Aug. 15, 1933. G. TOCCI 1,922,561

VENTILATING AND COOLING SYSTEM FOR CONCRETE DAMS OR OTHER HEAVY CONCRETE CONSTRUCTIONS

Filed Nov. 2, 1932 4 Sheets-Sheet 1

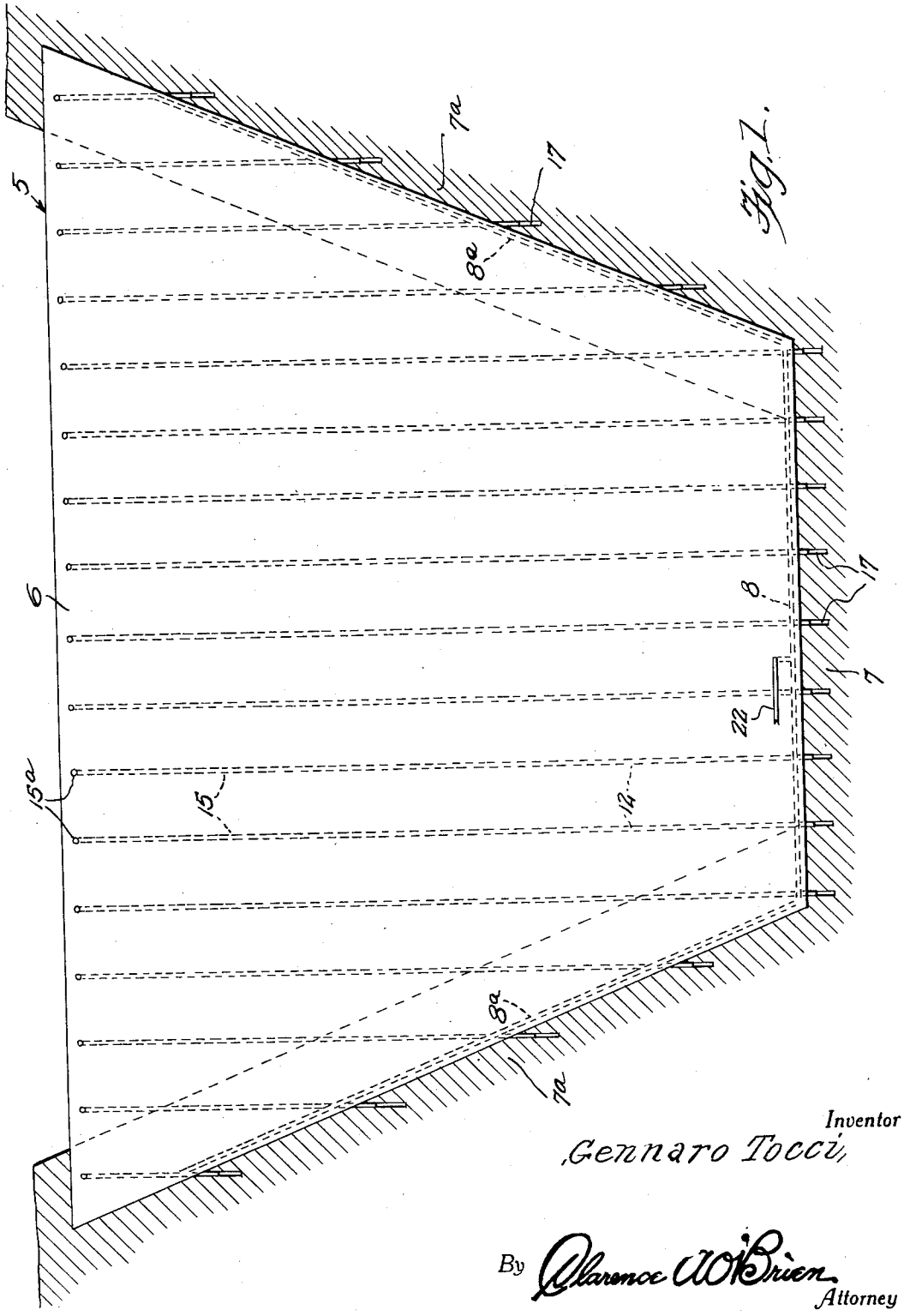


Fig. 1.

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Filed Nov. 2, 1932 4 Sheets-Sheet 2

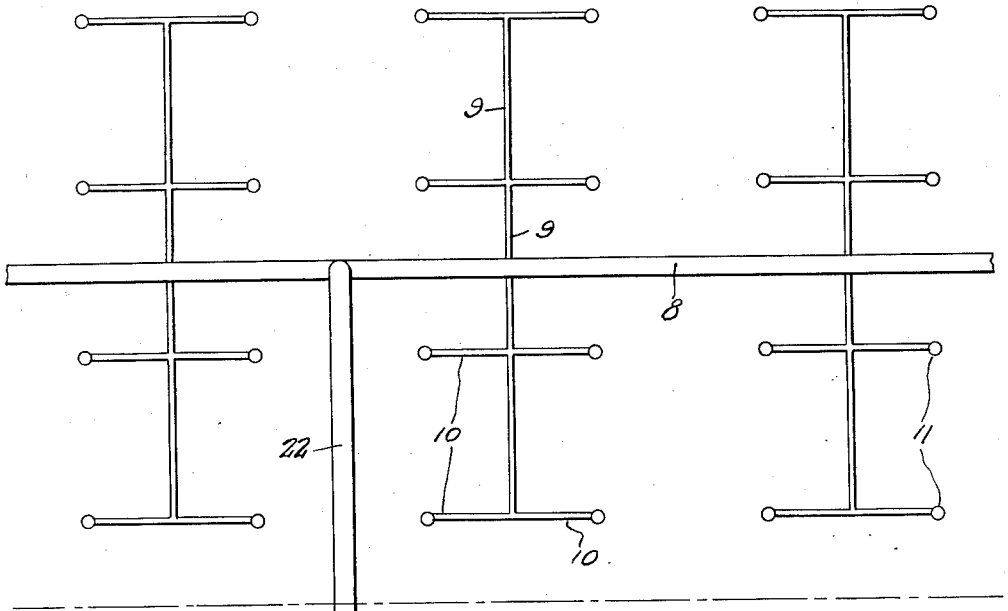


Fig. 2.

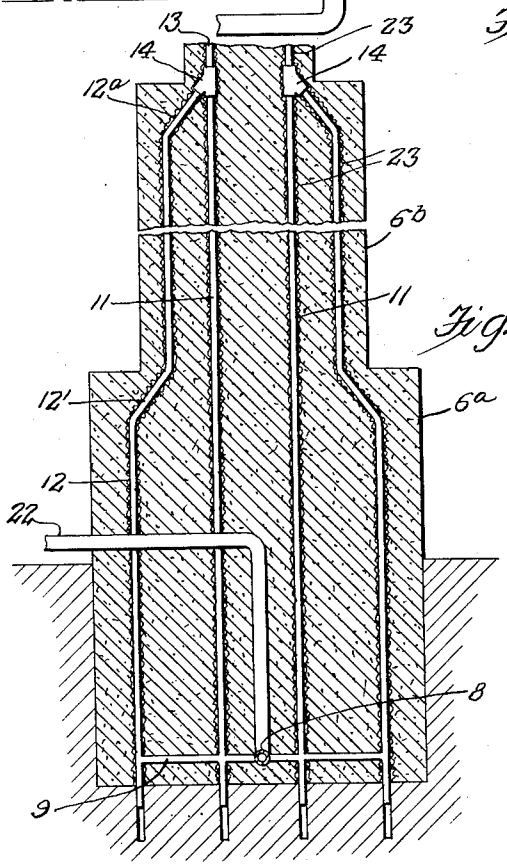


Fig. 3.

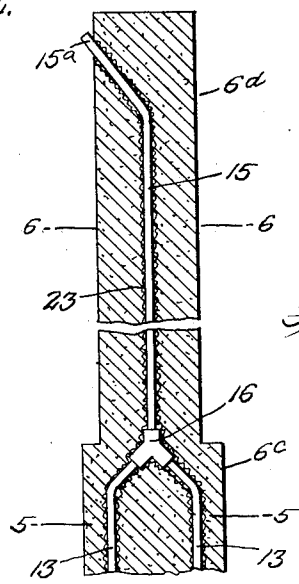


Fig. 4.

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VENTILATING AND COOLING SYSTEM FOR CONCRETE DAMS OR OTHER HEAVY CONCRETE CONSTRUCTIONS

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Fig. 7.

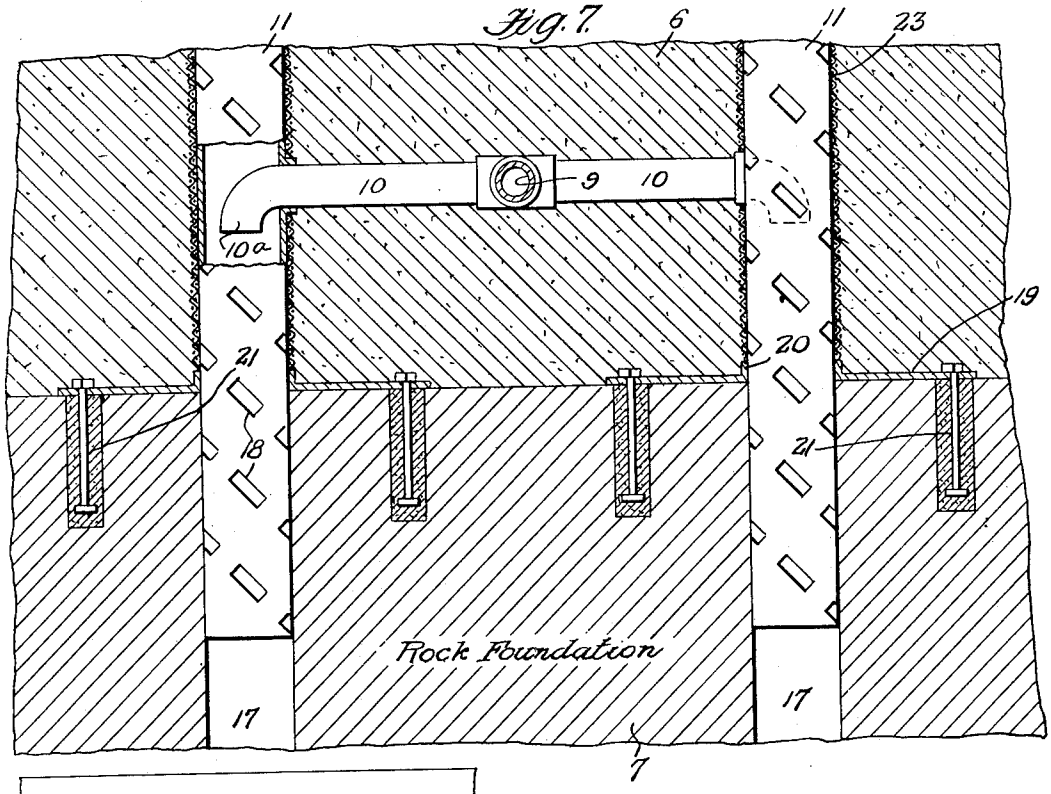


Fig. 5.

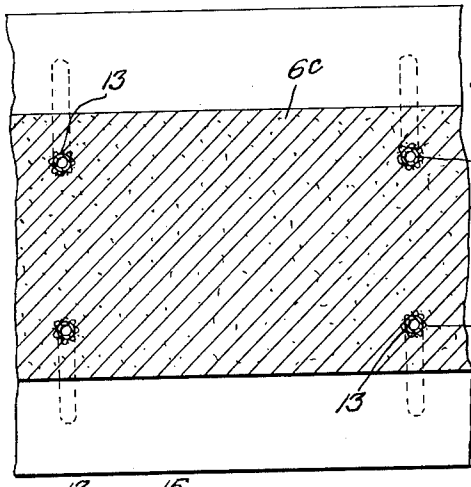
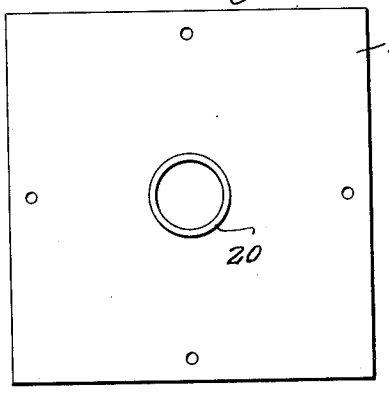


Fig. 8.



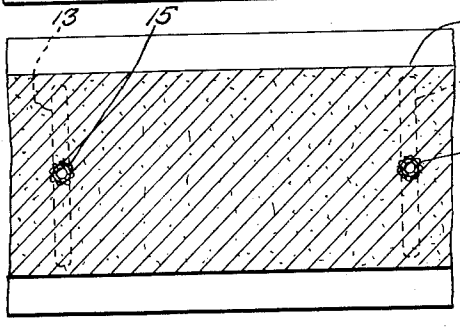


Fig. 6.

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VENTILATING AND COOLING SYSTEM FOR CONCRETE DAMS OR OTHER HEAVY CONCRETE CONSTRUCTIONS

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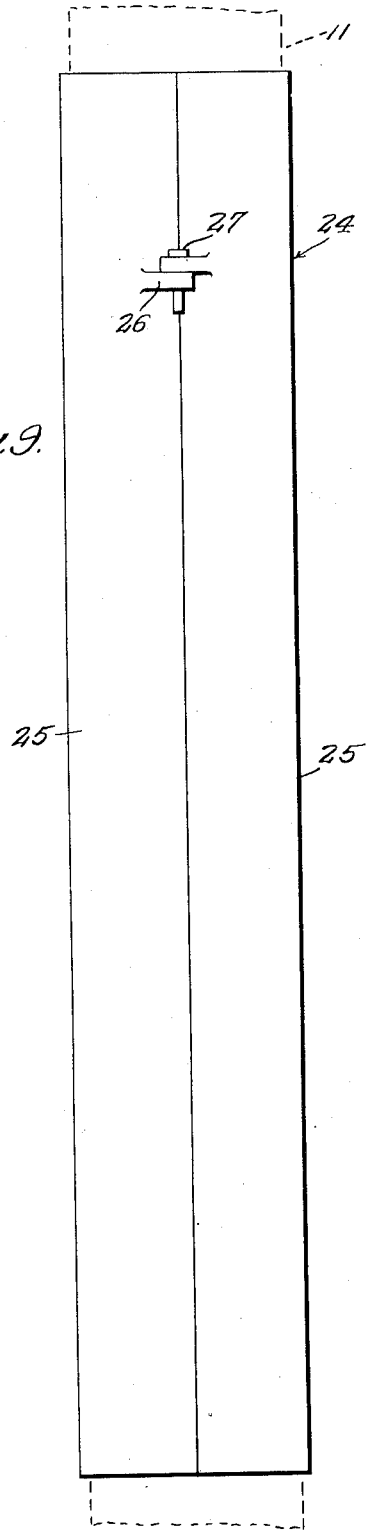
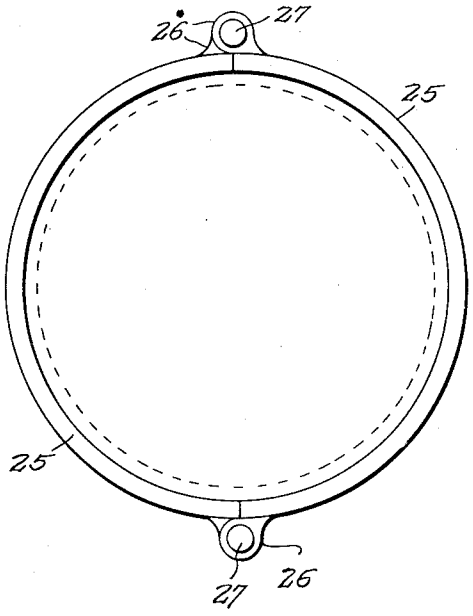


Fig. 9.

Fig. 10.



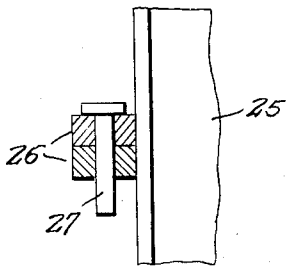


Fig. 11.

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UNITED STATES PATENT OFFICE

1,922,561

VENTILATING AND COOLING SYSTEM FOR CONCRETE DAMS OR OTHER HEAVY CONCRETE CONSTRUCTIONS

Gennaro Tocci, Boulder City, Nev.

Application November 2, 1932. Serial No. 640,910

4 Claims. (Cl. 61—30)

This invention relates to concrete dams and analogous heavy concrete constructions, and more particularly to a system and apparatus for ventilating and cooling the same.

It is a fact well known to engineers that large masses of concrete in the cooling process generate gases in the center of the mass and that the outer portions of the mass cool more rapidly than the inner portions, and it is therefore an object of the present invention to provide an apparatus and system for cooling and ventilating the mass of concrete during the construction of a dam or the like whereby the cooling of the inner portions of the concrete mass and the venting of the gases created is advantageously and efficiently effected.

The invention, together with its numerous objects and advantages, will be best understood from a study of the following description taken in connection with the accompanying drawings wherein:

Figure 1 is a side elevational view of a concrete dam embodying the features of the present invention.

Figure 2 is a diagrammatic view illustrating the application and arrangement of the cooling and ventilating system.

Figure 3 is a vertical transverse sectional view through a portion of the dam.

Figure 4 is a vertical transverse sectional view through the upper portion of the dam.

Figures 5 and 6 are transverse sectional views taken substantially on the lines 5—5 and 6—6 respectively of Figure 4.

Figure 7 is a fragmentary sectional elevational view through the lower portion of the dam illustrating certain details of construction to be hereinafter more fully referred to.

Figure 8 is a plan view of an anchoring plate.

Figure 9 is an elevational view of a shield to be used for the vent pipe during the pouring of the concrete.

Figure 10 is a top plan view of the shield.

Figure 11 is a fragmentary sectional elevational view showing the manner of securing the two sections of the shield together.

With reference more in detail to the drawings it will be seen that the dam in its entirety is designated generally by the reference character 5. As is well known, the dam 5 is made of concrete 6, the concrete being laid in sections, and the concrete dam being built on a rock foundation 7.

In accordance with the present invention, before any pouring of the concrete 6 is undertaken, there is provided a main air pipe or line 8 that has an intermediate portion extending above and in spaced parallelism to the top of the foundation 7, and inclined end portions 8a extending along and in spaced parallelism with the side walls 7a of the river bed. The walls 7a are also usually of hard rock. At spaced points throughout the intermediate portion and the end portions of the pipe or conduit 8 there are provided oppositely extending lateral branches 9, and each of the branches 9 has pairs of pipes or branches 10 extending therefrom, one pair of such branches being located at the terminal of a branch 9, and the other pair of such branches being located between the first named pair of branches 10 and the pipe 8 as shown in Figure 2.

Leading upwardly from the ends of the branches 10 nearest the pipe 8 are vertical conduit pipes 11, while leading upwardly from the ends of the branches 10 farthest remote from the pipe 8 are conduits or pipes 12 that are offset intermediate their ends as at 12' and at their upper ends are offset as at 12a and have their offset ends 12a connected with the upper ends of the pipes 11, and with the lower ends of pipes 13 through the medium of unions 14 as will be clear from a study of Figures 3 and 4.

Each pair of spaced parallel pipes 13 at their upper ends converge and are connected at said upper ends to a common exhaust pipe 15 through the medium of a Y-coupling 16 as will be clear from a study of Figure 4.

The pipes 15 at their upper ends are offset as at 15a and project outwardly from the dam 5 slightly below the upper edge of the dam as will be clear from a study of Figures 1 and 4. The ends 15a of the pipes 15 are thus open to the atmosphere.

Leading through the lower portion of the dam 5 is a pipe or line 22, the pipe or line 22 leading from a suitable compressor and being connected with the pipe 8 intermediate the horizontal portion of the pipe as will be clear from a study of Figures 1 and 3.

It will also be noted that the pipes 11 and 12 at their lower ends are fitted in holes or pockets 17 formed in the rock foundation 7, and that the lower or inner ends of pipes 11 and 12 terminate upwardly from the bottom or lower ends of the holes 17, so that the holes 17 form spaces for the accumulation of the gases which latter are allowed to escape through the pipes 11, 12, 13, and pipes 15 to the atmosphere.

As will be seen from a study of Figure 7, the pipes or branches 10 leading from the pipes or branches 9 have their free ends extending into the lower portions of the pipes 11 and 12 and

the inner ends of these pipes 10 are turned downwardly as at 10*a* for directing air under pressure initially downwardly through the pipes 11 and 12 to the bottom of the gas pockets or spaces 17.

From the description of the invention thus far it will be seen that air from a suitable compressor is forced under pressure through the pipes 12, and 8, and from the pipe 8 through the branches 9, and from the branches 9 through the branches 10, passing from the branches 10 downwardly through the lower portion of the pipes 11 and 12 displacing the gases accumulating in the spaces 17, causing the gases to travel upwardly through the pipes 11, 12, 13, and 15 to exhaust into the atmosphere adjacent the upper edge of the dam.

Sufficient air will also circulate through the several pipes and branches for ventilating the dam structure.

As will be clear from a study of Figures 3 and 4 the dam comprises a plurality of integral sections of concrete progressively decreasing in width from the bottom to the top of the dam, and accordingly, it is contemplated in the present proposed ventilating and cooling system and apparatus to first properly arrange pipes 8, 9, 10, 11, 12, and 22 after which the first section 6*a* of concrete should be poured, the section 6*a* of the concrete terminating considerably below the upper ends of the pipes 11 and 12. Next, the pipes 13 would be coupled through the medium of the unions 14 with the upper ends of the pipes 11 and 12 after which the second section of the concrete 6*b* should be poured, after which pipes 13 should then be coupled through the medium of the unions 16 with the pipes 15 permitting the concrete sections 6*c* and 6*d* to be subsequently poured.

As suggested in Figure 7, the pipes 11, 12, 13, and 15 are preferably perforated as at 18 for ventilating purposes, and are also encased in tubes 23 of screen material.

It is also proposed to use for the lower portions of each of the pipes 11 and 12 a substantially rectangular reinforcing plate 19 of metal. Each plate 19, as shown in Figure 7, is adapted to rest on the top of the rock foundation 7 and is provided in its center portion with a flanged opening or neck 20 through which the lower portion of a pipe 11, 12 extends. Each plate is also anchored in position through the medium of tie bolts 21 that are secured to the foundation 7 by cement or the like as clearly suggested.

To prevent water and fine particles of cement from entering into the pipes 11, 12, 13, and 15 through the screens 23 and perforations of the pipe, during the pouring of the concrete, there is provided an imperforate shield 24, the same consisting of a shield of semi-cylindrical sections 25 adapted to be disposed about the vent pipe, and adjacent the upper end of the shield, the sections 25 at their meeting edges are provided with apertured lugs 26 to accommodate pins 27 whereby to secure the sections 25 of the shield in assembled position and about the vent pipe in the manner suggested in Figure 9. Obviously, to separate the sections 25, or to remove the shield, all that is necessary is to remove the pins 27 and the sections 25 of the shield are then free of positive engagement one with the other.

In using the shield 24 it will, of course, be necessary to have as many shields 24 as there are pipes 11 and 12. A shield 24 is placed about each of the pipes 11 and 12 prior to the pouring of section 6*a* of the concrete. After this section of concrete has been poured, the shields are removed and subsequently placed about the upper portions of the pipes 11 and 12, after which section 6*b* of the concrete is poured. This operation is repeated until each section of concrete has been poured, and when the last section of concrete has been poured, the shields are removed, and the concrete then tamped.

Even though I have herein shown and described the preferred embodiment of the invention, it is to be understood that the invention is susceptible of further changes, modifications, and improvements coming within the scope of the appended claims.

What is claimed is:

1. In a dam including a rock foundation and a wall of concrete rising from said foundation, means for cooling and ventilating the dam comprising a main air conduit pipe having an intermediate portion embedded in the concrete mass adjacent the rock foundation and end portions extending upwardly adjacent relatively opposite ends of the dam and embedded in said concrete mass together with branches extending laterally from said main conduit transversely of the dam, and in turn having branches extending therefrom parallel to said main air conduit pipe, vertical pipes connected adjacent their lower ends with the last named branches and arranged in pairs, and terminating downwardly from the upper end of the dam, and exhaust pipes connected with and common to each pair of vertical pipes also embedded in the concrete mass and having upper end portions extending through said mass and opening to the atmosphere adjacent the upper end of the dam.

2. In a dam including a rock foundation and a wall of concrete rising from said foundation, means for cooling and ventilating the dam comprising a main air conduit pipe having an intermediate portion embedded in the concrete mass adjacent the rock foundation and end portions extending upwardly adjacent relatively opposite ends of the dam and embedded in said concrete mass together with branches extending laterally from said main conduit transversely of the dam, and in turn having branches extending therefrom parallel to said main air conduit pipe, vertical pipes connected adjacent their lower ends with the last named branches and arranged in pairs, and terminating downwardly from the upper end of the dam, and exhaust pipes connected with and common to each pair of vertical pipes also embedded in the concrete mass and having upper end portions extending through said mass and opening to the atmosphere adjacent the upper end of the dam, a feed pipe connected with an intermediate portion of said main air conduit pipe and serving to connect said main air conduit pipe with a compressor, and said rock foundation being provided with pockets receiving the lower end portions of the first named vertical pipes.

3. In a dam including a rock foundation and a wall of concrete rising from said foundation, means for cooling and ventilating the dam comprising a main air conduit pipe having an intermediate portion embedded in the concrete mass adjacent the rock foundation and end portions extending upwardly adjacent relatively opposite ends of the dam and embedded in said concrete mass together with branches extending laterally from said main conduit transversely of the dam, and in turn having branches extending therefrom parallel to said main air conduit pipe, vertical pipes connected adjacent their lower ends with

the last named branches and arranged in pairs, and terminating downwardly from the upper end of the dam, and exhaust pipes connected with and common to each pair of vertical pipes also embedded in the concrete mass and having upper end portions extending through said mass and opening to the atmosphere adjacent the upper end of the dam, a feed pipe connected with an intermediate portion of said main air conduit pipe and serving to connect said main air conduit pipe with a compressor, and said rock foundation being provided with pockets receiving the lower end portions of the first named vertical pipes, and said vertical pipes being perforated.

4. In a dam including a rock foundation and a wall of concrete rising from said foundation, means for cooling and ventilating the dam comprising a main air conduit pipe having an intermediate portion embedded in the concrete mass adjacent the rock foundation and end portions extending upwardly adjacent relatively opposite ends of the dam and embedded in said concrete mass together with branches extending laterally from said main conduit transversely of the dam, and in turn having branches extending therefrom parallel to said main air conduit pipe, vertical pipes connected adjacent their lower ends with the last named branches and arranged in pairs, and terminating downwardly from the upper end of the dam, and exhaust pipes connected with and common to each pair of vertical pipes also embedded in the concrete mass and having upper end portions extending through said mass and opening to the atmosphere adjacent the upper end of the dam, a feed pipe connected with an intermediate portion of said main air conduit pipe and serving to connect said main air conduit pipe with a compressor, and said rock foundation being provided with pockets receiving the lower end portions of the first named vertical pipes, and said vertical pipes being perforated, anchoring plates for said first named vertical pipes supported on said rock foundation and provided with apertures alining with said pockets and through which the lower portions of said vertical pipes extend into said pockets.

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