Jan. 14, 1941. S. G. RUDDELL ET AL 2,228,709

BORING RIFLER

Filed Nov. 4, 1938 2 Sheets-Sheet 1

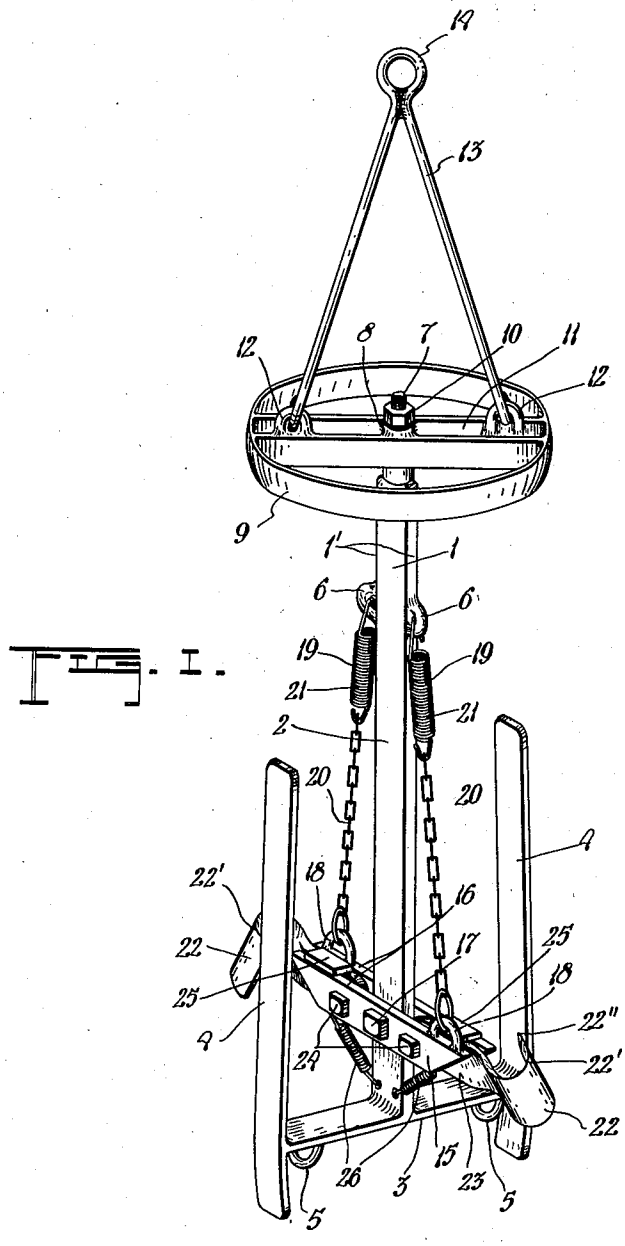


FIG. I.

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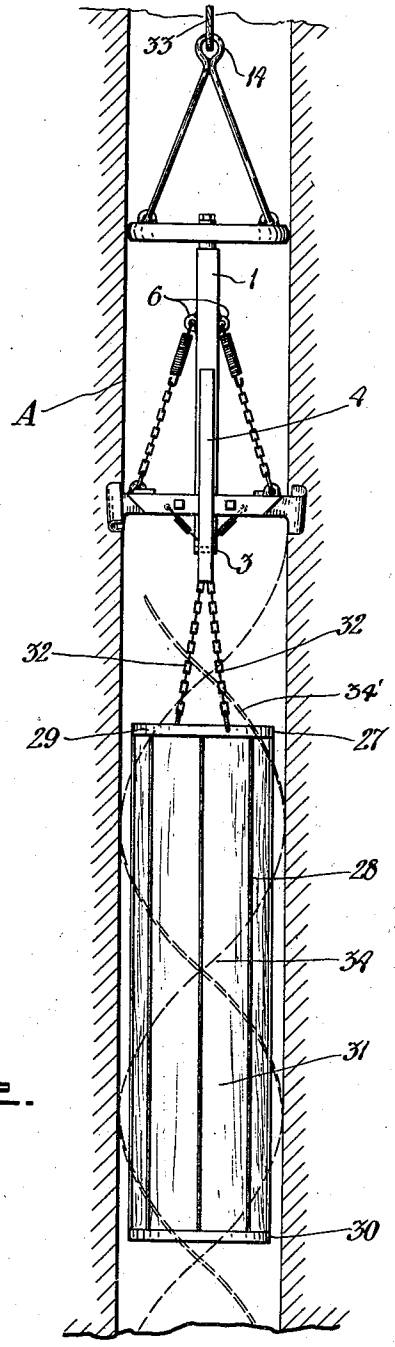


Fig. 2.

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UNITED STATES PATENT OFFICE

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BORING RIFLER

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In Canada December 4, 1937

10 Claims. (Cl. 255—73)

Our invention relates to improvements in earth boring rifflers, an object of the invention being to provide a device of the character hereinafter to be described which will rifle or in other words, cut, a spiral recess, or a plurality of spiral recesses upon the cylindrical wall of a vertical earth boring used for the purpose of receiving a cast-in-place concrete pile and especially for rifling the boring above the frusto-conical form made by the use of the implement defined in our Canadian Patent No. 368,164.

A further object of our invention is to provide an implement of the character herewithin described which is economical to construct and maintain and which cannot easily become out of order.

A further object of our invention is to provide a rifler of the character to be hereinafter described which may be lowered by means of a cable into a cylindrical boring, the act of raising the same being to cause a plurality of pivoted riflers to project radially from the vertical axis of the same and cut into the wall during its upward travel of the implement, the cutting blade of each rifler being set at such an angle as will cause the implement to rotate upon its upward travel and will cause each of the riflers to incise a spiral recess upon the wall of the boring.

A further object of our invention is to provide a device of the character herewithin described in which a cylindrical earth catching bag is suspended from the bottom of the rifling implement and moves simultaneously therewith.

A further object of our present invention is to provide a device of the character herewithin described in which means are provided for preventing the breakage of the blades thereof due to encountering some unusually hard obstacle during the rifling operation.

With the above more important objects in view and such other minor objects as may appear as the specification proceeds, our invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawings, in which:

Figure 1 is a perspective illustration of my rifling implement.

Figure 2 is a sectional view of my rifling implement with bag attached in situ in an earth boring.

In the drawings like characters of reference indicate corresponding parts in the different figures.

In the art of underpinning buildings and other structures by our use of the process which consists in excavating a cylindrical boring A to a certain depth below ground level, some controversy exists as to (1) whether the greatest support is provided for a superimposed structure by means of forming a broad base for the concrete which is poured into the drilling, (2) whether the boring should be drilled down to bed-rock so that the base of the concrete pier rests thereupon or (3) whether the best results are obtained by providing the maximum amount of friction as between the concrete pier formed within the drilling and the surrounding earth wall, the implements to be hereinafter described being designed to rifle the wall of the boring for this latter purpose.

Our invention accordingly consists of a body portion 1, upon which the remaining members of our invention are secured, and comprises a vertically disposed shank 2, of rectangular cross-section, to the base of which the mid-portion of a horizontally extending cross member 3 is secured integrally, the outer ends of said cross member being similarly formed integrally with a pair of substantially vertically disposed guide elements 4, the upper and lower ends of which are inturned slightly to preclude the possibility of snagging in the walls of an earth boring A. In addition, a pair of eyelets 5 are secured to the underside and adjacent the outer ends of the cross member 3, and a similar pair of eyelets 6 are secured in horizontally opposed relationship upon the relatively narrow edges 1' of the upper portion of the shank 1.

The upper end of the shank 1 is formed into a threaded bolt 7 upon which the vertically disposed bearing 8 forming the hub of the guide ring 9, is rotatably mounted and secured in place by the nut 10. A pair of bars 11 secured integrally at their outer ends to the inner surface of the ring 9, extend diametrically in parallel spaced relationship across said ring and are formed integrally at their mid-portions with the bearing 8. Upon diametrically opposite ends of the bars 11 are formed a pair of eyelets 12, in which are received the divergent lower ends of the hanger 13, the converging upper portion of which is formed into a cable attaching ring 14.

The rifling blade supporting member 15 consisting of two parallel plates 16 positioned apart upon opposite sides of the lower portion of the shank 1, is fulcrumed centrally upon the bolt 17 extending through said shank, and is provided with a pair of eyelets 18 secured upon opposite

ends of said member 15, one upon each of the plates 16. To maintain the rifling blade supporting member 15 normally in a horizontal position, while at the same time permitting the same to give under strain, we provide a pair of shock absorbing links 19, each extending between one of the eyelets 18 and the adjacent eyelet 6 upon the shank 2 and consisting of a chain link and tension spring 21.

A pair of outwardly projecting riflers 22 are mounted upon opposite ends of the member 15, the shank portion 23 thereof being positioned between the plates 16 and provided at their inner ends with suitable drill holes whereby they are pivotally mounted upon the bolts 24 extending between the plates 18. The rifling blades proper 22, are formed integrally with the outer ends of the shank portions 23, and will be seen to be of a U-shaped configuration, having the upper edges 22' bevel sharpened inwardly. The outer portion of the shanks 23 are swaged such that the major axes of the blades are obliquely disposed to the horizontal and the free ends 22'' of the cutting edges 22 are raised above the remainder thereof. This latter point has been found of importance in preventing breakage of this type of blade. The blades are prevented from falling below the horizontal by a pair of lugs 25 formed integrally with the upper edges of the shank portions 23 and engageable with the upper edges of the plates 16. Also, to preclude the possibility of the blades failing to return to their normal horizontal position after being pushed upwardly and inwardly, as is necessary when lowering the implement into a boring, we provide a pair of relatively small tension springs 26 extending diagonally between the base of the shank 2 and the under edges of the shank portions 23 of said blades.

Apart from the rifling implement, an earth catching receptacle 27 is provided and consists of a bag retaining frame 27 comprising a plurality of vertically disposed rods 28 secured in equispaced relationship at their upper ends about the circumference of a ring 29 and at their lower ends about the perimeter of a circular plate 30 within which is positioned a cylindrical fabric bag 31, the edges of the open mouth of which are secured to the ring 29. In operation, the receptacle 27 is secured below the rifling implement by a pair of chain links 32, which are secured at their upper ends to the eyelets 5 and at their lower ends to the ring 29, at diametrically opposite points thereupon.

The structure and arrangement of the various parts of our invention having been described, its mode of operation will now be explained.

With more particular reference to Figure 2 of the accompanying drawings, this consists essentially of attaching the receptacle 27 to the rifling implement in the manner described, and then by means of a cable 33 attached to the ring 14, lowering the whole assembly, receptacle first, into an earth boring A until said receptacle rests upon the base thereof. While travelling downwardly, the riflers 22 pivot upwardly and inwardly upon the bolts 24 and are maintained only slightly in contact with the wall of the boring by the springs 26. However, when the motion is reversed and the whole assembly is pulled up to the surface, the blades of the riflers 22 immediately dig into the walls of the boring and cut out U-shaped strips of material, at the same time, due to their obliquity, swivelling about the point of pivotal suspension of the body 1 in the bearings 8. Therefore as the whole assembly is drawn upwards, in this case, a pair of spiral grooves 34 will be cut in the wall of the boring and the material cut from the wall will be caught in the bag 31.

After the wall of the boring is rifled in the manner described above, the riflers 22 used are replaced by a pair having the blades reversely angled, and the process repeated, whereupon the grooves 34' formed in the boring wall this time will spiral in the opposite direction.

This method has been found most satisfactory, but obviously, if for any reason it is found desirable, the oppositely spiralling grooves may be formed simultaneously in the wall of the boring by pivotally coupling together two rifling implements, in which the riflers of one implement are oppositely skewed to those of the other. The earth receiving receptacle is then attached to the lower implement and the process executed in the usual manner.

At this point, it may be pointed out that the one body portion 1 of the rifling implement may be used for rifling borings of various diameter, by simply substituting riflers of a suitable length and receptacles and ring guides of suitable diameter. It is also of importance to note that the rifling blade supporting member 15 is cut off obliquely at its outer ends and is open at the top and bottom, as this structure prevents mud from catching in between the plates 16 and interfering with the action of the riflers 22.

After the rifling of the walls of the boring is completed, the boring is then filled with concrete, which when set, due to the frictional resistance of the oppositely spiralling fins formed in the grooves cut by the riflers, forms a pier which will not slip under loads much greater than similarly sized piers of other designs.

Since various modifications can be made in the above invention, and many apparently widely different embodiments of same, made within the scope of the claims without departing from the spirit and scope thereof, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense and we desire only such limitations placed thereon as are specifically expressed in the accompanying claims.

What we claim as our invention is:

1. An implement for cutting a spiral groove in the cylindrical wall of an earth boring designed to receive a cast-in-place concrete pile, said implement consisting of a body portion, a cable being secured thereto for raising and lowering said implement within said boring, said implement being rotatably secured to the end of said cable, a pair of diametrically opposed rifling element upon said body portion, obliquely disposed cutting blades at the outer end of each element, said blades being designed to project into the wall of a cylindrical earth boring and being caused to rotate due to their obliquity upon the application of an upward force applied to said cable and upon said body portion, thus cutting a pair of spiral recesses upon the wall of said boring.

2. An implement for forming a pair of spiral recesses in the cylindrical wall of an earth boring designed to receive a cast-in-place concrete pile, consisting of a body portion, said body portion being secured to the end of a cable whereby the same may be raised or lowered within said boring, a pair of recess forming elements upon said body portion, the outer ends of said recess or groove forming elements being angulated between 0° and 45° with respect to the longitudinal axis of

said boring, the direction of inclination upon the end of one element being opposite to that of the other element when viewed together from one side, said elements being designed to move outwardly at any desired point within the depth of said boring and project into the wall thereof, the same being caused to rotate upon the application of an upward force upon said implement due to the angulation thereof with respect to the vertical axis of said boring.

3. The implement as defined in claim 2 in which said elements are pivotally attached to said body portion, being designed to rest against the wall of said boring upon the lowering of said implement thereinto and being designed to project outwardly and into the wall of said boring upon the application of an upward force upon said implement.

4. An implement for cutting a spiral groove in the cylindrical wall of a boring formed to receive a cast-in-place concrete pile, said implement consisting of a body portion rotatably secured to the end of a cable, a pair of diametrically disposed cutting elements upon said body portion, a cutting blade being provided upon the outer end of each of said elements, said cutting blades being angulated between 0° and 45° with respect to the longitudinal axis of said boring, the direction of angulation of the blades of one of said elements being reversed with respect to the direction of angulation of the blade upon the other element when viewed together from one side, said elements being pivotally secured upon said body portion and designed to bear lightly against the wall of said boring upon the lowering of said implement but being caused to project into the wall thereof upon the raising of said implement and to cut a spiral groove upon the wall thereof upon the application of an upward force upon the implement due to the angulation of said blades.

5. The device as defined in claim 1 which includes means for permitting said rifling elements to yield upon encountering obstacles in their path.

6. In the device as defined in claim 1, a rifling element supporting member, said elements being mounted upon diametrically opposed ends thereof, said member being centrally fulcrumed upon said body portion and means for maintaining said member in a horizontal position during normal operation.

7. An implement for forming a pair of spiral grooves in the cylindrical wall of an earth boring designed to receive a cast-in-place concrete pile, comprising a body portion, a guide element pivotally secured upon the upper end of said body portion and attached to the lower end of a cable, a rifling element supporting member comprising a pair of parallel plates spaced apart and centrally fulcrumed upon the lower end of said body portion, a pair of diametrically opposed rifling elements pivotally mounted between said plates, the outer ends of said elements being formed into obliquely disposed groove cutting blades, means for preventing the movement of said rifling elements below the horizontal, a pair of resilient shock absorbing links, each of said links extending between said body portion and an outer end of said rifling element supporting member, thereby maintaining said member normally in a horizontal position.

8. The device as defined in claim 7 in which spring means are provided for returning said rifling elements downwardly to the horizontal and in which a loose material receiving receptacle is suspended below said implement and designed to move simultaneously therewith.

9. An implement for forming a pair of spiral grooves in the cylindrical wall of an earth boring designed to receive a cast-in-place concrete pile, comprising a body portion consisting of a vertically disposed shank and a pair of vertically disposed guide members spaced apart in the lower end of said shank, a guide ring pivotally secured upon the upper end of said shank and attached to the lower end of a cable, a rifler supporting member consisting of a pair of spaced parallel plates centrally fulcrumed upon a bolt extending through the lower portion of said shank, a pair of resilient shock absorbing links, each of said links comprising a chain and a tension spring and extending diagonally between the upper portion of said shank and an outer end of said rifler supporting member, thereby maintaining said rifler supporting member normally in a horizontal position, a pair of diametrically opposed riflers, each of said riflers consisting of a shank portion and blade portion, said shank portion being pivotally secured at its inner end upon a bolt extending between said plates, said blade portion having its central axis obliquely disposed to the horizontal and being formed integrally with the outer end of said shank portion, lugs formed integrally upon the upper edges of said riflers and engageable with the upper edges of said plates, a pair of tension springs, each of said springs extending diagonally between the underside of one of said riflers and the lower end of said shank, and an open-topped cylindrical receptacle, said receptacle being centrally suspended from the underside of said body portion.

10. An implement for forming a spiral groove in the wall of a previously excavated cylindrical earth boring of which the wall functions as the mold for a subsequently formed concrete pile, comprising a body portion, means for rotating said body portion and means upon said body portion projecting outwardly therefrom and into the wall of said boring to form said groove upon actuation of said body portion and mechanism for permitting said spiral groove forming means to yield upon encountering obstacles in advance of the groove to be formed thereby.

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