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E. P. GRAY.
DIFFERENTIAL GEARING.
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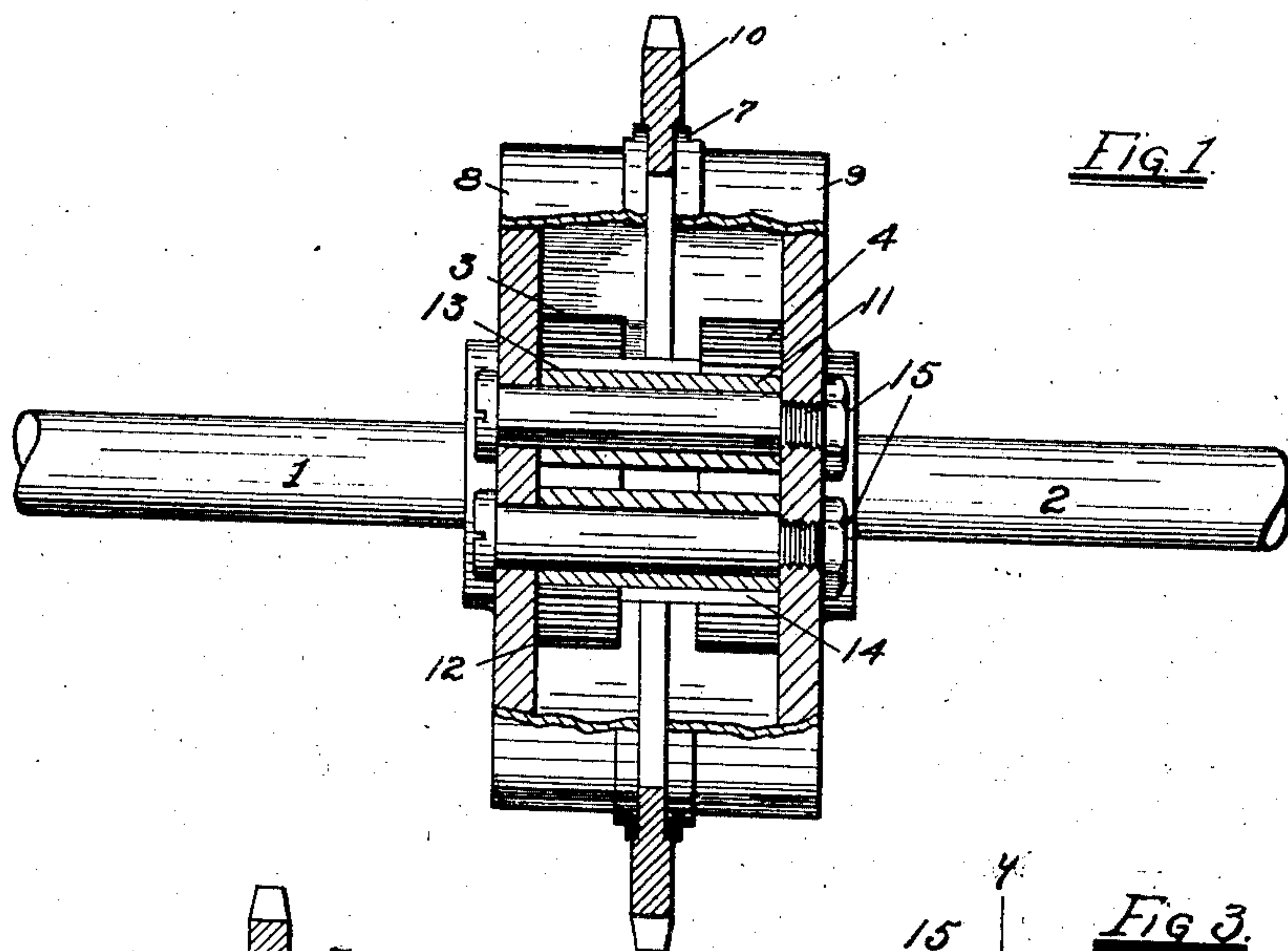


Fig. 1.

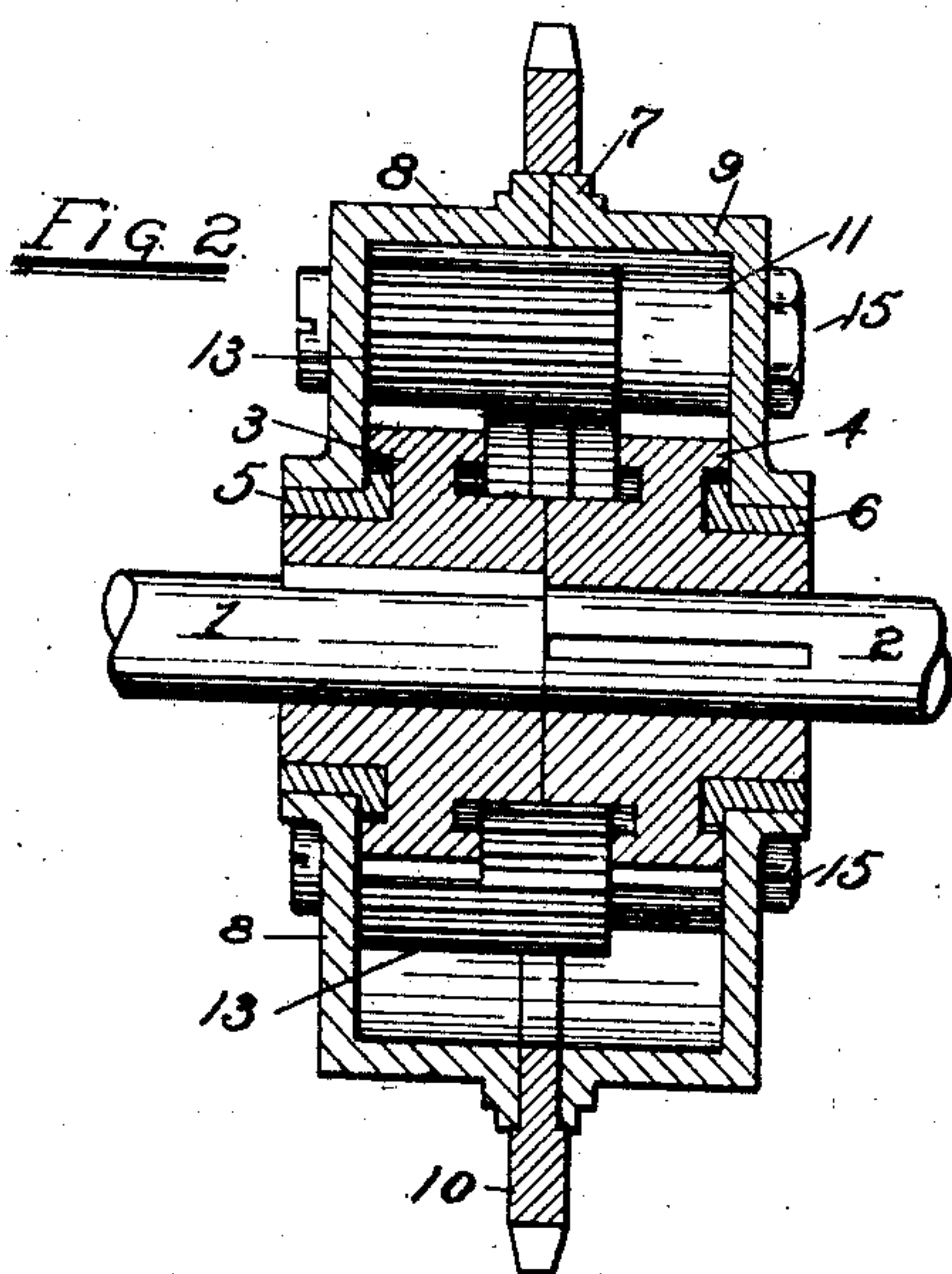


Fig. 2.

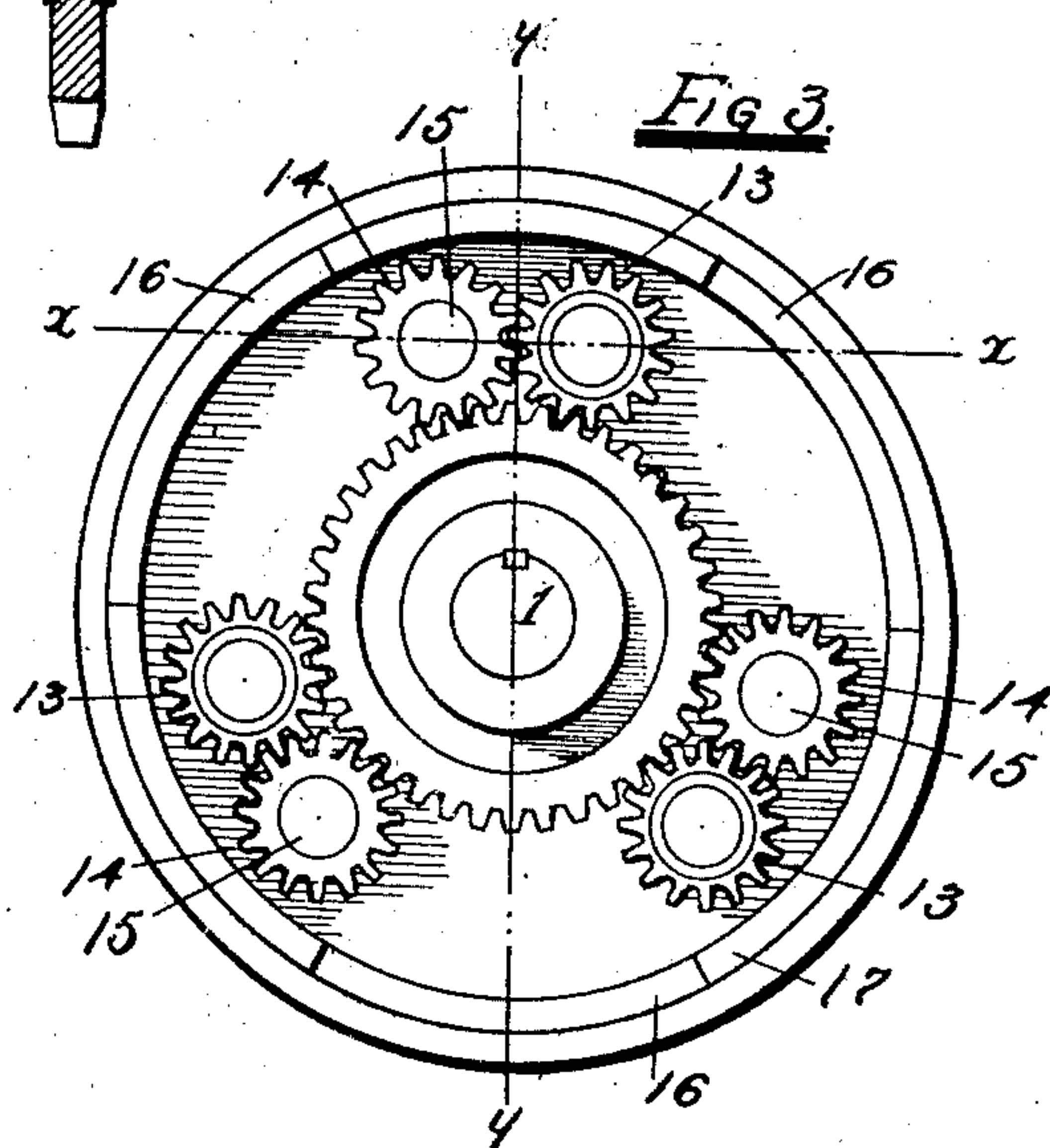
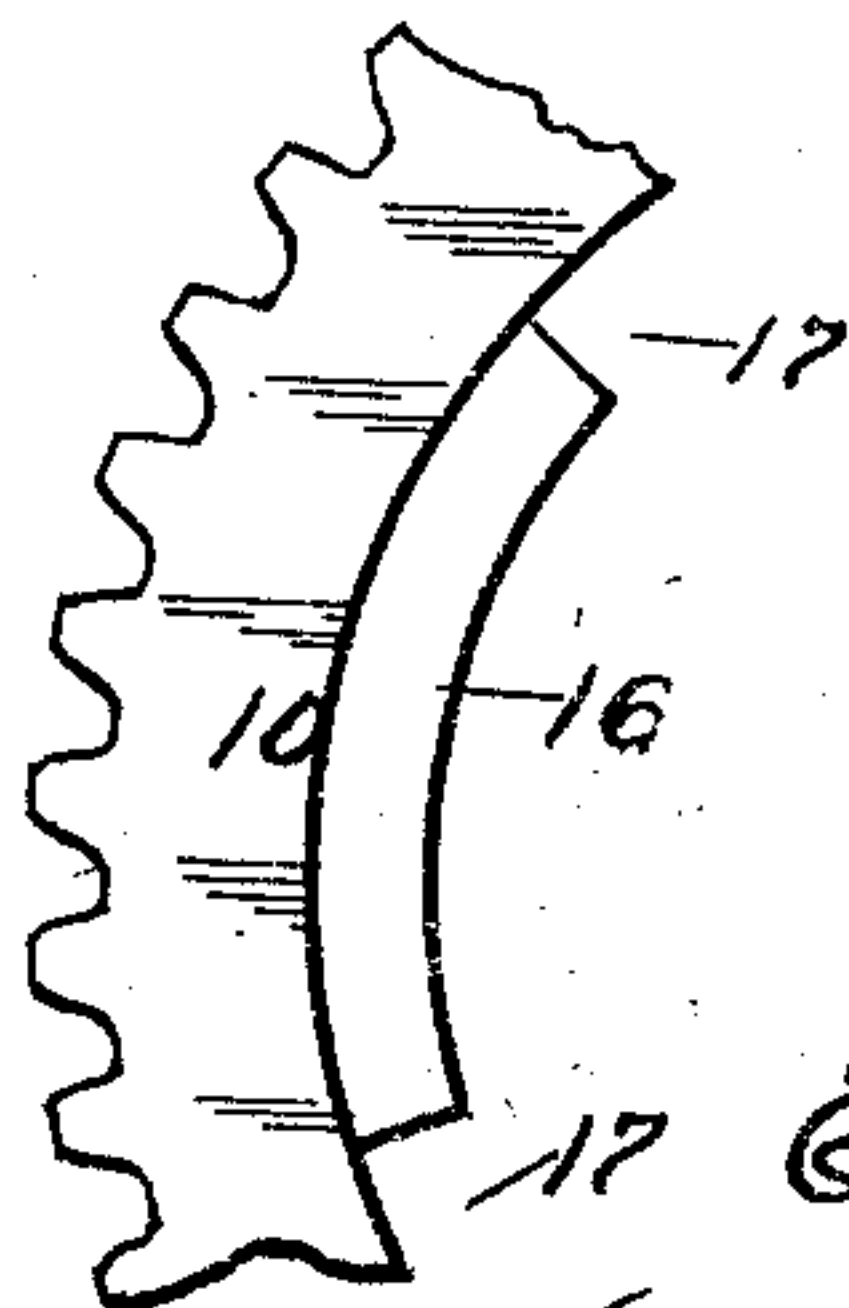


Fig. 3.

Fig. 4.



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DIFFERENTIAL GEARING.

No. 827,095.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EMMET P. GRAY, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Differential Gearing, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to a differential gearing especially adapted for automobile-work and to be secured upon the divided driving-axle of the same or upon a two-part axle where one part is a sleeve; and it has for its object the provision of a gearing of the class referred to which shall be exceedingly simple in construction, strong and durable, and thoroughly efficient in action.

The novelty of my invention will be hereinafter more fully set forth, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional plan view of the assembled gearing and parts of the axle, taken on the dotted line *x x* of Fig. 8. Fig. 2 is a sectional end elevation on the dotted line *y y* of Fig. 3 with the sprocket in place. Fig. 3 is a side elevation of the complete gearing arranged in one side of the shell or case. Fig. 4 is an enlarged elevation of a portion of the sprocket.

The same numerals of reference are used to indicate identical parts in all the figures.

As illustrating the simplest form of my improved differential gearing, reference is had to the accompanying drawings, in which 1, Figs. 1 and 2, is one end of an axle, and 2 the other adjacent end, the two being in alignment and carrying keyed upon their adjacent ends two spur-gears 3 and 4. These spur-gears have extended hubs on each side thereof, surrounding which, on the exterior sides thereof, are bushings 5 and 6.

Journalled loosely on the bushings 5 and 6, respectively, are two half parts 8 and 9 of a drum or casing, between the meeting edges of which at the periphery is clamped in any suitable manner a sprocket-wheel 10. I have shown two methods of clamping the sprocket-wheel 10, which is but a skeleton ring, which while projecting above the periphery of the drum or casing does not extend to the inte-

rior thereof to interfere with the mechanism contained in said drum or casing.

As a simple and very efficient method of securing the sprocket-wheel in place I divide the circumference of the central aperture into six equal portions and then cut out the metal between any two of these portions, leave the metal in between the next two, cutting out between the next two, and so on, which will leave projecting portions 16 and cavities 17, as shown in Fig. 4, in the sprocket, and by similarly cutting the adjacent faces of the two halves of the drum the sprocket and drum will interlock, doing away with the necessity of any bolts or pins or any other holding devices, so far as shearing or twisting strains between the sprocket and drum are concerned. Of course the two portions of the drum and the sprocket will have to be bolted together in some suitable manner; but all the shearing or twisting strains are borne by the interlocking of the lugs 16 with the cavities in which they are contained in the periphery of the drum, and to more perfectly center and unite the parts the lugs 16 are made somewhat thinner than the main body of the sprocket, thus providing shoulders which rest upon raised portions or flanges at the inner adjacent edges of the drum, as seen at 7, Figs. 1 and 2.

Arranged within the drum or casing in pairs (in this instance three pairs being shown) are spur-pinions, each pair overlapping and meshing together and at the same time having a cut-out or blank portion 11 to escape one of the spur-gears—as 4, for instance, in Fig. 2—and its mate having a similar cut-out or blank portion at its opposite end to escape the other gear 3, as at 12 in Fig. 1. Thus while the two pinions 13 and 14, Fig. 3, of each pair constantly mesh together intermediate of the gears 3 and 4 the one meshes at its outer end with one of the gears fast on the shaft or axle within the drum or casing and the other meshes with the other gear, similarly fast upon the other end of the shaft or axle within the drum or casing, as will be readily understood. In this way I produce a very nicely balanced gearing uniting the divided ends of the shaft, which is differential in its character and permits of independent movements of the two parts of the shaft at

different speeds or even in opposite directions, and as a further means of simplifying the construction and uniting the parts the pinions 13 and 14 are bored entirely through to receive bolts 15, which pass through the drum-casing and serve to lock the two parts of the drum and sprocket together against endwise movement.

It will be readily seen from the foregoing description and illustration that while the two parts of the drum and sprocket are locked together against endwise movement by the pinion carrying bolts 15 no part of the twisting or shearing strain put upon the sprocket is borne by said bolt, but is borne altogether by the two parts of the drum with which the sprocket is interlocked without the necessity of screws or bolts for that purpose, which under the heavy strains to which the parts are put will have a tendency to come loose and fall out, as will be readily understood.

As before stated, the object in causing the sprocket to interlock with the two halves of the drum is to obviate all shearing strains on the bolts 15, in this way entirely doing away with the necessity of any extra bolts or rivets and always maintaining all of the gearing in proper working alinement, the only function of the bolts 15 besides affording a bearing for the pinions 13 and 14 being to clamp the two halves of the drum and the sprocket together endwise in such manner as to maintain the interlocking parts in their proper positions.

While I have shown a chain-sprocket in the drawings, it is obvious that a bevel-gear or a spur-gear may be substituted to transmit the power without departing in any way from the spirit of my invention and that where it is desired to employ a band-brake upon the differential it may be placed and have its bearing upon either one or both of the halves of the drum, as will be readily understood.

Having thus fully described my invention, I claim—

1. In a differential gear, the combination of two alined shafts arranged end to end, two spur-gears disposed side by side and fast respectively to the ends of said shafts, a two-part drum or casing surrounding said gears and held from endwise movement by the same, a sprocket-wheel made fast to said drum or casing by internal projecting lugs fitting cut-out portions in the drum to form interlocking means to prevent shearing or twisting strains, intermeshing pinions in pairs within said drum or casing, one of each pair engaging the spur-gear on one side and the other the spur-gear on the opposite side, and clamping-bolts extending through the end walls of said drum or casing to hold the parts together and serve as bearings for the intermeshing pinions, substantially as described.

2. In a differential gear, the combination of two alined shafts arranged end to end, two spur-gears disposed side by side and fast respectively to the ends of said shafts, a two-part drum or casing surrounding said gears and held from endwise movement by the same, a sprocket-wheel made fast to said drum or casing by shouldered internal projecting lugs fitting cut-out portions in the drum with said shoulders resting on the periphery of the same to form interlocking means to prevent shearing or twisting strains, intermeshing pinions in pairs within said drum or casing, one of each pair engaging the spur-gear on one side and the other the spur-gear on the opposite side, and clamping-bolts extending through the end walls of said drum or casing to hold the parts together and serve as bearings for the intermeshing pinions, substantially as described.

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