Oct. 14, 1941. O. KOZLOVSKIS 2,259,252

BLOCK AND TACKLE

Original Filed Sept. 1, 1936

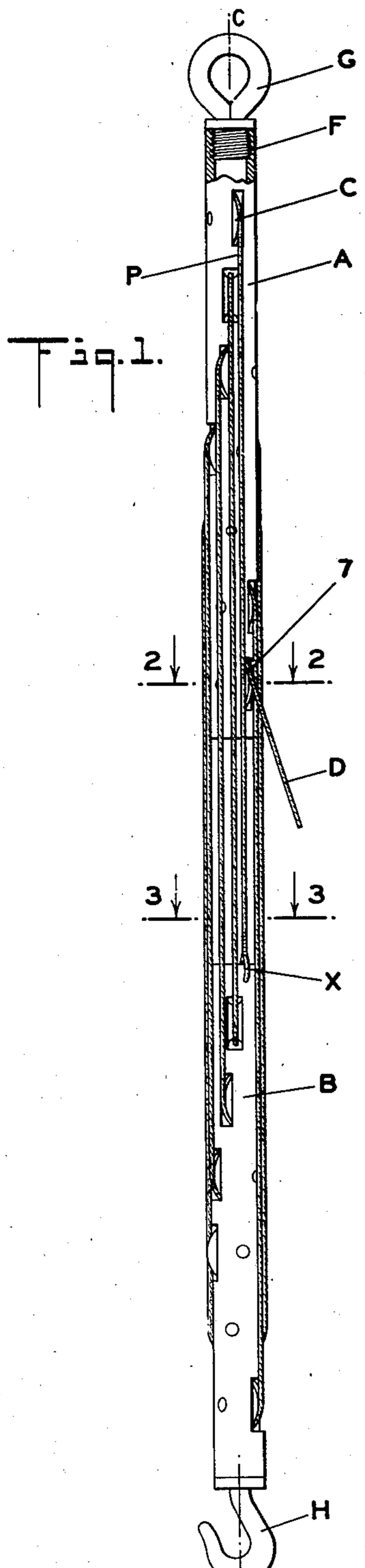

Fig. 1.

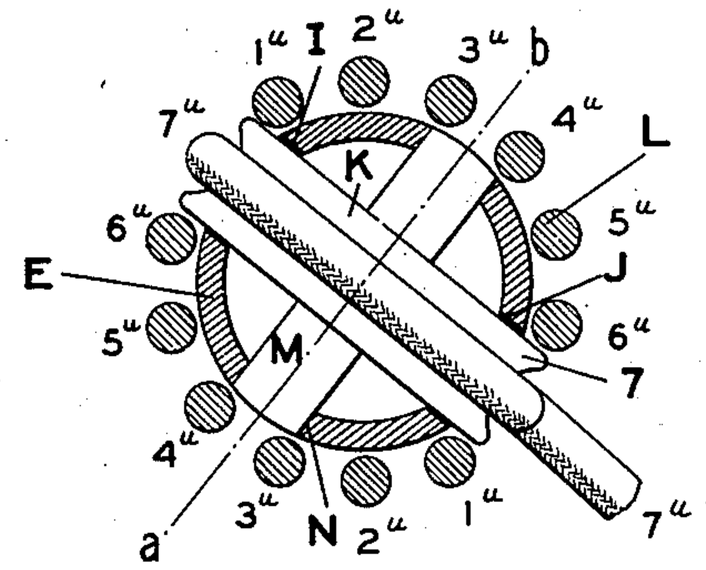

Fig. 2.

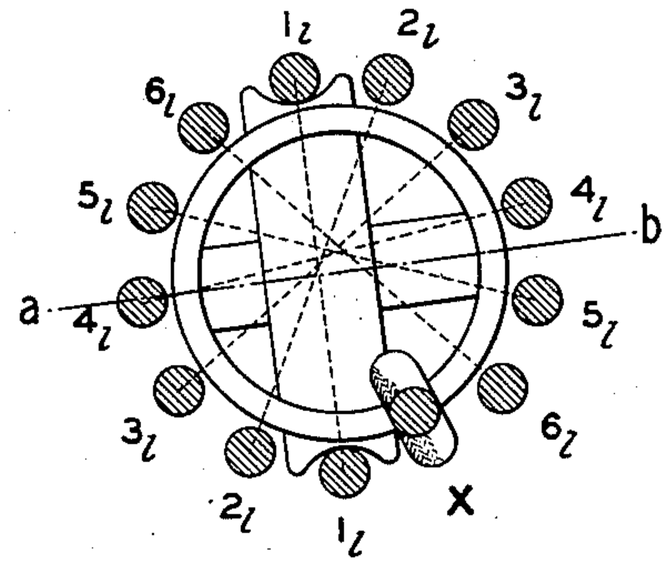

Fig. 3.

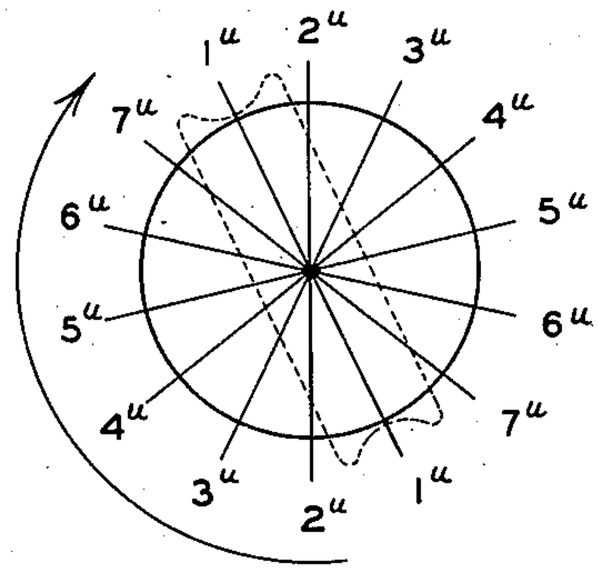

Fig. 4.

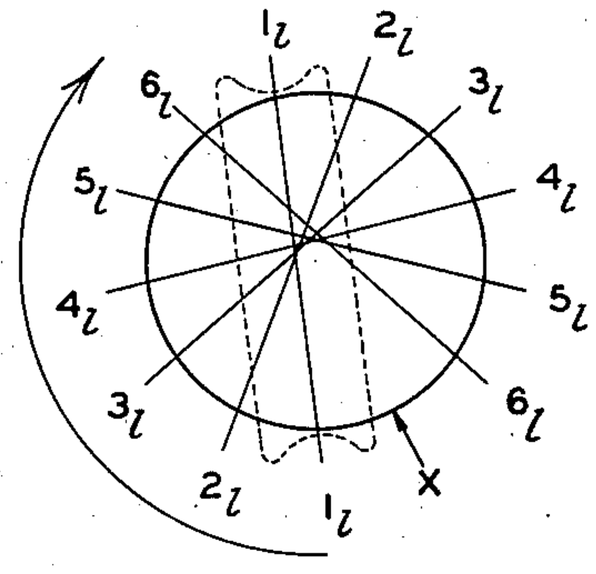

Fig. 5.

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BLOCK AND TACKLE

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Substituted for abandoned application Serial No. 98,881, September 1, 1936. This application February 12, 1941, Serial No. 378,587

13 Claims. (Cl. 254—188)

The invention relates to a block and tackle. The present application constitutes a substitute for abandoned application Serial No. 98,881 filed September 1, 1936.

The primary object of the invention is to improve and make more efficient lifting devices of the block and tackle type and at the same time to simplify and improve such structures.

Incidental to this general objective, the invention features compactness of structure so that it may operate in a containing tube or other confined space of minimized transverse dimension and the providing of a structure which will tend to minimize frictional losses between the several movable parts. Broadly this latter object is attained by a novel arrangement of the pulley elements which are so disposed in relatively offset relation as to cause the falls or lengths of rope or equivalent draft element to be disposed in non-contacting arrangement and thus free of any scraping or other mutual interference.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawing:

Fig. 1 is a view largely in side elevation, with the top portion slightly broken away to show means for securing a suspension eye and illustrating a preferred embodiment of the invention in operative position;

Figs. 2 and 3 are each transverse, horizontal, sectional views taken respectively on the planes indicated by the lines **2—2** and **3—3** of Fig. 1, looking downwardly as indicated by the arrows; and

Figs. 4 and 5 are explanatory views showing the axes of rotation of the several pulleys; Fig. 4 showing the arrangement of the pulley axes in the upper block and Fig. 5 showing the arrangement of the pulley axes in the lower block.

In the drawing there are shown an upper block A, a lower block B, each provided with a plurality of pulleys C through which pulleys are trained a pulley rope D. Each block is formed of a hollow, open end cylinder E. The upper end of the block A and the lower end of the block B have their bores internally threaded, as shown at F at the top of block A, and into which threaded end is secured a fastening device, such as suspension eye G at the top of the device and the weight engaging hook H at the lower end of the device.

For a detailed description of each of the pulleys C and associated parts, it is noted that the cylindrical wall of both blocks A and B is slotted at opposite sides to form a pair of transversely aligned vertical slots I and J. A grooved pulley wheel K is contained, for the most part, within its associated cylinder and has its opposite edges fitted in the slots I and J so that the slots coact to limit lateral movement of the pulley wheels. Each wheel projects slightly beyond the outer peripheral face of the cylinder a distance sufficient to bring the lengths L of the pulley rope D slightly outwardly away from and thus clear of the cylinder wall as shown in Figs. 2 and 3. The pulley wheel is mounted on a solid cylindrical axis M which extends across the interior of the cylinder diametrically thereof in the case of the pulleys in the upper block and almost so in the case of the pulleys in the lower block. Each axle has its opposite ends secured as by welding at N to the opposite sides of the cylinder.

In the illustrated embodiment of the invention block A is shown provided with seven pulleys and block B is provided with six pulleys but, of course, it is to be understood that any desired number of pulleys may be used as with other forms of block and tackle. The pulleys of each block are arranged in superposed relation, that is, are disposed with their axes of rotation indicated at *a—b* in both Figs. 2 and 3, in vertically spaced apart planes and preferably equidistantly spaced apart. In the illustrated showing the slots I and J are located in their superposed relation so as to leave enough of the cylinder material therebetween, herein shown to be a bar or strip P, to minimize any weakening effect in the cylinder as a whole.

Not only are the pulleys of each block arranged in superposed planes, but the pulley wheels are arranged to extend in different vertical planes, one offset circumferentially from the other. Differently expressed, the axis of rotation *a—b* of block A and individually numbered clockwise 1^u, 2^u, etc., in Figs. 2 and 4, mutually intersect the axis indicated by the line *c—d* of the two cylinders when disposed in operative position. As the pulley axes 1^u, 2^u, etc., are equidistantly spaced in their relative angular relation and as there are seven pulleys in block A, it follows that when the axis of rotation of one pulley is projected vertically into the plane containing the axis of the next adjacent pulley, the angle

formed therebetween, such, for instance, as the angle between 1^u and 2^u of Fig. 4, is a little more than 25 degrees (25°). Of course, with a different number of pulleys and equiangularly disposed, the angle between adjacent pulley axes considered in plane would be 180 degrees (180°) divided by the number of pulleys.

In order to provide clearance for securing the fixed end X of the rope to the lower block B and at the same time to avoid interferences of the lengths of ropes with each other, the mutual intersecting arrangement of the axes of rotation featured in connection with the upper block A and illustrated in Figs. 2 and 4 cannot be used in arranging the pulleys of the lower block. In the lower block B the axes indicated 1^1, 2^1, etc., in Figs. 3 and 5, are disposed in slightly offset relation to the vertical axis *c—d* a distance sufficient to provide the necessary space at the periphery to permit the attachment of the fixed end of the rope at the point X. As will be noted from the showing in Fig. 5, the circle representing the cylinder B and hereinafter referred to as a circle of reference is divided into thirteen equal divisions, one point designated X and the other twelve points connected in approximately diametrical pairs to form the six axes 1^1, 2^1, etc. It is noted from the showing in Fig. 3 that there are shown in cross section the thirteen lengths of rope immediately above the upper end of the lower cylinder as seen on the plane 3—3.

To accommodate the thirteen lengths of rope in their spaced apart relation shown, the circle of reference shown in Fig. 5 is divided into thirteen rope receiving spaces. Differently expressed the axes 1^1, 2^1, etc., each intersect the circle at approximately diametrically opposite points and intersect each other adjacent but not exactly at the center of the circle. Considering the portion of the circle counterclockwise from the five o'clock position of 6^1 to the six o'clock position of 1^1, it will be seen that the arcs along the circle subtended by the axes are of equal length and that the axes divide the circle into a number of degrees in each arc equal to 360 degrees (360°) divided by one more than twice the number of pulleys present.

Hereinafter the axes in both blocks will be referred to generically as chords of the circle formed by the outer perimeter of the cylindrical blocks, with the axes of the upper block generically defined as those chords which are diameters.

In assembling the parts it will be understood that the rope D is fastened to the lower block at X, extends upwardly therefrom and is trained over the uppermost pulley wheel of Fig. 1 shown in dotted outline in Fig. 4. It then extends downwardly therefrom along the reverse side of the cylinder shown in Fig. 1 and is trained under the uppermost pulley of the lower block, shown in dotted outline in Fig. 5 and hence again upwardly to the second pulley from the top and thus progressively trained through all of the pulleys in progressively descending order with its free end passing outwardly over the top of the lowermost pulley marked 7 of the upper block as shown in Figs. 1 and 2.

In operation and assuming the structure to be hung from a proper support by engagement with the eye G, a weight on the hook will tend to cause the rope lengths to straighten out and be placed under tension and thus assume the position indicated in Fig. 1 if not already in such position. By means of a pull on the loose end of rope D, the hook H with the weight to be elevated is drawn upwardly as is well known in other forms of block and tackle devices.

While in operation, the rope lengths will be maintained in the spaced apart relation suggested in Figs. 2 and 3 and there is thus avoided any possibility of one portion of the pulley rope scraping or frictionally rubbing against an adjacent portion. The rope lengths are maintained in their parallel relation and assume the form of a cylinder extending between the blocks and entanglement is practically impossible.

It is a feature of this disclosure that the device of Fig. 1 might be wholly contained in a cylinder or pipe and any number of pulleys may be used; simply provided that there is sufficient circumferential clearance in any provided circular area to accommodate the requisite number of pulleys and this in turn depends upon the width of the several pulley wheels used, of course, controlled by the diameter of the rope which they are designed to receive.

The construction also features the localizing of vertical pull or direction of lift at, or immediately adjacent, the vertical axis of the block and tackle and in this way there is avoided the tendency in known devices to develop tortional or twisting strains.

Another form of the invention is disclosed in my copending application Serial No. 378,588 filed Feb. 12, 1941.

While there have been shown, described and pointed out in the annexed claims, certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

I claim:

1. In a block and tackle, the combination of two pulley blocks each comprising a hollow tubular cylinder and disposed in axial alignment, a plurality of pulleys rotatably mounted in each block with their axes of rotation in progressively higher planes and each pulley axis, when projected vertically into the plane contacting the axis of the next adjacent pulley forming an angle with such axis, there being one more pulley in the upper block than in the lower block, the axes of rotation of the pulleys in the upper block intersecting the axis of the block and the axes of rotation of the pulleys in the lower block forming chords with the periphery of the lower block and disposed in slightly off-centered relation to the axis of the lower block and a pulley rope having an end fixed to the lower block, trained in succession through the several pulleys in progressively descending order in the two blocks and having its free end extending from the lowermost pulley of the upper block.

2. In a block and tackle, the combination of two pulley blocks, a plurality of pulleys rotatably mounted in each block with the axes of rotation of the pulleys in one of the blocks intersecting a common vertical line and disposed one above the other, and the axes of rotation of the pulleys in the other block being slightly offset from said common vertical line and similarly disposed one above the other, there being one more pulley in one block than in the other, and a pulley rope having one end secured to one of the blocks and threaded in vertically progressive order through a pulley of one block and then through the correspondingly located pulley of the other block and the lengths of rope between the blocks being dis-

posed in substantially parallel and spaced apart relation.

3. In a block and tackle, the combination of two pulley blocks, a plurality of pulleys rotatably mounted in each block with the axes of rotation of the pulleys in one of the blocks intersecting a common vertical line and disposed one above the other, and the axes of rotation of the pulleys in the other block being slightly offset from said common vertical line and similarly disposed one above the other, and a pulley rope having one end secured to one of the blocks and threaded in vertically progressive order through a pulley of one block and then through the correspondingly located pulley of the other block and the lengths of rope between the blocks being disposed in substantially parallel and spaced apart relation.

4. In a block and tackle, two pulley blocks, each of cylindrical form and disposed in axial alignment, each block provided with a plurality of pulleys each having their opposing sides projecting laterally beyond the adjacent side of their associated blocks and having their axes extending chordinally of their associated blocks, and each pulley axis being in circumferentially spaced relation with the axis of its next adjacent pulley, and a pulley rope threaded through the several pulleys with its lengths between the blocks disposed to form a cylinder of substantially parallel lengths, enclosing the lower portion of the upper block and the upper portion of the lower block.

5. In a block and tackle, a pulley block of cylindrical form, a plurality of pulleys mounted in the block, said pulleys being in superposed relation and each projecting slightly beyond opposite sides of the block, the axis of the cylindrical block and said pulley axes when projected in a plane containing any one of the pulley axes, extending in relatively angular relation to each other.

6. In a block and tackle, a single pulley block, a plurality of pulleys mounted in the block in relatively superposed relation and having certain of their axes of rotation intersecting approximately adjacent a common vertical line and each of said axes being fixed relative to every other axis and when viewed in plan extending at an angle to every other axis and a pulley rope threaded through the several pulleys and having its lengths extending from the pulleys and disposed to form a cylinder of substantially parallel lengths.

7. A pulley block comprising a hollow cylinder slotted at opposite sides to form a pair of transversely aligned slots, a grooved pulley wheel for the most part contained in the cylinder and having opposite edges fitted in the slots and projecting therefrom slightly beyond the outer face of the cylinder, and an axle for the pulley wheel, said axle having its opposite ends secured to the cylinder and securing the axis of rotation of the pulley wheel relative to the cylinder.

8. A pulley block comprising a hollow metal cylinder having its bore threaded at one end, a pulley mounted in the cylinder in spaced relation to said threaded end and a fastening element in screw threaded engagement with said threaded end and offset from said pulley.

9. In a block and tackle, a single pulley block including not less than three pulleys each disposed in different vertical planes and having their axes of rotation each disposed in different horizontal planes and extending each at an angle to the other when viewed in plan.

10. A single pulley block provided with a plurality of pulleys having their axes of rotation fixed relative to each other and disposed in different horizontal planes, and each axis extending at an angle to every other axis and intersecting each other adjacent the center of a circle of reference, and intersecting the circle at approximately diametrically opposite points, said points dividing the major portion of the circle into equal arcs each equal to three hundred and sixty degrees (360°) divided by one less than twice the number of pulleys and a pulley rope threaded through each pulley and having its lengths disposed in said circle of reference.

11. A single pulley block provided with more than two pulleys in relatively superposed relation and with the axis of rotation of one pulley extending at an angle to the axis of rotation of the pulleys, both above and below the same and each axis intersecting a circle of reference and dividing a portion of the circle into substantially equal arcs, one of which is less than one hundred and eighty degrees (180°).

12. A block and tackle, comprising an upper block and a lower block disposed symmetrically relative to a common vertical axis, a pulley journalled for rotary movement in the upper block for rotary movement about a horizontal axis, a pulley journalled for rotary movement in the lower block and in a vertical plane containing the upper pulley and the common axis, a third pulley journalled in the upper block, a fourth pulley journalled in the lower block, said third and fourth pulleys disposed in a vertical plane also passing through said common axis and forming an acute angle with the first mentioned plane, and a pulley rope having an end secured to one of the blocks and threaded in order through the pulleys in one plane and then through the pulleys in the other plane and the lengths of the rope between the blocks being spaced substantially equidistant from said common axis.

13. In a block and tackle, the combination of an upper block and a lower block disposed symmetrically with reference to a common vertical line of reference, each provided with more than two pulleys arranged in superposed relation and with each pulley disposed in a plane containing said line of reference and different from the planes containing every other pulley in the associated block, and a pulley rope having one end secured to one of the blocks and threaded in order first through a pulley in one block and then through a pulley in the other block.

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