

N° 17,944



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Complete Specification Left, 21st June, 1916—Accepted, 7th Dec., 1916

PROVISIONAL SPECIFICATION.

Means for Locking Differential or Balance Gear of a Motor Vehicle.

We, WOLSELEY MOTORS, LIMITED, of Adderley Park, in the City of Birmingham, Manufacturers, and EDWARD REEVE, of the same address, Chief Draughtsman, in the employment of the said Company, do hereby declare the nature of this invention to be as follows:—

5 This invention has for its object means whereby differential or balance gear of a motor vehicle may be readily partially or completely locked, at will, to ensure that both the driving road wheels will revolve together, thereby enabling a vehicle to be readily extricated from an awkward place, such as from soft soil or from a depression, such as a ditch or the like, into which the vehicle may have
10 run.

Broadly describing the invention, it consists, as to its main feature, in the employment of clutches, whereby both the divisions of the live-axle may be clutched to the differential cage, or to each other, in a manner which prevents them from turning in relation thereto, the means by which the locking is effected
15 of course allowing the cage to revolve and carry the divisions of the axle round with it.

The clutches employed are of the friction type, and according to convenient means of carrying out the invention these clutches are of the plate kind; and to partially or completely lock each live-axle division to the cage the alternate
20 plates of a set are engaged with the axle division, conveniently through the medium of a sleeve which is splined upon the axle division, and the other plates of the set are engaged with the cage, so that when the plates are pressed tightly together a locking action is set up between the axle division and the cage. The set of plates is conveniently arranged within a recess in the inner face of
25 the corresponding side of the cage, and the tightening together of the plates may be effected by moving the sleeve in an outward direction thus causing the plates to be pressed together between the differential wheel which surrounds the sleeve, and is formed therewith or fixed thereto, and the inner face of the recess, and in such case the movement may be imparted to the sleeve through a
30 pair of short levers which are carried by the fixed casing which surrounds the gear and bear against a washer which surrounds the sleeve and between which and an annular abutment which is carried by the sleeve is interposed a ring of anti-friction balls. According to an alternative arrangement for pressing the plates of a set together, a number of pins, having their axes parallel with the
35 axle, may pass through the nave of the cage and, through the medium of a washer, press against the inner plate of the set, these pins being pushed in, to press the plates together, by means of short levers, corresponding to those above described, which press against a washer which transmits movement imparted to it to a washer which is formed with or bears against the outer ends of the pins,
40 anti-friction balls being introduced between the washers.

[Price 6d.]



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The short arms aforesaid may be operated by longer arms which are rigid therewith and are exterior to the fixed casing which surrounds the live axle, the outer ends of these latter arms being linked to a common rod, which ensures that substantially equal pressure will be exerted upon both clutches when the rod is pulled. 5

The rod may be operated by means, such as of a screw device, which is mounted upon the casing; or by means, such as of a screw device, which is mounted in any convenient position upon the vehicle frame and is connected with such rod through the medium of a rod and of levers which are carried upon a transverse rock shaft which is mounted in bearings of the frame. 10

The invention, as thus far described, is capable of considerable variation in detail, as will be obvious, and the methods above described by which it may be carried out are given simply as examples.

According to a further feature of the invention, means by which the partial or complete locking of the differential gear is effected, may be used with gear of the bevel or spiral type in which, through the medium of friction clutches, it is ensured that as the resistance of one driving road wheel decreases and of the other increases, the driving effort tending to turn the wheel which offers the greater resistance is automatically increased, the driving effort being therefore more nearly distributed as required for the even propulsion of the vehicle, the said clutches being, according to this feature of the invention, utilised as the clutches by which the differential gear may be partially or completely locked when required. 15 20

Dated this 22nd day of December, 1915.

STEPHEN WATKINS, SON & GROVES,
Chartered Patent Agents,
Metropolitan Chambers, Wolverhampton,
Agents for the Applicants. 25

COMPLETE SPECIFICATION.

Means for Locking Differential or Balance Gear of a Motor Vehicle. 30

We, WOLSELEY MOTORS, LIMITED, of Adderley Park, in the City of Birmingham, Manufacturers, and EDWARD REEVE, of the same address, Chief Draughtsman, in the employment of the said Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:— 35

This invention has for its main object improved means whereby a pair of road wheels of a motor vehicle which are driven through the medium of differential or balance gear may be readily frictionally engaged together, at will, with a view to ensure that both the wheels will be constrained to revolve together, thereby enabling a vehicle to be readily extricated from awkward places, such as from soft soil or from a depression, such as a ditch or the like, into which the vehicle may have run. 40

Broadly describing the invention, it consists, as to its main feature, in the employment of externally operated friction clutches of the plate type by means of which the divisions of the live-axle may, at will, be frictionally engaged together, leaving them still free to revolve. 45

According to a convenient means of carrying out the invention, the clutches are utilised to frictionally engage together the live-axle divisions and the cage,

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alternate plates of each set being engaged with the corresponding axle division, conveniently through the medium of a sleeve which is splined upon the axle division, and the other plates of each set being engaged with the cage, so that when the plates are pressed tightly together a frictional connection is set up
 5 between each axle division and the cage and consequently between the two driving road wheels. Each set of plates is conveniently arranged within a recess in the inner face of the corresponding side of the cage, and the pressing together of the plates may be effected by moving the corresponding sleeve in an outward direction, thus causing the plates to be pressed together between the
 10 corresponding differential wheel, which surrounds and is carried by the sleeve, and the back of the recess, and in such case movement may be imparted to the sleeve through a pair of short levers which are carried by the fixed casing which surrounds the gear, and bear against a washer which surrounds the sleeve and between which and an annular abutment which is carried by the sleeve is inter-
 15 posed a ring of anti-friction balls. According to an alternative arrangement for pressing the plates of a set together a number of pins, having their axes parallel with the axle, may pass through the nave of the cage and, through the medium of a washer, press against the inner plate of the set, these pins being pushed in, to press the plates together, by means of short levers, corresponding
 20 to those above described, which press against a washer which transmits movement imparted to it to a washer which is formed with or bears against the outer ends of the pins, anti-friction balls being interposed between the washers.

The short arms aforesaid, may be operated by longer arms which are rigid therewith and are exterior to the fixed casing which surrounds the live axle,
 25 the outer ends of these latter arms being linked to a common rod, which ensures that substantially equal pressure will be exerted upon both clutches when the rod is pulled.

The invention, as thus far described, is capable of considerable variation in detail, as will be obvious, the method above described by which it may be
 30 carried out being given simply as an example.

According to a further feature of the invention, clutches whether of the plate or other suitable type by which the frictional locking of the differential gear is effected according to the main feature of the invention, may be used, with
 35 differential or balance gear of the bevel or spiral spur type, and constitute clutches through the medium of which it will be ensured that as the resistance of one driving road wheel decreases and of the other increases, the driving effort tending to turn the wheel which offers the greater resistance will be automatically increased, the entire driving effort being therefore more nearly distributed as required for the even propulsion of the vehicle.

40 In order that the invention may be clearly understood, we will describe, by reference to the drawings herewith, certain practical forms thereof, which are illustrated by way of example.

Of these drawings:—

45 Figure 1 is a view, mainly in longitudinal section, of one application of the invention.

Figure 2 is a view corresponding to Figure 1, illustrating a further form of the invention; and,

Figure 3 is a view, also corresponding to Figure 1, showing a further form of the invention.

50 Referring first to Figure 1:—A A are the two divisions of the live-axle. B is the cage of the differential gear. C C are the differential wheels, and D is one of the differential pinions. E E are plate clutches each of which surrounds a sleeve F which is splined upon the corresponding axle division A, and these clutches are within recesses *b*, respectively, which are formed in the inner faces
 55 of the side walls of the cage B. The wheels C surround and are prevented from turning in relation to the sleeves F, in the particular arrangement shown, held from moving along the sleeves in a direction towards one another by nuts *f*

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which are screwed upon portions of the sleeves which project beyond the wheels. The sleeves F may be simultaneously moved outwards to clamp, more or less tightly, the plates of the clutches between the wheels C and the backs of the recesses. Alternate plates of each clutch are prevented from turning in relation to the corresponding sleeve and the other plates of the clutch are prevented from turning in relation to the cage, in a manner well understood, such, for instance, in the manner in which alternate plates of similar clutches are prevented from turning in relation to a sleeve and the other plates are prevented from turning in relation to a cage as described with reference to Figures 2 and 4 of the drawings accompanying Patent Specification No. 7557 of 1915. A washer f^1 is passed over the end of each sleeve F and is held against a shoulder of the sleeve by means of a nut f^2 , and between a washer f^3 , which loosely surrounds each sleeve F, and the corresponding washer f^1 is interposed a ring of anti-friction balls. A pair of arms G^1 , which pass at opposite sides of each sleeve F and are rigid with a fulcrum pin G, are adapted to bear against the back face of the corresponding washer f^3 . The pin G is carried in bearings of the casing H which encloses the differential gear, and on a projecting end of the pin, and consequently exterior to the casing H, is fixed a lever G^2 . The pair of levers G^2 are connected by links g with a rod g^1 which is common to them, and thus by pulling the rod g^1 the arms G^1 may be pressed against the washers f^3 and draw the sleeves F in directions outwards from one another, thus causing considerable friction between the plates of the clutches E, to the extent, if desired, of completely locking the wheels C to the cage B and consequently locking the driving road wheels together.

Referring now to Figure 2:—The only substantial difference between the form of the invention shown thereby and that described with reference to Figure 1 is that, in lieu of drawing the sleeves F outwards from one another to ensure the required friction in the clutches E, a washer e is interposed between the inner plate of each clutch and the back of the corresponding recess of the case B, and pins K, which are slidable through holes formed through the nave of the cage, are pressed against the washer to clamp the plates of the clutch more or less tightly between the washer e and the corresponding wheel C. Arms G^1 , which correspond to the arms similarly lettered in Figure 1, are adapted to bear against the back of a washer f^3 between which and a washer f^1 is interposed a ring of anti-friction balls, and the washer f^1 bears against, or is formed with, the outer ends of the pins K. The washer f^3 surrounds and is slidable across a collar a of the corresponding axle division A. The arms G^1 are operated from a rod g^1 , through the medium of links g and arms G^2 , similarly as the arms G^1 of Figure 1 are operated, but in the reverse direction, for effecting the same purpose.

Referring now to Figure 3:—The form of the invention illustrated thereby is the same as that shown by Figure 1 (or it might be the same as that shown by Figure 2), except that the differential gear is of the bevel type (or it might be of the spiral type), which ensures an outward thrust of the wheels C and a constant friction between the plates of the clutches E so that, as the resistance of one driving road wheel decreases and of the other increases, the driving effort tending to turn the wheel which at any time offers the greater resistance is automatically increased, the entire driving effort being, therefore, more nearly distributed as required for the even propulsion of the vehicle. In this form of the invention therefore, the clutches E are utilised both as the medium for ensuring that automatically the driving effort will be more nearly distributed and as the medium by which the driving road wheels may, at will, be frictionally engaged together. Apart from the utilisation of the clutches E for the purpose of frictionally engaging the road wheels together at will, the arrangement shown by Figure 3 is substantially the same as that shown by Figure 5 of the drawings accompanying said Patent Specification No. 7557 of 1915; and the present

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invention is equally applicable to the arrangement shown by Figure 1 of the said drawings.

The rod g^1 , described with reference to either form of the invention, may be operated through suitable mechanism from the driver's seat, or may be operated by a screw device which is carried by the casing H or by the frame of the vehicle, or in any convenient manner.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

- 10 1. The use, with differential or balance gear of a motor vehicle, of externally operated plate clutches by means of which, at will, a pair of driving road wheels may be frictionally engaged together, leaving them still free to revolve.
2. The utilisation in a case in which the differential or balance gear of a motor vehicle is of the bevel or spiral spur type, of clutches by means of which, at will, a pair of driving road wheels may be frictionally engaged together, leaving them still free to revolve, as clutches which provide frictional resistance through the medium of which it will be ensured that as the resistance of one driving wheel decreases and of the other increases, the driving effort tending to turn the wheel which offers the greater resistance will be automatically increased.
- 20 3. The clutches referred to in Claim 1, or in Claim 2, constituted as multiple plate clutches, and means whereby the plates of the different clutches used in connection with the same balance gear may be simultaneously pressed together, at will, to produce the frictional resistance required to ensure that the two road wheels will be frictionally engaged together, leaving them still free to revolve.
- 25 4. The clutches referred to in Claim 1 located between the driven differential wheels and the surfaces of the cage, and pressure brought thereagainst, at will, by forcing such wheels in directions outwards from one another, or by pressing washers against the sides of the clutches which are the more remote from such wheels.
- 30 5. In combination with the invention as claimed in Claim 1, means by which the required frictional hold of the clutches, with a view to constraining the driving road wheels to revolve together, is simultaneously ensured, which comprise arms which are linked to a common rod substantially as set forth.
- 35 6. The invention as claimed in Claim 1, substantially as described with reference to Figure 1 of the drawings herewith.
7. The invention as claimed in Claim 1, substantially as described with reference to Figure 2 of the drawings herewith.
8. The invention as claimed in Claim 2, substantially as described with reference to Figure 3 of the drawings herewith, whether the balance gear is of the bevel or spiral spur type, and whether the means for externally operating the clutches at will are as described with reference to Figure 1, or as described with reference to Figure 2.

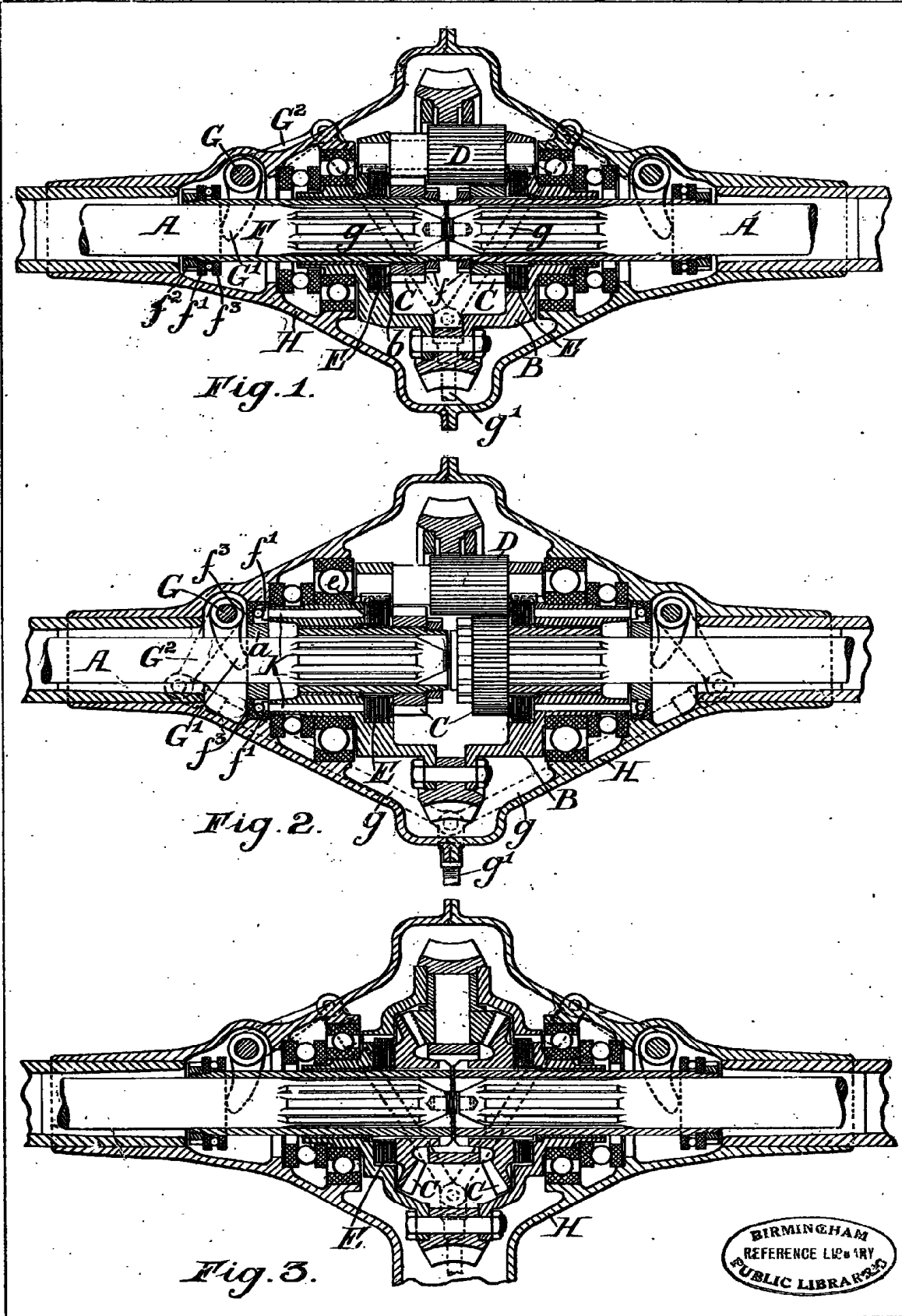
Dated this 19th day of June, 1916.

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WOLSELEY MOTORS [LTD.] & *another's* COMPLETE SPECIFICATION.

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