Aug. 18, 1936. H. J. KEELEY 2,051,559

DRIVE MECHANISM FOR FUEL BURNERS

Filed Nov. 11, 1933 2 Sheets-Sheet 1

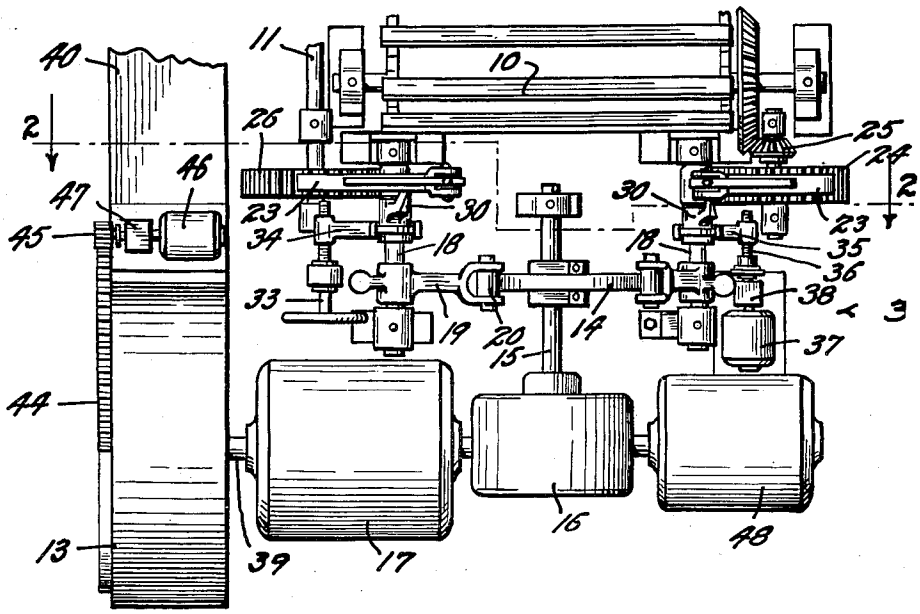

FIG 1

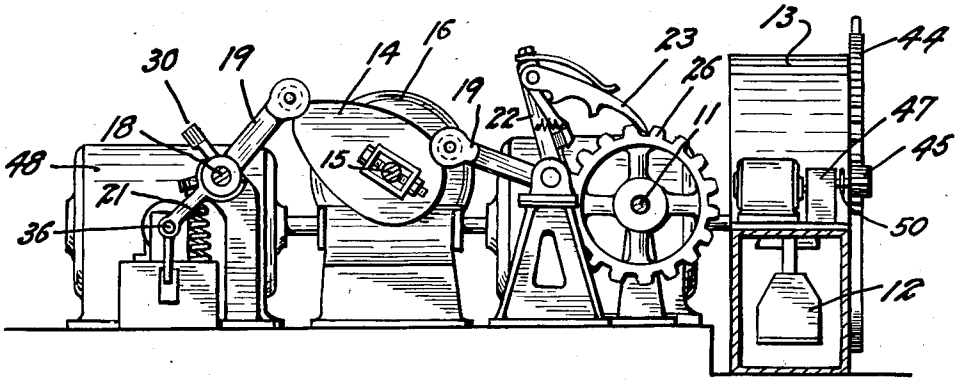

FIG 2

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DRIVE MECHANISM FOR FUEL BURNERS

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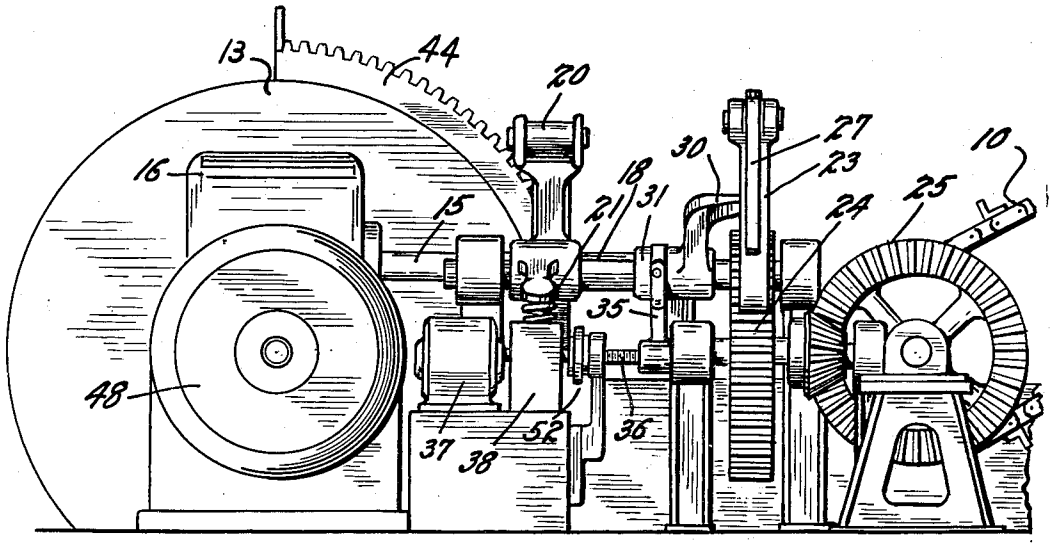

Fig 3

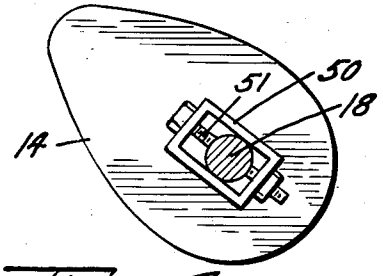

Fig 4

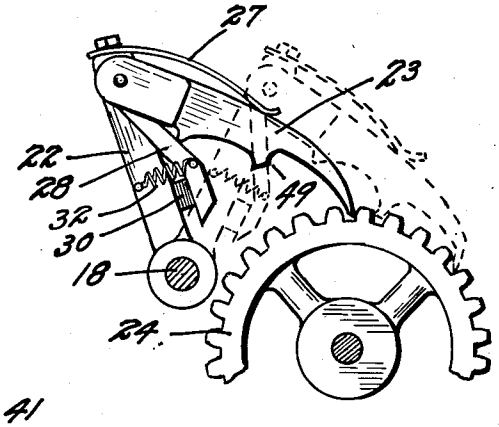

Fig 5

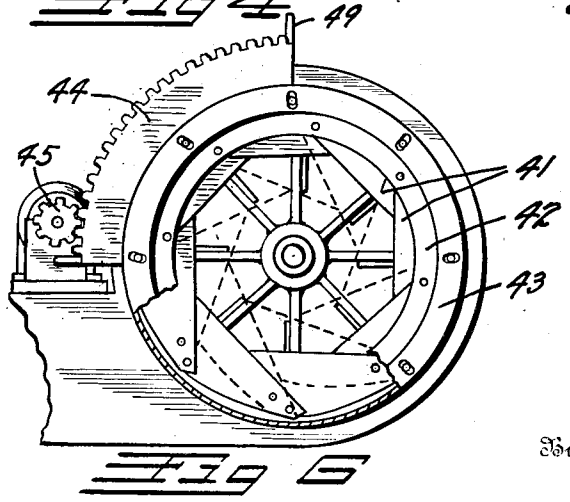

Fig 6

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Patented Aug. 18, 1936 2,051,559

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DRIVE MECHANISM FOR FUEL BURNERS

Henry J. Keeley, Denver, Colo.

Application November 11, 1933, Serial No. 697,637

6 Claims. (Cl. 74—124)

This invention relates to a mechanism for driving the grates, feed conveyors, ash conveyors, blowers, etc., of a stoker or burner. It is more particularly applicable for driving a burner of the type illustrated in applicant's copending application, Serial No. 691,649, but is, of course, not limited to this particular application.

The principal object of the invention is to provide a mechanism which can be controlled to advance traveling grate bars, feed conveyors, etc., at a speed proportionate to the rate of combustion of the fuel.

Another object of the invention is to so construct the device that the incoming power may be alternately employed to drive two or more independent drive mechanisms so that a single prime mover may be used for all drives, yet need only be large enough to drive any one of the drives.

A further object is to provide a novel and efficient means for accurately controlling the air supply to a burner blower.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

Fig. 1 is a plan view of the invention applied to a fuel burner of the type illustrated in the said copending application.

Fig. 2 is a cross section therethrough taken on the line 2—2, Fig. 1.

Fig. 3 is a enlarged side elevation thereof looking in the direction of the arrow 3, Fig. 1.

Fig. 4 is a detail view of the actuating cam.

Fig. 5 is a detail view of the ratchet lever.

Fig. 6 is a detail view illustrating the intake of the blower.

In the drawings a portion of a coal feed conveyor such as illustrated in applicant's said copending application is illustrated at 10 and a grate drive shaft, for driving a traveling grate of the type illustrated in said copending application, is shown at 11. A fan 12 mounted in a fan housing 13 supplies the combustion air to the burner.

The present invention resides in means for driving the conveyor 10, the grate drive shaft 11, the fan 12, and for controlling the air intake of the fan housing 13.

The invention comprises an actuating cam 14 mounted on a cam shaft 15 actuated from a speed reducer 16. The power is furnished to the speed reducer 16, from a drive motor 17. At each side of the cam 14, a ratchet shaft 18 is positioned. The ratchet shafts 18 carry cam follower levers 19 secured thereto and provided with suitable rollers 20 for rolling on the periphery of the cam 14. The rollers are maintained in constant contact with the cam by means of suitable springs 21. Thus as the cam rotates, it will impart an alternating rotation to the ratchet shafts 18.

Each of the ratchet shafts 18 is provided with a pawl arm 22, on the extremity of each of which, a pawl 23 is hinged. One of the pawls 23 actuates a ratchet gear 24 which drives the feed conveyor 10 through the medium of bevel gears 25. The other pawl 23 actuates a ratchet gear 26 mounted on the grate drive shaft 11. Each pawl is provided with a pawl spring 27 which constantly urges it towards its gear.

It can be readily seen that as the pawls 23 swing toward the gears they will contact the teeth of and rotate the latter and as they swing rearward they will ride over the gear teeth. The pawls are so arranged that they can be caused to engage more or less of the gear teeth so as to rotate the gears any desired interval. This is accomplished by means of a stop lever 28 which is hinged on the pivot of the pawl 23 and contacts with the latter. If the stop member 28 is swung outwardly it will limit the amount of descent of the pawl so as to maintain it at a height which will not allow it to contact with the gear teeth until it approaches the extremity of its movement. If the stop is swung downwardly it lowers the pawl 23 so that it will contact with the gear teeth earlier in its arc of movement.

The inward and outward movement of the stop lever 28 is accomplished by means of a wedge 30 which is supported from a collar 31 splined on the ratchet shaft 18 so that it may be moved longitudinally thereof but must rotate therewith. It can be seen that as the wedge 30 is moved toward the pawl lever 22 it will enter between the pawl lever and the stop lever so as to raise the latter. If moved away from the pawl lever 22 it will allow the stop lever to be drawn toward the pawl lever by means of a tension spring 32.

The longitudinal movement of the wedge 30 may be accomplished by means of a manually actuated screw 33 which is threaded through a yoke 34 engaging the collar 31, as shown on the drive of the grate shaft 11. It may also be operated by means of a motor, as shown on the

conveyor drive. In the latter construction, a yoke 35 is threaded on a threaded shaft 36. The shaft 36 is driven by means of a motor 37 through a suitable speed reducer 38. Thus as the motor 37 moves in one direction it will withdraw the wedge 30 from between the levers 22 and 28 and as it moves in the other direction it will force the wedge between these levers so as to constantly control the number of teeth to be engaged by the pawl 23.

The fan 12 is preferably mounted on an extension motor shaft 39 from the drive motor 17. The air from the fan discharges through a conduit 40 to the combustion chamber. The air to the fan intakes through the sides of the housing 13. The intake opening is surrounded by a series of iris plates 41, each of which is pivoted adjacent its one extremity on both a stationary ring 42 and a rotatable ring 43. Thus, as the ring 43 is rotated, it will swing the iris plates inwardly over the intake opening so as to reduce the size thereof, as indicated in broken line in Fig. 6. The rotation of the ring 43 may be accomplished through the medium of an arcuate rack 44 and a rack pinion 45. The rack pinion 45 is driven from a small motor 46 through a suitable speed reducer 47.

It is preferred to have the motors 37 and 46 and the various electrical controls operate from direct current in order that a variable speed may be effectively obtained. Since practically all installations will be made where only alternating current is available, a direct current generator 48 is provided. The alternating current is used to drive the motor 17 at a constant speed. The motor 17 then drives the generator 48 to furnish the current for the motors 37 and 46.

It is desired to call attention to the fact that while the cam 14 is actuating one of the follower levers 19, the other follower lever 19 is descending so that it not only absorbs no power but actually assists the rotation of the cam 14, owing to the springs 21. Thus, the power required need only be sufficient to drive either the conveyor 10 or the shaft 11 since only one of these members is being driven at a time.

A stop claw 49 is preferably formed on each pawl 23 so as to engage in the teeth of the ratchet gear at the extremity of the pawl stroke so as to definitely stop the gear at this point and prevent it from coasting.

The cam 14 is preferably, but not necessarily, constructed as illustrated in Fig. 4 so that a variation may be obtained in its effective length. This is accomplished by mounting the cam on a shaft frame 50 having a shape which allows movement on the shaft 18. Adjusting bolts 51 pass through the frame 50, there preferably being one bolt on each side of the cam 14. These bolts are threaded through the shaft 18 so that rotation of the bolts varies the position of the frame 50 on the shaft and varies the axial point or the effective length of the cam 14.

It can be seen from the above that an exceedingly accurate and minute adjustment of the movement of the conveyor 10 and the grate bars can be obtained from the above construction without variation in the speed of the motor 17. Should it be desired to retard this movement the wedge members 30 are actuated toward the cam levers 22 and when it is desired to accelerate the speed the wedge members are moved in the opposite direction.

It is possible that the motor 37 might start to operate at a time when the pawl 23 was in engagement with the teeth of the ratchet gear. At this time it would be practically impossible for the wedge to enter between the levers 22 and 28 which might result in damage to the motor. To avoid this a friction clutch 52 is positioned between the speed reducer 38 and the shaft 36 which allows the motor 37 to idle until the load is released from the pawl 23.

It is desired to call attention to the fact that stops 53 are positioned at each extremity of the rack 44 so as to prevent the pinion 45 from running off the ends thereof. As the pinion 45 strikes these stops, the motor is allowed to continue its rotation through the medium of the friction clutch 52.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:—

1. Means for actuating a grate drive shaft comprising: a cam; means for driving said cam; a pawl shaft positioned at one side of said cam; a cam follower projecting from said pawl shaft into a contact with said cam; a pawl arm projecting from said pawl shaft; a pawl hinged to said pawl arm and extending therefrom; a ratchet gear in contact with said pawl, and operatively connected with said grate drive shaft; a stop member movably supported by said pawl arm so as to contact with said pawl and limit its arc of contact with said ratchet gear; a wedge member; a collar slidably mounted on said pawl shaft and supporting said wedge member; and means for moving said collar longitudinally of said pawl shaft so as to project said wedge member into contact with said stop member to vary the position of the latter.

2. Means for actuating the grate drive shaft of a fuel burner comprising: a cam; means for driving said cam; a pawl shaft positioned at one side of said cam; a cam follower projecting from said pawl shaft into a contact with said cam; a pawl arm projecting from said pawl shaft; a pawl hinged to said pawl arm and extending therefrom; a ratchet gear in contact with said pawl, and operatively connected with said grate drive shaft; a stop member movably supported by said pawl arm so as to contact with said pawl and limit its arc of contact with said ratchet gear; a wedge member; a collar slidably mounted on said pawl shaft and supporting said wedge member; a threaded shaft; a yoke actuated by said threaded shaft and connected with said collar so as that rotation of said threaded shaft will move said collar longitudinally of said pawl shaft so as to project said wedge member into contact with said stop member to vary the position of the latter.

3. Means for intermittently rotating a drive shaft comprising: a ratchet wheel on said shaft; a pawl shaft positioned alongside and parallel to said drive shaft; means for rocking said pawl shaft through a preset arc; a pawl arm projecting from said pawl shaft; a pawl hinged to said pawl arm and extending over said ratchet wheel; a pawl supporting member hinged to said arm and contacting said pawl; a wedge member slidably mounted on said pawl shaft, said latter member having a wedge-shaped extremity positioned between said arm and said

pawl supporting member; and means for varying the position of said wedge member along said pawl shaft so as to project or withdraw said wedge-shaped extremity and cause said pawl supporting member to vary the effect of said pawl on said ratchet wheel.

4. Means for intermittently rotating a drive shaft comprising: a ratchet wheel on said shaft; a pawl shaft positioned alongside and parallel to said drive shaft; means for rocking said pawl shaft through a preset arc; a pawl arm projecting from said pawl shaft; a pawl hinged to said pawl arm and extending over said ratchet wheel; a pawl supporting member hinged to said arm and contacting said pawl; a wedge member slidably mounted on said pawl shaft, said latter member having a wedge-shaped extremity positioned between said arm and said pawl supporting member; a threaded shaft extending alongside and parallel to said pawl shaft; a nut carried on said threaded shaft; a yoke projecting from said threaded shaft to a contact with said wedge member; and a motor for rotating said threaded shaft so as to move said wedge-shaped extremity into more or less contact with said pawl supporting member so as to vary the effective arc of movement of said pawl.

5. Means for actuating the fuel feed mechanism of a fuel burner comprising: a pawl shaft; a cam shaft parallel to said pawl shaft; a cam mounted on said cam shaft; a follower arm extending from said pawl shaft over said cam and resting thereon; a pawl arm extending upwardly from said pawl shaft; a ratchet shaft positioned parallel to said pawl shaft; a ratchet wheel mounted on said ratchet shaft; a pawl extending outwardly from the upper extremity of said pawl arm over and into contact with said ratchet wheel; means for rotating said cam shaft so as to oppositely rock said pawl shaft; a movable stop member contacting said pawl; a wedge member mounted for slidable movement along said pawl shaft and acting through said stop member to limit the arc of contact of said pawl with said ratchet wheel; and means for moving said wedge member longitudinally of said pawl shaft.

6. Means for actuating the fuel feed mechanism of a fuel burner comprising: a pawl shaft; a cam shaft parallel to said pawl shaft; a cam mounted on said cam shaft; a follower arm extending from said pawl shaft over said cam and resting thereon; a pawl arm extending upwardly from said pawl shaft; a ratchet shaft positioned parallel to said pawl shaft; a ratchet wheel mounted on said ratchet shaft; a pawl extending outwardly from the upper extremity of said pawl arm over and into contact with said ratchet wheel; means for rotating said cam shaft so as to oppositely rock said pawl shaft; a movable stop member contacting said pawl; a wedge member mounted for slidable movement along said pawl shaft and acting through said stop member to limit the arc of contact of said pawl with said ratchet wheel; and means for moving said wedge member longitudinally of said pawl shaft; a yoke member engaging said wedge member; a threaded shaft for moving said yoke member so as to move said wedge member longitudinally of said pawl shaft; and a reversible, variable speed motor for operating said threaded shaft.

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