No. 793,855. PATENTED JULY 4, 1905.

F. C. STINZING.

REVERSE MECHANISM.

APPLICATION FILED AUG. 31, 1904.

2 SHEETS—SHEET 1.

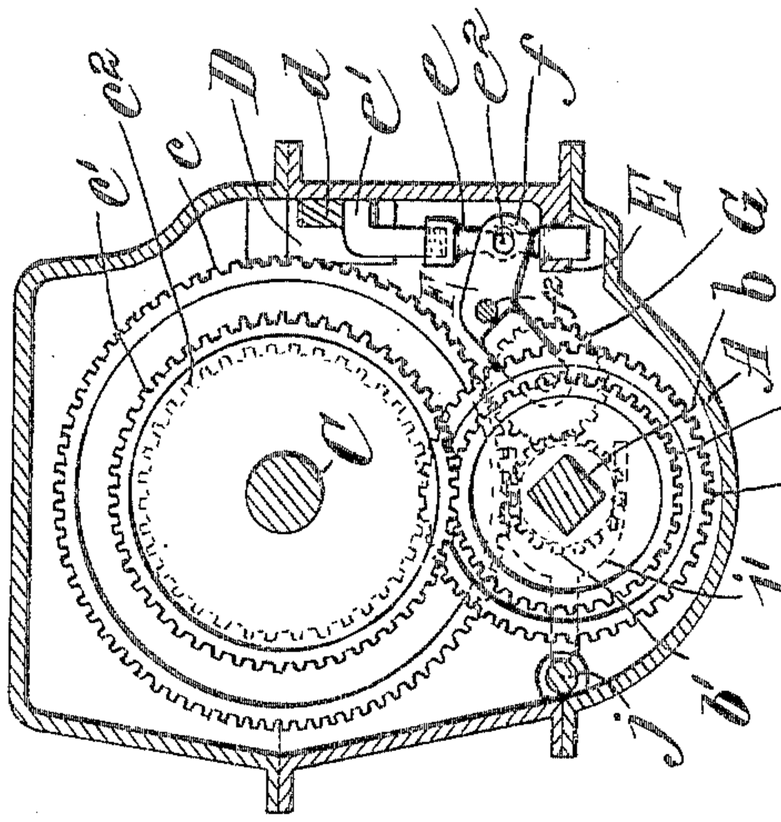

Fig. 2.

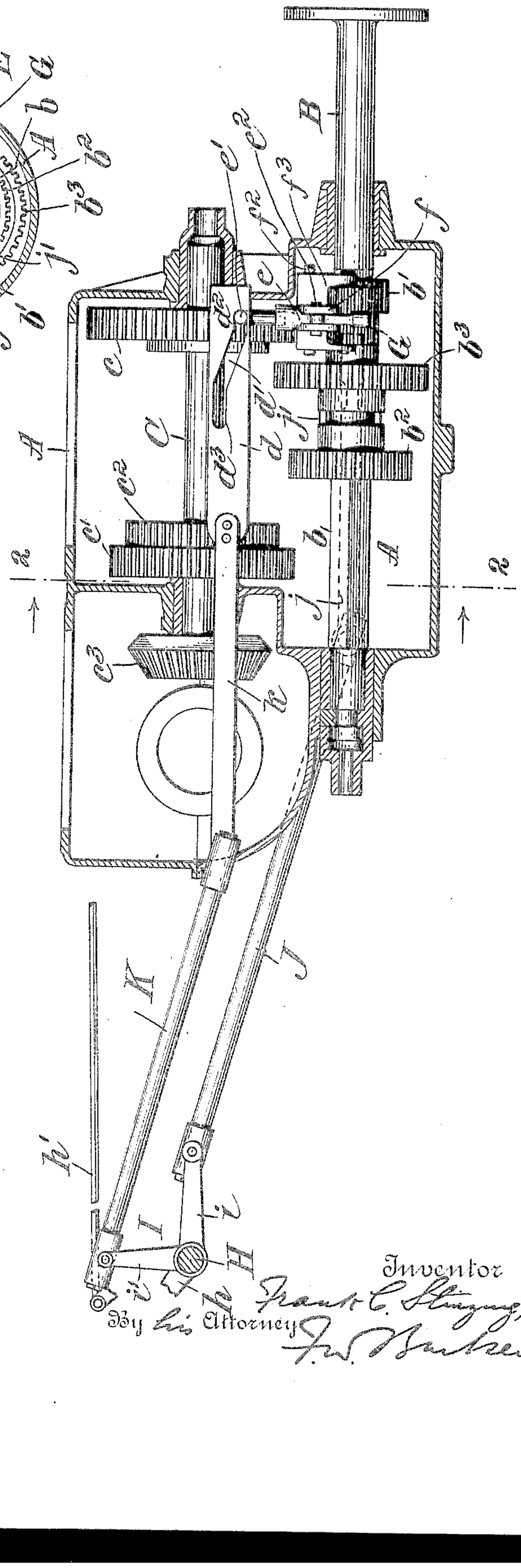

Fig. 1.

Witnesses
Edgworth Bruce
R. A. Etherson.

Inventor
Frank C. Stinzing,
By his Attorney
F. W. Baker.

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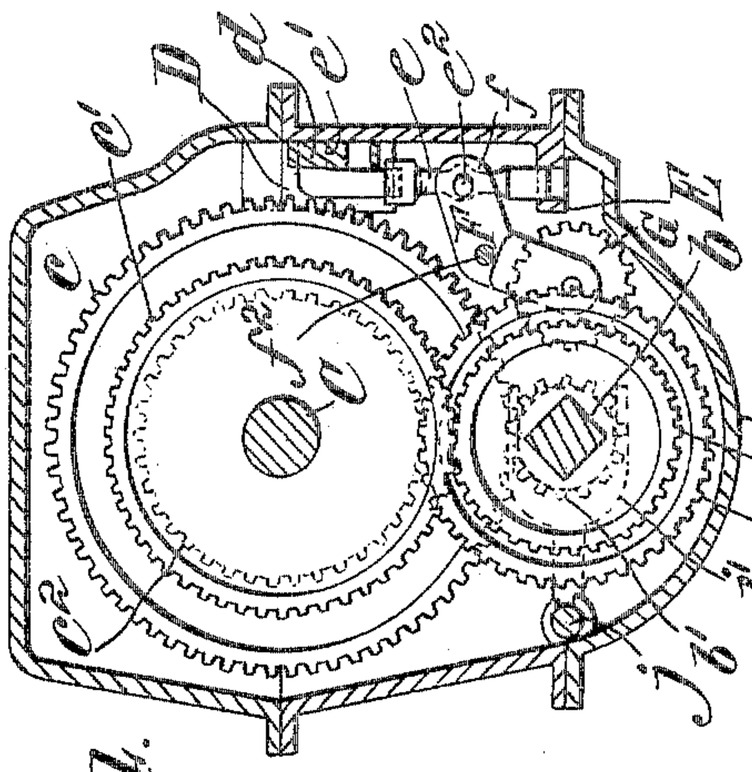

Fig. 4.

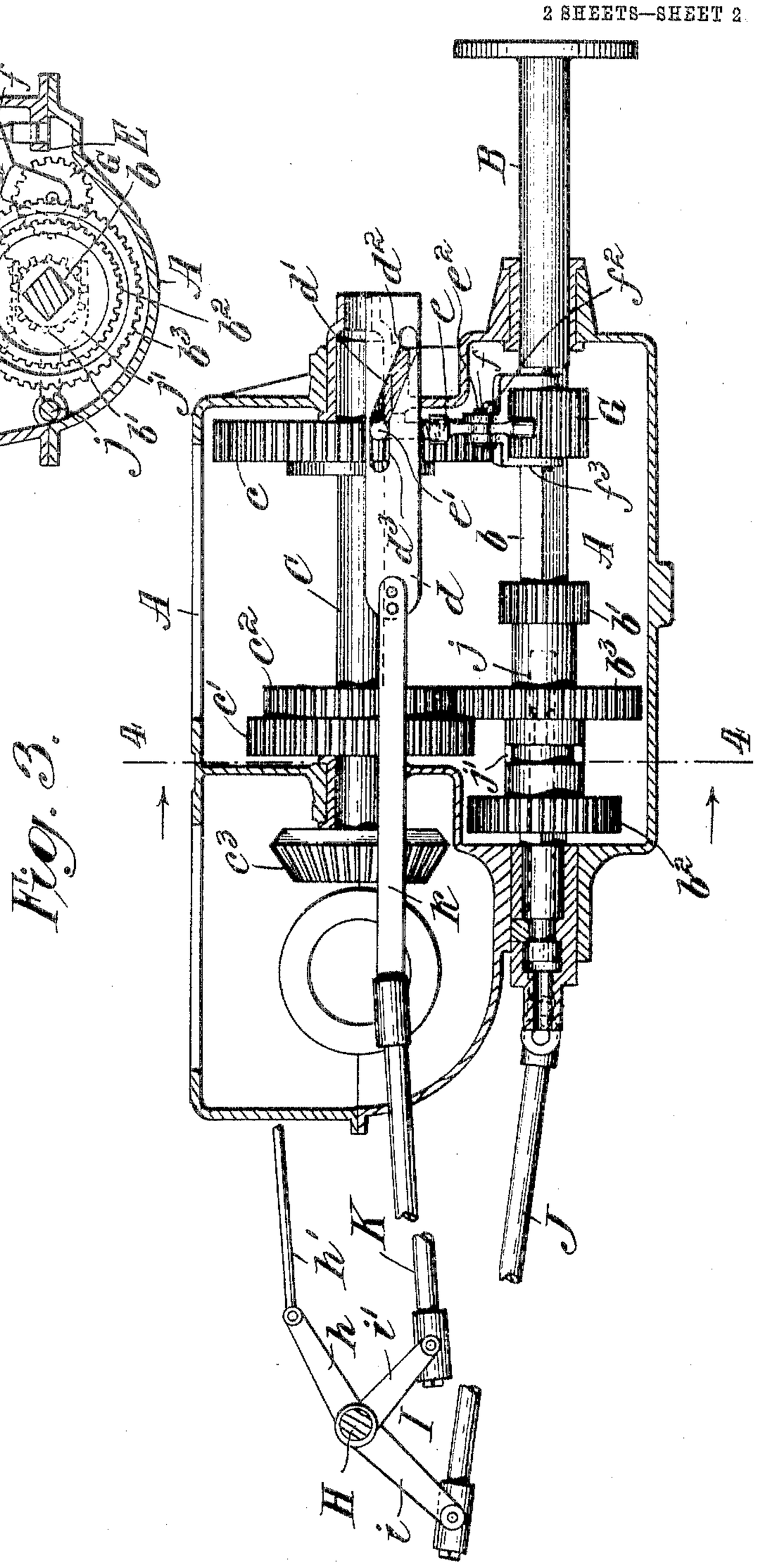

Fig. 3.

Witnesses
Edgeworth Bruce
R. A. Atherton

Inventor
Frank C. Stinzing
By his Attorney H. D. Parker

No. 793,855. Patented July 4, 1905.

# UNITED STATES PATENT OFFICE.

FRANK C. STINZING, OF UNION, NEW JERSEY.

## REVERSE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 793,855, dated July 4, 1905.

Application filed August 31, 1904. Serial No. 222,849.

*To all whom it may concern:*

Be it known that I, FRANK C. STINZING, a citizen of the United States, residing in the town of Union, in the county of Hudson and State of New Jersey, have invented a new and useful Improvement in Reverse Mechanism, of which the following is a specification.

This invention relates to reverse mechanism for automobiles; and its object is to provide means whereby in a continuation of the direct sliding movement of the change-speed gears upon the main driving-shaft a reverse pinion is automatically interposed between the low-speed gear and its coacting spur-wheel upon the counter-shaft to automatically reverse the direction of motion imparted, my improvement also including means whereby with the direct sliding movement of the change-speed gears in the opposite direction to successively engage the several change-speed gears the reverse pinion aforesaid is automatically disengaged from its operative position before the several change-speed gears are successively engaged with the several spur-wheels upon the counter-shaft.

In brief, my invention consists of a bell-crank lever pivotally connecting the rod employed in communicating sliding movement to the change-speed gears upon the main driving-shaft with a link carrying a guide-piece whose function is to alter the position of the reverse-pinion according to the position given said guide-piece. Said bell-crank lever is mounted on a pivotal support and is so arranged that while one of its arms is describing an arc in moving the aforesaid guide-piece in the performance of its functions the other arm of said lever in its movement carries its pivotal connection with the change-speed-gear-operating rod past the dead-center in readiness for the requisite pull or thrust wherewith the change-speed gears are operated.

In the drawings accompanying this application, Figure 1 is a vertical longitudinal section of a system of change-speed gearing including my improved reverse mechanism, the latter being shown in operative arrangement. Fig. 2 is a transverse section taken on the line 2 2 of Fig. 1. Fig. 3 is a view corresponding with Fig. 1 and showing the reverse mechanism disengaged, the transmission being shown with the high-speed gears in operation; and Fig. 4 is a transverse section taken on the line 4 4 of Fig. 3.

Like letters of reference indicate corresponding parts in all the figures.

The letter A indicates the usual form of casing for transmission-gearing, and B a main driving-shaft having a square portion *b*, upon which the change-speed gears $b'$, $b^2$, and $b^3$ are slidable.

C indicates the usual counter-shaft, having the spur-wheels *c*, $c'$, and $c^2$ fast thereon, said counter-shaft having the usual bevel-gear $c^3$ for transmitting power to the mechanism for operating the driving-wheels of the vehicle. (Not shown.)

Attached to the casing A is a longitudinal guide D, within which is slidably placed a guide strip or piece *d*, having an inclined slot $d'$, which terminates at its opposite ends in horizontal ways $d^2$ $d^3$, respectively. Vertically slidable in a guide E, that projects from the casing, is a bearing member *e*, having a hooked extension $e'$, which latter is entered within the slot $d'$, whereby said member *e* is governed as regards its vertical movement according to the horizontal movement of guide-piece *d*. The bearing member *e* is provided with a transversely-projecting pivot $e^2$, to which is pivoted the forked end *f* of a carrier F, consisting of a member having a central pivot $f^2$, by which it is supported from the casing, and said member at the opposite side of its pivot $f^2$ is provided with a yoke $f^3$, within which is pivotally carried an idler G, which constitutes the reversing-pinion.

Mounted upon a rod or shaft H, which is pivotally supported by the machine-frame, is a bell-crank lever I, having the arms *i* $i'$, while an arm *h*, secured to the shaft H, is adapted to rock the latter through the medium of a rod $h'$, which is adapted to be operated by a hand-lever (not shown) in the manner well known in this art. The lever-arm *i* is pivotally connected with a rod J, which at its opposite end is pivoted to a yoke-

stem $j$, carrying the usual yoke $j'$ for moving the change-speed gears. The bell-crank lever-arm $i'$ is pivotally connected with a rod K and pivotally unites with an extension $k$ of the guide-piece $d$ to move the latter.

In the views illustrated in Figs. 1 and 2 the rod $h'$ has been moved to rock the bell-crank lever I to the position indicated, wherein the arm $i'$ is in a substantially vertical position, having drawn the guide-piece $d$ toward the left, in which action the hooked extension $e'$ has been lowered through the travel accomplished by the guide-piece $d$, so that the idler G has been moved upwardly into engagement with the spur-wheel $c$ and the low gear $b'$, whereby reverse motion has been communicated to the vehicle driving-wheels. Movement of the rod $h'$ in the opposite direction—this movement as accomplished being indicated in Figs. 3 and 4—has produced the following result: It has rocked the bell-crank lever I so that the rod K has impelled the guide-piece $d$ toward the right, whereby the slot $d'$ has raised the member $e$, and the carrier F has swung upon its pivot and removed the idler G away from contact with the spur-wheel $c$ and low gear $b'$, enabling the transmission of power to be communicated to propel the vehicle driving-wheels forwardly. In the various stages of the movement referred to the low gear $b'$ may have been placed in mesh with the spur-wheel $c$, the middle gear $b^2$ may have been placed in mesh with the spur-wheel $c'$, and, as illustrated, the high-speed gear $b^3$ may have been placed in mesh with the spur-wheel $c^2$.

Particular attention is directed to the position of the bell-crank lever-arm $i$ with relation to the rod J at the time when the reverse-idler G is in mesh with the gear $b'$ and the spur-wheel $c$. It will be noted that in the position shown in Figs. 1 and 2 the low-speed gear $b'$ has been moved past the spur-wheel $c$, and therefore is out of mesh therewith, while the idler G, being of sufficient width, is moved into mesh with both said low-speed gear and spur-wheel, so that now when it is desired to remove the idler G out of mesh the arm $i'$ of the bell-crank lever in describing its arc moves the rod K a relatively considerable distance over to the right, whereby the guide-piece $d$ performs its function of elevating the bearing member $e$, and during said operation the arm $i$ of the bell-crank lever in rocking over the dead-center of its pivotal connection with rod J imparts but a trifling movement to said rod J and to the change-speed gears; but directly said dead-center is passed and continuing the movement toward the right of rod $h'$ then the arm $i$ swings outwardly and draws the low-speed gear $b'$ into mesh with the spur-wheel $c$. Continuation of this movement of the rod $h'$ enables the middle, and subsequently the high-speed, gears to mesh with their respective spur-wheels, as is obvious. Hence the main feature of my invention resides in the properties possessed by the bell-crank lever I, enabling the change-speed gears to remain substantially unmoved while the reversing-idler G is being either placed into mesh with the low-speed gear $b'$ and spur-wheel $c$ or removed from such meshed engagement.

By means of the horizontal ways $d^2$ and $d^3$, which engage with the hooked extension $e'$ of the bearing member $e$ when the idler G is either in a meshed position or supported in inactivity, it will be seen that said idler G is thereby locked in these respective positions.

Having now described my invention, I declare that what I claim is—

1. Transmission mechanism comprising a main driving-shaft, a set of change-speed gears slidable thereon, a counter-shaft, and a set of spur-wheels carried thereby and adapted to mesh, respectively, with said slidable gears, a pivotally-supported idler adapted to be interposed between one of said slidable gears and an adjacent spur-wheel, a guide-piece for actuating said idler, a rod controlling the movement of said guide-piece, and a rod controlling the movement of said slidable gears; together with a pivotal connection between said rods to regulate their relative movements, whereby, during the operative movement of the guide-piece in either placing the idler in mesh between a slidable gear and an adjacent spur-wheel, or in removing it from such meshed engagement, the slidable gears have practically no longitudinal movement.

2. Change-speed gearing for automobiles including a main driving-shaft, variable gears slidable thereon, a counter-shaft, variable spur-wheels carried thereby, and means for moving said slidable gears longitudinally, a pivotally-supported bearing member, a reverse-idler carried thereby, a pivotal support for said bearing member, a guide-piece having an inclined slot to receive a projection from said support, means for actuating the guide-piece and slidable gears unitedly, and means enabling the bearing-member support to move the idler either into or out of engagement with a slidable gear and adjacent spur-wheel while the variable gears remain relatively inert with respect to their longitudinal movement.

3. Change-speed gearing for automobiles including a main driving-shaft, variable gears slidable thereon, a counter-shaft, variable spur-wheels carried thereby, and a rod having means for moving said slidable gears longitudinally, a pivotally-supported bearing member, a reverse-idler carried thereby, and a guide-piece for actuating said bearing member to place the reverse-idler in mesh with an adjacent slidable gear and spur-wheel to reverse the motion communicated to the counter-shaft, and to remove said re-

verse-idler from such engagement; together with a pivotal shaft, a bell-crank lever secured thereon and pivotally connecting through its respective arms with said rod and guide-piece, and means for turning said shaft to effect the operation of changing speed and applying or disconnecting the reverse-idler.

4. Change-speed gearing for automobiles, including a main driving-shaft, variable gears slidable thereon, a counter-shaft, variable spur-wheels carried thereby, and means for moving said slidable gears longitudinally, a pivotally-supported bearing member, a reverse-idler carried thereby, and a bell-crank lever for automatically actuating said bearing member to place the reverse-idler in mesh with an adjacent slidable gear and spur-wheel, to reverse the motion communicated to the counter-shaft, and to remove said idler from such engagement.

FRANK C. STINZING.

Witnesses:
R. A. ETHERSON,
FREDERICK C. BONNY.