

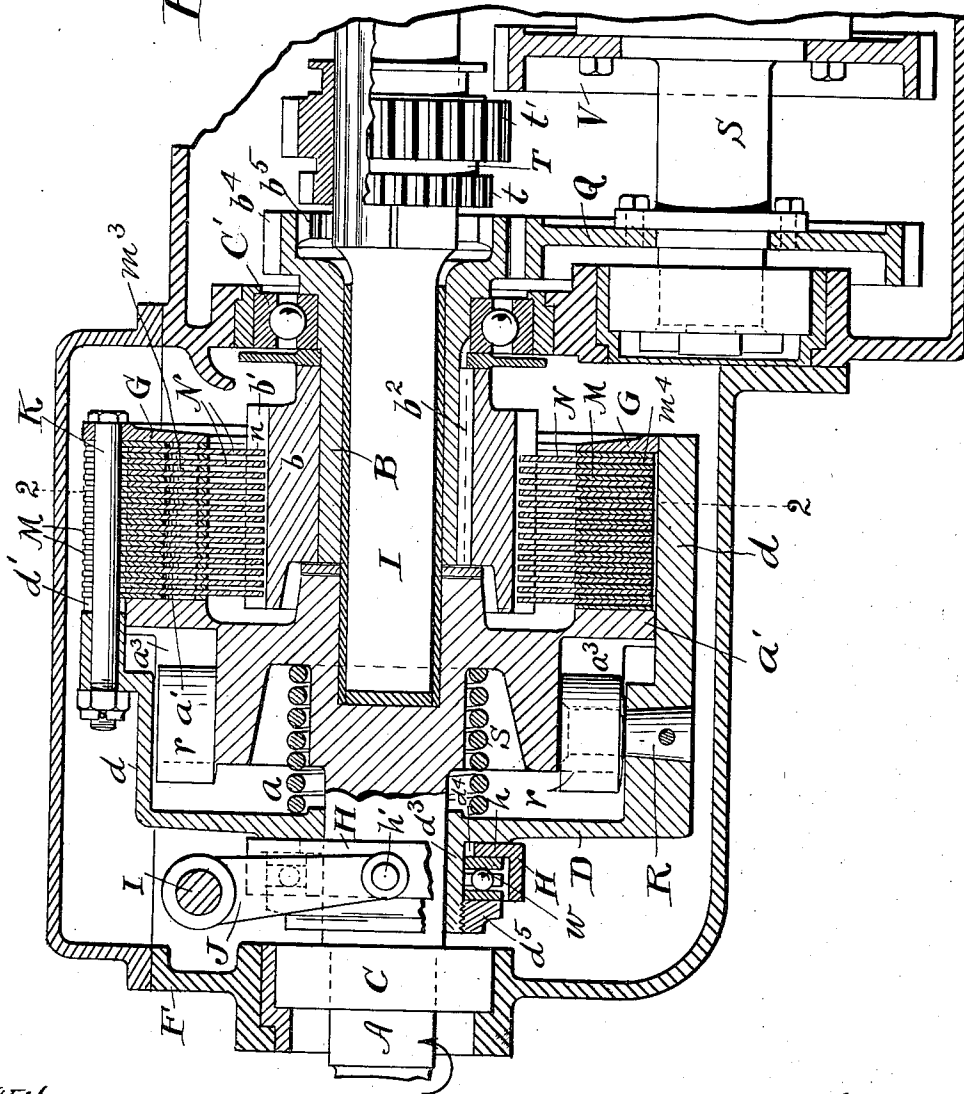
A. P. BRUSH.
 MULTIPLE DISK CLUTCH.
 APPLICATION FILED JAN. 12, 1910.

987,954.

Patented Mar. 28, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses
 E. B. Gilchrist.
 H. B. Sullivan.

Inventor
 Alanson P. Brush
 by E. I. Thurston
 Attorney

A. P. BRUSH.
 MULTIPLE DISK CLUTCH.
 APPLICATION FILED JAN. 12, 1910.

987,954.

Patented Mar. 28, 1911.

3 SHEETS—SHEET 2.

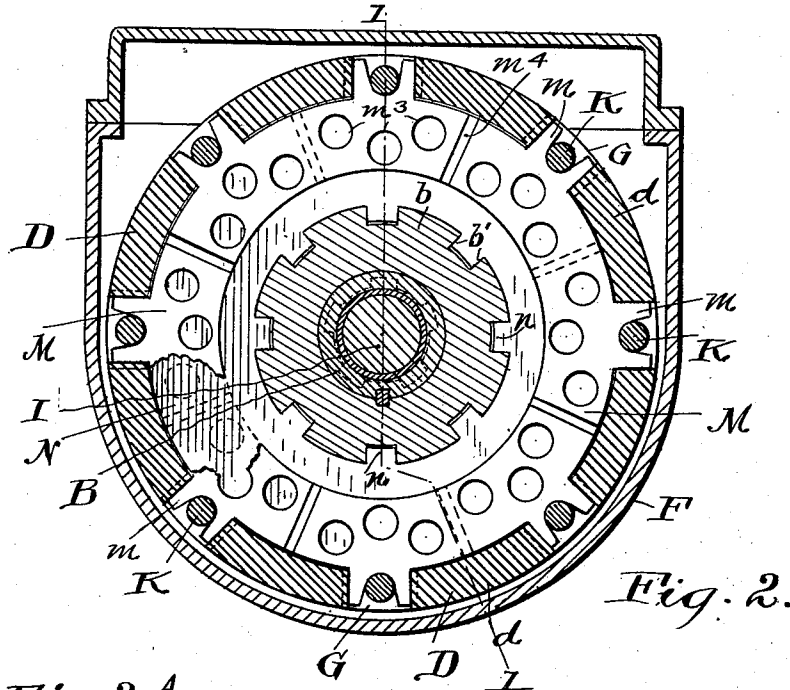
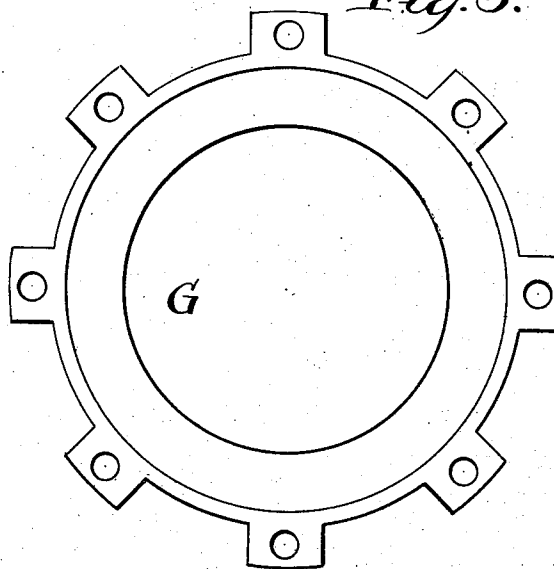


Fig. 2.

Fig. 3. A



Fig. 3.



Witnesses.
 E. B. Gilchrist,
 H. R. Sullivan.

Inventor,
 Hanson P. Brush
 by E. L. Thurston
 Attorney

A. P. BRUSH.
 MULTIPLE DISK CLUTCH.
 APPLICATION FILED JAN. 12, 1910.

987,954.

Patented Mar. 28, 1911.

3 SHEETS-SHEET 3.

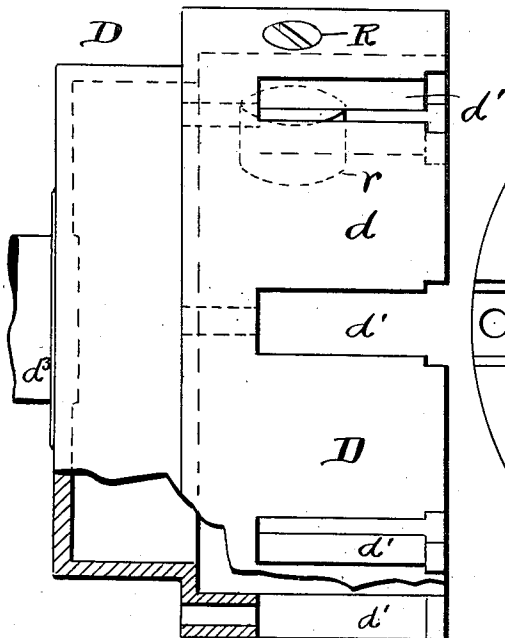


Fig. 4.

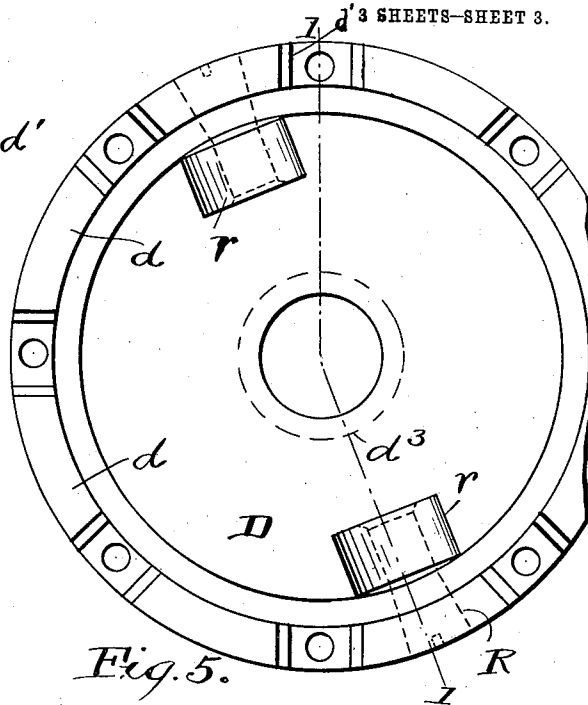


Fig. 5.

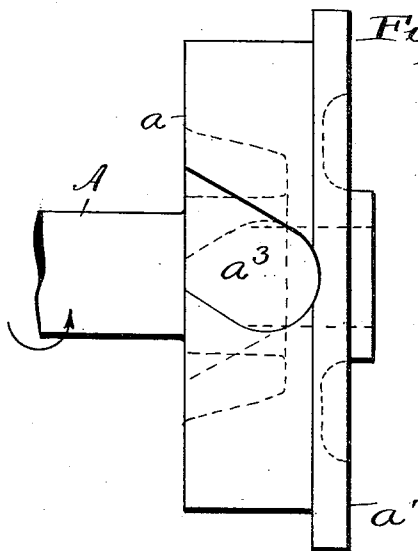


Fig. 6.

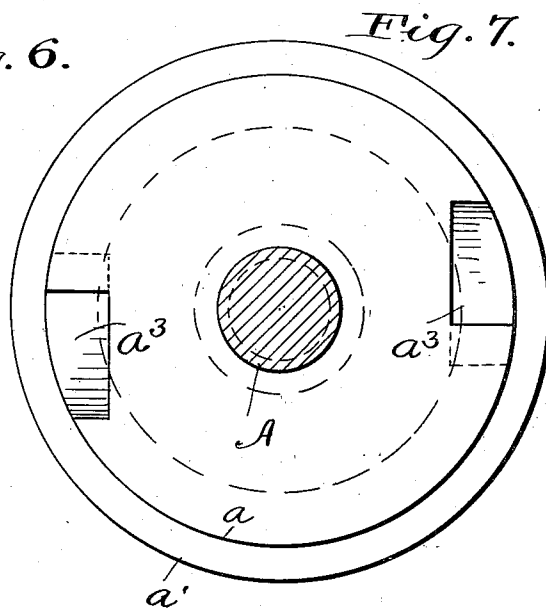


Fig. 7.

Witnesses.
 E. B. Gilchrist,
 H. B. Sullivan

Inventor.
 Hanson P. Brush
 by E. L. Thurston
 Attorney

UNITED STATES PATENT OFFICE.

ALANSON P. BRUSH, OF FLINT, MICHIGAN.

MULTIPLE-DISK CLUTCH.

987,954.

Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed January 12, 1910. Serial No. 537,623.

To all whom it may concern:

Be it known that I, ALANSON P. BRUSH, a citizen of the United States, residing at Flint, in the county of Genesee and State of Michigan, have invented a certain new and useful Improvement in Multiple-Disk Clutches, of which the following is a full, clear, and exact description.

This invention has for its special object the adaptation of multiple disk clutches for use as a part of the power transmitting mechanism of an automobile.

The invention consists in the novel combinations of parts shown in the drawing and hereinafter described and pointed out definitely in the claims.

In the drawing Figure 1 is a central vertical longitudinal section of the invention embodied as a part of a transmission control unit adapted to be interposed between the power shaft of the motor and the propeller shaft through which the power is transmitted to the rear axle mechanism and is a section upon the line 1—1 of Figs. 2 and 5. Fig. 2 is a sectional view in the plane of line 2—2 on Fig. 1. Fig. 3 is an end view of the vise jaw G. Fig. 3^A is section of same. Fig. 4 is a side view, sectioned along the lower edge of the member D. Fig. 5 is an end view of said member. Fig. 6 is a plan view of the inner end of shaft A; and Fig. 7 is an end view of said shaft.

Referring to the parts by letters, A represents the driving shaft of the clutch mechanism,—said shaft being mounted in a bearing ring C supported by the inclosing case F. On the inner end of this shaft within the case is a cylindrical enlargement *a* which is shown to be an integral part of the shaft, although this is not essential. The left end face *a'* of this enlargement serves as one of the vise jaws between which the friction disks are clamped. In the inner end of the shaft A is a concentric longitudinally extended socket for the reception of the inner end of a shaft I, which is one of the shafts of the change speed mechanism which the clutch mechanism is designed to drive.

The driven shaft B of the clutch mechanism is supported in bearings C' carried by the case F; and this shaft is tubular so that the shaft I may pass through it, and be rotatably supported by it and may project into the socket in the end of shaft A.

Rigid with the shaft B (it is keyed to it in the construction shown) is one of the

disk carriers *b* which has a series of longitudinal grooves *b'*. The disks N, which constitute the inner series of disks, embrace and are supported by the disk carrier *b*; and are provided with a plurality of tongues *n* which enter the grooves *b'*, thereby providing a sliding torque transmitting engagement between the disks and driven member B. D represents the other disk carrier. The hub *d*³ of this disk carrier is supported by and is longitudinally movable upon the shaft A. It has a cylindrical flange *d'*, which surrounds the enlargement *a'* of the shaft A and the disk carrier *b*. In this flange are a plurality of longitudinal slots *d'*. The vise jaw G which is in the form of a flat ring is secured to the end of this flange by means of bolts K which extend lengthwise in the grooves *d'*. The disks M of the outside series of disks, have a series of tongues *m* which enter and slidably fit in the grooves *d'* and each of these tongues has a U-shaped notch extending in from its periphery, in which notches the several bolts K lie, whereby said bolts serve to center the disks. The described construction provides an easily assembled sliding torque transmitting engagement between said disks and the disk carrier D.

On the hub portion *d*³ of the disk carrier D is an annular groove *d*⁴ formed between the nut *d*⁵ and the web which connects the hub *d*³ with the flange *d'*. A ring H is provided with an inwardly turned flange *h* which enters this groove between the web and thrust bearings *w* of familiar form, which bearings lie between nut *d*⁵ and the flange *h*. A rock shaft I, which is mounted in the casing has fixed to it a forked arm J which embraces the ring H and has holes which loosely receive pins *h'* projecting outward from said ring H at diametrically opposite points.

In the outer periphery of the enlargement *a* of the shaft A are helical grooves *a*³. Studs R fixed to the flange *d'* project inward therefrom; and on each a friction roller *r* is mounted, which rollers and studs project severally into said helical grooves. These grooves *a*³ are open at their ends so as to facilitate the introduction of the rollers *r* therein. The disk carrier D is driven from the shaft A through these helical slots and roller bearing studs.

In order to set the clutch, the rock shaft I may be rocked in such manner that

through the forked arm J and the ring H the disk carrier D is moved to the left as shown in Fig. 1. Preferably, however, a spring S which may surround the shaft A and may thrust endwise against the enlarged part *a* and the rib of the disk carrier D, supplies the force to move the disk carrier as stated. The lever is preferably used mainly to move the disk carrier D in the relieving direction. The described movement of the disk carrier D, however produced, draws the vise jaw G toward the vise jaw *a'* and thereby moves the disks of both series into frictional engagement with each other. The object of producing the frictional engagement of the disks is to drive the shaft B, and to thereby propel the motor vehicle, the rotation of member B being transmitted to the driving wheels by suitable mechanism which must include change speed mechanism. When the disks are first brought into frictional contact, and before the member B has acquired the speed of rotation of the member A, the frictional engagement of the disks will cause the disk carriers D to lag a very little behind the shaft A. This backward turning of the disk carrier D relative to shaft A will, by the reaction of the rollers *r* and the helical grooves *a*³, cause the disk carrier D to move toward the left, as shown in Fig. 1, and thereby apply increased pressure upon the disks, and this movement of the disk carrier D relative to shaft A and the resultant increase of pressure between the disks will continue until shaft B and shaft A rotate in unison. At all times the pressure of the inclined walls of the helical slots against said rollers *r* tends to move the disk carrier to the left and thereby to hold the disks pressed tightly together. If there is any slip between the disks, this very slip, which must be accompanied by a relative backward moving of the disk carrier B on shaft A, will apply additional pressure to the disks.

As before stated, this clutch is particularly designed for use on an automobile as a part of the transmission control mechanism through which motion is transmitted from the engine shaft to the so-called propeller shaft. This transmission control mechanism, of necessity, includes not only clutch mechanism through which the engine shaft may be disconnected from the transmission mechanism, but it also includes speed changing mechanism. In Fig. 1 there is shown enough of the speed changing mechanism to illustrate the particular applicability of the described clutch for the intended use. The shaft I is a part of this speed changing mechanism and is, in fact, the terminal member thereof which is to be driven backward or forward at various speeds. To accomplish this result the shaft B is provided with one external gear *b*⁴ and a concentric

internal gear *b*⁵. The external gear is constantly in mesh with a gear Q fixed to a parallel counter shaft S. A sliding sleeve T mounted on the squared part of the shaft I has one gear *t* adapted to be slipped into the gear *b*⁵, and another gear *t'* adapted, when the said sleeve is moved to the right to engage with a gear V fixed to the counter shaft S; whereby, in the first instance, shaft S will be rotated at the same speed as the shaft B, and in the second instance, it will be rotated at a different speed through the gear *b*⁴, gear Q, the counter-shaft S, the gear V and the gear *t'*. It is not necessary to further describe the change speed mechanism. Enough has been described to show that the clutch is not only particularly adapted for the desired use, but also to show in what manner it may be associated and combined with the speed changing mechanism for said use.

In the described construction it is preferred that the outer series of disks M shall be made of bronze and the inner series of disks N of steel. It is also desirable that oil be put into the case in such quantity that the disks shall dip into it, thus insuring that the friction surfaces shall become oil coated when not clamped together. If it were not for this coating of oil the disks would wear rapidly as they move in contact with each other when first pressed into contact, or else the disks would grip each other too suddenly, or both of these undesirable results might take place. Neither takes place, however, when the surfaces are coated with oil, but nevertheless it is necessary to squeeze most of the oil out from between the disks when they are pressed together before the disks can be completely locked together so as to prevent relative movement of the two sets of disks. For the principal purpose of hastening the flow of oil from between said friction surfaces when they are clamped together recesses are made in the friction surfaces of the bronze disks. These recesses may be in the form of holes or pockets *m*³ or grooves *m*⁴ running across the friction surface of said disks, or both forms of recesses may be employed, as shown. When, now, the friction disks are pressed together, the oil, as it is squeezed from between the friction surfaces, will flow into these recesses, thereby enabling the disks to become locked without shock and without undue wear, but in a reasonable time.

Having described my invention, I claim:

1. In a multiple disk clutch, the combination of a rotatable driving member carrying an annular vise jaw, a coaxial driven member, a series of friction disks embracing said driven member and having a sliding torque-transmitting engagement therewith, a disk carrier slidably mounted on the driving member and having a flange which over-

hangs said driven member, a series of disks within said flange having a sliding torque-transmitting engagement therewith, a vise jaw fixed to said flange, and means for moving said disk carrier longitudinally.

2. In a multiple disk clutch, the combination of a rotatable driving member carrying an annular vise jaw, a coaxial driven member, a series of friction disks embracing said driven member and having a sliding torque-transmitting engagement therewith, a disk carrier slidably mounted on the driving member and having a flange which overhangs said driven member, a series of disks within said flange having a sliding torque-transmitting engagement therewith, a vise jaw fixed to said flange, and means for moving said disk carrier longitudinally, said driving member and disk carrier having respectively a helical groove and a roller carrying stud projecting into said groove.

3. In a multiple disk clutch, the combination of a rotatable driving member carrying an annular vise jaw, a coaxial driven member, a series of friction disks embracing said driven member and having a sliding torque-transmitting engagement therewith, a disk carrier slidably mounted on the driving member and having a flange which overhangs said driven member, a series of disks within said flange having a sliding torque-transmitting engagement therewith, a vise jaw fixed to said flange, and means for moving said disk carrier longitudinally, said driving member having open ended helical slots, and said disk carrier having inwardly projecting radial studs and friction rollers carried thereby extending into said grooves.

4. In a multiple disk clutch, the combination of a rotatable driving member carrying an annular vise jaw, a coaxial driven member, a series of friction disks embracing said driven member and having a sliding torque-transmitting engagement therewith, a disk

carrier slidably mounted on the driven member and having a flange which overhangs said driven member, said flange having a series of open ended longitudinal slots, a vise jaw and bolts lying in said slots for securing said vise jaw to the end of said flange, a series of disks within said flange having outwardly extended tongues which enter said grooves, which tongues have U-shaped notches in their peripheries for embracing said bolts, and means for moving said disk carrier longitudinally.

5. In a multiple disk clutch, the combination with a rotatable driving member, of a rotatable driven member, a series of friction clutches connected with the driven member, and a series of interspersed disks connected with the driving member, means for forcing said disks into engagement, and additional means for further forcing said disks into engagement during the period before the driven shaft attains the speed of the driving shaft.

6. In a multiple disk clutch, the combination with a rotatable driving member, of a rotatable driven member, a series of friction disks operatively connected with the driven member, a series of friction disks interspersing the first mentioned disks, a member upon which the last mentioned disks are carried, means for moving said member so that the disks are brought into engagement with each other, means for operatively connecting said carrying member and the driving shaft, said means serving to cause additional friction between the disks during the period before the driven shaft attains the speed of the driving shaft.

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

ALANSON P. BRUSH.

Witnesses:

H. R. SULLIVAN,
E. L. THURSTON.