Jan. 13, 1942. E. A. FIELD, JR 2,269,932

DRAFT CONTROL

Original Filed July 28, 1939

Fig. 1

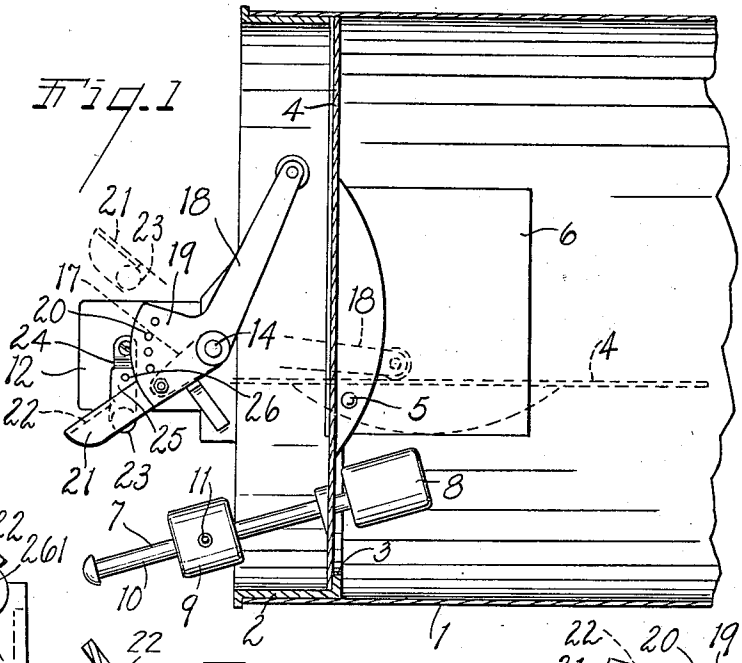


Fig. 4

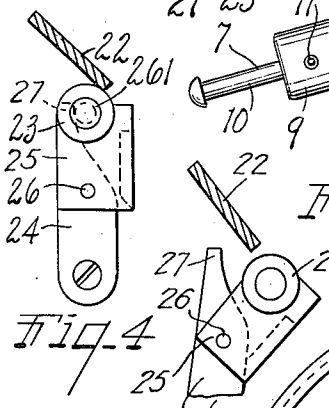


Fig. 5

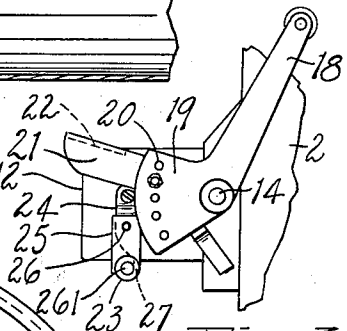
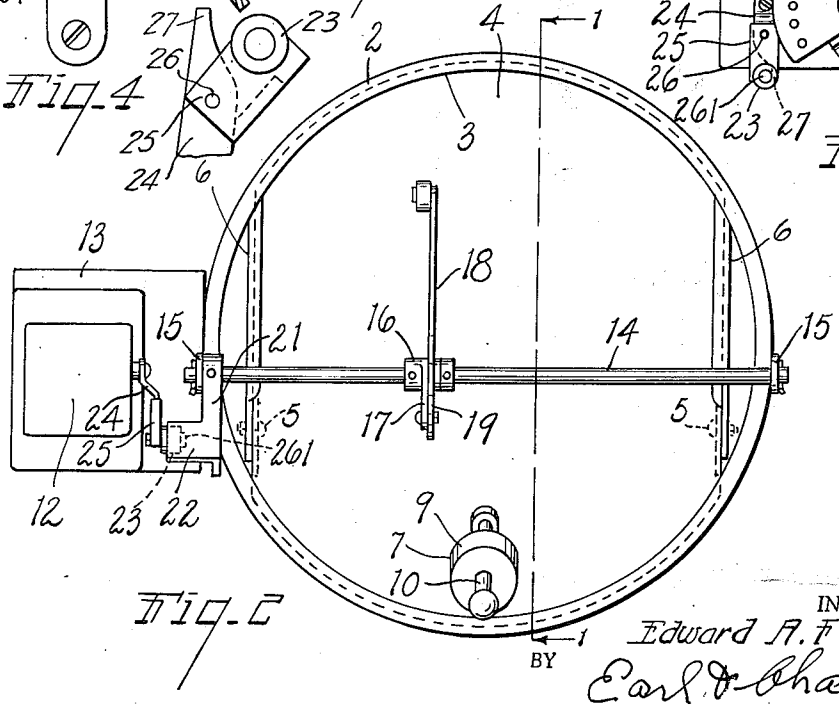


Fig. 6



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DRAFT CONTROL

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Original application July 28, 1939, Serial No. 286,975. Divided and this application February 24, 1941, Serial No. 380,096

8 Claims. (Cl. 236—45)

This is a division of my Patent No. 2,241,590 of May 13, 1941, for Draft controls.

The main objects of this invention are:

First, to provide an automatic motorized draft control well adapted for use with furnaces or boilers fed by automatic intermittently operating stokers.

Second, to provide a draft control of the type indicated having means to automatically increase the draft during periods of stoker operation.

Third, to provide a draft control having these advantages which permits a wide range of draft regulation both during the fuel feeding periods and the non-feeding periods.

Fourth, to provide a draft control having these advantages which is quickly responsive and capable of a wide range of adaptation for particular installations.

Further objects pertaining to details and economies of my invention will definitely appear from the description to follow. The invention is defined in the claims.

A structure which embodies the features of my invention is clearly illustrated in the accompanying drawing, wherein:

Fig. 1 is a fragmentary view in vertical section along the line 1—1 of Fig. 2, illustrating a control in accordance with my invention, the control gate opening position of the parts being indicated in dotted lines.

Fig. 2 is a view in front elevation further illustrating details of construction and relation of parts illustrated in Fig. 1.

Fig. 3 is a fragmentary view in side elevation further illustrating details of the structure shown in Figs. 1 and 2.

Fig. 4 is a fragmentary detail view in section on line 4—4 of Fig. 2, illustrating a quick release arrangement associated with the motor arm, the parts being shown in their positions during the period of inaction of the combustion device for the heating system, when natural draft is employed.

Fig. 5 is a view in section similar to Fig. 4, illustrating the parts in the positions assumed thereby upon commencement of operation of the combustion or other instrumentality governing the action of the present control.

The draft control of my present invention is particularly designed for use on boilers and furnaces equipped with automatic stokers or other firing or control devices which operate intermittently. In such installations it is desirable to have a full draft or at least substantially increased draft during the periods when the stoker is in operation as this insures more satisfactory combustion during such period. However, it is desirable that such draft be checked during the periods when the stoker is not in operation, at the same time providing means for a normal draft control adjustable or adaptable for different operations and for varying operating conditions.

To this end I provide a draft control gate in operative association with the breeching of the furnace or boiler, along with means for variably controlling the operation thereof under non-stoking conditions, and with a motor driven means for increasing the draft during the stoking periods.

Referring to the drawing, wherein there is illustrated a simplified form of motorized draft control in accordance with the present invention, the reference numeral 1 designates a circular draft housing communicating with a furnace or boiler breeching (not shown), this housing being provided with a fitting or adaptor plate 2 at the front end thereof defining a control opening 3. A sheet metal control gate 4 is pivotally mounted in the housing at a point 5 somewhat below the center of the housing to control opening 3. The gate has the sides thereof cut off or vertically truncated and the housing is provided with wing plates 6 similar to the structural features illustrated in my Patent No. 2,182,625, dated December 5, 1939, and for a similar purpose.

The gate is normally counterbalanced by a simplified adjustable counterbalance mechanism generally designated 7, including a pair of internal and external weights 8 and 9 on a forwardly and downwardly inclined rod 10 on the gate, the external weight 9 being adjustably held on the rod by a set screw 11.

The gate control motor 12 is of a unidirectional, intermittently operating type and is secured to a mounting plate or bracket 13 at one side of the control housing. This motor is adapted when energized to operate a predetermined number of degrees and come to rest. Such motors are well known. In this embodiment the gate opening mechanism is positively acting and take the form of a shaft 14 extending across the housing and pivoted in ears 15 carried by the latter. The shaft has a collar or sleeve 16 fixed thereto provided with an extending arm or crank 17. Adjacent this arm I loosely mount the gate opening arm 18 on the shaft which arm has a rearwardly extending segmental section 19 provided with a plurality of holes 20 arranged arcuately and adapted to selectively receive a pin extending

through section 19 and through crank 17 to thereby connect gate opening arm 18 to shaft 14 in various angular relations, whereby the extent of opening of gate 4 by the arm is controlled for a predetermined angular movement of the arm.

In order to actuate shaft 14 and the gate engaging arm 18 thereon, I provide the shaft with a tappet or trip arm 21 having a wing 22 adapted to be engaged by the roller 23 on the motor arm 24. The last named arm is preferably of a jointed or yielding construction similar to the arrangement illustrated in my Patent No. 2,241,590 identified above, including a stamping 25 on which the tappet engaging roller 23 is journaled, the said stamping being pivoted to motor arm 24 at 26. Motor arm 24 has an extension or finger 27 thereon projecting longitudinally behind the roller journal 261, and during the larger portion of the period of engagement of the roller with the tappet wing 22, as the roller travels upwardly from the solid line position of Fig. 1 to the dotted line position, it is supported by this finger and operates to rock shaft 14 and the gate 4 to the dotted line position of Fig. 1. This corresponds to the showing of Fig. 4 and is the position in which the parts, i. e., the motor, trip and gate engaging arms and gate are maintained during the period of inoperation of the stoker. It will be appreciated that the draft in the breeching is substantially checked. When the stoker comes into operation, motor 12 is energized, the mid point of the roller passes the bottom edge of the wing 22 on trip arm 21, the roller snaps past the wing and ahead of roller supporting finger 27, from the position illustrated in Fig. 4 to that illustrated in Fig. 5, thereby quickly clearing the tappet of the motor arm and allowing the gate to return to closed position under the influence of gravity. When arm 24 rotates to the position at which it comes to rest during the period of stoker operation, i. e., as illustrated in solid lines in Fig. 1, the roller drops back into place again resting on finger 27. This is the forced-draft position in which the roller and the other associated parts are maintained during the period the stoker is in operation. As illustrated, lever arm 18 is out of engagement with the gate. When the stoker again shuts off, the motor arm and roller section pivoted thereon repeat the cycle of pivoting the gate actuating trip arm to open the gate and hold the same open, as described above.

In operation, when the stoker shuts down, the damper motor 12 is energized for predetermined rotation whereby its arm engages the trip or tappet arm 21, turning shaft 14 a predetermined number of degrees and causing the gate engaging arm 18 to open the gate the proper extent, then come to rest, depending upon the relative position of the arm on the shaft. When the stoker comes into operation, damper motor 12 again rotates in the same direction to free the trip arm from the motor arm and the gate returns to closed position.

In the foregoing specification, I have referred extensively to actuation of the governing motor for the draft control gate in a stoker-fired installation. The structures involved herein are well adapted for such automatic solid fuel burning units either of large size for industrial applications or of smaller size for apartments, homes, and the like; however, it will occur to those skilled in the art that the application thereof to other than solid fuel consuming units, for example, oil burners, gas burners, and the like, is equally advantageous in promoting economy. Therefore, I desire the invention to be regarded in its broadest sense as a draft control unit which is under the influence of an intermittently operative combustion device, whether it be a fuel supply device, fan, blower, or the like, the units being actuated in a particular manner at certain phases in the functioning of such a device to vary the draft in the breeching and thereby effect a very desirable increase in thermal efficiency of the furnace or boiler with which it is associated.

I have illustrated and described my improvements in an embodiment which is very practical. I have not attempted to illustrate or describe other embodiments or adaptations as it is believed this disclosure will enable those skilled in the art to embody or adapt my improvements as may be desired.

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

1. A draft control for furnaces or boilers having an intermittently operated combustion device, comprising a pivotally mounted draft control gate, and means for facilitating opening movement of said gate during periods when said device is not operating, comprising a motor having an arm attached thereto and adapted to be energized to rotate said arm a predetermined amount upon initiation and termination of the operation of the device, a pivoted trip arm engageable by said motor arm during a predetermined portion of the cycle of movement thereof, adjustable gate engaging means connected to and actuated by said trip arm for opening said gate during the period of engagement of said motor and trip arms, said motor rotating the motor arm a predetermined increment at the commencement of the period of inoperation of the device and said motor and trip arms remaining in engagement during the period of inoperation of the device, and means for returning the gate to closed position when the device comes into operation, said motor rotating said motor and trip arms a predetermined further increment at the commencement of operation of the device, said motor arm disengaging from the trip arm at the beginning of said last named increment, enabling said gate return means to function.

2. A draft control for furnaces or boilers having an intermittently operated combustion device, comprising a pivotally mounted draft control gate, and adjustable counterbalance for said gate and means for facilitating opening movement of said gate during periods when said device is not operating, comprising a motor having an arm attached thereto and adapted to be energized to rotate said arm a predetermined amount upon initiation and termination of the operation of the device, a pivoted trip arm engageable by said motor arm during a predetermined portion of the cycle of movement thereof, and means connected to and actuated by said trip arm for opening said gate during the period of engagement of said motor and trip arms, said motor rotating the motor arm a predetermined increment at the commencement of the period of inoperation of the device and said motor and trip arms remaining in engagement during the period of inoperation of the device, said motor rotating said motor and trip arms a predetermined further increment at the commencement

of operation of the device, said motor arm disengaging from the trip arm at the beginning of said last named increment.

3. A draft control for furnaces or boilers having an intermittently operated combustion device, comprising a pivotally mounted draft control gate and means for facilitating opening movement of said gate during periods when said device is not operating, comprising a motor having an arm attached thereto and adapted to be energized to rotate said arm a predetermined amount upon initiation and termination of the operation of the device, a pivoted trip arm engageable by said motor arm during a predetermined portion of the cycle of movement thereof, and means connected to and actuated by said trip arm for exerting opening effort on said gate during the period of engagement of said motor and trip arms, said motor rotating the motor arm a predetermined increment at the commencement of the period of inoperation of the device and said motor and trip arms remaining in engagement during the period of inoperation of the device, said motor rotating said motor and trip arms a predetermined further increment at the commencement of operation of the device, said motor arm disengaging from the trip arm at the beginning of said last named increment.

4. A draft control for furnaces or boilers having an intermittently operated combustion device, comprising a pivotally mounted draft control gate and means for facilitating opening movement of said gate during periods when said device is not operating, comprising a motor having an arm actuated thereby and adapted to be energized to rotate said arm a predetermined amount upon initiation and termination of the operation of the device, a pivoted trip arm engageable by said motor arm during a predetermined portion of the cycle of movement thereof, and means actuated by said trip arm for exerting opening effort on said gate during the period of engagement of said motor and trip arms, said motor and trip arms remaining in engagement during the period of inoperation of the device, and disengaging upon actuation of the motor at the commencement of operation of the device, one of said arms including a section having a lost motion jointed connection thereto and drivingly actuated thereby at certain periods, and journalling a roller drivingly engageable with the other arm, and means restraining said section from movement in one direction relative to the arm carrying the same so as to positively actuate said other arm, said roller snapping past said other arm and out of driving engagement with the arm carrying the same at the commencement of operation of the device to thereby quickly clear said arms of one another.

5. A draft control for furnaces or boilers having an intermittently operated combustion device, comprising a pivotally mounted draft control gate and means for facilitating opening movement of said gate during period when said device is not operating, comprising a motor having an arm actuated thereby and adapted to be energized to rotate said arm a predetermined amount upon initiation and termination of the operation of the device, a pivoted trip arm engageable by said motor arm during a predetermined portion of the cycle of movement thereof, and means actuated by said trip arm for exerting opening effort on said gate during the period of engagement of said motor and trip arms, said motor and trip arms remaining in engagement during the period of inoperation of the device, and disengaging upon actuation of the motor at the commencement of operation of the device, one of said arms including a section having a lost motion jointed connection thereto and drivingly actuated thereby at certain periods, said section being drivingly engageable with the other arm, means restraining said section from movement in one direction relative to the arm carrying the same so as to positively actuate said other arm, said section snapping past said other arm and out of driving engagement with the arm carrying the same at the commencement of operation of the device to thereby quickly clear said arms of one another.

6. A draft control for furnaces or boilers having an intermittently operated combustion device, comprising a pivotally mounted draft control gate, an adjustable counterbalance for said gate normally acting to urge the same to closed position, and means for facilitating opening movement of said gate during periods when said device is not operating, comprising a motor adapted to be energized a predetermined amount upon initiation of the operation of the device, and gate engaging means actuated by said motor for engaging and actuating the gate to decrease the resistance of said gate to flow of air therethrough during the period of inoperation of the device, said last named means including an arm actuated by said motor, a trip arm pivoted on an axis transverse the gate, a gate engaging arm loosely pivoted on an axis transverse the gate and means for securing said gate engaging and trip arms together for rotation as a unit, including means for varying the angular relationship thereof.

7. A motorized draft control for an automatically fired furnace or boiler wherein the fuel supply device operates intermittently, comprising a pivotally mounted draft control gate adjacent the opening, and means for controlling movement of the gate to open position during the periods of inaction of the device and to at least partially closed position when the device comes into operation, comprising a damper motor controlled by the device to operate for predetermined intervals at the initiation and termination of operation of the device, an arm connected to and actuated by said motor, said arm having a trip member loosely pivoted thereto and restrained from rotation relative thereto opposite the direction of rotation of the motor arm, a shaft pivoted adjacent said gate, a gate engaging arm mounted on said shaft, and a trip arm on the shaft drivingly engaged by said trip member during the actuation of the motor arm by the motor at the termination of operation of the device to thereby shift said gate engaging arm into opening engagement with said gate, said motor being energized by the device to shift the motor arm and trip member out of engagement with the trip arm at the initiation of operation of the device, and means for returning the gate to at least partially closed position at this time, said trip member snap pivoting away from the motor arm in the direction of rotation of the motor arm as said member disengages the trip arm, thereby enabling the motor arm to disengage the trip arm quickly and permit reverse pivoting of the shaft and gate engaging arm.

8. A motorized draft control for an automatically fired furnace or boiler wherein the fuel supply device operates intermittently, comprising a pivotally mounted draft control gate ad-

jacent the opening and means for controlling movement of the gate to open position during the periods of inaction of the device and to at least partially closed position when the device comes into operation, comprising a damper motor controlled by the device to operate for predetermined intervals at the initiation and termination of operation of the device, an arm connected to and actuated by said motor, said arm having a trip member loosely pivoted thereto and restrained from rotation relative thereto opposite the direction of rotation of the motor arm, a trip element pivoted on said housing adjacent said gate, means actuated by movement of said trip element to open said gate, said trip element being drivingly engaged by said trip member during the actuation of the motor arm by the motor at the termination of operation of the device to thereby shift said gate engaging means into opening engagement with said gate, said motor being energized by the device to shift the motor arm and trip member out of engagement with the trip element at the initiation of operation of the device, and means for returning the gate to at least partially closed position at this time, said trip member snap pivoting away from the motor arm in the direction of rotation of the motor arm as said member disengages the trip arm, thereby enabling the motor arm to disengage the trip element quickly.

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