Oct. 3, 1967 J. S. LINGNAU 3,344,672

HEAT OPERATED DISCHARGER FOR CONDENSATION WATER

Filed April 5, 1965

Fig. 1

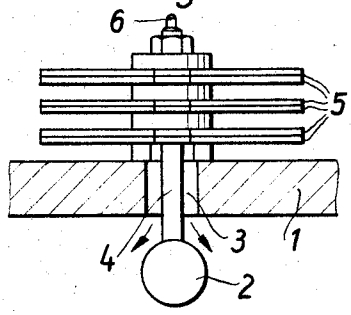


Fig. 2

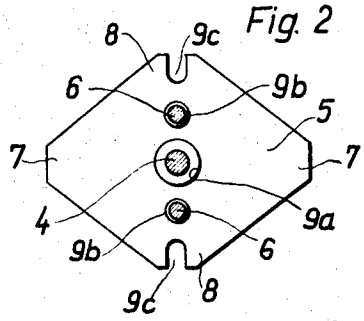


Fig. 3

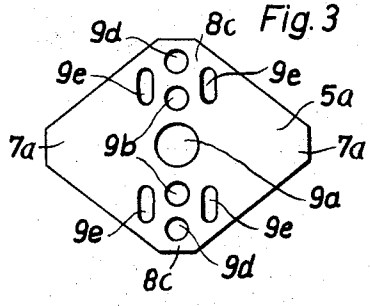


Fig. 4

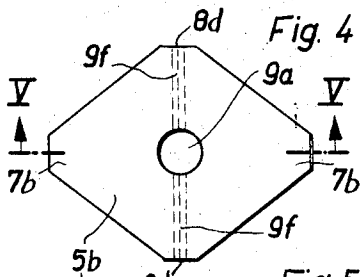


Fig. 5

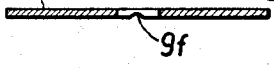


Fig. 6

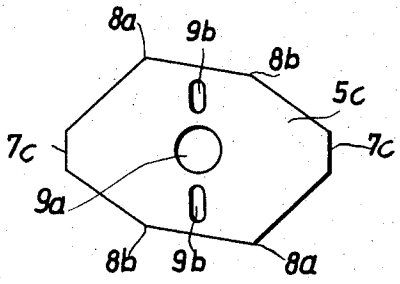


Fig. 7

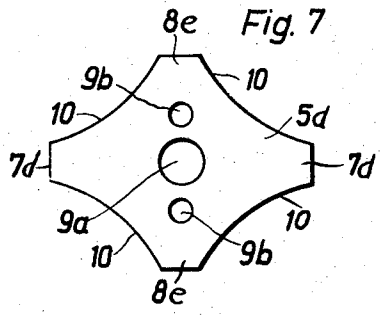
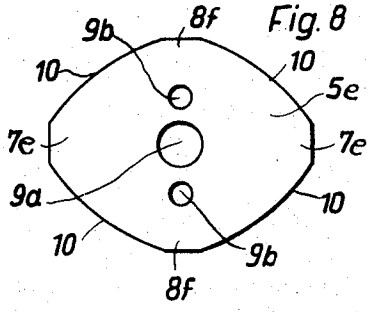


Fig. 8



Inventor:
J. S. Lingnau
By Richards & Geier
ATTORNEYS

United States Patent Office

3,344,672

Patented Oct. 3, 1967

3,344,672

HEAT OPERATED DISCHARGER FOR CONDENSATION WATER

Josef S. Lingnau, Bremen-Borgfeld, Germany, assignor to Gustav F. Gerdts K.G., Bremen, Germany, a corporation of Germany

Filed Apr. 5, 1965, Ser. No. 445,428
6 Claims. (Cl. 73—363.5)

ABSTRACT OF THE DISCLOSURE

A discharger for condensation water has a flow passage which can be closed by the action of bimetallic plates operated by the temperature of the water. The bimetallic plates are of rhombic shape and are provided with holes, recesses or grooves for the purpose of reducing the torque.

This invention relates to a thermally operated discharger for condensation water and refers more particularly to a discharger provided with a thermostat which is affected by the temperature of the flowing liquid and which steers the regulating and the closing elements of the discharger depending upon this temperature. The thermostat consists of a column composed of pairs of polygonal bimetallic plates which are located one over the other and the corners of which serve as supports, whereby the bimetallic plates of each pair curve in opposite directions when there is a rise in temperature of the water flowing through the discharger.

A technical requirement which has been in existence for a long time, provides that the opening and closing characteristical features of dischargers for condensation water should be adapted to the greatest possible extent to the non-linear saturated steam line.

Round bimetallic discs have been used in the past. However, the use of polygonal bimetallic plates as thermal operational elements of dischargers of condensation water has, as compared to these round discs, a progressive spring characteristic which makes it possible to adapt the closing force of the discharger to the saturated steam curve. Rhombic bimetallic plates are particularly effective to provide an extensive adjustment of the spring characteristics to the saturated steam curve, in that such plates have two opposed long portions extending from the middle portion of the plate and two short portions which are also opposed to each other, so that in the beginning the interengagement of the two adjacent plate pairs takes place over the long extensions. This results in a softer spring characteristic and thus produces a better adaptation to the sharply rising part of the saturated steam line. On the other hand, when the temperature is further increased, gradually the shorter extensions also move into engagement so that the spring characteristic of the plates becomes harder, with the result that it is better adapted to the upper flatly extending part of the saturated steam line.

An object of the present invention is to improve constructions of thermally operated dischargers of condensation water.

Another object is the provision of a discharger with bimetallic plates wherein the progressive spring characteristic of the bimetallic plates is so influenced that it closely follows the saturated steam line at a short distance therefrom, substantially without buckling.

Other objects of the present invention will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention, it was found desirable to provide a discharger, the bimetallic plates of which have the known rhombic shape and wherein the middle portion of the plates between the long supporting extensions is provided with means which reduce the torque, such as holes, recesses,

grooves and the like. The holes may be arranged in a plurality of parallel rows.

This construction of the present invention which is particularly concerned with the lower greatly curved portion of the saturated steam line, exerts such an influence upon the spring characteristic of the bimetallic plates that the spring characteristic follows in a particularly ideal manner the pressure and the temperature curve.

By a suitable selection of the means reducing the torque, particularly by determining their number, size and extension, the preferably rhomb-like shaped bimetallic plates can be easily adapted to any existing operational requirements. Preferably, the number, size and extension of the holes diminishes with an increase in distance from the center of the plate.

In constructions of dischargers wherein the bimetallic column is mounted upon the shaft of the closing device and is guided by separate means, the row formed by holes, recesses or the like for the passage of the valve shaft and of the guide means, extends along a central axis which is transverse to the longitudinal extensions so that it constitutes at the same time, either by itself or together with additional holes, recesses or the like, the means which reduce the torque.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing, showing by way of example preferred embodiments of the inventive idea.

In the drawing:

FIGURE 1 shows diagrammatically in side view and partly in section, a discharger of condensation water.

FIGURES 2 to 4 are front views of differently constructed bimetallic plates which can be used for the bimetallic column of the present invention.

FIGURE 5 is a section along the line V—V of FIGURE 4.

FIGURES 6 to 8 are front views showing bimetallic plates of other constructions.

The discharger of condensation water which is shown in FIGURE 1 is divided in a known manner by the separation wall **1** of the discharge casing into an inlet side and an outflow side. The wall **1** is provided with a flow passage **3** which can be closed by the closure member **2**. The closure member **2** is connected with a shaft **4** which is movable to close the passage **3** in a direction opposed to operational pressure by a bimetallic column consisting of several bimetallic plates **5** which are located in the inlet side of the discharger. The bimetallic column is preferably guided by pins **6**.

Various bimetallic plates **5**–**5***e* of rhomb-like shape are shown in FIGS. 2 to 8. Each of these plates has two long opposed supporting extensions **7**–**7***e* and two opposed short supporting extensions **8**–**8***f*. The long extensions are the only ones which engage each other during the lower sharply rising portion of the saturated steam line. Later the short extensions also become effective during the upper flat portion of the saturated steam line, so that then the spring characteristic becomes considerably harder.

To adapt the closing force line of the bimetallic discs to the greatest possible extent to the saturated steam line without changing or weakening the predetermined thermic bending, various means **9***a*–**9***f* are provided between the long extensions for reducing the torque.

FIGURE 2 shows a rhombic bimetallic plate **5** which includes longer extensions **7** and shorter extensions **8**. The plate **5** is provided with holes **9***a* and **9***b* which serve for the passage of the valve shaft **4** and the guiding pins **6**, respectively, and which at the same time reduce the torque. The short extensions **8** are provided with recesses **9***c* at their ends; these recesses further support the action of the holes **9***a* and **9***b*.

FIGURE 3 shows a rhombic bimetallic plate **5***a* which

in addition to the holes **9***a* and **9***b* of the previously described construction has further holes **9***d* which continue the row of holes formed by the holes **9***a* and **9***b*. Furthermore, elongated holes **9***e* are provided on opposite sides of the row of holes **9***a*, **9***b*, **9***d*, thereby forming a plurality of parallel rows.

FIGURES 4 and 5 show a rhombic bimetallic plate **5***b* which is provided solely with a central bore hole **9***a* for the valve shaft **4**. In this construction the means reducing the torque consist of a groove **9***f* which extends through the entire plate transversely to its longitudinal direction. As shown in FIG. 5, the groove **9***f* is shaped so that it merely reduces the thickness of the material.

FIGURE 6 shows a rhomb-like bimetallic plate **5***c* wherein in addition to the opposed long supporting extensions **7***c* two opposed shorter extensions **8***a* and two opposed shorter extensions **8***b* are provided between the portions **7***c*. The portions **8***a* and **8***b* have different radial lengths. In use, first the extensions **7***c* will be engaged, then the somewhat shorter extensions **8***a* and finally, the still shorter extensions **8***b*. By suitably dimensioning the size of these extensions, it is possible to adapt the spring characteristic in a most advantageous manner to the saturated steam line.

FIGURE 7 shows a rhomb-like bimetallic plate **5***d* provided with longer extensions **7***d* and shorter extensions **8***e*, as well as inwardly extending curved edges **10** located between the end portions **7***d* and **8***e*.

FIGURE 8 shows a rhomb-like bimetallic plate **5***e* which is somewhat similar to the plate **5***d*. However, in the construction of FIGURE 8 the edges **10***a* extending between the extensions **7***e* and **8***f* are curved outwardly.

It is apparent that the examples described above have been given solely by way of illustration and not by way of limitation and that they are subject to many variations and modifications within the scope of the present invention. All such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. In a thermally operated discharger for condensation water, a thermostat comprising a plurality of superposed bimetallic plates, each of said bimetallic plates being of rhomb-like shape and having a middle portion and at least two long supporting extensions on opposite sides of said middle portion, and torque-reducing means upon at least said middle portion, wherein said means comprise at least one recess formed in the plate.

2. In a thermally operated discharger for condensation water, a thermostat comprising a plurality of superposed bimetallic plates, each of said bimetallic plates being of rhomb-like shape and having a middle portion and at least two long supporting extensions on opposite sides of said middle portion, and torque-reducing means upon at least said middle portion, wherein said means comprise a groove extending transversely to said long supporting extensions.

3. In a thermally operated discharger for condensation water, a thermostat comprising a plurality of superposed bimetallic plates, each of said bimetallic plates being of rhomb-like shape and having a middle portion and at least two long supporting extensions on opposite sides of said middle portion, and torque-reducing means upon at least said middle portion, wherein said means comprise holes formed in the plate and extending in a plurality of rows.

4. In a thermally operated discharger for condensation water, a thermostat comprising a plurality of superposed bimetallic plates, each of said bimetallic plates being of rhomb-like shape and having a middle portion and at least two long supporting extensions on opposite sides of said middle portion, a valve shaft extending through holes formed in said plates, pins guiding said plates and extending through other holes formed in said plates, all said holes of each plate extending in a row transversely to said long supporting extensions and constituting torque-reducing means, wherein additional holes located in said row are formed in at least some of said plates.

5. In a thermally operated discharger for condensation water, a thermostat comprising a plurality of superposed bimetallic plates, each of said bimetallic plates being of rhomb-like shape and having a middle portion and at least two long supporting extensions on opposite sides of said middle portion, a valve shaft extending through holes formed in said plates, pins guiding said plates and extending through other holes formed in said plates, all said holes of each plate extending in a row transversely to said long supporting extensions and constituting torque-reducing means, wherein at least some of said plates have recesses extending in said row.

6. In a thermally operated discharger for condensation water, a thermostat comprising a plurality of superposed bimetallic plates, each of said bimetallic plates being of rhomb-like shape and having a middle portion, two long supporting extensions on opposite sides of said middle portion, two shorter opposed supporting extensions between said long supporting extensions, two still shorter opposed supporting extensions between said long extensions and said shorter extensions, and torque-reducing means upon at least said middle portion.

References Cited

UNITED STATES PATENTS

3,107,532	10/1963	Lingnau	73—363.5
3,169,704	2/1965	Domm et al.	73—363.3

FOREIGN PATENTS

848,969	9/1960	Great Britain.

LOUIS R. PRINCE, *Primary Examiner.*

W. A. HENRY, *Assistant Examiner.*