March 6, 1951 C. J. KEIM ET AL 2,544,327

WELL DRILLING DRAWWORKS

Filed May 24, 1946 3 Sheets-Sheet 1

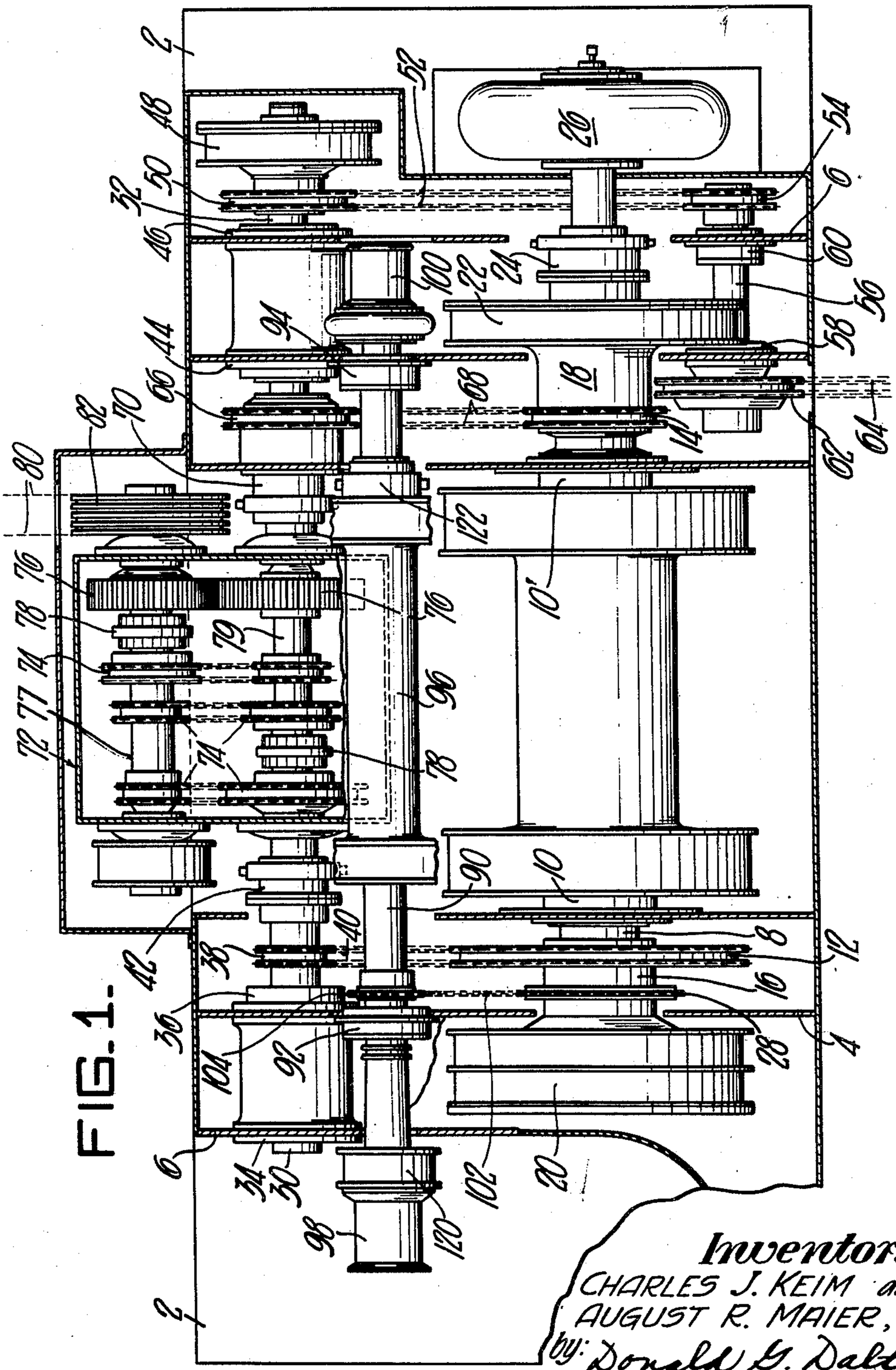

FIG. 1.

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FIG. 2.

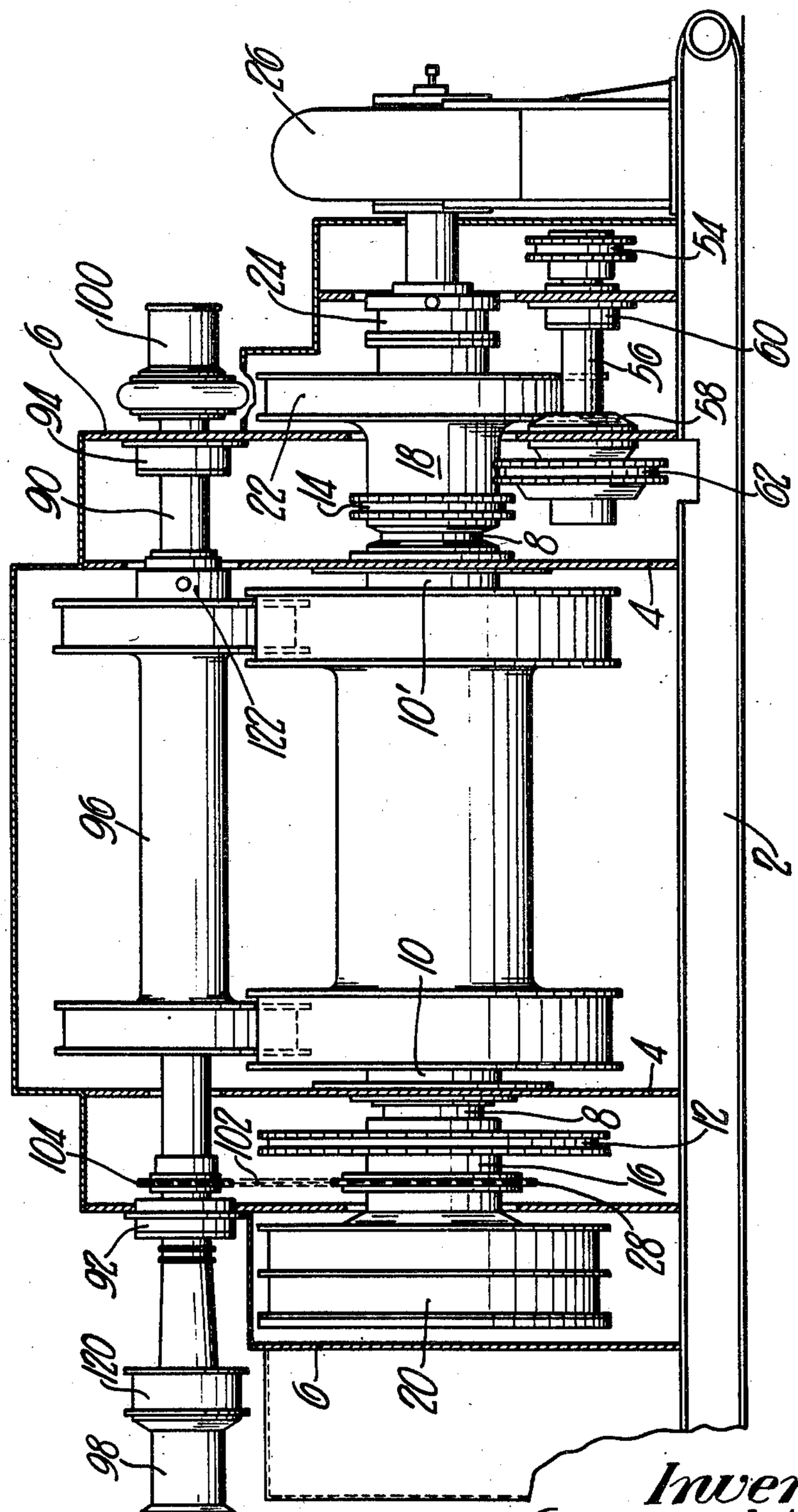

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FIG. 3.

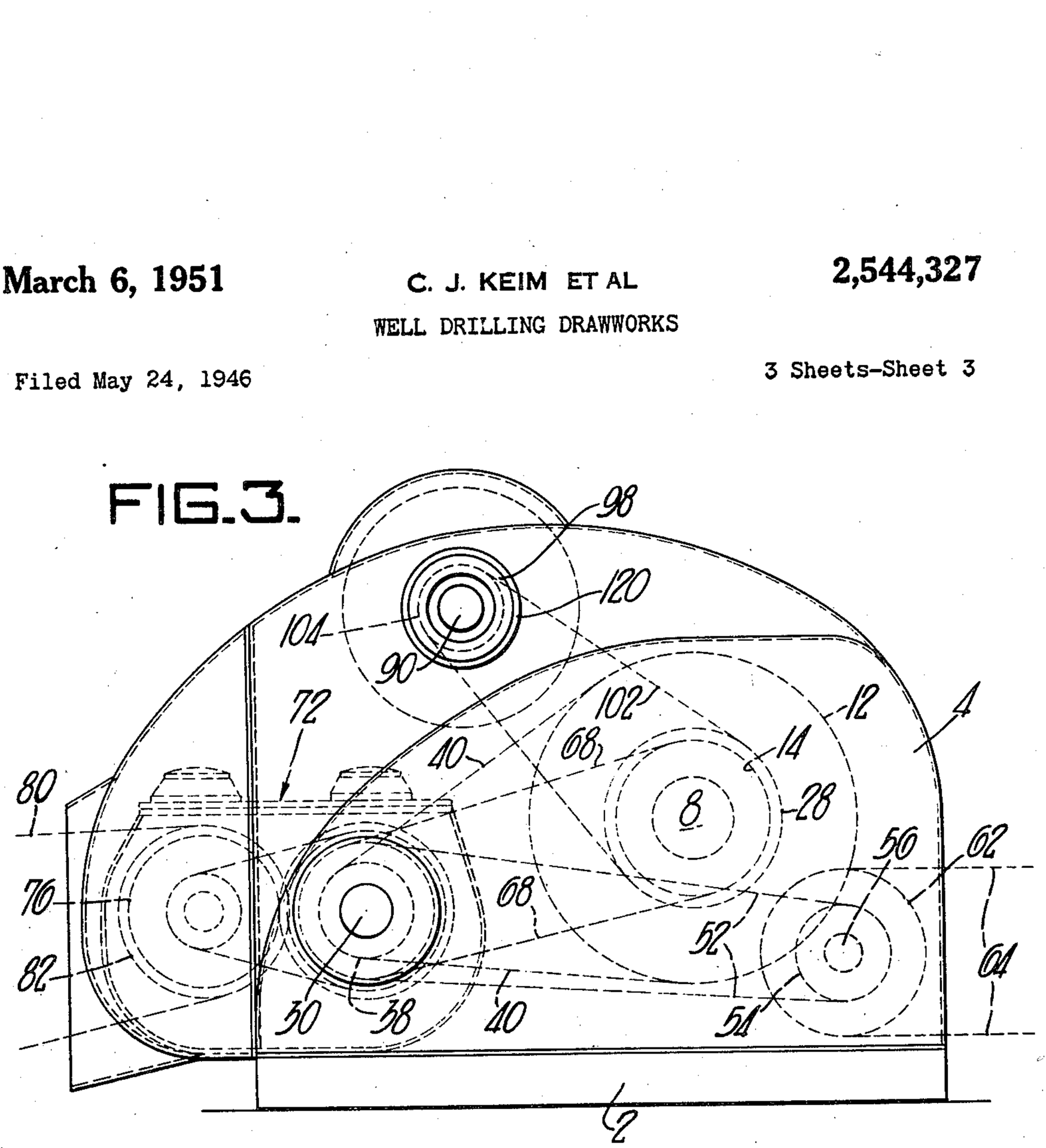


FIG. 5.

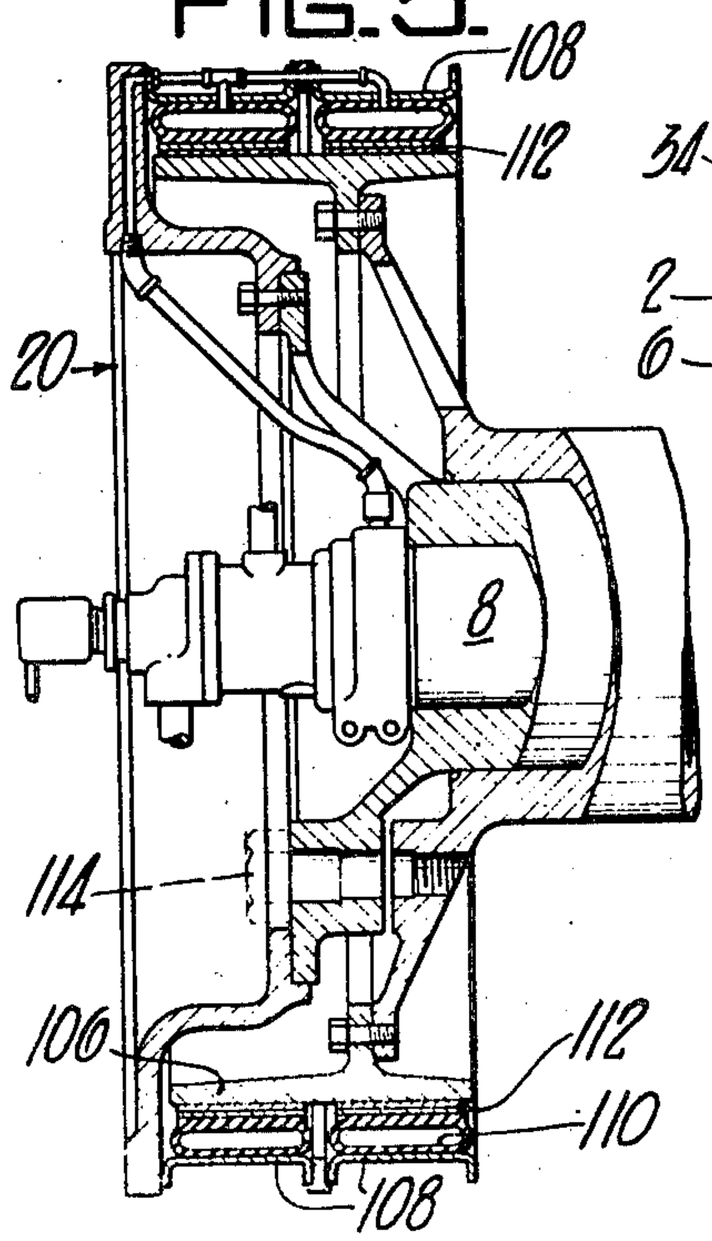
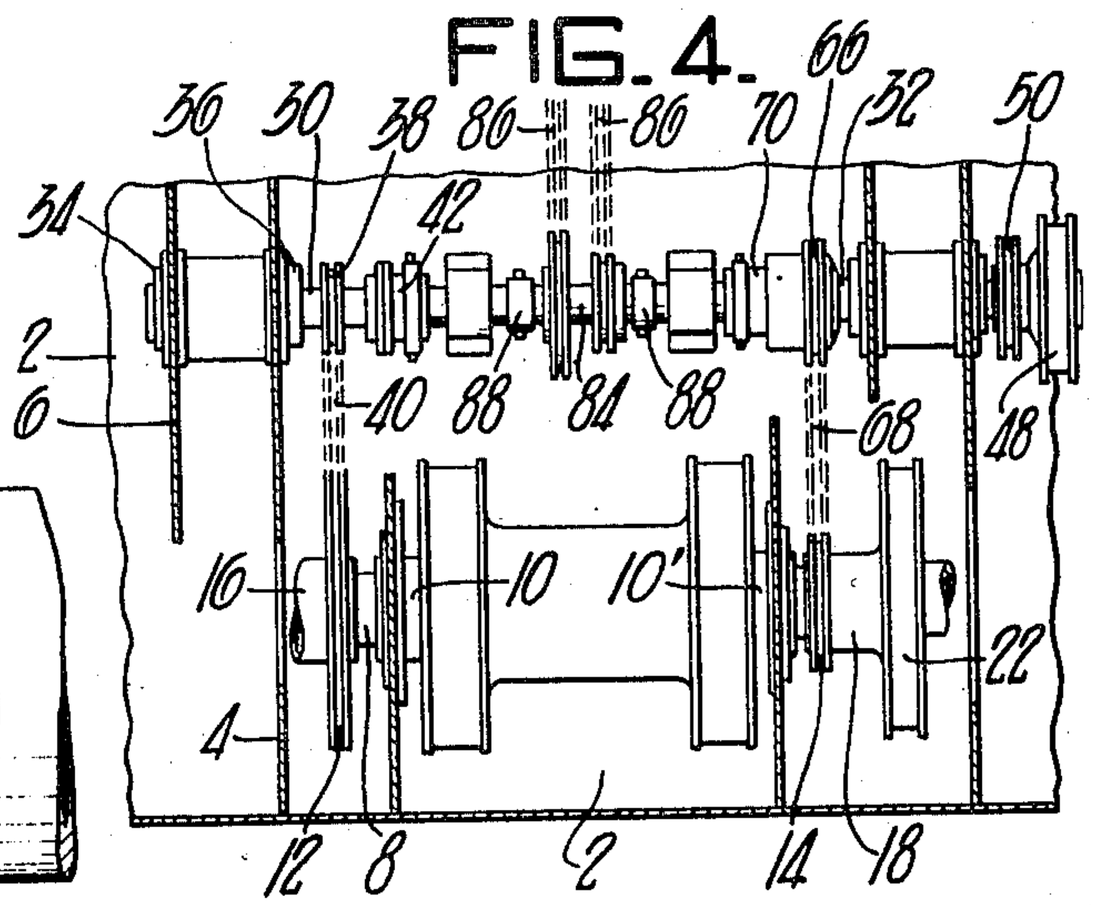


FIG. 4.



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UNITED STATES PATENT OFFICE

2,544,327

WELL-DRILLING DRAWWORKS

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11 Claims. (Cl. 74—217)

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This invention relates to improvements in heavy-duty drawworks for drilling oil wells and the like.

In designing an oilfield drawworks or hoist for heavy-duty drilling and suitable for internal combustion drive, one of the main problems is to combine the various shafts, drives and transmission required for obtaining a satisfactory range of speeds and power into a unit sufficiently compact to be readily movable.

In order to comply with state regulations these units must not exceed 10 feet in width if they are to be readily transportable over the highways. This width is further restricted in some localities to a maximum of 8 feet. Heretofore, in order to comply with the 8 foot width, it has been necessary to break the units up into several sub-assemblies. In so doing, many of the multi-strand roller chain drives, gears and other operating parts which ordinarily run in oil bath enclosures were exposed to dirt and moisture. Also the disassembly and reassembly required considerable time and there was always the possibility of misaligning shafts and sprockets when reassembling the unit.

It is accordingly an object of the present invention to provide a readily portable compact heavy-duty drawworks.

It is a further object to provide a heavy-duty drawworks which can be readily reduced to a maximum of 8 feet in width.

It is another object to provide a heavy-duty drawworks which can be reduced to 8 feet in width without exposing any of the working parts normally enclosed in oil baths or the like.

It is still another object to provide a heavy-duty drawworks which is simple in design and durable in operation.

The foregoing and further objects will be apparent from the following specification when read in conjunction with the attached drawings, wherein:

Figure 1 is a plan;
Figure 2 is a side elevation;
Figure 3 is an end elevation;
Figure 4 is a modification; and
Figure 5 is a pneumatic clutch.

The drawworks of our invention are mounted on a skid 2 and supported by a hoist frame 4 having end members 6.

The drawworks includes a drum shaft 8 rotatably supported in bearings 10, 10' and carrying low-speed sprocket 12 and high-speed sprocket 14, mounted on hubs 16 and 18 and connected to the shaft by automatic pneumatic clutches 20

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and 22 of conventional type. A jaw clutch 24 is provided at the right hand end of shaft 8 to connect it with a hydromatic brake 26. A sprocket 28 is also provided on the hub 16.

Disposed behind and somewhat below the drum shaft 8 are two longitudinally spaced and preferably aligned stub jackshafts 30 and 32. Shaft 30, which is the low-speed jackshaft, is rotatably supported by two bearings 34 and 36, carried by the frame 4, and has a sprocket 38 keyed thereto which is connected by a chain 40 to the sprocket 12 on shaft 8. At the inner end of the shaft 30, there is provided a flexible coupling or jaw clutch 42. The high-speed jackshaft 32 is mounted in bearings 44 and 46 carried by the frame 4. At the outer end of the shaft, there is a sprocket 50 operated by an automatic pneumatic clutch 48. The sprocket 50 is connected by a chain 52 to a sprocket 54 on rotary shaft 56, mounted on bearings 58 and 60 . The rotary shaft 56 is connected to the rotary by a sprocket 62 and chain 64. The rotary shaft is in front of and slightly below the drum shaft 8 and is also slightly below the jackshafts. A sprocket 66 is keyed to the inner end of the high-speed jackshaft 32 which is connected to the sprocket 14 of the drum shaft 8 by a chain 68. At the inner end of the jackshaft 32, there is provided a flexible coupling or jaw clutch 70.

Mounted between the flexible couplings or jaw clutches 42 and 70, is a unitary removable transmission unit 72. This provides three forward speed changes and a reverse by reason of suitable sprockets 74, gears 76, jaw clutches 78, driving shaft 77 and driven shaft 79. This transmission is contained in a fully enclosed housing separate from the drawworks housing and may be removed therefrom by releasing the flexible couplings or clutches 42 and 70 from the shaft 79. Since the drawworks is contained in a separate housing, the removal of the transmission unit 72 will not expose any of the wearing parts or gears normally enclosed in oil baths or the like to dust or rain.

The transmission 72 is connected to the prime movers (not shown) by a chain 80 and sprocket 82. As shown in Figure 4, the transmission unit may be removed and the jackshafts 30 and 32 connected by a shaft 84, which may be connected to steam or electric prime movers by chains 86 and jaw clutches 88.

Mounted above the jackshafts 30 and 32, and the drum shaft 8, is a line shaft 90 supported on bearings 92 and 94. The line shaft is disposed rearwardly of the drum shaft and slightly forwardly of the jackshafts. If desired, a sand reel

96 in addition to catheads 98 and 100 may be mounted on the line shaft. The line shaft has a sprocket 104 keyed thereto which is connected by a chain 102 to the sprocket 28 on the hub 16 rotatably mounted on the drum shaft 8. The sand reel 96 is operated by a clutch 122 and the cathead 98 by a clutch 120.

As shown in Figure 5, the automatic pneumatic clutches are composed of inner and outer flanges 106, 108, one of which carries a pneumatic member 110 for pressing shoes 112 in engagement with a drum on the other member. In case of failure of the air pressure supply, the webs of the two flanges can be locked together by a pin 114 so that drilling operations may still be carried on.

From the foregoing, it is seen that we have provided in one compact frame, rigidly supported, a drum shaft, high and low-speed jackshafts, a line shaft, and a rotary shaft, all interconnected by suitable drives. The jackshafts are suitably connected to a self-contained multi-speed transmission which may be removed to reduce the width of the unit or to directly interconnect the jackshafts, if it is desired to use a steam or electrical prime mover. In this arrangement, the drum shaft is driven selectively by the high or low-speed jackshafts. Likewise, the rotary shaft is driven selectively from the high-speed jackshaft. The line shaft is driven from the low-speed jackshaft independently of the drive shaft through the hub carrying the drum shaft sprocket connected to the low-speed jackshaft. Moreover, this arrangement permits the use of short two-bearing jackshafts thereby avoiding excessive deflection since the bearings are widely spread and maintaining good alignment of all parts which is essential for long, trouble-free performance. The use of short jackshafts permit chain drive take-offs from the outer ends. This permits the jackshaft bearings to be located in a cartridge-type housing so that the bearings and housings can be assembled prior to mounting in position. In the present design, the rotary is driven from the high-speed jackshaft. No take-off is shown on the low-speed jackshaft but, if desired, a take-off may be installed thereon for auxiliary equipment. It should also be noted that all load carrying bearings are supported by the same rigid frame, assuring proper alignment of all parts. As before stated, the removal of the transmission does not expose any of the working parts to the atmosphere. The high and low-speed jackshafts and the three speed transmission provide a total of six forward speeds and two reverse for the drum shaft.

While we have shown and described several specific embodiments of our invention, it will be understood that these embodiments are merely for the purpose of illustration and description and that various other forms may be devised within the scope of our invention, as defined in the appended claims.

We claim:

1. A drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of spaced longitudinally aligned jackshafts, a multi-speed transmission disposed between said jackshafts, said transmission having a driven shaft, said driven shaft being disposed in alignment with said jackshafts, means for connecting the driven shaft of said transmission to said jackshafts, means whereby said jackshafts may selectively drive said drum shaft, means on one of said jackshafts for driving said rotary shaft and means whereby the other of said jackshafts may drive said line shaft.

2. A drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of spaced longitudinally aligned jackshafts, a removable multi-speed transmission disposed between said jackshafts, said transmission having a driven shaft, said driven shaft being disposed in alignment with said jackshafts, means for connecting the driven shaft of said transmission to said jackshafts, means whereby said jackshafts may selectively drive said drum shaft, means on one of said jackshafts for driving said rotary shaft and means whereby the other of said jackshafts may drive said line shaft.

3. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of longitudinally spaced jackshafts and means for driving said jackshafts, a chain driving connection between one of said jackshafts and said rotary shaft, a clutch on said jackshaft for operating said chain driving connection, chain drives between each of said jackshafts and said drum shaft, a pair of clutches on said drum shaft for establishing a driving connection between said chain drives and said drum shaft and means for driving said line shaft from one of said jackshafts.

4. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of longitudinally spaced jackshafts and means for driving said jackshafts, a chain driving connection between one of said jackshafts and said rotary shaft, an automatic pneumatic clutch on said jackshaft for operating said chain driving connection, chain drives between each of said jackshafts and said drum shaft, a pair of automatic pneumatic clutches on said drum shaft for establishing a driving connection between said chain drives and said drum shaft and means for driving said line shaft from one of said jackshafts.

5. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of spaced longitudinally aligned jackshafts and means for driving said jackshafts, a chain driving connection between one of said jackshafts and said rotary shaft, an automatic pneumatic clutch on said jackshaft for operating said chain driving connection, chain drives between each of said jackshafts and said drum shaft, a pair of automatic pneumatic clutches on said drum shaft for establishing a driving connection between said chain drives and said drum shaft, means for driving said line shaft from one of said jackshafts and means for positively locking said pneumatic clutches.

6. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of longitudinally spaced jackshafts mounted on a unitary framework and a unitary removable transmission constructed and arranged to drive said jackshafts, chain drives between each of said jackshafts and said drum shaft, a pair of automatic pneumatic clutches on said drum shaft for selectively connecting said chain drives to said drum shaft, a chain drive between one of said jackshafts and said rotary shaft, and an automatic pneumatic clutch for operating said chain drive and drive means between the other of said jackshafts and said line shaft.

7. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of spaced longitudinally aligned jackshafts mounted on a unitary framework and a unitary removable transmission constructed and arranged to drive said jackshafts, chain drives between each of said jackshafts and said drum shaft, a pair of automatic pneumatic clutches on said drum

shaft for selectively connecting said chain drives to said drum shaft, a chain drive between one of said jackshafts and said rotary shaft, and an automatic pneumatic clutch for operating said chain drive, drive means between the other of said jackshafts and said line shaft, and means for positively locking said pneumatic clutches.

8. Drawworks comprising a housing, a drum shaft, a pair of longitudinally spaced jackshafts adjacent one side of said housing, each of said shafts being disposed inside of said housing and a multi-speed transmission disposed between said jackshafts and extending outwardly beyond said housing, said transmission having a driven shaft, said driven shaft being disposed between said jackshafts and detachably connected thereto whereby said transmission can be readily removed from said drawworks to materially reduce the width thereof, and driving means between said jackshafts and said drum shaft.

9. Drawworks comprising a housing, a line shaft, a drum shaft, a rotary shaft, a pair of spaced longitudinally aligned jackshafts adjacent one side of said housing, all of said shafts being disposed inside of said housing and a unitary multi-speed transmission disposed between said jackshafts and extending outwardly from said housing, said transmission having a driven shaft, said driven shaft being disposed in alignment with said jackshafts, means detachably connecting said driven shaft to said jackshafts whereby said unitary transmission can be readily removed from said drawworks to materially reduce the width thereof, a chain driving connection between one of said jackshafts and said rotary shaft, a clutch for operating said chain driving connection, a chain drive between each of said jackshafts and said drum shaft, a pair of clutches on said drum shaft for establishing a driving connection between said chain drives and said drum shaft, and means for driving said line shaft from one of said jackshafts.

10. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of longitudinally spaced jackshafts, a multi-speed transmission disposed between said jackshafts, said transmission having a driven shaft, means connecting the driven shaft of said transmission to said jackshafts, means whereby said jackshafts may selectively drive said drum shaft, means on one of said jackshafts for driving said rotary shaft and means whereby the other of said jackshafts may drive said line shaft.

11. Drawworks comprising a drum shaft, a line shaft, a rotary shaft, a pair of longitudinally spaced jackshafts and means for driving said jackshafts, a chain driving connection between one of said jackshafts and said rotary shaft, a clutch on said jackshaft for operating said chain driving connection, chain drives between each of said jackshafts and said drum shaft, a pair of clutches on said drum shaft for establishing a driving connection between said chain drives and said drum shaft and a chain drive between said drum shaft and said line shaft for driving said line shaft.

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