No. 643,258. Patented Feb. 13, 1900.

E. A. SPERRY.

MOTOR VEHICLE.

(Application filed Oct. 30, 1899.)

(No Model.) 2 Sheets—Sheet 1.

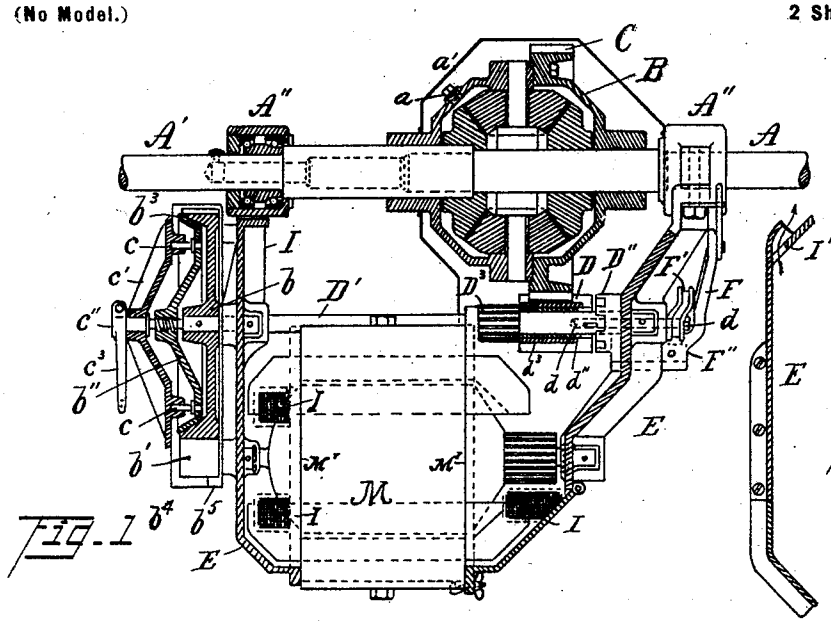

Fig. 1

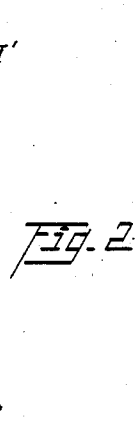

Fig. 2

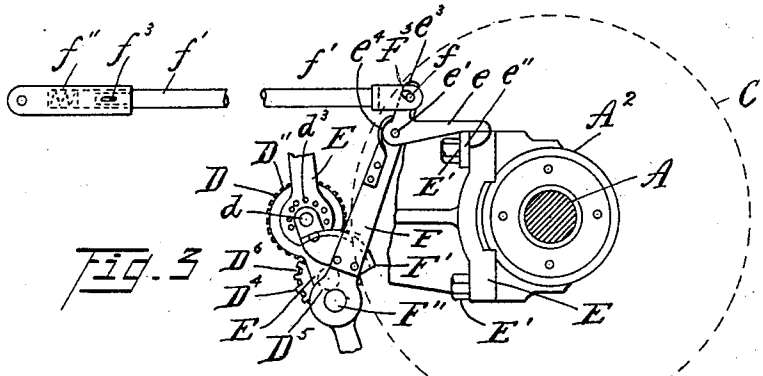

Fig. 3

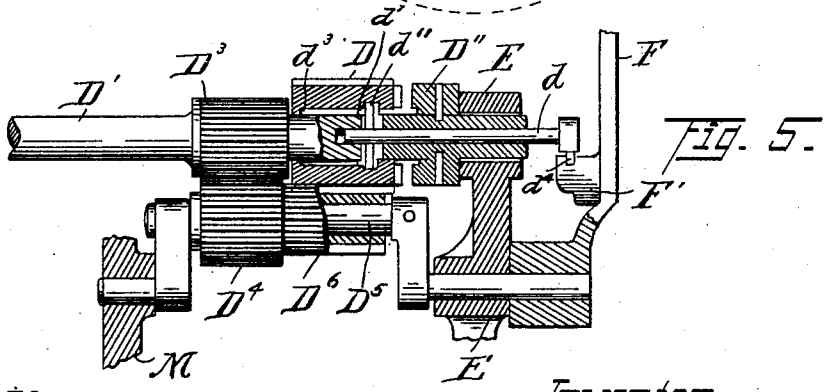

Fig. 5

Witnesses:
F. F. Griswold.
Walter L. Upson.

Inventor:
Elmer A. Sperry.
By: Buckingham Hewart.

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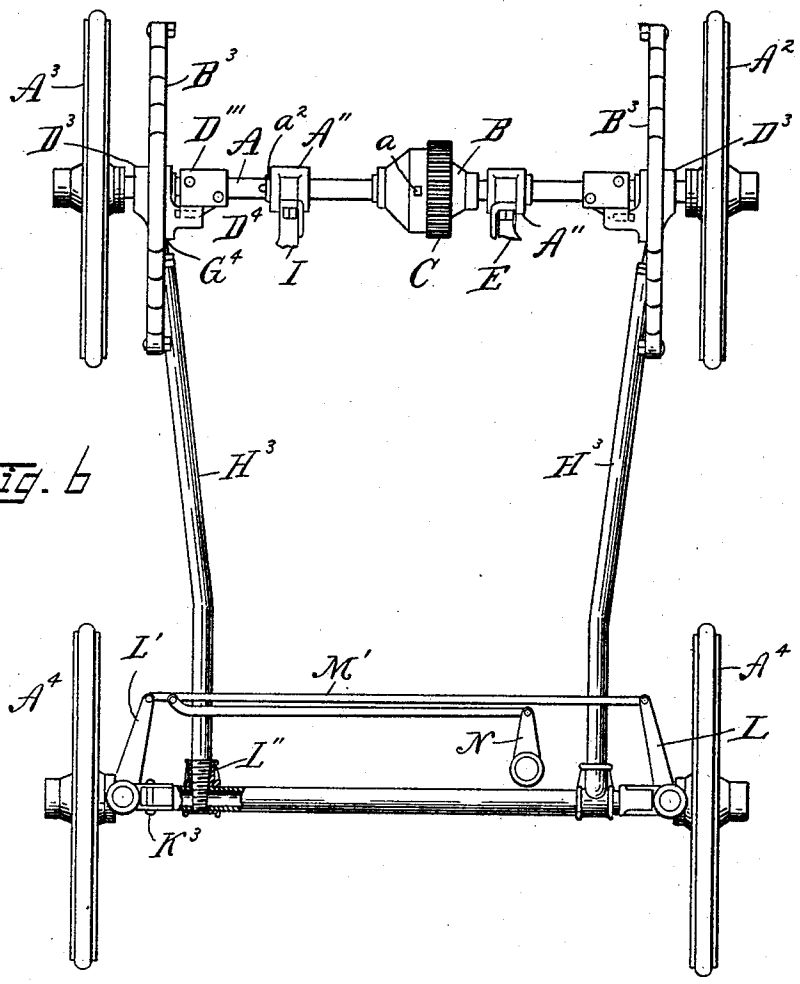

Fig. 6.

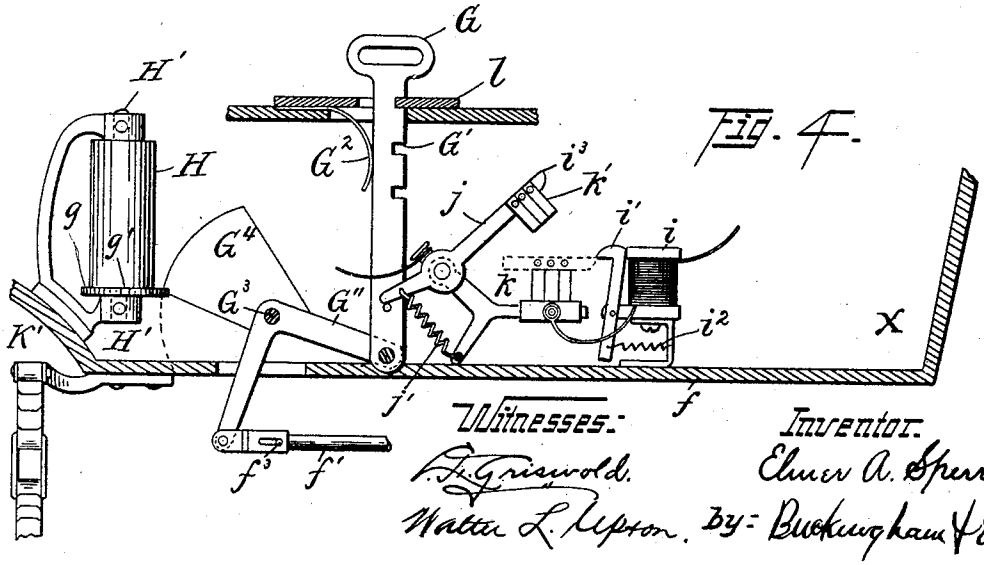

Fig. 4.

Witnesses:-
F. E. Griswold.
Walter L. Upton.

Inventor.
Elmer A. Sperry.
By:- Buckingham & Ewart.

UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CLEVELAND, OHIO.

MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 643,258, dated February 13, 1900.

Original application filed August 25, 1898, Serial No. 689,462. Divided and this application filed October 30, 1899. Serial No. 735,167. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Motor-Vehicles, of which the following is a specification.

My invention relates to motor-gearing for vehicles; and it consists in various details of the motor-housings, power connections from the motor to the driving axle or axles, actuating means and connections from the actuator to the gearing, certain controlling mechanism, and interlocking devices between the control and the connections for manipulating the gearing.

All of the above are described and fully set forth in the present specification and shown in the accompanying drawings, in which—

Figure 1 is a sectional view of motor housings and gearing; Fig. 2, a detail of the housing, showing ventilating-passages; Fig. 3, a diagram showing arrangement of the control and lock for the change-gear devices. Fig. 4 is a diagram showing the manipulating devices mounted upon the body connected with and operating parts of the motor-gearing. Fig. 5 is supplemental to Figs. 1 and 3, being a section through the intermediate shaft, showing change-gear. Fig. 6 is a general view of the supporting-truck and axle-gear.

Similar letters of reference indicate like parts throughout.

Referring now to Fig. 1, let A and A′ represent the members, respectively, of a compound axle and a planetary-gear arrangement. (Shown in more general view in Fig. 6.) To these shafts are connected, respectively, gears meshing with revolving pinions, all within the oil-housing B, furnished with oil-plug *a*. The housing will be seen to consist of the extended web of the gear C, which meshes with the pinion D, all within the inclosing housing *a*′. The "jack-in-the-box" structure being familiar, it will not be explained in detail. The pinion D is mounted upon a shaft D′, which in turn is mounted within the motor-housings, which receive support from the journals A″ A″, mounted upon the compound axle. The motor-housings E are secured to the circular journal-case A″ by two surfaced angular recesses, preferably parallel with the axis, for holding the parts accurately in line, being clamped by suitable bolts, (shown at E′ E′.) The shaft D′ is preferably supplied with a driving-gear *b*, which meshes with the motor-pinion *b*′. A mechanical clutch or brake is shown, consisting of the disk *b*″, coöperating with the bevel-face within the gear at b^3 and supported by pins *c c*, which slide in the yoke *c*′, suitably attached to the motor frame or housing E and serving at its center to hold a rotating screw-threaded shaft *c*″, rotated by the arm c^3, the screw-threads operating to insert and withdraw the conical friction-disk *b*″. All is preferably surrounded by the housing b^4, separable at b^5. The other end of the shaft D′ is socketed for the reception of the rod *d*, fitted to slide within the socket. The pin *d*′, carried by the rod *d*, extends laterally through an elongated slot, (clearly seen,) having its ends securely fastened within the internal circular groove, (clearly seen at *d*″.) The rod *d* in moving backward and forward thus serves to move the pinion D, which is loose upon the shaft D′, out of and into engagement with the clutch D″, rigidly attached to shaft D′. This clutch may be of any suitable construction—such, for instance, as a friction-clutch—but I prefer to use the positive jaw-clutch shown, so that when the pinion D is slipped to the left, as shown, it is free from the clutch and to the right it is in engagement therewith. The pinion is moved by a swinging cam F′, mounted upon the cam-lever F, swinging about a pivot F″, reference to which will be made later.

Attention is called to the fact that the pinion D is in a position difficult of lubrication, which is required when same is free upon the shaft. This of necessity is done away with by supplying it with a roller-bearing, consisting of a circular roll of needles, (indicated at d^3,) this style of bearing being also adapted for longitudinal motion upon the shaft necessary in this instance.

The shaft D′ is supplied with the rigidly-attached gear D^3. (Clearly seen in Figs. 1, 3, and 5.) This gear is organized to mesh with gear D^4 on a swinging shaft D^5, (clearly seen in Fig. 5,) being pivoted at F″ in the housing

E and being manipulated by lever F, which attaches to pivot F'' outside the housing. Integral with the gear D^4 and rigidly attached thereto is gear D^6, which, together with D^4, is organized to turn loosely upon the shaft D^5 and which is organized to mesh with master-pinion D, mounted loosely upon shaft D'. It will be seen that by use of lever F the shaft D^5 is swung into and out of mesh or operative engagement with their coöperating gears, and at the same time the master-gear D may be made to engage and disengage with its coöperating clutch D'' by means of the cam F', (clearly seen in Figs. 1, 3, and 5,) which is mounted upon lever F' and moves therewith. This cam engages rod *d*, provided with an engaging pin d^4, manipulating the rod *d* longitudinally within the socketed shaft D', and thus manipulating one member of the coöperating clutches. The arrangement shown in the drawings contemplates the movement of the loose pinion D longitudinally upon the shaft, so that the engaging teeth may be engaged, and this action will be seen to occur at the same time that the throwing in and out of engagement of the gears upon the shaft D^5 takes place, the cam-slot being of such contour that the action is not simultaneous with the actual engagement of the gears, but rather occurs dissimultaneously or successively, the clutch being disengaged before the gears are engaged, and vice versa.

In Fig. 5 is seen the lateral pin d^4, which serves to connect the rod *d* with the cam F'. The contour of this cam is plainly seen in the figures and operates to engage the pinion D with its clutch D'' and with its coöperating gear alternately, there being a position where both are disengaged, there being a region in the center part of the cam where one is disengaged before the other is engaged, where the pinion is entirely free from either.

Owing to the mechanical strains brought to bear upon the lever F and its connected parts a mechanical lock is used, (shown by the latch *e* and its coöperating stationary part *e''*,) having an undercut pawl pivoted upon the lever F at *e'*, engaging the finger e^3. The finger e^3 is pressed upon at one side by a spring e^4 and upon the other side engages a pin *f*, connected rigidly with the rod *f'*. The pin *f* slides in a slot (shown in dotted lines at F^3, constituting a lost-motion device) in the head of the lever F, so that the pin *f* after traveling a short distance comes into rigid engagement with the lever in either one or the other direction. The rod *f'* is manipulated by any suitable device located in the carriage, preferably in the body X—as, for instance, the handle G, locked by the notches G', as shown, and connected to the rod *f'* by any suitable means—such, for instance, as the bell-crank lever G'', pivoted at G^3. In case the manipulator G is upon the vehicle-body X it is found desirable and in fact necessary that some sort of resilient or yielding connection be supplied between the lock-handle upon the body and the operated device secured to the axle A. This is shown in Fig. 3 by the spring *f''*, which presses against the end of the rod *f'*, the motion being limited by the slot and pin shown at f^3.

Within the vehicle-body X is mounted the controller for the motor M, (indicated at H,) pivoted so as to revolve in journals H' H' and supplied at some point in its moving system—for instance, at the base of the cylinder—with a disk *g*, having notches, one of which is shown at *g'*, and which serve to allow the segment G^4 to pass freely. The segment G^4 forms a part of the manipulating system or connection for the compound gear, as described above. It will be seen that when the controller is so turned that a notch *g'* is presented in the path of the segment G^4 the handle G may be manipulated freely, but if the controller is not so turned that a notch is present, the handle G is locked, and this locking action may take place in either of its extreme positions. This position I will denominate as that in which the controller is out of action—viz., when the segment G^4 is allowed to pass freely, and it will be seen that when the segment is only partially turned the controller will be locked in this position or locked out of action and prevented from turning into any one of its active positions. Moreover, it will be noticed that should the operation of the handle G be stopped in the middle of its excursion—say at notch indicated at G'—the segment G^4 will then be found only part way through the notch, thereby effectually locking the controller H from rotation in either direction, as above referred to. Of course the notch *g'* may be a wide one, so that the lock is effectual only in one direction without departing from the spirit of the invention.

In or about the vehicle and within operating distance of the manipulating-handle G or its connected parts is the limit-switch or automatically-operating self-releasing cut-off or cut-out. The operation of this device is well known and may be briefly referred to as follows:

The magnet *i* when energized retracts its hooked armature *i'*, pivoted, as shown, against the spring *i''*, which has a predetermined tension. The hook coöperates with the nose i^3 of the lever *j*, which also is furnished with the retractile spring *j'*. The stationary contact, which may be inserted with the magnet *i*, is shown at *k*, and coöperates with the contact *k'*, mounted upon the lever *j*. When these contacts are closed, the circuit is complete, and the hook *i'* engages the nose i^3 and holds the contacts in closed-circuit relation against the tension of the spring *j'*. Whenever the current increases beyond a certain strength, the hooked armature *i'* is retracted, releasing the lever *j* and allowing the spring *j'* to open the contacts *k* and *k'*. I prefer to reëngage the cut-off contacts or close the circuit by a movement of the handle G for the following reasons, among others: first, the

double use of the same handle simplifying construction and operation, and, second, when the limit-switch or cut-off operates, it indicates that an extraordinary demand is being made upon the motor and may be made to indicate that the compound gear, which greatly increases the leverage of the motor over the load, should be called into operation, and it is natural that the same handle be made in this way to accomplish both purposes—viz., that of increasing the power for the motor over the load, and thereby correcting the cause and reëstablishing the circuit, so that its operation may again go forward.

The motor is of any ordinary construction, being cylindrical or rectangular in the main body (shown at M) and is provided with two lateral faces at M′ M′. To these faces are attached the ordinary motor-housings E E, which serve to shield the field-windings and support the bearings, as is well known in the art. The upper part of the forward and rear wall of this motor-housing, together with the top, is shown at E, Fig. 2. Here also are shown three screws, by means of which the housing is attached to the face M′ of the motor M. The only special feature to which attention is desired to be called in this connection is that these housings, while otherwise entirely inclosing the motor and gearing in any of the ordinary well-known methods, are provided with apertures for ventilation, (shown at I I I,) which are in the bottom and preferably forward in reference to the carriage-axle A A′. These apertures are shown as covered with gauze or other means for preventing the sudden inrush of water or "splash" of water or saturated mud, and in the upper part of the housing (illustrated in Fig. 2) is a coöperating discharge-aperture, (indicated at I′,) which, as will be seen, is located in the upper part of the housing and to the rear. The relative locations of these apertures in the housings are for the purpose of facilitating the ventilation and cooling of the motor.

The running-frame of the vehicle is clearly indicated in Fig. 5, and the spring-support between the running-gear and the body is clearly indicated in Figs. 5 and 6. As attention is especially called to the fact that when the body is mounted upon springs, as shown, and a part of the mechanism lying in the body is to be connected with a device mounted upon the running-gear some portion of the operating connection should be supplied with a resilient feature. This has been illustrated and described and will be pointed out in the claims.

From the different diameters of the gears D^3, D^4, D^6, and D increased leverage from their use will readily be understood. It will also be seen that the pinion D serves two other gears—viz., being in constant engagement with the main driving-gear C and also at times with the gear D^6.

The use and operation of the various structures have been faithfully pointed out as they have been described and will readily be understood by those versed in the art to which it pertains.

Features and details herein shown and described not forming the subject-matter of the claims hereto annexed have been divided out and form the subject-matter of separate applications for Letters Patent.

It will readily be understood that while it is designed to use the above parts in the relation shown, yet some may be used without the others, and the invention extends to such use. It will, furthermore, be readily understood that the construction and arrangement may be varied without departing from the spirit of the invention.

The present application constitutes a division of my prior application, Serial No. 689,462, dated August 25, 1898, for motor-gearing.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a motor-gearing for vehicles, a vehicle-body, a running-gear including an axle, vehicle-springs between the running-gear and body, a change-gear mechanism mounted on one side of the said springs, an operating means extending from the body to the mechanism, a locking device for locking the mechanism in a predetermined position, located on the other side of springs a lost-motion-operating connection extending between the lock, upon one side of the springs and the mechanism upon the other side of the springs and means for holding the lock in engagement.

2. In a vehicle, a vehicle-body, a running-gear for the vehicle, including an axle, springs between the running-gear and the body, a change-gear mechanism connected with the axle, an operating means extending from the body to the mechanism, a locking device for locking the mechanism in a predetermined position, located upon the mechanism, upon one side of the springs, a lost-motion-operating connection between the means and the lock, means for holding the lock in engagement, located upon the other side of the springs and a compressible resilient member in said operating means.

3. In a vehicle-motor gearing and gear-operating mechanism, mounted on an axle, a motor-car body, springs between the motor-car body and the axle, operating means located in the car-body, an operating connection extending from the means to the gear-changing mechanism, a lock for the gearing on the axle, and a resilient or compressible member in such connection.

4. In a motor-gearing, a change-gear for increasing the power of the motor over the load, a load-limiting power cut-off for the motor, operating means extending to the mechanism for manipulating the change-gear and a device for operating the cut-off, reëstablishing

the power connection to the motor when thus throwing the gear into operation, the device operated by the means.

5. In a vehicle-motor gearing and gear-operating mechanism, mounted on an axle, a motor-car body, springs between the motor-car body and the axle, operating means located in the car-body, an operating connection extending from the means to the gear-changing mechanism, a lock for the gearing on the axle, a resilient or compressible member in such connection and a lock for the means located in the car-body whereby the said means is retained in its various positions.

6. In a motor-gearing, a rotating axle, a circular journal-case for such axle, a power-gearing, a recessed journal-frame therefor, a journal-case provided with two machined angular recesses, for receiving the journal-frame, and clamping-bolts near the recesses, substantially for the purpose specified.

7. In a motor-gearing for vehicles, an electric motor, bearings for the armature-shaft of such motor, in combination with a casing for the ends of the motors, supporting such bearings, provided with ventilating-passages, low on the motor-casing on one end of the armature-shaft and high on the casing upon the opposite end.

8. In a motor-gearing for vehicles, an electric motor, bearings for the armature-shaft of such motor, a casing for the ends of the motor, supporting such bearings, provided with ventilating-passages low on the motor-casing on one end of the armature-shaft and high on the casing upon the opposite end, in combination with a hood, as I″, for the passage of the last-named end.

ELMER A. SPERRY.

Witnesses:
W. S. ROGERS,
M. C. PRENDERGAST.