W. O. FOSS.

DRIVING MECHANISM.

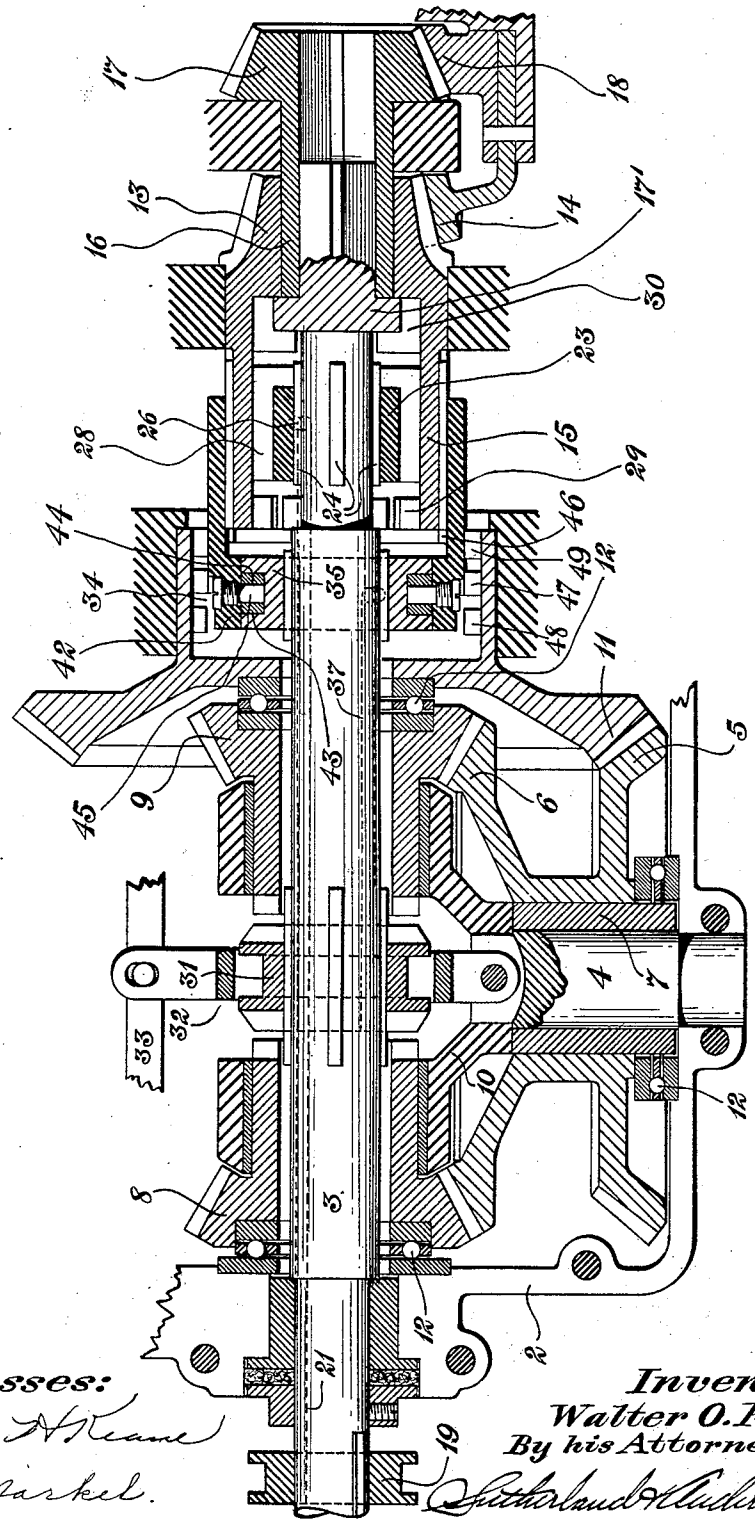
APPLICATION FILED MAR. 2, 1911.

1,042,101.

Patented Oct. 22, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

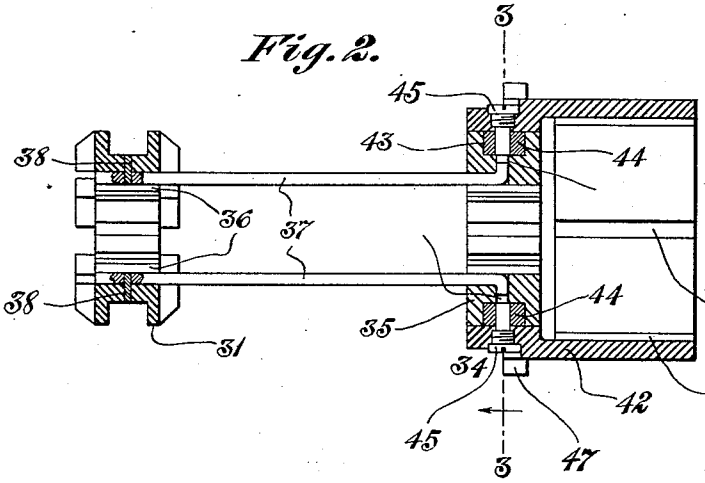


Fig. 3.

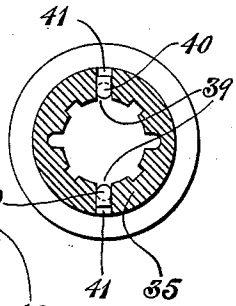


Fig. 4.

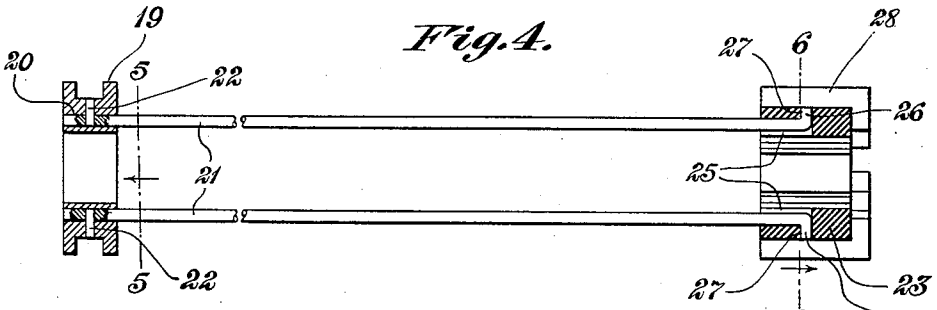


Fig. 5.

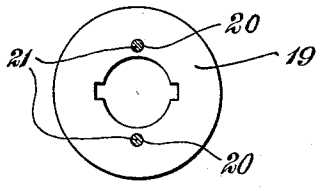
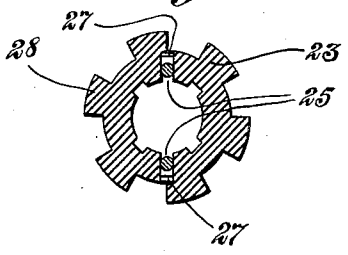


Fig. 6.



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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM.

1,042,101. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed March 2, 1911. Serial No. 611,932.

To all whom it may concern:

Be it known that I, WALTER O. FOSS, a citizen of the United States, residing at Branford, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Driving Mechanism, of which the following is a specification.

This invention relates to what I shall for convenience term a driving mechanism, and the primary purpose of the invention is to provide simple and effective means whereby different relations can be readily secured, such for instance as a change in speed or direction of movement.

In the drawings accompanying and forming part of the present specification I have shown in detail one form of embodiment of the invention which to enable those skilled in the art to practice the same will be set forth fully in the following description, while the novelty of the invention will be included in the claims succeeding said description. From the statements just made it will be evident that I do not restrict myself to the showing made by said drawings and description; I may depart therefrom in several respects within the scope of my invention included in said claims.

Driving mechanism involving my invention includes preferably a plurality of clutch devices and means for shifting or throwing the same generally together, although this is not essential. In a copending application filed February 23, 1910, Serial No. 545,410, I have shown, described and claimed a driving mechanism, and in the main view of the drawings in the present case I have shown rather fully the principal parts of the driving mechanism of said application with the object of indicating definitely the nature of the improvements and also to set forth clearly the mode of operation thereof. I do not limit myself to the use of any of these driving members, as others of a radically different type might be substituted for them. The invention rather resides in means for readily obtaining different driving conditions.

Referring to said drawings: Figure 1 is a longitudinal sectional view of driving mechanism embodying my invention. Fig. 2 is a sectional view of two clutch members and their connecting means. Fig. 3 is a cross section on the line 3—3 of Fig. 2. Fig. 4 is a sectional view of another clutch member, a collar, and connecting means between said clutch member and collar. Figs. 5 and 6 are sectional views on the lines 5—5 and 6—6 of Fig. 4.

Like characters refer to like parts throughout the several figures.

In practice as in the prior application already referred to, the different parts of the mechanism are carried upon a suitable support and the casing 2 answers satisfactorily in this connection. There is preferably a driving shaft and that denoted in a general way by 3 answers in this respect. The casing is shown sustaining the stud shaft 4 located at right angles to the main or driving shaft 3. The bevel gears 5 and 6 rotate around said stud shaft 4 or more properly around a bushing 7 inclosing and supported by said stud shaft, the latter being supported at its ends in bearings on the casing 2. Said gears 5 and 6 may, as a matter of convenience be made integral. The inner gear 6 is shown in mesh with the gears 8 and 9 facing toward each other, this mesh in the present instance being a constant one. Said gears 8 and 9 are supported for rotation about the main or driving shaft 3, and their hubs are shown somewhat elongated and as supported by the branches of the bearing 10 sustained by the casing 2. It will be understood that there is no contact between the gears 8 and 9 and the main shaft 3. The outer gear 5 is in mesh with the bevel gear 11, the hub of which is supported for rotation by the casing 2. I may, as shown, interpose anti-friction bearings between the gears 9 and 11 and between the gear 5 and the casing 2 and also between the gear 8 and said casing, and as a matter of convenience, each of said anti-friction bearings is denoted by 12. It will be understood that the gears 8 and 9 do not move longitudinally of the main shaft 3.

Surrounding the shaft 3 near the outer end thereof is a bevel gear 13, said bevel gear

13 being fitted in a bearing formed in the casing 2 and being in constant mesh with the bevel gear 14. The said bevel gear 13 has an elongated hub or sleeve 15 which surrounds the shaft 3, the two parts being wholly separated, and preferably in the space between the two, as will hereinafter appear, is operative a clutch device. The bevel gear 13 turns around the elongated hub 16 of the bevel gear 17 which is axially alined with the shaft 3 and which meshes with the bevel gear 18. I might state at this point that the bevel gears 13 and 14 and 17 and 18 respectively are in constant mesh and that said bevel gears 14 and 18 are rotatively connected together, in practice, being preferably connected with the part to be driven, which part may vary greatly as to character. When the driving mechanism is incorporated in an automobile, this driven member will be the rear axle, and it will be assumed for sake of illustration that the driving mechanism is on an automobile, and that the parts already described are so related that in such a use as this, I can obtain three forward speeds, one the high, another the intermediate, and the final the third or low speed, while in addition to this I can also obtain a reverse. It may not be necessary in all cases to use all these members in one organized structure. In the present instance the main or driving shaft 3 is continuously operable, that is it is rotated as long as the engine or motor is in action. I provide means whereby the gears 8 and 9 can be alternately clutched or coupled to said shaft 3 and whereby at the same time the bevel gear 11 will, when either of said gears 8 or 9 is clutched to the shaft 3, be clutched to the gear 13. That is to say when the gear 8 is clutched to the shaft 3, the gear 9 at this time being unclutched therefrom, the gear 11 will be also clutched to the gear 13, while on the other hand when the gear 8 is unclutched from the said shaft 3 and the gear 9 clutched thereto, the said gear 11 and the gear 13 will be also clutched together. In addition to this there is also means for clutching the gears 13 and 17 alternately to the shaft 3 or equivalent source of power. I might state that in the present case the parts are so organized that when the gear 17 is clutched to the shaft 3, both the gears 8 and 9 at this time being out of clutched relation with said shaft as is also the gear 13, the driving axle in the case of an automobile would be so rotated as to drive the car forward at its high speed. When the said gear 17 is unclutched from said shaft 3 and the gear 13 clutched thereto both said gears 8 and 9 at this time being out of clutched relation with said shaft, the car will be driven forward at its intermediate speed. To secure the slow forward speed and the reverse, the forward gears or those in the left in Fig. 1 including the gears 8, 9 and 11 are utilized and while the forward slow and reverse mechanisms are in action, the gears 17 and 13 are unclutched from the shaft 3. To obtain the slow speed the gear 9 will be clutched to the shaft 3 and simultaneously therewith the gear 11 will be clutched to the gear 13, while to reverse, the gear 8 will be clutched to said shaft 3 and simultaneously the gear 11 will be clutched to the gear 13. The parts are so proportioned as to secure these various effects. While bevel gears are shown, this is not a matter of consequence. Hereinafter I will trace out how the different gears are employed in effecting the various conditions, although I might state at this time that in the forward high speed and the forward intermediate speed only the clutch between the gears 13 and 17 comes into operation, said clutch being simply utilized to alternately clutch said gears 13 and 17 to the shaft 3. In obtaining the slow forward speed and the reverse two clutch members are called simultaneously into action.

At what might be considered the extreme forward end of the shaft 3 is slidably keyed a collar 19 which is peripherally grooved or channeled to receive the branches of a clutch shifter. (Not shown.) Fitted within the opening of said collar 19 and suitably rigidly fastened in the apertures 20 in the wall of said opening, are the butts of elongated rods 21 of which there are two, said rods being shown diametrically opposite each other, and held rigidly to said collar 19 by pins 22. These rods 21 extend along the shaft 3 and into the clutch device 23. Said clutch device 23 is keyed to the shaft 3 so as to rotate therewith and slide thereon, the keys being denoted in each case by 24. The outer ends of said rods 21 as intimated extend into the opening of the clutch device 23, the latter having in its wall diametrically opposite grooves 25 to receive the rods, the extreme outer ends of which are provided with bends or hooks 26 to enter perforations 27 in the clutch device 23 and extending from the grooves 25 thereof toward the periphery thereof. Said clutch device 23 is shown having external teeth 28 extending along the exterior of the same and down the outer side thereof, adapted to alternately engage teeth 29 and 30 respectively on the gears 13 and on a clutch head 17′ having a squared shank fitted within a square hole in the hub of the gear 17. This clutch device 23 slides within the elongated hub 15 of the gear 13, and the teeth 29 are formed on said gear 13 near the outer end of said sleeve or hub 15 interiorly of the same, while the teeth 30 are formed on the square shanked clutch head 17′ which is al-

ways in driving relation with the gear 17. By moving the collar 19 forward, the rods 21 will be carried therewith, so that the clutch device 23 can be moved to carry its teeth 28 into engagement with the teeth 29 whereby the gear 13 will be put into driving relation with the shaft 3, the consequence being that in case the driving mechanism be on an automobile, the latter will be driven forward at its intermediate speed. Should the collar 19 be moved rearward to project the teeth 28 of the clutch device 23 into engagement with the teeth 30, the gear 17 will be put into driving relation with the shaft 3 whereby said automobile will be driven forward at its high speed, and I might state that at this time the clutch device hereinafter described between the gears 8 and 9 is in its neutral or intermediate position.

The shaft 3 supports between the gears 8 and 9 the clutch device 31 which is keyed or otherwise suitably connected therewith for sliding movement thereon. This clutch device 31 is operable by a shifting member denoted in a general way by 32 and supported for rocking motion by the stud shaft 4. The shifting member 32 in turn may be actuated by the rod 33 having a loose connection therewith as shown. In Fig. 1 the clutch device 31 is represented occupying its neutral position, it being in engagement with neither of the gears 8 and 9. Should the said clutch device 31 be shifted to the left to put its side teeth into engagement with the teeth on the hub of the gear 8, the latter will be clutched to the shaft 3, while should said device 31 be shifted to the right to put its opposite side teeth into engagement with teeth on the hub of the gear 9, the latter will be clutched to said shaft 3. There is a third clutch device, as will hereinafter appear, and this third clutch device is controlled by the clutch device 31, and it is shown somewhat in detail in Fig. 2 being denoted in a general way by 34. The clutch device 34 in the present case is of compound construction, one of its elements being connected directly with the clutch device 31. Said clutch device 34 comprises an inner member 35 keyed or otherwise suitably connected with the shaft 3 for sliding movement thereon. From this it will be apparent that the member 35 rotates with said shaft 3.

The wall of the opening of the clutch device 31 has grooves 36 in which are fitted the forward ends or shanks of the rods 37, rigidly connected with said clutch device 31 for instance by pins 38. These rods 37 are somewhat like the rods 21 except that they are shorter and like said rods 21 extend longitudinally of the shaft 3 at diametrically opposite points. The outer ends of said rods 37 are fitted in grooves 39 in the inner member 35, and they have outwardly extending bends or hooks 40 fitting in holes 41 leading from the respective grooves 39. It will, therefore, be apparent that when the clutch device 31 is shifted, the member 35 will be moved therewith. The outer member of the clutch 34 is designated by 42, and it has what might be considered an anti-friction key connection with said inner member 35. Said inner member is shown having an annular circumferential channel 43 in which are fitted several rollers 44 extending inward from the inner wall of the outer member 42, the rollers being held in place by screws 45 extending through the outer member 42 which is made somewhat in the form of an elongated sleeve, the heads of the screws being countersunk in the outer surface of said member 42, and their inner parts constituting studs or pivots for the rollers 44 which, as will be understood, are fitted in the channel 43. It should be understood that the outer member 42 turns relatively to the inner member and the construction I have pointed out is an advantageous one for obtaining this relative motion, although the same result can as others be obtained in different ways. It will be remembered that in both the slow forward movement and the reverse, the gear 13 is employed and in this event the clutch device 34 should be in constant driving relation with said gear 13, and this effect I can with advantage obtain by a sliding key connection between the member 42 and the elongated hub 15 of the said gear 13, there being a key connection between said hub 15 and member 42 for example by forming keyways 46 within the said member 42 adapted to receive keys on the exterior of said hub 15. The clutch device 34 is shown as having teeth 47 which in the present case are formed exteriorly of the member 42 thereof, and these teeth are adapted alternately to engage teeth 48 and 49 inside the elongated hub 50 of the large bevel gear 11. When the clutch device 31 is moved to the left in Fig. 1 to clutch the gear 8 to the shaft 3, the clutch device 34 is carried therewith whereby the teeth 47 will be engaged with the teeth 48, and in this event the driven member of whatever character it may be, is reversed. On the other hand if the clutch device 31 be moved to the right in said figure to clutch the gear 9 to the shaft 3, the clutch device 34 will be carried therewith so as to cause the teeth 47 to engage the teeth 49 whereby the driven member will be driven forward at its slow speed.

The two sets of rods 21 and 37 as set forth extend longitudinally of the shaft 3 and project through the central openings of those gears around the said shaft which are between their limits, this presenting a very compact construction. Of course, I do not

limit myself to this construction nor to the use of several rods for shifting any one clutch.

I have shown in the drawings and hereinbefore described certain clutch mechanism which is not claimed herein but is covered in certain applications for patents filed by me on May 20, 1911, Serial Nos. 628,513 and 628,514 respectively.

What I claim is:

1. The combination of a power transferring member, a second power transferring member, a third power transferring member, means for operatively connecting the second and third power transferring members with the first power transferring member, a clutch for alternately connecting said second and third power transferring members with a source of power, a fourth power transferring member, a second clutch, and means for putting the second clutch into clutching relation with the first power transferring member when the first clutch is moved in either direction from its neutral position.

2. The combination of a rotary shaft, a power transferring member loosely surrounding said shaft, a second power transferring member also loosely surrounding said shaft, a third power transferring member also loosely surrounding said shaft, a clutch slidingly keyed to the said shaft in the space between the second and third power transferring members and shiftable from a neutral position alternately into engagement with said second and third power transferring members, means connecting said second and third power transferring members operatively with the first power transferring member, a fourth power transferring member, a second clutch member surrounding said shaft, and means for causing said second clutch member to clutch together the fourth and first power transferring members when the first clutch member is moved in either direction from said neutral position.

3. The combination of a bevel gear, a second bevel gear, a third bevel gear, rotatively connected fourth and fifth bevel gears, the fourth bevel gear being in mesh with both the second and third bevel gears and the fifth bevel gear being in mesh with the first bevel gear, a clutch shiftable from a neutral position alternately into positions to put the second and third bevel gears into operative relation with a source of power, a sixth bevel gear, a second clutch, and means for causing the second clutch to put the first and sixth bevel gears into clutched relation when the first clutch is shifted in either direction from its neutral position.

4. The combination of a gear, forward driving and reversing mechanisms operatively connected with said gear and each comprising a gear, a clutch shiftable from a neutral position into positions for alternately putting said gears of said forward driving and reversing mechanisms into operative relation with a source of power, a fourth gear, a second clutch, and means for causing the second clutch to put the first and fourth gears into clutched relation when the first clutch is moved in either direction from its neutral position.

5. The combination of a gear, a second gear, a clutch shiftable from a neutral position into a position to alternately put said first and second gears into operative relation with a source of power, a second pair of gears, operative connections between said first and second gears and one of the second pair of gears, a second clutch, and means for causing the second clutch to put the second pair of gears into operative relation when the first clutch is moved in either direction from its neutral position.

6. The combination of a gear, a second gear, a third gear, a clutch for alternately connecting the second and third gears with a source of power, a fourth gear, a second clutch, a rod connecting the first and second clutches and serving when the first clutch is moved in either direction from its neutral position to cause the second clutch to put the first and fourth gears into operative relation, said rod extending through the openings of the first and second gears.

7. The combination of a rotary shaft, a gear loosely surrounding said shaft, a second gear also loosely surrounding said shaft, a third gear also loosely surrounding said shaft, a clutch keyed to the shaft between the second and third gears and movable from a neutral position alternately into engagement with the second and third gears, operative connections between the second and third gears and the first gear, a fourth gear, a second clutch, a rod connecting the first and second clutches and serving to cause the second clutch to put the first and fourth gears into operative relation when the first clutch is moved in either direction from its neutral position and extending through the openings of the first and second gears.

8. The combination of a rotary shaft, a gear loosely surrounding said shaft, a second gear also loosely surrounding said shaft, a third gear also loosely surrounding said shaft, operative connections between the second and third and the first gears, a clutch keyed to said shaft and movable from a neutral position alternately into engagement with the second and third gears, a fourth gear, a clutch between the first and fourth gears, a pair of rods rigidly connected with the first and second clutches and

serving to cause the second clutch to put the first and fourth gears into driving relation with each other when the first clutch is moved in either direction from its neutral position, said rods being external to the shaft and extending through the openings of said first and second gears.

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

WALTER O. FOSS.

Witnesses:
L. L. MARKEL,
F. E. ANDERSON.