

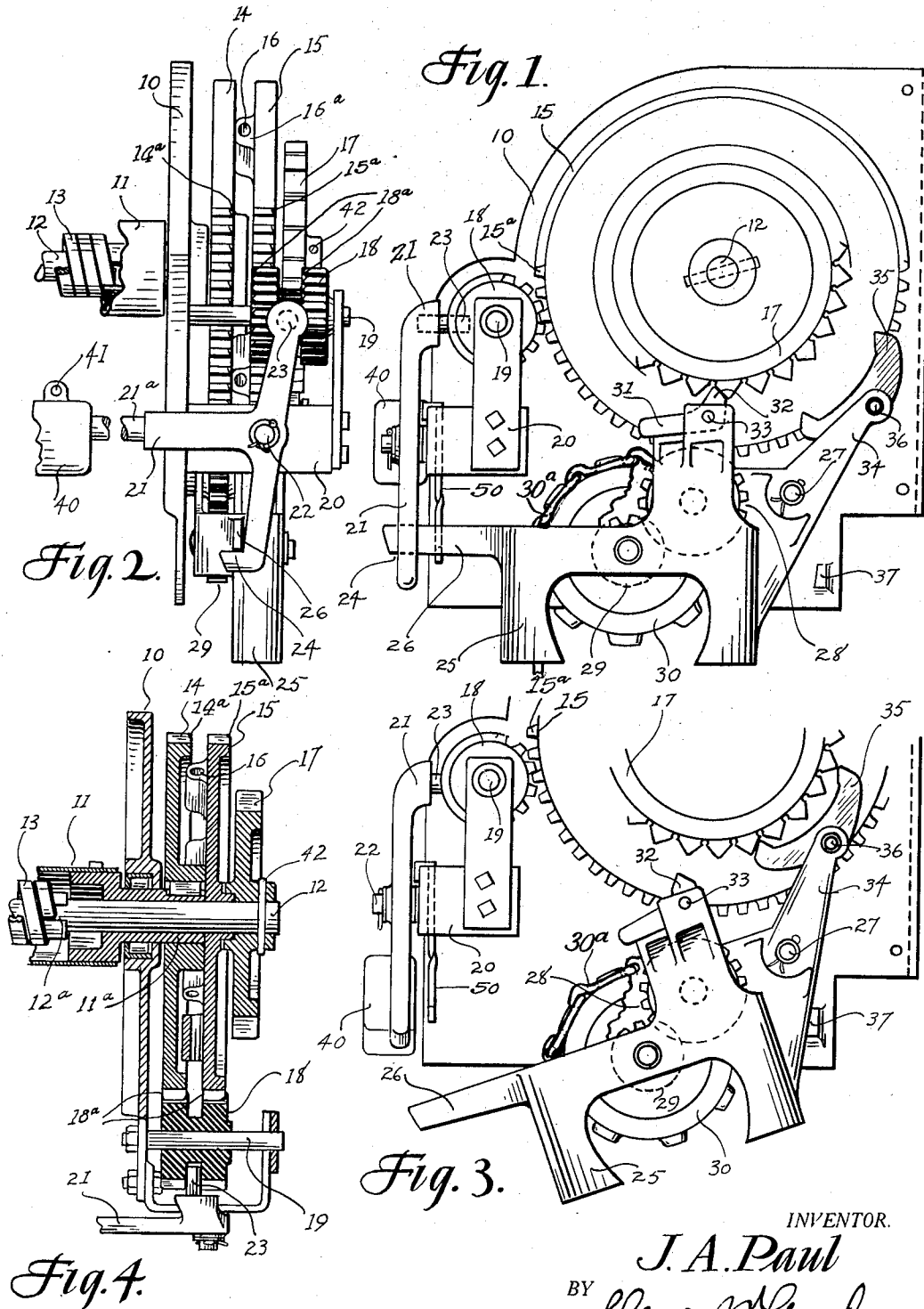
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AUTOMATIC FIRE DOOR

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AUTOMATIC FIRE DOOR

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This invention relates to an automatic fire door for use in buildings generally, and has to do particularly with a mechanism for closing a fire door of the roller curtain type.

from the drum a fire proof curtain (not shown). The drum 11 will usually have the curtain wrapped thereabout so as to unroll when the drum is rotated in a clockwise direction with reference from the right end of the drum, Figure 1.

Almost without exception fire doors of the roller curtain type are carried upon a drum or roller above the door opening which is to be closed in the event of fire in the building. Usually a coiled spring is used as a means for turning the curtain drum to unwind and lower the curtain. Various arrangements of gears and the like have been employed for coupling the drum to the spring so that the effort of the spring may be governed in a manner to provide for a retarded and uniform descent of the curtain.

The primary gear 14 is loosely keyed to the hub 11a of the barrel 11 to permit a slight rotational movement of the gear on said hub. A shaft 12 extends into the barrel 11 and through said hub. The shaft 12 is free to rotate within the bearing in the hub 11a and another bearing (not shown) further within the drum 11. To this shaft 12 a conventional escapement ratchet gear 17 is rigidly attached by means of a pin 42. A lug (not shown) on the hub of the gear 17 loosely meshes a like lug on the gear 15 so as to permit a limited rotational movement between the two gears.

Among the objects of the present invention is the provision of a fire door closing mechanism adapted to lower a curtain into an opening of any height.

A fire door closing mechanism requiring no added parts or additional adjustment when placed in a doorway requiring a greater or lesser curtain travel.

An improved and simplified escapement for controlling the closing movement of a fireproof curtain.

Improved means for coupling a spring to a drum to rotate the latter so that a fireproof curtain may be unwrapped therefrom.

These objects, and other desirable objects are obtained through the novel arrangement, unique combination and improved construction of the parts comprising the present device which is fully set forth in the following description when taken in connection with the accompanying single sheet of drawing hereby made a part of this specification and in which:

Figure 1 is an end view of the device taken in end elevation;

Figure 2 is a perspective view of the device taken from the above;

Figure 3 is an end view of the device illustrating the operating position; and

Figure 4 is a horizontal sectional view of the device.

Like reference characters are used to designate similar parts in the drawing and in the description of the invention hereinafter given.

Reference should be had first to Figures 1 and 2. A mounting bracket 10 is provided to support the curtain barrel or drum 11 and the primary operating gear 14 which, through the gears 28 and 29 in combination with a pull chain gear 30 having a chain 30a thereon, is caused to revolve (by manual movement) to either roll or unroll

One end of a torsional motive spring 13 is attached to the shaft 12 at 12a and thus is connected indirectly to the gears 17 and 15. The opposite end of the spring 13 and which is not shown may be fixedly anchored to an immovable shaft or rod which extends inwardly of the drum 11 from the end opposite to that shown. Holes 16 are provided in bosses 16a projecting from the gear 15 for the insertion of a lever so that the gear and the shaft 12 may be turned thereby to adjust the tension of the spring 13. The spring 13 urges the shaft 12 and the gears 15 and 17 thereon to rotate in a clockwise direction as viewed from the right end of the shaft 12. Hereinafter in this description the direction of rotation of the various gears, shaft and drum will be with reference from such right end unless expressly stated otherwise.

A double gear 18 is slidably mounted on a stationary shaft 19 and in the position shown in Figure 2 only the left gear element is meshed, the connection being with the gear 15. The shaft 19 is supported by a bracket 20 which is rigidly attached to the mounting bracket 10 in any standard manner. To this bracket 20 is pivoted at 22 a lever member 21 having three congruent legs. The upwardly projecting leg of the lever 21, by means of a pin 23 between the two elements of the double gear 18, may slide the gear 18 along the shaft 19. A counter clockwise movement of the lever 21, Figure 2, will through the agency of the pin 23 carry the gear 18 into common mesh with the two gears 14 and 15 so that rotation of the latter will cause a like rotation of the former. One arm of the lever member 21 has a hooked end 24 which engages the arm 28 to support the chain hoist gear housing 25 to keep the gear 28 meshed with the primary gear 14.

Supported at the end of a horizontally arranged rod 21a is a weight 40 which is provided with an eye 41. The weight 40 is engaged by a cord or wire (not shown) that has an end passed through the eye 41. By means of the said cord or wire the weight 40 is supported at an elevation substantially equal to the pin 22 whereby the leg of the lever 21 to which the weight 40 is attached may be maintained in a horizontal position. If it were not for the means supporting the weight 40, it would drop to pivot the lever 21 in a counter-clockwise direction, Figure 2. A section of the said cord or wire having an end engaged to the eye 41 for supporting the weight 40, is replaced by one or more fusible links. The links are of an alloy metal of low melting temperature which has long since been the subject matter of commercial use.

The housing is pivoted at 27 and is capable of dropping to the position shown in Figure 3. An arm 34 projecting from the housing 25 carries an escapement lever 35. A conventional pawl 31 is pivotally connected to the housing 25 by means of a pin 33 and has a projection 32 for engaging the ratchet gear 17 to prevent the uncoiling of the spring 13.

In order to set the device so that it will operate in case a high temperature is reached within a building, such as would be caused by a fire, the housing 25 is pivoted in the position shown in Figure 1. The housing is locked in this position by rotating the lever 21 in a clockwise direction, Figure 2, to place the hook 24 beneath the arm 26 and supporting the weight 40 by means of the cord or wire containing the fusible link heretofore described. When in this position, the lever 21 displaces the double gear 18 to the position shown in Figure 2 so that the gear 14 which is connected to the hub 11a will be free to rotate the drum 11. Gear 28, when the housing 25 is rotated in its most clockwise direction, is meshed with the gear 14 so that the curtain (not shown) may be rolled upon the drum 11 by manipulating the chain 30a which may hang over the sprocket wheel 30 in the conventional manner.

When a sufficiently high temperature is reached within the building the fusible link above mentioned will melt to allow the weight 40 to drop thereby pivoting the lever 21 to carry the double gear 18 into common mesh with the gears 14 and 15. Simultaneously, the lock 24 will release the arm 26 so that the housing 25 may drop down into the position shown in Figure 3. When the housing 25 is dropped to this position the pawl 32 is carried away from the ratchet wheel 17 so that the latter will be free to turn under the impetus of the spring 13. If it were not for the lever escapement 35 which is pivoted at 36 upon the lever 34, the spring 13 would cause the shaft 12 and the escapement wheel 17 to rotate rapidly in a clockwise direction. The speed of rotation of the shaft 12 and the ratchet wheel 17 is, however, governed by the ratchet lever 35 as is the speed of the gear 15 which is caused to rotate with the ratchet wheel 17 by means of lugs hereinabove mentioned.

When the housing 25 drops down, the lug 37 stops the turning movement thereof about the pivot 27 and with the extended end of the arm 34 a selected distance from the ratchet wheel 17 so that the points of the lever 35 will not be jammed within the cogs of the escapement wheel to frustrate the escapement operation.

The drum 11 is ordinarily free to rotate in-

dependently of the shaft 12. When, however, the gear 18 bridges the two gears 14 and 15, the drum 11 will be caused to rotate with the shaft 12. From the foregoing it is deduced that when the lever 21 is rotated by the weight 40 to release the housing 25, the shaft 12 and the drum 11 are caused to rotate by the urge of the spring 13 to unroll the fireproof curtain (not shown) from the drum 11 at a uniform rate of speed.

Gears 14 and 15 are mounted in the manner providing for a limited rotative movement above the members upon which they are carried to facilitate the common meshing of the gear 18 therewith. To further assist the meshing of the teeth upon the gear 18 with those upon the gears 14 and 15, the end of the teeth may be beveled as shown at 14a, 15a and 18a, Figure 1.

When it is again desired to set the device for operation, the housing 25 may be replaced to the position shown in Figure 1, and the curtain rolled upon the drum 11 by turning the chain gear 30. Thereafter, the shaft 12 is rotated in a counter-clockwise direction by inserting an instrument into the apertures 16 in the gear 15 to obtain leverage for rotating the gear and the shaft 12 against the urge of the spring 13. Each time that the gear 15 is rotated by the instrument, the pawl 32 holds the shaft 12 to the mount rotated and against the urge of the spring 13 by engaging the teeth on the ratchet wheel 17. Thus the pawl 32 provides that the shaft 12 may be turned intermittently so that when further turning of the gear 17 by the instrument is prevented by the instrument striking the wall or the like, the instrument may be withdrawn and a new engagement had with the gear 15 by means of a succeeding aperture 16.

An alternate, and the preferred method of resetting the device for unrolling the curtain incident to the occurrence of such temperature within the room, is accomplished by using a hook member 50. After the drum 11 and the spring 13 have been unwound the housing 25 is replaced to the position shown in Figure 1, but the lever 21 is left in the position as retained by the weight 40, and to hold the compound gear 18 in the position to the left, Figure 2, and in mesh with the two gears 14 and 15. At this time the gear 28 will be in mesh with the gear 14 so that when the chain hanging over the gear 30 is operated the gear 14 upon turning will turn the gear 15 therewith through the agency of the compound gear 18. Thus the shaft 12 and the drum 11 are turned concurrently against the urging of the spring 13 until the curtain is raised. After the curtain is rolled into the elevated position, the hook member 50 is removed and the arm 26 is held in the horizontal position by engaging it with the hook 24 at the bottom of the lever 21. This method of re-setting the device turns the shaft 12 and contorts the spring 13 the proper amount for unrolling the curtain upon a future occasion.

What is claimed as new and is desired to be secured by Letters Patent of the United States is:

1. In combination with a fire door including a drum and a curtain upon said drum, a door closing mechanism comprising a shaft coincident with the axis of said drum and adapted to rotate therein, a spring anchored independently of said drum urging said shaft to rotate, a gear upon said drum, a gear upon said shaft and juxtaposed to the first named gear, and means for connecting said gears to rotate under the urge of said spring and at the same speed.

2. The combination with a fire door including a drum and a curtain upon said drum of a door closing mechanism comprising a shaft journaled in said drum, a spring anchored independently of said drum urging said shaft to rotate, a gear upon said shaft to rotate therewith, a gear upon said drum in juxtaposition to the first named gear, and a third gear for coupling the first two gears for rotation under the urge of said spring and at the same speed. 80
3. The combination with a fire door including a drum and a curtain upon said drum of a door closing mechanism comprising a rotatable shaft disposed within said drum coincident with the rotating axis thereof, a gear on said shaft to rotate therewith, removable means preventing rotation of said gear and said shaft, a spring urging rotation of said shaft, a gear on said drum adjacent to the first mentioned gear, a movable support for said means preventing rotation of said shaft, a gear movable into common engagement with the first two gears, a lever for moving said third gear into engagement with said first and second named gears, means on said lever for releasing the movable support and the means preventing rotation of said shaft concurrently with the moving of said third gear into co-engagement with the first two gears. 90
4. The combination with a fire door including a drum and a curtain upon said drum of a door closing mechanism comprising a rotatable shaft, a gear on said shaft for rotating therewith, a spring urging the rotation of said shaft, means for locking said shaft against rotation, a movable body in support of said locking means and adapted to carry said locking means to an ineffective position when released, an escapement wheel fixed upon said shaft, an escapement lever upon said movable body for engaging said escapement wheel when said body is released, a gear for rotating said drum and positioned next to the first mentioned gear, a third gear adapted to be moved into co-engagement with said first and second named gears so that the first named gear may drive the one last named, a lever for moving said third named gear into such co-engagement, and means on said lever for releasing said movable member substantially concurrently with the movement of the third named gear. 95
5. The combination with a fire-proof door comprising a drum and a fireproof curtain upon said drum of an automatic door closing mechanism comprising a bracket for journalling an end of said drum, a gear connected to said drum for rotating the drum in said journal, a shaft journaled in said drum to project therefrom and beyond said bracket, a torsional spring urging said shaft to rotate, a gear attached to said shaft to rotate therewith and being placed adjacent to the first named gear, an escapement wheel fixed to said shaft, a body pivotally supported upon said bracket, means on said pivotal body for locking said escapement wheel against rotation and being made ineffective incident to a release of said pivotal body, an escapement lever on said pivotal body and adapted to engage said escapement wheel incident to the release of said pivotal member, a third gear movable into co-engagement with the first and second named gears as a coupling whereby the second named gear may drive the gear first named, a lever having means for moving the third gear into said co-engagement and means for releasing said pivotal body pursuant to a movement thereof, means urging the movement of said lever and means rendered ineffective at a predetermined ambient temperature for counteracting the means urging the movement of said lever. 100 105 110
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