July 11, 1933. F. BELT 1,917,691

CAPSTAN

Filed July 16, 1929

Fig 1.

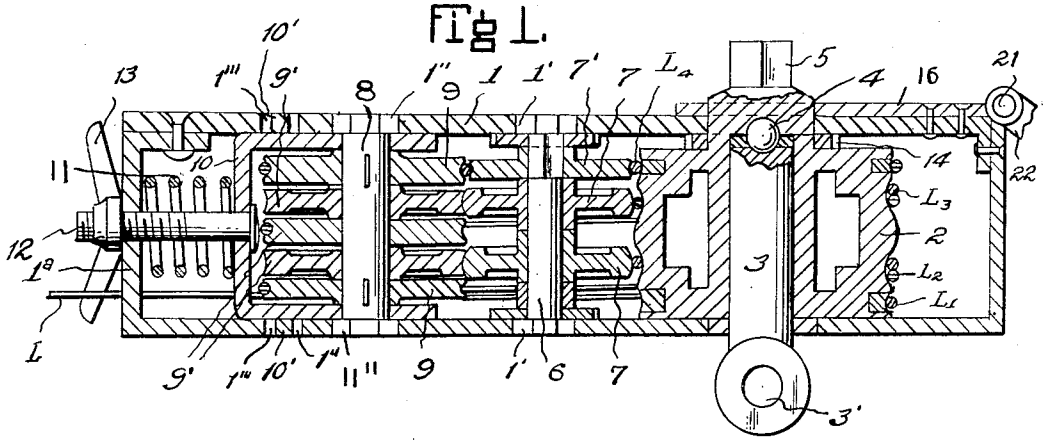


Fig 2.

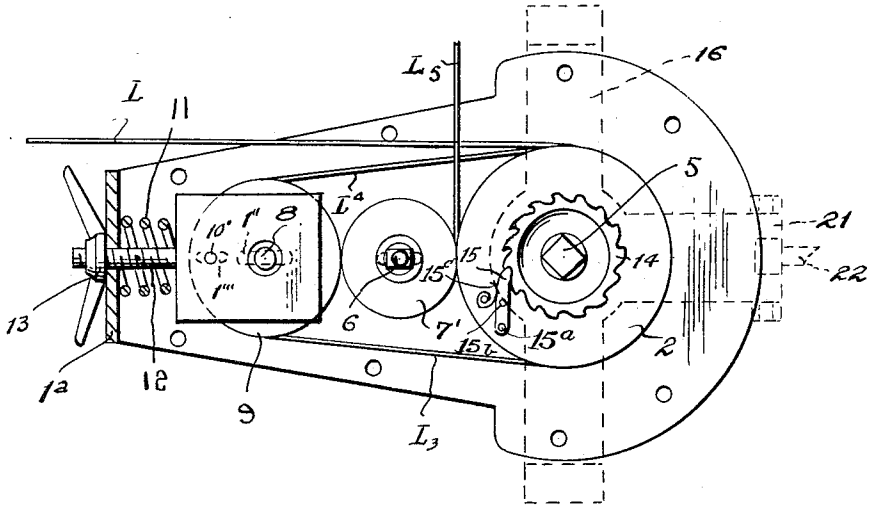
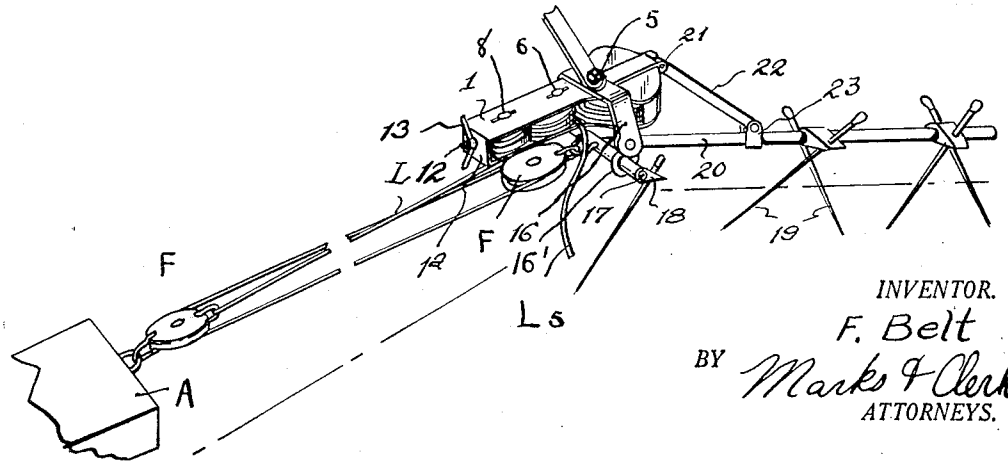


Fig 3.



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UNITED STATES PATENT OFFICE

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CAPSTAN

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This invention relates to improvements in capstans. The usual capstan as used on ships and in harbours consists essentially of a revolvable drum, around which several turns of the tow-rope are made. The free end of the tow-rope must then be submitted to a certain continuous tension in order to maintain the friction necessary to hold or haul the load. This simple type of capstan is rendered unsuitable for transportable use by its great weight, and by the fact that it requires at least two men to operate it—one to man the capstan itself and another to maintain the tension of the free end of the tow rope.

The object of the present invention is to provide an easily transportable capstan, which can be carried, mounted, and operated by one man, so that it can be carried for instance on board vehicles of all kinds, especially motor-cars and lorries, ready for use in the case of emergency to overcome obstacles or for salvage work. This object is attained in principle by providing pressure rollers which automatically clamp the running-out end of the tow-rope and which are pressed against the capstan drum by means of carrier rollers, the pressure of the latter on the pressure rollers and through these on the capstan drum being exercised by the pull of the load on the tow-rope, which is wound round both the capstan drum and the carrier rollers. In order to provide the necessary pressure before the load is taken up a pressure device for hand operation is provided. After withdrawing this initial pressure and releasing the ratchet of the capstan drum, the rope can be drawn through the apparatus in either direction to any extent, for the purpose of hanging on the load and taking up slack.

The capstan device is illustrated by the drawing in which Fig. 1 is a longitudinal section of the capstan case, Fig. 2 is a sectional view with the covering plate removed, and Fig. 3 is a view in perspective of the whole apparatus combined with pulley-blocks as set for work.

As shown in Figs. 1 and 2 the apparatus consists of a case 1, within which the capstan drum 2 is easily revolvable on an axle 3, through the ball-bearing 4, one end of the capstan drum 2 being provided with a square head 5 projecting through the cover of the case, and which can be turned by hand by means of a crank. Two freely revolvable rollers 7 and one keyed pressure roller 7′ are engageable with the drum 2 and are mounted on an axle 6, which is mounted in slots 1′ in the case 1 so as to be slidable in a direction at right angles to the axle of the capstan drum. At the side of the axle 6 opposite the axle 3 and in line with the two latter axles an axle 8 is mounted in the casing 1. Two carrier rollers 9 are keyed on the axle 8 and intermediate rollers 9′ are loosely mounted on the axle 8. For the purpose of moving the axle 8 in the case 1 a carriage 10 is provided, in which the axle 8 is firmly held and which is pressed in the direction of the capstan drum 2 by means of a spiral spring 11, which is supported by the cover 1*a* of the case 1. The pressing action of this spring can be withdrawn by means of the tension screw 12 which is revolvably connected to the carriage 10 and can be tightened by means of the butterfly-screw 13 thus compressing the spiral spring 11 and reducing the pressure on the axle 8, so that the latter becomes freely slidable in the slots 1″ of the case 1. To ensure its guidance in the case the carriage 10 is provided with lugs 10′ which engage in parallel slots 1‴ of the casing 1.

The capstan drum 2 is prevented from running back under load by means of the usual type of ratchet wheel 14 and pawl 15 which latter is pivoted at 15*a* and provided with a finger hold 15*b* projecting through an arcuate slot so as to be conveniently accessible. The pawl is spring pressed as indicated at 15*c*.

The case 1 is fastened to the ground by means of a stirrup 16 provided with eyes 16′ in line with the eye 3′ of the capstan axle 3, by means of which the case 1 is tiltably connected to the tubular carrying support 17. This support is fitted into bearing brackets 18, which are provided with slanting holes through which pegs or nails 19 can be driven, thus anchoring the apparatus securely to the

ground. Connected at right angles to the tubular ground-support 17 is a similar support 20 which is also provided with slanting holes for pegs or nails. The case 1 is further provided with a back support 22 connected to it with a hinge joint 21 and possessing at its free end a clamping device, by means of which it can be slid along the ground support 20 and clamped thereto at any required point. By adjustment of the back support 22 the case 1 can be tilted about the axle 17 to any required angle, so that the capstan axle 3 can always be set at right angles to the direction which the tow-rope takes up under load. In Fig. 3 the capstan case is shown in a raised position; it can however be equally well tilted downwards. The functioning of the apparatus is as follows:—

The tow-rope L is first wound once round the capstan drum at L′, then round the carrier roller 9, back to the capstan drum 2 round which it is again wound in the groove L_2, after which it is again carried round the intermediate carrier roller 9′, once more round the capstan drum in the groove L_3, to the upper carrier roller 9, after which the free end is brought out clear of the apparatus through groove L_4 between the pressure roller 7 and the capstan drum 2. The threading in of the tow-rope (normally a steel wire cord of appropriately small diameter) is carried out once and for all before delivery of the apparatus to the user, who has only to free the pawl 15 in order to be able to shorten or lengthen the tow-rope available for hauling according to the needs of the moment.

In use the two ground bars 17 and 20 are first firmly anchored by means of pegs or pins in the ground in the required position, the pitch of the capstan case is then adjusted to correspond with the direction the tow-line will take up under load and fixed in this position by means of the clamping device 23, the pawl 15 is then freed and the tow-line pulled through the case until the slack between the capstan case and the load has been taken up. Then by loosening the hand nut 13 the bolt 12 is allowed to move longitudinally and permits the pressure of the spiral spring 11 to be brought to bear on the carriage 10, which presses the carrier rollers 9 and 9′ on the axle 8 against the pressure rollers 7 and 7′ on the axle 6, with the result that the pressure rollers press the turns of the tow-line L_2 L_3 L_4 against the capstan drum 2, and in particular the running out end L_5 is firmly gripped between the upper groove of the capstan drum and the upper pressure roller 7′. The pawl 15 is then engaged in the ratchet-wheel 14, and the capstan wound in the usual way by means of a crank applied to the square head 5.

In order to increase the hauling power of the capstan, pulley blocks F can be used in connection with it (as illustrated in Fig. 3 which shows how the apparatus can be used for pulling a car A up a slope).

For lighter loads the apparatus can be considerably simplified by reducing the number of turns round the capstan drum and the number of the pressure and carrier rollers.

The anchorage of the capstan by means of pins or pegs driven slantwise through the ground supports depends for its effectiveness upon the gripping of as great a cubic volume of the foundation material (earth) as possible.

The cooperation of the thus anchored capstan device with pulley blocks allows of the development of any desired hauling power within the range of the use described, and that without increasing the size and weight of the apparatus beyond the limits within which it is possible for one man to carry and mount it. For the purpose of attaching pulley blocks the anchorage supports of the capstan device are provided with means for making fast the hook of a pulley block.

I claim:—

1. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial movement in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned.

2. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial movement in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned, said pressure rollers being of less diameter than the capstan drum and carrier rollers and disposed out of engagement with the cable.

3. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial move-

ment in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned, and pressure exerting means acting on certain of the rollers tending to displace the pressure rollers in the direction of the capstan drum.

4. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial movement in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned, and pressure exerting means acting on certain of the rollers tending to displace the pressure rollers in the direction of the capstan drum, and means for adjustably limiting the movement of the rollers under the influence of the pressure exerting means.

5. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial movement in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned, and means tiltably supporting the casing for adjustment about an axis perpendicular to and intersecting the axis of the capstan drum.

6. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial movement in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned, a member partially embracing the casing, and a supporting member passing through the embracing member permitting the casing to tilt about an axis perpendicular to and intersecting the axis of the capstan drum.

7. In a capstan, a casing, a capstan drum journalled in said casing, a cable trained over said drum, carrier rollers mounted for rotary and radial movement in said casing and also having the cable trained thereover leading from the capstan drum, and pressure rollers mounted for rotary and radial movement in the casing and interposed between the rollers and the capstan drum and enclosed within the portion of the cable extending between the carrier rollers and the drum, said pressure rollers being brought into frictional engagement with the portion of the cable engaging the capstan drum when the cable is tensioned, a member partially embracing the casing, and a supporting member passing through the embracing member permitting the casing to tilt about an axis perpendicular to and intersecting the axis of the capstan drum, and means for attaching the supporting member to a support.

8. A device of the character described, a casing, a capstan drum journalled therein, carrier rollers, a cable trained over the drum and passing over the carrier rollers, and pressure rollers interposed between the carrier rollers and the capstan drum, the pressure rollers being engaged at one side with the exterior surfaces of the carrier rollers and at the opposite side with the portion of the cable trained over the capstan drum.

9. A device of the character described, a casing, a capstan drum journalled therein, carrier rollers, a cable trained over the drum and passing over the carrier rollers, and pressure rollers interposed between the carrier rollers and the capstan drum, the pressure rollers being engaged at one side with the exterior surfaces of the carrier rollers and at the opposite side with the portion of the cable trained over the capstan drum, and adjustable means for exerting variable pressure on the carrier rollers.

In testimony whereof I affix my signature.

FRANZ BELT.