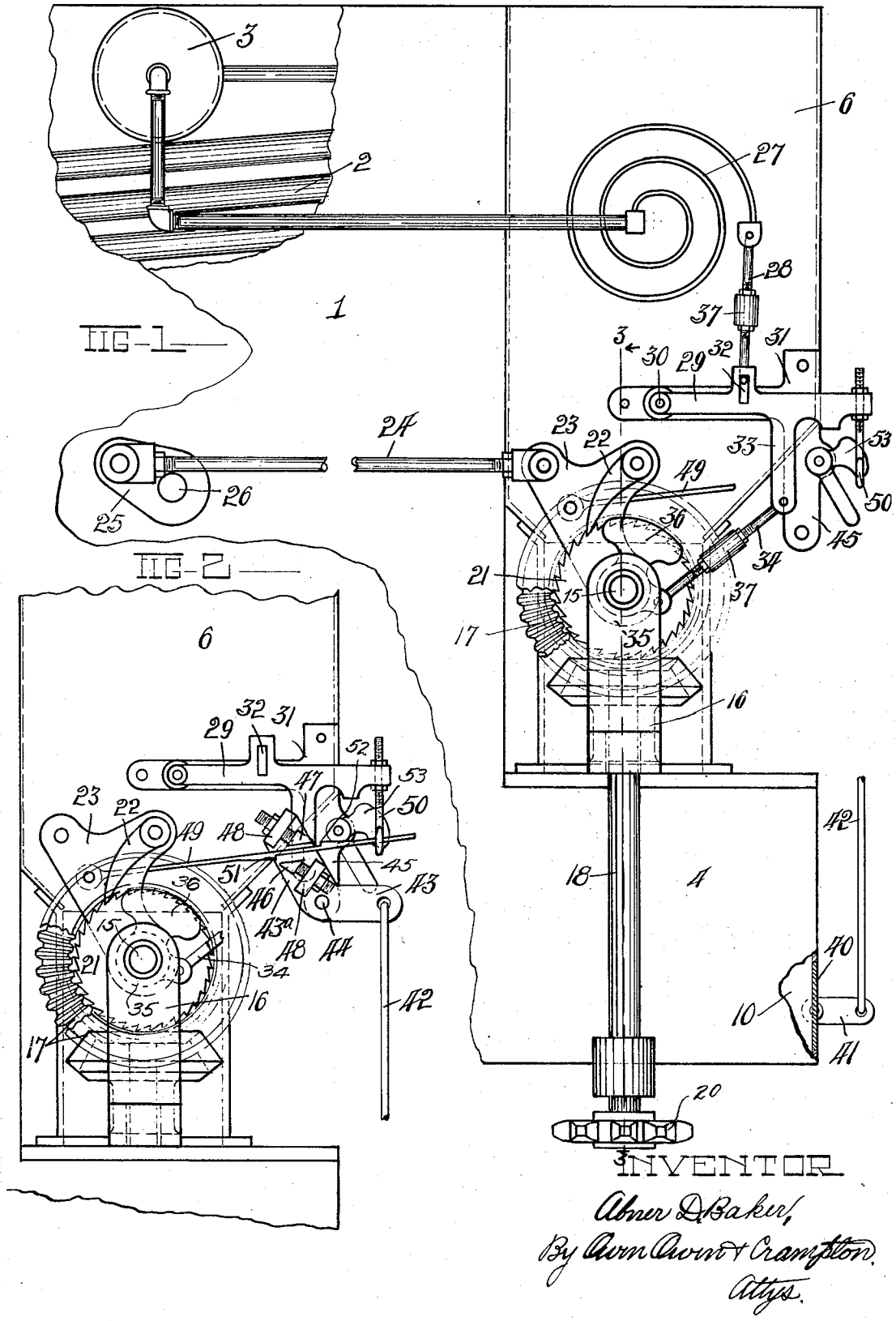
Dec. 30, 1924. 1,520,922

A. D. BAKER

BOILER PRESSURE CONTROL

Filed May 18, 1922 2 Sheets-Sheet 1



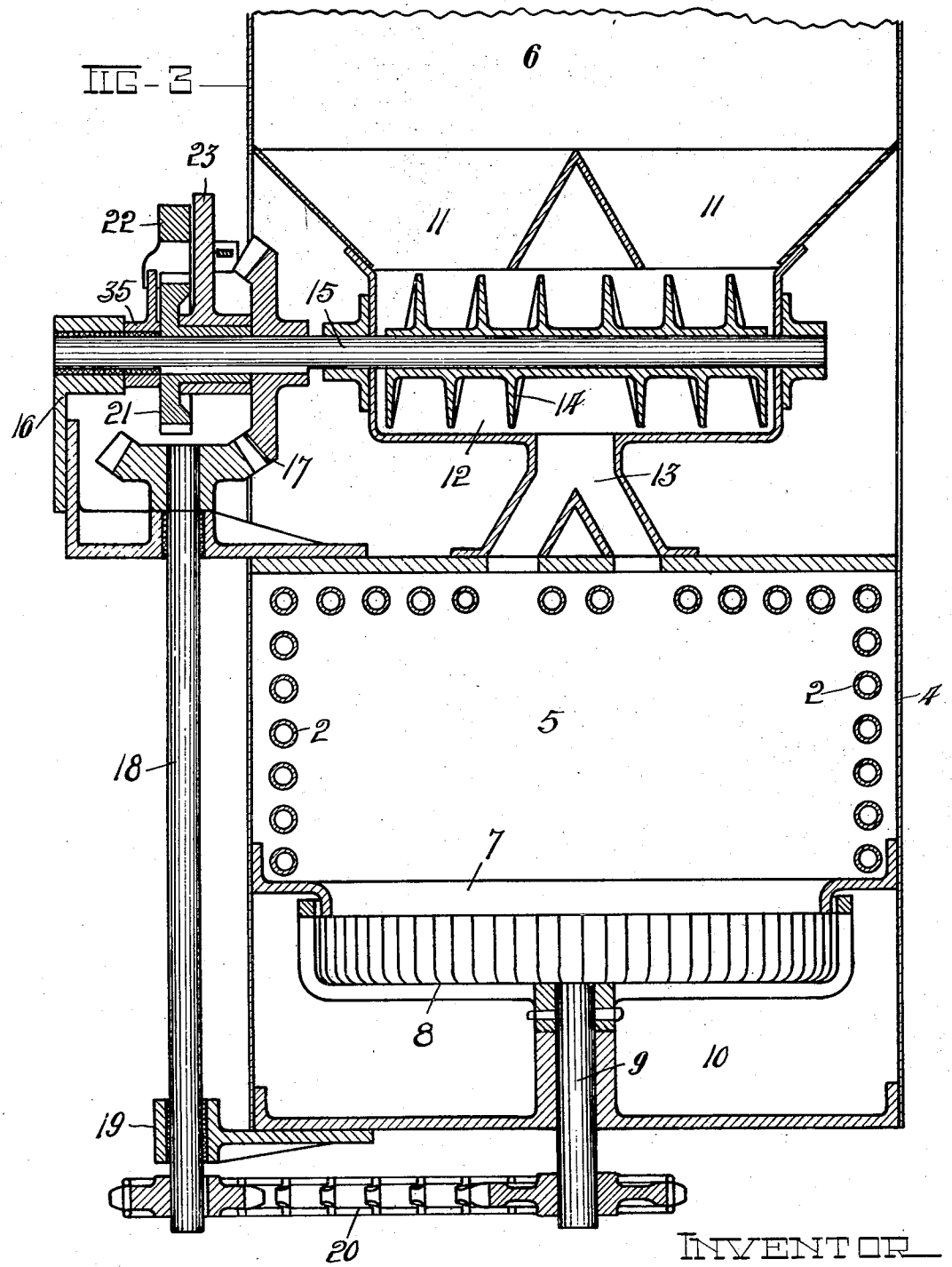
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FIG-3



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UNITED STATES PATENT OFFICE.

ABNER D. BAKER, OF SWANTON, OHIO.

BOILER-PRESSURE CONTROL.

Application filed May 18, 1922. Serial No. 561,950.

To all whom it may concern:

Be it known that I, ABNER D. BAKER, a citizen of the United States, and a resident of Swanton, in the county of Fulton and State of Ohio, have made an Invention Appertaining to a Boiler-Pressure Control; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to automatic fire control means for use particularly in connection with stationary boilers, steam trucks and tractors to maintain an approximately uniform predetermined steam pressure therein.

An object of the invention is the provision, in connection with a steam boiler having a fuel feeding means in association therewith, of simple and efficient mechanism which is operable by steam pressure in the boiler to control the operation of the fuel feeding means whereby when the steam pressure falls below a predetermined point the feeding of fuel to the boiler fire is commenced and when the pressure rises above a predetermined point the feeding of fuel is stopped.

A further object of the invention is the provision of simple and efficient means operated by boiler pressure to control the opening and closing of a draft damper associated with the boiler fire whereby the damper will be opened when the boiler pressure is below a predetermined point and will be closed when above such point.

Further objects and advantages of the invention will be apparent from the following detailed description thereof.

While the invention in its broader aspect is capable of embodiment in numerous forms, a preferred embodiment thereof is illustrated in the accompanying drawings, in which,—

Fig. 1 is a side elevation of a steam boiler equipped with my invention with parts broken away and removed, and particularly illustrating the automatic fuel feed control means. Fig. 2 is a similar fragmentary view thereof with parts broken away and removed and particularly illustrating part of the automatic draft damper control means, and Fig. 3 is an enlarged section taken on the line 3—3 in Fig. 1 with parts omitted.

Referring to the drawings, 1 designates a boiler casing having water tubes 2 therein in connection with a steam drum 3, and 4 the casing of a fire chamber 5 above which is disposed a fuel feed hopper 6. The fire chamber 5 is shown, in the present instance, as having its side and top walls lined with water pipes 2 of the boiler and is provided with a circular bottom opening 7 below which is disposed a circular rotatable grate 8 that is mounted on the upper end of a shaft 9, which extends down through the bottom of the ash pit 10 through a suitable bearing therein.

The hopper 6 is in restricted communication at its bottom through one or more tapering passages 11 with a worm casing 12, which in turn is in communication at its bottom centrally of its ends through passages 13 with the interior of the fire chamber 5 through the top thereof. A worm 14, preferably of right and left form, is mounted in the casing 12 to feed fuel from the hopper passages 11 to the centrally disposed outlet passage 13. The worm shaft 15 is journaled in the ends of the casing 12 and extends beyond one end thereof and has a bearing at its outer end in a bracket 16 projecting from the roof of the fire box 5. The worm shaft is in beveled gear connection 17 with a vertical shaft 18, which extends down at one side of the fire box and is journaled at its upper end in a bracket 16 and at its lower end in a bracket 19, which latter extends from the bottom of the furnace structure. A chain and sprocket wheel connection 20 is provided between the shaft 9 and lower end of the shaft 18 to drive one from the other. It is thus evident that the grate shaft 9 and worm shaft 15 are connected together to cause them to rotate in unison.

A ratchet wheel 21 is fixed to the worm shaft 15 and its teeth are intended to be engaged by a pawl 22, which pawl is carried by a lever 23 that is mounted for loose rocking movement on the shaft 15 at one side of the ratchet wheel, the pawl being preferably disposed at the top of the ratchet wheel to adapt it to have gravity engagement therewith. The lever 23 is connected by an operating rod 24 to a crank-arm 25 carried by a shaft 26 which shaft constitutes some rotating part of the driving mechanism or

other means which is associated with and preferably operated by the steam pressure generated in the boiler. In the present instance, the driving mechanism or other operating means is not illustrated as such means forms no part of the present invention, except that it provides a means for imparting reciprocatory movements to the lever 23. It will be understood, however, that whenever the steam driven means with which the boiler is associated is in operation, the part 26 is intended to turn therewith so as to impart continuous rocking movements to the lever 23 to cause the pawl 22 thereof to engage and impart successive step by step turning movements to the ratchet-wheel when the pawl is free to engage the same.

An expansible pressure coil 27 is mounted at a side of the hopper 6 over the ratchet means and is in communication at one end with a steam drum 3 so that the coil will respond to changing pressures in the drum. The free end of the coil has a rod 28 depending therefrom and the lower end of this rod is connected with a horizontally disposed lever 29, which is fulcrumed at 30 to a bracket 31 secured to the side of the hopper 6 for free vertical pivotal movements relative thereto. To permit limited relative movements of the rod 28 and lever 29 the rod is in hooked engagement at its lower end with a vertically disposed slot 32 in the lever. The lever has an arm 33 extending downward therefrom and connected by a link 34 to a rocking sleeve 35 on the shaft 15 so that rocking movements of the lever 29 will impart rocking movements to the sleeve. The sleeve 35 is provided on its upper side with a cam projection 36, which, when the lever 29 is in normal lowered position, stands forwardly retracted from the pawl 22, and upon a predetermined raising movement of the lever 29 the cam 36 is swung rearwardly a sufficient extent to engage under the nose of the pawl 22 and raise it out of coacting relation with the ratchet wheel 21. For this purpose the pawl 22 has a portion extending beyond the side of the ratchet wheel and overhanging the cam 36.

It is evident that when the coil 27 has expanded a predetermined extent by reason of an increase of pressure in the steam drum 3 the cam 36 will have been swung rearward by reason of the raising movement of the lever 29 a sufficient extent to lift the pawl 22 free from engagement with the ratchet wheel 21 so that the lever 23 may continue to rock without imparting any movement to the ratchet wheel and parts with which it is connected. In the present instance, the disconnecting of the pawl 22 from the ratchet wheel stops both the fuel feeding action of the worm 20 and the rotation of the grate 8. The control means can be adjusted to operate under any desired pressure by lengthening or shortening the connections between the coil 27 and lever 29 and between said lever and the sleeve 35, such adjustment being effected in the present instance by the provision of a turnbuckle 37 in each of the connecting rods 28 and 34. When the coil is in its normal contracted form the lower hooked end of the rod 28 is disposed below the upper end of the slot 32 thereby permitting a considerable expanding movement of the coil before it begins to act on the lever 29 to raise it from normal inoperative position.

The ash pit 10 is provided in its front with a damper 40, which is mounted for vertical pivotal opening and closing movements, and an arm 41 rigidly projects outwardly from the damper in radial relation to its pivot. A rod 42 connects the arm 41 to an arm 43 of a bell-crank lever which is pivoted at 44 to a bracket arm 45 projecting downward from the bracket 31. The other arm 43[a] of the lever projects upward from its fulcrum 44 and carries two vertically spaced catch members or dogs 46 and 47, which are rigid with respect to the lever arm but are adjustable to vary the space therebetween. For the purpose of adjustment the catch dogs 46 and 47 are carried by stems which are threaded through respective lugs 48 on the lever arm 43[a]. The noses of the dogs 46 and 47 are projected in opposite directions. A trip bar 49 is pivoted at one end to the rocker arm 23 and projects forward therefrom between the dogs 46 and 47 and is normally supported at its free end in advance of the lever arm 43[a] by a screw eye 50, which adjustably depends from the forward or free end of the lever 29. It is evident that the trip bar 49 has longitudinally reciprocatory movements in the screw eye 50 and that it is raised and lowered by vertical rocking movements of the lever 29. The bar 49 has a lug 51 on its under surface adapted when lowered a predetermined extent to engage the nose of the dog 46 and is provided on its upper surface with a lug 52 adapted when raised a predetermined extent, to engage the nose of the dog 47.

With the parts of the damper control mechanism in the position shown, the damper 40 is in closed position and the bar 49 is supported by the lever 29 and its screw eye 50 in neutral position between the dogs 46 and 47, so that the bar 49 is permitted to have longitudinal reciprocatory movements upon a rocking of the arm 23 without engaging either dog. As the intensity of the boiler fire diminishes and the steam in the boiler reduces in consequence, the expansion tube 27 will contract, permitting a lowering of the lever 29 and the free end of the bar 49. When the bar has lowered sufficiently for the lug 51 thereof to engage the lower dog 46, the lever arm 43[a] will be thrown for-

ward, thereby imparting a downward damper opening stroke to the rod 42. The lowering of the lever 29 also effects a forward retraction of the cam 36 from the pawl 22 to permit the latter to engage the ratchet wheel 21 and communicate a fuel feeding movement to the worm 14. Upon again raising the steam pressure the coil 27 expands raising the lever 29 which moves the cam 36 to raise the pawl 22 to inoperative position to stop the fuel feed and also to raise the bar 49 until its lug 52 is in position to engage the upper dog 47 and effect a drawing of the lever arm 43a to its rearward damper closing position. A cam lever 53 is pivoted to the bracket arm 45 and is movable into engagement with the lever 29 to hold it in elevated position when desired.

It is evident that I have provided simple and efficient means which is automatically operable to control the fuel feed and draft damper to suit the steam pressure requirements, the feed of the fuel being stopped and the damper closed when the steam pressure has been raised a predetermined extent, and vice versa.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of embodiment in numerous forms without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is,—

1. In combination with a furnace, a boiler, fuel feeding means, means to operate said fuel feeding means, boiler pressure controlled means for governing said operating means, draft controlling means, means to actuate the draft controlling means including a member connected to the operating means of the fuel feeding means and having opposed abutments, spaced opposed abutments connected to the draft controlling means and receiving said member in the space therebetween, and means actuated by the boiler pressure controlled means for effecting predetermined movement of said member to effect engagement of one of the abutments thereof with the corresponding abutment of said actuating means.

2. In combination, a furnace, a boiler, mechanism operable to feed fuel to the boiler furnace and having members which are disconnectible to stop the fuel feeding operation of the mechanism, an expansion coil operable to expand and contract by changing boiler pressures, a cam movable to disconnect the members of said mechanism, a lever connected to the coil and to the cam and operable to impart member disconnecting movements to the cam when the boiler pressure is above a predetermined point and to permit an engagement of the members when the boiler pressure is below a predetermined point and manually operable means to hold the lever against movement.

3. In combination, a furnace, a boiler, a rotatable grate for the boiler furnace, mechanism to feed fuel to the boiler furnace, mechanism to rotate the grate from said feed mechanism, driving mechanism for said feed mechanism having parts which are separable to stop the fuel feeding and grate turning operations, and fluid pressure controlled means automatically operable to disconnect said parts of the driving mechanism when a predetermined pressure is present in the boiler and to permit a connection of said parts when the boiler pressure falls below a predetermined point.

4. In combination, a boiler, a furnace in connection with the boiler and having a rotatable grate, means to feed fuel to the furnace, mechanism to rotate the grate from said feed means, driving means for said feed means having releasable normally engaged members which when released stop the fuel feeding and grate turning movements, and fluid pressure controlled means automatically operable to release the engaged parts of the driving means when a predetermined pressure is present in the boiler, and to permit an engagement of said parts when the boiler pressure falls below a predetermined point.

5. In combination, a boiler, a furnace in connection with the boiler, a movable grate and fuel feeding means for the furnace, mechanism continually operable to actuate the fuel feeding means and the grate and having parts capable of disengagement to stop the feed of fuel and movement of the grate, and fluid pressure controlled means automatically operable to disengage the parts of said mechanism to stop the movement of the grate and of the fuel feeding means when a predetermined pressure is present in the boiler and to permit an engagement of said parts when the boiler pressure falls below a predetermined point.

6. In combination, a boiler, a furnace in connection with the boiler and having a rotatable grate, a continually operating reciprocatory member, means connected with said member and operable by movements thereof to feed fuel to the furnace, means operated from the feed means to rotate the grate, and fluid pressure controlled means automatically operable to disconnect said member and feed means when a predetermined pressure is present in the boiler and to permit operating connection thereof when the boiler pressure falls below a predetermined point.

7. In combination, a furnace, a boiler, a draft control damper in connection with the

boiler furnace, a continually operating means having a reciprocable member pivoted at one end and fluid pressure controlled means automatically operable to raise and lower the opposite end of the member from neutral position according to the boiler pressure, and means connected to the damper and operable by a longitudinal movement of the member to close the damper when the member is moved in one direction from neutral position, and operable by a longitudinal movement of the member to open the damper when the member is moved in the other direction from neutral position.

8. In combination, a furnace, a boiler, a draft control damper for the boiler furnace, a member pivoted at one end and mounted for both longitudinal reciprocatory and transverse movements, means for reciprocating said member, fluid pressure controlled means automatically operable by a predetermined change of pressure in the boiler to transversely move the opposite end of the member a predetermined extent in one direction or the other from neutral position, and means in connection with the damper and operable by longitudinal movements of the member to open or close the damper when transversely moved in one direction or the other a predetermined extent from neutral position.

9. In combination, a furnace, a boiler, a draft control damper in connection with the boiler furnace, a member mounted for longitudinal reciprocatory movements and for transverse vertical movements and having lugs on its upper and lower surfaces, a lever having vertically disposed dogs between which the member is adapted to have free longitudinal reciprocatory movements and with one or the other of which a respective lug on the member is adapted to engage to impart a predetermined rocking movement to the lever from a longitudinal movement of the member when the member is raised or lowered a predetermined extent from neutral position, connection between the lever and damper for causing rocking movements thereof to open or close the damper, and fluid pressure controlled means automatically operable to raise and lower the member to have engagement with one or the other of the lever dogs under predetermined varying pressure conditions in the boiler.

10. In combination, a boiler, a furnace in connection with the boiler, a rotary grate and a draft damper for the furnace, an operating means, means releasably connected to said operating means and operable thereby to feed fuel to the furnace, means operated from the feed means, to rotate the grate, a member reciprocally movable by the operating means and capable of rocking movements relative thereto, means connected to the damper and operable by longitudinal movements of the member to impart opening or closing movements to the damper depending on a rocking movement of the member in one direction or the other from neutral position, and fluid controlled means automatically operable to disengage the operating means from the fuel feeding means and to rock the member in one direction from neutral position when a predetermined pressure is present in the boiler and to permit an engagement of the operating means with the fuel feeding means and a rocking of the member in the opposite direction from neutral position when the boiler pressure falls below a predetermined point.

11. In combination with a furnace, a boiler, and a draft control damper for the furnace, actuating means pivoted at one end, means to continuously reciprocate the actuating means, boiler fluid pressure controlled means loosely supporting the opposite end of the actuating means so as to permit of said reciprocatory movement thereof and for raising and lowering said opposite end of the actuating means, and means for operating the damper having parts past which the actuating means reciprocates and with which the actuating means is operatively engageable upon either raising or lowering of the actuating means.

12. In combination with a furnace, a boiler, and a draft control damper for the furnace, actuating means pivoted at one end and including a pair of elements, means to continuously reciprocate the actuating means, boiler fluid pressure controlled means loosely supporting the opposite end of the actuating means so as to permit of said reciprocatory movement thereof and for raising and lowering said opposite end of the actuating means, and means for operating the damper having a pair of spaced parts between which the actuating means reciprocates and with which the respective elements of the actuating means are operatively engageable upon either raising or lowering of the actuating means.

13. In combination with a furnace, a boiler, and a draft control damper for the furnace and means to actuate same, a lever connected to said actuating means, boiler fluid pressure controlled means connected to the lever, and manually operable means movable into and out of engagement with the lever to hold the latter against operation.

In testimony whereof, I have hereunto signed my name to this specification.

ABNER D. BAKER.