

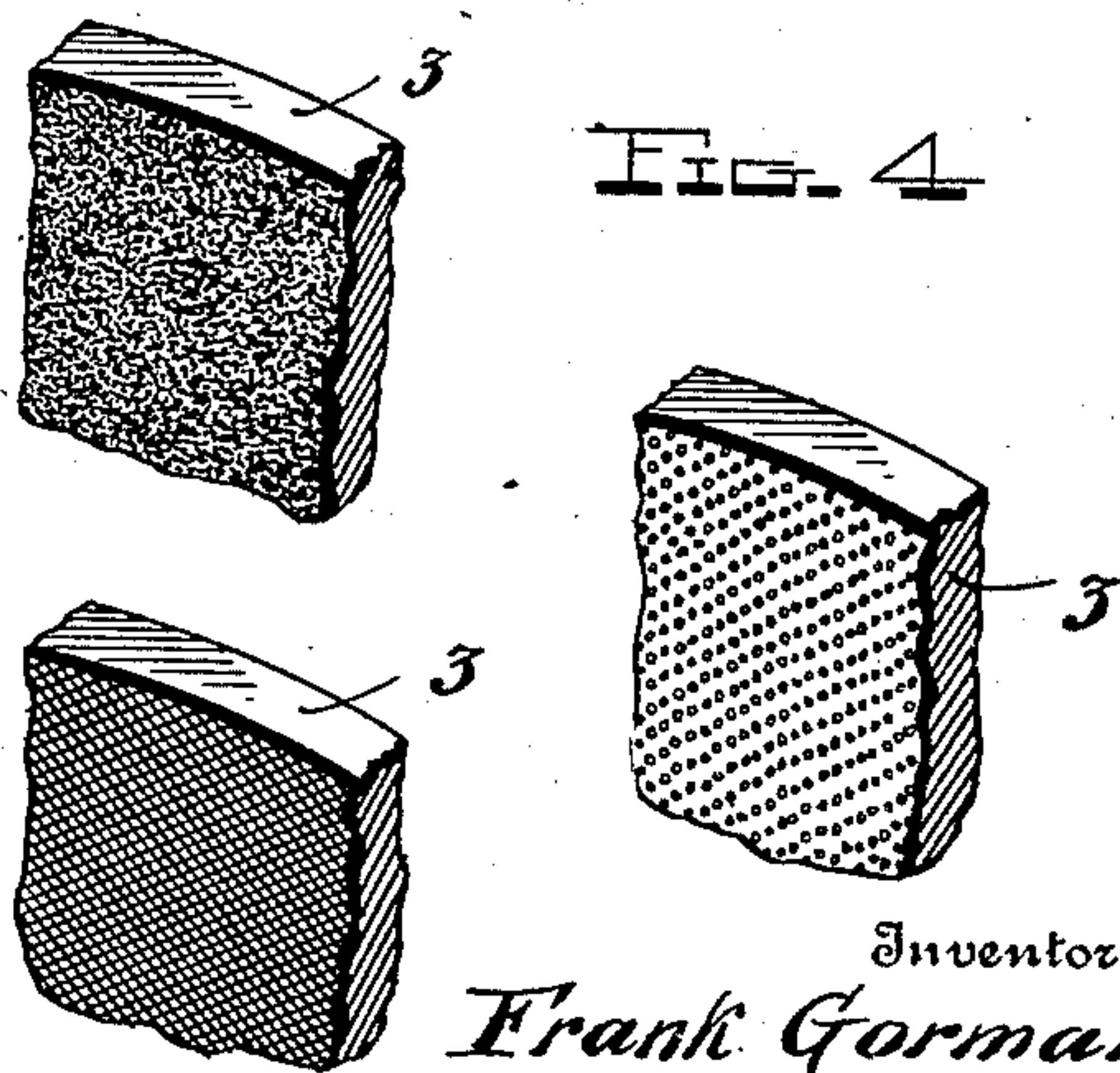
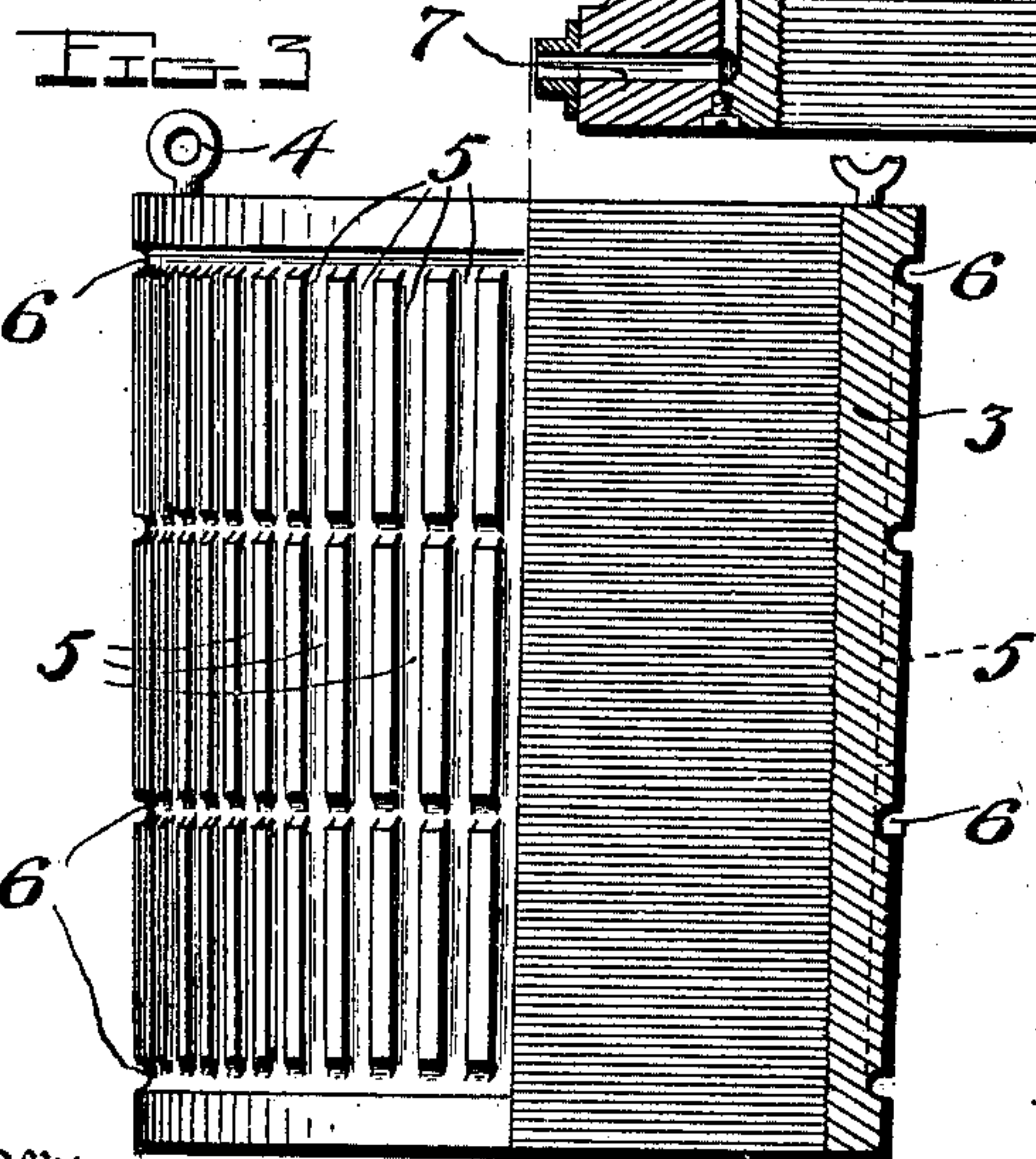
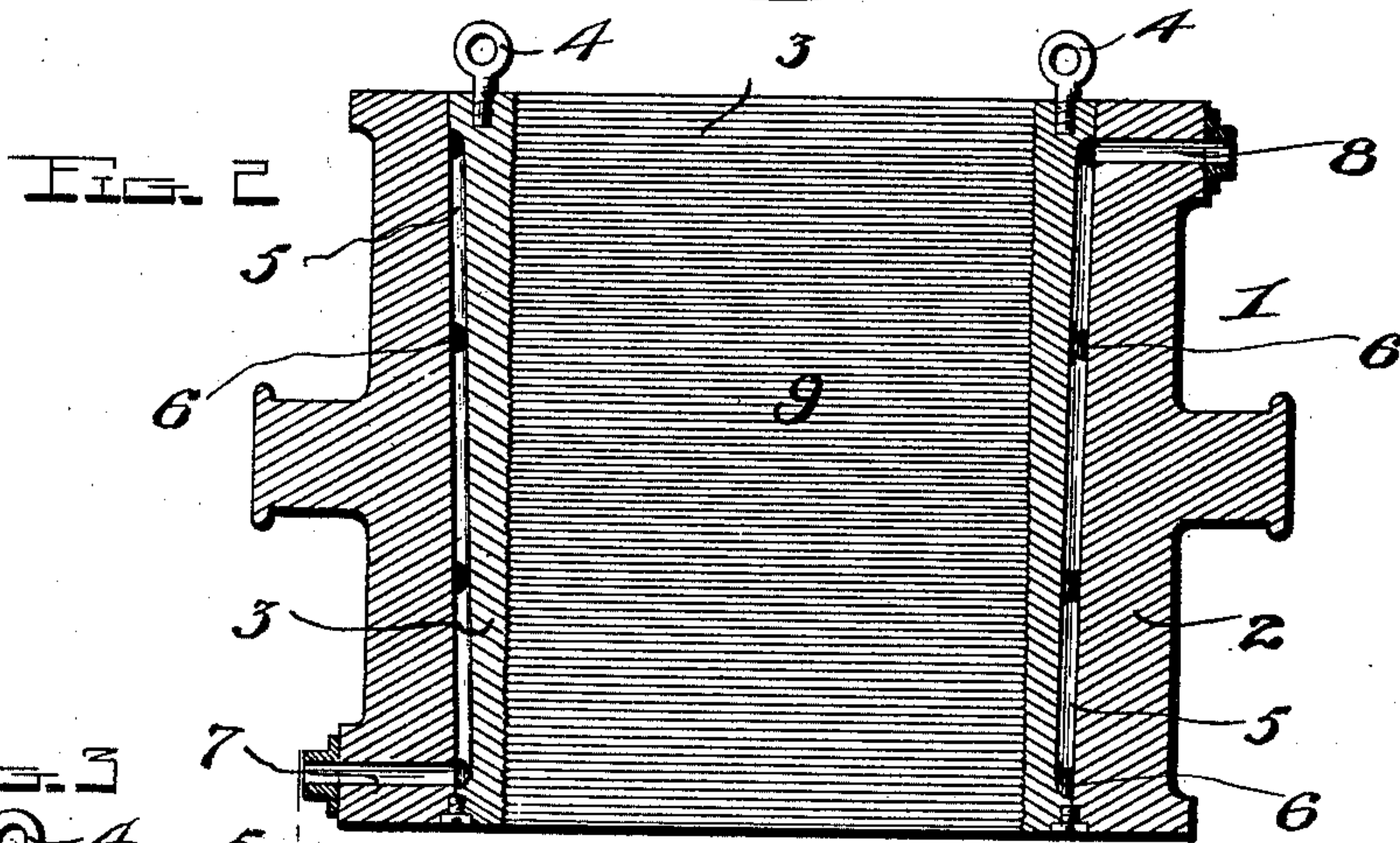
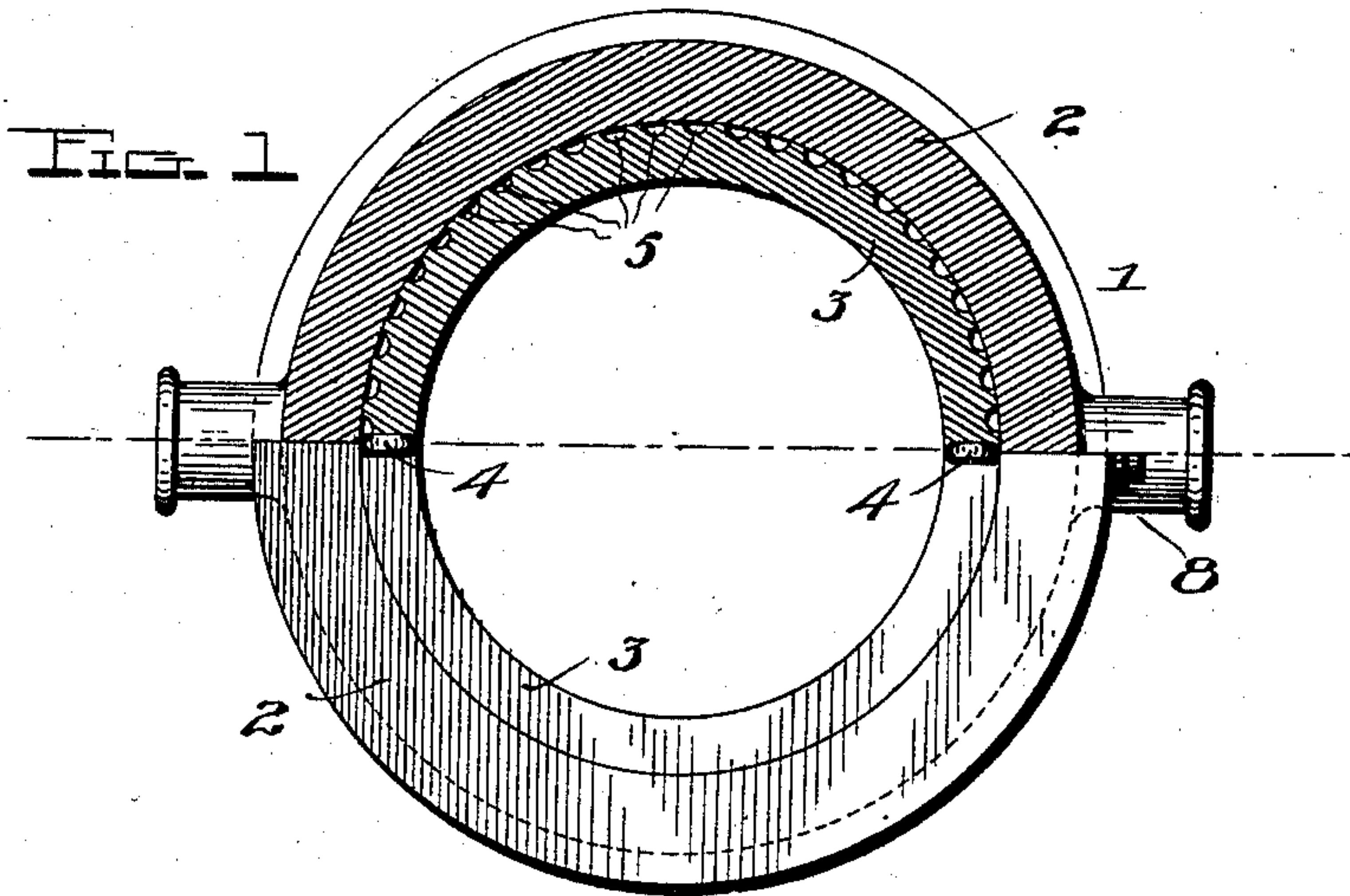
No. 679,743.

Patented Aug. 6, 1901.

F. GORMAN.
MOLD FOR MAKING CHILLED ROLLS.

(Application filed Mar. 14, 1901.)

(No Model.)



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK GORMAN, OF MOUNT OLIVER, PENNSYLVANIA.

MOLD FOR MAKING CHILLED ROLLS.

SPECIFICATION forming part of Letters Patent No. 679,743, dated August 6, 1901.

Application filed March 14, 1901. Serial No. 51,144. (No model.)

To all whom it may concern:

Be it known that I, FRANK GORMAN, a citizen of the United States, residing at Mount Oliver, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Molds for Making Chilled Rolls; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in molds for making chilled rolls.

One object of the invention is to provide a mold of this character wherein provision is made to secure a uniform cooling of the mold to avoid cracking, warping, or other similar injury and the liability of the carbon in the metal of the mold to crystallize and form into an oxidized state under the intense heat to which it is subjected after the roll is cast.

Another object of the invention is to provide a mold having a corrugated, roughened, or serrated bore or inner surface in contradistinction to the smooth-finished bores in common use, whereby certain beneficial results are secured, as hereinafter described.

With these and other objects subordinate thereto in view, and which will appear as the nature of the invention is better understood, the invention consists of certain novel features of construction, combination, and arrangement of parts, which will be hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a view, partly in top plan and partly in horizontal section, of a mold embodying my invention. Fig. 2 is a vertical sectional view thereof. Fig. 3 is a side elevational and partial sectional view of the inner mold-section removed from the casing. Fig. 4 shows several fragmentary detail views illustrating some of the many forms the roughened face of the mold may assume.

Referring now more particularly to the drawings, the numeral 1 represents the mold, which comprises an outer inclosing tubular casing 2, having the exterior fittings of the ordinary form of mold, and an inner remov-

able mold-section 3, which fits snugly within said casing. As shown, the casing and inner removable section are cylindrical in form; but they may have any other desired formation and the internal configuration of the inner section 3 may be varied to suit the shape to be given the rolls to be cast. Eyebolts 4 or other suitable devices are provided upon the upper end of said inner section 3 to facilitate its insertion within and removal from the casing.

It is well known that in making chilled rolls the mold is subjected to intense heat and that the ordinary construction of chill-mold now in common use is liable to warp and crack and the carbon in the metal of the mold to crystallize and become oxidized under the action of the heat, rendering the mold unfit for further use and also causing flaws in the roll. This is due to unequal expansion and contraction and to the ordinary method of cooling, which renders uniform cooling practically a matter of impossibility. In order to avoid this objection and provide for the uniform cooling of the mold and casting, I form a water-circulating space between the casing 2 and removable mold-section 3, through which water at or below the normal temperature may flow and abstract the heat. This space may be formed in any approved manner and may consist, as shown, of channels located in one or both of said parts. In the present instance I have shown the inner removable section 3 provided upon its outer sides with vertical grooves 5, terminating adjacent to the upper and lower ends thereof and intersected by annular grooves 6, whereby the grooves 5 are made intercommunicating for the free flow of the water around the entire surface of the mold. When the section 3 is inserted, these grooves, in connection with the inner wall of the casing 2, form water-circulating channels, which are in communication at the base of the mold with an inlet 7 and at the top of the mold with an outlet 8, formed or provided in said casing 2. Water may thus be supplied from any suitable source of supply to circulate continuously through the channels until the mold and casting are cooled and may discharge

into a drain-pipe or suitable receptacle. The purpose of locating the inlet at bottom and outlet at top of the mold is to more quickly carry off the heat at the outset from the bottom, which is ordinarily the hottest part, and to thereby secure a more thorough and equal cooling of the mold and casting. It will be readily understood that as the water enters the base of the mold first a greater proportion of the heat will be abstracted at that point until the temperature of the mold and casting is substantially the same at all points, when a practically uniform cooling will ensue, whereby all liability of unequal contraction of the metal will be avoided.

In the ordinary process of casting a chill-roll the mold is first heated to a temperature high enough to dry the sand mold which forms the neck and coupling of the roll and is then cooled to a lower temperature to receive a coating of blacking, consisting of a solution of plumbago, molasses, and water, which is applied by means of a brush, to prevent the molten metal when poured in from adhering to the internal face of the mold. To apply this solution to the smooth face of the ordinary mold when the mold is hot is difficult, and it is practically impossible to secure an even and uniform coating on such a surface. Hence irregularities exist, which cause cracks in the surface of the roll, owing to the sticking of the metal to the mold. Another objection to the common form of mold having a smooth or dressed inner surface is that cracking of a large proportion—sometimes as high as ten per cent.—of the rolls occurs in casting, owing to the entire weight of the roll falling upon the chilled portion of the roll, which splits under the strain. When the molten metal to form the roll is poured in, a quick contraction of such metal and expansion of the mold takes place, by which the outer or chilled portion of the roll is drawn away from the wall of the mold, and as the roll is supported only at the base it will be clear that the chilled portion is subjected to great strain and that even when cracking is avoided flaws are liable to occur. I avoid these difficulties by providing the inner wall of the mold with a roughened face 9, formed by either pitting, corrugating, or ribbing said inner wall, as shown in Fig. 4, or by serrating or roughening the surface in any other approved manner to the depth of, say, from one-sixteenth to one-eighth of an inch, or more or less, as occasion may require. This roughened surface not only permits of the internal wall of the mold being uniformly coated with the solution before mentioned, by which surface flaws in the roll are prevented, but the interstices thereof are filled by the molten metal as it flows in the mold, forming a corresponding roughened surface on the roll, and these two surfaces act in the nature of a separable bond to assist in supporting the roll until the expansion of the

roll has been sufficient to withdraw its roughened surface from engagement with that of the mold. By this means the entire chilled surface of the roll is supported and braced until the central portion of the roll has to a great extent settled and said chilled surface has become hard enough to withstand the strain. This feature of roughening the inner surface of the mold is of great value in connection with the cooling means employed, as the latter assists in securing the described result by arresting the settling of the molecules of the mass and equalizing expansion and contraction. A further advantage of the roughened surface is that it provides a larger area of cooling-surface acting on the face of the roll to chill the same.

From the foregoing description, taken in connection with the accompanying drawings, the construction, mode of operation, and advantages of my invention will be manifest without a further extended description.

I claim the feature of a chill-mold consisting of an external tubular casing and an internal removable mold-section having an interposed water-circulating space, said removable mold-section being provided with an internal roughened or serrated surface adapted to serve as a support for the external surface or shell of the casting, as I believe I am the first to employ this construction and combination of parts and also to employ the said internal roughened surface for the purpose set forth.

Various modifications other than those indicated may be made without departing from the spirit and scope of the invention.

Having thus fully described my invention, what I claim as new and useful, and desire to secure by Letters Patent of the United States, is—

1. As a new and improved article of manufacture, a chill-mold consisting of an external tubular casing and an internal tubular removable mold-section, having an interposed water-circulating space, said removable mold-section being provided with an internal roughened or serrated surface adapted to serve as a support for the external surface or shell of the casting, substantially as described.

2. A chill-mold comprising a casing and an internal removable mold-section having an interposed water-circulating space or jacket, said mold-section being provided with a continuous internal roughened surface formed by minute pits and projections, and supply and exhaust pipes communicating, respectively, with the bottom and top of said water-circulating space so as to cause the upward flow of a current of water supplied thereto, substantially as described.

3. A chill-mold comprising an outer inclosing casing and an inner removable mold-section, said mold-section being provided upon its exterior with vertical grooves terminating adjacent to the ends thereof and intersected

by annular transverse grooves, said grooves forming a water-circulating space or jacket between the casing and mold-section, and supply and exhaust pipes connected to the casing and communicating with said chamber, substantially as described.

5. In testimony whereof I have hereunto set

my hand in presence of two subscribing witnesses.

FRANK GORMAN.

Witnesses:

W. J. WHITE,
JOHN E. WATERS.