

(No Model.)

4 Sheets—Sheet 1.

H. L. SMITH.  
CAPSTAN.

No. 572,457.

Patented Dec. 1, 1896.

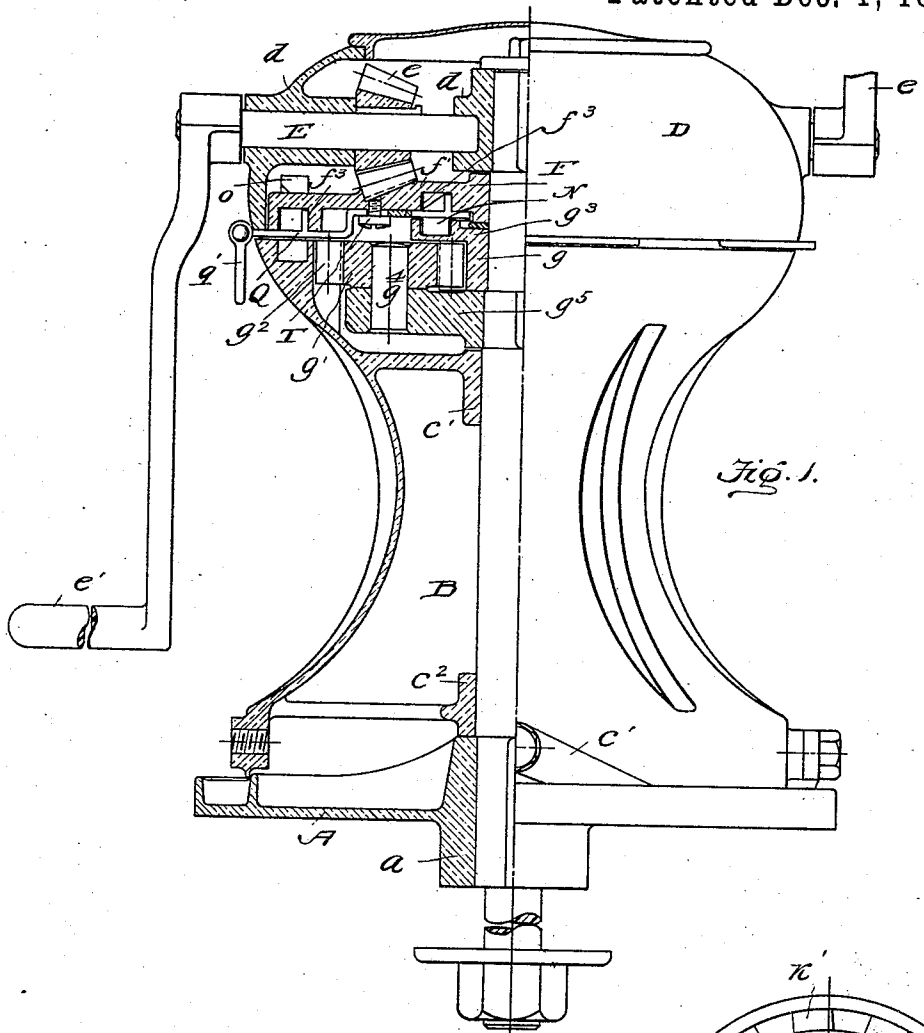
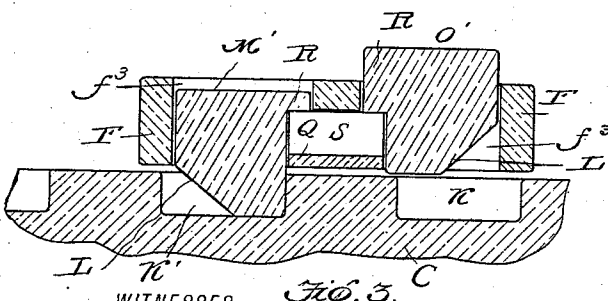


Fig. 1.



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Fig. 3.

Wm. E. Ashlee  
H. J. Berukoff

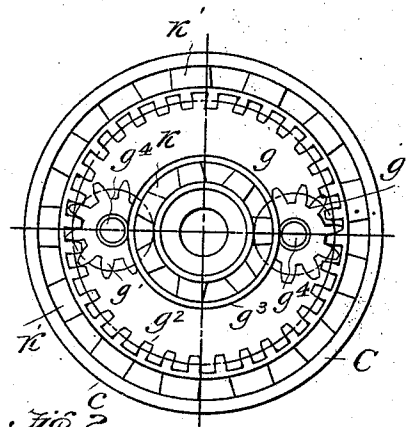


Fig. 2.

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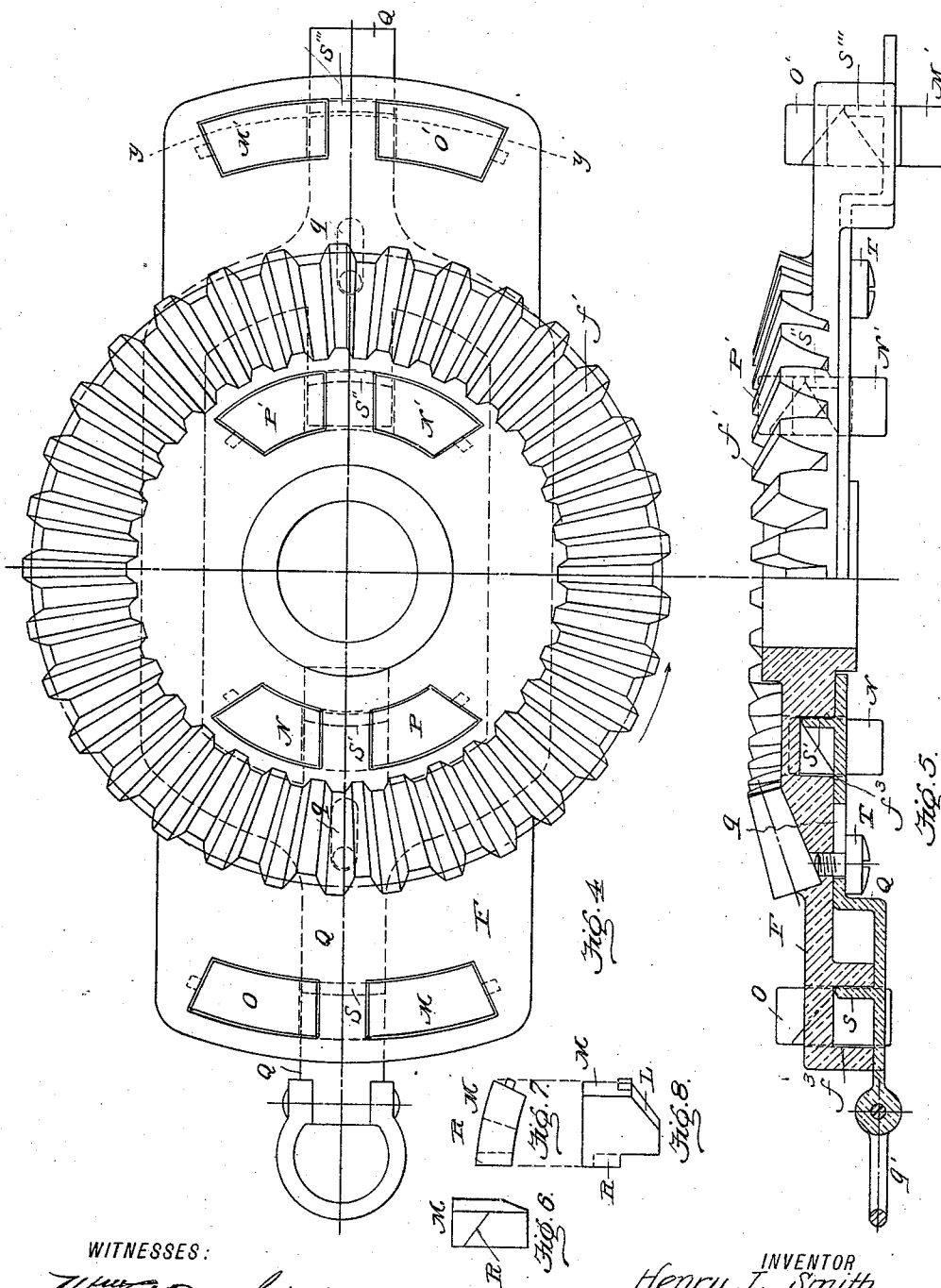
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H. L. SMITH.  
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4 Sheets—Sheet 2.

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(No Model.)

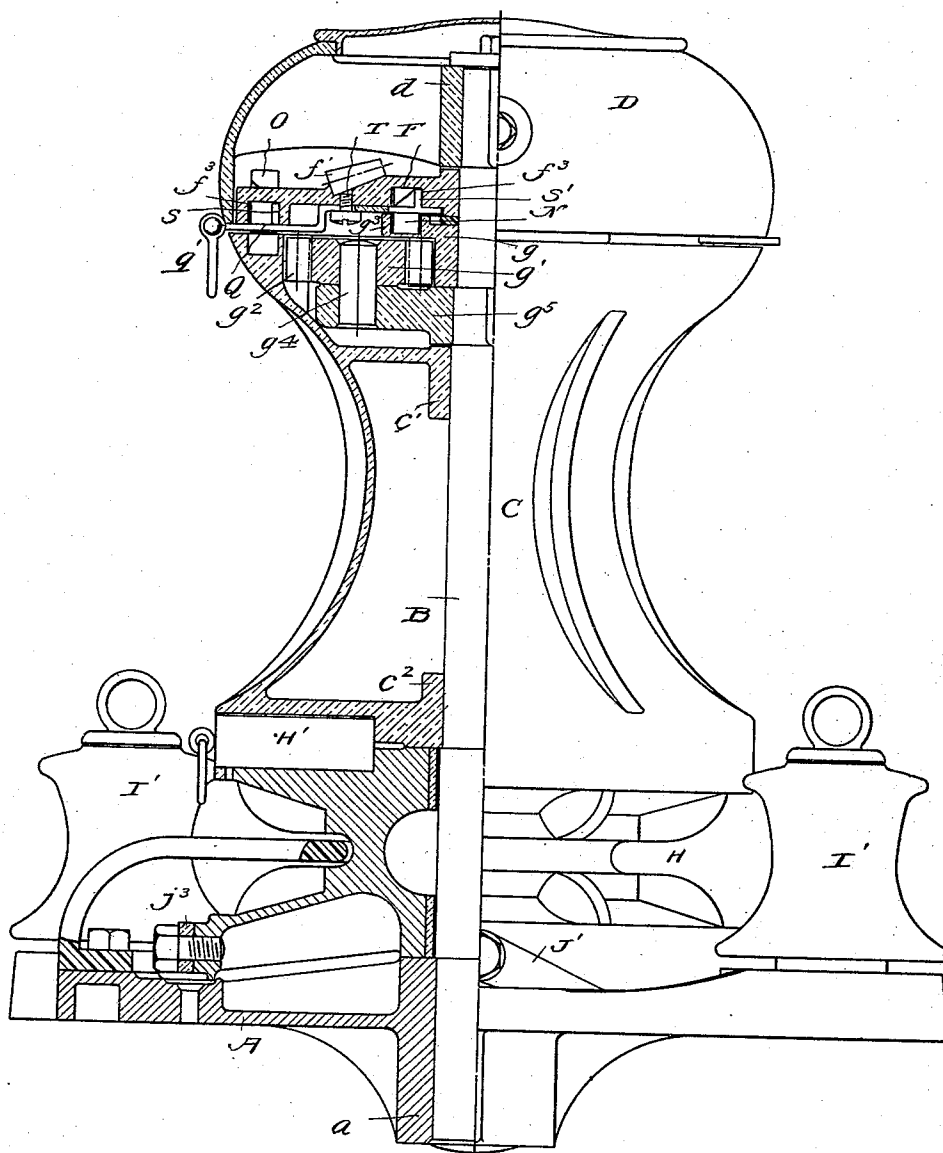
H. L. SMITH.  
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4 Sheets—Sheet 3.

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Fig. 9.



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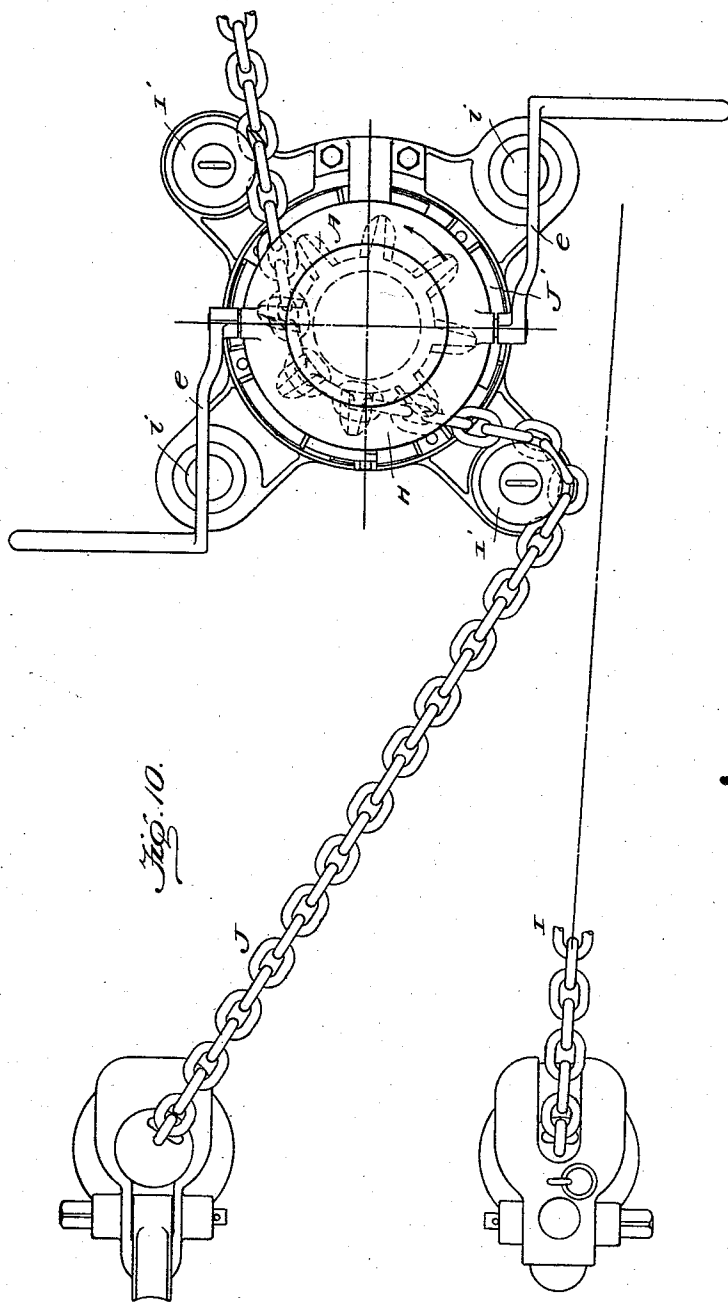
(No Model.)

4 Sheets—Sheet 4.

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# UNITED STATES PATENT OFFICE.

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## CAPSTAN.

SPECIFICATION forming part of Letters Patent No. 572,457, dated December 1, 1896.

Application filed June 3, 1896. Serial No. 594,141. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY L. SMITH, a citizen of the United States, residing at Seekonk, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Capstans; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to an improvement in capstans arranged to be driven by cranks and gears at variable speeds and in either of two directions of rotation at the will of the men operating the cranks, and it is more especially designed as an improvement in capstans of the class described in Letters Patent of the United States No. 231,949, and granted September 7, 1880, to Frank Allen and Frank A. Grater, to which reference is made. In the capstan described in said Letters Patent No. 231,949 provision is made for rotating the capstan-barrel at rapid speed for the purpose of hauling in the slack of the anchor-chain when the anchor is to be raised, and provision is also made for increasing the power, through compound gearing, applied to the capstan-barrel for the purpose of exerting greater strain or pull on the anchor-chain when the anchor itself is reached and is to be drawn from the earth. This capstan (Patent No. 231,949) could be operated at will through single or double gearing by reversing the direction of rotation of the cranks, the barrel always revolving in the same direction, but it was not possible to turn the barrel by the cranks in the reverse direction. It is sometimes desirable to have the capstan so arranged that the barrel can be driven in either direction at either speed, and it is to accomplish this object that I have invented the form of capstan which I now desire to secure by Letters Patent.

Reference being had to Patent No. 231,949, hereinbefore referred to, it will be seen that the capstan was provided with four ratchet-pawls working in pairs and holding in one direction. In a modified form I have used these four pawls in a substantially similar way, but I have added four more pawls of

modified form, making eight in all, the four new pawls being exactly like the others, but of the reverse hand, so as to hold in the opposite direction. It is evident that the same number of pawls as before must be in action at once and the other set must be thrown up out of contact with the pockets. To do this, I employ a novel form of pawl-tripper, hereinafter described. It is also evident that the pockets of the capstan (Patent No. 231,949) can be used only in one direction, and there must be provided either an extra and reverse set of pockets or else the form of the original pockets must be modified.

I do not restrict my claim to any particular number or shape of pawls or pockets, but the form in which I prefer to construct my capstan and which I consider to be the best for practical use is that which I will now proceed to explain, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation showing the capstan, one half being in vertical section. Fig. 2 is a plan view of the upper end of the barrel and the compound gear placed within the barrel, showing the pockets in the barrel in which the pawls in the driving-disk engage, so as to drive the barrel directly, and also the pockets in the central driving-pinion by which the capstan is driven with increased power. Fig. 3 is a sectional view on the plane *yy* of Fig. 4, showing the pawls, also section of the pockets in top of capstan-barrel. Fig. 4 is an enlarged plan view of the driving-disk, showing the pawls and also showing the pawl-tripper in dotted outline. Fig. 5 is an elevation of the devices shown by Fig. 4, one half being shown in section. Fig. 6 is a side elevation of one of the pawls. Fig. 7 is a plan elevation of one of the pawls. Fig. 8 is a front elevation of one of the pawls. Fig. 9 is a front elevation, half in vertical section, showing a modified capstan provided with a wildcat or chain wheel. Fig. 10 is a plan view of same, showing a method of taking in chain, using rolls to guide the chain, so as to give the required contact with the lugs of the wildcat.

Like letters of reference denote corresponding parts in all the figures of the drawings.

A designates the base of the capstan, which

is firmly secured to the deck by bolts. Said base A has a central sleeve  $a$ , through which passes the shaft or spindle B, which is stationary. On this spindle B is fitted the barrel C, which is provided with two bearings surrounding the spindle, the barrel-bearings being indicated at  $c' c^2$ . This barrel C is free to revolve on the spindle in either direction, but it is provided with pawls  $C'$ , which may be changed to hold the barrel from turning in the reverse direction from that in which it is desired to turn the barrel.

To the upper end of the stationary spindle B is fixed a capstan-head D, provided with bearings  $d d$  for the reception of the crank-shaft E, the ends of which shaft are suitably formed for the attachment of the cranks  $e' e$ . On this crank-shaft E is keyed or otherwise fastened the beveled pinion  $e$ , the teeth of which mesh with the teeth of a large bevel-gear  $f'$ , provided on the horizontal rotatable plate or disk F, which is fitted loosely on the spindle B and is designed to be driven by the motion imparted to the gear  $f'$  by the pinion  $e$  and crank-shaft E. This rotatable disk or plate F is equipped with four pairs of gravity-pawls, which are loosely fitted in pockets  $f^3$ , provided in said plate or disk, and these pawls are arranged so that the disk may be connected either directly with the capstan-barrel to turn it at a high or low speed by reversing the direction of the cranks, either to the right or left, according to the adjustment of the pawl-tripper.

M M' designate one pair of pawls fitted in the plate or disk F, near the ends thereof, and arranged to engage with pockets K' in the upper edge of the capstan-barrel when the plate or disk F is to be connected directly to said capstan-barrel for the purpose of turning the latter in the same direction with said plate or disk and at the same speed.

O O' is another pair of pawls, but of reverse hand to the pawls M M', and these pawls O O' are fitted in pockets in said disk or plate F to also engage with the pockets K' in the upper edge of the capstan-barrel C when said barrel is to be rotated in the reverse direction, the pawls O O' being arranged to connect the barrel C and disk or plate together to insure the barrel turning with the plate or disk. Obviously the set of pawls O O' must be out of action and out of engagement with the capstan-barrel when the pawls M M' are in engagement with said barrel, and vice versa, and this is effected by constructing the pawls with beveled heels and lugs R and by providing lugs on the pawl-tripper Q to engage with the beveled lugs or heels R on the pawls, as shown by Figs. 3 and 5.

The pawl-tripper is shown by Figs. 4 and 5 as consisting of a slidable plate Q, applied or fitted to the lower or under side of the disk or plate F, to which said pawl-tripper is attached by the bolts T passing through the slots  $q$ , provided in said pawl-tripper plate, one end of the pawl-tripper plate extending

beyond the capstan-barrel and having a suitable loop  $q'$  for sliding the pawl-tripper within the limit of the length of the slots  $q$ .

The pawls O O' are fitted in the plate or disk F adjacent to the pawls M M', respectively, as shown by Fig. 4; and the heels of the pawls O O' are beveled in the reverse direction to the heels of the pawls M M' in order that when the pawl-tripper is adjusted to one position the pawls O O' will be lifted and held in a raised position free from the pockets in the capstan-barrel while the pawls M M' are lowered into position to engage with said pockets in the capstan-barrel, but when the pawl-tripper is changed to its reverse position, as by moving it endwise, the pawls M M' will be raised and held free from the pockets in the capstan-barrel.

The faces or noses of all the pawls are beveled, as indicated at L in Fig. 8, to allow the pawls to ride out of the pockets when the driving disk or plate F is revolved in the opposite direction from the direction in which it is desired the pawl shall drive. Thus the pawls O O' have beveled noses or faces L, which are of reverse hand to the beveled noses or faces L of the pawls M M', and the set of pawls M M' are arranged to drive the capstan-barrel C to the right when the disk or plate F is turned to the right, but the pawls O O' are arranged to engage with the barrel C and drive it to the left when the driving disk or plate F is rotated by the cranks, because the pawls O O' only engage with the pockets in the barrel C to hold and drive it in the contrary direction to the pawls M M'. Said driving disk or plate F is provided with two other pairs of pawls N N' and P P', constructed and arranged similarly to the pawls M M' and O O', but the pawls N N' and P P' are arranged nearer the center of the driving disk or plate. The pawls N N' have beveled noses or faces and beveled heels R, corresponding to the inclination of the faces and heels on the pawls M M', while the pawls P P' have beveled faces L and beveled heels R corresponding to the bevels on the pawls O O'.

The pawls N N' and P P' are adapted to engage, according to the adjustment of the pawl-tripper Q, with pockets K in the head  $g^3$  of the pinion  $g$ , which is fitted loosely on the fixed spindle B, and this pinion  $g$  meshes with the gear-wheels  $g' g'$ , which are mounted loosely on fixed pins or arbors  $g^4$ , fastened to a cross-bar  $g^5$ , which is fixed to the spindle B, said gear-wheels  $g' g'$  meshing with a circular rack  $g^2$  on the inside of the capstan-barrel. The loose pinion  $g$  and gears  $g' g'$  constitute the compound gear by which the capstan-barrel may be driven at slow speed, but with increased power, on a reversal of the cranks.

The pawl-tripper Q has projections or lugs S S' S<sup>2</sup> S<sup>3</sup>, corresponding in number to the pairs of pawls M M', O O', N N', and P P', and each projection or lug is adapted to engage with two adjacent pawls. Thus the lug

S engages with the reversely-slanting heels on the pawls M O, the projection S' with the reversely-slanting heels on pawls P N, the projection S<sup>2</sup> with the reverse heels of pawls N' P', and projection S<sup>3</sup> with pawls M' O'.

The heels R of the four pairs of pawls are so inclined or slanted that when the pawl-tripper Q is in the position shown by Figs. 4 and 5 the projections on said pawl-tripper operate to lift the pawls O O' and P P' out of contact with the pockets in the capstan-barrel C and the pockets in the central loose pinion *g* while the pawls M M' and N N' are in working position. If the cranks are turned to rotate the disk F to the right, the pawls M M' operate to turn the capstan-barrel at the same speed and in the same direction with the disk, the pawls N N' slipping idly over the walls of the pockets in the head of the loose pinion *g*; but if the cranks are reversed to turn the disk F in the reverse direction the pawls M M' slip idly over the pockets in the capstan-barrel, while the pawls N N' engage with the pockets K' in the loose pinion *g*, thus making said pinion *g* fast with the disk F and rotating the pinion *g* to drive the gears *g'*, which in turn drive the capstan-barrel in the same direction, but at slower speed and with increased power, as when the pawls M M' were in action.

If the pawl-tripper Q be shifted so that the projections are in the opposite sides of the pockets in the driving plate or disk F, the positions of the pawls will be reversed, that is, the pawls M M' and N N' will be thrown out of action and the pawls O O' and P P' will be brought into action. Now when the cranks are turned to drive the disk or plate F to the left the pawls O O' engage with the pockets in the capstan-barrel C, and thus drive the barrel in the same direction and at the same speed as the driving-disk, but if the direction of the cranks is reversed the pawls P P' engage with the pinion *g* to drive the gears *g'* and rotate the barrel C in the same direction as it was driven by the pawls O O'. It will thus be seen that by proper adjustment of the slidable pawl-tripper the capstan-barrel may be turned in either direction and that it may be driven at fast or slow speed by reversing the direction of the cranks.

In Figs. 9 and 10 I have shown one adaptation of the windlass in which it is important that the capstan-barrel may be rotated in either direction and at variable speeds for the purpose of quickly taking in slack cable or chain by rapid rotation of said capstan-barrel and for hauling the anchor out of the earth at a slow speed, but with increased power.

When this capstan is used in the combination with a wildcat, it is important that it should be capable of turning in both directions, for as will be seen in the accompanying drawings, Fig. 10, if the wildcat H turned only in the direction indicated by the arrow it would be necessary to lift the starboard

chain I over the windlass each time the starboard anchor was hoisted. In the arrangement here shown it is only necessary to remove the rolls I' I', which allows the port chain J to lead in a straight line from the deck-pipe E to the bow of the boat, and is thus cleared from the windlass. Now the rolls I' I' may be placed in the sockets *i i*, and the starboard chain I placed in the same relative position as the port chain J here shown. Then by reversing the direction of the wildcat through the capstan-barrel C and the driving-gears, as has been explained, the starboard anchor may be raised. The wildcat H, as shown in Fig. 9, may be driven directly from the capstan C by the block-key H' or by any other suitable method. The wildcat H has retaining-pawls J' J', which may be turned over so as to hold in the opposite direction when the direction of the wildcat is reversed.

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

1. In a crank-capstan, substantially such as herein described, the combination with a crank-operated driving-shaft, a rotatable driving disk or plate geared with said shaft, a capstan-barrel, and a compound gear, of two independent sets of pawls all carried by said rotatable driving disk or plate and adapted to engage with said capstan-barrel or with the compound gear, and a single pawl-tripper also carried by the rotatable driving disk or plate in operative relation to all of the pawls and adapted to throw one set of pawls into engagement with the barrel or the other set of pawls into operative relation to the compound gear, whereby the single pawl-tripper may control the pawls and cause the capstan-barrel to be rotated in either direction and at variable speeds from the driving-shaft, as set forth.

2. In a crank-capstan, the combination with a capstan-barrel, of a driving mechanism substantially such as specified, embracing a compound gear, two sets of pawls of reverse hand, and a single pawl-tripper carried by the driving mechanism and arranged at all times in operative relation to the two sets of pawls, said pawl-tripper engaging normally with one set of pawls to hold the same out of action and free from the other set of pawls to adapt the latter or free set of pawls to engage with said capstan-barrel and compound gear, whereby the capstan-barrel may be rotated in either direction by adjustment of the pawl-tripper and at either fast or slow speed by reversal of the crank-shaft of the driving mechanism, as set forth.

3. In a crank-capstan, substantially such as described, the combination with a crank-operated driving-shaft, and a rotatable driving disk or plate geared thereto, of a capstan-barrel having a plurality of pawl-pockets, two independent sets of pawls of reverse hands all carried by said rotatable disk or plate and

two pairs of which pawls are arranged to engage alternately with said capstan-barrel, a compound gear engaging with said capstan-barrel and arranged in such relation to the driving disk or plate as to enable two other pairs of pawls to engage alternately with said compound gear, and a single slidable pawl-tripper carried by said rotatable driving plate or disk in operative relation at all times to the whole series of pawls and adapted to permit two pairs of pawls to engage with the capstan-barrel or with the compound gear, for purposes described, substantially as set forth.

4. In a crank-capstan, the combination with a driving-shaft, a capstan-barrel, a compound gear, and a rotatable driving disk or plate, of two sets of pawls of reverse hand carried by said driving disk or plate in position to engage with said capstan-barrel and with one member of the compound gear, and a slidable tripper-plate carried by said driving-disk in operative relation to all the pawls and adapted to hold one set of pawls out of action while allowing the other sets of pawls to engage with the barrel and compound gear, each pawl having a beveled face and a beveled heel or lug to ride upon a projection on the pawl-tripper plate, as and for the purposes described.

5. In a crank-capstan, the combination with a driving-shaft, a barrel, and a compound gear, of a rotatable driving disk or plate between said driving-shaft and compound gear, and provided with a plurality of pawl-pockets two sets of vertically-slidable pawls of reverse hand which are fitted in the pockets of driving plate or disk and either set of pawls adapted to have its members engage with said barrel or the compound gear according to the direction of rotation of the driving-shaft, and a slidable pawl-tripper attached to said driv-

ing plate or disk and having means to engage with either set of pawls to throw them out of operative relation to the barrel and compound gear and leave the other set of pawls free to engage with said barrel and compound gear, as set forth.

6. In a crank-capstan, the combination with a driving-shaft, a barrel, and a compound gear, of a driving plate or disk, a set of pawls of one hand carried by said driving plate or disk, as O, O', P, P', another set of pawls of reverse hand, as M, M', N, N', also carried by said driving plate or disk, and a pawl-tripper slidably attached to the driving disk or plate and engaging with either set of pawls to throw them out of operative relation to the barrel and compound gear, as and for the purposes described.

7. In a crank-capstan, the driving plate or disk having a number of pawl-pockets, the two sets of pawls of reverse hand slidably fitted in the pockets of said disk or plate and each pawl having a beveled heel, and a pawl-tripper attached to said driving disk or plate and having two sets of cam-lugs corresponding in number to the pawls of the two sets, each set of cam-lugs arranged to ride against the beveled heels of its corresponding set of pawls to raise them when the pawl-tripper is in one position and to lower said pawls when the tripper is reversed, in combination with a capstan-barrel, a driving-shaft geared to the plate or disk, and a compound gear, the whole arranged and combined for service as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY L. SMITH.

Witnesses:

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CHAS. T. PRATT.