Feb. 9, 1926. 1,572,228

P. BURKE

FAIRLEAD FOR DRAGLINE EXCAVATORS

Filed August 4, 1924 2 Sheets-Sheet 1

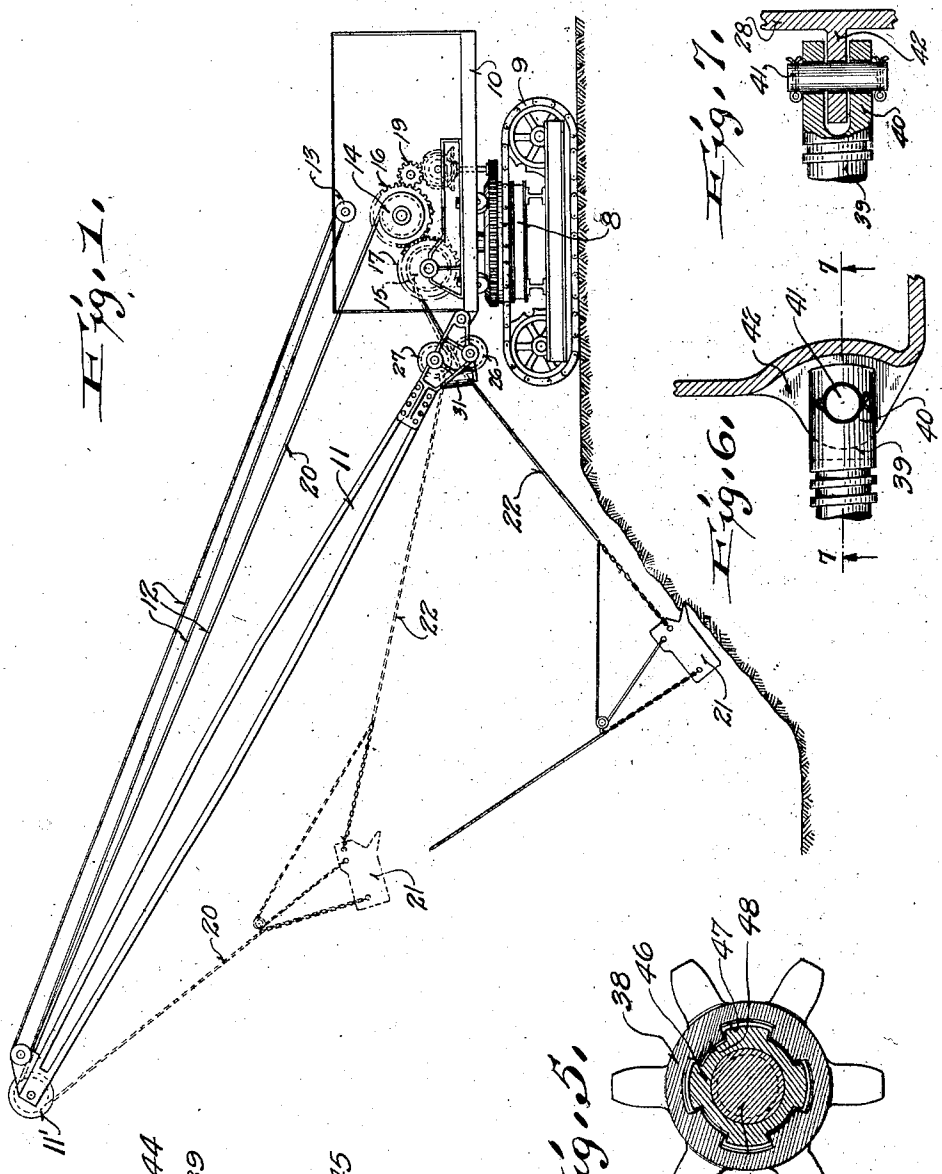

Fig. 1.

Fig. 7.

Fig. 6.

Fig. 5.

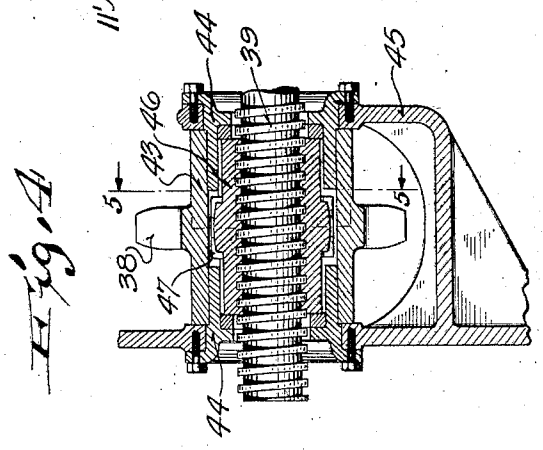

Fig. 4.

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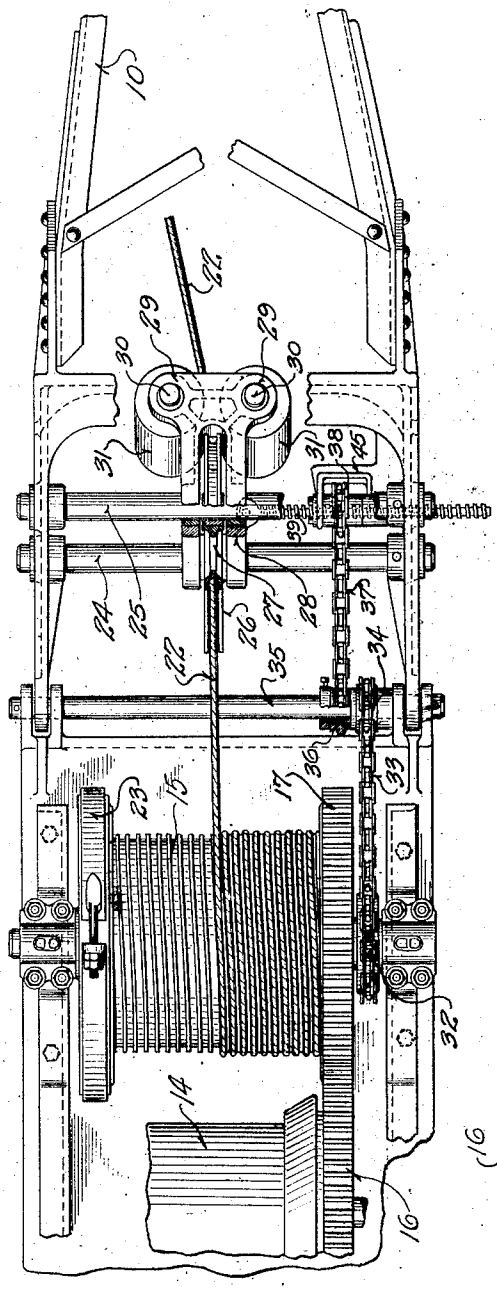

Fig. 2.

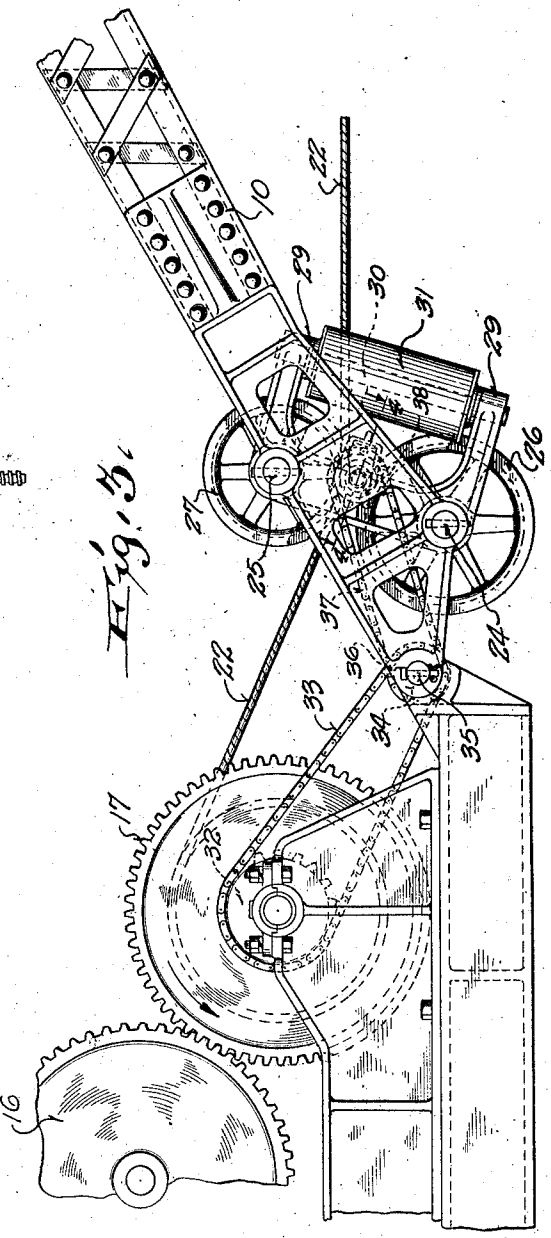

Fig. 3.

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UNITED STATES PATENT OFFICE.

PAUL BURKE, OF GREEN BAY, WISCONSIN, ASSIGNOR TO NORTHWEST ENGINEERING COMPANY, OF GREEN BAY, WISCONSIN, A CORPORATION OF WISCONSIN.

FAIRLEAD FOR DRAGLINE EXCAVATORS.

Application filed August 4, 1924. Serial No. 730,068.

To all whom it may concern:

Be it known that I, PAUL BURKE, a citizen of the United States of America, and resident of Green Bay, in the county of Brown and State of Wisconsin, have invented new and useful Improvements in Fairleads for Dragline Excavators, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

The invention relates to fairleads for excavating machines, and more particularly to fairleads for dragline excavators.

In operation, the bucket of a dragline excavator is often displaced a considerable distance to one or the other side of the boom, which entails a corresponding lateral angular displacement of the portion of the drag cable between the fairlead and bucket with respect to the portion lying between the drag drum and fairlead. Also, as the bucket in operation must assume a large variety of positions in the vertical plane, there will be a vertical angular relative displacement of these two portions of the drag cable. To absorb the lateral and vertical components of the drag cable tension, resulting from the above displacement, is the function of the fairlead. The types of fairlead in use today are so constructed that the contacts between the main drag cable and the sheaves or rollers of the fairlead are principally rolling, such rolling, as against sliding contact, being a necessary condition for satisfactory cable life. Unfortunately, however, these fairleads still leave a considerable source of cable wear, namely, in the lead of the cable between fairlead and drum, where, unless this lead is substantially tangent to the helix formed by the last wrap of the cable, there may be and usually is side contact between the oncoming or offgoing section of cable and the last previous wrap, with resulting abrasion and wear.

Thus, the ideal condition would be to have the drag cable form, at all times, a straight line which is tangent to the helix from which the cable leads at the moment. No known fairleads at the present time bring about this condition, and it is the object of this invention to provide a fairlead capable of positively insuring that that portion of the drag cable lying between the winding or dragline drum and the fairlead will be, at all times, nearly or substantially tangent to the helix formed by the successive wraps of said cable about the cylindrical surface of the drum.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings: Fig. 1 is an elevation view of an excavating machine equipped with the fairlead embodying the invention;

Fig. 2 is a detail plan view of the fairlead, drum and inner end of the boom, parts being shown in section;

Fig. 3 is an elevation view of the mechanism shown in Fig. 2;

Fig. 4 is a detail sectional view of part of the fairlead feed mechanism, taken on the line 4—4 of Fig. 3;

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a detail plan view of the feed-screw connection;

Fig. 7 is a detail sectional view taken on the line 7—7 of Fig. 6.

Referring to Fig. 1, I have here shown a dragline excavator equipped with the fairlead embodying the invention, in which the numeral 8 designates the travelling base of the machine, here shown as provided with endless propelling treads 9, and having the rotating base 10 mounted for turning thereon. The boom 11 is pivotally mounted at its lower end on the base 10 and held in adjusted position by cables 12 connecting the outer end of the boom with the frame 13 of the machine. The hoisting drum 14 and the dragline drum 15 are suitably mounted on the base 10 and their shafts are provided respectively with intermeshing gears 16 and 17, and the gear 16 meshes with a drive pinion 19 driven in any suitable manner from a prime mover, not shown, on the base. Each of the drums 14 and 15 are also provided with clutches and brakes to control their operation. A hoist line 20 leads from the drum 14 over a pulley 11′ on the boom and is operatively connected to the bucket 21. The dragline 22 leads from the drum 15 through the fairlead hereafter described and is operatively connected to the bucket 21. The bucket 21, here shown, is of well-known construction, and its connection with the hoist line 20 and dragline 22 are also well known and operate in the usual manner to cause the bucket to perform its dig-

ging and unloading operations. Turning gear for the base 10, of usual construction, is also provided and is driven by the prime mover, not shown, on the base 10.

Referring to Figs. 2 and 3, the dragline drum 15 is shown as grooved, which is preferred, though a plain surface drum may be used. The cable 22 is wound in by the rotation of the drum 15 through the drive from the gear 16 to the gear 17, and said drum is provided with a brake 23 of usual construction. Clutch mechanism, not shown, is provided for connecting or disconnecting the drum 15 with its source of power.

Forward of the drum and mounted for convenience upon the lower end of the boom 11 are two parallel stationary shafts 24 and 25 and respectively mounted on these shafts, so that they may slide as well as rotate thereon, are guide sheaves 26 and 27. These sheaves are confined between the parallel sides of a housing 28 also adapted to slide on the stationary guide shafts 24 and 25. This housing 28 has sets of spaced arms 29 formed upon its front, each set of which is bored to receive inclined pins 30 upon which rollers 31 are mounted to rotate. The space between the sheaves 26 and 27 and between the rollers 31 is such as to allow passage of the cable 22 therebetween, which is wound at one end on the drum 15 and is secured in any well-known manner to the bucket 21, as previously mentioned.

Secured to the drum 15 and concentric with it, is a chain sprocket 32 connected by a chain 33 to a sprocket 34 on the shaft or hinge-pin 35 of the boom. A sprocket 36 on the shaft 35 is connected by a chain 37 to a sprocket 38 operatively connected with a lead or feed-screw 39. The double-chain-drive is here employed because as a matter of convenience the fairlead is mounted on the boom. It will, of course, be understood that when the fairlead, including the shafts 24 and 25, is mounted on a frame on the base 10 that only a single chain-drive between the drum and the screw 39 would be used.

The feed-screw 39 is preferably connected with the housing so as to permit some universal play, as shown in Figs. 6 and 7, where the forked end 40 of said screw is loosely connected by a pin 41 with a lug 42 on the housing 28.

The preferred form of driving connection between the sprocket 38 and the screw 39 is shown in detail in Figs. 4 and 5, wherein the hub 43 of the sprocket is in the form of a sleeve journalled on fixed bearings 44 removably secured to a fixed support 45 on the boom, and the sprocket 38 drives the nut 46 on the lead-screw 39 by means of loosely-fitting splines 47 and 48, respectively, on the hub of the sprocket and the nut 46, said nut being mounted between the bearing members 44. This construction is of advantage as it allows a certain degree of flexibility in the degree of parallelism between the axes of the stationary shafts 24 and 25 and the screw 39, which is desirable on account of ordinary wear in service as well as to allow for any possible initial inaccuracies of alignment.

From the foregoing it will be noted that as the drum 15 revolves the housing 28 with the fairlead sheaves and rollers will move laterally on the shafts 24 and 25 under the action of the screw 39 whose nut 46 is rotated by the drive from the drum, and I so choose the relative numbers of teeth of the sprockets and the pitch of the thread on the lead-screw 39 that when the drum makes one revolution the lead-screw advances the housing 28 a distance equal to the axial pitch of the rope grooves on the drum or the thickness of the cable plus a slight amount of clearance when said grooves are not used. The hand of the lead-screw is the same as that of the helix formed by the cable wrapped upon the drum. Thus, I am able to maintain the run of the cable between the fairlead and the drum nearly or substantially tangent to the helix formed by the last wrap of cable on the drum, thereby preventing the usual abrasion and wear of the cable.

By preference, the diameter and length of the drum are large enough so that it is unnecessary to use more than one layer of drag cable. It is obvious that the initial adjustment being properly made so that the drag cable is substantially tangent to the helix of the wrapped rope, that this relation will be maintained automatically whether the drum is wound full of rope, unwound empty, or in any condition intermediate these two.

When the fairlead is mounted on the boom there is, of course, a slight relative rotation of the feed-shaft in adjustment of the boom angle, but inasmuch as the boom angle need be varied only within a limited range, it is obvious that such variation in boom angle can cause only a neglible degree of error in the lateral relationship between the fairlead and the drum grooves or wrapped rope.

From the foregoing description it will be noted that I have provided a fairlead mechanism in which the run of the drag cable between the fairlead and drum is so guided as to prevent the usual wear due to the sliding contact of parts of said cable on each other as they pass off or are wound on said drum.

I desire it to be understood that this invention is not to be limited to any specific form or arrangement of parts except in so far as such limitations are specified in the claims or necessitated by the prior art.

What I claim as my invention is:

1. In a machine, the combination with a

supporting platform, of a winding drum mounted thereon, a boom pivoted at its lower end on said platform, a fairlead mechanism including a reciprocating frame mounted on the lower end of the boom, line guide means carried by said frame, and means driven by the drum for moving said frame relative to the longitudinal axis of said drum to maintain the run of the line between said guide means and drum substantially tangent to the helix formed by the previous wrap of line on the drum in any operating position of the boom relative to said platform.

2. In a machine, the combination with a winding drum and a line associated with said drum, of a fairlead mechanism including a reciprocating frame, line guide means carried by said frame, a feed-screw connected with said frame, a nut on said feed-screw, and means rotating in synchronism with the drum and having a loose driving connection with said nut for turning said nut, said feed-screw moving said frame relative to the longitudinal axis of the drum at a rate to maintain the run of the line between said guide means and drum substantially tangent to the helix formed by the previous wrap of line on said drum.

3. In a machine, the combination with a winding drum, a line associated with said drum and a pivoted boom, of a fairlead mechanism including a pair of stationary shafts mounted at the lower end of the boom adjacent its pivot, a frame slidably mounted on said shafts, line guide means carried by said frame, a feed-screw connected with said frame, a nut for said feed-screw, a gear mounted in bearings on the boom and having a splined connection with said nut, transmission mechanism between said gear and said frame including a drive from the drum to the hinge-pin of the boom, and a drive from said hinge-pin to said gear, said transmission mechanism and feed-screw adapted to move said frame relative to the drum at a rate to maintain the run of the line between said guide means and drum substantially tangent to the helix formed by the previous wrap of line on said drum.

4. In a machine, the combination with a winding drum, a line associated with said drum and a pivoted boom, of a fairlead mechanism including a pair of stationary shafts mounted at the lower end of the boom adjacent its pivot, a frame slidably mounted on said shafts, a pair of lateral-thrust line guide rollers on said frame and between which said line passes, a pair of guide sheaves on said frame between which said line passes to the said drum, a feed-screw connected with said frame, a nut for said feed-screw, a gear mounted in bearings on the boom and having a splined connection with said nut, transmission mechanism between said gear and said frame including a drive from the drum to the hinge-pin of the boom, and a drive from said hinge-pin to said gear, said transmission mechanism and feed-screw adapted to move said frame relative to the drum at a rate to maintain the run of the line between said guide means and drum substantially tangent to the helix formed by the previous wrap of line on said drum.

5. In a machine, the combination with a winding drum and a line associated with said drum, of a fairlead mechanism including a reciprocating frame, a feed-screw connected with said frame, a nut on said feed-screw, a driving member having a loosely splined driving connection with said nut, said feed-screw moving said frame relative to the longitudinal axis of the drum at a rate to maintain the run of said line between said guide means and drum substantially tangent to the helix formed by the previous wrap of line on said drum.

6. In a dragline excavator, the combination with the dragline drum and the dragline, of a fairlead mechanism including guide means movable relative to the longitudinal axis of the drum to guide the run of the cable between the fairlead and the drum, and driving means between the drum and said guide means producing a positive ratio between the lateral displacement of said guiding means and the angular displacement of the drag-drum about its axis and maintaining the direction of movement of said guiding means in correspondence with the direction of angular displacement of the drag-drum in either direction.

In testimony whereof, I affix my signature.

PAUL BURKE.