Nov. 15, 1927. 1,649,511

G. E. COX

COOLING WHEEL

Filed May 5, 1925

Fig. 1

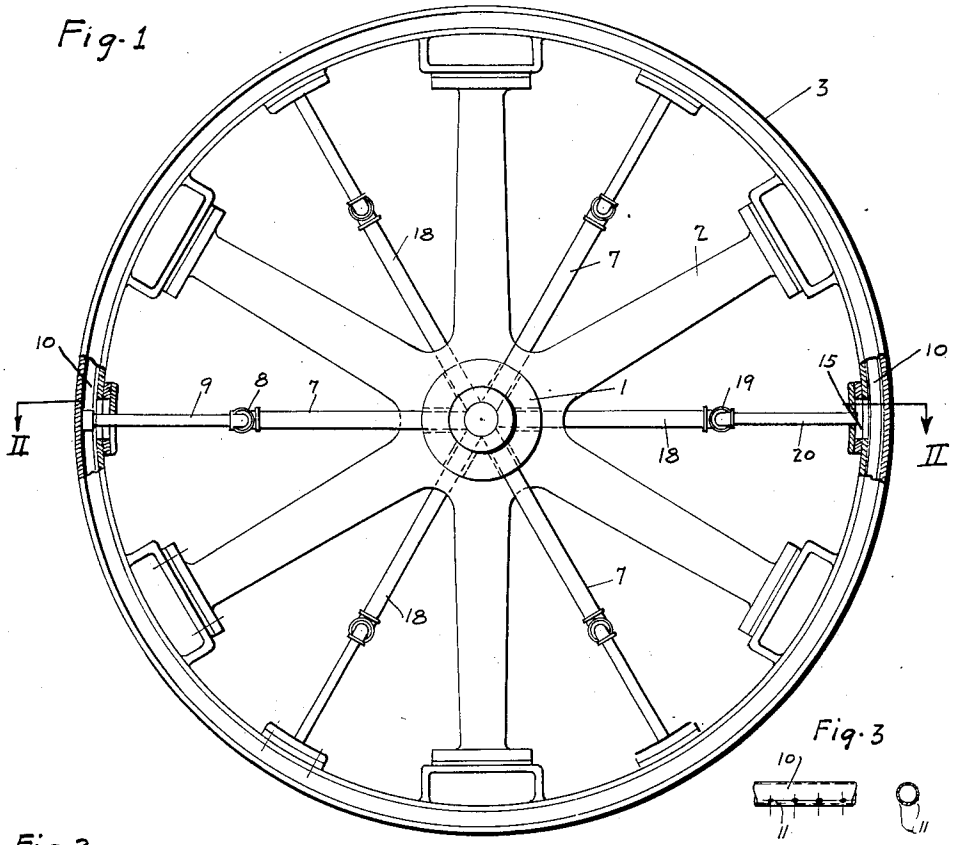
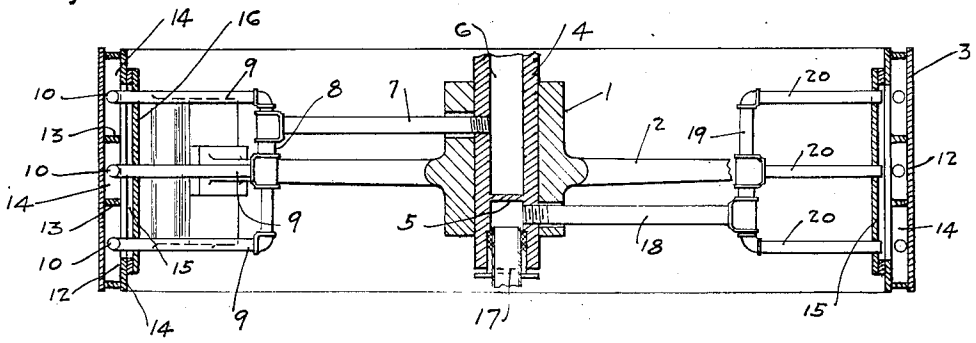


Fig. 3

Fig 2



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UNITED STATES PATENT OFFICE.

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COOLING WHEEL.

Application filed May 5, 1925. Serial No. 28,173.

This invention relates to cooling apparatus, more particularly to means for quickly and effectively cooling molten materials to cause the same to solidify.

In the manufacture of various materials by first forming a fusion and then cooling the same, it is, in many cases, desirable to accomplish the same quickly in order to prevent detrimental changes, and in some cases it is desirable to obtain the final product in a certain physical condition. For instance, in the manufacture of calcium cyanide, the ingredients are mixed together, placed in an electric furnace and fused at a high temperature to form the cyanide. This cyanide is stable at ordinary room temperature as well as at the temperature of formation, but is highly unstable at intermediate temperatures, making it necessary to quickly cool the same to prevent decomposition thereof. The temperature of formation of the cyanide is in the neighborhood of 1000° to 1500° C. and it must be chilled to a temperature below 300° to 400° C., at which point the tendency to decompose ceases. To obtain the quick cooling is difficult because of the large range of temperatures through which the product must be brought and because of the large amount of heat which must be carried away.

My invention is adapted to do this, it being among the objects thereof to devise a method of and means for cooling which shall rapidly and effectively cool molten materials from a high temperature to the solid state.

In practicing my invention I provide a cooling wheel, which includes a hub, spokes and a rim mounted for rotation, and I further provide means for bringing a cooling medium, such as water, into the hub and then distributing the medium to the inner surface of the rim to cool the same. In the rotation of the wheel, the outer surface of the rim, which is cooled by the flow of the cooling medium, comes in contact with the molten material which is to be quickly cooled, either by dipping into a pool of the material or being subjected to a spray or a stream thereof. More specifically, I provide a wheel, mounted upon a hollow shaft, having a partition therein dividing the same into two sections, through one of which water is caused to flow. A plurality of ducts, opening into the said section, conduct the cooling water therefrom by means of branch pipes to the interior of a chamber formed in the rim of the wheel. To facilitate the distribution of the water, I provide a plurality of annular pipes fitting closely to the surface of the rim within the same and having a plurality of sets of openings of relatively small diameter, causing a multiplicity of jets of water to impinge directly upon the rim, practically uniformly over the whole surface thereof, thus providing effective cooling. The waste water is removed by a plurality of ducts having branch pipes leading from the chamber formed in the rim and through the second section of the hollow shaft, formed by the above mentioned partition.

In the accompanying drawing, constituting a part hereof, and in which like reference characters indicate like parts;

Fig. 1 is a side elevational view of my cooling wheel, some parts being shown in section for clearness;

Fig. 2 is a horizontal, cross sectional view thereof taken along the line II—II of Fig. 1, and

Fig. 3 shows a fragmentary, enlarged, side elevational view and transverse, cross-sectional view of one of the cooling pipes which are placed in the rim.

The structure consists essentially of a hub 1, having a plurality of spokes 2 radiating therefrom and a rim 3 secured thereto. The hub is provided with a hollow shaft 4 having a partition 5 in an intermediate portion thereof, providing an opening 6 for a cooling medium, such as water. A plurality of ducts 7, of which there are shown three in number, spaced 120° apart, extend from opening 6 radially outward toward the rim and are connected to headers 8 carrying branch pipes 9, leading into the rim itself. Within the rim and in close proximity to the surface thereof are a plurality of annular spray pipes 10, each of which is connected to one of the branches 9 of ducts 7 and which have two sets of perforations 11 so placed that jets of water issuing therefrom impinge upon the surface 12 of the rim at an angle of approximately 45°. Partitions 13 are welded or otherwise secured to the interior of the surface 12 of the rim to divide the same into a number of compartments 14 so that each of the spray pipes 10 is in a compartment of its own. The said compartments 14 lead to a common chamber 15 which is

closed by plates 16 secured to the wheel in any suitable manner.

On the side opposite opening 6 in shaft 4 is an opening 17 into which extend other ducts 18, here shown as three in number, extending radially outward, equally spaced at an angle of 120° and placed midway between corresponding inlet ducts 7. The ducts 18 are provided with headers 19 having branches 20 leading into chamber 15.

The operation of the wheel is as follows:

The wheel is rotated and cooling water is caused to flow into opening 6, whence it is distributed by ducts 7 and branches 9 to pipes 10, practically uniformly over the entire surface of the rim. Because of the large number and the small size of the perforations 11 in pipe 10, small jets of cold water are continuously coming in contact with the plate constituting the surface 12 of the rim, causing effective cooling thereof. In fact, under the most strenuous conditions of operation I have found that the temperature of the surface of the rim is but a very few degrees above the temperature of the cooling water which impinges upon it. The water in each of the compartments 14 then flows into the common chamber 15, whence it is removed by branches 20 of duct 18 and is run to waste through opening 17.

Although I have described the invention, setting forth a single specific embodiment thereof, it will be recognized that my invention is not limited thereto as various changes may be made both in the construction and in the method of operation thereof without departing from the principles herein set forth. Instead of using water as the cooling medium, it is obvious that I may use some other fluid, such as cold air or other gas, and liquids other than water, such as oil.

In the ordinary use of my wheel, the lower edge thereof dips into a pool of the material to be cooled but this is not essential as it is apparent that the molten material may, in the operation of the wheel, be sprayed thereupon in a single or a plurality of sprays, or a more or less solid stream of the material may be caused to flow thereover. In removing the solidified material from the surface of the wheel, I generally utilize a knife edge or scraper which removes the same therefrom as a thin flake, say one-thirty second of an inch thick. However, I may so operate the apparatus as to produce thicker or thinner flakes or other means for removing the same may obviously be employed. The number of inlet or outlet ducts and branches and the number and location of the spray pipes and partitions may obviously be varied within the spirit of this invention, the scope of which is defined in the claims appended hereto.

What I claim is:

1. A cooling wheel for molten materials comprising a hub, spokes, a rim, means for bringing a cooling medium into the hub, and a duct having branches for distributing the same to cool the rim.

2. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct for distributing the same to cool the rim and a perforated pipe in said rim through which the cooling medium flows to the inner surface of the said rim.

3. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct for distributing the same to cool the rim and a pipe having a plurality of perforations so placed as to cause streams of cooling medium to impinge upon the inner surface of said rim.

4. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct for distributing the same to cool the rim and a pipe having a plurality of sets of perforations so placed as to cause streams of cooling medium to impinge upon the inner surface of said rim.

5. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct having branches for distributing the same to cool the rim and a perforated pipe in said rim through which the cooling medium flows to the inner surface of said rim, connected to each of the branches of said duct.

6. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct having branches for distributing the same to cool the rim, and a pipe having a plurality of perforations so placed as to cause streams of cooling medium to impinge upon the inner surface of said rim, connected to each of the branches of said duct.

7. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct having branches for distributing the same to cool the rim, a pipe having a plurality of perforations so placed as to cause streams of cooling medium to impinge upon the inner surface of said rim connected to each of the branches of said duct and partitions in said rim providing a separate compartment for each of said pipes.

8. A cooling wheel for molten materials comprising a hollow hub, spokes, a hollow rim, means for bringing a cooling medium into the hub, a duct for distributing the same to cool the rim, a pipe having a plurality of perforations so placed as to cause streams of

cooling medium to impinge upon the inner surface of said rim, connected to each of the branches of said duct, partitions in said rim providing a separate compartment for each of said pipes, said compartments opening into a common chamber and a duct therein for removing the cooling medium therefrom.

9. A cooling wheel for molten materials comprising a hub, spokes, a rim, a perforated annular pipe within the rim, a duct for supplying a cooling medium connected thereto, and a duct for returning the said medium from the rim.

10. A cooling wheel for molten materials comprising a hub, spokes, a rim, a perforated annular pipe within the rim, a plurality of ducts for supplying a cooling medium connected thereto, and a plurality of ducts for returning the said medium from the rim.

11. A cooling wheel for molten materials comprising a hub, spokes, a rim, a perforated annular pipe within the rim, a plurality of ducts for supplying a cooling medium connected thereto, and a plurality of ducts for returning the said medium from the rim, said supply and return ducts being arranged alternately along the rim.

12. A cooling wheel for molten materials comprising a hub, spokes, a rim, a perforated annular pipe within the rim, a plurality of ducts for supplying a cooling medium connected thereto, and a plurality of ducts for returning the said medium from the rim, said supply and return ducts being arranged alternately along the rim and being uniformly spaced.

13. A cooling wheel for molten materials comprising a hub, spokes, a rim, a plurality of perforated annular pipes within the rim, a branched duct for supplying a cooling medium connected thereto and a duct for returning the said medium from the rim.

14. A cooling wheel for molten materials comprising a hub, spokes, a rim, a plurality of perforated annular pipes within the rim, a branched duct for supplying a cooling medium connected thereto and a branched duct for returning the said medium from the rim.

15. A cooling wheel for molten materials comprising a hub, spokes, a rim, a plurality of perforated annular pipes within the rim, a plurality of branched ducts for supplying a cooling medium connected thereto and a plurality of branched ducts for returning the said medium from the rim.

16. A cooling wheel for molten materials comprising a hub, spokes, a rim, a plurality of perforated annular pipes within the rim, a plurality of branched ducts for supplying a cooling medium connected thereto and a plurality of branched ducts for returning the said medium from the rim, said supply and return ducts being arranged alternately along the rim and being uniformly spaced.

17. An apparatus for cooling comprising a wheel, the rim thereof being adapted to dip into a pool of molten material and a plurality of jets within the rim adapted to cause a cooling medium to impinge on the inner surface of said rim.

In testimony whereof, I have hereunto subscribed my name this first day of May, 1925.

GEORGE E. COX.