No. 683,285. Patented Sept. 24, 1901.

J. L. HORNIG.

IMPACT AND REACTION MOTOR.

(Application filed Dec. 10, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

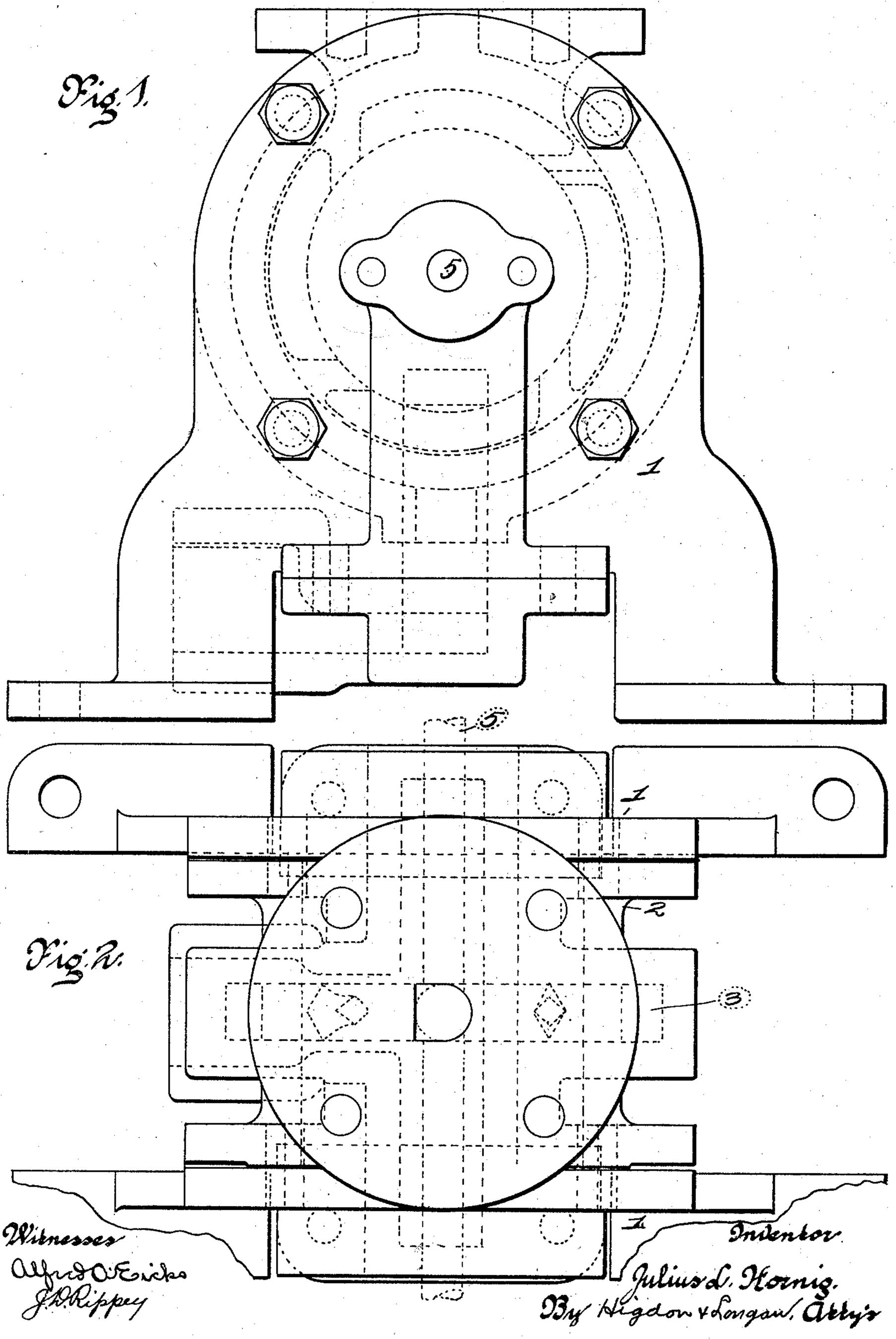

Fig. 2.

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Fig. 3.

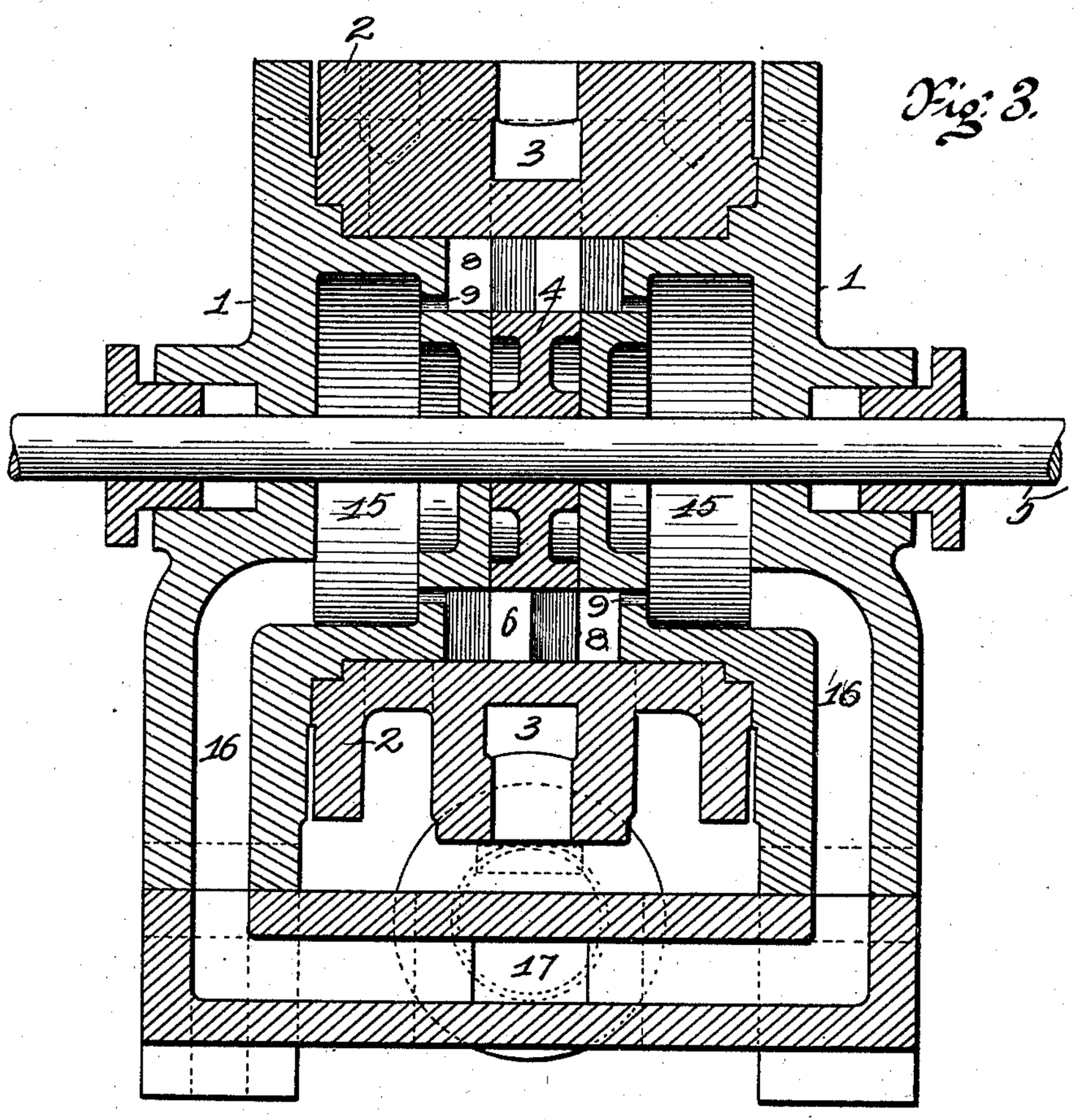


Fig. 4.

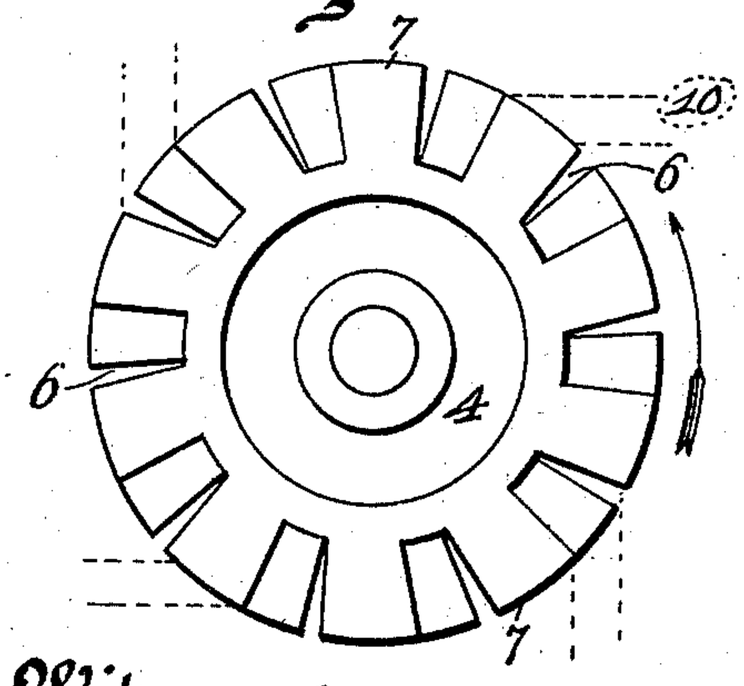
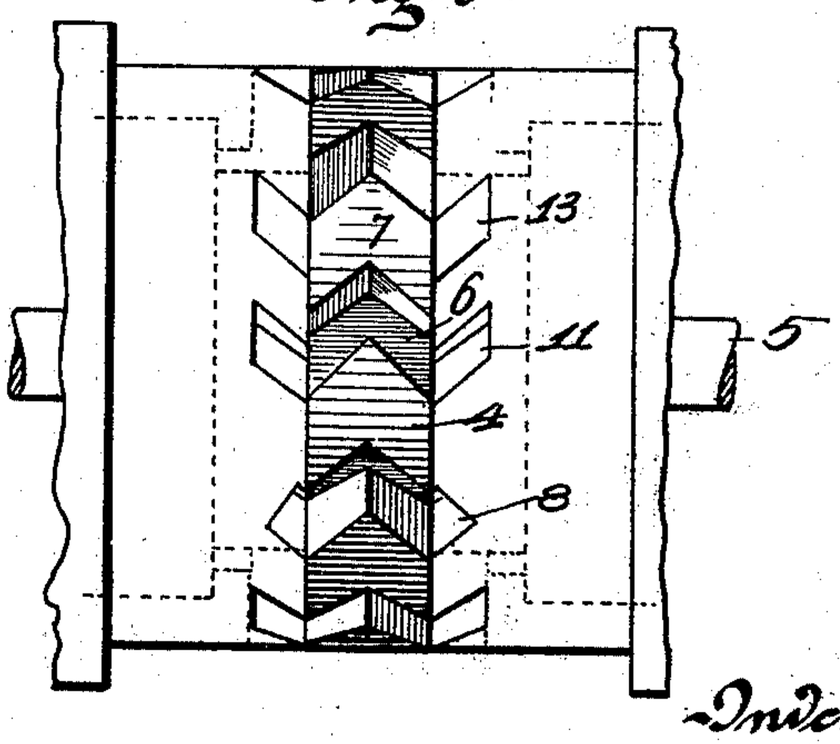


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

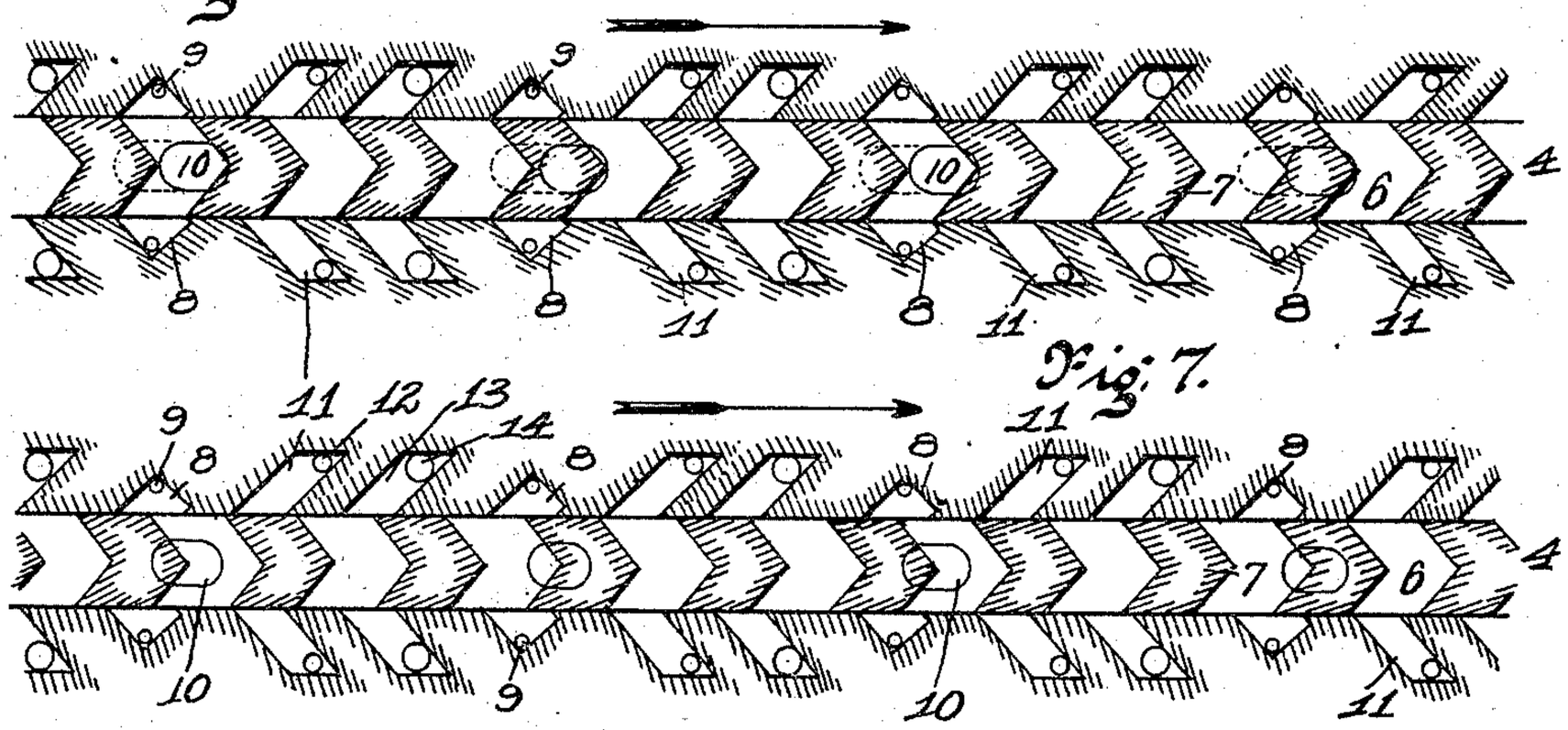


Fig. 7.

Fig. 8.

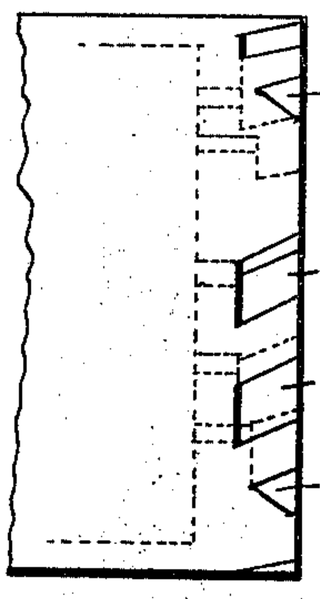
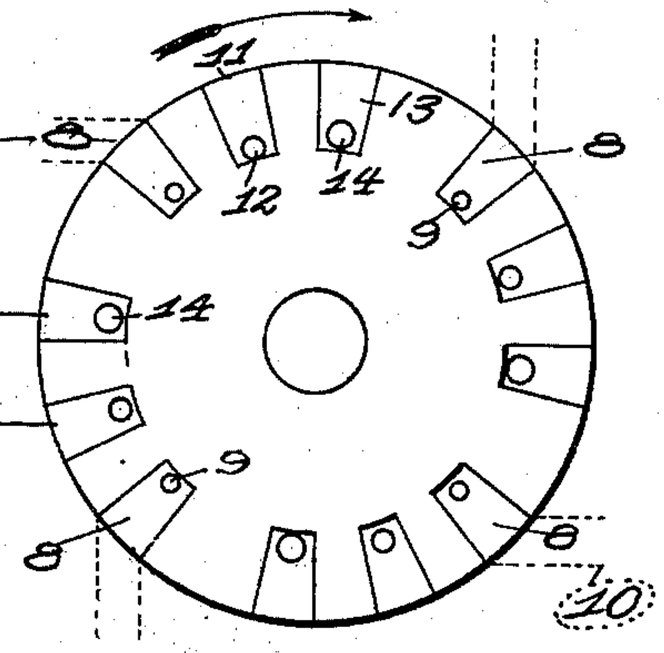


Fig. 9.



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UNITED STATES PATENT OFFICE.

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IMPACT AND REACTION MOTOR.

SPECIFICATION forming part of Letters Patent No. 683,285, dated September 24, 1901.

Application filed December 10, 1900. Serial No. 39,271. (No model.)

To all whom it may concern:

Be it known that I, JULIUS L. HORNIG, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Impact and Reaction Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to impact and reaction motors; and it consists of the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

The object of this invention is to provide an improved impact and reaction motor in which a constant and uniform flow is maintained through the injection-pipes to the impact-wheel, upon which the flow impinges with equal force on opposite sides in order to produce a balance.

Another object is to arrange a series of pockets in the casing at each side of the impact-wheel to receive and discharge the elastic fluid and to utilize its expansive force by causing it to react upon the impact-wheel in the next bucket.

Other objects and advantages will appear from the following detailed description.

Figure 1 is a side elevation of my improved impact and reaction motor. Fig. 2 is a plan view. Fig. 3 is a vertical sectional view showing the manner in which the impact-wheel is mounted within the casing. Fig. 4 is a side elevation of the impact-wheel, showing the position of its bridges relative to the different injection-pipes. Fig. 5 is a view showing the periphery of a portion of the impact-wheel and the position of the buckets formed therein relative to the pockets formed at each side. Figs. 6 and 7 are diagrammatic views showing the impact-wheel in different positions relative to the casing in which the pockets are formed. Figs. 8 and 9 are views showing the arrangement of the pockets in the casing at the sides of the impact-wheel.

The impact-wheel is formed with a series of buckets and revolves in a cylindrical inclosure in which lead a number of injection-pipes approximately tangential to the periphery of the wheel. In the drawings I have shown four passages, but any other even number may be used, provided they are spaced at equal distances from each other to produce a balance. The buckets are preferably curved or V-shaped, and the bridges intervening between them are rigid with the body of the wheel and are so arranged as to give full opening to only one half of the injection-passages at any one time; but as the wheel moves and closes any of the passages the others are correspondingly opened, thereby giving a constant and uniform flow upon the wheel. To provide for the expansive action of the elastic fluid, I provide a series of pockets in the side of the inclosure to receive and discharge elastic fluid, from which a portion is retained to react upon the next bucket. As the elastic fluid discharges from the buckets in the wheel it meets the stationary sides of the pockets in the casing, from which a portion reacts, as stated, the remainder being discharged through proportionate discharge-passages into the reception-chambers, from which openings lead to a general discharge-pipe.

Referring more particularly to the drawings, 1 denotes the castings forming the side of the inclosure in the impact-wheel.

2 indicates a casting carried between the castings 1 and which surrounds the impact-wheel and through which lead injection-pipes for conveying elastic fluid to the impact-wheel. The casting 2 is provided with a belt-passage 3, leading entirely around the impact-wheel, and from the said passage 3 the elastic fluid is forced through openings into the buckets formed in the wheel.

4 indicates the impact-wheel, which is carried within the inclosure formed by the castings 1 and 2 and which is rigid upon the shaft 5. The said wheel 4 is provided with a series of curved or V-shaped pockets 6, between which are the bridges 7, rigid with the body of the wheel. The elastic fluid being forced through injection-passages impinges upon the concave surfaces of the bridges with the buckets, thereby rotating the wheel and the shaft upon which it is mounted. As shown in Fig. 4, one half of the injection-passages are closed by means of the bridges 7, while the other half open into the buckets 6. Other positions of the bridges on the impact-wheel relative to the injection-passages are shown in the diagrammatic views in Figs. 6 and 7.

I form a plurality of pockets in the casting

1 adjacent to the impact-wheel, the function of which is to receive and discharge the elastic fluid and cause a portion of it to react upon the impact-wheel in the next following bucket. The number of these pockets is greater than the number of buckets formed in the impact-wheel, by which arrangement certain of the pockets will be closed by the bridges 7, while the others are open, registering with the buckets 6. Those pockets, which are open, register with the buckets which receive the elastic fluid from the injection-passages. In the form shown I have provided ten of the buckets 6, separated by an equal number of bridges 7. The pockets formed in the casting 1 are twelve in number and are arranged in different series, there being three in each series. This number may be varied, as may the number of buckets formed in the impact-wheel, and I do not desire to limit myself to any specific number. The first pocket of the series I designate by the numeral 8, and leading from said pockets 8 are the small outlet-passages 9. The injection-passages 10 admit the flow of elastic fluid onto the impact-wheel approximately in alinement with the pockets 8, into which a portion of the elastic fluid passes, and striking against the solid wall of the said pockets 8 it reacts upon the wheel, since it cannot pass through the outlet 9 as rapidly as it is admitted through the injection-passages 10. Part of the elastic fluid within the pockets 8 is carried forwardly as the wheel is turned, and that part of the elastic fluid which has been previously received and retained within the second pocket 11 of the series reacts in like manner against the bridges 7. Outlets 12 lead from the pockets 11, which outlets are slightly larger than are the outlets 9. The operation is repeated in the third pocket 13 of the series, which are likewise provided with outlets 14, through which the remaining portion of the elastic fluid may pass outwardly into the reception-chambers, there to be discharged through the outlet-pipe. I have shown and described three pockets for each series; but it is manifest that the number may be increased or diminished, the same principle being involved in either case. From this it appears that the injection-passages 10 are intermittently opened and closed by the operation of the impact-wheel, as are also the pockets which I have just described. Furthermore, it appears that when an injection-passage is closed the pockets 8, corresponding thereto, are also closed, which feature is clearly illustrated in Fig. 6.

As the impact-wheel rotates and moves its bridges 7 from the injection-passages the pockets 8, which were closed simultaneously with the injection-passage, are also opened with equal rapidity to permit the elastic fluid to react upon the bridges, as above described. Thus it appears that my improved impact and reaction motor is different from the ordinary turbine for the reason that the injection-passages and the outlets are correspondingly and intermittently opened and closed and a constant and uniform flow of elastic fluid is always maintained upon the impact-wheel and that a constant and steady balance is maintained at all times. The elastic fluid having been received within the pockets 8, 11, and 13 and having reacted in the manner described passes from the said pockets through their respective openings into the reception-chambers 15, formed in the castings 1 at each side of the impact-wheel. Suitable outlet-passages 16 lead from the respective chambers 15 to receive the elastic fluid and thence to the general outlet-pipe 17, where it is discharged in the usual manner.

The operation of my improved impact and reaction motor may be understood from the above description, and it should be noted that it differs from the turbine wheels and from the ordinary impulse-wheel by the fact that the injection-passages are intermittently opened and closed, those on diametrically opposite sides of the impact-wheel being mated to be opened and closed simultaneously. It further appears that when the elastic fluid is admitted through an injection-passage there is no reaction from the pockets 8 corresponding thereto, and the reaction only takes place when the bridge 7, closing the injection-passage, moves away therefrom to admit the elastic fluid when it impinges against the concave side of the bridge and is deflected into the pockets 8 at either side, from which it reacts in the manner described, a part passing out through the openings 9 and a part being carried onto the next adjacent pockets 11, where the operation is substantially repeated and the portion of the elastic fluid remaining in the pocket is carried to the next adjacent pockets 13 to operate again in the manner described. From this it appears that I have produced an improved motor in the nature of an impact and reaction motor and which is substantially different from the turbine and from the impulse-wheel. It further differs from the turbine in the fact that bridges instead of vanes intervene between the buckets of the wheel and that stationary pockets admit reaction by only partial discharge of the elastic fluid and that by the outflow through the outlets the full advantages of the well-known Hero engine are also provided.

I claim—

1. A motor, consisting of an impact-wheel within a suitable inclosure and having a number of curved or V-shaped buckets formed in its periphery and bridges between them, an injection-passage, and a plurality of reaction-pockets at the side of the said impact-wheel there being a greater number of the pockets than there are buckets in the wheel.

2. A motor, consisting of an impact-wheel within a suitable inclosure and having a number of curved or V-shaped buckets and bridges intervening between them, a number of in-

jection-passages, and a plurality of reaction-pockets formed at each side of the said impact-wheel there being more of the reaction-pockets than there are buckets in the impact-wheel.

3. In a motor, an impact-wheel having a number of buckets and bridges between them, a series of pairs of injection-passages adapted to be intermittently opened and closed by the said bridges, and so arranged that an equivalent of one-half of the full capacity of all the passages will be admitted at all times to preserve complete uniformity and a series of opposite pockets at the sides of the impact-wheel.

4. In a motor, an impact-wheel having a series of buckets and intervening bridges, means for admitting a steady flow of elastic fluid into said buckets, and a series of pockets provided with different-sized outlets at the side of said wheel, adapted to receive and retain a part of the elastic fluid to utilize its reactive force against the other bridges.

5. In a motor, an impact-wheel having a series of buckets and intervening bridges, means for admitting a steady flow of elastic fluid into said buckets, and a series of pockets provided with different-sized outlets at each side of said wheel, adapted to receive and retain a part of the elastic fluid to utilize its reactive force against the other bridges.

6. In a motor, a casing having an annular passage formed therein, an impact-wheel having a number of V-shaped buckets and bridges between them, within said casing, suitable injection-passages leading from the annular passage to the face of the wheel to admit a steady flow of elastic fluid, and a series of different-sized pockets at the side of said wheel to receive and retain a part of the elastic fluid to utilize its expansive force against the bridges.

7. A motor consisting of a suitable casing forming an inclosure and having a series of opposite reaction-pockets arranged in pairs therein, an impact-wheel having a number of V-shaped buckets communicating with said pockets, contained in said inclosure, means for conveying elastic fluid into said buckets, separate reception-chambers, and means for discharging the elastic fluid therefrom through a common outlet.

8. In a motor, an impact-wheel, means for conveying the elastic fluid thereto, a series of pairs of reaction-pockets having different-sized outlets for receiving and discharging the elastic fluid, a reception-chamber at each side for receiving the discharge, and means for conveying it to a common discharge-pipe.

9. In a motor, the combination of an inclosing casing having a series of pairs of reaction and discharge pockets, an impact-wheel within the said casing, and having a smaller number of buckets formed therein than there are pockets, a passage around the wheel, in the casing, means for discharging the elastic fluid onto the wheel, from which it is discharged laterally into the pockets, reception-chambers for receiving the elastic fluid, and means for discharging it through a common outlet.

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

JULIUS L. HORNIG.

Witnesses:
EDWARD E. LONGAN,
JOHN C. HIGDON.