

A. I. CROOK.
 APPARATUS FOR FORMING CHILLED PASS ROLLS.
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990,710.

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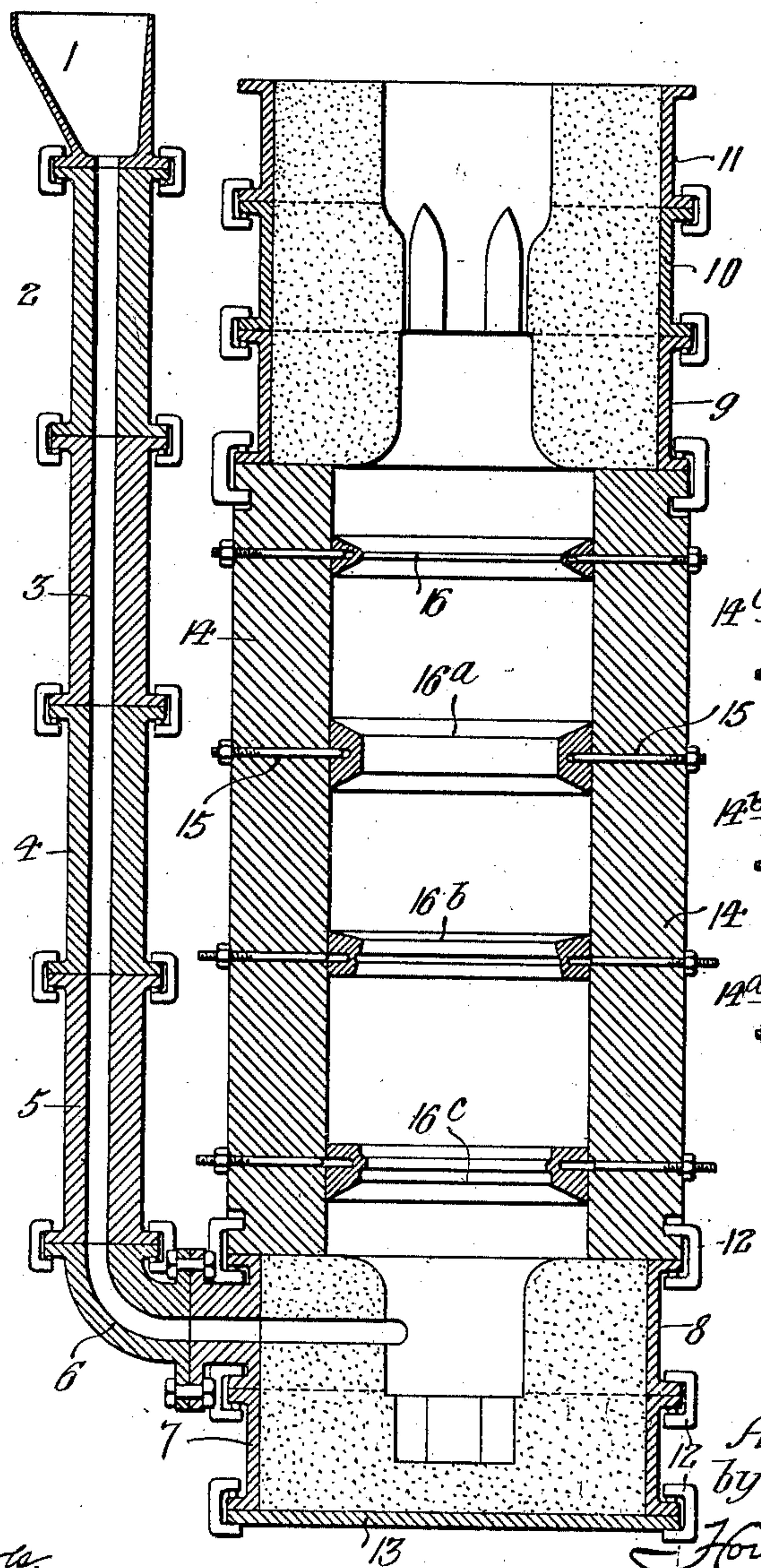
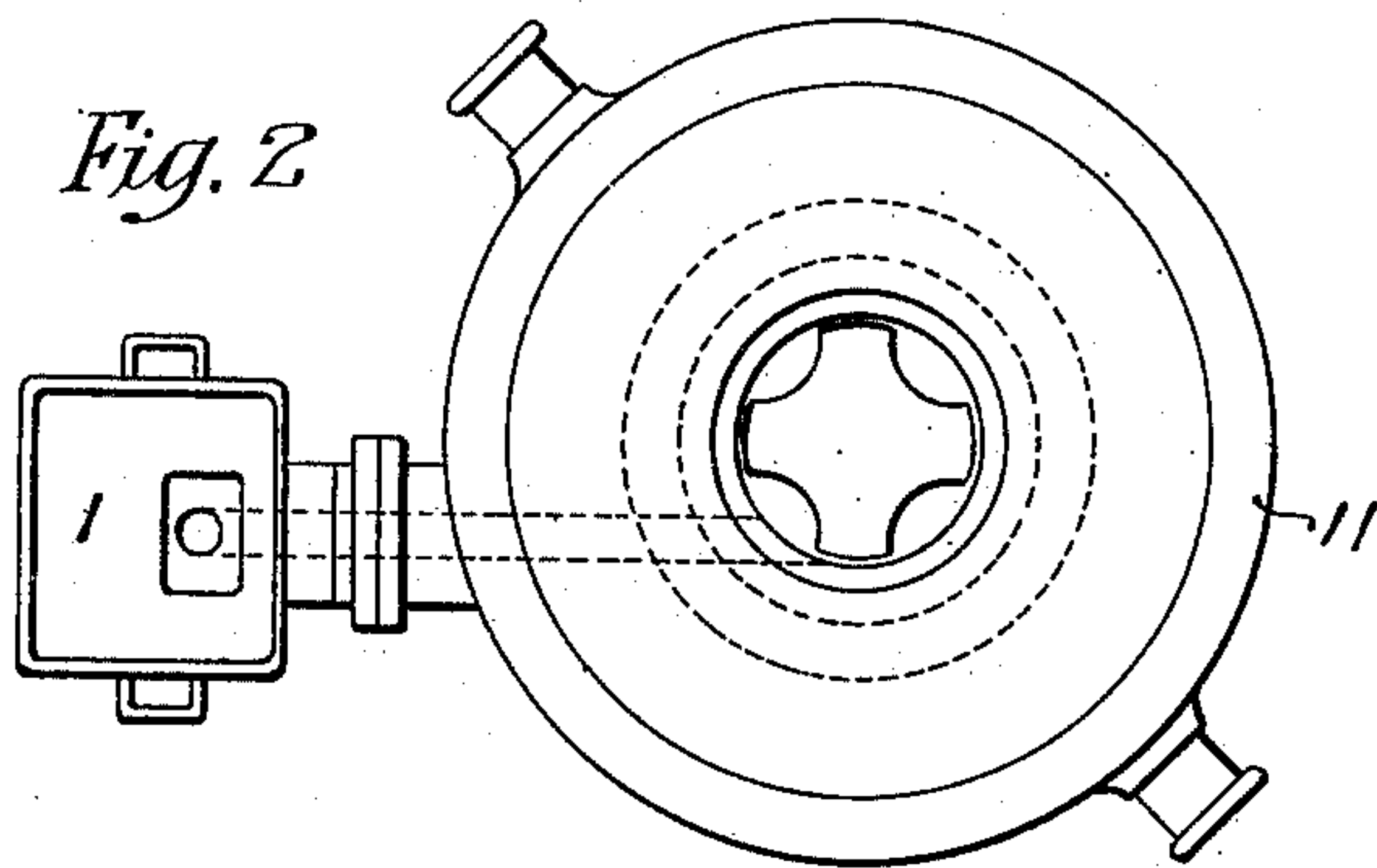
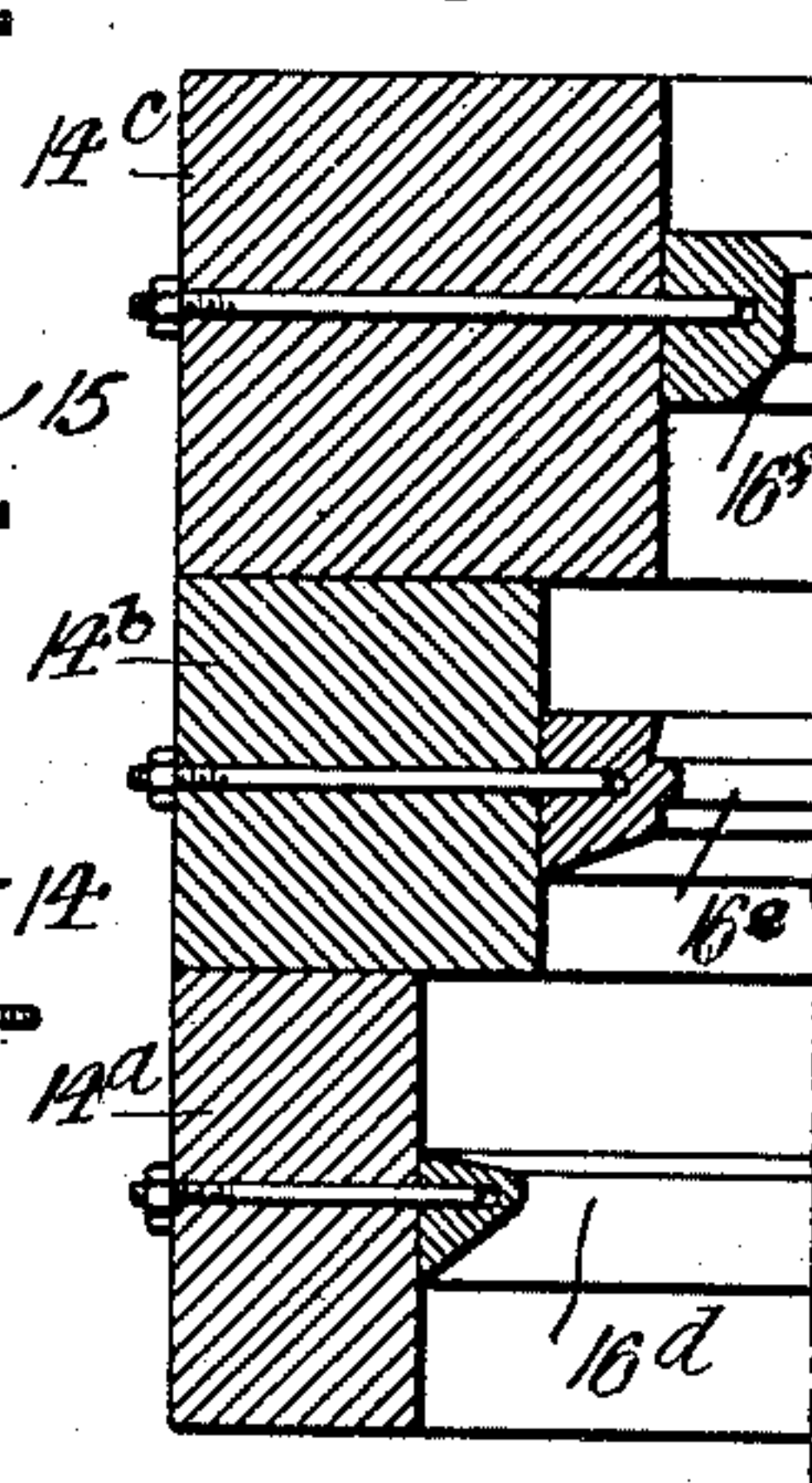


Fig. 1.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR FORMING CHILLED PASS-ROLLS.

990,710.

Specification of Letters Patent.

Patented Apr. 25, 1911.

Application filed December 23, 1910. Serial No. 598,935.

To all whom it may concern:

Be it known that I, ALFRED I. CROOK, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Apparatus for Forming Chilled Pass-Rolls, of which the following is a specification.

One object of my invention is to provide a chill for the successful, practical, and economic production of cast iron chilled rolls or similar structures having one or more depressions or passes cast within the limits of their chilled surfaces; it being also desired that the apparatus shall be capable of producing an even depth of chill on the roll and shall be conveniently adjustable in order to produce chilled pass rolls of different designs. These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which;—

Figure 1, is a vertical section of a chill embodying my invention and in which my improved method of procedure may be carried out; Fig. 2, is a plan of the apparatus shown in Fig. 1, and Fig. 3, is a fragmentary vertical section of a special form of my improved chill.

In the above drawings 1 is a pouring basin of the usual construction and this has connected to it a series of runner boxes, indicated at 2, 3, 4, 5, and 6, whereby molten metal may be conveyed to the mold. This latter includes bottom flasks 7 and 8 and top flasks 9, 10 and 11 for the purpose of molding those portions of the roll which it is not desired to chill.

Clamps 12 hold the various flasks and sections of the runner boxes together and these latter are bolted or otherwise rigidly held to the flask 8 in any suitable manner; there being a plate 13 closing the bottom opening of the flask 7.

Mounted between the flasks 8 and 9 is a cylindrical shell 14 of the proper thickness and diameter, provided with suitable lugs or flanges for the reception of the clamps 12 whereby it is held respectively to the flasks 8 and 9; it being made of cast iron or other chilling material. Extending radially

through the walls of this shell are a number of holes for the reception of pins 15 whose outer ends are threaded for the reception of nuts, as shown, whereby they may be drawn outwardly at will; the lengths of these pins being such as to permit them to extend into the interior cavity of the shell 14 for a purpose hereafter noted.

The surface of the internal cavity of the shell 14 is machined or otherwise accurately formed to conform to the largest diameter of the chill portion of the roll which it is desired to cast and there are mounted within said shell one or more rings 16, 16^a, 16^b and 16^c whose outer surfaces are machined or otherwise accurately formed to fit closely within the same.

The inner faces or surfaces of the rings are so formed as to conform to the shape of the recesses which it is desired to cast in the roll and they are made each in one piece or in two or more pieces, as may be desired, being divided either vertically or horizontally according to their shapes and positions within the shell 14. Said shell 14 is ordinarily made of cast iron or of other suitable material of such a composition that it possesses a coefficient of expansion in excess of that of the rings 16, 16^a, etc., and in the preferred form of my invention it is made with a less proportion of silicon than are the rings in order to secure this object.

While as will be understood by those skilled in the art, the substances and the proportions of the same used to obtain the above noted result may be widely varied, I have found that an iron compound containing 1.25% silicon will answer the requirements for the shell 14, if the rings be made of a composition the same as that of the shell except that the silicon be in the proportion of 2.25%. Each ring is provided with a number of radial holes or recesses for the reception of the ends of the pins 15 whereby it may be held in a definite position within the shell 14.

Under conditions of use, the shell with the rings 16, 16^a, etc., properly positioned by the pins 15, is mounted on the two flasks 7 and 8 which contain sand molds for one

neck and the end portion of the roll whose body is to be chilled in the shell 14.

The flasks 9, 10, and 11, with the necessary sand molds for the other neck and end portion of the roll, are then mounted on the top of said shell and are held in position in the well known manner by means of clamps. The pouring basin and the runner boxes are then attached to the flask 8, as shown; the entire inner surface of the mold having been previously coated with a suitable protective wash. The molten metal is then poured into the basin 1 and is conducted by the runner boxes to the mold formed by the flasks and shell; the pouring being continued until the interior cavity of said mold is filled. The latter is then permitted to stand a short time or until a solid shell of metal has formed within the shell 14, when the pins 15 are partly withdrawn so as to be free from the various rings 16, 16^a, etc. The roll casting is thus allowed to contract freely so that it has no tendency to form the cracks which would otherwise result if such free contraction was prevented.

After the cooling has continued for a suitable time, the flasks 7, 8, 9, 10 and 11 are removed; as is also the shell 14, this latter being rendered possible by the contraction of the roll casting, as well as by the difference in the coefficients of expansion of the rings 16, 16^a, etc., and the shell 14. That is to say, owing to the difference in the composition of these parts, as above noted, the expansion of the shell when the hot metal enters it, is relatively greater than that of the rings, so that these latter do not bind upon its inner cylindrical surface but are at all times free to adjust themselves under the action of the hot metal. To this fact is due the possibility of making and using the shell 14 in a single piece, as otherwise the rings 16, 16^a, etc., would have a tendency to expand to such an extent as to grip or stick to the inside cylindrical surface of the shell and thereby defeat the purposes of my invention by preventing the removal of the finished casting, as well as by setting up undue strains in this latter or even causing cracking thereof. Said shell 14 may then be set aside for future use, as it is obvious that it may be employed for the casting of other similar or substantially similar rolls. The rings 16 and 16^a, etc., are then removed in a manner depending upon whether they are of the divided or continuous type; it being obvious that if they are of the former construction they may be conveniently taken off over one end of the roll casting, while if of the continuous form they may be removed by breaking or cutting. Thereafter the roll is ready for finishing in the usual and well known manner.

From the above description it will be seen

that according to my method of procedure and by the use of my improved apparatus, it is possible to repeatedly employ the same shell 14 in the casting or rolls where hitherto it was necessary to destroy the shell after the production of a single roll, unless the objectionable split shell be used. Moreover, owing to the fact that the rings 16 and 16^a, etc., are left free of the shell 14, the shrinkage or contraction of the cooling metal is permitted without the formation of chill cracks or the setting up of abnormal strains which later develop cracks.

It will be understood that the cavity of the chill is not necessarily of uniform diameter throughout its length since it may be made in two or more sections 14^a, 14^b, 14^c of different diameters as in Fig. 3, each or any having rings or projections 16^a, 16^b, 16^c, as heretofore described. It is to be noted that each of the sections 14^a, etc., has a cavity of uninterrupted or uniformly cylindrical form, though it is obvious that slight changes may be made from this shape without departing from my invention.

I claim;—

1. A device for manufacturing chilled pass rolls consisting of a chill; with a ring within the same shaped to form the desired recess in the roll and made of a material having a coefficient of expansion different from that of the chill.

2. A device for manufacturing chilled pass rolls consisting of a chill; a ring within the same shaped to form the desired recess in the roll and made of a material having a coefficient of expansion different from that of the chill; and means for holding the ring temporarily in position in said chill.

3. The combination of a hollow chill; a plurality of rings within said chill made of a material whose coefficient of expansion is less than that of the chill and means for temporarily holding said rings in position.

4. The combination of a chill having a cavity and including silicon in its composition; with a ring fitted to said cavity and shaped to form the desired recess in the casting to be made; said ring being of a composition having a higher silicon content than that of said chill.

5. The combination of a chill consisting of a shell; a ring mounted in the cavity of said shell and made of a material having a coefficient of expansion different from that of the shell; with removable pins extending through the shell into the ring for temporarily holding the latter in place.

6. The combination of a chill consisting of a plurality of single piece shell sections having cavities of different diameters; and rings in said cavities being made of a composition having a coefficient of expansion less than that of said shell sections.

7. A device for manufacturing chilled pass
rolls, consisting of an elongated shell with a
ring within the same shaped to form the de-
sired recess in the roll; and made of a ma-
5 terial having a coefficient of expansion per-
mitting its free removal from said shell
after the casting of the roll.

In testimony whereof, I have signed my
name to this specification, in the presence of
two subscribing witnesses.

ALFRED I. CROOK.

Witnesses:

WILLIAM E. BRADLEY,
WM. A. BARR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."
