No. 886,938. PATENTED MAY 5, 1908.

A. P. BRUSH.

STEERING GEAR.

APPLICATION FILED JAN. 30, 1907.

Fig. 1.

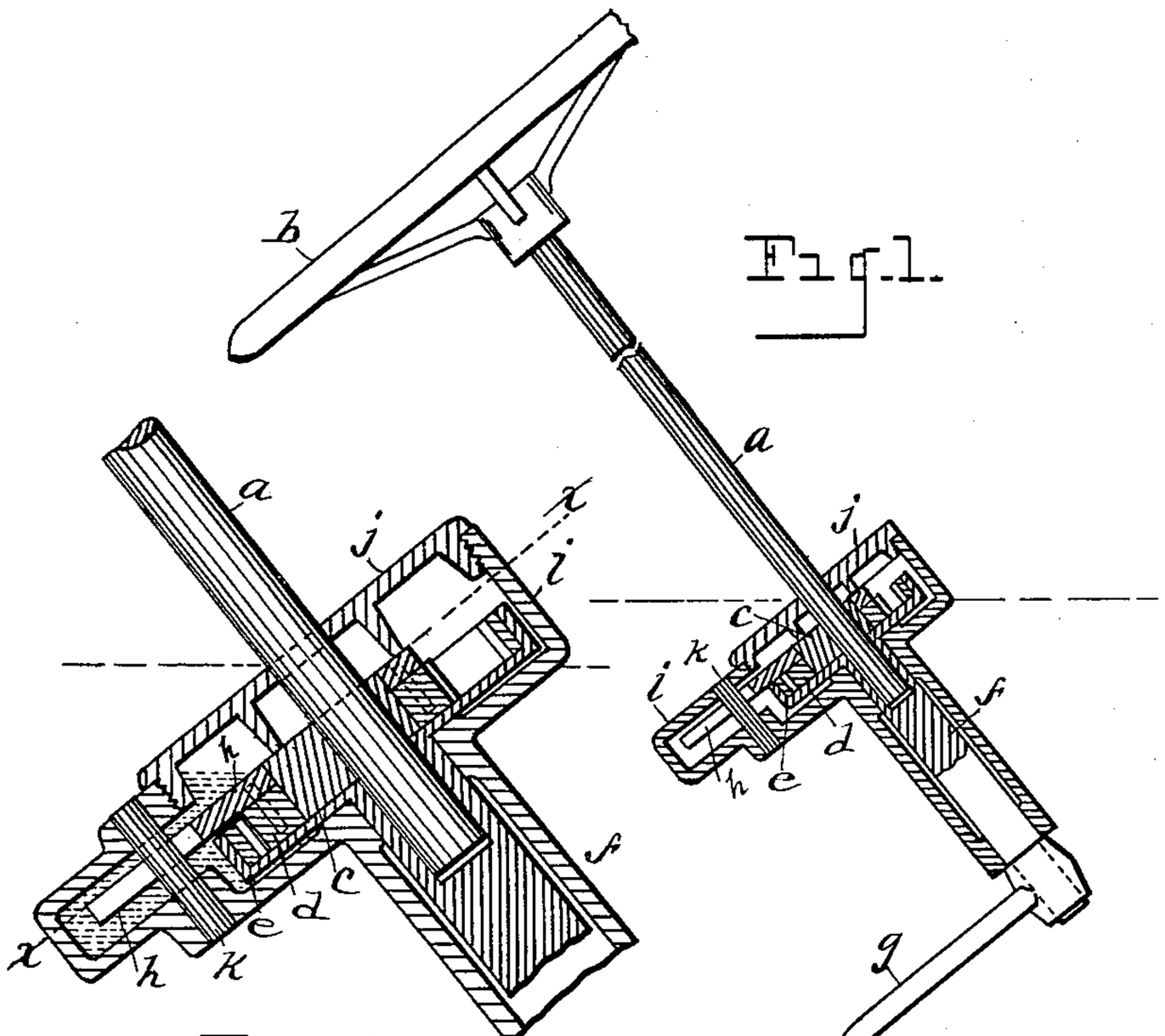
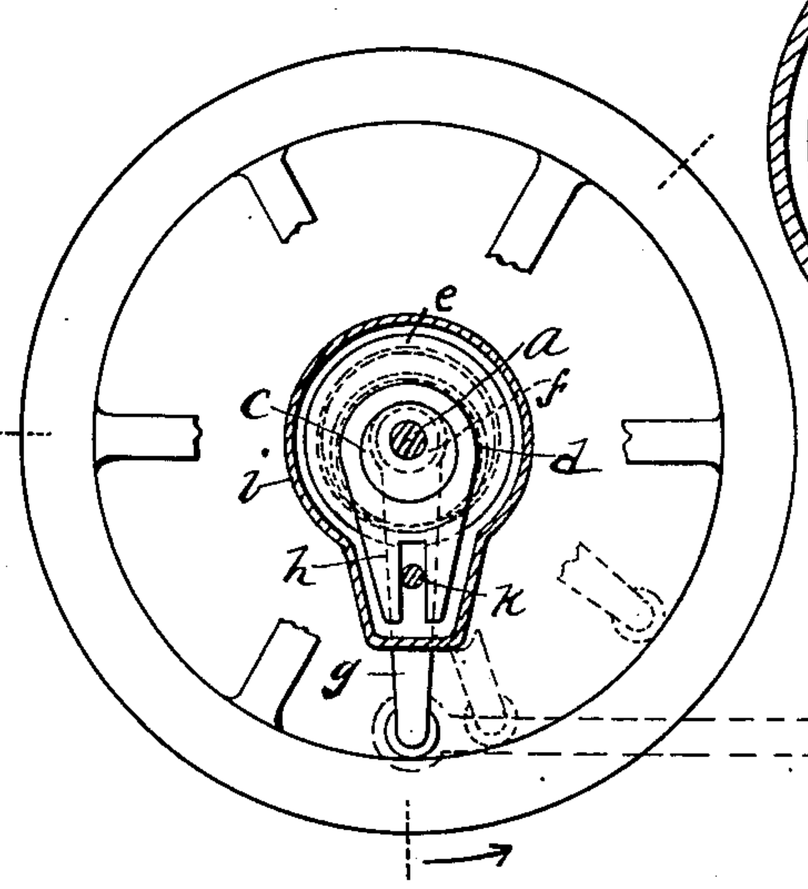


Fig. 2.

Fig. 3.



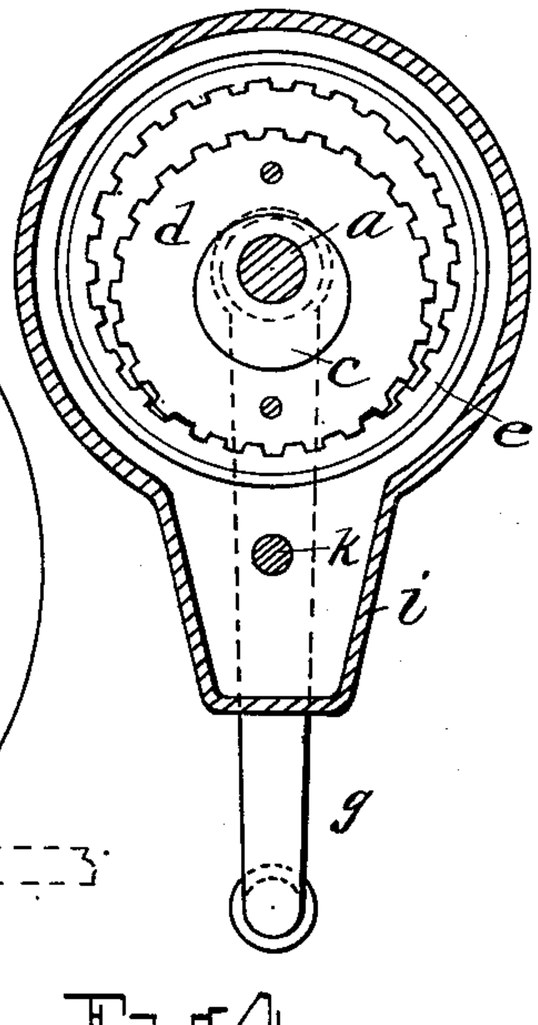


Fig. 4.

WITNESSES

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ALANSON P. BRUSH, OF DETROIT, MICHIGAN.

STEERING-GEAR.

No. 886,938. Specification of Letters Patent. Patented May 5, 1908.

Application filed January 30, 1907. Serial No. 354,813.

To all whom it may concern:

Be it known that I, ALANSON P. BRUSH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in a Steering-Gear, of which the following is a specification.

My invention has for its object a novel steering gear for automobiles and analogous vehicles, and it consists of the construction, combination and arrangement of devices hereinafter described and claimed and illustrated in the accompanying drawings, in which,

Figure 1 is a view in vertical section showing parts in elevation. Fig. 2 is an enlarged view in vertical section of portions of the mechanism shown in Fig. 1. Fig. 3 is a view in section on the line *x*—*x*, Fig. 2. Fig. 4 is also a view in section on the line *x*—*x*, Fig. 2, with the portion *h* removed.

The object of my invention is to provide an improved steering gear of superior quality and efficiency; to provide a steering gear wherein the wearing surfaces are exceptionally durable and easy to manufacture; to provide a mechanism of this nature wherein the gears are incased in an oil chamber; to provide a steering gear wherein through the range of action which will normally be used for high speed driving the action of the gear is much slower than through the extreme ranges of action which can only be employed for slow driving.

In carrying out my invention *a* represents a steering shaft and *b* the customary hand wheel thereupon. Mounted upon this shaft is an eccentric *c* actuating an external gear *d* meshing with an internal gear *e*, the interior periphery of the internal gear being of larger diameter than the external periphery of the external gear, as shown. The internal gear is provided with a shaft *f* provided with a customary steering connection or arm *g*. It will be observed that the shaft *a* is a driving shaft, and that the shaft *f* is a driven shaft. The external gear *d* is provided with an arm *h*. The eccentric *c*, the external gear *d*, and the internal gear *e*, with the arm *h*, are inclosed in an oil tight case *i* which may be formed with a removable cap *j*. The arm *h* is held from rotation in any suitable manner, as by means of a pin *k* engaging said arm with said case, the arm *h* being preferably bifurcated to engage said pin. It will be evident that by this construction the external gear *d* is held from turning and yet is permitted to be carried around by the eccentric in constant mesh with the internal gear, causing the rotation of the internal gear thereabout.

The hand wheel and related parts being in the position indicated in the drawings, where the front wheels of the vehicle will be set straight ahead, it will be apparent that the initial movement of the hand wheel in either direction from such normal position produces much less deviation of the front wheels than would an equal movement of the hand wheel nearer the extreme turning range of the mechanism. The extreme position, as is customary in such mechanisms, is usually about three-fourths of a revolution of the hand wheel in either direction from the position in which the front wheels of the vehicle are set straight ahead. By an initial movement from a straight ahead position for, say three-eighths of a turn of the hand wheel, the steering arm is shifted from a straight ahead position about 15°. If the steering wheel be turned a further three-eighths of a turn, the second three-eighths of a turn produces a further variation or shifting of the steering arm of say 35°, *i. e.*, the first one-half of an entire movement of the steering wheel in either direction from a straight ahead position produces approximately one-half as much actual deviation of the steering arm from a straight ahead position as the last or extreme half of the movement of the steering wheel, the mechanism thus producing a steering gear of superior durability and efficiency, as well as of superior excellence for fast driving without sacrificing quickness of handling when driving slow.

While for the sake of illustration conventional standards of movement have been shown, it is obvious that the gear might be arranged so as to equal a standard gear for fast driving conditions, and of superior quick handling qualities for slow driving, or the mechanism might be arranged to provide a portion of both advantages, being somewhat quicker for handling at slow speeds and some-

what slower and better for driving at high speeds. It will also be apparent from the drawings, and the above description, that the amount of variation may be controlled, for example, by the location of the pin *k*. Moreover, because of the nature of the mechanism the extremely good tooth action of gears of this type, and the generous surface permitted by the eccentric, the frictional losses of the gear are exceptionally low, and since an eccentric is an exceptionally efficient driving member, but not an efficient driven member, the reaction to the hand wheel of road shocks will be very slight. The variation of velocity are due to the engagement of the forked arm *h* or external gear with the pin *k*. Through the medium of said arm and the position of the pin with reference to the center of the steering shaft, the variations in velocity are controlled.

It will be obvious that as the eccentric rotates it will move the external gear sidewise in mesh with the internal gear. Obviously also the variations above described in the operation of the mechanism may be modified. For example, the amount of rotation of the hand wheel necessary to reach the extreme point in either direction could be varied by varying the length of the lever *g*, or it might be varied by varying the relative diameters of the external and internal gears, or the variation in velocities between the steering wheel and steering rod or lever *g* might be modified by varying the position of the pin *k* or the length of the arm *h*, as described. The arm *h*, for the sake of convenience, is preferably made separate from the external gear in the form of a spider or plait and secured thereupon, as shown.

What I claim as my invention is:

1. A steering mechanism comprising a steering shaft, a driven shaft in line with the steering shaft, an internal gear carried by the driven shaft, an external gear in mesh with the internal gear, an eccentric mounted upon the steering shaft to actuate the external gear, and means to hold the external gear from turning on its axis to cause the relative velocities of the steering and driven shafts to vary.

2. A steering mechanism comprising a driving shaft, a driven shaft in line with the driving shaft, and an eccentric upon the driving shaft to cause the relative velocities of the driving and driven shafts to vary.

3. A steering mechanism comprising a driving and a driven shaft, an eccentric upon the driving shaft, an internal gear carried by the driven shaft, an external gear upon said eccentric meshing with the internal gear, and means to hold the external gear from rotation.

4. A steering mechanism comprising a driving and a driven shaft, an eccentric upon the driving shaft, an internal gear carried by the driven shaft, an external gear upon said eccentric meshing with the internal gear, and means to hold the external gear from rotation, the internal diameter of the internal gear being greater than the external diameter of the external gear.

5. A steering mechanism comprising a driving shaft, a driven shaft in line with the driving shaft, an internal gear carried by the driven shaft, an external gear actuated by the driving shaft, an eccentric mounted upon the driving shaft to actuate the external gear to cause the relative velocities of the driving and driven shafts to vary, and an oil case located about said gears and eccentric.

6. A steering mechanism comprising a driving and a driven shaft, an eccentric upon the driving shaft, an internal gear carried by the driven shaft, an external gear upon said eccentric meshing with the internal gear, means to hold the external gear from rotation, and an inclosing oil case for said gears.

7. A steering mechanism comprising a driving and a driven shaft, an eccentric upon the driving shaft, an internal gear carried by the driven shaft, an external gear upon said eccentric meshing with the internal gear, means to hold the external gear from rotation, and an inclosing oil case for said gears, said external gear provided with an arm having a fixed engagement with said case.

8. A steering mechanism comprising a hand wheel, a hand wheel shaft, an eccentric mounted upon said shaft, an external gear operated by the eccentric, an internal gear actuated by the external gear, and a steering arm actuated by the internal gear, said internal gear rigidly connected to the steering arm, means to prevent the external gear from rotation, and an inclosing case containing the said gears and said eccentric.

9. A steering mechanism comprising a steering shaft, a driven shaft provided with a steering connection at one extremity thereof, an internal gear carried by the driven shaft at the other extremity thereof, an external gear in mesh with the internal gear, an eccentric mounted upon the steering shaft to actuate the external gear, and means to hold the external gear from turning on its axis to cause the relative velocities of the steering and driven shafts to vary, the external gear being carried around by the eccentric in constant mesh with the internal gear causing the rotation of the internal gear thereabout.

10. A steering mechanism comprising a driving shaft, a driven shaft provided with a steering connection, and an eccentric upon the driving shaft to cause the relative velocities of the driving and driven shafts to vary.

11. A steering mechanism comprising a steering shaft, a driven shaft in line with the

steering shaft provided with a steering connection, and means comprising an internal gear, an external gear in mesh with the internal gear, and an eccentric within the external gear to cause the relative velocities of the steering and driven shafts to vary, the external gear being held from turning on its axis.

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

ALANSON P. BRUSH.

Witnesses:
N. S. WRIGHT,
ETHEL M. SPIELBURG.