Feb. 28, 1939. E. C. CHAPMAN ET AL 2,149,008

TUBE WITH METALLIC BLOCK AND METHOD OF ATTACHING LATTER

Filed Sept. 15, 1937

Fig. 1

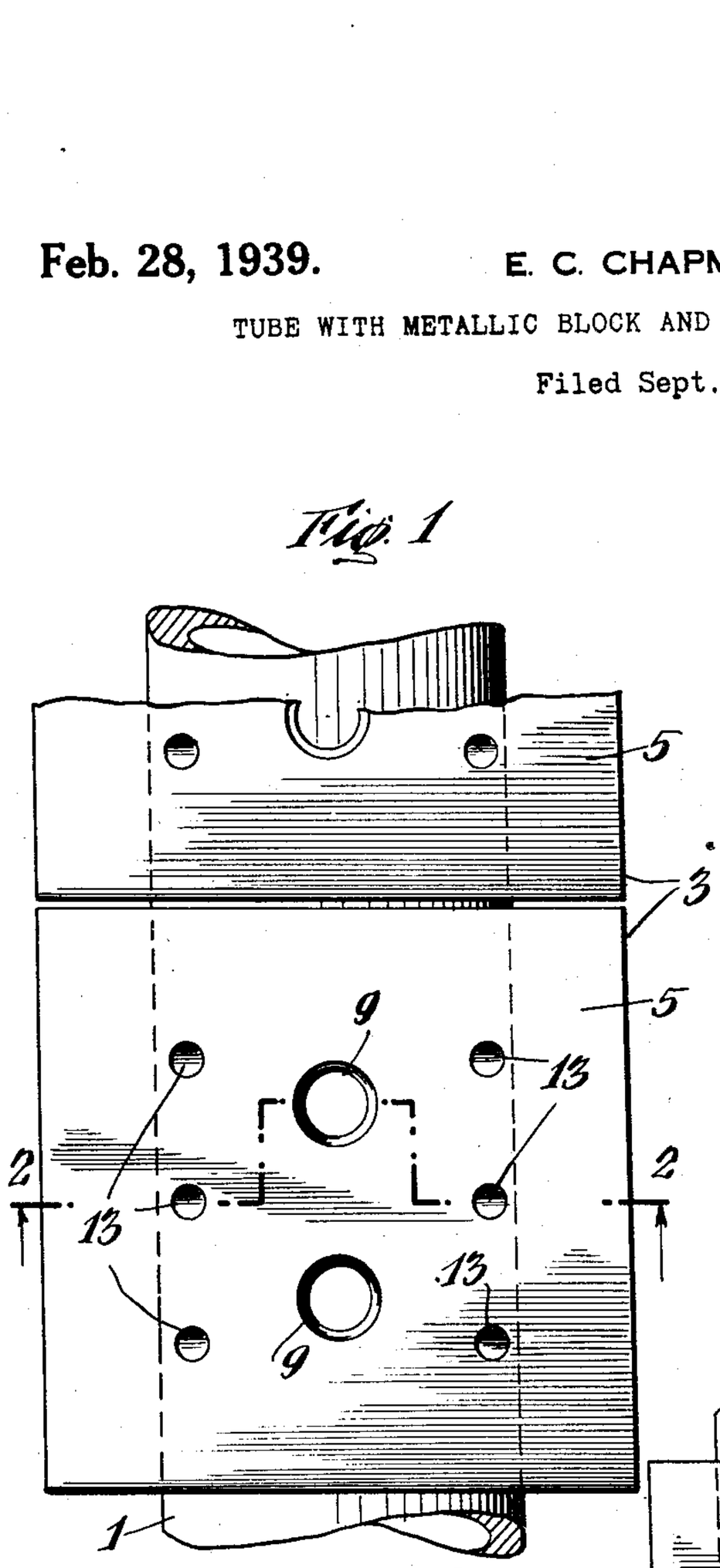


Fig. 2

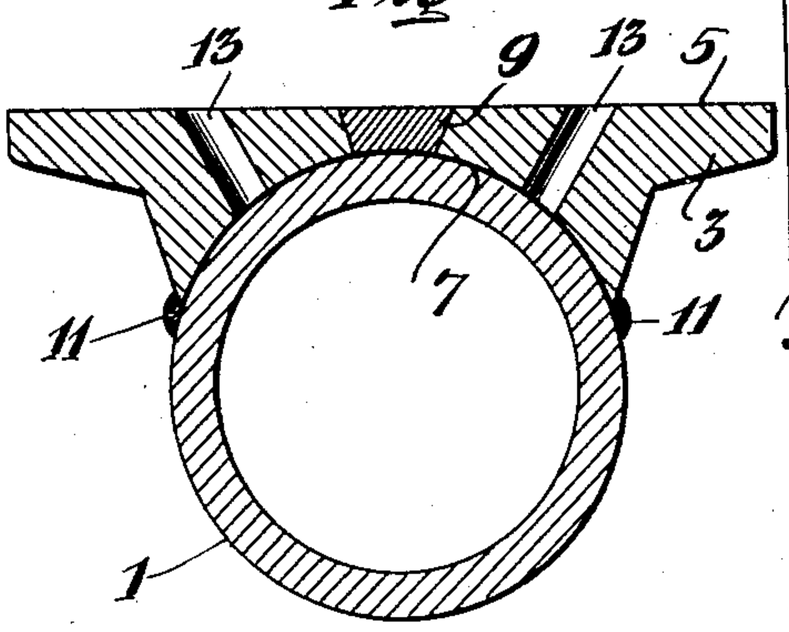


Fig. 3

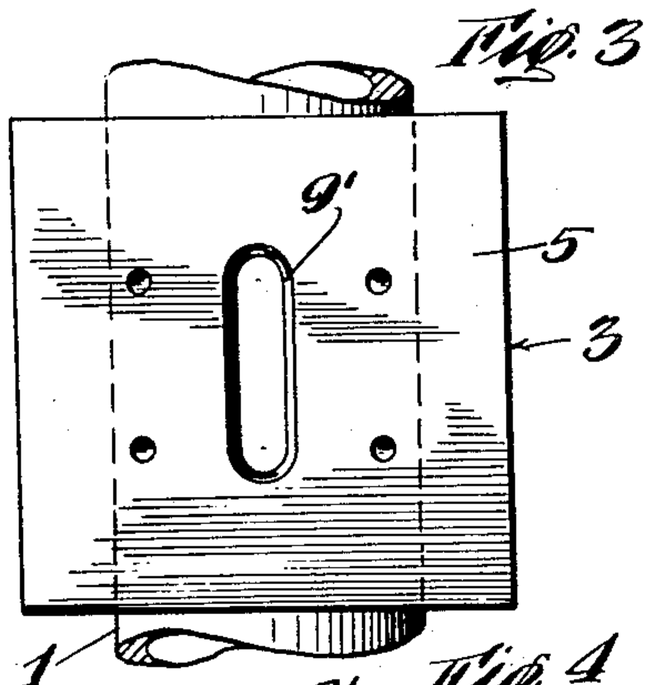


Fig. 4

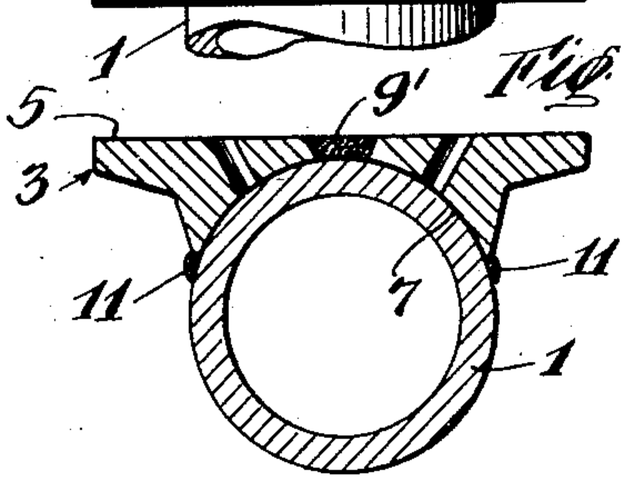


Fig. 5

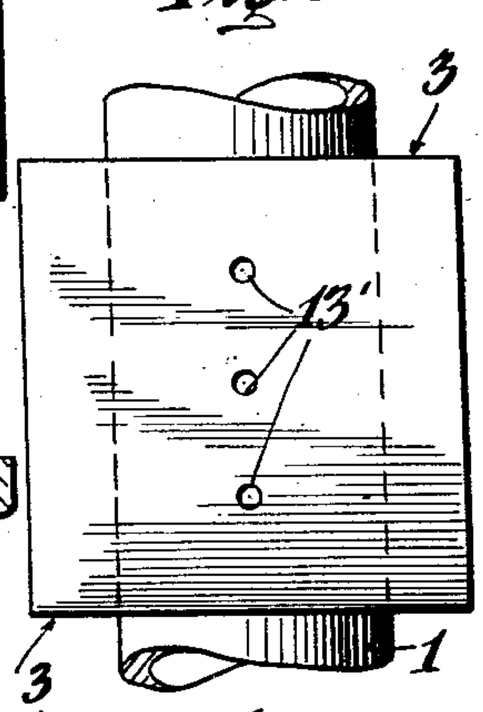


Fig. 7

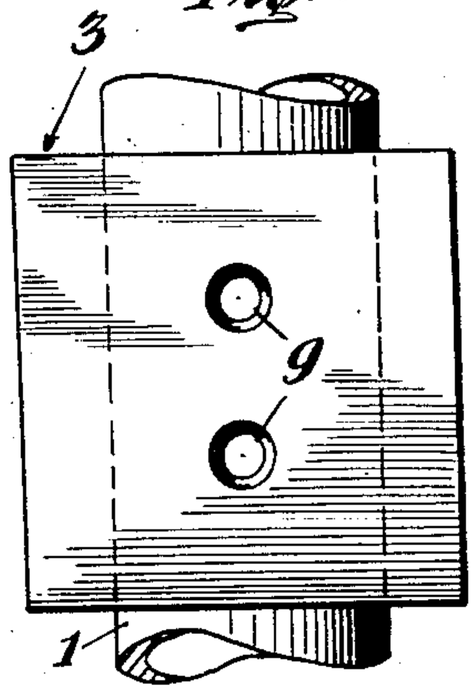


Fig. 6

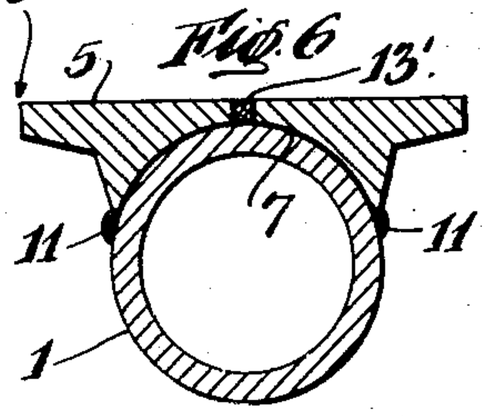
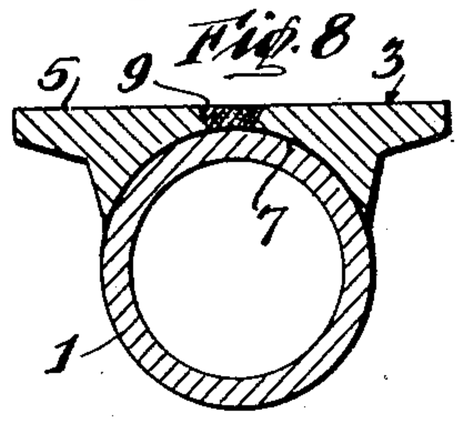


Fig. 8



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Patented Feb. 28, 1939 2,149,008

UNITED STATES PATENT OFFICE

2,149,008

TUBE WITH METALLIC BLOCK AND METHOD OF ATTACHING LATTER

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Application September 15, 1937, Serial No. 163,942

9 Claims. (Cl. 122—6)

In connection with furnace water walls there is a demand for tubes which are provided with metallic blocks on the side facing the furnace. The object of these blocks is to protect the tubes against the intense heat on the furnace side. In order that the blocks themselves may be protected against becoming overheated, there must be good heat transfer between them and the tubes so that heat absorbed by the blocks can be transmitted to the tubes and carried off by the water circulating through them. No doubt the best means for assuring good heat transfer between the blocks and the tubes is to make the two integral with each other as disclosed in United States Patent 1,732,514 granted on October 22, 1929, to A. T. Hunter.

The present invention has for its object the provision of such blocks secured to the tubes by means which assure substantially as good heat transfer as in the patented form referred to, such means employed by the present invention however being less expensive than those employed by the patentee.

The invention will be described in connection with the accompanying drawing in which Fig. 1 shows a portion of a tube with blocks secured to it in accordance with my invention; Fig. 2 is a section on line 2—2 of Fig. 1; Figs. 3 and 4 are views corresponding to Figs. 1 and 2 illustrating a variation; Figs. 5 and 6 are views likewise corresponding respectively to Figs. 1 and 2 and showing a further variation, and Figs. 7 and 8 are two similar views showing another variation.

Referring first to the form of Figs. 1 and 2, the tube to which the blocks are secured appears at 1, two blocks being shown at 3—3 in Fig. 1. It will be understood that as many of these blocks are put on each pipe as are required. The blocks are shaped similar to those used in prior instances, resembling quite closely those of the patent referred to above. Their flat side 5 will face the furnace in the completed installation and the blocks are of such size related to the spacing of the pipes that a substantially continuous surface is formed. Adjacent blocks 3—3 on any given pipe are either in contact or substantially so. The blocks are formed with a curved surface 7 corresponding to the curvature of the tube to which they are to be secured. This surface is either cast directly to the required form or machined to such form.

In accordance with the present invention these blocks are brazed on the tubes, the material used being ordinary spelter or spelter of such composition and melting point as seems indicated in any given case for the service to which the tubes are intended. It has been found that the heat transfer from the block to the tube is entirely satisfactory with blocks brazed on as stated. There is, however, the difficulty that the brazing material does not furnish sufficient strength to keep the block and tube from separating when stresses occur due to unequal heating, or from other causes, such as warping. To furnish the additional strength the invention provides for welding the block to the tube at certain points and over certain areas. In the form shown in Figs. 1 and 2 there are provided two plug welds 9—9 for each block and two longitudinal welds 11—11 along the lateral edges of the block.

In practice the blocks are first welded to the tube at 9—9 and 11—11, the brazing material is then placed into the openings 13—13 provided for this purpose, and the assembled tube and blocks are then placed in a furnace where they are kept at the proper temperature and for the required time to effect brazing. Capillary attraction will cause the melted brazing material to flow into and fill even the smallest crevices and cavities between the tube and the block. It may be desirable in some instances to use a flux and in some instances it may further be desirable to treat the surfaces of the tube and the block in one way or another before the brazing operation. For example, it has been found beneficial to oxidize the surface of the block, if the block is made of cast iron.

While the temperature at which the brazing material melts is far below the melting point of the steel, this melting temperature of the brazing material is not reached in service because the water flowing through the tube keeps the temperature at a point only slightly above the temperature of the water itself.

In the form shown in Figs. 1 and 2 there are indicated two openings 9—9 and six openings 13—13. This of course is illustrative only. In some cases it may be sufficient to have a smaller number of such plug welds and openings 13—13 and in some cases more may be required. Likewise, the particular length of the block in the direction of the tube axis may obviously be varied from that shown.

Instead of having circular plug welds 9—9 as in Figs. 1 and 2, an elongated weld 9', as shown in Figs. 3 and 4, will be found preferable

in many cases. This is easier to weld than the circular plugs of Figs. 1 and 2.

It will be understood that the primary object of the plug welds 9—9 and the line welds 11—11 is to furnish strength and to prevent the tube from separating from the plug. In some types of surface it will prove sufficient to use only the line welds 11—11. Such a case is illustrated in Figs. 5 and 6. In that case the openings 13'—13' for the introduction of the brazing material are preferably placed centrally as illustrated in these figures.

In Figs. 7 and 8 there is shown a variation in which the line welds along the sides are omitted, only the plugs 9—9 being used. In this case the brazing material is placed either on the tube or along the edges of the blocks, and no feed holes 13 are used. The tube is placed into the furnace in a position with the blocks below and the tube above. This is to prevent the brazing fluid from running out.

From the standpoint of avoiding rapid oxidation of the block, cast iron is a desirable material to use for the blocks. The openings for the introduction of the brazing material and for the welding in of the plugs can in that case be either cored out or machined out. From the standpoint of ease of welding the blocks to the tubes steel is a preferable material for the blocks. If made of steel, the blocks can also be cast or they can be drop forged or machined out of a larger piece. Heat resistant steels may be used if desired. In case ordinary carbon steel is used, it will be found necessary in most cases to coat the blocks, particularly the exposed surface 5, with some oxidation resisting material. This can be applied by calorizing, spraying, dipping, electric plating, or other preferred means.

What we claim is:

1. In or for the wall or lining of a furnace, a tube, and a metallic block having a surface curved complementarily to a portion of the tube surface, the complementary surfaces being united by brazing to provide good heat conductivity from the block to the tube, the block being secured to the tube further by welding to furnish strength to prevent separation from warping or differential expansion.

2. Apparatus in accordance with claim 1, the welding comprising a plug weld extending through the body of the block.

3. Apparatus in accordance with claim 1, the curved surface of the block terminating in two edges extending lengthwise of the tube, said two edges being welded to the tube.

4. Apparatus in accordance with claim 1, the curved surface of the block terminating in two edges extending lengthwise of the tube, said block being welded to the tube along said two edges and also by means of a plug weld extending through the body of the block.

5. Apparatus in accordance with claim 1, the curved surface of the block terminating in two edges extending lengthwise of the tube, said block being welded to the tube along said two edges and also by means of a plug weld which extends through the block at its thinnest point and which is longer in a direction parallel to the length of the tube than in a direction at right angles thereto.

6. In or for the wall or lining of a furnace, a tube, a plurality of metallic blocks each having a surface curved complementarily to a portion of the tube surface, the complementary surfaces being united by brazing to provide good heat conductivity from the blocks to the tube, the blocks being arranged end to end along the tube and being further secured to the tube by welding to furnish strength to prevent separation from warping or differential expansion.

7. The process of uniting to a tube a block of the kind described comprising the steps of shaping one surface of the block to fit the surface of the tube, brazing said surface to the tube to provide for ready heat transmission from the block to the tube, and welding the block to the tube over sufficient area to provide strength to resist any tendency for the two to separate arising from the operating conditions to which the structure is subjected.

8. The process in accordance with claim 7 and further comprising providing a plurality of passages from said shaped surface of the block to the opposite surface, the brazing material being introduced into said passages.

9. The process in accordance with claim 7 and further comprising providing a plurality of passages from said shaped surface of the block to the opposite surface, the brazing material being introduced into said passages, and the brazing being done by placing the assembly of tube and block into a furnace and keeping it for the required length of time at the required temperature.

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