(No Model.)

3 Sheets—Sheet 1.

W. F. BROTHERS.

CABLE CRANE WITH GRAVITY ANCHOR.

No. 551,614. Patented Dec. 17, 1895.

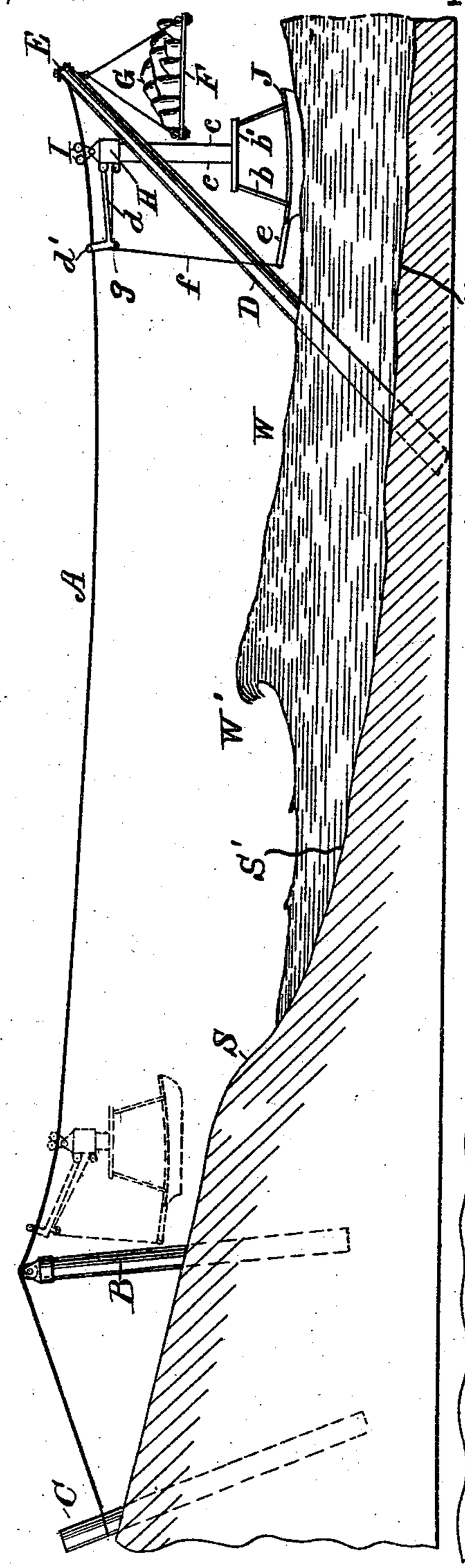

Fig. 1.

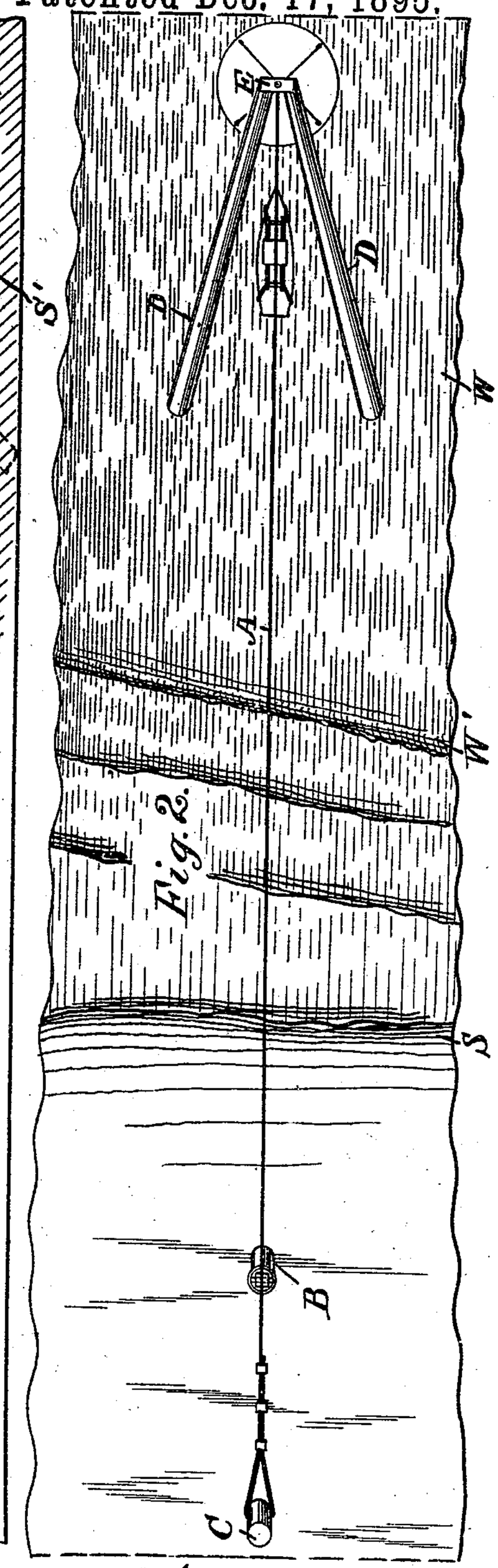

Fig. 2.

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Edw. F. Kinsey

Inventor.
William F. Brothers,
per Thomas S. Crane, Atty.

(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

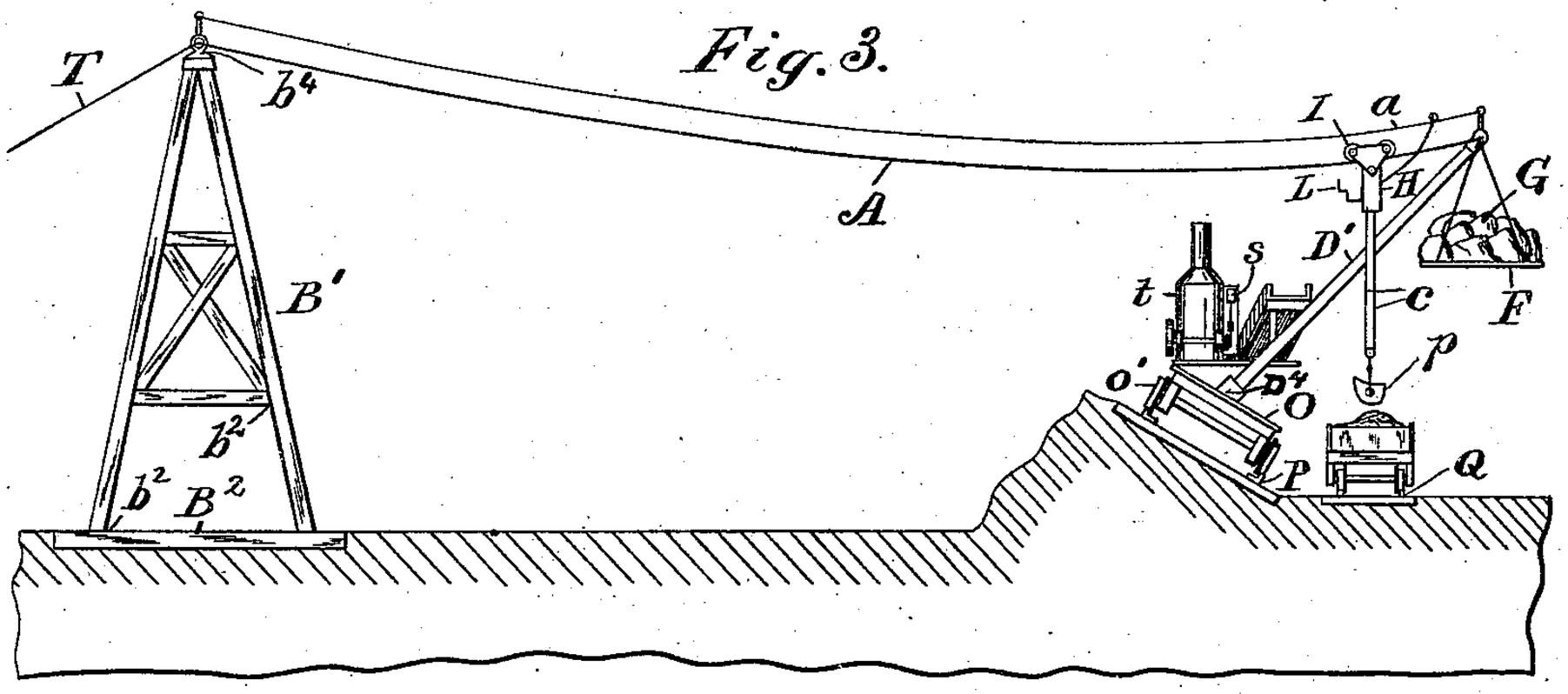
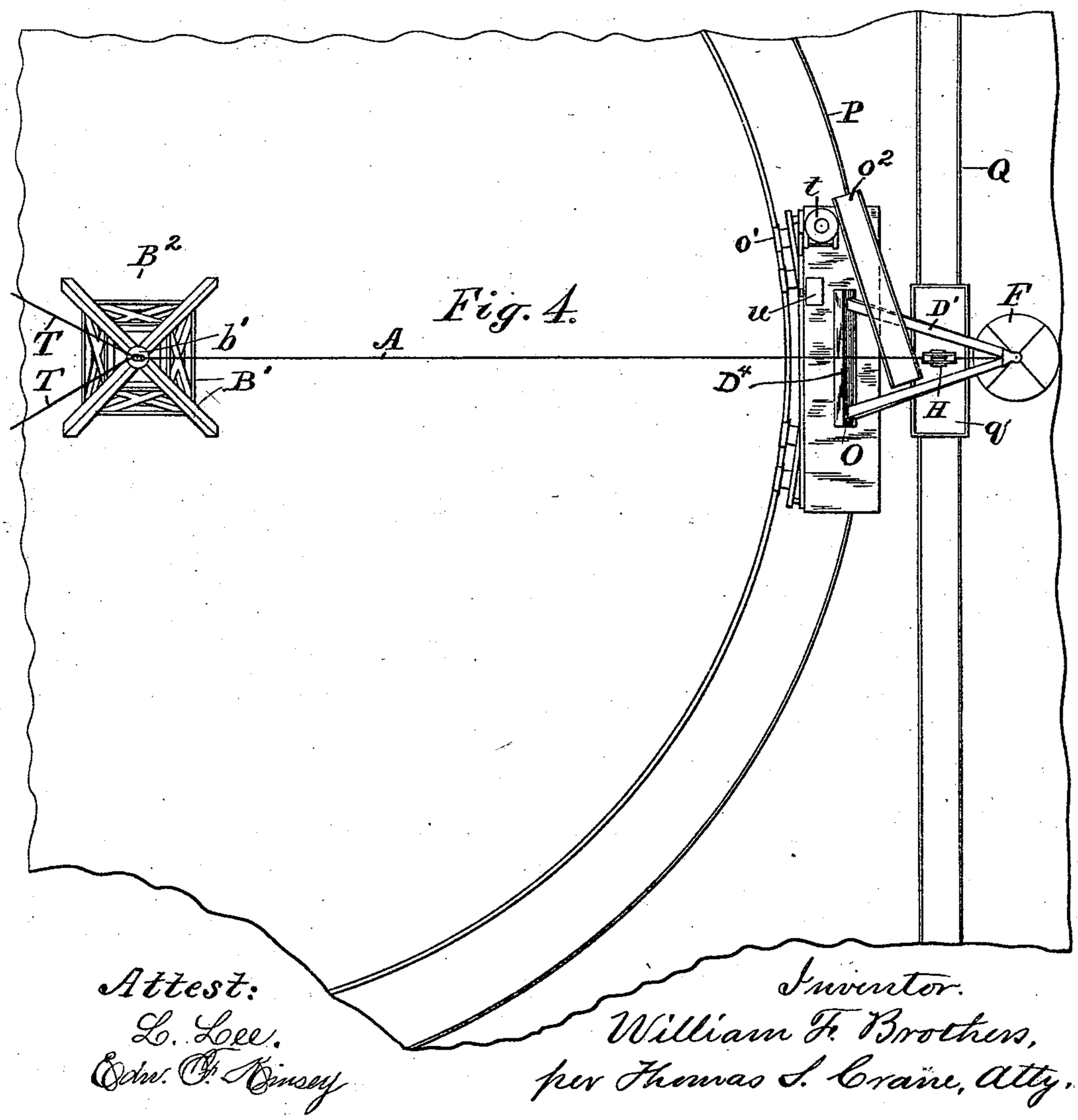


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

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CABLE CRANE WITH GRAVITY ANCHOR.

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Fig. 5.

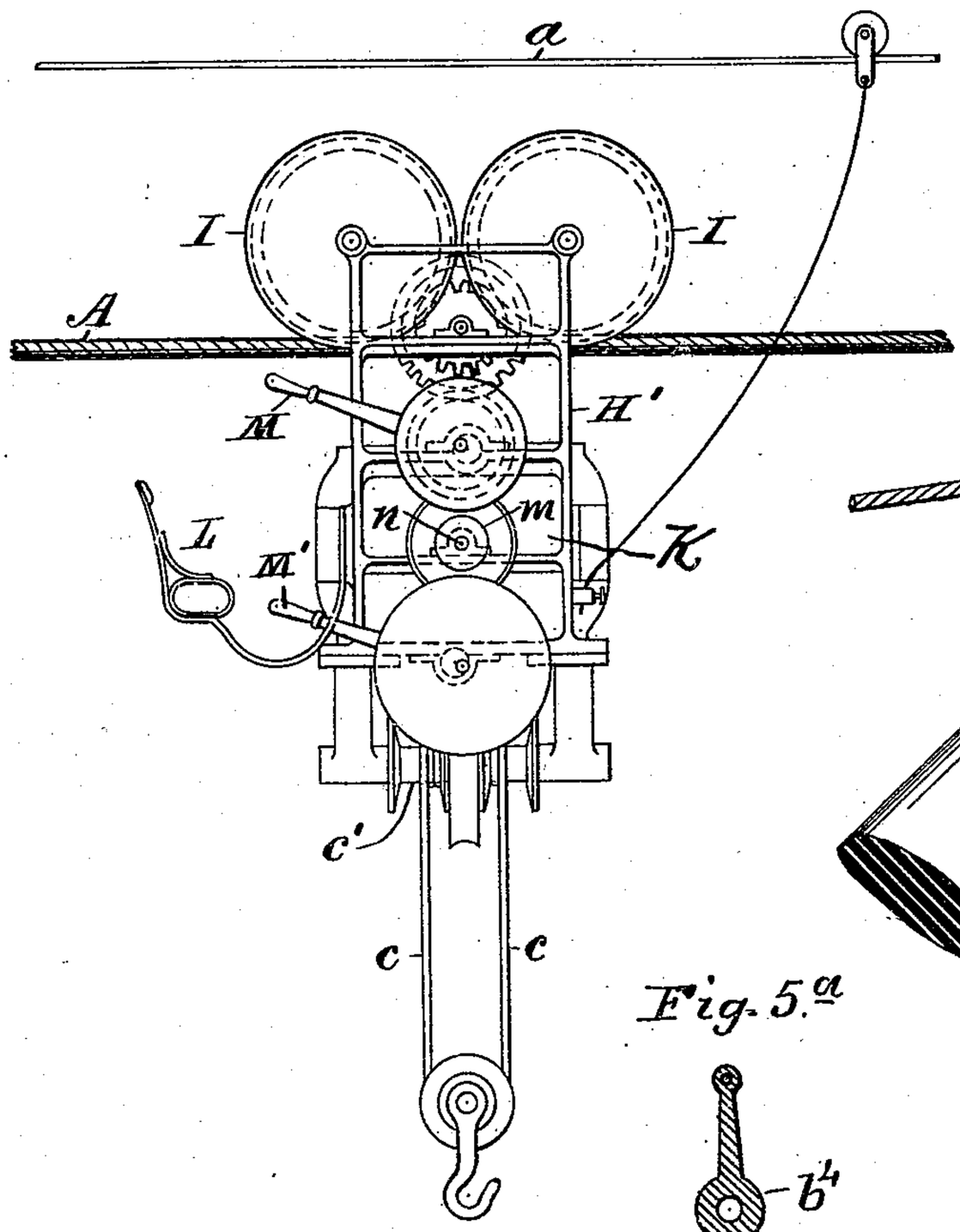


Fig. 5ª

Fig. 6.

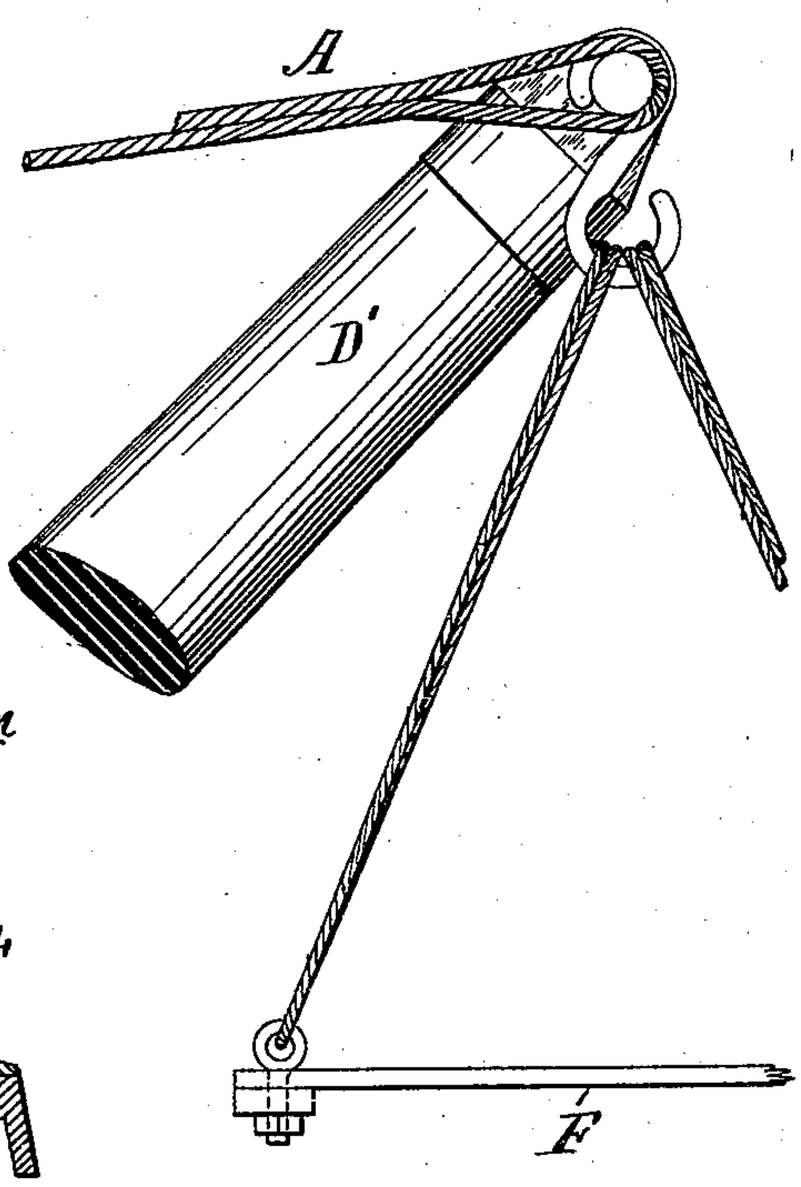
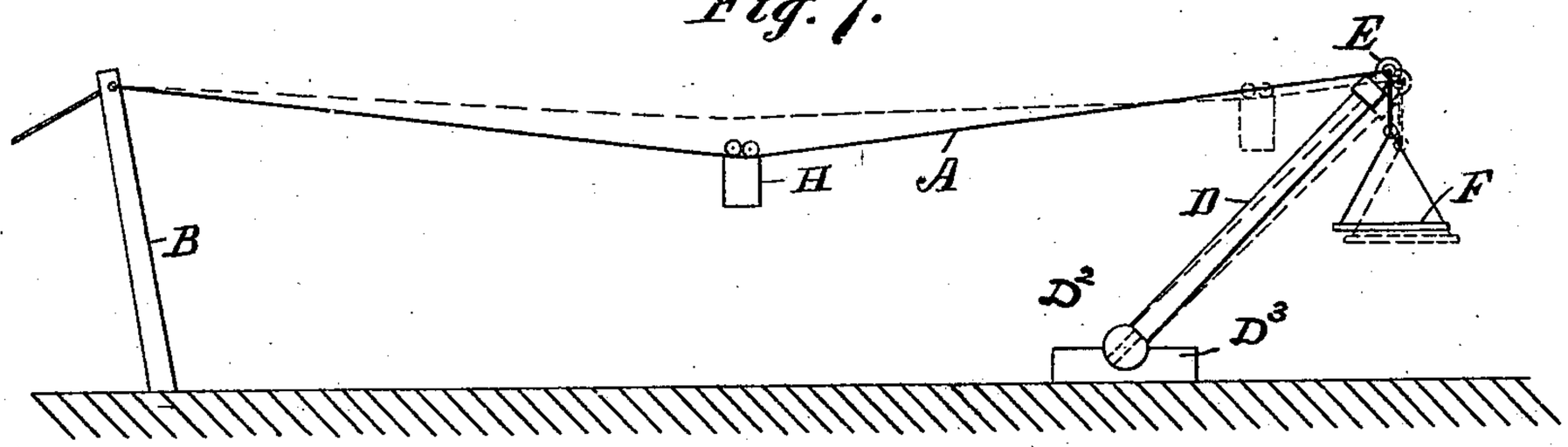


Fig. 7.



Attest:
L. Lee.
Edw. F. Kinsey

Inventor.
William F. Brothers,
per Thomas S. Crane, Atty.

UNITED STATES PATENT OFFICE.

WILLIAM F. BROTHERS, OF BROOKLYN, NEW YORK, ASSIGNOR TO SARAH E. BROTHERS, OF SAME PLACE, AND MARIA A. BROWN, OF PLAINFIELD, NEW JERSEY.

CABLE-CRANE WITH GRAVITY-ANCHOR.

SPECIFICATION forming part of Letters Patent No. 551,614, dated December 17, 1895.

Application filed July 18, 1895. Serial No. 556,327. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. BROTHERS, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Cable-Cranes with Gravity-Anchors, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to facilitate the erection and operation of a suspension-cable in situations where a suitable anchorage could not be obtained for one or both ends of the cable; and the invention consists in combining a tension-weight upon the end of the cable with an inclined sheers or post adapted to transform the vertical tension of the weight into a horizontal tension upon the cable.

By this invention an anchorage for a cable may be erected either temporarily or permanently with very slight expense and may be employed in many situations, as in the surf upon the seashore, where a permanent anchorage could only be maintained with great expense and difficulty. By inclining the sheer-poles and weighting their upper ends, the tension of the cable is converted into a thrust at the lower ends of the sheers; but I have termed the device a "gravity-anchor," as it depends for its efficiency entirely upon the operation of gravity. The suspending-cable, having its outer end supported and anchored above the water upon a post or sheers at some distance from the shore, may be used with great advantage at life-saving stations during the stormy portion of the year to convey a life-boat over the surf into the still water. As repeated unsuccessful attempts are often made to launch life-boats in rough weather, great delay and loss may be avoided upon occasions where it is necessary to promptly assist vessels in distress by thus launching the life-boat without encountering the surf.

The anchorage constructed according to my invention may also be made movable by supporting the sheers upon a suitable car or truck mounted movably upon a track, which in such case is preferably inclined to sustain the thrust at the base of the sheers. Such a movable anchorage may be used in excavating a large area to shift the end of a cable around the periphery of a circle, thus enabling a single cable if fastened to a suitable abutment in the center of the circle to sweep over the entire surface of the same and to sustain and shift a cable-crane or similar hoisting device over the entire circular area.

The invention will be understood by reference to the annexed drawings, in which—

Figure 1 is a diagram representing in elevation a suspending-cable anchored adjacent to an ocean-beach with a carrier and boat suspended therefrom. Fig. 2 is a plan of the same. Fig. 3 is a side elevation, partly in section where hatched, of the improvements applied to a cable-crane with movable anchorage. Fig. 4 is a plan of the same. Fig. 5 is an elevation of a portion of the cable with the carrier and hoisting devices thereon. Fig. 5^a is a section of the cap b^4 on an enlarged scale. Fig. 6 is a diagram showing the connections at the top of the sheers for the cable end and the gravity-load; and Fig. 7 is a diagram showing the compensating effect of the gravity-anchor, with an indication, by dotted lines, of the carrier and cable in different positions.

In Figs. 1 and 2, A designates the cable, B the fixed abutment, and C the fixed anchorage. D designates the sheer-poles, two being preferably used and braced toward one another at the top, where they are united by a cap E.

Figs. 1 and 2 represent an arrangement suitable for launching a life-saving boat, S designating the shore, W the water adjacent thereto, and S′ the bottom below the water, upon which the sheer-poles are set. The sheers are set at an angle, of preferably forty-five degrees, to the cable, and a platform or pan F is suspended from the cap E and loaded with tension-weights G. Sand or stones may be readily employed for such weight, by making the platform of suitable strength and dimensions. A carrier H is shown suspended upon the cable by a frame with wheels I, and a boat J is shown supported beneath the carrier by hanger-ropes b, hanger-frame b', and hoisting-ropes c. The ropes c would be wound upon

drums in the carrier H. These parts are shown in dotted lines adjacent to the shore abutment B with the boat hoisted to clear the breakers indicated by the elevation W′ upon the water, and the boat is shown in full lines, lowered upon the water adjacent to the sheer-poles D beyond the breakers, where the boat can be launched with safety. The means for suspending the boat may be entirely detachable, so that they can be cast off as soon as the boat is in the water and the boatmen have their oars extended. Means to prevent the boat from twisting upon the rods *c*, or from being displaced by the wind when in transportation upon the cable, may be used, if desired; and such means may consist of a guide-arm *d*, attached to one side of the carrier H and provided with a wheel *d′* to ride upon the cable. An arm or pole *e* is attached to one end of the boat beneath the arm *d*, and its outer end is attached to a cord *f*, which is extended over a pulley *g* upon arm *d* to a drum upon the carrier H. The ropes *c* and *f* are wound and unwound simultaneously, and the guides *d* and *e* serve to keep the boat from swinging when it is raised or lowered.

The carrier may be made of any suitable construction and propelled upon the cable by any suitable power. A construction is indicated in Fig. 5, which is substantially the same as that in my application, Serial No. 457,116, filed January 3, 1893, and designed for use with an electric motor. In this construction, the wheels I are shown journaled directly upon a frame H′, which sustains an electric motor K and suitable gearing to rotate the wheels I and hoisting-drums *c′*. A seat L for an operator is shown affixed to the side of the carrier in proximity to handles M M′, which are adapted to connect a friction-wheel *m* upon the motor-shaft *n* at pleasure with the gearing of the wheels I or the hoisting-drums *c′*. The poles D are shown in Fig. 1 stepped in the bottom S′, but projected therefrom sufficiently to bend freely under the strain of the cable and the tension-weight G.

With the sheer-poles set an angle of forty-five degrees to the cable, the weight of the poles, if permitted to yield, exerts a very material tension upon the cable independently of the tension-weight, and the latter may be proportioned to produce the additional tension required to strain the cable in the required degree. Such tension-load may be computed, if required to transport over the surf a boat which, with the boatmen and the carrier H, would weigh two thousand pounds. The deflection of the cable in such case would be made a given proportion of its length, and the tension-weight would be made correspondingly greater than the load upon the cable.

The tension-weight, with the sheer-poles, constitutes an anchorage which may be planted at any point to produce the required tension upon the cable, and thus avoid the necessity of an anchorage in the earth. It is well known that the tension at the ends of a suspending-cable is much greater with a given load at the middle of the cable than when the load is close to either abutment, and my improved anchorage varies the angle of the cable in proportion to the load, if the sheer-poles be so made as to support the load and also yield under variations of the tension.

Fig. 7 illustrates in diagrammatic form the changes of angle in the cable, the parts being indicated in solid lines with the load in the middle of the cable, and in dotted lines with the load close to the sheer-poles. In the latter position the slack of the cable is partially taken up by the tension-weight, and the sheer-poles are bent outwardly from the fixed abutment, thus holding the cable at a smaller angle with its abutment than would be the case if the sheer-poles were rigidly fixed and the slack of the cable were unchanged during the shifting of the load. I have found that with the use of the flexible sheer-poles and the tension-weight G, the angle of the cable to the horizontal line at the cap E is substantially the same for all positions of the load, as is indicated by the parallelism of the full lines and dotted lines adjacent to the cap E.

In Fig. 7 the base of the sheer-poles D is attached to a log or axle D^2 arranged to rock or oscillate in bearings D^3, to assume the various positions required; but the poles are adapted to move through the small angle required in practice if stepped in or on a flat beam, as shown at D^4 in Fig. 3.

Where the carrier is used in a cable-crane for transporting a load from one point to another, such automatic adjustment of the cable is of material importance, as it preserves the same inclination of the cable to a horizontal line where the load is moving near the abutments, and the expenditure of great power is thus avoided, which would otherwise be required with a comparatively slack cable, which would produce a very great inclination at the abutments if the latter were rigid.

A construction for operating a cable-crane over all points within a circular area is shown in Figs. 3 and 4, B′ representing a stationary abutment and D′ the sheers erected upon a moving platform-car O. Such platform is shown mounted, by suitable trucks with wheels *o′*, upon a circular track P, the inner rail of the track being considerably elevated to resist the inward thrust of the sheers.

The carrier H is represented with a seat L for the operator, and the hoisting-ropes *c* are shown connected with a dumping-bucket *p*. An ordinary railway-track Q is shown outside the circular track P and provided with an ordinary dirt-car *q* beneath the sheers D′. The inclination of the sheer-poles permits the bucket *p* or any other load carried by the ropes *c* to be moved between the sheer-poles and placed upon or over the track Q. For excavating a reservoir or other large area the abutment B′ would be erected in the center of the

area and the track P extended around its entire periphery. Guy-ropes T (of which a part only is shown in Figs. 3 and 4) would be extended from the abutment B′ to suitable points to resist the cable strain upon a certain arc of the track P, and such guy-ropes could be changed when it was required to operate upon another arc.

A railroad-track could be extended to different sides or the area to receive the dumpage from the carrier, or the carrier when set above the sheer-poles, as shown in Fig. 1, could discharge its load into wagons or carts of any description. A portable engine *s* and boiler *t* with dynamo *u* for generating the electric current, and gearing to drive the car O upon the track P, may be mounted upon the platform of such car, and the car may thus be adapted to traverse the track P while carrying a load upon the cable to shift the load to any desired point. The load may thus be taken up at one point of the area and delivered to another part or discharged to a track located at one side, as shown in Fig. 4. The shifting of the tension devices can be effected by this means, as the weight G maintains the tension of the cable during any variation in the location of the load.

The entire apparatus may be readily constructed to be taken down with facility at the close of a given piece of work, and all the parts of the sheers and other apparatus constituting the gravity-anchor may be packed upon such car for transportation to any desired place.

The abutment B′ supported by the guy-ropes T constitutes a stationary support for one end of the suspended cable, while the sheers D′ constitute a support which is movable concentric with such abutment, its tension being supported by the guy-rope operating upon the opposite side of the abutment from the sheers.

Although the abutment B′ is stationary, it may be made portable, and is shown in Figs. 3 and 4 of the drawings with a pyramidal framing and with sills B^2 set upon the ground to support the vertical strain. A cap b^4 (illustrated by an enlarged section in Fig. 5^a) is shown pivoted upon the top of the pyramidal frame and formed with an eye to engage the cable and the guy-ropes, and adapted to turn upon the support as the position of the ropes is varied. Such a stationary support would, in practice, be tenoned at the intersection b^2 of the horizontal and vertical joints and secured when in use by bolts, so that its parts may be separated and packed upon the car with the parts of the gravity-anchor, the whole constituting a plant for excavating by the methods described above. Owing to the inclined position of the sheers, it necessarily stands intermediate to the cable and the weight G, the cable being approximately horizontal and attached to the sheers at an acute angle, while the weight G hangs vertically below its point of attachment upon the opposite side of the sheers. Owing to the inclination of the sheers, the bottom of the sheers necessarily projects toward the fixed support, the tension of the cable, by the operation of the gravity-anchor, being converted into a thrust toward such fixed support. Such thrust may obviously be increased, with the same amount of weight G, by diminishing the angle between the cable and the sheers and approximating the latter more closely to a horizontal line.

The operation of the tension device in automatically taking up the slack of a suspended cable, when the load approaches the supports, enables me to move the load much closer to the supports, with the same degree of power, than has heretofore been possible. Where the cable-supports are rigidly fixed, the inclination of the cable adjacent to the support is materially increased when the load approaches such support, and the power required to propel the carrier up such inclined portion toward the support is four or five times greater than is necessary to move the load over other portions of the cable.

By the use of my automatic tension device the angle of the cable is kept nearly the same throughout the movement of the load toward the supports, and the angle adjacent to the support, when the load is at such point, is no greater than when the load is in the middle of the cable. The same degree of power which is capable of transporting the load at other points is therefore able to move it close to the supports. By transporting the load close to the supports at both ends of the cable I am enabled to utilize the entire length of the cable with a moderate exertion of power, which has not heretofore been possible.

It is obvious that the guide-arm *e* (shown projected from the boat J in Fig. 1) might be similarly attached to any load suspended from the carrier by the cords *c*, and the load may thus be guided in like manner and kept from swaying, or twisting the cords, when lowered thereby.

The guide-poles upon the carrier and upon the load may be duplicated if desired by projecting them from opposite sides of the carrier and from opposite sides of the load, and having cords *f* operating upon both guides in the manner already described.

Having thus set forth the nature of my invention, what I claim herein is—

1. The combination, with a suspended cable, a carrier to support a load movably upon the cable and means for propelling the carrier thereon, of a stationary support or anchor at one end of the cable, and a gravity anchor at the opposite end of the cable, consisting of an inclined sheers with the cable attached thereto, and a weight hung permanently from the sheers upon the opposite side to the cable, as and for the purpose set forth.

2. The combination, with a suspended cable, a carrier to support a load movably upon the

cable and means for propelling the carrier thereon, of a fixed anchor at one end of the cable, and a gravity anchor at the opposite end of the cable, consisting of inclined sheer-poles braced toward one another and united at the top, and a weight hung permanently from the sheers upon the opposite side to the cable, as and for the purpose set forth.

3. The combination, with a suspended cable, a carrier to support a load movably upon the cable and means for propelling the carrier thereon, of a fixed anchor at one end of the cable, and inclined sheer-poles held movably at the base so as to yield with variations of load upon the cable, with the cable attached to the top of said sheers, and a weight hung permanently from the sheers upon the opposite side to the cable, as and for the purpose set forth.

4. The combination, with a suspended cable, of a fixed support at one end of the same, a track concentric with the fixed support, a car upon the track, inclined sheers attached to the outer end of the cable and supported upon the car, and a weight attached to the sheers upon the opposite side from the cable, the sheers, weight and car forming a gravity anchor movable about the fixed support, the whole arranged and operated substantially as herein set forth.

5. The combination, with a suspended cable, of a stationary support at one end of the same, and a movable gravity anchor at the opposite end of the same, consisting of an inclined sheers with the cable attached thereto at an acute angle, and a weight attached to the sheers upon the opposite side from the cable, means for moving the base of the sheers about the fixed support, and a guy-rope for bracing the stationary support upon the side opposite to the sheers, substantially as herein set forth.

6. A portable plant for excavating, consisting of a cable, a portable stationary support as B′, a movable gravity anchor for the opposite end of the cable, consisting of inclined sheer poles and a weight or weight pan attached thereto as set forth, and a car fitted to the base of the sheer pole for use upon a circular track, and adapted when required to contain the stationary support and the parts of the gravity anchor and to transport them together when packed thereon, substantially as herein set forth.

7. The means for guiding the load from a suspended carrier, consisting of the combination with the cable A and the carrier H, of the arm *d* having wheel *d′* fitted to the cable, the arm *e* projected from one end of the load beneath the arm *d*, and a cord connecting the arms, as and for the purpose set forth.

8. The means for guiding the load from a suspended carrier, consisting of the combination with the cable A and the carrier H, of the arm *d* having wheel *d′* fitted to the cable, the arm *e* projected from one end of the load beneath the arm *d*, one or more cords *c* suspending the load from the carrier with a drum to wind up the same, the cord *f* extended over pulley *g* upon the arm *d*, and a drum upon the carrier to wind up said cord simultaneously with the cord *c*, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM F. BROTHERS.

Witnesses:

L. LEE,

THOMAS S. CRANE.