July 28, 1931. L. VON REIS 1,816,307

ROLL FOR ROLLING GLASS PLATES FROM MOLTEN GLASS

Filed Oct. 10, 1927

Fig. 1.

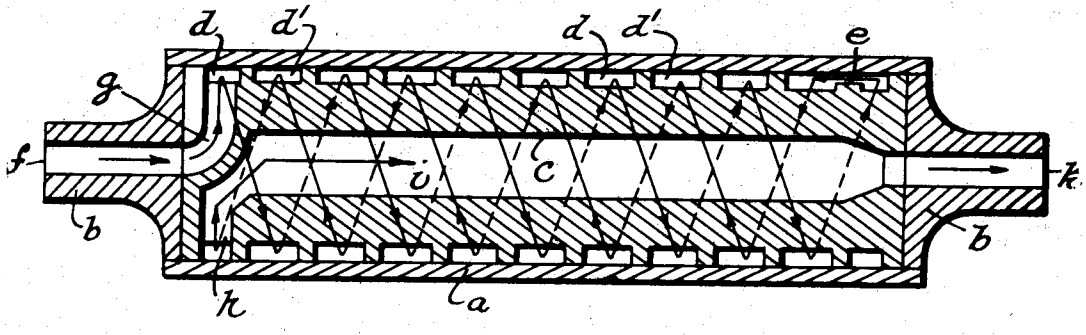
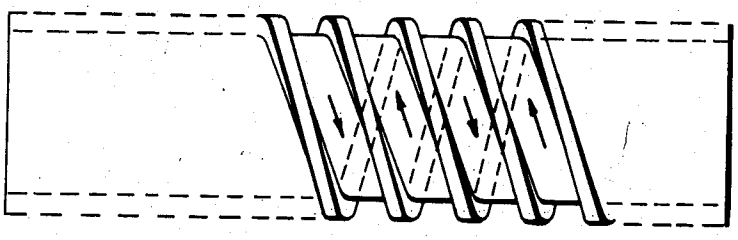



Fig. 2.



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# UNITED STATES PATENT OFFICE

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## ROLL FOR ROLLING GLASS PLATES FROM MOLTEN GLASS

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The rolls used for rolling a liquid glass mass into glass plates or the like are made of cast iron or other suitable metal. At the beginning of the rolling operation the liquid glass mass first comes into contact with one side of the roll so that the roll is heated on that particular side and therefore subjected to an unequal expansion and deflection, whereby the production of perfectly even glass plates is rendered impossible. This is a great disadvantage especially in the manufacture of glass plates designed to be subsequently ground and polished. In order to overcome this disadvantage it has been proposed to use rolls having an outer shell, an inner core and a hollow space between the two for the passage therethrough of a cooling medium. This cooling medium serves to produce as far as possible an equalization of temperatures at all points of the roll shell.

It has, however, been found in actual practice that these known rolls are subject to a warping or deflection in spite of the cooling. This is due to the fact that, on the one hand, the passing of a cooling medium through a cooling room consisting of one or two chambers does not suffice to equalize the high one-sided heating of the roll and, on the other hand, the inner core of the roll is too weak to resist or sufficiently resist the deflection of the roll shell because in the known rolls such core is hollow and connected with the roll shell only at the ends of the same.

Now, the invention has for its object to construct and improve rolls of the kind stated in such a manner that the deflection of the same is entirely avoided or at least reduced to a minimum which needs not be taken into consideration. This object is essentially attained by providing the roll with a solid core on which the surrounding roll shell is tightly seated throughout its entire length the bearing surface being only interrupted by channels extending around the core. Owing to the fact that the shell is very well braced in this manner and the core is protected against the influence of the hot glass mass by the cooling or heating medium passed through the said channels about its outer surface, the core will efficiently resist the bending forces arising in the outer roll shell.

Another feature of the invention effective in preventing the deflection of the roll resides in the special arrangement of the passages through which the temperature equalizing medium is caused to flow. According to the invention, these passages are formed by one or more channels which are arranged underneath the roll shell in such windings that the foremost channel sections are contiguous with the last channel sections and corresponding intermediate channel sections are contiguous with each other in such a manner that almost equal temperatures are obtained at all points of the roll shell. With this arrangement of the channels the changes of temperature to which a medium serving to cool or heat the roll surface is otherwise subjected on its way through the roll, are rendered ineffective. There may for instance be provided in accordance with the invention a channel formed by two helical grooves in the manner of a double thread, which grooves are in communication with each other near one end of the roll so that the heating or cooling media for equalizing the temperature of the roll shell will first flow axially through one helical groove in one direction and then axially through the other helical groove in the opposite direction.

Still another object of the invention is to use in connection with the improved roll a cooling or heating medium which may be raised to a temperature above 100 degrees C., such as oil or the like, or which possesses already a temperature of more than 100 degrees C., such as steam. By the use of cooling or heating media of such temperatures the temperature of the roll is brought nearer to that of the glass mass, whereby a deflection of the roll is further avoided or rendered ineffective.

The invention will now be described with reference to the accompanying drawing which illustrates one embodiment of the subject-matter of the invention and in which:

Fig. 1 is a central longitudinal section of the roll and

Fig. 2 is a partly diagrammatic side view of the roll core with the helical channels on its surface.

The roll consists of a thin shell *a* which is tightly mounted on an inner solid core *c*. *b* are the journals of the roll. *d* and $d^1$ are two helical grooves constituting the channel system and cut or otherwise formed on the cylindrical surface of the core *c* in the manner of a double thread. The helical grooves are covered by the roll shell *a* and are in communication with each other at one end of the roll, as shown at *e*. According to Fig. 1, a medium for cooling or heating the roll may be introduced at *f* through a bore of the left-hand journal *b*, whence it passes through a communication port *g* to the adjacent end of the helical groove *d* through which it flows about the core toward the right-hand end, whereupon it passes by the port *e* into the helical groove $d^1$ through which it flows back to the left and then by a communication port *h* into a central channel *i* which leads the medium to a bore *k* of the right-hand journal *b* through which it leaves the roll. The inlet and outlet for the temperature equalizing medium may also be arranged at other suitable points of the roll. Besides, the direction of flow of the medium may be different from that shown; the supply and discharge of the medium may for example take place at each end of the roll.

Before the beginning of the rolling operation, there is preferably introduced at *f* a heating medium, such as boiling oil, which flows through the channel *d*, $d^1$ of the roll in the direction of the arrows indicated. Owing to the heating of the thin shell *a*, thereby obtained, this shell when coming into contact with the hot liquid glass mass to be rolled out will no longer be able to absorb as much heat as if it were in a cold condition. The liability of the roll to be bent is therefore avoided at all or is only very inconsiderable also at the time only one side of the roll is under the influence of the hot glass mass, i. e. before the roll is set rotating. The cooling or heating medium is constantly flowing through the channels *d*, $d^1$. After the rolling has been started the temperature of the shell *a* increases with respect to that of the medium in accordance with the progress of the rolling. The temperature of the medium in flowing through the helical groove *d* will gradually increase from the left toward the right. As the grooves *d* and $d^1$ are in communication at *e*, the medium has at this point the same temperature in both grooves. At the left hand end of the roll the hottest section of the medium is contiguous with its coolest section and at all points intermediate the two ends of the roll a cooler current coming from *f* is flowing beside a hotter current coming from *e* in the opposite direction, whereby a perfect equalization of temperatures is attained throughout the entire circumference of the roll shell.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent is:—

1. In a glass-forming roll comprising an inner core, a thin-walled outer shell tightly mounted on said core, and a single channel between the shell and core for the passage therethrough of a temperature-equalizing medium, said channel having the form of a double thread, adjacent ends of which are connected.

2. In a glass-working roll comprising an inner core, a thin-walled outer sell tightly mounted on the core, the core having a double thread thereon connected together at one end, induction and eduction means connected with the opposite ends of the respective threads.

3. In a glass-forming roll comprising an inner core, a thin-walled outer shell mounted tightly on said core, the core having a channel on its surface formed by helical grooves in the form of a double thread, means for inducting a temperature-equalizing medium into the end of one of the threads at one end of the roll, and means for discharging the medium from the corresponding end of the other of the threads at the same end of the roll.

In testimony whereof I have signed my name to this specification.

LAMBERT VON REIS.