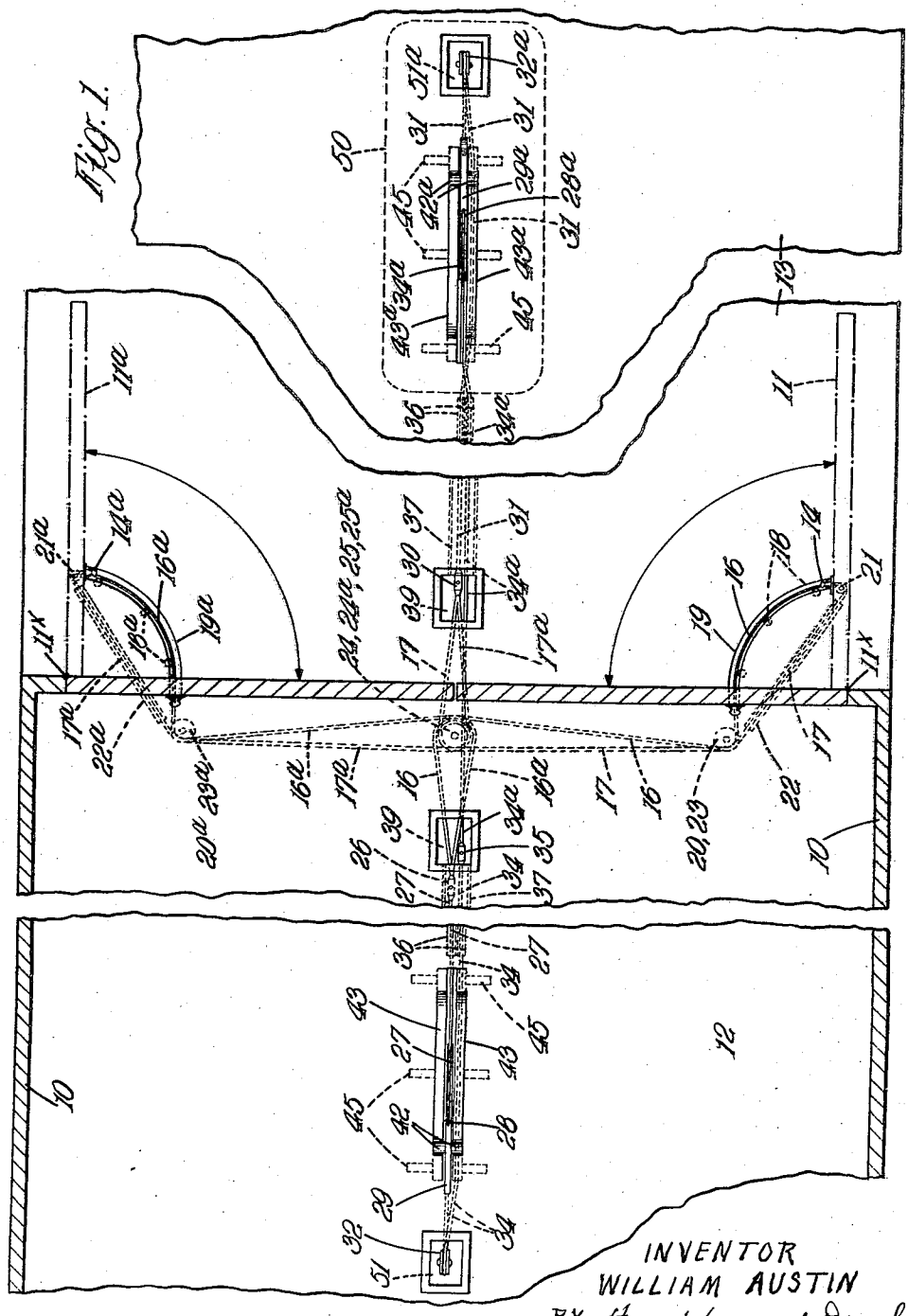
June 7, 1938. W. AUSTIN 2,120,084

VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

Filed Oct. 31, 1936 6 Sheets-Sheet 1

Fig. 1.



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VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

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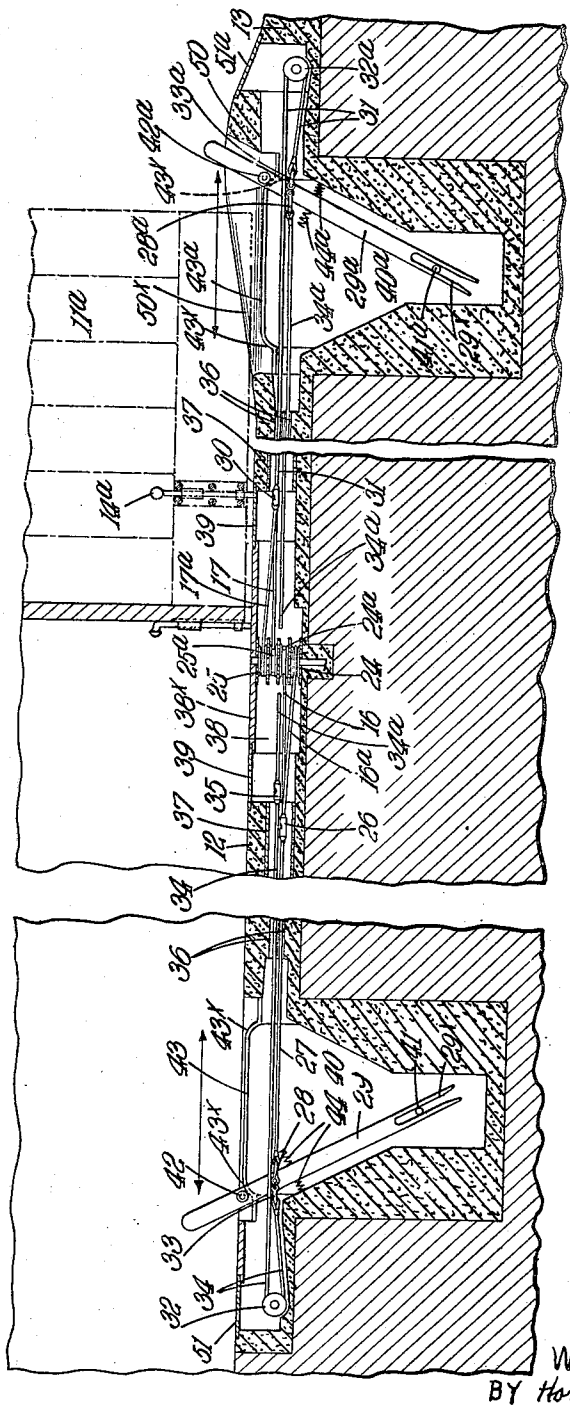


Fig. 2.

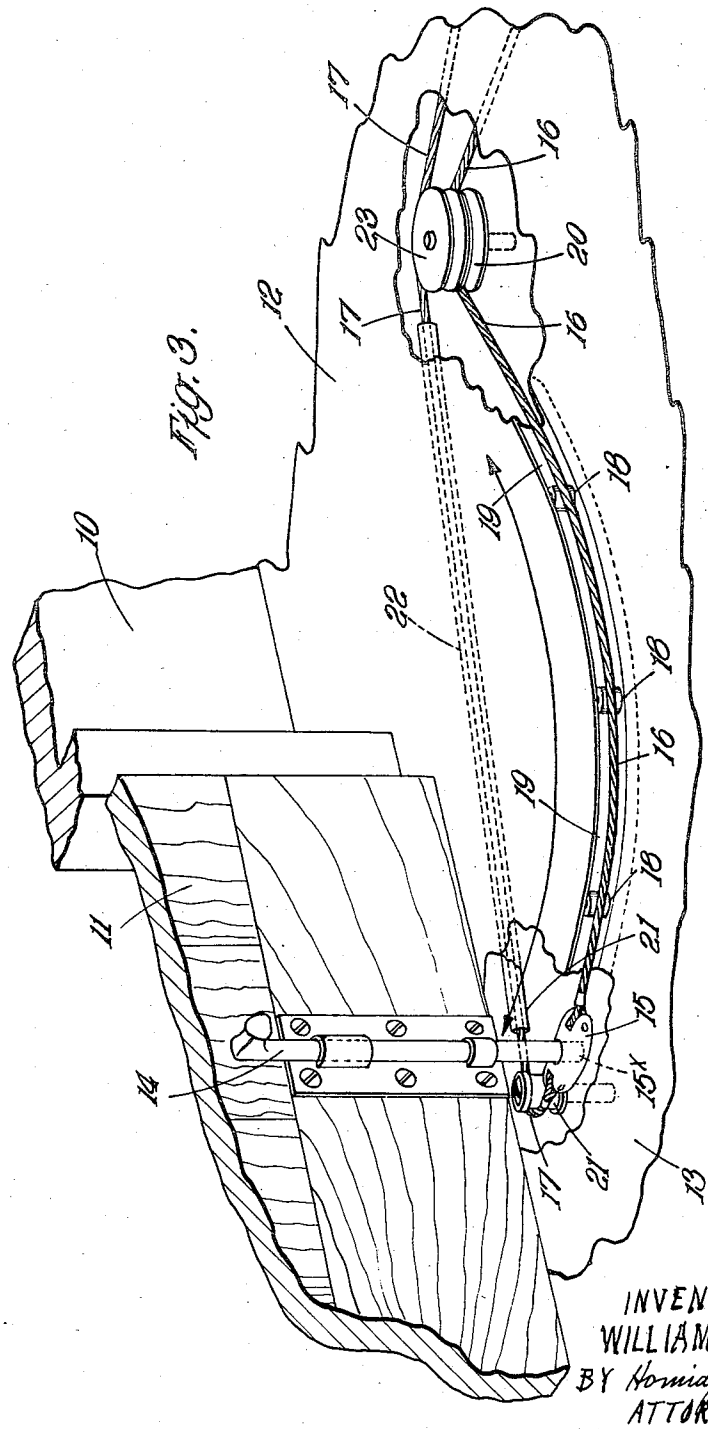
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VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

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Fig. 3.



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VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

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Fig. 4.

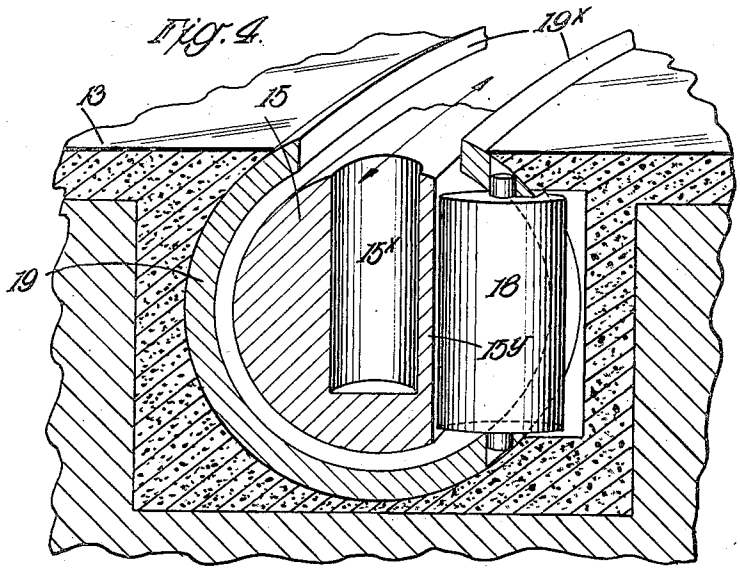


Fig. 5.

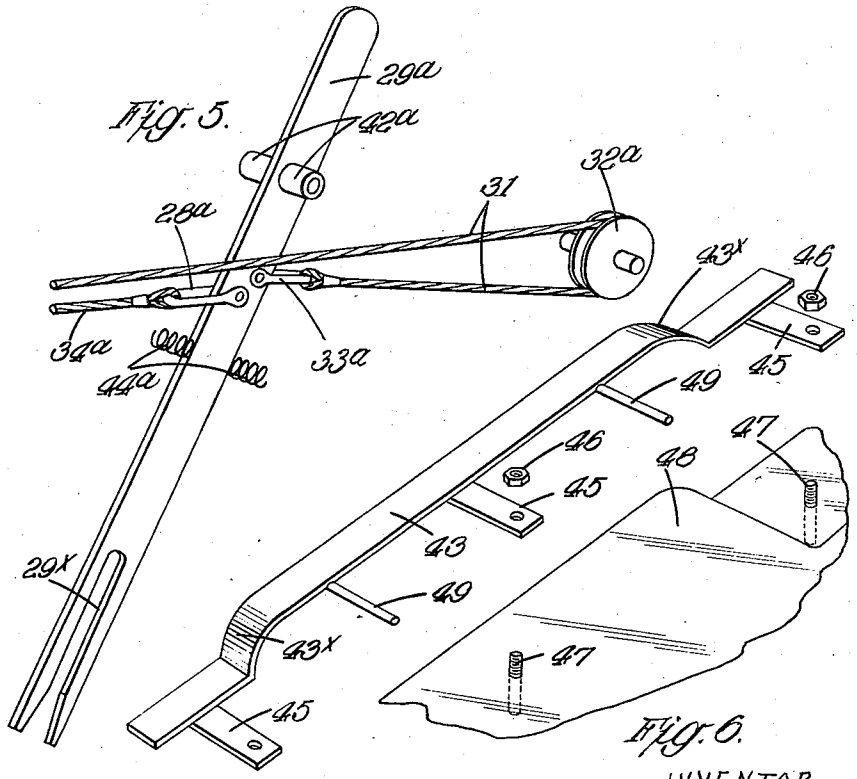


Fig. 6.

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VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

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Fig. 7.

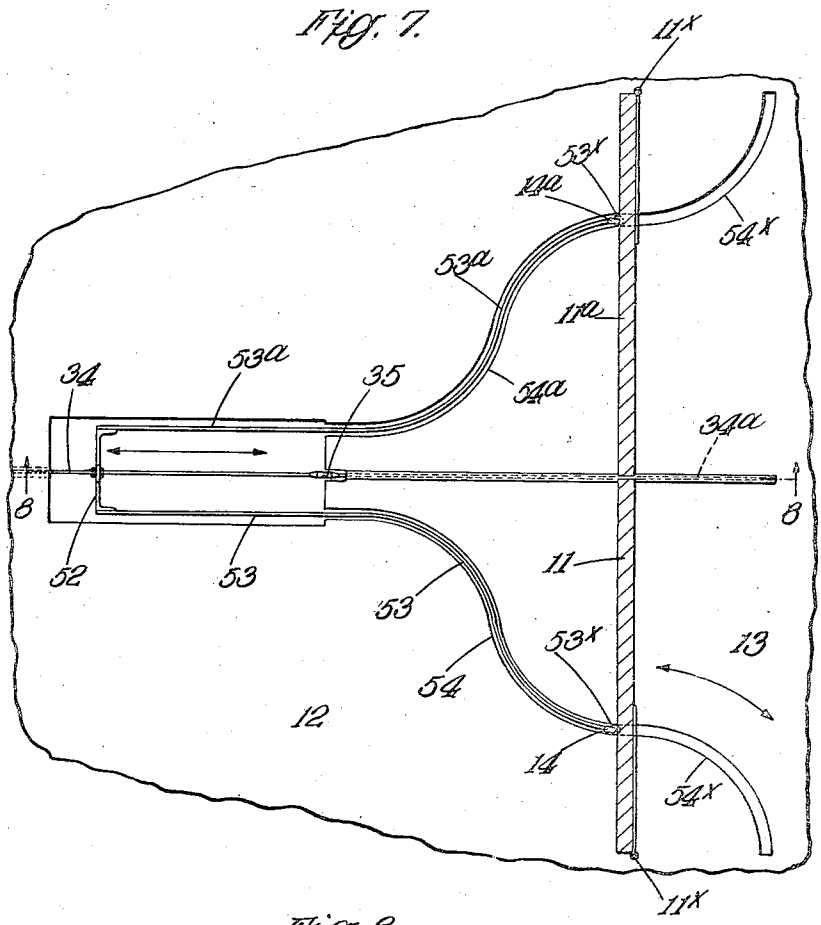
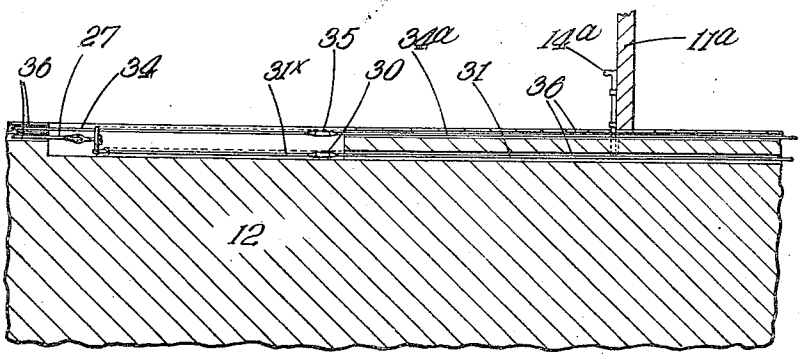


Fig. 8.



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VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

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Fig. 9.

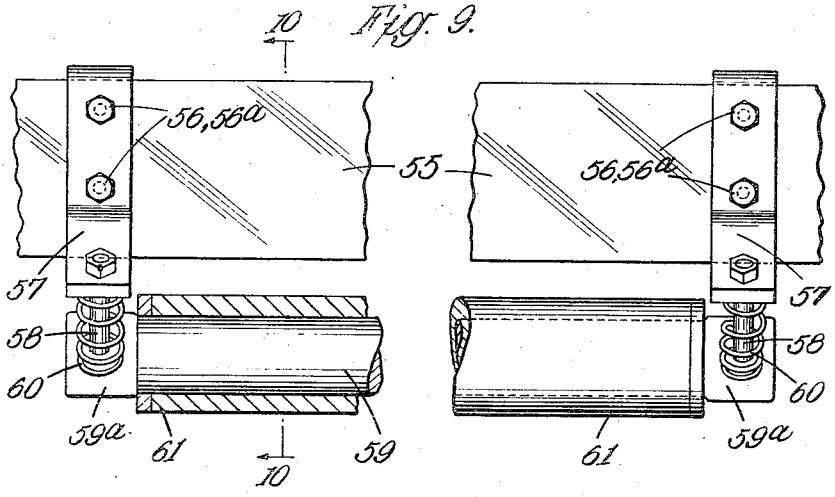


Fig. 10.

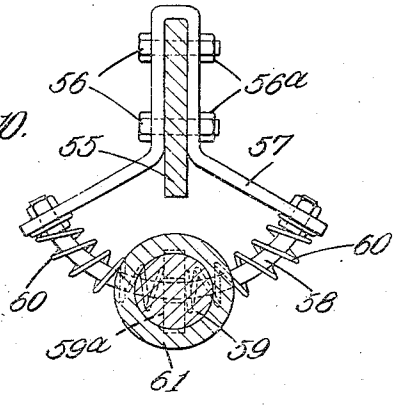
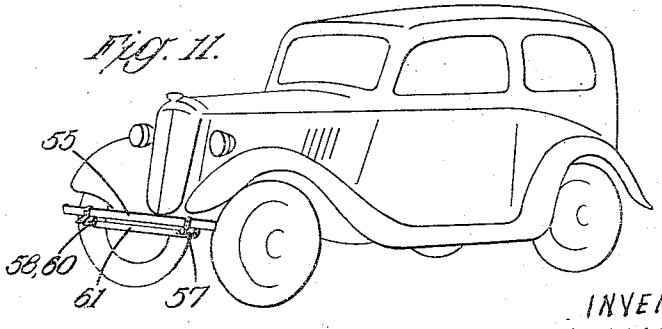


Fig. 11.



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Patented June 7, 1938 2,120,084

UNITED STATES PATENT OFFICE

2,120,084

VEHICLE ACTUATED MEANS FOR OPENING AND/OR CLOSING DOORS AND GATES

William Austin, Canterbury, England

Application October 31, 1936, Serial No. 108,614
In Great Britain November 6, 1935

10 Claims. (Cl. 268—35)

The present invention relates to vehicle actuated means for opening and/or closing doors, gates and the like.

The invention is applicable to the opening and/or closing of any kind of doors, gates or the like through which the vehicle is required to pass; for example, the doors of a garage in which the vehicle is to be housed, or gates in a roadway, such as the entrance gates of mansions. The doors of a garage, if hinged, are usually constructed to open outwards, whereas hinged gates of private carriageways leading off a public highway must be constructed to open inwards. It is therefore desirable that the vehicle actuated opening and closing means when applied to hinged doors or gates may be adaptable to both kinds of doors or gates, viz. those that open outwards and those that open inwards, the actual detail of the mechanism employed being modified to suit either class.

An object of the invention is to provide improved means for opening and/or closing doors, gates or the like, which will be simple, cheap and easy to install and require the minimum of maintenance.

In its broadest aspect the present invention consists of mechanical means for opening and/or closing doors, gates and the like operable by a vehicle approaching and/or receding from said doors, gates or the like.

A particular object of this invention is to reduce to a minimum the amount of excavation required for the installation of the device and to eliminate the necessity for a separate prime mover.

A further object of the invention is to provide means whereby the actuating force is always applied to the door or gate approximately in the direction of movement of said door, gate or the like, throughout the whole of the opening or closing movement.

The present invention therefore comprises a vehicle-actuated mechanical device for opening and/or closing doors, gates and the like in which the momentum of the vehicle itself is utilized to provide the force required for the opening and/or closing operation and including one or more actuating members adapted to be engaged by a part of the vehicle other than the wheels thereof.

The present invention further comprises a vehicle-actuated device for opening and/or closing hinged doors or gates having a flexible train (or trains) of motion transmitting elements, of which train one constituent flexible element is adapted to be attached to the door or gate to be operated and is guided in a quadrant-shaped path centred on the hinge of the door or gate, and an actuating member (or members) projecting above the ground level at a distance from said door or gate within the track of the vehicle and movable in the line of travel thereof and connected with the said train of motion transmitting elements, the latter being capable of transmitting motion in both directions to the door or gate and so arranged that movement of the actuating member towards the said door or gate causes the latter to open and vice versa, the whole of the mechanism, with the exception of the projecting parts of actuating member or members, being so placed, e. g. by being laid at or below ground level, as not to obstruct the passage of the vehicle.

A feature of the invention consists in the application of the actuating force to the door or gate at such a point that the travel of the actuating member is considerably less than that of the extremity of the door or gate remote from the hinge and preferably at a point distant from the hinge about one third of the width of the door or gate.

This device may be adapted to open and close a door or doors, e. g. of a garage, from the outside only, in which case it will comprise a single actuating member situated in the roadway outside the said door or doors, gate or gates.

Alternatively, the device may be adapted to open and close a door or doors, gate or gates, from either side, in which case it will comprise two actuating members situated respectively on the inside and outside of said door (doors) or gate (gates).

On approaching the door or gateway the vehicle operates the device by a fixed part thereof, e. g. the front axle coming in contact with an actuating member which is moved in the direction towards the door or gateway by the progress of the vehicle, thereby opening the door or gate. When the door is fully opened the said fixed part of the vehicle rides over the actuating member, which may be arranged to yield as hereinafter more particularly described. If the apparatus is required to close the door behind the vehicle after its passage a second actuating member is placed on the other side of the door and is arranged to close the door on being moved in the direction of travel by contact with the fixed part of the vehicle.

When the second actuating member has completed its travel and the doors are fully closed the said fixed part of the vehicle may ride over it for which purpose it may be arranged to yield in the

same way as the first mentioned actuating member. On reversing the vehicle the sequence of operations mentioned above is performed in the reverse direction, the doors being opened to allow the vehicle to pass and finally closed again.

It is desirable, especially in the case of the application of the device to the doors of a garage or in any other situation where economy of space is required, that the same part of the vehicle shall make contact with the actuating member or members irrespective of whether the vehicle is travelling forward or in reverse. For example, hinged garage doors are usually constructed to open outwards and unless the actuating member is distant by more than the vehicle's length from the door it is necessary to ensure that the actuating member is not fouled by the rear axle of the vehicle when it is reversed out of the garage, as this would cause the doors to close before the vehicle was clear of them.

It is therefore desirable that the projection above the ground level of the actuating member or members shall be less than the general ground clearance of the vehicle, the necessary contact being established by providing on a convenient part of the vehicle an attachment or device projecting below the level of the rest of the under part of the chassis. As the more usual method is to drive into a garage forwards and reverse out again, the front axle or bumper is the most convenient position for mounting the said attachment or device, but if a vehicle owner is in the habit of reversing into his garage the attachment or device may be mounted at the back, e. g. on the rear bumper or on the back axle.

Further, in order that the actuating lever may be placed as close as possible to the garage doors to save space it is preferable to mount the attachment or device for operating the door actuating member at the furthest forward point of the vehicle, i. e. on the front bumper if one is fitted.

In applying the device to the operation of a gate or gates, e. g. of a private driveway leading off a public road, such gates being invariably arranged to open inwards, the position on the vehicle of the part adapted to make contact with the actuating element is of less importance as there is generally sufficient room inside the gateway to mount the actuating member far enough from the gate (or gates) to avoid any possibility of fouling the gate, whatever part of the vehicle is used to make contact with the actuating member. Even in this case, however, as the available space on the outside of the gateway may be limited, it is preferable to arrange the contacting attachment or device at the front of the vehicle.

The fitting of a suitable projecting part or contact element to a vehicle may be done in any convenient way and it is to be understood that the mere attachment to a vehicle of a projecting member does not in itself constitute a part of the present invention.

This invention, however, includes the provision, as an attachment to the vehicle, of a device comprising a resiliently mounted member adapted to make contact with the actuating element, the resilient mounting of the said member allowing it to yield in the direction of pressure and upwardly, so as to enable it to ride over the actuating element after completing the throw of the latter for operating the door, gate or the like.

Conveniently, the resiliently mounted member may consist of a transverse bar preferably carrying a roller mounted below the bumper or axle and supported at its ends on arcuate guides arranged in the fore and aft direction with their convexities downwards and carrying springs resisting the movement of the bar in either direction on said guides. The springs must be stiff enough not to yield appreciably to the pressure required for operating the door opening device, but when the actuating element reaches the end of its throw the yielding of the springs allows the bar to rise along the arcuate guides and ride over the actuating element. For appearance this attachment may preferably be fixed to the axle, in which case if the axle is of I section a sheet metal cover may be applied to it to prevent the end of the door actuating element (if long enough) from catching in the hollow of the I section. On the other hand if space-saving in the door operating installation is a consideration, the attachment should be fixed on the bumper as above indicated.

In the case of an installation for operating the doors of a domestic garage, it is undesirable that the actuating element or elements should project much above ground level and thereby constitute obstructions on which a person might stumble or trip in the dark.

This may be obviated by raising an artificial hump in the ground surrounding the actuating element.

Preferably in a vehicle actuated device for opening and/or closing doors or gates as hereinbefore set forth, the flexible train of motion transmitting elements comprises an endless motion transmitting member running on fixed pulleys, of which member at least those elements which pass over the pulleys are of flexible material, e. g. stranded cable.

If the device is provided with a single actuating member capable of operating the door or gate from one side only, the said actuating member and the door to be operated are respectively connected to two opposite limbs of the endless motion transmitting member. On the other hand, if the device is adapted to operate the door or gate from either side the two actuating members thereof are respectively connected to opposite limbs of the endless motion transmitting member. In this case the limb of the endless member to which the door or gate to be operated is connected depends on the direction in which the door or gate opens.

In one form of construction the device is adapted to operate double doors or gates, in which case it comprises duplicated elements each adapted to operate one of the two doors or gates and both connected to an actuating member or members situated centrally of the carriageway.

In one preferred embodiment of the invention the flexible train of motion transmitting elements is entirely composed of flexible cable operating in tension and includes a portion of cable provided with an element adapted to be attached to the door or gate, and led over a plurality of idle rollers mounted in a quadrantal channel centred on the door hinge and situated in or below the carriageway.

In another preferred embodiment of the invention, the flexible motion transmitting train includes a motion transmitting element or elements constituted by a strip (or strips) of spring steel guided in a vertical slot or channel (slots or channels), partly quadrantal in plan form, and having no abrupt bends, situated in or below the carriageway.

The attachment to the door or gate is pref-

erably effected by means of a vertical bolt mounted on the door, which bolt can be dropped into (or raised from) a suitable eye formed in a constituent member of the motion transmitting train.

Other features of this invention will appear in the following description with reference to the accompanying drawings of an embodiment of the invention and a modification thereof, both adapted to operate double doors or gates from either side, the arrangement being suitable for the double doors of a private garage. An attachment to the vehicle for operating the device is also described and illustrated.

In the drawings:—

Fig. 1 is a fragmentary plan view of an embodiment of the invention applied to operating double doors of a domestic garage;

Fig. 2 is a fragmentary central longitudinal vertical section of the same;

Fig. 3 is a fragmentary view in perspective on an enlarged scale and partly broken away, showing the attachment of the operating mechanism to the door and adjacent parts of the mechanism;

Fig. 4 is a detail view in perspective, partly in section and on a further enlarged scale, of the door attachment and adjacent parts;

Fig. 5 is a detail view in perspective on an enlarged scale, showing the attachments to one of the actuating levers and adjacent parts;

Fig. 6 is a detail view in perspective to approximately the same scale as Fig. 5, showing one of the guides of the actuating lever detached from its foundation;

Fig. 7 is a fragmentary plan view of a modification;

Fig. 8 is a view in central longitudinal vertical section taken along the line 8—8 of Fig. 7;

Fig. 9 is a fragmentary view in front elevation, partly in section, of an attachment to a vehicle resiliently mounted on the front bumper for actuating a device as shown in any of Figs. 1 to 8;

Fig. 10 is a view in section taken along the line 10—10 of Fig. 9; and

Fig. 11 is a somewhat diagrammatic view to a reduced scale showing the device of Figs. 9 and 10 in position on a motor vehicle.

Referring to Figs. 1 to 6; a domestic garage having walls 10 and a cement or concrete floor 12 continued outside the doors by an apron 13, is provided with double doors 11, 11*a* hinged at 11*x*. As the two doors and their attachments are exactly similar, it is only necessary to describe the attachments to the door 11. The corresponding parts associated with the other door 11*a* have similar reference numbers to those associated with the door 11, and are distinguished, where shown in the drawings, by addition of the letter *a*.

Near the hinge and at a distance therefrom about one-third of the width of the door, the door 11 is provided with a vertical bolt 14 adapted to be dropped into or raised from a socket 15*x* in a metal block 15, to which are attached cables 16 and 17. The metal block 15 and the adjacent part of the cable 16 are located in a channel 19 which may be of metal, cement, earthenware or other suitable material and is substantially buried in the apron 13. The channel 19 is circular in cross-section and quadrantal in plan form, being centred on the door hinge 11*x*. The upper part of the channel 19 is cut away to form a slot 19*x*. The part of the cable 16 adjacent the block 15 is led over a number of idle rollers 18 mounted in the channel 19. The block 15 is partly circular in cross-section, being of a size to be a running fit in the channel 19, and is provided with a flat 15*y* to roll on the rollers 18. Furthermore, the block 15 is curved in plan to fit the plan curvature of the channel 19 and this prevents the block from turning on its axis of movement.

Beyond the outer end of the channel 19 the cable 17 is led over a fixed roller 21 and then passed through a straight duct 22 which may conveniently be of metal piping buried within the concrete flooring, and beyond the inner end of the channel 19 the cables 16 and 17 are led over idle pulleys 20, 23 respectively, located below the floor level just within the door and mounted independently on the same axle. These details are best shown in Figs. 3 and 4.

From the pulleys 20, 23 the cables 16 and 17 are passed transversely of the door opening to the centre line of the garage where they are led round idle pulleys 24, 25 respectively. As already stated the arrangements associated with the other door 11*a* are exactly similar and the cables 16*a* and 17*a* corresponding to the cables 16 and 17 are led round idle pulleys 24*a*, 25*a*. The pulleys 24, 24*a*, 25, 25*a* are all mounted on the same vertical axle but are independent of one another. After passing round the pulleys 24, 24*a* the cables 16, 16*a* are led length-ways of the garage towards the inside and are both connected to a fitting 26 which may conveniently be a turnbuckle, for adjusting the tension of the cables. To the fitting 26 is attached a single cable 27 which lies in continuation of the cables 16, 16*a* and is led along the centre line of the garage towards the back and shackled at 28 to a vertical actuating lever 29 arranged to rock in a longitudinal direction.

In a similar manner the cables 17, 17*a*, after passing round the pulleys 25, 25*a* are led along the central line towards the outside of the garage and are both joined to a turnbuckle 30 similar to turnbuckle 26, to which is attached a single cable 31 in continuation of the cables 17, 17*a*. The cable 31 is led along the centre line of the carriageway and passed over a fixed pulley 32*a* located in the carriageway outside the garage. It is then brought back along the same line and then attached to a shackle 33*a* of a lever 29*a* similar to the lever 29. The lever 29*a* is provided with a shackle 28*a* similarly placed to the shackle 28 of the lever 29, which is in turn provided with a shackle 33 similarly placed to the shackle 33*a* of the lever 29*a*. To the shackle 33 is attached a cable 34 which is passed over a fixed pulley 32 similarly situated with respect to the lever 29*a* as is the pulley 32*a* with respect to the lever 29*a*. The cable 34 is then led back along the centre line of the garage and is prolonged by a cable 34*a* attached to the shackle 28*a* of the lever 29*a*. Cables 34 and 34*a* are shown as joined together at 35 by a turnbuckle for adjusting the tension of the cables. The cables 27, 31, 34, 34*a* are guided in ducts 36 laid in the floor of the garage and in the external apron; these ducts may conveniently be of iron or steel pipe.

The pulley assembly 24, 24*a*, 25, 25*a* and the adjacent parts of the cables 16, 17, 16*a*, 17*a* are located in a shallow excavation 38, which is covered by a cover plate 38*x*, inspection covers 39 being provided (where shown) for access to the adjusting turnbuckles 26, 30 and 35. In order to accommodate these turnbuckles when the cables move, short lengths of large-bore ducts 37 ex-

tending from the excavation **38** enclose the cables **27**, **31**, **34** and **34***a* (where shown), the small ducts **36** each enclosing a single cable opening into the larger ducts **37**, which may be formed of cement, earthenware or other suitable material.

It will be seen from the foregoing that the doors **11**, **11***a* are connected to an endless train of flexible motion transmitting elements consisting successively of the cables **16** or **16***a*, **27**, **34**, **34***a*, **31**, and **17** or **17***a*, the said train being branched at **30** and **26** for connection to the two doors to be operated.

The parts more particularly associated with the two actuating levers **29** and **29***a* being exactly similar, it will be unnecessary to describe more than one.

The lever **29** is situated in a narrow but relatively deep excavation **40**, in the bottom of which is arranged a fixed transverse fulcrum pin **41** engaging in a slot **29***x* at the bottom of the lever. Near the upper end the lever is provided with a pair of rollers **42** arranged on each side of the lever which ride on a pair of longitudinal guides **43**. These guides are horizontal but terminate at each end in an abruptly curved ramp **43***x*. The slotted connection **41**, **29***x* enables the rollers **42** to remain in contact with the guides **43** and the weight of the lever is supported on the rollers. The lever is thus guided in its travel in such a way that the projection of the lever above the floor or ground level remains substantially constant throughout its travel except at the ends thereof, where the ramps **43***x* allow the lever to drop slightly and this enables the part of the vehicle which makes contact with the lever to ride over the end thereof when the lever has completed its stroke in either direction. To raise the lever again after the passage of the vehicle by forcing it up the ramps **43***x*, buffer springs **44** are fixed to the lever on either side thereof which make contact with the walls of the excavation **40**.

The lever **29***a* is constructed and mounted in an exactly similar manner to the lever **29**, being fulcrumed on a pin **41***a* and provided with rollers **42***a* riding on ramps **43***a* and with buffer springs **44***a*.

The details of the lever and its attachments to the cables operating the doors are shown on an enlarged scale in Fig. 5.

To enable the cable **31** to pass the lever **29***a* it is deflected slightly to one side thereof as shown in Figs. 1, 2, and 5. The mounting of the guides **43** is shown in greater detail in Fig. 6. The upper edges of the cement or concrete walls of the excavation **40** (or **40***a*) are shaped to the same form as the guide **43**, as shown at **48** in Fig. 6, and the guide itself is provided with lateral tongues **45** which are secured by nuts **46** to studs **47** embedded in the cement edging **48**. After securing the tongues **45** on the studs **47** the whole (except the guide itself) is preferably covered over with a rendering of cement and to assist in positioning and securing the guides there are further provided lateral pins **49** which become embedded in the said cement rendering.

In order to prevent the external lever from constituting a dangerous obstruction over which persons might trip in the dark, the projecting end of the lever is preferably surrounded by an artificial hump of cement provided with a slot **50***x* in which the lever moves. When the doors are closed, the lever **29***a* is always at the outermost end of its throw, and for this reason the highest point of the hump **50** is arranged at the outer end thereof as shown in Fig. 2.

For inspecting the fixed pulleys **32**, **32***a*, detachable covers **51**, **51***a* are preferably provided.

The operation of the device is as follows.

Assuming the doors to be closed and the external and internal levers **29***a*, **29** at the outer and inner ends of their throws respectively, the approach of the vehicle brings a suitable part thereof in contact with the lever **29***a*. Further progress of the vehicle throws over the lever **29***a* from the outer to the inner end of its travel (right to left in Figs. 1 and 2). The movement of the lever is communicated in tension by the cables **31**, **17** and **17***a* to the blocks **15**, **15***a* which are caused to travel along the quadrantal channels **19**, **19***a* carrying with them the bolts **14**, **14***a*, and thereby opening doors **11**, **11***a*. When the lever **29***a* reaches the end of its travel the rollers **42***a* drop down the ramps **43***x* and the consequent dropping of the lever **29***a* allows the vehicle to pass. After the passage of the vehicle the lever is sprung up the ramps again by the action of the spring buffer **44***a*.

At the same time the movement of the lever **29***a* is further communicated by the blocks **15** and **15***a* to the cables **16**, **16***a* and the cable **27** (acting in tension) to the lever **29**, which is thereby thrown over from the inner to the outer end of its travel (left to right in Figs. 1 and 2), where it is prevented from dropping down the ramps **43***x* by the buffer spring **44**.

Further progress of the vehicle brings it within the garage until the appropriate part thereof strikes the lever **29** and throws it back again to the inner end of its travel where it drops down the ramps **43***x* of the guides **43** and allows the vehicle to pass over it, after which it is sprung back again by the buffer spring **44** in readiness for engagement again. The movement of the lever is communicated by the cable **27** and the cables **16**, **16***a* (acting in tension) to the blocks **15**, **15***a* which are thereby pulled back along the quadrantal channels **19**, **19***a* and close the doors again. This movement is further communicated from the blocks **15**, **15***a* by means of the cables **17**, **17***a* and **31** (acting in tension) to the lever **29***a* which is thereby pulled back from the inner to the outer end of its stroke.

In this way the vehicle on approaching and entering the garage first opens the doors and then closes the doors after its entry.

When it is required to reverse the vehicle out of the garage the sequence of operations is exactly reversed. In this case the outward movement of the lever **29** is communicated by the cables **34**, **34***a* acting in tension, to the lever **29***a*, and thence by means of the cables **31**, **17**, and **17***a*, also acting in tension, to the blocks **15**, **15***a*; and on emerging from the garage the outward movement of the lever **29***a* is communicated by means of the cables **34***a* and **34** (acting in tension) to the lever **29**, and thence by means of the cables **27**, **16**, and **16***a*, also acting in tension, to the blocks **15**, **15***a*. In this way the vehicle, on being reversed out of the garage, first opens the garage doors and then closes them after it.

The movement of the actuating levers **29**, **29***a* is indicated in Fig. 2 by double-ended arrows and a similar curved double-ended arrow in Fig. 3 indicates the movement of the bolt **14** and block **15**.

It will easily be seen that this arrangement can be modified to operate a single door or gate by eliminating one set of the branched cables **16**, **16***a*, **17**, **17***a* and the appropriate parts of the duplicate mechanism actuated thereby.

Further, it will be seen that the apparatus can be modified to operate a door or gate (or pair of doors or gates) from one side only, i. e. the inside or the outside, by eliminating one of the levers **29** or **29***a*, and coupling up the appropriate cables, e. g. **34**, **27**, directly to one another. With such an arrangement the car will open the doors (or gates) on approaching them from one side, e. g. the outside, and leave them open after passing through, and on passing out in the opposite direction will then close the doors (or gates) from the outside after it has passed.

Whereas the device is shown in Figs. 1 and 2 as installed for operating the doors of a garage which open outwards, it will readily be understood that if the device is to be adapted for operating gates in a carriageway or the like which open inwards, the left hand half of the drawing will represent the outside of the carriageway and the right hand half of the drawing the part of the carriageway within the gates, the doors **11**, **11***a* being replaced by the gates in question and the garage walls omitted. In such a case only so much of the carriageway need be cemented or concreted as is necessary to form a suitably rigid housing and support for the gate operating mechanism.

It should further be noted that in this instance the outer actuating lever **29** may be set quite close to the gateway, as it will be operated by the front part of the vehicle. The inner lever **29***a* must be set back from the gateway by a distance at least greater than the vehicle's length.

In this instance, moreover, it is not so necessary to take precautions against creating obstructions projecting from the ground, so that the hump **50** may be omitted, but if such hump is thought advisable, both the actuating levers should be shrouded by a hump and not only one as shown in Figs. 1 and 2.

It will be seen by reference to Fig. 2 that when the external lever **29***a* is at the inner end of its travel it is approximately in line with the outer edges of the doors **11**, **11***a*. This length, together with the length of the excavation **40***a* containing the lever mechanism, represents the minimum space outside the garage doors required for installing the device. If the external lever mechanism **40***a* was placed any nearer the door opening, the front of the vehicle would foul the doors as they open on its approach.

It is further to be noted that if the external lever mechanism is placed as close to the doors as this, the lever must be actuated by the most forward part of the vehicle, i. e. by the front bumper or a member attached thereto. If the axle is used for actuating the lever, the lever mechanism must be set back outside the garage by a further distance equal to the distance by which the axle is set back from the most forward part of the vehicle, e. g. the bumper or dumb irons.

Similarly the exact position for the internal lever mechanism within the garage must be determined in accordance with what part of the vehicle is adapted to actuate the internal lever; at least when the garage is only just large enough to hold the vehicle it is to house. Obviously if the garage has an excess of length over that of the vehicle, a corresponding tolerance may be exercised in the placing of the lever mechanism.

In a modification of the device described above, the cable system **16**, **16***a*, **17**, **17***a* (acting always in tension) is replaced by a push and pull system utilizing strips of spring steel guided in suitable channels.

This modification is illustrated in Figs. 7 and 8 from which the lever mechanism is omitted, as it may conveniently be identical with that already described with respect to Figs. 1 to 6.

Referring to Figs. 7 and 8, it will be seen that the cable **27**, instead of being connected to the branched cables **16**, **16***a*, is directly attached to a rigid crosshead **52**, which is also connected direct to the cable **31** by substituting for the branched cables **17**, **17***a* (Figs. 1 and 2) a short single length of cable **31***x* in prolongation of the cable **31**. To the ends of the crosshead are connected the inner ends of a pair of strips **53**, **53***a* of spring steel set on edge and guided within narrow channels **54**, **54***a* formed in the concrete flooring **12**. The outer ends of these spring steel strips are bent over to form eyes **53***x* which receive the lower ends of the bolts **14** and **14***a*.

It will be evident that the movement of the actuating levers shown in Figs. 1 and 2 for opening the doors is communicated by the cable **31**, **31***x* acting in tension to the crosshead **52** and thence by means of strips **53** and **53***a* acting in compression, to the doors. To enable the strips **53**, **53***a* to operate in compression, the guide channels **54**, **54***a* must not be too wide otherwise the strips **53**, **53***a* will be liable to buckle and jam on the sides of the channels. On the other hand the guide channels must obviously not be so narrow that binding occurs.

As will be seen from the drawings (Fig. 7) the channels **54** are generally ogival in plan form terminating at their outer ends in a quadrantal part **54***x* centred on the upper hinge **11***x*. These quadrantal parts **54***x* form the tracks of the bolts **14**, **14***a* in opening and closing the doors.

In Fig. 7 double-ended arrows indicate the approximate movement of the doors on their hinges and the longitudinal movement of the crosshead.

The apparatus described above with reference to any of Figs. 1 to 8 may also be modified to operate simultaneously the door or doors of a garage and an outer gate or gates in the carriageway, e. g. as may be provided to close access to a private drive-way leading to the garage from the public high-way.

In this case the external actuating member (lever) is arranged on the outside of the outer gates and so much of the mechanism as is necessary is duplicated. For example, in the form of the device shown in Figs. 1 to 6, the set of elements **14** to **25**, **14***a* to **25***a*, **26** and **30** will be duplicated, one set being connected to the garage doors and the other to the outside gates, the cables **27**, **31** being extended as necessary between the duplicated connections **26**, **30** respectively. If the outer gates open the same way as the garage doors, e. g. outwards, the duplicate set of elements **14** to **25**, **14***a* to **25***a*, connected to the outer gates will be arranged exactly similarly to the first set operating the garage doors; but if the outer gates open the opposite way to the garage doors, the duplicate quadrantal channels **19**, **19***a* of the duplicate sets will be disposed oppositely in plan and the adjacent parts of the installation arranged accordingly.

The above described arrangements are most easily installed if the drive-way between the outside gates and the garage doors is straight but if not, the installation is still possible, provided the bend or curve of the drive-way is not too abrupt,

the change of direction being accommodated by providing suitable guiding pulleys or fair-leads for the cables **31**, **34***a*.

As the invention also comprises a resilient device for attachment to a vehicle and adapted to engage with the actuating levers of a door (or gate) operating device in accordance with this invention, an example of such an attachment to the vehicle is shown in Figs. 9, 10, and 11 and may be briefly described as follows:—

The bumper bar extending across the front of the vehicle is shown at **55**. To this are secured by bolts **56** and nuts **56***a* a pair of clips **57** to which are secured a pair of guide bars **58** which are curved in a circular arc and arranged with their convexities downwards. A transverse bar **59** has its flattened ends **59***a* pierced to thread on the bars **58**, on which are further mounted helical springs **60**, which are threaded on the bars **58** and disposed on either side of the flattened ends **59***a* of the bar **59**. The bar **59** serves as the axle for a roller **61**. By this arrangement the transverse roller **61** is resiliently suspended beneath the front bumper **55** and is capable of yielding either backwards or forwards. The ground clearance of the roller **61** is selected to enable it to engage the actuating levers of the door operating device when the roller is in its normal position, midway between the ends of the guide bars **58** and it is to be noted that in this position the ground clearance of the roller must be less than that of any other part of the vehicle lying on the central line.

The strength of the springs **60** is so chosen that the resistance offered by the actuating lever to the roller **61** during the operation of the doors (or gates) is not sufficient to cause the springs **60** to yield appreciably, but when the actuating lever reaches the end of its travel the resistance it encounters causes springs **60** to yield, so that the supporting axle **59** of the roller slides along the guide bars **58**, either forward or backwards as the case may be, and thereby raises the roller slightly. The engagement of the actuating lever with the roller when the latter is in its normal position must not therefore be too deep, in order to enable the roller to ride easily over the end of the actuating lever when the springs **60** yield.

If the space available for the door or gate operating mechanism permits of it, the device described with reference to Figs. 9 to 11, may, instead of being mounted on the front bumper, be mounted on the front axle, and this is preferable as far as the appearance of the vehicle is concerned.

If the device in question is so fitted to the axle and the latter is of I section, a sheet metal fairing is preferably fitted over the axle to prevent the upper ends of the actuating levers from catching in the hollow of the I section.

What I claim is:—

1. Vehicle-actuated means for operating a hinged door or gate, including an element attachable to said door or gate, means arranged below ground level for guiding said element in a quadrantal path centred on the hinge of said door or gate and mechanism actuable by an approaching or receding vehicle for moving said element along said guiding means in the appropriate direction, said mechanism including flexible tension transmitting elements connected to said first named element to move the same in either direction along its quadrantal path, and guiding and supporting means for said tension transmitting elements, including a number of idle rollers mounted within said first named guiding means and pulleys running on fixed axes mounted adjacent the ends of said quadrantal path.

2. Vehicle-actuated door operating means as claimed in claim 1, wherein the first mentioned guiding means consists of a hollow channel member quadrantal in plan form and slotted along its upper face and the mentioned element guided therein consists of a piece of metal so shaped as to fit in said channel and to prevent turning of itself on its axis of movement.

3. For co-operation with vehicle-actuated means for operating a door, gate or the like including an element movable in the line of travel of an approaching or receding vehicle by contact therewith and mechanism actuated thereby for operating said door, gate or the like; means attachable to a vehicle for actuating said actuating element including a bar arranged transversely of the vehicle, means mounted on the vehicle for supporting the ends of said bar and guiding them in arcuate paths lying in the fore and aft direction of the vehicle with their convexities downwards, and spring means mounted on said supporting and guiding means for resisting movement of said bar on said last named means in either direction from a mean position.

4. For co-operation with vehicle-actuated means for operating a door, gate or the like including an element movable in the line of travel of an approaching or receding vehicle by contact therewith and mechanism actuated thereby for operating said door, gate or the like; means attachable to a vehicle for actuating said actuating element including a bar arranged transversely of the vehicle, means mounted on the vehicle for supporting the ends of said bar and guiding them in arcuate paths lying in the fore and aft direction of the vehicle with their convexities downwards, spring means mounted on said supporting and guiding means for resisting movement of said bar on said last named means in either direction from a mean position, and roller means mounted on said bar.

5. Vehicle-actuated means for operating a hinged door or gate, including motion transmitting mechanism, means for connecting said mechanism to the door or gate to be operated, a lever for actuating said mechanism slidably engaged with a fulcrum arranged in the track of an approaching vehicle below ground level with its axis transverse to the direction of travel of the vehicle and means comprising horizontal guide rail means and coacting means mounted on the lever at a fixed point thereof, and causing a substantially constant length of the lever to project above ground level throughout the greater part of the travel of the lever.

6. Vehicle-actuated means for operating a hinged door or gate as claimed in claim 5 wherein the means mounted on the lever for coacting with the guide rail means comprises rollers.

7. Vehicle-actuated door operating means as claimed in claim 5, wherein the mentioned horizontal guide rail means have downwardly curved ends and spring means are provided for yieldably resisting the lever when the means mounted thereon for coacting with the guide rail means are in contact with the curved ends of the guide rail means, so as to maintain the normal degree of projection of the lever except when the latter is forcibly moved to either extreme end of its travel.

8. Vehicle-actuated means for operating a hinged door or gate, including mechanism actu-

able by an approaching or receding vehicle and operating in the line of travel of the vehicle, a flexible motion transmitting member operative in tension and compression comprising a strip of springy steel set on edge and guided in a narrow channel of generally ogival plan form terminating in a quadrantal part centred on the door hinge and means connecting the end of the said strip moving in the quadrantal part of said channel to the door or gate.

9. A vehicle actuated device for opening and closing doors or gates mounted on vertical hinges comprising at least one actuating member projecting above ground level and movable in the line of travel of the vehicle by contact therewith, an endless flexible train of motion transmitting elements actuable by said actuating member, a quadrantal channel centred on the hinge of the door or gate to be operated, said channel being located in the floor or roadway adjacent said hinge, an element connected with said endless motion transmitting train and situated in and movable along said channel, means detachably connecting the door or gate to said element, the endless motion transmitting train being so disposed, and its connection with the coacting parts, i. e. the said door-connected element and the actuating member, being such that movement of the actuating element towards the door opens it and vice versa and the whole mechanism with the exception of the projecting part of the actuating member being laid below ground or floor level.

10. A vehicle actuated device for opening and closing doors or gates mounted on vertical hinges comprising at least one actuating member projecting above ground level and movable in the line of travel of the vehicle by contact therewith, an endless flexible train of motion transmitting elements actuable by said actuating member, a quadrantal channel centered on the hinge of the door or gate to be operated, said channel being located in the floor or roadway adjacent said hinge, an element connected with said endless motion transmitting train and situated in and movable along said channel, said element having a socket therein, and a vertical slidable bolt mounted on the door or gate and engageable with said socket for detachably connecting the door or gate to said element, the endless motion transmitting train being so disposed, and its connection with the coacting parts, i. e. the said door-connected element and the actuating member, being such that movement of the actuating element towards the door opens it and vice versa and the whole mechanism with the exception of the projecting part of the actuating member being laid below ground or floor level.

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