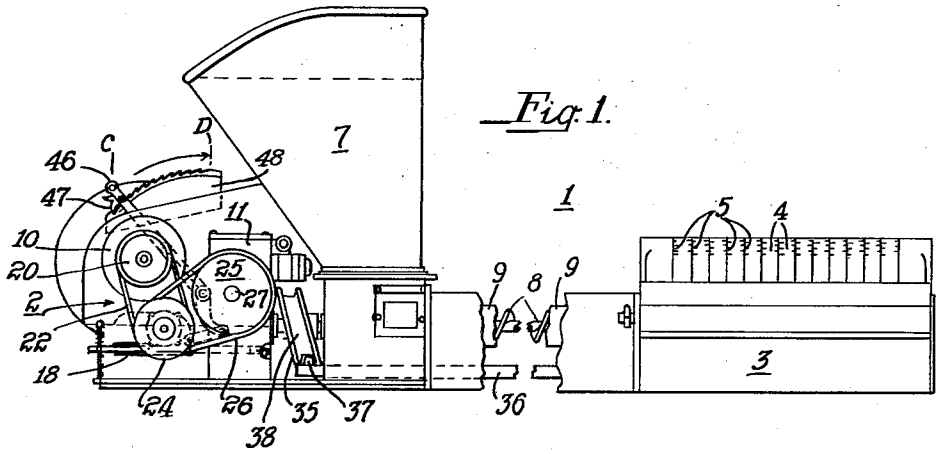
Feb. 16, 1937. J. S. SKELLY 2,070,756

VARIABLE SPEED DRIVE FOR MECHANICAL STOKERS

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Fig. 1.



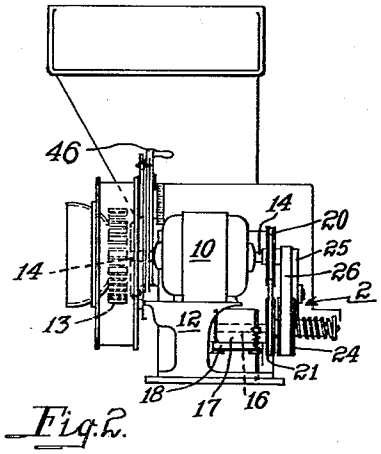


Fig. 2.

Fig. 5.

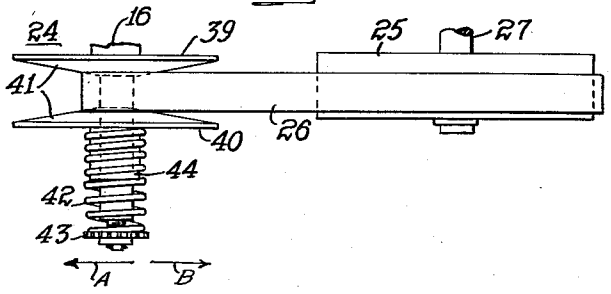
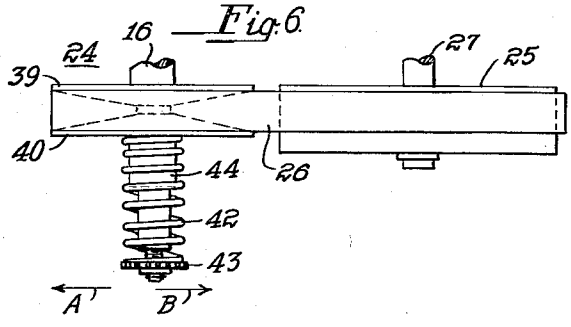


Fig. 6.



INVENTOR
John S. Skelly
By Green & McCallister
His Attorneys

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Fig. 3.

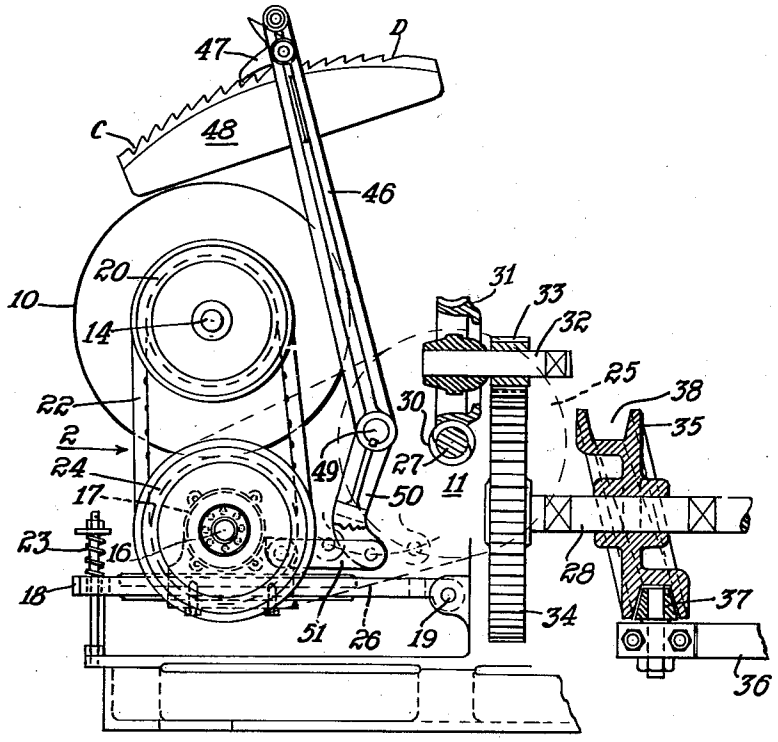
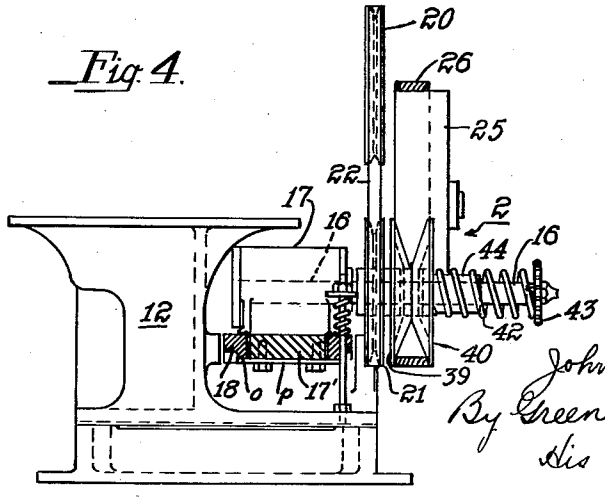


Fig. 4.



INVENTOR
John S. Skelly
By Green & McCallister
His Attorneys

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UNITED STATES PATENT OFFICE

2,070,756

VARIABLE SPEED DRIVE FOR MECHANICAL STOKERS

John S. Skelly, Monongahela, Pa.

Application January 10, 1934, Serial No. 706,040

9 Claims. (Cl. 74—230.17)

This invention relates to mechanical stokers, and more particularly to variable speed drives therefor.

An object of this invention is the provision of means for adjusting the speed of operation of the fuel feeding apparatus employed in mechanical stokers without changing the speed of operation of the driving motor or of the speed of operation of the forced draft fan driven thereby.

Another object of the invention is the provision of an adjustable speed drive for stoker fuel-feeding mechanism, whereby a large numbr of different operating speeds may be obtained without the use of speed change gears or variable speed gear transmission, or without changing the fan and motor speeds.

Other objects of the invention will, in part, be apparent, and will, in part, be obvious from the following description taken in conjunction with the accompanying drawings in which:

Figure 1 is a view in side elevation of a mechanical stoker provided with an adjustable speed drive for the fuel-feeding mechanism and embodying one form of the invention;

Fig. 2 is a view, in elevation, of the front end of the stoker showing the adjustable speed drive;

Fig. 3 is an enlarged, fragmentary view, partially in section, showing the mechanism employed for adjusting the speed of operation of the fuel feeding mechanism;

Fig. 4 is a view in elevation, and partly in section, of the front end of the apparatus shown in Fig. 3; and

Figs. 5 and 6 are top plan views showing an adjustable speed element embodied in the variable speed drive in its minimum and maximum speed settings.

Throughout the drawings and the specification, like reference characters indicate like parts.

In Fig. 1 of the drawings, a mechanical stoker assembly 1 is illustrated to which an adjustable speed drive 2 for the fuel feeding mechanism is applied. Enlarged views of this drive are shown in Figs. 3 and 4. The stoker illustrated is of the underfeed type and comprises, in general, an air chamber or box 3 in which a retort (not shown) is disposed. A row of tuyère blocks 4 is supported on the top of the one side of the air box and these blocks are formed with openings 5 through which combustion air discharges from the air box to the combustion space at the top of the retort. The particular type of construction embodying the air chamber, retort and tuyère blocks herein shown, is illustrated in detail in my copending application, Ser. No. 677,981, filed June 28, 1933.

Fuel is delivered to the retort above-mentioned from a hopper or magazine 7 by means of a screw conveyor 8 disposed in a housing 9. This conveyor delivers the fuel to the retort through an opening (not shown) in the front end thereof.

The feed screw or conveyor 8 is driven by a motor 10 illustrated as an electric motor, the motor being coupled thereto by means of the adjustable drive mechanism 2 and a gear reduction mechanism 11, the latter mechanism being often denominated a speed reducer.

The motor is stationarily mounted on a support frame or table 12.

The combustion air delivered to the air chamber or box 3 is supplied by a forced draft fan 13 driven by motor 10. As illustrated, the fan is directly connected to a shaft 14 of the motor and therefore operates at the same speed as the motor shaft.

It is generally known that fans or blowers, of the type above-mentioned, to be efficient must operate at relatively high speed and for the size of blowers employed on stokers of this type, the fan speed is on the order of 1700 to 1800 R. P. M., and motors operating at these speeds happen to be the most practical for the type of apparatus herein illustrated.

It is therefore important that the adjustable speed drive for the fuel feeding mechanism be so arranged that speed adjustments may be made without changing the speed of operation of the motor or the position of the motor with respect to the fan.

It is appreciated that in the prior art, speed change gears or adjustable speed transmissions have been employed whereby the speed of operation of the fuel feeding mechanism could be adjusted without changing the position of the motor, but such speed adjusting drives were complicated, expensive, and did not provide a wide range of speed adjustments nor a wide number of speed settings between the maximum and minimum running speeds.

The adjustable speed drive herein contemplated makes possible any desired or practical number of speed adjustments without shifting the position of the motor or changing gears, is simple in construction, and relatively inexpensive compared to the speed change gear transmissions above mentioned.

The adjustable drive above mentioned, comprises a jack shaft or countershaft 16, which is journaled in a bearing housing or support 17, that is movably mounted on and secured to a support 18, which is hinged at one end on a bearing pin

19. As shown, support 17 has a portion 17' extending through an elongated opening O in support 18 and is slidably secured to support 18 by a plate P secured to portion 17' and spanning the opening O.

Motor 10 has a driving connection with the jack shaft 16 that includes grooved pulleys 20 and 21 secured to the motor shaft and jack shaft, respectively, and an endless belt 22. This belt is held taut at all times by means of a compression spring 23 that acts on top of the support 18 urging pulley 21 in such direction as to exert a pull on the belt. The weight of support 18, jack shaft 16 and bearing housing 17 also aids in the maintenance of the proper tension in belt 22. Instead of a compression spring, a counterweight may be employed to maintain the proper tension in driving belt 22.

The driving connection between the jack shaft 16 and the speed reducer 11 includes pulleys 24 and 25, one of which is an adjustable effective diameter pulley and a belt 26. As shown, pulley 24 is mounted on the jack shaft, and is the one whose effective diameter may be adjusted, while pulley 25 is mounted on the power input shaft 27 of the speed reducer. By shifting the position of bearing housing 17 in a longitudinal direction of support 18, the diameter of pulley 24 may be adjusted to thereby adjust the speed of operation of the power take-off shaft 28 of the speed reducer. Since the take-off shaft is connected to the feed screw 8, the speed of operation of the feed screw may be adjusted.

Before giving a detailed description of the adjustable speed drive mechanism 2, the mechanism embodied in the speed reducer, as shown in Fig. 3, will be briefly described.

As shown in Fig. 3, the power input shaft 27 has a worm 30 thereon that meshes with a worm gear 31 secured to a jack shaft 32 on which a pinion 33 is mounted. This pinion meshes with a gear 34 secured to the output or power take-off shaft 28 of the speed reducer. A wobble plate cam 35 is mounted on the power take-off shaft for operating a reciprocating bar 36 which is provided with a roller 37 that operates in a groove 38 of the wobble plate. The reciprocating bar is attached to distributing and agitating mechanism (not shown) disposed within the retort, and this construction is also illustrated in my above-mentioned copending application.

The adjustable speed drive mechanism is illustrated more clearly in the enlarged views of Figs. 3 to 6, inclusive. As shown in Figs. 4, 5, and 6, the adjustable diameter pulley 24 comprises discs 39 and 40 having tapered working faces 41 which frictionally engage the opposite edges of the driving belt 26. Disc 39 is stationarily mounted on jack shaft 16 while disc 40 is slidably mounted thereon, but is urged towards the stationary disc by a compression spring 42, the tension of which can be adjusted by means of a nut 43 threaded on the jack shaft. The movable disc 40 is provided with a sleeve 44 which operates within the compression spring and serves to act as a guide for the spring to prevent its buckling.

When the discs are separated, the maximum amount, as indicated in Fig. 5, the opposite edges of the belt engage these discs relatively close to the jack shaft so that in effect, a pulley of small diameter drives pulley 25 through the belt 26. When these discs are brought together to the position shown in Fig. 6 so that the belt engages the periphery of these discs, the largest working diameter of the pulley is brought into play, so that a pulley of relatively large diameter drives pulley 25 through belt 26. By moving the bearing support 17 longitudinally of the hinged support 18, the diameter of the pulley 24 may be varied in small steps.

If pulley 24 is moved in the direction of arrow A in Fig. 3, the increased tension imposed on belt 26 causes the plates to separate a predetermined amount; and if the pulley is moved in the direction of arrow B, the tension on the belt is relieved so that the compression spring 42 will force plate or disc 40 towards the stationary disc and thereby increase the effective diameter of the pulley. By shifting the support, in which the jack shaft 16 is journaled, longitudinally of the support, the above-mentioned changes in diameter of the pulley may be effected.

In Fig. 3, a convenient mechanism has been shown for changing the diameter of pulley 24 in the manner above described. This mechanism comprises a lever 46 having a pawl 47 thereon cooperating with a stationary ratchet 48. This lever is attached to a shaft 49 to which an arm 50 is attached. Arm 50 is connected to the jack shaft bearing support or housing by means of a link 51. If lever 46 is moved to position C in Fig. 3, the effective diameter of pulley 24 is adjusted to its greatest effective value and this represents the maximum driving speed of the fuel feeding mechanism. By shifting lever 46 to position D in Figs. 1 and 3, pulley 14 is adjusted to its smallest diameter and therefore the fuel feeding mechanism will operate at its minimum speed. If lever 46 is set in any position intermediate, that is in any positions intermediate C and D, the speed of operation will be at a value intermediate the minimum and maximum operating speeds.

When the adjustable support 17 is shifted as above described, the jack shaft 16 moves or swings in the arc of a circle, the center of which is at the center of the motor shaft 14, and the proper tension is maintained in the driving belt 22. The jack shaft swings in the arc of a circle because support 18 is hinged at one end; therefore, the free end of the support may move up or down according to the position it must maintain to provide the necessary tension in belt 22.

While the adjustable effective diameter pulley 24 has been shown as mounted on the jack shaft 16, it will be apparent that this pulley may as well be mounted on the power input shaft of the speed reducer 11. The change in centers between the jack shaft 16 and the power input shaft 27 is what effects the change in the effective diameter of the pulley 24; therefore whichever shaft pulley 24 is mounted on, the change in effective diameter of the pulley may be effected by changing the distance between the centers of these shafts.

While but a single form of the invention has been shown and described herein, it will be appreciated by those skilled in this art that various modifications and changes may be made without departing from the spirit or scope of the invention. It is desired, therefore, that only such limitations shall be placed on the invention as are imposed by the prior art and the appended claims.

What I claim as new and desire to secure by Letters Patent is:—

1. In an adjustable speed drive for mechanical feed stokers, the combination with a motor and a gear reduction mechanism adapted to be connected to the fuel feeding mechanism of the stoker, of a movable bearing having a countershaft journalled therein, a pulley on the motor

shaft, a pulley on said countershaft and a belt for said pulleys, means for maintaining a substantially constant tension in said belt, a driving pulley for the gear reduction mechanism, an adjustable effective diameter pulley on the countershaft, a belt connecting said driving pulley and the adjustable effective-diameter pulley, and means for shifting the position of said movable bearing to vary the effective diameter of the adjustable pulley and thereby adjust the speed of operation of said fuel feeding mechanism.

2. In an adjustable speed drive for mechanical feed stokers, the combination with a motor, and a gear reduction mechanism adapted to drive the feed mechanism of a stoker, of a variable speed drive between said gear reduction mechanism and the motor comprising a movable bearing having a countershaft journalled therein, a pulley and belt connection between said motor and countershaft, a belt and pulley connection between the countershaft and gear reduction mechanism including an adjustable effective diameter pulley, means for shifting said movable bearing to change the effective diameter of said adjustable effective diameter pulley and thereby adjust the speed of operation of the fuel feeding mechanism, and means for maintaining a substantially constant tension in the belt of the belt and pulley connection between the motor and countershaft.

3. In an adjustable speed drive for mechanical feed stokers, the combination with a motor, and a gear reduction mechanism having its driven member connected to the fuel feeding mechanism, of an adjustable speed drive between said motor and gear reduction mechanism, comprising a hinged support, a bearing housing movably mounted on the support, a countershaft journalled in said housing, a belt and pulley connection between the motor and countershaft, an adjustable effective diameter pulley on said countershaft, a drive pulley for said gear reduction mechanism, a belt running on said adjustable effective diameter pulley and said drive pulley, and means including a crank-arm connected to the housing and a lever for moving the bearing housing on its support to thereby adjust the effective diameter of said adjustable effective-diameter pulley and the speed of operation of the fuel feeding mechanism.

4. In an adjustable speed drive for mechanical feed stokers, the combination with a motor, and a gear reduction mechanism having its driven member connected to the feeding mechanism, of an adjustable speed drive between said motor and gear reduction mechanism, comprising a hinged support, a bearing housing movably mounted on the support, a countershaft journalled in said housing, a belt and pulley connection between the motor and countershaft, a driving connection between the countershaft and gear reduction mechanism including at least two pulleys and a belt, one of which pulleys is an adjustable effective diameter pulley, and means for shifting said bearing housing to thereby adjust the effective diameter of said adjustable effective-diameter pulley, and the speed of operation of said fuel feeding mechanism.

5. A variable speed drive for coupling a motor to an element to be driven by said motor comprising a hinged support having a bearing slidably mounted thereon, a jack-shaft journaled in said bearing, a fixed diameter pulley on said jack-shaft, a fixed diameter pulley on the motor shaft, and a driving belt connecting said pulleys; an adjustable effective-diameter pulley on said jack-shaft, a fixed diameter pulley coupled to said driven element, a belt connecting said latter pulleys, and means for shifting the jack-shaft bearing on its support to either increase or decrease the effective diameter of said adjustable effective-diameter pulley.

6. A variable speed drive for coupling a motor to an element to be driven by said motor comprising a hinged support having a bearing slidably mounted thereon, a jack-shaft journaled in said bearing, a fixed diameter pulley on said jack-shaft, a fixed diameter pulley on the motor shaft, and a driving belt connecting said pulleys; an adjustable effective-diameter pulley on said jack-shaft, a fixed diameter pulley coupled to said driven element, a belt connecting said latter pulleys, means for maintaining a substantially constant tension in the driving belt, and means for shifting the jack-shaft bearing on its support to either increase or decrease the effective diameter of said adjustable effective-diameter pulley.

7. A variable speed drive for coupling a motor to an element to be driven by said motor comprising a hinged support having a bearing slidably mounted thereon, a jack-shaft journaled in said bearing, a fixed diameter pulley on said jack-shaft, a fixed diameter pulley on the motor shaft, and a driving belt connecting said pulleys; an adjustable effective-diameter pulley on said jack-shaft, a fixed diameter pulley coupled to said driven element, a belt connecting said latter pulleys, means for adjusting the tension in the driving belt, means for maintaining the adjusted tension in the driving belt substantially constant, and means for shifting the jack-shaft bearing on its support to either increase or decrease the effective diameter of said adjustable effective diameter pulley.

8. A variable speed drive for coupling a motor to an element to be driven by said motor comprising a hinged support having a bearing slidably mounted thereon, a jack-shaft journaled in said bearing, a fixed diameter pulley on said shaft, a fixed diameter pulley on the motor shaft, and a driving belt connecting said pulleys; a second pulley on said jack-shaft, a pulley coupled to the driven element, one of said latter pulleys being an adjustable effective-diameter pulley, a belt connecting said latter pulleys, and means for shifting the jack-shaft bearing on its support to either increase or decrease the effective diameter of the adjustable effective-diameter pulley.

9. A variable speed drive for coupling a motor to an element to be driven by said motor comprising a movable support having a bearing slidably mounted thereon, a jack-shaft journaled in said bearing, fixed diameter pulleys on said shaft, a fixed diameter pulley on the motor shaft, and a driving belt connecting said pulleys; a second pulley on said jack-shaft, a pulley coupled to the driven element, one of said latter pulleys being an adjustable effective diameter pulley, a belt connecting said latter pulleys, means for maintaining the tension in the driving belt substantially constant, and means for shifting the jack-shaft bearing on its support to either increase or decrease the effective diameter of the adjustable effective diameter pulley.

JOHN S. SKELLY.