside the tubes, and
20 this defect I overcome by my invention, according to which I provide inside each of the water-circulating tubes a metal rod or tube to which a continuous or an occasional longitudinal reciprocating movement is impart-
25 ed, the water circulating along the annular space between these inner rods or tubes and the exterior circulating-tubes. The water in the tubes is thus divided into thin annular films, and any incrustation and accumulation of mud in the tubes are effectually pre-
30 vented.

On the accompanying drawings, Figure 1 is a general view of a vertical feed-water heater with my invention applied. Fig. 2 shows the same feed-water heater with portions broken away so as to show the interior. Fig. 3 is a sectional plan of the same feed-water heater on an enlarged scale across the line X X, Fig. 1; and Fig. 4 shows separately
40 the interior rods or tubes which work inside the circulating-tubes.

The same letters of reference indicate the same parts in all the figures.

45 A is the upright tubular body of the feed-water heater, made with an upper inlet B for the exhaust-steam, which passes around the outsides of the copper or other metal circulating-tubes C inside the cylinder A, the steam which is not condensed passing away through the outlet D to the exhaust-pipe. The copper or other metal circulating-tubes
50 C are retained in position and carried by the

usual tube-plates E F, one being above the inlet B and the other below the outlet D. These circulating-tubes are attached to the tube-plates in the usual manner, so as to allow of expansion and contraction. The outlet G from the cylinder A, immediately above the tube-plate F, is for the purpose of carrying off the condensed water to the drain,
60

H is the inlet for the cold water below the tube-plate F, and I above the tube-plate E is the outlet for the water to the boiler.

In applying my invention to this feed-water heater I provide in each of the circulating-tubes C a rod J, extending through the tubes C, or instead of the rods I may employ tubes closed at one or both ends, and these rods or tubes J are at their top ends fixed to and hang from a plate K, situated in the space between the tube-plate E and the top L of the cylinder A. These tubes or rods J are made somewhat longer than the tubes C, so as to project through the ends of the same. Attached to the plate K is a vertical rod M,
75 which passes through a stuffing-box in the cylinder-cover L and is for the purpose of imparting a reciprocating movement to the plate K and rods or tubes J. Various means may be adopted for moving the rod M and parts attached thereto up and down. For instance, as shown on my drawings, the horizontal lever N may be employed, this lever passing through a loop m on the vertical rod M and jointed to a stationary fulcrum-bracket
85 O, fixed to the cover L and provided with a handle P at the outer end of the lever N, by which the lever can be moved up and down. Q is a counterbalance which counterbalances the plate K and rods or tubes J, secured
90 thereto.

The feed-water enters the cylinder A at H below the tube-plate F and passes up the narrow annular spaces between the rods or tubes J and the interior of the circulating-tubes C into the upper part of the cylinder A above the top tube-plate E, and having thus been heated by the exhaust-steam in its passage through the tubes the water passes away through the outlet I to the boiler. A few
100 strokes up and down occasionally by the handle P suffices to prevent any incrustation or accumulation of mud in the circulating-tubes C. The blow-off R from the lower part of the

cylinder A is for the purpose of getting rid of any dirt that may have collected there.

The feed-water heater above described will act equally well as a surface condenser, the water for condensation being forced by the circulating-pump into the cylinder A by the inlet and up through the annular spaces in the tubes C and through the outlet I, the exhaust-steam entering at B and the condensed water being pumped away by the air-pump through the outlet D.

With large-size heaters or surface condensers a continuous slow reciprocating movement is imparted to the rods or tubes J, which can readily be done by connecting the rod P to a revolving crank or the like.

The drawings illustrate my invention as applied to a vertical feed-water heater or condenser; but it will be understood that my invention can be similarly applied to a feed-water heater or condenser in which the circulating-tubes C are arranged in an inclined direction or are horizontal.

It will be seen that in addition to my invention preventing the incrustation or accumulation of mud in the circulating-tubes C it considerably increases their power of extracting or transmitting heat, as when the water passes through the tubes in the form of a thin annular

column, as above described, it is obvious that nearly the whole of the water comes in contact with the heat extracting or transmitting surface of the tube, and therefore the apparatus is much more efficient than when, as in the usual feed-water heaters and condensers, the water passes through the tubes in a thick mass.

When it is desired to clean the rods or tubes K and circulating-tubes C, this can readily be done by first removing the cover-plate L and then lifting up the plate K with the rods or tubes J attached thereto.

What I claim as my invention, and desire to secure by Letters Patent, is—

In the water-circulating tubes of steam-condensers and water-heaters, the employment of internal rods or tubes of rather smaller diameter than the interior of said circulating-tubes with means for reciprocating said internal rods or tubes to and fro to keep the circulating-tubes free from incrustation and mud substantially as set forth.

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

CHARLES PHILIP HORTON.

Witnesses:

CHARLES BOSWORTH KELLEY,
THOMAS JOHN ROWE.