W. F. BRANNING.

UNDERGROUND PORTABLE DRILL.

APPLICATION FILED NOV. 3, 1917.

1,310,274.

Patented July 15, 1919.

8 SHEETS—SHEET 1.

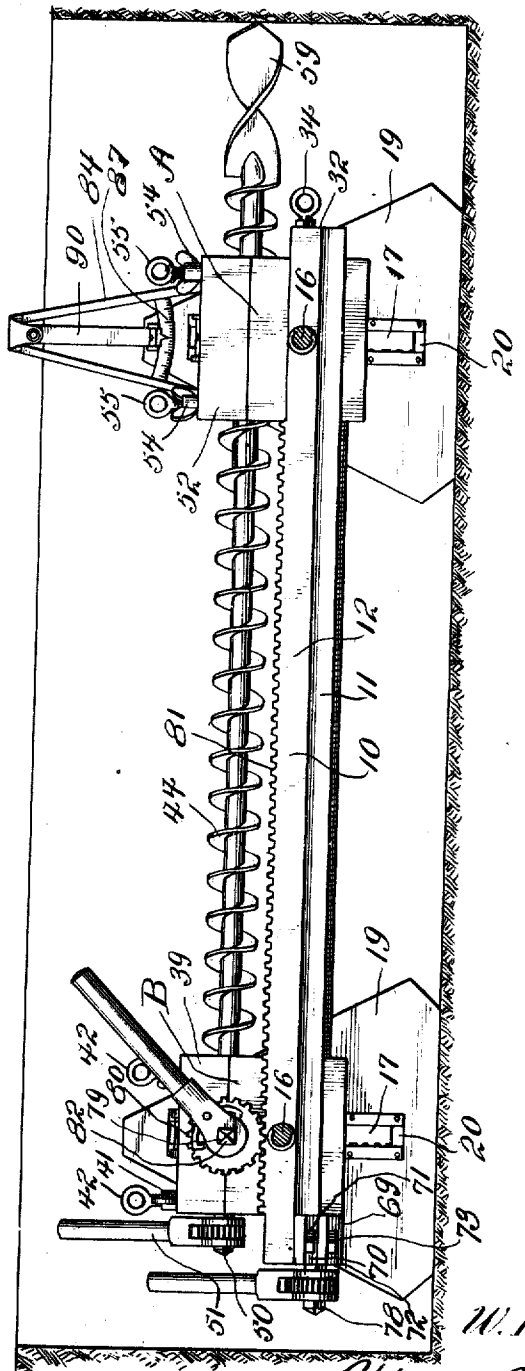


Fig. 1.

WITNESSES

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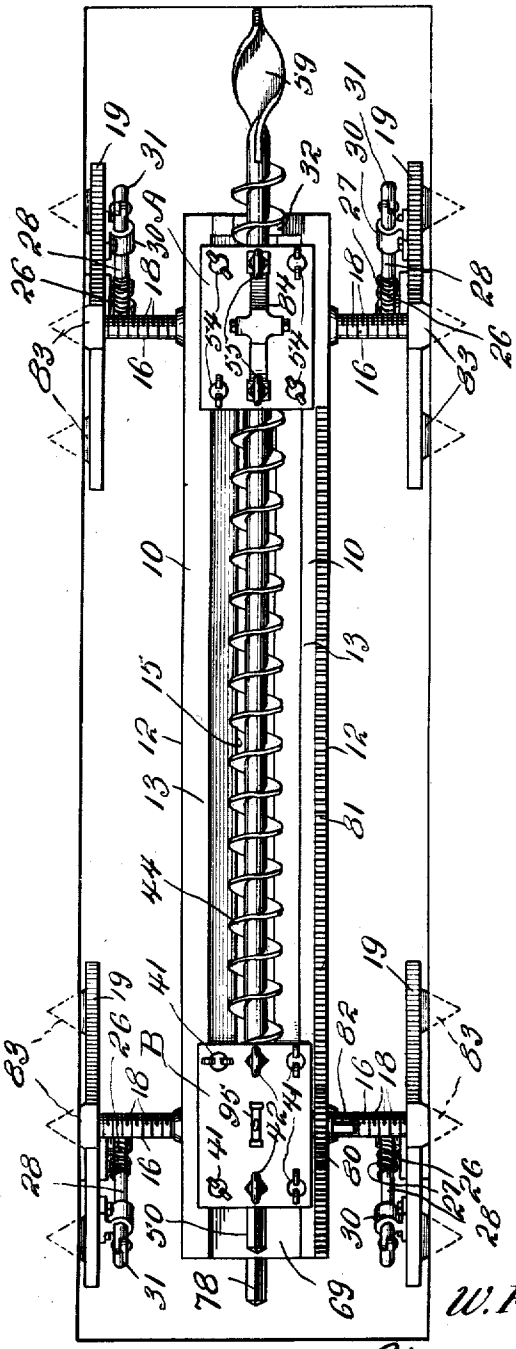


Fig. 2.

WITNESSES

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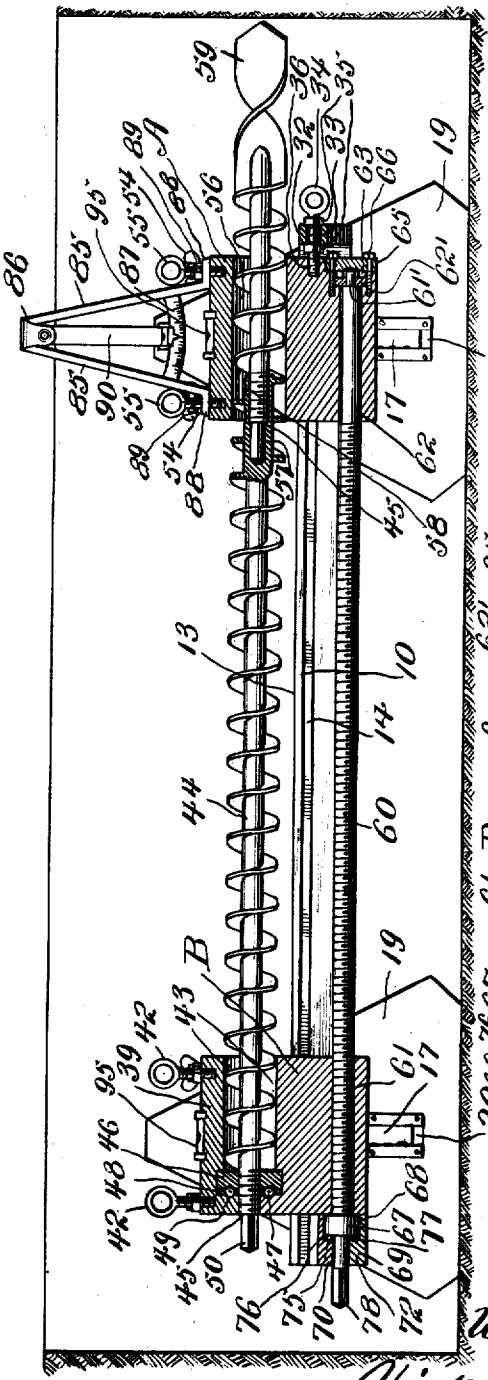


Fig. 3.

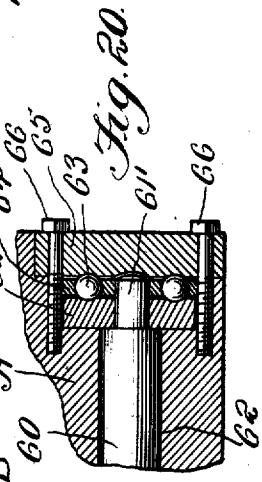


Fig. 20.

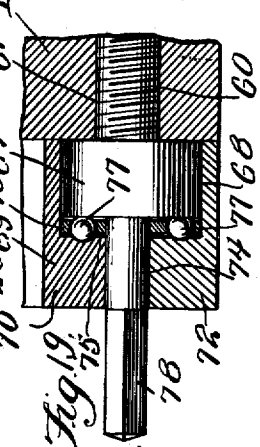


Fig. 19.

WITNESSES

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8 SHEETS—SHEET 4.

Fig. 4.

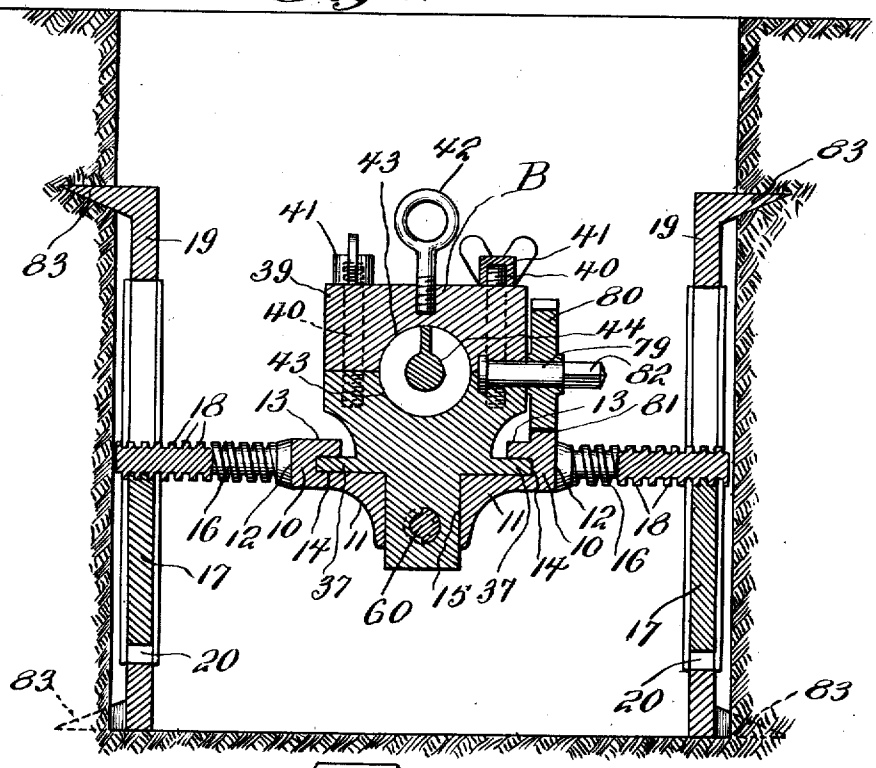


Fig. 5.

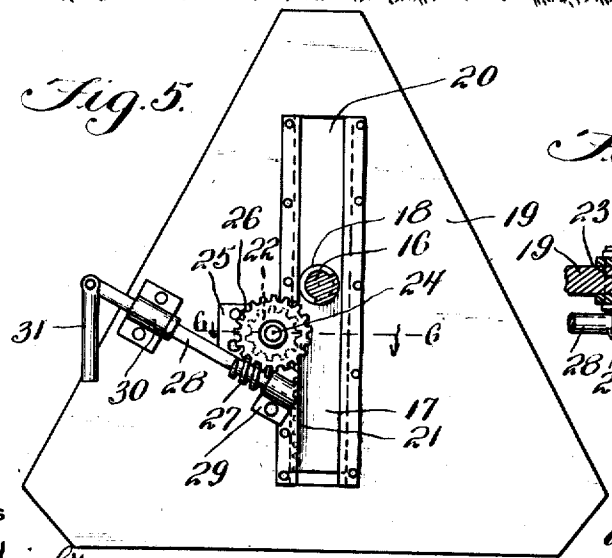
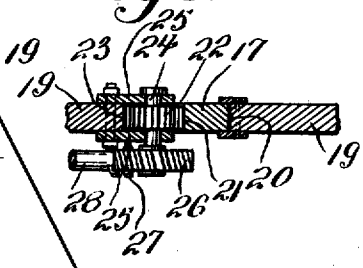


Fig. 6.



WITNESSES

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8 SHEETS—SHEET 5.

Fig. 7.

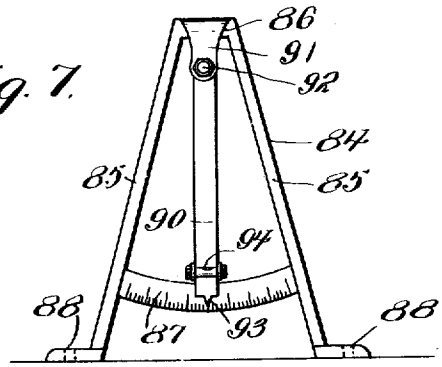


Fig. 8.

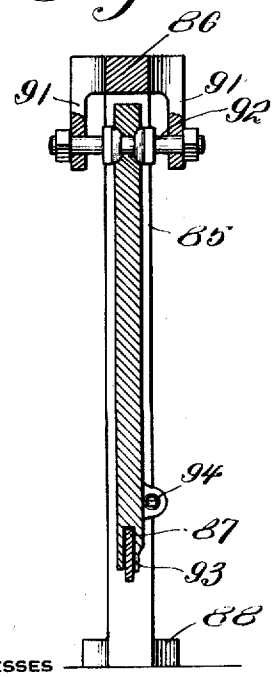


Fig. 9.

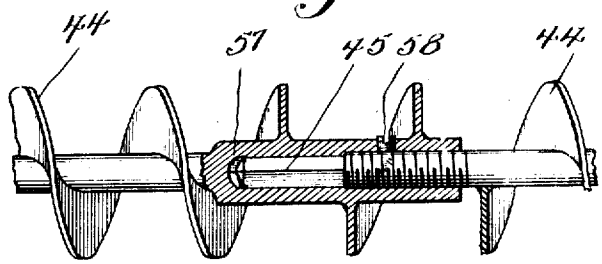
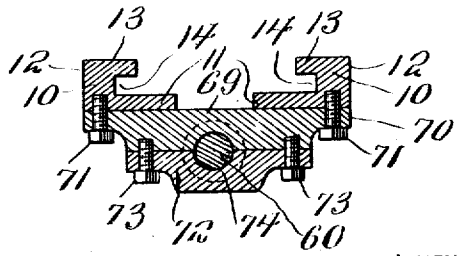


Fig. 10.



WITNESSES

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8 SHEETS—SHEET 6.

Fig. 11.

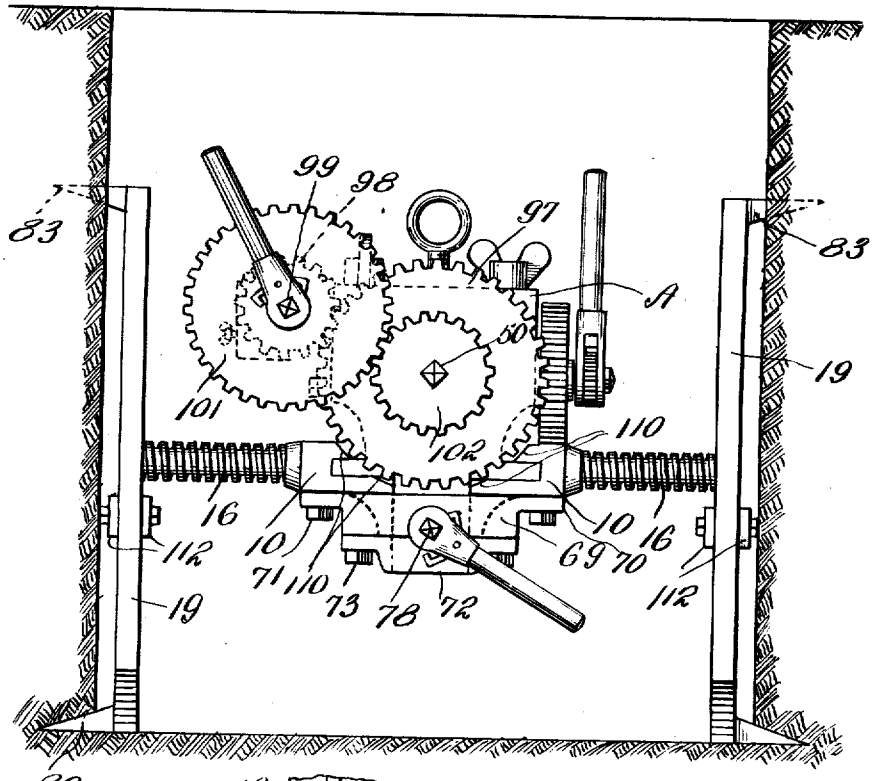
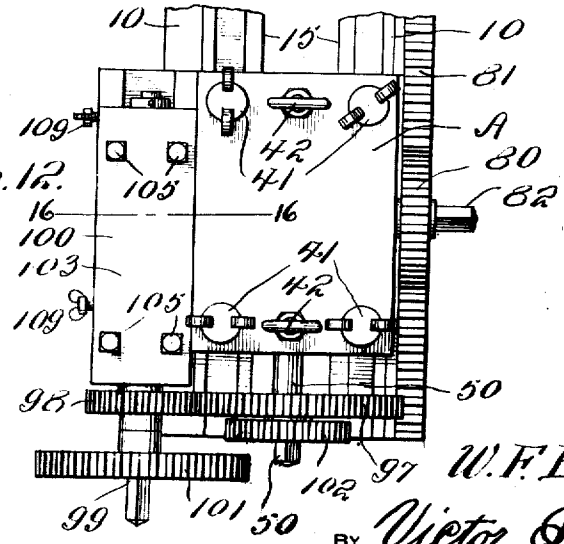


Fig. 12.



WITNESSES

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8 SHEETS—SHEET 1.

Fig. 13.

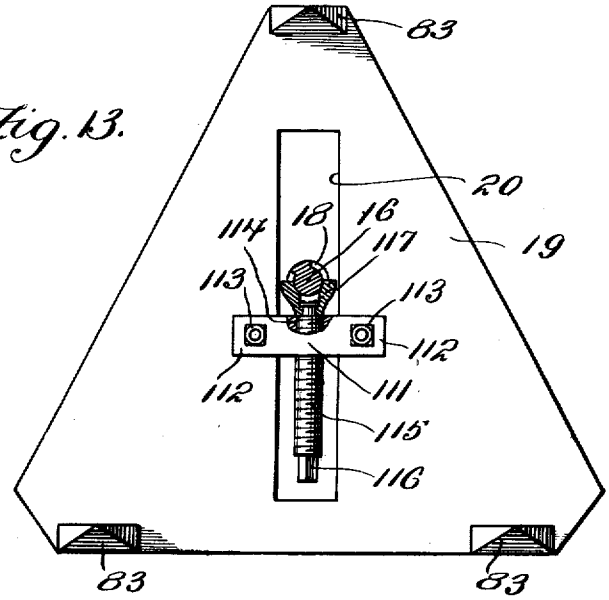


Fig. 17.

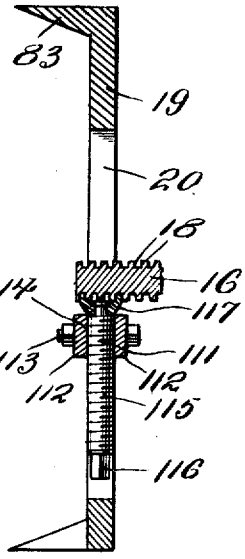
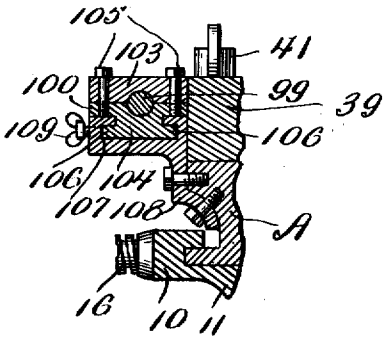


Fig. 16.



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8 SHEETS—SHEET 8.

Fig. 15.

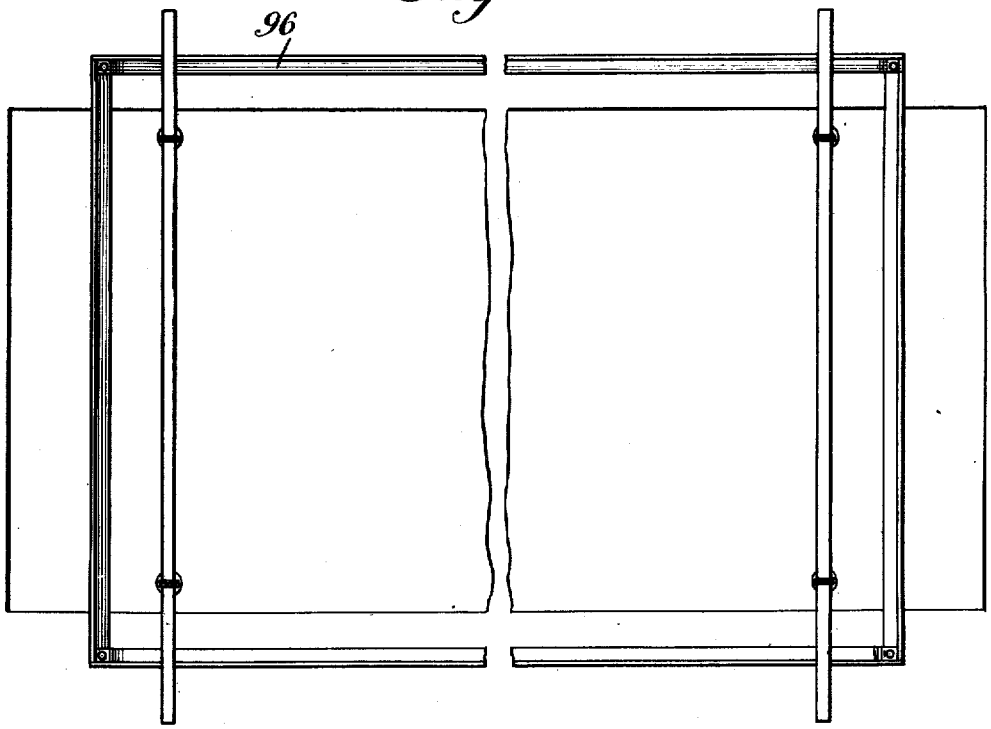
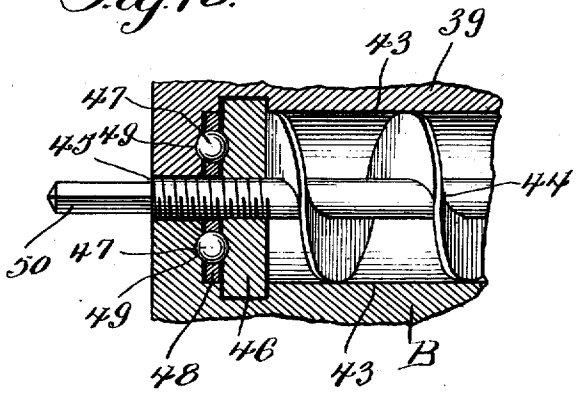


Fig. 18.



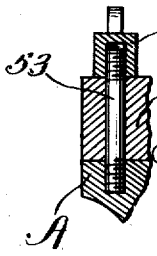


Fig. 17.

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIE F. BRANNING, OF SAN ANTONIO, TEXAS.

UNDERGROUND PORTABLE DRILL.

1,310,274. Specification of Letters Patent. Patented July 15, 1919.

Application filed November 3, 1917. Serial No. 200,148.

To all whom it may concern:

Be it known that I, WILLIE F. BRANNING, a citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented new and useful Improvements in Underground Portable Drills, of which the following is a specification.

This invention relates to drilling machines and has for its object the provision of a machine for drilling underground openings for laying gas, electric, water or other conduits.

Another object of the invention is the provision of a sectional drill or track worm, which carries the drill bit, the said sections having interlocking engagement with one another in order that the operation of drilling may be continued after the original section has been fed its entire length, an additional section being inserted and the drilling operation continued without the necessity of moving the machine.

Another object of the invention is to provide a machine of the above class in which the direction of the opening to be drilled may be regulated, the machine being capable of adjustment so as to drill in a direct or perfectly straight line or at an angle to the surface of the ground.

A further object is to provide means carried by the machine for determining the direction of the bore, the machine being capable of adjustment to angles of various degrees and the degrees of such adjustment shown, so that it is possible to accurately set the machine for the boring at any desired angle.

With the above and other objects in view, the invention consists of the following novel combination and arrangement of parts, hereinafter more fully described and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a drilling machine embodying the present invention and shown positioned within a trench.

Fig. 2 is a plan view of the same.

Fig. 3 is a central longitudinal vertical sectional view.

Fig. 4 is a cross-sectional view taken through the rear end of the machine, illustrating the means for adjusting the height of the machine for the purpose of leveling the same and regulating the direction of the bore.

Fig. 5 is a detail elevation of one of the supporting plates.

Fig. 6 is a detail sectional view through one of these plates further illustrating the adjusting means.

Fig. 7 is an enlarged elevation of the altitude or leveling gage.

Fig. 8 is a detail section illustrating the manner of mounting the swinging spirit level.

Fig. 9 is an enlarged detailed section showing the connection between the sections of the drill or drag worm.

Fig. 10 is a detail sectional view through the end plate.

Fig. 11 is an end elevation illustrating a modified form of driving mechanism.

Fig. 12 is a fragmentary plan view of the mechanism shown in Fig. 11.

Fig. 13 is an elevation of one of the supporting plates showing a modified form of adjusting means.

Fig. 14 is a vertical sectional view of the same.

Fig. 15 is a diagram showing the location of the templet over the trench in the initial positioning of the machine.

Fig. 16 is a sectional view on line 16—16 of Fig. 12.

Fig. 17 is an enlarged section showing the manner of connecting the plate to the guide block.

Fig. 18 is a similar view of the manner of mounting the drill in the feed block.

Fig. 19 is an enlarged section showing the manner of mounting the feed worm within the feed block; and

Fig. 20 is a like view showing the mounting of the opposite end of the feed worm within the guide block.

Referring in detail to the drawings, the machine includes a guide block designated in its entirety by the reference character A and a feed block shown at B. These blocks are adapted to be mounted upon a track, which constitutes a support therefor and consists of a pair of longitudinally disposed members 10 which are formed each of a plate 11, provided with a side flange

12 and a substantially parallel inwardly extending flange 13, to provide a longitudinal groove 14. The track members 10 are spaced apart to provide a longitudinal central groove 15, the purpose of which will be presently apparent, Each of the track members 10 carries oppositely extending supporting arms 16, which arms are each adapted to engage the upper concaved end of a vertically adjustable plunger 17. The arms 16 are formed with threads 18, which engage the upper ends of the plungers 17 and provide for a lateral adjustment of the track. By this means a lateral horizontal adjustment of the drill may be effected.

As shown in the drawings, there are four of the supporting arms 16, each one of which is adapted to engage one of the plungers 17, which are mounted for vertical movement in supporting plates 19. For the purpose of accommodating the plungers 17 the plates 19 are provided with centrally and vertically disposed slots 20, the said plungers being positioned within these slots in a manner to permit of their vertical movement, but preventing their accidental disengagement from the slots.

The plungers 17 are adjusted by means of suitable gearing, each of the plungers being provided upon one face with rack teeth 21, which are adapted to engage a pinion 22 housed within an opening 23 formed in the supporting plate and communicating with the slots 20. The pinion 22 is mounted upon a short shaft 24, which has bearings in plates 25, secured upon each side of the supporting plate 19. The inner end of the shaft 24 carries a gear 26, which is adapted to engage a worm 27, carried by the angularly disposed shaft 28, which shaft is mounted in bearings 29 and 30 secured to the face of the plate 19. The outer end of the shaft 28 has pivoted thereto an operating handle 31, by means of which the said shaft is rotated to operate the gears 22 and 26 for the purpose of adjusting the plunger 17. It will be thus seen that as each of the plates 19 is supplied with this adjusting mechanism, the track 10 may be easily and accurately adjusted, so as to control the direction of travel of the feed block thereon.

The track 10 has the end next the guide block A closed, and this closed end has secured thereto a block 32, which is formed with a bore 33, for the purpose of receiving an eye bolt 34, which bolt is located within the opening of the bore 33 by means of the lock nuts 35. The eye bolt 34 is adapted to engage a threaded socket 36, located in the front face of the guide block A and when positioned therein will lock the said guide block upon the track against movement.

The blocks A and B are capable of longitudinal movement within the track 10, each of the said blocks being provided with laterally extending flanges 37, which are adapted to engage the longitudinal openings 14 of the track members 10. This enables the block A when assembling the machine to be positioned within the track at the open end thereof and moved along to the forward end of the track for the purpose of engaging the eye bolt 34, while the feed block B is capable of such longitudinal movement along the track during the operation of the machine.

The feed block B is formed with a top section or plate 39, which is adapted to be secured to the body of the block by means of the bolts 40, which are provided with winged heads 41 to aid in assembling the block. The top section of plate 39 of the block is also provided with eye bolts 42, which form a convenient means for handling this section.

The body portion of the block B and the top section or plate 39 are each formed with one-half of a bore 43, within which is adapted to be positioned one end of a sectional drill or drag worm 44. This end of the worm is reduced as shown at 45 and is threaded, for the purpose of receiving thereon a cone 46, which is formed with a ball race way in one face thereof, which is adapted to receive balls 47 carried by a retainer 48, the end of the bore 43 being also provided with a race way 49. The extremity of the worm 44 is formed with a squared portion 50, which is adapted to removably receive a ratchet wrench 51 or any approved type.

The guide block A is formed similarly to the feed block B, in that it is composed of a body portion and a removable section or plate 52, which is held to the said body portion by means of the bolts 53 and the winged heads 54. The section 52 also carries eye bolts 55. The guide block A is formed with a bore 56, which is adapted to be alined with the bore 43 of the block B, the bore 56 extending longitudinally through the guide block A for the purpose of permitting the passage of the worm 44.

The worm 44 is of novel construction, in that it is extensible, the said worm being formed in sections, one end of which is provided with a socket 57, which is adapted to receive a reduced end 45 previously described, each of these sections being identical, so that the reduced end of one section will engage the socket of the engaging section to provide interlocking connection, the said connection being secured by means of a set screw 58.

It will thus be seen that as the screw is fed forward, additional sections may be added until a bore of the required length is obtained.

Secured to the outer end of the worm 44 is a drill bit 59, which may be of any approved

type suitable for the purpose and while the machine herein illustrated is designed for the purpose of boring in earth, a different style of drilling bit may be substituted for the one shown so as to adapt the machine to various other purposes, such as boring through rock or steel.

For the purpose of keeping the bit tensioned, or close up to the work, the guide block A and the feed block B are connected together by means of a feed worm 60, the said worm being threaded throughout the major portion of its length, for engagement with the threaded opening 61 formed in the feed block B. The end of the feed worm which enters the bore 62 of the block A is reduced for that portion of its length and is formed with a plane rounded surface for the purpose of permitting it to revolve freely within the block A. The extreme end of this worm is further reduced as shown at 61′ and over this reduced portion is fitted a cone 62′, that is adapted to engage within its race way balls 63 carried by a retainer 64. Another cone 65 is adapted to be positioned upon the opposite side of the retainer and held in such position by means of the bolts 66, the construction just described providing a thrust bearing for this end of the feed worm 60.

The opposite end of the feed worm is provided with an annular flange 67 which is adapted to be received within the bore 68 formed in an end bearing block 69 secured transversely beneath the bottom of the track members 10. This bearing block is formed of the upper section 70, which is adapted to be secured to the track members 10 by means of the bolts 71 and the lower section 72, which latter is secured to the upper section by means of the bolts 73, the bore 68 previously mentioned being positioned between these two sections. The bore 68 is reduced throughout a portion of its length as shown at 74, for the purpose of providing a shoulder 75, between which shoulder and the annular flange 67 of the worm 60 is positioned a ball retainer 76, carrying balls 77 to provide a thrust bearing for this end of the worm. The worm 60 is formed with a reduced squared extremity 78, which extends beyond the bearing block and is adapted to receive a ratchet wrench, similar to the wrench 51 previously mentioned.

The bearing block B has mounted therein a short shaft 79, which carries a gear 80, the shaft 79 extending at one side of the machine so as to position the gear above one of the track sections 10. This section of the track is formed with rack teeth 81, for engagement with this gear, the gear being operated by means of a ratchet wrench adapted to be removably positioned upon the squared extension 82 of the shaft 79.

In its operation the machine is adapted to be positioned within a trench of suitable dimensions, the depth of the trench being regulated by the depth of the opening to be bored, and when positioned within this trench the plates 19 are adapted to abut the sides of the trench and to be held in position therein by means of sharpened angular extensions 83 provided at each side of the lower end of these plates.

In order that the machine may be adjusted to the proper level for boring a hole in a direct line, or at the desired inclination, the block A has removably secured thereto an altitude or leveling gage 84. This gage includes the standards 85 which are connected at their upper ends by means of a transverse bar 86, the said standards being positioned apart at their lower ends and connected by means of the segment 87. The extreme lower ends of the standards 85 are provided with feet 88, in which openings are formed for the reception of eye bolts 55, by means of which the leveling gage is secured to the machine. In order to securely hold the gage in position locking nuts 89 are adjustably mounted upon the eye bolts 55, so that the feet 88 of the standards may be clamped between these lock nuts and the upper surface of the block A.

Mounted for swinging movement on the bar 86 is a pendulum 90, the said pendulum being pivoted in depending ears 91 by means of the shaft 92, which if desired may be provided with suitable ball bearings. The lower end of the pendulum 90 is adapted to straddle the segment 87, and is provided with a pointer 93 for engagement with suitable graduations upon the said segment, these graduations indicating the various degrees of a circle. The pendulum 90 also carries a spirit level 94 for the purpose of determining the true vertical position of the said level. To further aid in leveling the machine the blocks A and B are also provided with spirit levels 95.

In setting up the machine for operation a suitable trench is dug at a point where it is desired to begin drilling, the said trench being of a sufficient depth to enable the drill bit to be positioned far enough below the surface of the ground. Over this trench is placed a templet 96 and the machine is positioned thereon, the initial leveling of the machine being obtained by the use of wedge blocks, or in any other desired manner.

After the machine has been positioned within the trench and suitably leveled by means of its various leveling devices, the templet is then withdrawn and the operation of drilling begun.

In this drilling operation the worm 44 is revolved by means of the ratchet wrench previously described, the ratchet upon the shaft 79 being provided for a forward movement of the feed block to feed the drill into

the bore, while the ratchet on the feed worm 60 is utilized for tensioning or keeping the point of the bit into the work.

In the modification shown in Figs. 11, 12 and 16, the worm 44 is illustrated as being driven through suitable gearing, this being accomplished by mounting upon the extension 50 of the worm, a gear 97, this gear being driven by means of a pinion 98 mounted upon a stub shaft 99, having bearings in block 100. The shaft 99 may be operated by a suitable ratchet wrench similar to the ones previously described, it being preferred to use the Mueller type for this purpose. If desired provision may be made for the mounting of a motor which may be geared to the stub shaft 99 for the purpose of operating the worm 44. The shaft 99 is slidably mounted within the block 100 and carries thereon in addition to the pinion 98, a gear 101, which is adapted to be moved into engagement with the pinion 102 mounted upon the extension 50 of the worm 44, so that by sliding the shaft 99 a different speed may be obtained for the drill worm.

The block 100 is formed of an upper section 103 and a lower section 104, the two sections being secured together by means of the bolts 105. The lower section of the block is formed with oppositely extending flanges 106, which are adapted to engage a track or groove 107, provided with a bracket 108, which is bolted or otherwise secured to the body block. This mounting of the bearing block 100 provides for the shifting of the shaft 99 for the purpose of changing the speed of the drill worm, the said block being held in its adjusted position by means of set screws 109.

In order to accommodate the gear 101, the track members 10 are cut away as shown at 110.

In the modification shown in Figs. 13 and 14, there is provided a different form of means for obtaining the proper angular adjustment of the machine. These means comprise a bearing block 111, which is mounted within the slot 20 of the plate 19, this block being secured to the plate by means of oppositely located ears 112, secured to the plate by the bolts 113. The block 111 is provided with a threaded bore 114, for engagement with the adjusting screw 115, which is formed upon its lower end with a rectangular wrench engaging portion 116. The opposite end of the adjusting screw has swiveled thereto an arcuate plate 117, which is adapted to receive the end of one of the track supporting arms, after the manner of the plunger 17.

It is believed that from the foregoing description when taken in connection with the accompanying drawings, the construction, operation and advantages of the invention will be apparent, and that a more extended description is unnecessary. The right is reserved to make such changes in the form, proportion and details of construction of the invention as will fall within the scope of the claims hereto appended.

Having described the invention, what is claimed is:

1. A drilling machine comprising a support, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm and means including vertically movable elements for regulating the angle of the bore.

2. A drilling machine comprising a support, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm and means including vertically slidable elements engageable with each end of the machine for regulating the angle of the bore.

3. A drilling machine comprising a support adapted to be positioned within an opening, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm, said support including oppositely located vertically disposed plates and a track relatively adjustable in said plates.

4. A drilling machine embodying a track, supports located at each end thereof, a drill worm mounted for movement upon said track, a drill bit, means whereby the worm may be operated to rotate the bit, vertically movable adjusting elements mounted in each of said supports and means for connecting the track to each of the adjusting elements for regulating the angle of the bore.

5. A drilling machine embodying a track, supports located at each end thereof and provided with vertical guide slots, a drill worm mounted for movement upon said track, a drill bit, means whereby the worm may be operated to rotate the bit, vertically movable adjusting elements mounted in the slots of each of said supports and means for connecting the track to each of the adjusting elements for regulating the angle of the bore.

6. A drilling machine embodying a track, supports located at each end thereof and provided with vertical guide slots, a drill worm mounted for movement upon said track, a drill bit, means whereby the worm may be operated to rotate the bit, vertically movable adjusting elements mounted in the slots of each of said supports and laterally extending arms for connecting the track to each of the adjusting elements for regulating the angle of the bore.

7. A drilling machine embodying a track, suports located upon the opposite sides of each end of said track, a drill worm mounted upon the track, a drill bit, means whereby the worm may be operated to rotate the bit and laterally extending arms mounted upon

the opposite sides of each end of the track and engageable with the supports in a manner to permit of the track being adjusted laterally with respect to the supports.

8. A drilling machine embodying a track, supports located upon opposite sides of each end of said track, a drill worm mounted upon the track, a drill bit, means whereby the worm may be operated to rotate the bit and laterally extending arms mounted upon opposite sides of each end of the track and threadedly engaging the supports, whereby said track may be adjusted laterally with respect to the supports.

9. A drilling machine embodying a track, supports located upon opposite sides of each end of said track, a drill worm mounted upon the track, a drill bit, means whereby the worm may be operated to rotate the bit, laterally extending arms mounted upon opposite sides of each end of the track and rotatably mounted threaded elements carried by each of the supports, whereby the track may be adjusted laterally with respect to the supports.

10. A drilling machine comprising a support, a guide block carried thereby, a feed block, means for slidably connecting both blocks to the support, means for removably holding the guide block in position, a drill worm, a drill bit carried by the worm and adjustable means positively connecting the guide block and feed block for holding the bit against the work.

11. A drilling machine comprising a support, a guide block carried thereby, a feed block, means for slidably connecting both blocks with the support, means including a threaded member carried by the support and engageable with the guide block for removably holding the guide block in position, a drill worm, a drill bit carried by the worm and adjustable means positively connecting the guide block and feed block for holding the bit against the work.

12. A drilling machine comprising a support, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm, and means engageable with each end of the support whereby either or both ends may be adjusted to regulate the height or angle of the bore.

13. A drilling machine comprising a support, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm, and means including slidably mounted bearings connected to the support whereby either or both ends may be adjusted to regulate the height or angle of the bore.

14. A drilling machine comprising a support, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm, and means for adjusting the support transversely to regulate the position of the bore.

15. A drilling machine comprising a support adapted to be positioned within an opening, a guide block carried thereby, a feed block, a drill worm, a drill bit carried by said worm, said support including oppositely located vertically disposed plates and a track provided with oppositely disposed grooves engageable with said guide and feed blocks, whereby said blocks may be guided along the track.

In testimony whereof I affix my signature.

WILLIE F. BRANNING.