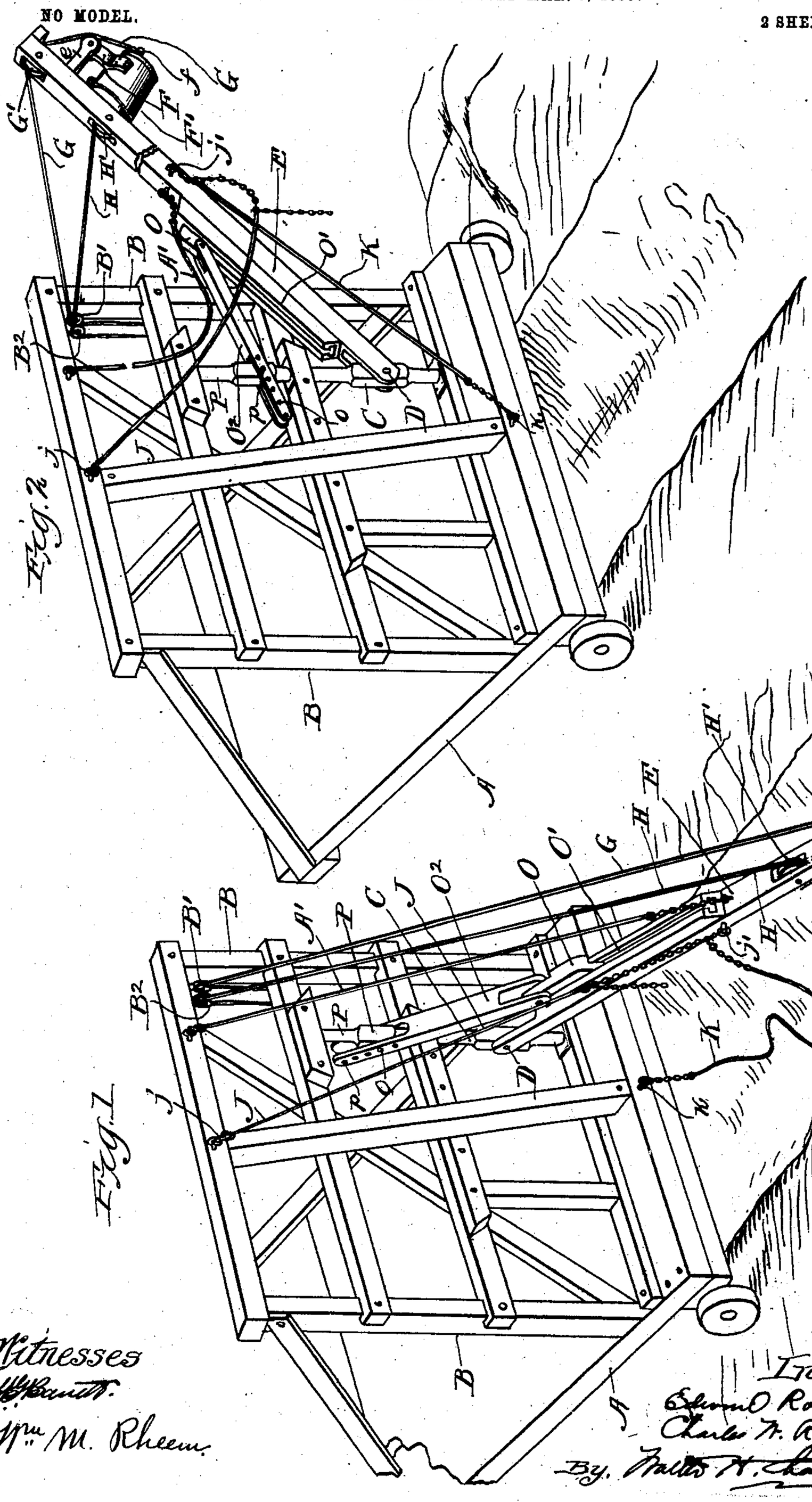
No. 746,168. PATENTED DEC. 8, 1903.

E. O. & C. W. ROOD.

CRANE ARM.

APPLICATION FILED MAR. 6, 1899.

NO MODEL. 2 SHEETS—SHEET 1.



Witnesses
H. G. Bartlett.
Wm. M. Rheem.

Inventors
Edmund O. Rood
Charles W. Rood
By. Walter H. Chamberlin
Atty.

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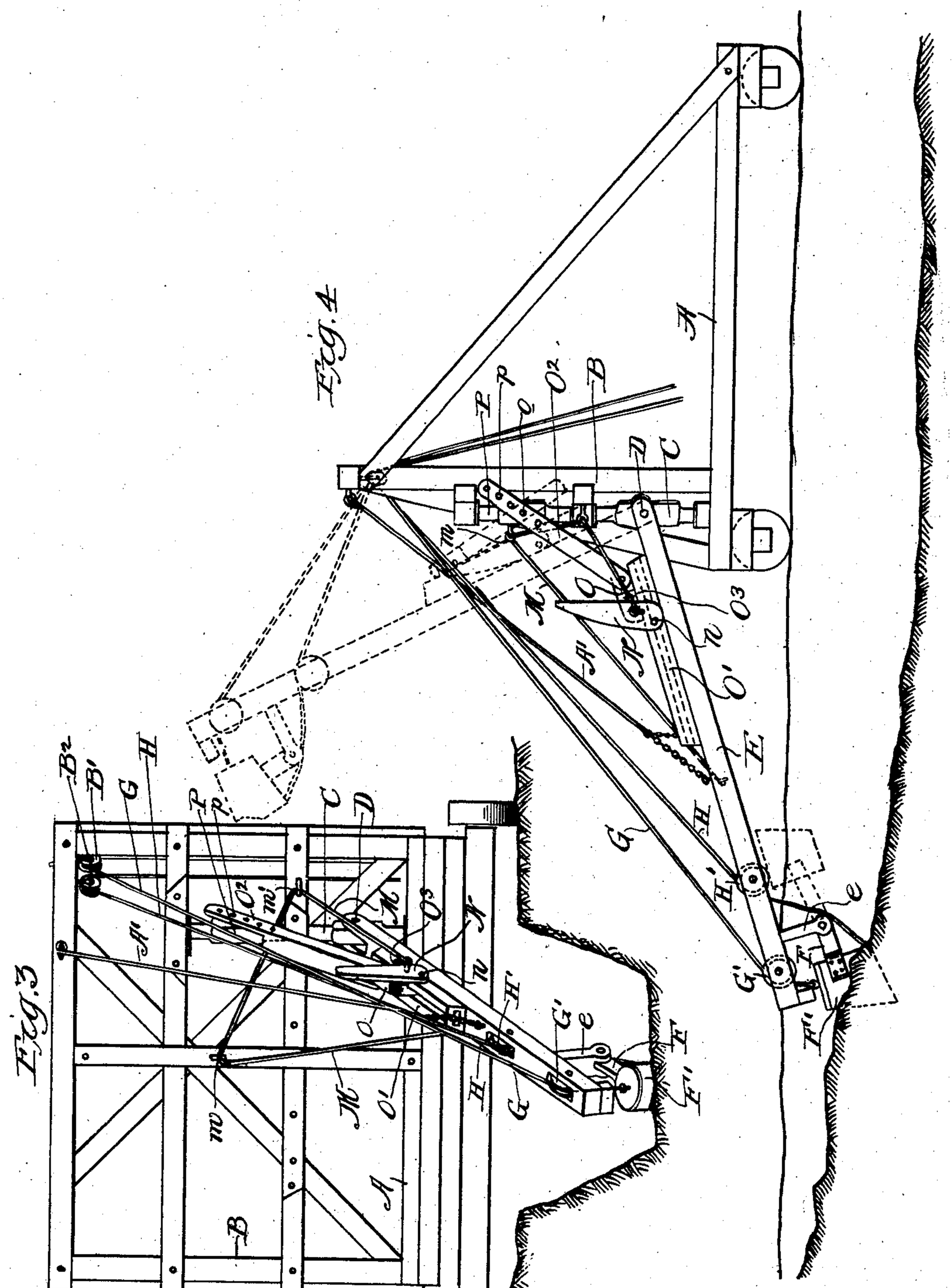

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H. G. Barrett.
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Inventors,
Edwin O. Rood
Charles W. Rood
By Wallis H. Chamberlin
Atty.

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UNITED STATES PATENT OFFICE.

EDWIN O. ROOD AND CHARLES W. ROOD, OF BRITT, IOWA, ASSIGNORS TO THE INTERSTATE DRAINAGE AND INVESTMENT COMPANY, OF BRITT, IOWA, A CORPORATION OF IOWA.

CRANE-ARM.

SPECIFICATION forming part of Letters Patent No. 746,168, dated December 8, 1903.

Application filed March 6, 1899. Serial No. 708,009. (No model.)

To all whom it may concern:

Be it known that we, EDWIN O. ROOD and CHARLES W. ROOD, citizens of the United States, residing at Britt, county of Hancock, State of Iowa, have invented a certain new and useful Improvement in Crane-Arms; and we declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to ditching-machines, dredging-machines, cranes, &c., wherein is employed a swinging crane-arm.

The invention relates particularly to that class of machines wherein the inner end of the crane-arm is engaged to a vertical pivot (whereby the arm can swing horizontally) by a horizontal pivot, whereby it can swing vertically, the combination of the two pivots enabling the crane-arm to be swung in any place desired.

Also the invention relates more particularly to that class of crane-arms known as "gravity" crane-arms, wherein the arm is swung by one or more ropes or chains or the like engaged to the outer end of the arm and extending through sheaves or the like at a point above the plane of the arm and extending thence to the desired power mechanism, the said sheaves or the like being located out of the vertical plane of the pivoted end of the crane-arm, whereby when the power is exerted and the rope, chain, or the like is pulled the outer end of the crane-arm will be raised, and because of the location of the sheave over which the rope passes being out of the vertical plane of the pivotal point of the arm the arm will be swung laterally.

The construction above set forth is shown and described in the patent to Edwin O. Rood, dated July 17, 1888, No. 386,438, and it is to this structure and similar structures that our improvements are directed.

More particularly, our present invention relates to the provision of one or more suitable lateral guy or guide ropes for directing the crane-arm in its movement.

At this point we wish it understood that in the present specification where we have used the term "rope" we of course mean any flexible or substantially flexible connection between the parts.

The invention consists in the combination of devices and appliances hereinafter more fully described and claimed.

Our invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in two convenient and practical forms, and in which—

Figure 1 is a perspective view of our improvement; Fig. 2, another perspective view showing the crane-arm in its elevated position; Fig. 3, a front elevation of our improved apparatus, showing a slightly-modified arrangement of the guide-ropes; and Fig. 4, a side elevation of the modified arrangement shown in Fig. 3.

In carrying out the invention we will first describe briefly the apparatus to which our improvement is applied.

A represents any suitable structure for carrying the parts and will hereinafter be termed the "main" frame. Extending upward from the main frame is a suitable upright frame B.

C is what we will term a "vertical" pivot suitably journaled in the main frame, so it can revolve in a horizontal plane, and pivoted thereto by the horizontal pivot D is a crane-arm E. In the present instance we have illustrated a ditching-machine. Pivoted in a depending arm *e* is a bucket-arm F, carrying the bucket F′. Engaged to the bucket F′ at *f* is a rope G, which passes over the sheave G′ in the outer end of the crane-arm E and up to the sheave B′ in the frame B, and thence down to the main frame A, where it is engaged to any suitable power mechanism. We have not considered it necessary to show this, since any form of windlass or other motor may be employed to pull the rope G. Engaged to the bucket F′ is another rope H, which passes over the sheave H′ in the crane-arm E, and thence up and over the sheave B^2 in the frame B and down to any suitable source of power on the main frame. It will be observed that sheaves B′ B^2 are slightly to one side of the plane of the pivot C, so that when a pull is exerted on, say, the rope H which would tend to lift the outer end of the crane-arm the

same pull will throw the crane-arm E horizontally.

A′ is a rope having one end engaged to the crane-arm and the other to the frame B to regulate the depth to which the outer end of the crane-arm drops.

We now come to our improvement, which consists in suitable guide-ropes for directing the movement of the crane-arm as it swings and is lifted.

Referring more particularly to Figs. 1 and 2, J is a guide-rope, one end engaged at *j* to the main frame, while the other end is engaged at *j′* to the crane-arm. In practice this engagement is substantially at the middle of the length of the crane-arm, although not necessarily so. If desired, several points of engagement may be provided, so that the particular point at which the guide-rope J is engaged may be varied to suit the exigencies of any particular case. K is another guide-rope, one end engaged to the crane-arm at substantially the same points that the rope J is engaged and the other end engaged at *k* to the upright frame B. In lieu of the guide-ropes J and K we have shown in Figs. 3 and 4 a single guide-rope M, engaged to the crane-arm at substantially the same point that the ropes J and K are engaged, extending through a staple *m* on the upright frame, thence to another staple *m′* on the upright frame, and thence back to the crane-arm, where it is engaged to an arm N. This arm N is pivoted eccentrically at *n* to the crane-arm.

In all the figures, O is a block movably engaged in the guideways O′ on the top of the crane-arm. Pivoted to the block O is a rod O^2, the other end of said rod being pivoted to a vertical bar P, which is pivoted in the upright frame B, the pivotal engagement of the rod O^2 and the bar P being made adjustable by means of the orifices *o p* in the respective members. It will be observed that the rope M is engaged to the arm N at a point between the pivot *n* and the free end of the arm. On the block O is an arm or projection O^3, which bears upon and slides along the arm N.

We will now explain the operation and the effects produced by the various guide-ropes arranged as shown in Figs. 1 and 2. The rope J is what may be termed the "slope-rope." As the crane-arm is raised or lowered by means of either or both the ropes G H the slope-rope J determines the path in which the outer end of the crane-arm shall travel, and by lengthening or shortening this rope J any desired path may be given to the outer end of the crane-arm. Before describing the functions of the rope K it is necessary to call attention to the mode of operation of the bucket F. Supposing the crane-arm is in its lower position, with the bucket as shown in Fig. 4, the operator exerts a pull on the rope H (the rope G yielding correspondingly) and causes the bucket to move to the position shown in Fig. 1, thus picking up the desired quantity of earth. Both ropes G and H are then pulled, and this causes the crane-arm to be lifted and swung out to the desired position. The operator then allows the rope H to slacken while the rope G is held taut, and this causes the bucket to dump; but this movement in an apparatus not provided with our improvement also allows the crane-arm to move laterally back correspondingly, the result being that as the bucket dumps the earth is scattered along and is not dumped in one place. It is the function of the rope K to obviate this difficulty, as will now be explained. When both ropes G H are pulled to swing the crane-arm outward and upward (rope J giving the proper slope, as before explained) and the arm has reached the desired lateral position, rope K comes into play and stops the movement laterally of the crane-arm, and a continued pull on the ropes G H raises the crane-arm vertically without the lateral movement. When the rope H is slackened, the tension of the rope G swings the bucket into the position shown in dotted lines at the top of Fig. 4, thereby dumping the contents. The rope G passes around the pulley G′, when the bucket swings from the position shown in Fig. 2 to that shown in dotted lines at the top of Fig. 4, thereby permitting the crane-arm to descend vertically by gravity, without, however, moving laterally, inasmuch as the distance which it drops vertically corresponds to the distance which it was elevated vertically owing to the tension of the guide-rope K. After the bucket is emptied the ropes G and H are slackened, thereby allowing the crane-arm to swing by gravity back to its lower position ready to pick up the next load, the crane-arm being guided in such return movement by the guide-rope J. The object, therefore, of the rope K is to permit the crane-arm after it has attained the desired lateral movement to have a sufficient vertical movement, so that during the dumping operation the crane-arm will not move laterally until after the load has been dumped and the ropes G and H have been slackened to permit the crane-arm to return to its lower position.

As before explained, the slope-rope J by being lengthened or shortened will give the desired inclination to the movement of the crane-arm. This is so except where the desired movement is a comparatively sharp angle—such, for instance, as an angle of forty-five degrees, which in engineering terms is a "slope of one to one." If the slope-rope J alone were used in a slope of one to one, the bucket would not be carried far enough away from the edge of the bank before it dumps, and the dumpings would fall back in the ditch.

When it is desired to carry the arm laterally after it has cleared the edge of the bank, the rope M (shown in Figs. 3 and 4) is used in lieu of the guide-ropes J and K. The operation of this rope is as follows:

As the ropes G H are pulled after the bucket

has picked up its load the arm first moves horizontally and slightly vertically. The vertical movement of the crane-arm causes the block O to move forward along the crane-arm, and the arm O^3, bearing upon the arm N, pressing the latter down and consequently exerting a pull on the rope M, and owing to the eccentric connection of the rope M with the arm N the movement of the latter from the position shown in Fig. 4 to a position parallel with the guide O′ increases the amount of the rope M extending from the guide-eye *m′* to the arm N and consequently shortens the portion of the rope between the guiding-eye *m* and its end fixed to the crane-arm. The effect of such operation is to diminish the lateral movement of the crane-arm until the same has moved to a point above the ditch from which the earth is being removed. As soon as the arm O^3 in its travel passes beyond where the rope M is engaged to the arm N it continues to slide along the top of the arm N, and the rope M will permit the crane-arm to have the desired lateral movement until the dumping-point has been reached.

It is obvious from the above description that where the inclination of the slope on the edge of the bank to be dug is greater than one to one—as, for instance, one and one-half to one or two to one—the rope M and its shortening mechanism just described are unnecessary, but that when a slope of one to one or even steeper slope is to be dug the rope M comes into play and enables the crane-arm to be swung first vertically along the face of the slope and then laterally to carry the bucket to the desired dumping-point. It is obvious that the various engaging points of the various ropes may be easily made adjustable without departing from the spirit of our invention. It is also obvious that more guide-ropes than those shown and described in this application may be employed without departing from the spirit of the invention, the essential feature being the provision on one side of the crane-arm opposite to the lateral direction of movement of the arm of one or more guide-ropes for directing the arm in the desired path in its lateral and vertical movement.

What we claim is—

1. In a machine of the class described, the combination with the crane-arm and one or more ropes secured to the outer end of said crane-arm for lifting the same and moving it laterally, of one or more guide-ropes secured to said crane-arm and engaging a stationary point and adapted to direct the path of movement of the crane-arm by exerting a restraint on the crane-arm, substantially as described.

2. In a machine of the class described, the combination with the crane-arm and one or more ropes secured to the outer end of said crane-arm for lifting the same and moving it laterally, of one or more guide-ropes adapted to direct the path taken by the crane-arm in its movement, said guide rope or ropes being engaged to said crane-arm and engaging a stationary point located in a vertical plane on the opposite side of the pivot of the crane-arm from the direction of its movement, said guide rope or ropes being adapted to direct the line of movement taken by the crane-arm by exerting a restraint thereon, substantially as described.

3. In a machine of the class described, the combination with the crane-arm, one or more ropes for lifting the outer end of said crane-arm and moving it laterally, of a guide-rope engaged to said crane-arm and engaging a stationary point above the horizontal plane of the pivoted point of the arm and in a vertical plane on the opposite side of the crane-arm from the direction of its lateral movement and means for automatically varying the length of said guide-rope between its engagement with the crane and its engagement with said stationary point as the crane-arm is elevated, substantially as described.

4. In a machine of the class described, the combination with the crane-arm, one or more ropes for lifting the outer end of said crane-arm and moving it laterally, of a guide-rope engaged to said crane-arm and extending thence to a point located in a vertical plane opposite to that of the direction of movement of the crane-arm, thence to a point in a vertical plane in the direction of the movement of the crane-arm and thence back to the crane-arm and means at one point of engagement to the crane-arm for shortening the length of said guide-rope through the movement of the crane-arm, substantially as described.

5. In a machine of the class described, the combination with the crane-arm, one or more ropes for lifting the outer end of said crane-arm and moving it laterally, of a guide-rope engaged to the crane-arm and extending thence first to a point located in a vertical plane on one side of the pivot of the crane-arm and thence to a point located in a vertical plane on the other side of the pivot of the crane-arm, thence to an arm eccentrically pivoted on the crane-arm, a movable arm on the crane-arm and connections to a stationary point whereby a vertical movement of the crane operates to move said movable arm along the crane-arm, said movable arm adapted to bear upon the arm to which the guide-rope is attached and thereby tilt said latter arm and thus shorten the guide-rope, substantially as described.

In testimony whereof we sign this specification in the presence of two witnesses.

EDWIN O. ROOD.
CHAS. W. ROOD.

Witnesses as to Edwin O. Rood:
WALTER H. CHAMBERLIN,
GERTRUDE HEIDELBERGER.
Witnesses as to Chas. W. Rood:
THOS. NOWERS,
JOHN F. NOWERS.