(No Model.) 4 Sheets—Sheet 1.

S. M. FAY.

BRAKE MECHANISM FOR ELEVATORS.

No. 572,789. Patented Dec. 8, 1896.

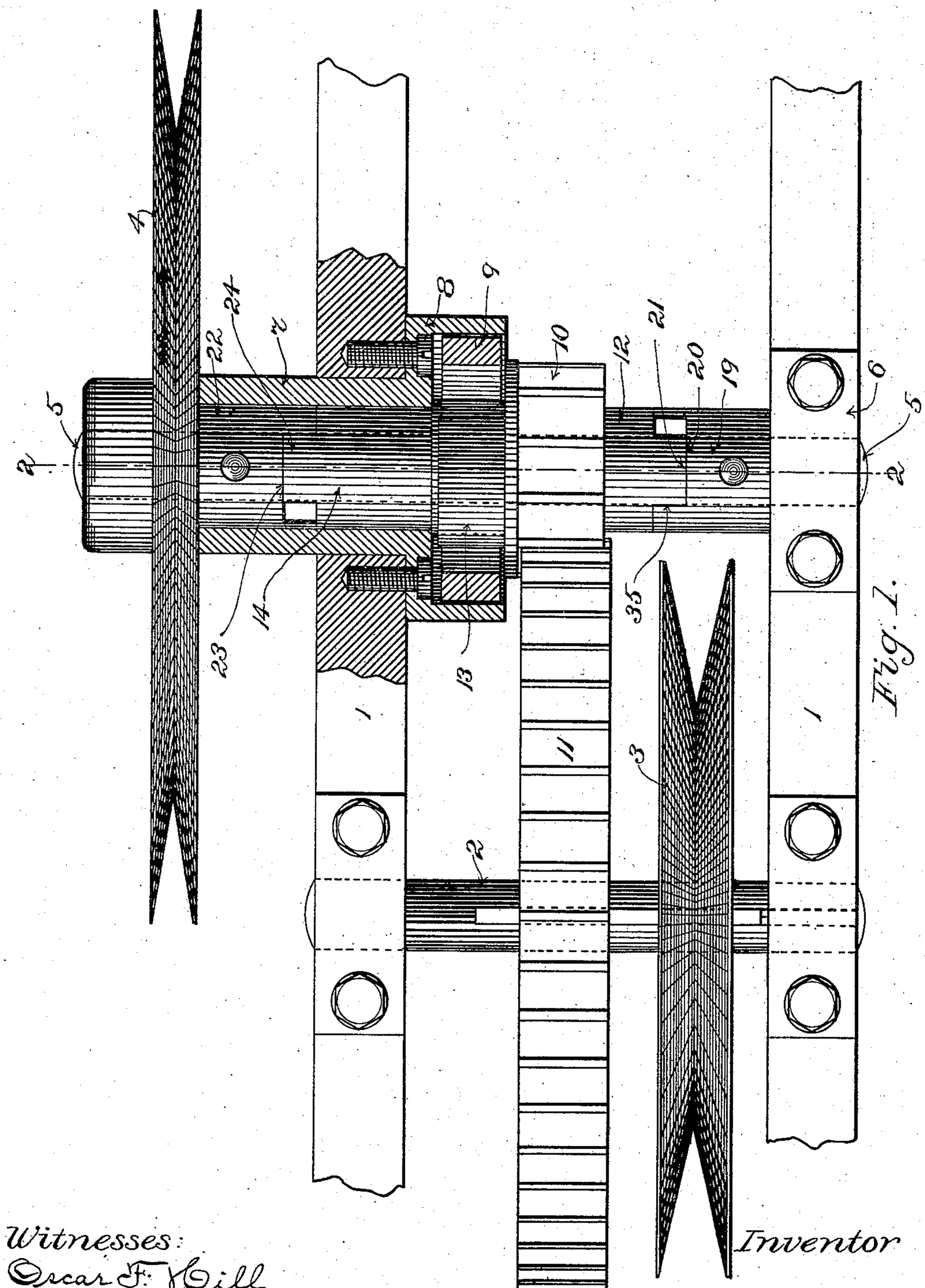

Fig. 1.

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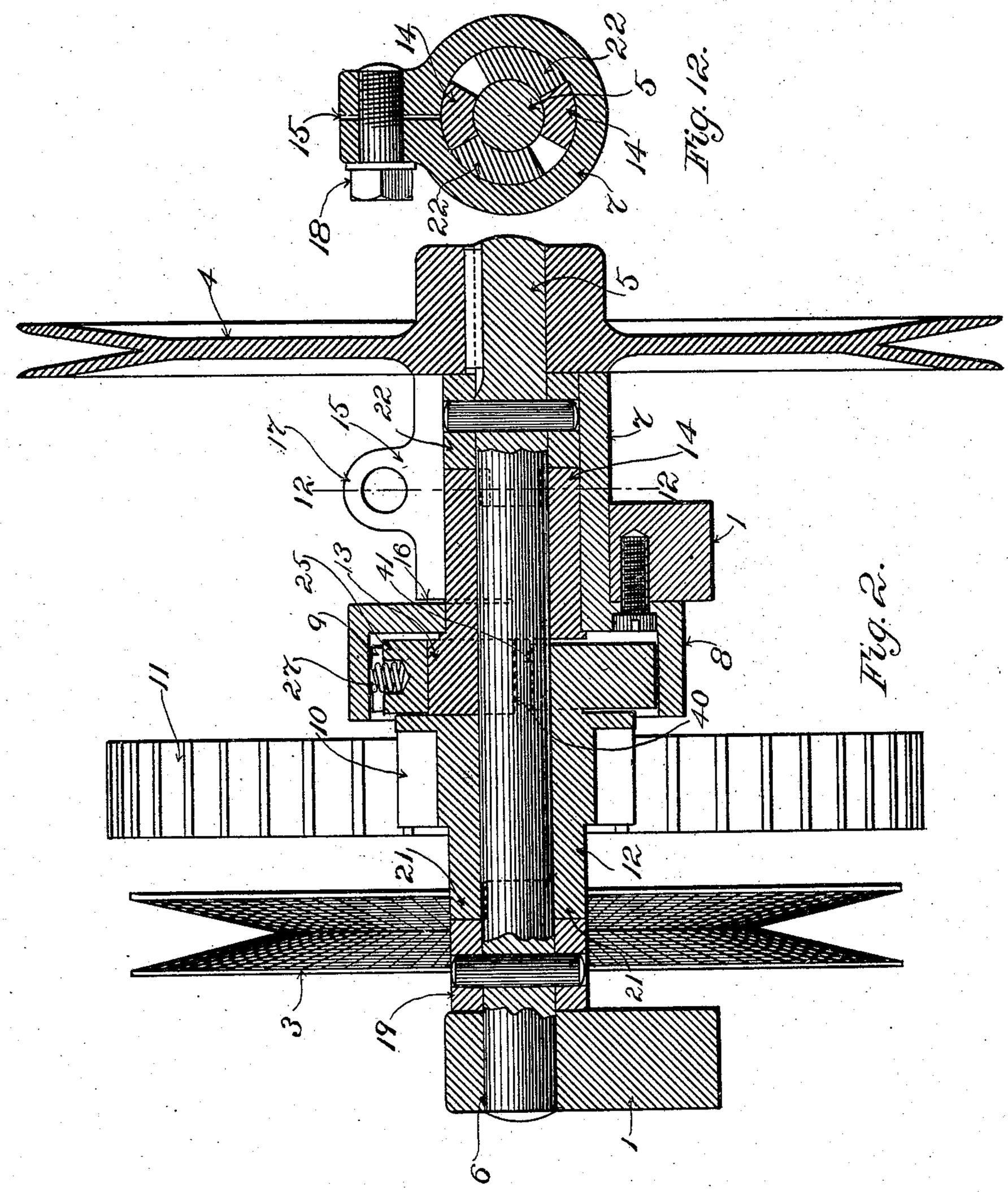

Fig. 12.

Fig. 2.

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BRAKE MECHANISM FOR ELEVATORS.

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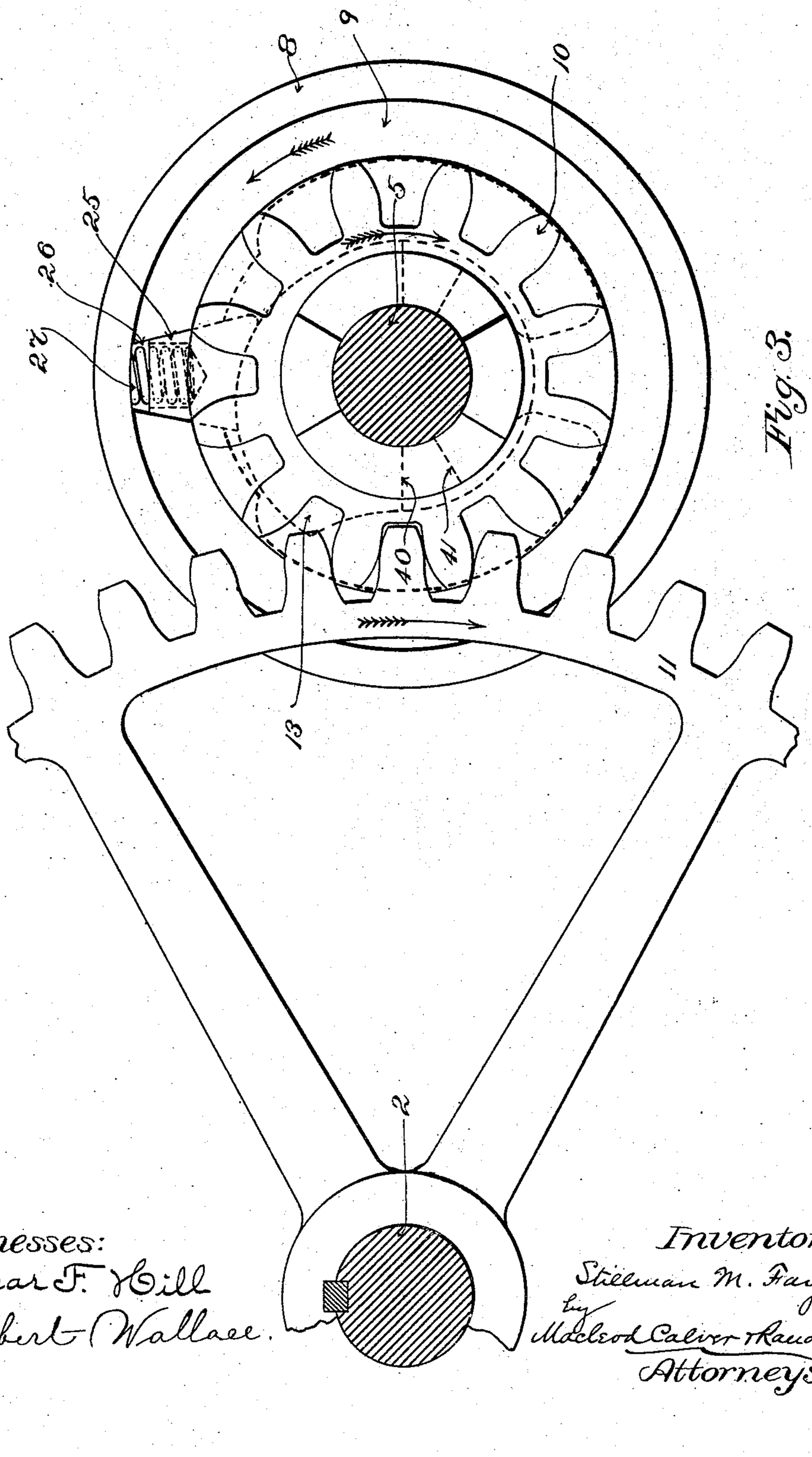

Fig. 3.

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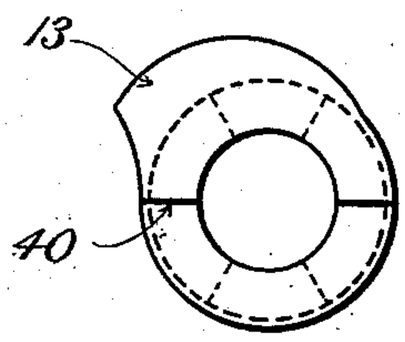

Fig. 4.

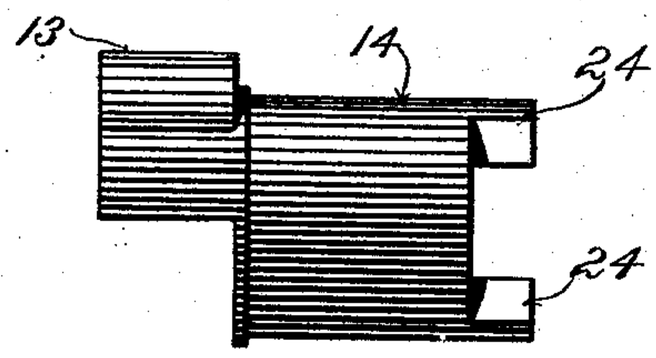

Fig. 5.

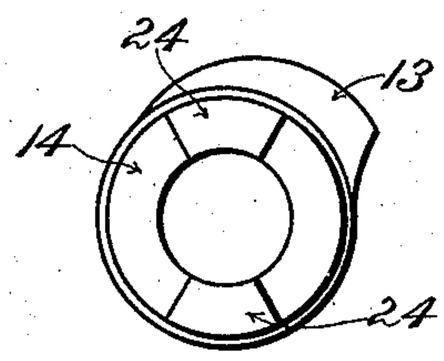

Fig. 6

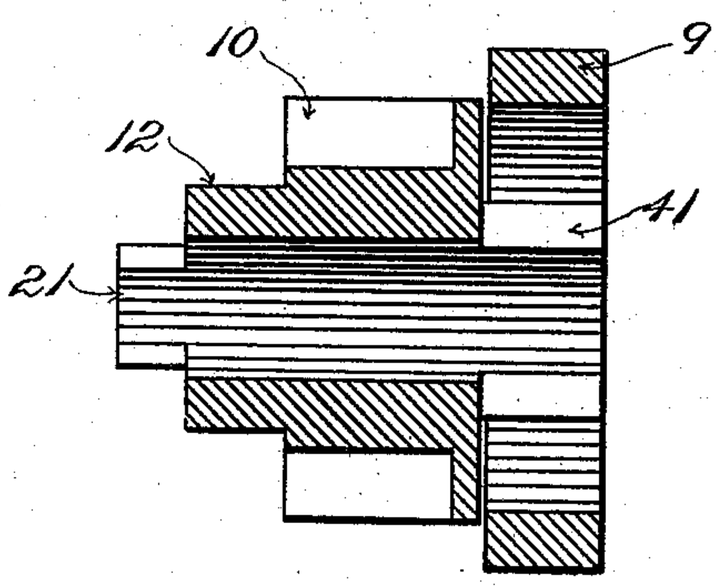

Fig. 7

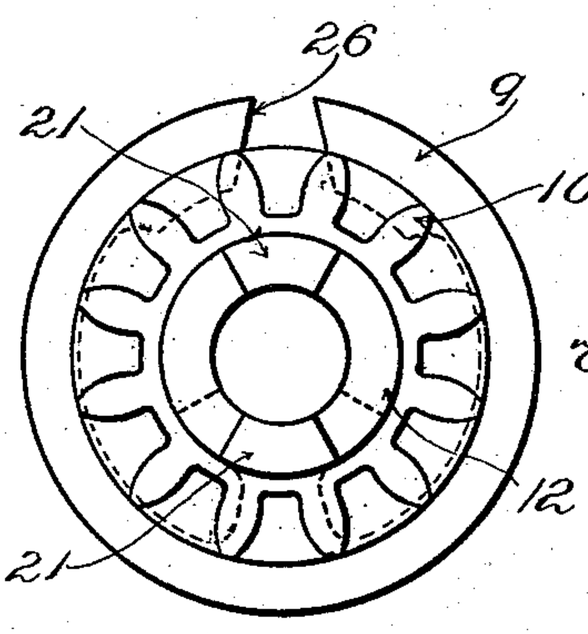

Fig. 8

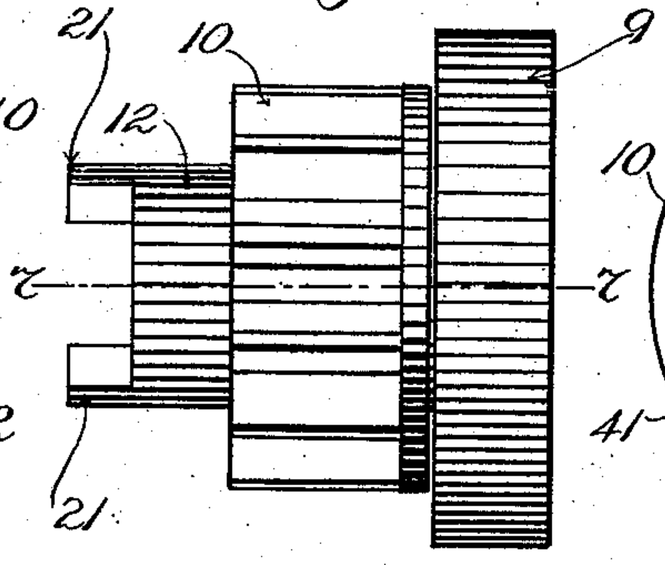

Fig. 9.

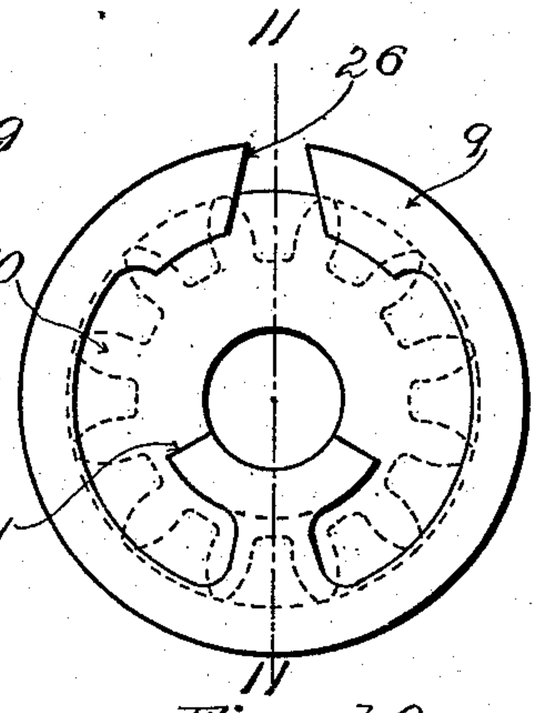

Fig. 10.

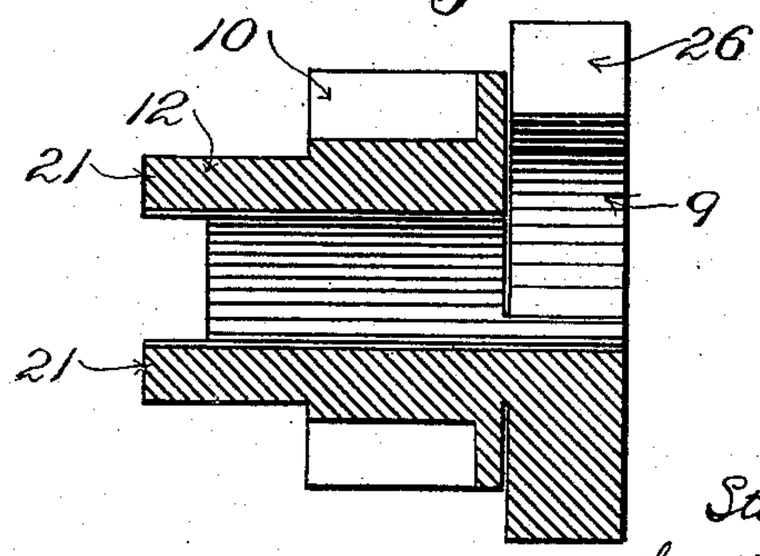

Fig. 11.

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UNITED STATES PATENT OFFICE.

STILLMAN M. FAY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO JOHN T. MACDONALD, JR., OF SAME PLACE.

BRAKE MECHANISM FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 572,789, dated December 8, 1896.

Application filed March 17, 1896. Serial No. 583,501. (No model.)

To all whom it may concern:

Be it known that I, STILLMAN M. FAY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Brake Mechanism for Elevators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has for its object to provide an automatic brake mechanism for elevators, which shall be strong and positive in operation; and it consists in a device constructed and arranged as hereinafter shown and described, and the novel features of which are pointed out and clearly defined in the claims at the end of this specification.

In the accompanying drawings, to which reference is made in the following description, I have shown my invention in the best form now known to me.

In said drawings, Figure 1 is a partly-sectional plan view of an elevator apparatus having my invention applied thereto. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is a side elevation of part of the device shown in Fig. 1, enlarged, and showing particularly the clutch device and method of operating the same. Fig. 4 is an end view of the operating-cam from the left in Fig. 5. Fig. 5 is a side elevation thereof. Fig. 6 is an end view from the right of Fig. 5. Fig. 7 is a section of the expansible ring and connected parts, which are formed integral therewith on the line 7 7 of Fig. 9. Fig. 8 is an end view of the same from the left of Fig. 9. Fig. 9 is a side elevation of the said parts. Fig. 10 is an end view from the right of Fig. 9. Fig. 11 is a vertical section on line 11 11 of Fig. 10. The said Figs. 4 to 11, inclusive, show the two principal parts of the brake device detached and in detail. Fig. 12 is a section on line 12 12 of Fig. 2.

My invention is more especially designed to be applied to elevator apparatus of the kind which is operated by hand, that is, where the load is hoisted by the power of the operator, and particularly to apparatus of this kind which is so constructed that the lifting-rope is pulled in one direction during the hoisting of the load and in the other direction during the lowering of the load. It is important that such elevator mechanism be provided with a positive and effective brake by which, in case the operator should cease to exert power on the lifting-rope in hoisting the load, the elevator will be caused to stop and remain at the point to which it has been raised, and which, in like manner, if the operator is lowering a load will, in case he ceases to pull on the rope, operate at once to hold the elevator and prevent it from further descent.

My device will be readily understood from the following description and the accompanying drawings.

At 1 are shown the side frames upon which the elevator apparatus is mounted, and which are ordinarily located at the top of the elevator-well. The side frames 1 may be suitably secured together by cross or tie pieces in the well-known manner. At 2 is shown a shaft which is journaled on the side frames 1. At 3 is the hoisting-rope pulley, which is secured on said shaft 2, and which has a V-shaped groove in its periphery in which the hoisting-rope (not shown) lies.

The hoisting-rope is attached to the elevator-car and passes over the pulley 3 in the well-known manner, a counterweight being secured at the other end of said rope. At 4 is shown the pulley around which the operating-rope passes, said pulley having a V-shaped groove 1 in its periphery and being of well-known construction. The operating-rope passes over the pulley 4 and is connected at its ends, forming an endless loop of rope which hangs down to the bottom of the elevator-well and passes the elevator car or platform within easy grasp of the operator, who may either be on the elevator or on one of the floors of the building.

The pulley 4 is fast to a shaft 5, which is journaled at one end in a bearing 6, secured to one of the side frames, and near its opposite end in a housing 7, which is secured to the opposite side frame 1. The housing 7 is enlarged at 8, inside the frame-piece 1, (see Fig. 1,) and the inner periphery of this enlarged portion 8 coöperates with an expansible ring 9, which is located inside the said enlarged portion 8. The ring 9 moves with the shaft 5, and when the said ring is ex-

panded, as hereinafter described, so that its periphery bears against the enlarged portion 8 of the housing the mechanism is stopped, that is, the expanding of the split ring 9 into contact with the housing effects the braking. At 11 is shown a cog-wheel, which is mounted on the shaft 2 and which meshes with the pinion 10. The pinion 10 is rigidly connected with the expansible ring 9, both of said parts being secured to or preferably integral with a sleeve 12, which is mounted on the shaft 5, as shown, Fig. 2. At 13 is a cam, which is secured to a collar or sleeve 14, which is also placed on the shaft 5, between the said shaft 5 and the fixed housing 7. The housing 7 is preferably split lengthwise thereof, as shown at 15, and is also partially severed by a line of cut 16 at right angles to the line 15. Lugs 17 are provided upon each of the parts of the housing 7, formed by the line 15, and a clamping-screw 18, Fig. 12, is passed through said lugs. By this construction the housing 7 may be sprung or compressed slightly onto the sleeve or collar 14, causing said collar or sleeve to be retarded slightly in its rotary movement with the shaft 5, so that the shaft 5 is slightly freer in its movement of rotation than is the collar or sleeve 14. The object of thus slightly retarding the movement of the sleeve 14 will be hereinafter explained.

At one end of the shaft 5 I place a dog 19, which consists of a collar which is rigidly secured to said shaft and which is provided at its inner end with preferably two recesses 20 20, which engage corresponding projections 21 21 on the sleeve or collar 12. The said projections are smaller than the recesses on the dog with which they engage and therefore do not fill the same, so that the shaft 5 may move throughout a portion of one rotation before the dog 19 will engage the collar 12. When the said dog is in engagement with the collar, the said collar will revolve in unison with the shaft 5. At the opposite end of the shaft 5 a dog 22 is rigidly secured to said shaft, said dog 22 having, preferably, two recesses 23 23, with which corresponding projections 24 24 on the collar 14 engage. The projections 24 are also smaller than the recesses, so that in some positions of the parts the dog may move with the shaft 5 throughout a portion of the rotation of the shaft before it engages the collar 14. After engagement with the collar 14 the shaft, dog, and collar will rotate together.

The pulley 4 for the operating-rope may, if desired, be secured to or formed integral with the dog 22, as will be clear. I prefer, however, for obvious reasons, to form them separately and secure them separately. The cam 13 is in contact with the wedge-shaped block 25, which fits a correspondingly-shaped slot 26, formed in the expansible ring 9, so that as the said wedge-shaped block is forced into the said slot 26 the ring 9 will be expanded and forced into close contact with the enlarged portion 8 of the housing, thus forming a frictional clutch device which operates to lock the parts and stop the mechanism.

The cam 13 is of the shape shown, Figs. 3, 4, and 6, and the contact-face of the block 25 is correspondingly shaped. It will be clear that if the cam 13 is moved to the right in Fig. 3 relatively to the block 25, so as to bring the thicker portion of the cam under the said block 25, the latter will be forced into the slot 26 and caused to expand the ring 9 and force the said ring into contact with the fixed part 8. If now the cam 13 be moved in the opposite direction relatively to the block 25, the block will be released from the slot 26, the pressure of said block or wedge will be removed from the ring 9, and the parts of the ring will be allowed to spring back into their normal position, freeing the ring from contact with the part 8 and releasing the brake. The wedge-shaped block 25 may be of any suitable angle, that is, the angle of divergence of the sides of the wedge which engage the correspondingly-inclined ends of the ring 9 is not material. Such angle should be, however, sufficient to prevent the wedge sticking when it is forced into the slot 26.

Any possibility of the sticking of the wedge may be obviated by the employment of a spring 27, which may be placed in the slot 26 between the end or edge of the wedge and the part 8. I have, however, not found such a spring necessary in practice.

Beginning with the mechanism at rest, the elevator being at the bottom of the well, to cause it to move upwardly the operator seizes the operating-rope which passes over the pulley 4 and causes the said pulley to rotate in the direction of the arrow shown thereon at Fig. 1. This causes the shaft 5 to rotate in the same direction, as also the dog 22, which is fast on said shaft. During the above movement the said dog is out of engagement with the collar 14, there being a space in the recess 23 at one side of the projection on the collar 14, as shown Fig. 1. During the above movement or partial revolution of the shaft 5, which occurs before the dog 22 engages the collar 23, the dog 19, which is fast on said shaft 5 and which at this time is in engagement at 35 with the collar 12, (see Fig. 1,) operates to turn the collar 12 with the shaft 5. The collar 12 carries rigidly connected therewith as integral parts thereof the pinion 10 and the expansible ring 9, so that before the dog 22 engages the collar 14 the dog 19 has moved the collar 12 and expansible ring 9 a sufficient distance to slide the wedge-block 25 relatively to the cam 13, removing the pressure of the cam from the said wedge-block and allowing the block to recede from the slot 26, thereby removing the pressure of the wedge 25 from the ring 9 and freeing the ring from the part 8 of the fixed housing. When this has been accomplished, the dog 22 has come into engagement with the collar 14, and the collar 14 then revolves in unison with the other parts, and the various parts above described are main-

tained in the same position relatively to each other, that is, with the pressure of the cam off of the wedge-block and the ring 9 free. The parts will continue to remain in this position while the elevator is being raised until the power which is raising it ceases to be applied. As soon as the said power ceases to be applied gravity will cause the elevator to descend. The descent of the elevator will cause the gear 11 (see Fig. 3) to move in the direction indicated by the arrow thereon. This will cause the pinion 10 to move in a reverse direction to that indicated by the arrow thereon. This movement of the pinion 10 causes the wedge-block 25 and split ring 9, with the latter of which the pinion 10 is connected, to move relatively to the cam 13, causing the said wedge-block to be slid onto the thicker part of said cam, so that the cam will operate to force the said block into the slot 26, expanding the ring 9 against the part 8 of the housing and stopping the mechanism. It will therefore be clear that a very slight downward movement of the elevator will operate the said brake.

In lowering the elevator the first movement of the operating-rope on the pulley 4, (the said rope being moved in the reverse direction from that in which it is moved when the load is to be hoisted,) will operate through the parts which have been previously described to shift the cam 13 relatively to the wedge-block 25 and expansible ring 9, permitting the block to recede in the slot 26 and the ring 9 to be freed from contact with the fixed part 8. At this point in the operation of the device the face 40 of the hub portion of the cam is in engagement with the face 41 of the hub portion of the expansible ring, thus causing the relation of the said cam and the said ring to remain fixed, the brake being off, as above described, while the elevator is being lowered.

The continued application of power to the operating-rope will cause the elevator to be lowered, the parts of the brake mechanism remaining in the free position. As soon as the operator ceases to exert power on the rope the weight of the elevator will cause the same change relatively in the position of the cam, wedge 25, and expansible ring 9 as was previously described, thus operating the brake and locking the mechanism. When the weight of the elevator operates, as just described, to shift the relation of the brake parts and apply the brake, it is desirable that the cam 13 or the collar 14, to which the said cam is secured, should not move as freely relatively to the fixed housing 7 as does the shaft 5 relatively to the said collar 14 and attached cam. The split construction of the said housing 7 is provided, in order that the said housing may be clamped or sprung slightly upon the exterior of the collar 14, and thus a slight retarding influence is exerted upon said collar.

What I claim is—

1. The combination in a brake mechanism with the shaft upon which said mechanism is mounted, a fixed housing in proximity to said shaft, and a yielding or expansible part intermediate said shaft and said housing and engaging the latter when the brake is set, of a cam intermediate said shaft and said yielding or expansible part for expanding the latter, substantially as described.

2. The combination with a shaft, of a brake mechanism therefor comprising a fixed part located in proximity thereto, a split ring mounted on said shaft and normally out of engagement with said fixed part, and means for expanding said split ring comprising a cam mounted on said shaft and movable therewith, means to oppose the rotation of said cam, and a block intermediate said split ring and said cam, whereby as the cam is moved relatively to said block the latter will be forced into the opening in said ring and will expand the same into engagement with said fixed part, substantially as set forth.

3. The combination with a shaft, of a brake mechanism therefor comprising a fixed part located in proximity thereto, a split ring mounted upon said shaft and adapted to engage with said fixed part, a dog on said shaft engaging the hub of said ring with lost motion to actuate the ring, a rotatable cam for expanding said ring, and a dog on said shaft engaging the hub of said cam with lost motion to actuate the cam, substantially as set forth.

4. The combination with the actuating-shaft and the operating-wheel for said shaft, of a rotatable cam, means to oppose the movement of the said cam, a fixed brake device, an expanding brake device rotating with said shaft and expanded by the action of the said cam, the lifting-wheel actuated from the said shaft, and devices to rotate the said expanding brake device and cam from the actuating-shaft with lost motion, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

STILLMAN M. FAY.

Witnesses:

WM. A. MACLEOD,

CHAS. F. RANDALL.