May 15, 1934. A. R. HARMON 1,958,663

TIME CONTROLLED APPARATUS

Filed July 22, 1931 3 Sheets-Sheet 1

Fig. 1.

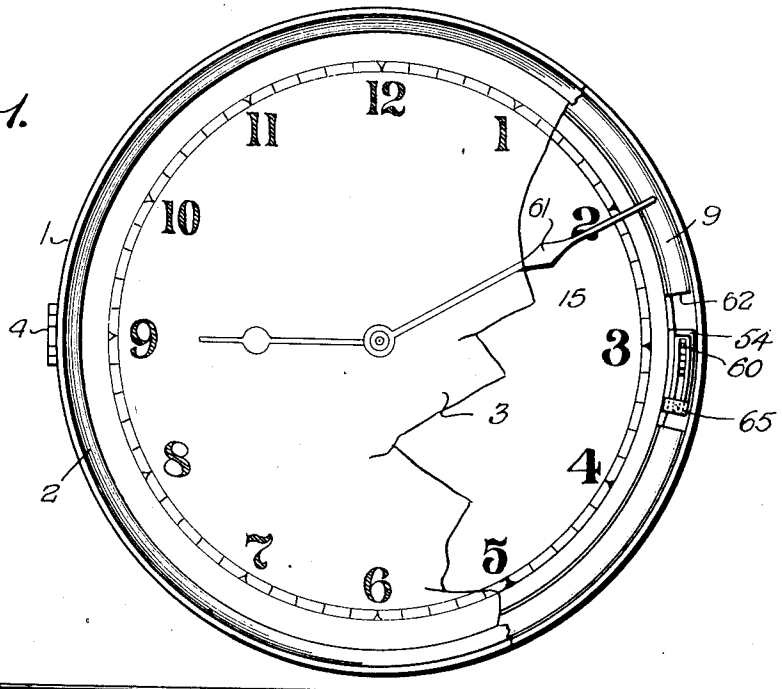
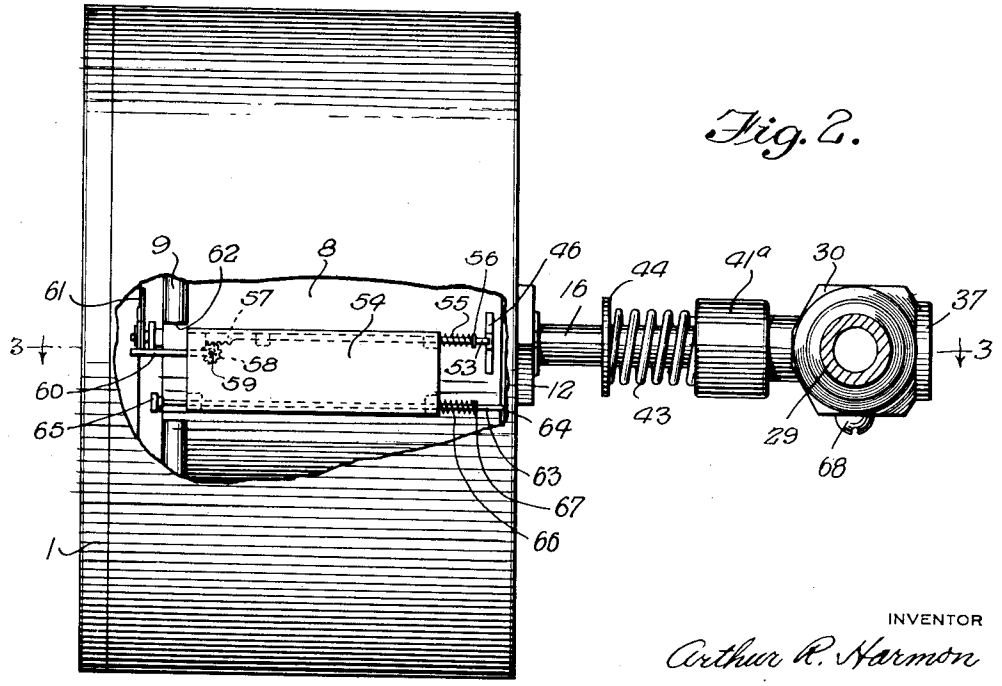


Fig. 2.



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TIME CONTROLLED APPARATUS

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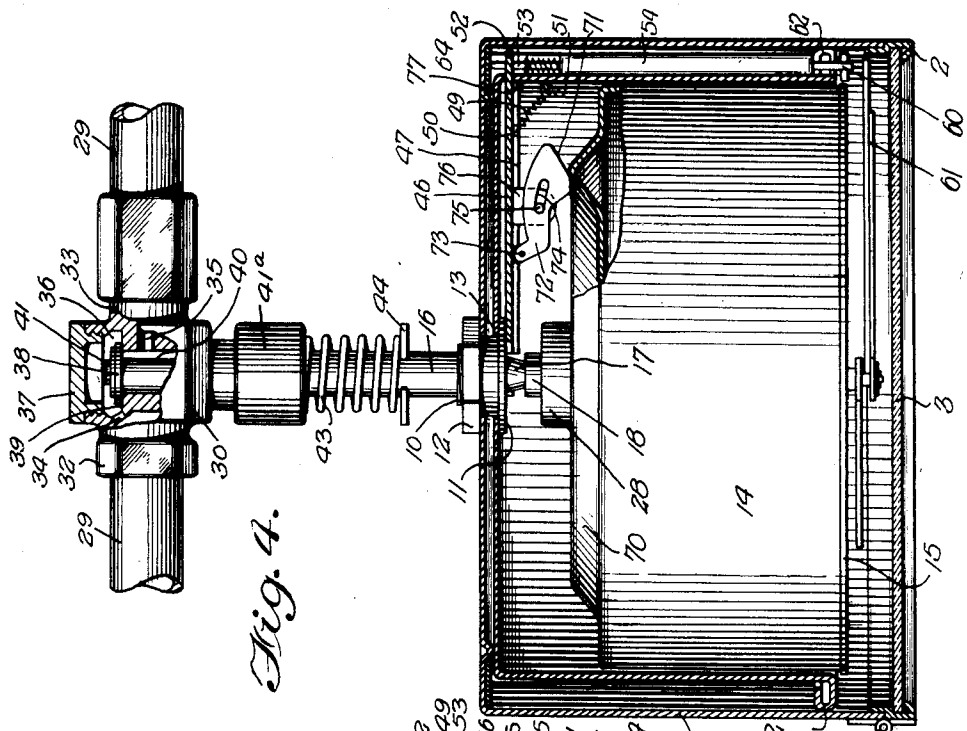

Fig. 4.

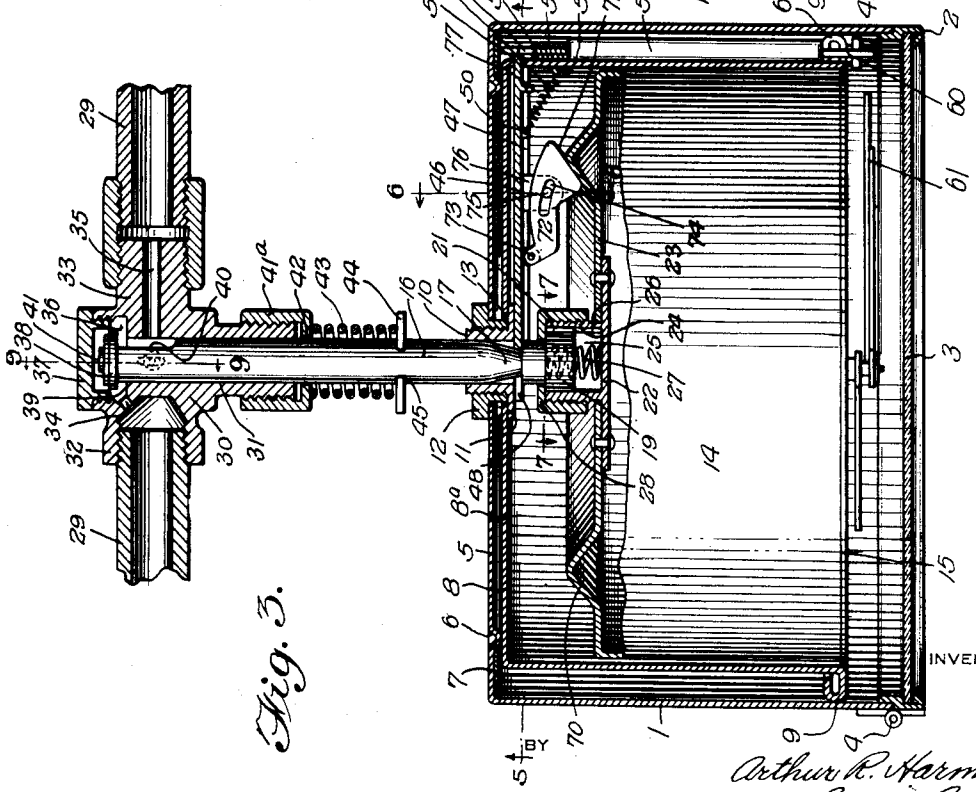

Fig. 3.

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TIME CONTROLLED APPARATUS

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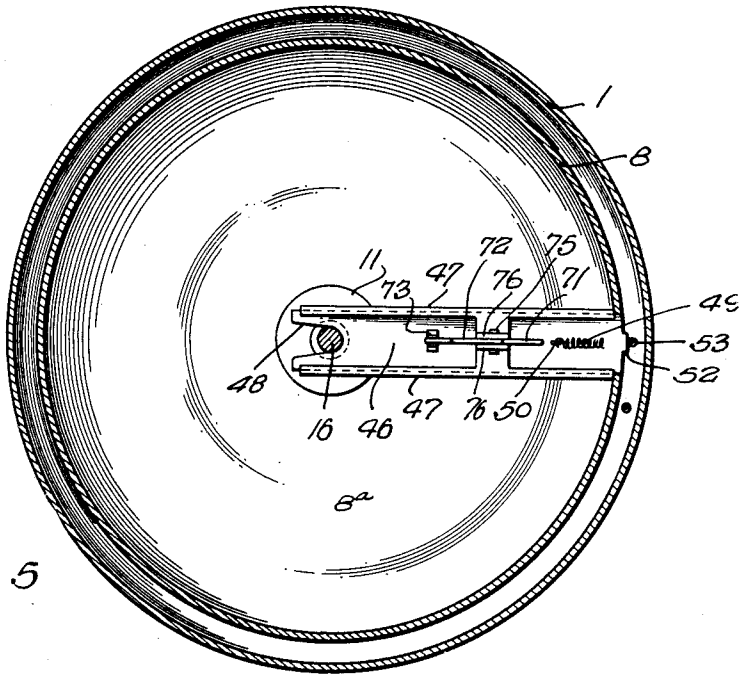

Fig. 5

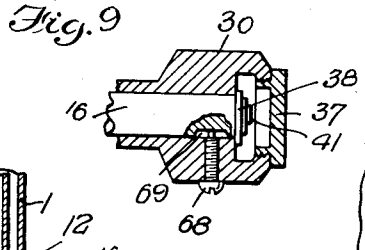

Fig. 9

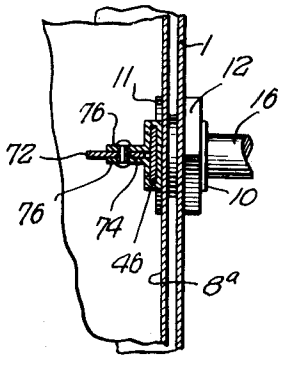

Fig. 6.

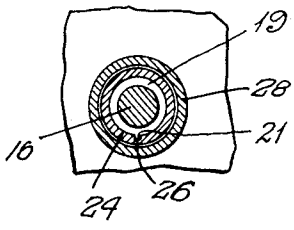

Fig. 7.

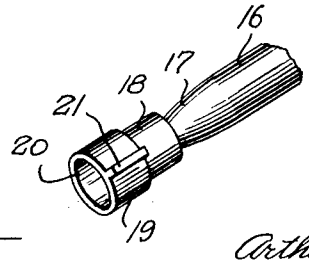

Fig. 8.

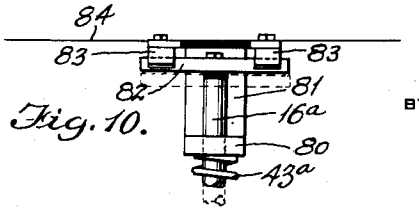

Fig. 10.

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Patented May 15, 1934

1,958,663

UNITED STATES PATENT OFFICE

1,958,663

TIME-CONTROLLED APPARATUS

Arthur R. Harmon, La Grange, Ill., assignor of one-third to Herbert L. Munson, Chicago, Ill., and one-third to Victor E. Carlson, La Grange, Ill.

Application July 22, 1931, Serial No. 552,505

11 Claims. (Cl. 161—7)

The invention relates to time-controlled apparatus for closing valves and the like and has for its objects to provide certain new and useful improvements in devices of this character.

The invention is of particular utility in the automatic control of fuel or current to gas or electric stoves and ovens, or may be employed to equal advantage for other purposes where it is desired to open or close a valve at a predetermined time.

An important object of the invention is to provide a time-control or clock actuated valve or switch which is positive in its action and which is so designed as to insure its instant operation when desired.

A further object of the invention is to provide devices or apparatus of the character described which may be conveniently set and reset before and after operation, for example by the housewife, to obtain a subsequent operation of the apparatus at a predetermined time.

With such objects in view as well as other advantages which may be incident to the use of the improvements, the invention consists in the parts and combinations thereof hereinafter set forth and claimed, with the understanding that the several necessary elements constituting the same may be varied in proportions and arrangement without departing from the nature and scope of the invention.

In order to make the invention more clearly understood there are shown in the accompanying drawings means for carrying the same into practical effect, without limiting the improvements, in their useful applications, to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

In the said drawings:

Fig. 1 is a front elevation of a time-controlled apparatus embodying the invention.

Fig. 2 is a side elevation of the same, (looking from the right hand side of Fig. 1), a portion of the outer casing being broken away.

Fig. 3 is a horizontal section on line 3—3 of Fig. 2, showing the time-controlled valve in open position.

Fig. 4 is a similar view showing the valve in closed position.

Fig. 5 is a vertical section on line 5—5 of Fig. 3.

Fig. 6 is a detail vertical sectional view on line 6—6 of Fig. 3.

Fig. 7 is a similar view on line 7—7 of Fig. 3.

Fig. 8 is a detail perspective view of the outer end of the reciprocating valve stem.

Fig. 9 is a detail vertical section on line 9—9 of Fig. 3.

Fig. 10 is a detail view showing a modification of the invention designed to control an electric switch in a heating or lighting circuit instead of a valve.

Referring to the drawings, 1 indicates a cup-shaped stationary outer casing member which is suitably fixed in position in a panel or other desired portion of a gas or electric range (not shown) and preferably relative to the gas or electric flow line for supplying fuel to the stove burner. The casing 1 is provided with a cover or closure 2 having a transparent wall 3 and hinged at 4 to the outer stationary casing. The rear wall 5 of the outer casing is or may be provided with an annular inwardly projecting ridge or shoulder 6 to provide a peripheral channel for the reception of an annular gasket member 7 preferably of soft or yieldable material such as felt or the like.

As intermediate rotary adjustable casing member 8 is contained within the outer casing or housing 1 and is adapted to be rotated relative to and within the latter for the purpose of setting the time-controlled mechanism as hereinafter described. The intermediate casing member 8 is also of cup-shaped formation and is provided with an annular shoulder or bead 9 to properly space the same within and relative to the stationary casing 1.

A centrally apertured bushing member 10 having an inner peripheral flange 11 projects rearwardly through a central aperture in the rear wall 8a of the intermediate housing 8 and has threaded engagement with an internally threaded outer bushing member or nut 12 projecting through a similarly disposed coincident aperture in the rear wall 5 of the stationary casing or housing 1. In this manner the outer and intermediate casing members are assembled relative to each other and held against axial displacement by the opposed flanges of the inner and outer threaded bushing members 10 and 12 respectively. A slight clearance is provided in the aperture 13 of the intermediate casing to permit the same to be rotated relative to the outer stationary casing 1, the latter as previously stated being suitably fixed in position against movement on a panel or other appropriate frame portion of the gas or electric range.

An inner casing member 14 is suitably housed within the intermediate casing 8 and is adapted for the reception of a clock, such as an ordinary alarm clock generally indicated at 15 (Fig. 1) and

which is adapted to nest snugly within and secured to the inner cup-shaped clock casing member 14. The casing 14 and clock 15 carried thereby are held against rotary movement but are designed to be moved inwardly and outwardly relative to the intermediate casing member 8 and outer stationary casing 1.

A reciprocating non-rotary valve stem is indicated at 16 and its outer end is provided with a reduced or necked-in portion 17 terminating in an enlarged portion 18 and a still further enlarged head portion 19. The latter is provided with a cup-shaped recess or depression 20 and an integral side rib or key 21 (Fig. 8). A cup-shaped member 22 is suitably secured to the rear wall 23 of the clock casing 14 and has an externally threaded hub 24 provided with a central chamber 25. The latter is further provided with a key-way or depression 26 designed to receive the rib or key 21 on the enlarged head 19 of the outer end of the valve stem when the latter is assembled, as shown in Fig. 3. The engagement of the key 21 with the key-way 26 locks the clock casing 14 and clock 15 against rotary movement relative to the valve stem 16. A coil spring 27 is normally maintained under compression within the chamber 25 and bears at its outer end against the bottom of said chamber. The inner end of the coil spring is housed within the depression or chamber 20 of the enlarged head 19 of the valve stem. An outer centrally apertured nut or bushing has threaded engagement with the hub 24 of the cup-shaped member 22 to hold the parts in adjusted position, the flange 28 of the nut permitting relative movement of the enlarged portion 18 of the valve stem but preventing the removal of the still further enlarged portion 19 from the internal chamber 25 of the cup-shaped member 22.

The gas flow line is indicated at 29 and consists of a stationary pipe line disposed in back of the range and in the rear of the clock and its associated casing members. A valve housing 30 is interposed in the flow line and includes a central channel bore 31 in which the valve stem 16 is slidably mounted. The valve housing further comprises opposite threaded extensions 32 and 33 having gas passages 34 and 35 respectively and a central chamber 36 closed by a screw-threaded cap or closure 37. The valve is shown at 38 and is adapted to move axially or longitudinally of the valve stem relative to the valve seat 39. The valve stem is further cut away as indicated at 40 to provide a channel communicating between the chamber 36 and the port 35. The valve 38 is suitably packed and removably secured in position on the inner end of the valve stem 16 by means of a screw or pin 41. At its outer end the valve stem 16 is held against rotation but permitted to reciprocate longitudinally by means of a set screw 68 on one side of the valve housing 30, the inner end of said set screw being adapted to engage an elongated slot or recess 69 on the inner end of the valve stem adjacent and below the valve 38.

A centrally apertured internally threaded screw cap member 41*a* has threaded engagement with the outer end of the valve housing 30, the central aperture 42 permitting sufficient clearance for the valve stem 16 to reciprocate relative to the valve housing to seat and unseat the valve 38. A coil spring 43 is held under compression and bears at its inner end against the cap member 41*a* and at its outer end against a removable or adjustable split washer or abutment 44 engaging opposite recesses 45 in the valve stem. The tendency of the spring 43 is to force the valve stem 16 outwardly to close the valve 38 and shut off the supply of fuel in the flow line 29.

A latch member 46 is suitably mounted within side guide members 47 secured to the inner wall of the intermediate cup-shaped housing 8, said latch member being cut away at its inner end as at 48 to form a recess designed to engage the reduced or necked-in portion 17 of the valve stem 16 (Fig. 3) and in this position the engagement of the latch with the valve stem holds the latter against being forced outwardly (or downwardly as viewed in Fig. 3) to close the valve. The latch 46 is normally urged radially outwardly of the housing 8 away from the valve stem, by a coil spring 49 having one end secured at 50 to the latch member and its other end attached at 51 to the side wall of the housing 8. The outer end 52 of the latch projects through an opening in the side wall of the housing 8 and is urged by the spring 49 against the inner end of a spring pressed detent 53. The latter is suitably housed within a guide or casing 54 secured to the outer wall of the intermediate casing 8 and is normally urged in the path of the latch 46 by means of a compression coil spring 55 bearing at one end against the housing 54 and at its other end against a stop 56 on the detent shaft. The opposite or outer end of the detent rod or shaft 53 is provided with rack teeth 57 meshing with the teeth of a pinion 58 pivotally mounted at 59 to the housing 50 (Fig. 2). A rocking lever 60 is integrally or rigidly secured to the pinion 58 and projects outwardly from the housing 50 into the path of the minute hand 61 of the clock 15. From the construction and arrangement just described it will be observed that the engagement of the minute hand with the lever 60 rocks the same on its pivot 59 and the resulting partial rotation of pinion 58 retracts the detent rod 53 against the tension of spring 55 to withdraw the end of the detent from the path of the latch 46. The latter is then free to be drawn radially outwardly by spring 49 to release its opposite end recess 48 from engagement with the valve stem 16, thereby permitting the valve to be closed by the outward pressure on the valve stem of coil spring 43. A stop 77 on latch 46 is adapted to engage the wall or housing 8 to limit outward movement of the latch under the tension of spring 49 (Fig. 4).

The annular bead 9 on the intermediate housing 8 is cut away as at 62 to permit the lever 60 to project outwardly into the path of the minute hand 61 of the clock.

The intermediate casing member 8 and the elements carried thereby are rotatably adjustable relative to the clock 15 and outer casing 1, the latter two elements being held against rotary movement. The intermediate housing 8 is normally held in adjusted position relative to the casing 1 and the clock 15 by means of a locking rod 63 slidably mounted within suitable guides in the housing 54 and provided at its inner end with a sharpened point or pin 64 normally engaging or slightly penetrating the annular gasket member 7. The rod 63 is provided at its outer end with a handle 65 and is normally urged into locking position by a spring 66 bearing at one end against the housing 54 and at its opposite end against a stop 67 on the rod. The handle 65 may be manually retracted outwardly to withdraw the pin 64 from gasket 7 to permit the intermediate casing 8 to be rotated relative to the clock 15 and

stationary casing 1 when it is desired to set the mechanism for any predetermined time of operation. In this manner it will be noted that the lever 60 may be moved around and relative to the clock dial and minute hand 61 to provide for any predetermined elapsed time up to one hour before hand 61 will engage lever 60 to actuate the mechanism and close the valve 38.

The means for setting the time-controlled apparatus will now be described.

The inner clock-container casing 14 is provided on its rear wall with an annular rib or projection 70 adapted to engage a cam face 71 of a lever 72 pivotally mounted at 73 on the latch member 46. The intermediate portion of said lever is provided with an arcuate slot 74 engaging a pin 75 extending between upstanding ears or projections 76 on the guide member 47. Assuming the valve 38 to be closed as shown in Fig. 4 and it is desired to open the valve to permit the flow of gas or fuel to the range burner as shown in Fig. 3, the cover 3 is opened and the clock 15 and its containing casing 14 are manually forced inwardly, or upwardly as view in these figures. The annular projection 70 engages cam face 71 of pivoted lever 72 to move latch 46 radially inward to engage the necked-in portion 17 of valve stem 16. Said necked-in portion 17 is simultaneously moved into registering position with recess 48 of the latch as the latter is coincidentally forced radially inward against the tension of spring 49. When this engagement is effected outer end 52 of latch 46 slips past detent 53 and the latter is immediately projected into the path of said latch by spring 55 to lock the parts in position as shown in Fig. 3. When manual pressure on the clock is released after locking the valve stem 16 in innermost position, spring 27 forces the clock casing and clock outwardly a short distance to enable the cam face 71 of lever 72 to clear annular projection 70 on the clock casing, so that this lever will be in position for a resetting independently of the outward motion of the valve stem 16. In this position valve 38 is open to permit flow of fuel to the burner. The rod 63 is then retracted to permit intermediate casing 8 to be manually rotated relative to the clock dial to position lever 60 at the desired location relative to minute hand 61 of the clock to obtain an actuation of the apparatus at the expiration of any desired predetermined time up to one hour. It will be noted that this manual adjustment of casing 8 permits the device to function to close the valve at any time without disturbing the setting of the clock.

At the expiration of the predetermined time when it is desired to shut off the flow of fuel to the burner, the minute hand 61 engages and swings lever 60 on its axis to retract detent 53 from the path of spring-pressed latch 46. The latter is projected by the spring 49 out of engagement with necked-in portion 17 of valve stem 16, thereby permitting the valve stem to be moved outwardly by spring 43 to close the valve 38. This outward movement of valve stem 16 also projects the clock casing 14 and clock outwardly relative to outer and intermediate casings 1 and 8. The latch 48 is permitted to be released from valve stem 16 by the movement of arcuate slot 74 relative to the stationary pin 75 to again re-position the cam lever 72 for engagement by the annular projection 70. The valve stem 16 is moved outwardly to closed position by the tension of coil spring 43. At this time spring 27 moves the clock and its casing slightly outwardly independently of valve stem 16 to correctly position annular projection 70 and lever 72 for a subsequent setting of the apparatus.

From the foregoing it will be apparent that the clock 15 and its casing are permitted to move inwardly and outwardly with the valve stem 16 relative to the casings 1 and 8 but are held against rotary movement by the described non-rotary engagement of the outer end of the valve stem with the clock casing, and also by the described non-rotary engagement of the inner end of the valve stem with the valve housing 30.

If desired a suitable indicator may be fixed on the intermediate rotary adjustable casing 8 adjacent pivoted lever 60 to clearly indicate to the observer the exact time of operation for which the device is set to close the valve.

It will be noted that the provision of the rack and pinion engagement of lever 60 between the minute hand of the clock and the valve tripping apparatus greatly decreases the resistance and friction at this point and obviates any possibility of the clock being stopped by the engagement of the minute hand with the lever 60.

By constructing the adjusting or setting mechanism in the manner described it will be noted that it is unnecessary to interfere with the clock setting in order to procure the automatic operation of the valve at any desired predetermined interval up to and including one hour. The clock which controls the apparatus will therefore continue to give the correct time regardless of the setting of the apparatus, which is an obvious advantage.

In Fig. 10 I have illustrated a slight modification of the invention for controlling the flow of electric current through a lighting circuit or the heating circuit of an electric range. The inner end of the shaft 16*a* which corresponds to the inner end of the valve stem 16, is slidably mounted in a suitable bearing 80 of a switch block 81 and terminates in a switch arm or knife switch 82. The ends of the switch are adapted to be moved by spring 43*a* into and out of registration with suitable spring contacts 83 of the switch to make and break the flow of current in the line 84. The stem 16*a* is automatically moved outwardly or downwardly as viewed in this figure by means of the time controlled devices heretofore described and in exactly the same manner as in the case of the valve which has been illustrated in the remaining figures.

What is claimed is:

1. In a time-controlled apparatus, the combination of a reciprocating valve having a valve housing and a valve stem, a clock non-rotatably secured to the opposite end of said valve stem, means for moving said valve stem to closed position, means normally holding said valve stem in open position, and means engageable by the hand of said clock for releasing said valve stem holding means to permit said valve to be closed by said valve stem moving means.

2. In a time-controlled apparatus, the combination of a reciprocating valve having a valve housing and a valve stem, a clock non-rotatably secured to the opposite end of said valve stem, a spring bearing against said valve stem and tending to move the valve to closed position, a slidable latch member normally holding said valve stem in open position, and means disposed in the path of said latch member and adapted to be engaged by the hand of said clock for releasing said latch member to permit said valve to be closed by said spring.

3. In a time-controlled apparatus, the combi-

nation of a normally open valve having a valve stem, a stationary casing, a clock housed within said casing for bodily movement relative thereto and connected to said valve stem, means for moving said valve to closed position, means normally holding said valve in open position, and means actuated by the hand of said clock to release said holding means and permit said valve to be closed by said valve moving means, whereby the movement of said valve to closed position moves said clock bodily relative to said casing.

4. In a time controlled mechanism the combination of a flow line having a valve housing and a reciprocating valve for controlling the flow of fuel through said line, a clock casing having a clock secured therein, a second casing mounted for rotary adjustment relative to said clock casing, a reciprocating valve stem secured at one end to said valve and at its other end to said clock casing, means normally tending to move said valve stem and valve to closed position, means slidably mounted on said adjustable casing and engaging said valve stem for maintaining the latter against movement, and clock actuated means on said adjustable casing and engaging said slidable means to hold the latter in engagement with said valve stem, said clock actuated means being adapted to be engaged by the hand of said clock to release said slidable means from engagement with said valve stem to permit said valve to be closed by said valve moving means.

5. In a time controlled mechanism the combination of a flow line having a valve housing and a valve for controlling said line, a clock casing having a clock secured therein, a second casing enclosing said clock casing, one of said casings being rotatably adjustable relative to the other, a valve stem secured at one end to said valve and at its other end to said clock casing, means normally tending to move said valve stem and valve to closed position, means mounted on said adjustable casing and engaging said valve stem for maintaining the latter against movement, and clock actuated means mounted on one of said casings and engaging said valve stem engaging means to hold said valve stem against movement, said clock actuated means being adapted to be engaged by the hand of said clock to release said valve stem engaging means from said valve stem to permit said valve to be closed.

6. In a time controlled mechanism, the combination of a normally open valve, a clock casing having a clock secured therein, a second casing member enclosing said clock casing, one of said casings being mounted for rotary adjustment relative to the other, a valve stem secured at one end to said valve and at its other end to said clock casing, a spring tending to move said valve stem and valve to closed position, a latch member slidably mounted on said adjustable casing and engaging said valve stem for maintaining the same against movement, a detent slidably mounted on said adjustable casing and having one end disposed in the path of said latch member, and means whereby the opposite end of said detent is adapted to be actuated by a hand of said clock to release said latch member from engagement with said valve stem and permit said valve to be closed by said spring.

7. In a time controlled mechanism the combination of a flow line having a valve housing and a reciprocating valve for controlling the flow of fuel through said line, a clock casing having a clock secured therein, a second casing mounted for rotary adjustment relative to said clock casing, a reciprocating valve stem secured at one end to said valve and at its other end to said clock casing, a spring normally tending to move said valve stem and valve to closed position, a slidable latch member on said adjustable casing and engaging said valve stem for maintaining the latter against movement, a lever slidably mounted on said adjustable casing and disposed in the path of said latch member to hold the latter in engagement with said valve stem, and means whereby said lever is actuated by the hand of said clock to release said latch member from engagement with said valve stem to permit said valve to be closed by said spring.

8. In a time-controlled apparatus, the combination of a reciprocating valve having a valve housing and a valve stem, a rotatable casing, a clock housed within said casing and non-rotatably secured to the opposite end of said valve stem, means for moving said valve stem to closed position, means normally holding said valve stem in open position, and means on said casing engageable by a hand of said clock for releasing said valve stem holding means to permit said valve to be closed by said valve stem moving means, said casing being rotatably adjustable relative to said clock to position said engaging means to be actuated by said clock hand at the expiration of a predetermined time.

9. In a time-controlled apparatus, the combination of a flow line having a valve provided with a valve stem, a clock secured to one end of said valve stem and movable as a unit therewith, means for moving said valve to closed position, means normally holding said valve in open position, and means actuated by a hand of said clock to release said holding means and permit said valve to be closed by said valve moving means, said clock actuated means being adjustable in a rotary direction relative to said clock to be engaged by said clock hand after the elapse of a predetermined time.

10. In a time-controlled apparatus, the combination of a fluid flow line having a valve provided with a valve stem, a clock secured to one end of said valve stem and bodily movable therewith, means for moving said valve to closed position to shut off the flow of fluid in said flow line, means engaging said valve stem for normally holding said valve in open position, and means actuated by a hand of said clock to release said holding means and permit said valve to be closed by said valve moving means.

11. In a time-controlled apparatus, the combination of a fluid flow line having a valve provided with a valve stem, a clock secured to one end of said valve stem and movable as a unit therewith, a spring for moving said valve to closed position, a latch member engaging said valve stem and normally holding said valve in open position, and means normally engaging said latch member and actuated by a hand of said clock to release said latch member from engagement with said valve and permit the latter to be closed by said spring.

ARTHUR R. HARMON.