No. 776,397. PATENTED NOV. 29, 1904.

C. P. & F. E. HOWARD.

OPERATING DEVICE FOR DOUBLE DOORS.

APPLICATION FILED JULY 7, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 3

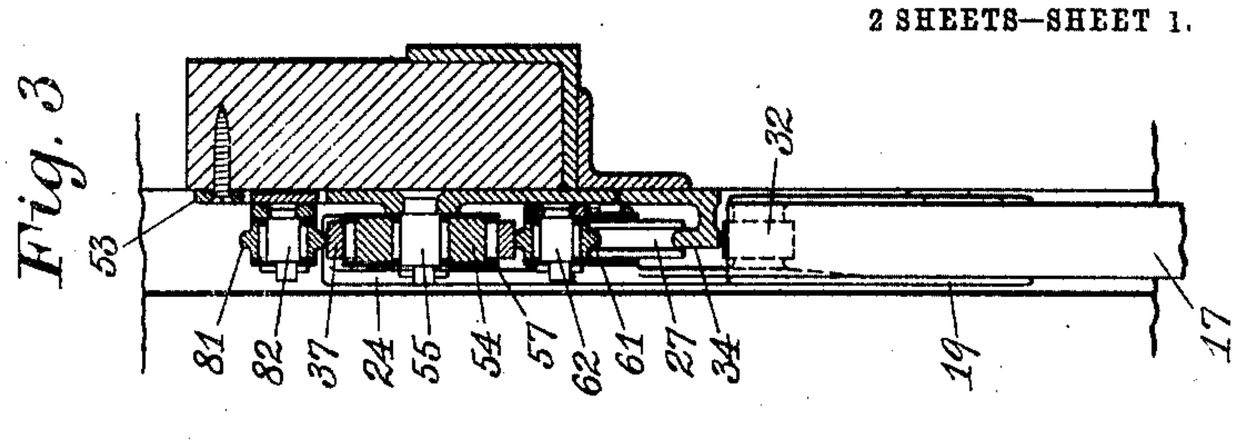


Fig. 2

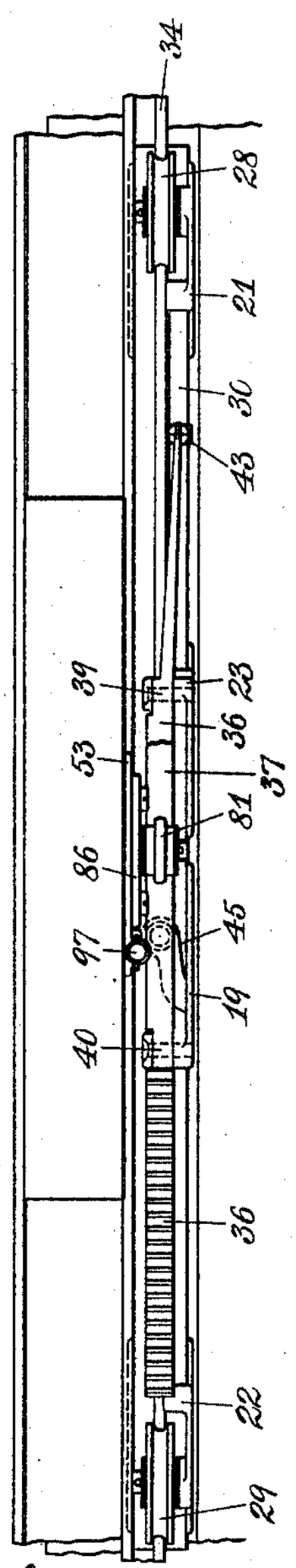
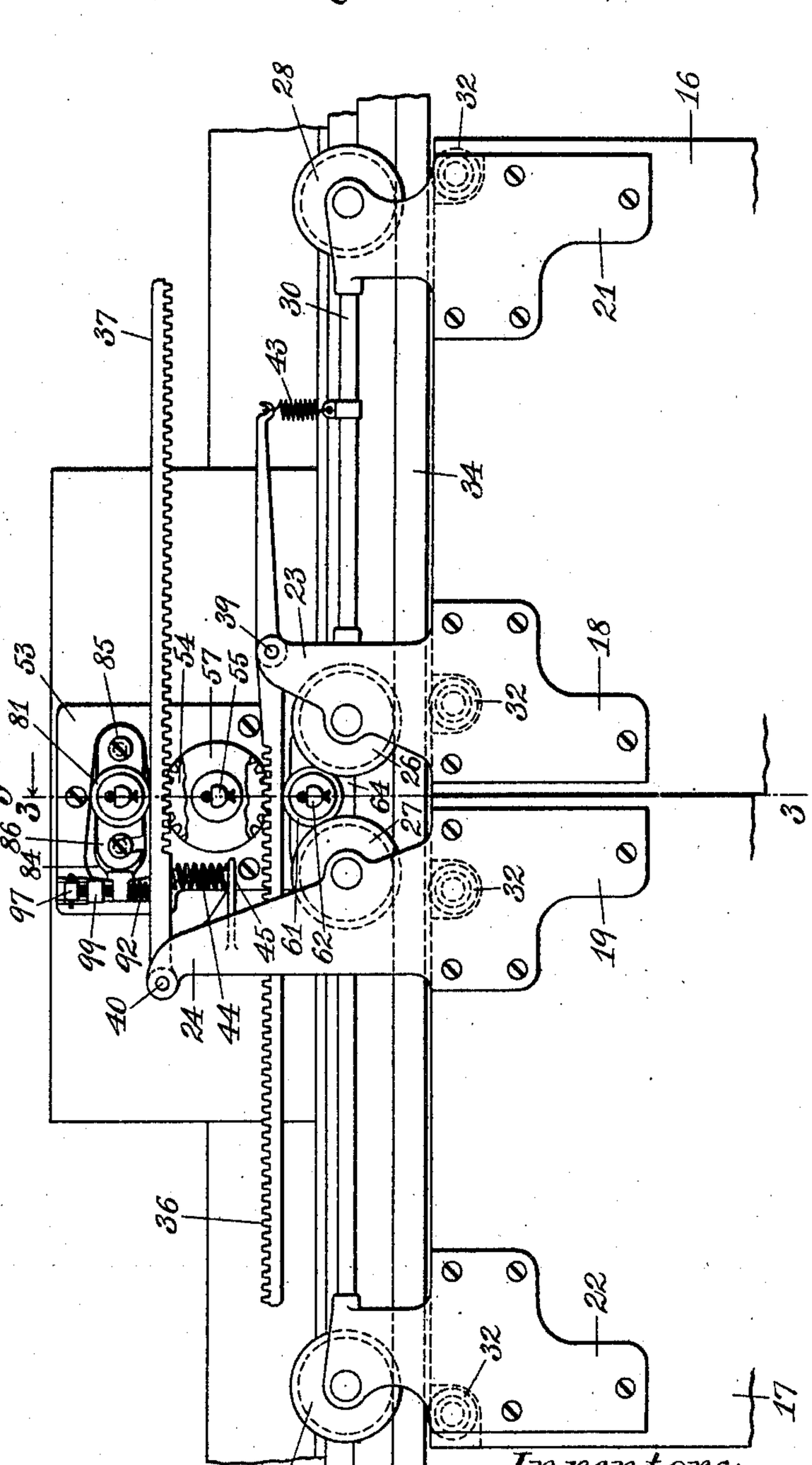


Fig. 1



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 6

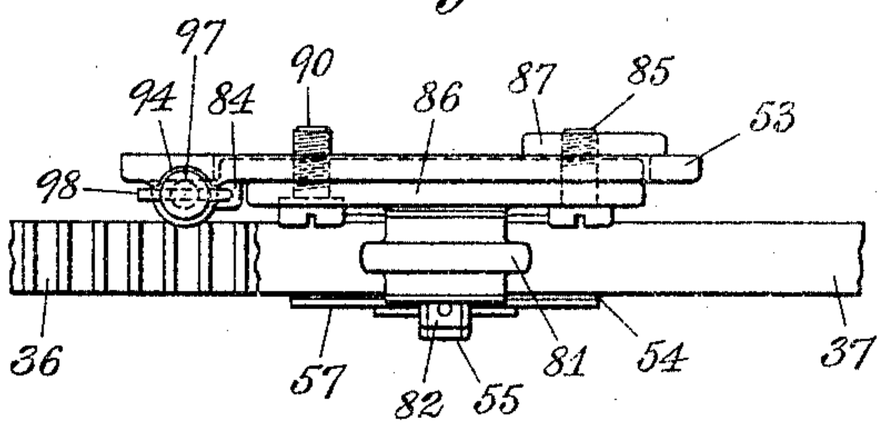


Fig. 4

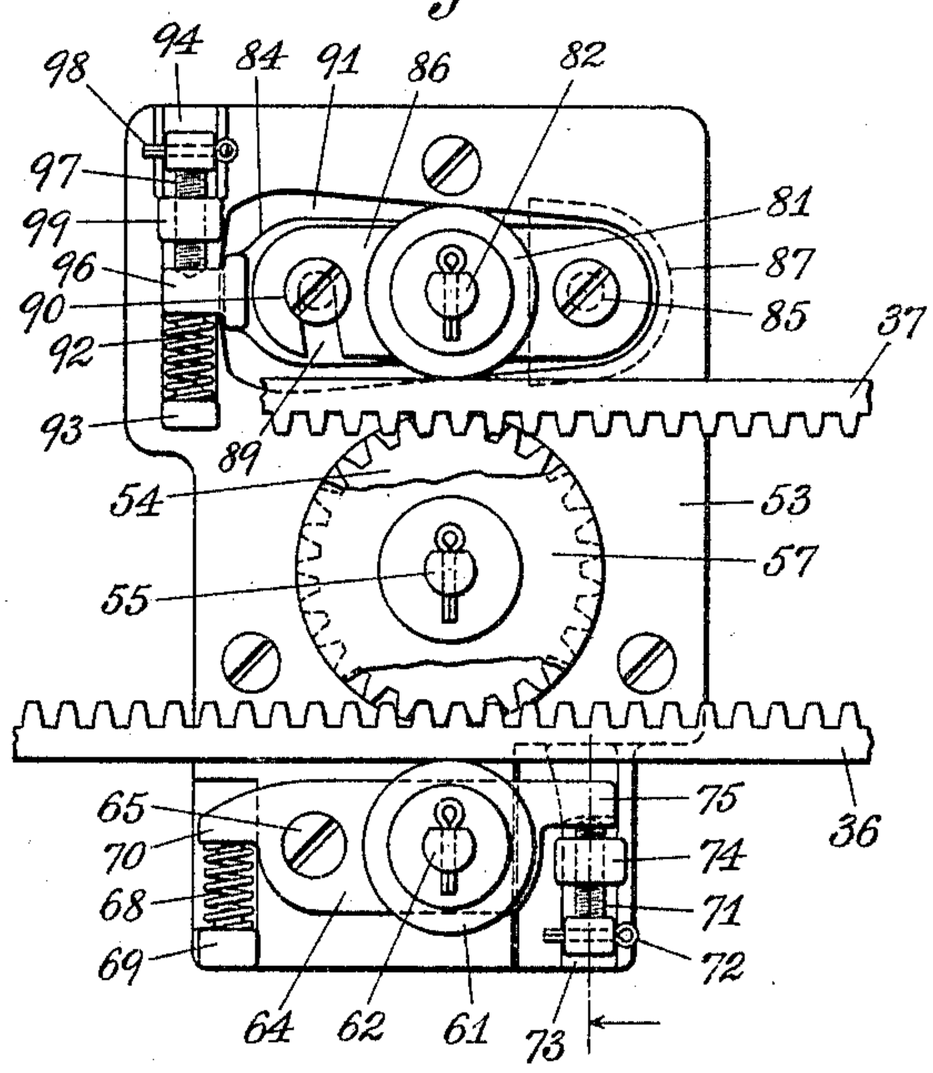


Fig. 5

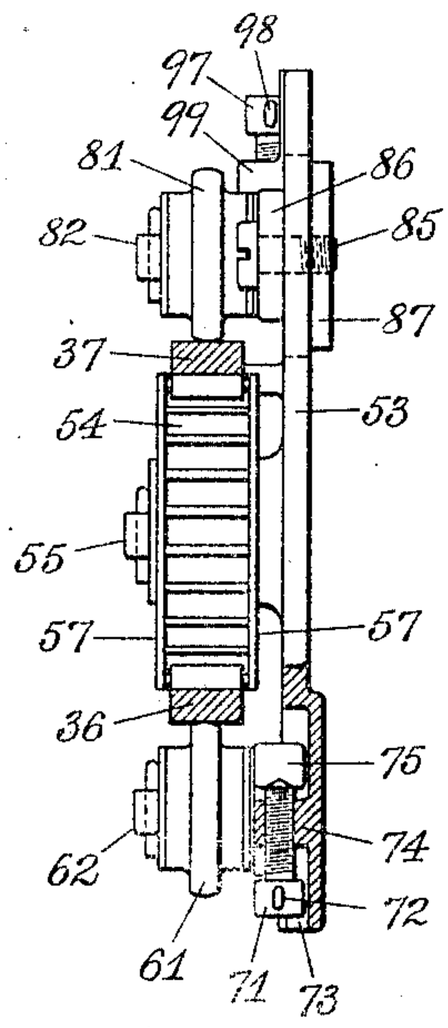


Fig. 7

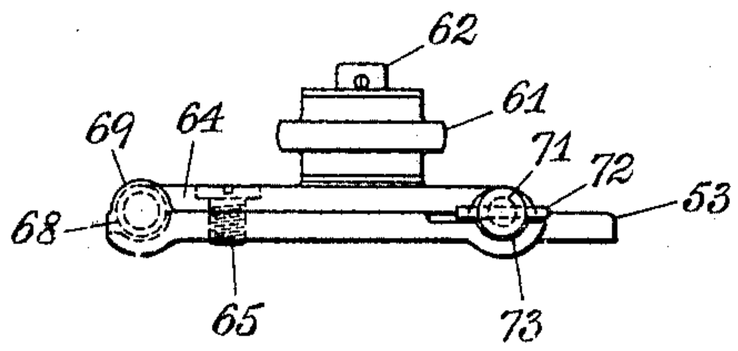
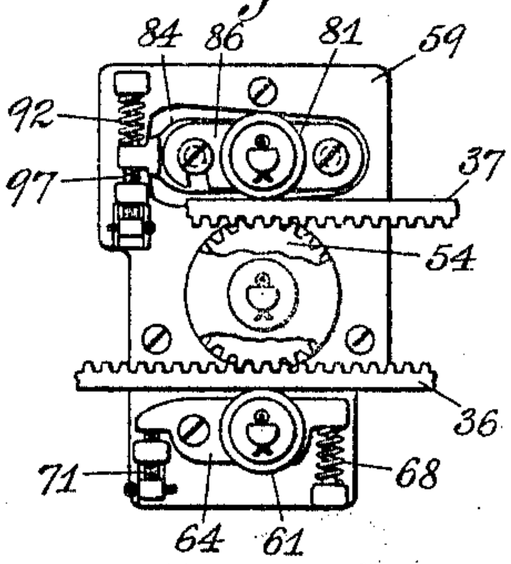


Fig. 8



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No. 776,397. Patented November 29, 1904.

UNITED STATES PATENT OFFICE.

CHARLES P. HOWARD AND FRANK E. HOWARD, OF HARTFORD, CONNECTICUT, ASSIGNORS TO JAMES L. HOWARD & COMPANY, A CORPORATION OF CONNECTICUT.

OPERATING DEVICE FOR DOUBLE DOORS.

SPECIFICATION forming part of Letters Patent No. 776,397, dated November 29, 1904.

Application filed July 7, 1904. Serial No. 215,618. (No model.)

To all whom it may concern:

Be it known that we, CHARLES P. HOWARD and FRANK E. HOWARD, citizens of the United States, and residents of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Operating Devices for Double Doors, of which the following is a full, clear, and exact specification.

This invention relates to operating devices for double doors in which the opening or closing movement of either door causes a simultaneous opening or closing movement of the other door by means of a pair of racks secured to the doors and disposed on opposite sides of a pinion, so that motion imparted to one door is transmitted to the other.

The invention consists in improved means whereby the coöperating movements of the two doors are affected smoothly and easily with a minimum of noise and whereby the adjustment of the parts to their most suitable operating position and the removal of the parts for examination or repairs is quickly and easily accomplished.

Figure 1 is a side view of the upper part of a pair of doors, showing the hangings and connections with this invention applied thereto. Fig. 2 is a plan view, and Fig. 3 a side view, of Fig. 1, the latter being taken in section on the line 3 3 of Fig. 1. Figs. 4 and 5 are side and end views of the pinion and adjacent parts. Figs. 6 and 7 are plan and bottom views, respectively, of Fig. 4. Fig. 8 is a side view of a modified way of mounting and adjusting the guide-rolls.

Double sliding doors of the type specified must be connected together in such a manner that the opening or closing movement of either door will simultaneously produce a corresponding movement in the other door. Doors of this class are frequently used for passenger-vehicles, and for such uses the connecting devices of the two doors should be so constructed that their operation will be smooth, easy, and as nearly noiseless as possible. The mechanism should also be so arranged that it can be readily readjusted as it wears and easily taken apart for examination and repairs in case it gets out of order. With the rack-and-pinion mechanism as ordinarily constructed for sliding doors difficulty has been experienced in supporting the racks in suitable meshing relation to the pinion at all positions of the doors. This relation should be such that all portions of the racks shall mesh properly with the pinion during the movement of the latter. Otherwise noisy and imperfect working will result, causing annoyance to those within hearing, besides unduly wearing out the working parts. These racks are usually long and slender and are liable to become bent and "snaky" in the processes of manufacture or in handling. It is the object of the present invention to provide means for maintaining the racks in correct mesh with the pinion at all portions of the movement of the doors, even when the racks are not straight; also, to furnish means for adjusting them to this position while the doors are in place.

The doors 16 and 17, Fig. 1, are supported by the inner brackets 18 and 19 and the outer brackets 21 and 22. These brackets have rollers 26, 27, 28, and 29, which roll on the track 34, secured to the door-frame. Under rollers 32 are also provided to prevent the doors from lifting. The inner bracket 18 has a rack 36 pivoted at 39 to the arm 23, and the short end of this rack has secured to it one end of the spring 43, while the other end of the spring is secured to the rod 30, extending from the bracket-arm 23 to the bracket 21. The bracket 19 has a similar rack 37, pivoted to it at 40 on the arm 24. The rack 37 rests upon the spring 44, supported by an abutment 45 on the arm 24. Each rack 36 and 37 extends over the opposite door, and the two racks mesh in a pinion 54, mounted on a stud 55 appurtenant to the base-plate 53, secured to the door-frame. The pinion 54 is preferably mounted on a roller-bearing and is provided with plates 57 to guide the racks in central position with relation to the pinion as the racks move forward and back.

The under surface of the rack 36 rests upon the guiding-roll 61, Fig. 4, mounted on a stud

62, appurtenant to the yoke 64 and opposite the pinion 54. This yoke is pivoted at 65 on the plate 53 and has its outer end 75 supported on the adjusting-screw 71. This screw is secured from turning by means of a split pin 72, which is inserted in its head and extends beyond the sides of the groove 73, Fig. 7, formed in the plate 53 to receive the head of the screw. The spring 68, supported on the lug 69, appurtenant to the plate 53, pushes upward against the projection 70 on the end of the yoke 64, thus holding the other end of the yoke yieldingly against the screw 71.

The upper side of the rack 37 is pressed by the spring 44 against the guiding-roll 81, Fig. 4, mounted on the stud 82, appurtenant to the swinging support 86. This support is pivoted at one end to the screw 85 and is supported at the other end by the screw 90, the head of which is counterbored into the support 86. The screw 85 also serves as a pivot for the yoke 84, being screwed into the boss 87, Fig. 5, on the base-plate 53. The yoke 84, which is located in the recess 91 in the plate 53, carries the screw 90 and has a lug 96 at its outer end, which rests upon the spring 92, supported on the lug 93, appurtenant to the base-plate 53. The upper side of the lug 96 is engaged by the end of the screw 97, carried in the lug 99, appurtenant to the base-plate 53. The screw 97 is kept from turning by the split pin 98, which is inserted in its head and extends beyond the sides of the groove 94, Fig. 6, formed for the screw-head in the base-plate 53.

The operation of the parts is as follows: When the door 16, Fig. 1, is moved to the right, it carries with it the rack 36, which being in engagement with the pinion 54 turns the pinion, and thereby moves the rack 37 and also the door 17 to the left. Similarly, if the door 17 is moved to the left it will cause the pinion 54 to revolve, and thus move the door 16 to the right by means of the rack 36, each door moving always the same distance toward and from the center of the doorway. The racks 36 and 37 are counterbalanced by means of the springs 43 and 44, so as to be in practically uniform and free working mesh with the pinion 54. The spring 44 more than overcomes the weight of the upper rack 37, while the spring 43 does not quite counterbalance the rack 36. Hence both racks press outwardly away from the pinion and against their respective rolls 81 and 61, but with only a slight pressure sufficient to prevent them from pressing against the pinion at any portion of the stroke. The racks are therefore so counterbalanced that each has a slight outward pressure against its guiding-roll, and this pressure is made sufficiently uniform to minimize the rattling noises due to the uneven pressure of the racks against the pinion or against the rolls at different positions of the door.

By means of the springs 68 and 92, Fig. 4, and the adjusting-screws 71 and 97 the guiding-rolls 61 and 81 may be adjusted so as to bring the racks 36 and 37 into the most suitable position relative to the pinion 54. If, for instance, it is desired to move the rack 36 a little nearer to the pinion 54, the pin 72 is withdrawn from the head of the screw 71 and the latter given a half-turn or turn in one direction or the other, according as it is desired to move the rack 36 toward or from the pinion 54, the spring 68 pressing upward against the end 70 of the yoke 64 and keeping the end 75 of the yoke in contact with the adjusting-screw 71. Similarly, if it is desired to move the rack 37 toward or from the pinion 54 the adjustment may be effected in the same way by means of the screw 97. With the above-described construction these adjustments may be made while the doors are in place. Thus the pitch-line of the pinion may be kept substantially coincident with that of each rack, thereby insuring a smoothly-running contact free from unnecessary noise.

By the arrangement of the support upon which the upper roll 81 is mounted the roll may be swung upward on the pivot 85 by turning back the screw 90 a few turns to carry the head of the screw out of its counterbored seat in the support, the slot 89 enabling the support 86 to move upward past the screw 90. This releases the upper rack 37 from the pinion 54, and thereby facilitates the assembling, inspection, dismounting, and adjustment of the device.

In the modified form of roll-adjustment shown in Fig. 8 the plate 53 is replaced by the plate 59. The lugs and grooves which support the springs 92 and 68 and the screws 97 and 71 are here located so that the positions of the springs 92 and 68 and their respective screws 97 and 71 are transposed from the construction shown in the other figures. By this means the racks 36 and 37 are held resiliently against the pinion 54 and may move away from the pinion in case dirt or any foreign matter gets into the teeth between the racks and pinion, thus precluding the possibility of the mechanism becoming inoperative from such a cause.

For ideal conditions the racks should presumably be perfectly balanced; but these conditions, however, are not found in actual practice, and it is therefore advisable to make the preponderance definitely in one direction or the other. In the construction herein shown and described the preponderance is away from the pinion, and this is believed to be the preferable direction. It is obvious, however, that the preponderance might be made toward the pinion by suitably adapting the coöperating members and the counterpoising means. It is also obvious that the construction herein described may be altered and varied in a number of particulars without departing from the

spirit of this invention. The springs may be changed or modified in position or in degree of tension, so as to secure the desired balance or the desired preponderance in one direction or the other. Also flat springs may be employed instead of the coiled forms herein shown, or weights may be employed to counterbalance the overhanging racks, and those weights or springs may be made adjustable, so as to exactly poise the rack or to overpoise it in either direction.

We claim as our invention—

1. The combination in devices of the class specified, of a pinion, a rack pivotally supported at or near one end, and means for approximately balancing the overhanging weight of the rack.

2. The combination, in devices of the class specified, of a pinion, a pivotally-supported rack traveling in mesh with the pinion, guiding means for the rack, and resilient means for holding the guiding means in engagement with the rack.

3. The combination, in devices of the class specified, of a vertical pinion, a pivotally-supported rack traveling in mesh with the upper side of the pinion, guiding means for the rack, and means for overbalancing the weight of the rack.

4. The combination, in devices of the class specified, of a vertical pinion, a pivotally-supported rack traveling in mesh with the under side of the pinion, guiding means for the rack, and means for partially supporting the weight of the rack.

5. The combination, in devices of the class specified, of a vertical pinion, a pair of racks traveling in mesh with the upper and under sides of the pinion, guiding means for the racks, means for overbalancing the weight of the upper rack, and means for partially supporting the weight of the lower rack.

6. The combination in devices of the class specified, of a pivotally-supported traveling rack, guiding means for the rack, and means for adjusting the guiding means to vary the position of the rack.

7. The combination, in devices of the class specified, of a pivotally-supported traveling rack, guiding means for the rack including a pivoted yoke, means for adjusting the position of the yoke around its pivot, and a coöperating spring device.

8. The combination, in devices of the class specified, of a traveling rack, guiding means for the rack including a swinging support, and means for clamping and releasing the support.

9. The combination, in devices of the class specified of a traveling rack, guiding means for the rack including a swinging support and a clamping-screw having its head seated in a counterbore in the support.

10. The combination, in devices of the class specified, of a traveling rack, guiding means resiliently engaging the rack, and means for adjusting the guiding means to vary the position of the rack.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES P. HOWARD.
FRANK E. HOWARD.

Witnesses:
WM. H. HONISS,
JAS. W. GREEN.