A. H. SHOEMAKER.

FLUID CLUTCH.

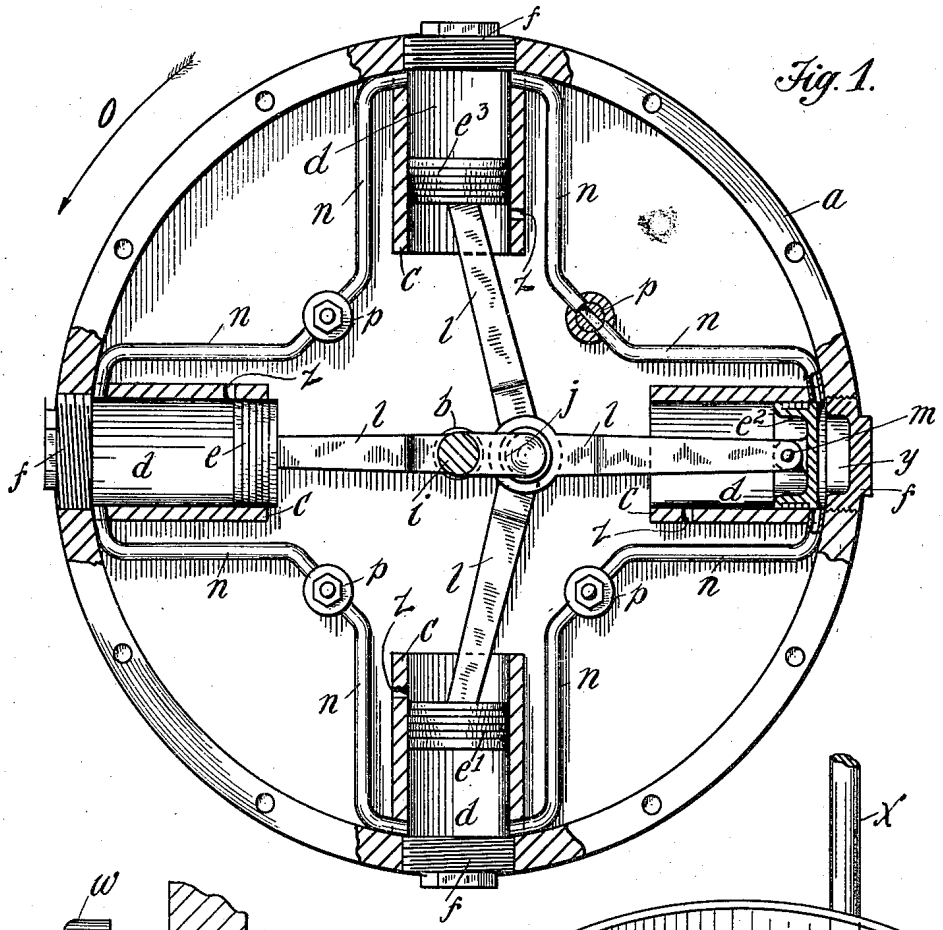
APPLICATION FILED SEPT. 11, 1911.

1,034,739.

Patented Aug. 6, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



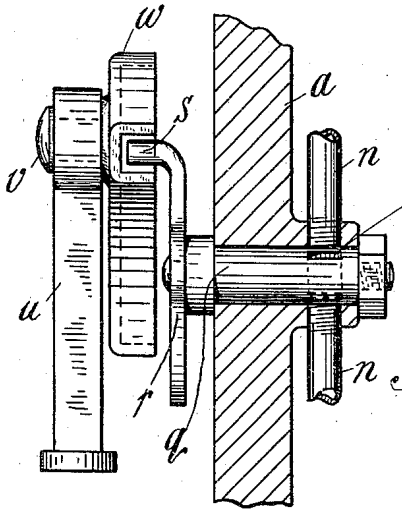


Fig. 4.

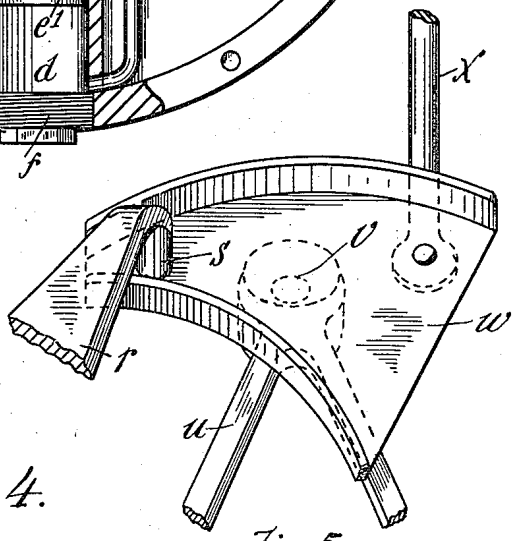


Fig. 5.

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2 SHEETS—SHEET 2.

Fig. 2.

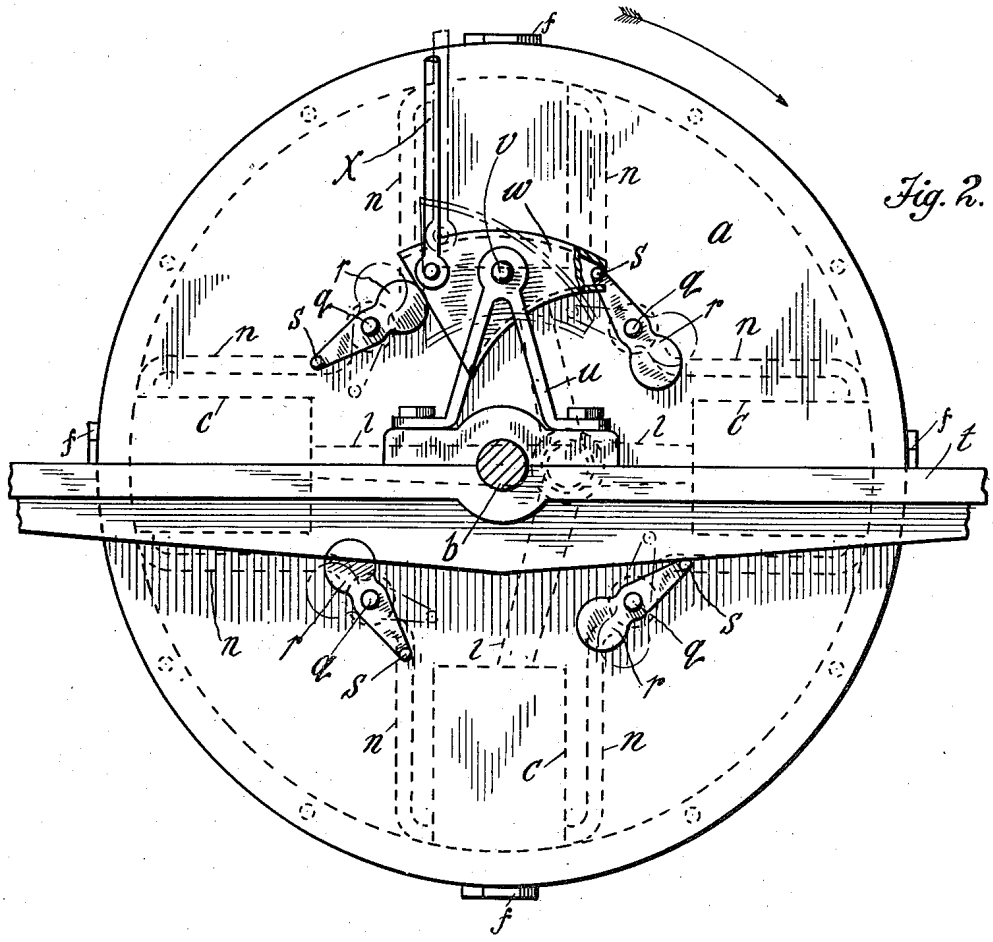
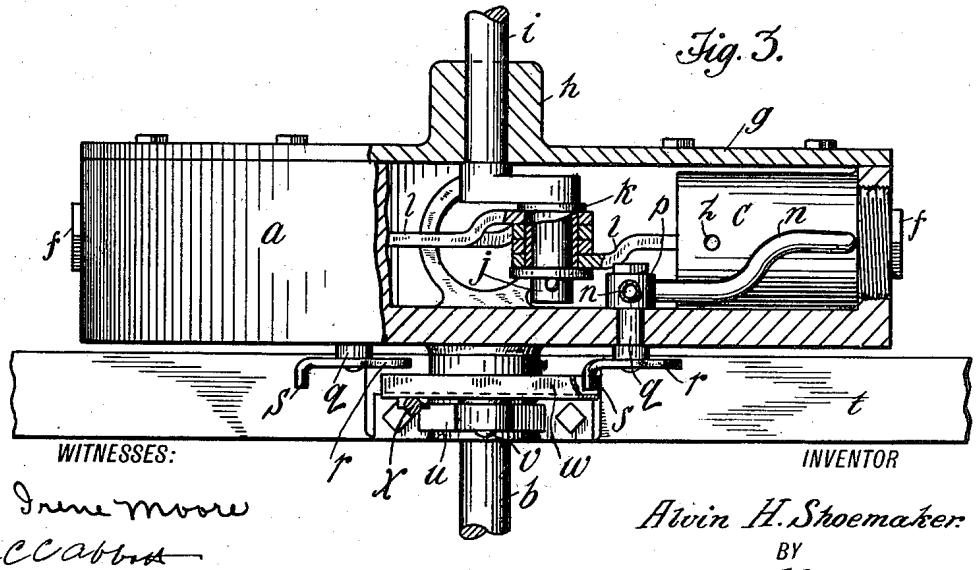


Fig. 3.



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UNITED STATES PATENT OFFICE.

ALVIN H. SHOEMAKER, OF PORTLAND, OREGON, ASSIGNOR OF TWO-THIRDS TO ALBERT CLEVELAND AND E. A. TYROLL AND ONE-THIRD TO J. W. HURLEY, ALL OF PORTLAND, OREGON.

FLUID-CLUTCH.

1,034,739. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed September 11, 1911. Serial No. 648,811.

To all whom it may concern:

Be it known that I, ALVIN H. SHOEMAKER, a citizen of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Fluid-Clutches, of which the following is a specification.

My invention relates to means for governing the speed of a vehicle propelled by an internal combustion engine, and has for its object generally speaking to provide a device of greater flexibility and durability of simpler construction and of greater ease of operation than the transmission gearing usually employed in this type of vehicle.

To this end my invention consists in the features and combinations clearly set forth in the following description.

In the appended drawings forming part of the specification my device is illustrated in the following manner.

Figure 1 is a rear elevation of the engine fly-wheel in which parts of my device are mounted, Fig. 2 is an inverted or front elevation of the fly-wheel showing the remaining parts of my invention, Fig. 3 is a sectional plan view of the mechanism illustrated in Figs. 1 and 2. Fig. 4 illustrates in sectional side elevation the valve mechanism of my device, and Fig. 5 shows perspectively the valve controlling mechanism.

Fly-wheel *a*, rigidly secured to engine drive-shaft *b*, is cupshaped and in the cylindrical chamber thus formed are mounted a series of radially disposed lugs *c*. These lugs are preferably integral with the wheel and are provided with radially disposed cylindrical perforations *d*, adapted to receive a corresponding series of pistons *e*, *e'*, e^2 and e^3. The outer ends of perforations *d* are closed by airtight screw-caps *f*. The open face of fly-wheel *a* is tightly closed by a flange *g* provided with a central projection or hub *h*, in which journals a crank-shaft *i* in alinement with engine drive shaft *b*. Crank-shaft *i* is in any suitable manner connected with the drive wheels of the vehicle. On crank-pin *j* of shaft *i* is rotatably hung a sleeve *k*, on which a series of piston rods *l* fulcrum, and said rods are by hinge joints *m* operatively connected with pistons *e*. The outer ends or bottoms of piston chambers *d* are interconnected by a series of air-ducts or tubes *n*. The fly-wheel and engine, when directly connected, revolve together. If a clutch is interposed between the fly-wheel and the engine, the latter is first permitted to attain its normal speed, whereupon the clutch is thrown to connect the two members in the usual manner.

The function of the mechanism described is to transmit the rotary motion of the fly-wheel to crank-shaft *i*, but as said crank-shaft is restrained by a load equal to the power required to move the vehicle, said crank-shaft tends to resist the action of the fly-wheel and to remain stationary. The consequence is that the pistons, due to the eccentric position of crank-pin *j*, commence to reciprocate in cylinders *d*, the result of which is better understood by referring to Fig. 1, where piston *e* is positioned at the beginning of its stroke and the opposite piston e^2 at the end of its stroke, while the other pistons e^1 and e^3 both are centrally located. The fly-wheel, rotating in the direction of arrow *o*, causes pistons *e* and e^1 to move forward and pistons e^2, e^3 to recede. The air behind pistons *e*, e^1 is thus forced into and through tubes *n* into the space behind pistons e^2 and e^3, and vice versa. If tubes *n* are relatively large the air flows freely and rapidly from cylinder to cylinder, permitting the fly-wheel to revolve and crank-shaft *i* to remain stationary, but if the tubes are very small relative to the volume of air in the cylinders, then the air pulsations become retarded, with the consequence that the crank-shaft is caused to rotate.

It is readily seen that the greater the load is on crank-shaft *i*, the greater becomes the air pressure, and the quicker the pulsations, and as the load usually is greatest on starting the vehicle from a dead stop, the latter starts slowly and only gains speed as the load decreases.

The above described mechanism works entirely automatically, it is only necessary to correctly calculate the relative areas of the cylinders and the air tubes to develop a predetermined speed with a given load, and also to take care that the pistons are well fitted to prevent leakage. As the fly-wheel is tightly covered by flange *g*, the fly-wheel chamber may be partly or en-

tirely filled with suitable lubricants to insure the smooth and easy running of the inclosed mechanism. It is found desirable however to manually regulate the air pressure and the consequent rapidity of pulsations in order to adjust the speed of the vehicle to various loads, and this I accomplish in the following manner. I calculate tubes *n* large enough to develop a certain speed with the minimum load applicable, and provide said tubes with regulating valves *p*, the opening and closing of which govern the range of pulsations. The stems of said valves journal in and extend through the wall of the fly-wheel and are on their outer projecting ends provided with fixed heads *r*. These heads are oblong in shape and at one end made with a projecting finger *s*, while the other end is heavy enough to perfectly balance the head, so as to prevent the centrifugal force of the revolving wheel from disturbing the angular position of the head.

On bearing support *t* of engine drive-shaft *b* I mount a standard *u*, in which is rotatably fixed a stud *v*, integral with one end of which is a deflector *w*. The latter is made on the form of a wedge-shaped trough and so positioned relative to finger projections *s* of valve heads *r*, that said projections, in revolving with the fly-wheel, pass through said trough entering at the large end and escaping through the small end, which is barely wide enough to permit the projections to pass. Deflector *w* is by hinged rod *x* operatively connected with a suitable hand-lever mechanism (not shown), by means of which the operator of the vehicle may adjust the angular position of the deflector, and thereby control the opening and closing of the valves, as clearly shown in full and broken lines in Fig. 2. When the deflector is set to entirely close the valves no pulsations can take place, and my device operates as a positive and yet very elastic clutch.

Screw-caps *f* are preferably made with cavities *y*, and piston chambers *d* are made long enough so that the pistons do not bottom. In this manner an air cushion always remains behind a piston, and prevents any jerking tendency on the part of the piston on reaching the end of its stroke.

Finally I wish to call attention to air vents *z* of the piston chambers, which are so positioned relative to the pistons, that air can enter said chambers when the pistons have reached the end of their return stroke. The object of these air vents is to increase the air pressure in the pulsative system of my device, in order thereby to make it more efficient. As a piston completes its return stroke, a partial vacuum forms behind it, which causes air to enter through said vent, and this performance is repeated until so great a pressure is created in the system, that the tension behind said piston equals atmospheric pressure.

I claim:

1. In a device of the character described in combination, an engine shaft, a series of radially disposed cylinders rigidly mounted on said engine shaft, a crank-shaft in horizontal alinement with said engine shaft and operatively connected with the vehicle drive-wheels, a series of piston rods rotatably hung on the crank-pin of said crank-shaft, said rods pivotally fixed to the pistons of said cylinders, and a series of air-tubes connecting the outer ends of said cylinders.

2. In a device of the character described in combination, an engine shaft, a fly-wheel operatively connected with said engine shaft, a series of radially disposed cylinders mounted on said fly-wheel, a crank-shaft in horizontal alinement with said engine shaft and operatively connected with the engine drive-wheels, a series of piston rods rotatably hung on the crank-pin of said crank-shaft, a bearing sleeve interposed between said rods and said crank-pin, said piston rods pivotally fixed to the pistons of said cylinders, a series of air-tubes connecting the outer ends of said cylinders, and an air vent in each cylinder so positioned relative to the piston that air is free to enter the cylinder on completion of the inward stroke of the piston.

3. In a device of the character described, an engine shaft, a fly-wheel operatively connected with said engine shaft, a series of radially disposed cylinders rigidly mounted on said fly-wheel, a crank-shaft in horizontal alinement with said engine shaft and operatively connected with the vehicle drive-wheels, a series of piston rods rotatably hung on the crank-pin of said crank-shaft, a bearing sleeve interposed between said rods and said crank pin, said rods pivotally fixed to the pistons of said cylinders, a series of air-tubes connecting the outer ends of said cylinders, each of said air-tubes provided with a regulating valve, and manually operated means for controlling said valves.

4. In a device of the character described, an engine shaft, a fly-wheel operatively connected with said engine shaft, a series of radially disposed cylinders rigidly mounted on said fly-wheel, a crank-shaft in horizontal alinement with said engine shaft and operatively connected with the vehicle drive wheels, a series of piston rods rotatably hung on the crank-pin of said crank-shaft, a bearing sleeve interposed between said rods and said crank-pin, said rods pivotally fixed to the pistons of said cylinders, a series of air tubes connecting the outer ends of said cylinders, each of said air-tubes provided with a regulating valve, manually operated

means for controlling said valves, and an air vent in each cylinder so positioned relative to the piston that air is free to enter the cylinder on completion of the inward stroke of the piston.

5. In a device of the character described in combination, an engine shaft, a fly-wheel operatively connected with said engine shaft, a series of radially disposed cylinders rigidly mounted on said fly-wheel, a crank-shaft in horizontal alinement with said engine shaft and operatively connected with the drive wheels of the vehicle, a series of piston rods rotatably hung on the crank-pin of said crank shaft, a bearing sleeve interposed between said rods and said crank-pin, said rods pivotally fixed to the pistons of said cylinders, a series of air-tubes connecting the outer ends of said cylinders, a regulating valve on each of said air-tubes, an elongated balanced head rigidly secured to the end of each valve stem, a finger projection on one end of the valve head, manually operated means coöperating with said finger projection for oscillating said valve heads to regulate the opening of said valves, and an air vent in each cylinder so positioned relative to the piston that air is free to enter the cylinder on completion of the inward stroke of the piston.

6. In a device of the character described, an engine shaft, a fly-wheel operatively connected with said engine shaft, a series of radially disposed cylinders rigidly mounted on said fly-wheel, a crank shaft in horizontal alinement with said engine shaft and operatively connected with the vehicle drive wheels, a series of piston rods rotatably hung on the crank-pin of said crank shaft, a bearing sleeve interposed between said rods and said crank pin, said rods pivotally fixed to the pistons of said cylinders, a series of air-tubes connecting the outer ends of said cylinders, a regulating valve on each of said air tubes, an elongated balanced head on the end of each of the valve stems, a finger projection on one end of the valve head, a bracket mounted on the engine shaft support, a deflector journaled in said bracket in registration with the finger projections of said valve heads, manually operated means for adjusting said deflector, and an air vent in each cylinder so positioned relative to the piston that air is free to enter the cylinder on completion of the inward stroke of the piston.

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

ALVIN H. SHOEMAKER.

Witnesses:
L. W. HUMPHREYS,
GRACE L. TWITCHELL.