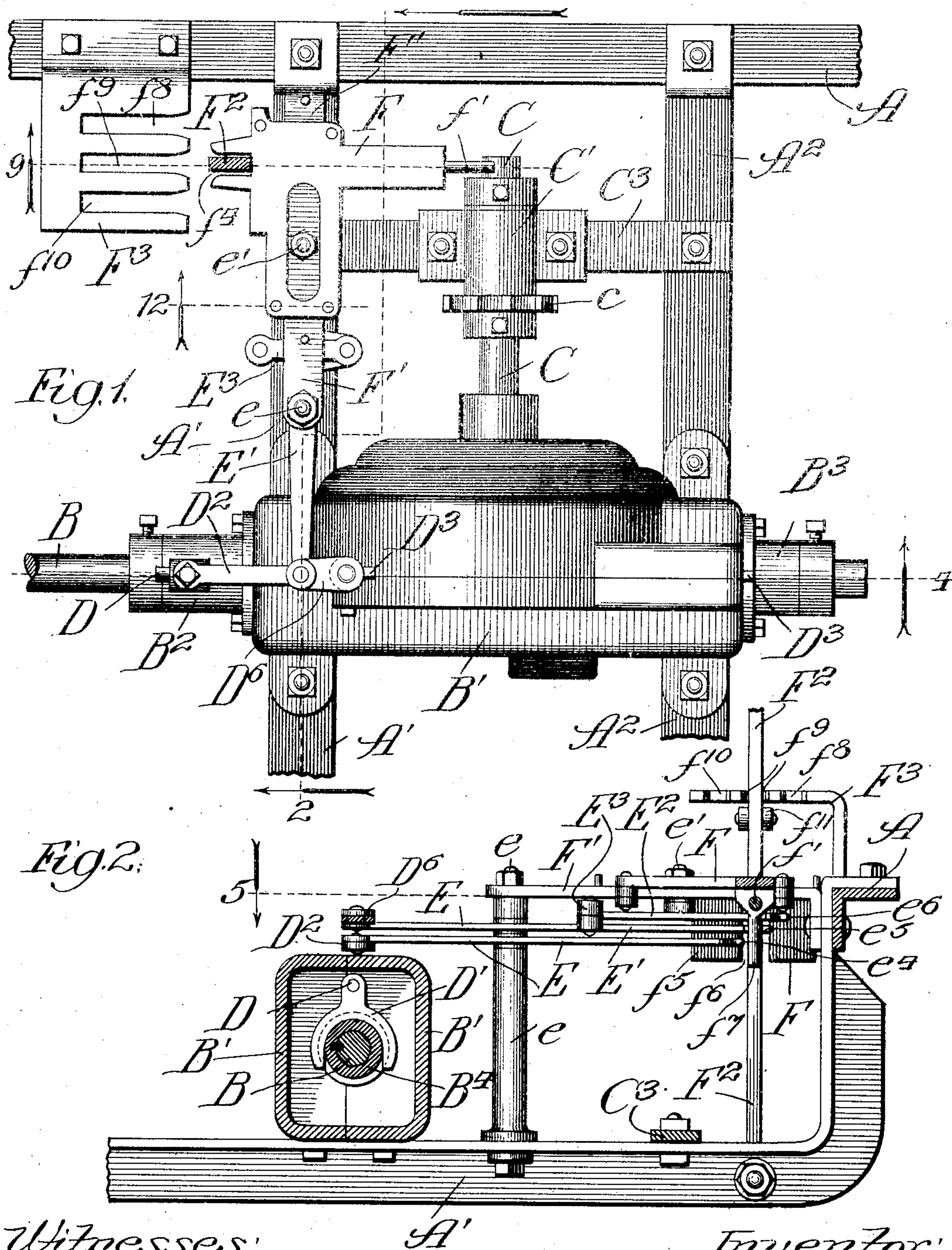


M. HENDRICKSON.

GEARING.

APPLICATION FILED JULY 1, 1904.

3 SHEETS—SHEET 1.



Witnesses:  
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Inventor:  
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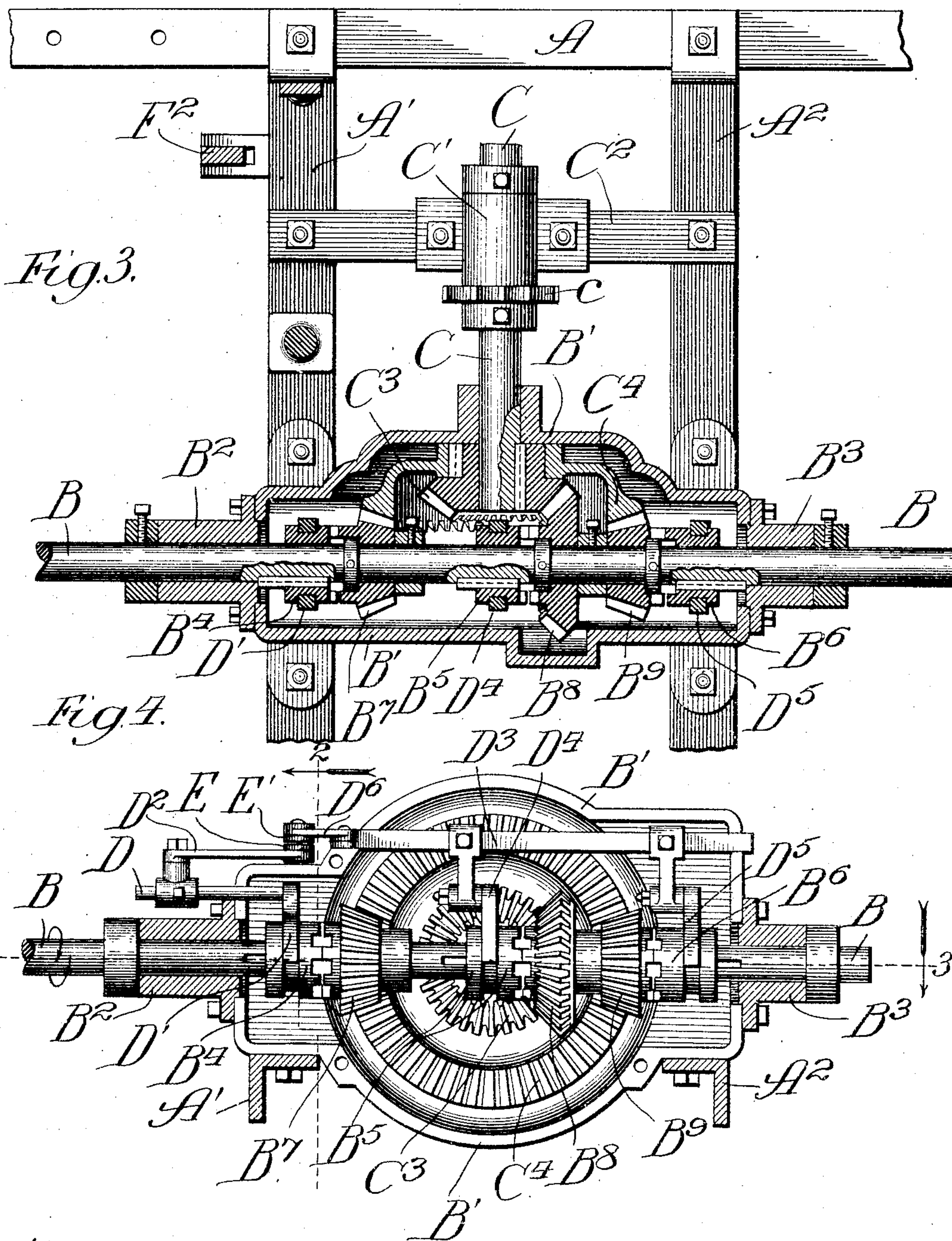


M. HENDRICKSON.

## GEARING.

APPLICATION FILED JULY 1, 1904.

3 SHEETS—SHEET 2.



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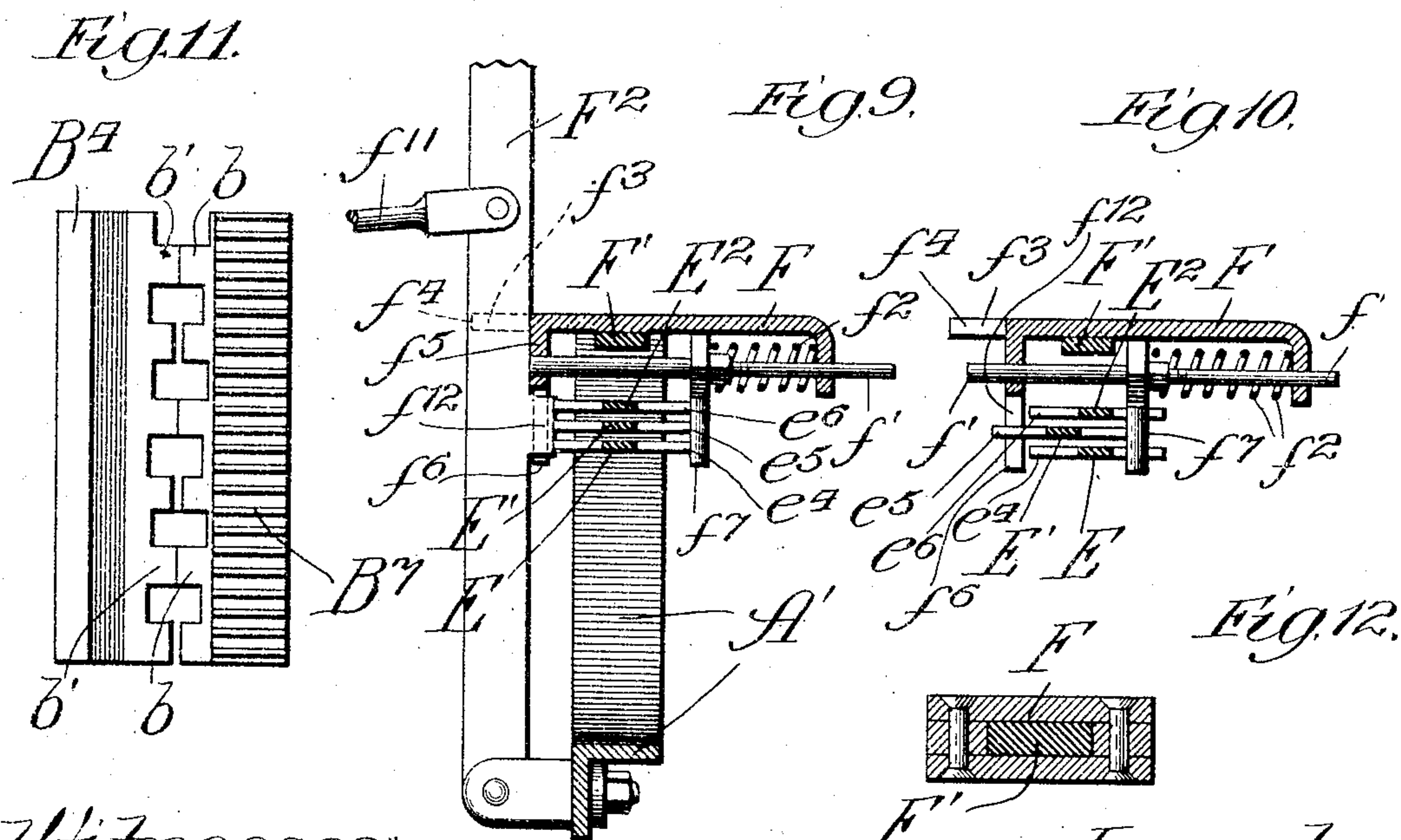
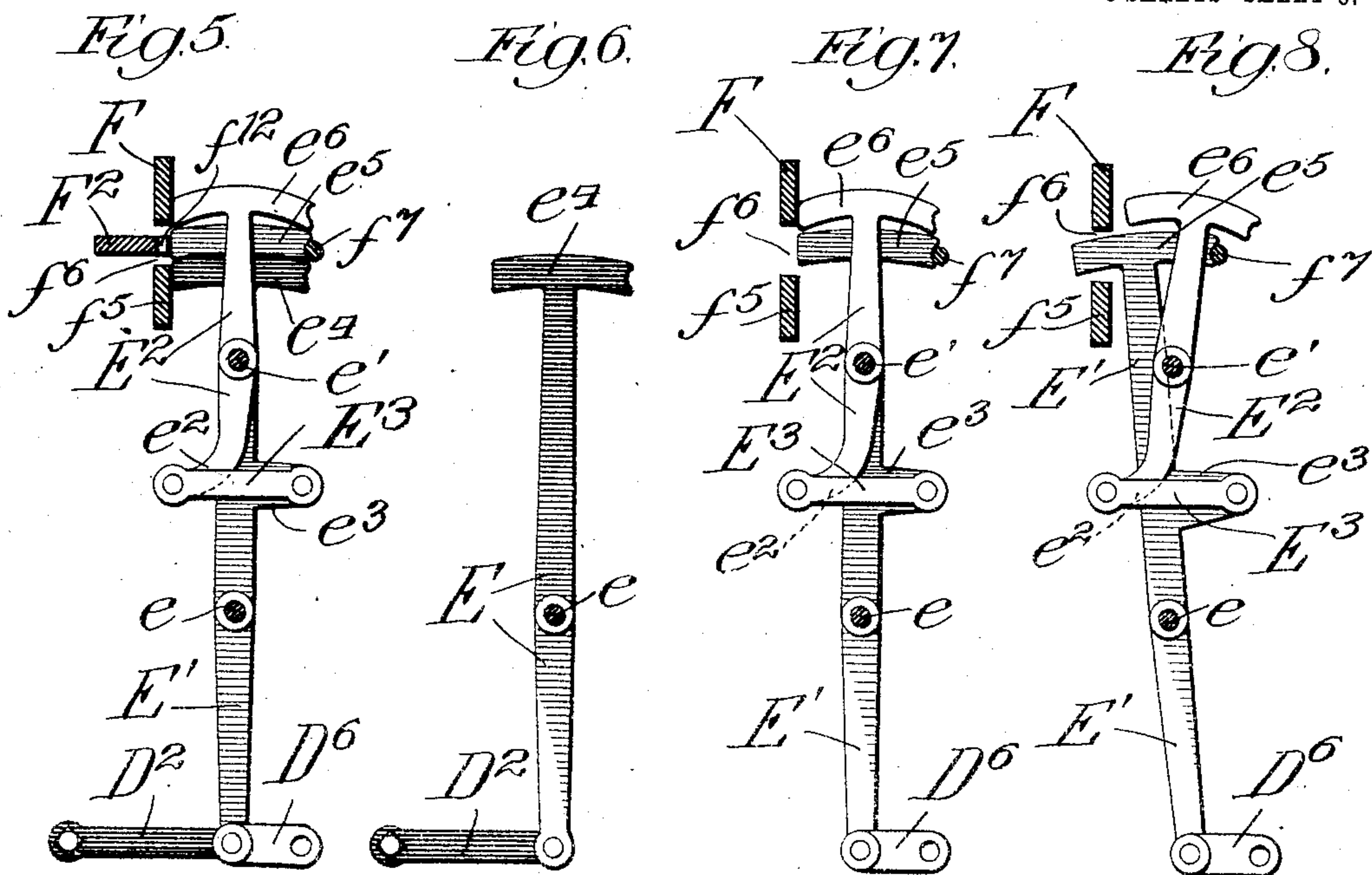


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GEARING.

APPLICATION FILED JULY 1, 1904.

3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

MAGNUS HENDRICKSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO JACOB LAUTH, OF CHICAGO, ILLINOIS.

## GEARING.

SPECIFICATION forming part of Letters Patent No. 786,214, dated March 28, 1905.

Original application filed April 4, 1904, Serial No. 201,428. Divided and this application filed July 1, 1904. Serial No. 214,896.

*To all whom it may concern:*

Be it known that I, MAGNUS HENDRICKSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Gearing, of which the following is a specification.

The present application constitutes a division of application Serial No. 201,428, filed April 4, 1904, and relates particularly to the gearing in the power-transmission mechanism shown in said application.

The primary object of the present invention is to provide an advantageous and compact arrangement of gearing whereby power may be transmitted from a driving-shaft to a shaft at right angles thereto, provision being made in this case for two speeds forward and a reverse motion.

The accompanying drawings illustrate the power-transmission mechanism for motor-vehicles disclosed in the above-mentioned application; but the claims of the present application are limited to the construction of the gearing proper. In this construction there are employed a plurality of clutch-shifting levers which serve to shift clutches pertaining to the speed and reversing-gear mechanism, a shiftable lever-controller coacting with said levers and equipped with means for preventing the actuation of all but the desired lever and equipped also with means for actuating any desired lever in one direction to throw the corresponding clutch into operative engagement, and a controller-shifting hand-lever capable of swinging in a longitudinal plane and also in a transverse plane, the transverse movement determining the position of said controller, and therefore which clutch-shifting lever is to be actuated, and the longitudinal movement permitting when the hand-lever is swung forwardly the actuation of the proper clutch-shifting lever by said controller and serving when the hand-lever is swung rearwardly to retract said clutch-shifting lever.

In the drawings, Figure 1 represents a broken plan view of the running-gear of a motor-vehicle equipped with my improvements, of which the improved gearing claimed

in the present application forms a part, the large arrow serving to indicate the direction of the front of the machine, to which the mechanism is applied; Fig. 2, a broken transverse sectional view taken as indicated at line 2 of Figs. 1 and 4 and looking toward the front end of the machine; Fig. 3, a plan sectional view taken as indicated at line 3 of Fig. 4; Fig. 4, a longitudinal sectional view taken as indicated at line 4 of Fig. 1; Fig. 5, a broken plan section taken as indicated at line 5 of Fig. 2 and showing certain clutch-shifting levers; Fig. 6, a similar view showing the lower one of the levers shown in Fig. 5; Fig. 7, a similar view showing the upper one of the levers shown in Fig. 5, the same being a compound lever; Fig. 8, a similar view showing the position of the compound lever changed; Fig. 9, a vertical longitudinal section taken as indicated at line 9 of Fig. 1; Fig. 10, a similar section showing certain parts omitted; Fig. 11, a development of certain clutch members employed, and Fig. 12 a section taken as indicated at line 12 of Fig. 1.

A description of the complete preferred construction is as follows:

A represents a fragment of the running-gear frame having the cross members  $A'$   $A''$ , comprising angle-bars having their top flanges turned toward each other; B, a longitudinal rotary shaft actuated from the engine (not shown) at the front end of the machine, preferably through the medium of a friction-clutch, (not shown);  $B'$ , a gear-casing supported on the members  $A'$   $A''$  and comprising members separable at a longitudinal plane and provided with bearings  $B^2$   $B^3$  for the shaft B;  $B^4$ ,  $B^5$ , and  $B^6$ , clutch members splined upon the shaft B and shiftable longitudinally thereof;  $B^7$ ,  $B^8$ , and  $B^9$ , bevel-gears journaled upon the shaft B and suitably confined against longitudinal movement with relation thereto, said gears being equipped at their hubs with clutch members coacting with the clutch members  $B^4$   $B^5$   $B^6$ , respectively; C, a transversely-extending sprocket-shaft journaled in one side of the casing  $B'$  and in a bearing  $C'$ , supported by a member  $C''$ , secured on the transverse members  $A'$   $A''$ ;  $C^3$ , a bevel-gear fixed on the shaft



C and meshing with the gear B<sup>8</sup>; C<sup>4</sup>, a larger bevel-gear fixed on the hub of the gear C<sup>3</sup> and meshing at its front portion with the gear B<sup>7</sup> and at its rear portion with the gear B<sup>9</sup>; D, Figs. 1 and 4, a longitudinally-movable clutch-shifting rod equipped with a yoke D', engaging the clutch member B<sup>4</sup>, said rod having connected therewith an actuating-link D<sup>2</sup>; D<sup>3</sup>, a longitudinally-movable clutch-shifting bar equipped with yokes D<sup>4</sup> D<sup>5</sup>, engaging, respectively, the clutch members B<sup>5</sup> B<sup>6</sup>, said bar D<sup>3</sup> having connected with the front end thereof a shifting-link D<sup>6</sup>; E, a transversely-extending lever having its left-hand end, Fig. 2, connected with the free end of the link D<sup>2</sup>; E', a parallel lever located just above the lever E and connected at one end with the link D<sup>6</sup>; E<sup>2</sup>, a relatively short lever connected with the lever E' by a link E<sup>3</sup> and constituting therewith a compound lever; F, a transversely-movable lever-controller mounted on a guide F', supported on the member A'; F<sup>2</sup>, a controller-shifting hand-lever capable of swinging both in longitudinal and transverse planes, and F<sup>3</sup> a stationary guard for said hand-lever.

Any suitable friction-clutch may be employed at the engine for communicating motion to the shaft B, and where such a clutch is employed it preferably is controlled by a rod connected with the hand-lever F<sup>2</sup>.

Any desired arrangement of the speed and reversing gear mechanism may be employed. In the construction shown the shaft B extends longitudinally through the casing B', and the shaft C is perpendicular to and has one end adjacent to the shaft B at about the center of said casing. The gear C<sup>3</sup> is fixed on the adjacent end of the shaft C and meshes with the gear B<sup>8</sup>, and the gear C<sup>4</sup> is fixed on the hub of the gear C<sup>3</sup> within the gear-casing and is suitably dished to enable it to engage the gears B<sup>7</sup> B<sup>9</sup>, which face each other. The clutch members B<sup>5</sup> B<sup>6</sup> have teeth extending toward each other, so that when the bar D<sup>3</sup> is shifted in one direction one of said clutch members is brought into operative engagement with the corresponding gear, and when said bar D<sup>3</sup> is shifted in the opposite direction the other one of said clutch members is brought into engagement with the corresponding gear. The gear-casing is provided with suitable guides for the rod D and bar D<sup>3</sup>. A detail of the construction of the clutch members employed within the casing B' is shown in Fig. 11, which shows the gear B<sup>7</sup>, for instance, provided with lateral teeth b of substantially square cross-section and the clutch member B<sup>4</sup> provided with similarly-shaped teeth b'. The teeth of each member are alternately long and short, as shown; the result of this construction being to enable the clutch members to be readily thrown into interlocking engagement. The shaft C is shown equipped with a sprocket-wheel c, through the medium of which power may be transmitted to the differ-

ential-gear mechanism on the driving-axle of the vehicle.

Any suitable construction for the yoke-actuating members D D<sup>3</sup> and the attendant parts may be employed, and it is unnecessary to describe these parts with more particularity.

The levers E and E' are pivotally supported on a post e, rising from the member A'. The short lever E<sup>2</sup> is supported near its center on a stationary pivot e' and has one end curved, as shown at e<sup>2</sup>, and connected with one end of the link E<sup>3</sup>. The other end of said link is connected with a lug e<sup>3</sup> on the lever E' and to the right of the pivoted point thereof, Fig. 2. The free ends of the levers E E' E<sup>2</sup> are equipped, respectively, with segmental heads e<sup>4</sup> e<sup>5</sup> e<sup>6</sup>, which lie in different longitudinal planes, as shown in Fig. 2. The rear end of each of said segmental heads is slightly grooved for engagement with an actuating-stud with which the lever-controller F is equipped. The device F comprises a transversely-movable slide f, mounted on the guide F', a lever-actuating plunger f', movable longitudinally with relation to the vehicle-body, and a spring f<sup>2</sup>, serving to force said plunger forwardly, thereby to cause it to actuate the appropriate clutch-shifting lever after the slide f has been preparatorily shifted by the hand-lever F<sup>2</sup>. The slide f is provided with a forwardly-projecting lug f<sup>3</sup>, equipped with a slot f<sup>4</sup> for receiving the hand-lever. Said slide is provided also with a downwardly-projecting flange f<sup>5</sup>, which is equipped with a slot f<sup>6</sup>, which may be entered by any of the segmental lever-heads mentioned, according to the position of the slide f. The plunger f' is equipped with a downwardly-extending finger or stud f<sup>7</sup>, which serves to engage the appropriate lever-head, according to the position of the slide f. The guard F<sup>3</sup>, as shown in Fig. 1, is located adjacent to the lug f<sup>3</sup> of the slide and is provided with a plurality of slots f<sup>8</sup> f<sup>9</sup> f<sup>10</sup>, which correspond with the several positions of the lever-controller. The hand-lever F<sup>2</sup> may enter either one of these slots, according to the position of the controller. The lever F<sup>2</sup> has connected with it a forwardly-extending rod f<sup>11</sup>, which may be connected with any suitable clutch or other shiftable power-transmission member (not shown) at the engine. (Not shown.) In such case when the hand-lever is swung rearwardly to retract the clutch-shifting lever at the speed and reversing-gear mechanism which happens to be in use the rod f<sup>11</sup> will serve to disconnect the clutch at the engine, and when the hand-lever is swung forwardly to permit the plunger f' to actuate a clutch-shifting lever the rod f<sup>11</sup> will serve to throw the clutch at the engine into engagement again. The hand-lever is provided at its rear edge with a lug f<sup>12</sup>, which serves to enter the slot f<sup>6</sup> and engage the head of the clutch-shifting lever which happens to be in use, thereby to cause the



same to clear the slot  $f^6$  and permit the controller to be shifted.

The operation will be readily understood from the foregoing detailed description.

5 When the hand-lever is in a position wholly in the rear of the guard  $F^3$ , the clutches are all out of operative engagement. When it is desired to employ the slow speed forward, this may be accomplished by shifting the bar  $D^3$  forward, which in turn may be accomplished by shifting the controller  $F$  so that its slot  $f^4$  registers with the slot  $f^8$  of the hand-lever guard and then pushing the hand-lever forward into the slot  $f^8$ , thereby permitting the plunger  $f'$  to operate, through the medium of the finger  $f^7$ , upon the lever  $E^2$ . When the finger  $f^7$  is in position to engage the head  $e^6$  on the lever  $E^3$ , the slot  $f^6$  in the flange  $f^5$  of the controller-slide  $f'$  is in position to receive the head  $e^6$ , while the flange  $f^5$  serves to prevent forward movement of the heads of the other two levers. When the lever  $E^2$  is actuated through the medium of the plunger, it serves to throw the right-hand end of the lever  $E'$  rearwardly, thereby drawing the link  $D^6$  forwardly and causing the clutch member  $B^6$  to engage the corresponding clutch member on the gear  $B^9$ . When it is desired to change from slow speed forward to fast speed forward, this may be accomplished by withdrawing the hand-lever from the slot  $f^8$  and shifting the controller to its intermediate position and then advancing the hand-lever into the slot  $f^9$  of the guard.

35 When the hand-lever is retracted preparatory to shifting the controller, it retracts the plunger  $f'$  and also retracts the head of the lever  $E^2$ . When the hand-lever is advanced into the slot  $f^9$  of the guard, the plunger operates to force the head of the lever  $E'$  forwardly, the slide at this time being properly located to enable the head of said lever to enter the slot  $f^6$ . When it is desired to reverse the machine, the hand-lever is withdrawn from the slot  $f^9$  of the guard and moved laterally into alinement with the slot  $f^{10}$  of the guard and then thrust forwardly into the said last-named slot. The last-mentioned shifting movement brings the controller into position to enable the plunger  $e'$  to thrust the head of the lever  $E$  forward, thereby drawing the link  $D^2$  rearwardly and throwing the clutch member  $B^4$  into engagement with the gear  $B^7$ . If the rod  $f^{11}$  be connected as above suggested, at each forward movement of the hand-lever  $F^2$  the clutch at the engine will be operated to cause the shaft  $B$  to rotate, and at each rearward movement of the hand-lever said clutch will be operated to release said shaft  $B$ . It is obvious that the controller can be shifted at will to enable the hand-lever to enter any one of the slots of the guard. Moreover, it will be understood that it is impossible to shift the controller for the purpose of causing a fresh set of gears to operate without

first disconnecting the set which chances to be in use. When the members of a given clutch are brought together, the clutch-teeth are caused to operate almost instantaneously, owing to the fact that by means of the alternately long and short tooth arrangement ample time is allowed to enable the teeth to interlock. This overcomes the great objection which has heretofore existed to the use of clutch members of the same general character, due to the slippage incident to an effort to cause the clutch-teeth to interlock. Moreover, the expedient provides against injury to the teeth, inasmuch as it enables substantial engagement of the teeth at the moment when the first operative engagement occurs. The sockets between the teeth are alternately deep and shallow, providing for perfect interlocking when the clutch members are in engagement.

The novel clutch construction described is not claimed in the present application.

It will be understood that many changes in details of construction within the spirit of my invention may be made. Hence no undue limitation should be understood from the foregoing detailed description.

What I regard as new, and desire to secure by Letters Patent, is—

1. In mechanism of the character described, the combination of a casing comprising two members meeting in a vertical longitudinal plane and equipped at its ends with bearings, a longitudinal shaft extending through said casing and journaled in said bearings, a plurality of bevel-gears journaled on said shaft, clutch members corresponding with said gears, a shaft at right angles to said first-named shaft and projecting through one side of the casing, bevel-gears fixed to said second-named shaft and meshing with said first-named gears, longitudinally-slidable members projecting into said casing, means for actuating said last-named members, and clutch-shifting yokes carried by said last-named members, substantially as and for the purpose set forth.

2. In mechanism of the character described, the combination of a shaft equipped with a plurality of bevel-gears, a shaft perpendicular to said first-named shaft, gears journaled on said second-named shaft and engaging said first-named gears, clutch members shiftable longitudinally on said second-named shaft, levers for actuating said clutch members extending transversely with relation to said second-named shaft, a controller shiftable transversely with relation to said second-named shaft, lever-actuating means carried by said controller, a hand-lever pivoted to swing in longitudinal and transverse planes, and a guard provided with a plurality of sockets for said hand-lever.

3. In mechanism of the character described, the combination of speed and reversing-gear mechanism, comprising pairs of intermesh-



ing-gears, suitable clutching members there-  
for, levers serving to actuate said clutch mem-  
bers, a shiftable lever-controller, a hand-lever  
coacting therewith and having universal con-  
5 nection at its lower end with a support, and  
a rod connected with said hand-lever above  
said universal connection and adapted to shift  
a power-transmission member, for the pur-  
pose set forth.

10 4. The combination of a casing equipped at  
its ends with bearings, a shaft extending  
through said casing and journaled in said bear-  
ings, a plurality of bevel-gears journaled on  
said shaft, clutch members corresponding  
15 therewith, longitudinally-shiftable links ex-  
tending into said casing, clutch-shifting yokes  
carried by said links, a shaft perpendicular  
to said first-named shaft and projecting

through one side of the casing, bevel-gears  
secured on said second-named shaft and mesh- 20  
ing with said first-named gears, a guide ex-  
tending parallel with said second-named shaft,  
a plurality of levers extending parallel with  
said guide and connected with said links, a  
lever-controller movable on said guide, and a 25  
controller-shifting hand-lever having a move-  
ment in a plane parallel to said second-named  
shaft in shifting the controller, and in a plane  
parallel to said first-named shaft in retracting  
a lever, substantially as and for the purpose 30  
set forth.

MAGNUS HENDRICKSON.

In presence of—

F. M. WIRTZ,

WALTER N. WINBERG.