No. 885,945. PATENTED APR. 28, 1908.

D. A. MOORE.

DRILLING MACHINE.

APPLICATION FILED SEPT. 8, 1906.

3 SHEETS—SHEET 1.

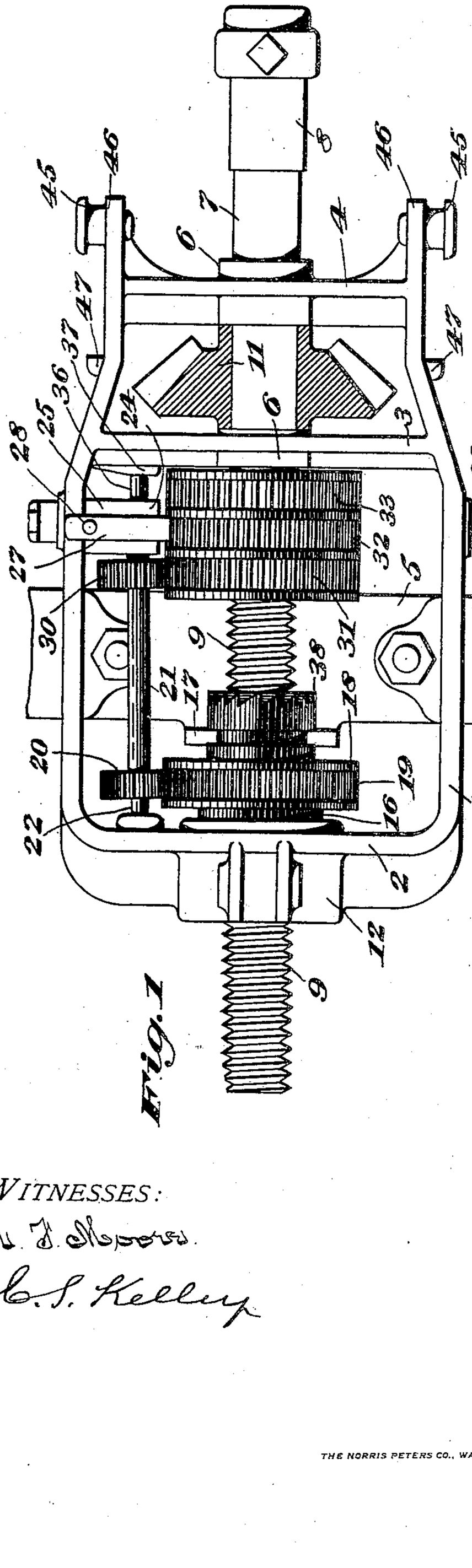

Fig. 1

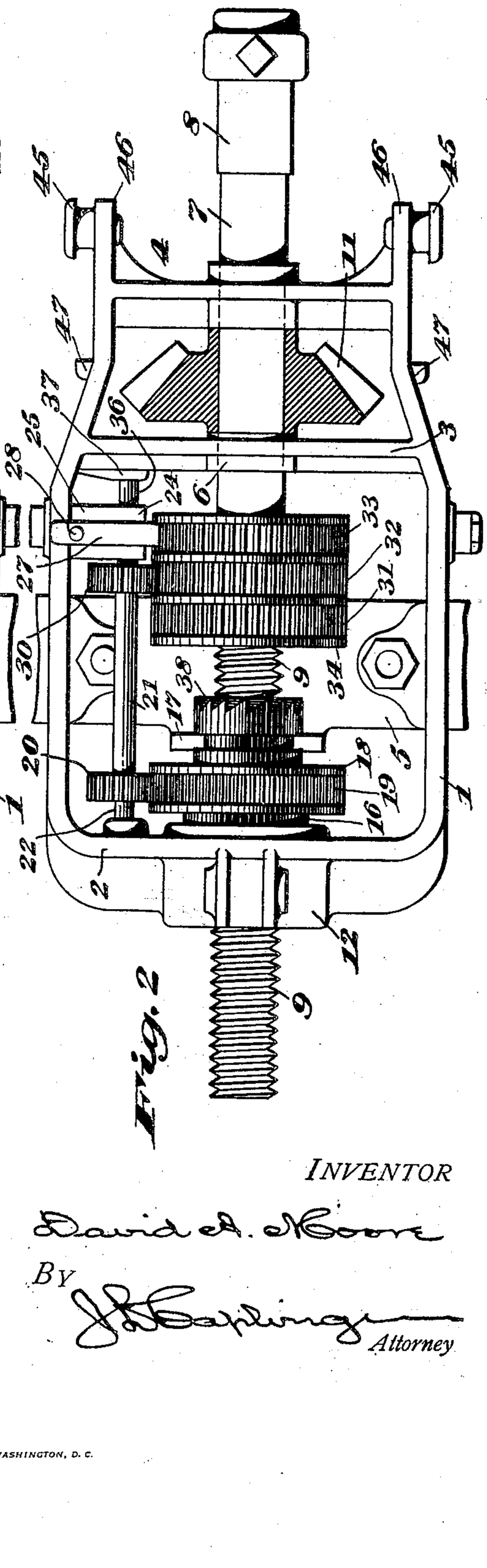

Fig. 2

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3 SHEETS—SHEET 2.

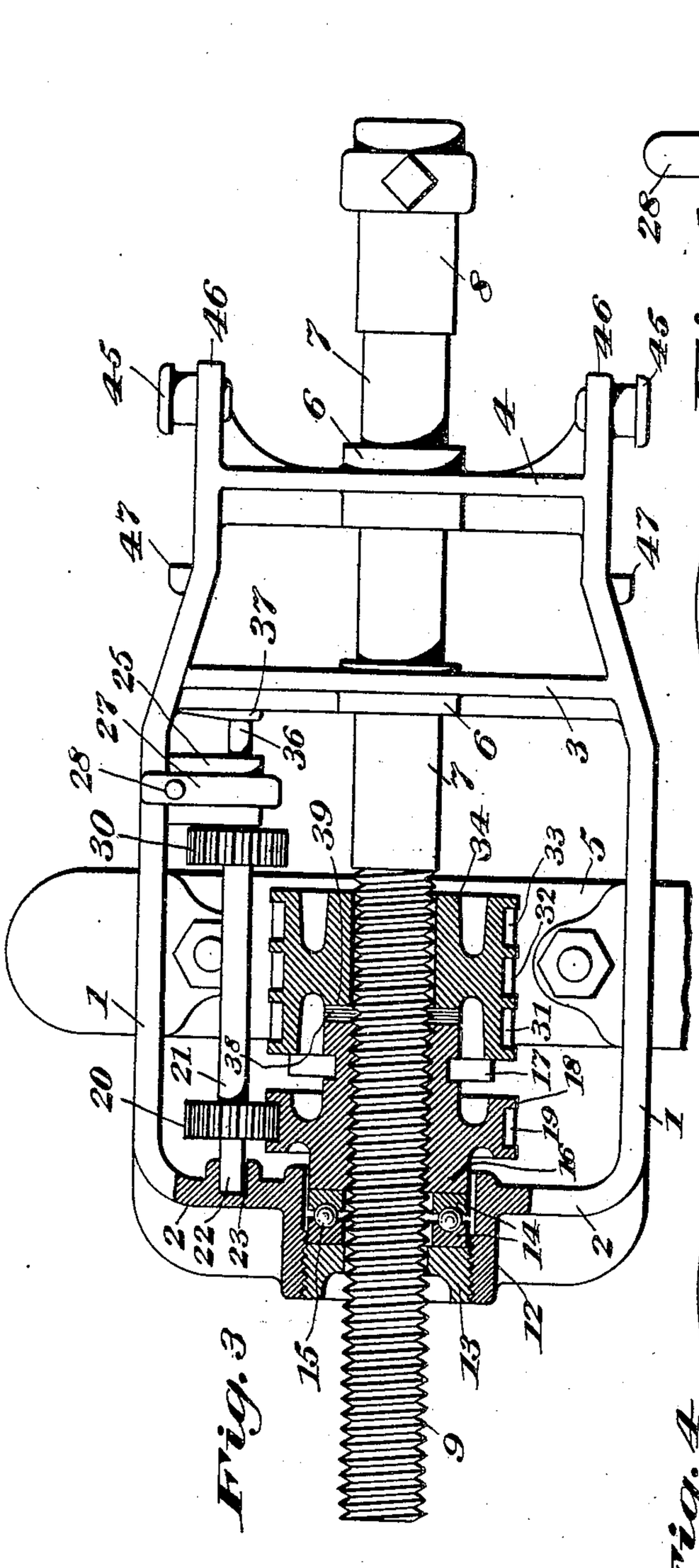

Fig. 3

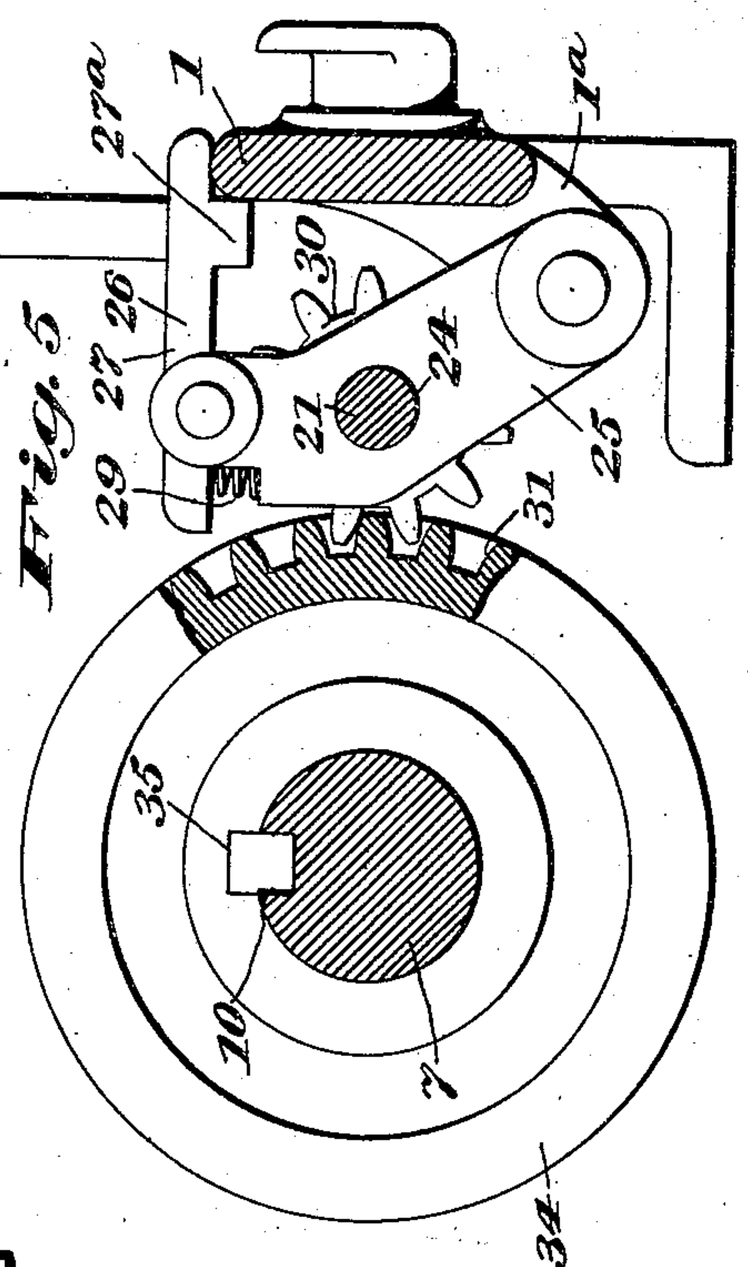

Fig. 5

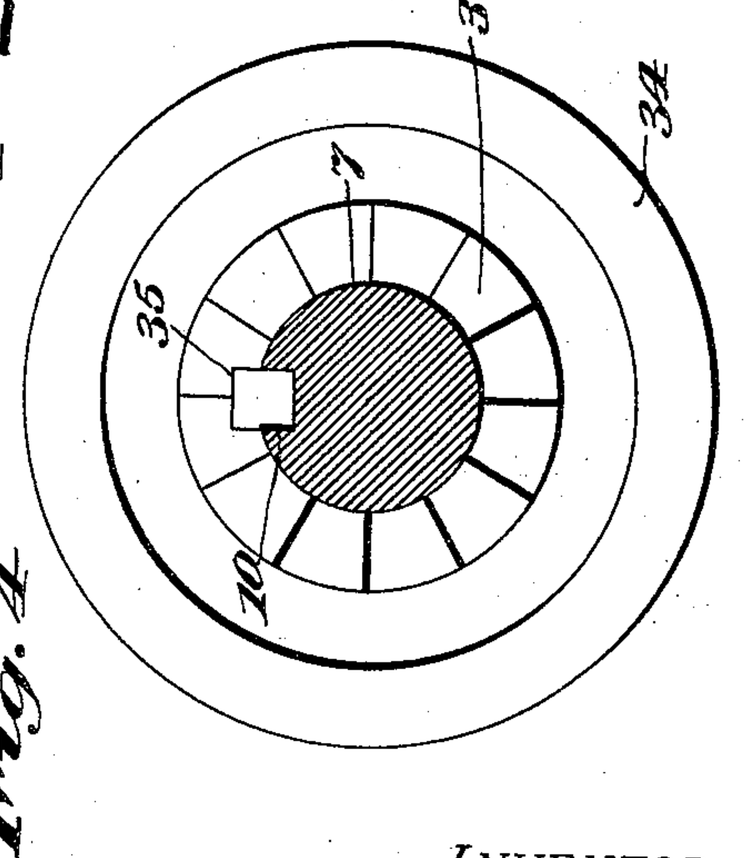

Fig. 4

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3 SHEETS—SHEET 3.

Fig. 7

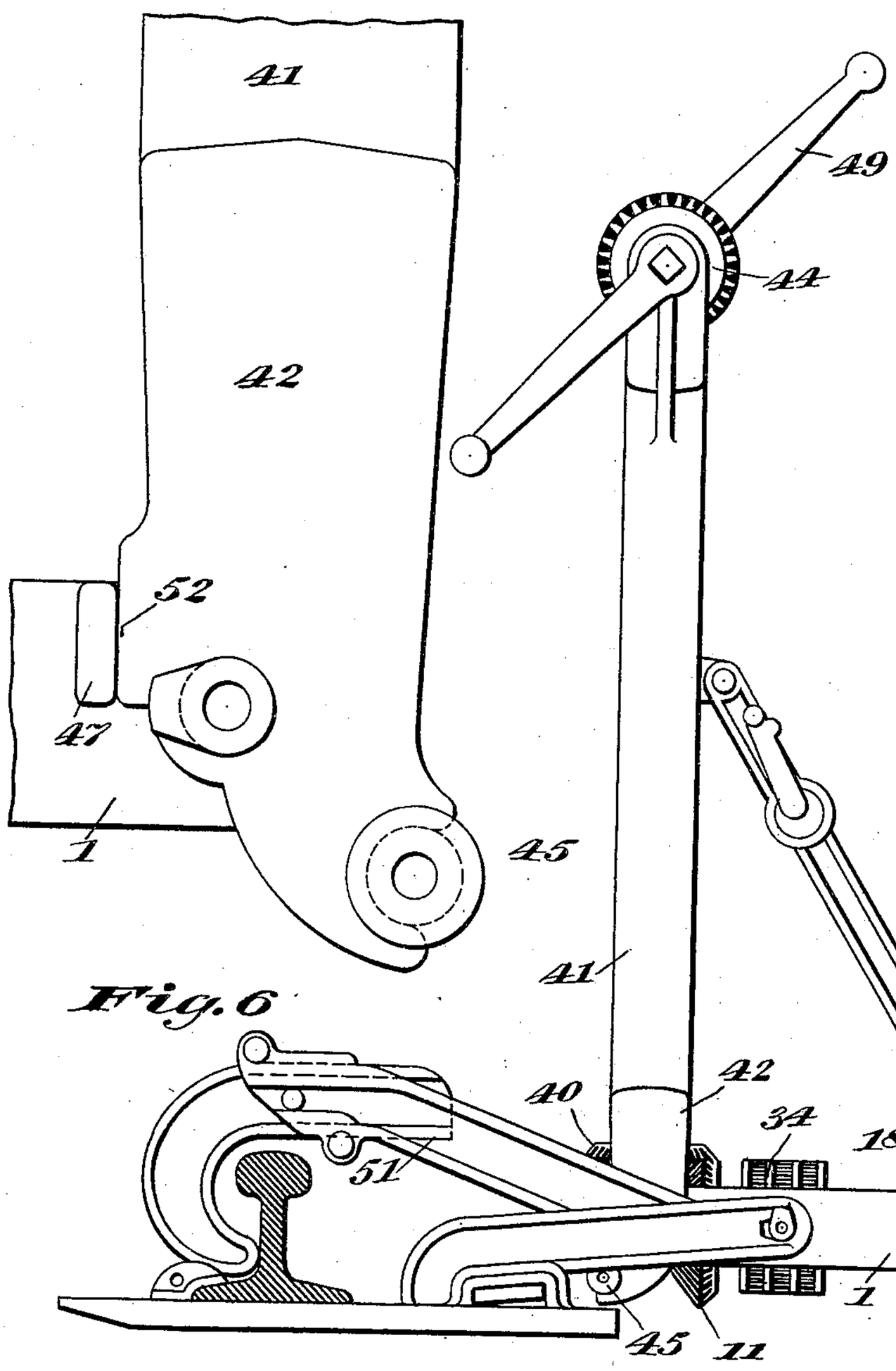

Fig. 6

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UNITED STATES PATENT OFFICE.

DAVID A. MOORE, OF KALAMAZOO, MICHIGAN.

DRILLING-MACHINE.

No. 885,945. Specification of Letters Patent. Patented April 28, 1908.

Application filed September 8, 1906. Serial No. 333,744.

To all whom it may concern:

Be it known that I, DAVID A. MOORE, a citizen of the United States, residing at Kalamazoo, in the county of Kalamazoo and State of Michigan, have invented certain Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to certain improvements in drilling machines and more particularly in that class of such machines which are especially designed and adapted for employment in railway service for drilling track-rails, and the object of the invention is to provide a drilling machine of this general character, of a simple and inexpensive nature and of a compact, strong and durable construction which shall be adapted for convenient and effective use, being provided with feeding mechanism of an improved and simplified character whereby certain desirable feed variations are capable of attainment.

The invention consists in certain novel features of the construction, combination and arrangement of the several parts of the improved drilling machine, whereby certain important advantages are attained and the device is rendered simpler, cheaper and otherwise better adapted and more convenient for use, all as will be hereinafter fully set forth.

The novel features of the invention will be carefully defined in the claims.

In the accompanying drawings which serve to illustrate my invention—Figure 1 is a plan view of the improved drilling machine, its driving mechanism being omitted and its feed mechanism being adjusted to one feeding position; Fig. 2 is a view similar to Fig. 1, but showing the feed mechanism of the improved drilling machine adjusted to a feeding position different from that illustrated in Fig. 1; Fig. 3 is a sectional plan view, similar to Figs. 1 and 2 but showing the feed mechanism adjusted to a feeding position different from that illustrated in either Figs. 1 and 2; Fig. 4 is an end view showing the adujstable gear member of the feed mechanism, detached from other parts of the machine and illustrating the formation of the clutch surface at the end of the same; Fig. 5 is a fragmentary sectional view, drawn upon an enlarged scale and showing the adjustable gear pinion forming part of the feed mechanism of the improved drilling machine; Fig. 6 is a side elevation showing the improved drilling machine set up in position for use in connection with its driving mechanism, and—Fig. 7 is an enlarged fragmentary view showing the joint between the upper and lower frames which carry, respectively the driving and drilling devices of the improved drilling machine.

The improved drilling machine as herein shown comprises a lower base frame or body portion 1, in which the drilling and feeding devices are mounted and which is adapted to be positioned upon the road-bed between the rails or outside the same and is provided with rail engaging means of any preferred kind and which form no part of the present invention, for engagement with the rail to be drilled by the devices upon said frame or body portion. As herein shown, said frame or body portion 1 is in the nature of an integral cast metal frame having parallel spaced side bars, tied together by transverse ties or braces 2 and 4 which are, respectively, at the rear and forward ends of the frame, and by a similar transverse tie or brace 3, extended across the frame between said ties 2 and 4. The frame or body portion 1 is also provided with a transversely extended foot plate 5, the ends of which are extended at opposite sides of the frame or body portion 1 for engagement upon the ties of the railway to insure proper support of the drilling machine while in use for drilling the rails.

The transverse ties or braces 3 and 4, which are adjacent to the forward end of the machine, have bearings 6, 6 in which is held to turn the drill spindle, 7, the forward end of said spindle being provided with a socket 8 to receive a detachable drill and the rear end thereof being threaded to produce the feed screw 9, as clearly shown in Fig. 3. The feed mechanism of the improved drilling machine is supported upon the frame 1 between the ties or braces 2 and 3 at the rear end of the machine and has engagement with the threaded end 9 of the drill spindle for moving the same endwise through the bearings 6, 6, in order that the drill carried at the socket 8 may penetrate the rail, and the driving mechanism of the improved drilling machine comprises a bevel gear wheel 11, located upon the drill spindle 7 between the braces or ties 3 and 4 at the forward end of the frame 1 and having a key engaged in a key way 10 longitudinally extended along one side of the spindle 7 in a well known way so that the spindle will be held to turn in

unison with said bevel gear wheel while being permitted to move endwise when actuated from the feeding devices for feeding the drill carried by the spindle up to its work.

12 indicates a central boss or bearing integral with the rearmost brace or tie 2 of the frame and through which the feed screw 9 of the drill spindle is passed, and 13 is an annular nut or abutment having threaded engagement within said boss or bearing 12 and having a central opening through which the end of the screw 9 plays freely when moved endwise by operation of the feed mechanism to be hereinafter described.

14, 14 indicate annular ball races or bearing members, held within the boss or bearing 12 and having annular race-ways within which are engaged balls 15 interposed between said bearing members 14, 14 in order to reduce friction as much as possible, the rearmost member 14 being free to turn with relation to the nut 13 upon which it abuts as shown in Fig. 3.

16 is a feed-nut, the bore of which is threaded to conform to and receive the feed screw 9 upon the drill spindle, and the rear end of said nut 16 has a rearwardly directed boss which is extended within the forward end of the bearing or boss 12 of the frame brace 2 and abuts upon the forward surface of the adjacent bearing member 14, being free for turning movement upon said member 14. The ball bearing formed between the members 14, 14 materially lessens the friction which would otherwise retard the turning movement of the feed nut 16 and thereby permits easy operation of the drilling machine, but I do not desire to be understood as limiting myself to the employment of such bearing in all cases since the same may be dispensed with without bad results in many machines. The forward end of the nut 16 is also formed into a reduced boss in which is produced an annular groove or channel wherein is engaged a rib or projection 17 extended upward from the central part of the foot plate 5, as shown in Figs. 1 and 2, whereby the feed nut 16 is held against movement in the direction of the length of the drill spindle, and the central part of the feed nut 16 is formed with an annular enlargement 18, the perimeter whereof has an annular gear surface 19 with which is engaged a pinion 20 secured upon a shaft or stud 21 loosely journaled along one side of the frame or body 1 of the machine.

At its rear end, behind the pinion 20 and adjacent to the rearmost frame brace 2, the shaft 21 is formed into a reduced pin or stud 22 which has loose engagement within a bearing or socket 23 upon said frame brace 2, said bearing or socket 23 being of larger diameter than the reduced end of the shaft so that when desired, and as will be hereinafter explained, a certain extent of lateral or pivotal movement of the shaft in said bearing or socket 23 is permitted. The opposite or forward end of shaft or stud 21 is engaged to turn in a bearing 24 formed at the central part of a downwardly extended link 25 (seen in Fig. 5,) the lower end of which is pivoted upon an arm 1^a of the frame or body portion 1, adjacent to and at the rear of the tie or brace 3. In this way, said forward end of the shaft or stud 21 is held to turn in the bearing of the link 25 while being adapted, when said link is swung pivotally, to be moved toward and away from the drill spindle 7 for a purpose to be hereinafter explained.

30 represents another pinion secured upon the shaft or stud 21 adjacent to the link 25 and having teeth adapted to mesh with one or another of a plurality of gears disposed upon a driving member 34, forming part of the feed mechanism and which is adapted for adjustment lengthwise along the drill spindle, which passes through said driving member as seen in Figs. 3, 4 and 5, said member 34 being provided with a key 35 engaged with the key way 10 of the drill spindle 7 so that the rotation of said spindle will be communicated to said member irrespective of the movement of the member in the direction of the length of said spindle.

As herein shown, the feed member 34 is provided with three gears 31, 32 and 33, designed for engagement with the pinion 30 on shaft or stud 21 for attaining three different speed variations for the feed mechanism of the drilling machine, and the several gears 31, 32 and 33 of the member 34 are formed with different numbers of teeth, respectively, the teeth of said gears 31, 32 and 33 and of the pinion 30 being of irregular or "bastard" pitch, so that the pinion 30 is adapted for operative engagement with either of the gear surfaces on member 34, the shaft or stud 21 on which said pinion is held being adapted for movement toward and away from the spindle 7, accordingly as the gear on member 34 with which said pinion is engaged has a less or greater number of teeth. For example, the gear 31 may have 33 teeth, the gear surface 32 may have 34 teeth and the gear 33 may have 35 teeth. In such event, the shaft or stud 21 will be pivotally moved so that its end whereon pinion 30 is held will be swung away from spindle 7 when said pinion is engaged with the gear 31, as seen in Fig. 1, and when said pinion is engaged with gear 32, as seen in Fig. 2, said shaft or stud 21 will be substantially parallel with spindle 7, while when pinion 30 is engaged with gear 33, the shaft or stud 21 will be reversely inclined from the position shown in Fig. 1, so as to permit the teeth of pinion 30 to sink deeper in the teeth of said gear 33.

By this construction and arrangement of the parts, it will be obvious that when the

pinion 30 is engaged with one or another of the gears on member 34, the shaft or stud 21 will be driven at a corresponding speed from the drill spindle 7 and its movement will be communicated to the feed-nut 16 through the mesh of the teeth of pinion 20 with those of the gear 19 on the feed nut, so that a regular and uniform feeding movement will be imparted to said feed-nut as the drill spindle turns, and in this way the feeding of the drill carried by said spindle is effected as will be readily understood. When the pinion 30 is disengaged from one gear surface on member 34 and is engaged with another gear on such member, a variation in feed will be effected corresponding to the difference in the number of teeth in the respective gears on member 34. Thus it will be seen that any desired number of gears may be provided on the member 34, accordingly as a greater or less number of feed variations may be desirable, and for this reason I do not desire to be limited to the employment of any particular number of said gears upon the feed member.

Beyond the bearing 24 of shaft or stud 21 in link 25, the end of said shaft or stud is reduced and extended to form a projecting pin or stud 36 which, when the parts are in operative position with pinion 30 adapted for engagement with a gear of the feed member, is adapted to abut upon a stop 37 integral upon the frame brace 3 to prevent endwise movement of the shaft or stud 21. To permit of conveniently operating the stud or shaft 21 to engage or disengage its pinion 30 from the gears of the feed member 34, I extend the link 25 upwards above the bearing 24 as seen in Fig. 5, and pivot upon the upwardly extended end of the same a lever 27, one end of which is extended outwards or away from the drill spindle and towards the side bar of the frame 1, as seen at 26 in Fig. 5 and has an extremity adapted to rest upon said side bar, a pendent lug 27^a being integrally produced on the underside of said end 26 of the lever 27 in position to bear upon the inner face of the side bar of frame 1 when said lever is lowered and link 25 is moved over toward the drill spindle as shown in Fig. 5 in position to bring pinion 30 in position for operative engagement with the teeth of one or another of the gears of the feed member. The gear 19 and the feed nut, and also the gears of the feed member 34, are preferably shrouded gears as, by this means, the pinion 30 is kept in mesh with the desired gear on the feed member and the pinion 20 is kept in mesh with the gear on the feed nut. As the tendency of the feed member is to advance with the spindle, the advantage of the shrouds on the gears will be obvious.

28 is a handle produced upon the outer end 26 of lever 27 and adapted to be grasped by the hand of a person using the machine for lifting said lever 27 to disengage the lug 27^a from the inner surface of the frame side bar so that the link 25 may be swung outwards towards said side bar to disengage the pinion 30 from one gear of the feed member, after which the feed member may be moved lengthwise along the drill spindle to bring another gear thereon into alinement with pinion 30 in order that said pinion may be engaged therewith for effecting a desired feed variation.

29 represents a spring which is seated at its lower end on the link 25 and has its upper end engaged beneath the lever 27 at its inner end opposite to the end 27 whereon handle 28 is carried. By means of said spring 29 it will be evident that the outer end of the lever 27 will normally be depressed to hold its pendent lug 27^a engaged upon the inner surface of the frame side bar except when said outer end of the lever is lifted in changing the feed of the drilling machine.

The length of the shaft or stud 21 and the proportions of various other parts of the machine are such that it is possible to move the feed member 34 sufficiently far along the drill spindle and toward the feed-nut 16 to bring the forward gear 33 on said feed member to the rear of and out of alinement with the pinion 30 on the forward part of the shaft or stud 21, and on the adjacent sides of the feed nut 16 and feed member 34 are produced reciprocal clutch surfaces 38 and 39, which are adapted for engagement with each other when the feed member is so moved, whereby the feed nut is rotated with the drill spindle. It is at times desirable to do this to "clear" or to "ease off" the drill where the feed is too great.

To enable the rapid feeding of the drill up to, or its retraction from, the work, I provide means for locking the feed nut against rotation, in which condition it is obvious that the screw is rapidly advanced or retracted. I preferably accomplish this by arranging the parts so that when the lever 27 is hooked back to relieve the pinion 30 from the feed member 34, the lug 27^a of the lever being engaged over the frame, the pinion is held against the frame, thereby preventing its rotation and consequently holding the feed nut against rotation. It is evident that the parts may be very quickly adjusted to secure this result. By this arrangement, the feed of the drill may be varied according to the nature of the work and the size of the drill or power; and also that it may be rapidly advanced or retracted from the work, or in case that the feed has been too great, by shifting the feed member 34 into engagement with the nut the nut is positively driven so that feeding is prevented, thereby "easing off" or "clearing" the drill.

The forward end of the frame 1 of the improved drilling machine has at opposite sides alined forks 46, spaced apart and provided

at their forward outer sides with outwardly projecting headed pins or lugs 45, 45, which are adapted to be engaged by hook like portions produced at the lower ends of forks 42 formed at the lower end of a detachable upper frame member or part 41 which is extended vertically above the member 1 of the frame and has the vertical driving shaft journaled in it in a well known way, said shaft being provided with a bevel gear wheel 40 at its lower end for engagement with the bevel gear wheel 11 on the drill spindle.

49 represents a crank shaft journaled at the upper end of said upper frame member 41 and geared to drive the said vertically arranged driving shaft through bevel gearing 44 as seen in Fig. 6.

50 represents a detachable brace carried by the upper frame member 41 and adapted for detachable connection with the rear end of the lower frame member 1 as seen in Fig. 6 for holding the member 41 in relation during the drilling operation, being capable of disengagment from the lower frame member 1 in order that the said upper member 41 may be disengaged therefrom so that, when the drilling machine is in use between the track rails, the said upper member may be detached from the lower member to permit the passage of trains along the track, the lower member with its drilling devices being left *in situ* during such passage since when the upper member is removed there will be no parts of said lower member projecting far enough upward to interfere with the free passage of the trains over the device. The upper member 41 also carries rail engaging means 51 of any preferred kind. At the rear side of each fork 42 of the lower end of the upper frame member 41 is produced a vertical shoulder 52 and upon each of the corresponding forwardly extended forks 46 of the lower frame member 1 is produced an outwardly projecting lug 47 adapted for engagement with such shoulder when the hooks of the frame fork 42 are engaged with the pins or lugs 45, and the upper frame member is in a vertical position as seen in Fig. 7, so that the structure is then braced and strengthened to afford sufficient rigidity to hold the upper frame member in position for use.

From the above description of my invention it will be seen that the improved drilling machine is of an extremely simple and inexpensive nature and is especially well adapted for use since its feed mechanism permits of such variations of feed as are desirable in average work along the tracks while being of such a character as not readily to become deranged or broken by careless handling.

It will also be obvious from the above description that the devices are capable of considerable change without material departure from the principles and spirit of the invention and for this reason I do not desire to be understood as limiting myself to the precise form and arrangement of the several parts herein set forth in carrying out my invention in practice.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The combination with the frame, of a spindle; driving mechanism for said spindle; a feed-screw for said spindle; a feed-nut therefor, said feed-nut having a gear thereon; a feed-member splined upon said spindle, comprising a plurality of shrouded gears, said gears being of substantially the same circumference but having varying numbers of teeth; a shaft; a pinion thereon arranged to mesh with said gear on said feed-nut; a pinion on said shaft, adapted to be brought into mesh with one or another of said feed gears; and means for shifting said shaft to bring said pinion into mesh with one of the said shrouded gears of said feed-member, whereby said feed-member is held against longitudinal movement on said spindle, or to bring it into engagement with the frame, whereby the revolution of said feed-nut is prevented.

2. The combination with the frame, of a spindle; driving mechanism for said spindle; a feed-screw for said spindle; a feed-nut therefor; a feed-gear on said spindle; a pinion having driving connections to the said feed-nut and means for shifting said pinion to bring it into mesh with said feed-gear or into engagement with the said frame, whereby said feed-nut is driven or its revolution prevented, as desired.

3. The combination with the frame, of a spindle; driving mechanism for said spindle; a feed-screw for said spindle; a feed-nut therefor, said feed-nut having a gear thereon; a feed-gear on said spindle; a pinion; gear connections for said pinion to said gear on said feed-nut; and means for shifting said pinion to bring it into mesh with said feed-gear or into engagement with the said frame, whereby said feed-nut is driven or its revolution prevented, as desired.

4. The combination with the frame, of a spindle; driving mechanism for said spindle; a feed-screw for said spindle; a feed-nut therefor, said feed-nut having a gear thereon; a feed-member splined upon said spindle, comprising a plurality of gears, said gears having varying numbers of teeth; a shaft; a pinion thereon arranged to mesh with said gear on said feed-nut; a pinion on said shaft, adapted to be brought into mesh with one or another of said gears.

5. The combination with the frame, of a spindle; a driving mechanism for said spindle; a feed-screw for said spindle; a feed-nut therefor; a pinion, having a driving connection with said feed-nut; a feed-member splined upon said spindle comprising a

plurality of shrouded gears, said pinion being arranged to be shifted to bring it into mesh with one or another of the said shrouded gears of said feed-member, said pinion being fixed against axial movement, whereby the longitudinal movement of said feed-member on said spindle is prevented when said pinion is in mesh with one of the gears thereof.

6. The combination with a frame, of a spindle; a driving mechanism for said spindle; a feed-screw for said spindle; a feed-nut therefor; a shrouded feed-gear splined upon said spindle; and a pinion having driving connection with said feed-nut, said pinion being arranged to be shifted to bring it into mesh with said shrouded feed-gear, said pinion being fixed against axial movement, whereby the longitudinal movement of said feed-gear on said spindle is prevented when said pinion is in mesh therewith.

7. The combination with a frame, of a spindle; a feed-nut therefor; a feed-gear splined upon said spindle, said feed-gear being adapted to be shifted on said spindle to engage said feed-nut, whereby said feed-nut is connected to be rotated with said spindle; and a pinion having driving connections to said feed-nut, said pinion being adapted to be shifted to throw it into or out of mesh with said feed-gear when the same is shifted into proper position, whereby said feed-nut may be driven through said pinion and its driving connections.

8. A drilling machine comprising a frame, a drill spindle movable therein, a feed-screw connected with the spindle, a feed-nut engaged with the screw, driving mechanism, a feed-member keyed on the drill spindle and driven from the driving mechanism and adapted for movement lengthwise thereof and provided with a plurality of gears, a shaft having a pinion interchangeably engageable with the respective gears of the feed-member, said shaft having one end movable toward and away from the drill spindle for engaging and disengaging said pinion with and from the gears of the feed-member, means for communicating the movement of said pinion to the feed-nut, a link pivoted on the frame and in which the movable end of said shaft has a bearing, and a spring-actuated lever pivoted on the link and having a portion engageable with the inside or the outside of the side-piece of the frame, to hold said link against movement when the pinion on the shaft is engaged with one of the gears of the feed-member, or to hold said pinion against said frame to lock said feed-nut.

9. A drilling machine comprising a frame, a drill spindle movable therein, a feed-screw connected with the spindle, a nut engaged with the screw and secured against longitudinal movement, driving mechanism, a feed-member keyed on the drill spindle and driven from the driving mechanism and adapted for movement lengthwise thereof and provided with a plurality of gears, a shaft having a pinion interchangeably engageable with the respective gears of the feed-member, said shaft having one end movable toward and away from the drill spindle for engaging and disengaging said pinion with and from the gears of the feed-member, means for communicating the movement of said pinion to the feed-nut, a link pivoted on the frame and in which the movable end of said shaft has a bearing and a spring-actuated lever pivoted on the link and having a portion engageable with the frame to hold said shaft in position.

10. A drilling machine comprising a frame, a drill spindle movable thereon, a feed-screw connected with the spindle, a feed-nut engaged with the screw and secured against longitudinal movement, driving mechanism, a feed-member keyed on the drill spindle and driven from the driving mechanism and adapted for movement lengthwise thereof and provided with a plurality of gears, a shaft having a pinion interchangeably engageable with the respective gears of the feed-member, said shaft having one end movable toward and away from the drill spindle for engaging and disengaging said pinion with and from the gears of the feed-member, means for communicating the movement of said pinion to the feed-nut, and a link pivoted on the frame and in which the movable end of said shaft has a bearing.

In testimony whereof I have hereunto signed my name at Chicago, Illinois, this 15th day of November, 1905, in the presence of two subscribing witnesses.

DAVID A. MOORE.

Witnesses:

J. D. CAPLINGER,

W. F. MOORE.