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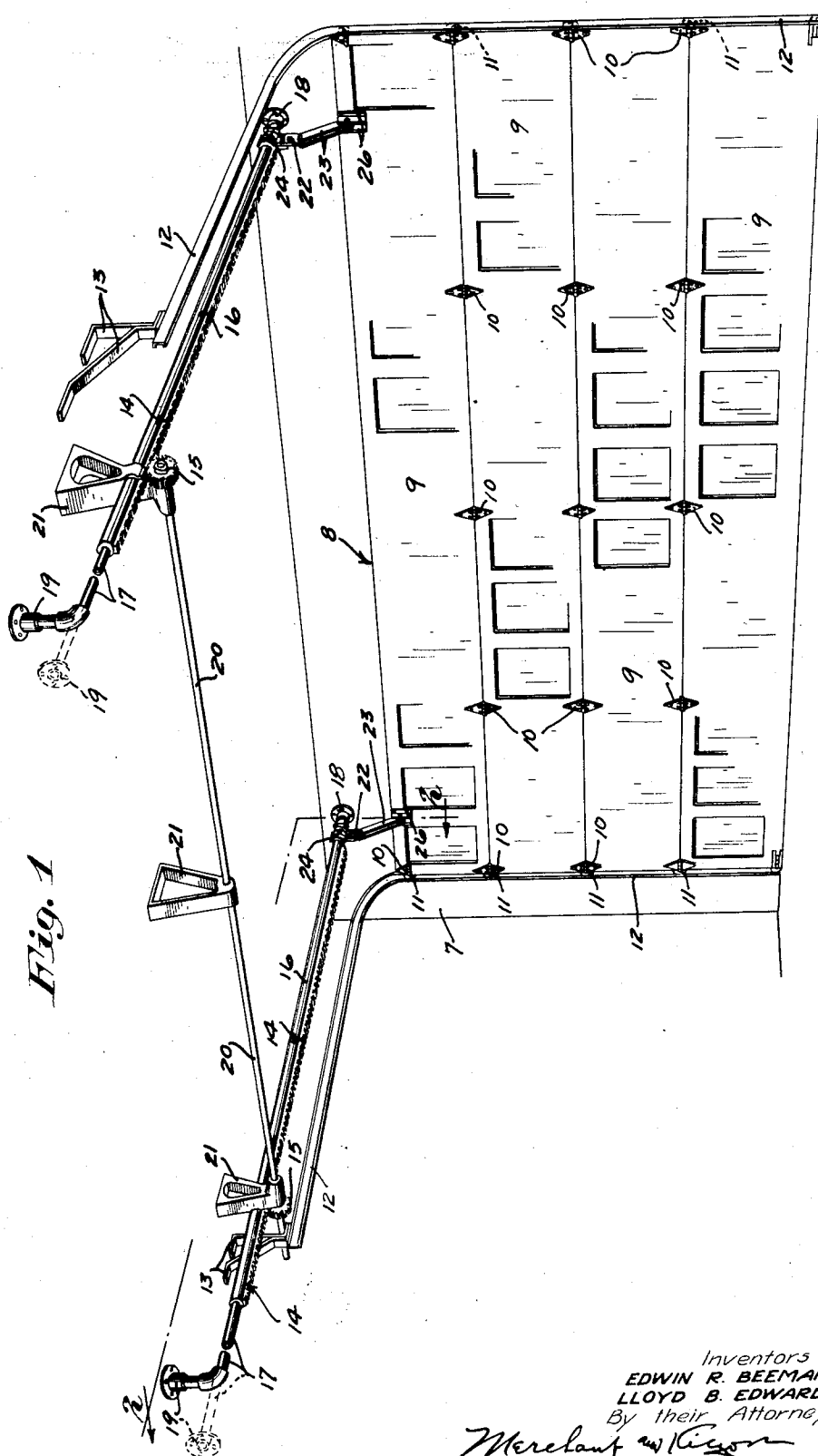
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1,916,652

DOOR OPERATING MECHANISM

Filed Dec. 28, 1931

2 Sheets-Sheet 1



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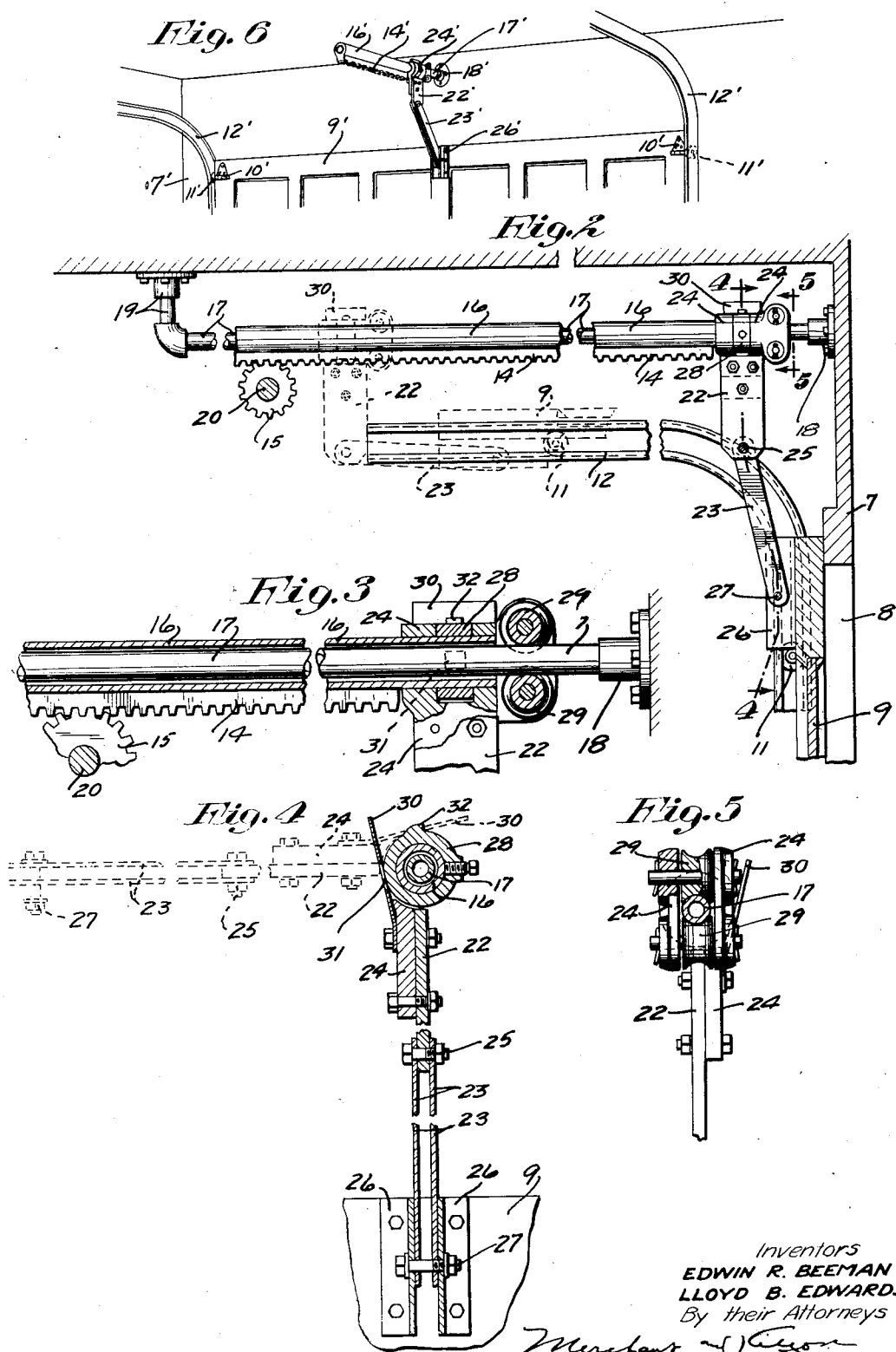
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UNITED STATES PATENT OFFICE

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DOOR OPERATING MECHANISM

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Our present invention has for its object to provide an extremely simple and highly efficient mechanism for operating an overhead sliding door for a garage or the like.

To the above end, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective view taken from the inside of a garage or other building, fragmentarily illustrated, having a wide door opening that is closed by a multi-section overhead sliding door and also illustrating the improved operating mechanism as designed and used for opening and closing a wide door;

Fig. 2 is a fragmentary detail view partly in side elevation and partly in section taken substantially on the line 2-2 of Fig. 1, on an enlarged scale, some parts being shown in different positions by means of broken lines;

Fig. 3 is a view corresponding to Fig. 2 with the exception that the number of parts illustrated have been reduced and certain of the illustrated parts have been broken away and sectioned on an enlarged scale;

Fig. 4 is a detail view principally in section taken on the line 4-4 of Fig. 2, on an enlarged scale, with certain of the parts shown in different positions by means of broken lines;

Fig. 5 is a detail view partly in elevation and partly in vertical section taken on the line 5-5 of Fig. 2, on an enlarged scale; and

Fig. 6 is a view corresponding to Fig. 1, but still further fragmentarily illustrated, with the exception that the operating mechanism shown is designed for opening and closing a relatively narrow multi-section overhead sliding door.

The numeral 7 indicates a garage or other building having a wide door opening 8 and a multi-section overhead sliding door 9 for closing said opening. Adjacent sections of

the door 9, which are vertically spaced when closed, are connected at their inner faces by hinges 10. The door 9 is supported and guided by a plurality of rollers 11 arranged to run in channeled tracks 12. Certain of the rollers 11 are journaled on the pivot pins of the hinges 10, at the vertical edges of the door 9, and the other of said rollers are journaled on pins at the four corners of the door 9. The tracks 12 are arranged with their channels in opposing relation and include vertical sections at the sides of the door opening 8, which are rigidly secured to the frame therefore, and overhead horizontal sections which are just above the door opening 8. These horizontal sections of the track 12 are supported by brackets 13 from the ceiling of the building 7. The elbows of the track 12 are formed on curves for the free and easy travel of the rollers 11 between the vertical and horizontal sections of the tracks 12.

The parts thus far described are of standard and well-known construction and have been illustrated simply for the purpose of showing the invention in working position.

Referring now in detail to the invention which shows two of the improved operators for the door 9, which is relatively wide, and which operators are attached to said door, one near each upper corner thereof, and simultaneously operated to positively open and close the door 9 without angular movement in the plane thereof. Each operator, which is complete in itself, includes a long horizontal rack 14 and an intermeshing driven pinion 15. This rack 14, which extends longitudinally of the door 9 when open, is inverted and has on its back or upper edge a tubular body 16 which is parallel to said rack. A long shaft 17 extends axially through the rack body 16 and affords a guide for said body which holds the rack 14 for straight line endwise movement. The rack guide or shaft 17 is above the horizontal sections of the tracks 12 and is rigidly secured at its front end to the front wall of the building 7, as indicated at 18, and likewise secured at its rear end to the ceiling of said building, as indicated at 19. In some instances the rear end

of the shaft 17 may be secured to the rear wall of the building 7, as indicated by broken lines in Fig. 1, instead of to the ceiling, as indicated by full lines.

Both pinions 15 are rigidly secured to a long shaft 20 which extends transversely under the racks 14 and is journaled in bearings 21 on the ceiling of the building 7. In actual installation the shaft 20 will be operated to reciprocate the racks 14 by a reversible electric motor or other motive power but for the purpose of this case, it is not thought necessary to illustrate the same.

Each rack 14 is attached to the door 9 by a toggle-acting connection which includes an arm 22 and a link 23. This arm 22 is formed with and projects radially downward from a bifurcated head 24 turnably mounted on the front end portion of the rack body 16 and the link 23, which is made up of a pair of laterally spaced flat metal bars. These link bars are pivoted at their upper ends to the arm 22, one on each side thereof, by a nut-equipped bolt 25 for swinging movement toward and from the door 9. The other or lower ends of the bars forming the link 23 extend between a pair of laterally spaced vertical angle bars 26 and are pivoted and detachably secured thereto by a nut-equipped bolt 27. The two pairs of angle bars 26 are rigidly secured to the door 9 at its inner face and near the two upper corners thereof with the axis of the bolts 27 substantially aligned with the pivot pins of the uppermost pair of hinges 10.

The bifurcated head 24 is held against axial movement on the rack body 16 by a fixed collar 28 on said body between the prongs of the head 24. Journaled on the head 24, forward of the rack body 16, is a pair of anti-friction rollers 29 arranged to run on diametrically opposite sides of the shaft 17 and support the respective end of said body out of contact therewith. It will be noted that the internal diameter of the rack body 16 is slightly larger than the external diameter of the shaft 17. The pinion 15 supports the rack 14 with its body 16 out of contact with the shaft 17 so that there is very little friction produced by the endwise movement of the rack 14 in respect to said shaft.

It is important to note that when the door 9 is closed and rests on the door sill, the head 24 is axially spaced from the shaft support 18 with freedom for further forward endwise movement and that the link 23 is oblique to the plane of the door 9, or in other words the toggle formed by the arm 22 and the link 23 is buckled, see Fig. 2. Obviously, forward endwise pressure on the rack 14 by the pinion 15 will tend to straighten the toggle 22-23 and thereby press the door 9 downward onto the sill and it will also press the upper portion of the door laterally against the frame stops.

In case the electric current or other source of energy for the mechanism operating the shaft 20 should be shut off, the link 23 may be detached from the door 9 by removing the bolt 27 and the head 24 turned about its axis, to position the link 23 out of the path of movement of the door 9, as shown by broken lines in Fig. 4, so that said door may be manually operated.

A spring latch 30 is provided for holding the link 23, as indicated by broken lines in Fig. 4. This latch 30 is in the form of a flat plate rigidly secured to the arm 22 and provided with a central aperture 31 arranged to receive a detent 32 on the collar 28 to interlock the latch 30 therewith.

It is well-known that a wide vertical sliding door will bind or stick, even when guided by rollers in tracks or ways, if it is not evenly lifted or lowered or in case there should be an obstruction on the sill that would tend to tilt the door in the plane thereof. By using two of the improved door operators attached to a door near each upper corner thereof, as shown in Fig. 1, and simultaneously actuating the two operators, the door will be evenly moved and positively held against play or slack that would tend to cause the same to bind or stick in its tracks or ways.

From the illustrations in the drawings and the above description it is evident that the shafts 17, which are rigidly secured at each of their ends to the building structure, positively hold the racks 14 against movement in all directions except straight line endwise movement. When the door 9 is closed, the links 23, which are upright, positively lock the door closed without any play whatsoever. It is also evident that very little head room, above the door opening 8, is required for the installation of either the single or double operator.

Fig. 6 shows the use of only a single operator for a relatively narrow door and in which installation the link 23 is attached to the door at the transverse center thereof. In this showing of the single operator, parts thereof corresponding to like parts shown in Figs. 1 to 5, inclusive, are given the same reference numerals followed by a prime.

While the drawings show a multi-section overhead sliding door the operating mechanism is equally well adapted for use in connection with a solid door mounted for bodily swinging movement about a horizontal axis.

From what has been said, it will be understood that the door operator described is capable of modifications as to details of construction and arrangement within the scope of the invention herein disclosed and claimed.

What we claim is:

1. In a device of the class described, an overhead sliding door, means for guiding the door from a closed vertical position to an open overhead horizontal position, a rack

having a tubular body, a shaft extending axially through the rack body and supporting the rack for endwise movement thereon, means connecting the door to the rack body for movement therewith, and means for reciprocating the rack to open and close the door.

2. The structure defined in claim 1 in which the shaft is secured at each end to a relatively fixed support.

3. The structure defined in claim 1 which further includes a pair of anti-friction rollers journaled on the rack body at its front end and arranged to run on diametrically opposite sides of the shaft.

4. In a device of the class described, an overhead sliding door, means for guiding the door from a closed vertical position to an open overhead horizontal position, a rack having a tubular body, a shaft extending axially through the rack body and supporting the rack for endwise movement thereon, a head on the rack body at the front end thereof, a pair of anti-friction rollers journaled on the head arranged to run on diametrically opposite sides of the shaft, a link pivotally connecting the door to the head, and means for reciprocating the rack to open and close the door.

5. In a device of the class described, an overhead sliding door, means for guiding the door from a closed vertical position to an open overhead horizontal position, an overhead horizontal shaft extending longitudinally of the door when open, a member mounted on the shaft for reciprocatory movement longitudinally thereof, means connecting the door to said member, means for reciprocating said member to open and close the door, said door connecting means being movable into an inoperative position to disconnect the door from the rack, and means for holding the door connecting means in an inoperative position.

6. In a device of the class described, an overhead sliding door, means for guiding the door from a closed vertical position to an open overhead horizontal position, an overhead horizontal guide extending longitudinally of the door when open, a member mounted on the guide for reciprocatory movement, a link pivotally connecting the door to said member, means for reciprocating said member to open and close the door, said link being detachable from the door for

movement out of its path of movement to permit the door to be manually operated, and a latch for holding the link out of said path of movement.

7. In a device of the class described, an overhead sliding door, means for guiding the door from a closed vertical position to an open overhead horizontal position, an overhead horizontal guide extending longitudinally of the door when open, a member mounted on the guide for reciprocatory movement, a bifurcated head turnably mounted on the member, a fixed collar on the member between the prongs of the head for holding said head against axial movement on the member, a link pivotally connecting the door to the head, said link being detachable from the door for movement with the head about the axis thereof out of the path of movement of the door to permit the same to be manually operated, and means for reciprocating the member to open and close the door.

8. The structure defined in claim 7 which further includes a latch on the head arranged to interlock with a detent on the collar during turning movement of the head on the member by the movement of the link out of the path of movement of the door.

9. The structure defined in claim 1 in which the means for connecting the door to the rack body includes a radially projecting arm on the rack body and a link pivoted at one end to the arm and at its other end to the door, said arm and link when the door is closed afford a toggle and at which time the door affords a base of resistance for the toggle and causes the same to straighten under the action of the door reciprocating means and press the door closed.

10. In a device of the class described, an overhead sliding door, means for guiding the door from a closed vertical position to an open horizontal position, a rack, a fixed shaft supported at its ends, said rack being mounted on the shaft for endwise reciprocatory movement between the supported ends of said shaft, means connecting the door to the rack for movement therewith, and means including a pinion meshing with the rack for reciprocating the same to open and close the door.

In testimony whereof we affix our signatures.

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