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MECHANICAL STOKER

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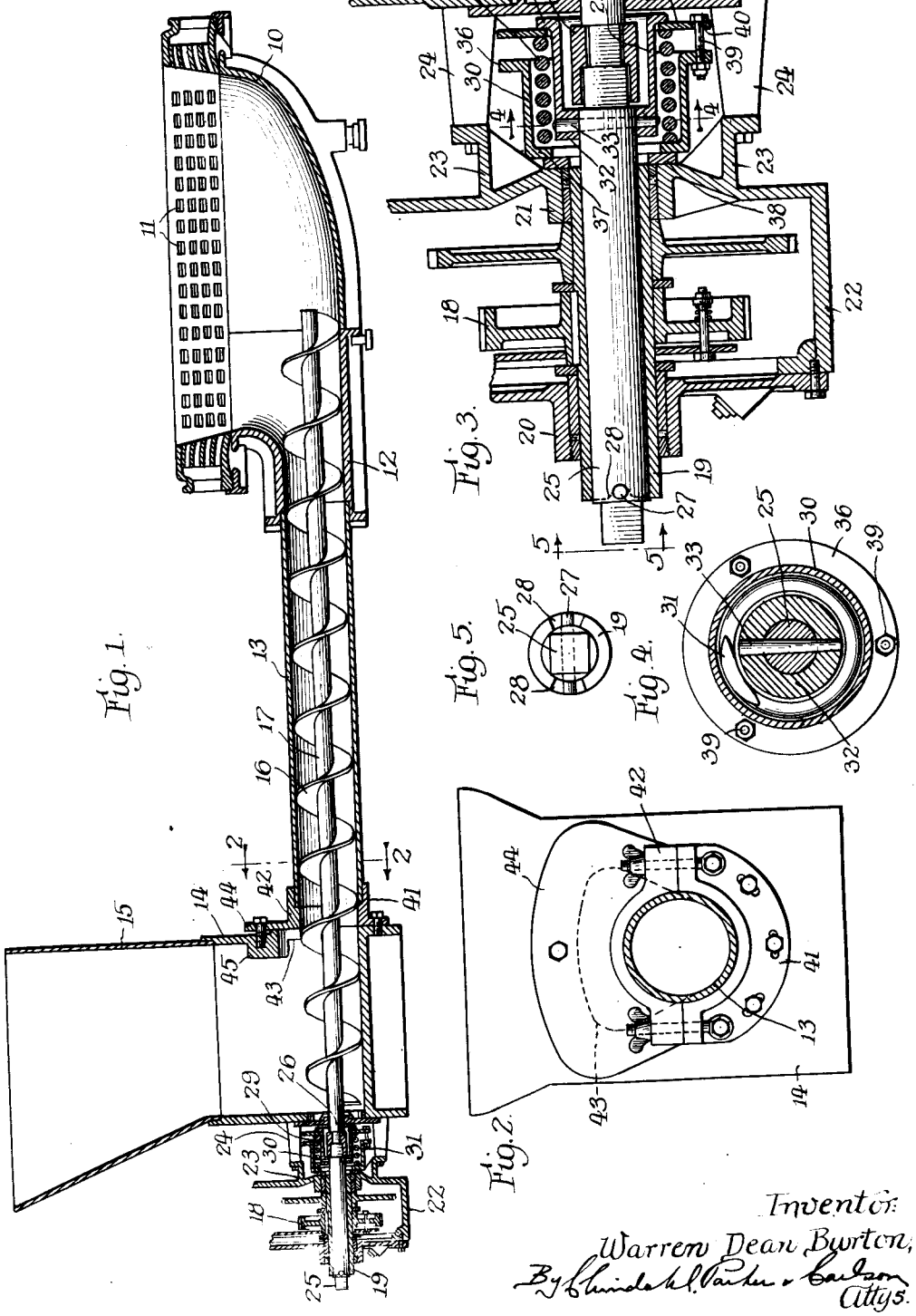


Fig. 1.

Fig. 3.

Fig. 5.

Fig. 4.

Fig. 2.

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MECHANICAL STOKER

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The present invention relates to improvements in mechanical stokers, and is particularly applicable to stokers of the underfeed type.

In one form of underfeed stokers, coal is fed by a power driven screw conveyor from a hopper through a conveyor casing or duct into the bottom of a retort where it is consumed. The coal supplied to the hopper often contains foreign objects, such as pieces of iron, steel or rock, which will not crush. Frequently, these objects form obstructions at the outlet of the hopper, thereby clogging the apparatus. In this event, if the drive for the screw conveyor is not disconnected, serious damage to the apparatus may result. To avoid the possibility of such damage, it is common to interpose a member in the drive for the screw conveyor which will shear when subjected to a force somewhat in excess of the force required in normal operation, and which can be readily replaced.

If an obstruction in the hopper causes a break down in the operation, obviously, the obstruction must be removed and a new shear member must be provided before the operation can be started again. This involves inconvenience and often a considerable loss of time.

The primary object of the present invention therefore resides in the provision of a novel safety cut-out mechanism which will automatically disengage the power drive for the conveyor if an obstruction causes a force substantially in excess of the normal force to be applied to the conveyor.

In operation, the conveyor is subjected to end thrust. An important object of the invention resides in the provision of a new and improved safety cut-out mechanism which comprises means adapted to resist the normal end thrust but to permit endwise movement of the conveyor in instances of excessive end thrust, and means operable upon such endwise movement of the conveyor to disengage the power drive for the conveyor until the excessive thrust has been relieved.

A more specific object resides in the provision in combination with a safey cut-out mechanism of the foregoing character of a removable closure in the hopper adjacent the conveyor outlet for permitting obstructions to be readily and quickly removed without removing all of the coal from the hopper.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawing, Figure 1 is a vertical, longitudinal sectional view of a stoker embodying the features of my invention.

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is an enlarged fragmentary sectional view of the drive and safety cut-out mechanism for the conveyor.

Fig. 4 is a transverse sectional view taken along line 4—4 of Fig. 3.

Fig. 5 is an end view of the clutch taken along line 5—5 of Fig. 3.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawing and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more specifically to the drawing, the exemplary embodiment of the invention comprises an upwardly opening retort 10 of standard construction having tuyère openings 11 about the upper edge and having an inlet duct 12 at the bottom. The inlet duct 12 is connected through a conveyor duct or casing 13 preferably cylindrical in form, to the base 14 of a hopper 15 into which coal is supplied. Extending through the base 14 and the casing 13 into the retort 10 for conveying coal from the hopper 15 into the bottom of the retort is a suitable conveyor screw 16 having a longitudinal shaft 17.

The end of the shaft 17 extends out of the hopper base 14 for connection to a suitable power drive. In the present instance, this power drive comprises a gear 18 adapted to be connected to a suitable source of power (not shown), and keyed to a sleeve 19 journaled in bearings 20 and 21 in opposite side

walls of a suitable housing 22. The latter is rigidly secured in spaced relation to the hopper base 14, and to this end is formed with suitable lugs 23 bolted to a plurality of spacing arms 24 projecting from the base. Slidably and rotatably disposed in the sleeve 19 is a shaft 25. The inner end of the shaft 25 is suitably connected to the shaft 17, as by a coupling 26. The outer end of the shaft 25 is provided with a transverse pin 27, the opposite ends of which are adapted to engage in two diametrically opposed notches 28 formed in the outer end of the sleeve 19. The pin 27 and the notches 28 constitute a clutch for operatively connecting the sleeve 19 to the shaft 25. The pin 27 also is in the nature of a shear pin, and hence will shear to break the drive connection between the sleeve 19 and the shaft 25 if subjected to a torque in excess of a predetermined safety torque.

Means is provided for yieldingly holding the pin 27 in the notches 28 to complete the drive connection for the conveyor 16. Preferably, this means is a spring unit acting on the shaft 25, and tending to move or hold the latter together with the conveyor 16 to the right opposite to the normal direction of thrust. The spring unit comprises inner and outer spaced concentric sleeves 29 and 30 and a coil spring 31 disposed between the sleeves. The inner sleeve 29 is provided on one end with a hub 32 embracing the inner end of the shaft 25 outside of the housing 22, and rigidly secured thereto by means of a suitable taper pin 33. The other end of the sleeve 29 adjacent the hopper base 14 is turned out to form a peripheral flange 34 constituting a backing for a disk 35 on the sleeve against which one end of the spring 31 impinges. Of the outer sleeve 30, the end adjacent the disk 35 is turned out to form a peripheral flange 36 normally spaced from the disk 35 to permit relative movement thereof axially of the shaft 17, and the other end is turned inwardly to form a peripheral flange 37 against which the adjacent end of the spring 31 impinges. The flange 37 bears against a wearing plate 38 on the housing 22 and about the shaft 25.

Secured to the flange 36 are a plurality of spaced bolts 39 which project freely through openings 40 in the disk 35, and the heads of which normally engage the disk to limit the extent of separation between the flange and the disk. The spring 31 tends to urge the conveyor 16 to the right only when the disk 35 and the flange 36 are not separated to the fullest permissible extent. The self-contained spring unit thus takes up the reaction of the spring except when the end thrust on the conveyor exceeds the spring pressure.

The spring is of such strength that under compression it exerts a pressure sufficient to withstand the end thrust of the conveyor when the latter is operating under the most severe normal condtions. In the event of an obstruction in the hopper base 14, the end thrust on the conveyor 16 is greatly increased, and tends to move the latter endwise against the action of the spring 31. If the end thrust exceeds a predetermined amount, the pin 27 will be moved out of the notches 28, thereby breaking the power drive for the conveyor and causing the latter to stop. When the end thrust is relieved, the spring 31 automatically reestablishes the power drive. Thus, the pin 27 is not sheared and need not be replaced each time the operation is discontinued because of excessive load on the conveyor.

If, in the event of an excessive load the conveyor should fail to move endwise, the pin 27 would still operate as a shear pin, thereby preventing injury to the parts.

One of the features of the present invention resides in combining the safety cut-out with means for facilitating the removal of obstructions in the base 14 tending to interfere with the operation of the conveyor screw, without necessitating the removal of all of the coal from the hopper 15. To this end, the hopper is formed with one or more openings giving access to the interior of the base 14 adjacent the outlet to the conveyor casing 13. In normal operation, these openings are sealed by removable closures. The construction for permitting the ready removal of obstructions may assume various forms.

In the preferred form shown in Figs. 1 and 2, the casing 13 is secured to the hopper base 14 by means of a semi-cylindrical bracket 41 bolted to the base and welded to the underside of the casing, and an upper semi-cylindrical bracket 42 embracing the top of the casing and removably secured, as by means of bolts, to the adjacent wall of the hopper base and the bottom bracket 41. Formed in the wall of the hopper base 14 directly over the outlet to the casing 13 is a suitable opening 43 for permitting the removal of material. This opening normally is closed by an upstanding plate 44 formed integral with the upper bracket 42. Formed adjacent the upper margin of the opening 43 on the inside of the base wall is an inwardly extending deflector 45 preferably in the form of a flange. This deflector tends to prevent coal from the hopper from passing directly to the entrance of the conveyor casing 13. If an obstruction binds or stops the conveyor screw 16, and thereby causes the power drive to be broken, the upper bracket 42 with the plate 44 is quickly removed, and the obstruction is removed through the opening 43 by merely removing the material from the hopper base at the point at which the obstruction would take effect. Coal from the hopper is prevented from filling the space so

created by the deflector flange 45. It will be evident that by reason of the foregoing construction, the obstruction can be readily and quickly removed without removing all of the coal from the hopper, and that the stoker thereupon will be put automatically into operation without any considerable loss of time.

I claim as my invention:

1. A stoker comprising, in combination, a hopper, a discharge duct opening from the lower end of said hopper, an axial thrust rotary feeding means extending through said hopper into said duct, said means having a limited axial movement, means for driving said feeding means, said last mentioned means including a clutch adapted to be opened and closed automatically upon axial movement of said feeding means in opposite directions, and spring means acting on said feeding means in a direction to close said clutch.

2. A stoker comprising, in combination, a container, a rotary screw conveyor in said container, said conveyor having a limited axial movement, means for rotating said conveyor, said means including a clutch adapted to be opened and closed automatically upon axial movement of said conveyor in opposite directions, and yielding means acting on said conveyor in a direction to close said clutch.

3. A stoker comprising, in combination, a container, a rotary screw conveyor in said container, said conveyor having a shaft extending from said container, means for driving said shaft, said means including a clutch adapted to be opened and closed upon endwise movement of said conveyor in opposite directions, and a self-contained spring unit tending to move said conveyor endwise for a limited distance in a direction to maintain said clutch in closed position.

4. In a stoker, in combination, a shaft, a fixed abutment, an inner concentric sleeve rigidly secured to said shaft, and having a spring seat at one end, an outer concentric sleeve having a spring seat opposed to said first mentioned seat and engaging said abutment, spring means interposed between said sleeves and abutting at opposite ends against said seats, said spring means tending to effect a relative axial movement between said sleeves, and means for limiting the extent of said movement.

5. In a stoker, in combination, a shaft, an abutment, an inner spring retainer rigidly secured to said shaft, and having a spring seat at one end, an outer spring retainer having a spring seat opposed to said first mentioned seat and engaging said abutment, a coil compression spring interposed between said retainers and abutting at opposite ends against said seats, and guide means connecting said retainers for limited relative movement axially of said shaft.

6. A stoker comprising, in combination, a container, a rotary screw conveyor in said container, said conveyor having a shaft extending out of said container, a gear transmission mounted on said container in spaced relation thereto and comprising a shaft and a clutch operable to open and close upon axial movement of said last mentioned shaft in opposite directions, means connecting said shafts for joint movement, and a spring compression unit mounted between said container and said transmission and acting on said last mentioned shaft in a direction to close said clutch.

7. In a stoker, in combination, a casing, a sleeve journaled in said casing, means for rotating said sleeve, a shaft extending rotatably and slidably through said sleeve, one end of said sleeve being formed with a pair of diametrically opposed notches, a shear pin extending diametrically through said shaft and adapted to engage in said notches to effect a driving connection between said sleeve and said shaft, and spring means tending to hold said pin in said notches.

8. In a stoker, in combination, a casing, a sleeve journaled in said casing, means for rotating said sleeve, a shaft extending rotatably and slidably through said sleeve, one end of said sleeve being formed with a recess, a projection on said shaft adapted to engage in said recess to effect a driving connection between said sleeve and said shaft, and yielding means tending to maintain said projection in said recess.

9. In a stoker, in combination, a casing, a sleeve journaled in said casing, means for rotating said sleeve, a shaft extending rotatably and slidably through said sleeve, one end of said sleeve being formed with a recess, a projection on said shaft adapted to engage in said recess to effect a driving connection between said sleeve and said shaft, and spring means acting on said shaft to move the latter endwise in a direction to maintain said projection in said notch.

10. In a stoker, in combination, a casing, a sleeve journaled in said casing, means for rotating said sleeve, a shaft rotatable in said sleeve, said shaft and said sleeve being relatively slidable, one end of said sleeve being formed with a recess having a side face inclined to the plane of said end, a projection on said shaft adapted to engage in said recess to effect a driving connection between said sleeve and said shaft, and yielding means tending to maintain said projection in said recess, said face being effective when the rotative force applied by said sleeve to said shaft exceeds a predetermined value to force said projection out of said recess against the action of said yielding means.

11. A stoker comprising, in combination,

a hopper having a discharge outlet, a rotary screw conveyor in said hopper for discharging fuel through said outlet, a drive sleeve, said conveyor having a shaft extending through said drive sleeve, said sleeve and said shaft having relative axial movement, one end of said sleeve being formed with a recess, a projection on said shaft adapted to engage in said recess to effect a driving connection between said sleeve and said shaft, yielding means tending to maintain said projection in said recess, said hopper being formed with an opening adjacent said outlet, and a removable closure for said opening.

12. A stoker comprising, in combination, a hopper, a lateral duct opening from the bottom of said hopper, a retort connected to the discharge end of said duct, a conveyer screw extending through the bottom of said hopper and through said duct into said retort, said conveyer having a limited axial movement, means for driving said conveyer, said last mentioned means including a clutch adapted to be opened and closed automatically upon axial movement of said conveyer in opposite directions, and spring means operatively mounted axially of said conveyer screw and normally acting thereon to move the conveyer in a direction to close said clutch.

13. A stoker comprising, in combination, a hopper, a lateral duct opening from the bottom of said hopper, a retort connected to the discharge end of said duct, a conveyer screw extending through the bottom of said hopper and longitudinally of said duct into said retort and means for driving said conveyer screw, said means including a clutch normally spring pressed into closed position and adapted to open automatically when the rotative force applied by said driving means to the conveyer screw exceeds a predetermined value, one element of said clutch being secured to said conveyer screw for movement therewith, said clutch being restored to driving relation with said conveyer as an incident to the reduction of resistance to rotative movement thereof.

14. A stoker comprising, in combination, a hopper, a lateral duct opening from the bottom of said hopper, a rotary screw conveyer extending through the bottom of said hopper and into said duct and means for driving said conveyer including a driving member, spring means normally acting to move said conveyer endwise relatively to said member and interengaging means on said member and said conveyer effective to provide a driving connection therebetween, said spring means acting to move said conveyer to effect a driving engagement with said member.

15. An underfeed stoker comprising, in combination, a vertical fuel container, a horizontal duct opening laterally from the lower end of said container, a rotary screw conveyor extending from said container into said duct for discharging fuel thereto, said container having an opening at its juncture with said duct, a removable closure for said opening, said opening affording convenient access to the interior of said container for removing obstructions that may lodge between said conveyor and said closure and tend to interfere with the rotation of said conveyor, and drive means for said conveyor, said drive means comprising a shaft operatively connected to said conveyor, a sleeve on said shaft, said shaft and said sleeve being relatively axially movable, means for rotating said sleeve, coacting clutch elements on said shaft and said sleeve movable into and out of engagement upon relative axial movement of said shaft and sleeve in opposite directions, and spring means tending to hold said elements in operative engagement, said elements being adapted to be disengaged automatically upon relative movement between said shaft and said sleeve in response to a load exceeding a predetermined value.

In testimony whereof, I have hereunto affixed my signature.

WARREN DEAN BURTON.