July 10, 1934. O. L. BARDES 1,965,761

FURNACE STOKER

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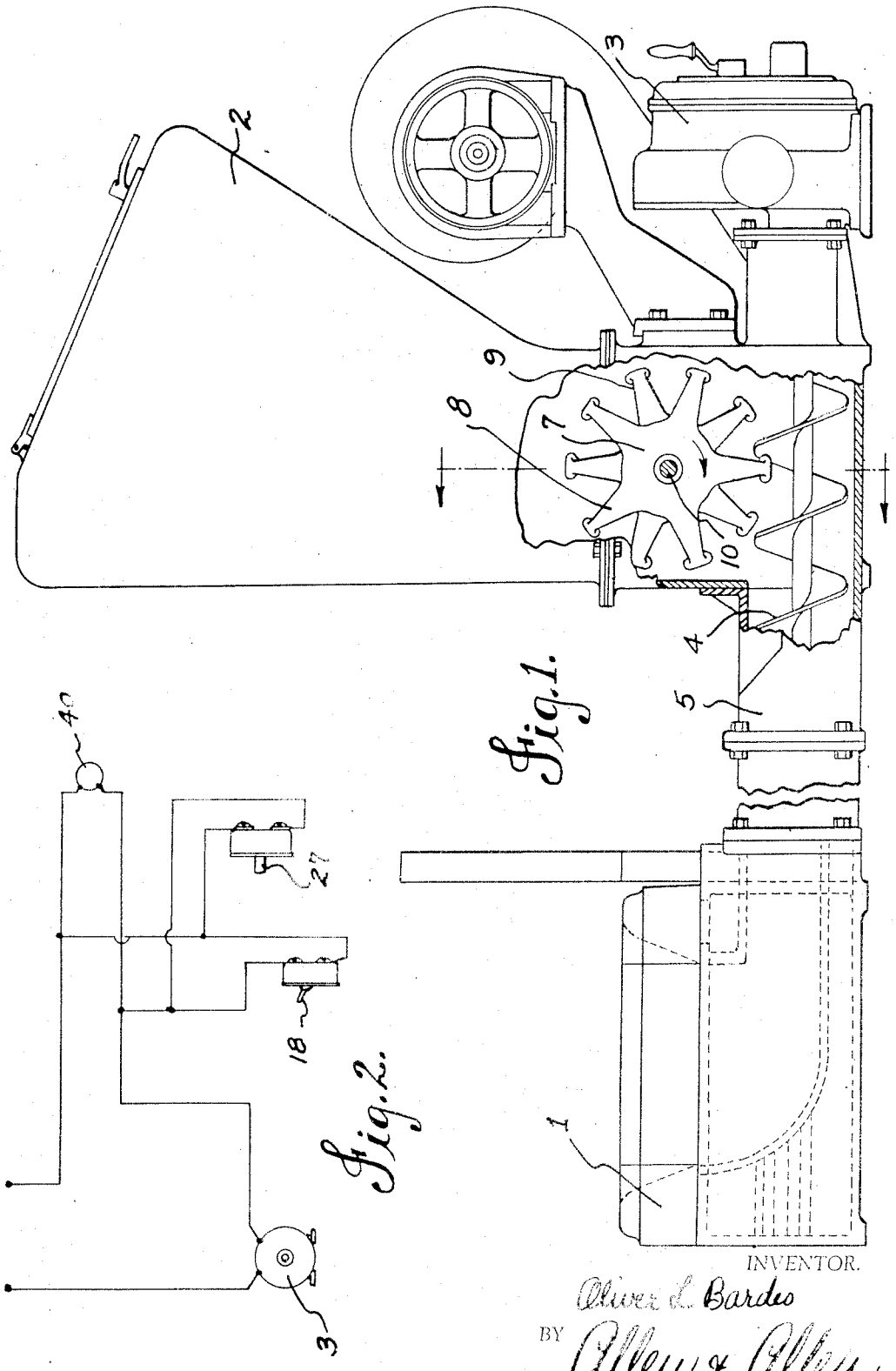


Fig. 1.

Fig. 2.

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Fig. 3.

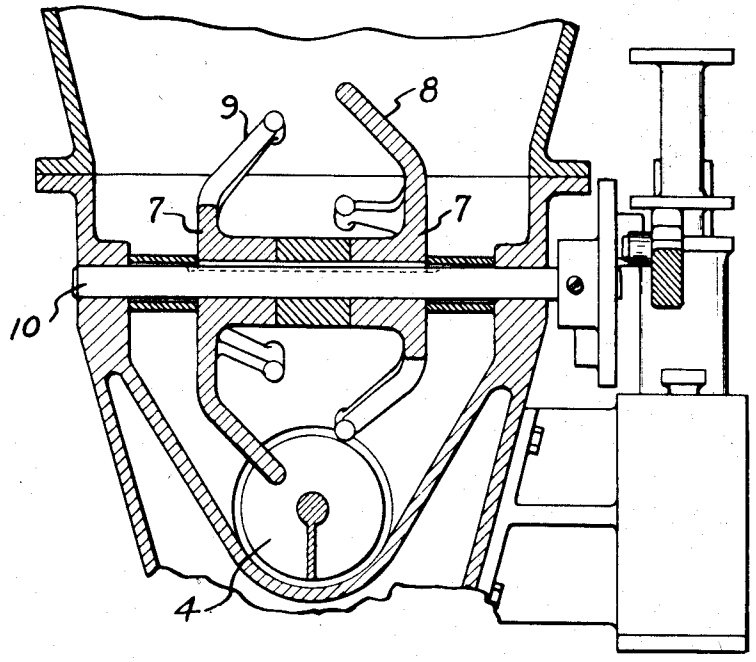
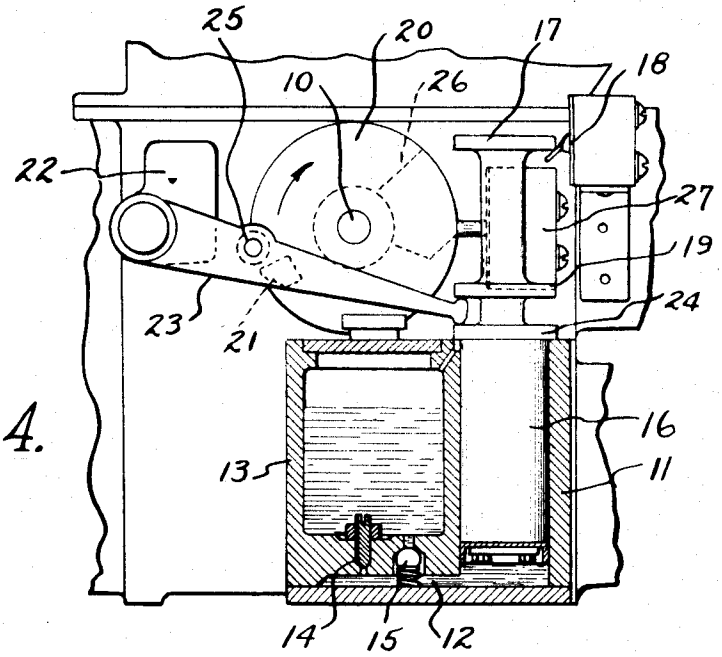


Fig. 4.



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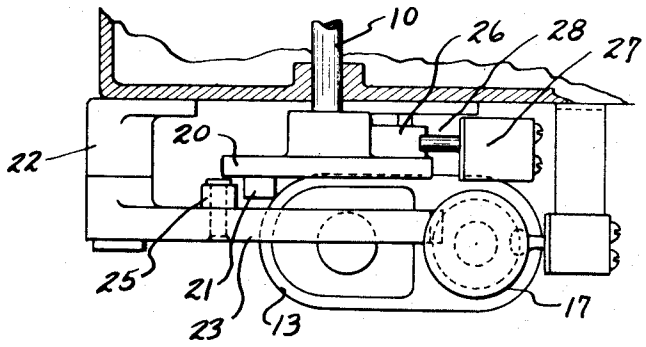


Fig. 5.

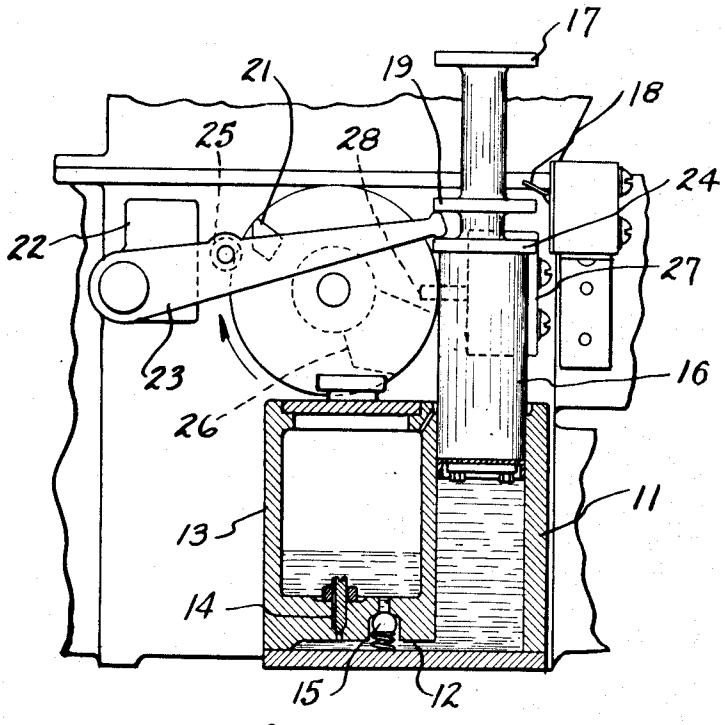


Fig. 6.

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UNITED STATES PATENT OFFICE

1,965,761

FURNACE STOKER

Oliver L. Bardes, Cincinnati, Ohio, assignor to The E. H. Bardes Range and Foundry Company, Cincinnati, Ohio, a corporation of Ohio

Application July 11, 1932, Serial No. 621,861

5 Claims. (Cl. 236—1)

My invention relates to stokers for furnaces, boilers, or the like, in which means is provided for thermostatic control of the stoker and also for a time-controlled operation thereof, which controlled operation is timed solely with reference to the last preceding operation of the stoker, thereby providing for holding the fire in the furnace, but avoiding an operation of the stoker at definite timed intervals irrespective of temperature requirements, which is the system advocated by manufacturers.

Where a stoker is operated say every hour, irrespective of temperature requirements, the situation is often brought about where immediately following one operation of the stoker in accordance with temperature requirements, it is set into operation again by a clock controlled apparatus. According to my invention, a timing element, such as an oil drip, is provided; but arrangements are such that this timing device cannot be effective except for a definite interval after the last operation of the stoker for any reason, be it because of the temperature requirements, or because of the time-interval firing arrangement.

In the description and drawings which follow, I describe and show a typical structure embodying my invention; but let it be understood that various other mechanisms could be adapted to the same end, and that in the claims following the specification, the essential structural features (of which I describe and illustrate an exemplary embodiment) will be duly set forth.

In the drawings:—

Figure 1 is a side elevation partly broken away, showing my invention.

Figure 2 is a suitable wiring diagram.

Figure 3 is a section taken vertically and centrally through the agitator device.

Figure 4 is an elevation partly in section of the elapsed time control element.

Figure 5 is a top plan view thereof.

Figure 6 is an elevation partly in section showing the parts in another position from those in Figure 4.

In Figure 1, I show an underfeed stoker receptacle 1, and a fuel hopper 2. A motor 3 is illustrated as being employed to drive a fuel screw conveyor 4 located in a tube 5, and extending across the bottom of the hopper. Located within the hopper is an agitator consisting of a pair of discs 7 having staggered arms 8 and 9, bent inwardly toward each other. The agitator is mounted on the shaft 10 in a position which will bring the ends of the arms 8 and 9 into driving relation with the screw 4, so that as the screw is revolved to feed fuel to the furnace, the agitator will be driven at a speed corresponding to the speed of the screw, which is naturally very slow. The agitator arms are so arranged as to be ten in number in the illustrated instance, so that the agitator shaft 10 is revolved once for each ten revolutions of the feed screw. As will be noted in Figures 3 and 4, the agitator shaft sets the elapsed time device.

Referring to Figures 4 to 6, it will be noted that the timing element which I employ consists of a dash pot 11, having a port 12 communicating with an oil receptacle 13, there being an adjustable bleed passage 14 between the port and the receptacle, and also another port controlled by a ball check 15. A plunger 16, which is heavy and acts as a gravity member, moves in the dash pot 11. On the upper end of the plunger is a disc portion 17, which, when the plunger reaches the bottom of the dash pot, operates a switch finger 18, applying current to the stoker drive. The plunger also has a disc portion 19, which, when the plunger is in its upper position, throws off the switch by contacting with the switch finger 18, said finger 18 preferably being of the quick throw type. As will be noted, the agitator shaft in the fuel hopper is employed to raise the plunger 16 to its uppermost point, at each operation of the stoker, so that as the plunger cannot operate the switch 18 until it has moved to the bottom of the dash pot, there will be an interval of elapsed time after each operation of the stoker before the stoker will be operated, irrespective of temperature requirements.

The shaft 10 of the agitator has mounted on its outer end within the elapsed time control box, the disc 20, said disc having a tapered lug 21 on its outer surface. Mounted on a suitable bracket 22 is a rock arm 23, which extends across the face of the disc 20 and engages the plunger 16 between the quick switch actuating disc portion 19 and a disc portion 24 at the top of the piston portion of the plunger. Any one complete rotation of the agitator shaft 10 will result in the lug 21 engaging a roller 25 on the rock arm and lifting the rock arm so as to raise the plunger to its uppermost position. As will be noted, the lug 21 will pass the roller 25 when the rock arm 23 is in its upper position.

A temperature requirement operation of the stoker will necessarily result in several complete rotations of the agitator shaft 10, and elapsed time operation of the stoker will continue long enough to raise the plunger 16 to its uppermost

position as indicated in Figure 6, whereupon the parts will stop in the locations shown in Figure 6.

If it should happen that a temperature controlled operation of a stoker were to leave the parts in a position shown in Figure 4, the operation of the device would be assured as described. But if the lug 21 were somewhat advanced from the position shown in Figure 4, the rock arm could not fall far enough to permit the plunger to get to the bottom of its dash pot thus opening the switch, and starting the stoker into operation.

Accordingly, I provide on the rear of the disk 20 a lug or cam 26 having a cylindrical face which engages a spring push button 28 of a switch 27 that shunts the switch 18. The result of this structure is that no operation of the stoker can stop with the rock arm holding lug 21 in a position between that shown in Figure 4 and that shown in Figure 6.

The operation of my device will now be clear. Assuming that in accordance with an operation of the thermostat fuel has been fed to the furnace and the agitator shaft stops with the time-control mechanism in the position shown in Figure 6, there will be no further feeding of the fuel until (*a*) a further thermostat demand, or (*b*) until the time-control plunger has descended sufficiently to operate the switch finger 18. This will occur, of course, only after the elapse of a predetermined time-interval. Should thermostatic demands occur more frequently than the predetermined time-interval aforesaid, my time-interval control mechanism will be inoperative, or will operate only sufficiently to return the time-control mechanism to the position shown in Figure 6. Should there be no thermostatic demand for longer than the predetermined time-interval, my time-control mechanism will operate at said predetermined interval to feed sufficient fuel to the furnace to maintain combustion therein. The amount of fuel feed as determined by the time-interval control mechanism, may be apportioned as desired. In the particular embodiment shown, the time-interval control mechanism will be operative to turn the agitator shaft one complete revolution or less. This means ten turns of the feed screw. Other ratios may be chosen, or my time-control mechanism may be operated by a shaft having some other ratio of rotation to the feed screw of the stoker.

Should the thermostatically controlled demand cease with the agitator shaft in any other position than that shown in Figure 6, the next time-interval-control feed will be only sufficient to return the mechanism to the position shown in Figure 6. It will therefore be less than a normal time interval feed, which is desired, since a thermostatically controlled feed has occurred only one time interval ago, and whereas a thermostatically controlled feed is sufficient to maintain the combustion for at least two time intervals.

It may be noted that the speed of rotation of the feed screw of the stoker has nothing to do with the time that it takes for the plunger to fall from its upper to its lower position, so that adjustments for speed of screw rotation will not require any adjustment of the elapsed time device which has been above described. The elapsed time device may thus be set at the factory and left unchanged upon installation. To control the elapsed time, the bleed opening 14 is changed or adjusted.

While I have shown the agitator shaft as operating the elapsed time device, this is not necessary, as any reduction gear from the motor will serve the same purpose. It is not necessary to employ an oil bleed dash pot arrangement for elapsed time, as other elapsed time elements might be employed. The one shown has advantages in being simple to make and sturdy in operation, and quite readily adjustable by control of the bleed opening.

In the wiring diagram I have shown the motor 3, and the circuit to the motor controlled by the thermostatic switch 40, which starts the stoker into operation in accordance with temperature requirements. The elapsed time switch is shown at 18 and the clearance switch at 27, said switches 18 and 27 being in shunt of the thermostatic switch.

Having thus described a typical embodiment of my invention, what I claim as novel therein and desire to secure by Letters Patent, is:—

1. In a furnace stoker, a drive therefor, thermostatic means for closing an electric circuit actuating said drive, a movable member, means operated by the said drive for moving the member to a limit of movement in one direction, a supplementary circuit for the drive, said member being arranged to set up an open circuit position of said supplementary circuit upon said limit of movement being reached, said member arranged to move of its own power to the other limit of its motion during a period of elapsed time, and arranged to establish a closed circuit position of said supplementary circuit upon reaching said other limit of its motion.

2. An elapsed time circuit closer for use in stokers comprising in combination with the stoker drive, a dash pot and plunger, means operated by the stoker drive to raise the plunger, and circuit opening and closing means operated by said plunger at the limits of its movement when raised in the dash pot and when settled down therein, respectively.

3. An elapsed time circuit closer for use in stokers comprising in combination with the stoker drive, a member having slow timed movement in one direction, means operated by the stoker drive for moving said member in the opposite direction and means for closing and opening a circuit to the stoker drive operated by said member at the limits of its movement respectively, the stoker drive having a feed screw, and agitator operated by the feed screw at a slower speed, and means driven by the agitator for operating the said member oppositely to its timed movement.

4. An elapsed time circuit closer for use in stokers comprising in combination with the stoker drive, a member having slow timed movement in one direction, means operated by the stoker drive for moving said member in the opposite direction and means for closing and opening a circuit to the stoker drive operated by said member at the limits of its movement respectively, an arm for moving the said member oppositely to its timed movement, a rotatable element driven by the stoker drive for raising said arm, means on the rotatable element engaging said arm and releasing it at its high point of said opposite movement, and means also on the rotatable element for preventing an open circuit condition to the stoker drive with the said engaging means in position to prevent the full slow timed movement of said member.

5. In a furnace stoker, a drive therefor, thermostatic means for closing electric circuit to the said drive, a movable member, means operated

by the said drive for moving the member to a limit of movement in one direction, a supplementary circuit for the drive, said member arranged to set up an open circuit position of said supplementary circuit upon said limit of movement being reached, said member arranged to move of its own power to the other limit of its motion during a period of elapsed time, and arranged to establish a closed circuit position of said supplementary circuit upon reaching said other limit of its motion, said means for moving the member to limit of movement in one direction so arranged as to release the member when so moved to said limit.

OLIVER L. BARDES.