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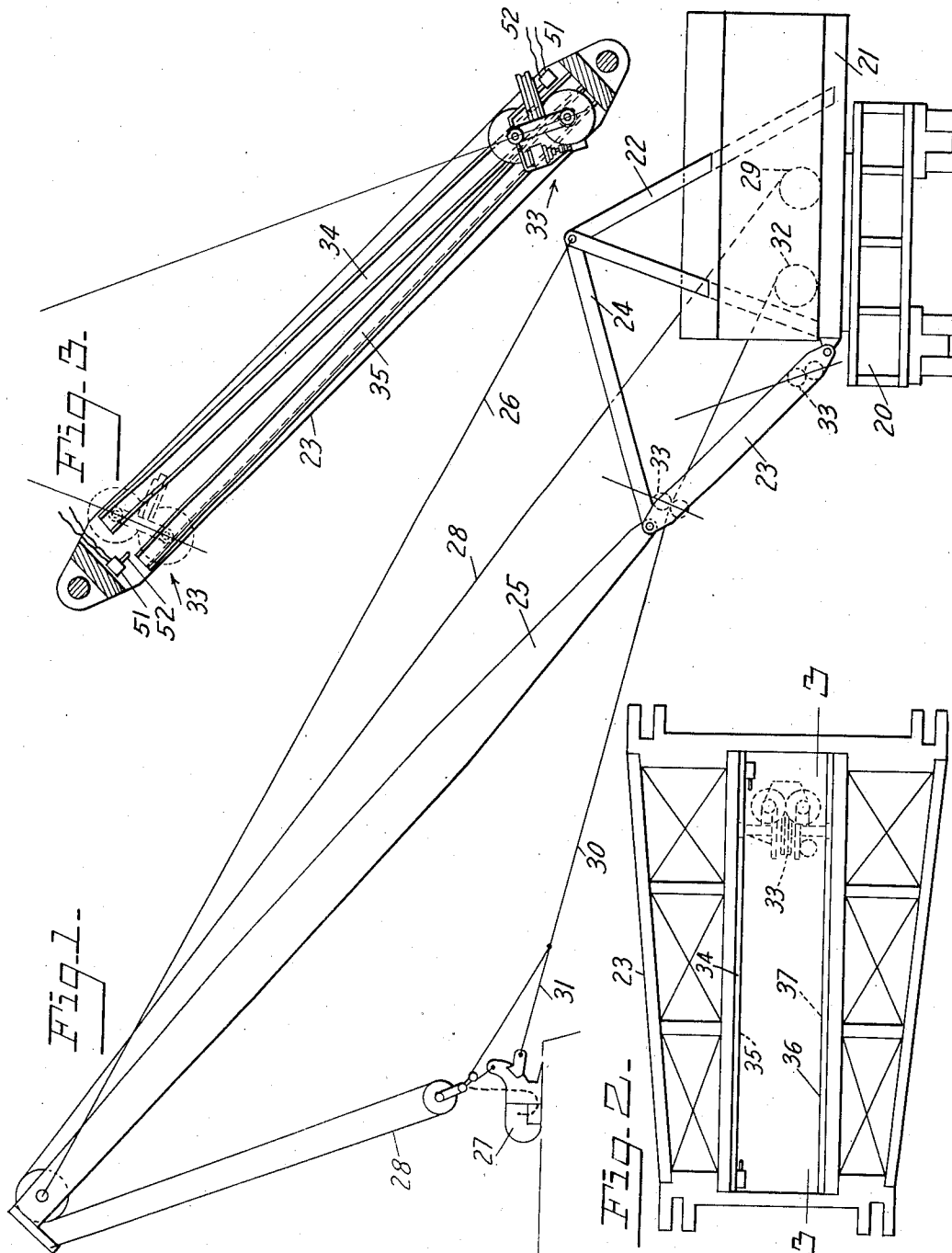
D. J. SHELTON ET AL

2,133,406

FAIR-LEAD

Filed June 4, 1937

5 Sheets-Sheet 1



INVENTORS.  
D. J. SHELTON, B. JACOBY,  
G. B. HEFFELFINGER.  
by *Edward Reed*  
their ATTORNEY.

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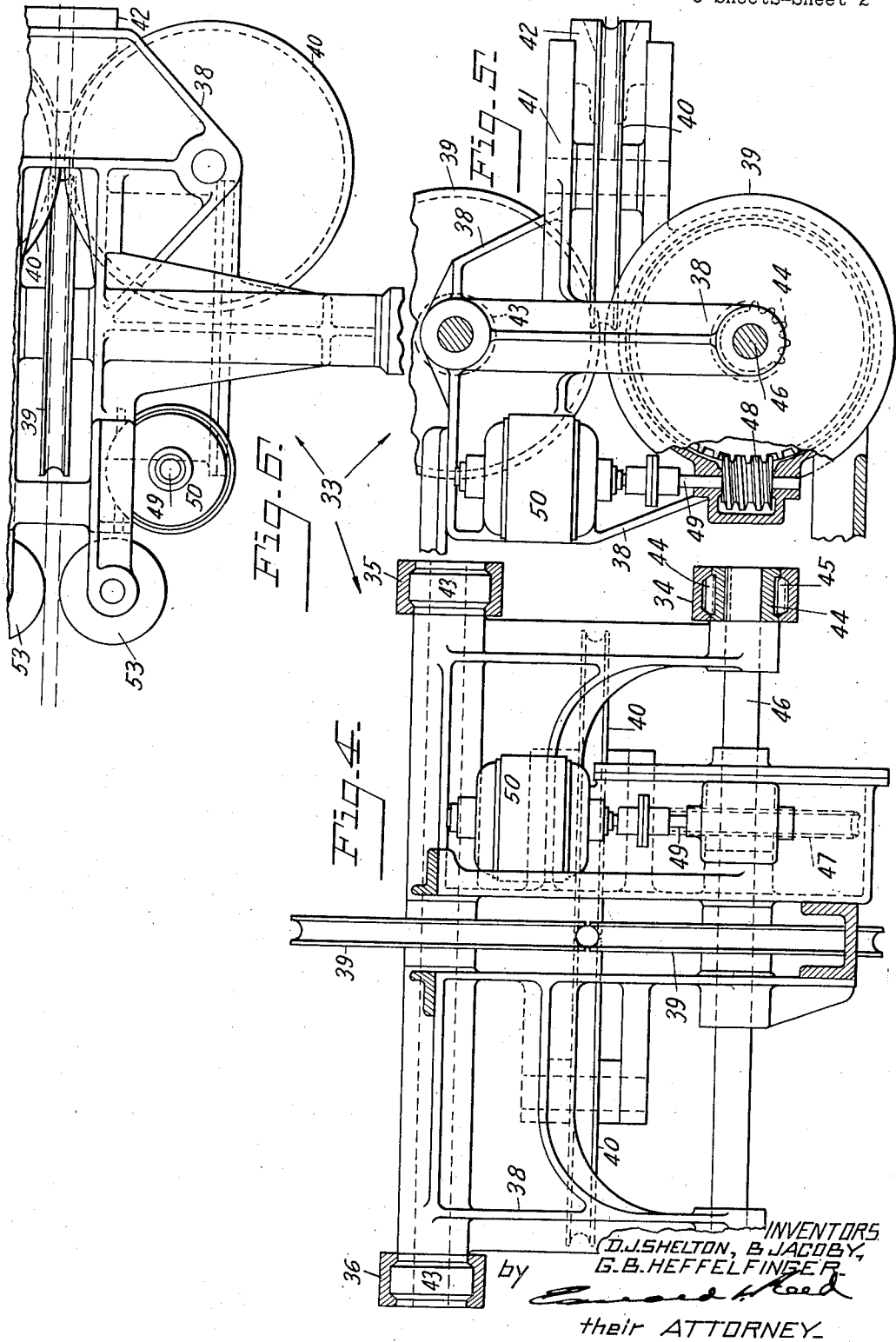
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FAIR-LEAD

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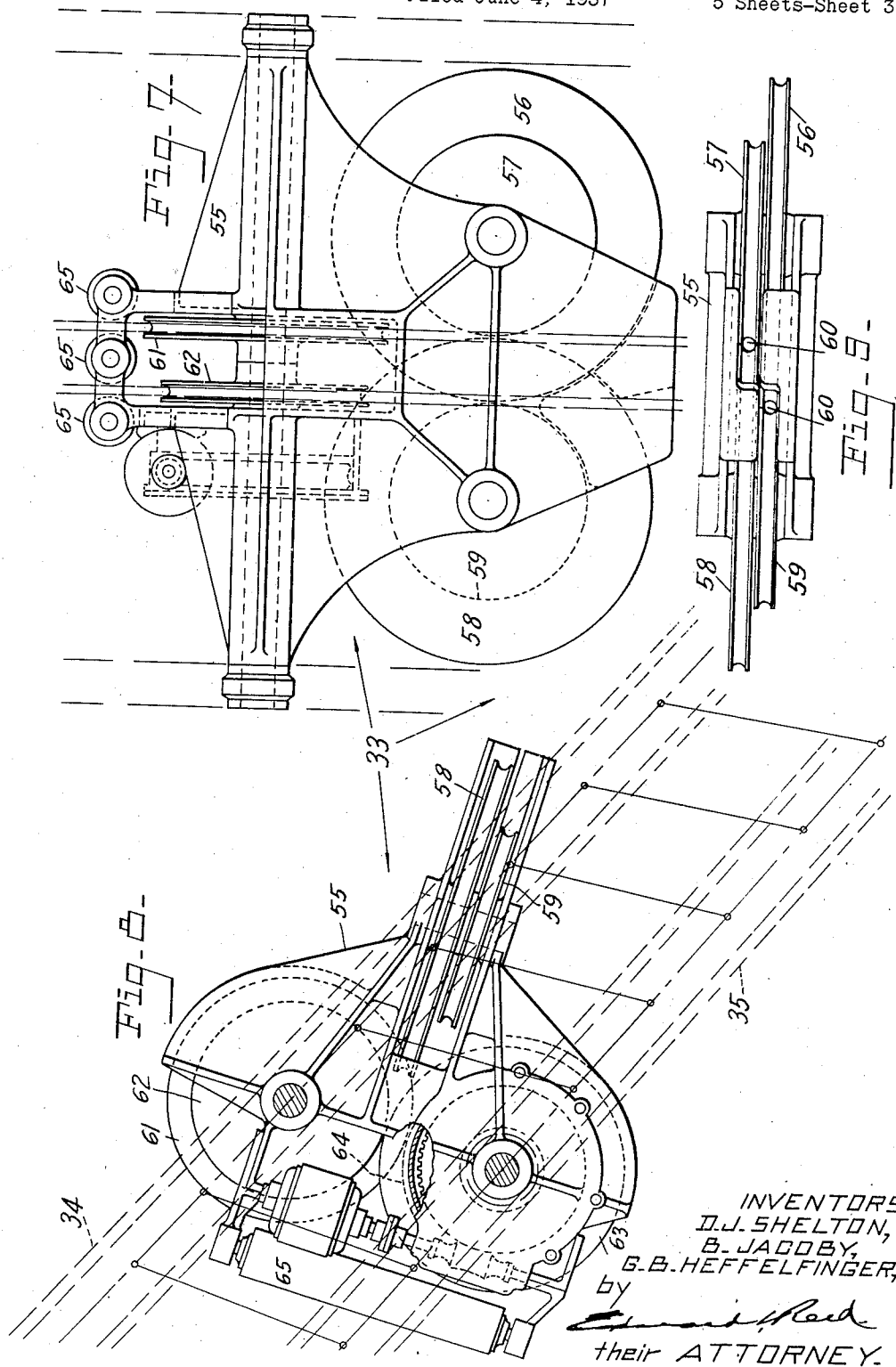
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FAIR-LEAD

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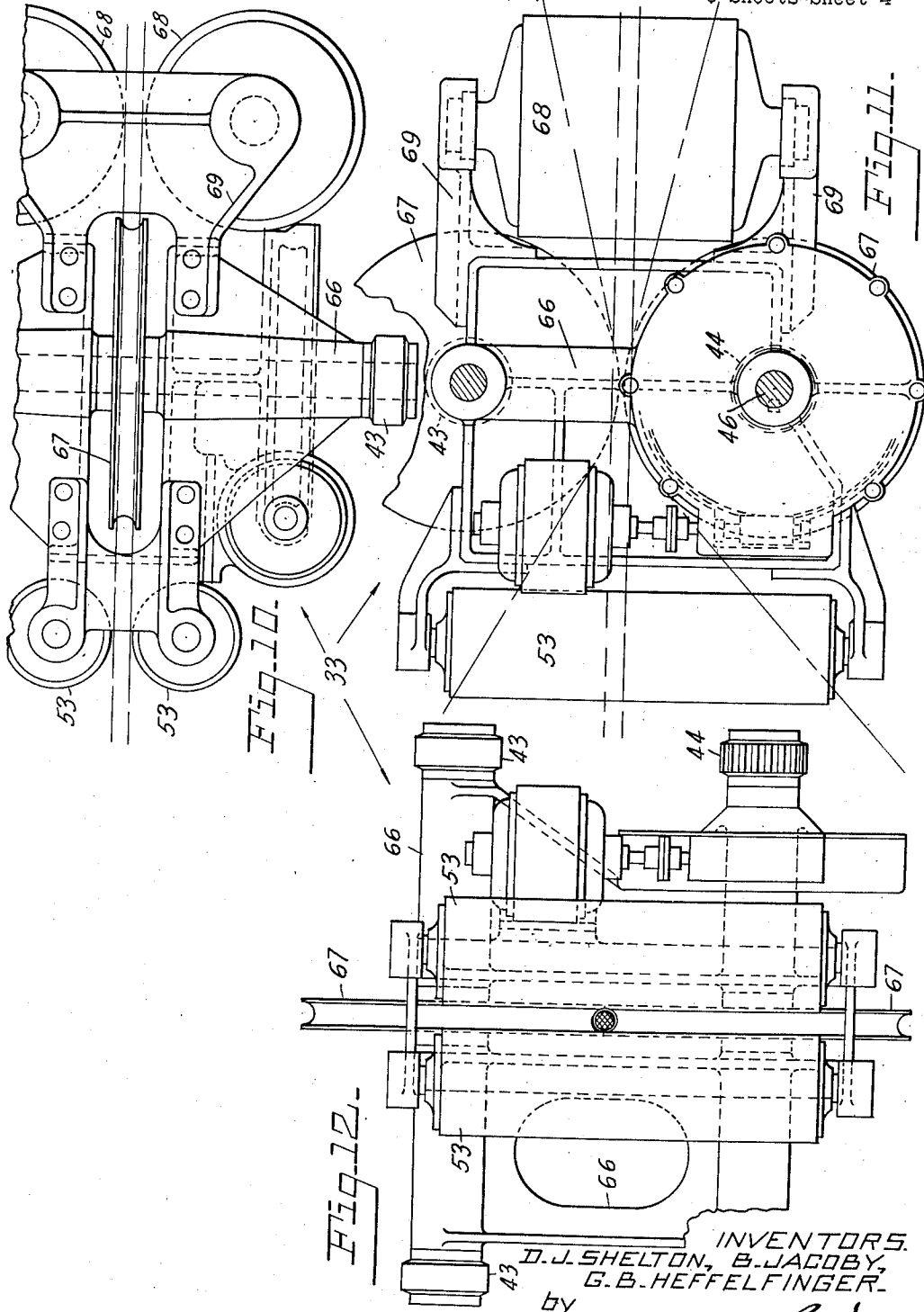
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5 Sheets-Sheet 4



INVENTORS.  
D. J. SHELTON, B. JACOBY,  
G. B. HEFFELFINGER.

by

*Edward Reed*

their ATTORNEY.

Oct. 18, 1938.

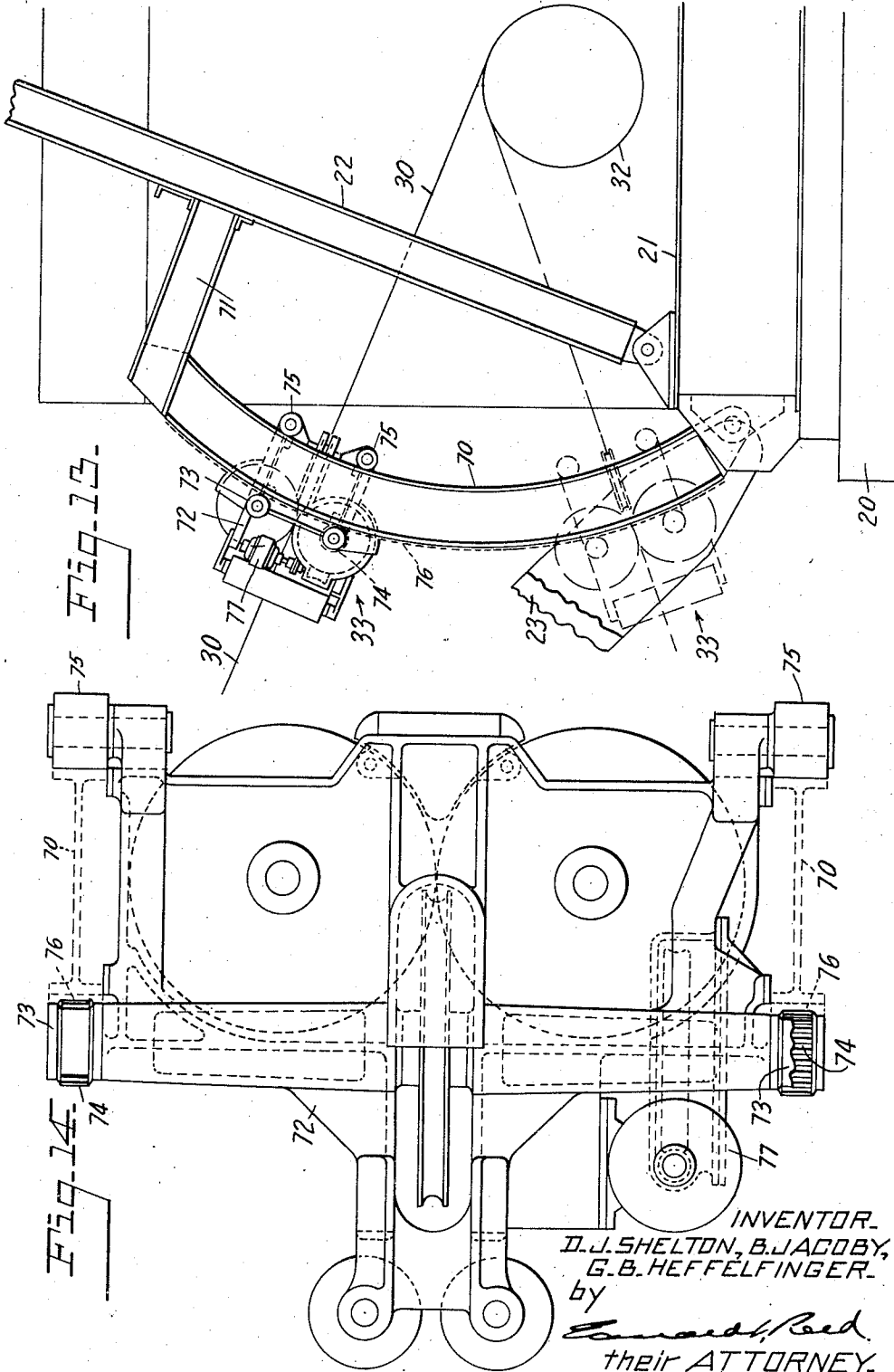
D. J. SHELTON ET AL

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FAIR-LEAD

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5 Sheets-Sheet 5



INVENTOR.  
D. J. SHELTON, B. JACOBY,  
G. B. HEFFELFINGER.  
by  
*Edward J. Reed*  
their ATTORNEY.

## UNITED STATES PATENT OFFICE

2,133,406

FAIR-LEAD

Dwight J. Shelton, Benjamin Jacoby, and Glen B. Heffelfinger, Marion, Ohio, assignors to The Marion Steam Shovel Company, Marion, Ohio, a corporation of Ohio

Application June 4, 1937, Serial No. 146,374

33 Claims. (Cl. 37—135)

This invention relates to a fairlead for a cable and is designed primarily for use in connection with drag line excavators.

As is well known, in a drag line excavator the excavating element or scoop is supported by a hoisting cable from the point of the boom and operates on the material to be excavated at a point spaced a substantial distance from the operating mechanism of the machine, a drag cable connecting the scoop with the operating mechanism on the platform of the machine and serving to move the open end of the scoop toward the machine in the excavating operation. The hoisting cable and the drag cable are controlled in unison to cause the scoop to be filled, hoisted and dumped. It is customary to provide such a machine with a fairlead, or cable guide, to control the position of the cable with relation to the boom and other parts of the mechanism and this fairlead is usually mounted on or adjacent to the platform of the machine. When the surface of the material on which the scoop is operating is below or not substantially higher than the platform this arrangement of the fairlead is satisfactory but when the scoop is operating on a surface substantially higher than the platform the downward pull of the drag cable produces objectionable results. For example, in surface mining of coal or mineral it is customary to remove overburden by means of a large capacity power operated shovel, of the type commonly known as a stripping shovel, but it is impractical to remove the overburden to a depth of more than approximately forty-five feet by such a stripping shovel. In many cases the size of the vein of coal is sufficient to justify the removal of a greater mass of overburden, say from sixty to seventy feet in depth. Under such circumstances a drag line excavator may be employed to remove the excess overburden, that is, that part of the overburden which is above the operating limit of the stripping shovel, the latter resting upon the floor of the cut, that is, the upper surface of the vein of coal. In a large capacity drag line excavator the platform may be about twenty feet above the floor of the cut and when the fairlead is at the level of the platform it will be obvious that the drag cable will extend upwardly to the scoop at a sharp angle and the downward pull of this cable on the front end of the scoop tilts the same forwardly. As a result it is often difficult and sometimes impossible to completely fill the scoop due to the tendency of the loosened material to fall away from the scoop by gravity. Further, when the scoop

is operated within a few feet of the edge of the bank it will tend to break the edge portion of the bank away and cause the same to fall to the floor of the cut. These objectionable features may be largely eliminated by mounting the fairlead at a higher elevation, which will reduce the downward pull of the cable on the scoop. However, with the fairlead mounted at this high elevation the scoop can not be satisfactorily operated on a level below the level of the platform, due to the tendency of the drag cable to elevate the front end of the scoop. Before each advance movement of the excavator it is usually necessary to clean up the floor of the cut, by removing such material as may have accumulated thereon, and for the reasons given this cannot be satisfactorily accomplished with the fairlead at a high elevation.

It is therefore one object of the invention to provide a fairlead which can be quickly and easily adjusted from one elevation to another, to accommodate it to the character of the work to be performed.

A further object of the invention is to provide such a fairlead with power operated adjusting mechanism which can be controlled from the platform of the machine.

A further object of the invention is to provide such a fairlead with means for maintaining the same at all times in proper position with relation to that portion of the cable which lies between the fairlead and the drum which operates the cable.

A further object of the invention is to provide a fairlead with means for controlling a two cable drag line and maintaining the cables in proper relative positions during their operation.

A further object of the invention is to provide such a fairlead with means for adjustably mounting the same on the boom of the excavator.

A further object of the invention is to provide such a fairlead with means for mounting the same on the platform of the machine or the excavator.

Other objects of the invention may appear as the mechanism is described in detail.

In the accompanying drawings Fig. 1 is a side elevation of a drag line excavator showing the fairlead mounted on the boom thereof; Fig. 2 is a plan view of that portion of the boom on which the fairlead is mounted; Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2; Fig. 4 is a front elevation of the fairlead, partly broken away; Fig. 5 is a side elevation of the fairlead, partly

broken away; Fig. 6 is a plan view of the fairlead, partly broken away; Fig. 7 is a plan view of a two cable fairlead; Fig. 8 is a side elevation of the two cable fairlead; Fig. 9 is an edge view of the horizontal guide sheaves; Fig. 10 is a plan view of a fairlead having a single pair of guide sheaves, partly broken away; Fig. 11 is a plan view of the fairlead of Fig. 10; Fig. 12 is a front elevation of the fairlead of Fig. 10; Fig. 13 is a side elevation of a portion of an excavator showing the fairlead adjustably mounted on the platform; and Fig. 14 is a plan view of the fairlead of Fig. 13, partly broken away.

In these drawings we have illustrated the invention as applied to a drag line excavator but it will be understood that the invention may take various forms and may be applied to machines of various kinds which involve a similar problem.

The drag line excavator shown in Fig. 1 is of a well known type and comprises the usual portable base 20 on which is mounted a revolving platform 21 which carries the operating mechanism and the gantry 22. A boom extends upwardly and forwardly from the platform and is normally supported at a fixed inclination. So far as the present invention is concerned the boom may be of any suitable character. It is here shown as what is known as a stiff leg boom, the lower portion 23 of the boom being mounted at its lower end on the platform and being rigidly connected at its upper end with a gantry 22 by means of a strut 24. The outer portion or leg 25 is pivotally mounted on the leg 23 and is supported at a fixed inclination by the usual supporting cable 26. The excavating element 27, herein referred to as a scoop, is supported from the point of the boom by a cable 28 which is connected with a drum 29 on the platform. Operative or excavating movement is imparted to the scoop by a drag cable 30 which is connected with the front end of the scoop by a bridle 31 and is wound upon a drum 32 on the platform. The cable usually extends through the boom, and a fairlead, indicated by the reference numeral 33, is provided to guide the cable through the boom. To facilitate the operation of the scoop at different levels with relation to the platform of the machine the fairlead is of such a character that it may be supported at different levels with relation to the platform, and operating mechanism is provided for shifting it from one position to another. The fairlead may be mounted on any suitable part of the machine but, as shown in Figs. 1, 2 and 3, it is mounted on the lower portion of the boom. This portion of the boom comprises side members 34 rigidly connected one to the other and spaced apart for at least a portion of their length to provide between them a slot or elongate opening and the fairlead is mounted in this slot for adjustment lengthwise thereof. For this purpose the boom is provided with a track extending lengthwise thereof and adapted to movably support the fairlead. As here shown, this track comprises two pairs of side rails 35 and 36 rigidly secured to the respective side members of the boom. In the present construction each side rail comprises two opposed channel members, 37, spaced apart to form between them guideways for guide members carried by the fairlead.

The fairlead comprises a frame 38 on which are mounted cable guides, the latter comprising a pair of opposed sheaves 39 arranged in the same vertical plane and having grooved peripheries to

receive the cable between them, as shown in Figs. 3, 4 and 5. Suitable means are provided for guiding the cable into the space between these vertical sheaves and preventing the same from being laterally displaced with relation thereto. As shown in Figs. 4, 5 and 6, this means comprises a pair of opposed sheaves 40 arranged in a substantially horizontal plane and supported by a rearward extension 41 of the frame 38, the space between the horizontal sheaves being in line with the space between the vertical sheaves. The plane of the horizontal sheaves 40 intersects and is preferably at right angles to the plane of the vertical sheaves 39 and is also preferably at right angles to a vertical plane extending through the axes of the vertical sheaves. Preferably the frame extension 41 is provided with a flared opening 42 to properly position the cable with relation to the horizontal sheaves and to permit the same to flex laterally with relation to the sheaves as the cable travels from one end of its drum to the other.

The guide members which support the frame 38 of the fairlead on the side rails of the track are preferably in the form of rollers 43 mounted in the channel members of the respective side rails. The operating mechanism for shifting the frame 38 lengthwise of the track preferably comprises a toothed rack associated with the track and a pinion carried by the frame and meshing with that rack. In the present construction one of the guide rollers, 44, is provided with teeth and constitutes a pinion which meshes with a rack 45 carried by and arranged within one of the channel members of the corresponding side rail 35. The pinion 44 is rigidly secured to a shaft 46 rotatably mounted in suitable bearings in the frame 38 and having rigidly secured thereto a worm wheel 47 which meshes with a worm 48 secured to a shaft 49 which is connected with and driven by an electric motor 50 mounted on the frame 38. Thus the fairlead and its operating mechanism constitutes a single unit which moves as a whole along the track. The motor 50 is connected with a suitable circuit controlling device mounted on the platform of the machine which may be of any suitable character and is not here shown. However, it is desirable that means should be provided for automatically interrupting the operation of the motor before the fairlead has moved far enough in either direction to contact with the boom structure, thus possibly injuring the mechanism. To this end I have mounted on the boom, near each end of the slot therein, switches 51 having switch actuating members 52 projecting into the path of the frame of the fairlead and so arranged that they will be engaged by the frame and the motor circuit opened before the fairlead is contacted with the boom.

It will be noted that as the fairlead is moved from one position to the other the angle at which the inner portion of the drag cable extends from its drum 32 to the fairlead changes and in order to maintain the horizontal sheaves of the fairlead in proper relation to this inner portion of the cable the horizontal sheaves are mounted for tilting movement so that they may be properly aligned with the cable. In the present instance the fairlead as a whole is tilted to properly position the horizontal sheaves, and in the particular arrangement here shown this is accomplished automatically by the arrangement of the side rails of the track. As shown in Fig. 3, the rails of each pair of side rails converge

downwardly so that as the fairlead is moved from its lower position, as shown in full lines, to its upper position the frame 38 will move from a forwardly and upwardly inclined position across a vertical position to a position in which it is slightly inclined rearwardly and upwardly, as shown in dotted lines at the end of Fig. 3, thus tilting the frame as a whole and adjusting the horizontal sheaves to such an inclination as will place them in proper relation to the inner portion of the drag cable.

The operation of the mechanism will be readily understood and it will be apparent that the fairlead may be quickly and easily shifted from one elevation to another, under the control of the operator on the platform, to accommodate the same to the particular height of the material on which the scoop is to operate and further, it will be apparent that the fairlead will be automatically locked in the position to which it is adjusted by the action of the worm gearing 47 and 48. If desired, the fairlead may be provided at its front end, that is, the end at which the cable leaves the vertical sheaves, with a pair of vertical guide rollers 53 rotatably mounted on the frame 38 and spaced apart to receive the cable between them and thus serve to prevent the lateral displacement of the cable at its point of contact with the vertical sheaves but permitting it to have free vertical movement with relation to said sheaves.

Some large capacity drag line excavators are provided with a drag line comprising two parallel cables which operate in unison and in Figs. 7, 8 and 9 there is shown a form of fairlead adapted to guide the two cables and to maintain the same in their properly spaced relation. The frame 55 of this fairlead is similar to that above described and it is mounted on and moved along the track in the same manner. The cable guiding sheaves comprise a set of vertical guide sheaves and a set of horizontal guide sheaves and each set of sheaves comprises two pairs of sheaves, the sheaves of each pair being of different diameters. As shown in the drawings the set of horizontal sheaves include one pair comprising a large sheave 56 and a relatively small sheave 57 and a second pair comprising a large sheave 58 and a relatively small sheave 59. The large sheave of each pair is arranged in the same plane with and cooperates with the small sheave of the other pair so that the guide openings between the cooperating sheaves will be spaced laterally one from the other, as shown at 60, in Fig. 9. The set of vertical sheaves comprises one pair having a large sheave 61 and a relatively small sheave 62 and a second pair having a large sheave 63 and a relatively small sheave 64, the small sheave of each pair being in the same plane with and cooperating with the large sheave of the other pair, thus locating the guide openings between the vertical sheaves in positions to receive the cables from the guide openings between the corresponding horizontal sheaves. At the front end of the frame 55 there are mounted three vertical rollers 65 spaced one from the other to receive between them the cables from the respective pairs of vertical sheaves and to hold those cables against lateral displacement with relation to said sheaves, while permitting the cables to flex freely in vertical planes.

In Figs. 10, 11 and 12, there is shown a fairlead similar to that shown in Figs. 4, 5 and 6, but having different means for guiding the cable

to the vertical sheaves. As there shown, the frame 66 and vertical sheaves 67 are substantially similar to those shown in Figs. 4, 5 and 6, and the frame is supported and moved from one position to another in the same manner. In the rear of the vertical shafts the horizontal sheaves have been omitted and in lieu thereof there are provided two parallel rollers 68 of relatively large diameter which are mounted at their upper and lower ends in brackets 69 extending rearwardly from the frame 66. These rollers rotate about parallel vertical axes and the space between them is in line with the space between the vertical sheaves 67. Thus as the inner portion of the cable travels from one end of its drum to the other end thereof the cable may flex about these vertical rollers or drums but will be held against lateral displacement with relation to the vertical sheaves of the fairlead. As the fairlead is adjusted from one elevation to the other the cable will move vertically between the rollers 68, thus permitting it to flex in a vertical plane and making unnecessary the tilting of the fairlead.

As has been heretofore stated, the fairlead may be adjustably mounted on any suitable part of the machine and in Figs. 13 and 14 we have shown an arrangement in which the guide or track for the fairlead is mounted directly upon the revolving platform of the excavator. As shown in these figures the fairlead is mounted on an upright track 70 mounted at its lower end on the platform 21, preferably between the lower parts of the boom, and rigidly secured at its upper end to brackets 71 carried by the gantry 22. This track is curved forwardly about an axis adjacent the point of contact of the cable 30 with the drum 32. It comprises two side rails, as shown in Fig. 14, and the fairlead is supported on these side rails with the cable guiding sheaves arranged between the same. These sheaves are mounted on a frame 72 in a manner substantially similar to that shown in Figs. 4, 5 and 6. This frame is provided on each side thereof with two guide members 73 and 74 arranged to engage the forwardly curved surfaces of the side rails of the track. The frame is also provided on each side thereof with two other guide members, or rollers, 75 to engage the rear or inner curved surfaces of the side rails. Preferably each track rail is provided on its forward surface with a toothed rack 76 and the guide members 74 are in the form of pinions which mesh with the respective racks and are driven by a motor 77 in the manner above described. Thus the fairlead can be moved along the track to any selected position thereon and, due to the curvature of the track, the guide sheaves will be in substantial alignment with the point of contact of the cable with the drum in all positions of the fairlead, thereby avoiding the necessity of tilting or otherwise adjusting the fairlead to maintain the sheaves in proper relation to the cable.

While we have shown and described certain embodiments of our invention we wish it to be understood that we do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a machine comprising an operating mechanism, a device to be operated, means carried by said machine for movably supporting said device at a point remote from and at a higher ele-

vation than said operating mechanism, an operating cable connecting said device with said operating mechanism, a frame supported on said machine for movement to different elevations with relation to the point of support for said device, opposed guides carried by said frame and arranged to receive said cable between them, and actuating means carried by said frame for moving the same to different elevations.

2. In a machine comprising an operating mechanism, a device to be operated, means carried by said machine for movably supporting said device at a point remote from and at a higher elevation than said operating mechanism, an operating cable connecting said device with said operating mechanism, a fairlead for said cable including a frame, a track on which said frame is mounted for movement to different elevations with relation to the point of support for said device, and means for moving said frame to and for retaining the same in adjusted positions on said track.

3. In a machine comprising an operating mechanism, a device to be operated, means carried by said machine for movably supporting said device at a point remote from and at a higher elevation than said operating mechanism, an operating cable connecting said device with said operating mechanism, a fairlead for said cable including a frame, a track on which said frame is mounted for movement to different elevations with relation to the point of support for said device, a motor mounted on said frame, and means actuated by said motor for moving said frame along said track.

4. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead for said cable including a frame, a track on which said frame is movably mounted, and adjusting mechanism for moving said frame along said track and for automatically locking the same in its adjusted position thereon.

5. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part and comprising a frame and guide elements carried thereby, means for supporting said frame at different elevations with relation to said machine, and means for adjusting said fairlead to locate said guide elements in proper relation to said cable at all elevations of said frame.

6. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part and comprising a frame and guide elements carried thereby, a supporting structure on which said frame is mounted for bodily movement, and means for moving said frame along said structure, said supporting structure and said frame having cooperating parts for adjusting said frame about an axis transverse to its line of movement to properly locate said guide element with relation to said cable.

7. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating

mechanism and said part and comprising a frame and guide elements carried thereby, a track on which said frame is movably mounted, and means for moving said frame along said track, said track being arranged to impart tilting movement to said frame as the latter moves along said track to maintain said guide elements in proper relation to said cable.

8. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part and comprising a frame and guide elements carried thereby, a track on which said frame is movably mounted, a toothed element associated with said track and extending lengthwise thereof, a pinion carried by said frame and meshing with said toothed element, a motor mounted on said frame, and means driven by said motor for actuating said pinion.

9. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part and comprising a frame and guide elements carried thereby, a track comprising side rails each having channel members spaced one from the other, a toothed rack associated with one of said rails, a frame having at each side thereof rollers mounted in the channel members of the respective side rails, one of said rollers having teeth meshing with said rack, and means carried by said frame for rotating said toothed roller.

10. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part and comprising a frame and guide elements carried thereby, a track comprising two laterally spaced pairs of side rails, the rails of each pair being spaced one from the other, said frame having at each side thereof guide members movably supported on the respective side rails, and means carried by said frame for moving the same lengthwise of said track, the side rails of each pair converging toward one end of said track to cause said frame to tilt as it moves lengthwise of said track.

11. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, an upwardly extending track arranged between said operating mechanism and said part and including two pairs of side rails, the rails of each pair being spaced one from the other, a toothed rack associated with one of said rails, a frame having at each side thereof two guide members mounted on the respective side rails, one of said guide members comprising a pinion meshing with said toothed rack, a pair of horizontal cable guiding sheaves mounted on said frame, a pair of vertical cable guiding sheaves mounted on said frame and arranged to receive the cable from said horizontal sheaves, a motor mounted on said frame, and means actuated by said motor for rotating said pinion.

12. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism,

an upwardly extending track arranged between said operating mechanism and said part and including laterally spaced side rails, a frame having guide members movably mounted on said side rails, cable guiding sheaves carried by said frame, a motor mounted on said frame, means actuated by said motor for moving said frame lengthwise of said track, and circuit controlling devices for said motor arranged near the respective ends of said track and each including a part to be engaged by said frame and moved to circuit opening position.

13. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead for said cable including a frame, a track on which said frame is movably mounted, driving mechanism for moving said frame along said track, and means controlled by said frame for interrupting the operation of said driving mechanism when said frame is near the limit of its movement on said track.

14. In a drag line excavator comprising an inclined boom, a scoop, a cable for movably supporting said scoop from said boom at a point remote from the foot thereof, a drag cable for said scoop, and a drum for operating said drag cable, a frame mounted near the foot of said boom for movement with relation thereto, opposed guides carried by said frame and arranged to receive said drag cable between them, and operable means carried by said frame for moving the same to different elevations with relation to said boom.

15. In a drag line excavator comprising an inclined boom, a scoop, a cable for movably supporting said scoop from said boom at a point remote from the foot thereof, a drag cable for said scoop, and a drum for operating said drag cable, a frame movably mounted on said boom near the foot thereof, opposed guides carried by said frame and arranged to receive said drag cable between them, said frame and said boom having parts co-operating to move said frame lengthwise of said boom, and operating mechanism carried by said frame and having driving connection with one of said parts.

16. In a drag line excavator comprising an inclined boom, a scoop, means for movably supporting said scoop from said boom, a drag cable for said scoop, and a drum for operating said drag cable, said boom having a longitudinal slot, longitudinal guide members arranged near the respective sides of said slot, a frame movably mounted on said guide members, guides for said drag cable carried by said frame, and means for moving said frame on said guide members.

17. In a drag line excavator comprising an inclined boom, a scoop, means for movably supporting said scoop from said boom, a drag cable for said scoop, and a drum for operating said drag cable, said boom having a longitudinal slot, longitudinal guide members arranged near the respective sides of said slot, a frame movably mounted on said guide members, guides for said drag cable carried by said frame, and means for moving said frame on said guide members and for locking the same in adjusted positions thereon.

18. In a drag line excavator comprising an inclined boom, a scoop, means for movably supporting said scoop from said boom, a drag cable for said scoop, and a drum for operating said drag cable, said boom having a longitudinal slot, longitudinal guide members arranged near the respective sides of said slot, a frame movably mounted on said guide members, guides for said

drag cable carried by said frame, and means for moving said frame on said guide members, said guide members being arranged to tilt said frame with relation to said boom to aline said cable guides with said cable in different adjusted positions of said frame.

19. In a machine comprising a part to be operated, means for operating said part including two parallel cables connected therewith, and a drum on which said cables are wound, a fairlead comprising two pairs of cable guiding sheaves arranged in substantially vertical planes, and two pairs of cable guiding sheaves arranged in planes intersecting the planes of said vertical sheaves, the sheaves of each of the last mentioned pairs being of different diameter and the small sheave of each of said pairs being in the plane of the larger sheave of the other of said pairs.

20. In a machine comprising a part to be operated, means for operating said part including two parallel cables connected therewith, and a drum on which said cables are wound, a fairlead comprising two pairs of cable guiding sheaves arranged in substantially vertical planes, and two pairs of cable guiding sheaves arranged in planes intersecting the planes of said vertical sheaves, the sheaves of each of the last mentioned pairs being of different diameters and the small sheave of each of said pairs being in the plane of the larger sheave of the other of said pairs, and means for adjusting said fairlead to different elevations with relation to said drum.

21. In a machine comprising a part to be operated, means for operating said part including two parallel cables connected therewith, and a drum on which said cables are wound, a fairlead comprising two pairs of cable guiding sheaves arranged in substantially vertical planes, and two pairs of cable guiding sheaves arranged in planes intersecting the planes of said vertical sheaves, the sheaves of each of the last mentioned pairs being of different diameters and the small sheave of each of said pairs being in the plane of the larger sheave of the other of said pairs, means for adjusting said fairlead to different elevations with relation to said drum, and means for tilting the last mentioned pairs of sheaves to maintain the same in proper relation to said cables.

22. In a machine comprising a part to be operated, means for operating said part including two parallel cables connected therewith, and a drum on which said cables are wound, a fairlead for said cables comprising two sets of cable guiding sheaves, the sheaves of one set being arranged in planes intersecting the planes of the sheaves of the other set, each set including two pairs of sheaves, the sheaves of each pair being of different diameters and the smaller sheave of each pair being in the same plane with the larger sheave of the other pair of that set.

23. In a machine comprising a part to be operated, means for operating said part including two parallel cables connected therewith, and a drum on which said cables are wound, a fairlead for said cables comprising two sets of cable guiding sheaves, the sheaves of one set being arranged in planes intersecting the planes of the sheaves of the other set, each set including two pairs of sheaves, the sheaves of each pair being of different diameters and the smaller sheave of each pair being in the same plane with the larger sheave of the other pair of that set, a frame for supporting said sheaves in fixed relation one to the other and a track along which said frame may be moved to locate said sheaves

in different positions in relation to said drum.

24. In a machine comprising a part to be operated, means for operating said part including two parallel cables connected therewith, and a drum on which said cables are wound, a fairlead for said cables comprising two sets of cable guiding sheaves, the sheaves of one set being arranged in planes intersecting the planes of the sheaves of the other set, each set including two pairs of sheaves, the sheaves of each pair being of different diameters and the smaller sheave of each pair being in the same plane with the larger sheave of the other pair of that set, a frame for supporting said sheaves in fixed relation one to the other and a track along which said frame may be moved to locate said sheaves in different positions in relation to said drum, and means for tilting said frame with relation to said frame.

25. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part to be operated and including a pair of opposed sheaves to receive said cable between them, means for adjusting said fairlead to different vertical positions with relation to said machine, and a pair of substantially cylindrical elongate rollers mounted in line with said sheaves for adjustment therewith and each rotatable about an axis transverse to the axes of said sheaves, said rollers serving to prevent the lateral displacement of the cable with relation to said sheave and to permit said cable to flex in the plane of said sheaves.

26. In a machine comprising operating mechanism, a part to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead interposed between said operating mechanism and said part to be operated and including a frame and a pair of opposed sheaves mounted on said frame to receive said cable between them, means for adjusting said frame to different positions with relation to said operating mechanism, and a pair of rollers mounted on said frame to the rear of said sheaves on axes substantially parallel with the plane of said sheaves, and serving to guide said cable to said sheaves and to permit the same to flex in the plane of said sheaves.

27. In a machine comprising a platform, a boom mounted on said platform, a device to be operated, means for movably supporting said device from said boom at a point remote from the foot thereof, a cable for actuating said device, operating mechanism for said cable mounted on said platform, an upwardly extending track supported wholly by said platform, a fairlead mounted on said track for movement thereon toward and from said boom, and means for adjusting said fairlead on said track and for securing the same in adjusted positions thereon.

28. In a machine comprising a platform, a cable, operating mechanism for said cable mounted on said platform, an upwardly extending track supported wholly by said platform, a fairlead movably mounted on said track for adjustment lengthwise thereof and including a pair of cable guiding sheaves rotatable about axes

extending lengthwise of said track, and means for adjusting said fairlead on said track, said track being so shaped that said sheaves will be supported in proper relation to said cable in all positions of said fairlead on said track.

29. In a machine comprising a platform, a gantry, a drum mounted on said platform, and a cable wound on said drum and extending forwardly therefrom, a track supported at one end on said platform and at its other end by said gantry and curved forwardly about an axis adjacent the point of contact of said cable with said drum, a fairlead mounted on said track, and means carried by and movable with said fairlead for actuating the same.

30. In a machine comprising a platform, a gantry and a drum mounted on said platform, and a cable wound on said drum and extending forwardly therefrom, a track supported at one end on said platform and at its other end by said gantry and curved forwardly about an axis adjacent the point of contact of said cable with said drum, a fairlead comprising a frame and cable guiding sheaves carried by said frame, and guide members arranged to engage the opposite edges of said track to movably support said frame thereon, a motor carried by said frame, and means driven by said motor for moving said frame along said track.

31. In a machine comprising a platform, a drum mounted on said platform, and a cable wound on said drum and extending forwardly therefrom, an upright track supported wholly by said platform and curved forwardly about an axis adjacent the point of contact of said cable with said drum, said track having side rails provided on their forward edges with teeth, a fairlead comprising a frame and cable guiding sheaves carried by said frame, rollers carried by said frame and engaging the opposite edges of the respective side rails, pinions carried by said frame and meshing with the teeth on said side rails, a motor carried by said frame, and means driven by said motor for rotating said pinions.

32. In a machine comprising an operating mechanism, a device to be operated, means carried by said machine for movably supporting said device at a point remote from said operating mechanism, and a cable connecting said device with said operating mechanism, a fairlead for said cable movable to different elevations with relation to said machine, and means for moving said fairlead to said different elevations and for tilting said fairlead to properly position the same with relation to said cable.

33. In a machine comprising operating mechanism, a device to be operated at a point remote from said operating mechanism, and a cable for connecting said part with said operating mechanism, a fairlead for said cable movable to different elevations with relation to said machine and comprising a frame and cable guide elements, and means for guiding said frame in its movement to said different elevations and for simultaneously adjusting said guide elements to maintain the same in proper relation to said cable in all positions of said fairlead.

DWIGHT J. SHELTON.  
BENJAMIN JACOBY.  
GLEN B. HEFFELFINGER.