

No. 696,138.

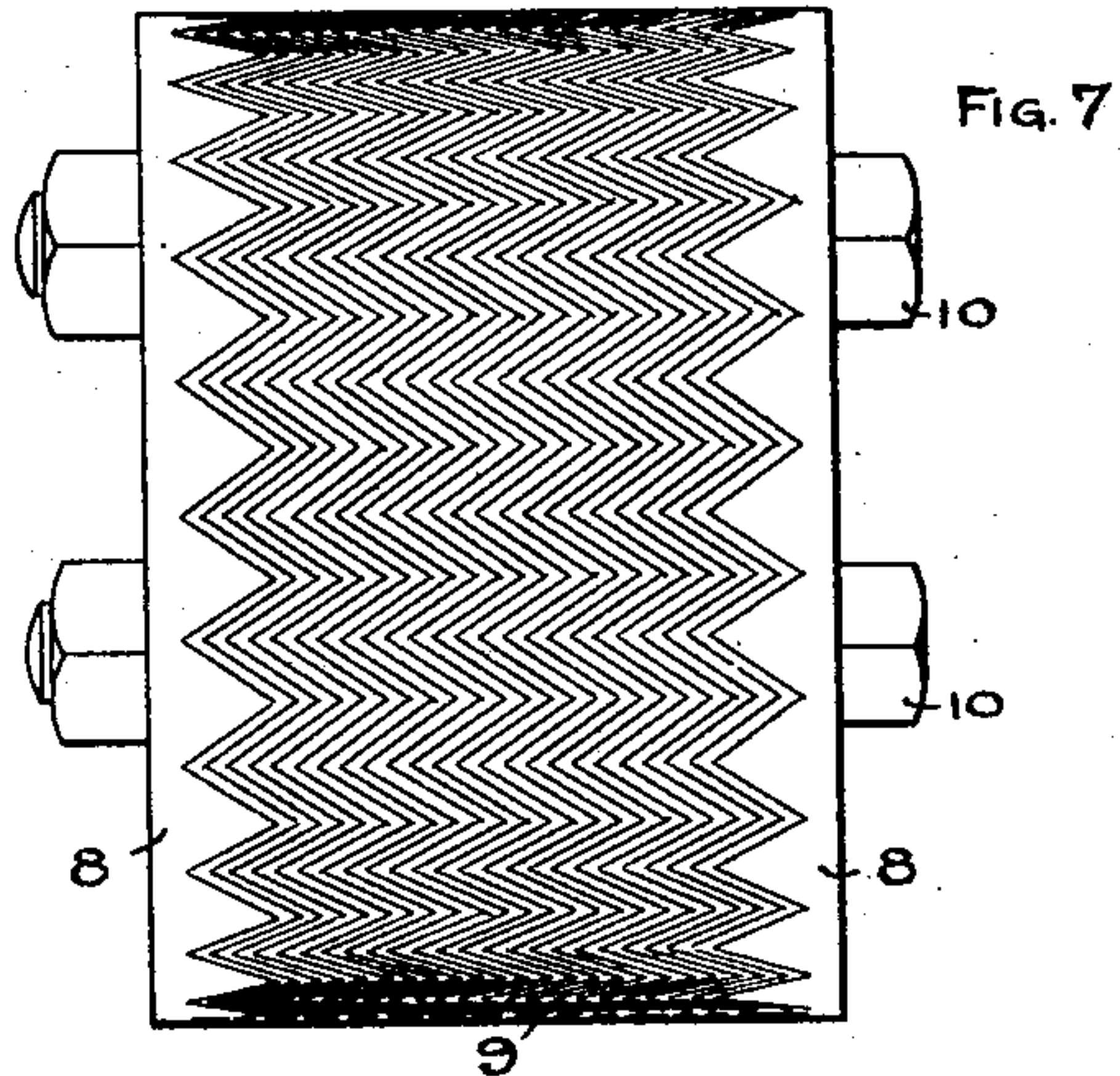
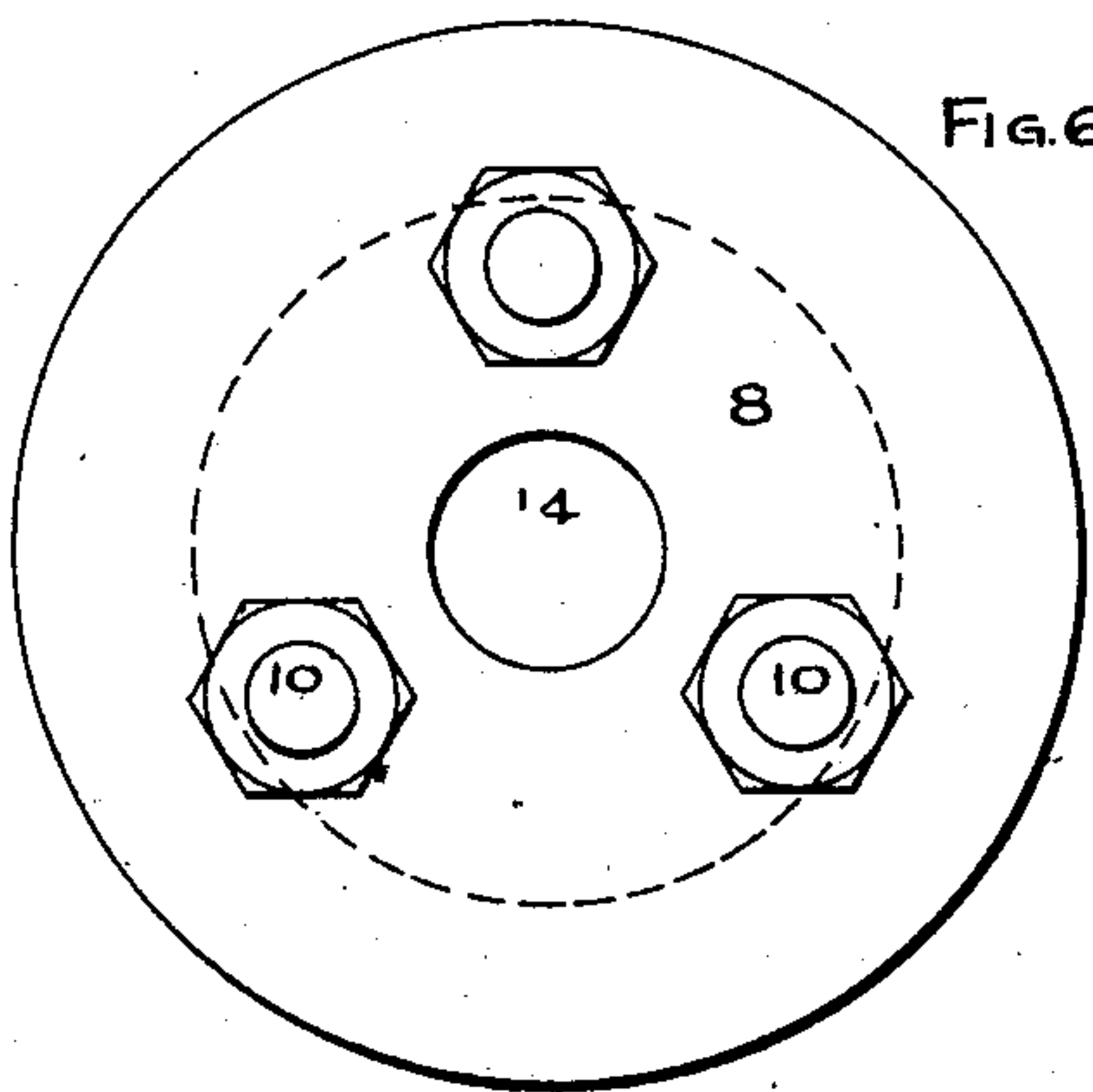
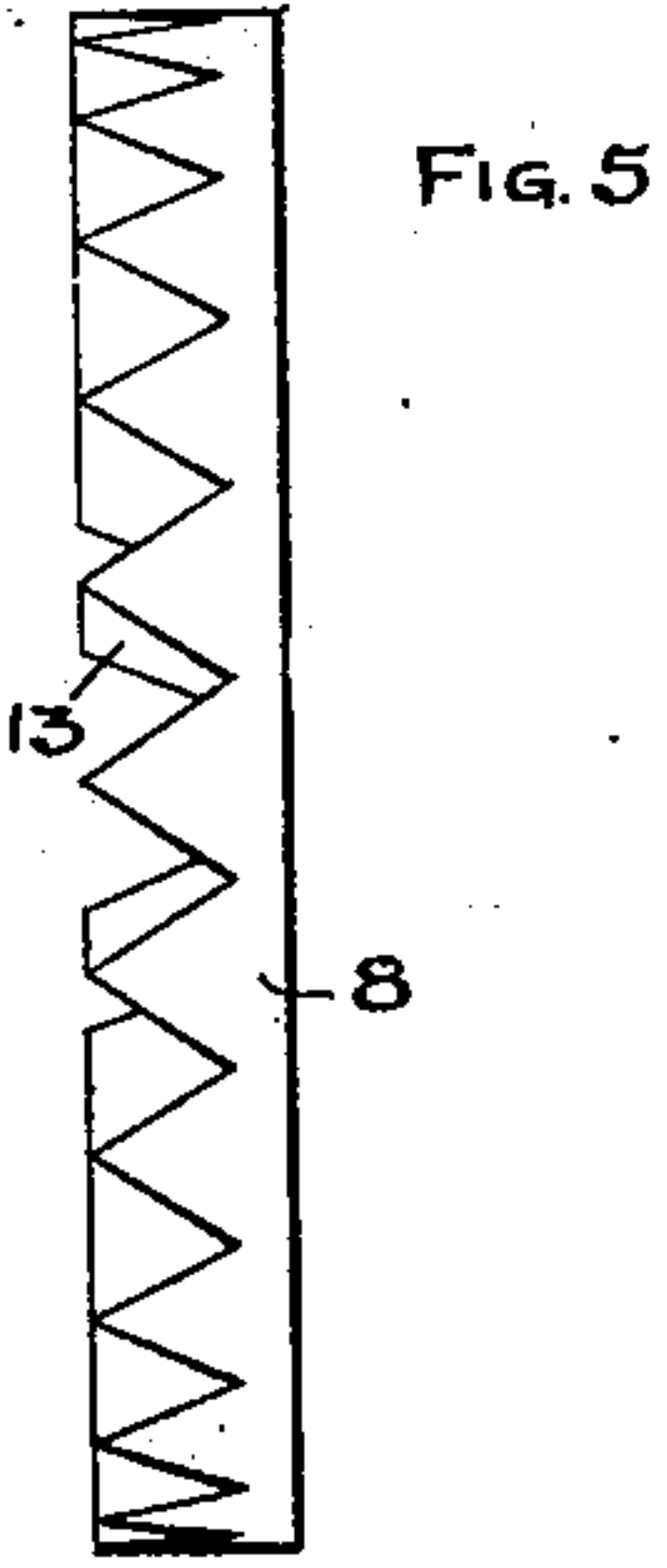
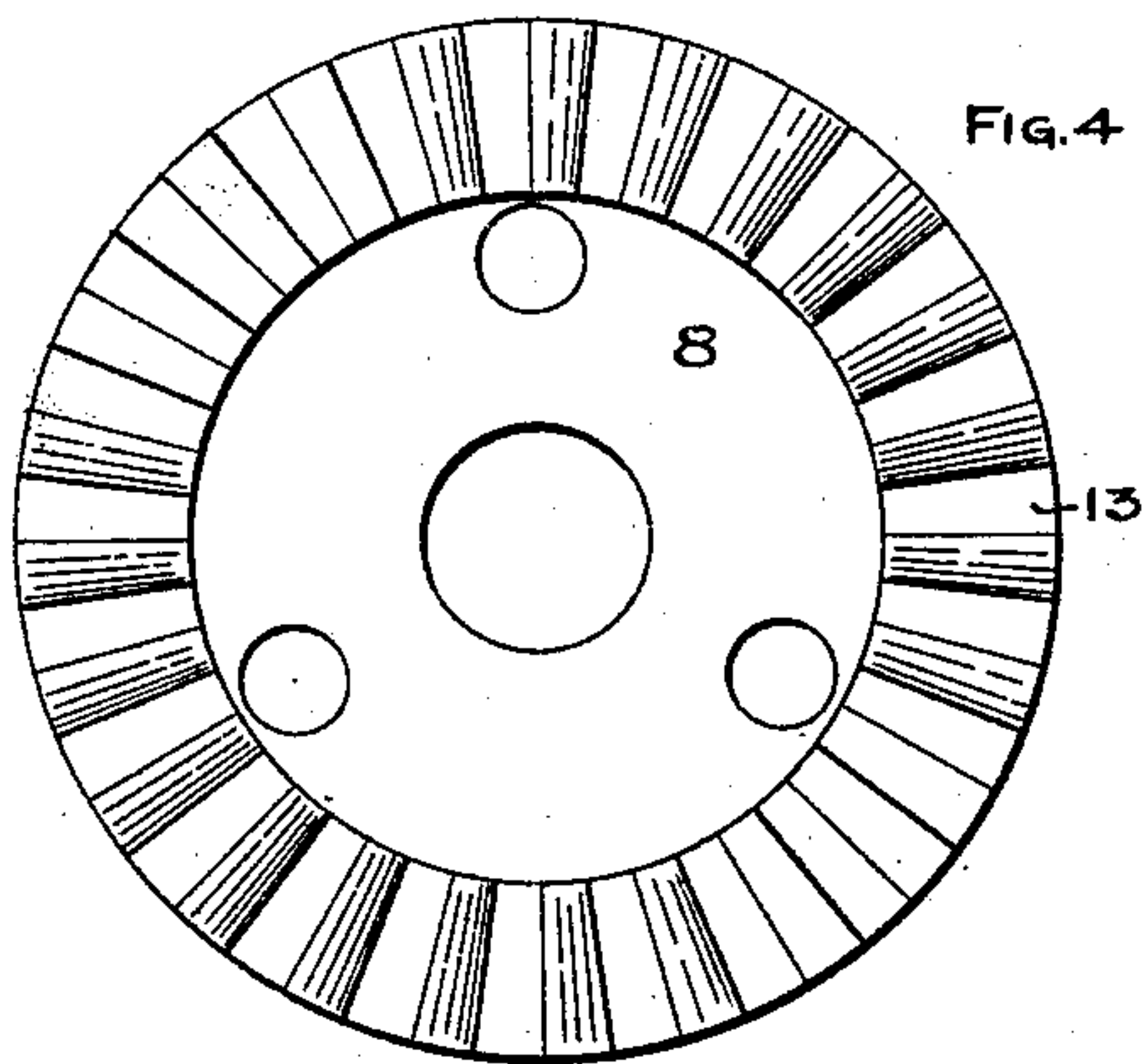
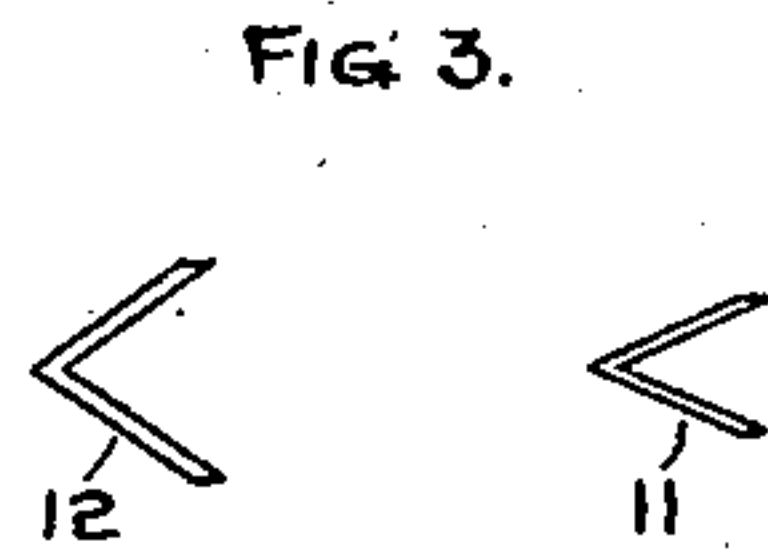
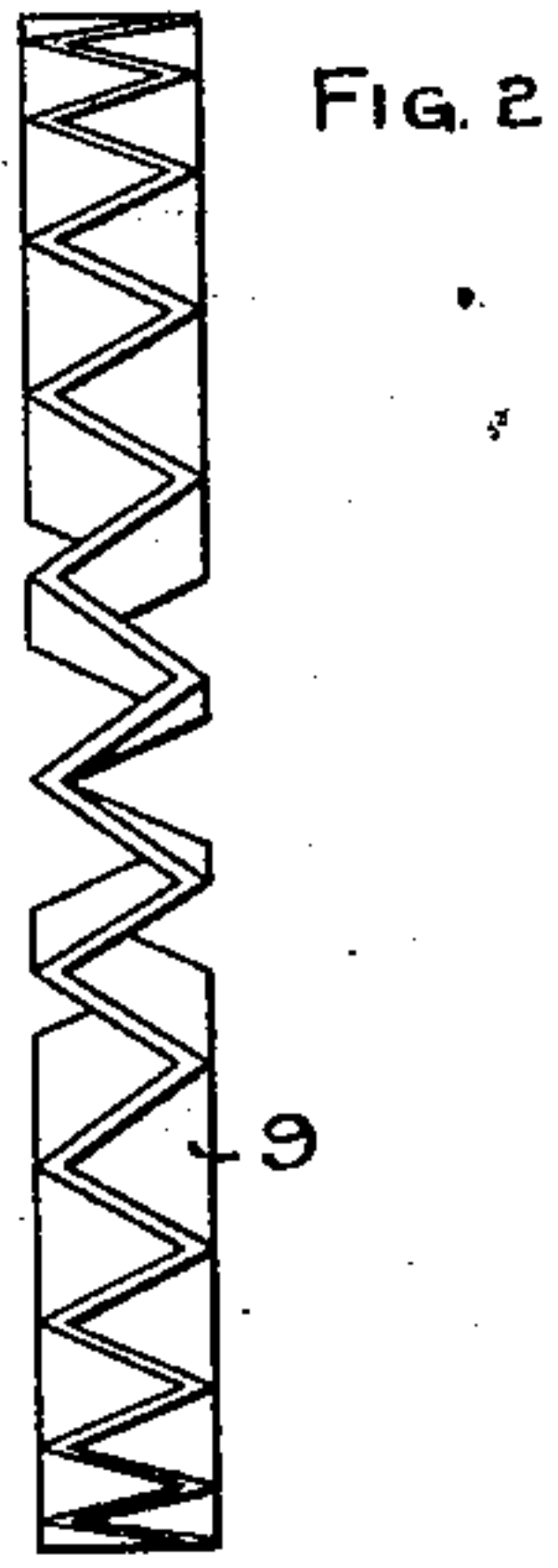
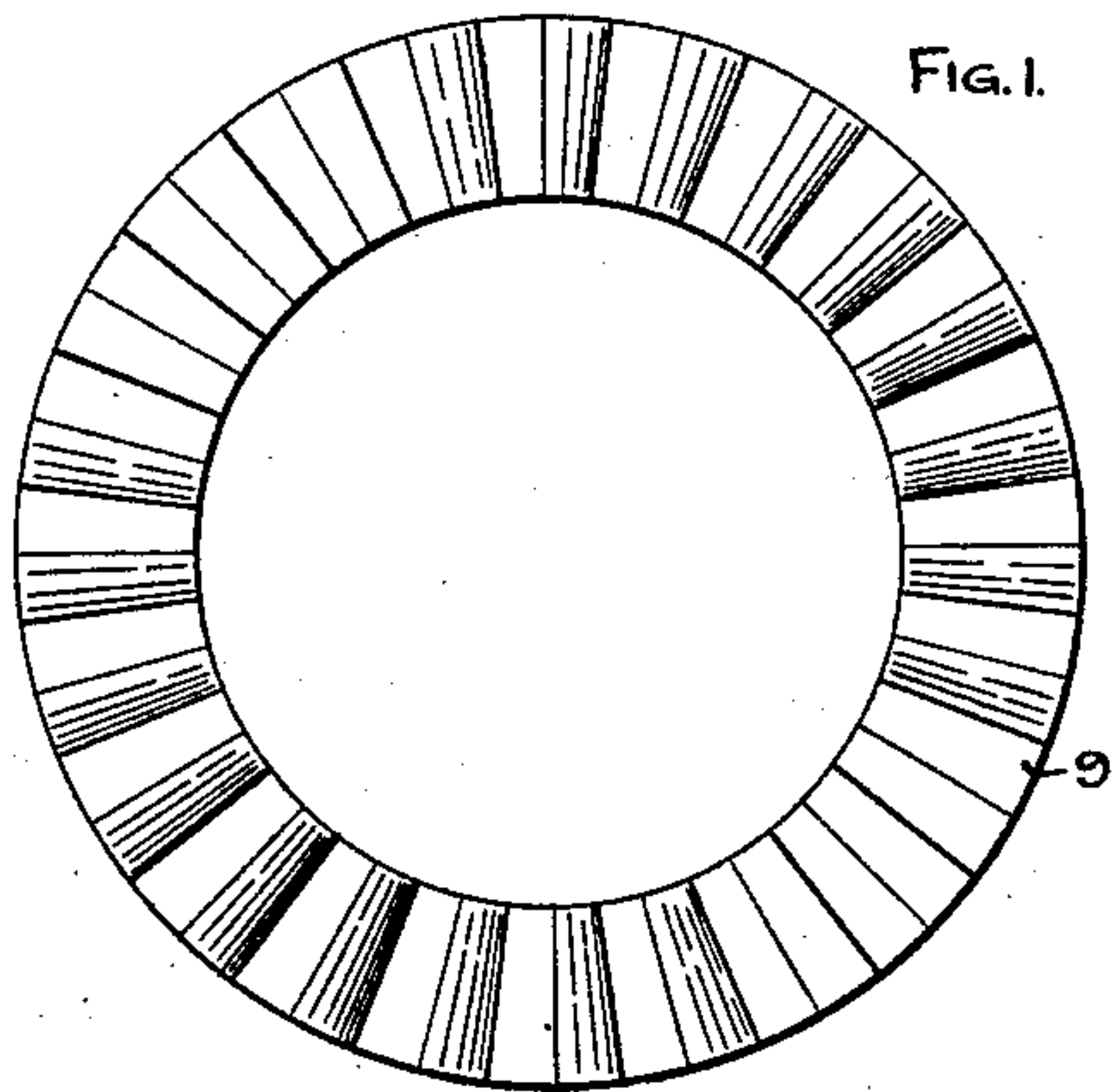
Patented Mar. 25, 1902.

G. A. GERDTZEN.
ROLL.

(Application filed Dec. 22, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES

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2 Sheets—Sheet 2.

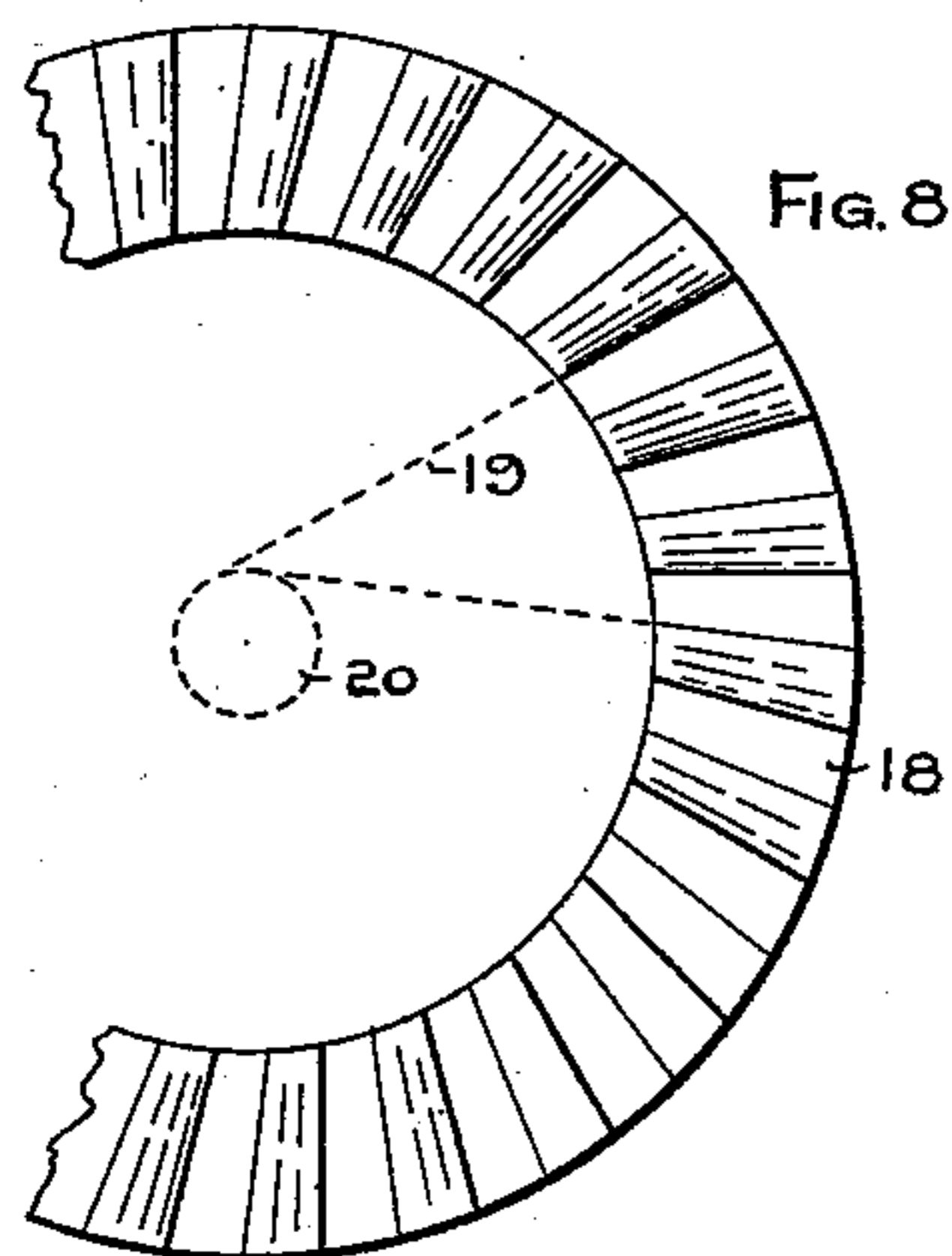


FIG. 8



FIG. 9

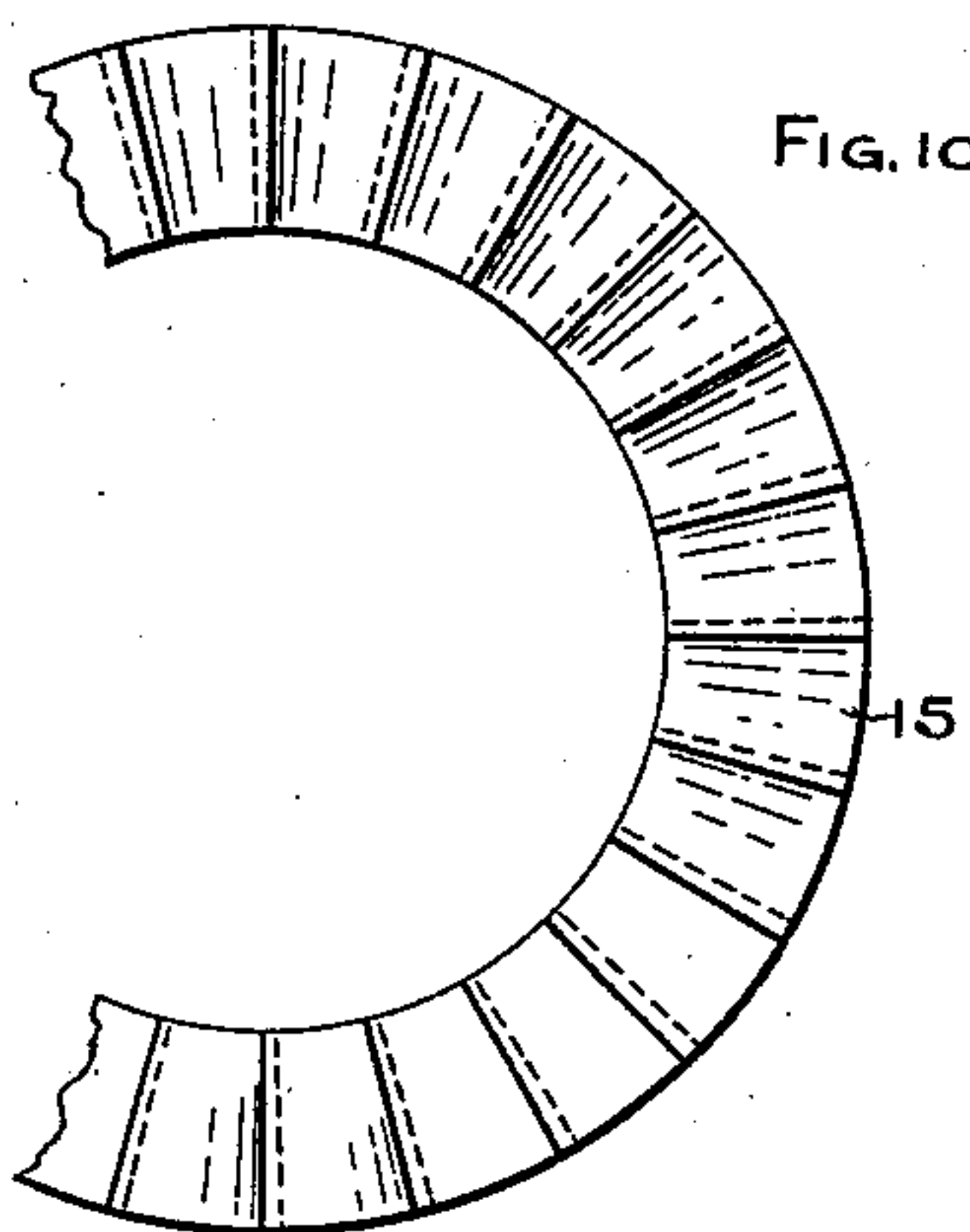


FIG. 10

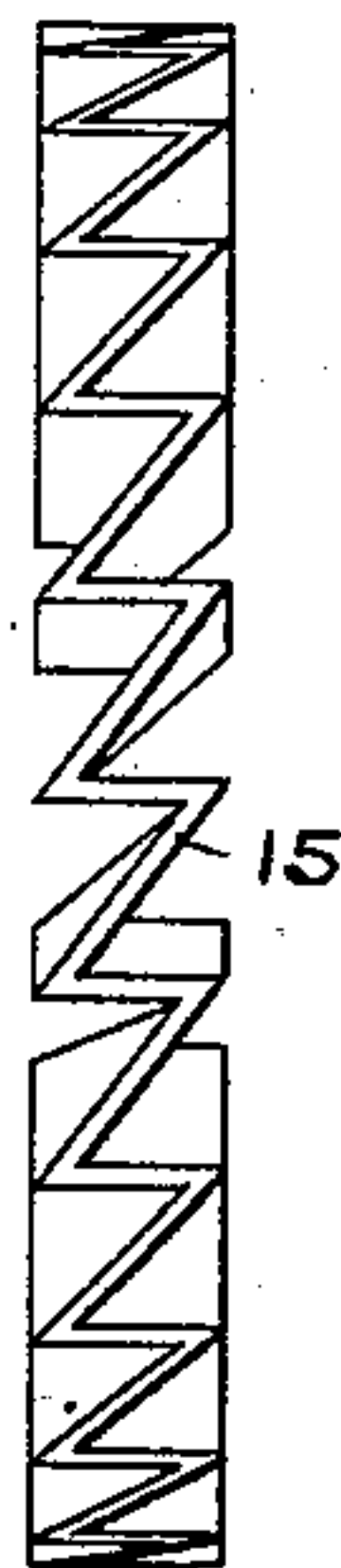


FIG. 11

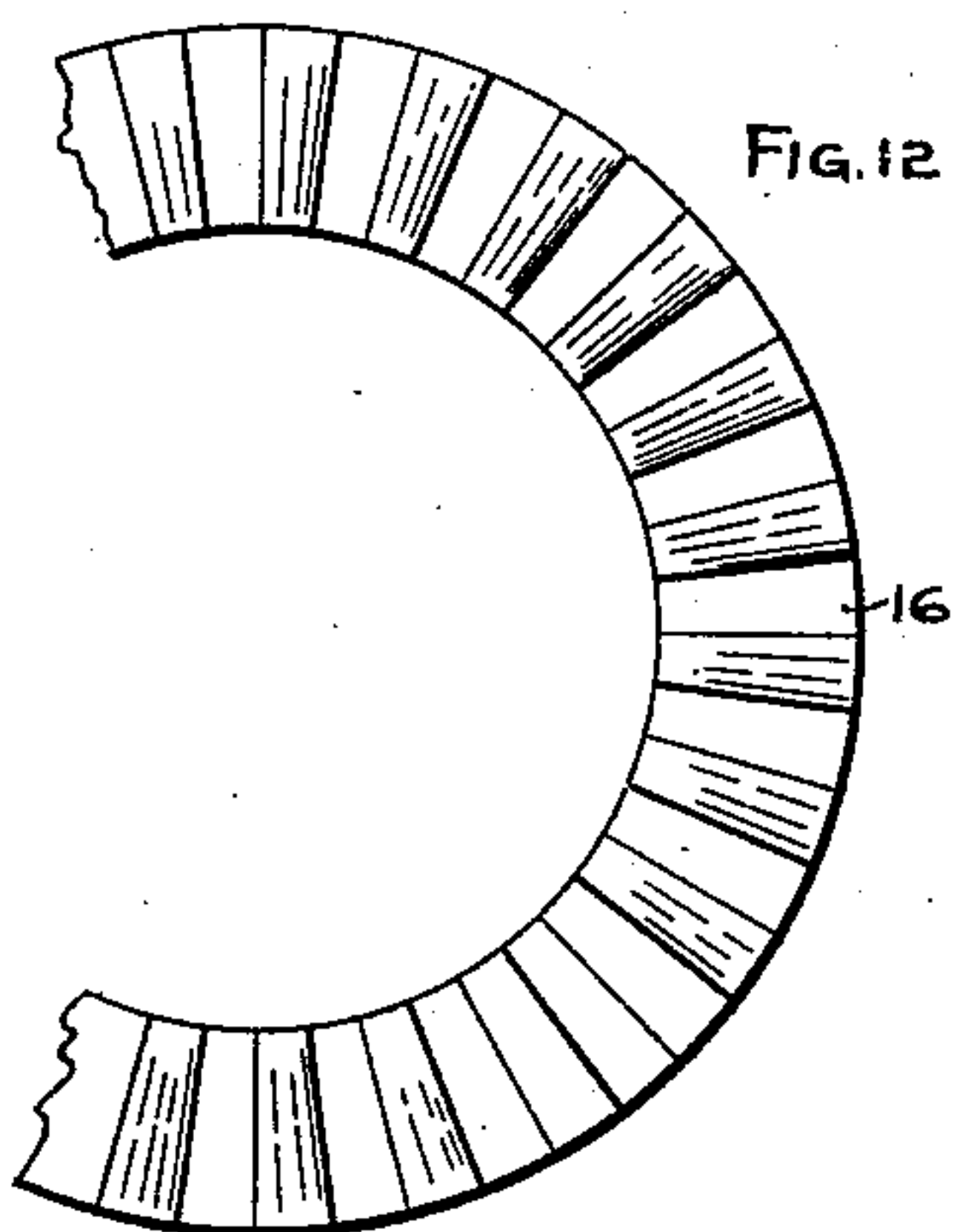


FIG. 12

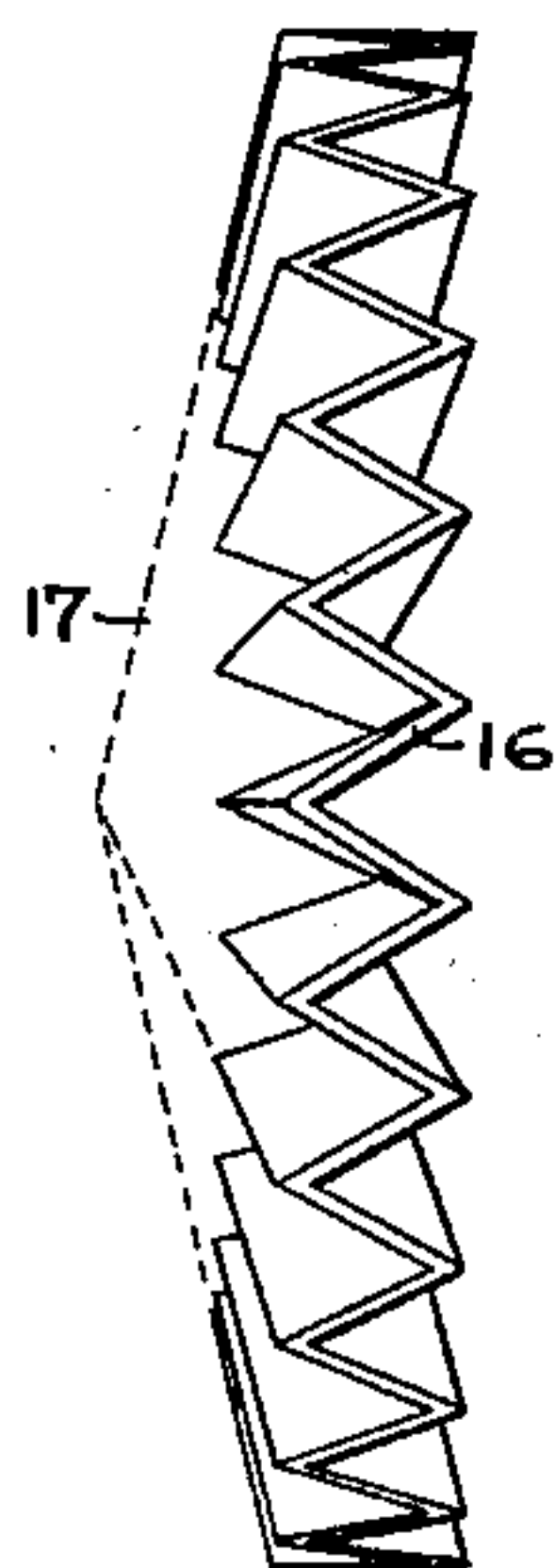


FIG. 13

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UNITED STATES PATENT OFFICE.

GERDT A. GERDTZEN, OF MILWAUKEE, WISCONSIN.

ROLL.

SPECIFICATION forming part of Letters Patent No. 696,138, dated March 25, 1902.

Application filed December 22, 1900. Serial No. 40,717. (No model.)

To all whom it may concern:

Be it known that I, GERDT A. GERDTZEN, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Rolls, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention is of an improved roll and its parts. In using the word "roll" it must be understood that the invention relates to a roll or wheel or analogous construction.

The object of the invention is to provide an improved roll, primarily for crushing and grinding purposes, embodying lightness in weight, strength and endurance in character, homogeneousness of quality, convenience of repair, and other advantages hereinafter enumerated or incidental thereto. Rolls or wheels for these purposes when constructed of metal are usually provided with roughened surfaces, except in some cases, as in the finishing-rolls employed in the flour-milling process, where a smooth roll is generally used. For crushing purposes rolls are made of a great variety of construction; but for grinding purposes they are usually cast solid, or nearly so, and ground and "corrugated," as the roughening of the surface is styled, or ground smooth when so required. In all cases of crushing or grinding with roughened-surface rolls the roughened surface soon wears too smooth to act properly and the problem is to renew the roughness of the surface. This is accomplished by my construction by a plain grinding operation, which has, to my knowledge, not been done with any other construction of roll. For all rolls used for service of this kind homogeneousness of quality is required—that is, absence of holes, soft, or porous spots, &c. This is achieved by my construction, as the corrugated rings, having no thick parts and being substantially of a uniform thickness, can be made homogeneous as to quality, and consequently will form a roll of uniform quality. This does not necessarily imply homogeneousness throughout the roll. In fact, one of the advantages of this construction is that, for instance, alternate rings can be made hard and soft or of different materials with equal facility.

In rolls as at present made from disks or

rings each ring is supported by bearing upon a central shaft or its equivalent unless special means are provided to give it support from its neighbors. In my construction the very nature of the surfaces bounding the sides of the corrugations of the rings provides a wedging action between adjacent rings, which resists external, internal, or circumferential forces tending to move any ring out of its place or tending to change the form of the roll, so that when the rings are simply held together axially they form a strong, rigid, hollow roll, and no support from the center is required. This wedging action is independent of the friction of the rings against each other, as will be seen by cutting away large portions of alternate rings and having the binding-bolts quite loose and then attempting to remove the remaining portions of the alternate rings from between their neighbors. For some uses to which such a roll may be put this specific construction that provides unfilled spaces and yet maintains the integrity of the roll is a valuable feature.

My invention consists of the roll, its parts, and combinations of parts, as herein described and claimed, or the equivalents thereof.

In the drawings, Figure 1 is a view of one side of a ring adapted to form an interior section of my improved roll. Fig. 2 is a view of the exterior edge and corrugated surfaces of the ring-section of Fig. 1. Fig. 3 shows views, respectively, of the outer and inner ends of the same corrugation of the ring-section of Fig. 1. Fig. 4 is a view of the inner surface of a disk or plate forming an end section of the roll. Fig. 5 is an edge view of the section or plate of Fig. 4. Fig. 6 is a view of the end of the complete roll. Fig. 7 is a side view or elevation of the complete roll. Figs. 8 and 9 illustrate, respectively, a side and an edge view of another form of ring embodying my invention. Figs. 10 and 11 illustrate, respectively, a side and an edge view of still another form of ring embodying my invention; and Figs. 12 and 13 illustrate, respectively, yet another form of ring embodying my invention.

My improved roll may be made of any material or materials suitable therefor, but for purposes to which it will be most commonly

put is advisably made of cast-iron or steel. The roll is made up of end sections 8 8, preferably in disk-like form, and interior ring-sections 9, bound together by bolts or rods 10 10. The roll is chiefly composed of ring-sections 9 9, of a common form, in such number as necessary to construct a roll of such axial length as is desired. These ring-sections are bound together firmly, forming a rigid roll, by the roll-terminal disk sections 8 8, placed against the respective ends of the series of ring-sections and held together by the bolts or rods 10, which are provided with heads at one end and with nuts turning thereon at the other end.

Each ring-section 9 consists of a ring of such radial depth as to give the roll sufficient crushing strength and wearing capability and is comparatively thin in its axial direction or direction parallel with its axis as a member of the roll. Each ring is composed of a series of substantially radial corrugations. The words "radial" or "radially" in this specification are to be understood in their broad sense as opposed to circumferentially, and "substantially radial" or "radially" meaning that the length of the corrugations lies, broadly speaking, in a radial direction. These rings are interchangeable, and the corrugations are of such form that the rings fit to each other and bear against each other their full depth. The expression "interchangeable" is not meant to preclude differences in the internal or external diameters of the rings, but means that the side surfaces of each and every ring are substantially identical as to form, though not necessarily as to extent, so that any ring wherever placed in the roll will fit and bear against its neighbors. This construction will be secured if the surfaces bounding the sides of these corrugations are made portions of warped surfaces, alternately right and left, or portions of warped surfaces alternating with portions of planes. "Warped surfaces," as the term is used in mathematical science, describes in general surfaces generated by a right line having its motion guided by three directrices, which may be lines or surfaces. One of the warped surfaces most easily produced by mechanical means is a helicoidal surface having as directrices a helix, the axis of the helix, and a plane director perpendicular to the axis of the helix. The generatrix moves so as to constantly touch the two directrices, and so as to be constantly parallel to the plane director.

Figs. 1, 2, 8, 9, 10, 11, 12, and 13 illustrate rings the corrugations of which have as their bounding surfaces some of the simpler forms of warped surfaces.

In Figs. 1 and 2 a ring is illustrated the corrugations of which are bounded by portions of helicoidal surfaces alternately right and left. These surfaces are generated by moving a right line so as to touch a helix and the axis of the helix, having its different positions parallel to a plane at right angles to the

axis of the helix. These are the same surfaces which form the curved surface of the ordinary square-thread screw.

In Figs. 10 and 11 a ring is illustrated the corrugations 15 of which are bounded by portions of a helicoidal surface alternating with planes passing through the axis of the helix. The helicoidal surface is generated by moving a right line so as to touch a helix and the axis of the helix, having its different positions parallel to a plane at right angles to the axis of the helix.

In Figs. 12 and 13 a ring is illustrated the corrugations 16 of which are bounded by portions of helicoidal surfaces alternately right and left. These helicoidal surfaces are generated by moving a right line (dotted line 17) so as to touch a helix and the axis of the helix, having its different positions in succession parallel to the different rectilinear elements of a cone. These are the same surfaces which form the curved surface of the ordinary V-thread screw.

In Figs. 8 and 9 a ring is illustrated the corrugations 18 of which are bounded by portions of warped surfaces alternating right and left. These warped surfaces are generated by moving a right line (dotted line 19) so as to touch two helices, (shown in horizontal projection by the outermost circle and the innermost circle, dotted circle 20,) having its different positions parallel to a plane at right angles to the axis of the helices.

The disks 8 are each provided with a ring-like corrugated surface 13, adapted to receive against it and fit to one surface of a ring 9, and a series of rings 9, with the terminal disks 8, are bound together by the rods 10 through the roll longitudinally, the heads of the rods bearing against the outer surface of one disk 8 and the nuts, turning on the rods, bearing against the outer surface of the other disk 8. An axial shaft-aperture 14 is provided in each disk 8 for inserting and securing a shaft in the roll.

The uses to which this roll can be put to advantage are numerous, and, in fact, include all the various uses to which either smooth rolls or rolls with roughened surfaces or with cutting edges can be put. A common use to which a roll of this character can be put is as a grinding-roll, and when the roll is to be employed for grinding purposes, where a roughened-surface roll is wanted, every alternate ring may be made of less outer diameter than the other rings, and when the rings of greater diameter are worn off exteriorly the alternate rings may be removed and clamped together as a roll and placed in a lathe and turned or ground down to a less diameter and can then be replaced in the roll. Thus the roughness of the surface of the roll can be conveniently renewed by a plain grinding operation, and this because of the fact that the corrugations are in the rings making up the body of the roll instead of, as usual, on the surface of the roll. In a roll of this gen-

eral character each alternate ring may be of softer metal, as lead, than the other rings, thus providing for the faster wearing away of these rings of softer metal, thereby maintaining by virtue of the hard rings constantly cutting or abrading edges on the roll at regular intervals and in oblique directions to planes cutting the axis of the roll at right angles. It should not be understood that to construct a roll with these rings having cutting edges that every alternate ring must be of soft metal or of less diameter than the other rings, because every third ring, or even every fourth ring, may be of such soft metal or of less diameter than the other rings, and thus provide cutting edges that would be satisfactory for some purposes.

What I claim as my invention is—

1. A roll consisting of a series of interchangeable substantially radially corrugated thin rings fitting to and bearing against each other, and means securing them together axially forming a hollow rigid roll.

2. A roll consisting of end pieces and a series of intermediate rings, each ring being corrugated and formed to fit and bear against any other ring, the rings being interchangeable, and means binding the end pieces and rings together into a rigid hollow roll.

3. A ring for a hollow roll constructed of suitable material and of uniform thickness in axial direction, and comprising a series of

substantially radial corrugations, the corrugations having warped side surfaces, and the side surfaces of the ring thus formed being substantially identical as to form.

4. A ring for a hollow roll constructed of suitable material and comprising a series of substantially radial corrugations, the side surfaces of the ring thus formed being substantially identical as to form, and adapted to fit on either side interchangeably against a ring formed with the same side surfaces.

5. In combination in a roll, a series of interchangeable rings having similar substantially radial corrugations on their side surfaces and fitting to and bearing against each other, end pieces provided on one side with substantially radial corrugations fitting to and bearing against a surface of a ring, and means binding the rings and the end pieces together in a rigid hollow roll.

6. A roll consisting of a series of interchangeable substantially radially corrugated rings having side surfaces of such form as to fit against each other and support each other without central support, and means binding the rings together into a rigid hollow roll.

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

GERDT A. GERDTZEN.

Witnesses:

C. T. BENEDICT,
ANNA V. FAUST.