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L. FUCHS.
AUTOMOBILE FIRE ENGINE.
APPLICATION FILED DEC. 10, 1910 .

Patented Oct. 31, 1911.

4 SHEETS-SHEET 1.

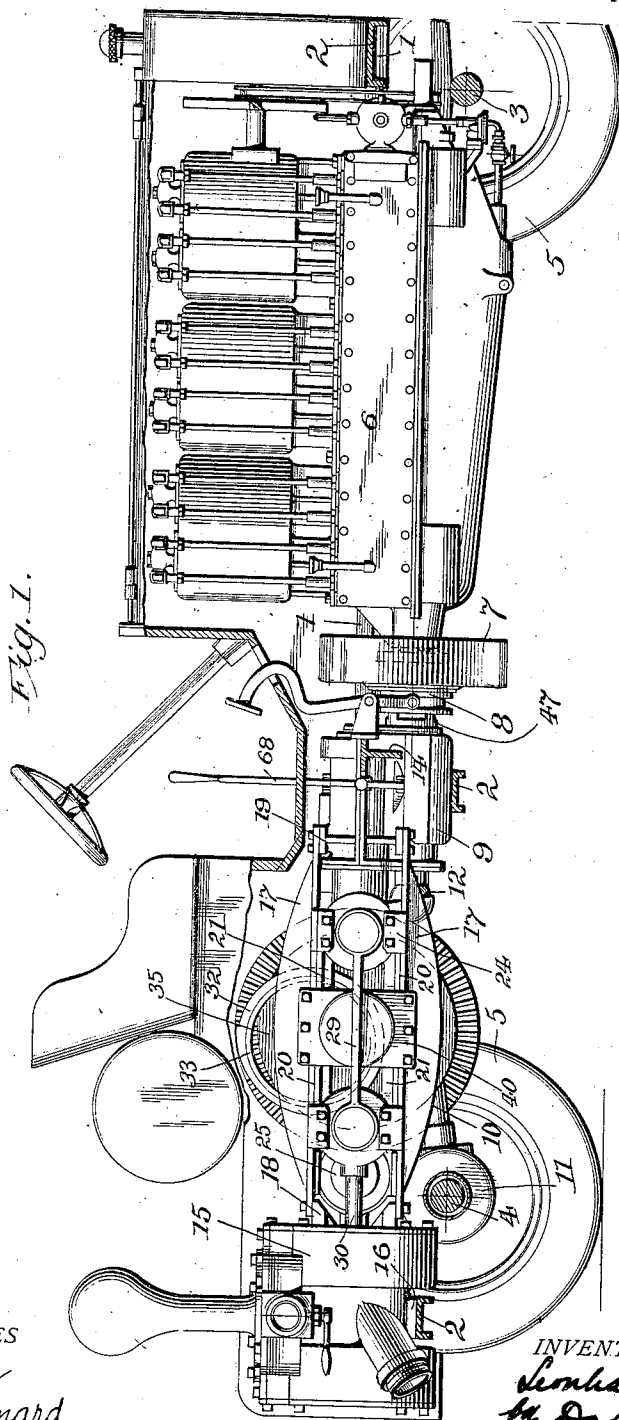


Fig. 1.

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Howard B. Leonard.

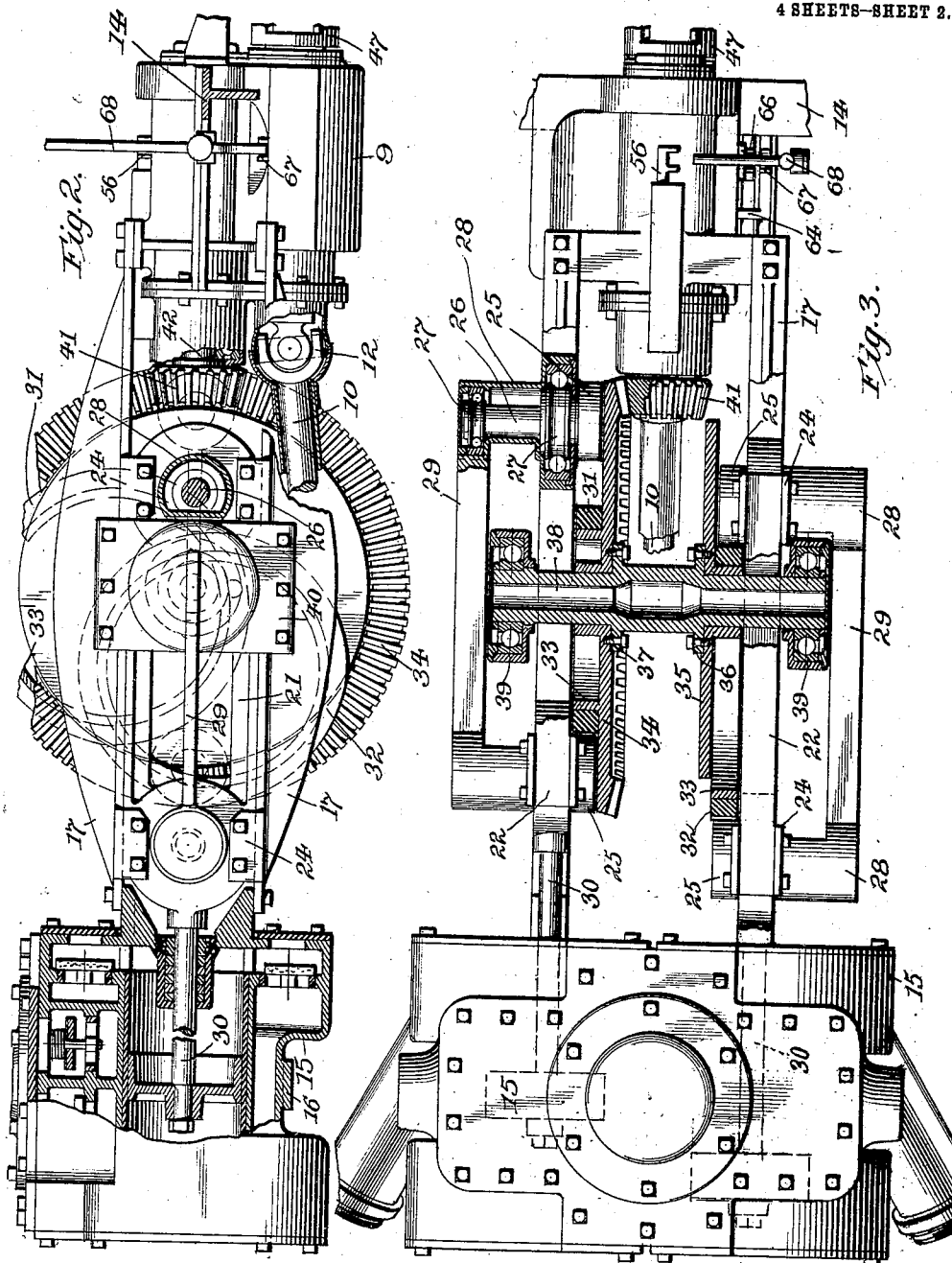
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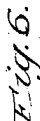
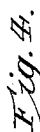
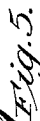
4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.



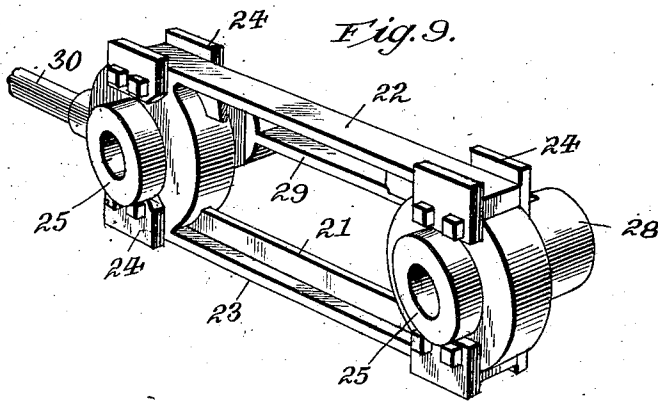
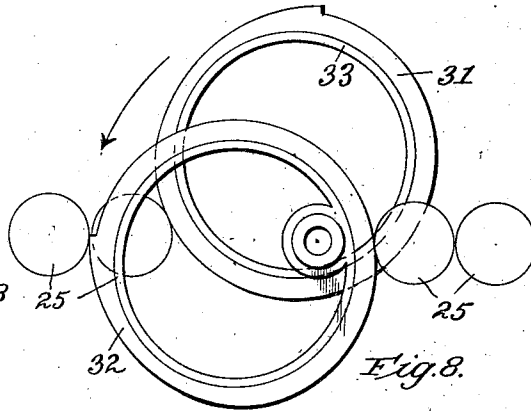
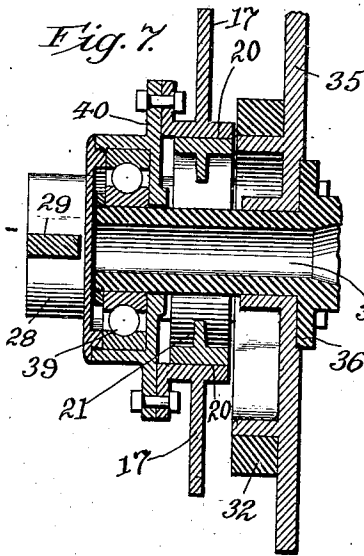
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4 SHEETS-SHEET 4.



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UNITED STATES PATENT OFFICE.

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AUTOMOBILE FIRE-ENGINE.

1,007,551.

Specification of Letters Patent.

Patented Oct. 31, 1911.

Application filed December 10, 1910. Serial No. 596,567.

To all whom it may concern:

Be it known that I, LEONHARD FUCHS, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Automobile Fire-Engines, of which the following is a specification.

This invention relates to automobile fire engines and particularly to a special type of mechanism designed to combine the best features of modern automobile practice with the simplest, lightest and most accessible form of reciprocating pump adapted to machines of this type.

The purpose of my invention is to construct a fire engine propelled by an internal combustion motor which motor is also used to drive the pump when the machine arrives at the fire, the mechanism being so designed that the weights are properly distributed, and all the machinery is accessible for inspection or repairs.

Absolute reliability and accessibility, combined with light weight and high efficiency of the pump mechanism are essentials of any machine of this character, and in my invention I have retained all the standard features of modern automobile practice and have combined therewith a specially designed form of pump and actuating mechanism affording the advantages of accessibility, rigidity, light weight and high efficiency. I retain in the structure the usual vertical multiple cylinder gas engine having the usual clutch and selective transmission gear. I modify the transmission gear however, by the addition of a jaw clutch located on the usual jack shaft through which the pumping mechanism may be operated. The pumping mechanism preferably consists of a double-acting two-cylinder pump operated by a special form of cam mechanism, the pump and its actuating mechanism being specially designed for use in connection with the engine, and transmission gear of an automobile of approved type. The chassis of the automobile requires only very slight modification in order to receive and support the pumping mechanism and this modification resides primarily in the location and form of the cross members of the chassis.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical section of a machine embodying the features of my invention; Fig. 2 is an elevation, partly sectional, of the pump actuating mechanism showing the method of connecting it to the transmission gear and to the pump, certain parts being shown in section for clearness; Fig. 3 is a plan view of the same, certain parts being sectioned on the center line of the cam shaft; Fig. 4 is a vertical section on the center line of the transmission mechanism; Fig. 5 is a transverse section of the same on the line *e—e* of Fig. 4; Fig. 6 is a section on the line *f—f* of Fig. 5; Fig. 7 is a vertical fragmentary section on the center line of the cam shaft showing the mode of supporting the cam shaft and the cam roller slides; Fig. 8 is an elevation diagram of the cams showing their relative positions and the positions of the cam slide rollers; and Fig. 9 is a perspective view showing a cam slide with its rollers.

Referring to the drawings and particularly Fig. 1, it will be seen that the machine comprises the usual chassis having the side members 1 and the cross members 2. This frame is supported by the usual springs upon the axles 3 and 4 having wheels 5 of the ordinary automobile type. Supported in the chassis in any usual manner is the engine 6, here shown as consisting of six vertical cylinders cast in pairs, but which might be of any type suitable for this service. The engine-control, radiator connections, etc., differing in no essential particulars from those ordinarily used on automobiles, are not shown in detail in the drawings. The engine is provided with the usual fly wheel 7 in which is mounted a friction clutch 8 of any suitable form.

Immediately behind the clutch is the transmission gear case 9, later to be described in detail, from which runs the propeller shaft 10 to the differential-gear case 11 on the rear axle 4. The propeller shaft 10 is connected by the usual universal or Hooke's joint 12 to the driven shaft 13 of the transmission. The differential gear indicated at 11 is of a type commonly employed in automobiles and the construction of pro-

PELLER shaft and its connections differ in no essential particular from that ordinarily used.

The transmission case is supported from the side bars 1 of the chassis by yokes 14 cast integrally with the case. A two-cylinder double-acting pump 15 is supported on an integral lug or boss 16 bolted to a cross member 2 of the chassis.

The pump and the transmission case are held rigidly together by four guide yokes 17 bolted to lugs 18 and 19 on the pump and transmission case respectively. In this manner the pump and the transmission are tied tightly together, forming essentially a single rigid structure supported at three points upon the chassis. Consequently power may be transmitted from the transmission case to the pump without lost motion and there will be no tendency for the working parts to bind or cramp. These guide yokes 17, as clearly seen in Fig. 7, are of T-section and assembled in pairs with their flat parallel guide surfaces 20, between which are guided the slides 21, toward each other. The slides 21 consist of substantially rectangular frames open at their middle to clear the cam shaft, and having upper and lower bearing surfaces 22 and 23 coacting with the faces 20 of the yokes 17. The slides are retained between the yokes by the plates 24 bolted to the slides and are provided at their opposite ends with rollers 25 carried on spindles 26 which turn in ball or roller bearings 27 in the cam slides. The bearings 27 are supported in lateral extensions 28 formed integrally with the slides and held together at their outer ends by an integral tie member 29. In this way ample support is given to the rollers and the two bearings 27 of each roller are brought sufficiently far apart and are adequately braced to prevent any undue wear or lost motion. The slides 21 are directly connected to respective piston rods 30 of the pump 15 so that the movement of the slides forward and back in the guide yokes 17 will operate the pump. This pump may be of any desired form and need not be here described in detail.

The rollers 25 coact with cams 31 and 32 forced on circular flanges 33 formed respectively on a bevel gear 34 and a plate 35. This permits the cams to be formed of any desired material so as to withstand the wear and so as to permit convenient manufacture of the gear 34 and plate 35. This gear and plate are bolted to flanges 36 and 37 formed on the cam shaft 38, here shown as hollow and journaled in ball or roller bearings 39. The bearings 39 are mounted in supporting plates 40 which are bolted at top and bottom to the guide yokes 17. The supporting plates 40 and the bearings 39 are thus sustained by the guide yokes 17 immediately outside of the slides 21 and just within the

tie members 29. The shaft 38 consequently extends through the central opening of the slides 21 which opening is sufficiently long to permit full movement of the slides as the cams rotate.

It will be noted that the form of the cam is such that a cam is in contact with both its rollers only at the point of reversal of motion of its corresponding slide. This is diagrammatically represented in Fig. 8 where the cam 32 is shown at such point, while the cam 33 is at 90° to the cam 32, the two pump pistons being displaced with respect to each other. In this figure it will be seen that the cam 33 is in contact only with its left hand roller (as viewed in this figure), the slide 21 corresponding to this cam being then moved to the left. Since, however, the cam is in contact with both rollers at the point of reversal there is no tendency to hammer or pound, but a perfectly smooth action is secured. The particular form of and method of designing these cams will not be described in the present application as it does not form a part of the subject-matter hereof, and other forms of cams might be used.

The bevel gear 34 is driven by a smaller bevel gear 41 which is carried by the shaft 42. This shaft 42 is aligned with the jack shaft 43 of the transmission, the jack shaft and the driven shaft 13 of the transmission being parallel as is usual in such transmissions. The shaft 42 turns in a ball bearing 44 in the transmission case 9 and is further journaled at one end as at 45 in the end of the jack shaft 43 which in turn is mounted in ball bearings 46 in the transmission case 9. Driving shaft 47 is similarly aligned with the driven shaft 13, the driving shaft 47 being connected to the driven member of the clutch 8 so as to be clutched to or released from the engine crank shaft. The shaft 47 supported in ball bearings 48 carried in the case 9. The driven shaft 13 is mounted at one end in ball bearings 49, and the other end is journaled at 50 in the driving shaft 47. The driving shaft 47 carries a gear 51, which meshes with a gear 52, on the jack shaft 43. Thus the rotation of the shaft 47 through the clutch from the engine will cause rotation of the jack shaft 43. The jack shaft 43 also carries one member 53 of a jaw clutch, the other member 54 of which is splined upon the shaft 42. The member 54 may be moved by a shifter rod 55 having jaws 56 for a purpose later to be described, into and out of engagement with the member 53. Thus when 54 and 53 are in mesh and the clutch 8 is engaged, the engine will drive the shaft 47 which through gears 51 and 52 drives the shaft 43 clutched to the shaft 42. Consequently the gear 41 is rotated and turns the

large gear 34. This rotates the cams and operates the pump as will be apparent

The operation of the transmission to propel the automobile is essentially that of the transmission in common use but will be described in order that it may be fully understood. The shaft 43 carries gears 57 and 58 of different diameters and the gear 57 meshes with a pinion 59 which turns on a shaft 60 together with a gear 61. Splined on the driven shaft 13 are two gears 62 and 63, each movable in two directions by shifter yokes 64 and 65 respectively. The shifter yokes 64 and 65 are each provided with jaws, 66 and 67 respectively, similar in form to the jaws 56 on the shifter rod 55. A lever 68 of the so-called selective type is mounted to slide on its fulcrum so as to engage selectively the jaws 56, 66 and 67, and when moved into engagement with one or another of these jaws may be thrown to cause the shifting of the clutch member 54 or of either of the gears 62 or 63, as will be apparent.

On the right face of the gear 63 as viewed in Fig. 4 is formed one member 69 of a jaw clutch whose other member 70 is on the driving shaft 47. Thus the lever 68 may be shifted to bring it into proper operative relation and may then be thrown to produce the following effects: first, to cause the engagement of the members 54 and 53 to cause the engine to drive the pump; second, to move the gear 62 to the left to mesh with the gear 61 which gives a reverse drive to the automobile; third, to shift the gear 62 to the right to mesh with the gear 58 to give the first forward speed for the automobile; fourth, to shift the gear 63 to the left to mesh with the gear 57 to give the second forward speed of the automobile; and fifth, to shift the gear 63 to the right to cause the clutch members 69 and 70 to enter into direct driving relation which gives the third forward speed which is a direct drive from the engine to the differential, there being no gears there in driving relation in the transmission. Thus the single lever 68 is caused to operate selectively to bring the engine into the various driving relations including the driving relation with the pump.

It will be observed that by the construction above pointed out, I am enabled to mount the engine and all its accessory parts in a manner which long experience has established as the best. I am enabled to use a transmission gearing of the simplest form, and by the addition of one clutch to the jack shaft thereof to secure a drive for my pump with the fewest working parts.

The pump actuating mechanism is of such form as at once to guide and support the working parts and to brace together the transmission case and the pump. Ample

space is left between the gear 34 and disk 35 to give clearance for the propeller shaft, and the pump and pump-actuating mechanism are of such form as to give clearance for the differential gear case.

The cams may be designed so as to give constant delivery without pulsation, an essential feature in pumps of this class. All the weights in the machine are very low, so that the machine may safely be run at the high speed desired for vehicles of this class, and it may be successfully operated by a driver familiar with the ordinary form of automobiles.

The particular form of the pump and the form and construction of the cam form no part of the present invention, and hence are not set forth in detail.

Although I have described an actuating mechanism of the cam type, it is obvious that the advantages of the invention, particularly arising from the rigid connection between the power transmitting mechanism and the pump, may be derived with other well known pump-actuating mechanisms, and I do not limit myself to the particular form shown, except where specifically stated in the claims. It is obvious also that other forms of transmission mechanism might be used, the one shown being a well known type and chosen for purposes of illustration. The feature of controlling the entire machine including its pumping action from the driver's seat is important because the engine controls, lubricating devices, etc., are usually and most satisfactorily accessible from this point, and this arrangement avoids any needless duplication of these parts.

Having thus described the invention, what I claim is:—

1. In an automobile fire engine, the combination of suitable running gear having the usual propelling wheels; an engine mounted therein; a pump mechanism also mounted in the running gear; a driving shaft adapted to receive power from the engine; a clutch interposed between the driving shaft and the engine; a driven shaft; connections from the driven shaft to the propelling wheels of the running gear; a jack shaft; enmeshed gears on the jack shaft and the driving shaft; change gears on the jack shaft and on the driven shaft adapted to be moved selectively into driving relation with each other to produce different speed relations between their respective shafts; a pump-actuating mechanism; a clutch adapted to connect the pump actuating mechanism and the jack shaft; and a selective shifting mechanism for alternately operating the last mentioned clutch or moving the gears upon the driven shaft into and out of driving relation.

2. The combination in an automobile fire

engine of suitable running gear having driving wheels; an engine; a clutch controlling the application of power from the engine; a pump; a transmission gear case; a pump-actuating mechanism operatively connected to the pump, interposed between the pump and the transmission gear case, and having a frame rigidly connected to both; a driving and a driven shaft mounted in the transmission case, the driving shaft being adapted to receive power from the engine; a jack shaft and suitable gears through which power may be transmitted from the driving to the driven shaft; means for controlling such gears to establish or destroy such power transmitting relation; and a clutch adapted to throw the jack shaft into and out of driving relation with the pump actuating mechanism at the will of the operator.

3. The combination in an automobile fire engine of a suitable running gear having driving wheels; an engine; a clutch controlling the application of power from the engine; a pump; a transmission gear case; a pump-actuating mechanism interposed between the pump and the transmission gear case and having a frame rigidly connected to both; a driving and a driven shaft mounted in the transmission case, the driving shaft being adapted to receive power from the engine and the driven shaft being operatively connected to the driving wheels; a jack shaft driven by the driving shaft; suitable change gears through which power may be transmitted from the jack shaft to the driven shaft; a releasable connection for placing the jack shaft in driving relation with the pump actuating mechanism; and a selective mechanism for individually operating said releasable connection and actuating said change gears.

4. In an automobile fire engine, the combination with suitable running gear, engine, clutch, and power transmitting change gear; of a pump supported by the running gear; a transmission gear case adapted to support and inclose the transmission gear and itself supported by the running gear; a plurality of guide yokes rigidly connecting the pump and the transmission case; a pump-actuating mechanism comprising cams and slides supported by the guide yokes, the slides being operatively connected to the pump; driving means for rotating said cams; means for clutching said driving means to a part of the power transmitting change gear; and means for establishing driving relations through the transmission gear to the driving wheels.

5. The combination with an automobile chassis having an engine of usual type, clutch, transmission change gear mechanism and propelling mechanism; of a pump supported in the chassis; a case supporting the

transmission mechanism; a pump-actuating mechanism interposed between the pump and the transmission mechanism and having a frame rigidly connected to both; and means for placing said pump operating mechanism in operative relation with a portion of the transmission change gear mechanism.

6. In an automobile fire engine, the combination of a running gear having driving wheels; an engine; a transmission case; a pump supported in the running gear; guide yokes rigidly connecting the transmission case and the pump; a slide operatively connected to the pump and guided by the guide yokes; bearings supported by the guide yokes; a shaft journaled therein; a cam carried by the shaft and coacting with the slide to reciprocate the latter; and a power transmission mechanism supported by the transmission case, adapted to receive power from the engine and to transmit it alternately to said shaft or to the driving wheels of the running gear.

7. In an automobile vehicle, the combination of the usual transmission case and change gear mechanism; a pump; rigid connections distinct from the frame of the vehicle between the pump and the transmission case; a shaft supported thereby; driving connections between said shaft and the pump; and means for establishing driving relation between said shaft and a portion of the change gear mechanism.

8. In an automobile fire engine, the combination of a suitable running gear, having the usual driving wheels; an engine; a clutch controlling the transmission of power from the engine; a transmission gear case; a pump-actuating mechanism interposed between the pump and the transmission gear case and having a frame rigidly connected to both; a variable speed mechanism in the transmission case and adapted to receive power from the engine; driving connections operatively connected to the driving wheels of the running gear; a shaft operatively connected to the pump-actuating mechanism; means for establishing driving relations between a portion of the variable speed mechanism and said shaft; and means for establishing driving relations through the variable speed mechanism to said driving connections.

9. In an automobile fire engine, the combination of a suitable running gear including the usual driving wheels; an engine; a clutch controlling the transmission of power from the engine; a transmission gear case; a pump-actuating mechanism interposed between the pump and the transmission gear case and having a frame rigidly connected to both; a variable speed mechanism in the transmission case; driving connections in operative relation to said variable speed

mechanism and connected to the driving wheels of the running gear; a shaft operatively connected to the pump-actuating mechanism; a releasable connection for establishing driving relations between a portion of the variable speed mechanism and said shaft; and a selective actuating mechanism adapted alternatively to operate said releasable connection or to operate the variable speed mechanism.

10. In an automobile fire engine, the combination of a running gear having driving wheels; an engine; a transmission case; a pump supported in the running gear; guide yokes rigidly connecting the transmission case and the pump; slides operatively connected to the pump and guided by the guide yokes; bearings supported by the guide yokes; a shaft journaled therein; cams carried by the shaft and coacting with the slides to reciprocate the latter; a power transmission mechanism supported by the transmission case adapted to receive power from the engine and to transmit it alternately to said shaft or to the driving wheels of the running gear; and a selective lever mechanism adapted to control said power transmitting mechanism to cause it to perform either of said functions alternatively.

11. In an automobile fire engine the combination of suitable running gear including a frame and driving wheels; an engine; suitable driving connections to the driving wheels of the running gear; a pump; a pump-actuating mechanism; a power transmitting device adapted to establish driving relations selectively between the engine and the pump-actuating mechanism and between the engine and said driving connections; and a supporting frame distinct from the running gear frame forming one rigid structure and adapted to support and position the pump actuating mechanism and said power transmitting device.

12. In an automobile fire engine, the combination of suitable running gear having a frame and driving wheels; an engine; means for controlling the application of power from the engine; driving mechanism operatively connected to the driving wheels of the running gear; a pump; actuating mechanism therefor; a power transmitting device adapted selectively to transmit power from the engine to the pump-actuating mechanism or to said driving connections; a supporting frame independent of the running gear rigidly connected to the pump and forming a single rigid structure adapted to support said power transmitting device and the pump actuating mechanism; and means for supporting the pump and said connected supporting frame at three points in the running gear.

13. In an automobile fire engine, the combination of running gear having driving

wheels; an engine; a pump; a pump drive shaft; a propeller shaft positioned below the pump drive shaft and adapted to transmit power to the driving wheels; a power transmitting device adapted to transmit power alternatively to the pump drive shaft and to the propeller shaft; slides operatively connected to the pump; a cam shaft driven by the pump drive shaft; and cams carried by the cam shaft and coacting with the slides to reciprocate the latter said cams being spaced apart to give clearance to the propeller shaft which passes between them.

14. In an automobile fire engine, the combination of running gear having driving wheels; an engine; a pump; a pump drive shaft; a propeller shaft positioned below the pump drive shaft and adapted to transmit power to the driving wheels; a power transmitting device adapted to transmit power alternatively to the pump drive shaft and to the propeller shaft; slides operatively connected to the pump; a cam shaft; flanged disks mounted on said shaft one disk being formed with gear teeth; cam rings carried by the flanges of the disks and coacting with the slides to reciprocate the latter; the disks being spaced apart to give clearance to the propeller shaft which passes between them; and a gear carried by the pump drive shaft and meshed with the teeth on the disk.

15. In an automobile fire engine, the combination of suitable running gear including a frame and driving wheels; an engine; suitable driving connections to the driving wheels of the running gear; a pump supported in the frame; a pump actuating mechanism; a power transmitting device adapted to establish driving relations alternatively between the engine and the pump actuating mechanism and between the engine and said driving connections; and a supporting frame distinct from the running gear frame but connected thereto and to the pump and forming one rigid structure adapted to support and position the pump actuating mechanism and said power transmitting device.

16. In an automobile fire engine, the combination of a suitable running gear including a frame and driving wheels; an engine; driving connections to the driving wheels of the running gear; a pump supported by the frame of the running gear; a pump actuating mechanism; a power transmitting device including a variable speed mechanism adapted to establish and destroy driving relation between the engine and the driving connections at various speed ratios, and a clutch adapted to establish driving relation between the engine and the pump actuating mechanism; a selective lever mechanism associated with the power transmitting device and adapted alternatively to actuate the speed change mechanism or to operate the

clutch; and a supporting frame distinct from the running gear frame and connected to the pump, the said supporting frame being adapted to support and position the
5 pump actuating mechanism and the power transmitting device.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

LEONHARD FUCHS.

Witnesses:

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PARKER DODGE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."