Oct. 17, 1944. C. M. ANDERSON 2,360,753

UNIVERSAL SPEED CONTROL FOR MULTIPLE PRIME MOVERS

Filed June 17, 1941 3 Sheets-Sheet 1

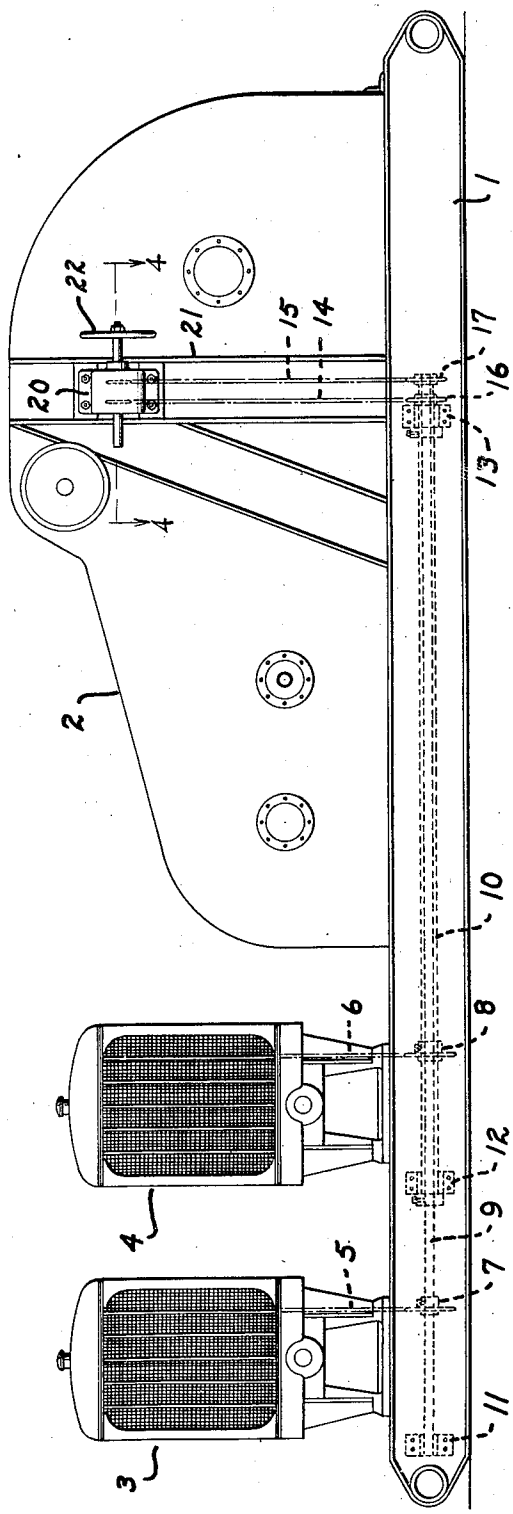


Fig. 1.

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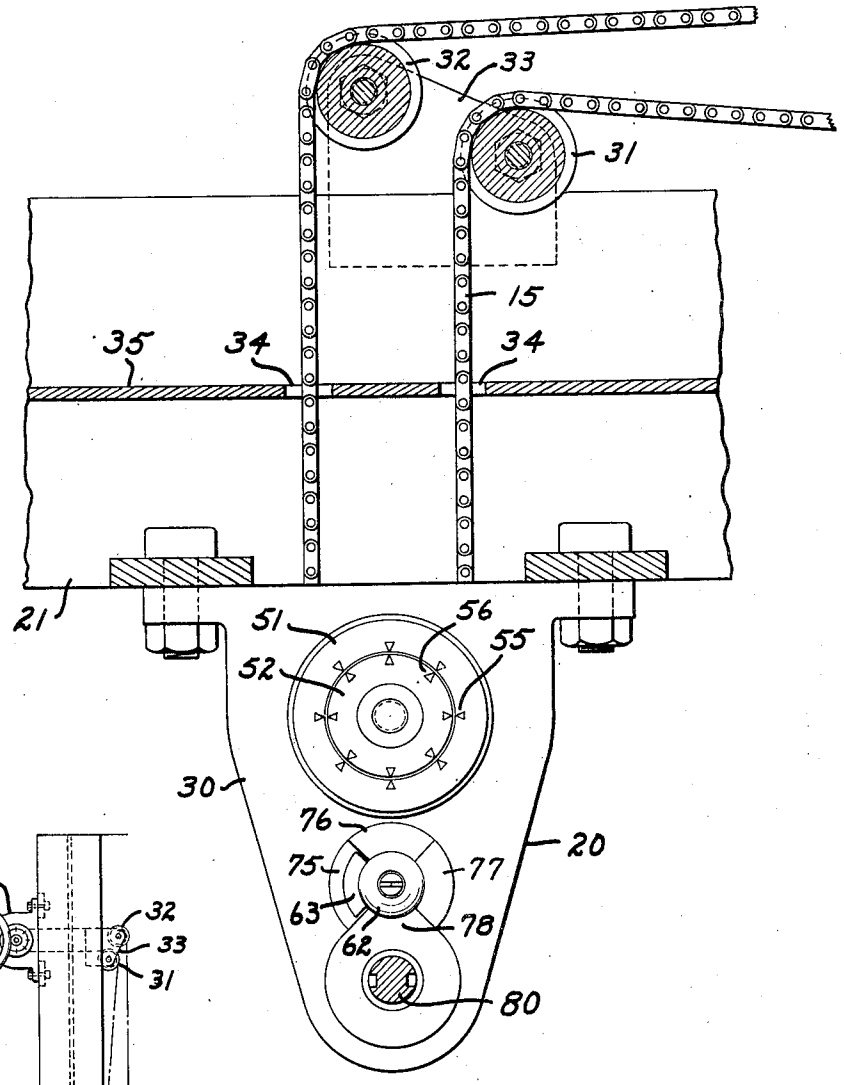


Fig. 3.

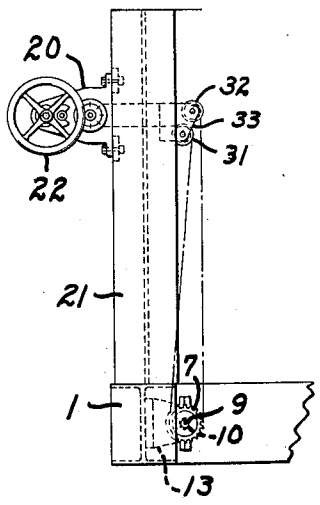


Fig. 2.

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Filed June 17, 1941 3 Sheets-Sheet 3

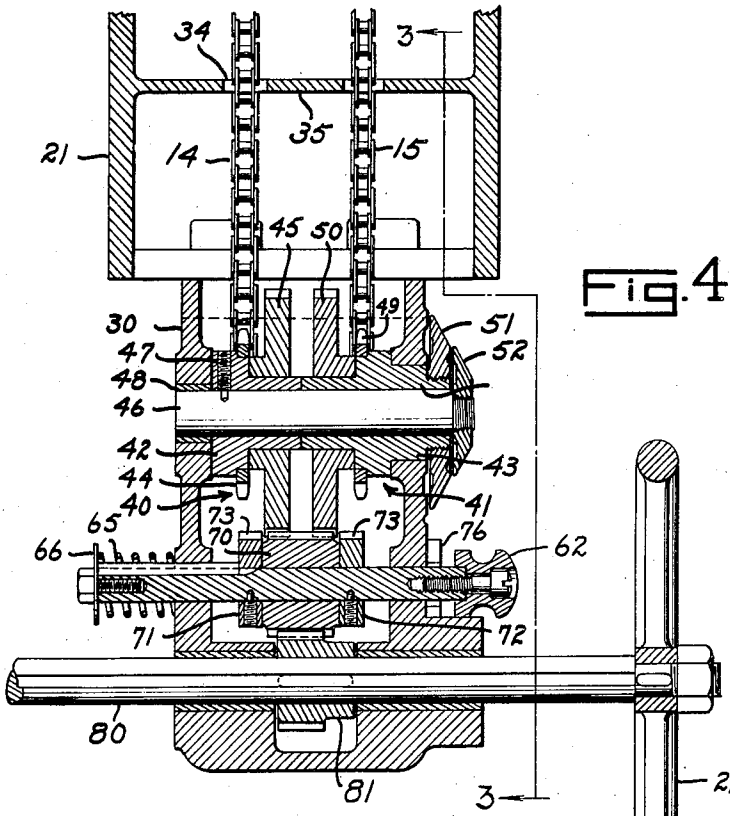


Fig. 4.

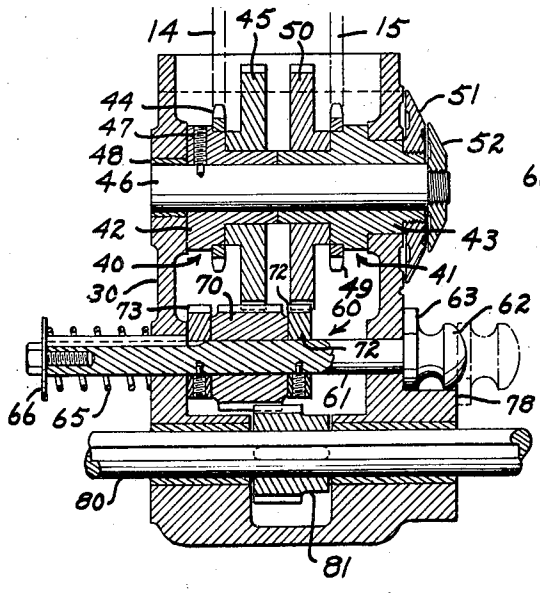


Fig. 5

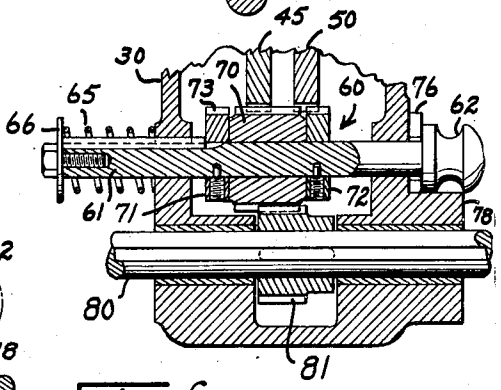


Fig. 6.

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UNITED STATES PATENT OFFICE

2,360,753

UNIVERSAL SPEED CONTROL FOR MULTIPLE PRIME MOVERS

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Application June 17, 1941, Serial No. 398,467

9 Claims. (Cl. 74—389)

This invention relates to power plants and in particular to apparatus of this type utilizing a plurality of prime movers which are to be controlled synchronously, separately, or locked in a predetermined operating position.

Although the invention is not confined thereto it is of particular utility in power plants for rotary well drilling where separate engines may be used at times for operating different equipment but at other times are to be used in multiple or tandem for handling excessive loads. When using such arrangement it is necessary to provide one or more power units, each of which is capable of handling the load imposed by certain operations such as the driving rotary table, operating the mud pumps, or auxiliary hoisting. When, however, it is necessary to pull a long string of drill pipe from a deep well, a large amount of power is required and it is then necessary to utilize the total output of the prime movers for carrying out this operation.

An object of the invention is to provide a power plant including a plurality of prime movers respectively of a capacity to handle individual machines of the drilling rig and capable of being controllably operated for such purpose, it being also intended to controllably operate the prime movers synchronously in multiple or tandem to handle excessive loads requiring power in excess of that available from a single prime mover.

Another object is to provide a control unit for multiple prime movers which may be readily adjusted to lock the power units in a predetermined operating condition.

Still another object is to provide a device of the class described including a pair of prime movers, such device being capable of locking one of the units while the other unit may be desirably controlled.

These and other objects will be more fully apparent from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is an assembly view in elevation showing the invention as embodied in a well drilling mechanism operated by multiple prime movers;

Fig. 2 is an end elevational view of the control unit of the invention;

Fig. 3 is an enlarged view similar to that shown in Fig. 2, parts being cut away to more clearly illustrate structural features, the view being taken on line 3—3 in Fig. 4;

Fig. 4 is a sectional view taken on line 4—4 in Fig. 1, parts being shown in their relative positions when both prime movers are synchronously controlled;

Fig. 5 is a view similar to that shown in Fig. 4 but showing the relative position of parts when the control mechanism for one of the prime movers is locked and the control mechanism of the other prime mover is operatively controlled by the operator;

Fig. 6 is a fragmentary sectional view showing the relative position of parts when the control mechanisms for both prime movers are locked.

In Fig. 1 of the drawings there is shown in side elevation a power plant such as are used in deep well drilling operations by the rotary method, such plant comprising supporting skids 1 upon which is mounted hoisting equipment 2 to be driven by either or both of the prime movers shown as internal combustion engines 3 and 4. Each of the engines 3 and 4 includes control mechanism as is well known in the art and such control mechanism is operated in accordance with the illustrated embodiment by means of driving chains 5 and 6 which are operatively connected through sprockets 7 and 8 to concentric rock shafts 9 and 10 mounted upon brackets 11, 12 and 13 upon one of the skids 1. Shafts 9 and 10 are in turn respectively connected through chains 14 and 15 passing beneath sprockets 16 and 17 and thence to a control unit generally referred to as 20 mounted upon an upright 21 so that, as will more fully appear, control may be had by the operator of the prime movers 3 and 4 through the operation of the hand wheel 22.

It is to be understood that suitable mechanisms (not shown) are provided for connecting the prime movers 3 and 4 in tandem to the hoisting or other equipment 2 or for selectively connecting such prime movers to other mechanisms such as a rotary table, mud pumps, or other supplementary or auxiliary equipment. It is also to be understood that the device of the invention is of equal utility whether the prime movers 3 and 4 be internal combustion engines such as illustrated or other sources of power provided with individual speed control mechanisms.

As best seen in Fig. 3, the control unit 20 comprises a housing or supporting frame 30 bolted to the upright 21, the control elements such as chains 14 and 15 passing upwardly from the sprockets 16 and 17 and over idling pulleys 31 and 32 on bracket 33 secured to the support 21. Thence the chains 14 and 15 pass through openings 34 in the web 35 of the support and into the interior of the housing 30 where they pass over drive members 40 and 41 (Figs. 5 and 6) so that

rotation of these members will drivably operate the control mechanisms of the prime movers 3 and 4.

The respective drive members 40 and 41 comprise hub portions 42 and 43. The hub 42 has affixed thereto a sprocket 44 and a gear 45 and this assembly is fixed to the transverse shaft 46 by means of a set screw 47. The shaft 46 has one end thereof journaled in a bearing 48 in the wall of the housing 30, the other end of this shaft being journaled within the hub member 43 which is in turn journaled in the other wall of the housing 30. The hub 43 has a sprocket 49 and gear 50 attached thereto, such sprocket and gear being identical to the sprocket 44 and gear 45 attached to the hub member 42. The chains 14 and 15 pass over the respective sprockets 44 and 49 and it seems apparent that the rotation of these sprockets is effective in exercising control of the speed of the prime movers 3 and 4.

The outer end of the hub 43 and the adjacent end of the shaft 46 are threaded and have secured thereto concentric dials 51 and 52. These dials are provided with indicia or marks 55 and 56 to serve as an indication to the operator of the relative angular position of the drive members 40 and 41.

A control assembly generally indicated as 60 extends transversely of the housing 30 adjacent the wheels 45 and 50. This assembly comprises a rod or shaft 61 which is slidably but non-rotatably mounted within openings on the opposite sides of the housing 30. One end of the shaft is provided with a rotatable head 62 of a configuration to be readily grasped by the hand of the operator. This head is provided with an ear 63 to serve a purpose hereinafter described.

The rod 61 and associated elements is constantly urged to the left, as viewed in Figs. 4, 5 and 6, by means of a spring 65 which surrounds the rod exteriorly of the housing 30 and has its ends in engagement with the outer wall of the housing and a washer 66 secured to the end of the rod.

Interiorly of the housing 30 the control assembly 60 includes a pinion 70 rotatably mounted upon the rod 61 between spaced sectors 71 and 72. Each of these sectors is provided with a peripheral tooth or teeth 73 having the same pitch diameter as the teeth on the pinion 70.

In view of the structural features just described, it seems apparent that when the indicia 55 and 56 on the dials 51 and 52 are in mating relation it is possible to manually shift the assembly 60 transversely of the housing 30. The position which this assembly will take when released by the operator will depend upon the angular position of the ear 63 about the axis of the rod 61 since this ear is adapted to engage the respective stepped surfaces 75, 76, 77 and 78 upon the exterior of the housing 30.

Adjacent the assembly 60 there is journaled in the housing 30 a shaft 80 to which is keyed a drive pinion 81 so that upon rotation of the hand wheel 22 a driving effort will be imparted to the pinion 70 and thence to the control mechanism erstwhile described. It is to be understood that this driving connection between the drive pinion 81 and the pinion 70 is maintained regardless of the adjusted position of the control assembly 60.

The operation of the structure comprising an illustrative embodiment of the invention is believed apparent from the foregoing description. By way of summary it may be stated that when the control assembly 60 is adjusted to the position indicated in Fig. 4 of the drawings, rotation of the hand wheel 22 is instrumental in imparting rotational effort to each of the wheels 45 and 50 and thence mediately to the control mechanisms of the respective prime movers 3 and 4.

If the control assembly 60 is adjusted by the operator to the position indicated in Fig. 5, it is to be noted that the sector 72 has been moved into engagement with the gear 50 and, since the sector 72 is non-rotatable, such gear and associated mechanism are locked in predetermined position and hence the control for the motor 3 is locked. At the same time, however, there is a driving connection between the drive pinion 81 and the gear 45 through pinion 70 which thus serves as an idler gear. Accordingly rotation of the hand wheel 22 is instrumental in desirably controlling the speed of the prime mover 4 while the mechanism for controlling motor 3 is maintained in locked position. It seems apparent that in event the control assembly 60 is shifted to the right by means of the knob 62, the sector 71 will engage the gear 45 and hence the control for the prime mover 4 becomes locked whereas there is effected a driving connection between the hand wheel 22 and the speed control mechanism of the motor 4 whereby the control is reversed relative to that just described.

When the control assembly 60 is adjusted to an intermediate position as illustrated in Fig. 6, it is to be noted that the sector 71 or the sector 72 moves into engagement with one of the gears 45 or 50 whereby such gear is locked in position. At the same time, however, the pinion 70 has not moved from engagement with such locked gear and accordingly such pinion is locked against rotation and in this manner locking of both of the gears 45 and 50 is brought about. Such adjustment of the device is desired when both of the prime movers 3 and 4 are to be operated for a period of time with their speed control mechanisms in fixed position. Such setting of the controls may be desired whether the prime movers 3 and 4 be operated in tandem at synchronous speed, or separately and whether synchronously or asynchronously.

While the foregoing description has been confined to a specific illustrative embodiment of the invention, it is to be distinctly understood that the invention is not confined to such specific embodiment. Broadly the invention comprehends a power plant comprising a plurality of prime movers and means for selectively controlling the speed control mechanisms of such prime movers.

What is claimed is:

1. In a control device for a pair of prime movers each having speed control means, a control unit, said control unit comprising a pair of drive members, each of said drive members being operatively connected to one of said speed control means, a control shaft, and a control assembly adjustably interposed between said shaft and members to selectively drive one of said members and to lock the other of the members.

2. In a speed control device for twin motors each having a speed control mechanism, the combination therewith of a pair of drive members operatively connected to the respective control mechanisms, a gear wheel on each of said members, a control assembly movable axially of said gear wheels, said assembly including a pinion adapted to engage both of the gear wheels, and means for driving said pinion to operate the speed control mechanisms in synchronism.

3. In a speed control device for twin motors

each having a speed control mechanism, the combination therewith of a pair of drive members operatively connected to the respective control mechanisms, a gear wheel on each of said members, a control assembly adjacent said gear wheels, said assembly including a rod movable transversely of said wheels, a rotatable toothed member mounted on said rod adapted to simultaneously engage said gear wheels and an additional member fixed on said rod adapted to engage one of said wheels so that the wheels and associated mechanisms are locked in position.

4. In combination, a support, a pair of drive members mounted thereon, each of said members including a gear, a control assembly adjacent said gears, said assembly including a fixed toothed member and a rotatable toothed member movable axially of the gears so that movement of said toothed members successively provide synchronous driving of the drive members by the rotatable member, locking of the drive members, and thereafter continued locking of one of the drive members and a driving connection between the rotatable member and the other drive member.

5. In combination, a housing, a pair of drive members rotatably mounted thereon, each of said members including a gear, a control assembly within the housing adjacent said gears, said assembly including a rod non-rotatably mounted within but movable axially of the housing, spaced gear sectors fixed on said rod and adapted to engage one of the gears, a rotatable pinion between said sectors adapted to simultaneously engage both of said gears, a drive gear for said pinion, and means for selectively positioning said assembly transversely of the housing to control the operation of said drive members by the drive gear.

6. In a device of the class described, a support, a pair of drive members having toothed peripheral areas thereon, an axially movable pinion adjacent said members and engageable with both of the toothed areas, means for driving said pinion, and a non-rotatable member movable with said pinion and adapted to engage one of said toothed areas simultaneously with the pinion whereby the pinion is locked against rotation.

7. In a device of the class described a support, a pair of drive members having toothed surfaces thereon, an axially movable pinion adjacent said members and engageable with both of the toothed areas, means for driving said pinion and non-rotatable members at opposite sides of the pinion and movable therewith to engage one of said areas.

8. In combination a support, a pair of drive members mounted thereon and having peripheral toothed areas, a rod slidably but non-rotatably mounted adjacent said members, a fixed member and a rotatable member mounted upon said rod and adapted to engage said toothed area so that the fixed member engages one of the drive members and the rotatable member engages both of said members whereby the members are locked against movement.

9. In a control device for a pair of prime movers each having speed control means, a control unit, said unit comprising a pair of rotatable drive members operatively connected respectively to said control means, a control shaft, means adjustably interposed between said shaft and said members for synchronously rotating the drive members, and juxtaposed indicia carrying means operable respectively in synchronism with the drive members to indicate the relative positions of the control means when said interposed means is moved to synchronous driving position.

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