Oct. 8, 1935. G. KRAUSE 2,016,720

HEAT EXCHANGING PIPE

Filed April 5, 1933

Fig. 1

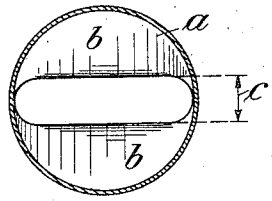


Fig. 2

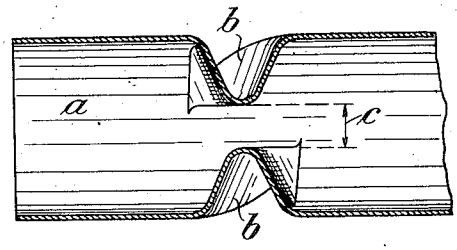


Fig. 3

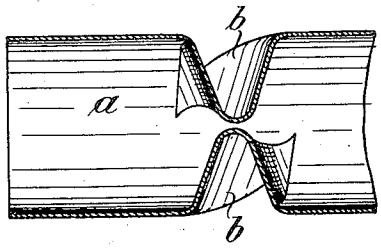


Fig. 4

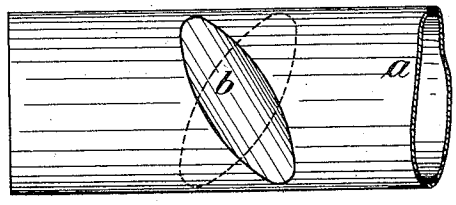
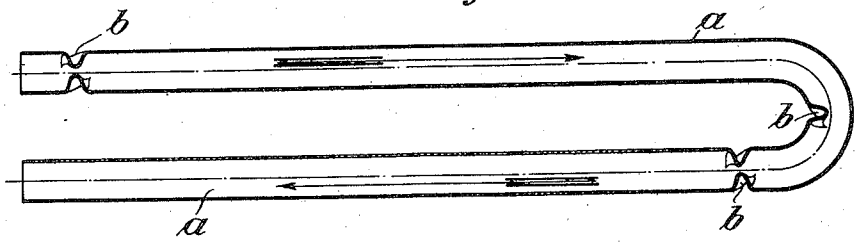


Fig. 5



Inventor:

Georg Krause.

Patented Oct. 8, 1935

2,016,720

UNITED STATES PATENT OFFICE

2,016,720

HEAT EXCHANGING PIPE

Georg Krause, Lubeck, Germany

Application April 5, 1933, Serial No. 664,587
In Germany April 11, 1932

4 Claims. (Cl. 138—38)

This invention relates to boiler flues or pipes and particularly to fire tubes designed to be surrounded by water and through which products of combustion pass and wherein, in order to obtain greater efficiency, means are provided for imparting axial rotation to the fluid travelling therethrough.

Known boiler pipes of this kind are usually fitted with insertions in the form of baffle plates arranged at such an angle to the pipe axis as to impart to the fluid the desired rotary motion. These plates are liable to get excessively heated and will therefore soon be destroyed. They are also, owing to the extreme changes in temperature to which they are subjected, liable to get loose and to be carried away with the heating gases.

The object of the present invention is to obtain an arrangement wherein these defects are obviated, and the invention consists in forming the boiler tube or pipe with opposed, inwardly extending projections in the length of the pipe extending diagonally with relation to the axis of the pipe and to each other whereby a relatively narrow passage is left between the depressions. This construction results in the following effect,—that the cylindrical body of combustion gases advancing through the pipe meets with the two oppositely disposed diagonally extending depressions and is given an axial twisting movement along the tube, bringing the component parts of the gases into intimate contact with the tube wall. At the same time, the contracted central passage causes the fluid to be given an increased velocity so that the velocity and rotation imparted to the column of fluid prevents the deposit of any soot or other solid particles of combustion on these inwardly projecting portions. Where ordinary baffles are used along the length of the pipe for merely creating turbulence, these baffles tend to check the speed of the fluid and particles of carbon lodge behind the baffles and along the length of the tube, thus preventing the radiation of heat. With my construction, however, this lodgement of these particles is prevented and at the same time the fluid is given an axial rotation at a high velocity along the whole length of the straight portion of the boiler tube.

Fig. 1 of the accompanying drawing represents a cross-section of a pipe according to the invention,

Fig. 2 is a longitudinal section thereof,

Fig. 3 is a longitudinal section showing depressions of a different form,

Fig. 4 is a plan view of a pipe construction according to Fig. 2,

Fig. 5 is a section showing the preferred arrangement of depressions in a bent pipe.

The pipe *a* is formed with depressions *b* which are arranged at an angle to the pipe axis so as to impart to the fluid passing through the pipe a rotary motion. The depressions are arranged in pairs, one diametrically opposite the other, as shown in Figs. 1 to 4, and the bottom outlines of the depressions may either be straight and situated in parallel planes *c*, as shown in Figs. 1 and 2, or they may be curved as shown in Fig. 3.

There is no need to provide the pipe with depressions along its entire length. A pair of depressions at the leading end of the pipe, and further depressions wherever, by a bend in the pipe, the direction of motion of the fluid is changed, as indicated in Fig. 5, will suffice.

When employed in boiler and like pipes the depressions are not, like the inserted baffle plates, liable to be overheated since they are in direct contact with the fluid at both sides of the pipe wall. The depression should be not less than one-third in order to secure for the gases a high velocity in order to cause them to rotate throughout the entire length of a straight portion of the tube.

I claim:

1. A boiler tube for conducting combustion gases having in its length directly opposed inwardly extending projections extending diagonally with respect to the axis of the tube and crosswise with reference to each other whereby a relatively narrow passage is left between the projections, said narrow passage acting to increase the velocity of the fluid at this point.

2. A boiler tube for conducting combustion gases, the tube in its length being bent to change the direction of the tube, said tube having at its inlet end directly opposed projections extending diagonally with respect to the axis of the tube and crosswise with reference to each other whereby a relatively narrow passage is left between the projections and having at the point where the tube changes its direction another pair of directly opposed projections extending diagonally with respect to the axis of the tube and crosswise with reference to each other, each of the opposed pairs of projections defining between them a relatively narrow passage acting to increase the velocity

of the fluid as it passes through the tube at this point.

3. A boiler tube for conducting combustion gases having straight portions and bends connecting the straight portions, the tube having at the inlet end of each straight portion and at the point where the tube is bent a pair of directly opposed projections extending diagonally with respect to the axis of the tube and crosswise with reference to each other whereby a relatively narrow passage is left between the projections acting to increase the velocity of the fluid at these points.

4. A boiler tube for conducting combustion gases having in its length directly opposed projections extending in a general longitudinal direction but diagonally with respect to the axis of the tube and crosswise with reference to each other, said projections together having a total depth approximately equal to two-thirds of the diameter of the tube whereby a relatively narrow passage is left between the projections acting to increase the velocity of the fluid at this point.

GEORG KRAUSE.