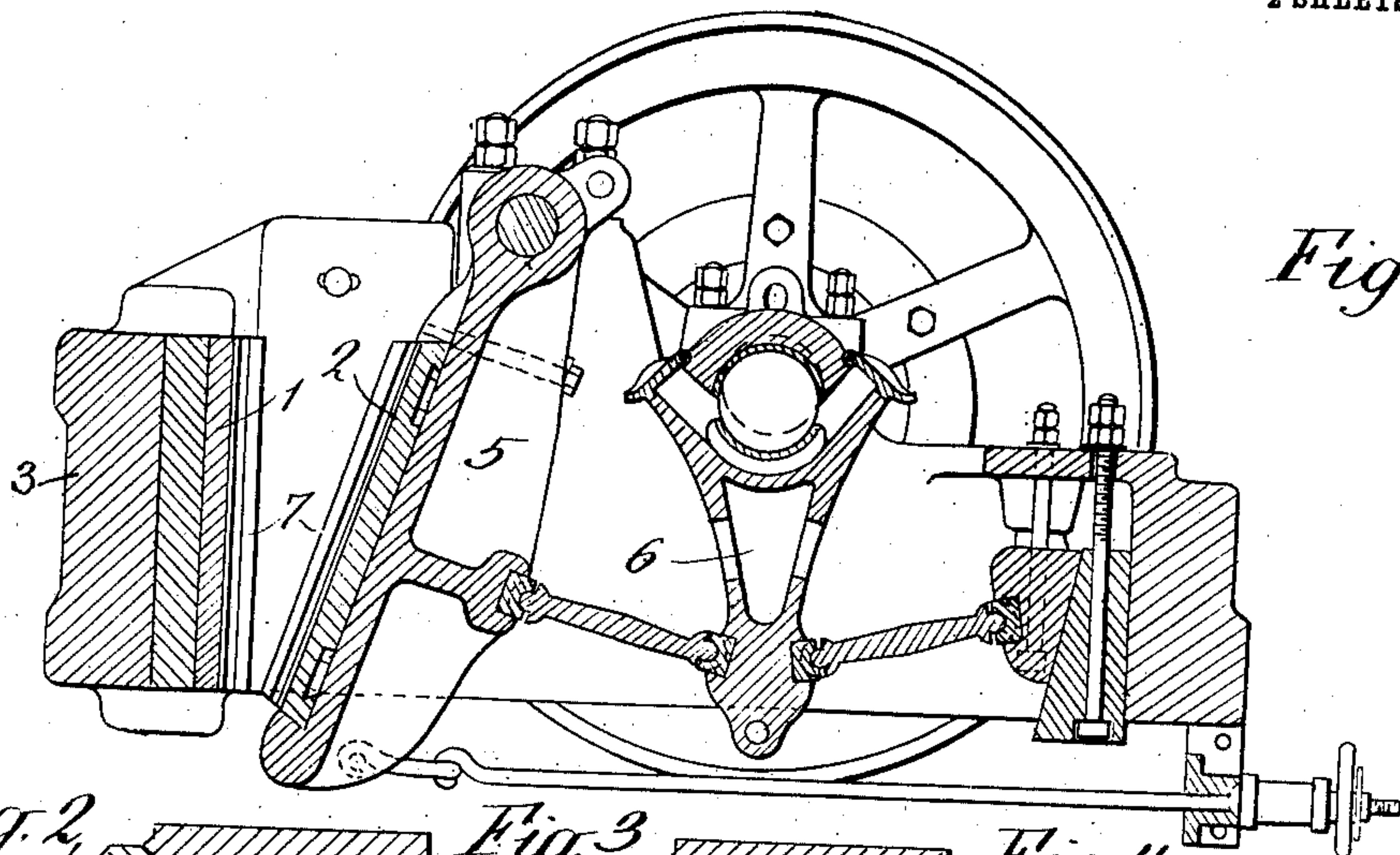


No. 883,619.

PATENTED MAR. 31, 1908.

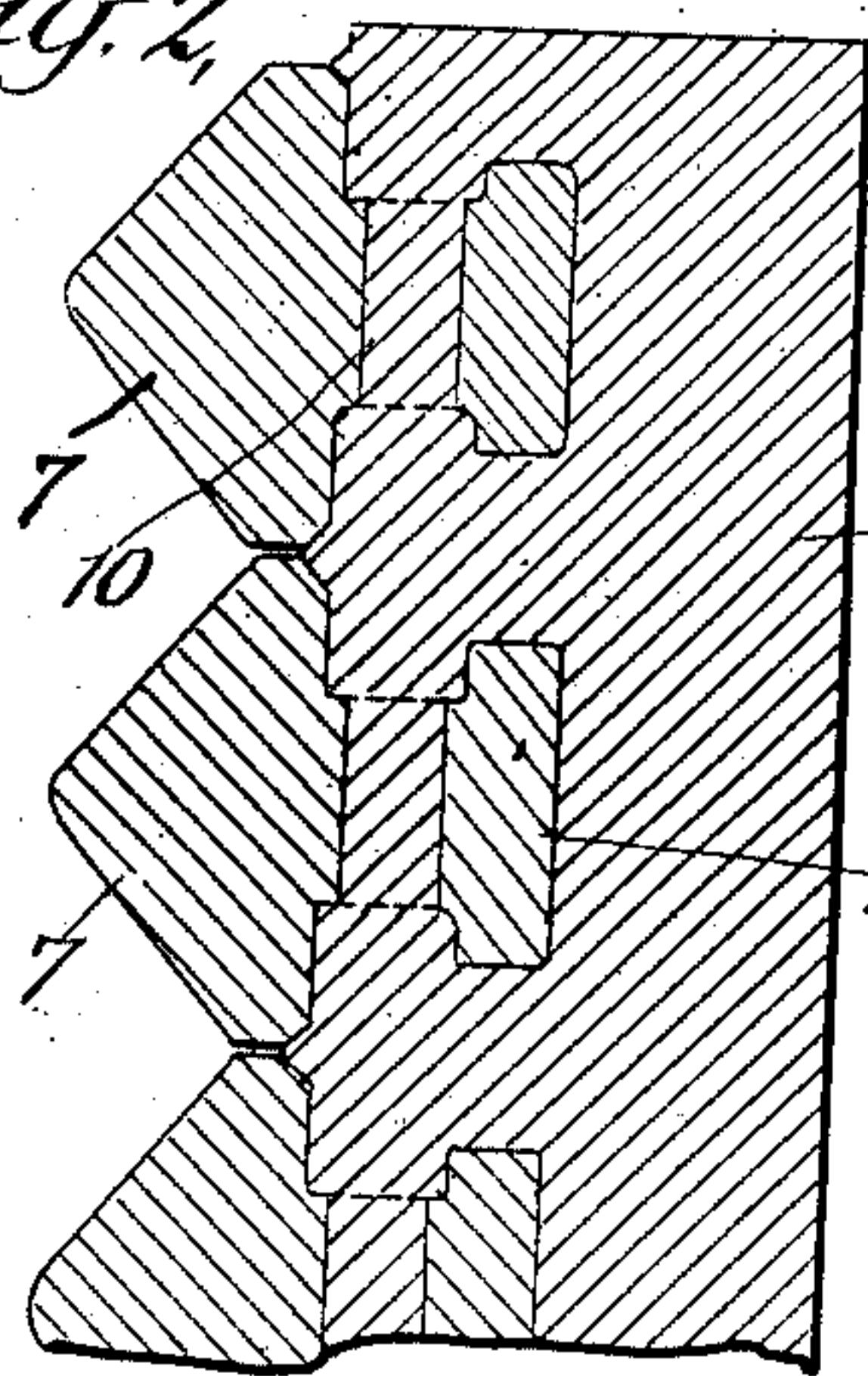
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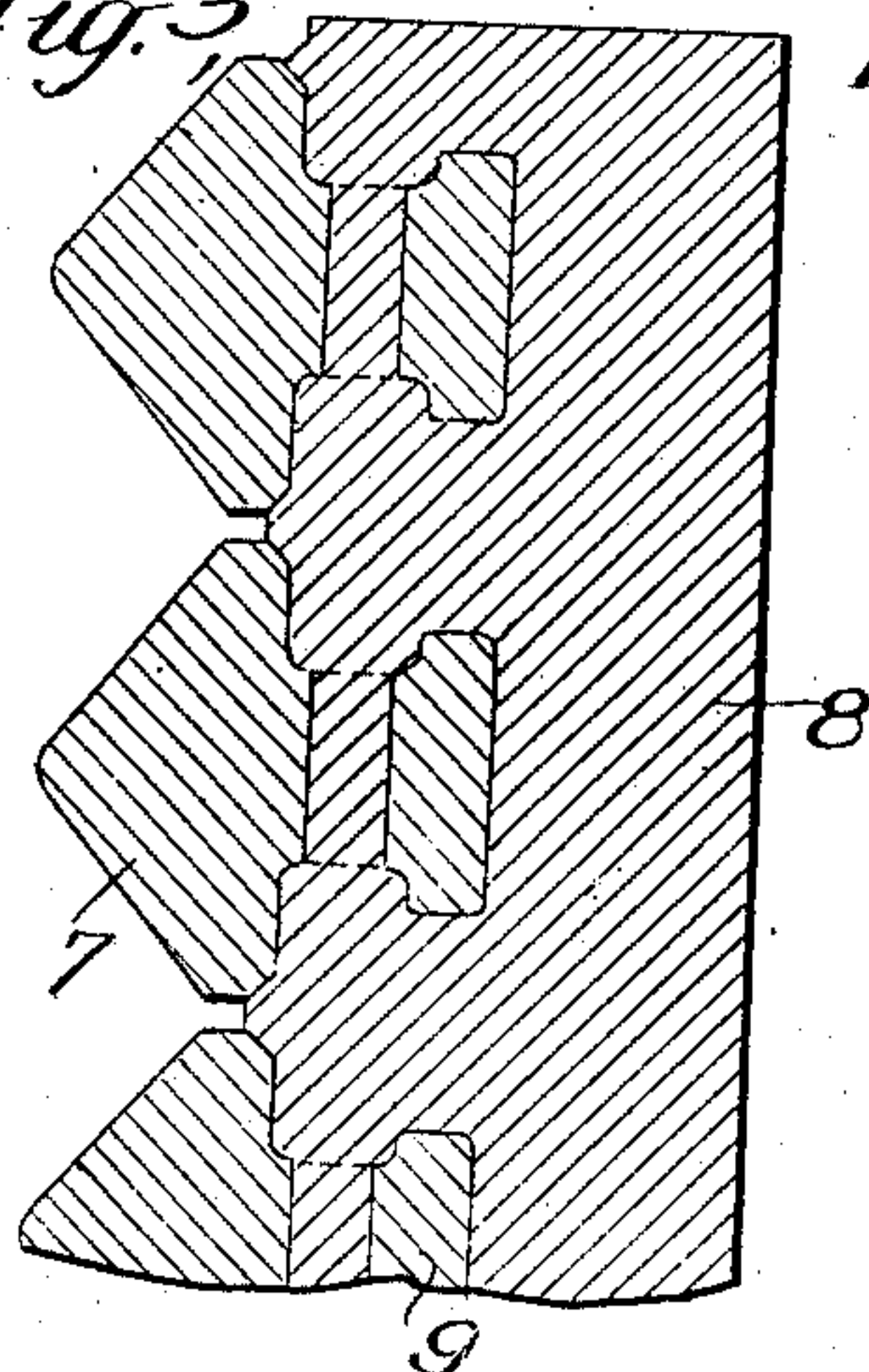


*Fig. 1,*

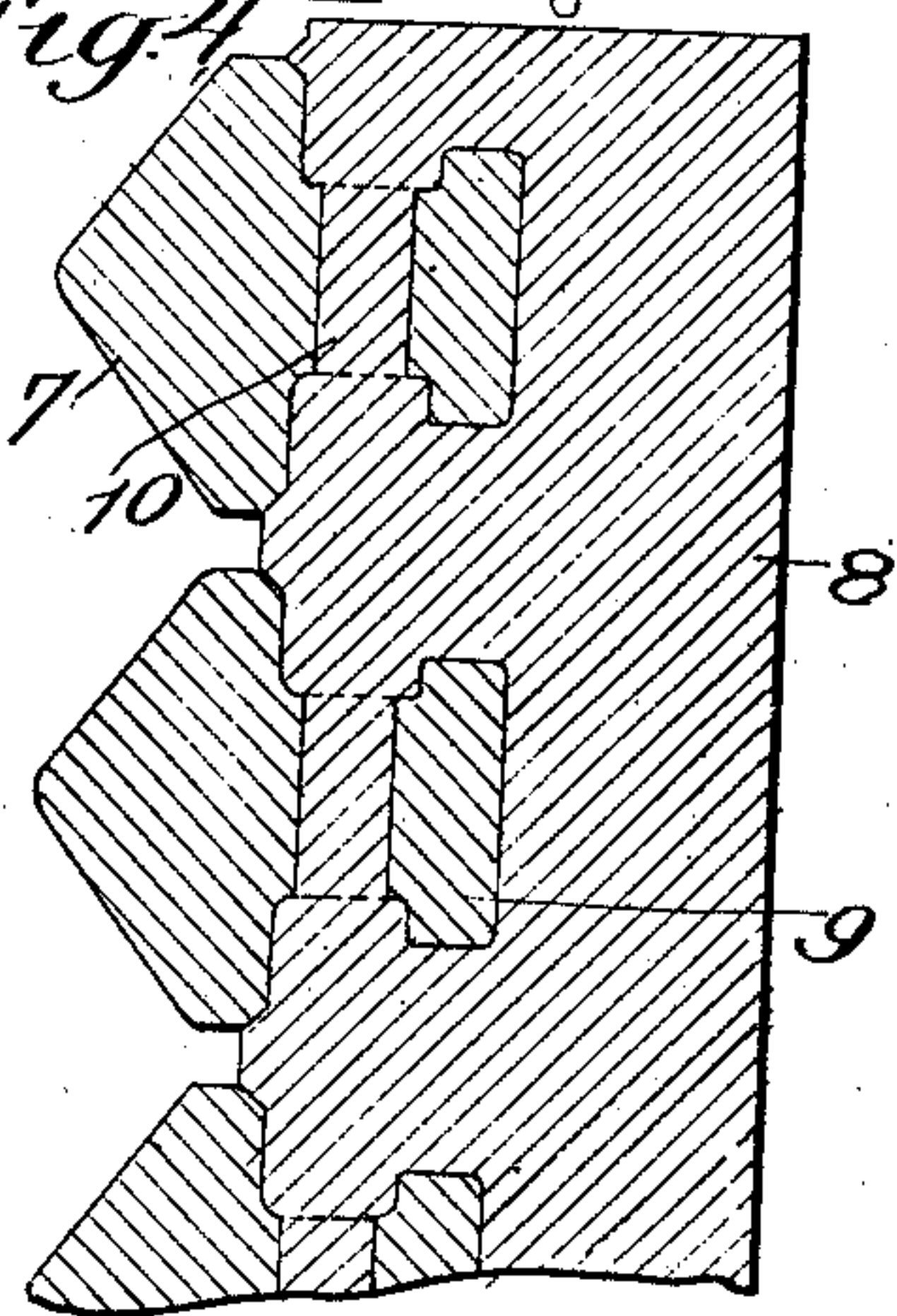
*Fig. 2,*



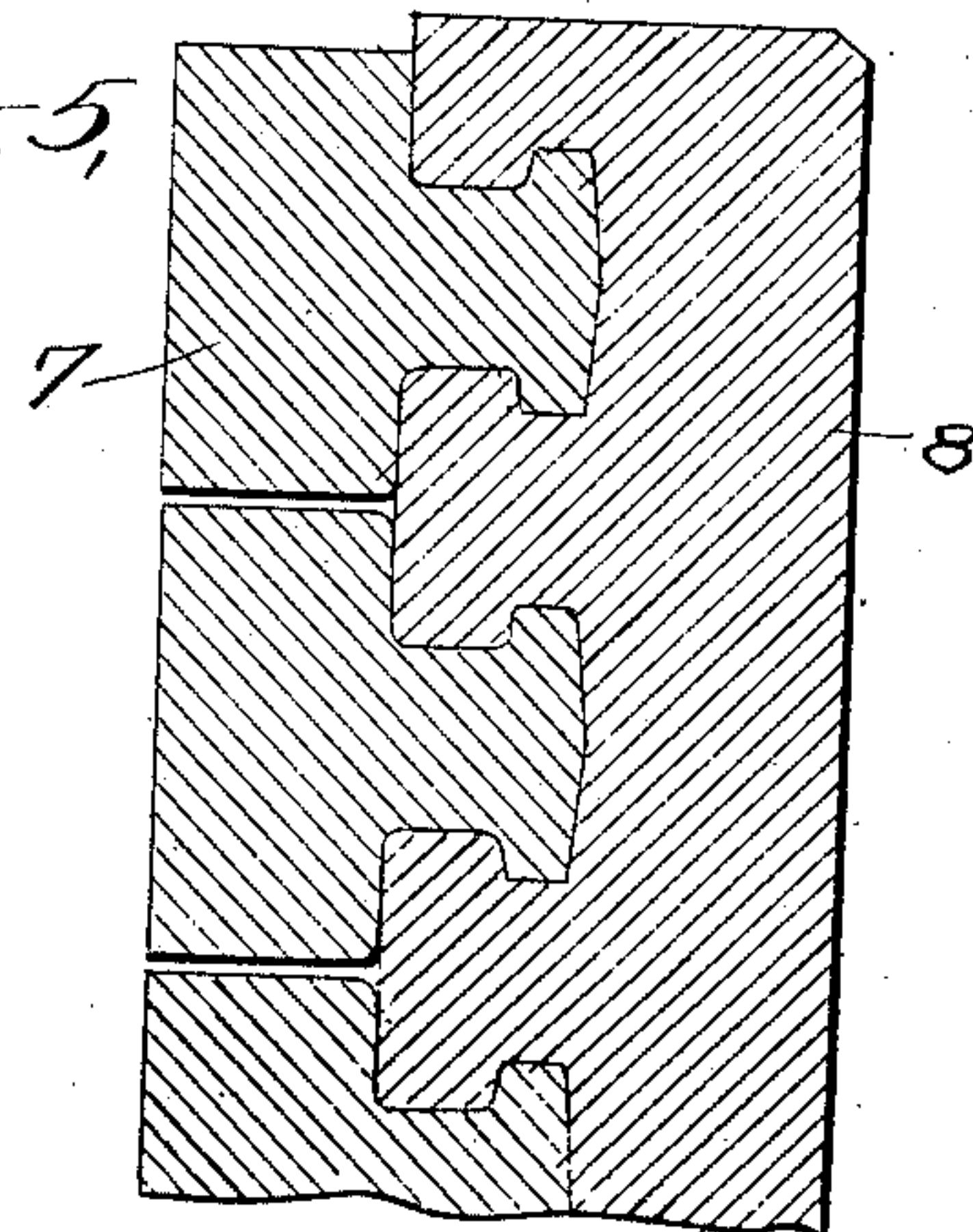
*Fig. 3,*



*Fig. 4,*



*Fig. 5,*



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2 SHEETS—SHEET 2.

Fig. 6.

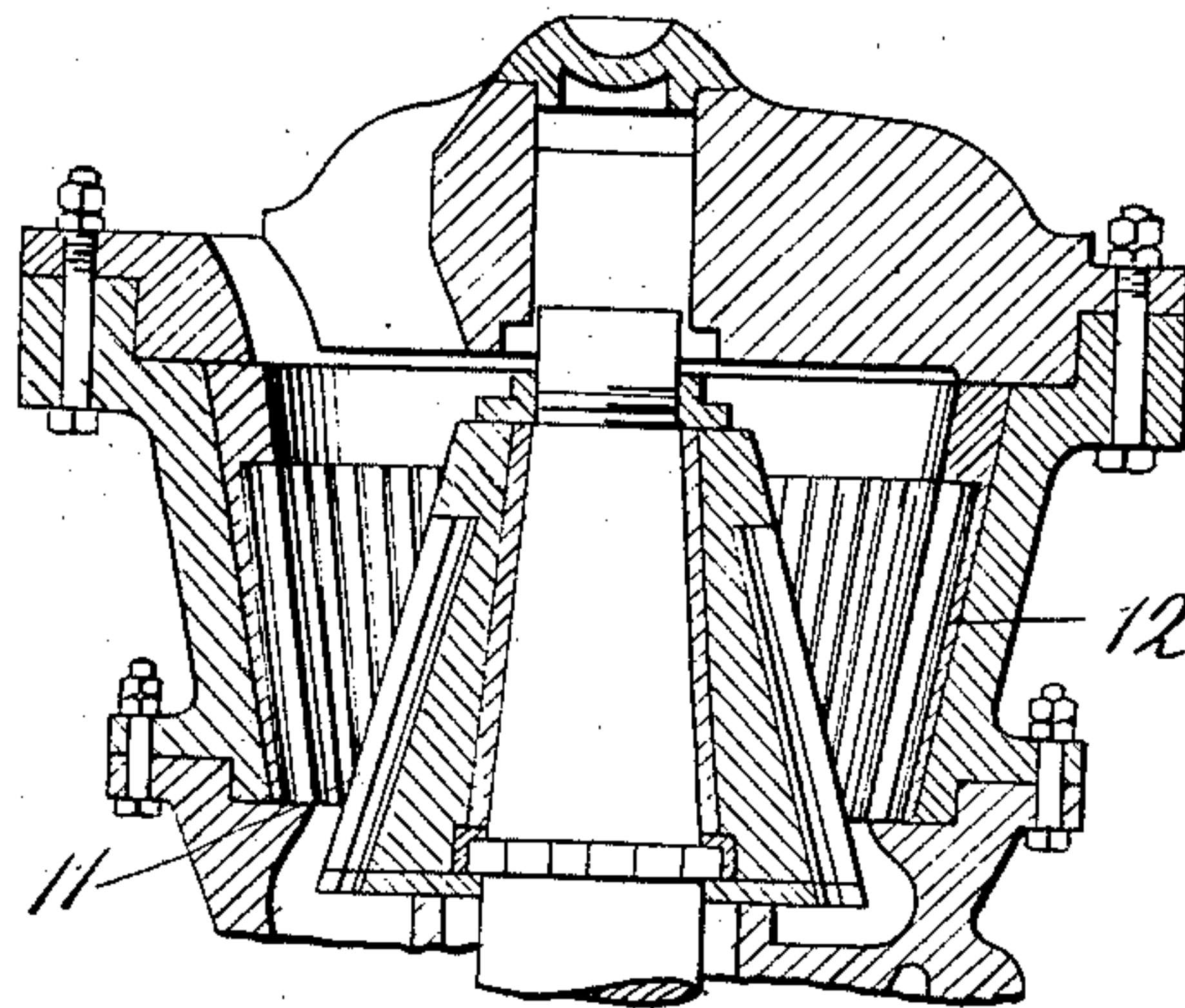


Fig. 7.

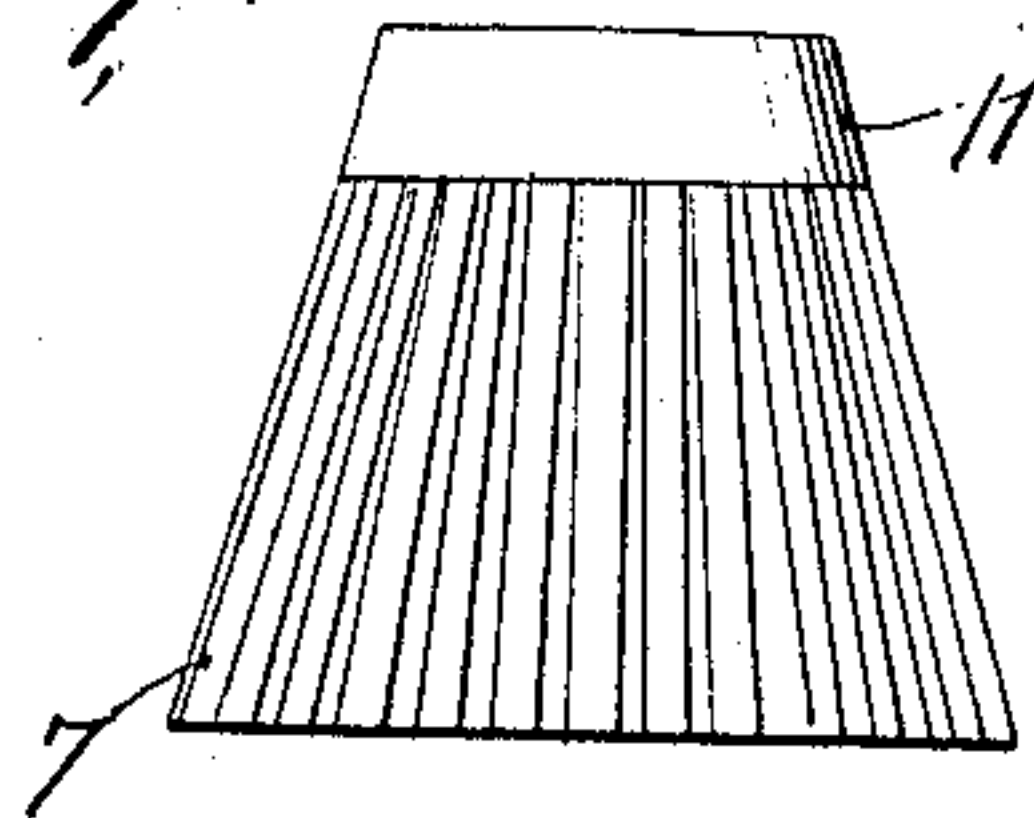


Fig. 8.

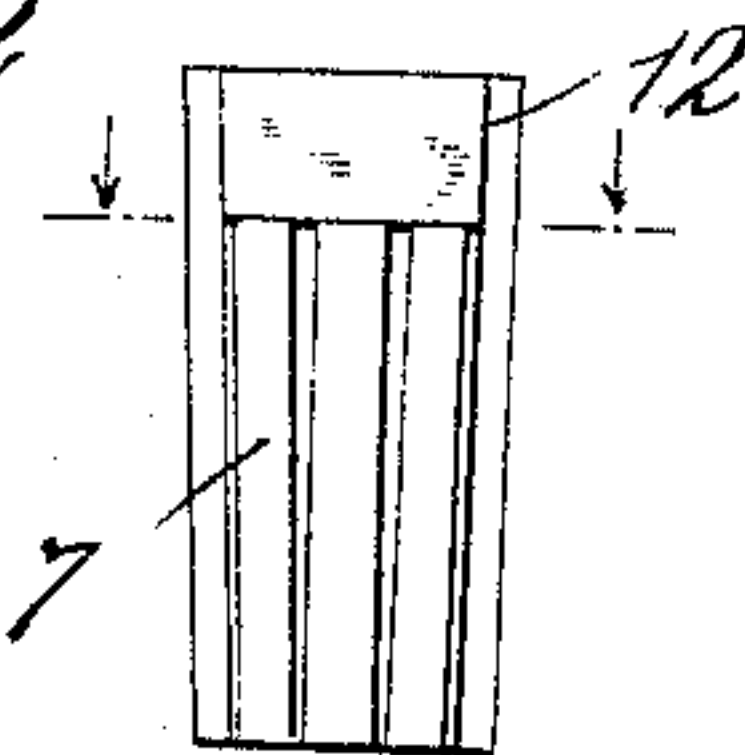


Fig. 9.



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# UNITED STATES PATENT OFFICE.

FERDINAND MORA CANDA, OF NEW YORK, N. Y.

## CRUSHER PLATE, HEAD, AND THE LIKE.

No. 883,619.

Specification of Letters Patent.

Patented March 31, 1908

Application filed March 28, 1906. Serial No. 307,996.

*To all whom it may concern:*

Be it known that I, FERDINAND MORA CANDA, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Crusher Plates, Heads, and the Like; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates generally to improvements in rock crushers and particularly to improvements in the wearing faces or elements of such crushers, and consists in a wearing plate or element comprising ribs of hard material, projecting from a backing of softer and usually tougher material cast about their bases, and in other features of invention, all as more fully hereinafter described and pointed out in the claims.

The objects of my invention are to improve the construction of the wearing elements of rock crushers and the like; to make the same stronger, harder and more durable and less expensive; and to facilitate the manufacture of such elements to fit the crushing apparatus of different manufacturers.

I will now proceed to describe my invention with reference to the accompanying drawings, illustrating the application of the invention to certain types of rock crushers, and will then point out the novel features in claims.

In the said drawings: Figure 1 shows a vertical section of one well known type of rock crushers; Figs. 2, 3 and 4 are similar sections of crusher plates for a rock crusher of the type shown in Fig. 1, showing how by different spacing of the cast-in ribs of such plate one type and size of rib may be used in producing crusher plates for different sizes and makes of rock crusher. Fig. 5 is a sectional view similar to Fig. 2, illustrating an alternative construction. Fig. 6 is a central vertical section of a portion of a gyratory crusher, illustrating the application of my invention thereto; Fig. 7 is a detail elevation of a head for such a machine constructed in accordance with my invention; and Figs. 8 and 9 show respectively an elevation, and a part elevation and part transverse section, of a liner ring for such a machine, likewise constructed in accordance with my invention.

Rock crushers, as for example jaw crushers

such as shown in Fig. 1, are provided with removable face plates, since these faces are subject to excessive wear and must be renewed from time to time. These faces or wearing plates are commonly provided with teeth, ribs or corrugations. To reduce their wear so far as possible, these plates, which are customarily made integral, are made of very hard material, as for example, chilled cast-iron or manganese steel—the latter a very expensive material. Not only must these plates be very hard, but they must be quite strong and preferably should be tough and not brittle, though it is difficult to find a material which has at once the requisite hardness and the requisite toughness.

High carbon steel, such as tool steel, possesses to a high degree the qualities required for the faces of crusher plates, being very hard, particularly when properly tempered or hardened, and also having great surface toughness and so being not at all likely to crumble. However because of its high cost, and for other reasons, it is hardly practicable to make crusher plates entirely of forged tool steel. A cast plate made of such steel cannot be hardened or tempered without great risk of breaking during the hardening process.

According to my invention I produce crusher plates and similar wearing elements of rock crushers, by forming bars of high carbon steel or other hard steel of the proper section, placing such bars at suitable distances apart in a suitable mold, and pouring low carbon steel or cast-iron about the bases of these bars, thereby producing plates consisting of hard steel ribs, cast into a backing of cheaper and, usually, tougher material. When the backing is of low carbon steel, the heat of the molten steel and the pressure due to its solidification and shrinking about the bases of the cast-in ribs, is usually sufficient to weld these ribs into the metal of the cast base, such low carbon steel or iron being of relatively high melting point; but whether or not a weld be aimed at, I preferably form the bases of the ribs so that when the molten metal is cast about them said ribs are firmly locked into the mass of the cast metal and are held immovably therein. Such a shaping of the base of the ribs aids materially in the proper distribution of stresses and strains in the plate as a whole and adds to its life. In this way I am able to produce crusher



plates and similar elements of rock crushers having a ribbed face of very hard material and a backing of softer but tougher material, and I am able to do this very cheaply. Moreover, by spacing the ribs at different distances from each other, I am able to produce plates for practically all the standard makes and sizes of rock crushers, using only one or two sizes of ribs. I am thereby enabled to keep such ribs in stock and to fill orders quickly for any of the commercial forms of rock crushers, as the casting of the plates is a simple matter.

By rolling out tool steel bars they can not only be given any desired shape and dimension but they are given a fibrous structure as well. When these bars are assembled to give the desired crusher face and soft steel is cast about their bases, a compound plate is produced having the tool steel bars protruding from, and forming the face of, a relatively large mass of metal. While a tool steel bar of the character described cannot well be given a fractional tempering, or a tempering on one face only, in combination with the mass of metal such a fractional tempering can be easily given. Upon plunging the heated compound plate in water, the exposed angle faces of course take a temper while the body of the bar, or its base, being surrounded by a mass of hot metal, chilling but slowly by conduction, does not take a temper but remains tough and fibrous. The tempering operation of course produces but little effect on the soft metal of the base.

Referring now to the accompanying drawings and at first to Fig. 1: numerals 1 and 2 designate wearing-plates such as above referred to and such as may be constructed according to my invention, the former of said plates being carried by the main frame 3 and the plate 2 being carried by the jaw 5. I have shown the familiar toggle mechanism 6 for operating jaw 5.

Numerals 7 designate the above mentioned ribs of plates 1 and 2.

Referring now to Figs. 2, 3 and 4, which are similar views showing how by spacing the ribs differently, I am able to produce plates of different dimensions, numerals 7 designate the said ribs and 8 the cast backing therefor. I preferably form these ribs with working portions of substantially triangular sections, said working portions or heads, having projecting from their rear sides, base portions 9 flanged slightly as shown. Ribs of this section may be produced very readily by rolling, and may be cut to length as desired. In making a plate by the use of such ribs, the said ribs are placed at proper distances apart in a mold for the plate, and molten metal to form the backing 8 is cast around their base portions as shown, the molten metal surrounding the flanges of these base portions, and thereby firmly interlocking with the ribs, making

them absolutely immovable when the cast metal has set. To further interlock the ribs with the cast base, I sometimes form perforations 10 in the neck portions of such bases, as illustrated, and in such cases the molten metal will flow into such perforation and form keys to unite the ribs to the base metal. However, sometimes I omit the perforation of the ribs as indicated in Fig. 5. The plate when so produced may have its ribs hardened or tempered in the ordinary manner. The presence of the backing 8 does not prevent such hardening or tempering, the said backing, if of steel, being customarily of such low carbon steel that it will not harden to any great extent, but remains tough. In this way a plate with a very hard surface and a very tough back may be secured.

In general I prefer to make the ribs of bars which have been rolled or forged, as a material which has been so worked has a fiber better adapting it to resist abrasion than a cast material. Also, the forged material can be tempered readily, while a cast steel of sufficient carbon to take temper, would, in all probability, break during the tempering processes.

My invention is not limited to the formation of plates for jaw crushers, but is applicable to the formation of wearing surfaces for rock crushers of all types. In Figs. 6, 7 and 8 I have illustrated the application of my invention to a crusher of the gyratory type. In Figs. 6 and 7 numeral 11 designates a head for such crusher having cast-in ribs as illustrated in the preceding figures. I may make either the head 11 or the rings 12 or both according to my invention, and in Fig. 8 have illustrated one section of such a ring so formed—such rings being usually built up of a number of segments or sections. When forming the segment of the ring of the gyratory crusher, according to my invention, I commonly use flat headed ribs and place them close together so that practically a smooth surface is formed. And I may use similar ribs similarly arranged to form flat wearing surfaces for any other crusher element. Thus, in Fig. 5 I have shown ribs so arranged for a crusher plate of a jaw crusher. The advantage of forming the wearing surfaces of the plate or other crusher element by means of separate ribs cast into a base, instead of forming such wearing face in one piece is, that thereby I am able to harden or temper the ribs without destructive warping or breaking such as would inevitably occur if the hardened surface were in one piece. As is well known, steel when hardened or tempered undergoes slight change in form. Unless due provision be made for this change in form the hardening or tempering causes warping. When the wearing surface is formed of a series of separate ribs secured to a common backing, as above described, the



several ribs may be hardened and tempered without change in form of the plate or wearing element as a whole.

What I claim is:—

- 5 1. A wearing face or element for rock crushers and the like comprising a series of hard ribs forming a practically continuous crushing surface, each of said ribs being provided with a reduced lower portion of a shape adapted to interlock with a base and  
10 a softer and tougher cast metal base engaging, interlocked with and shrunk on said reduced lower portions and filling the space therebetween.
- 15 2. A wearing face or element for rock crushers and the like comprising a series of ribs of high carbon steel forming a practically continuous crushing face, each of said ribs being provided with a reduced lower  
20 portion of a shape adapted to interlock with a base, and a softer and tougher cast metal base engaging, interlocked with and shrunk on said reduced lower portions and filling the space therebetween.
- 25 3. A wearing face or element for rock crushers and the like, comprising a series of angle-faced ribs of high carbon steel, each of said ribs being provided with a reduced lower portion of a shape adapted to inter-  
30 lock with a base, and a cast metal base of low carbon steel cast around, engaging, interlocked with and shrunk on said reduced lower portions and filling the space therebetween.
- 35 4. A wearing face or element for rock crushers and the like, comprising a series of ribs having heads and reduced lower portions, the latter being flanged, and a softer

and tougher cast metal base enveloping said flanged lower portions, shrunk thereon and  
40 filling the spaces therebetween.

5. A wearing face or element for rock crushers and the like, comprising a series of ribs having heads and base portions, the latter being reduced and provided with per-  
45 forations, and a softer and tougher cast metal base enveloping and shrunk on said reduced lower portions and entering the perforations.

6. A wearing face or element for rock  
50 crushers and the like, comprising a series of angle-faced hardened steel ribs having reduced lower portions, said series together forming a practically continuous crushing face, and a softer and tougher cast metal  
55 base enveloping said reduced lower portions, shrunk thereon and filling the spaces therebetween.

7. A wearing face or element for rock  
60 crushers and the like, comprising a series of angle-faced rolled ribs of fibrous high carbon steel, said series of ribs together forming a substantially continuous crushing face and said ribs below said face being provided with reduced lower portions, and a soft, cast,  
65 low carbon base plate enveloping such reduced portions and shrunk thereon and filling the space therebetween, such low carbon plate being mechanically interlocked with the reduced portions.  
70

In testimony whereof I affix my signature, in the presence of two witnesses.

FERDINAND MORA CANDA.

Witnesses:

H. M. MARBLE,  
MAY I. TRIMBLE.