

May 18, 1926.

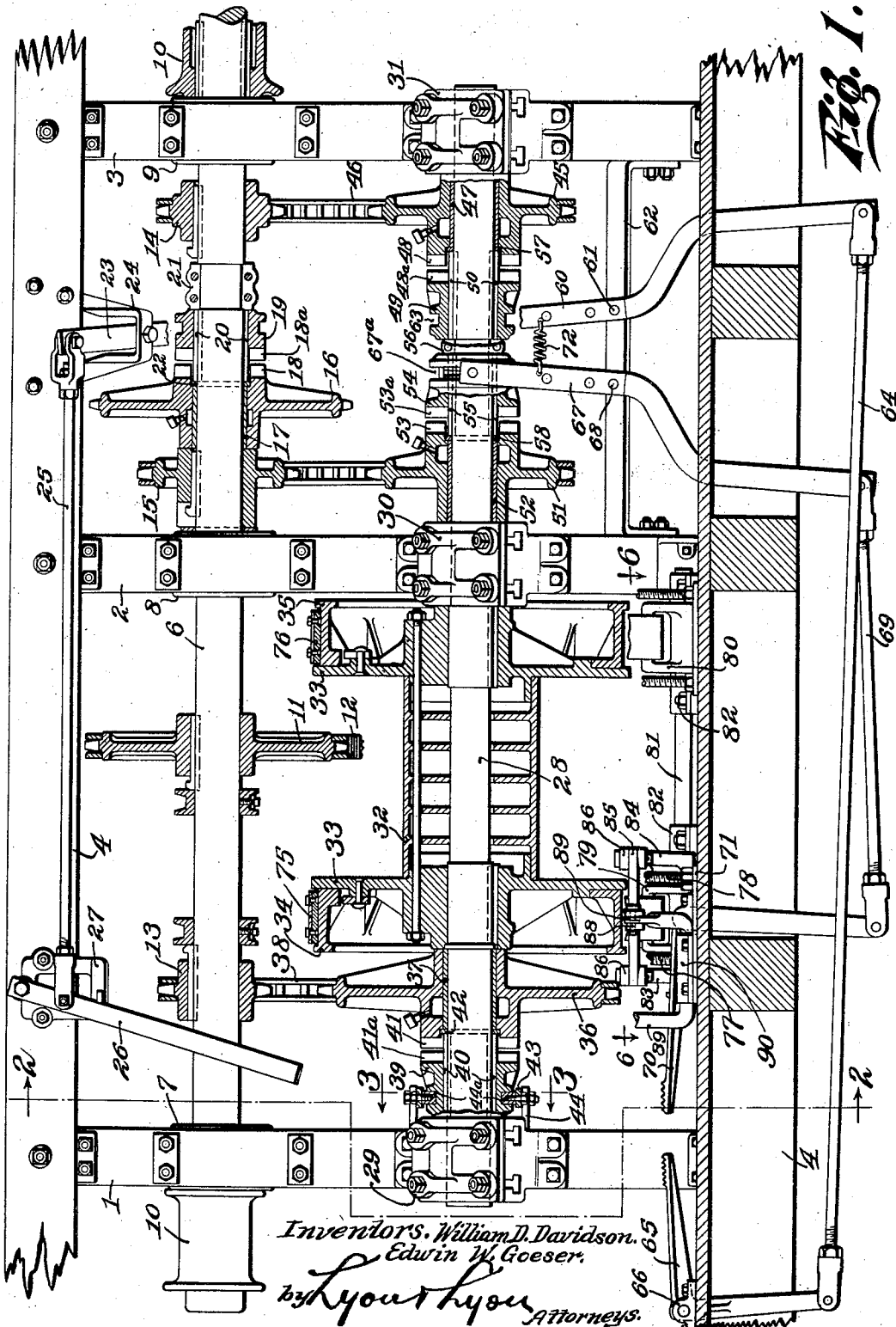
W. D. DAVIDSON ET AL

1,585,085

ROTARY DRAW WORKS

Filed May 1, 1922

3 Sheets-Sheet 1



May 18, 1926.

1,585,085

W. D. DAVIDSON ET AL

ROTARY DRAW WORKS

Filed May 1, 1922

3 Sheets-Sheet 2

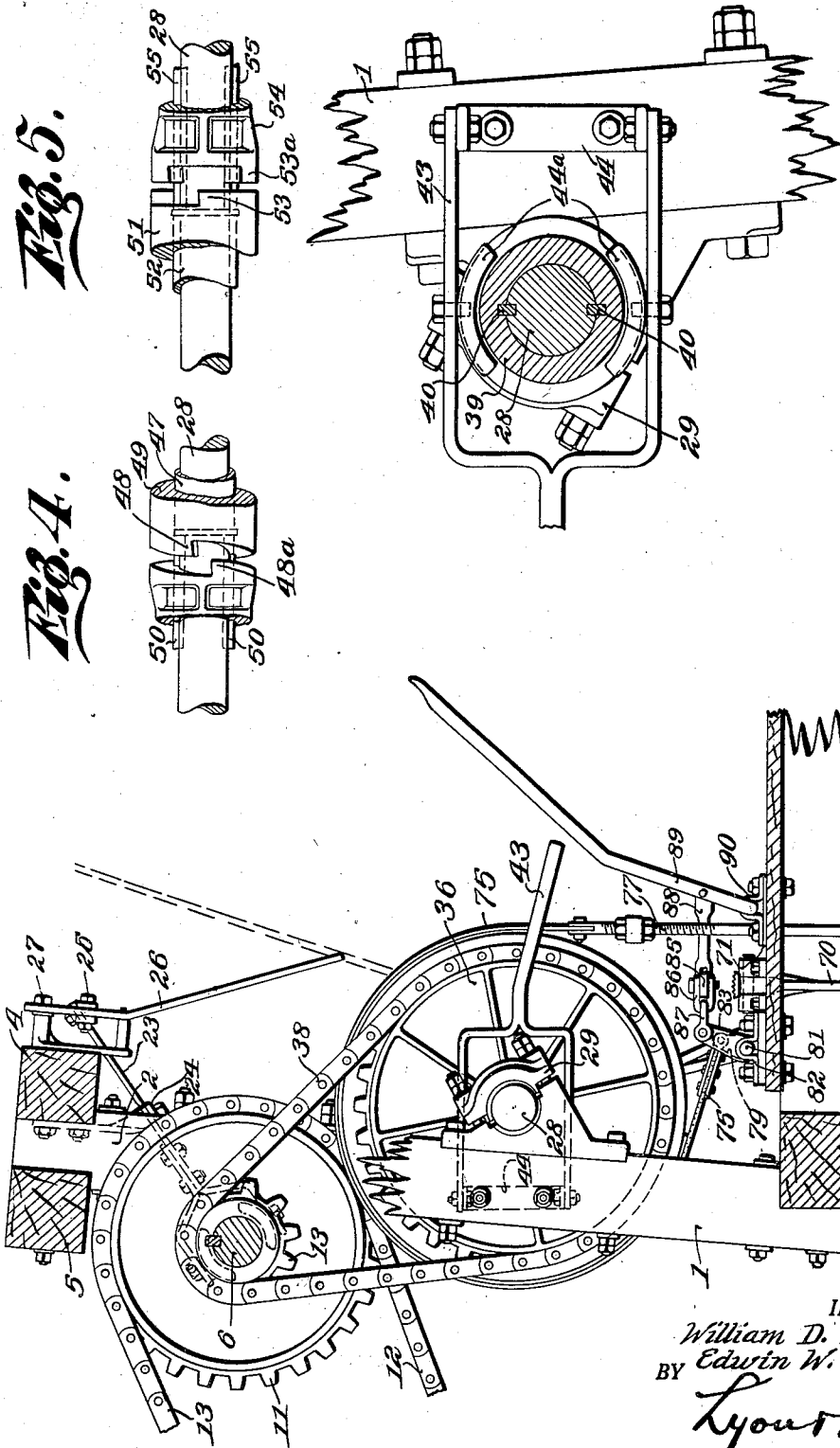


Fig. 3.

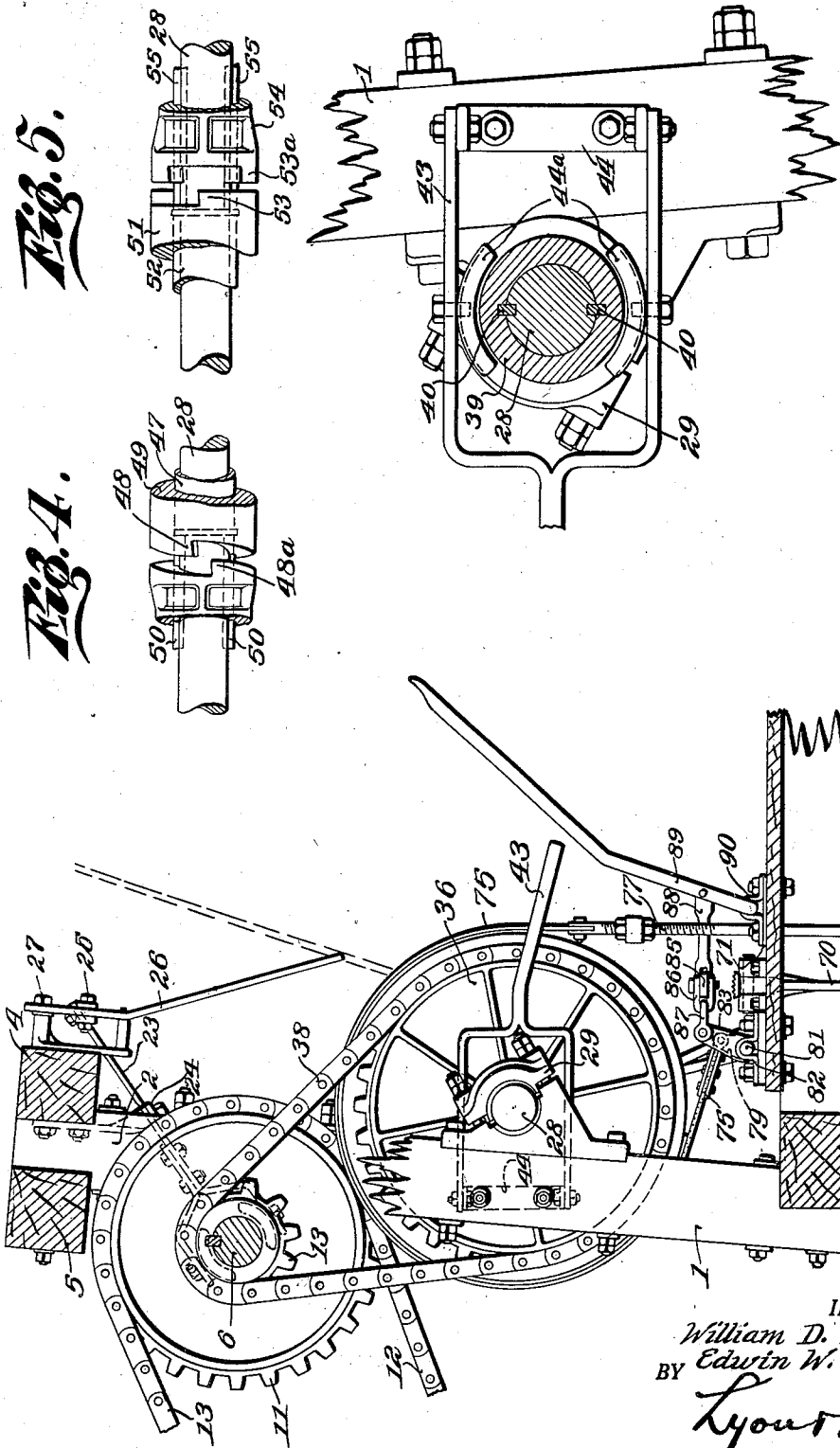


Fig. 3.

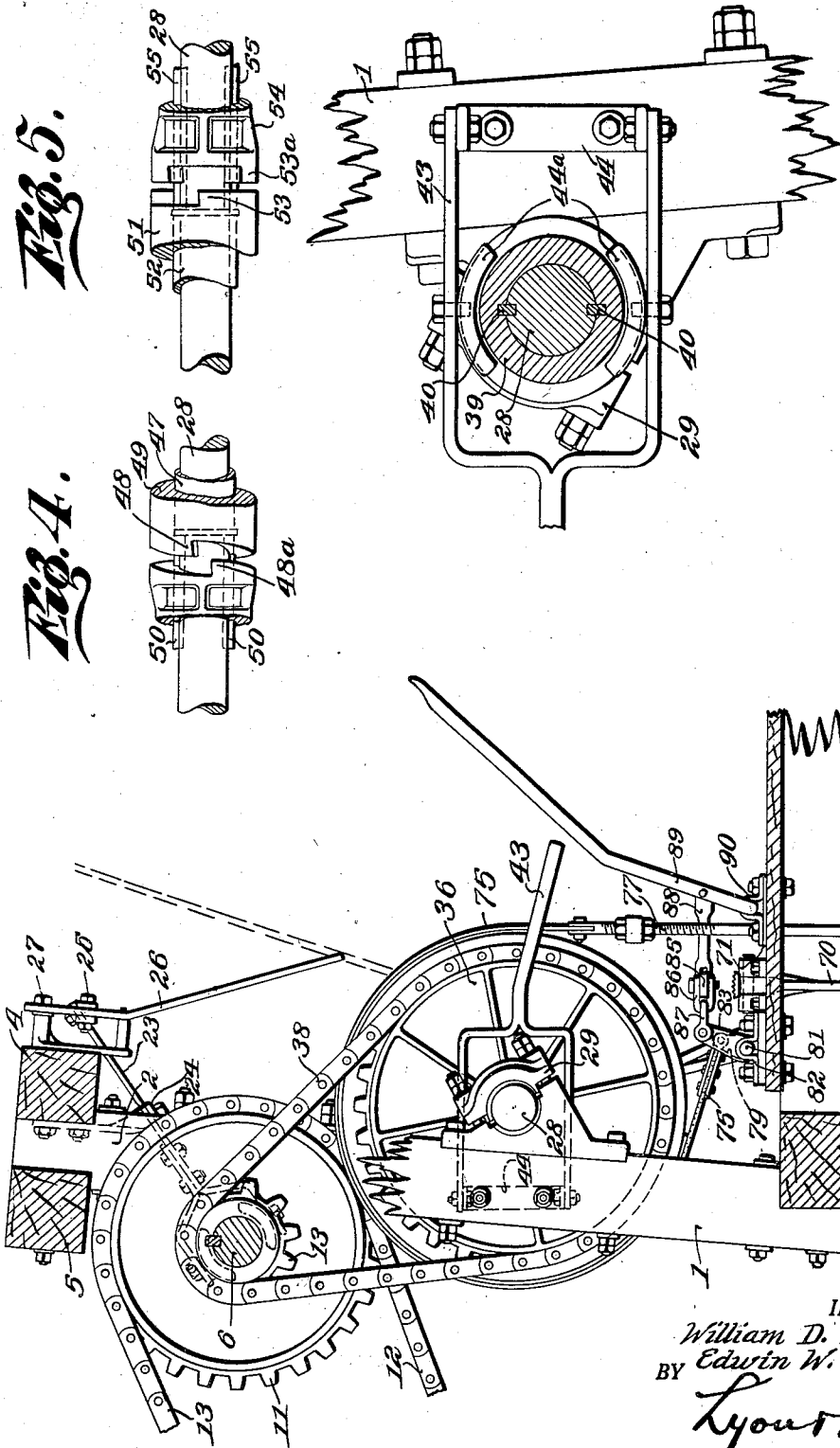


Fig. 3.

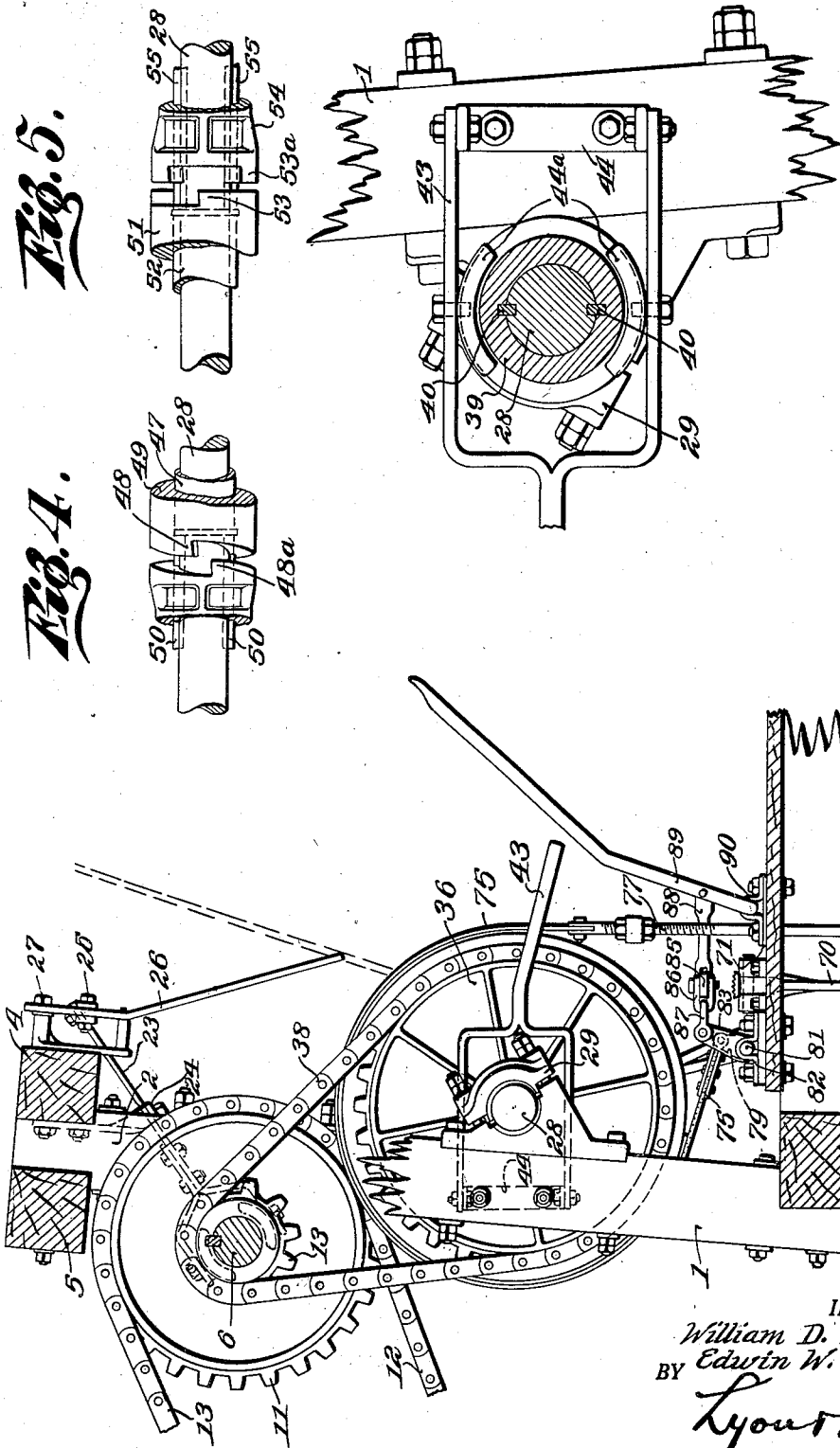


Fig. 3.

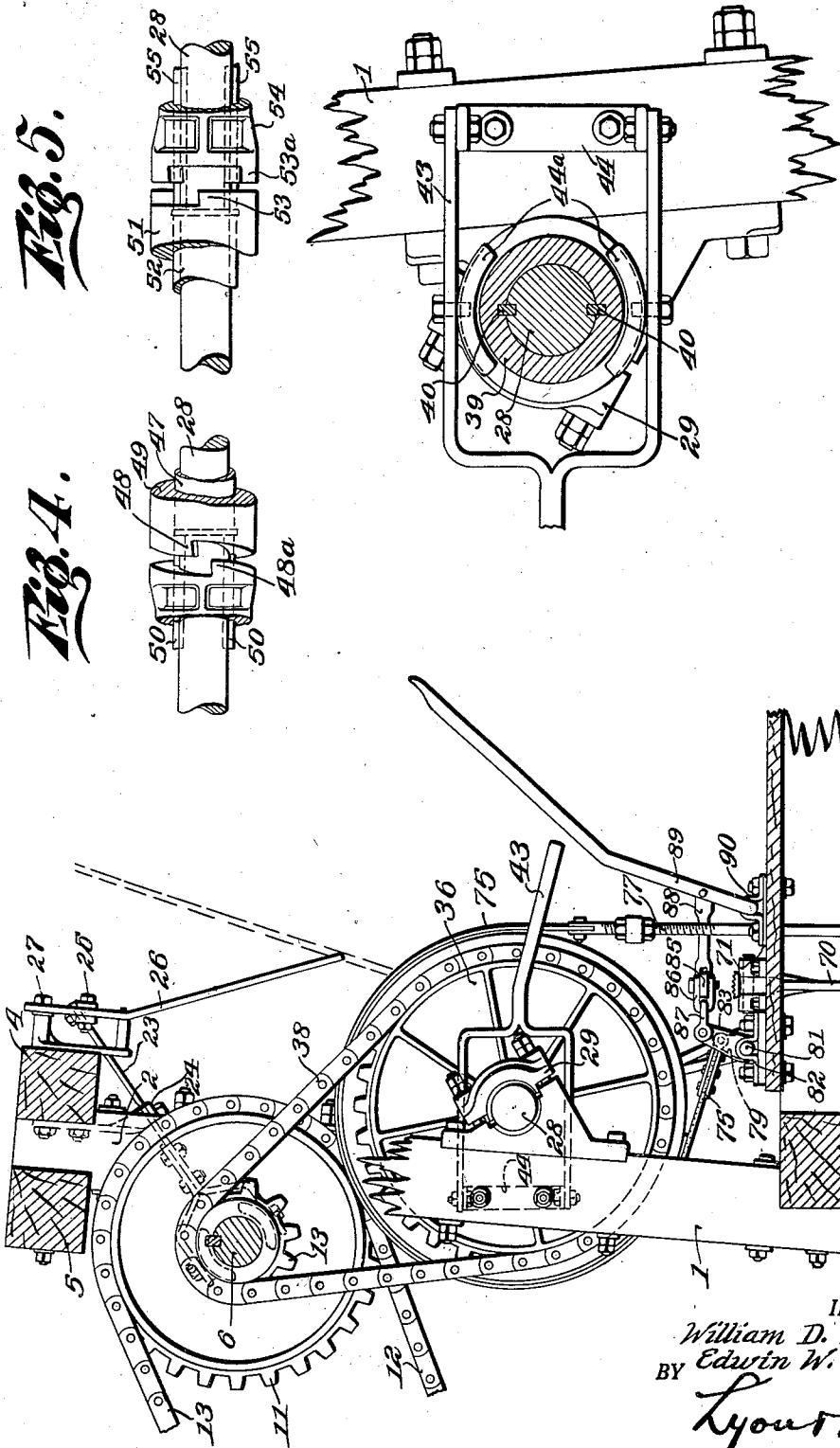


Fig. 3.

May 18 , 1926.

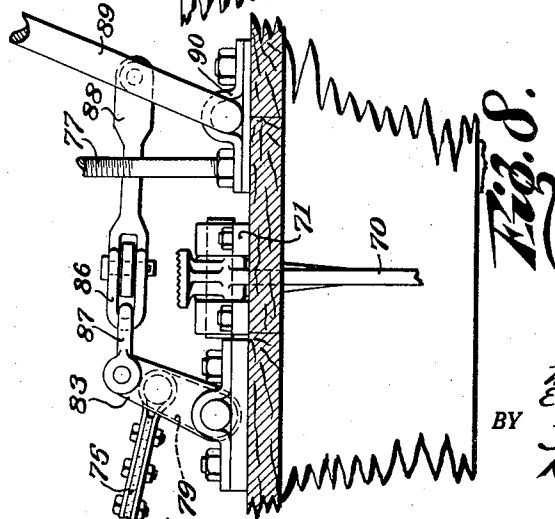
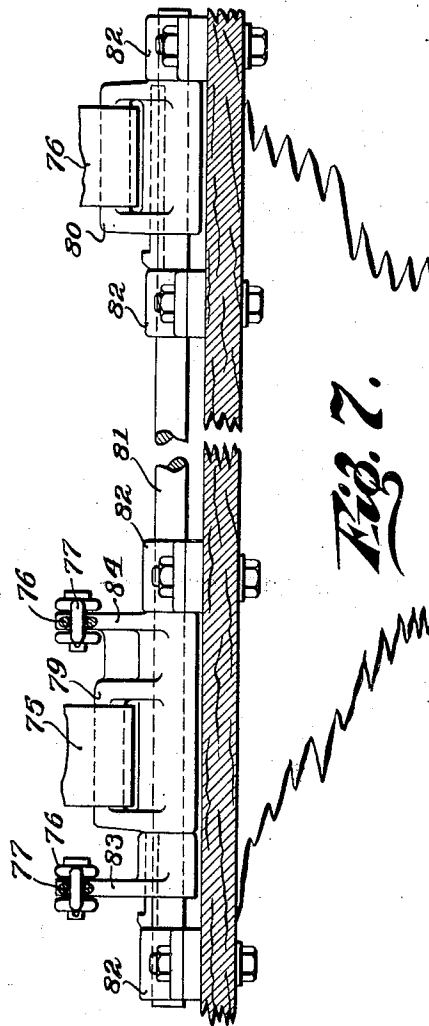
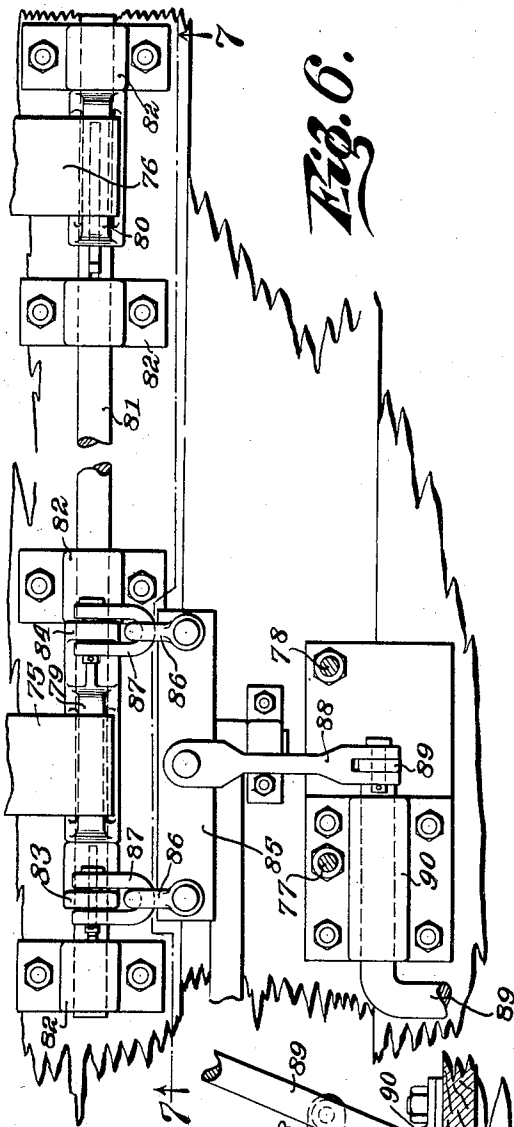
1,585,085

W. D. DAVIDSON ET AL

ROTARY DRAW WORKS

Filed May 1, 1922

3 Sheets-Sheet 3



INVENTORS.
William D. Davidson,
Edwin W. Goeser,
BY
Lyon & Lyon
attys

UNITED STATES PATENT OFFICE.

WILLIAM D. DAVIDSON AND EDWIN W. GOESER, OF LOS ANGELES, CALIFORNIA, ASSIGNORS TO UNION TOOL COMPANY, OF TORRANCE, CALIFORNIA, A CORPORATION OF CALIFORNIA.

ROTARY DRAW WORKS.

Application filed May 1, 1922. Serial No. 557,671.

This invention relates to rotary draw works, particularly such draw works as are utilized in connection with rotary well drilling equipment.

5 The general object of the invention is to provide a rotary draw works having a cable drum associated with mechanism by which it may be driven at any one of three different speeds, that is to say, the invention is applied to the type of drawworks in which the drum shaft is driven from a line shaft, through sprocket chains, and one of the objects of this invention is to locate the driving connections so as to improve their efficiency in operation, providing an organization of the driving connections and the clutches which simplifies the construction and facilitates the control of the driving connections.

20 Another object is to provide a construction in which two of the driving connections are effective to drive the drum only in one direction with the third driving connection effective to drive the drum in either direction.

Another object is to provide a structure preventing axial translation of the drum shaft due to end thrust incident to a winding or unwinding of the cable.

30 The invention consists in the novel parts and combinations of parts to be described hereinafter, all of which contribute to produce an efficient rotary draw works.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

Of the drawings:

40 Figure 1 is a front elevation partly in section illustrating the draw works in normal condition.

Fig. 2 is a section on line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail section on line 3—3 of Fig. 1.

45 Fig. 4 is a detail elevation of one of the one way clutches.

Fig. 5 is a detail elevation of the two way clutch.

50 Fig. 6 is an enlarged plan section on line 6—6 of Fig. 1.

Fig. 7 is a section on line 7—7 of Fig. 6.

Fig. 8 is an elevation looking at the left hand end of Fig. 6.

In the preferred form or embodiment of

the invention, as illustrated in the drawings, 55 the draw works is supported by a frame structure comprising relatively spaced upright beams or posts 1, 2, 3, resting upon a sill member 4 of a derrick floor structure and having their upper ends joined by cross 60 beams or girts 4, 5.

A line shaft 6 is journaled in bearings 7, 8, and 9, and has keyed to its opposite ends, the usual cat-heads 10. A drive sprocket wheel 11, keyed to the shaft 6, is engaged 65 by a sprocket chain 12 connecting with any suitable source of power. The shaft 6 is further provided with three sprocket pinions 13, 14, 15, each keyed to said shaft and connected with means for driving the drum 70 shaft at different relative speeds, as will later be explained.

According to our invention we mount two of the driving connections (preferably the high speed and intermediate) adjacent 75 respectively to the intermediate post 2 and the end post 3. The sprocket wheels of these drives on the drum shaft are located so that they abut against the bearings for this shaft. The sliding clutch members are disposed on the shaft between these sprocket wheels which facilitates the connection of the controlling apparatus for them.

An independent sprocket wheel 16, which may be utilized to drive a rotary drill table 85 or any other mechanism, is loosely journaled on a thrust sleeve 17 on the shaft 6, and is provided with clutch teeth 18 for cooperation with companion clutch teeth 18^a of a slidable clutch element or sleeve 19 keyed by 90 opposed keys 20, to rotate with the shaft. A two part or split stop collar 21 is secured to the shaft and limits the release movement of the clutch sleeve, and a thrust ring 22 is positioned between the thrust sleeve 17 95 and the adjacent ends of the keys 20, said ring forming a stop shoulder to retain the wheel 16 against axial movement and serving to protect the sleeve 17 against wearing action of the ends of the keys. 100

The clutch element 19 may be shifted by a lever 23 pivoted on a bracket 24 and connected by a link 25 with a manually operable shift lever 26, the lever 26 being pivoted on a bracket 27. This arrangement of clutch 105 operating means is of a standard and well known type and need not be described in greater detail herein.

The drum shaft 28 is journaled in bearings 29, 30, 31, and keyed to said shaft adjacent the bearing 30 is a cable drum 32 having side flanges 33 which carry opposed brake-drums 34, 35 respectively.

A low speed sprocket wheel 36 rotates freely on a thrust sleeve 37 on the drum shaft and is in constant driving connection with the low speed sprocket pinion 13 on the line shaft 6, by means of a sprocket chain 38.

Axially slidable on the drum shaft adjacent the sprocket wheel 36 is a clutch element or sleeve 39 which is splined to rotate with the shaft by means of opposed keys 40, the opposed surfaces of the wheel 36 and the sleeve 39 being provided with cooperating clutch teeth 41, 41^a. A thrust ring 42 is positioned between the thrust sleeve 37 and the adjacent ends of the keys 40, forming a stop shoulder retaining the wheel 36 against a shifting movement along its axis and serving to protect the sleeve 37 against wearing action of the ends of the keys.

The means for operating the clutch member 39 comprises a yoke arm 43 pivoted in a bracket 44 on the beam 1 and having opposed shoes 44^a engaging into a groove in said clutch member.

An intermediate speed sprocket wheel 45, in constant driving connection with the intermediate speed sprocket pinion 14 on the line shaft 6 by means of a sprocket chain 46, rotates freely on a thrust sleeve 47 on the drum shaft and is provided with clutch teeth 48 for cooperation with companion clutch teeth 48^a on a slidable clutch element or sleeve 49 splined to rotate with the drum shaft by means of opposed keys 50. A high speed sprocket wheel 51, likewise in constant driving connection with the high speed sprocket pinion 15 on the line shaft 6, rotates on a thrust sleeve 52 on the drum shaft and is provided with clutch teeth 53 for cooperation with companion clutch teeth 53^a on a slidable clutch element or sleeve 54 splined to rotate with the drum shaft by means of opposed keys 55. A two part stop collar 56 is secured to the drum shaft between the two clutch members 49, 54 to limit their respective release movements, and between the respective thrust sleeves 47 and 52 and the adjacent ends of the keys 50 and 55 is provided thrust rings 57 and 58, each forming a stop shoulder for preventing axial movement of the adjacent sprocket wheel, and serving also to prevent wearing of the thrust sleeves by the adjacent ends of the keys.

The intermediate clutch 49 is operated by a lever 60 pivoted at 61 on a bracket 62 and provided at its upper end with means engaging into a groove 63 in said clutch sleeve. The lower end of the lever 60 con-

nects by a link 64 with an operating foot lever 65 pivoted in a bracket 66 on the derrick floor. A similar operating mechanism is provided for the high speed clutch 54, and comprises a lever 67 pivoted at 68 on the bracket 62 and having means engaging into a groove 67^a in the clutch sleeve, a connecting link 69, and a clutch operating foot lever 70 pivoted in a bracket 71 on the derrick floor.

A spring 72 interposed between the two levers 60 and 67 normally urge the clutch elements 49-54 to release position, as shown in Fig. 1.

The cooperating clutch teeth 53, 53^a of the high speed sprocket wheel 51 and corresponding clutch member 54 are two way clutch teeth, that is, in either direction of rotation they establish a driving connection when coengaged, and as illustrated in Fig. 5 their driving surfaces are slightly angled to retain them against accidental disengagement.

The clutch teeth 18, 18^a of the independent sprocket wheel 16 and cooperating clutch sleeve 19 are of the same character.

The cooperating clutch teeth 48, 48^a of the intermediate sprocket wheel 45 and companion clutch sleeve 49, and the cooperating clutch teeth 41, 41^a of the low speed sprocket wheel 36 and the cooperating clutch sleeve 39, are of the one way type, (see Fig. 4) that is, they are so formed that during a driving rotation in one direction the teeth cooperate to drive the respective sprocket wheels, while when rotated reversely the teeth have a cam action which will cause the respective clutch sleeve to be thrown out.

The above described organization of parts provides a three speed draw works having a forward or reverse high speed driving connection and forward intermediate and low speed driving connections, with the intermediate and low speed connections arranged to be automatically thrown out upon relative reverse rotation of the drum. Further by the organization of parts on the drum shaft endwise movement thereof, due to the winding and unwinding of the cable, is prevented by reason of the fact that the thrust sleeves 47, 52, thrust rings 57, 58, keys 50, 55 and stop collar 56, occupy the entire distance between the two bearings 30, 31, with the rings 57, 58 being slightly larger in diameter than the sleeves 47, 52, to form shoulders each maintaining the respective sprocket wheel against axial displacement.

Brake bands 75, 76 surround the respective brake drums 34, 35, and have one end secured against lineal movement by bolts 77, 78 with their opposite ends connected to brake operating toggle members 79, 80. A rock shaft 81 is journaled in bearings 82 on the derrick floor beneath the cable drum, the toggle member 80 being keyed to said shaft

and the toggle member 79 being loose thereon. (See Figs. 6 and 7.) An arm 83 is keyed to the shaft 81 adjacent the toggle member 79 and said toggle member has a companion arm 84, and is held against axial movement by engagement with the arm 83 and with the adjacent bearing 82. The arms 83, 84 are connected to the opposite ends of an equalizer bar 85 by means of clevis links 86, 87, and the bar 85 is connected at its medial portion with a link 88 which in turn is connected to a brake operating lever 89 journaled in a bearing 90 on the derrick floor.

This organization of parts provides an equalizing means for applying braking pressure simultaneously to both of the brake drums 34, 35, thereby minimizing the torsion strains in the cable drum, permitting the cable drum and brake drums to be of lighter construction, and insuring a long life, or period of effective functioning of the brake bands.

The yoke arm 43 is not provided with any spring and hence the low speed clutch 41 will remain open when left open. This is most advantageous because it facilitates the quick opening of this clutch when it becomes necessary. In this connection it should be understood that in the operation of a draw works it is frequently necessary for the operator to open or close the clutch without an instant's delay. With our arrangement this low speed clutch is normally open without being held open, while the other two clutches are normally held open and either of them may be closed at will by the pressing of the proper foot lever.

While the embodiment of the invention herein shown and described is admirably adapted to fulfill all the objects primarily stated it is not intended that the invention be limited in this regard for it is susceptible of embodiment in various forms, all coming within the scope of the claims which follow.

We claim:

1. In a three-speed rotary draw works, the combination of a frame having two end posts and an intermediate post, a drum, a drum-shaft carrying the same and supported on the posts, a line shaft supported on the posts, a high speed driving connection from the line shaft to the drum-shaft including a sprocket chain and sprocket wheels mounted on the two shafts, an intermediate-speed driving connection between the line-shaft and the drum-shaft including a sprocket-chain and sprocket-wheels on the shafts, said driving connections being located one adjacent to the intermediate post and the other adjacent to one of the end-posts, a low-speed driving connection for connecting the line-shaft and the drum-shaft located between

the intermediate post and the other end post, an intermediate clutch on the drum shaft corresponding to the intermediate driving connection, a high-speed clutch on the drum-shaft corresponding to the high-speed driving connection, a spring connecting the high speed and intermediate clutches operating to hold both clutches normally open, and enabling the closing of either clutch to open the other, and a low speed clutch for the low speed driving connection.

2. In a rotary draw works, the combination of a drum shaft, a line shaft, three driving connections between the two shafts each of a different driving ratio and each including its corresponding clutch, one of said clutches being a two-way clutch and the other two clutches being one-way clutches, means for opening and closing the two-way clutch and means connecting the same with one of the one-way clutches for opening the latter clutch when the two-way clutch is actuated to its closed position.

3. In a rotary draw works, the combination of a drum shaft, a line shaft, three driving connections between the two shafts each of a different driving ratio and each driving connection having its corresponding clutch, one of said clutches being a two-way clutch and the other two clutches being one-way clutches, a lever for operating the two-way clutch, a lever for operating one of the one-way clutches, a spring connecting said levers, and means connected with the lever of the two-way clutch for closing the same, whereby the closing movement of the two-way clutch actuates the lever of the connected one-way clutch to open the same.

4. In a rotary draw works, the combination of a frame having two end posts and an intermediate post, a drum, a drum shaft carrying the same and supported on the posts, a line shaft supported on the posts, two driving connections from the line shaft to the drum shaft each including a sprocket wheel on the line shaft and a sprocket chain and a sprocket wheel on the drum shaft, one of said driving connections being disposed adjacent the intermediate post and the other driving connection being disposed adjacent one of the end posts, the sprocket wheels on the drum shaft constructed to constitute clutch members, a pair of sliding clutch members mounted on the drum shaft between the sprocket wheels, a lever corresponding to each of said sliding clutch members, and a spring connecting said levers whereby the closing of one clutch opens the other clutch.

Signed at Torrance, California this 25th day of April, 1922.

WILLIAM D. DAVIDSON.
EDWIN W. GOESER.