

No. 672,436.

Patented Apr. 23, 1901.

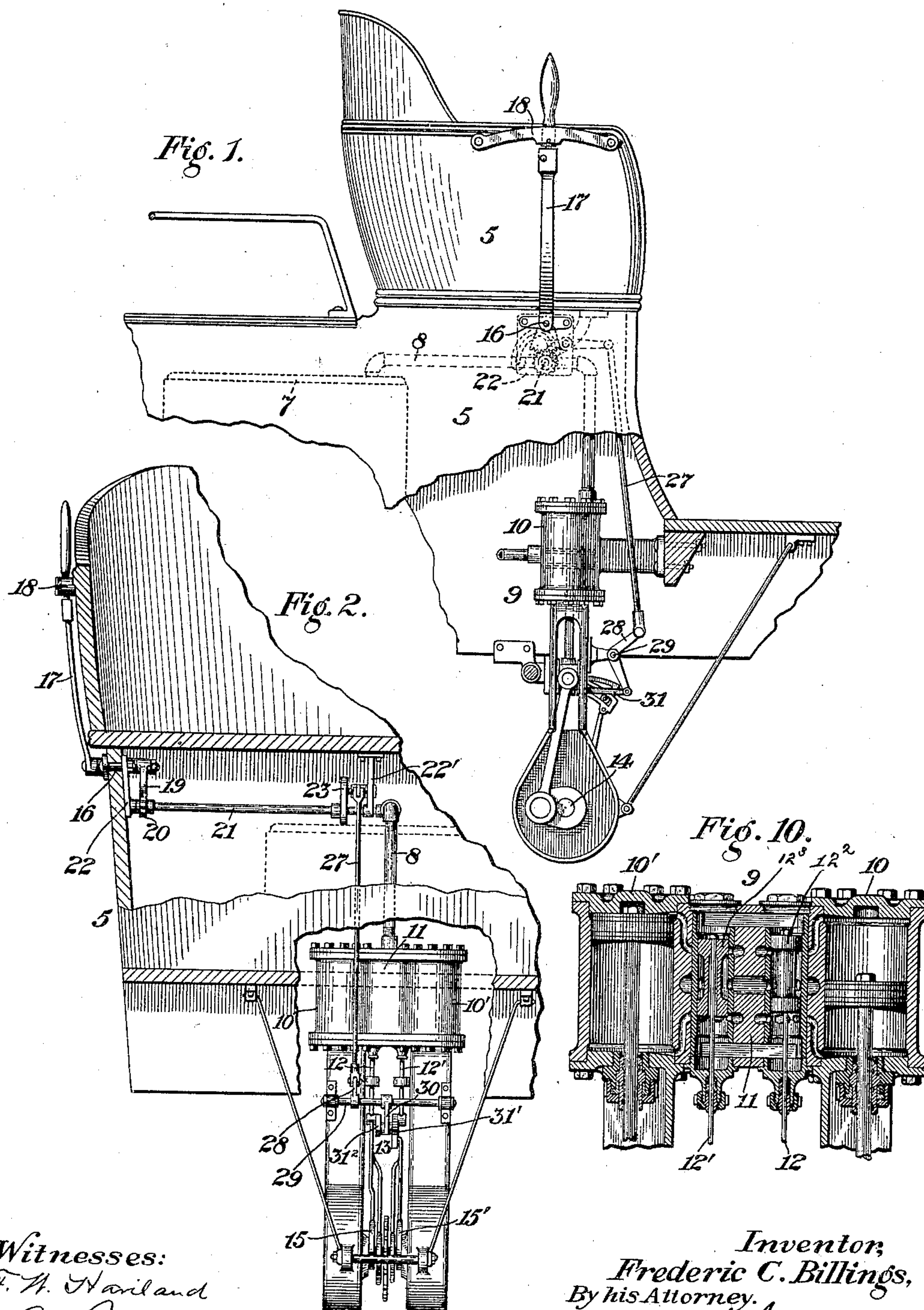
F. C. BILLINGS.

MECHANISM FOR CONTROLLING THROTTLE AND CYLINDER VALVES.

(Application filed July 6, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:  
F. H. Nailand  
R. H. Pittman

Inventor,  
Frederic C. Billings,  
By his Attorney,  
F. A. Richards.



No. 672,436.

Patented Apr. 23, 1901.

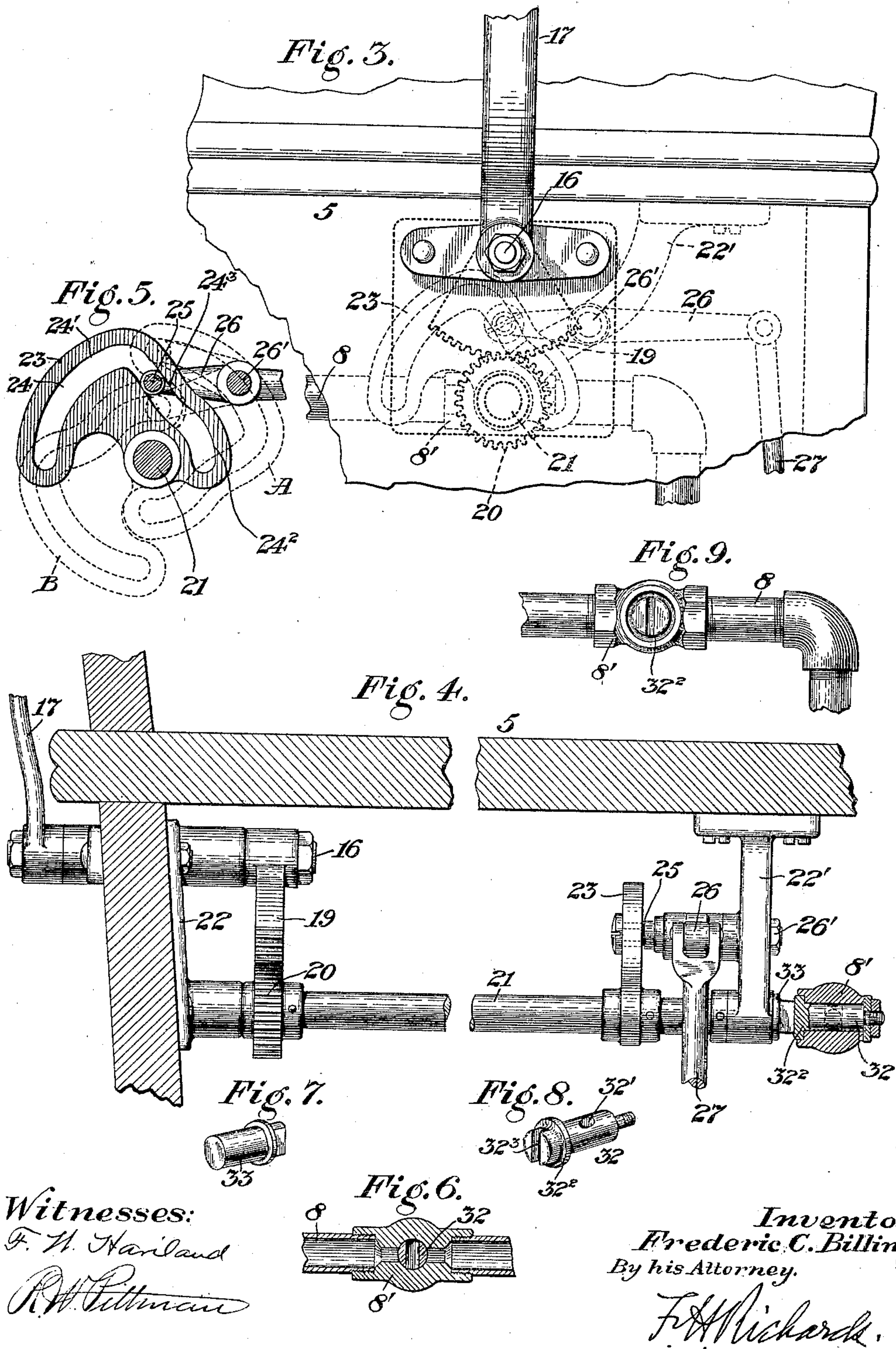
F. C. BILLINGS.

MECHANISM FOR CONTROLLING THROTTLE AND CYLINDER VALVES.

(Application filed July 6, 1900.)

(No Model.)

2 Sheets—Sheet 2



Witnesses:  
F. H. Harland  
R. W. Pittman

Inventor,  
Frederic C. Billings  
By his Attorney,  
F. H. Richards.



# UNITED STATES PATENT OFFICE.

FREDERIC C. BILLINGS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO  
AMERICAN BICYCLE COMPANY, OF NEW YORK, N. Y., AND JERSEY  
CITY, NEW JERSEY.

## MECHANISM FOR CONTROLLING THROTTLE AND CYLINDER VALVES.

SPECIFICATION forming part of Letters Patent No. 672,436, dated April 23, 1901.

Application filed July 6, 1900. Serial No. 22,686. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERIC C. BILLINGS, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Mechanism for Controlling Throttle and Cylinder Valves, of which the following is a specification.

My invention relates to mechanism for controlling throttle-valves and cylinder-valves; and it has for one object the provision of instrumentalities whereby when the throttle-valve is operated either to open, adjust, or close it a valve-controlling device will also be simultaneously adjusted and the valve governed thereby will consequently be made to conform in its movements to the desired conditions.

A further object of the invention is the provision of a geared connection between the reversing-lever and the throttle-valve and of a cam controlled by the reversing-lever and adapted to operate the mechanism for adjusting the valve for admitting motive fluid to and permitting the exhaust from a motor-cylinder.

A further object of the invention is the provision of means actuated by the reversing-lever for simultaneously operating the throttle-valve and the link-motion of an engine.

In the accompanying drawings, Figure 1 is a side elevation of an engine shown in place in the frame (broken away) of a motor-vehicle, my invention being represented in dotted lines. Fig. 2 is a front view of the invention, part of the frame of the motor-vehicle being in section. Fig. 3 is a partial side elevation of the frame of a motor-vehicle, my invention being represented in part by dotted lines. Fig. 4 is a transverse section of the frame, showing my invention in elevation. Fig. 5 is a longitudinal vertical section of the reversing-cam, showing the arm from the lever connecting said cam with the link-motion in elevation. Fig. 6 is a section of the steam-pipe and throttle-valve. Fig. 7 is a perspective view of a plug carried by the rock-shaft and adapted to turn the throttle-valve. Fig. 8 is a perspective view of the throttle-valve.

Fig. 9 is a side elevation of the steam-pipe,

showing the throttle-valve in position. Fig. 10 is a section of the cylinder-frame, showing the cylinder-valves in elevation.

Like numerals designate similar parts throughout the several views.

Referring to the drawings, the numeral 5 designates the frame on which an engine is mounted, and while this frame is shown as that of a motor-vehicle it is distinctly to be understood that the invention is not limited to any particular use.

A steam-generator (designated by the numeral 7) is partially represented by dotted lines in Fig. 1, and from this projects a steam-pipe 8, leading to the steam-chest of the engine, (designated in a general way by 9,) comprising cylinders 10 10', an intermediate steam-chest 11, valve-rods 12 12', cylinder-valves 12<sup>2</sup> 12<sup>3</sup>, a link-motion, (designated in a general way by 13,) a crank-shaft 14, operated by pitmen connected to cross-heads reciprocated by the pistons, and the usual eccentrics 15 15' for actuating the link-motion.

Two direct-acting steam-engines are shown, each being of like construction; but my invention is not limited thereto, for it is applicable to motors driven by other agents and may also be employed with single motors, if desired.

Connected to a short shaft 16, journaled in a bearing of the frame, is a reversing-lever 17, adapted to be engaged with the usual notched bar 18, and to the inner end of shaft 16 is secured a segment 19, in engagement with a pinion 20, attached to a rock-shaft 21, journaled in bearings of brackets 22 22' of the frame. Carried by the shaft 21 is a cam 23, having a peculiarly-formed groove 24, and fitted within said groove is a pin 25, projecting from an arm of a lever 26, journaled on a stud 26', secured to the bracket 22' of the frame. Articulated to the end of the lever 26 is a reversing-rod 27, connected at its other extremity to an arm 28, carried by a tumbling-shaft 29, from which projects another arm 30, connected by a link 31 with the usual slotted links 31' 31<sup>2</sup> of the link-motion.

Mounted for rotation in a fitting 8', connecting two of the sections of the steam-pipe 8, is a throttle-valve 32, the stem of which



has a port 32', and this valve is provided with a flanged head 32<sup>2</sup>, having a deep nick or slot 32<sup>3</sup> for the reception of the flat end of a plug 33, secured to the extremity of the shaft 21.

5 By the construction described it will be seen that when the reversing-lever 17 is actuated it will, through segment 19 and pinion 20, rock the shaft 21, thereby turning the valve 32 to the desired extent, and will also, 10 through the instrumentality of cam 23, lever 26, reversing-rod 27, and the other connections set forth, simultaneously shift the slotted link or links of the link-motion, thereby throwing it or them to a position to cause the 15 valve-rod or valve-rods 12 12' to be actuated in a manner suitable to conform to the adjustment of the valve 32. In this way the motor will always be kept under perfect control by the movements of but a single lever, 20 thereby greatly simplifying the construction by dispensing with many of the parts usually employed for this purpose.

As will be seen by reference to Fig. 5, the cam-groove 24 of cam 23 is of substantially 25 L-shaped form, and the walls of the L part 24' of said groove are drawn on easy curves and act when adjusted to the position shown by the dotted lines A, Fig. 5, to throw the end of the lever 26 to the position also represented by dotted lines in said figure, and 30 thereby shift the link of the link-motion, so that it will actuate the valve-rods to admit and exhaust steam for full forward speed, it being remembered that simultaneously with 35 the turning of the cam to said position A the throttle-valve 32 is also thrown wide open, so that the full volume of steam enters the steam-chest 11. When it is desired to reverse the action of the motor, the cam is 40 thrown to the position represented by the dotted lines B and the curved walls of the stem portion 24<sup>2</sup> of the substantially L-shaped cam-groove will throw the lever 26 below the axis of the shaft 26', as represented by dotted lines in Fig. 5, and will through the connections described shift the link-motion for 45 reverse speed of the motor. A portion 24<sup>3</sup> of the stem of the cam-groove 24 is formed with straight walls, which do not move the lever 26, and this portion is in the position shown by full lines in Fig. 5 and by dotted lines in Fig. 3 when the motor is not running, the valve 32 being turned to shut off the supply of motive fluid, (see Fig. 6,) as the portion 24<sup>3</sup> of the cam is brought to the full-line 55 position shown and the slotted link being shifted to its inert position.

By means of the cam described the desired degree of speed may be obtained either forward or backward, and the engine is placed 60 under perfect control of the operator, who employs for this purpose but a single lever.

My invention is not limited to the exact shape of the cam-groove shown, for it may be 65 modified in many ways and still accomplish the result set forth; nor is it limited to the devices illustrated for connecting the cam

with the link-motion. Furthermore, the invention may be employed with many substitutes for the link-motion and with many different kinds of motors, and it is not, therefore, limited to the cylinder-valve-controlling mechanism shown. 70

Having described my invention, what I claim, and desire to secure by Letters Patent, 75 is—

1. The combination, with a motor, of a throttle-valve; a shaft for actuating said valve; a cam carried by the shaft; a cylinder-valve; means operated by the crank-shaft of 80 the motor for operating said cylinder-valve; and connections between the cam and the means for operating the cylinder-valve.

2. The combination, with a motor, of a throttle-valve; means for actuating said valve; 85 a cam controlled by the valve-actuating means; a cylinder-valve; and means controlled by said cam for operating the cylinder-valve.

3. The combination, with a motor, of a 90 throttle-valve; a shaft for actuating said valve; a reversing-lever; connections between the reversing-lever and shaft; a cam carried by the shaft; a link-motion; and means connecting the cam and said link-motion. 95

4. The combination, with a reversing-lever carrying a segment, of a shaft having a pinion actuated by said segment; a cam secured to the shaft; a lever actuated by said cam; a motor-cylinder; a valve in the steam-chest of 100 said cylinder; means for actuating said valve; and connections between the valve-actuating means and the lever.

5. The combination, with a motor having a pair of cylinders and a steam-chest intermediate said cylinders, of a throttle-valve; 105 means for actuating said throttle-valve; a cam controlled by the throttle-valve-actuating means; a lever actuated by the cam; cylinder-valves; means actuated by the crank-shaft of the motor for operating the cylinder-valves; and connections between said means and said cam. 110

6. The combination, with a motor having a pair of cylinders, of slide-valves located 115 within the steam-chest of said cylinder; link-motions connected to said slide-valves; a reversing-lever; a shaft actuated by said reversing-lever; a cam on the shaft; a lever in engagement with said cam; a reversing-rod; 120 and means connecting said rod with the link-motions.

7. The combination, with a motor having a pair of cylinders and an intermediate steam-chest, of a steam-supply pipe leading to said 125 steam-chest; a throttle-valve within said steam-supply pipe; a shaft for actuating said throttle-valve; a grooved cam carried by the shaft; a pivoted lever having a stud in engagement with the walls of the groove of said 130 cam; a reversing-rod pivoted to said lever; link-motions; and means controlled by the reversing-rod for shifting said link-motions.

8. The combination, with a reversing-lever,



of a shaft; means connecting said lever and said shaft; a cam having a substantially L-shaped groove carried by the shaft; a steam-pipe having a throttle-valve actuated by the shaft; a link-motion; and means connecting said cam with the link-motion.

9. The combination, with a motor having a cylinder and a steam-chest, of a valve within the steam-chest; a steam-supply pipe; a throttle-valve in said pipe; a shaft for actuating said throttle-valve; a reversing-lever for controlling the movement of said shaft; a cam carried by the shaft; a link-motion; and means connecting the cam with said link-motion.

10. The combination, with a motor having a cylinder and a steam-chest, of a valve in the steam-chest; a link-motion for controlling the movement of said valve; a supply-pipe; a throttle-valve in said supply-pipe; a shaft for actuating said throttle-valve; means for rocking the shaft; a grooved cam carried by the shaft; a pivoted lever having a stud inserted in the groove of said cam; a reversing-rod connected to said lever; and means connecting said reversing-rod with the link-motion.

11. The combination, with a reversing-lever, of a shaft carrying a segment, to which said lever is secured; a rock-shaft carrying a pinion in engagement with said seg-

ment; a cam carried by the rock-shaft; a pivoted lever actuated by said cam; a reversing-rod; a link-motion; and means for connecting said reversing-rod with the link-motion.

12. The combination, with a motor having a cylinder and a steam-chest, of a slide-valve located within the steam-chest; a link-motion for controlling the movements of said valve; a reversing-lever; a shaft having a grooved cam; a pivoted lever having a stud inserted in the groove of said cam; a reversing-rod; a tumbling-shaft having an arm to which said rod is connected; and means connecting the tumbling-shaft with the link-motion.

13. The combination, with an engine having a pair of cylinders and an intermediate steam-chest, of slide-valves operative in said steam-chest; link-motions for actuating said slide-valves; a reversing-lever; a rock-shaft actuated by said reversing-lever; a grooved cam carried by the rock-shaft; a throttle-valve actuated by said rock-shaft; a pivoted lever having a stud entering the groove of said cam; a reversing-rod; and means connecting said reversing-rod with the links of the link-motions.

FREDERIC C. BILLINGS.

Witnesses:

F. C. BLAND,  
H. B. BELFIELD.