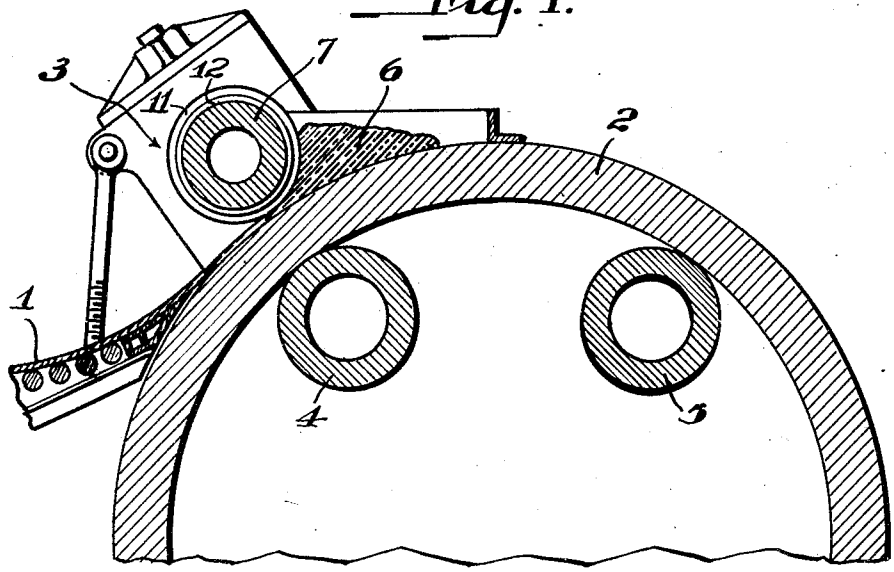
Feb. 9, 1932. J. H. FOX 1,844,062

FLUID COOLED ROLL

Filed May 27, 1930

Fig. 1.



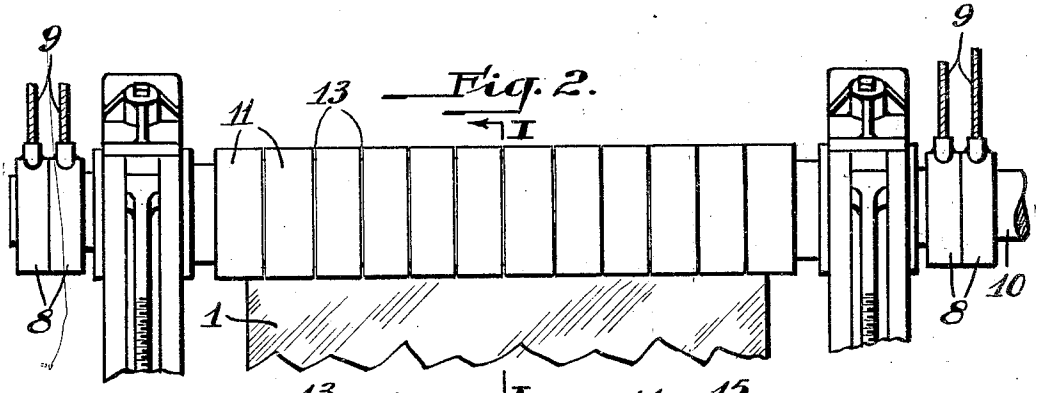


Fig. 2.

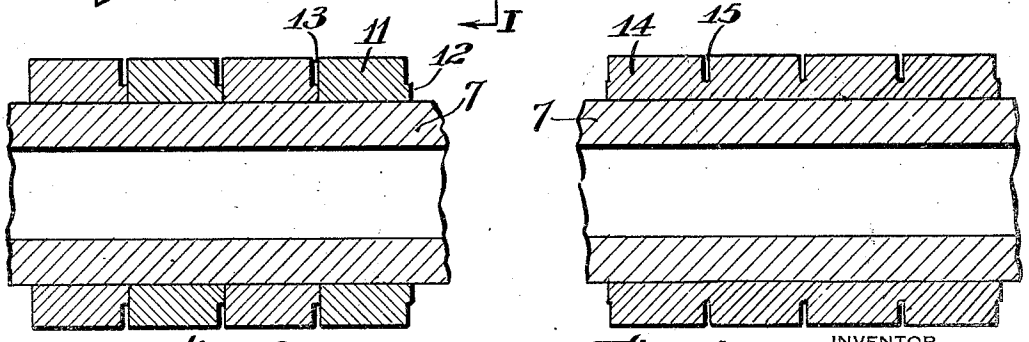


Fig. 3.

Fig. 4.

INVENTOR

John H. Fox

Atty

James C. Bradley

Atty

Patented Feb. 9, 1932

1,844,062

UNITED STATES PATENT OFFICE

JOHN H. FOX, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO PITTSBURGH PLATE GLASS COMPANY, A CORPORATION OF PENNSYLVANIA

FLUID COOLED ROLL

Application filed May 27, 1930. Serial No. 456,233.

The invention relates to fluid cooled rolls for use in glass rolling apparatus. The invention has for its principal object the provision of a roll in which the tendency to warp under the severe heat condition encountered in forming glass sheets in an intermittent rolling operation is reduced to a minimum. Certain embodiments of the invention are illustrated in the accompanying drawings, wherein:

Figure 1 is an assembly view in vertical section showing the roll in position of service, the section being taken on the line I—I of Fig. 2. Fig. 2 is a front elevation of the construction of Fig. 1. Fig. 3 is a partial longitudinal section through the roll. And Fig. 4 is a partial longitudinal section through a modified form of roll.

Figure 1 illustrates the application of the roll to an intermittent rolling apparatus, the glass sheet 1 being formed between the rolls 2 and 3, the latter being the structure to which the present invention is directed. The rolls are suitably driven, the roll 2 being supported upon the driven drive rolls 4 and 5. The body of glass 6 which forms the sheet is teemed into a pocket between the two rolls. One of the difficulties encountered in a rolling operation of this kind is that of maintaining the roll 3 at a proper temperature to prevent warping due to the fact that the application of the large body of molten glass on one side of the roll tends to distort it. As a result, the roll bows to a certain extent and the glass sheet which is formed is of uneven thickness. As a result the sheet must be cast somewhat thicker than would otherwise be the case and more grinding is required in order to bring the two faces of the sheet into parallelism throughout. The present invention is designed to overcome this difficulty to a large extent and reduce any bowing or warping of the roll to a minimum.

The roll preferably consists of the hollow supporting cylinder or casing 7 through which a circulation of water is provided by means of the swivels 8, 8 provided with the water supply connection 9, 9. The end of the cylinder 7 is also provided with a connection to the tumbler shaft 10 for driving the roll.

The supporting cylinder or casing 7 is provided with a jacket made up of a plurality of rings 11, 11, 11, etc. These rings are shrunk onto the cylinder 7 and are provided with shoulders, as indicated at 12 (Fig. 3), so that when the rings are in engagement, the slots 13 are provided between the adjacent faces of the rings. The size of these slots is much exaggerated as shown in Fig. 3 for the purpose of illustration and in actual construction would be about one-hundredth of an inch in width so that the molten glass will not penetrate into the slots. By this arrangement any warping due to the roll being overheated on one side is reduced to a minimum since each ring can expand longitudinally of the roll without affecting the other rings. Any other suitable means might be employed for spacing the rings apart the necessary distance, but the shoulders 12 seem to be the best means for accomplishing this result.

In order that the expansion of the rings 11 under the action of the hot glass shall not cause them to loosen on the cylinder 7, the rings are made of a material having a lower coefficient of expansion than the cylinder 7. A wide variety of materials may be employed for giving this differene in expansion. The cylinder 7 is preferably made of a steel alloy known as "resistal" which on analysis shows iron 65 per cent, chromium 5.5 per cent, nickel 22 per cent, silicon 1.25 per cent, and carbon .5 per cent. This alloy has a coefficient of expansion of .0000159. The rings 11 are preferably of steel, which has a coefficient of expansion of .000011. With this combination of materials, the rings will not loosen in service upon the cylinder under operating conditions, such as are present in a casting operation with an apparatus of the form illustrated.

Fig. 4 illustrates a modification in which the jacket is made in the form of a one-piece sleeve 14 instead of being made in a series of rings. This sleeve is shrunk onto the cylinder 7 as heretofore described in connection with the rings and the materials employed are the same as heretofore pointed out, the cylinder 7 being of the alloy having a higher coefficient of expansion than that of the

sleeve. The sleeve is sawed at intervals to provide the slots 15 to take the place of the slots 13 of the construction of Figs. 1 to 3.

If the rings or sleeve are not secured on the cylinder by shrinking, they must be secured by brazing, and this is preferably done by the use of copper as a brazing material in a hydrogen furnace. If a brazing method is employed, the material of the sleeve or rings may be of the same coefficient of expansion and the copper union will be of sufficient strength to prevent the loosening of the rings under the temperature conditions encountered in the use of a roll of this kind. Any tendency to loosen with a brazed joint may also be reduced by shrinking the sleeve on, or by having the sleeve of a material with a lower coefficient than the material of the cylinder, although these expedients are not essential if a properly brazed joint is secured. The copper may be applied in the form of a thin sleeve lying between the parts to be joined, or by plating the surfaces to be joined with copper preliminary to bringing them to the temperature necessary for brazing in the hydrogen furnace.

What I claim is:

1. In combination in a roll, an inner supporting cylinder, means for circulating a cooling fluid through the cylinder, and a jacket secured on the cylinder and subdivided by a plurality of parallel slots extending inward from the surface of the jacket, said jacket being of a metal having a lower coefficient of expansion than the metal of the cylinder so that the jacket will not become loose when heated to a higher temperature than the cylinder.

2. In combination in a roll, an inner supporting cylinder, means for circulating a cooling fluid through the cylinder, and a jacket secured on the cylinder and made up of a plurality of rings spaced apart a slight distance at their opposing side edges, said rings being of a metal having a lower coefficient of expansion than the metal of the cylinder.

3. In combination in a roll, an inner supporting cylinder, means for circulating a cooling fluid through the cylinder, and a jacket secured on the cylinder and made up of a plurality of rings contacting with each other at their inner edges, but spaced apart slightly from such points of contact to their peripheries for expansion, said rings being of a metal having a lower coefficient of expansion than the metal of the cylinder.

4. In combination in a roll, an inner supporting cylinder, means for circulating a cooling fluid through the cylinder, and a jacket secured on the cylinder and made up of a plurality of rings placed end to end having their opposing ends closely adjacent, but out of contact, said rings being of a metal having a lower coefficient of expansion than the metal of the cylinder so that the rings will not become loose when heated to a higher temperature than the cylinder.

5. A roll comprising a cylinder and a jacket secured thereto formed of a series of rings provided with radially extending slots.

6. A roll comprising a cylinder and a jacket formed of a plurality of rings provided with radially extending slots, said rings being brazed to the cylinder.

7. A roll comprising a cylinder adapted to receive a cooling fluid and a series of rings individually secured to the cylinder, said rings being mounted in engagement and provided with recessed portions to permit expansion.

In testimony whereof, I have hereunto subscribed my name this 20th day of May, 1930.

JOHN H. FOX.