Oct. 24, 1967 H. A. WHITE, JR 3,348,528

COOLING APPARATUS

Filed June 16, 1966

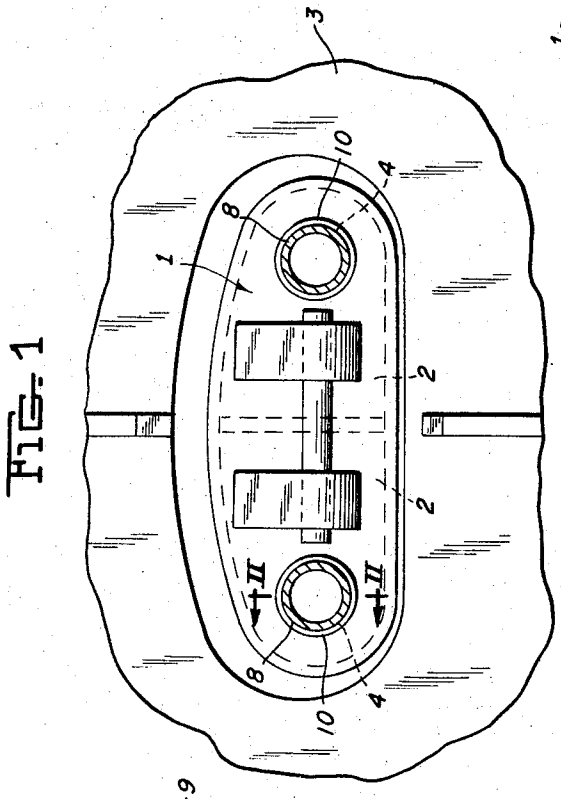


FIG. 1

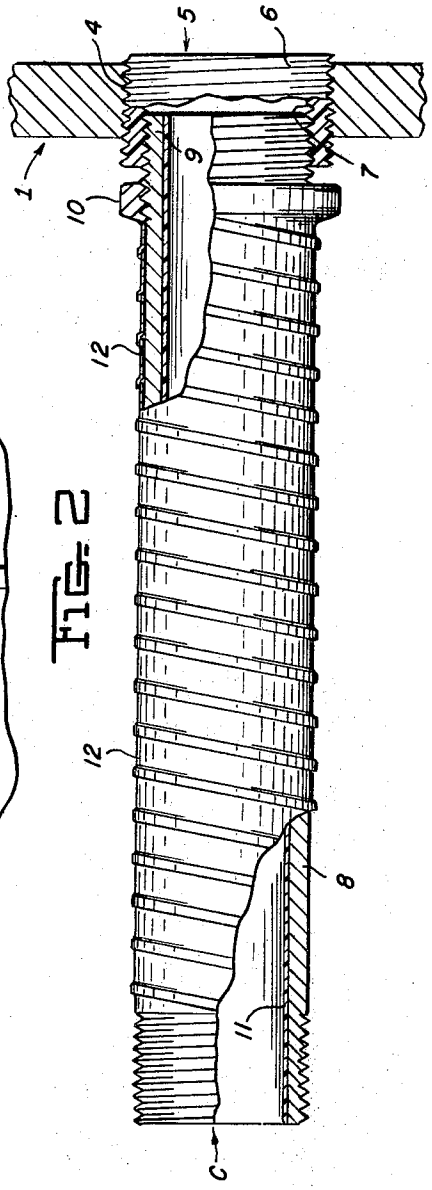


FIG. 2

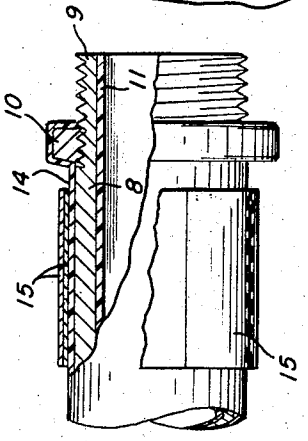


FIG. 3

INVENTOR
HERBERT A. WHITE, Jr.
By Stanley J. Price Jr.
Attorney

United States Patent Office

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COOLING APPARATUS

Herbert A. White, Jr., Churchill, Pa.
(2516 Collins Road, Pittsburgh, Pa. 15221)

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This invention relates to cooling apparatus, particularly to such apparatus embedded in the wall of a furnace. The invention is particularly directed to apparatus where the member embedded in the furnace wall is made of copper or copper bearing material, such as blast furnace cooling plates, and the cooling medium, raw water, is introduced into and returned from the embedded member through steel pipe. The water is usually taken from a river or lake and is often corrosive so that the inside of the steel pipe rusts or corrodes. Sulphur vapor from slag or the like combines with atmospheric moisture and attacks the outside of the pipe. In addition, galvanic corrosion takes place at the joint between the copper and steel. For these reasons the life of the pipes leading into and away from the copper member is very short and they must be replaced often. There are often many such pipes, especially in a blast furnace, and the cost of replacing them is very high since the relative high temperature and other conditions make replacement a difficult task. In addition, replacement is a dangerous job.

It is thus an object of my invention to provide cooling apparatus which has a much longer life than previous cooling apparatus.

This and other objects will be apparent after referring to the following specification and attached drawing, in which:

FIGURE 1 is an elevation of the cooling apparatus;

FIGURE 2 is a view, on an enlarged scale, taken on the line II—II of FIGURE 1; and

FIGURE 3 is a fragmentary view showing the preferred embodiment of my invention.

Referring now to the drawing, reference number **1** indicates a cooling plate having a cooling chamber **2** therein. The cooling plate **1** is made of copper or copper alloy and is embedded in furnace wall **3**. The cooling plate **1** may be of any conventional type such as that shown in Loecher Patent No. 3,241,528 dated Mar. 22, 1966. The cooling plate **1** has two threaded openings **4** therein to permit flow of coolant C therethrough.

According to my invention, a dielectric bushing **5** is threaded into each opening **4**. The bushing **5** may be made of various types of material, but must be made of a material having a melting point of at least approximately 400° F. One particular material found to be very satisfactory is polytetrafluoroethylene, sold under the trade name of Teflon. It is seen that the bushing **5** has external threads **6** and external threads **7**. A ferrous pipe **8**, preferably made of steel, has a threaded end **9** threaded into bushing **5**. An external flange **10** is provided on pipe **8** adjacent the threaded end **9** which forms a stop to limit inward movement of the pipe **8**. It is preferred that the flange **10** be a segment of a coupling threaded on the inner end of threaded end **9** as shown. A protective coating **11** is provided on the inside of pipe **8**. The coating **11** must have a melting point of at least approximately 400° F. The coating **11** is preferably a coal tar epoxy such as

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that disclosed in Whittier et al. Patent No. 2,765,288 dated Oct. 2, 1956. A coating **12** is also provided on the outside of pipe **8**. The coating **12** may be made of nylon filament tape wound around the pipe **8** in overlapping relationship as shown in FIGURE 2. Minnesota Mining and Manufacturing Type 898 filament tape has proved satisfactory. However, I prefer that the outer coating be made of the same material as coating **11**, this being shown in FIGURE 3 as coating **14**. In this case I prefer that a length of nylon filament tape **15** be applied over the coating **14** for the purpose set forth below. The coating **14** is also useful for assuring that coupling segment **10** will not move.

To assemble the parts, bushing **5** is threaded onto pipe **8** and the bushing **5** then threaded into opening **4**. The tape **12**, in addition to protecting the pipe from atmospheric attack, can withstand the abrasion of the pipe wrench used in turning the pipe **8**. This also is the purpose of tape **15**. The flange **10** prevents the bushing **5** and pipe **8** from moving inwardly too far so that the pipe **8** is properly positioned.

Other adaptations and modifications may be made within the scope of the following claims.

I claim:

1. Cooling apparatus comprising a copper member having a cooling fluid chamber therein and a threaded opening into said fluid chamber, a dielectric bushing having internal and external threads threaded into said opening, a ferrous pipe threaded into said bushing, an external flange on said pipe adjacent said bushing, and a protective coating on the inside and outside of said pipe, said protective coating having a melting point of at least about 400° F.

2. Cooling apparatus according to claim **1** in which said bushing is made of polytetrafluoroethylene.

3. Cooling apparatus according to claim **1** in which the inner protective coating is a coal tar epoxy and the outer protective coating is nylon.

4. Cooling apparatus according to claim **3** in which said bushing is made of polytetrafluoroethylene.

5. Cooling apparatus according to claim **1** in which said copper member is supported in a furnace wall.

6. Cooling apparatus according to claim **5** in which said bushing is made of polytetrafluoroethylene.

7. Cooling apparatus according to claim **5** in which the inner protective coating is a coal tar epoxy and the outer protective coating is nylon.

8. Cooling apparatus according to claim **7** in which said bushing is made of polytetrafluoroethylene.

9. Cooling apparatus according to claim **1** in which the inner and outer protective coatings are a coal tar epoxy.

10. Cooling apparatus according to claim **9** including a nylon tape surrounding the outer protective coating adjacent the external flange on said pipe.

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CHARLES J. MYHRE, *Primary Examiner.*