

G. A. MONTGOMERY.
 DRIVE SHOE.
 APPLICATION FILED APR. 29, 1914.

1,153,811.

Patented Sept. 14, 1915.

Fig. 1,

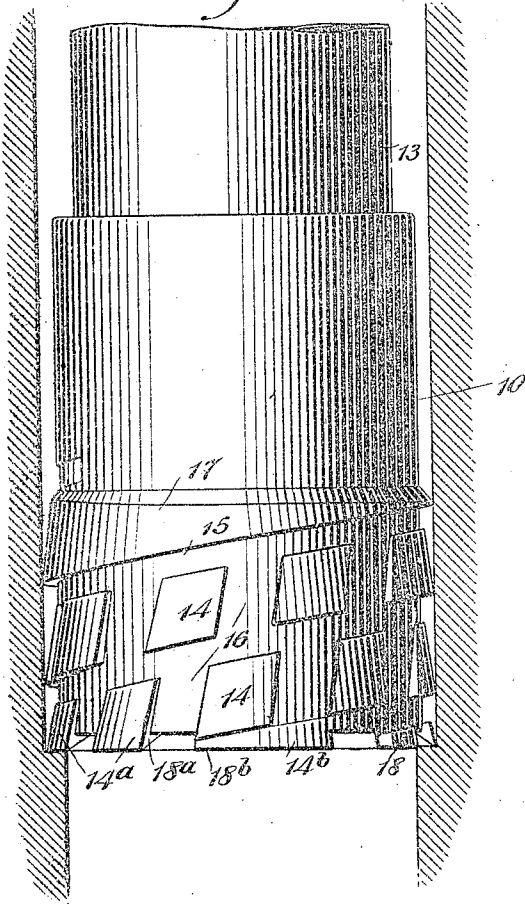


Fig. 2,

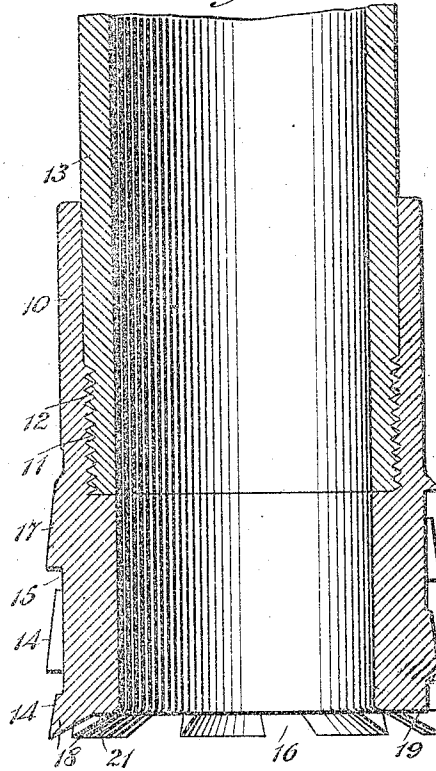
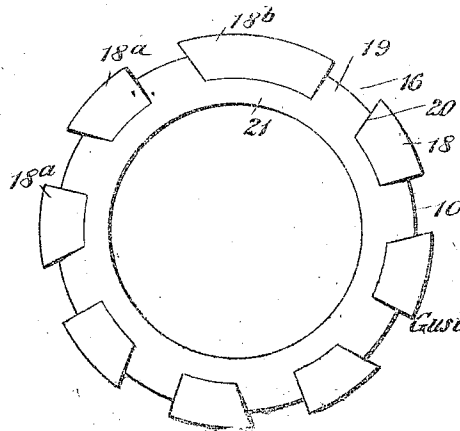


Fig. 3.



WITNESSES

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GUSTAVUS A. MONTGOMERY, OF OILFIELDS, CALIFORNIA, ASSIGNOR OF ONE-FOURTH
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DRIVE-SHOE.

1,153,311.

Specification of Letters Patent. Patented Sept. 14, 1915.

Application filed April 29, 1914. Serial No. 335,443.

To all whom it may concern:

Be it known that I, GUSTAVUS A. MONTGOMERY, a subject of the Czar of Russia, and a resident of Oilfields, in the county of Fresno and State of California, have invented a new and Improved Drive-Shoe, of which the following is a full, clear, and exact description.

The invention relates to a drive shoe for well casings, and particularly to a drive shoe having reaming cutters, so that the shoe will ream its own way after the drill hole has been driven with a regular club bit.

As is well known, the ordinary club bit does not always form the hole sufficiently large to admit the collars on the casing, and my improved drive shoe is designed to constitute a reamer and either entirely eliminate under-reaming, or make the under-reaming operation unnecessary in many cases.

In carrying out the invention, use is made of a shoe in the form of a sleeve to receive the lower end of the casing as usual, and on the exterior of the shoe a spiral series of reaming cutters are produced, there being desirably a spiral groove formed between the convolutions of the reaming cutters, and notches or intervening spaces alternating with the said cutters throughout the spiral series. The presence of the groove facilitates the forming of the notches, and the forming of the reaming cutters with the proper rake, while preserving the cylindrical formation of the shoe.

In connection with the lateral reaming cutters, forward cutting teeth are provided, on the forward end face, having a novel relation to the reaming cutters, as hereinafter explained, and the face of the shoe within the teeth thereon, is so formed as to receive the blows of the reamer bits of an under reamer when the latter is employed on the shoe, thereby preventing injury to the said teeth.

The invention will be particularly explained in the specific description following. Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of a drive shoe

formed in accordance with my invention, showing the same applied to a casing; Fig. 52 is a central vertical section; and Fig. 3 is a face view of the shoe.

In forming the illustrated practical embodiment of the invention, the shoe 10 is in the form of a sleeve having internal threads 11 to receive corresponding threads 12 on the casing 13. The lower portion of the shoe is of larger diameter than the upper portion and has formed thereon a spiral series of reaming cutters 14, and a spiral groove 15 is produced between the convolutions of the cutters. Notches or spaces 16 are produced between adjacent cutters 14 and intersect the groove 15. The spiral groove 15 is continued at the upper end beyond the reaming cutters 14, so that a spiral rib 17 is produced continuous with the convolutions of the series of cutters. The spiral rib 17 is beveled or tapered at the upper or outer side, and the cutters 14 are similarly beveled. It will be seen that the presence of the spiral groove facilitates the forming of the notches and the giving of the proper bevel and rake to the cutters while preserving the cylindrical form of the enlarged lower portion of the shoe.

It is to be observed that the lower edges of the rib 17 and the reaming cutters 14 form part of the same cylindrical surface. The notches or spaces 16, it will be observed, are not cut perpendicular to the face, but are oblique, thereby giving an effective cutting formation to the forward edges of the reaming cutters 14.

On the face of the shoe, at the outer edge, an annular series of teeth 18 are produced, separated by intervening notches or spaces 19. The outer edges of the teeth 18 form part of a cylindrical surface with the reaming cutters 14 and rib 17. The notches 19, it will be observed from Fig. 3, are not cut radially, in the end face of the shoe, but at a tangent, so that the forward edge 20 of a tooth 18 will have the proper angle for effective cutting action by a rotary movement of the shoe. The teeth 18 terminate at the inside radially outward from the bore of the shoe, so that a plane surface 21 is produced on the face within the teeth. This surface 21 is for the purpose of a seat of an under-reamer (not shown) when the under-

reamer is employed in connection with the shoe. Thus the teeth 18 are fully protected from the blows of the under-reamer bits.

It will be observed that some of the cutters in the lowermost convolution of the spiral series, as seen at 14^a, are formed jointly with the adjacent face teeth 18^a. It will be noted also (see Figs. 1 and 3) that the first reaming cutter 14^b at the lower end of the spiral series, together with the adjacent face tooth 18^b, res t in a plowshare formation on the advance cutting element, the said tooth 18^b being continued across the next adjacent notch 16.

The provision of spiral reaming elements on the exterior side surface of the shoe results in giving a turning movement to the whole string of casing sections in "spudding" or letting the casing down on the bottom of the drill hole. A further advantage attending the spiral elements as compared with the ordinary bell shoe, is that the life of the shoe is prolonged in proportion to the number of convolutions; since the first convolution will wear first by reason of bearing the brunt of the cutting action, the second convolution being then subjected to the greatest wear, and so on. Approximately three convolutions are preferred. The spiral rib presenting more or less of a convolution of unbroken continuity will, in addition to sustaining its proper proportion of wear, serve to clear the hole of any projections left by the separate cutters 14.

By the described construction the drive shoe will in many cases, suffice to produce the necessary reaming action to accommodate the casing and its collars, etc., without the employment of an under-reamer.

The lateral cutters arranged in a spiral series as described, it will be seen, results in a progressive cutting action by the successive cutters in a convolution, considering a turning movement of the tool through a given annular zone, the cutters serving to successively cut portions in the given zone of action.

The formation of the lateral teeth with interdental spaces gives the series of teeth the form of a broken square thread; the opposed walls of the two adjacent teeth being formed by the side walls of an intervening space and the teeth on the front face merging into the forward teeth of the spiral.

The result obtained is that the teeth act as reaming cutters as distinguished from producing a mere broaching action. Again, the spiral series of teeth, defined by the interdental spaces to present a broken square thread, result in cutters having pronounced forward cutting action, but a negative rake for reverse. Also, the very important result is obtained, that the casing is automatically rotated within certain limits, giving a rifling effect. Furthermore, the shoe will have

on an earth wall a plastering effect so that the wall will stand up better.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent:

1. A drive shoe for well casings having reaming cutters on the outer side thereof, the cutting edges of which are spirally disposed.

2. A drive shoe for well casings, having a spiral series of reaming cutters obliquely disposed on the outer sides thereof, and oblique notches between and defining the cutters.

3. A drive shoe for well casings, having a spiral series of reaming cutters on the outer side thereof, and a spiral groove, the convolutions of which alternate with the convolutions of the reaming cutters, there being spaces alternating with the cutters and intersecting the said groove.

4. A drive shoe for well casings, having on the front face an annular series of cutting teeth separated by intervening spaces, and on the outer side having lateral reaming cutters, the said reaming cutters being disposed in the form of a spiral series, the said front teeth merging into the forward teeth of the spiral series.

5. A drive shoe for well casings, having on the front face thereof an annular series of cutting teeth, and a plane seat radially inward from the cutting teeth adapted to seat under-reamer elements.

6. A drive shoe for well casings, having on the front face thereof an annular series of cutting teeth, and lateral reaming cutters on the outer side of the shoe, the said teeth and cutters presenting cutting edges forming part of a cylindrical surface.

7. A drive shoe for well casings, having on the outer surface thereof a spiral series of reaming cutters beveled on the outer surfaces, the lower edges of the several cutters forming part of a cylindrical surface.

8. A drive shoe for well casings, having on the outer side thereof an annular spiral series of separated reaming cutters presenting a plurality of convolutions, the cutters of one convolution of the spiral series being in staggered relation to the cutters of an adjacent convolution of said series.

9. A drive shoe for well casings, having on the outer side thereof a spiral series of separate reaming cutters, and a spiral rib continuous with the uppermost convolution of the series of cutters.

10. A drive shoe for well casings, having on the outer side thereof a spiral series of reaming cutters, and an annular series of cutting teeth on the front face of the shoe, certain of said teeth being formed continuous with certain of the cutters in the lowermost convolution of the spiral series of cutters, said cutters on the front face of the

shoe terminating at their inner sides, outward from the bore of the shoe.

11. A drive shoe for well casings, having a spiral series of reaming cutters obliquely disposed on the outer side thereof separated by intervening spaces, and an annular series of cutting teeth on the front face of the shoe, one of the said teeth being formed in conjunction with the first cutter in the lowermost convolution, and extending across the space between the two adjacent cutters in the next convolution.

12. A drive shoe for well casings, having a spiral series of reaming cutters on the outer side thereof and a spiral groove, the convolutions of which alternate with the convolutions of the cutters, and a spiral rib presenting a convolution continuous with the spiral series of cutters, the said groove being continued above the said rib.

13. A drive shoe for well casings having lateral cutters on the outer side thereof rearward of the front end, and a rib on the exterior surfaces above the said cutters, the rib and cutters presenting edges, forming part of a cylindrical surface.

14. A drive shoe for well casing, having a toothed front cutting edge, lateral cutters on the outer side of the shoe rearward of the said front cutting edge, and a rib on the exterior surface above the said lateral cutters.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUSTAVUS A. MONTGOMERY.

Witnesses:

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