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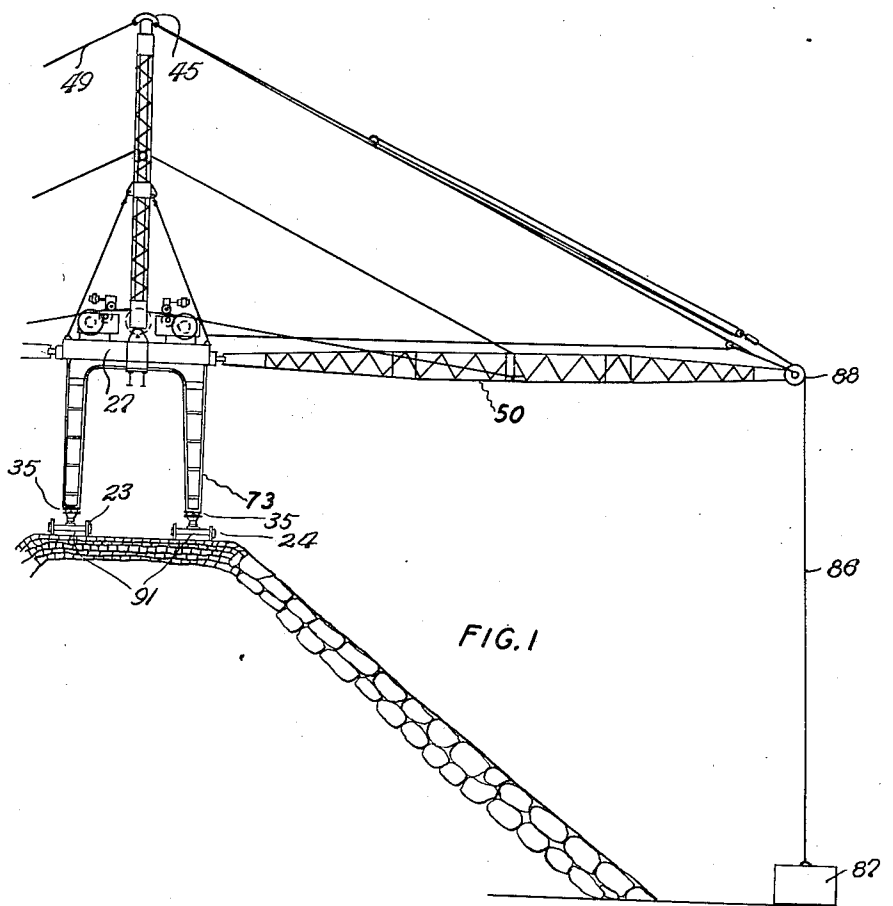
A. A. JOYCE

2,092,122

TRAVELING CRANE

Filed Sept. 25, 1935

3 Sheets-Sheet 1



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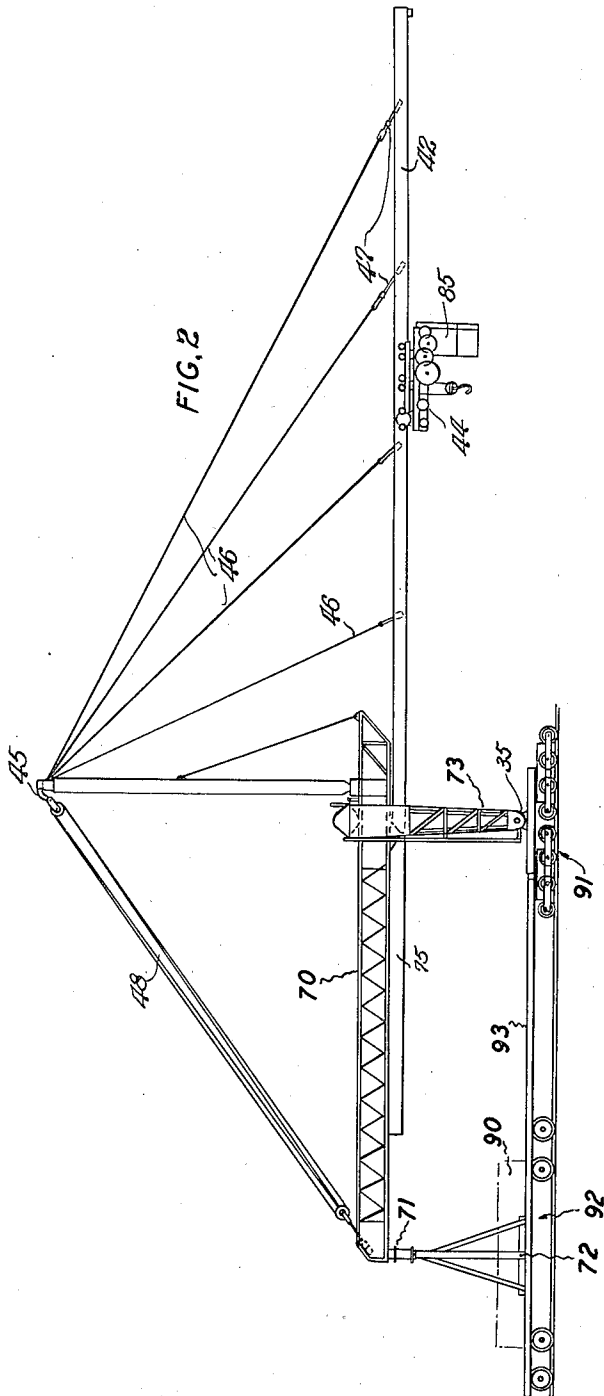
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3 Sheets—Sheet 2



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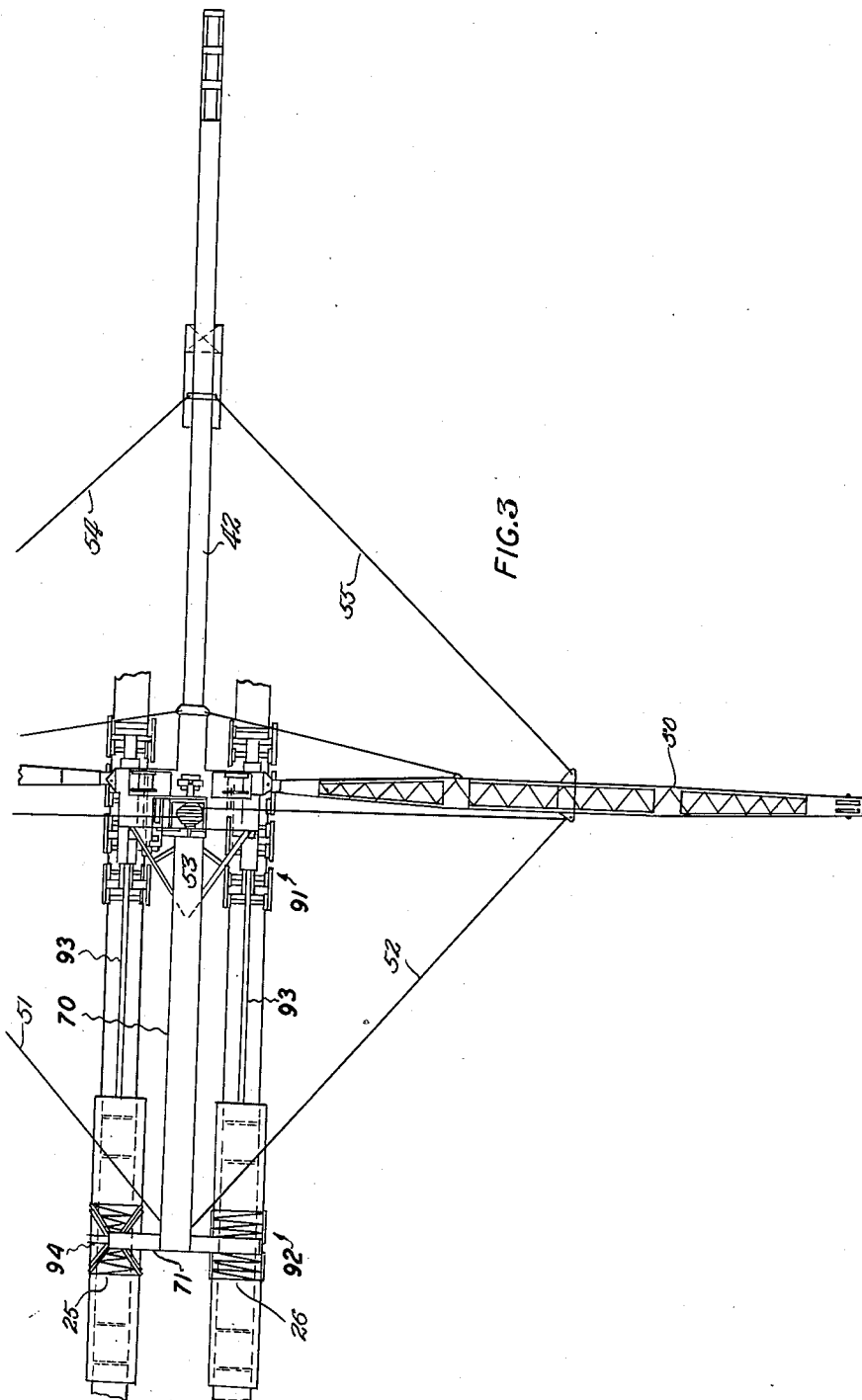
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UNITED STATES PATENT OFFICE

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TRAVELING CRANE

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In Australia October 15, 1934

2 Claims. (Cl. 212—15)

Certain difficult working conditions not common to other building construction are encountered in the erection of breakwaters and moles. In most cases blocks of stone or concrete of large dimensions and great weight must be emplaced on an irregular or unsound sea bottom to form the facings of the structure before the hearting of the structure can be filled and consolidated, and it is necessary to carry these heavy blocks as well as other weighty structural material over the unsettled unconsolidated hearting as the work proceeds. In the unconsolidated condition the roadbed on the hearting is liable to subsidence and distortion, involving risk of overturn or wreck of cranes and other building plant which is supported upon it, and this risk is accentuated by the fact that the load is an irregular one owing to the fact that great weights of blocks and filling must be swung outboard laterally of the line of work on booms or the like, in bringing them to position for depositing or emplacing. Cranes which are appropriate in building operations where a sound foundation is available cannot always be utilized in the conventional way in breakwater and mole construction, particularly when stones of great mass are used in the building of the structure.

The major object of the invention is to provide a comparatively light crane for the purpose described having a long slewable boom, in which stability is maintained throughout the working conditions irrespective of settlement or subsidence or unevenness of foundations, and to provide means whereby difficulties causable by uneven loading of the foundations are practically eliminated.

The present invention provides a novel method of building breakwaters and moles, and novel crane equipment for operating that method, in which adequate safeguards are provided against risk of overturning and difficulties due to displacements and subsidences in the bed by a system of laterally counterbalancing the crane structure, by special structural features in the crane, and by a system of compensating yielding supports for the crane; and it provides also means for economically effecting movement of masses of stone and filling material from the land side to the forward part of the work, there to be within reach of the crane boom to which it is to be raised and on this boom swung out forwardly and/or laterally of the crane's position to be set or dumped in the section of the work in progress. The invention includes certain structural features in the crane and its equipment and in truck

undercarriages on which it is supported, directed to making the same safely movable on an indifferent roadbed laid on top of the partially unsettled and unconsolidated hearting of the work, more particularly the most recently filled-in portions of it. These features provide, inter alia, for automatic accommodation of the equipment to subsidences in the roadbed on which it is supported, and are so devised that they permit the work in progress to be advanced well forward of the locus of the loading stresses which the roadbed is required to sustain. Considerable consolidation of the roadbed thus occurs before it is subjected to loading consequent on the equipment being moved forward.

The system of operation and the apparatus hereinafter described with reference to the accompanying drawings, though schemed and designed for the building of moles and breakwaters, is, nevertheless, usable advantageously in certain other structural works, as, for instance, in the formation of foundations in unsound ground and the building of embankments.

Three parallel lines of rail tracks are laid down on sleepers set along the top of the work which has been already brought up to near finish level. The two outer tracks support a crane of novel design on bogies, and the middle track carries trucks and locomotives by which stone and concrete blocks and stone and earth filling are transported from sites rearward of the work to an advance position on the works forward, and when required, laterally, of the position of the crane thereon. The mid-track is single where it is paralleled by the crane supporting tracks, but forward and rearward thereof it is branched to form two or more tracks with turnouts to facilitate handling of traffic-loaded trucks going forward and empties returning.

When the crane is being advanced to a fresh working position, the single mid-track with its forward and rearward branchings and turnouts is temporarily raised and suspended from bearers bridged across the bogies; then the mid-track and the crane structure are moved forward to an advanced position and the mid-track then set down again.

In one arrangement the crane platform is built up of two long longitudinal girders of either single truss or double truss type, cross connected, and the structure stiffened by transverse frame members. The platform rests on a three-point base and does not suffer stresses referable to displacement or irregularity in the level of the trackway. The height of the cross members

which brace the girders is such that loaded trucks may pass under them along the mid-track or tracks.

The boom is suspended by a plurality of guy ropes from the apex of the crane mast. The inner end of the boom is pivotally connected at the base of the mast. The boom has a horizontal swing of approximately 160° and is therefore usable for placing or dumping the load. The load is suspended from a traveller which runs along the lower flanges of the boom.

The boom relative to its length is of light section and receives its strength for supporting loads at any point from guy ropes which are attached to it at short intervals apart and are taken to a common anchorage at the apex of the crane mast. The boom is thus a suspended runway. The reaction of the weight of the boom and its load is taken by back stays extending from the said apex to a rear member of the platform and by stays from lateral outriggers. The boom is therefore in effect a resilient member as it is entirely supported by resilient members and guy ropes.

In the accompanying drawings:—

Fig. 1 is a partial transverse sectional elevation showing a breakwater in course of construction with a crane embodying the features of the invention, standing on the roadbed on the top of the already emplaced portion of the structure. The crane assembly is supported on a platform which is carried on relatively high stilt legs which are footed on trucks which run on a pair of rail tracks which are spread apart to allow adequate room for loaded trucks and lorries to pass under the crane, carrying stone and filling to the part of the work in progress in advance of the locus of the crane. Lateral outriggers extending from the base of the crane carry deadweight anchoring loading by which transverse stability of the crane is ensured notwithstanding displacement or sinking of the roadbed with consequent distortion or settlement of the rail tracks thereon;

Fig. 2 is a side elevational view of the crane with the boom directed forward in alignment with a cantilever which extends rearward of the crane; and

Fig. 3 is a top plan view corresponding in Fig. 2.

The lifting and dropping gear is contained in the traveller which runs on the boom. Boom slewing gear and counterweight lifting gear are installed adjacent to the base of the mast. In the slewing gear the slewing lines are wound over a differential drum which is designed to take care of the slack in the slewing lines during the swing of the boom laterally from centre line.

90 and 91 are long trucks on bogies which respectively run on the outer tracks 23 and 24; centrally on each of these trucks 91, a truss pillar 73 is erected. These pillars are cross connected at the head by a bearer 27, and they are borne on pivot or like bearings 35 on spreader plates which are fixed centrally on the decks of the trucks 90. The single truss beam 70 is connected to a straddle bearer 71 at the outboard end by a flexible joint, and this straddle bearer 71 is connected by a flexible joint centrally to each side bogie truck 92, on which counter-weights 90 are carried. The legs 73 which carry the mast and the forward end of the beam 70 are pivot footed at 35 on the trucks 91 below, and the forward and rearward trucks 91 and 92 on each line of track are so connected by link rods 93 that they are retained with a predetermined distance between the rear ones and forward ones. The clearance

offered for mid-track traffic in this arrangement is seen in Fig. 1. Provision is made for lateral adjustment between the two bogie trucks front and rear to provide for variation in width between tracks. The girder section boom 42 is carried on a pivot at the crane mast base with the design schemed to allow clearance for slewing the boom 160° more or less across the centre line of the work. The traveller 44 runs on the boom 42, 85 being the driver's cab, in which motors and associated gear are installed for lifting and lowering and tripping loads and for moving the traveller inward and outward along the boom.

The boom 42 is suspended from the apex 45 of the mast by guy ropes 46 connected to it through strainers 47 at spaced intervals and the mast apex 45 is guyed back by the rope 48 to the bearer 71. Guy ropes 49 suspend the lateral outriggers 50 from the mast apex 45. The horizontal outriggers 50 are guyed by lines 51 and 52 which hold them fixedly in horizontal position. The slewing barrel 53 on which the boom slewing lines 54 and 55 are wound and slacked without showing sag is shaped to compensate for the relative difference in the length of the respective slewing lines during swing of the boom towards and away from the centre line. The slewing motor by which the barrel 53 is gear driven is installed near the foot of the mast, but is operated from the driver's cab.

The length of the cantilever 70 is proportioned to the length of the boom along which the building material is run to the depositing position, and it is heavily counterweighted on the bearers to which its rear end is connected to offset the load of the overhung boom.

On either side of the base structure of the crane two truss outriggers 50 are extended laterally at right angles, these outriggers being of such length that they overhang the foot of the breakwater. From their ends suspensory lines 86 are attached to heavy counterweights 87, which may be large blocks of stone or concrete or may be in the form of buckets loaded with stones. The suspensory lines for each outrigger are carried over sheaves 88 on the ends, with the falls brought to a winch. When the assembly has been located in the intended working position the two counterweights are lowered away until they just rest on the sea bottom clear of the toe of the breakwater sides, with the suspension lines in light tension.

The boom 42 is of girder section, and is supported at intervals by guys coming from the top end of the mast, and it is carried at the centre point under the mast on a heavy ball pivot about which it may be slewed laterally in either direction and on which it hangs vertically. The wheeled traveller runs on the boom, and is equipped with lifting gear by which loading may be lifted from a truck below, this gear being adapted for lowering away the load to dump it at any desired position in the line of work below the beam.

In operation, the whole assembly on its bogies is moved forward along the line of work so that the boom will extend so far beyond the end of the work that stone and filling may be dumped or placed in position by the traveller to extend it, and the outrigger counterweights are lowered away till they touch bottom outside the lateral range of the work. Then the bogie wheels are spragged. The building material is now transported on the mid-line of track through the portals of the crane, and is picked up by the traveller, con-

veyed to the destined position on the boom, the boom then slewed, the traveller driven to the appropriate position, and load placed or dumped. The angular position of the boom and the 5 traveller delivery positions are varied as required as the work proceeds, and as each section of the work is sufficiently advanced the hearting is dumped and filled in, and the whole assembly is advanced, and then the building of the section 10 ahead is carried on.

It will be understood that the invention is not limited to apparatus in which the structure is carried upon a three-point suspension on wheeled vehicles, as it may be supported on a plurality of hydraulic jacks, and when necessary 15 shifted forward by hydraulic jacks, or by other means. Also that the slewable boom may at centre position come to alignment with a rearwardly extending traveller track 75 as shown in 20 Fig. 3, and the boom traveller may be run back along this rear track to pick up material at the land end of the structure and transport it forwardly to and along the boom for emplacement. Material from a punt may also be picked up by 25 the traveller from the forward end of the boom.

Instead of using counterweights suspended from the outrigger ends, the outrigger ends may be connected by suspension lines to driven piles or to heavy floating punts anchored in appropriate 30 positions laterally of the work. In the claims the term "counterweight" is to be construed to include this alternative arrangement.

What I claim as my invention and desire to secure by Letters Patent is:—

35 1. Apparatus for carrying out breakwater and like construction works, comprising a mast, a slewable boom with a traveller thereon fitted with lifting and lowering devices, a pivotal mounting for the butt of said boom at the mast base, guy ropes suspending said boom from the upper part 40 of said mast, a three-point support for the base of said mast two of which points are spaced

apart laterally below it and the third point on a member extended rearwardly thereof, bogies carrying said support points, said bogies being provided with two parallel rail tracks spaced 5 apart and laid on the surface of the partially completed work, an intermediate track on which building material is transportable over the built portion of the work to an advance position on the line of work in progress, said mast base support straddling said intermediate track, lateral outriggers cooperating with said mast having counterweights suspended therefrom, and guys connecting said mast to said rearwardly extended member and to said outriggers, said counterweights and guys together maintaining the mast 10 in an upright position on the mast base.

2. Apparatus for carrying out breakwaters and like construction works, comprising a mast, a slewable boom with a traveller thereon fitted with lifting and lowering devices, a pivotal mounting for the butt of said boom at the mast base, 20 guy ropes suspending said boom from the upper part of said mast, a three-point support for the base of said mast two of which points are spaced apart laterally below it and the third point on a member extended rearwardly thereof, bogies carrying said support points, said bogies being provided with two parallel rail tracks spaced apart and laid on the surface of the partially 25 completed work, a suspended trackway with which the butt end of the boom is alignable and which is extended rearward from the aligning position to a pick-up position on the land side of the crane, said trackway adapted for supporting the boom traveller, lateral outriggers cooperating 30 with said structure having counterweights connected therewith, and guys connecting said mast to said rearwardly extended member and to said outriggers, said counterweights and guys together maintaining the mast in an upright position on the mast base. 35 40

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