G. L. BROCK.

GEAR SHIFT.

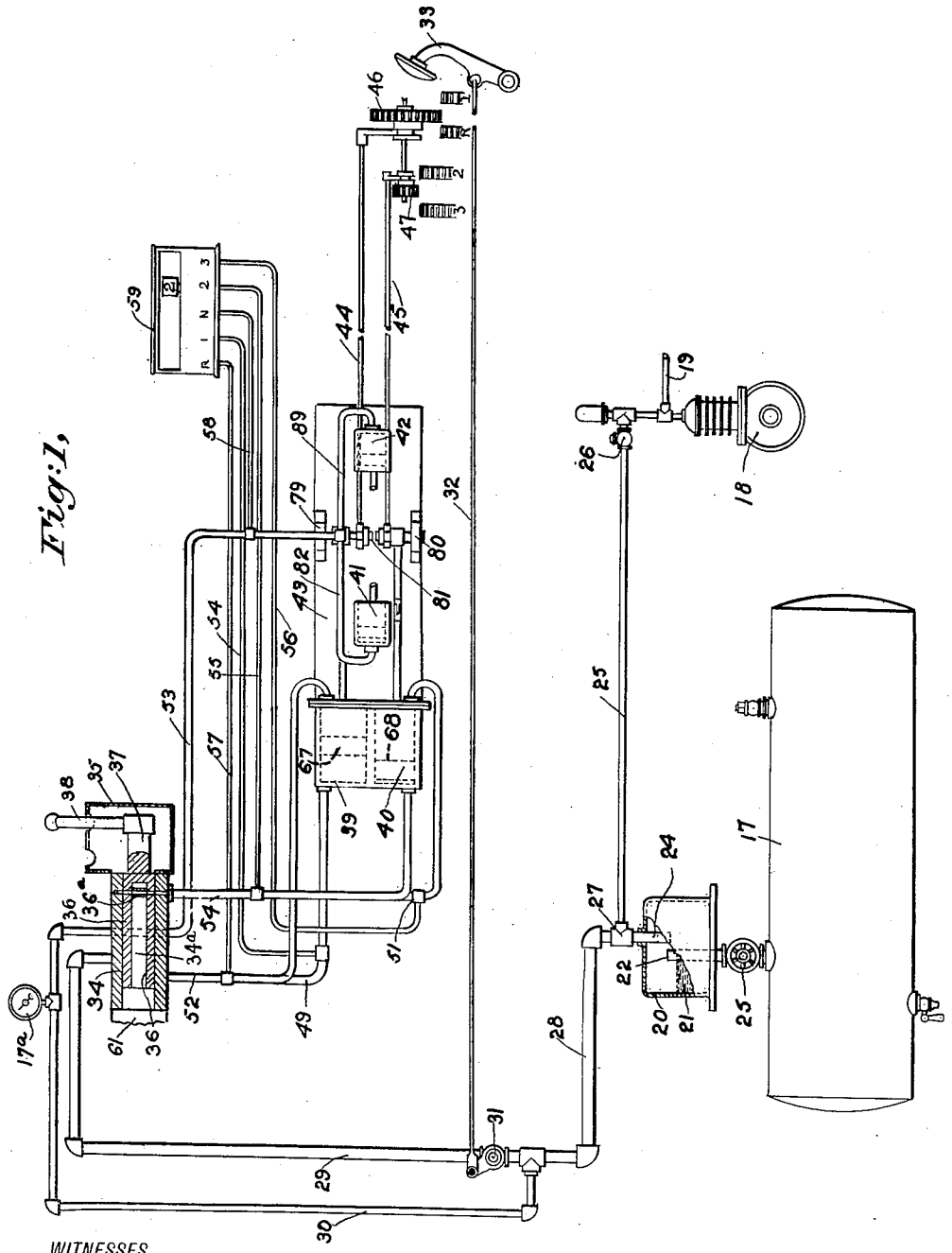
APPLICATION FILED JUNE 6, 1919.

1,354,948.

Patented Oct. 5, 1920.

4 SHEETS—SHEET 1.

Fig: 1.



WITNESSES

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4 SHEETS—SHEET 2.

Fig: 3,

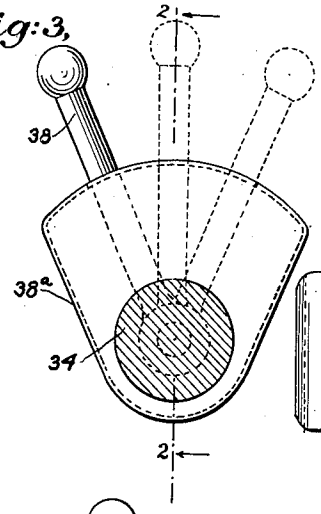


Fig: 2,

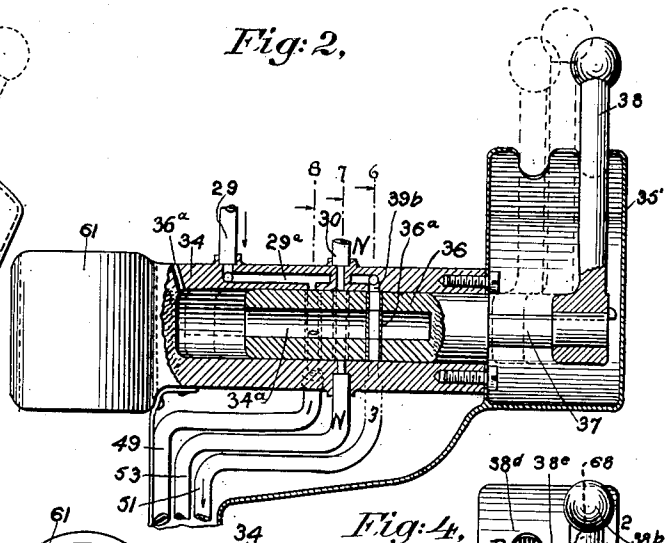


Fig: 6,

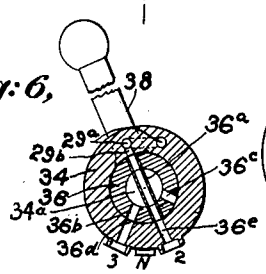


Fig: 4,

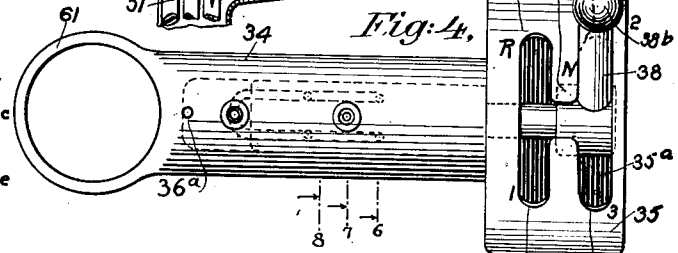


Fig: 7,

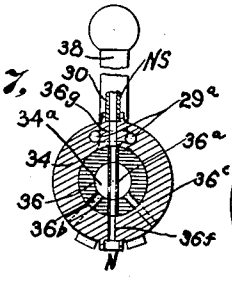


Fig: 5,

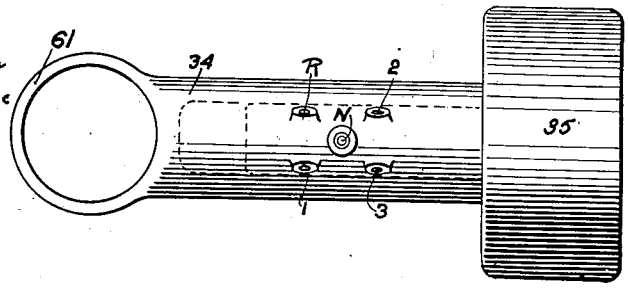
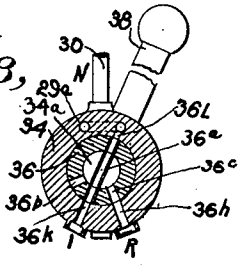


Fig: 8,



WITNESSES

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4 SHEETS—SHEET 3.

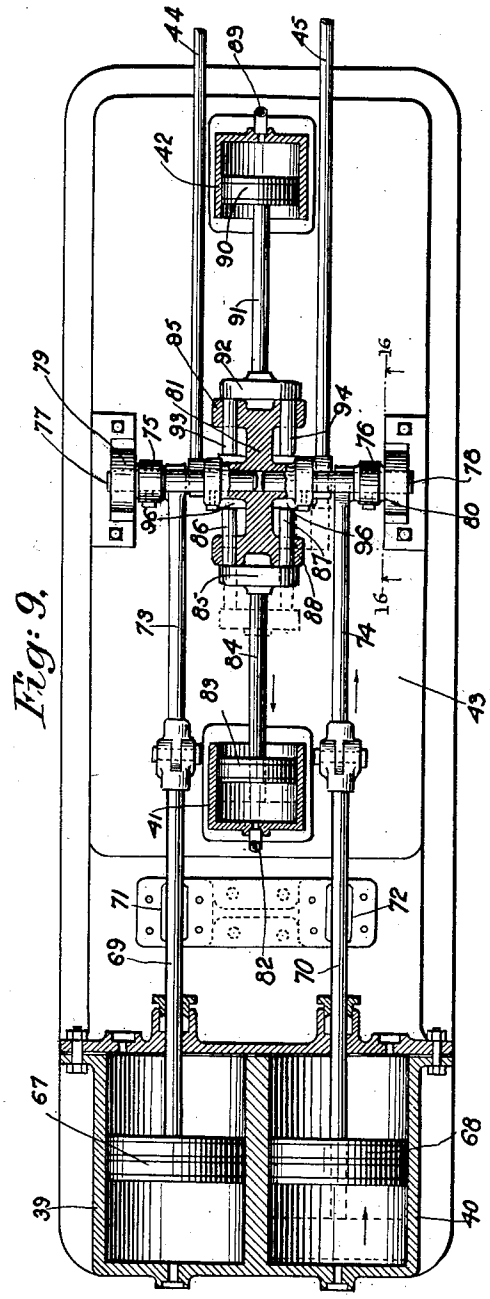


Fig: 9.

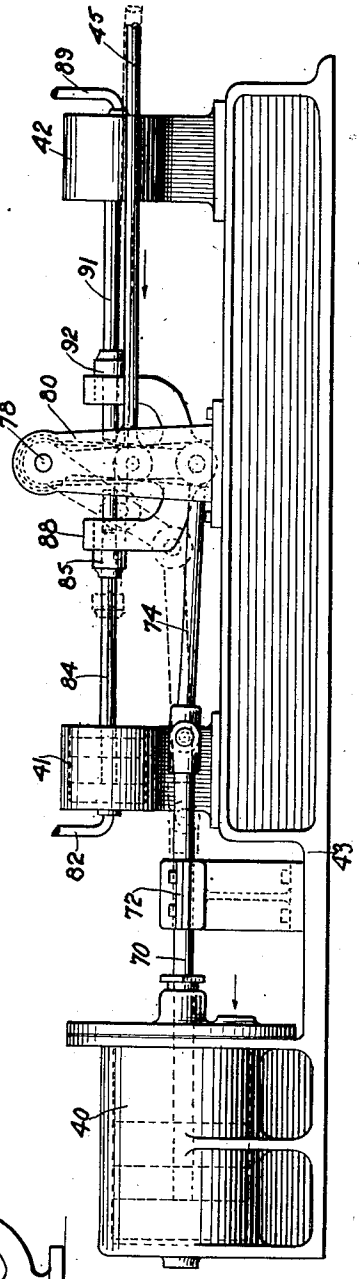


Fig: 10.

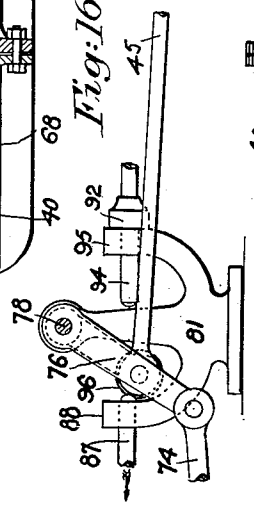


Fig: 16.

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4 SHEETS—SHEET 4.

Fig:11,

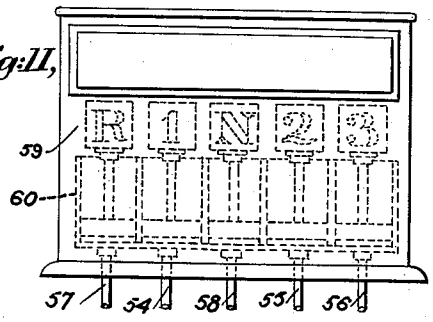


Fig:12,

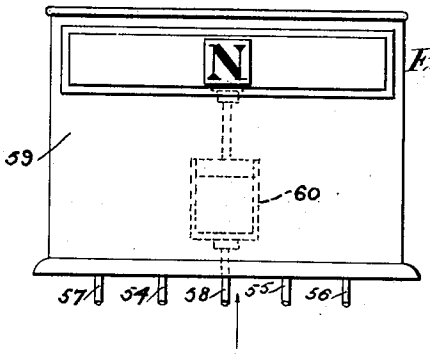


Fig:13.

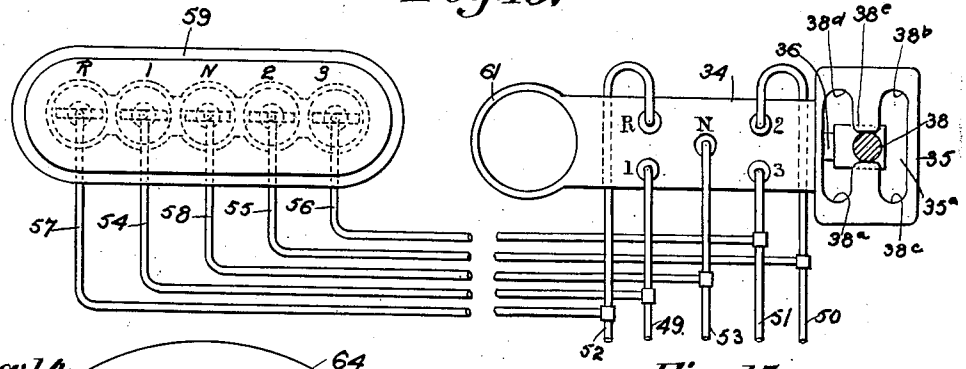


Fig:14

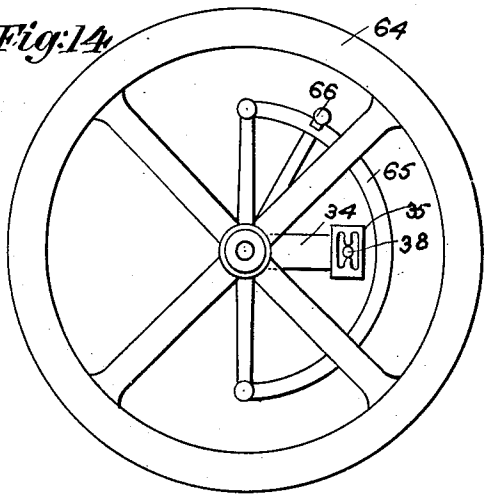
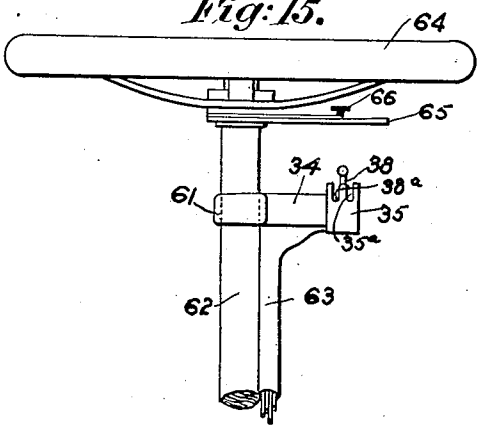


Fig:15.



WITNESSES

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GEAR-SHIFT.

1,354,948. Specification of Letters Patent. Patented Oct. 5, 1920.

Application filed June 6, 1919. Serial No. 302,159.

To all whom it may concern:

Be it known that I, GEORGE L. BROCK, a citizen of the United States, and a resident of West Point, in the county of Clay and State of Mississippi, have invented a new and Improved Gear-Shift, of which the following is a full, clear, and exact description.

My invention relates to gear shifts, that is, to devices used for shifting gear shafts and pinions, and is adapted for general use, but specially applicable to automobiles.

More particularly stated, my invention comprehends a tank for compressed air and a number of cylinders controllable by pressure of air supplied from said tank, together with means under the control of the operator for distributing the air into the different air cylinders; and also indicating means controllable by air pressure for disclosing to the operator the particular air cylinder which is in action and the consequent condition of the various movable parts controllable by said cylinder.

My invention further contemplates control of the pneumatic mechanism by means of a shifting lever and a casing provided therewith and having an H-slot, these last mentioned parts being mounted conveniently upon the steering post.

My invention further contemplates various improvements in the type of distributing valve used for distributing air to the various cylinders, the valve being given such form as to facilitate its control by means of the shifting lever.

My invention also contemplates various improvements in the construction and operation of the parts, as hereinafter brought out more particularly.

Reference is made to the accompanying drawings forming a part of this specification, and in which like characters indicate like parts throughout the several figures.

Figure 1 is a view of my device partly in section and partly diagrammatic;

Fig. 2 is a section through the distributing valve and shifting lever, and is taken upon the line 2—2 of Fig. 3 looking in the direction indicated by the arrow;

Fig. 3 is a vertical section through the mechanism shown in Fig. 2;

Fig. 4 is a top plan view of the machanism shown in Fig. 2;

Fig. 5 is a bottom plan view of the same;

Fig. 6 is a section on the line 6 of Figs. 2 and 4 looking in the direction of the arrow;

Fig. 7 is a section on the line 7 of Figs. 2 and 4 looking in the direction indicated by the arrow;

Fig. 8 is a section on the line 8 of Figs. 2 and 4 looking in the direction indicated by the arrow;

Fig. 9 is a horizontal section through the various air cylinders and parts immediately associated therewith;

Fig. 10 is a side elevation of the mechanism shown in Fig. 9;

Fig. 11 is a front elevation of the pneumatically operated indicator, showing it as inactive;

Fig. 12 is a front elevation of the pneumatic indicating mechanism, showing it as registering an indication;

Fig. 13 is a diagrammatic inverted plan view, showing the relation between the pneumatic indicating mechanism and the controlling valve and shifting lever;

Fig. 14 is a plan view of the steering post and parts immediately associated therewith;

Fig. 15 is a fragmentary elevation of the mechanism shown in Fig. 14; and

Fig. 16 is a section on the line 16—16 of Fig. 9 looking in the direction indicated by the arrows.

Referring more particularly to Fig. 1, an air reservoir is shown at 17 and an air pump for forcing air thereinto under pressure appears at 18. This air pump is provided with a pipe 19 leading to the pump governor, not shown. An oil trap appears at 20 and contains a volume of oil 21. Between this oil trap and the air reservoir 17 is a hand valve 23. Extending into the oil trap 20 is a pipe 24 which is connected with a pipe 25 having a check valve 26 and connected with an air pump 18. Air is supplied to the air reservoir 17 through the pipe 25. The pipes 24 and 25 are connected to a pipe 28, and connected with this pipe are two pipes 29 and 30. The pipe 29 is provided with a valve 31; and connected with this valve, for the purpose of actuating the same, is a rod 32; and this rod is likewise connected with the lever 33 which may be and preferably is the clutch lever of the automobile.

The operator by pressing his foot upon the lever 33 actuates the valve 31 and thus opens the pipe 29. A pressure gage 17^a is connected with the pipe 30 and indicates the air pressure within the reservoir 17. A stationary cylinder 34 forms the body of my

improved distributing valve and carries upon one of its ends a small casing 35 serving as a housing for the shifting lever 38, as hereinafter described more particularly.

A cylindrical valve member 36 is revolubly mounted within the stationary cylindrical member 34 and is provided with a cross-tube 36[a], as hereinafter described more particularly, for the purpose of controlling the distribution of the compressed air. The valve member 36 is provided with a stem 37, and mounted rigidly upon the latter is a shifting lever 38. Two large pneumatic cylinders are shown at 39 and 40 and are supplied with compressed air under control of the shifting lever 38. These two cylinders are used for the purpose of shifting the gears. Two other pneumatic cylinders 41 and 42, somewhat smaller than the cylinders 39 and 40, are employed for shifting the gears into neutral position. The cylinders 39, 40, 41 and 42 are mounted upon a base 43. The revoluble valve members 36 is provided with an axial passage 34[a] and the stationary valve member 34 is provided with a vent hole 36[b] for the purpose of discharging the dead air from the air cylinders and thus preventing back pressure.

A pair of shifting rods are shown at 44 and 45 and are connected respectively with a pair of gears 46 and 47 which are to be shifted. Adjacent these gears are other gears 3, 2, R, 1, used for conferring different speeds upon the machine. A number of air pipes are shown at 49, 50, 51, 52 and 53. These pipes are all connected to the stationary cylindrical valve member 34. The pipe 49 is connected with the cylinder 39, and the pipe 50 is similarly connected with the cylinder 40. The pipe 51 is also connected with this cylinder but at the end thereof opposite the connection of the pipe 50. The pipe 52 is connected with the cylinder 39 but at the end thereof opposite the connection of the pipe 49 therewith. From the pipes 49, 50, 51, 52 and 53 there are smaller pipes 54, 55, 56, 57 and 58 which lead to a pneumatic indicator shaft at 59. This indicator is so arranged as to register an indication whenever the compressed air is directed into any one of the pipes 49, 50, 51, 52 or 53. The indicator is provided with pneumatic cylinders 60, in this instance five in number. The indicator is also provided with legends, "R, 1, N, 2 and 3", associated with the respective different positions of the shifting lever and signify respectively the conditions known in this art as "reverse", "first speed", "neutral", "second speed" and "third speed". As shown in Fig. 12, the indicating device is for the moment registering the indication "neutral".

The stationary cylindrical valve member 34 is provided with a collar 61 whereby it is mounted upon the steering post 62, as indicated more particularly in Figs. 13, 14 and 15. As shown in Fig. 13, the member 34 is also provided with legends "R, 1, N, 2, 3", corresponding to the legends of the indicating device as above described. Mounted upon the steering post 62 and extending downwardly from the valve member 34 is a sheath 63 through which the air pipes extend and in which they are housed. The steering wheel is shown at 64, the throttle lever at 66 and the arcuate member associated with the throttle lever, at 65, these parts all being supported upon the steering post 62.

Mounted within the air cylinders 39, 40 respectively are pistons 67, 68, and connected with these pistons are piston rods 69, 70 which engage bearings 71, 72. Connected with the piston rods 69, 70 are pitman rods 73, 74, the latter being connected to crank arms 75, 76 which are mounted rigidly upon a pair of shafts 77, 78 movable independently of each other, as may be understood from Fig. 9. These shafts at their outer ends are supported by bearings 79, 80, and at their inner ends by a single bearing 81, of the form shown more particularly in Figs. 9, 10, and 16. A pipe 82, Figs. 9 and 10, leads from the pipe 53 to the cylinder 41. This cylinder contains a piston 83, and extending from this piston is a rod 84 carrying a head 85. This head is provided with a pair of projecting stems 86, 87 which extend through holes in the bearing 88, this bearing constituting practically an arm of the bearing 81, as may be understood from Fig. 16. A pipe 89 is connected with the pipe 53 and leads therefrom to the cylinder 42, as shown more particularly in Figs. 1 and 9. A piston 90 is mounted within the cylinder 42, and extending from this piston is a piston rod 91 carrying a head 92. Extending from this head are a pair of sliding bars 93 which extend through holes in a bearing 95, this bearing being practically an arm extending from the bearing 81, as indicated in Fig. 16.

The parts are so arranged that the shifting rods 44, 45 are under control of the various cylinders 39, 40, 41 and 42, as may be understood from Figs. 9 and 10. A movement of the piston 68 in the cylinder 40 causes the shaft 78 to rock in a contra-clockwise direction, according to Fig. 10. If, however, the piston 68 be driven to the left according to Fig. 10, the shaft 78 is rocked in a clockwise direction according to Fig. 10. Similarly, a movement of the piston 67 in the cylinder 39 to the right or left, according to Fig. 9, causes the shaft 77 to rock in the corresponding direction. The

rocking of the shafts 77, 78 causes the shifting rods 44, 45 to be moved each in the direction of its length so that the shifting gears 46, 47 are changed in position accordingly.

If, however, air under pressure be directed into either cylinder 41 or 42, the corresponding shaft 77 or 78, if it occupies a position given it by virtue of the action of either piston 67 or 68 as just described, is restored to its normal or middle position, representing the so-called neutral position of the gear shaft.

The parts are so proportioned and arranged that neither piston 83, 90 after restoring the parts controllable by them to neutral position is able to move them past such neutral position. Suppose, for instance, that the shaft 78 is rocked into a clockwise position according to Fig. 10, so as to occupy the position indicated by dotted lines in said figure. If, now, compressed air be directed into both cylinders 41 and 42 it can have no effect in the cylinder 42, but in the cylinder 41 it pushes the piston 83 to the right. This causes the head 85 to move against the bearing 88 against which it lodges, having reached the limit of its travel. The result is that the shaft 78 is turned slightly so as to occupy a position corresponding to the so-called neutral position of the shifting lever.

I will now describe more in detail the action of the distributing valve and shifting lever associated therewith and shown in Figs. 2 to 8 inclusive of the drawing. The revoluble valve member 36 is provided adjacent the crosstube 36^a with two ports 36^b, 36^c, these ports being disposed in the same plane as the crosstube 36^a. The stationary cylindrical valve member 34 is provided with a passage 29^a of substantially U form, and communicating with this passage is a port 39^b. The stationary cylindrical valve member is further provided with ports 36^d, 36^e, as shown more particularly in Fig. 6, these ports being located in the plane represented by the section line 6 in Figs. 2 and 4. In the plane represented by the section line 7 in Fig. 2, the stationary cylindrical member 34 is further provided with two ports 36^f, 36^g. In the plane represented by the section line 8 in Figs. 2 and 4, the stationary cylindrical valve member 34 is further provided with two ports 36^h, 36^k, 36^l.

The various ports are so arranged that when the shifting lever 38 occupies the position indicated in Figs. 2 and 6, the crosstube 36^a establishes communication between the port 29^b and the port 36^e; when the shifting lever occupies the position indicated in Fig. 7, however, the crosstube 36^a establishes communication between the ports 36^g and 36^f; and when the shifting lever 38 is moved into position indicated in Fig. 8, the crosstube establishes communication between the ports 36^l and 36^k.

The casing 35 is provided with an H-slot 35^a through which the shifting lever 38 extends and into various portions of which this lever can be shifted in the manner well known in this art. The H-slot is provided with various portions 38^a, representing the so-called "first speed"; 38^b, representing the second speed; 38^c, representing the third speed; 38^d, representing the so-called "reverse position"; 38^e, representing the so-called "neutral position." Thus, there are five positions for the shifting lever 38; and these five positions are directly related to five different positions and five different conditions of the crosstube 36^a.

If, now, the shifting lever 38 be moved to the left according to Figs. 2 and 4, and into the portion 38^a of the H-slot, that is, into the position associated with the first or low speed of the machine, it is obvious that the movable valve member 36 is shifted to its limit to the left according to Fig. 2, and that the crosstube 38^a is brought into the position indicated in Fig. 8. This means that there is open communication from the pipe 29 through the control valve to the pipe 49, so that compressed air is thrown into the left end of the cylinder 39. This pushes the piston 67 to the right according to Fig. 9 and rocks the shaft 78 in a contraclockwise direction according to Fig. 10. Back pressure of air in the cylinders is avoided owing to the fact that any air at the right of the piston can make its escape through the pipe 52, passage 34^a and vent hole 36^a. The result is that the shifting rod 44 shifts the gear 46 to the right according to Fig. 1, and into engagement with the gear 1, used for low speed.

Suppose next that the operator brings the shifting lever 38 into the portion 38^b of the H-slot, or in other words, shifts the lever into position of second or intermediate speed, as indicated by full lines in Figs. 2, 4 and 6. In doing this it is obvious that the operator shifts the movable cylindrical valve member 36 in the direction of its length to the right according to Fig. 2, and also that he brings the crosstube 36^a into position indicated in Fig. 6, so as to establish communication between the ports 39^b and 36^e. This establishes communication from the pipe 29 through the controlling valve, through the pipe 50, so that compressed air is admitted into the left of the cylinder 40. The result is, the piston within this cylinder is driven to the right and the shaft 78 is moved in contraclockwise direction according to Fig. 10. Any air within the cylinder and at the right of the piston makes its escape through the pipe 51 and cylindrical valve member 36. The gear shifting rod 45 is actuated accordingly and it moves the gear 47 to the

right according to Fig. 1 and into engagement with the gear 2, used for so-called second speed.

Since, however, the operator in shifting the lever 38 from the portion 38^a to the portion 38^b of the H-slot, due to bringing the shifting lever into the portion 38^e of the H-slot, representing the neutral position of the gearing, it is plain that during this movement of the movable member 36 of the valve the cross tube 36^n must have occupied momentarily the position indicated in Fig. 7. Such being the case, communication was necessarily established from the pipe 30 to the pipe 53. Thus, compressed air was admitted into the cylinders 41, and 42; and, as above explained, the various movable parts were restored to so-called "neutral" position, the rods 44, 45, used for shifting the gears, being also brought into neutral position. With the movable parts in their so-called neutral position, any dead air in cylinders 39 and 40 makes its escape through the pipes connected with these cylinders, and through the revoluble valve member 36.

Suppose next that the operator grasps the shifting lever 38 and moves it into the portion 38^c of the H-slot, that is, the position associated with the third or high speed of the machine. This brings the cross-tube 36^a into the position indicated in Fig. 8, so as to establish communication between the ports 36^l and 36^k. The result is that compressed air now passes from the pipe 39 through the control valve and into the pipe 51. Thus, compressed air is admitted into the cylinder 40, at the end thereof to the right according to Fig. 9. The shaft 78 is rocked as above described and the shaft 45 is shifted to the left according to Fig. 1, the gear 47 being shifted in the same direction so as to engage the gear 3, which is used for the third or high speed.

Suppose next that the operator transfers the lever 38 from the portion 38^c to the portion 38^d of the H-slot; in doing this he necessarily first brings the shifting lever into the portion 38^e of the H-slot, thus causing the gears to be moved into their so-called neutral position; then as the shifting lever 38 is carried into portion 38^d of the H-slot communication is established between the pipe 39 and the pipe 52. Compressed air is thus admitted into the cylinder 39 at the end thereof at the right according to Fig. 1, the exhaust air forcing out through the pipe 49 and revoluble valve member 36, and as a result the shifting rod 44 is moved to the left according to Fig. 9, the gear 46 being shifted to the left accordingly.

As may be understood from the foregoing description, the mechanism as I have arranged it takes care automatically of the gears to be shifted, in the sense that the shifting lever cannot be so actuated as to throw the compressed air into any cylinder where it can do undue harm, at least until after the gears are brought to their neutral position.

It will also be noted that the control over the gears for the purpose of shifting them by aid of the shifting lever is not only powerful but delicate, the result being that the operator by using one or two of his fingers can so actuate the shifting lever as to shift the gears positively and with considerable force.

The indicating mechanism, shown in Figs. 11 and 12, automatically registers a communication, and this communication remains so long as the parts retain the position into which they are thus brought. The operator by glancing at the indicating device can tell the exact condition of the gear shifting mechanism. Indeed, if everything is working properly, he can ascertain the condition of the gear-shifting mechanism by merely glancing at the shifting lever within the H-slot.

I do not limit myself to the precise mechanism shown, as variations may be made therefrom without departing from the spirit of my invention.

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

1. A device of the character described comprising a plurality of pneumatic cylinders, gears to be shifted thereby, connections from said cylinders to the gears to be shifted, a casing provided with an H-slot, a shifting lever mounted within said casing and extending through said H-slot, a distributing valve connected with said shifting lever, means for supplying compressed air to said distributing valve connections from the distributing valve to the pneumatic cylinders, and pneumatic indicating mechanism for disclosing the condition of the gear-shifting mechanism.

2. A device of the character described comprising a pneumatic distributing valve, means for mounting the same upon a steering post, a casing carried by said valve and provided with an H-slot, and a shifting lever mounted within said casing and extending through said H-slot, said shifting lever being connected with said distributing valve for the purpose of enabling the operator to actuate said distributing valve.

3. A device of the character described comprising a distributing valve, a shifting lever for actuating the same, a casing provided with an H-slot through which said shifting lever extends for the purpose of

enabling the operator, by moving the shifting lever into a predetermined position of the H-slot, to actuate the distributing valve accordingly, pipes connected with said distributing valve for the purpose of distributing the flow of a fluid motive medium, a set of gears to be shifted, and mechanism controllable by said fluid motive medium for shifting the gears.

4. A device of the character described comprising a pair of rocking shafts, means for supporting the same, crank arms mounted upon said shafts, gear-shifting rods connected with said crank arms and actuated thereby for the purpose of shifting gears, pneumatic mechanism for actuating said shafts, controlling mechanism connected with said pneumatic mechanism for enabling the operator to control the latter, a pair of pneumatic cylinders disposed upon opposite sides of said shafts, and connections from each of said pneumatic cylinders to both of said shafts for enabling said pneumatic cylinders to restore said shafts to predetermined normal positions.

5. A device of the character described comprising a distributing valve, a collar mounted upon the said distributing valve for encircling a steering post in order to support said distributing valve thereupon, a valve stem connected with said distributing valve for the purpose of actuating the same, mechanism controllable by said distributing valve for shifting gears, a shifting lever mounted upon said stem and controllable by the operator for the purpose of actuating said distributing valve, and a casing partially inclosing said shifting lever and provided with an H-slot through which said lever extends.

6. In a gear shift, the combination of gears, a plurality of pneumatic cylinders for shifting said gears, connections from said cylinders to the gears to be shifted, a casing provided with an H-slot, a shifting lever mounted within said casing and extending through said H-slot, a distributing valve connected with said shifting lever, connections from said distributing valve to said pneumatic cylinders, and means for supplying compressed air to said distributing valve.

7. A device of the character described, comprising gear members to be shifted, rods connected with said gear members for shifting the same, crank arms connected with said rods, rocking shafts upon which said crank arms are mounted, pneumatic cylinders for shifting said crank arms into predetermined positions at the will of the operator, other pneumatic cylinders controllable at the will of the operator for restoring said shafts and parts controllable thereby into predetermined normal positions, pipes connected with said pneumatic cylinders, a casing connected with said pipes and provided with an H-slot, a shifting lever mounted within said casing and extending through said H-slot, and a distributing valve connected with said shifting lever and mounted within said casing for the purpose of controlling the distribution of air through said pipes.

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