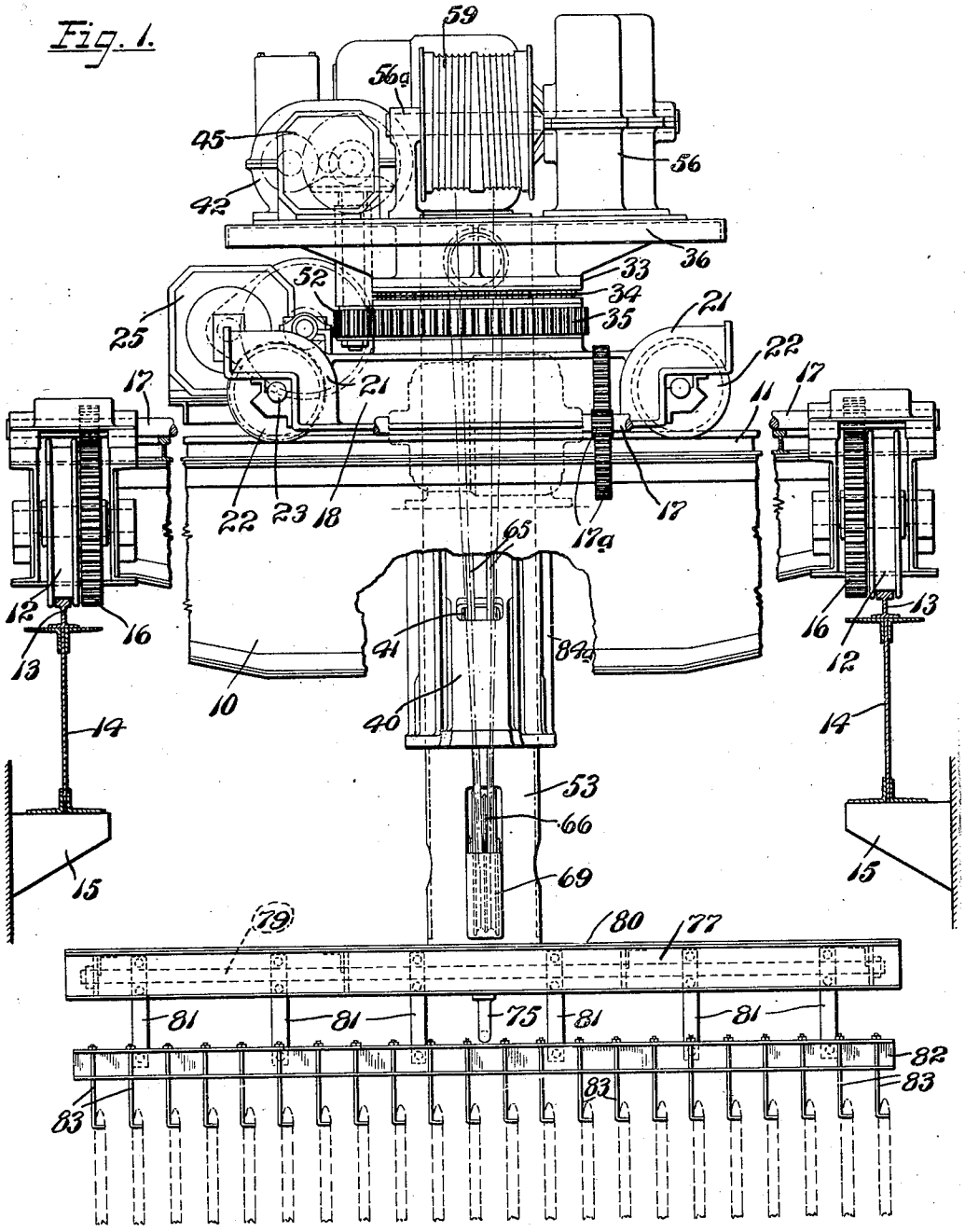
Jan. 1, 1929. 1,697,538

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TURNTABLE CRANE FOR ELECTROLYTIC REFINERIES

Filed June 30, 1924 6 Sheets-Sheet 1

Fig. 1.



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TURNTABLE CRANE FOR ELECTROLYTIC REFINERIES

Filed June 30, 1924 6 Sheets-Sheet 2

Fig. 2.

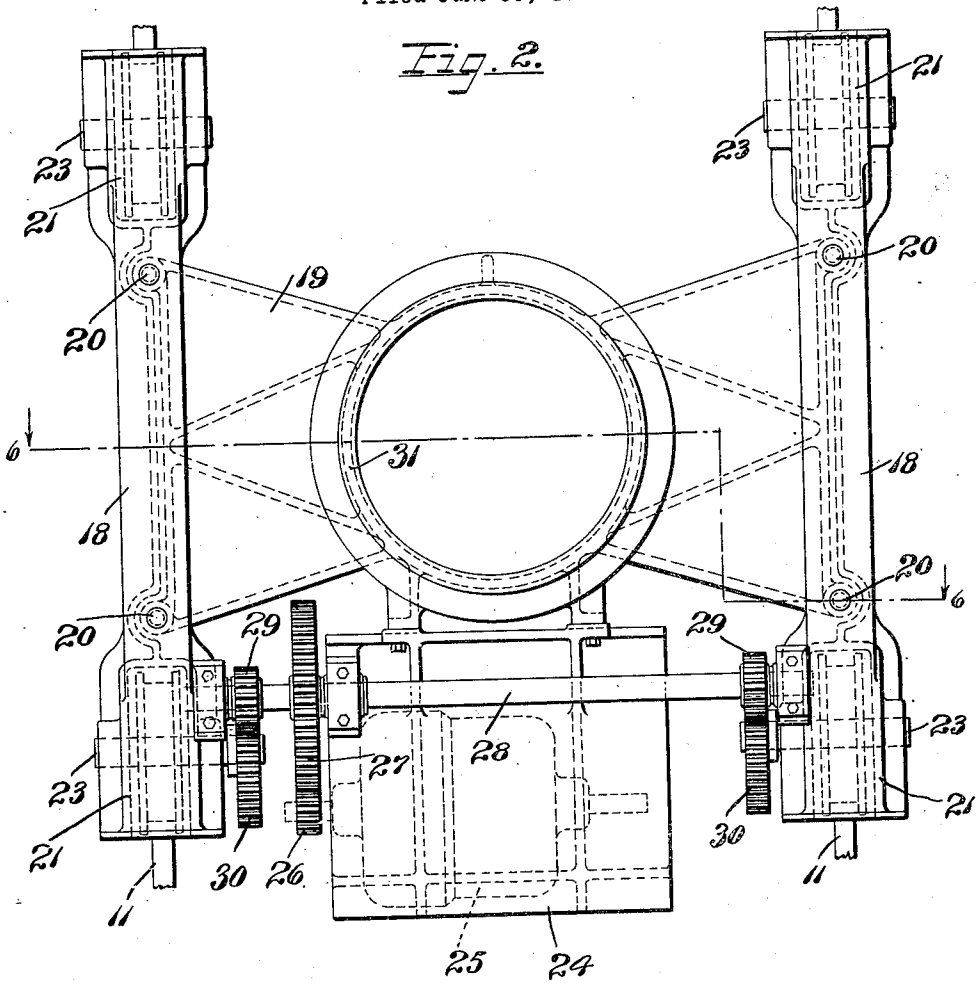
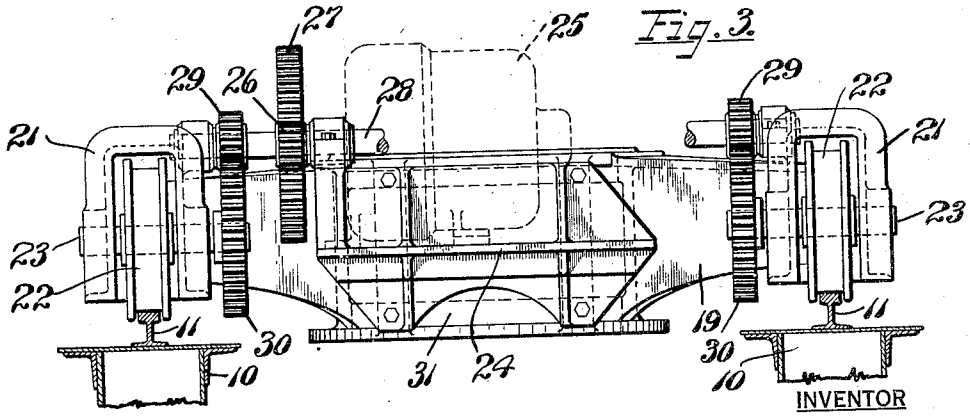


Fig. 3.



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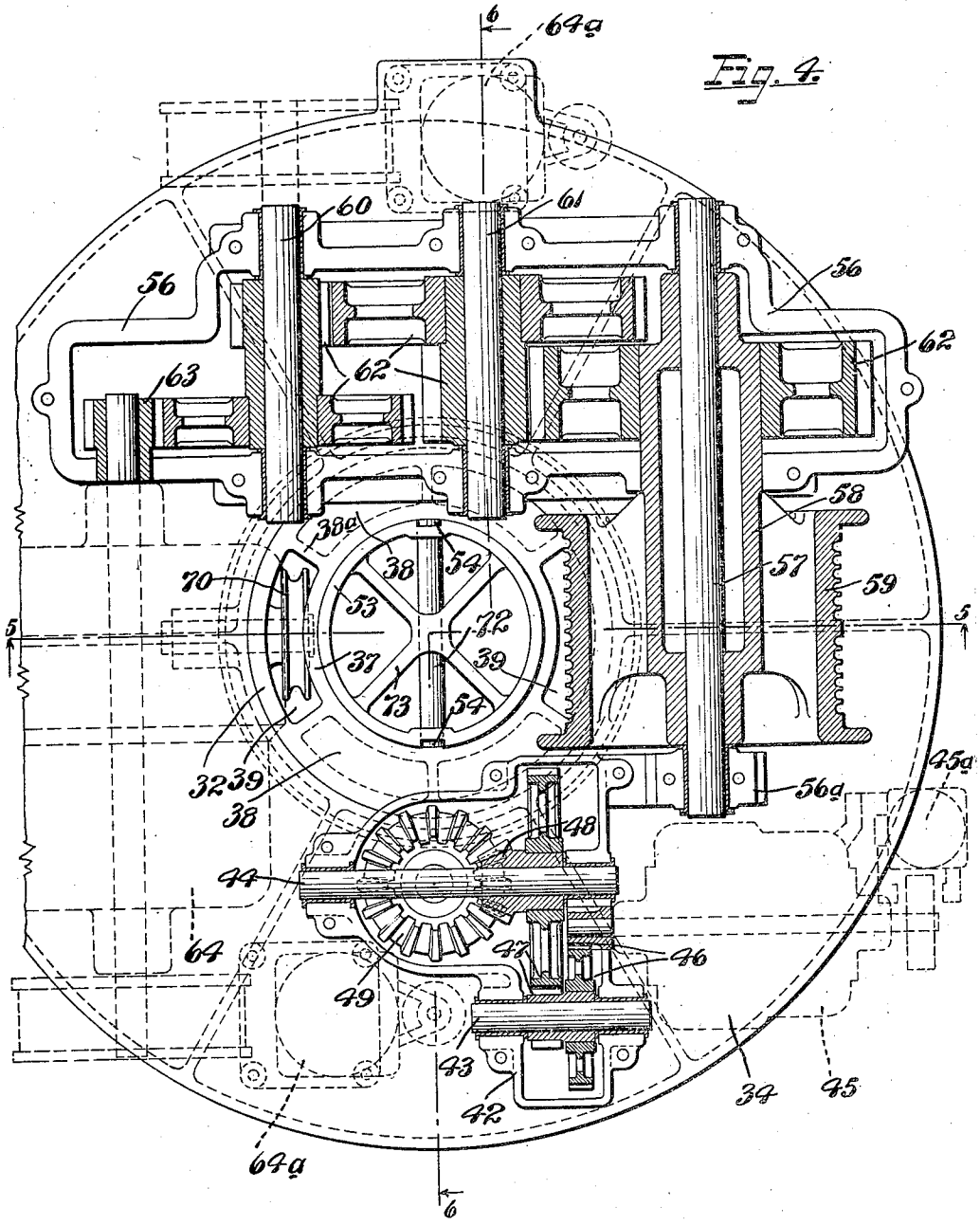
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Fig. 4.



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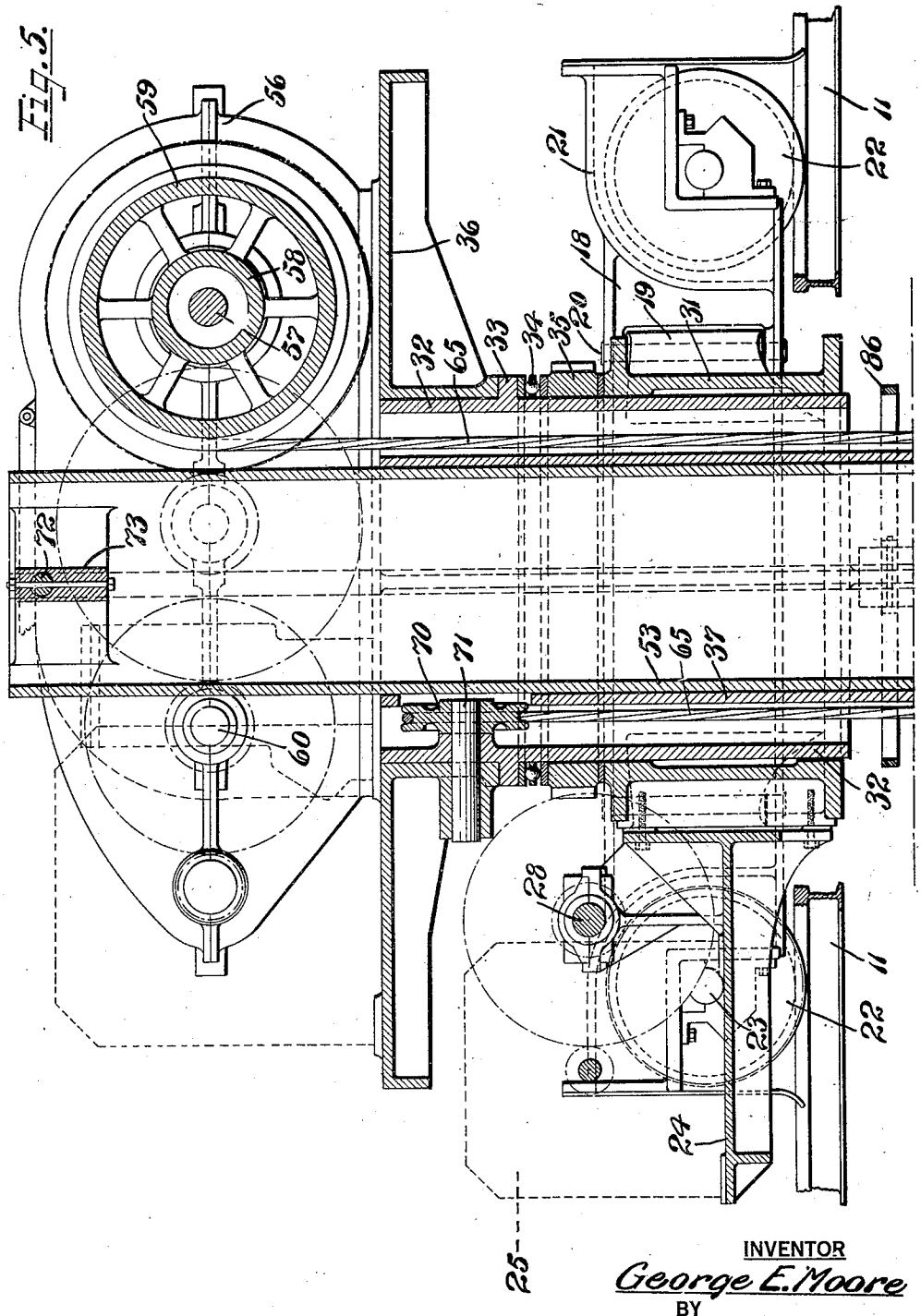
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Fig. 5.



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TURNTABLE CRANE FOR ELECTROLYTIC REFINERIES

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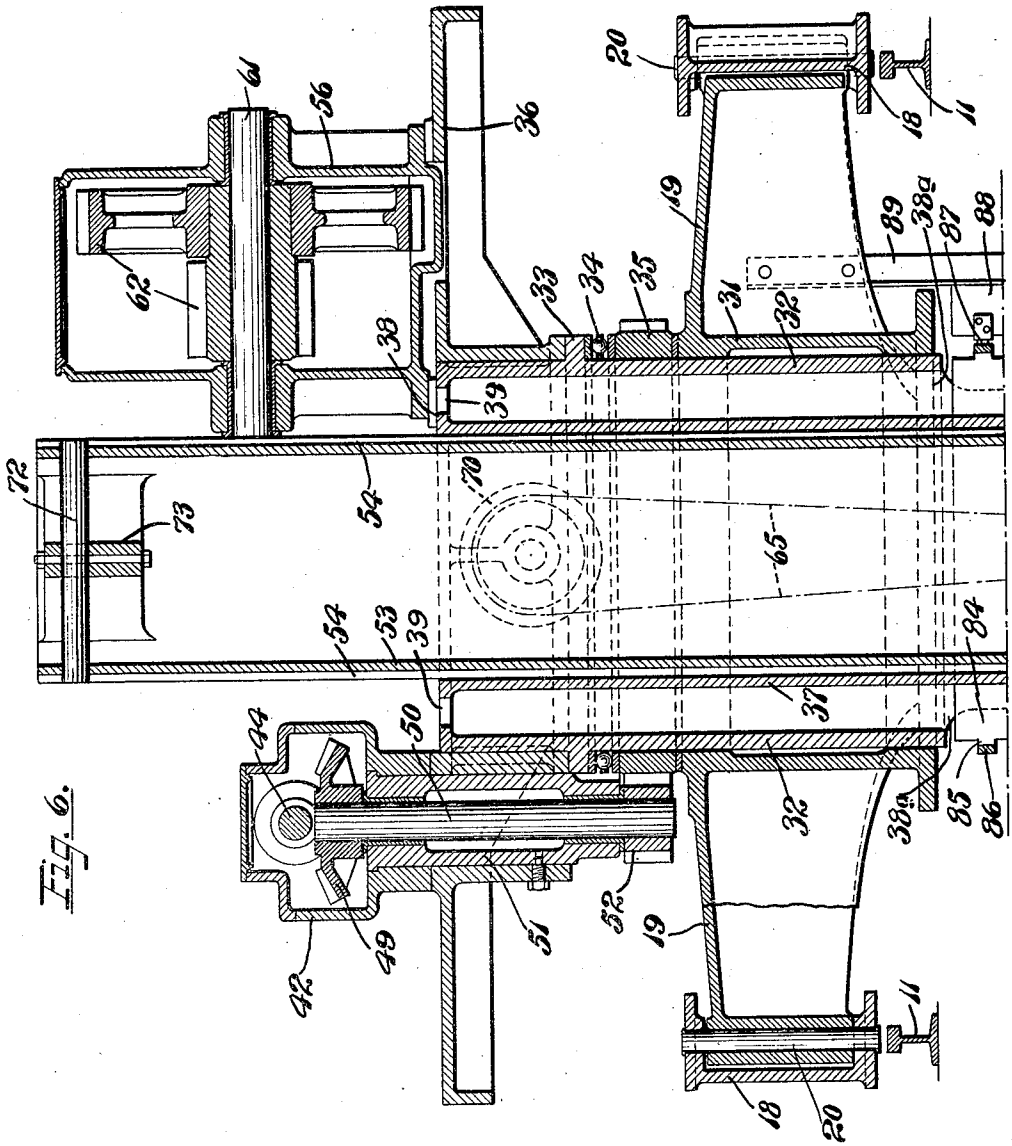


Fig. 6.

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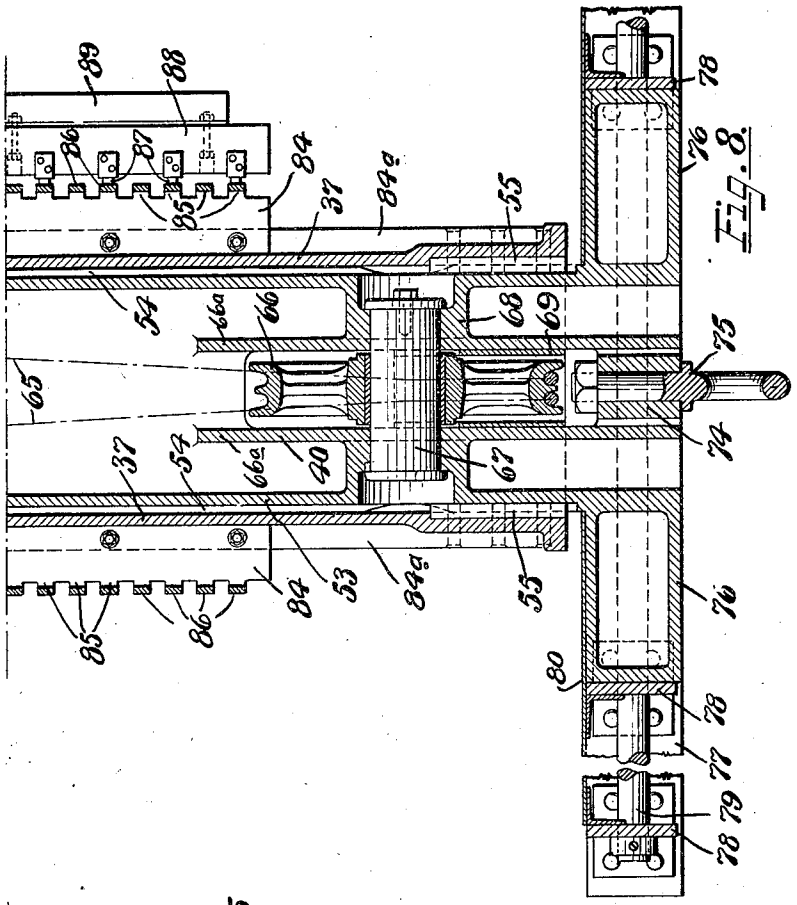


Fig. 8.

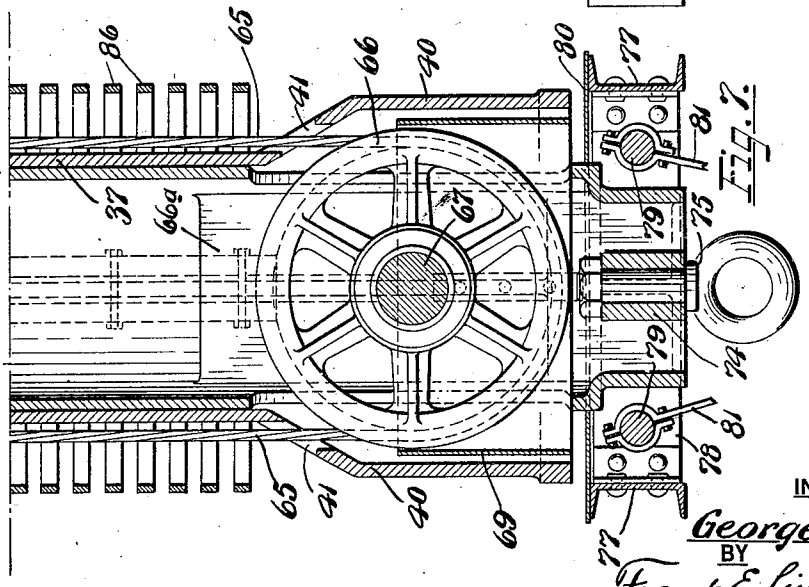


Fig. 7.

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UNITED STATES PATENT OFFICE.

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TURNTABLE CRANE FOR ELECTROLYTIC REFINERIES.

Application filed June 30, 1924. Serial No. 723,163.

This invention relates to a turn-table trolley designed to be used in connection with traveling cranes and having particular utility when said cranes are used in electrolyltic refining plants. In plants of this character batches of anodes or cathodes carried on racks have to be handled between electrolytic rack cars and arranged longitudinally inside the building, where the electrolytic plant is housed. The tracks on which these rack cars run are transverse of the tank house, whereas the tanks in which the anodes or cathodes are placed or arranged longitudinally of the building, and it is therefore necessary when a rack carrying anodes or cathodes is transferred from the tanks to the cars to turn them a quarter turn. It has been practice heretofore to have turn-tables on the floor where the cars can be given a quarter turn before the removal of the racks by cranes for transportation to the tanks.

The present invention eliminates the use of the floor turn-table for the cars by importing a turn-table into the trolley construction. At the same time by this addition of turn-table construction to the trolley, the problem of head room to take care of the mechanism is encountered; and a feature of the present invention resides in the design and construction of the trolley whereby it may be equipped with the necessary turn-table and the dimensions kept within the limits of space permitted in the buildings in which it is to be installed, wherein such space for head room is limited. This minimizing of sizes has a further distinct advantage in that construction costs are materially lowered, since compactness necessarily involves a conservation of materials used and lessening of machine work required in working the materials into the finished machine.

The general object of the invention is to produce an improved crane structure which is compact, light and strong with a conservation of the materials used in its manufacture and occupying a minimum of head room. A further object of the invention is to produce an improved turn-table construction for crane trolleys with hoisting mechanism thereon which is capable of especially near approach to the sides of the building in which it is installed so that it is possible to lift loads vertically from points close to the said sides of the building and one which is especially adapted for installation in buildings, such as electrolytic refineries already built. A still further object of the invention is to provide in a trolley for turn-table cranes, an improved arrangement of the turning and hoisting mechanism which is particularly compact, light, strong and durable and efficient in operation. Further objects of the invention are to provide hoisting mechanism for cranes of this character with an improved transmission gear and hoisting drum construction whereby among other advantages, bending torsional stresses are reduced and compactness and lightness are obtained, together with improved assembly and association of the operating and driving elements so that assembly or disassembly for repair or replacement of parts are facilitated; to provide an improved construction for the mounting of electric current carrying rings for the electric motors and one especially adapted for turn-table cranes; and to provide in a turn-table crane, improved structural arrangements and combination of parts for supporting the turning parts of the trolley and at the same time facilitating the accomplishment of the hoisting operations of the mechanism.

Various other objects and purposes than those particularly stated at this time will appear as understanding of the invention is had from the following description taken in connection with the accompanying drawings in which,

Fig. 1 is an elevation of a crane showing the bridge and trolley construction together with the hoisting mechanism used therewith in side elevation, the hoisting ram being shown as carrying a rack of anodes or cathodes such as used in electrolytic refineries.

Fig. 2 is plan view of the lower member of the trolley, the upper rotating member thereof being removed.

Fig. 3 is an end elevation of the structure shown in Fig. 2.

Fig. 4 is a plan of the upper rotating member of the turn-table, the winding drum and mechanism for driving the same and the gearing used for rotating the turn-table member of the trolley being shown in horizontal section.

Fig. 5 is a central vertical section taken substantially on the plane of line 5—5 of Fig. 4.

Fig. 6 is a like section substantially at right angles thereto on the plane of line 6—6 of Fig. 4, and also on the plane of line 6—6 of Fig. 2.

Fig. 7 is a section through the lower part of the apparatus, it being a lower continuation of that shown in Fig. 5, the section being on the same plane therewith, and

Fig. 8 is a like view of the lower part of the mechanism on the same plane as the section shown in Fig. 6, or at right angles to the plane of the section shown in Fig. 7.

Like reference characters refer to like parts in the different figures of the drawings.

The bridge members 10 of the crane are of conventional construction and design, carrying parallel track rails 11 at their upper sides. At the ends of the bridge members, rollers 12 are rotatably mounted to ride on tracks 13 supported at the upper side of built-up I-beam girders 14 mounted at opposite sides of the building in which the crane is to be installed on suitable brackets or supports shown at 15, this being conventional construction for the mounting of crane bridge members to travel lengthwise of a building. The shafts of the rollers 12 of one of the bridge members carry gears 16 which are simultaneously driven by suitable gearing connections with a shaft 17, as shown in Fig. 1, which may be driven from an electric motor through the interposed gearing connections indicated at 17^a.

The trolley comprises upper and lower members, the upper member being mounted to turn about a vertical axis with respect to the lower member. In construction the lower member comprises two spaced apart longitudinal members or beams 18 of I-beam cross section which are connected together by transverse member or beam 19 which is ribbed on its lower side for strength. Suitable sockets are made in the webs of the members 18 to receive bosses at the ends of the beam 19 and vertical pins 20 pass downwardly through alined holes in said members 18 and the bosses on the transverse beam 19, this making a very strong construction and one which is simple and economical to produce, all machine work for the connection of the members being done in the factory.

It will be noted that the centers of the bosses when in place are coincident with the longitudinal center lines of the members 18 whereby reactions from the loaded transverse beam 19 are central on said members 18 without any tipping tendency.

The ends of the members or beams 18 are hollowed out leaving recesses covered by the parts 21 wherein the truck rollers 22 may be rotatably mounted on shafts 23 so as to run on the rails 11. A supporting bracket 24 is securely attached to the transverse beam 19 at one side serving as a support for an electric motor 25 on the shaft of which is gear 26 meshing with and driving a larger gear 27 secured to shaft 28. The shaft 28 is mounted in suitable bearings carried by the beams 18 and by the bracket 24 and adjacent each end carries a gear 29 which meshes with and drives the gear 30 fixed on shaft 23. It is evident that the two shafts 23 at one end of the trolley are driven in unison and when the motor 25 is running the trolley may be moved back and forth to different positions on the bridge.

The transverse beam 19 midway between its ends is formed with an enlarged cylindrical bore 31 suitably flanged at its ends for strength through which a large sleeve 32 passes. This sleeve extends above the lower trolley member and is formed with an annular flange 33 which rests upon roller bearings 34 in turn bearing against a gear ring 35 located around and directly above the bore 31 and bearing against a plate 35^a in turn bearing on the lower member of the trolley. At the upper end of the sleeve 32 a circular platform 36 is mounted and permanently secured, its central portion resting on the flange 33 as shown in Figs. 5 and 6. A horizontal web 38 extends inwardly from the upper end of sleeve 32 for a short distance depending from the inner edges of which is a vertical cylinder 37, the same extending downwardly through the sleeve 32 at a distance below the lower end thereof. Radial ribs 38^a integrally connect the sleeve 32 and cylinder 37, the ribs extending downwardly below the lower end of sleeve 32 to add to the rigidity of said cylinder 37. In the web 38, as shown in Fig. 4, oppositely positioned openings 39 are cut, the purpose of which will later appear. At the lower end of the cylinder 37 and on opposite sides thereof, laterally projecting enlargements 40 having spaced apart sides are cast integral with the cylinder and at the upper ends thereof, openings 41 are made for the passage of hoisting cables as will later appear.

Mounted on the upper sides of the platform 34 is a housing 42 equipped with suitable bearings for mounting two shafts 43 and 44 in parallel relation to each other. An electric motor 45 through gears 46 is adapted to drive the shaft 43, and shaft 43 through gears 47 in turn drives the shaft 44 on which a beveled gear 48 is secured meshing with and driving a larger beveled gear 49 fixed to an upper end of a vertical shaft 50 which passes downwardly through an elongated and enlarged cylindrical mounting 51 therefor; the lower end of the shaft being equipped with a pinion 52 which engages with the teeth of the ring gear 35 heretofore described. When the motor 45 is operated shaft 50 is driven at a reduced speed. Pinion 52 engag-

ing with the ring gear 35, said ring gear being relatively stationary through frictional resistance to turning the platform 36 and mechanism mounted on and carried thereby turns about a vertical axis, as is obvious.

A hoisting ram 53 in the form of an elongated vertical cylinder is slidably mounted and extends through the cylinder 37. Keyways 54 are made in opposite sides of the ram 53 substantially the full length thereof. At the lower end of the cylinder 37 two oppositely disposed keys 55 are secured setting in the keyways and maintaining the ram and the upper turn-table portion of the trolley in the same angular relation to each other, but permitting the ram to be moved up and down vertically.

A housing 56 is mounted on and above the platform 36 being equipped with suitable bearings for the mounting of a drum shaft 57. On the shaft 57 an enlarged central core 58 is secured from which ribs project to the outer ends of which the winding drum 59 is connected, the core, ribs and drum being formed as an integral casting. Two counter shafts 60 and 61 are mounted parallel to the shaft 57 in bearings carried by the housing 56 and are spaced from each other and from said shaft 57. Suitable reduction gears and pinions 62 mounted on the shafts 57, 60 and 61 and driven by a gear 63 on the shaft of motor 64, serve to drive the drum 59 at a reduced speed. The motor being reversible, the drum may be driven in either direction. It will be noted that the drum gear 62 is fixed to the projecting end of the enlarged central core 58 and that intermediate gears are fixed to projecting portions or bosses on the pinions in the reduction gearing described whereby torsional strains such as are due to frictional resistance are entirely eliminated. Accordingly the diameter of the shaft 57 is determined by bearing pressure alone and kept to a minimum size. Also the diameter of the pinions can be reduced to a minimum, and a maximum gear reduction can be obtained with a minimum diameter of gears and the whole gear train be made as small and compact as possible. Moreover the gears being keyed to projections on the pinions or drums on a larger diameter than would be the case if both were keyed separately to a shaft, it follows that strains on the keys are greatly minimized and the keys will not easily work loose. The whole of the gearing is enclosed in one cast iron casing, only the motor and the drum being uncovered. In connection with the motor 45 any suitable form of magnetic brake mechanism, indicated at dotted lines at 45ª in Fig. 4, may be used and, similarly, magnetic brakes 64ª may be used in connection with the mechanism operated by the motor 64 in stopping and holding the mechanism in any position to which it may be moved.

Hoisting cables 65 wind around the drum 59, it being understood that both right and left hand grooves are formed in the drum and the ends of the cables are secured to the drum. The cable extends downwardly through one of the openings 39 heretofore described to and around a suitably grooved pulley or sheave 66 which is rotatably mounted on a shaft 67 carried on bosses cast integral with opposite sides of the ram 53 near the lower end thereof. The pulley is located between two vertical cross reinforcing plates 66ª cast integral with the ram, as shown in Fig. 8, and the ram is slotted at opposite sides to afford space for the size of the pulley or sheave required, the hoisting cable 65 passing downwardly on the outside of the cylinder 37 and through the openings 41 previously described in order to pass around the sheave. A guard 69 as shown in Figs. 7 and 8 covers the lower portion of the sheave 66 and maintains the cable in engagement with the sheave 66 and the laterally projecting portions 40 make room for the sheave 66 as shown when the ram is in upper position.

From the sheave 66 the cable passes upwardly and around an upper sheave 70 mounted on a short shaft 71 which passes through the upper end of the sleeve 32 and adjacent portion of the platform 36 as shown in Fig. 5. It then passes downwardly to and under the sheave 66, thence upwardly to the opposite side of the drum. Rotation of the drum in one direction serves to elevate the ram 53. In the opposite direction the ram is lowered and it may be lowered until the projecting ends of a cross pin 72 located in the upper end of the ram, as shown in Fig. 6, comes against the upper ends of the keys 55. The pin 72 is mounted and suitably supported by the spider 73 at the upper end of the drum 53 and its ends extend into the keyways 54 as best shown in Fig. 6.

In the lower end of the ram, a cross bar 74 is cast integral with the ram and located between the reinforcing plates 66ª. An I-bolt 75 is mounted on this bar (see Figs. 7 and 8). The lower end of the ram 53 is also formed with integral oppositely projecting head parts 76 paralleling the sides of which are channel bars 77, one located at each side of the lower end of the ram in parallel relation to each other. These bars 77 are connected by cross members 78 in turn secured to the head 76. Two rods 79 are located parallel to the channel bars 77 between the same and the lower end of the ram and carried by cross members 78. The frame structure provided by the side bars 77 and the cross bars 78 is preferably covered by a steel plate 80. From the rods 79 supporting straps 81 depend inwardly toward each other to serve as a support for the rack 82 formed with a plurality of hook members 83 on which the anodes or cathodes which are to

be placed in and removed from tanks in electrolytic refinery, are carried. As shown in Fig. 1 these anodes or cathodes are indicated in dotted outline.

It is evident that a crane structure of the type described may be moved back and forth lengthwise of the building in which it is installed on the tracks 13, that the trolley may be moved back and forth on the bridge members 10 and that the upper rotating member of the trolley may be turned about a vertical axis. In addition the vertically movable hoisting ram mounted for up and down movement with respect to the trolley is also mounted so that it must turn with the upper turntable member of the trolley. Accordingly the rack carrying the anodes or cathodes may be turned about a vertical axis to any desired position and the same handled readily between electrolytic tanks and rack cars despite the longitudinal location of the tanks and transverse location of the tracks in the electrolytic refinery building. Moreover the construction is such that a very close approach to the sides of the building may be had as where the tanks are located substantially directly against the sides of the building. The design and arrangement of the parts is such that the head room of the trolley carrying all of the mechanism for running the trolley back and forth, rotating the upper member of the trolley and raising or lowering the ram, is kept within the smallest possible limits and at the same time strength necessary for the service to which the crane will be put is maintained and the weight and size of the materials used conserved with a very material saving in manufacturing costs. All of which is very necessary from a practical standpoint in meeting the competition of others in the same business.

It will be noted, referring to Fig. 6, that the diameter of the member 51 in which shaft 50 is mounted is substantially the same or slightly larger than the diameter of the gear 52, whereby shaft 50 with the attached parts and the member 51 may be removed as a unit. The ring gear 35 bears directly on a hardened steel plate 35[a] as shown in Fig. 6 but is not otherwise attached and so long as the weight pressing this ring gear against the plate holds the gear stationary, the turntable part of the trolley may be rotated; but if an undue obstruction should be met, as if the head construction at the lower end of the ram should strike against a supporting column in a building, the ring gear would then move and prevent breakage, which might otherwise occur. The construction at the lower end of the ram consisting of the reinforcing cross plates 66[a] is for the purpose of strengthening and reinforcing the lower end of the ram against undue strains such as might occur if one side only of the rack should be loaded with anodes or cathodes and to compensate in part for the material cut away where the lower end of the ram is slotted for sheave 66.

Around the cylinder 37 and below the lower end of the sleeve 32 are positioned a plurality of vertical blocks 84 of impregnated wood which are bolted or otherwise secured to the cylinder and grooved to provide a plurality of projecting tongues 85 to which rings 86 of metal are secured. These rings contact with suitable brushes 87 carried on a vertical bar 88 in turn attached to a second bar 89 which is secured at its upper end to and depends from the transverse beam 19 of the lower trolley member. It is evident that the electrical contact of the brushes 87 against the rings 86 is maintained at all times irrespective of the rotatable movement of the turn-table member of the trolley. The rings 86 are electrically connected with the hoisting mechanism and trolley and bridge motors and the brushes with the respective controllers and the line. The horizontal grooves formed in the wood blocks 84 are for the purpose of increasing insulating surface on account of the relatively close spacing of the rings which is required due to space limitations.

It will be evident from the foregoing that a practical and operative construction of turn-table cranes especially adapted for use in electrolytic refineries has been produced and one which completely serves all of the objects and purposes for which it is designed, as explained in the initial statement of the invention. Many changes in details of construction may be resorted to without departing from the invention and it is to be considered that all forms of structure which come within the scope of the appended claims defining the invention are comprehended by said invention.

I claim:

1. In a crane, a travelling trolley for said crane, a tubular column supported by said trolley, a lifting ram guided for rotary and bodily movement by said column, and a hoisting sheave mounted on said ram, said column being provided with off-set pockets to receive said sheave when the ram is in elevated position.

2. In a crane, a travelling trolley for the crane having a tubular bore therein, a tubular column supported by said trolley and including inner and outer tubular members, webs joining said tubular members and extending below the outer tubular member to provide external ribs for reinforcing said inner tubular member, said outer tubular member extending into said bore and being rotatably supported therein, and a lifting ram guided for rotary and bodily longitudinal movement by said column.

3. A trolley for overhead cranes including, longitudinal side frame members comprising

castings of substantially I-section and having the webs thereof offset to provide pockets, a transverse beam comprising a casting provided with bosses adapted to be received in said pockets, and securing means extending through said bosses for securing said transverse beam in position upon said longitudinal side frame members.

4. In a crane, a traveling trolley, a hoisting ram guided for vertical movement by said trolley, a transverse head at the lower extremity of said ram, a load supporting frame adapted to be connected to said head, parallel shafts carried by said frame, and supporting means carried by said shaft for attachment of loads thereto.

5. In a crane, a combination, a traveling trolley, a hoisting ram guided for vertical movement by said trolley and having opposed slots in the lower extremity thereof, reinforcing walls extending between said slots, and a hoisting sheave disposed between and mounted on said walls and extending through said slots.

6. In a crane, a traveling trolley, a hoisting ram guided for vertical movement by said trolley and having opposed slots in the lower extremity thereof, reinforcing walls extending between said slots, a hoisting sheave disposed between and mounted on said walls and extending into said slots, a flexible hoisting member on said sheave, and a box-like guard for said sheave disposed within said walls and adapted to support said flexible member in position on said sheave.

7. In a crane, a trolley, hoisting mechanism carried by said trolley, a hoisting ram mounted on said trolley, a hoisting sheave carried by said ram, a flexible hoisting member issuing from said hoisting mechanism extending between said ram and trolley and being reeved over said hoisting sheave, and an equalizing sheave disposed between said ram and trolley over which said flexible member is reeved.

8. In a crane trolley, a tubular column mounted in said trolley and having inner and outer tubular members, hoisting mechanism carried by said trolley, a hoisting ram mounted on said trolley, a hoisting sheave carried by said ram, and a flexible hoisting member issuing from said hoisting mechanism extending between said tubular members and being reeved over said hoisting sheave.

9. In a crane in combination, a trolley, a tubular column mounted in said trolley and having inner and outer tubular members, hoisting mechanism carried by said trolley, a hoisting ram mounted on said trolley, a hoisting sheave carried by said ram, a flexible hoisting member issuing from said hoisting mechanism extending between said tubular members and being reeved over said hoisting sheave and an equalizing sheave disposed between said tubular members over which said flexible hoisting member passes.

10. In a crane, a trolley, a tubular column mounted in said trolley and having inner and outer tubular members, hoisting mechanism carried by said trolley, a hoisting ram mounted on said trolley, a hoisting sheave carried by said ram, a flexible hoisting member issuing from said hoisting mechanism extending between said tubular members and being reeved over said hoisting sheave, said inner tubular member extending beyond the outer tubular member and telescopically receiving the ram and guiding it in up and down movements.

11. In a crane, a trolley, a tubular column mounted in said trolley and having inner and outer tubular members, hoisting mechanism carried by said trolley, a hoisting ram mounted on said trolley, a hoisting sheave carried by said ram, a flexible hoisting member issuing from said hoisting mechanism extending between said tubular members and being reeved over said hoisting sheave, said inner tubular member extending beyond the outer tubular member and telescopically receiving the ram and guiding it in an up and down movement, and an equalizing sheave disposed between said inner and outer tubular members and receiving said flexible hoisting member.

12. In a crane, a lifting ram including a tubular member slotted adjacent one extremity for receiving a hoisting sheave, transverse walls adjacent said slots and spaced from the walls of said tubular member and bosses lying between adjacent walls and providing supports for said sheave.

13. In a crane, a lifting ram including a tubular member slotted adjacent one extremity for receiving a hoisting sheave, transverse walls adjacent said slots and spaced from the walls of said tubular member, bosses lying between adjacent walls and providing supports for the sheave, and a guard member lying between said transverse walls and enclosing said sheave.

14. In a crane, a trolley, a rotary tubular member supported by the trolley, a hoisting ram telescopically guided by said tubular member for relative longitudinal movement, but restrained against relative rotary movement, a hoisting sheave mounted adjacent the lower end of said ram in slots provided therein and a guard plate disposed in said slots and enclosing said sheave.

In testimony whereof I affix my signature.

GEORGE EDWARD MOORE.