Oct. 2, 1923. 1,469,531

H. C. POWEL

DEVICE FOR THE PROMOTING AND CONTROLLING OF THE CIRCULATION OF WATER IN WATER TUBE BOILER

Filed March 10, 1922

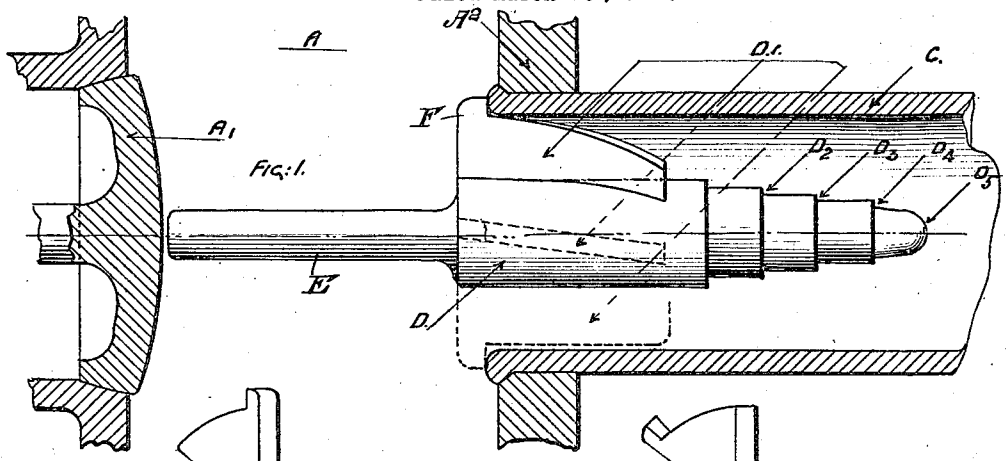


FIG. 1.

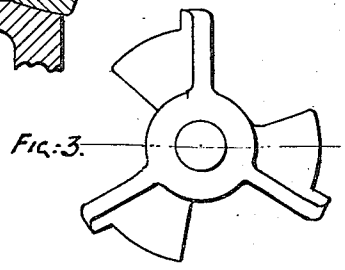


FIG. 3.

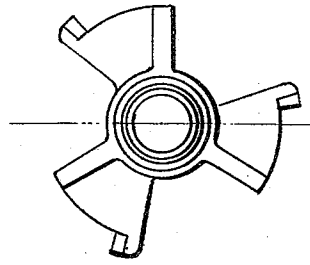


FIG. 2.

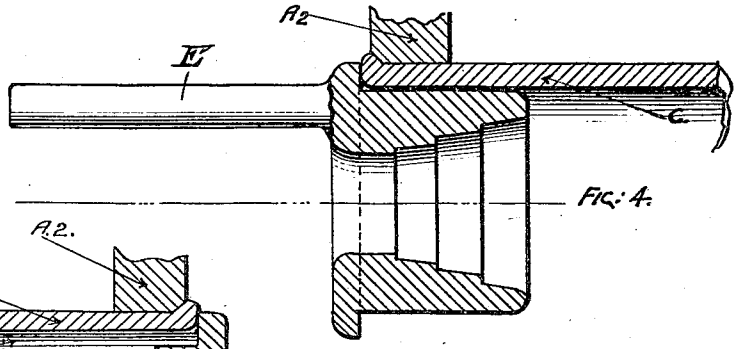


FIG. 4.

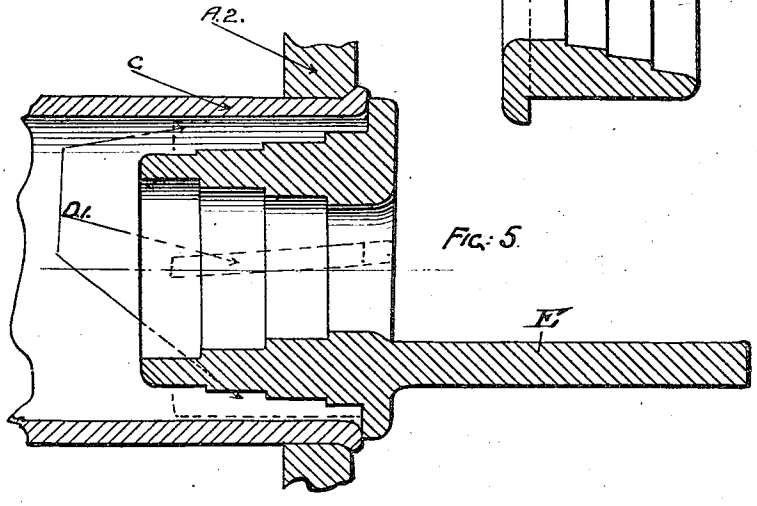


FIG. 5.

Henry Cable Powel

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UNITED STATES PATENT OFFICE.

HENRY COKE POWEL, OF LONDON, ENGLAND, ASSIGNOR TO THOMAS ANDREW LEWIS, OF NEW YORK, N. Y.

DEVICE FOR THE PROMOTING AND CONTROLLING OF THE CIRCULATION OF WATER IN WATER-TUBE BOILERS.

Application filed March 10, 1922. Serial No. 542,743.

To all whom it may concern:

Be it known that I, HENRY COKE POWEL, a subject of the King of Great Britian and Ireland, and a resident of Catford, in the county and city of London, England, have invented new and useful Improvements in Devices for Promoting and Controlling the Circulation of Water in Water-Tube Boilers, of which the following is a specification.

This invention relates to so called "circulation plugs" adapted for insertion in one end of the water tubes of water-tube boilers.

In steam boilers of the water-tube type, it is of prime importance that the circulation of the water in all the tubes of the boiler that form the heating and evaporating surface should be maintained in a uniform direction; further the circulation should be as rapid as practically possible; and again, the circulation should not be checked or reversed for if either of these cases happened it is likely that the tubes would become burnt, bent or blistered, or would even probably burst.

The primary object of my invention is to provide circulation plugs inside one end of each water tube which may be readily inserted and which serve to increase the velocity of the water entering therein, as well as to prevent, or reduce the possibility of, the reversal of flow of the water in the said tube.

Further objects will appear in the detailed description.

Fig. 1 is a longitudinal vertical section showing the plug in elevation.

Fig. 2 is a rear end view.

Fig. 3 is a front end view.

Figs. 4 and 5 are longitudinal vertical sections showing modifications of the improved device.

The letter A designates the header of a water-tube boiler. A_1 is a wedge-shaped hand-hole plate. The tubes C of the boilers are fixed in the tube-plate A_2. The plug D which I claim as my invention is inserted in the head end of the tube C. The plug D as shown in Fig. 1, is provided with a main body and a series of steps D_2, D_3, and D_4 of respectively decreased cross-sectional area. The inner end of the plug tapers off into a round nose-shaped member for the purpose of causing the water passing around the plug to break off gradually. Radial fins, D′ extend from the body of the plug D. These fins which preferably have a spiral contour, give the water a spiral direction around the plug and breaks it up into streams so that more of the water will be brought in direct contact with the heating surface of the tubes. The plug is further provided with lugs F, that limit the distance which the plug enters the water tube. Motion of the plug in the opposite direction is limited by the integral tail piece E.

The plug shown in Fig. 4, is a modification of the former in that the water is caused to pass through the center of the plug rather than around it. The internal diameter of the plug is increased gradually toward the inner end to form a series of conical shaped steps of increased mean cross-section.

Fig. 5, shows a further modification which is combination of the principal features of the plugs of Figs. 1 and 4. This modification includes the stepped external in addition to the stepped internal passage. It is likewise provided on the periphery with a number of spiral fins. As in the other species the mean cross-section of passage open for flow of water increases gradually toward the inner end.

It will be noted in view of the above descriptions that the emulsion of water and steam must first enter the restricted passage-way left by the plug and consequently acquires a comparatively high entering velocity. The fins of the plug break up the flow into a number of streams and cause them to move in a spiral direction so as to bring all of the water in direct contact with the heating surface of the tube. The steps on the plug serve to gradually increase the area of passage-way for flow into the tube so as to lead to decrease the resistance to flow in that direction. On the other hand they offer a great resistance to check any tendency of the water to reverse in direction of flow.

It is further noted that for the highest boiler efficiency the amount of water entering a tube should be just a little more than the tube evaporates, the excess serving to carry off any deposit left by the evaporation. The plugs described have been designed to accomplish this purpose.

It is understood that further modifications

may be made to the structure without departing from the nature and scope of the invention as defined in the claims.

What I claim is:—

1. A circulation plug for water tubes of water-tube boilers comprising a series of stepped shoulders disposed toward the inner end of said plug and arranged so that the flow area in that portion of the tube occupied by the plug increases in graduated steps toward the inner end of the said plug.

2. A circulation plug for loosely fitting the bore of water tubes comprising a stepped body portion gradually diminishing in thickness toward the inner end of said plug and means for holding the plug in position in the tube.

3. A circulation plug for loosely fitting in the bore of water tubes comprising a stepped body portion gradually diminishing in thickness toward the inner end of said plug, fins radiating spirally from the body portion and projections from said body for holding the plug in position in said tube.

4. A circulation plug for water tubes of water-tube boilers comprising a body portion, a series of integral stepped necks disposed from said body portion and gradually diminishing in diameter toward the inner end of said plug, fins radiating from and spirally disposed on the body of said plug, radial plugs for limiting the position of the plug within the tube and an extension for preventing the plug from moving out of the tube.

5. A circulation plug comprising a body portion, a series of necks stepped in gradually diminishing diameter toward the inner end of said plug and tapering off at the end to a rounded nose, spiral fins radiating from the surface of said body portion, lugs attached to the outer end of said fins and a longitudinal extension from the outer end of said body portion.

6. A circulation plug comprising integral members including a body portion, a series of stepped necks at the inner end and a longitudinal extension from the outer end of said body, fins radiating from said plug and lugs projecting from said fins.

Dated the twenty-second day of February of the year nineteen-hundred and twenty-two.

HENRY COKE POWEL.

Witness:

MARJORIE FIELDING.