A. G. BOWEN.

DIFFERENTIAL GEARING.

APPLICATION FILED DEC. 2, 1915.

1,320,979. Patented Nov. 4, 1919.

Fig 1.

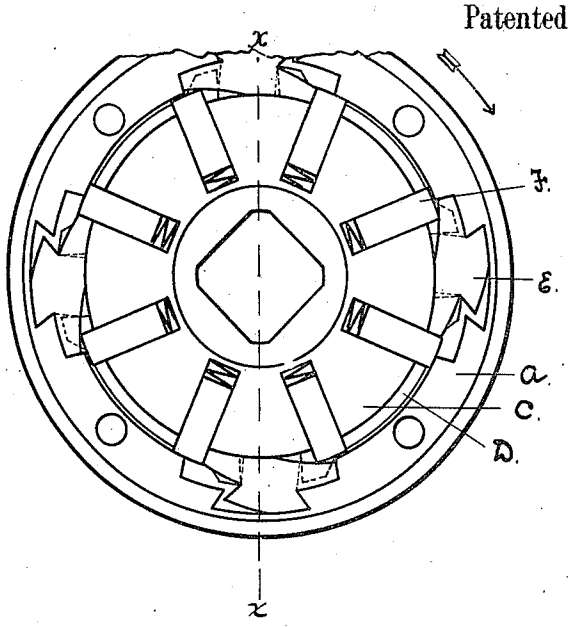


Fig 2.

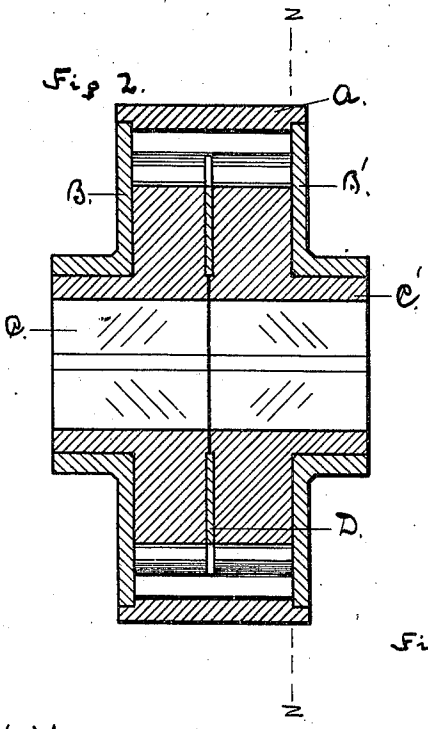


Fig 3.

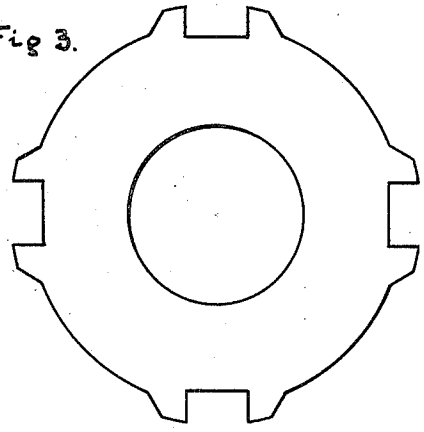


Fig 4.

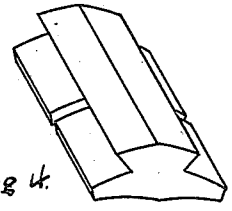
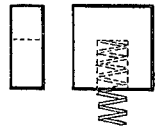


Fig 5.



Witnesses:

Abiel Bowen

Helen C. G. Bowen

Asa G. Bowen,

Inventor.

UNITED STATES PATENT OFFICE.

ADNA G. BOWEN, OF MEDINA, NEW YORK.

DIFFERENTIAL GEARING.

1,320,979. Specification of Letters Patent. Patented Nov. 4, 1919.

Application filed December 2, 1915. Serial No. 64,720.

To all whom it may concern:

Be it known that I, ADNA G. BOWEN, a citizen of the United States, residing in the village of Medina, in the county of Orleans and State of New York, have invented a certain new and useful Improvement in Differential Gearings; and I do hereby 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.

The object of my invention is to transmit power to two separate alined shafts in such a manner as to permit one of said shafts to revolve faster than the other, or overrun; and to remedy so far as may be, the defects of the present bevel type differential as disclosed in use in automobile construction.

This I accomplish by the construction and arrangement illustrated in the accompanying drawing, in which—

Figure 1 shows said differential gearing in elevation along the line Z—Z of Fig. 2, the plate B′ being removed.

Fig. 2 is a central transverse section of Fig. 1 along the line X—X of Fig. 1, the pawls E being removed that the recesses in the outer or driving member A may be better observed.

Fig. 3 is a plan view of the plate D.

Fig. 4 is a perspective view of one of the pawls E.

Fig. 5 is a side and end view of one of the ratchet teeth F, showing resilient means for retaining same in operative position.

In the several views similar letters refer to similar parts.

In the drawing, A represents what is normally the driving member, and it, together with the side plates B and B′ form the differential housing. The driving member A will also be called the outer member herein.

B and B′ represent the side plates above mentioned, and one may be integral with the member A.

C and C′ represent the two ratchet wheels. They will be referred to herein as the driven members or inner members.

D represents the plate shown in Fig. 3.

E represents one of the pawls, a perspective view of which is shown in Fig. 4.

F represents one of the ratchet teeth, a side and end view of which is shown in Fig. 5.

In the drawing the various parts are represented in the position they would take upon the application of power to the driving member to move it in the direction of the arrow shown in Fig. 1. Upon the reversal of the direction of movement of the driving member, the various parts would assume the position seen upon viewing the drawing from the reverse side when held before the light.

In further explanation of the office of the different parts and the principle believed to be embodied in the mechanism, having reference to the drawing, attention is first directed to the ratchet wheels C and C′. It will be observed that instead of having the usual teeth permitting the movement of a pawl in one direction only, they have inserted depressible teeth F, which are supported in their normal position by resilient means, and kept within bounds by the side plates B and B′ together with the plate D interposed between the two ratchet wheels, and are prevented from projection beyond the required distance by the member A. Coacting with these teeth there may be one or more pawls lying freely upon and across the two ratchet wheels and within the recesses seen in the driving member. Such a pawl is shown at E and in Fig. 4. Each pawl, it will be observed, engages both ratchet wheels, and when in operative position as shown in the drawing, lies locked within the recess of the driving member A and against the teeth of the ratchet wheels, and transmits motion from the one to the other, at the same time and while thus locked in position, permitting the faster moving ratchet wheel to overrun the other by reason of the depressible teeth.

If now we reverse the direction of the motion applied to the member A we find several forces coacting; first there is the angling surface of the recess within which the pawl lies. Upon a reversal of the direction of motion, as soon as this comes in contact with the pawl it tends to lift that side. Second the plate D, lying between the ratchet wheels and tending to remain stationary with them holds the pawls from following

the moving member A until picked up by the opposite side of the recess. Third the depressible teeth of the ratchet wheels coact with the other forces to reverse the position of the pawls because as the pawls are forced over the teeth the lifting force exerted by the resilient means supporting such teeth assist in lifting the pawl so that it is forced against the following tooth or teeth and assumes the reverse position; and as before, permits the faster moving ratchet wheel to overrun the other.

When the power is being transmitted from the ratchet wheels to the outer member A as in coasting or when the brakes are applied, having reference to the use of the differential in automobiles, it is the slower moving ratchet wheel, that, by reason of the depressible teeth, to compensate for the shorter distance traveled, is permitted to retard its movement.

The plate D is used to separate the ratchet wheels and prevent the inserted depressible teeth from interfering, and also to hold the pawls in proper relative position and cause them to act in unison, thus overcoming any tendency on the part of any pawl to lag or stick.

Each pawl, it will be seen upon examination of Fig. 4 and the dotted lines in Fig. 1 is slotted in either side for the purpose of receiving the projections of the plate D.

Having thus shown and described what I believe to be the best form of my invention, I do not limit myself to the details of construction herein described but reserve the right to such changes and modifications as fall within the scope and spirit of the drawing and of the appended claims.

I therefore claim as my invention:—

1. A differential gearing having an outer driving member and inner driven members, and one or more pawls lying between said outer member and said inner members, each pawl forming a separate differential driving unit with and connection between said outer member and said inner members.

2. A differential gearing having an outer driving member and inner driven members, and one or more pawls lying freely within recesses in said outer member, each pawl forming a separate differential driving unit with and connection between said outer member and said inner members.

3. A differential gearing having an outer driving member and inner driven members, said inner driven members being provided with depressible teeth, and one or more pawls lying freely between said outer member and said inner members, each of said pawls lying within a recess in said outer member and engaging the depressible teeth of said inner members and forming a separate differential driving unit therewith and connection therebetween.

4. A differential gearing having an outer driving member and inner driven members, one or more pawls lying therebetween, each forming separate driving connections therewith and a friction plate between the inner members controlling the relative movement of said pawls.

5. A differential gearing having an outer driving member and inner driven members, one or more pawls lying therebetween and each forming separate differential driving connections therewith, a plate between the inner of such members; said pawls lying freely within recesses in said outer member and depressible teeth on said inner members engaged by said pawls.

6. A differential gearing having an outer driving member and inner driven members, one or more pawls lying freely therebetween and forming differential driving connections therewith, a friction plate between the inner members; each of said pawls lying within a recess in said outer member and depressible teeth on said inner members, the outer member having its movement relative to one of the inner members controlled by said friction plate by restricting the action of said pawls.

7. A differential gearing having an outer driving member, forming a housing for the differential mechanism and having recesses on its inner surface parallel with its axis for the reception of pawls; one or more pawls, each lying freely within a recess in said outer member; and a pair of inner driven members consisting of ratchet wheels rotatable coaxially with said outer member and having inserted depressible teeth, each pawl forming with said depressible teeth a differential driving unit with and connection between said members.

8. A differential gearing having an outer driving member, forming a housing for the differential mechanism and having recesses on its inner surface parallel with its axis for the reception of pawls; one or more pawls, each lying freely within a recess in said outer member; a pair of inner driven members consisting of ratchet wheels rotatable coaxially with said outer member and having inserted depressible teeth; and a friction plate between said inner members separating the same; said pawls forming with said depressible teeth differential driving connection between said members, and said friction plate controlling the relative movement of said pawls.

9. A differential gearing having an outer driving member having recesses on its inner surface parallel with its axis for the reception of pawls; one or more pawls, each lying within a recess in said outer member; a pair of inner driven members consisting of ratchet wheels rotatable coaxially with said outer member and having inserted depres-

sible teeth; and a plate separating said inner members and equally spacing said pawls and preventing them from becoming inoperative; each pawl when engaging said teeth forming a differential driving unit with and connection between said members.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

ADNA G. BOWEN.

Witnesses:
ABIEL BOWEN,
HELEN C. G. BOWEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."