Feb. 14, 1933. H. M. LOEBER ET AL 1,897,434

TELESCOPING BORING BAR FOR EARTH BORING MACHINES

Filed Nov. 28, 1930 3 Sheets-Sheet 1

Fig. 5

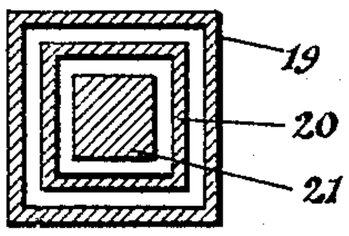


Fig. 1

Inventor
H. M. Loeber
A. P. Elliott

By Emil F. Lange
Attorney

Feb. 14, 1933. H. M. LOEBER ET AL 1,897,434

TELESCOPING BORING BAR FOR EARTH BORING MACHINES

Filed Nov. 28, 1930 3 Sheets-Sheet 2

Fig. 2

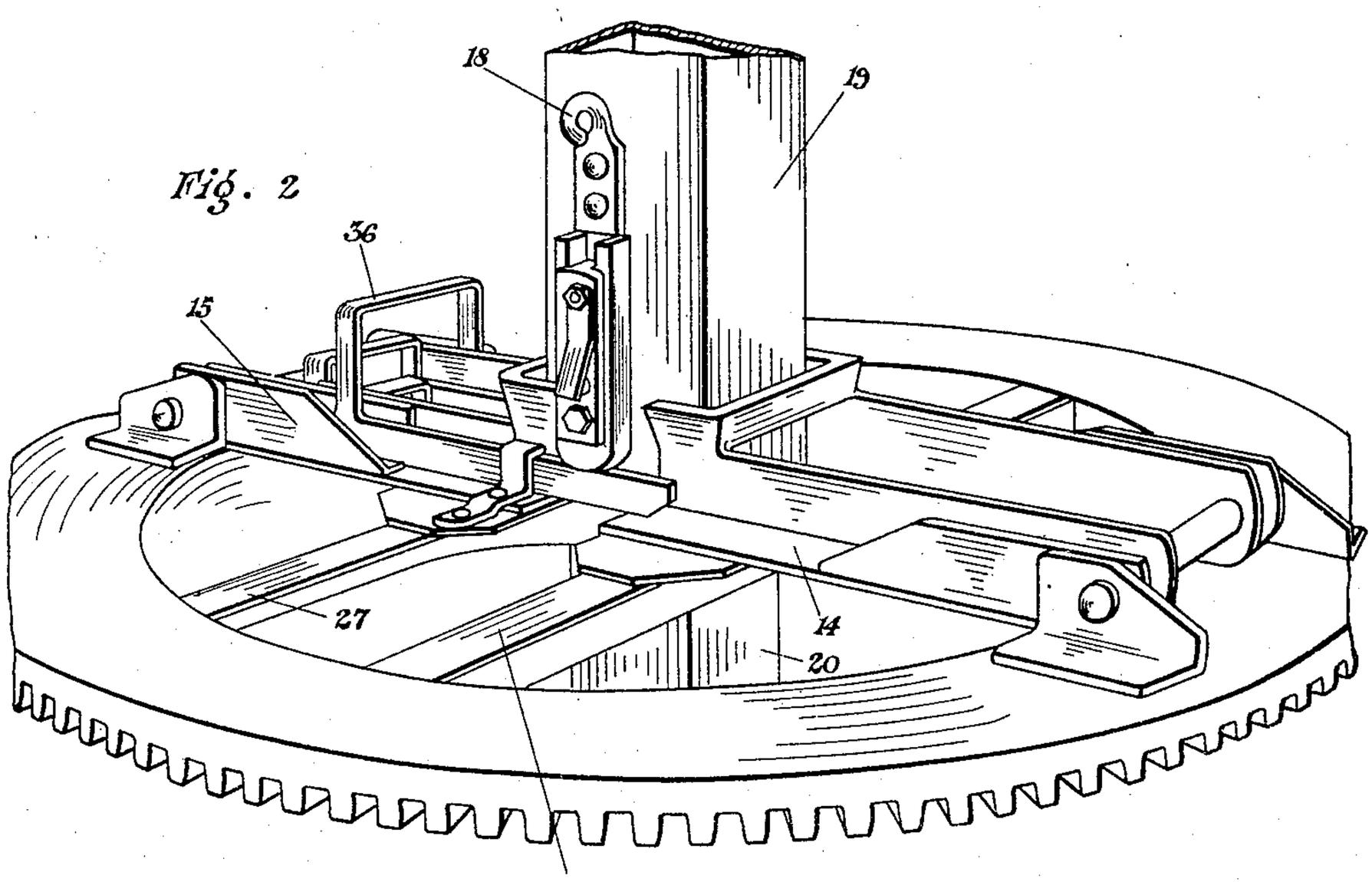


Fig 10

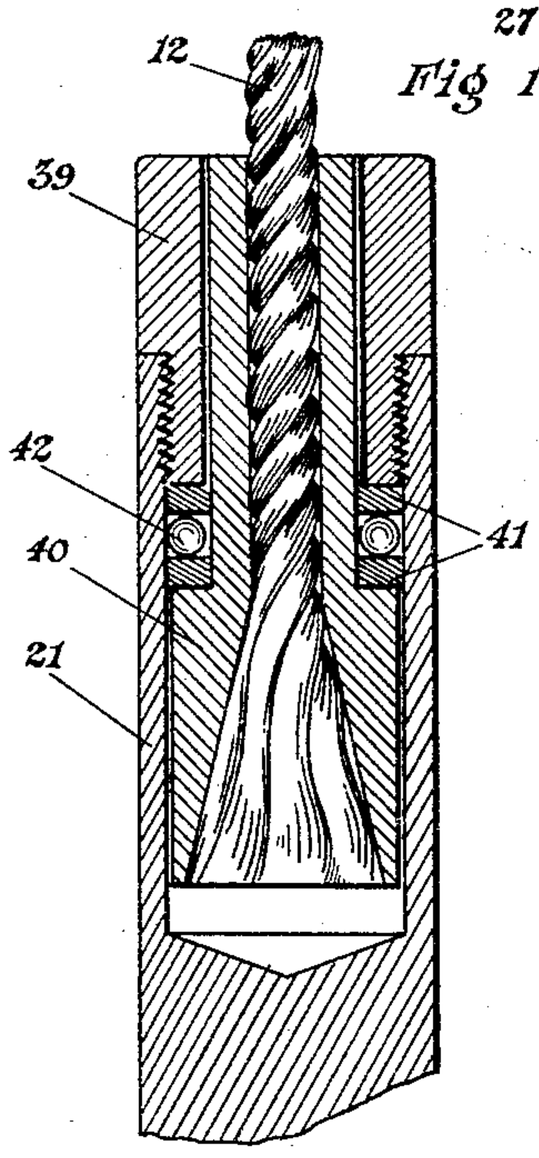
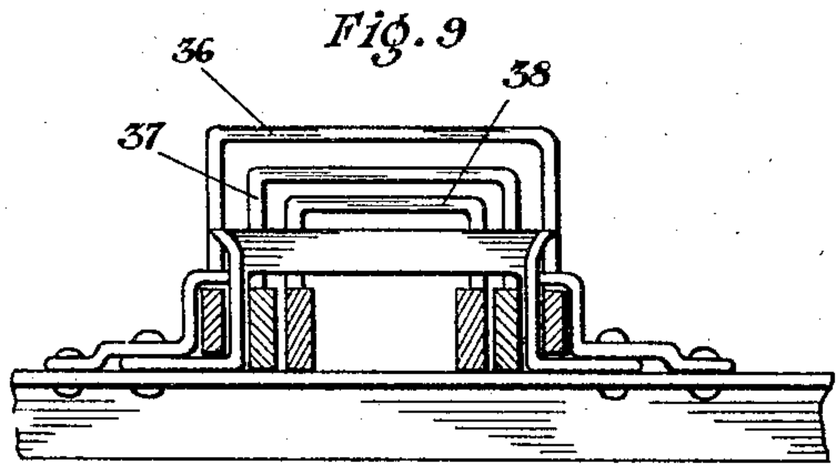


Fig. 9



Inventor
H. M. Loeber
A. P. Elliott

By Emil F. Lange
Attorney

Feb. 14, 1933. H. M. LOEBER ET AL 1,897,434

TELESCOPING BORING BAR FOR EARTH BORING MACHINES

Filed Nov. 28, 1930 3 Sheets-Sheet 3

Fig. 3

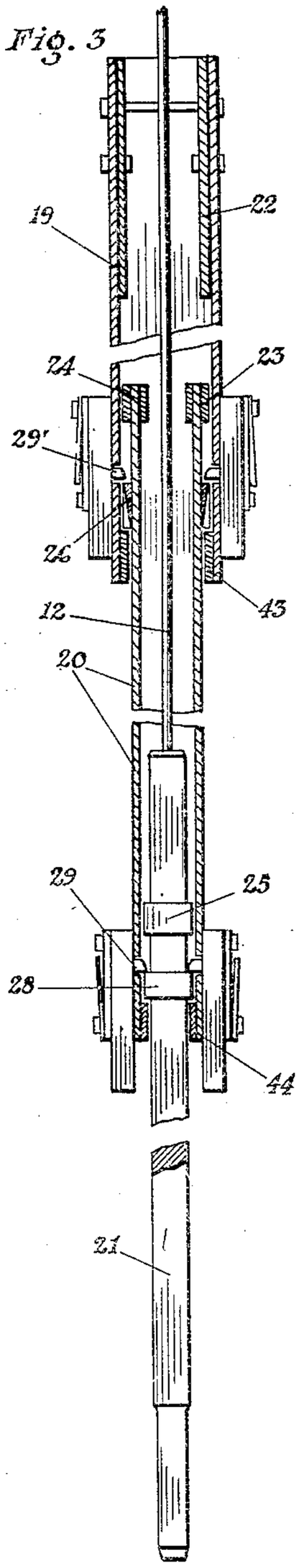
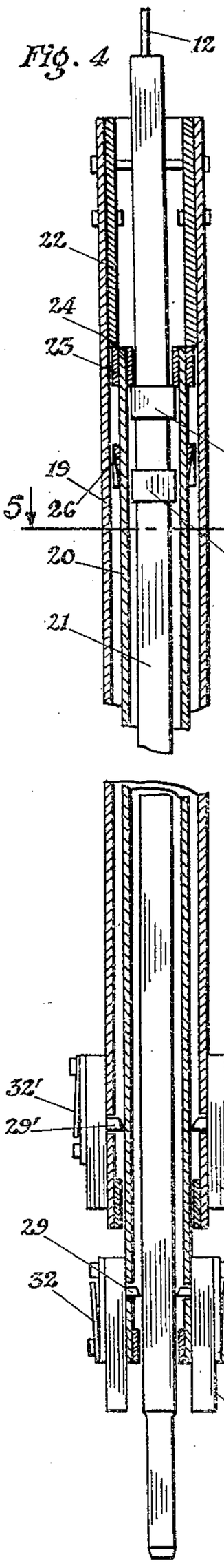


Fig. 4



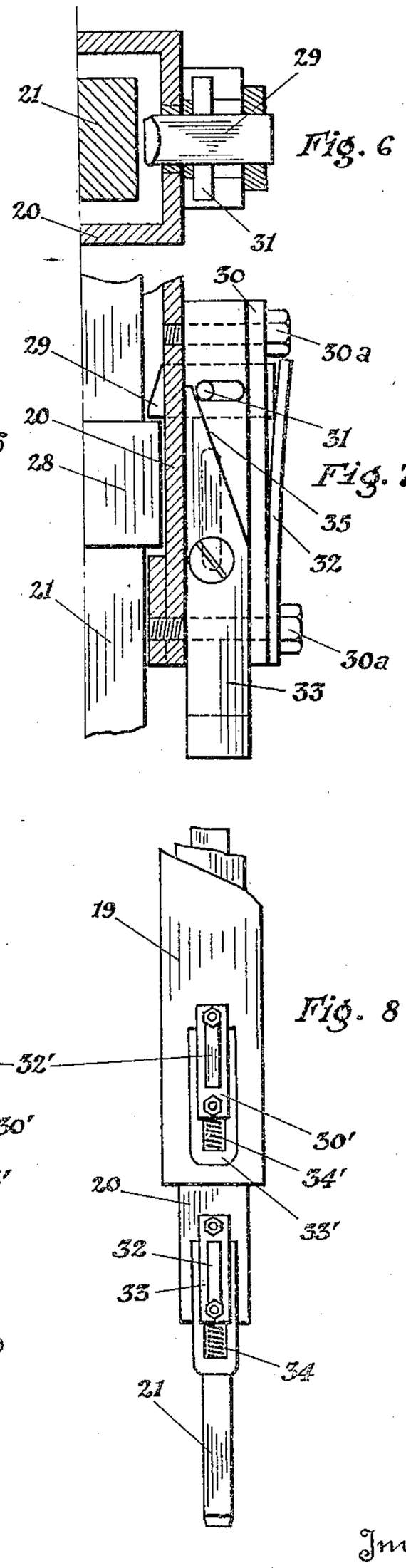


Fig. 6

Fig. 7

Fig. 8

Inventor

H. M. Loeber

A. P. Elliott

By Emile F. Lange

Attorney

Patented Feb. 14, 1933

1,897,434

UNITED STATES PATENT OFFICE

HERMAN M. LOEBER AND ANDREW P. ELLIOTT, OF BEATRICE, NEBRASKA, ASSIGNORS TO DEMPSTER MILL MANUFACTURING COMPANY, OF BEATRICE, NEBRASKA, A CORPORATION OF NEBRASKA

TELESCOPING BORING BAR FOR EARTH BORING MACHINES

Application filed November 28, 1930. Serial No. 498,874.

Our invention relates to telescoping boring bars for earth boring machines.

As is well known by those familar with earth boring machines, the auger is rotated in the hole until it is filled with earth when it must be brought to the surface and emptied. As the hole becomes deeper the boring bar must be lengthened by coupling additional lengths of bar. As this bar must be coupled and uncoupled every time the auger is brought to the surface, it can readily be seen that a considerable amount of time and labor is lost by coupling and uncoupling the boring bar.

The primary object of the present invention is to provide a means whereby holes of considerable depth may be bored without the necessity of coupling and uncoupling bars every time the auger is brought to the surface.

More specifically, an object of our invention is the provision of a telescoping boring bar which may be lengthened as the work demands and which may be shortened by telescoping the lower sections within the upper sections when it is desired to empty the auger.

Another of our objects is the provision of a latch for maintaining the telescoping sections in their extended relations, the latch being automatic in operation.

Another of our objects is the provision of means associated with the rotary driving gear for cooperation with the latch to facilitate the automatic release of the latch.

Still another of our objects is the provision of a boring bar which has a uniform weight throughout the entire boring operation so that the pressure of the boring bar on the auger will be the same at all depths.

It is also our object to provide a novel form of swivel connection between the lifting cable and the boring bar.

Having in view these objects and others which will be pointed out in the following description, we will now refer to the drawings, in which

Figure 1 is a view in side elevation of the earth boring machine.

Figure 2 is a view in perspective of the turning gear and of a portion of the boring bar and showing particularly the cooperating parts.

Figure 3 is a view in vertical section of the expanded boring bar.

Figure 4 is a view similar to Figure 3 but showing the sections of the boring bar in partially telescoped relation.

Figure 5 is a cross sectional view of the boring bar on the line 5—5 of Figure 4.

Figure 6 is a cross sectional view of the boring bar showing the latch.

Figure 7 is a view in side elevation of a portion of the boring bar and showing the details of the latch.

Figure 8 is another view in side elevation of a portion of the boring bar, the view being at right angles to that of Figure 7.

Figure 9 is a view partly in section and partly in elevation showing the sliding fork arrangement which cooperates with the latches for releasing the latches.

Figure 10 is a median vertical section of the top portion of the inner member of the boring bar and showing particularly the relation between the boring bar and the lifting cable.

The earth boring machine is shown in its broader outlines in Figure 1. It is provided with a horizontal turning gear 10 for turning a boring bar 11 which is suspended from a cable 12. The machine is further provided with a motor which is designated generally by the numeral 13, the motor having connections (not shown) for driving the turning gear 10 as well as the winding drums for the cable, all of the connections being under the control of the operator. As thus far described the mechanism is of common and quite general construction. The turning gear 10 is further provided with a pair of driving jaws 14 and 15 for engaging the boring bar. A cable 16 is provided with a hook 17 which is adapted to engage in the hook 18 of Figure 2 for the purpose of facilitating the tilting of the boring bar for emptying the auger.

The invention relates largely to the boring bar 11 and to its relation with the turning gear 10 and reference is therefore made to Figures 2 to 8 inclusive. The boring bar as

shown has three sections 19, 20 and 21, all of these being square in cross section as shown in Figure 5. The section 21 is of a size such that it slides readily into the section 20 while the section 20 is of such a size as to slide readily into the section 19. The boring bar when fully extended is almost three times the length of a single section. While these sections are slidable relative to each other in the direction of their length, they are not rotatable with respect to each other. We have shown a boring bar of three sections which are square in cross section but it is evident that the number of sections may be two or any number more and that the cross sectional shape may be anything but circular.

As shown in Figure 2 the locking jaws 14 and 15 are pivotally secured at diametrically opposite points to the turning gear 10. These locking jaws are forked at their inner or free ends to partially embrace the section 19 of the boring bar. When thus embraced, the boring bar is compelled to rotate as a unit with the turning gear 10. Braces 27 are attached to the free ends of the locking jaws 14 and 15, these braces being supported at their outer ends by lugs (not shown) on the inside of the turning gear 10. When the sections 20 and 21 are employed, they are beneath the turning gear and for this reason the locking jaws 14 and 15 always engage the upper section 19 at various points in its height during the boring operation.

The section 21 of the boring bar is suspended from the cable 12 and the boring bar must be so constructed that the section 21 will carry the sections 19 and 20, this being accomplished by limiting the telescoping movements of the various sections. The outer section 19 is provided with an inner collar 22 which coacts with an outer collar 23 on the section 20. Likewise the section 20 is provided with an inner collar 24 which coacts with an outer collar 25 on the section 21. These various collars are so positioned as to serve as stops when the sections are fully telescoped, this position being shown in Figure 4.

As shown in Figures 6 and 7 the latching pins 29 pass through guides 30 which are attached to the section 19 by means of studs 30*a*, the section 19 being provided with an aperture through which the latching pin 29 is adapted to pass. A smaller pin 31 is driven through the latching pin 29 at right angles to it to extend in both directions therefrom. A leaf spring 32 presses against the pin 29 to force it inwardly. The slide bar 33 is secured to the guides to have limited movement in one direction. A spring 34 normally maintains the slide bar 33 in the extended or inoperative position shown in Figure 7. The slide 33 is provided with an inclined upper edge 35 which is adapted to engage the projecting pins 31 to retract the pin 29 from its operative position. The spring 34 normally maintains the inclined edge 35 in inoperative position but it is evident that any upward pressure on the slide bar 33 sufficient to overcome the action of the spring 34 will cause the slide bar to engage the pin 31 and to retract the pin 29. The pin 29′ is operated by a latching mechanism of similar construction to that employed for the pin 29.

The latch as above described is the one which is secured to the intermediate section 20 to cooperate with the innermost or smallest section 21. A similar latch is secured to the section 19 to engage the intermediate section. This latch corresponds in all respects to the latch previously described, it being provided with pins 29′, guides 30′, leaf springs 32′, slides 33′, and springs 34′ corresponding to like parts of the similar latch on the intermediate section. In minor respects the two latches differ from each other only for the reason that certain slight changes are necessary in order to fully telescope the sections.

The driving jaw 15 is provided with a plurality of sliding bars 36, 37 and 38, the number corresponding with the number of sections of the boring bar. The fork portion of each sliding bar is designed for straddling a section of the boring bar, Figure 2 showing the fork portion of the slide 36 embracing the section 19. This embrace is such that the latching mechanism and especially the sliding portion of the latching mechanism rests on the tines of the fork which thus carries the entire weight of the section when the cable is slacked. This, of course, releases the latching pins and thus releases the sections from engagement with each other, the function of this mechanism being more fully explained in the explanation of the manner in which the boring bar is used. It is also apparent that the fork of the slide 37 may be seated underneath the lower extremity of the section 19 to straddle the section 20 or that the fork of the slide 38 may be seated underneath the lower extremity of the section 20 to straddle the section 21 whereby these two sections may be rested on the respective forks. The forks therefore have two functions depending on whether it is desired to unlatch the latches or to rest the weight of the upper or intermediate section on the forks without releasing the latches.

In Figure 10 is shown the connection between the cable 12 and the section 21 of the boring bar. The section 21 is hollowed out in its upper portion and it is provided with a screw thread on its interior surface. The collar 39 is provided with a lower offset portion which is externally screw threaded to engage the screw threaded portion of the upper end portion of the section 21. When the members 21 and 39 are assembled, their exterior walls are continuous. The collar

39 is designed for locking an anchor 40 within the section 21. The anchor 40 is provided with a central bore which is flanged at its lower extremity as shown in Figure 10. The central bore receives the end of the cable which is swedged into the lower end portion of the central bore and which is firmly secured within the anchor 40 by means of lead or other suitable material which is poured into the open end in molten form. The anchor 40 is rotatable with respect to the section 21 and it is provided with a pair of hardened steel washers 41 having a ball race 42 between the washers to minimize friction. In this manner the section 21 may be rotated at will during the boring operation without twisting or untwisting the cable 12.

In operating the device the hole is first bored down to the depth of the closed or telescoped bars. After this point is reached the intermediate and innermost sections are extended as a unit. This is accomplished by lowering the outer section 19 on to the tines of the slide 37 which are slid out into the opening of the driving jaws. The weight of the section 19 is thus supported on the fork and this allows the sections 20 and 21 to be lowered as a unit into the hole by merely applying slack to the cable. This lowering is then continued until the locking pins 29′ of the section 19 engage the upper surface of the collar 26. The upper and intermediate sections are thus held in extended relation by the cable 12 which normally prevents the outward sliding of the innermost section 21. When the hole has then been bored to the depth determined by the combined length of the sections 19 and 20, the fork of the slide 38 is brought into play to support the intermediate section 20 so as to permit the lowering of the innermost section 21. This also will be latched into the position shown in Figure 3 by the sliding of the collar 28 past the latching pin 29 which automatically prevents telescoping movement of the sections 20 and 21.

The expansive movements of the sections must also be limited. For this purpose we provide a collar 43 on the interior and at the lower extremity of the section 19, this collar cooperating with the collar 26 on the section 20 to limit the expansive movement of these two sections. Similarly the section 20 is provided with an interior collar 44 at its lower extremity for cooperation with the collar 28 of the section 21 to limit the expansive movements of the sections 20 and 21.

In machines of this type, the boring bar carries an auger at its lower extremity. This is turned until the auger becomes filled or partly filled with soil which must be removed from the auger before continuing the boring. To accomplish this, the boring bar is raised and then tilted so that the soil may be removed from the auger. In prior earth boring machines, this is done by uncoupling sections which must be again coupled after the soil has been removed from the auger. In the present machine, this is done by telescoping the sections to shorten the boring bar sufficiently to facilitate the raising of the auger above the level of the mouth of the hole. After the boring bar is raised so that the lower extremity of the section 19 will be in the position shown in Figure 2, the slide 36 may be manipulated so that its fork will straddle the section 19 and to engage the latch. By then slacking the cable 12, the entire weight of the boring bar will rest on the latches which thus become disengaged. Tension on the cable 29 will then lift the intermediate and innermost sections as a unit, the latch being maintained in inoperative position while the weight of the section 19 is supported on the latches. When the boring bar is used in its fully extended position, the two latches are released in succession in order to bring their sections into fully telescoped relation each time the auger is to be emptied.

The boring bar may be used for drilling wells or other holes in the ground. It is used to a large extent for drilling holes which are then filled with concrete to serve as piers for the erection of buildings. When used for this purpose, an underreamer is employed for enlarging the bottom of the hole to provide a firm footing for the pier. The boring bar as above described is adapted to carry any suitable auger including all suitable underreamers.

Having thus described our invention in such full, clear, and exact terms that its construction and operation will be readily understood by others skilled in the art to which it pertains, what we claim as new and desire to secure by Letters Patent of the United States is:

1. An earth boring machine having a rotatable telescoping boring bar consisting of a plurality of sections, collars secured to said sections for limiting the movements of said sections relative to each other in both directions of telescoping movement, means for turning said boring bar, and means coacting with the innermost of said sections for raising and lowering said boring bar.

2. An earth boring machine having a rotatable boring bar consisting of a plurality of telescoping sections, means for limiting the movements of said sections relative to each other in both directions of telescoping movement, means for latching any two contiguous sections in expanded relation, means for turning said boring bar, and means coacting with the innermost of said sections for raising and lowering said boring bar.

3. An earth boring machine having a rotatable boring bar consisting of a plurality

of telescoping sections, means for latching any two contiguous sections in expanded relation, means for turning said boring bar, means associated with said turning means for releasing said latching means at will, and means for limiting the movements of said sections relative to each other in both directions of telescoping movement.

4. An earth boring machine including a rotatable boring bar consisting of relatively nonrotatable telescoping sections, and latching means for maintaining said boring bar in expanded relation, said latching means including interengaging inner and outer collars secured to said sections.

5. An earth boring machine including a rotatable boring bar consisting of relatively nonrotatable telescoping sections, and gravity operated latching means for latching said sections in expanded relation.

6. An earth boring machine including a rotatable boring bar consisting of a plurality of sections of substantially equal lengths and secured together for relative sliding movement but against relative turning movement whereby said boring bar may be collapsed to a length substantially equal to one of said sections, and gravity operated latching means for maintaining said boring bar in expanded relation.

7. An earth boring machine including a rotatable boring bar consisting of relatively nonrotatable telescoping sections, a turntable for imparting rotary movement to said boring bar, gravity operated means for latching said sections in expanded relation, and means for supporting said boring bar on said turntable to release said latching means.

In testimony whereof we affix our signatures.

HERMAN M. LOEBER.
ANDREW P. ELLIOTT.