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T. W. SPRAKE

2,363,093

PLANETARY CAPSTAN

Filed Sept. 14, 1942

2 Sheets-Sheet 1

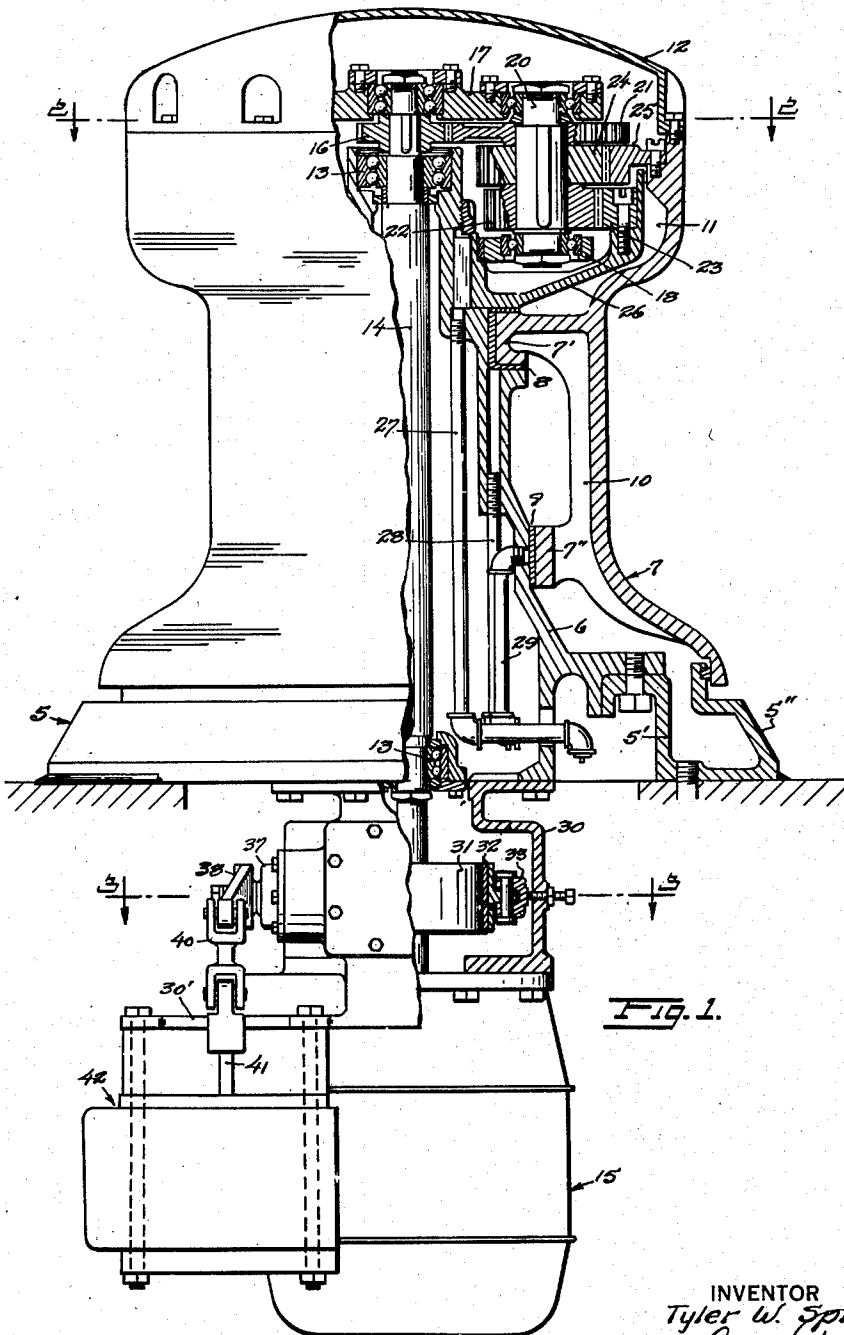


Fig. 1.

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2 Sheets-Sheet 2

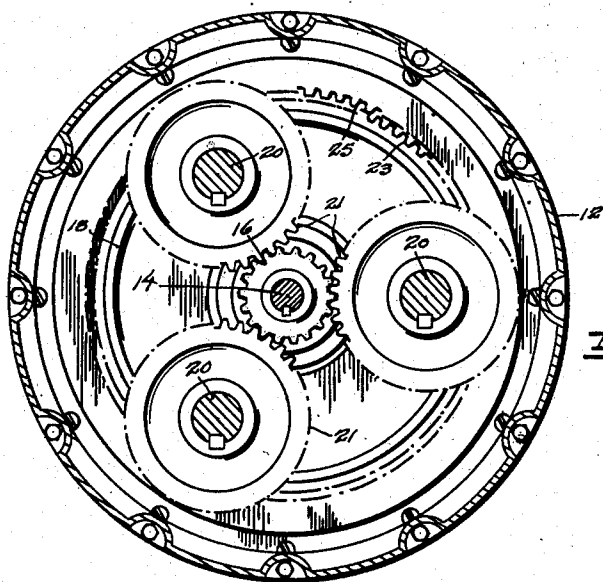
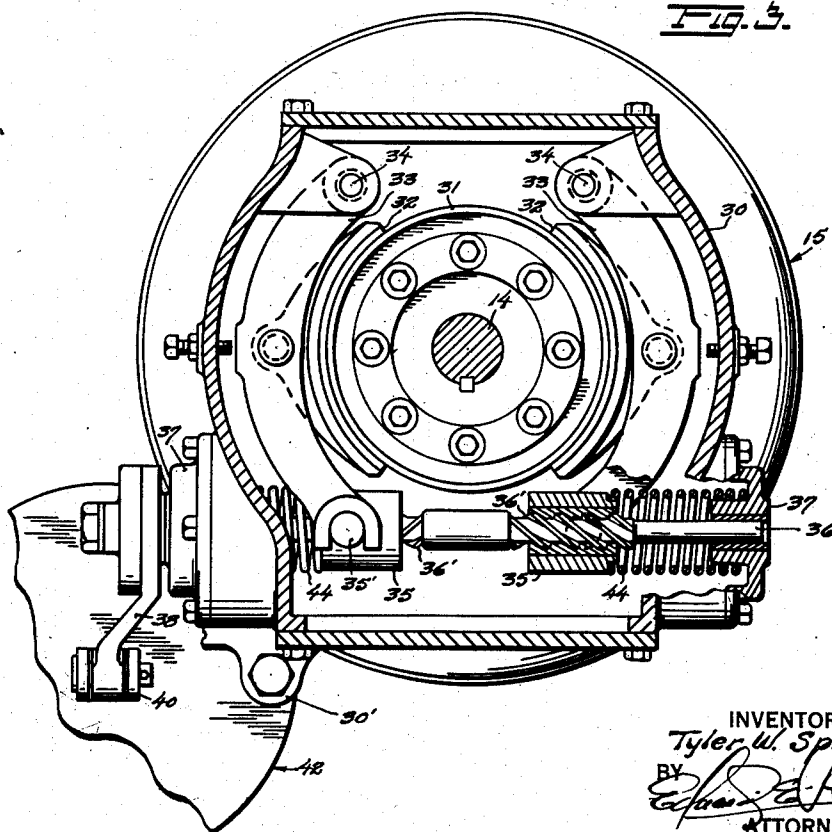


FIG. 2.



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PLANETARY CAPSTAN

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10 Claims. (Cl. 254—150)

This invention relates to improvements in capstans, and particularly contemplates the provision of a capstan structure embodying advanced differential planetary gearing for developing a reduction drive to the capstan barrel from a power source therefor.

It is a further object of the invention to devise a capstan structure driven from a below-deck electric motor and one in which the differential planetary gearing is housed in the cover of the capstan.

As a further object still, the invention aims to provide a capstan structure of the recited nature, namely one having a below-deck electric motor as its powering agent, and which is particularly characterized in that this said motor may be passed freely through an opening in the deck of the vessel and thus enable both the above-deck capstan proper and the below-deck electric motor to be bodily applied to or removed from the vessel as a connected unit.

The invention further aims to provide a structure including differential planetary gearing and in which the sun gear is co-axial with and direct-driven from the power shaft of the motor, by which I mean the armature shaft as distinguished from a power-take-off including gearing.

The invention has for a still further object to provide brake devices so engineered into the capstan as to permit maximum ease in the servicing thereof, and otherwise to provide a capstan in which ready accessibility is had to all of the parts thereof which are or may be subject to wear.

It is a still further object of the invention to provide a relatively inexpensive and comparatively simple capstan, a capstan which is of compact and especially sturdy construction looking to an elimination of frictional wear, and one which generally is more efficient from the standpoint of serviceability and operation than capstans heretofore devised.

The invention, visualizing the foregoing and having additional more particular objects and advantages in view which will fully appear and be understood in the course of the following description and claims, consists in the novel construction and in the adaptation and combinations of parts hereinafter described and claimed.

In the accompanying drawings:

Figure 1 is a vertical sectional view with parts in elevation illustrating a capstan constructed in accordance with the now preferred embodiment of the invention.

Fig. 2 is a horizontal section on line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary horizontal section taken to an enlarged scale on line 3—3 of Fig. 1.

Represented in said drawings by the numeral 5 is a spud base arranged to overlie a deck opening which, in diameter, generally corresponds with the internal diameter of the annular foot of the base. After spotting by recourse to bolt holes, the base is anchored by a peripheral weld. I form such spud base with upstanding internal and external flanges 5' and 5'', and employ the former flange as the pedestal for a spud 6 operating as the journal mounting for the barrel 7 of the capstan. 8 and 9 denote the bushings therefor, functional to internal collars 7' and 7'' which are produced integral with the barrel, and with the former said bushing serving both as a thrust and a rotary journal. As a support for the collar 7' I form the barrel with an imperforate wall which serves as a partition separating what may be termed a bearing chamber, as 10, lying therebelow from an upper gear chamber 11 fitted with an inspection cover 12.

Arranged to extend at its upper extremity into the gear chamber and journaled within the spud by oil-sealed bearings 13 is a drive shaft 14 connected by a Waldron coupling to extend as an axial prolongation of the armature shaft of a below-deck electric motor 15, and keyed to the upper end of such shaft is a sun pinion 16. 17 denotes a revolubly mounted spider which, in complement with a subjacent spider 18, carries a set of planetary stub shafts 20, and keyed to the stub shafts are sets of pinion gears comprised of a primary gear 21 meshing the sun pinion, a tracking pinion 22 meshing a stationary internal gear 23, and an output pinion 24 meshing an internal gear 25 fixedly carried by the capstan barrel. Supporting the stationary internal gear 23 is a plate 26 fixed by keys to the non-rotary spud and seating upon a shoulder formed by the latter. The operation of the described differential planetary gearing is believed to be clear.

Indicated at 27, 28 and 29 are oil pipes arranged to lie internally of the spud and feeding from a below-deck servicing point to the gear chamber, the bushing 8, and the bushing 9, respectively, an Alemite or equivalent fitting being provided for each such pipe. While not indicated in the drawings due to the fact that the same lies in circumferentially off-set relation from the indicated key, there is provided a diagonal bore through the plate 26 leading to the gear chamber from the delivery end of the pipe 27. Like-

wise, for lubricant-feeding purposes and as is customary, the two bushings 8 and 9 are drilled from the inner to the outer bearing surfaces.

Reverting now to the below-deck motor, it will be seen that a housing 30 receiving brake mechanism is boltably connected as a dependency to the spud, and that the motor is in turn suspended from the housing. Both the housing and its sub-jacent motor are of a diameter permitting the same to pass freely through the deck opening, and thus obviates any need for dismantling these parts from the above-deck capstan either when applying the capstan to the vessel or, should the need arise, removing same. Received in said housing 30 and functional to a brake wheel 31 keyed to the armature shaft 14 is the referred-to brake mechanism comprising brake shoes 32 which are carried by shoe-backing arms 33, one end of the arms being pivoted as at 34 and at the opposite ends being formed bifurcate to straddle trunnion heads 35 with each such bifurcation presenting a forked extremity to engage trunnion pins 35'. Said trunnion heads are bushed with internally-threaded liners—right and left hand threading—and working in the threads are screw elements 36' formed upon a spindle 36 revolvably mounted in bearing caps 37 and having connection at one end with a braking lever arm 38. A link 40 from the free end of such lever arm couples the latter to the activating rod 41 of a solenoid unit 42 suspended from a bracket extension 30' of the housing 30. Said threads of the trunnion head bushings are given a relatively steep pitch, with the braking arrangement being one in which the compression load of springs 44 is applied against the trunnion heads to normally urge the brake shoes into braking engagement with the brake wheel, the solenoid acting as an expanding agent in opposition to the springs for retracting the shoes to release the armature shaft 14 for operation of the capstan.

It is believed to be unnecessary to trace the operation in that the action of the capstan is thought to be self-evident from the foregoing description. Numerous departures from the illustrated and described preferred embodiment will suggest themselves, and I accordingly intend that the hereto annexed claims be read with only such limitations as are expressly introduced thereto to distinguish from prior knowledge in the art.

What I claim is:

1. The combination with a deck-mounted spud, and a capstan barrel revolvably journaled upon the spud and providing a gear chamber in its upper end: an electric motor hung directly from the spud to occupy a position below the deck and providing a power shaft extending upwardly in co-axial relation to the barrel into the gear chamber; differential planetary gearing housed in the gear chamber driven from the power shaft and driving the barrel; and oil pipes extending from a below-deck servicing point to the journal bearing for the barrel and to the gear chamber for supplying lubricant to the same.

2. The combination with a deck-mounted spud, and a capstan barrel revolvably journaled upon the spud and providing a gear chamber in its upper end: a below-deck electric motor directly suspended from the spud; a power shaft driven from the armature shaft of the motor and extending upwardly through the spud into the gear chamber of the barrel; reduction gearing housed in the gear chamber driven from the power shaft and driving the barrel; and lubricant-carrying

pipes extending from a point exposed for below-deck servicing to the journal bearing for the barrel and to the gear chamber.

3. The combination with a deck-mounted spud, and a capstan barrel revolvably journaled upon the spud and providing a gear chamber in its upper end: a below-deck brake housing suspended from the spud; brake mechanism housed in the brake housing; an electric motor suspended from the brake housing providing a power shaft extending axially of the barrel and as a prolongation of the armature shaft upwardly through the brake housing and the spud into the gear chamber, said power shaft being fitted with a brake wheel functional to the brake mechanism; and differential planetary gearing housed in the gear chamber, driven from the power shaft, and driving the barrel.

4. In a capstan: the combination of a deck-mounted spud forming an upstanding neck fitted externally with a coalescent journal-thrust bushing; a capstan barrel received over the spud providing an internal collar fitting the bushing and receiving a bearing therefrom and having an imperforate web supporting the collar and operating as a partitioning wall separating a chamber for the bearing described below from a gear chamber described above the web; an inspection cover for the gear chamber; a power shaft extending from a below-deck source of power through said neck of the spud into the gear chamber; an oil-sealed bearing for the shaft at the upper end of the spud neck; reduction gearing housed in the gear chamber and drive-coupling the power shaft to the capstan barrel; and lubricant-carrying pipes extending upwardly within the spud from a point exposed for below-deck servicing to the journal-thrust bushing and to the gear chamber.

5. In a capstan: the combination of a deck-mounted spud presenting an upstanding neck; a capstan barrel having a journal bearing on the neck and providing, above the journal bearing, an imperforate web surrounding the neck and operating as a partitioning wall separating the bearing chamber lying below from a gear chamber described above the web; an electric motor suspended directly from the spud to occupy a position below the deck and with its armature shaft in co-axial relation to the barrel; a power shaft extending as an axial prolongation of the armature shaft of the motor from said motor through the neck of the spud into the gear chamber; gearing housed in the gear chamber driven from the power shaft and driving the capstan barrel; and lubricant-carrying pipes extending from a point exposed for below-deck servicing to the journal bearing and to the gear chamber.

6. In a capstan: the combination of a spud-base adapted to be mounted upon a deck having an opening therethrough, and which base also provides an opening therethrough arranged to register with the deck opening; a spud detachably mounted upon the spud base and providing an upstanding neck; a capstan barrel revolvably mounted upon the neck and providing a gear chamber in its upper end; an electric motor arranged to pass through said openings of the spud base and the deck and suspended from the spud to occupy a position below the deck; a power shaft extending from said electric motor through the spud neck into the gear chamber of the barrel; and reduction gearing housed in the gear chamber and drive-coupling the power shaft to the capstan barrel.

7. In a capstan adapted to be applied upon a vessel's deck having an opening therethrough: the combination of a spud-base formed to a general ring shape and arranged to be fixedly anchored upon the deck to have the central opening of the spud-base register with the deck opening; a spud detachably secured to the spud-base; a capstan barrel revolubly supported by the spud and formed to provide a gear chamber lying above said registering openings; an electric motor of a size permitting the same to pass through said registering openings and suspended from the spud to occupy a position below the deck; a power shaft extending upwardly from the motor and through said registering openings into the gear chamber of the barrel; and reduction gearing housed in the gear chamber and drive-coupling the power shaft to the capstan barrel.

8. The combination with a deck-mounted spud, and a capstan barrel revolubly journaled upon the spud and providing a gear chamber: an electric motor and brake mechanism functional to the armature shaft thereof suspended from the spud to occupy a below-deck position; a power shaft extending as an axial prolongation of said armature shaft upwardly through the spud into

the gear chamber; and reduction gearing housed in the gear chamber and drive-coupling the power shaft to the capstan barrel.

9. In a winch structure adapted to be applied upon a vessel's deck having an opening therethrough: the combination of a mounting base having means for anchoring the same upon the deck to occupy a position in overlying relation to the deck opening and providing an opening therethrough which, when the base is so anchored, registers with the deck opening; a winch drum revolubly supported by said mounting base to occupy an above-deck position; an electric motor of a size permitting the same to pass through said deck opening and suspended from the mounting base to occupy a position below the deck; and a power shaft extending upwardly from the motor through said deck and base openings and having drive connection from its upper end with the winch drum for powering the latter.

10. Structure according to claim 9 providing oil pipes extending from a below-deck servicing point to the above-deck winch for supplying lubricant to the latter.

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