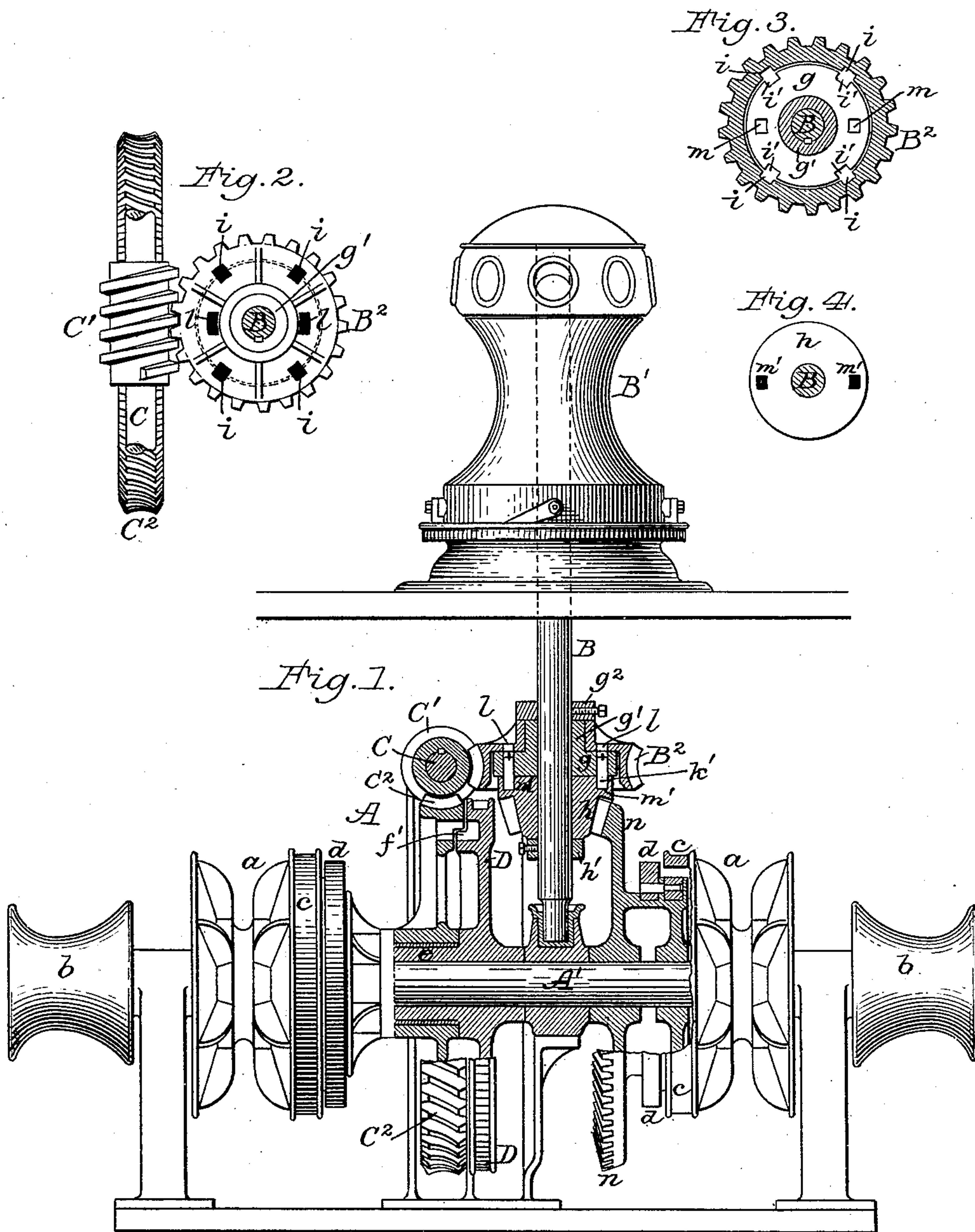


E. H. WHITNEY.
COMBINED SHIP'S WINDLASS AND CAPSTAN.

No. 446,825.

Patented Feb. 17, 1891.



Attest:
Philip F. Larnes.
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(No Model.)

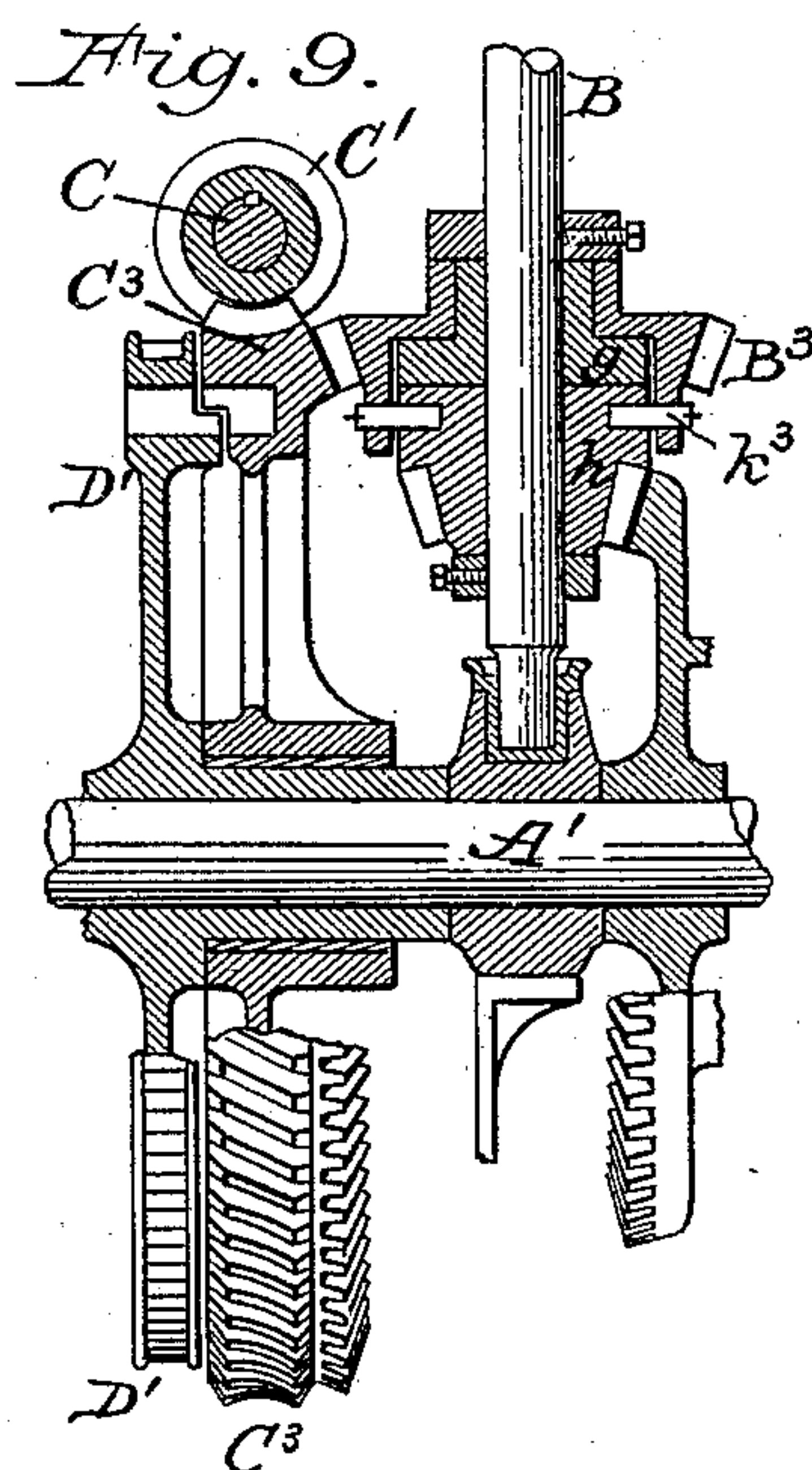
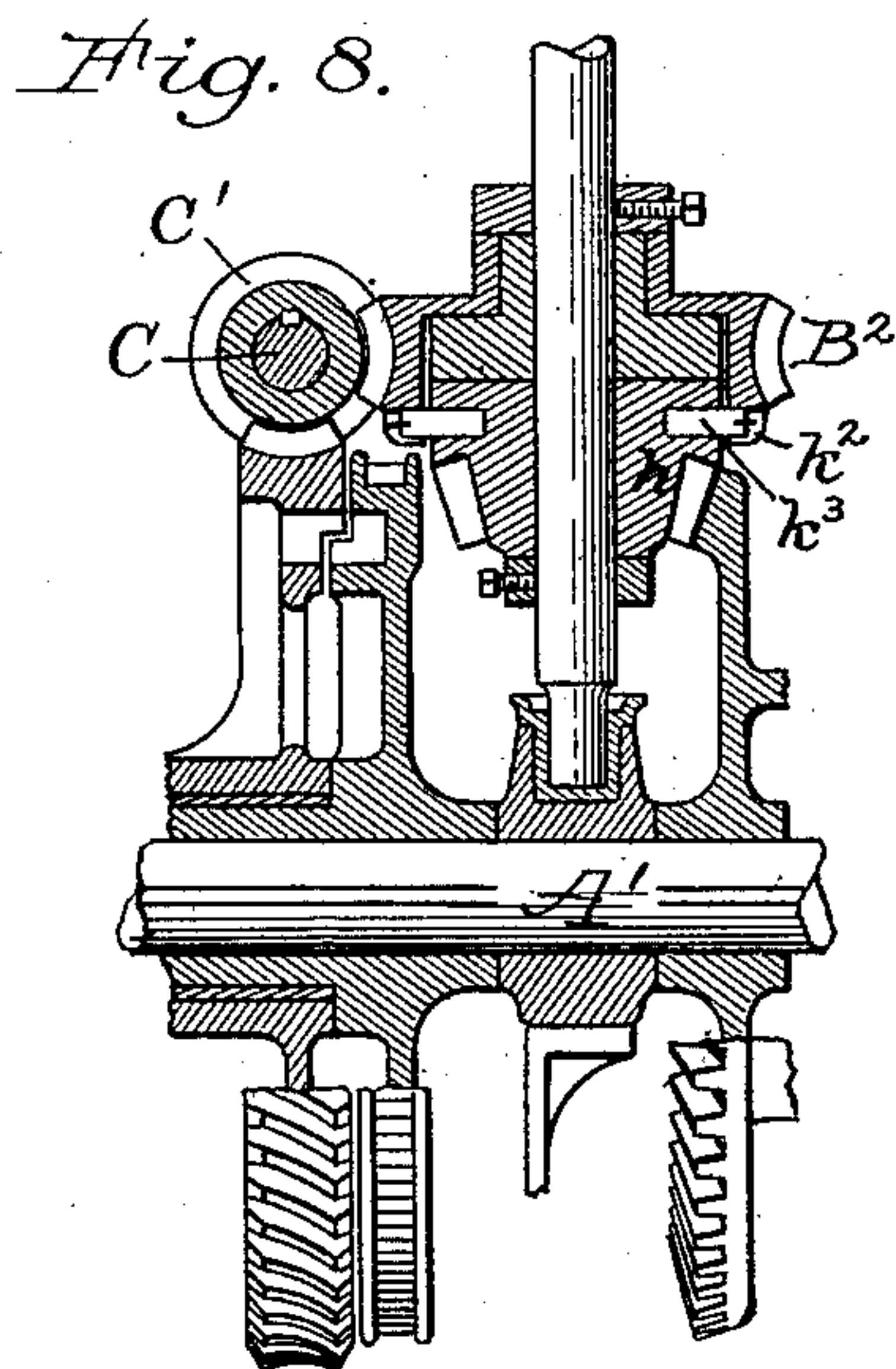
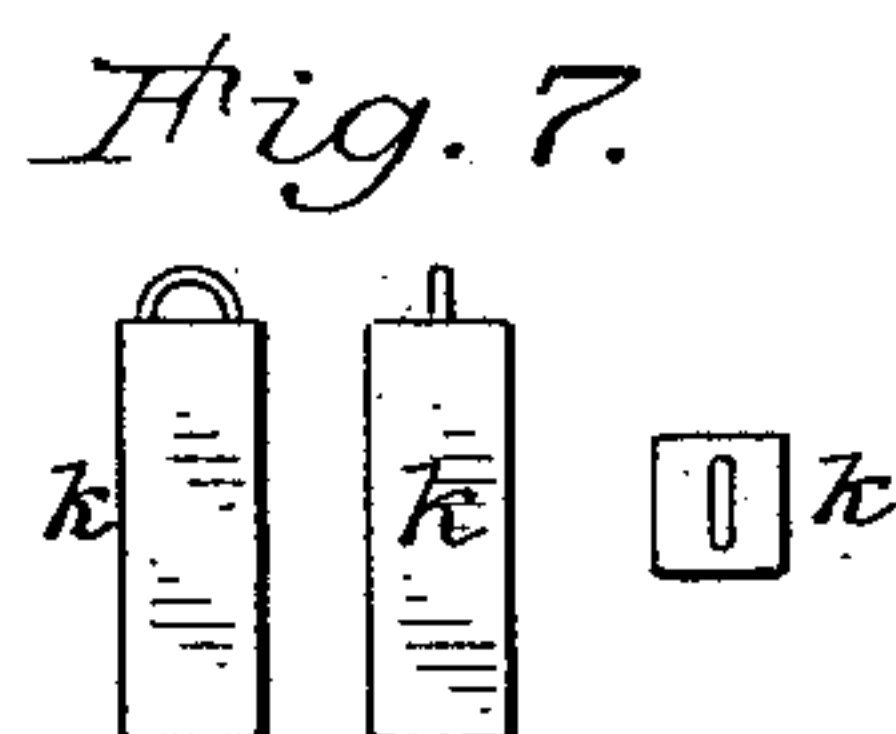
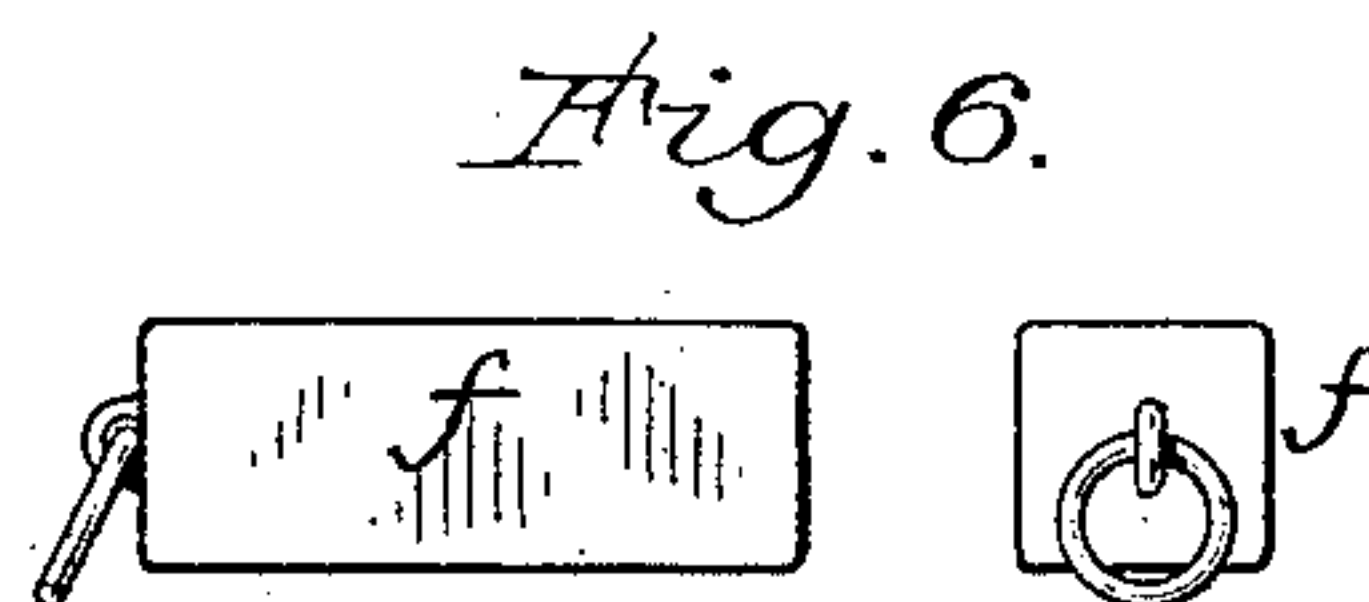
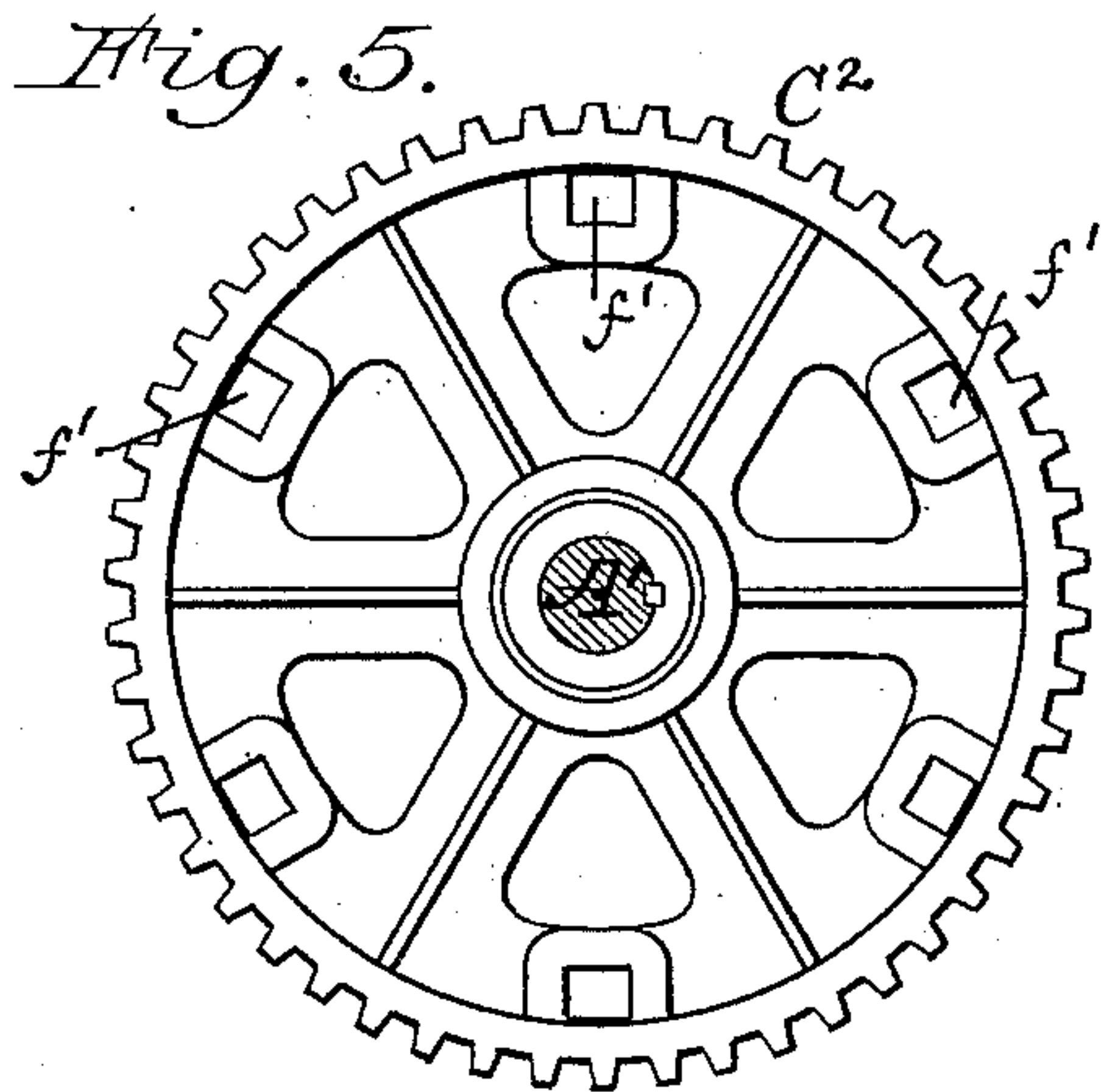
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UNITED STATES PATENT OFFICE.

EDWIN H. WHITNEY, OF EAST PROVIDENCE, RHODE ISLAND.

COMBINED SHIP'S WINDLASS AND CAPSTAN.

SPECIFICATION forming part of Letters Patent No. 446,825, dated February 17, 1891.

Application filed November 15, 1890. Serial No. 371,506. (No model.)

To all whom it may concern:

Be it known that I, EDWIN H. WHITNEY, of East Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Combined Ship Windlasses and Capstans; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of my invention.

My said improvements relate to that class of apparatus which embodies steam-driven worm-gearing for operating a windlass and capstan. I have devised my said improvements so as to secure such simplicity in construction and organization as involves economy in first cost as well as in maintenance, also substantial diminution in the weight of the machine without impairing its efficiency, accompanied with such compactness as will economize in space. I have also sought to enable the windlass to be not only driven at different speeds, (the engines being operated at their normal and most effective speed,) but also to drive the capstan at different speeds. To these ends I have for the first time, as I believe, so organized the capstan-gearing that it may be driven directly by the engine or main worm-shaft at one speed and by way of the windlass-shaft at a greater speed.

Another object of my invention is to provide for not only driving the windlass-shaft in both directions, but also to drive the capstan in both directions. The reversing of the windlass-shaft is a matter of well-known value, and the capacity for reversal at the capstan enables it to be conveniently worked not only for hoisting, but for safely lowering heavy bodies, and also for working a continuous line with suitable fixed blocks, as for warping lighters, to and from a ship, or from the shore, or a wreck, and in many other connections. To these ends all of the coupling-connections between the driven worm and the capstan-shaft whether directly or by way of the windlass-shaft, are positive, although detachable, connections, in that I employ block-keys, so that the engines on being reversed will reverse the rotation of the capstan or of the windlass. Variations in the capacities and modes of working apparatus of this general class are

of practical and substantial value, in that they provide for effective duty under the various contingencies at any time liable to be encountered on shipboard, and hence in my novel organization I have sought to secure a maximum of efficiency due to many variations provided for in the lines referred to. Block-keys have long been used as couplings in windlass and capstan-gearing, and so, also has worm-gearing; but I know of no prior organization involving their use in such novel combinations as I have now devised, all of which will be duly specified in appropriate clauses of claim hereunto annexed.

Referring to the drawings, Figure 1 illustrates so much of one of my novel machines as is deemed necessary for the purposes of this specification, the same being partially in front elevation and partially in vertical section on a line with the axis of the windlass-shaft. Fig. 2 in plan view illustrates a portion of the main or driving shaft and its worm, a large worm-gear on the windlass-shaft, and a smaller worm-gear on the capstan-shaft, both of said gears being in engagement with the one driving-worm, the capstan-shaft being in section and showing the several sockets in its worm-gear for the reception of block-keys. Fig. 3 is a lateral section of the capstan-shaft and its worm-gear, showing in top view a driving-head on said shaft within said gear and several sockets for block-keys. Fig. 4 is a top view of a normally-loose pinion on the capstan-shaft, with the latter shown in section. Fig. 5 is a side view of the large worm-gear, showing sockets for block-keys and the windlass-shaft in section. Figs. 6 and 7 illustrate, on an enlarged scale, block-keys respectively for use with the main worm-gear and with the capstan-worm and its driving-head. Fig. 8 illustrates a direct block-key connection between the main driving-shaft and the higher speed-gearing to the windlass-shaft. Fig. 9 illustrates gearing the capstan-shaft to the main driving-shaft by way of a large combined bevel and worm-gear and a beveled pinion instead of by a worm-gear on the capstan-shaft, the other gearing being as in Fig. 8.

The windlass A has a shaft A', carrying the wild-cats *a* and gipsy ends *b*, all as heretofore, with the usual brake-band heads *c*, and with driving-heads *d* organized with relation

to the windlass-shaft and the band-heads as disclosed in United States Letters Patent No. 403,356, issued to Frank S. Manton May 14, 1889.

5 The vertical capstan-shaft B, as in prior machines, is stepped in a bearing above the windlass-shaft, so that the axes of both are in the same vertical plane, and the capstan B' is, as usual, located on an upper deck, as indicated.

10 The engine-shaft or main driving-shaft C carries a single driving-worm C', which meshes with the large worm-gear C²; and the latter is loosely mounted upon a hub *e* of a windlass driving-head D, which is keyed to or fixed upon the windlass-shaft. The worm-gear C² and the windlass driving-head are provided with registering square hole or sockets *f*', and they are operatively coupled by means of one or more block-keys *f*, Fig. 6, which are readily inserted or removed from said sockets, all substantially as in certain forms of prior apparatus, and they enable the windlass to be operated forwardly or backwardly, the main shaft being driven in either direction by engines which are controlled by suitable reversing mechanism.

As a novel feature the capstan-shaft is so organized that it may be driven directly from the driving-worm or by said worm, by way of the windlass-shaft, and, as here shown, the capstan-shaft (located in the same vertical plane as the windlass-shaft) carries a worm-gear B², which is at right angles to the large worm-gear C², and meshes with the main driving-worm C' at its side, and with respect to this portion of my invention it is obviously immaterial in what manner the capstan worm-gear B² is mounted on the capstan-shaft, or what gear-coupling devices are employed, although minor portions of my invention involve the use of block-keys. In an annular recess in the under side of said worm-gear B² there is a driving-head *g*, fixedly keyed to the capstan-shaft B, and said head has a hub or sleeve *g*', on which the worm-gear B² is journaled, the shaft having above said sleeve a collar *g*², provided with a clamp-screw for properly securing the gear in place. Below the driving-head *g* there is a bevel pinion or gear *h*, loosely mounted on the capstan-shaft and secured so to its vertical position by a collar *h*' and its clamp-screw.

The upper portion or top of the worm-gear B² is provided with four square holes or sockets *i*, located near the rim, so that the lower portion of each socket is a slot at the inner side of the annular rim, as clearly indicated in Figs. 2 and 3. The driving-head *g* has at its periphery slots or recesses *i*', which register with the slots in the gear, so that each two of said recesses or slots constitute, in substance, an extension of a socket *i* for the reception of a block-key *k*, Fig. 7, thus securely, but detachably, coupling the worm-gear with the capstan-shaft by way of the driving-head. The worm-gear B² has also in its top rectan-

gular holes *l*, which are not sockets, but are mere gateways, affording access to the sockets *m* in the underlying driving-head *g*, which register with similar sockets *m*' in the top of the underlying pinion *h*, as indicated in Figs. 1 and 4, for the reception of one or two block-keys *k*'. The pinion *h* meshes with a large beveled gear *n*, which is keyed to or otherwise fixed upon the windlass-shaft, its hub serving as a part of the wild-cat driving-head *l*, before described.

With my machine thus organized it will be seen that when the block-keys *f* are in the sockets *f*' the worm-gear C² will be ready for service, and that with the block-keys *k* and *k*' removed from sockets *i* and *m* *m*' the worm-gear B² will be free to revolve without rotating the capstan-shaft B, and that the pinion *h* may also freely revolve. Under this adjustment the windlass may be driven as heretofore, and at a speed, say, of one revolution to fifty revolutions of the main shaft and its worm. If the block-keys *f* be removed and the block-keys *k* inserted in the small worm-gear B², and the worm-shaft operated, the windlass will rest and the capstan may be rotated at a speed of, say, nearly two and one-half revolutions to fifty revolutions of the main shaft. If the block-keys *f* be again inserted, as for driving the windlass, the block-keys *k* removed, and the block-keys *k*' inserted, the capstan may be rotated in the same direction as before by way of the large beveled gear *n*. The main shaft revolved, say, fifty revolutions will impart one revolution to the gear *n*, which will in that time cause the capstan-shaft to make, say, four revolutions; or, in other words, the capstan will be rotated much faster than when driven directly by way of the worm-gear B².

Although the capstan B' has a ratchet and foot-pawls, as indicated, the pawls can be inoperatively adjusted and the capstan driven backwardly at either of the two speed adjustments by reversing the engines, which are coupled to the main shaft C.

When the capstan-gearing is wholly uncoupled from the driving-head *g*, it is obvious that the windlass can be operated in either direction at one speed, or at a slower speed when the large worm-gear C² is freed from its keys and the capstan-gearing coupled, power being then communicated by way of the small worm-gear and the pinion to the large bevel-gear *n*. In thus operating the windlass the capstan would also be rotated, and this simultaneous operation is sometimes desirable, and although objectionable at times it is not wholly so, as it will serve to keep the capstan-shaft journals in good condition and be conducive to easy operation under hand-power by the use of handspikes, as when in cases of necessity both worm-gears must be uncoupled and the windlass operated either forwardly or backwardly by way of the capstan. It will, however, involve no departure from certain portions of my invention if the worm-gear B²

be capable of being coupled directly to the bevel-pinion gear without the intervention of the driving-head g —as, for instance, as illustrated in Fig. 8, wherein the worm-gear B^2 has a wide rim extending below its worm-teeth provided at its lower edge with notches or recesses k^2 . The upper portion of the beveled pinion h is of such a diameter that it nearly fills the annular recess in the worm-gear B^2 , and at its periphery it is provided with sockets registering with the notches k^2 , thus enabling laterally-inserted block-keys k^3 to be employed as connections, which will enable the main worm to slowly drive the windlass either backwardly or forwardly without rotation of the capstan-shaft.

Although certain portions of my invention depend upon the use of a worm-gear on the capstan-shaft in direct connection with the driving-worm, certain other portions of my invention are not so restricted, because the advantages incident to compactness and to the two speeds of the capstan and to its capacity for backward and forward rotation are attainable without that worm-gear on the capstan-shaft—as, for instance, as illustrated in Fig. 9, wherein the windlass driving-head D' and the large worm-gear C^3 are so arranged that the gear is at the inner side of the head instead of at its outer side, as shown in other figures. This large gear at the side of its rim is provided with beveled teeth, which mesh with a beveled pinion B^3 on the capstan-shaft B . The driving-head D' and gear C^3 are detachably coupled by block-keys f , as before, and when uncoupled, instead of the large worm-gear being functionless, as before, it now operates solely for gearing the capstan-shaft to the driving-worm, so that the capstan may be driven substantially as when in direct connection with the driving-worm by way of a worm-gear, and therefore the capstan-shaft is geared to the main shaft for working at one speed, and also geared to the windlass-shaft for working the capstan at a higher speed, as well as to enable the windlass to be operated at low speed by way of the capstan. The driving-head g and block-keys k and k' may be here used, as in the preferred form, and the block-keys k^3 here shown directly couple the gear B^3 with the beveled pinion h , as in Fig. 8, for proper operation with the large beveled gear n .

While I prefer to embody all of the mechanism shown, so as to provide for all of the capacities and modes of operation described, certain portions of my invention involve the use of sub-combinations of the mechanism shown—as, for instance, the main driving-shaft having a worm meshing with worm-gears, respectively, carried by the shafts of the windlass and the capstan constitutes a novel and valuable feature, regardless of the provisions by which the capstan and the windlass may be separately operated, or whereby either or both may be backwardly driven or the capstan operated at different speeds.

So, also, it is a novel and valuable feature to connect one reversibly-driven worm-shaft with two worm-gears, respectively, coupled by block-key connections to the windlass-shaft and the capstan-shaft, because then either or both the capstan and the windlass may be driven not only forwardly, as heretofore, but both or either may also be driven backwardly.

If the matters of simplicity and economy in space and construction should be in a measure ignored, certain advantages of portions of my improvements may be secured if in accordance with my invention a main driving-shaft be reversely-operated and provided with separate worms for respectively driving the capstan and the windlass, provided both of the co-operating worm-gears are furnished with block-key connections, and the gearing between the capstan-shaft and the windlass-shaft be so organized that either shaft may rotate in both directions, either independently of or in proper harmony with the other, as in my windlass.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a combined ship windlass and capstan, the combination, substantially as hereinbefore described, of a main worm-shaft adapted to be driven in either direction by its reversible engines, a windlass-shaft, a capstan-shaft which is detachably geared to said main shaft and also to the windlass-shaft, a worm-gear engaged by the main worm-shaft, a driving-head fixed on the windlass-shaft, and block-keys for detachably coupling said driving-head and worm-gear, whereby the windlass may be driven either backwardly or forwardly and with or without operating the capstan-shaft.

2. In a combined ship windlass and capstan, the combination, substantially as hereinbefore described, of a main worm-shaft adapted to be driven in either direction by its engines, and a windlass-shaft and a capstan-shaft, each having its own worm-gear and its own driving-head and both provided with block-key couplings, whereby the windlass and the capstan may be separately or simultaneously rotated either forwardly or backwardly according to the direction in which the main shaft is driven.

3. In a combined ship windlass and capstan, the combination, substantially as hereinbefore described, of a main driving-shaft carrying a single worm, a windlass-shaft, a capstan-shaft, and two worm-gears, respectively carried by the shafts of the capstan and windlass and meshing at right angles to each other with the worm on the driving-shaft.

4. In a combined ship windlass and capstan, the combination, substantially as hereinbefore described, of a main worm adapted to be reversibly driven by its engine, a capstan-shaft, a worm-gear meshing with said worm and detachably coupled to the capstan-

shaft by means of block-key connections, a beveled pinion carried on and detachably keyed to said capstan-shaft, and a windlass-shaft having a beveled gear fixed thereon and meshing with said pinion, whereby the windlass may be driven at low speed either backwardly or forwardly by the main shaft or by way of the capstan when the worm-gear on its shaft is disconnected therefrom.

10 5. In a combined ship windlass and capstan, the combination, substantially as hereinbefore described, of a main shaft carrying a single driving-worm, a windlass-shaft, a worm-gear detachably coupled to the windlass-shaft and engaging with said worm, a capstan-shaft, and a worm-gear detachably connected to the capstan-shaft and also engaging with said driving-worm, whereby power may be separately communicated from the one
15 20 main driving-worm to the capstan or to the windlass, or to both, simultaneously.

6. In a combined ship windlass and capstan, the combination, substantially as hereinbefore described, of a main shaft having a

driving-worm adapted to be reversibly driven by its engines, a windlass-shaft, a capstan-shaft, a worm-gear meshing with the driving-worm and detachably coupled to the capstan-shaft by means of block-key connections, a beveled pinion on the capstan-shaft detachably coupled thereto by means of block-key connections, a beveled gear meshing with said pinion and fixed upon the windlass-shaft, and a worm-gear meshing with the driving-worm and detachably coupled with the windlass-shaft by means of block-key connections, whereby the main shaft may drive the windlass and the capstan at different speeds, separately or together and forwardly or backwardly, and also whereby the capstan and the windlass may be disconnected from the main shaft and the windlass operated either forwardly or backwardly by rotating the capstan-shaft by way of the capstan.

EDWIN H. WHITNEY.

Witnesses:

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