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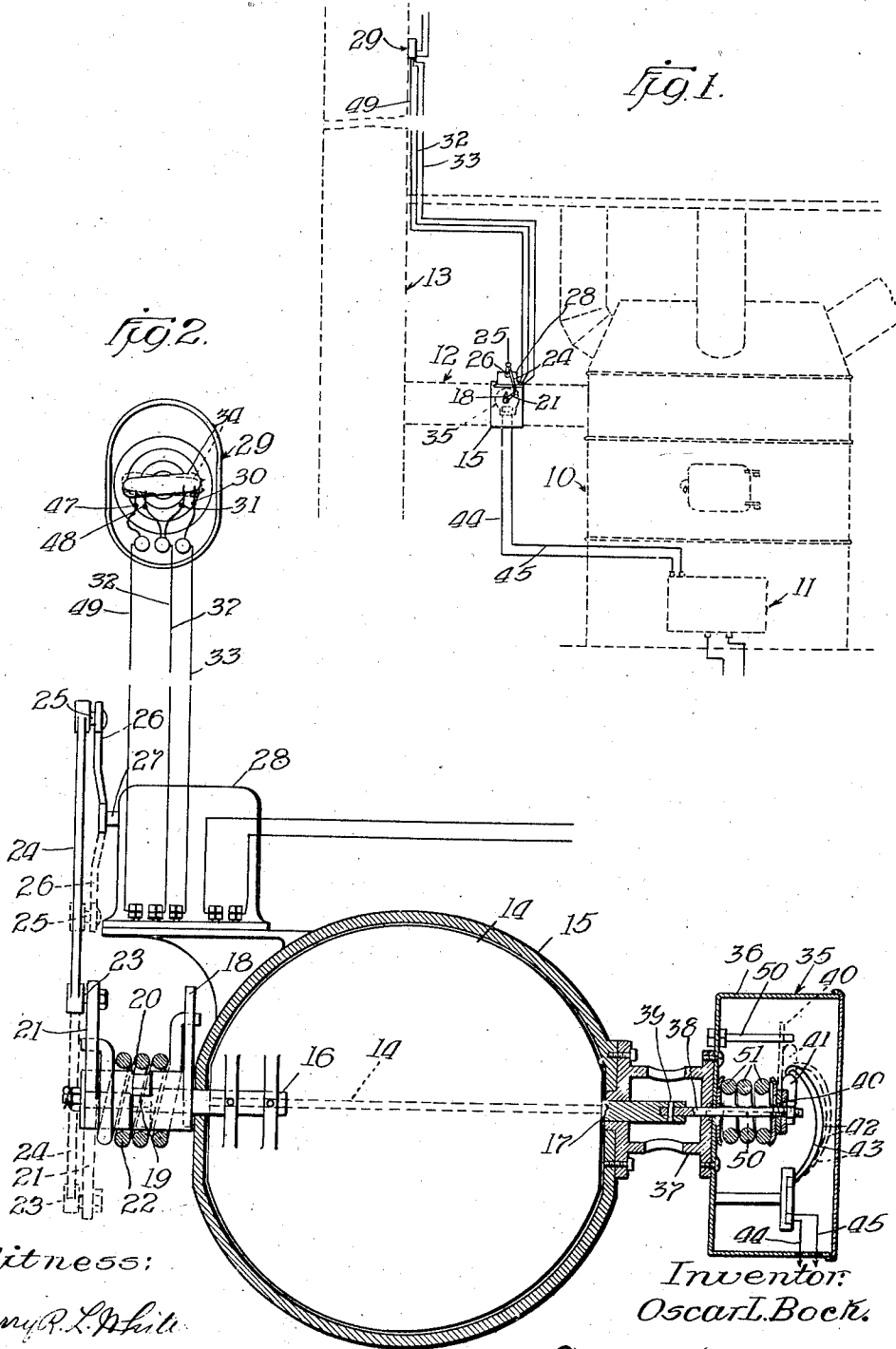
O. L. BOCK

2,117,787

BURNER REGULATING MECHANISM

Filed March 14, 1933

2 Sheets-Sheet 1



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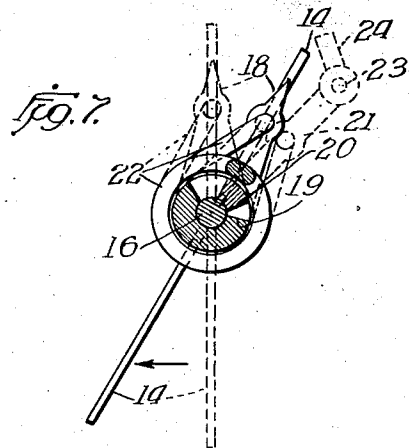
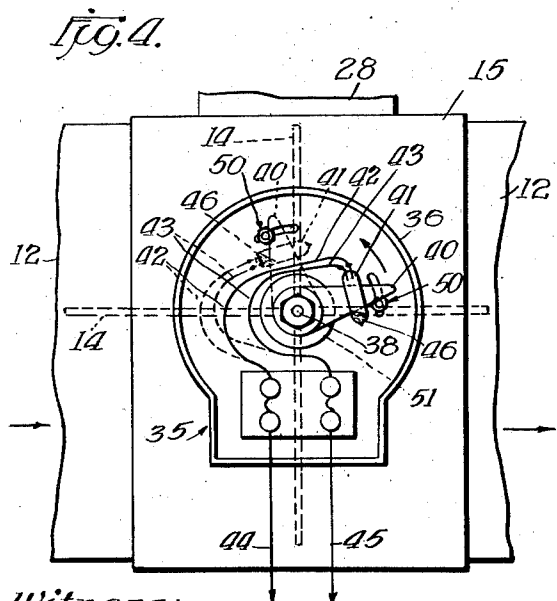
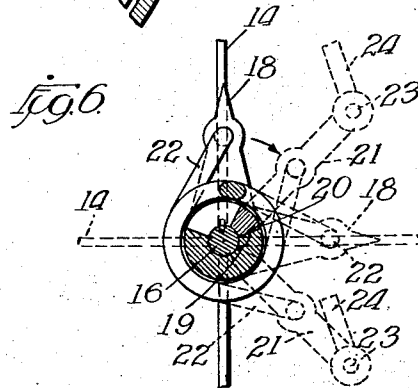
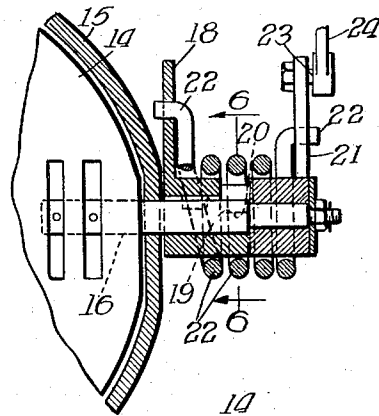
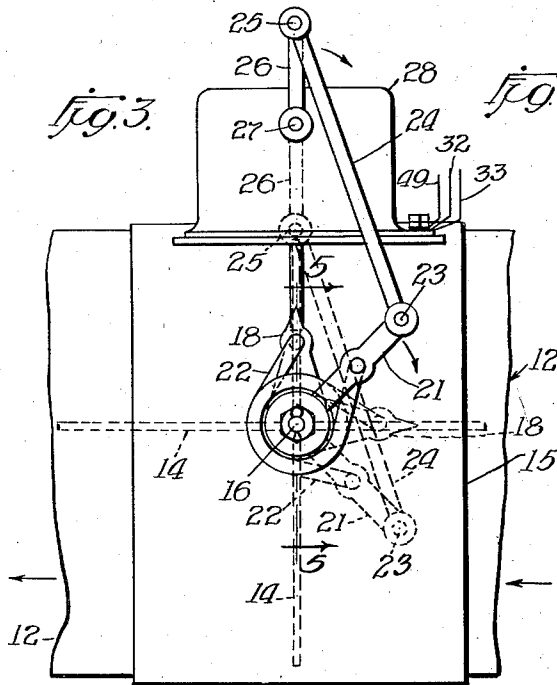
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BURNER REGULATING MECHANISM

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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BURNER REGULATING MECHANISM

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Application March 14, 1933, Serial No. 660,685

3 Claims. (Cl. 236—1)

This invention relates to burners in general and particularly to automatically controlled burners. More specifically, the invention relates to regulating mechanism for automatically controlled burners.

The primary object of the present invention is to provide regulating mechanism which operates in proper time sequence having the necessary time lag to perform the operation properly and correctly.

Another object of the invention is to provide regulating mechanism for burners which mechanism safeguards the burner against the possibility of firing when the damper is in any but the open position, and which provides a relief valve to permit abnormal pressures in the furnace to be relieved and escape through the chimney.

A further object is to provide damper regulating means operatively and synchronously associated with certain parts of the burner equipment and a thermostat, whereby the burner normally controlled by the operation of the thermostat will be prevented from operating except when the damper is open.

Numerous other objects and advantages will be apparent throughout the progress of the following specification.

The accompanying drawings illustrate a selected embodiment of the invention and the views therein are as follows:

Fig. 1 is a detail elevation of a furnace or other heating element and embodying the invention, the view showing the relative arrangement of the parts diagrammatically.

Fig. 2 is a detail vertical sectional view through the burner regulating mechanism and showing its association with parts of the burner equipment.

Fig. 3 is a detail end elevation of the damper operating mechanism.

Fig. 4 is a detail end elevation of the damper operated switch.

Fig. 5 is a detail sectional view on the line 5—5 of Fig. 3.

Fig. 6 is a detail sectional view on the line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 6 but showing some of the parts moved from initial toward operating position.

Referring to the drawings, 10 designates a furnace, boiler or other heating member which is provided with a burner 11, such as an oil burner or other heating element. The burner 11 includes the oil supply, the blower, and such other equipment necessary to cause combustion of the fuel. A flue 12 leading from the furnace 10 is

operatively connected to a chimney 13 in the usual manner.

A damper 14 is carried by a supporting collar or frame 15 which may be fastened to the flue 12 as shown in Fig. 1. The damper 14 has end shafts 16 and 17 fixed thereto, and these shafts are revolvably mounted in the damper frame 15, Fig. 2. An arm 18 is rigidly connected to the shaft 16 and has a shoulder 19 formed thereon which is adapted to be engaged by a shoulder 20 on the arm 21 which is freely mounted on the shaft 16. A spring 22 is interposed between the arms 18 and 21 and in engagement therewith to provide a yieldable connection between these two arms. The arm 21 is pivoted at 23 to a link or connecting arm 24 which is pivoted at 25 to a connecting arm or crank 26. The connecting arm or crank 26 is operated by the shaft 27 of a motor 28.

A thermostat 29 is positioned in a room or the living quarters of the building in which the burner is located and is provided with contacts 30 and 31 connected to the terminals 32 and 33 respectively which lead to the motor 28, Fig. 2. A suitable contacting device, such as a mercury tube 34, is controlled by suitable means operated by the rise and fall of the temperature. When the temperature of the room in which the thermostat is located reaches a predetermined minimum, the mercury tube 34 will be moved to the position shown in dotted lines in Fig. 2 and complete the circuit between the contacts 30 and 31 to operate the motor 28. The closing of the contacts 30 and 31 causes the motor to rotate 180°, the motor being constructed and arranged to rotate only 180° and then cease. The 180° rotation of the motor 28 will move the crank 180° and cause the members 24 and 21 to rotate the shaft 16 and consequently the damper 90° at which time the damper will be in open position.

A mercury switch 35 arranged in a casing 36, Figs. 2 and 4, is fastened to a bracket support 37 which is fixed to the frame 15. The switch has a shaft 38 which is fixed to the damper shaft 17 as indicated at 39, Fig. 2, and is movable therewith. An arm 40 is mounted on the shaft 38 and carries a mercury tube 41 having conductors 42 and 43. The conductors 42 and 43 are operatively connected to conductors 44 and 45 which lead to the burner equipment 11. When the mercury tube 41 is in the position shown in Fig. 4, the mercury 46 will be at one end of the tube, but when the motor 28 operates to open the damper and consequently swing the arm 40 by the spring 51 from the position shown in full lines to the

position shown in dotted lines in Fig. 4, the mercury 46 will close the contact between the conductors 42 and 43, cause the current to flow through the conductors 44 and 45 and operate the burner equipment 11. The burner will then operate until sufficient heat has been delivered to cause the thermostat to again operate and break the connection between the lines 32 and 33 to close the contacts 47 and 48 which connect with the conductors 49 and 32 respectively at which time the motor will again operate 180° and swing the damper from open to closed position. During the operation of the damper, the switch 35 will again operate and stop operation of the burner equipment.

The parts are so constructed and arranged that the position of the damper controls the operation of the heating equipment because when the damper is closed the burner equipment cannot operate. Therefore, the device completely safeguards the burner against the possibility of firing when the damper is in any but in open position. If the motor 28 should fail to operate, no hazard is created because the switch 35 cannot close. If the damper 14 is stuck or corroded tight so that it cannot open, no hazard will be created as the burner will remain in off position. A break in either circuit with the damper in closed position will create no hazard. Also, a break in either circuit with the damper open will not create a hazard. Current failure at any time will cause a shut-down of the equipment regardless of the position of the damper. Due to the yielding connection between the damper 14 and the arm 21, the damper is permitted to open against a pressure on its face from within the furnace. Therefore, should any abnormal pressure occur against the damper 14, the damper will be allowed to rotate away from the shoulder 20 against the tension of the spring 22. When the pressure against the damper ceases, the spring 22 will be returned to its normal position. The damper herein is pivoted above its normal axial center line.

The burner 11 is preferably wired to a separate line but if desired, the burner motor can be fed from a line running from the motor 28 or taken from the thermostat in which case the thermostat 29 and the switch 35 will be in series. The breaking of either of these switches will cause the burner to stop before the damper starts to close. Furthermore, the burner will not start until both of the switches are closed.

The invention provides a thermostatically controlled driving means operating a damper through a yieldable member. The damper operates a switch mechanism which controls the operation of a burner with respect to the position of the damper, and the damper is mounted off center so that it may be opened against the tension of the spring when there is pressure against the face of the damper. This construction provides for the necessary lag or lapse of time between the time the thermostat starts to open the damper and the starting of the burner. The burner stops quickly before the damper closes more than a fraction of its swing. This is due to the use of an independent switch which has no connection with the thermostat or damper operating mechanism. Therefore, the burner is provided with independent timing means and overcomes the objection to conventional burners now on the market which are so arranged that when the thermostat closes, its circuit starts the burner and the damper opening mechanism at the

same time as both of them are connected directly to the thermostat. Consequently, in the conventional construction, if the damper should stay shut, the burner would start just the same because the thermostat has closed the circuit. In the present construction, however, by using the separate switch which is operated only by the movement of the damper and entirely independent of the thermostat, entire safety is insured. The construction herein shown provides a switch which starts and stops the burner solely through the movement of the damper in the smoke-pipe of flue 12. When the damper is closed, the burner is stopped and when the damper is opened, the burner starts. The thermostatically controlled mechanism 29 causes the operation of the damper by opening or closing the same depending upon the temperature in the room, which temperature governs the operation of the thermostat. The spring relief and the mounting of the damper above its center line permits the damper to be moved a sufficient distance to overcome abnormal pressures in the furnace.

When the temperature in the room reaches a predetermined minimum, the thermostat 29 will operate and cause the motor 28 to open the damper. The movement of the damper will cause the switch to operate to start the burner equipment. However, it is to be noted that the damper will be almost to its open position before the switch operates to start the burner equipment. When sufficient heat has been generated to again effect operation of the thermostat 29, the thermostat 29 will cause the motor 28 to operate and swing the damper from open toward closed position. Slight movement of the damper 14, however, will quickly break contact of the switch 35 and cause an interval of time between the stopping of the burner equipment and the complete closing of the damper. Therefore, the pressures and gases in the furnace will be dissipated before the damper completely closes. As the damper closes shortly after the shut-off of the burner equipment, the heat in the furnace is kept for useful heating purposes instead of being rapidly dissipated through the flue.

The switch 35 is provided with adjustable means 50 for setting and/or limiting the movement of the arm 40, there being a spring 51, Fig. 2, provided for yieldingly operating the arm 40.

The invention provides new and improved simply constructed, positively and efficiently operated means for controlling the stopping and starting of the burner equipment which is controlled by the position of a damper.

Changes may be made in the form, construction, and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

The invention is hereby claimed as follows:

1. A combustion system comprising a furnace, a burner for the furnace, means to actuate the burner, a flue leading from the furnace for conveying off the combustion products of the burner, thermostatic control means arranged in operative relationship to the furnace and operable in accordance with temperature conditions created by the furnace, a damper in said flue, the thermostatic control means being operatively connected to the damper to selectively move the damper to open or closed position, a switch connected with the damper, said switch connection being ar-

5 ranged to actuate the switch to closed position
when the damper has opened a predetermined
degree and to return the switch to open position
when the damper has closed a predetermined de-
10 gree, said switch being wired to said burner ac-
tuating means for control thereof in accordance
with the setting of the switch, the damper being
yieldable by a predetermined elevated pressure
within the furnace toward open position, and
15 means to permit said yieldable opening of the
damper within limits without closing the switch.

2. A combustion system comprising a furnace,
a burner for the furnace, means to actuate the
burner, a flue leading from the furnace for con-
15 veying off the combustion products of the burner,
thermostatic control means arranged in operative
relationship to the furnace and operable in ac-
cordance with temperature conditions created
by the furnace, a damper in said flue and oper-
20 able to open or closed position, the thermostatic
control means being operatively connected to the
damper to selectively move the damper to open
or closed position, a switch connected with the
damper, said switch connection being arranged
25 to actuate the switch to closed position when the
damper is opened and to return the switch to
open position when the damper is closed, said
switch being connected to said burner for control
thereof, said damper being yieldably supported
30 for actuation toward open position by a prede-

termined increased pressure within the furnace
when the damper has been selectively actuated to
said closed position by the said thermostat, said
switch and damper connection being arranged to
5 permit said yieldable opening without actuating
the switch to closed position.

3. A combustion system comprising a furnace,
a burner for the furnace, means to actuate the
burner, a flue leading from the furnace for con-
10 veying off the combustion products of the burner,
thermostatic control means arranged in opera-
tive relationship to the furnace and operable in
accordance with temperature conditions created
by the furnace, a damper in said flue and operable
15 to open or closed position, the thermostatic con-
trol means being operatively connected to the
damper to selectively move the damper to open
or closed position, a switch connected with the
damper, said switch connection being arranged to
20 actuate the switch to closed position when the
damper is opened and to return the switch to
open position when the damper is closed, said
switch being connected to said burner for control
thereof, the damper being yieldable subject to a
25 predetermined elevated pressure within the fur-
nace toward open position, and means to permit
said yieldable opening of the damper within limits
without operating the burner.

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