

No. 765,876.

PATENTED JULY 26, 1904.

W. BRINTON.
STAMP SHOE OR DIE.
APPLICATION FILED APR. 8, 1902.

NO MODEL.

Fig. 1.

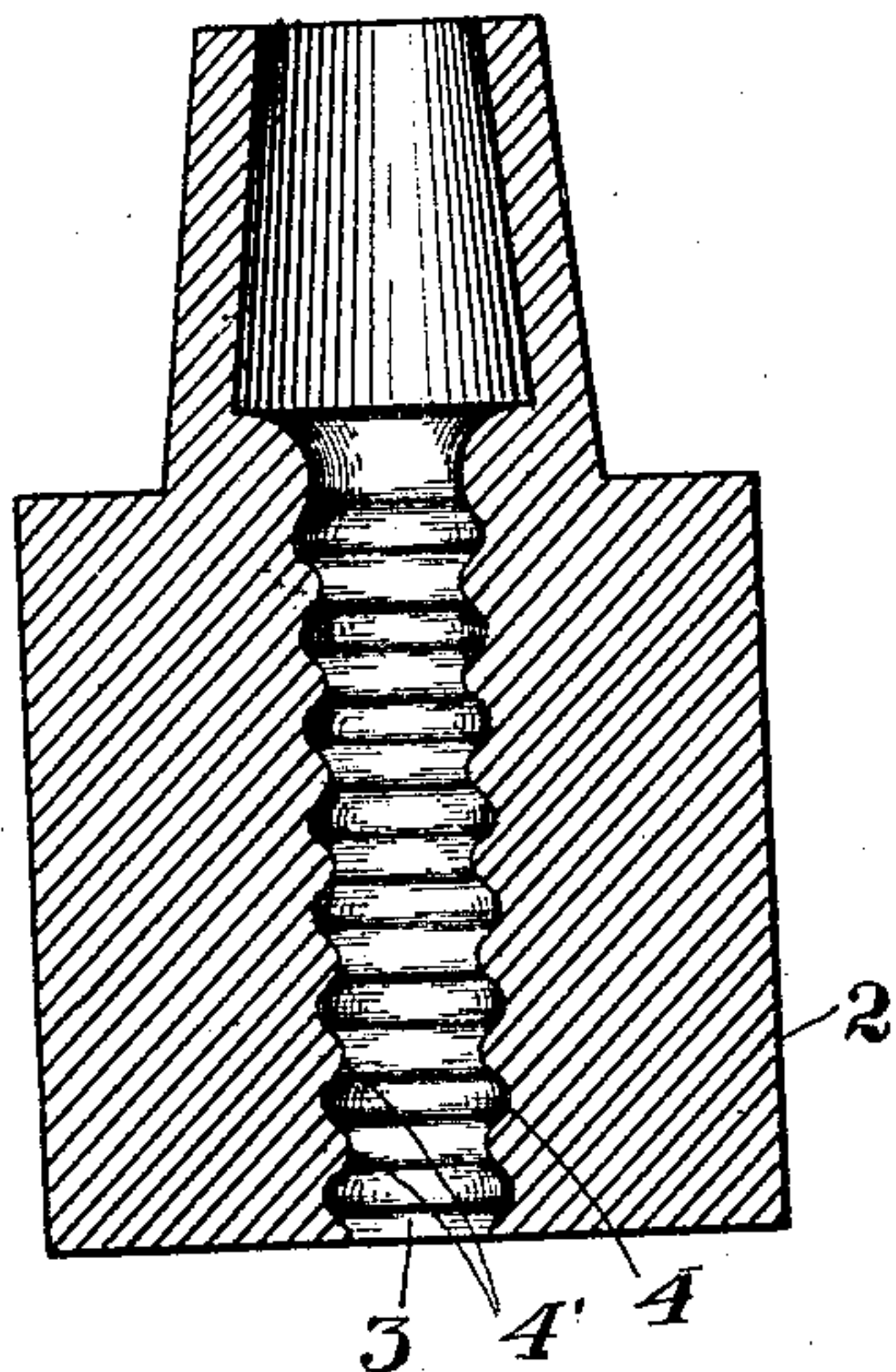


Fig. 2.

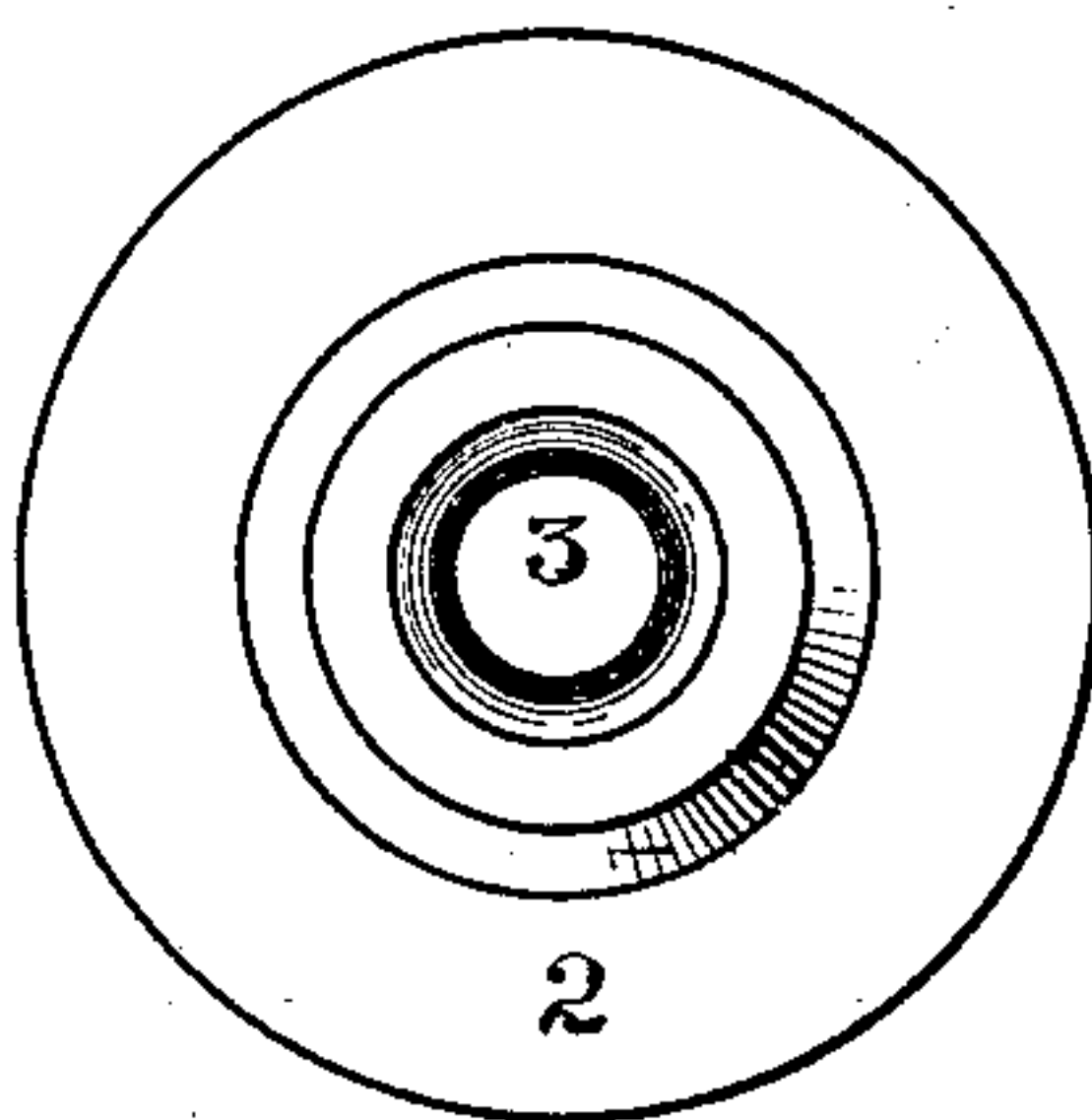


Fig. 4.

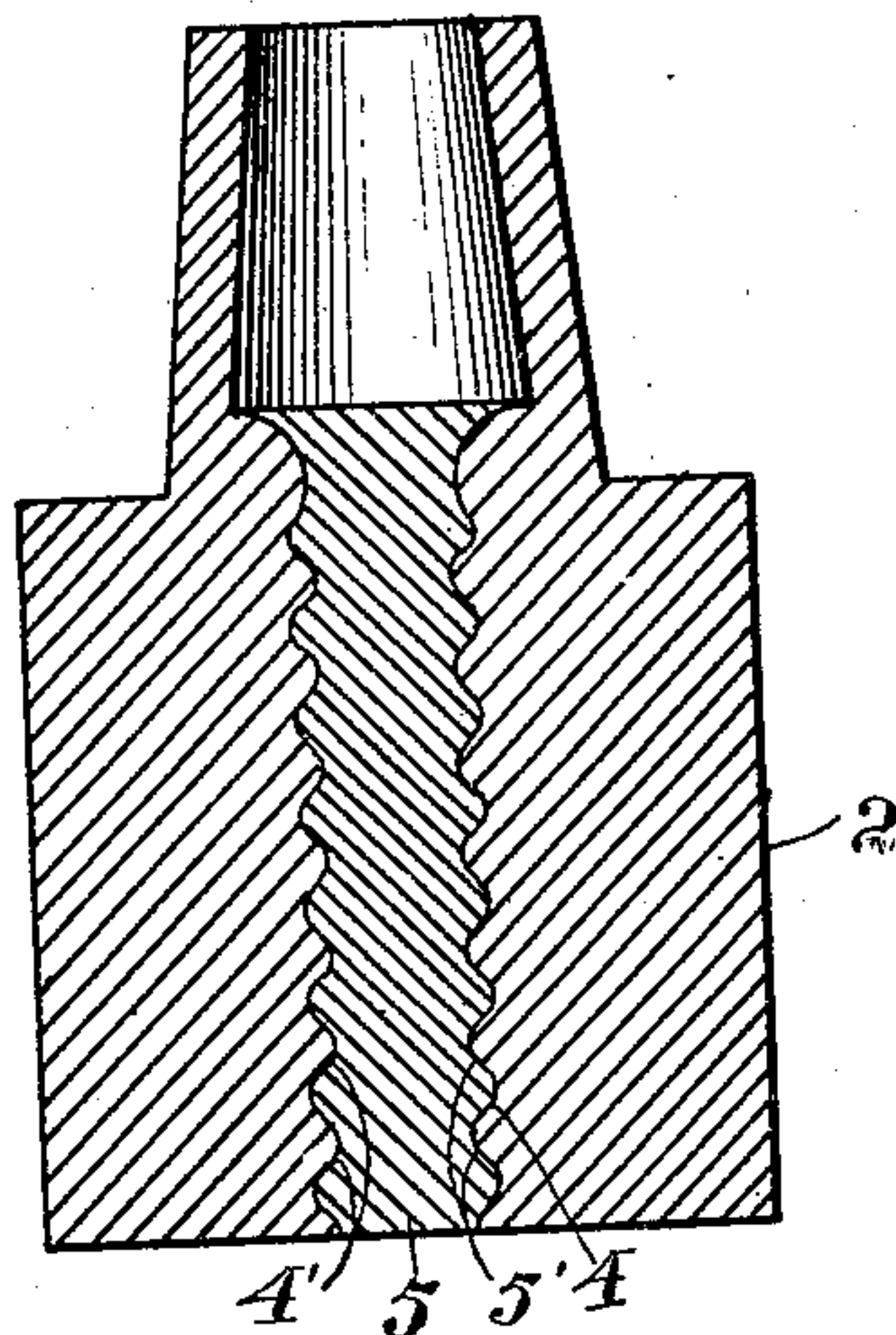
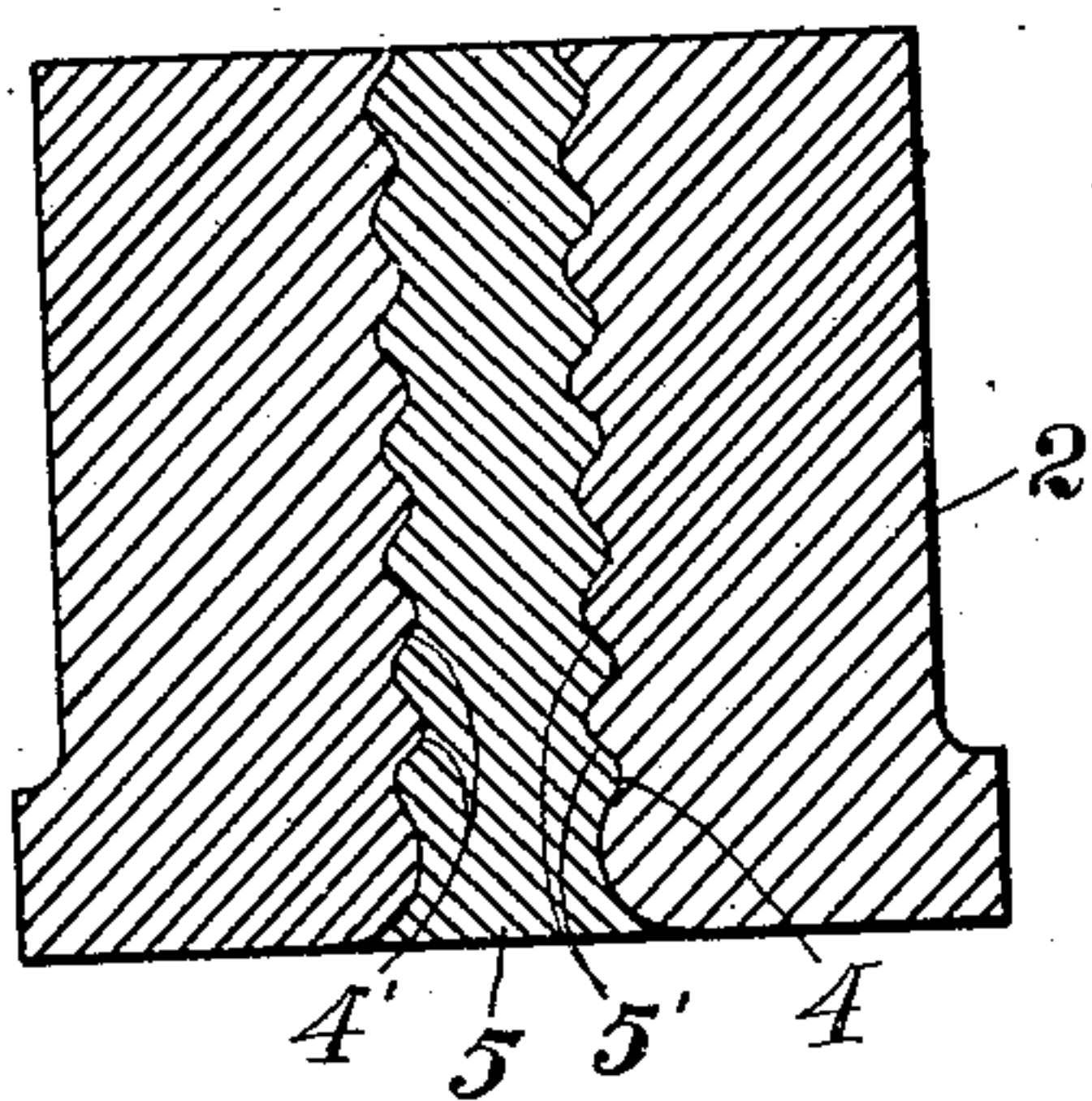


Fig. 3.



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WALTER BRINTON, OF HIGHBRIDGE, NEW JERSEY.

STAMP SHOE OR DIE.

SPECIFICATION forming part of Letters Patent No. 765,876, dated July 26, 1904.

Application filed April 8, 1902. Serial No. 101,890. (No model.)

To all whom it may concern:

Be it known that I, WALTER BRINTON, a citizen of the United States, residing in Highbridge, in the county of Hunterdon and State of New Jersey, have invented certain new and useful Improvements in Stamp Shoes or Dies, of which the following is a specification.

This invention relates to stamp shoes and dies for use in rock or other crushing mills, the object of the invention being to provide improved devices of this character formed of sections having a particular structure to facilitate the heat treatment thereof and by means of which also they are so interlocked that the separation of one from the other or the displacement thereof relatively to each other is not possible, whereby all the advantages of an integral device are obtained while providing a device commercially superior thereto.

Stamp shoes or dies for use in rock or other crushing mills have been manufactured in several ways—as, for instance, by making them solid—so as to obtain the requisite weight and resistance; but when it was desired to subject the shoe or die to heat treatment the solid mass of metal interfered materially with this step, since as such a mass of metal would conduct heat relatively slowly the interior of the shoe or die was heated or cooled much more slowly than the exterior, so that if rapid cooling was desired the interior would in consequence be less benefited than the exterior, this being especially true of manganese steel, which to be serviceable should be cooled very rapidly throughout the mass, the tendency of such steel being to cool irregularly on account of its poor heat conductivity. In order to get the full benefit of the treatment, manganese-steel castings after being heated are cooled quickly, generally by immersion in a cooling fluid or bath, the effect of which is to rapidly absorb the heat from the surfaces of the casting. If such casting is in the form of a ring or cylinder of the ordinary thickness of a stamp-shoe, such surface-cooling effect causes a rapid contraction of the part so affected, while the interior body of metal between the surfaces still contains a much higher degree of heat and is therefore contracting much more

slowly. It is therefore readily seen that during the whole process of treatment the interior heat must be absorbed through that part of the casting which has been more directly and rapidly affected by the cooling contact. It is generally accepted that the inner walls of a hollow cylindrical casting or a casting having a plain cylindrical or circular bore or inner surface form a very rigid arch, and as this surface is first affected in cooling therefore a perfectly-rigid arch is set up, the later contraction of the interior portion of the body of metal over such resistance of arch being sufficient to cause internal strains to develop in the later cooling portion of the body of steel. The advantages of the interior corrugations upon a ring or cylinder might also be applicable to the exterior of the same casting, but not permissible in a stamp-shoe, owing to the mechanical uses which it may be intended for. The resistance of the inner surface of the ring or cylinder provided with corrugations or broken surfaces while in a semiheated state does not set up such a rigid arch as does the plain surface. The diffusion of the interior heat of the casting radiating through these corrugated or broken surfaces also has a tendency to assist in the distribution and better equalization of the interior heat.

The form of heat treatment which may be used in practice for the metal from which the present structures may be manufactured consists in slowly heating to the desired temperature in a furnace the article after it has been cast and then immersing it in a cooling-bath, whereby it may be cooled much faster than if allowed to cool in the open air. In carrying out the heat treatment the casting may be placed in a furnace while such furnace is cold, after which fire may be started by igniting the fuel and regulating the supply of fuel and the access of air, whereby a gradual heating of the article is had until it assumes a bright-red color. This will generally take several hours, after which the castings are removed from the furnace and immersed in water. The water may be either fresh or brine, or any other preferable cooling-bath may be employed. To obviate this defect, the stamp shoes or dies were made with openings or

holes therein or therethrough, such heat-equalizing hole or holes thus facilitating very materially the heat treatment of the device, the hole being usually subsequently filled by
 5 a solid plug. In practice, however, it was found that in the constant use of the die and shoe the plugs work loose, frequently falling out and interfering materially with the proper working of the device, and while it has been
 10 attempted to wedge or otherwise secure these plugs in position dies or shoes constructed in this manner have not been free of the defects specified, since in the casting of the main body of the shoe or die irregularities, due to the
 15 shrinkage of the metal, caused settling around the opening—that is, the drawing away of the metal from the opening—and so left holes of irregular shape, so that when the plug (which heretofore has been in the form of a solid body)
 20 was fitted into the opening these irregularities in the wear of the device appear at the working surface of the die or shoe, permitting the plug to become loose and frequently drop out.

25 By constructing the dies and shoes in the manner herein set forth I am enabled to overcome these difficulties, since while still retaining the heat-equalizing opening or openings in the die or shoe, thereby to facilitate
 30 the heat treatment of such device, the wall of the opening is formed in such manner that it coöperates with the filling section or plug which is inserted not in the form of a solid plug, but cast therein, so that the sections of
 35 the die or shoe are so interlocked together, owing to their structure and without an independent or separate means, that to all intents and purposes the die or shoe is an integral structure, having all the advantages of such
 40 structure—namely, a filling-section not movable or separate from its body during the life of the shoe or die, but superior thereto, owing to its more uniform and thorough heat treatment.

45 In the drawings accompanying and forming part of this specification, Figure 1 is a vertical section of a shoe with its heat-equalizing opening unfilled. Fig. 2 is a top view thereof. Fig. 3 is a vertical section of a die
 50 with its heat-equalizing opening filled, and Fig. 4 is a vertical section of the shoe shown in Fig. 1 with its opening filled.

Similar characters of reference indicate corresponding parts in the different figures of the
 55 drawings.

As a preface to a further description of this improved die and shoe it will be understood that such dies and shoes may be made of various shapes and forms, being, however, illustrated herein as circular, and, if preferred,
 60 they could have one or more openings, one, however, of proper size being usually sufficient, and the opening or openings could extend into or all the way through the body of
 65 the device, as found most desirable in practice.

Since the die and the shoe are constructed in the same manner, a description of one will be deemed sufficient.

In the manufacture of this improved die or shoe the body 2, preferably formed of suitable unmachineable metal, although this is not
 70 absolutely necessary—such, for instance, as manganese-steel, which has been found to be particularly well adapted for the construction of devices of this character—is first cast in
 75 the usual manner with a heat-equalizing opening 3. This opening has its wall 4 formed with an irregular surface, comprising projections and grooves forming a corrugated wall
 80 4', adapted to interlock with the filling or plug. After the casting is cooled or cool enough to permit handling it is heated up to a predetermined temperature and then subjected to a cooling medium, such as a fluid—
 85 for instance, water. Various modes of cooling, however, according to the characteristics to be imparted to the device, may be used. After the toughening step is completed the body is placed in position to receive the filling-section 5, which may be of the same character
 90 of material as the body or of a different material, as found desirable, it being first in the form of molten metal, which is poured into the opening, filling the same and forming corresponding corrugated surfaces 5', interlocking rigidly with the surfaces of the
 95 body as such filling metal solidifies, thus fastening the section or plug against all possible displacement or separation during the life of the device. This mode of forming a shoe
 100 or die or analogous article results in the provision of a superior device, which while still retaining the heat-equalizing opening, so as to obtain the advantages resulting therefrom, enables the opening to be filled in such manner
 105 that the body and its filling-section are permanently interlocked, so that the device in use is equal in all respects to a solid piece of metal and even superior thereto, since it has received a more thorough heat treatment.

The corrugations or interlocking surfaces not only afford an interlock for retaining the filling-plug in position, but from practical experience it is known that they facilitate to a
 110 large extent the heat treatment of the article, since there is less likelihood of internal strains setting up while taking up heat and also less likelihood of the casting being affected by internal strains while giving up the heat or
 115 cooling. This mode of forming the heat-equalizing opening thus insures a more uniform expansion during the heating of the article and a more uniform contraction thereof during the cooling, thereby preventing abnormal and irregular strains and subsequent
 120 cracking of the casting, and by this process I am able to produce a shoe or die of manganese steel commercially superior to anything heretofore produced. By this improved
 125 method a sufficient toughening of the filling
 130

or plug is also obtained without independent heat treatment thereof, owing to the molten metal of which said filling is composed coming in contact with the cold corrugated walls of the casing or body. Moreover, owing to this mode of forming the device the necessity of filling the upper part or that part which may be designated the "shank" of the shoe is avoided, and since this is thrown into the scrap heap after the body of the shoe is worn out a material reduction in the weight of scrap metal is obtained.

Having described my invention, I claim—

1. A stamp shoe or die of manganese steel comprising a heat-treated body portion having corrugated inner walls, and a metal plug cast into said opening and conforming to said walls.

2. A stamp shoe or die comprising an outer body of cast and toughened manganese steel having a central opening throughout its en-

tire length the walls whereof are corrugated; and a plug of cast and toughened manganese steel having its surface in engagement and interlocked with the corrugated walls of the central opening of said body.

3. A stamp shoe or die comprising an outer body of cast and toughened manganese steel having an inner strain-breaking corrugated wall; and a plug of toughened manganese steel cast into said opening and having its walls conforming to and interlocking with the inner walls of said body.

4. A shell for a stamp shoe or die comprising a body of cast manganese steel having a central opening therein throughout its entire length, the walls whereof are corrugated.

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Witnesses:

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