J. L. LEWIS.

CASTING ROLLS.

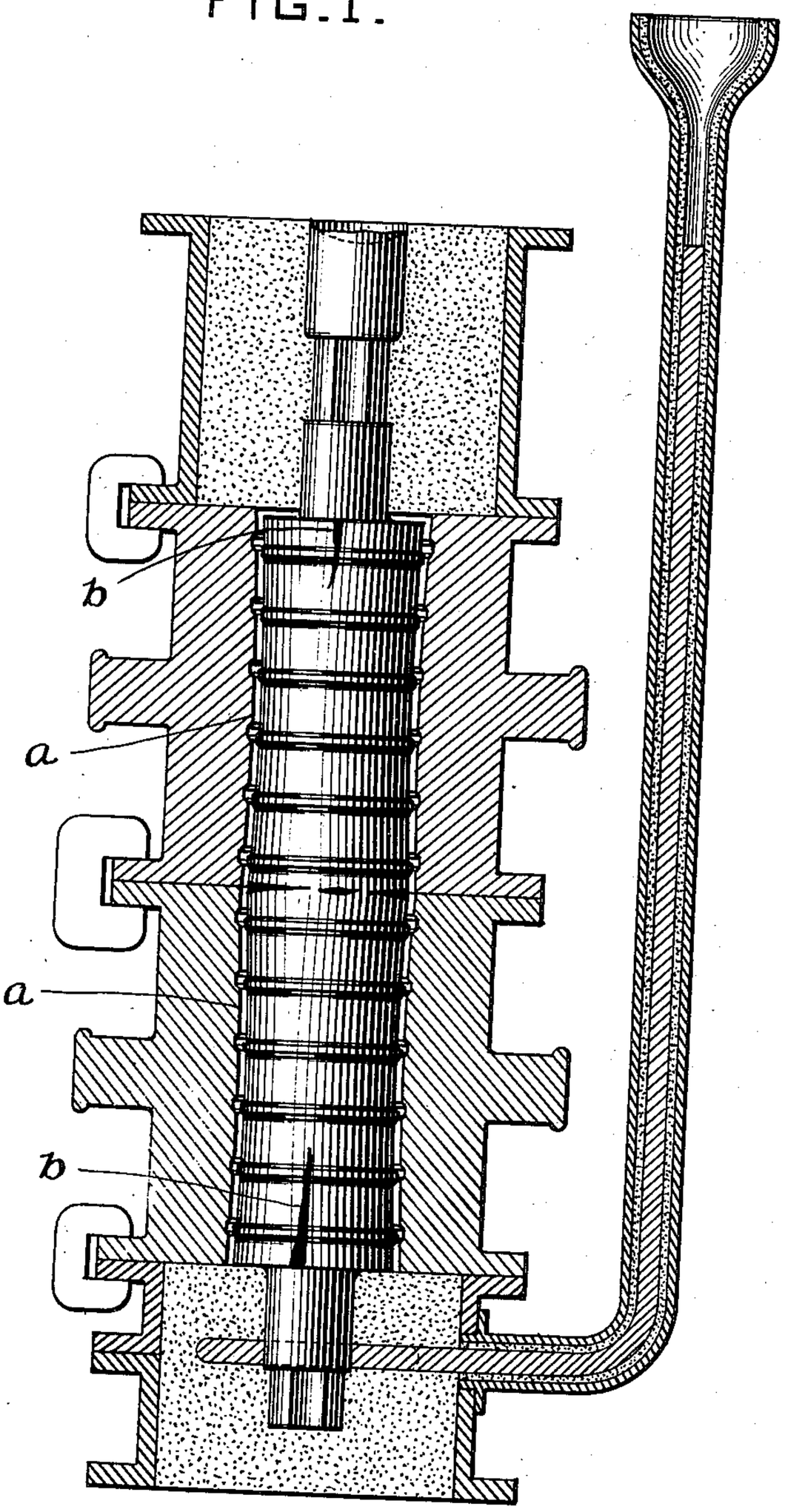
APPLICATION FILED JAN. 24, 1906.

933,996.

Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

Herbert Bradley.

Morrow Johnston

John L. Lewis

INVENTOR

by Christy and Christy

Atty's.

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2 SHEETS—SHEET 2.

FIG. 2.

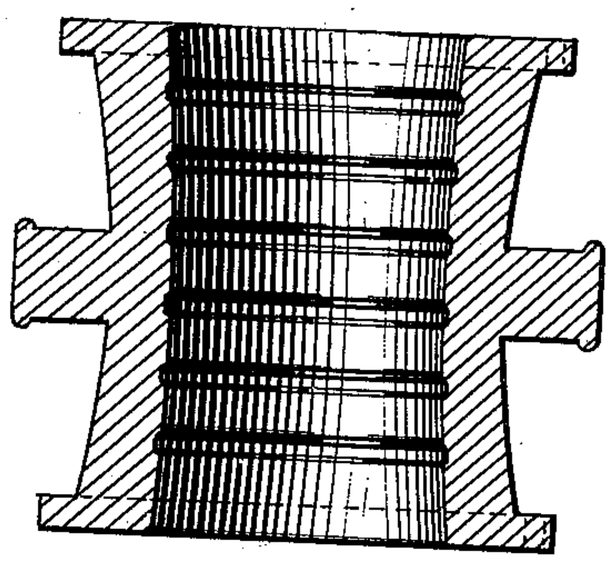


FIG. 3.

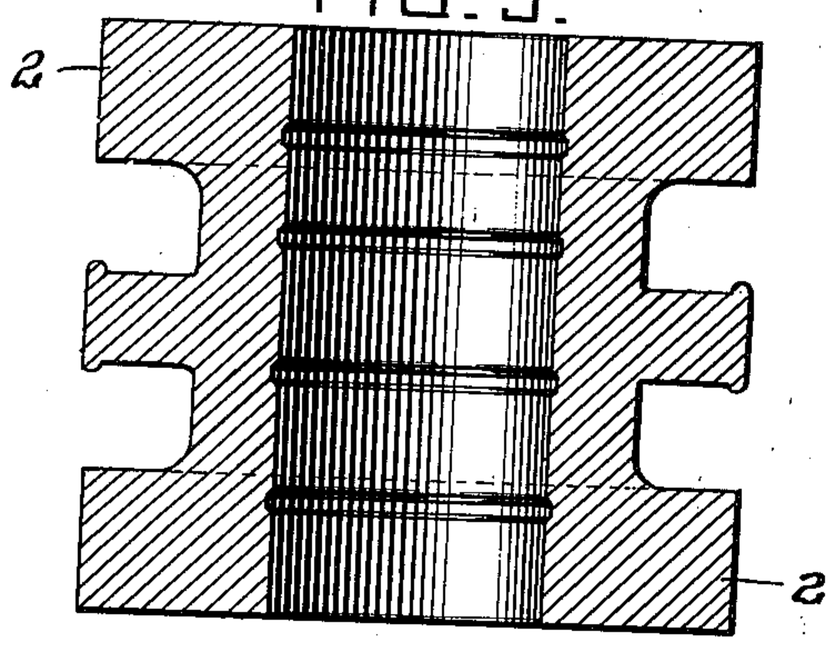


FIG. 4.

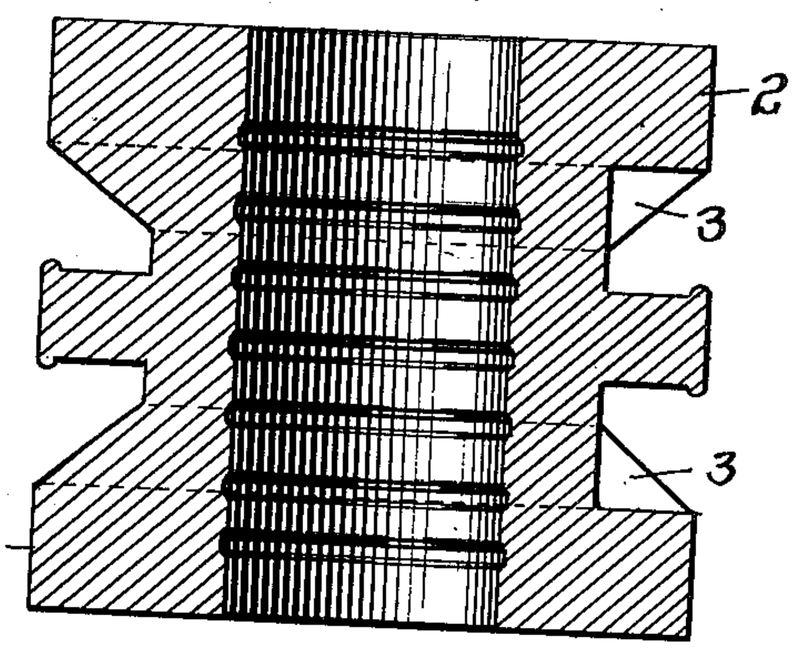


FIG. 5.

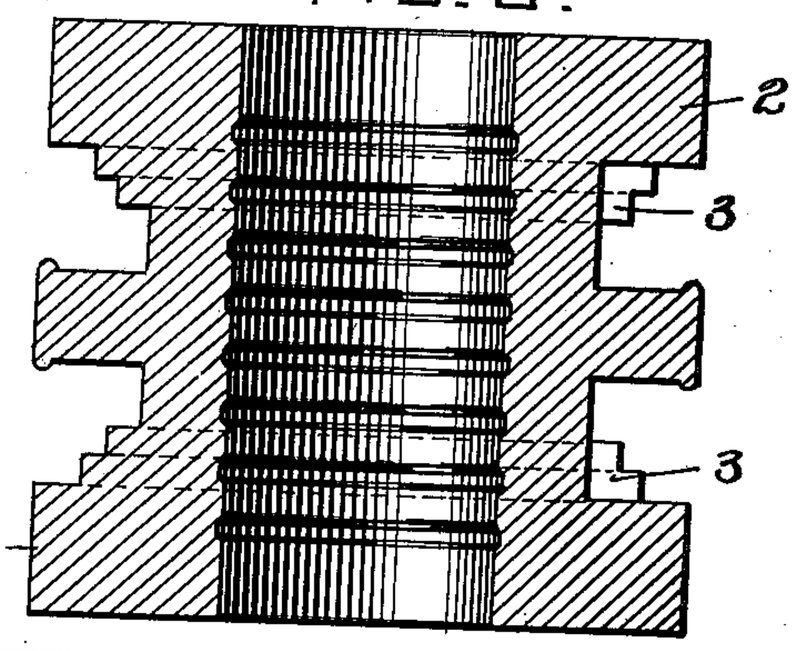
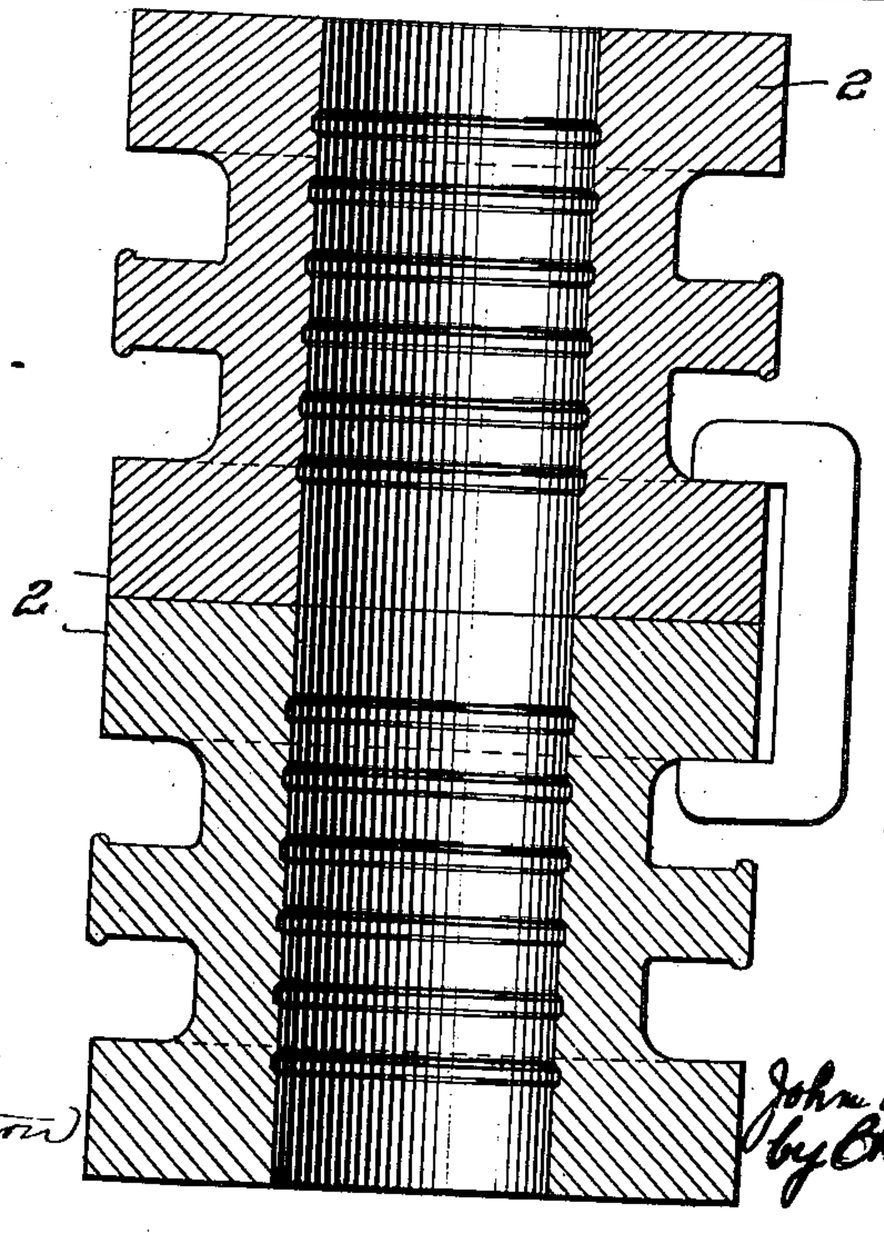


FIG. 6.



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Atty's.

UNITED STATES PATENT OFFICE.

JOHN L. LEWIS, OF PITTSBURG, PENNSYLVANIA.

CASTING ROLLS.

933,996. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed January 24, 1906. Serial No. 297,706.

To all whom it may concern:

Be it known that I, JOHN L. LEWIS, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered a certain new and useful Improvement in Casting Rolls, of which improvement the following is a specification.

Chilled rolls are formed in molds consisting of three parts or members, a cope formed of sand loam having a matrix for the journal at one end of the roll, a drag also formed of loam sand and having a matrix for the other roll journal and also having the necessary sprues or passages for the inflow of molten metal, and one or more chilling cylinders formed of cast iron and arranged between the cope and drag. These chilling cylinders which are now made with a uniform thickness of wall are provided at their ends with radial lugs which are sometimes continuous forming laterally projecting flanges as shown in Figure 2. As these lugs or flanges are employed only for the purpose of connecting the chilling cylinders to the cope and drag and to other chilling cylinders when two or more such cylinders are employed, they are made of only sufficient thickness to afford the desired strength and rigidity for coupling the several parts together. The mold constructed as described is arranged vertically and the molten metal enters through the drag rising up through the latter, and the chilling cylinder to the cope. As the molten metal comes into contact with the almost cold metallic surface of the chilling cylinders a thin skin or shell is formed on and completely inclosing the mass of molten metal which when cold will form the roll and the chilling cylinders become heated and expand proportional to the degree of heating.

I have found that the chilling cylinders are subjected during the casting of the roll to some force which causes a peripheral enlargement of the cylinders, the enlargement being greater at the ends. This enlargement produced during casting does not entirely disappear after a casting has been made but the end portions are permanently enlarged. As this enlargement occurs after each casting, it results that although each increment is small the cylinders will soon assume an hour-glass shape as shown at *a* in Fig. 1. This expansion of the cylinders seems to be due to an irregular heating of the chilling cylinders or to an ununiform action of the heat on the cylinder. Whatever may be the cause of the irregular expansion of the chilling cylinders and the incremental enlargement of the ends thereof, the deformation of the cylinders causes a considerable loss in defective castings. As the thin shell formed on the roll surface on contact of the molten metal with the chilling cylinder will be kept in a highly heated condition by the fluid interior of the casting, it will have but little strength, so that when the ends of the chilling cylinder expand outwardly leaving the thin skin or shell unsupported laterally or cross-wise the pressure of the fluid column will cause a bulging and very frequently a rupture of this shell diametrically on a plane with the end portions of the cylinder as shown at *b* in Fig. 1. Where two or more chilling cylinders are employed the double bulging diametrically on a plane with the adjacent ends of the chilling cylinders seems to subject the thin shell to such longitudinal strains that the ruptures are peripheral as shown at *c* Fig. 1.

The present invention has for its object an equalization of the rate of expansion of all parts of the chilling cylinder or cylinders, thereby maintaining a lateral support at all points for the thin shell or skin first formed by contact of the molten metal with the chilling cylinders. This equalization may be attained either by retarding the expansion of the end portions of the chilling cylinders or accelerating the rate of expansion of the waist portion or portions of such cylinders by the application of heat thereto. The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification Fig. 1 is a sectional elevation of the usual form of mold for casting a chilled roll, showing the latter in position in the mold and illustrating the results of the unequal expansion of the chilling cylinders. Fig. 2 is an enlarged sectional view of the form of chilling cylinder now in use but having the thickness of wall at its waist reduced in thickness; Figs. 3, 4 and 5 are sectional views of different forms of chilling cylinders embodying my improvement, and Fig. 6 is a sectional elevation showing two chilling cylinders of the form shown in Fig. 3 arranged together for the production of a long roll.

In the practice of my invention I provide means whereby the expansion of the ends of the chilling cylinder may be retarded or that of the waist or middle portions of cylinders may be accelerated, such retardation or acceleration being so regulated that the rate of expansion shall be the same or substantially the same at all points of the cylinders. The retardation or acceleration may be effected in many ways, as by the application of a cooling or heating medium to the respective portions of the chilling cylinders as now constructed or by proportioning the thickness of the wall of the chilling cylinder at certain points. This latter method which may be carried out either by reducing the thickness of the wall at and adjacent to the waist of the cylinders as shown in Fig. 2, or by increasing the thickness of the end portions of the cylinders, is for many reasons preferred, and of these two alternative steps the increasing of the end portions of the cylinders is preferred.

As shown in Figs. 3, 4, 5, and 6, the required thickness of wall at the ends of the chilling cylinders can be attained by increasing the thickness and radial extension of the flanges 2 at the ends of the chilling cylinders. The amount of metal thus added at the ends and adjacent portions of the cylinders is such that by the time the heat from the molten metal has diffused equally through the end portions, the waist portion will have been raised to the same temperature, and the expansion due to such heating will be the same at all points, and the relative internal dimensions will be preserved which is the purpose of the invention. As shown in Figs. 3 and 6 the added metal may project with considerable abruptness from the body of the cylinder or may extend with a more or less gradual decrease in thickness toward the waist of cylinder as shown in Figs. 4 and 5. In the construction shown in Figs. 3, 4, and 5 the added metal which is largely in excess of that required for chilling purposes is disposed in massive flange form and clamps can be readily applied thereto, as is the present practice, for connecting the chilling cylinder to the cope and draw and another cylinder when two or more are required. When the metal is added as to form a wall gradually decreasing in thickness toward the waist, notches 3 are provided for the reception of the ends of the clamps.

As shown in Fig. 2 the chilling cylinders now in use can be so altered as by decreasing the thickness of the wall of the waist portion as to insure a practically equal rate of expansion of all portions of the cylinder.

The retardation of the expansion of the ends of the cylinders can be effected by applying a cooling fluid to such portions, and an acceleration of the expansion of the waist of the cylinder can be had by applying a heating medium as gas jets to such waist portion.

Practical use of my invention has shown that by properly proportioning the thickness of the metal at the ends and waist portions of the chilling cylinder or cylinders the rates of expansion will be practically the same at all points and the chilling cylinder or cylinders will retain their cylindrical shape and hence there will not be any bulging or swelling out of any portion of the roll formed in such mold.

While I have described with considerable particularity forms of apparatus for carrying out my improved method, no claim is made herein to such apparatus as the same forms the subject matter of an application filed June 16th, 1906, Ser. No. 321,976.

I claim herein as my invention:

1. As an improvement in the art of casting chilled rolls, the method herein described which consists in preventing an irregular diametrical enlargement of the chilling cylinder during the teeming and cooling of the metal therein.

2. As an improvement in the art of casting chilled rolls the method herein described which consists in preventing enlargement of the end portions of the cylinder greater than that of the middle portions during the use of such cylinders.

In testimony whereof, I have hereunto set my hand.

JOHN L. LEWIS.

Witnesses:

CHARLES BARNETT,

MORROW JOHNSTON.