March 24, 1931.

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1,797,406
SHEAVE CROWN BLOCK
Filed March 8, 1928

3 Sheets-Sheet 1

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The object of this invention is to improve the construction of sheave crown blocks adapted particularly for use in connection with oil well operation so that a relatively large number of sheaves can be employed for use in connection with the very deep modern oil wells; and that they may be mounted very compactly so that the angles of the lines running from the traveling block over the sheaves will not be so great as to cause the lines to escape from the sheaves. An additional object is to mount the sheaves in a series on a single straight rigid axle and with the bearings of the entire series arranged so that they may be tightened up and adjusted on said axle by a single means, whereby the sheaves may be mounted and maintained in their proper relative positions and will not wobble and their bearings will last a relatively long time.

The full nature of the invention will be understood from the accompanying drawings and following detailed description and claims.

In the drawings:

Fig. 1 is an elevation of the sheave crown block, traveling block and cables connecting them with all but one series of sheaves being omitted. Fig. 2 is a plan view of the crown block with a full set of sheaves mounted thereon. Fig. 3 is a side elevation of the upper end of a derrick and the crown block shown in Fig. 2, the lower portion of the derrick being broken away. Fig. 4 is a central vertical section through the series of sheaves and their mounting, on the line 4-4 of Fig. 3, but on a larger scale. Fig. 5 is a section similar to that of Fig. 4, but of another form. Fig. 6 is an end elevation of the right hand end of a portion of Fig. 4.

There is shown in Fig. 3 the oil well derrick 10 of common type with the sheave crown block mounted thereon. Said crown block is formed of a series of I-beams 11, 12, 13 and 14 parallel with each other and of the same dimensions, preferably, excepting they may vary in length, as shown in Fig. 2. Thus, as there shown, the beams 11 are side beams and are relatively long. The beams 12 and 13 are somewhat shorter and the intermediate beams 14 are still shorter and at their ends they are connected with intermediate cross beams 15 and 16, and end cross beams 17 and 18. Between the beams 15 and 17 a bull line sheave 20 is mounted and between the beams 16 and 18 a cat line sheave 21 is mounted.

Midway of the crown block there is a series of sheaves 22 that are of substantially the same size and side by side and mounted on a single axle 23, as seen in Fig. 4. The line or cable 25 extends from an anchorage, not shown, over the cat line sheave 21 to the travelling block 26, and thence over the sheaves 22, as shown in Fig. 1, and finally from the travelling block 26 over the bull line sheave 20 to a sand reel, not shown.

It is important that the series of pulleys 22 be mounted compactly and as close to each other as possible, so as to minimize the angle between them and the line 25 that runs over them to and from the traveling block. This has become much more important in view of the very deep oil wells that are being drilled in recent times and which require a much longer line and a larger number of sheaves 22 than shallow wells, and, since there is only one traveling block, an increase in number of sheaves increases the angle between the sheaves and the line 25, so that if the sheaves are not very compactly mounted the lines will escape from the sheaves and cause considerable trouble. With the arrangement herein set forth for mounting these sheaves 22, we are enabled to mount the same number of sheaves almost twice as close together as in the crown block mountings heretofore employed. This compactness of the sheave mounting, therefore, is a very important feature of the invention.

In the prior crown block devices there is only one sheave on each axle. In this there is a plurality of sheaves on a single axle and there is here shown five sheaves on a single axle, all in a row with one sheave between each adjacent pair of I-beams and in series. In the prior crown block constructions this has not been true, as the axle of one sheave required an entire pair of I-beams and the next sheave and axle would have to be on an entirely different pair of I-beams. Hence,
between the pairs of I-beams there would be no sheave in the same alinement. Here there is a sheave beside every I-beam and all the sheaves in the series are mounted on one axle.

The axle 28 shown in Fig. 4 is of varying diameter, although that is not necessary, but it is preferable. In the form shown in Fig. 4 the thickest portion of axle 28 is at the left hand end, and it is provided with a series of sleeves 30, 31, 32, 33, 34 and 35, and the portion on the shaft between each pair of shoulders is of less diameter than the preceding portion to the left. Consequently the shaft is stepped from end to end and it furnishes portions of different diameters between the pairs of shoulders and on each of which portions a sheave is mounted. This requires the sheaves to have internal bores and roller bearing constructions of varying diameters, the diameters growing less and less from left to right in Fig. 4.

Each sheave is provided with a central bearing construction 45 having a width about one-half of the length of the portion of the axle on which it is mounted. The roller bearing on the left hand sheave is set up snugly against the left hand shoulder 30. At the right of the roller bearing construction of each sheave there is a sleeve 37 loosely surrounding the portion of the axle on which the sheave at the left of it is mounted. The width of the axle portion of such sheave and of the sleeve 37 adjacent thereto is as shown, slightly greater than the length of the portion of the axle on which they are mounted. The successive sheaves to the right have their roller bearing constructions held against the sleeves 37 at the left thereof and that arrangement leaves clearance spaces 38 which allow the parts of the mechanism to be tightened or taken up to allow for wear.

The bearings of said sheaves are held in place and said wear is taken up by a nut 128 on the threaded small end of the axle at the right hand, there being, however, a washer 29 between said nut and the right hand sleeve 37. When the sheaves are assembled and tightened up, the nut is locked in place by a pin 40 extending through longitudinal slots 140 in the reduced outer end of the nut. Therefore, said single means, namely the nut 128, takes up the wear of the bearings of all the sheaves in the series acting on them in succession through the series of roller bearing constructions and sleeves 37.

The sleeves 37 are mounted in bearings consisting of an upper strap portion 41 and a lower thicker bearing portion 241 bolted together as shown in Figs. 3 and 6. Said lower bearing portions 241 are secured by clamps 44 with the I-beams below, and their vertical thickness varies successively from one end of the series to the other end thereof, and the bearing openings for receiving the bearing sleeves 37 likewise increase in diameter successively from one end of the series to the other, but are in axial alinement. The large bearing at the left hand end of the axle is marked 42 to distinguish it as it is locked with the axle by the dowel pin 43.

The I-beams 11, 12 and 13 are held rigidly in position by the spacers 30 between them near their ends and the bolts 31 extend through the beams and spacers.

In Fig. 5 another form of the invention is shown. The axle 123 is of uniform diameter throughout the area for mounting sheaves. It has near its left hand end a shoulder 130 similar to the shoulder 30 of Fig. 4, for the same purpose. Also the sheaves are identical, or may be identical, in size and parts. The internal bores of the sheaves are of the same diameter and likewise the bearing constructions mounted therein are of the same diameter and the parts thereof are of the same size throughout. The bearings 141 for the axle differ from the bearings in Fig. 4, by extending lower somewhat than the hub of the sheaves so there will be no interference between them. This enables the sheaves to be set up closely to each other. This feature of construction could be applied to Fig. 4 and make that arrangement more compact if desired.

The adjustment of the sheaves or bearings on the axle in this second form by the nut 138 and intervening sleeves 37 is the same as in the construction shown in Fig. 4, excepting that there are no intermediate shoulders in the modified form to interfere with the lateral adjustment of the sheaves. This makes possible a greater amount of adjustment in Fig. 5. Hence since the take-up for the wear of the parts of the five sheaves would be cumulative, the right hand sheave 22, after several adjustments, would be further to the left than in Fig. 4 on account of the shoulders of the latter, and this difference would apply to the three intermediate sheaves in Fig. 5, but to a less degree.

In Fig. 5 the spacers 151 are longer than the spacers in Fig. 4, as the two I-beams 12 and 13 are omitted to allow greater adjustment of the right hand sheave without interfering with the I-beam and its bearing.

These sheaves are usually made of manganes, which is rather expensive and cannot be tooled. The bearings in the sheaves herebefore used wear out quickly, often before one well is drilled. It is expensive and difficult to replace the bearings; so heretofore it has been usual for the entire sheave to be thrown away, when the bearings wear too much, and an entirely new sheave and bearing construction substituted. This makes such sheave crown block even more expensive. The bearing cannot wear very much until the sheave begins to wobble, and then the bearing has to be either replaced or adjusted and taken up as shown in this application.
I claim:
1. A sheave crown block including a straight rigid axle mounted thereon, a series of sheaves mounted side by side on said axle, and means on said axle for simultaneously adjusting, tightening and holding in place all of said sheaves substantially as set forth.
2. A sheave crown block substantially as set forth in claim 1, said adjusting, tightening and holding means including a sleeve surrounding the axle between each pair of sheaves, a nut adapted to screw on one end of the axle, and a sleeve surrounding the axle between said nut and one of the sheaves, substantially as set forth.
3. A sheave crown block including a straight rigid axle mounted thereon having a shoulder near one end thereof and screw threaded at the other end, a series of sheaves mounted on said axle, a sleeve on said axle between each pair of sheaves, a nut on the threaded end of the axle, and a sleeve between the nut and first sheave, whereby the sheaves can all be simultaneously adjusted in position on the axle with the sheave remote from said nut being jammed against said shoulder and the other sheaves jammed against the intervening sleeves, substantially as shown.
4. A sheave crown block including non-adjustable I-beams and bearings thereon, an axle mounted in said bearings, a series of sheaves mounted side by side on said axle, and means on said axle for simultaneously adjusting, tightening and holding in place all of said sheaves independently of any adjustment of the I-beams and bearings.
5. A sheave crown block including a series of parallel I-beams, a row of bearings secured thereon having their axes in alinement with each other, a straight rigid axle mounted on said bearings and having a shoulder at one end, a series of sheaves mounted on said axle, a sleeve mounted on said axle and in said bearing and between each pair of sheaves, a nut screwed on the opposite end of the axle, and a sleeve on said axle between said nut and the nearest sheave, said sleeves being mounted in said bearings, whereby the nut can shift laterally all of said sheaves and hold and tighten the same in position on the axle substantially as set forth.
6. A sheave crown block including a series of parallel I-beams with their tops in transverse alinement with each other, bearings each of which consists of a top strap portion and a bottom thicker portion, means for securing the bottom portion of said bearings to said I-beams, an axle mounted in said bearings and having a shoulder at one end, a series of sheaves mounted on said axle, a sleeve mounted on said axle and in each bearing and between each pair of sheaves, and a nut screwed on the opposite end of the axle and engaging the adjacent sleeve, substantially as set forth.
7. A sheave crown block including a straight rigid axle having a succession of sections of different diameters separated by shoulders and successively reduced in diameter from one end to the other of the axle, a sheave mounted on each section of said axle near the shoulder at one side thereof, a sleeve surrounding the remaining portion of each section and abutting against the adjacent sheave, the width of each sheave and its adjacent sleeve being greater than the section of the shaft on which they are mounted so as to leave a clearance space between each sheave and its adjacent shoulder excepting the sheave at one end of the series, a nut screw-threaded on the opposite end of the axle, and a sleeve between the nut and the nearest sheave whereby the sheaves can be adjusted to take up wear thereof and held tightly in place substantially as set forth.
8. A sheave crown block including a series of parallel I-beams with their tops in transverse alinement with each other, bearings each of which consists of a top strap portion and a bottom thicker portion, the bottom portions of said bearings increasing in vertical thickness from one end of the series to the other, an axle having a succession of sections of different diameters separated by shoulders and successively reduced in diameter from one end to the other of the axle, a sheave mounted on each section of said axle near the shoulder at one side thereof, a sleeve in each of said bearings surrounding the remaining portion of each axle section and abutting against the adjacent sheave, the width of each sheave and its adjacent sleeve being greater than the section of the shaft on which they are mounted so as to leave a clearance space, and a nut screw-threaded on the smaller end of the axle for laterally adjusting and tightening and holding the sheaves and sleeves in place.

In witness whereof I have hereunto affixed my signature.

WALTER W. ERLEWINE.