No. 630,705. Patented Aug. 8, 1899.

W. IVES.

WHEEL.

(Application filed Jan. 18, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

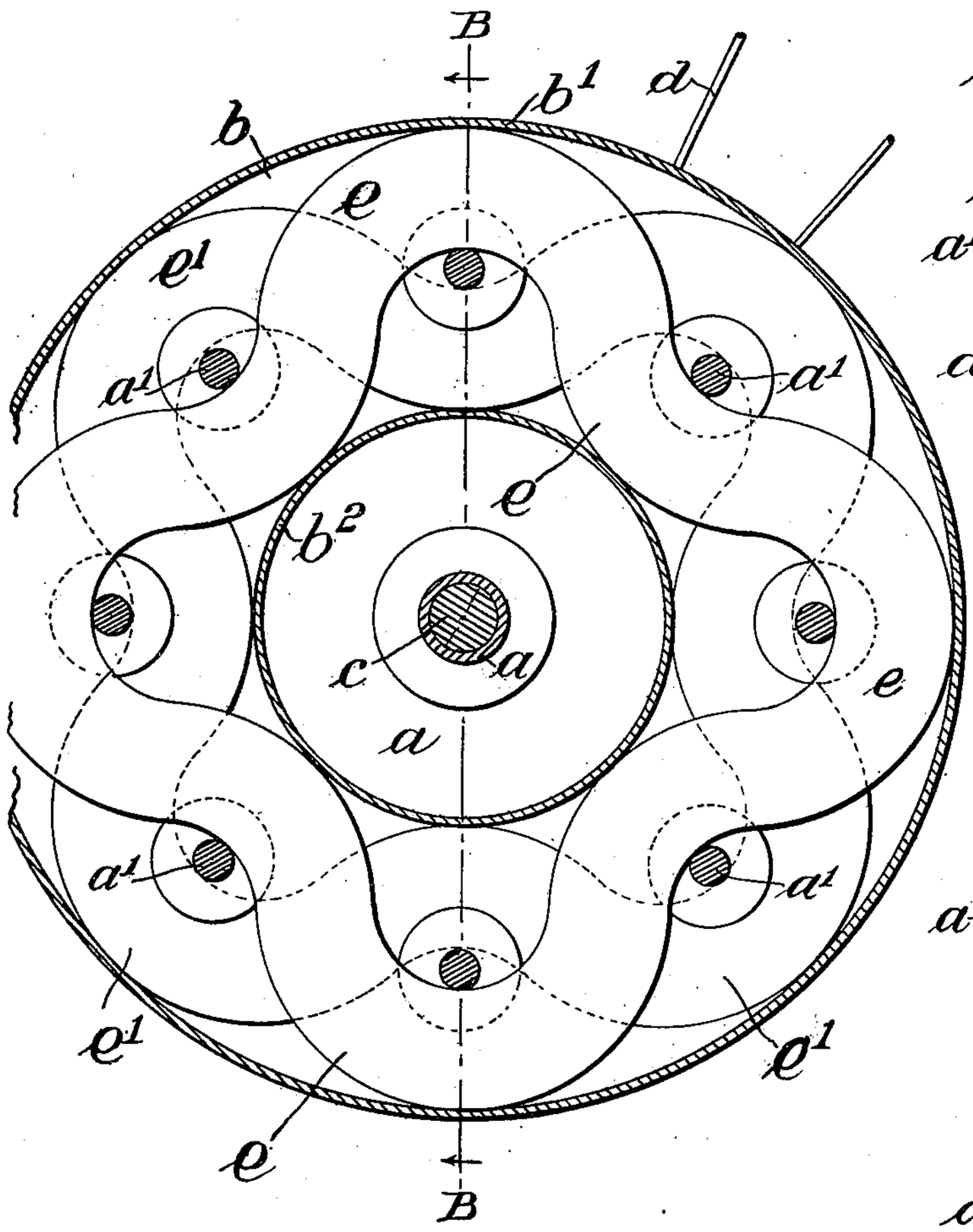
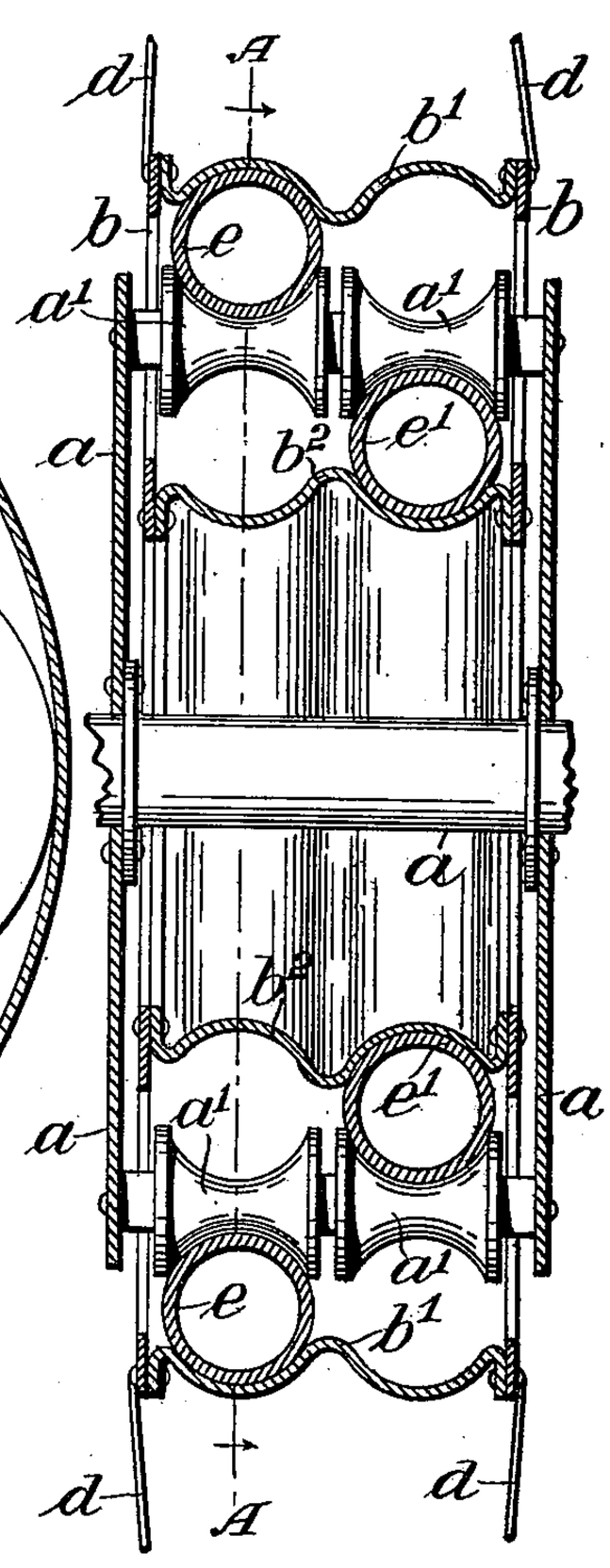


Fig. 2.



Witnesses:
Arthur Crosby
Frank Lewis

Inventor:
William Ives

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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

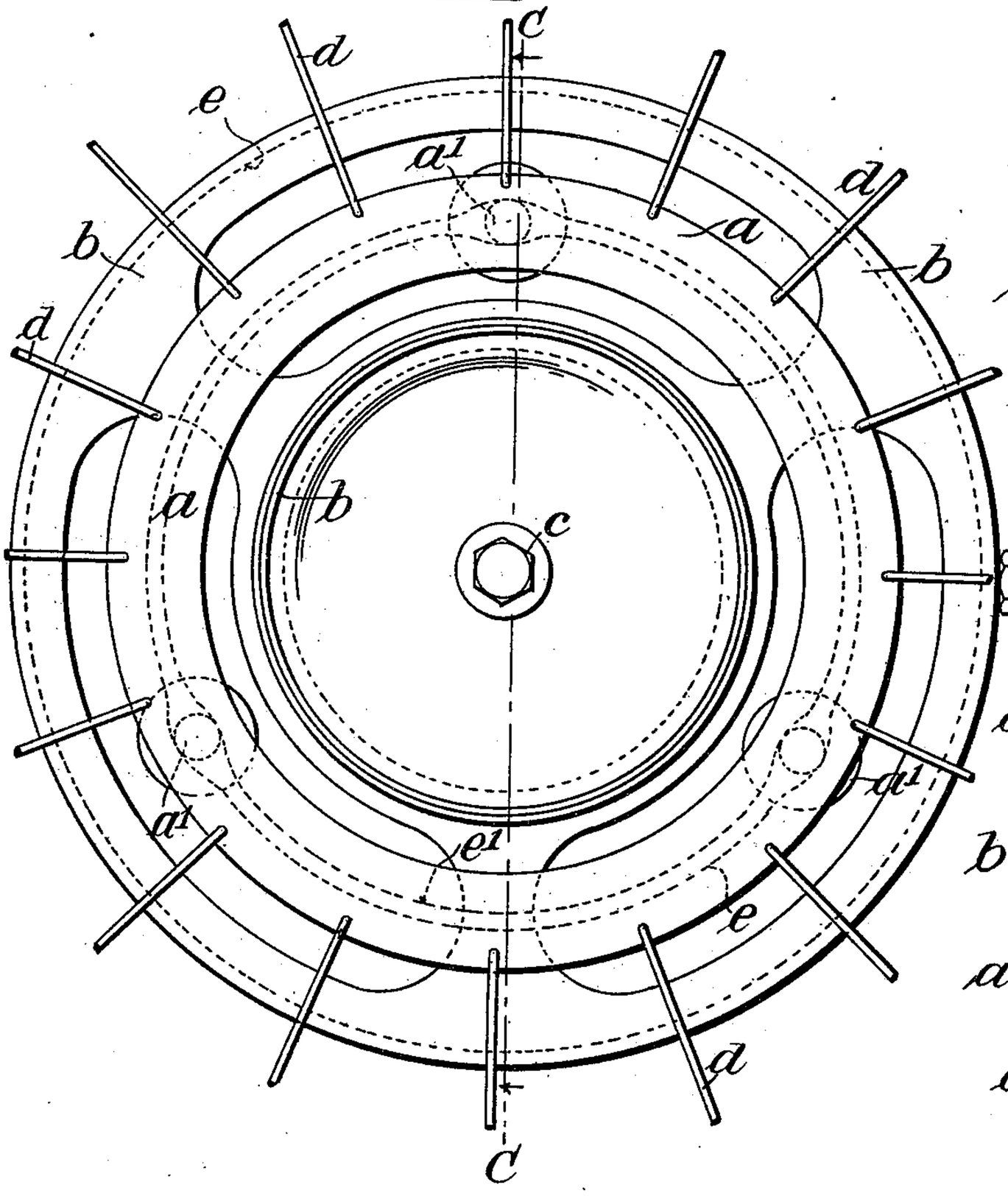
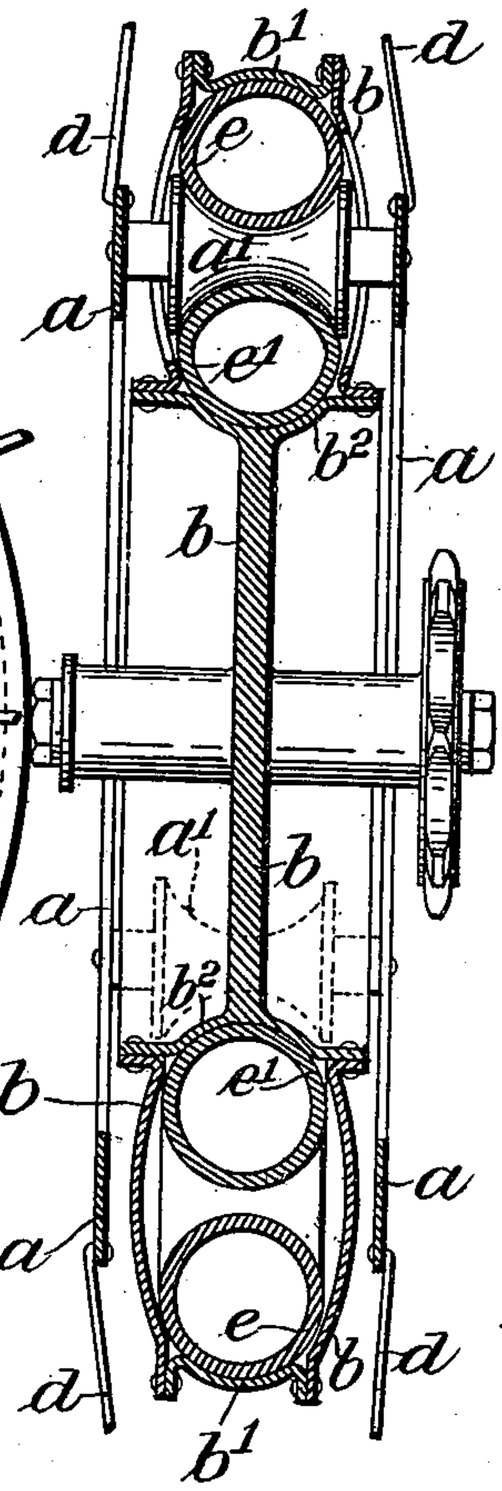


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

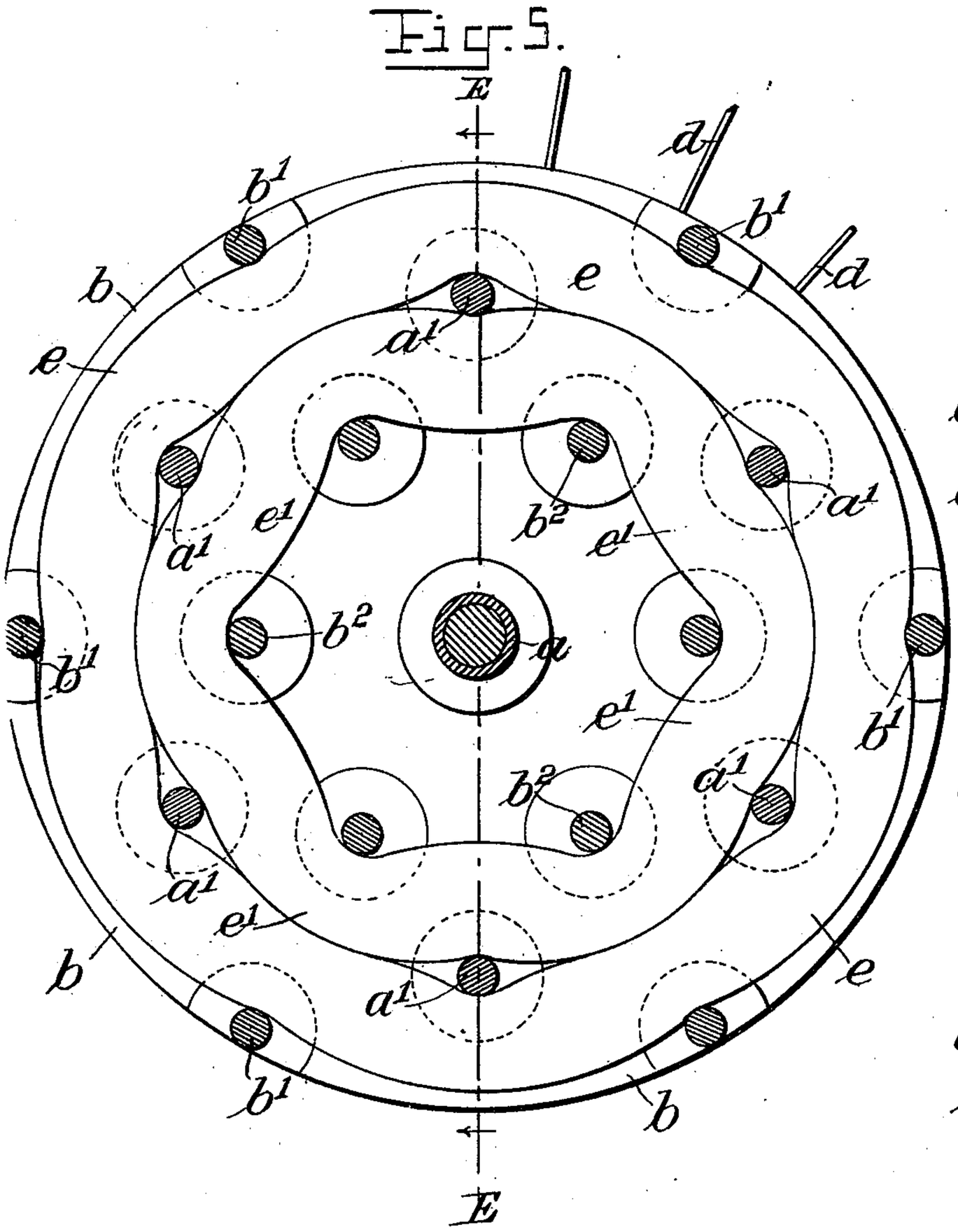
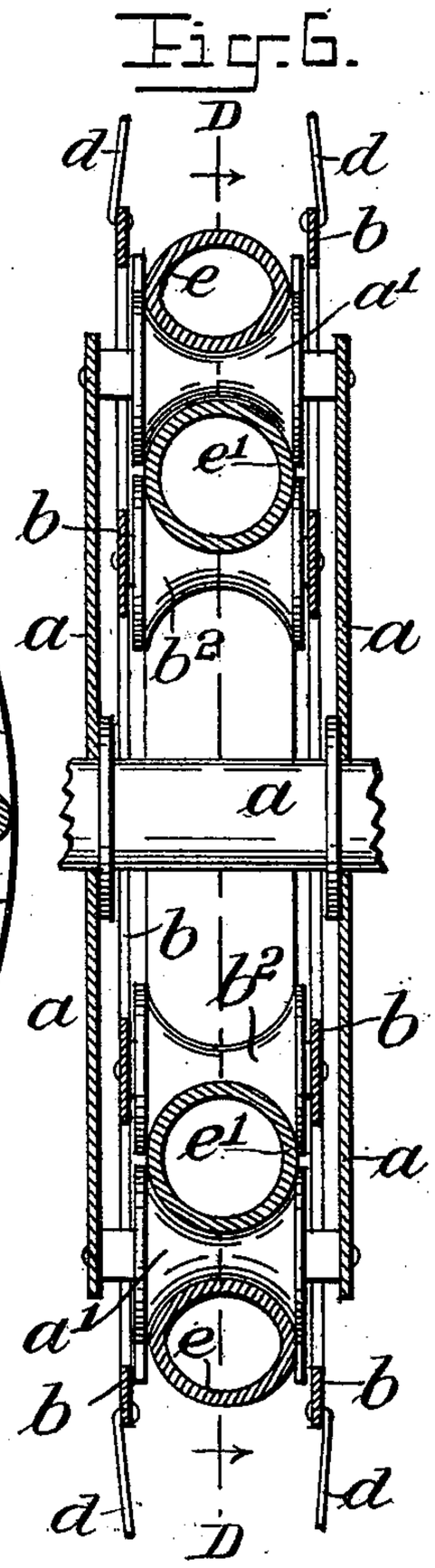


Fig. 6.



Witnesses:
Arthur Crosby
Frank L. Ewin

Inventor:
William Ives

UNITED STATES PATENT OFFICE.

WILLIAM IVES, OF HALIFAX, ENGLAND.

WHEEL.

SPECIFICATION forming part of Letters Patent No. 630,705, dated August 8, 1899.

Application filed January 18, 1899. Serial No. 702,540. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM IVES, a subject of the Queen of Great Britain, residing at Halifax, in the county of York, England, have invented certain new and useful Improvements in Wheels; 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.

This invention relates to those flexible or elastic hubs for cycle and vehicle wheels in which inflated tubes or elastic cushions are interposed between an outer and an inner or central portion of the hub, which hub is built up in two separate parts connected, respectively, with the felly of the wheel and with the axle, such inflated tubes absorbing vibration and concussion caused by stones or roughness of road and bearing and cushioning the weight or load on the wheel.

The object of my invention is to employ, in combination with a flexible or elastic hub constructed and arranged so that pressure or weight on the axle or the force of concussion will be borne by the inflated tubes both above and below the axle, new and novel means for increasing friction or purchase between the bearing or supporting surfaces and the inflated tubes and preventing side play of the inflated tubes or two separate parts of the wheel, and which will give greater resilience to the wheel or hub.

To the aforesaid purpose my invention consists in certain novel features of construction or arrangement and combination of parts of the flexible hub, as will be hereinafter fully described.

In the accompanying drawings, illustrating my invention, Figure 1 is a sectional elevation, taken on line A A of Fig. 2, of a flexible hub embodying my improvements. Fig. 2 is a transverse section taken on line B B of Fig. 1. Fig. 3 is an elevation of a flexible hub, showing a modified arrangement. Fig. 4 is a transverse section of Fig. 3, taken on line C C, same figure. Fig. 5 is a sectional elevation taken on line D D of Fig. 6, showing a modified construction of the flexible hub; and Fig. 6 is a transverse section taken on line E E of Fig. 5.

Like letters of reference indicate corresponding parts throughout.

Referring to the drawings, letters *a b* represent the two separate parts of which the hub is constructed or built up, part *a* being secured to or mounted loosely on the axle *c* (according to whether the wheel is to be driven from said axle or to rotate loosely thereon) and part *b* secured by the spokes *d* to the felly or rim of the wheel. The part *a* or hub proper comprises an axle-barrel and two side disks or plates secured thereto, each marked *a* on the drawings, the side disks being preferably on the outside of and nearly inclosing the whole of part *b*. The part *b* comprises two side disks or plates secured or tied together by two annular concentric rims b' b^2, spaced the proper distance apart, to the former of which the spokes *d* are attached, these rims being curved or hollowed circumferentially to receive the inflated or air-expanded elastic tubes *e e'*. Midway between the said rims b' b^2 and integral with or securely attached at short intervals apart to the side disks *a a* are cross bars or rods a', which are concaved or somewhat bobbin-shaped to receive a part of the outer and inner circumferences of the inflated tubes *e e'* and hold same securely in position therein, so that they cannot get displaced laterally or have any lateral play. Any shape of cross-bar, whether round or angular, provided it has rounded or non-cutting edges, will answer equally well; but in all cases I prefer to provide the cross-bars, if not concaved, as shown, with flanges or shoulders to bear against the lateral sides of the inflated tubes *e e'* to secure them against lateral play, which is an important feature. The distance between the ends of the concaved portions of the cross-bars or the equivalent shoulders thereon may be less than the diameter of the inflated tubes, so as to nip the same when fitted therein to further prevent side play. The tubes *e e'* are arranged side by side within the space between the rims b' b^2 of the part *b* of the hub and are passed first over one cross-bar a', then under the next, and so on over and under each cross-bar a' all around the hub, each tube being passed over and under alternate cross-bars, as shown in Fig. 1, so as to bear on opposite sides thereof in alternate order. By arranging the tubes *e e'*, inclosed in the part *b* of the hub, around the cross-bars a', attached to the part *a* of the hub at short distances apart radially of the same, as described

and shown, considerable friction or purchase is obtained between the tubes *e e'* and said cross-bars *a'*, such as will insure the driving of part *b* by part *a* of the hub, or vice versa, without the loss of power from independent axial movement. The cross-bars *a'* in addition to giving friction between the two separate parts of the flexible or elastic hub also form the bearing-surfaces intermediate of the inflated tubes *e e'*, by which cushioning of the hub or wheel is effected simultaneously above and below the axle. The weight or load placed on the axle or wheel or the riding of the wheel over stones or rough places will be borne by the downward pressure of one of the cross-bars *a'* (which must necessarily move with the axle) on the upper or outer circumference of one of the tubes *e e'*—that is to say, above the axle—and by another of the said cross-bars on the inner circumference of the second inflated tube—that is to say, below the axle—whereby the cushioning of the wheel or absorption of vibration and concussion is equally distributed above and below the axle. Moreover, as the cross-bars *a'* bear on only the smallest part of the circumference of the tubes and at intervals apart, such tubes are much more easily depressed and respond more readily to rough places or stones, and therefore render the wheel fast and resilient.

Essentially the same hub is shown at Figs. 3 and 4; but the inflated tubes are arranged differently within the compound hub. In said figures the tubes are arranged concentrically instead of side by side and slightly apart from each other, and, as shown, are confined in the part *b* of the hub, one bearing on the inner face of rim *b'* and the other on the periphery of rim b^2 of part *b*, which in this case is secured to the axle or axle-barrel, while the part *a* (which comprises two plain metal rings, one on each side of part *b*) is attached by the spokes *d* to the felly or rim of the wheel—that is to say, exactly the reverse to the hub shown at Figs. 1 and 2. The part *b* of the hub in Figs. 3 and 4 may, however, be attached to the spokes of the wheel and the part *a* attached to the axle or axle-barrel precisely as described with reference to Figs. 1 and 2, such alternative methods of connection of the two parts of the hub to the rim or felly and to the axle being immaterial and not affecting my improvements.

The part *a* of the hub, Figs. 3 and 4, has attached to it the cross-bars or bearing-surfaces *a'*, spaced apart at suitable distances radially thereof, three cross-bars only being shown in the example, although any other suitable number may be employed. These cross-bars occupy a position between the concentric inflated tubes *e e'*, compressing them slightly at the points of contact, as illustrated in Fig. 3, and give friction and resilience both above and below the axle and prevent side play, such as previously described with reference to Figs. 1 and 2.

At Figs. 5 and 6 I show a modification of the construction of the hub, comprising the substitution of cross-bars *b' b²*, attached to the side disks *a* of part *b* for the annular concentric rims shown at Figs. 1 to 4. In this example the part *a* of the hub is shown provided with six fixed cross-bars or bearing-surfaces *a'*, and therefore a corresponding number of cross-bars *b' b²* are attached to the part *b* of the hub, these occupying positions intermediate of the cross-bars *a'*, radially of the hub, and supporting the inflated tubes *e e'* at points out of line with the direction of depression of the said tubes by the cross-bars *a'*. The action and results obtained by this construction of hub and the arrangement of the inflated tubes *e e'* between the three sets of cross-bars *b'* and *a'* and *a'* and *b²* are the same as described with reference to Figs. 1 and 2.

In the employment of cross-bars or bearing-surfaces set at suitable distances apart radially of the hub and attached to or integral with one of the parts of the hub, as hereinbefore set forth, greater space or freedom is given to the inflated tubes *e e'* within the hub, and consequently their action is more sensitive.

I claim as my invention—

1. In a pneumatic wheel-hub, the combination, with one part mounted on the axle, and another part connected with the spokes; of a series of cross-bars having their ends secured to one of the said parts, and two annular pneumatic tubes bearing against the said parts and cross-bars, the said cross-bars being arranged between the said tubes and bearing against the outer surface of one and the inner surface of the other, substantially as set forth.

2. In a pneumatic wheel-hub, the combination, with one part mounted on the axle, and another part connected with the spokes; of a series of cross-bars having their ends secured to one of the said parts, and two annular pneumatic tubes arranged side by side and passing alternately under and over the said cross-bars and bearing against them and the two said parts, substantially as set forth.

3. In a flexible or elastic hub the combination with parts *a* and *b* attached one to the axle or axle-barrel, and the other to the spokes of the wheel, of fixed cross-bars or bearing-surfaces *a'* secured to part *a* at suitable distances apart radially and inflated tubes *e*, *e'*, arranged side by side in part *b* and passed under and over the said cross-bars in alternate order which bars under pressure or weight bear on said tubes both above and below the axle simultaneously, substantially as set forth.

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

WILLIAM IVES.

Witnesses:
ARTHUR CROSSLEY,
FRANK LEWIN.