(No Model.) 4 Sheets—Sheet 1.

W. SCHERMULY.

DIFFERENTIAL HOISTING TACKLE.

No. 511,863. Patented Jan. 2, 1894.

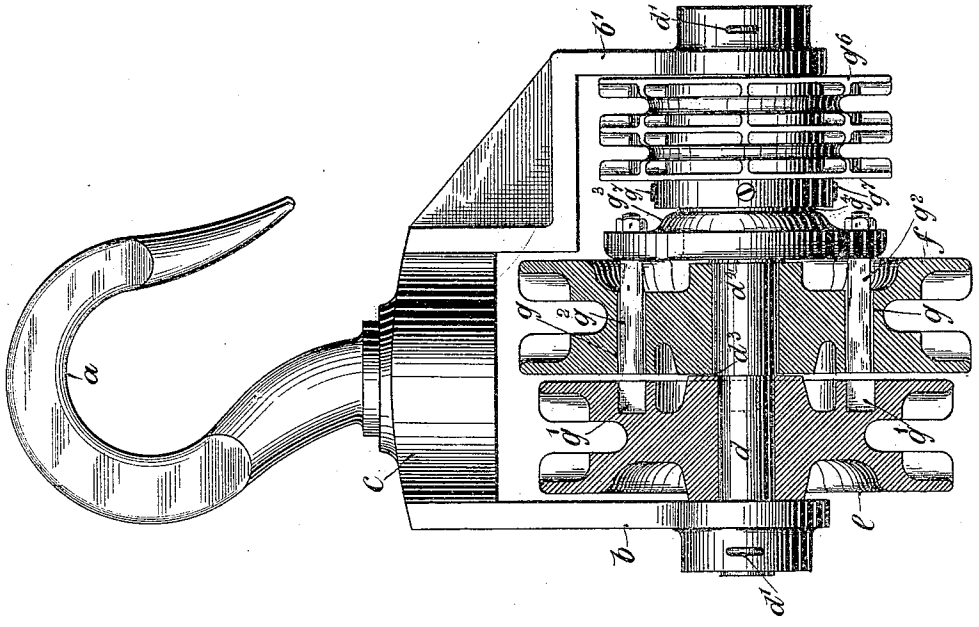

Fig. 2.

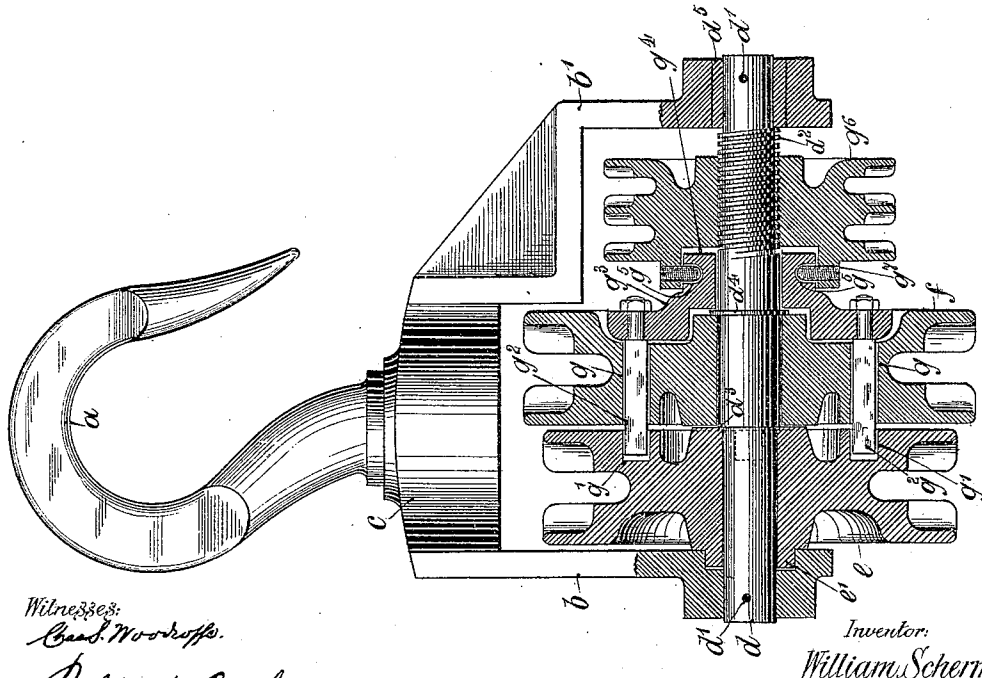

Fig. 1.

Witnesses:
Chas. F. Woodruff.
Robt. A. Blake.

Inventor:
William Schermuly,
by Henry H. Keisig
Attorney

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 2.

W. SCHERMULY.

DIFFERENTIAL HOISTING TACKLE.

No. 511,863. Patented Jan. 2, 1894.

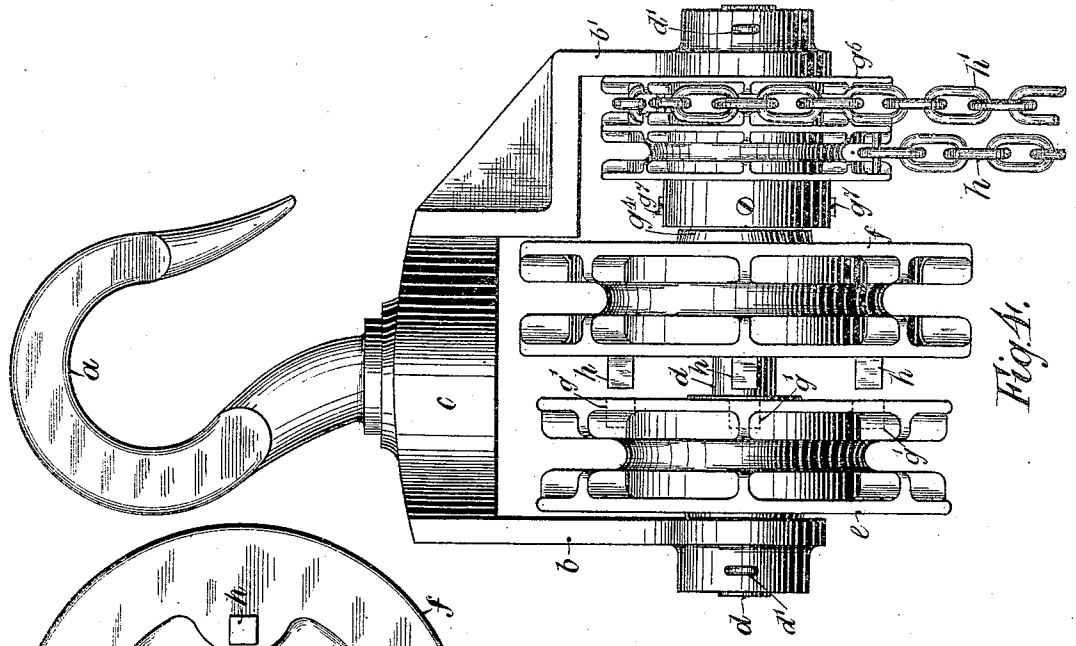

Fig. 4.

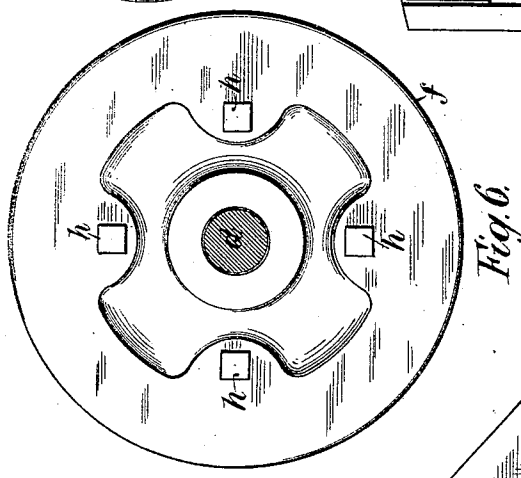

Fig. 6.

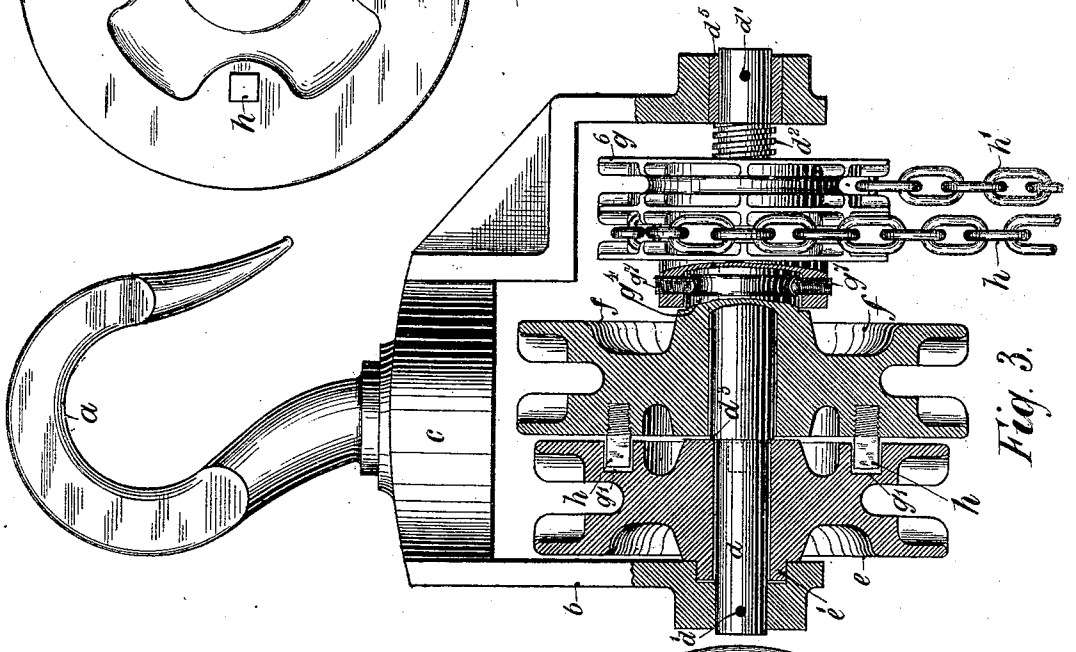

Fig. 3.

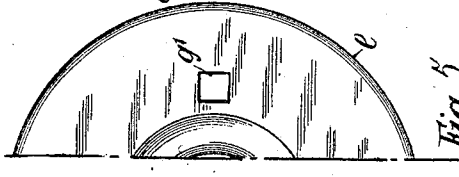

Fig. 5.

Witnesses:
Chas. Woodroffe
Robt. A. Blake

Inventor
William Schermuly
by Henry H. Keiser
Attorney

THE NATIONAL LITHOGRAPHING COMPANY.
WASHINGTON, D. C.

(No Model.)

4 Sheets—Sheet 3.

W. SCHERMULY.

DIFFERENTIAL HOISTING TACKLE.

No. 511,863. Patented Jan. 2, 1894.

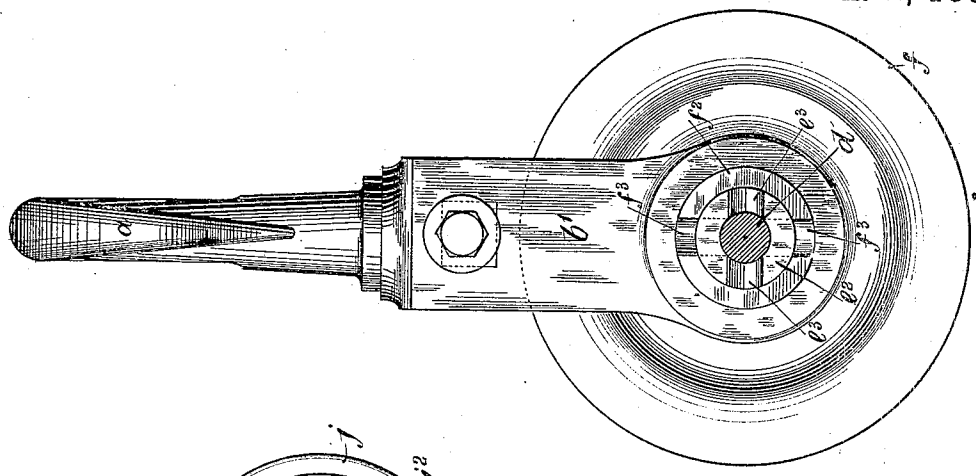

Fig. 8.

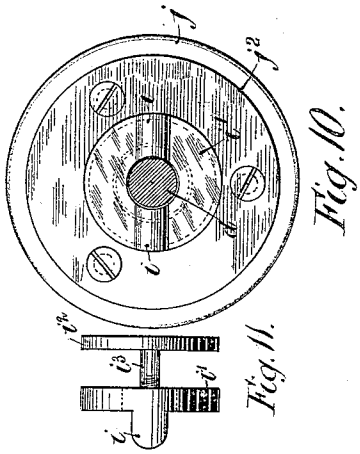

Fig. 10.

Fig. 11.

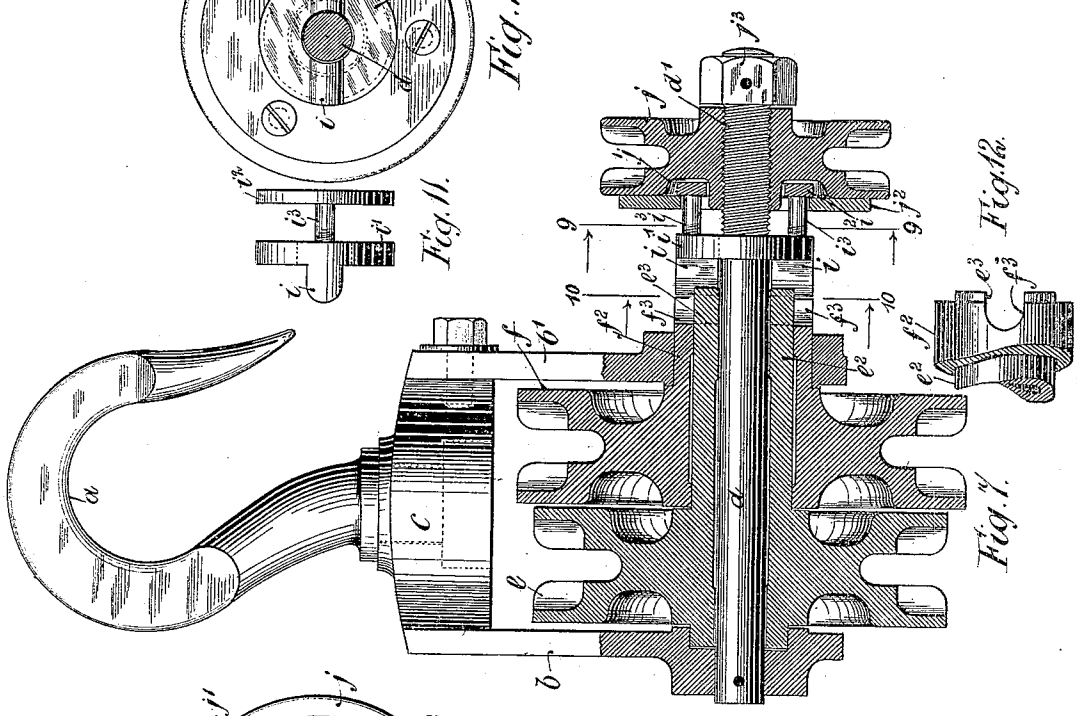

Fig. 12.

Fig. 7.

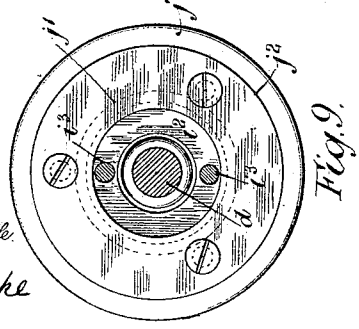

Fig. 9.

Witnesses:
Chas. L. Woodruff.
Robt. A. Blake

Inventor:
William Schermuly
by Henry H. Leigh
Attorney

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.)

4 Sheets—Sheet 4.

W. SCHERMULY.

DIFFERENTIAL HOISTING TACKLE.

No. 511,863. Patented Jan. 2, 1894.

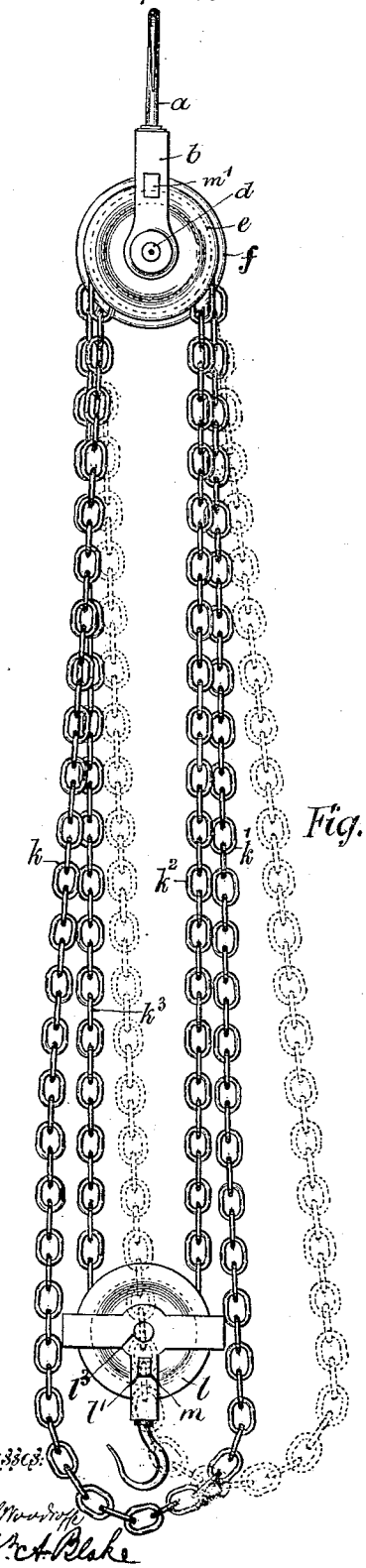

Fig. 13.

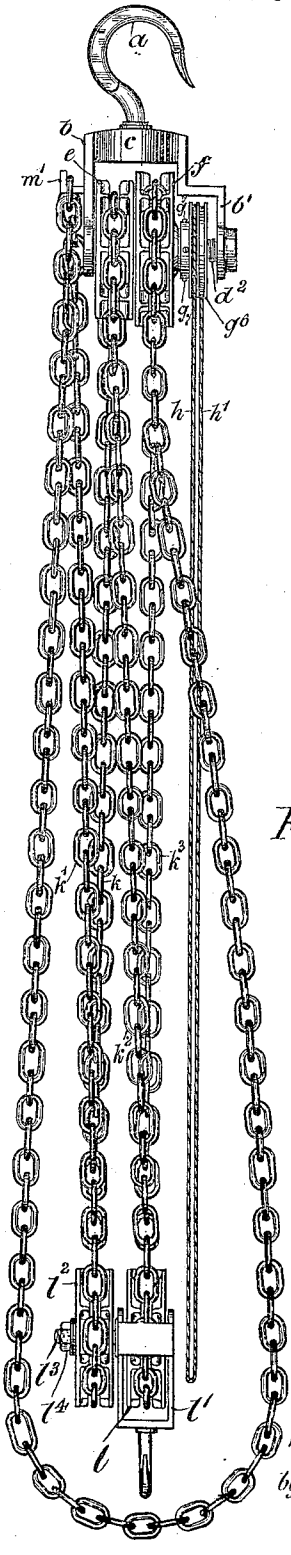

Fig. 14.

Witnesses:
Chas. Mowbray
Robt. A. Blake

Inventor:
William Schermuly,
by Henry H. Leigh.
Attorney.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM SCHERMULY, OF LONDON, ENGLAND.

DIFFERENTIAL HOISTING-TACKLE.

SPECIFICATION forming part of Letters Patent No. 511,863, dated January 2, 1894.

Application filed January 19, 1893. Serial No. 458,840½. (No model.) Patented in England October 6, 1892, No. 17,857.

To all whom it may concern:

Be it known that I, WILLIAM SCHERMULY, rope-splicer, a subject of the Queen of the United Kingdom of Great Britain and Ireland, residing at No. 62 Stainsby Road, Poplar, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Differential Hoisting-Tackle, (for which I have obtained Letters Patent in Great Britain, No. 17,857, dated October 6, 1892;) and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which are to be taken as part of this specification and read therewith, and one which will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in differential hoisting tackle and its objects are to provide improved means for locking together or holding independent of each other, the two sheaves of the standing block, and also for the conversion of a differential hoisting tackle into two single whip purchases, or into a single luff tackle or into a double luff tackle.

It consists in the combination with the separable sheaves of the standing block, of improved mechanism by which they can be either locked together or held independent of each other; also in the combination with the traveling block of a device by which any link in the hauling chain or fall may be made fast to it; also in the combination with the standing block of a device by which any link in the hauling chain or fall may be made fast to it and a second sheave be mounted upon the same axis as that of the traveling block.

Figure 1 is a sectional front elevation of a two sheave differential standing pulley block made according to the present invention, showing the two sheaves locked together. Fig. 2 is a sectional front elevation corresponding with Fig. 1 and showing the two sheaves unlocked, *i. e.*, left independent of each other. Fig. 3 is a sectional front elevation of a two sheave differential standing pulley block made according to my invention, showing the two sheaves locked together by a mechanism slightly different from the one illustrated in Figs. 1 and 2. Fig. 4 is a front elevation corresponding therewith. Fig. 5 is a part side elevation of the inner face of the smaller sheave. Fig. 6 is a side elevation of the inner face of the larger sheave. Fig. 7 is a sectional front elevation of a two sheave differential standing pulley block made according to my invention, showing the sheaves held unlocked by a modified type of locking mechanism. Fig. 8 is a side elevation of Fig. 7 from the right hand, omitting the locking bolts and their actuating pulley. Fig. 9 is a sectional elevation taken on the line 9—9 of Fig. 7. Fig. 10 is a sectional elevation taken on the line 10—10 of Fig. 7, after the coupling ring of the bolts has been turned through an angle of ninety degrees. Fig. 11 is a plan of the locking bolts and their coupling rings. Fig. 12 is a detail plan illustrating the coincidence of the notches in the ends of the sleeves of the sheaves of the standing block. Fig. 13 is a side elevation. The invention is illustrated by the full lines set for use as two single whips, and by the dotted lines, as a single luff tackle. Fig. 14 is a front elevation of the invention set for use as a double luff tackle. The standing block is shown locked so as to sustain the partially hoisted load at a given level.

Referring to Figs. 1 and 2, *a* is the well known hook by which the tackle is suspended. The frame consists of three pieces, the two cheeks *b*, *b'* and the bridge piece *c*. The latter receives the hook *a* which is connected to it swivelwise in the well known way. *d* is the axle. It is held fast in its bearings by any convenient device, *e. g.*, by pins *d'* through it and them.

It will be noticed that according to the construction of frame illustrated in Figs. 1, 2, 3 and 4, one cheek *b'* is cranked to a right angle twice, once outward near the bridge piece, and once downward. This is done to make room inside the frame for the locking and unlocking device. The cheeks and bridge piece aforesaid are made fast together in any suitable way.

e is the smaller, and *f* the larger sheave. They are of the chain type, for the purpose of preventing the chain falls slipping through their grooves. They are separate and distinct from each other and so long as they are not locked together, they are capable of rotation

upon their axle d in opposite directions. The boss of the cheek b is turned out to receive a boss e' upon the adjoining face of the sheave e, thereby providing for the shearing strain exerted by the load on that sheave upon the axle, being diminished by transferring some of it to the bearing in the boss e'.

The locking and unlocking mechanism illustrated in the figures now under specification, is as follows:

g, g are two sockets formed through the sheave f. They are formed in the latter instead of in the sheave e, not because it is the larger of the two, but because it is the one next to the twice cranked cheek b'. These sockets preferably are parallel with the axis of the block and stand between the central hole in the sheave and its chain groove. They are preferably of the same size and diametrically opposite each other in order that they may exert equal power and be subject to equal strain.

g', g' are four sockets. They are formed in the adjacent face of the other sheave e at the same distance from the axis of the block as the sockets g, and preferably as shown at a distance of ninety degrees from each other. The rotation of either sheave through that distance will consequently align the sockets g, g with two opposite sockets g', g' respectively.

g^2, g^2 are a pair of bolts. They are both of the same length and are made fast to the opposite ends of a yoke g^3 which, in consequence of its boss or central portion embracing the axle d, is capable of a sliding motion for a certain distance in either direction upon a special portion thereof. The bolts g^2 are adapted to slide in respective sockets g, and are long enough to project therefrom when the bolt yoke is moved up to its pulley, into the respective sockets g' as far as suffices to lock the two sheaves fast together. The projection of the bolts past their sheave and the motion of their yoke are necessarily equal. The bolt yoke carries a boss g^4 in the periphery of which there is formed a groove g^5.

g^6 is the pulley by which the bolts are locked and unlocked. It must therefore be capable of motion upon the axle to and from the sheave f. This is provided for by its boss being screwed internally to correspond with a thread d^2 cut upon the said axle. The locking pulley g^6 is connected with the bolt yoke by means of studs g^7, g^7 which engage permanently in the groove g^5. The pulley g^6 is shown as of the chain type and as having two grooves. It is rotated in either direction by a hand chain or chains. Whether it has one or two grooves is a matter of no importance. If it is made with a single groove, the chain running therein must be an endless one. If, on the other hand, it is made with two grooves, then two hand chains h, h' are used as illustrated in Figs. 3 and 4. These are fastened to and hang from opposite points in their respective grooves, so that as the sheaves e, f are unlocked by pulling one chain h downward, the other chain h' is wound up and is then ready for the reverse or locking motion.

When the sheaves are being unlocked, the withdrawal of the bolts g^2 from the sockets g' tends to draw the sheave e up to the sheave f. This tendency is counteracted by any suitable device. The one illustrated is as follows: That portion of the axle which carries the sheave e—the one farthest from the locking and unlocking device—is smaller than that which carries the sheave f, for the purpose of providing a shoulder d^3. d^4 is a collar on the axle between those portions of it on which the sheave f and the boss g^4 of the bolt-yoke g^3, respectively, rotate. The last mentioned portion is of the same diameter, or at any rate as large as the thread d^2 in order that the boss g^4 may move over it. If the collar is made fast on the axle d it will discharge the function of the shoulder d^3 above mentioned. d^5 is a bush which is driven into its seat in the cheek b' after the above described parts have been gotten into position.

Referring to Figs. 3 to 6, the locking bolts g^2 of Figs. 1 and 2 are replaced by studs h. These project from the side of the sheave f toward the sheave e and, in respect of relative position, correspond with their respective sockets g'. The bolt yoke g^3 too is discarded and its boss g^4 made fast to or in one piece with the sheave f. The latter is therefore moved to and fro with the locking pulley g^6.

The locking and unlocking mechanism last described is inferior to the one illustrated in Figs. 1 and 2 because the weight of the load tends to draw the two sheaves together. This tendency might lead to their becoming locked at a time when it was of importance that they should be independent of each other's motion.

Referring to Figs. 7 to 12, the locking and unlocking mechanism is outside the frame of the standing block. The cheek b' is therefore parallel with its fellow b. e^2 is a sleeve projecting from the boss of the sheave e in the direction of the locking and unlocking device. f^2 is a sleeve projecting in the same way from the boss of the sheave f. The latter sheave and its sleeve turn about the sleeve e^2. They both project past the outer face of the cheek b', one farther than the other, and each one has two notches e^3, f^3 cut in its vertical face. The two notches in either face are diametrically opposite to each other. i, i are two locking bolts. They are held together diametrically opposite to each other by a ring i' and, are of a proper size to engage fully in the four notches e^3, f^3 when the latter are aligned with each other, *i. e.*, when they are in the position illustrated in Fig. 12. When the sheaves e, f are unlocked, the bolts still remain engaged in the notches of one sleeve, preferably those of the longer sleeve as illustrated, while they stand clear of the notches in the shorter one. The full engagement of the bolts i with the four notches

e^3, f^3 effects the locking of the two sheaves together, and the withdrawal of them from the notches in the shorter sleeve effects the unlocking. The advantage of making one sleeve longer than the other is that the bolts are always engaged with it, which gives them a fair lead into the notches in the shorter sleeve. j is the unlocking pulley by means of which the locking pieces i, i are moved to and fro. Its boss is screwed to correspond with the screw d' on the axle d. Its groove is provided with an endless chain by which it can be rotated in either direction upon the said thread. Provided that it will rotate the pulley any kind of chain or of cord may be used. i^2 is a ring made fast to the ring i' and held at a short distance from it by pins i^3 on the side of the said ring i' opposite to the bolts i. The ring i^2 stands in the annular recess j' in the side of the locking pulley j in which it is held by a ring j^2 which is made fast to the same side. j^3 is a retaining nut fast on the outer end of the axle d and is put there to prevent the locking pulley j being rotated off it.

The invention constructed as above described is used as a differential block for hoisting and returning as follows: The two sheaves are locked together by rotating the locking pulley g^6 or j until the bolts g^2 or the studs h engage in the sockets g' or the bolts i into the notches e^3, f^3, according to whichever modification of locking and unlocking mechanism is used. The load is next lifted by hauling on the fall of the differential pulley block. After it has been loaded and the traveling block disengaged from it, the two sheaves of the standing block are unlocked. The weight of the traveling block and of the chains carries the former down with a run, because it can take chain from both pulleys e, f at the rate of its descent.

Referring to Fig. 13, the full lines illustrate the tackle set to work as two single whips both hoisting one weight. The sheaves of the standing block have been unlocked. k, k' are the hauling chains or falls. The former pulls the chain k^2 over the smaller sheave e, while the latter pulls the chain k^3 over the larger sheave f. Both these chains of course merge in each other under the traveling sheave l.

When it is desired to convert a differential hoisting tackle into a single luff tackle, it is necessary to have a standing part in the fall made fast to the traveling block. For this purpose there is provided any suitable device in the frame l' of the traveling sheave l by means of which a link of the fall can be easily made fast thereto. Provided this condition is met, any type of device may be made use of. I have illustrated one which satisfies the above condition and has the merit of being exceedingly simple. This is a hook m to which the fall is caught by passing one link over it. The two sheaves in the standing block having previously been unlocked, the tackle is now a single luff.

When it is desired to convert a differential hoisting tackle into a double luff tackle, it is necessary to have a standing part in the fall. This standing part must be made fast to the standing block. For this purpose any such device may be used as is described in connection with the standing part of Fig. 13. A second sheave also must be mounted in or on the traveling block. These additions are illustrated in Fig. 14. m' is a hook projecting from the frame of the standing block preferably on the side opposite the locking or unlocking gear. l^2 is a second sheave on the axle l^3 of the traveling block. The axle projects beyond the frame far enough to receive this second sheave which is prevented from coming off by a nut l^4. The slack of the fall from the sheave e in the standing block is passed round the second sheave l^2, then led up to the standing block and caught thereto by passing one of its links over the hook m'. The two sheaves in the standing block having previously been unlocked, the tackle is now a double luff.

The device for making a standing part on the fall for the purpose of converting the differential hoisting tackle into a single luff, viz: the hook m, may be, as is illustrated in the figure, combined with the traveling block.

My invention requires that its fall shall be an endless one as those of the differential tackles in use at the present time.

I claim—

1. The combination in a differential pulley block of two sheaves of different diameters adapted to rotate side by side about a common axis, a pulley adapted by being rotated upon a threaded portion of the axle of the block to move to and from the sheaves, the axle having the said threaded portion bolts adapted to travel to and for in sockets parallel with the axis of the block in one sheave, sockets in the other sheave adapted to receive the ends of such bolts and a connection between the said bolts and the said pulley adapted to make the said bolts partake of the to and fro motion of the said pulley, as set forth.

2. The combination with the traveling block of a differential hoisting tackle having the sheaves of its standing block independent of each other, of a mechanism adapted by its disengagement from one or both sheaves of the standing block to provide for their rotation about their common axis independently of each other and by its re-engagement to lock the said sheaves together, and a hook or catch on the frame of the traveling block adapted to receive and to hold fast the adjacent part of the hauling fall to the said frame.

3. The combination with the standing block of a differential hoisting tackle having its sheaves independent of each other, of a mechanism adapted by its disengagement from one or both the said sheaves to provide for their rotation about their common axis independently of each other and by its re-engagement

to lock the said sheaves together, a two-sheave traveling block, fall rove round the sheaves of both blocks and a hook or catch on the frame of the standing block adapted to receive and to hold fast the adjacent part of the hauling fall to the said frame.

4. The combination with the traveling block of a differential hoisting tackle having the sheaves of its standing block independent of each other, of a mechanism adapted by its disengagement from one or both the said sheaves to provide for their rotation about their common axis independently of each other and by its re-engagement, to lock the said sheaves together, a hook or catch on the frame of the traveling block adapted to receive and to hold fast the adjacent part of the hauling fall to the said frame, a second pulley in the traveling block around which a fall from the standing pulley is led and a hook or catch on the frame of the standing block adapted to receive and to hold fast the adjacent part of the hauling fall to the said frame.

In witness whereof I have hereunto affixed my signature, in presence of two witnesses, this 14th day of December, 1892.

WILLIAM SCHERMULY.

Witnesses:

CHAS. S. WOODROFFE,
22 *Southampton Buildings, London, W. C.*
THOMAS LAKE,
17 *Gracechurch Street, London, E. C.*