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FUEL FEEDER FOR GAS PRODUCERS AND HEATING APPARATUS.

APPLICATION FILED DEC. 21, 1909.

998,699. Patented July 25, 1911.

Fig. 1.

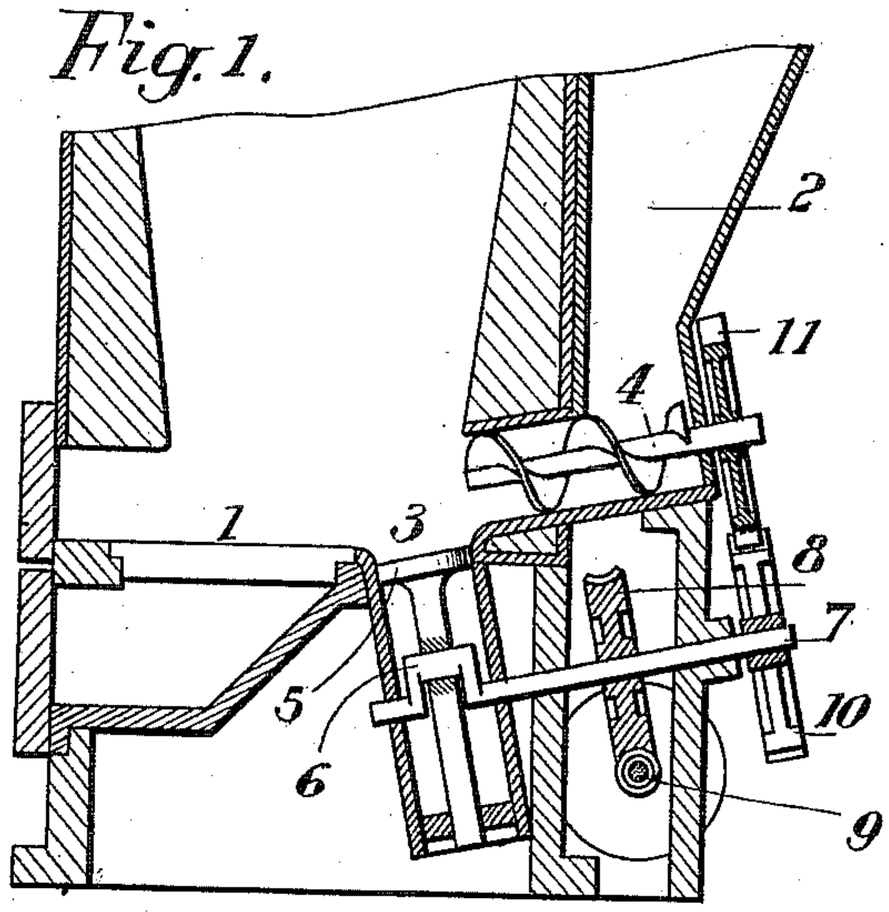


Fig. 2.

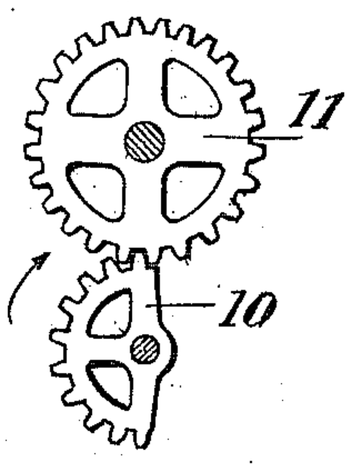
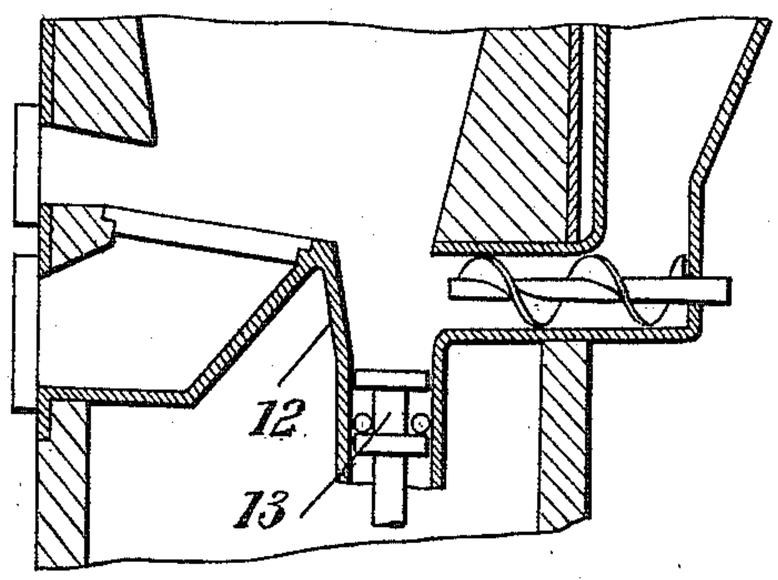


Fig. 3.



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NORBERT LALLIÉ, OF NANTES, FRANCE.

FUEL-FEEDER FOR GAS-PRODUCERS AND HEATING APPARATUS.

998,699. Specification of Letters Patent. Patented July 25, 1911.

Application filed December 21, 1909. Serial No. 534,370.

To all whom it may concern:

Be it known that I, NORBERT LALLIÉ, a citizen of the French Republic, and resident of Nantes, France, have invented certain new and useful Improvements in Fuel-Feeders for Gas-Producers and Heating Apparatuses, of which the following is a specification.

This invention has for its object to provide an automatic fuel feeding device for a gas producer or a heating apparatus, in which the feeding takes place from under the furnace. This device is essentially characterized by the novel application of a feed worm and a piston the mechanical movements of which are combined in a methodical manner. The invention is also characterized by the general arrangement of devices which have for their object to assure the easy working of the feed members in spite of the use of different materials as fuel, such as coals of different kinds, saw dust, peat, brown coal (lignite) and so on. These arrangements consist in the special method of control and in the particular shapes of the feed members; in the conical form given to the walls of the furnace, the positions of the feed ducts and of the grate.

This new type of gas producer or heating apparatus owing to its special method of feeding purges itself automatically and allows the employment of fuels which are rich in volatile products or even fat and bituminous fuel. The volatile products of distillation which are disengaged under the furnace are carried on at the very moment of their production by the rising gaseous current and are automatically burned in the zone of incandescent fuel. Besides, the sticking fuels which are continuously raised by the arrival of fresh fuel cannot produce the obstruction nor hinder the working of the apparatus; their agglomeration is mechanically prevented by the movements which they perform in the lowermost part of the furnace.

The accompanying drawings, given by way of example, show one form of embodiment of this invention applied to a gas producer and a modification of the construction.

In these drawings: Figure 1 is a vertical section through the axis of the feeding members; Fig. 2 shows the gear wheels employed in the driving mechanism; Fig. 3 is a detail, embodying certain modifications.

As shown by Fig. 1 the device comprises at the base of the furnace and at the front part thereof, a grate 1 positioned between two openings provided for the entry of the air and of the steam and for allowing the cleaning of the grate bars, feeding members are positioned in the rear part of the furnace. As shown by the drawing, the feeding operation is accomplished by a mechanical system comprising a feed worm (or a conveying member of a similar kind) and a piston (or a movable lifter) which operates in unison. The feed worm moves inside an inclined duct which opens out into the shaft of the gas producer at the level of the grate, the piston moves in a cylinder which is slightly conical or flared out at its upper part and opens out at the end of the grate. The piston 5 receives alternative movements, having regular phases, from an eccentric or a crank 6 provided on shaft 7. The latter is rotated in a continuous manner by the toothed wheel 8, actuated by the worm 9. A toothed sector 10, occupying half the circumference of a circle and secured to the shaft 7, (Figs. 1 and 2) gears at every revolution with the toothed wheel 11 at the moment when the piston is at the top of its stroke. A fuel feed conveyer, comprising a shaft 4 and a helical thread 4^a, has secured to its shaft, the toothed wheel 11, and by its rotation feeds the fuel from the charging hopper 2 which is provided with a closing device, and pushes it into the empty spaces which are gradually produced at 3 by the descending motion of the piston 5. The fuel is thus introduced into the furnace without unnecessary loss of power. If the fuel employed is coal it is not crushed. The feed worm does not serve to raise the fuel into the furnace, and as a consequence the way in which this worm works is entirely different from that of other worms of the same kind employed for feeding fuel into furnaces of gas producers and which, owing to their rotation, crush the coal which is compressed at their respective ends. As soon as the piston 5 has arrived at the lower end of its stroke the toothed sector 10 disengages with the toothed wheel 11 and the rotation of the feeding worm 4 is temporarily stopped. The piston continues its movement and is brought to its upper position by the eccentric or crank 6 and at the same time pushes the fuel, which has just been intro-

duced at 3, vertically into the furnace. It is readily understood that the introduction of the fuel and its raising into the furnace are distinct operations taking place after each other. The introduction is produced by the combination of the simultaneous movements of the worm feeder and of the piston while the raising of the fuel is effected by the shifting of the piston alone from the bottom to the top of the stroke of the latter. The feed worm performs an interrupted and periodical rotary movement while the piston performs a continuous reciprocating movement.

In order to prevent the blocking of the fuel by too great a pressure, even in a furnace having a small diameter, it is necessary that the lower part of the shaft has a clearly determined conical shape, this shape producing automatically a release of pressure which is normally directed with reference to direction of the pushing action along the lateral walls. It is besides necessary that the amount of fuel fed by the feeding worm be always less than the amount delivered by the piston; the volume produced by the descending motion of the piston during a given space of time, must in consequence always be greater or at least equal to the volume of fuel fed in by the feed worm.

The fuel is continuously sustained by the piston 5; this arrangement has been taken advantage of by giving this piston a stroke having a greater amplitude than it is necessary for providing for the fuel introduced by the feeding worm, in this manner the pressure exerted on the fuel contained in the lower part of the furnace shaft is periodically released and this fuel is submitted to the action of real pulsations. These alternating movements have for their effect to favor the combustion either by mechanically aiding the segregation of sticking fuels which would have a tendency to become agglomerated under the action of the heat, or by facilitating the penetration of the air and of the steam into the incandescent mass, by producing the fall of the ashes and the shifting of the clinkers toward the region where the cleansing is carried out.

In order to immediately and completely burn the abundant volatile products and the soot produced by a fat or bituminous fuel, it is easy if this is considered necessary to introduce into the furnace a supplement of air and of steam at the very place where the fuel enters into the furnace and where the distillation thereof begins.

The inclination of the feed duct and of the piston chamber is intended to facilitate the introduction of the fuel, and to direct the fuel toward the center of the furnace.

The shaft of the feed worm is preferably tapered inwardly of the furnace, and the threads of the worm are deepest at the end farthest from the feed hopper so as to bring the fuel as close as possible to the piston 5 and to prevent in the duct of the worm any useless compression and friction.

The system of feeding described above may be applied to different types of gas producers provided or not with grates and which will be modified in a suitable manner. The modification shown by Fig. 3 consists in changing the relative positions and locations of the feed duct and the cylinder under the furnace. It is obvious that the operating mechanism shown and described in Figs. 1 and 2 of the drawings are susceptible of being applied to Fig. 3. In the form shown by Fig. 3 the raising of the fuel takes place from under the furnace, but the introduction takes place at a level which is lower than the grate, into a conical part which forms a cup behind and at the bottom of the furnace.

Having now fully described my said invention what I claim and desire to secure by Letters Patent, is:—

1. In a fuel feeder, the combination with a furnace, a fuel hopper, a feed duct inclined downwardly and inwardly of the furnace, of a feed worm in said duct, said worm having a shaft provided with a gear, a cylinder under said furnace, a piston in said cylinder, a crank shaft actuating said piston, means actuating said crank shaft, and a toothed segment on said crank shaft coacting with said gearing to actuate said worm intermittently.

2. In a fuel feeder, the combination with a furnace, a fuel hopper and a feed duct inclined downwardly and inwardly of the furnace, of a feed worm in said feed duct, said worm having a shaft provided with a gear, an inclined cylinder under said furnace, a piston in said cylinder, means actuating said piston, and an intermittent gear mechanism connecting said means with the shaft of the worm.

3. In a fuel feeder, the combination with a furnace, a fuel hopper, and an inclined feed duct, of a conveyer in said duct, an inclined cylinder under said furnace, a piston in said cylinder, a crank shaft actuating said piston, a worm gearing, a worm meshing with said worm gearing for actuating said crank shaft, and gear means on said crank shaft coacting with said worm gear to actuate the conveyer.

4. In combination, a furnace, a hopper, a feed duct connecting the furnace and hopper, a helical conveyer in said duct, an extension under the furnace having a cylinder, a lifter in said extension, a crank shaft engaging the lifter for imparting thereto a reciprocatory motion, a toothed segment on said crank shaft, said segment gearing with a toothed gear, said toothed gear being

connected with the shaft of said conveyer for imparting intermittent motion to said conveyer.

5. In a fuel feeder, a furnace, a feed duct, a conveyer rotatable in said duct, said duct opening laterally and directly into said furnace, a cylinder under said furnace, a piston reciprocally movable in said cylinder, the direction of reciprocation of said piston being approximately at right angles to the axis of said conveyer, means for continuously reciprocating said piston, and means intermittently rotating said conveyer.

6. In a fuel feeder, a furnace, having a distinctly conical interior, a feed duct inclined inwardly of the furnace, a conveyer rotatable in said duct, said duct opening laterally and directly into said furnace, a cylinder under said furnace, a piston reciprocally movable in said cylinder, the direction of reciprocation of said piston being approximately at right angles to the axis of said conveyer, means for continuously reciprocating said piston, means intermittently rotating said conveyer, said cylinder communicating with said furnace directly under the point where the feed duct discharges into said furnace.

7. In a fuel feeder, a furnace having a distinctly conical interior, a grate in said furnace, a feed duct inclined inwardly of the furnace, a conveyer rotatable in said duct, said duct opening laterally and directly into said furnace (a cylinder under said furnace, a piston reciprocally movable in said cylinder, the direction of reciprocation of said piston being approximately at right angles to the axis of said conveyer, means for continuously reciprocating said piston, means intermittently rotating said conveyer, said cylinder communicating with said furnace directly under the point where the feed duct discharges into said furnace and behind said grate.

8. In a fuel feeder, a furnace having a distinctly conical interior, a grate in said furnace, a feed duct inclined inwardly of the furnace, a conveyer rotatable in said duct, said duct opening laterally and directly into said furnace, a cylinder under said furnace, a piston reciprocally movable in said cylinder, the direction of reciprocation of said piston being approximately at right angles to the axis of said conveyer, means for continuously reciprocating said piston, means intermittently rotating said conveyer, said chamber communicating with said furnace directly under the point where the feed duct discharges into said furnace and behind said grate, the said grate being inclined with respect to the axis of said cylinder.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

NORBERT LALLIÉ.

Witnesses:
LOUIS GOLDSCHMIDT,
RAOUL CHORNYEAU.