T. E. COLLINS

AUTOMATIC FIRE SHUTTER.

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1,290,514.

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Fig. 2

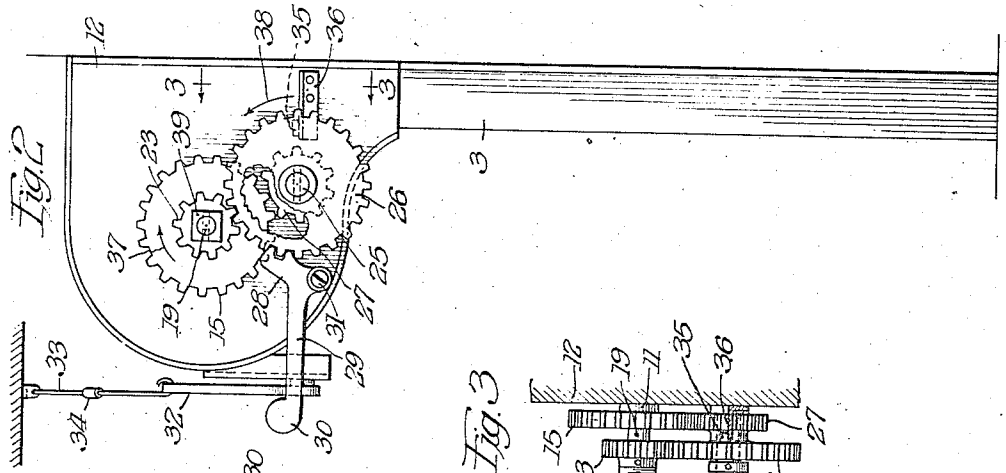
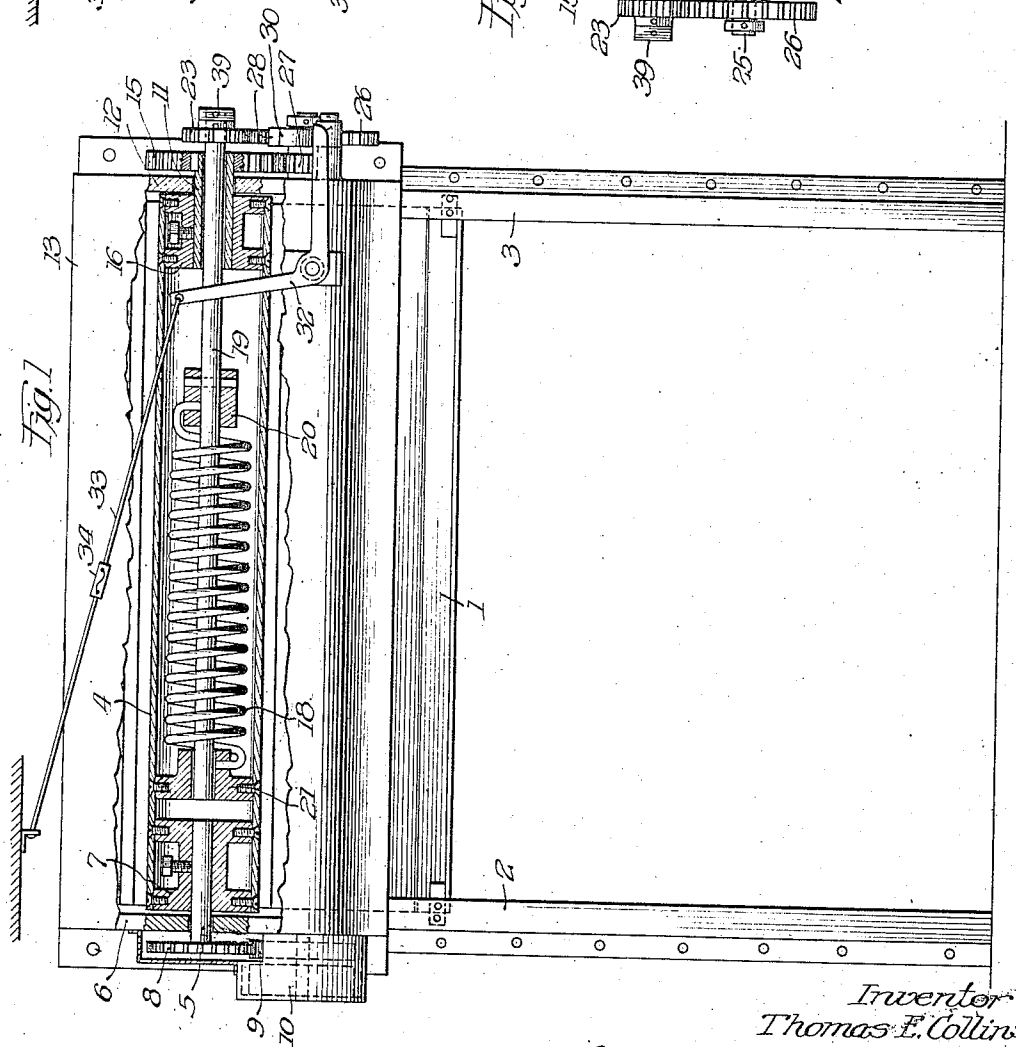


Fig. 3

Fig. 1



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UNITED STATES PATENT OFFICE.

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AUTOMATIC FIRE-SHUTTER.

1,290,514. Specification of Letters Patent. Patented Jan. 7, 1919.

Application filed October 5, 1917. Serial No. 194,862.

To all whom it may concern:

Be it known that I, THOMAS E. COLLINS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Automatic Fire-Shutters, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to automatic fire shutters.

One main difficulty with automatic fire shutters which has been experienced by users is the liability of the shutters to stick after long periods of inaction and to fail to start when they should automatically close. Most automatic fire shutters are provided with devices for restraining the shutter from falling when the same is in the normal set position and the rusting of the shutter or the application of paint makes the shutter so stiff that when the automatic release operates very often the shutter fails to descend. Various schemes have heretofore been proposed for connecting a weight to the shutter to cause the same to descend. Counterbalances have been applied to the curtain in such a manner that when the automatic release operates the counterbalance becomes ineffective and numerous other schemes have been proposed and employed.

According to my invention I employ a counterbalancing means for counterbalancing the shutter in all of its various positions and provide further means released by the automatic releasing device for causing this counterbalancing means to become effective in the opposite direction, namely in such a direction as to force the curtain down. This may be accomplished by weights or by springs, pneumatic or hydraulic devices or the like. In the preferred embodiment of my invention I employ a spring for normally counterbalancing the shutter and means released by the automatic device for causing this spring to force the shutter down for a part of the way. It is apparent that the spring might operate dnring the entire drop of the curtain or as much of the same as desired.

In order to acquaint those skilled in the art with a particular manner of constructing and using my invention, I shall now describe the preferred embodiment of the same in connection with the accompanying drawings.

Figure 1 represents in elevation and partly in section a front view of the device of my invention;

Fig. 2 is a right side elevation of the same; and

Fig. 3 is an elevation of the gearing and stop taken on the line 3, 3, of Fig. 2.

The curtain 1 comprises a plurality of metal slats or the like connected together so as to form a flexible curtain as is well understood by those skilled in the art. The side edges of the curtain 1 are adapted to be guided in ways 2 and 3 upon each side of the doorway to be controlled by the shutter. The curtain 1 in the normal raised position is rolled upon a drum 4. The left-hand end of the drum 4, as seen in Fig. 1, is journaled upon the stud-shaft 5 in a bearing plate 6. The stud-shaft 5 is connected to the drum 4 through a pillar block or spool 7. Upon the outer end of the shaft 5 is mounted a gear 8 which meshes with a pinion 9 for driving the centrifugal governor 10 which controls the speed of descent of the curtain 1. The right hand end of the drum 4 is journaled on a sleeve 11 having a suitable bearing in the end plate 12. The end plates or bearing plates 6 and 12 form the heads of a cylindrical shell or casing 13 which covers the shutter and protects it from the weather and interference by outside agencies. A large gear 15 is keyed upon the outer end of the sleeve 11 outside of the bearing plate 12. The sleeve 11 is connected to the drum 4 by means of the filler block 16. A strong counterbalancing spring 18 which is normally under tension has one end connected to a central shaft 19 by means of the collar 20 and the other end connected to a filler block 21 which is connected to the drum 4. The left hand end of the shaft 19, as seen in Fig. 1, has a bearing in the filler block 21 so that this shaft is rotatable with respect to said block. The block 20 is pinned to the shaft 19.

Upon the outer end of the shaft 20 a pinion 23 is fastened. A short countershaft 25 is mounted upon the end plate 12 in a position parallel with the shaft 19 on the axis of the drum 4. A large gear 26 which has integral therewith a pinion 27 is mounted upon the countershaft 25, these gears

serving as back gears between the pinion 23 and the large gear 15. The back pinion 27 is mutilated by the removal of several teeth so that when the parts are in the position shown in Figs. 1, 2 and 3, this pinion 27 does not mesh with the gear 15. The pinion 23 is at all times in mesh with the back gear 26.

The back gear 26 is normally held against rotation by the stop arm 28 of the lever 29. The lever 29 carries a weight 30 at its outer end and the entire lever is pivoted about the pin 31 so that when the lever 29 is released the stop arm 28 will disengage the gear 26 and permit it to revolve. The lever 29 is normally held in the raised position by a bell crank 32 which in turn is held by a cable 33 having one or more fusible links or fusible portions 34 as is well understood by those skilled in the art.

In order to prevent too great release of the spring tension the back gear 26 is provided with a stop 35 which normally lies above the bracket 36, this bracket being formed of a piece of angle iron fastened to the head 12 and forming a suitable abutment for the stop 35.

The operation of the device is as follows: Assuming that the parts are in the position shown in the figures, the curtain 1 may be raised and lowered by hand with ease. The centrifugal brake 10 is of the type which does not apply the brake shoes until an excessive speed is attained, this speed being such that it is normally unattained by manual raising and lowering of the curtain. In case of dangerous rise of temperature in the vicinity of the device the fusible section 34 releases the bell crank 32 and the weight 30 on the lever 29 drops, disengaging the stop arm 28 from the back gear 26. The tension of the spring 18 immediately acts through the pinion 23 upon the gear 26 and the gear 26 being integral with the back pinion 27 causes the same to advance and mesh with the teeth of the gear 15 which is connected to the drum 4. The direction of rotation of the pinion 23 is in the direction shown by the arrow 37 in Fig. 2. This causes the back gear 26 and the back pinion 27 to revolve in the direction indicated by the arrow 38 of Fig. 2. The result is a movement of the drum in the direction indicated by the arrow 37 such as to unwind the curtain 1 from the drum. The stop 35 and the bracket 36 prevent excessive release of the spring tension because after the curtain is once started down it will continue by its own weight since the spring tension 18 has been decreased. The stop 35 engages the lower side of the bracket 36 so that the wheel 26 makes substantially a complete revolution. When the back gear 26 stops with the stop 35 on the lower side of the bracket 36 the mutilated portion of the pinion 27 is again presented to the gear 15 so that the curtain is free to descend but further movement of the pinion 23 and the back gear 26 is prevented.

I construct the gears 23 and 27 of about the same size and the gears 15 and 26 of about the same size, the pinions being of about half the diameter of the gears. Consequently the pinion 23 makes two revolutions releasing two turns of the spring 18 in starting the curtain 1 downward.

In resetting the device the curtain 1 is rolled up and a wrench or other suitable device is applied to the squared end 39 of the pinion 23 to restore the spring tension and to rotate the gear 26 back into the position shown in Fig. 2. The stop arm 28 is then put in place and the bell crank 32 connected by the cable 33.

If the stop and abutment 35, 36 were not provided the spring would expend all of its energy in forcing the curtain down.

I do not intend to be limited to the details of construction shown and described as the invention may appear in other form.

I claim:

1. In combination, a drum, a curtain wound on the drum, balancing means applied to the drum and normally balancing the curtain, and means operable to reverse the application of the balancing means and apply the power of same to force the curtain down.

2. In combination, a drum, a curtain on the drum, a spring normally balancing the curtain in raised, intermediate or lowered position, clutch means interposed between the spring and drum and adapted normally to apply the force of the spring to balance the curtain, and means for reversing the action of the clutch to cause the spring to force the curtain down.

3. In combination, a shaft, a movable door member, a spring, means connecting the spring between the door member and the shaft and normally operating to cause the spring to balance the door member, and means for reversing the operation of the connecting means to cause the spring to force the door down.

4. In combination, a shaft, a movable door member, a spring, means connecting the spring between the door member and the shaft and normally operable to cause the spring to counter-balance the door member, and means for reversing the action of the connecting means to cause the spring to release a part of its tension and to give the door member a downward impulse.

5. In combination, a shaft, a movable door member, a spring normally under tension, means connecting the spring between the door member and the shaft and normally operating to cause the spring to counterbalance the door member, and means for re-

versing the normal action of the connecting means to cause the spring to force the movable door member down a limited distance and to release a predetermined part of the tension of the spring.

3. In combination, a drum, a curtain on the drum, a spring connected at one end to the drum, connecting means interposed between the opposite end of the spring and the drum, and normally operating to cause the spring to balance the curtain, and means for reversing the action of said connecting means to cause the spring to force the curtain down.

7. In combination, a shaft, a drum, a curtain, a counterbalancing spring connected between the drum and the shaft, differential gears between the drum and the shaft, said gears being normally disconnected and means to connect the gears to cause the spring to force the curtain downward.

8. In combination, a shaft, a drum, a curtain, a counterbalancing spring connected between the drum and the shaft, differential gears between the drum and the shaft, said gears being normally disconnected, one of the gears being normally locked against motion, thermal releasing means for releasing said locked gears and for causing the gears to engage.

9. In combination, a shaft, a drum, a curtain, a counterbalancing spring connected, between the drum and the shaft, differential gears arranged between the drum and shaft, one of said gears being locked, thermally controlled means for releasing said gears.

10. In combination, a shaft, a drum, a curtain, a counterbalancing spring connected, between the drum and the shaft, a large gear connected to the drum, a pinion connected to the shaft, a back gear shaft, a large back gear thereon meshing with said pinion, and a back pinion rigid with said large back gear and adapted to mesh with the large gear on the drum and thermal controlling means for said gears.

11. In combination, a shaft, a drum, a curtain, a counterbalancing spring connected, between the drum and the shaft, a large gear connected to the drum, a pinion connected to the shaft, a back gear shaft, a large back gear thereon, meshing with said pinion, and having a back pinion rigid therewith and adapted to mesh with the large gear on the drum and thermally controlled stop means for said gears, said back gear pinion being mutilated.

12. In combination, a shaft, a drum, a curtain connected to the drum, a counterbalancing spring connected between the drum and the shaft, a gear connected to the drum, a pinion connected to the shaft, a back gear shaft having a back gear and a back pinion, the back gear meshing with said pinion on the shaft, and the back pinion adapted to mesh with the gear for the drum, a stop on one of the gears and a coöperating abutment for engaging said stop.

13. In combination, a shaft, a drum, a curtain for the drum, a spring connected between the shaft and the drum, a sleeve connected to the drum, said sleeve forming a bearing for the shaft, a bearing bracket for said sleeve, a large gear on the sleeve, a pinion on the shaft, a back gear shaft parallel with said shaft, a back gear normally meshing with said pinion, a mutilated pinion rigidly connected to the back gear, means for normally holding the back gear against motion, and thermally controlled means for releasing said holding means.

14. In combination, a shaft, a drum, a curtain for the drum, a spring connected between the shaft and the drum, a sleeve connected to the drum, said sleeve forming a bearing for the shaft, a bearing bracket for said sleeve, a large gear on the sleeve, a pinion on the shaft, a back gear shaft parallel with said shaft, a back gear normally meshing with said pinion, a mutilated pinion rigidly connected to the back gear, means for normally holding the back gear against motion, and thermally controlled means for releasing said holding means, a stop on said back gear and an abutment for engaging said stop.

In witness whereof, I hereunto subscribe my name this first day of October, A. D. 1917.

THOMAS E. COLLINS.