H. E. PERRAULT.

DRIVING MECHANISM.

APPLICATION FILED NOV. 7, 1910.

989,040. Patented Apr. 11, 1911.

4 SHEETS—SHEET 1.

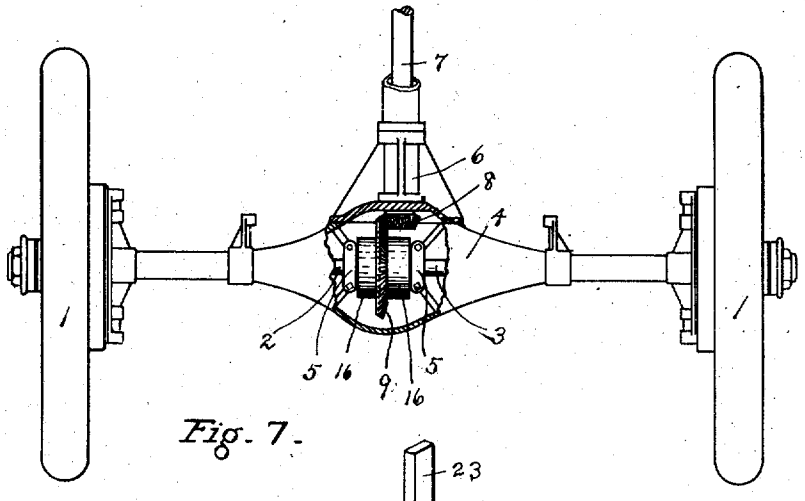


Fig. 7.

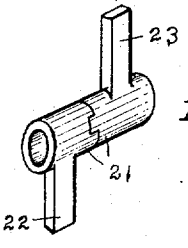


Fig. 8.

Fig. 1.

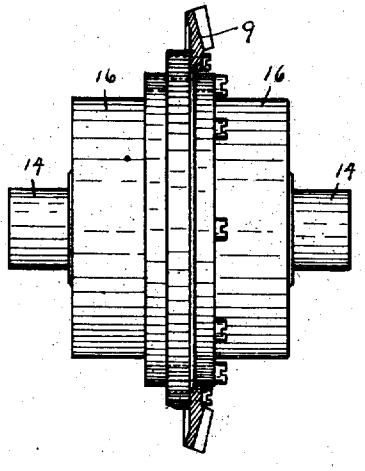
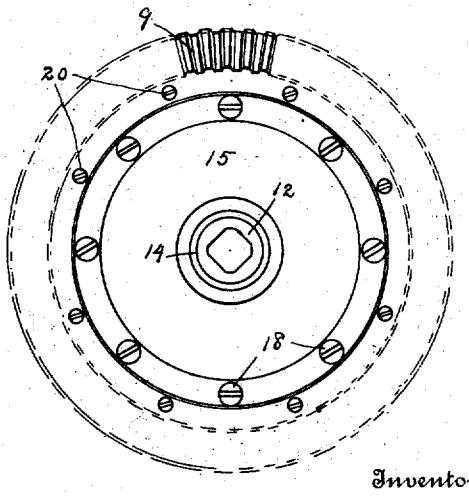


Fig. 2.



Witnesses

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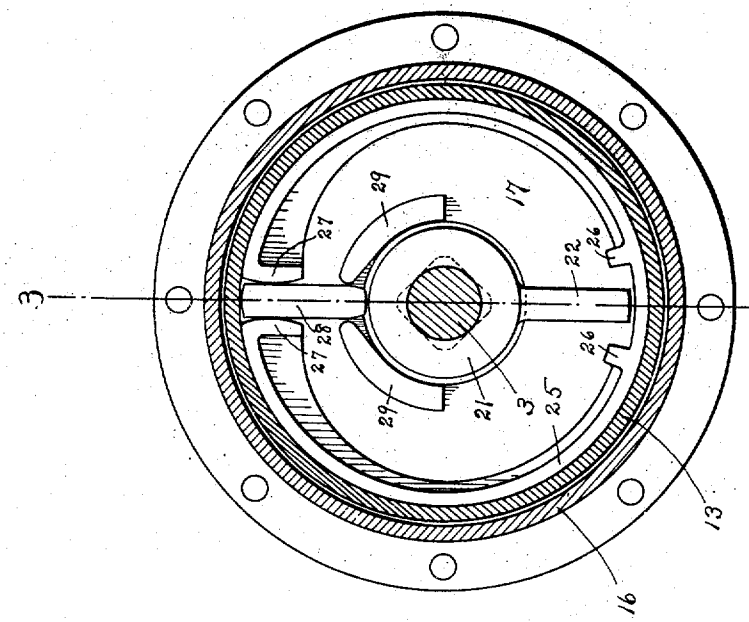

Fig. 4.

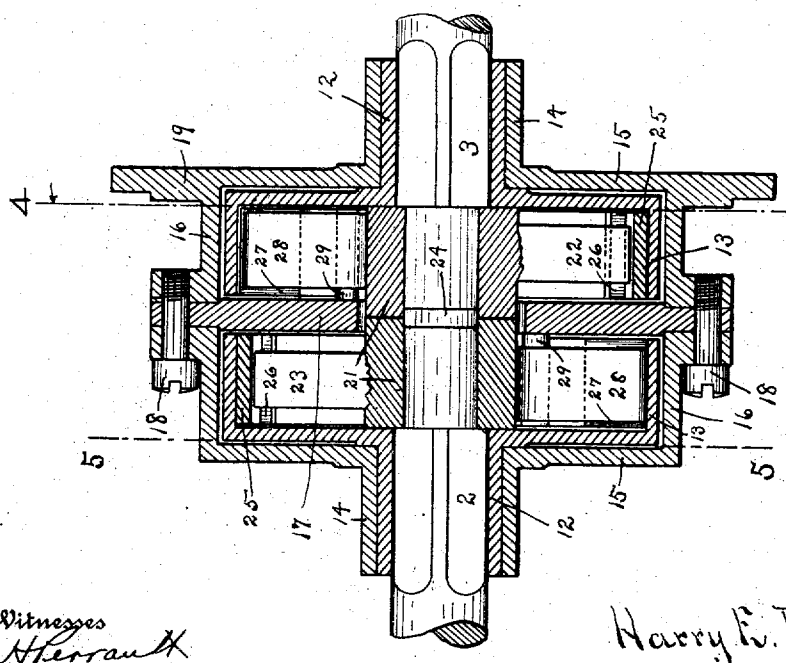

Fig. 3.

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4 SHEETS—SHEET 3.

Fig. 6.

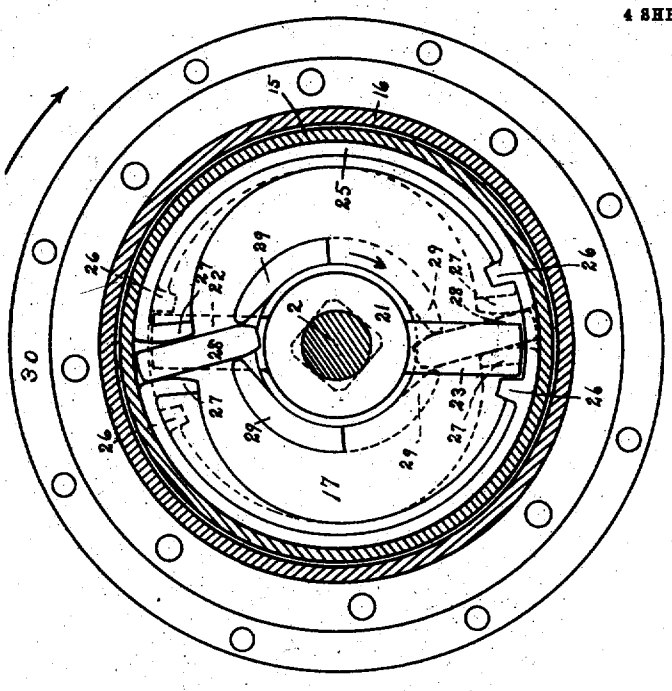
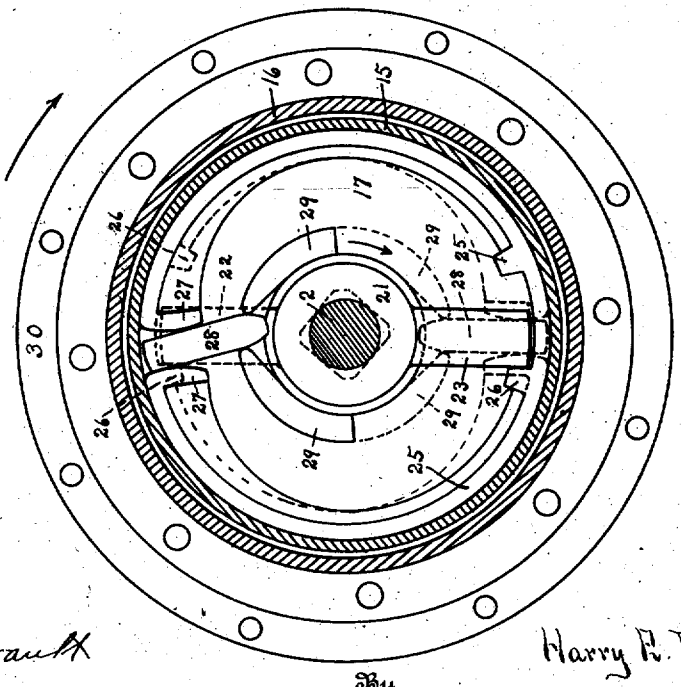


Fig. 5.



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4 SHEETS—SHEET 4.

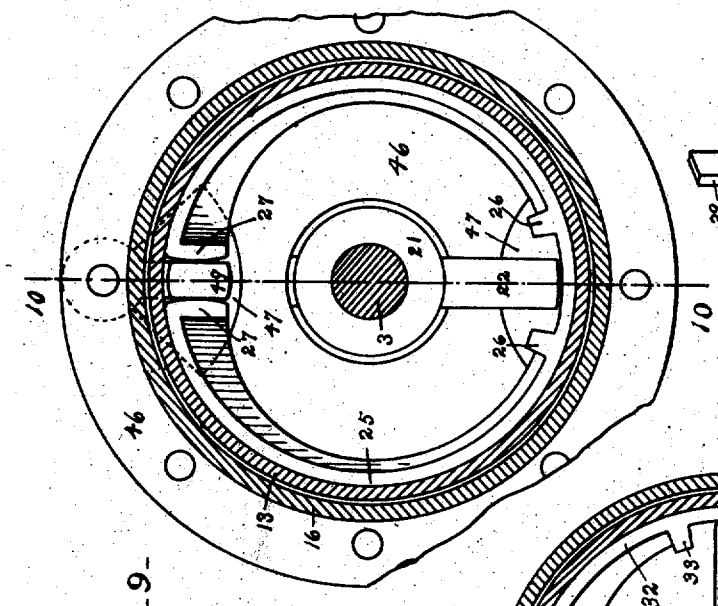

Fig. 9.

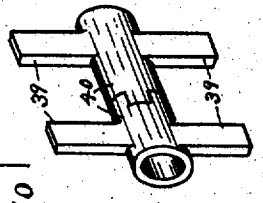

Fig. 12.

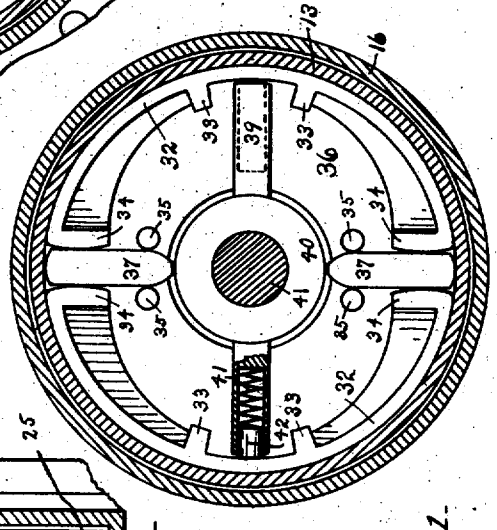

Fig. 11.

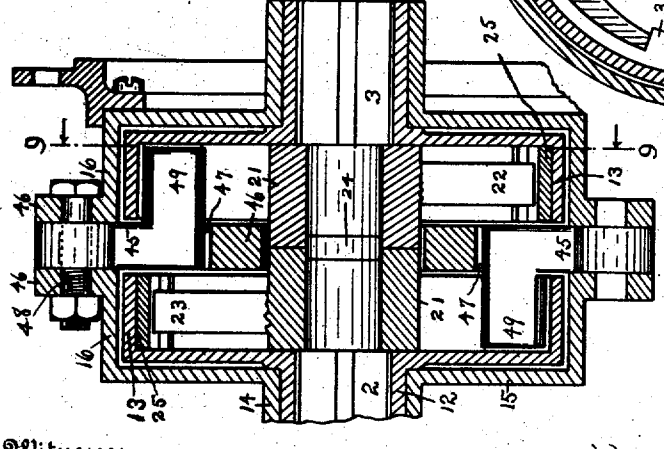

Fig. 10.

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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM.

989,040. Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed November 7, 1910. Serial No. 591,005.

To all whom it may concern:

Be it known that I, HARRY E. PERRAULT, a citizen of the United States, and residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Driving Mechanism, of which the following is a specification.

This invention relates to driving devices for two-part shafts, more especially for the two parts of a divided driving axle of an automobile, and its object is to provide means whereby a driving member may be so geared concentrically to the adjacent ends of a two-part axle or shaft that either part can revolve in the same direction as the driving member at the same or at a greater speed but not at a lesser speed nor in the opposite direction.

In the accompanying drawing, Figure 1 is a side elevation and Fig. 2 is an end elevation of this improved driving device. Fig. 3 is a longitudinal section on the line 3—3 of Fig. 4. Fig. 4 is a cross-section on the line 4—4 of Fig. 3. Figs. 5 and 6 are cross sections on the line 5—5 of Fig. 3 showing the parts in different positions. Fig. 7 is a plan of an axle showing this improved driving gear in position. Fig. 8 is a perspective of the releasing arms. Fig. 9 is a cross section on the line 9—9 of Fig. 10, showing a modified construction. Fig. 10 is a longitudinal section on the line 10—10 of Fig. 9. Fig. 11 is a similar cross section of another modification. Fig. 12 is a perspective of modified releasing arms adapted for the construction shown in Fig. 11.

Similar reference characters refer to like parts throughout the several views.

The usual differential driving gears of the planetary types connected to the two parts of the driving axles of automobiles are so constructed that they act as moving pivots around which the wheels revolve. Thus, the sum of the revolutions of the two wheels equals twice the revolutions of the driving member. If one wheel happens to be mired or on a slippery portion of the pavement, it may revolve at twice the speed of the driving member while the other wheel is stationary. The present invention prevents either wheel remaining stationary and compels both to revolve at the same speed as the driving member. It however permits either wheel to revolve faster than the driving member and therefore permits the necessary difference in speeds of the wheels for turning corners.

In Fig. 7, the two wheels 1 are shown connected by the shafts 2 and 3. A casing 4 supports the bearings 5 of the driving device and connects to a second casing 6 which supports the jack-shaft 7. A pinion 8 on the end of the jack-shaft meshes with the bevel-gear 9 of the driving device. Any other gear or chain drive may be used in this connection in the same manner as with the differential-gears now on the market. The gear 9 may be considered as the source of power although any other construction comprising a revoluble member concentric with the shafts 2 and 3 may be employed.

The inner ends of the shafts 2 and 3 are preferably squared and fit the hubs 12 of the friction driving-drums 13. The hubs are turned on the outside to revolve in the hubs 14 of the flanged disks 15, whose flanges 16 connect to the central driving disk 17 by means of the screws 18. The hubs 14 may revolve in the bearings 5 shown in Fig. 7. These hubs 14, disks 15 and flanges 16 form a shell which braces and supports the driving-disk.

In Fig. 3 a sprocket wheel 19 is formed on one part of the shell by means of which the shell and the driving-disk is turned. In Figs. 1 and 2, the driving disk 17 is formed with a groove into which is fitted the annular bevel-gear 9, being held in position by the screws 20. Any other desired means may be secured to the flange 30, (Figs. 5 and 6) to communicate power to this driving disk.

The inner ends of the shafts 2 and 3 are turned down to furnish bearings for the hubs 21 of the releasing arms 22 and 23. These hubs connect by means of a tongue-and-groove as shown in Fig. 8 and therefore turn together. A small disk 24 may be placed between the ends of the shafts. Within each driving drum 13 may be placed a clutch-ring 25 having inwardly projecting lugs 26. The rings are open, preferably opposite to these lugs, and have bearing-faces 27 between which are mounted the driving-levers 28. Lugs 29 on the driving-disk 17 project laterally along each side of the inner ends of these levers.

The operation of the mechanism is best illustrated in Figs. 5 and 6.

Referring first to Fig. 6, and consider-

ing the ring 30 as beginning to turn to the right, and with it the driving disk 17, it will at once be seen that the stationary driving drums 15, through slight friction, will tend to hold the clutch-rings 25 stationary, and with them, the outer ends of the levers 28. The lugs 29 will carry the inner ends of the levers with them, forcing them to assume an angular position relative to the faces 27, thus forcing them apart and tightly locking both clutch-rings to the interior of the driving-drums 15. The clutch-rings normally engage the driving drums but lightly, so that a slight pull will slide the rings within the drums, so long as the levers 28 are radial, but any deviation of the levers from the radial position locks the rings and drums together. It is immaterial whether the shafts or the disk 17 is driven, and the device operates equally well in both directions. It will also be noticed that when there is a resistance, however slight, by both shafts, that the releasing arms 22 and 23 are inoperative.

Fig. 5 illustrates the action of the parts when one shaft revolves faster than the driving-disk, as when the outside wheel of an automobile "speeds up" in going around a corner. With the usual differential-gear of the planetary types, the inner wheel slows up as the outer wheel increases its speed. But as shown in Fig. 6, neither shaft can revolve slower than the driving-disk. The releasing-arms operate to hold the lever 28 of the speeding side of the device radial and thus prevent the clutch-ring from operatively engaging.

With the front shaft 2 and drum 15 (Fig. 5) resisting, the front clutch-ring 25 is retarded, causing the front jaws 29 to incline the lever 28 as shown, locking the ring to the drum. The front shaft 2 will then turn with the driving disk 17, which shaft is connected to the inner wheel of the automobile turning a corner. The outer wheel "speeds up" revolving its drum 15 at an increased speed in the same direction, that is, to the right in Fig. 5. As soon as this occurs, the rear clutch-ring will be advanced, carrying the rear lever 28 (dotted in Figs. 5 and 6) from the inclined position in Fig. 6 to the radial position in Fig. 5, at which position the rear clutch-ring is released. There is, however, a slight friction between the ring and the drum which, if not prevented, would carry the lever to the opposite inclination and again lock the parts together and thus cause the wheels to act as if they were secured to a solid axle. But this movement is prevented by the releasing arms 22 and 23. In describing the operation of simultaneous driving of both shafts, it was stated that these arms are inoperative. Their hubs are loose on the turned ends of the shafts and the end of each arm extends between the lugs 26 of its ring. These lugs will be designated as forward and back with reference to the rotation of the disk 17.

When the rear clutch-ring has reached the position shown in Fig. 5, its back lug 26 will engage the rear arm 22. The front arm 23 will thereby be pushed against the forward lug 26 on the front ring. Any further pull to the right on the rear ring by its drum will be resisted by the front arm 23 and by the forward lug 26 on the front ring. The front ring is locked to its drum, the rear ring is in its loosest position where it can slide within its drum, which it accordingly does. The outside wheel of the automobile can therefore revolve faster than the disk 17, and its clutch-ring and lever will be held in the position shown in dotted lines in Fig. 5. As soon however as this outside wheel attempts to revolve slower than the disk 17, its ring and lever will be carried back to the position shown in dotted lines in Fig. 6 when the ring will be immediately locked to the driving drum. It will be noticed that to permit either shaft to run faster than the driving disk, the releasing arms 22—23 are necessary. While these lugs 26 are shown opposite the opening in the clutch-rings, this is not necessary. In fact, it is not necessary that the engaging member be a ring or a spring.

In Fig. 11 a construction is shown wherein each of the clutch-rings is replaced by two semi-circular shoes 32, having lugs 33 and cam faces 34. Pins 35 on the driving disk 36 engage the inner ends of the levers 37. The releasing arms 39 are double and are mounted on the hubs 40 which are loose on the inner ends of the shafts 41. The arms 39 may be drilled to receive the springs 41 and small plugs 42 so that the outward pressure of these springs will cause the necessary initial friction between the shoes 32 and the drums 13. The operation of this device is similar to that just described.

Instead of the levers 28, any other desirable means may be employed to separate the bearing-faces 27 of the rings 25. In Figs. 9 and 10, the L shaped levers 45 are shown pivoted on the bolts 48 between the flanges 46 of the shell, the central disk 46 being cut away at 47 to permit the levers to swing. If desired, the disk 46 may be entirely omitted, small ring sections being placed between the flanges 46 to position the same. In this case as in the others, the initial tendency is for the rings 25 to remain with their drums 13, and thus the movement of the shell results in the swinging of the levers 45. A change in the angularity of the parts 49 of the levers relative to the faces 27 of the rings causes a separation of these faces and a locking of the rings to the drums 13. When one of the shafts revolves faster than the

shell, the releasing arms 22 and 23 will operate to carry its ring 25 to such position that the lever will be radial, at which position the shaft can revolve independently of the shell.

It will be noticed that in each case it is impossible for either shaft to revolve more slowly than or in the opposite direction from the shell or driving-disk; that it is possible for either shaft to revolve faster than the driving-disk in the same direction; and that the shafts are independent of each other.

Many other changes in the details of construction may be made within the scope of the claims without departing from the spirit of my invention.

I claim:

1. In a driving mechanism for a two-part shaft, the combination of a shell, two independent drums revoluble therein, a clutch-ring mounted in each drum, a central driving-disk between the drums and connected to said shell, means to revolve said disk, levers to cause the operation of said clutch-rings, and a pair of connected arms for preventing the operation of said clutch-rings.

2. In a driving mechanism for a two-part shaft, the combination of two independent friction-drums, shafts connected thereto, a driving-disk revoluble between the drums, a clutch-ring within each drum, a lever to expand each ring, means carried by said disk to move the lever to ring-expanding position, and means to prevent such movement.

3. In a driving mechanism for a two-part shaft, the combination of two independent friction-drums, shafts extending therefrom, a driving member extending between said drums and concentric with said shafts, clutch-members comprising open rings and levers to expand the rings, means mounted on the driving member to cause the levers to operate, and connected releasing arms, one in engagement with each clutch-member, adapted to restrain its engagement with its friction-drum.

4. In a driving mechanism, the combination of two cylindrical drums, a driving member between the same and revoluble concentric therewith, a clutch device within each drum, a normally radially extending lever for each clutch device, means on the driving member to move the dogs from radial position to cause the clutch devices to engage the drums, and a pair of connected arms, one within each drum adapted to engage said clutch devices to prevent the engagement of either one with a drum revolved at greater speed than the driving member.

5. In a driving mechanism, the combination of a shell comprising a cylindrical portion, ends for the same and hubs projecting outward from the ends; driving drums within the shell, disks connected thereto and hubs journaled within the hubs of the shell; friction clutch-rings mounted with the drums, each having a gap and a pair of inwardly projecting lugs; a shaft extending into the hub of each friction drum and secured thereto, the inner ends of the shafts being cylindrical; a releasing arm within each clutch-ring with its outer end between the lugs on the same, and a hub for each arm, said hubs connected together and freely revoluble on the ends of the shafts; a driving disk connected to said shell and extending between the arms, clutch-rings and friction drums; a driving lever on each side of the driving-disk having its outer end in the gap of the adjacent clutch-ring; projections on each side of the driving disk engaging the inner end of the adjacent driving lever; and means to revolve the shell.

6. In a driving mechanism, the combination of a driving disk, means to revolubly support the same, means to revolve the disk, driving drums adjacent said disk and provided with supporting devices, shafts connected to said drums, clutch-members within the drums, driving levers extending between the ends of said clutch members, and connections between the driving disk and the levers to incline the same and thereby cause the clutch-members to engage the drums.

7. In a driving mechanism, the combination of a driving disk, means to revolubly support the same, means to revolve the disk, driving drums adjacent said disk and provided with supporting devices, shafts connected to said drums, clutch-members within the drums, driving levers extending between the ends of said clutch members, connections between the driving disk and the levers to incline the same and thereby cause the clutch-members to engage the drums, and connected releasing arms, one within each friction drum for preventing the engagement of the adjacent clutch member with a drum revolving faster than the driving disk.

8. In a driving mechanism, the combination of a driving member, means to revolubly support the same, friction drums adjacent said member, clutch-members within the drums having separated ends, driving levers between said ends, connections between said driving member and said levers whereby rotary movement between the driving member and the drums will cause at least one of the clutch-members to engage a drum to connect the driving member to said drum.

9. In a driving mechanism, the combination of a driving member, means to revolubly support the same, friction drums adjacent said member, clutch-members within the drum having separated ends, driving

levers between said ends, connections between said driving member and said levers whereby rotary movement between the driving member and the drums will cause at least one of the clutch-members to engage a drum to connect the driving member to said drum, and releasing devices whereby the other clutch member is prevented from operatively engaging its drum when said drum revolves in the same direction as the driving member but at greater speed.

10. In a driving mechanism, the combination of a revoluble driving member, shafts extending therefrom, clutch-members connected to said shafts, a controlling member for each clutch-member to cause each shaft to be connected to the driving member to be revolved thereby, and means mounted concentric with the shafts for preventing such engagement when a shaft revolves faster than the driving member.

11. In a driving mechanism, the combination of a revoluble driving member, shafts mounted concentric therewith, clutch-members on said shafts, a controlling member for each clutch-member to connect each shaft to the driving member to be revolved thereby at the same speed, and means mounted concentric with the shafts positioned by either clutch-member to prevent the other clutch-member from engaging when the shaft of the same revolves faster than the driving mechanism.

12. In a driving mechanism, the combination of a revoluble driving member, shafts mounted concentric therewith, clutches and controlling members for causing the shafts to revolve at the same speed as the driving member, and means mounted concentric with the shafts to release either shaft to permit it to revolve faster than the driving member.

13. In a driving mechanism, the combination of a revoluble driving member, shafts mounted concentric therewith, clutches for connecting the shafts to said driving member, and a controlling member mounted concentric with the shafts for each clutch operated by the driving member to cause such connection.

14. In a driving mechanism, the combination of a revoluble driving member, shafts mounted concentric therewith, clutches for connecting the shafts to said driving member, a controlling member for each clutch operated by the driving member to cause such connection, and means connecting said clutches and mounted concentric with said shafts for preventing either clutch from engaging when its shaft revolves faster than the driving member.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HARRY E. PERRAULT.

Witnesses:
ELIZABETH M. BROWN,
EDWARD N. PAGELSEN.