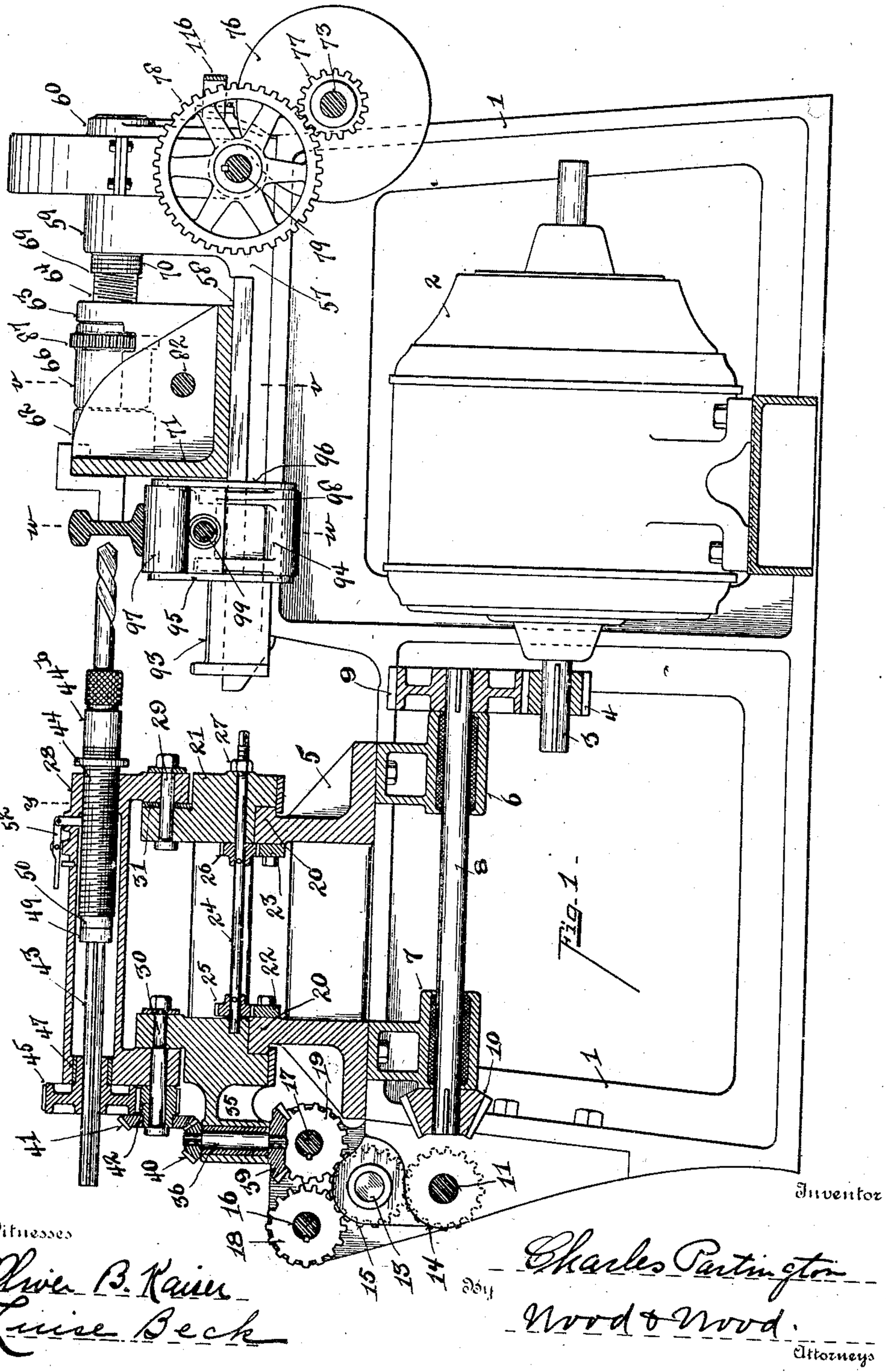
No. 845,372. PATENTED FEB. 26, 1907.

C. PARTINGTON.

DRILL.

APPLICATION FILED JUNE 25, 1904.

6 SHEETS—SHEET 1.




Witnesses

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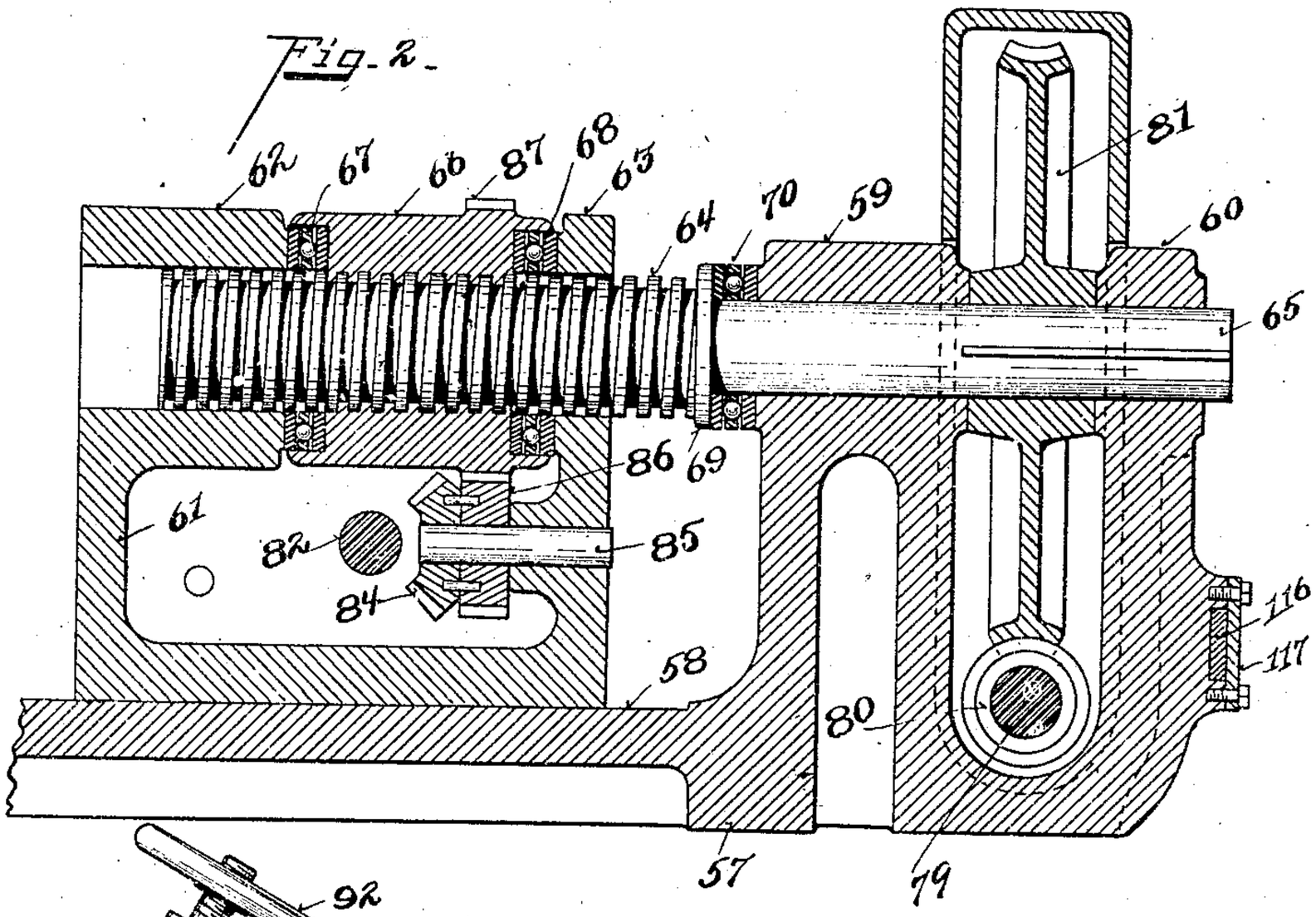
6 SHEETS—SHEET 2.

Fig. 2.



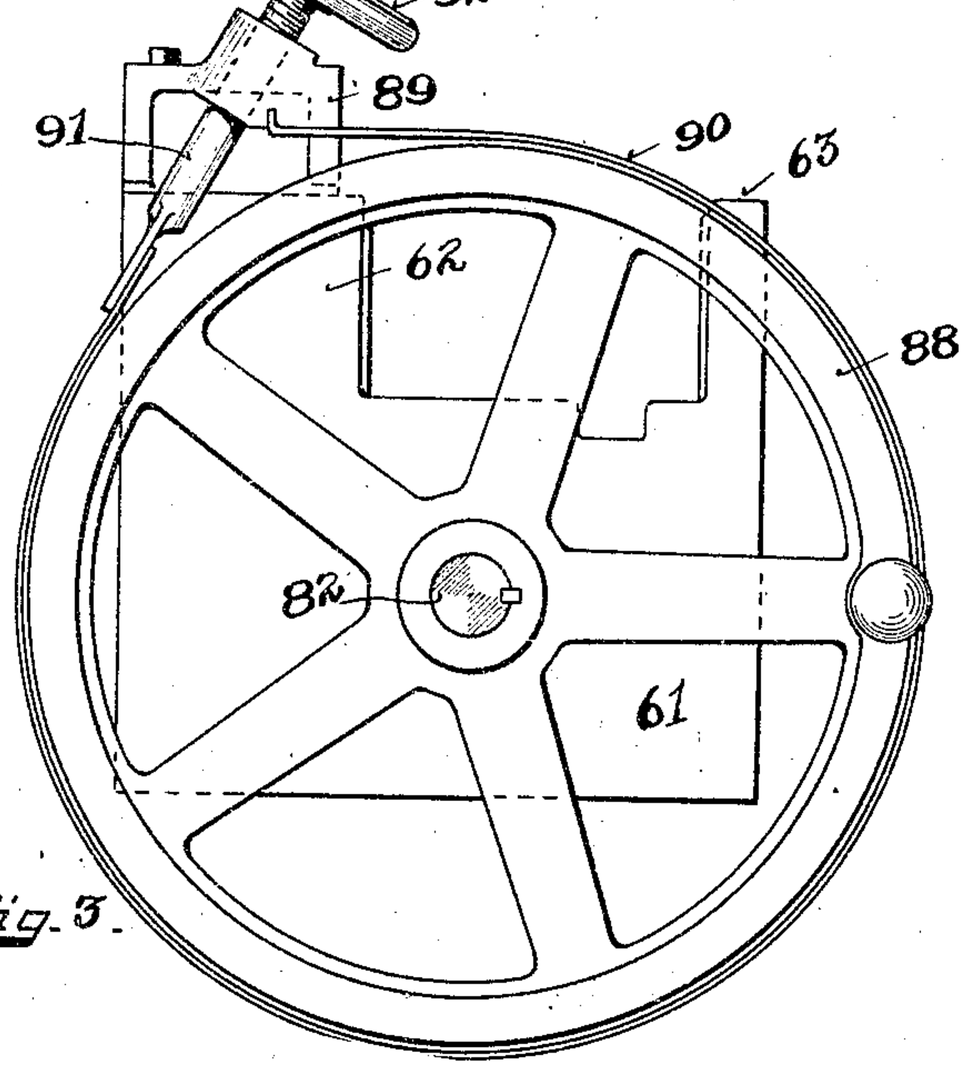




Fig. 3.

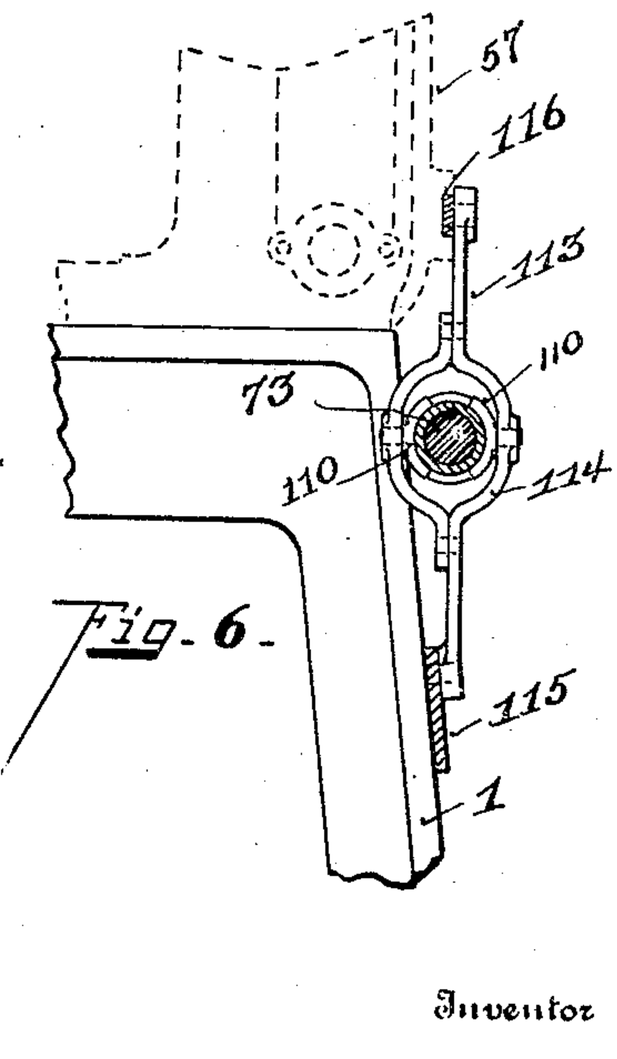



Fig. 6.

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6 SHEETS—SHEET 3.

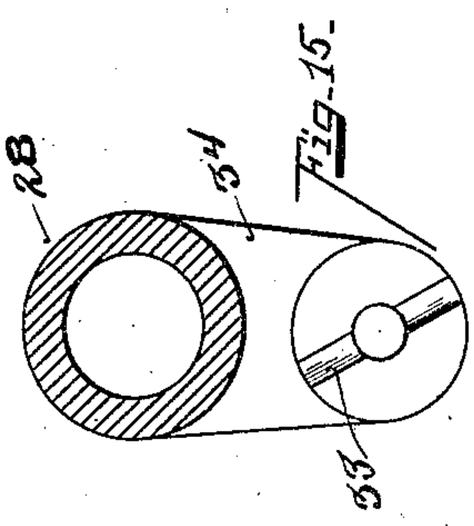

Fig. 15.

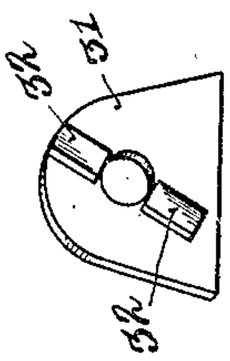

Fig. 14.

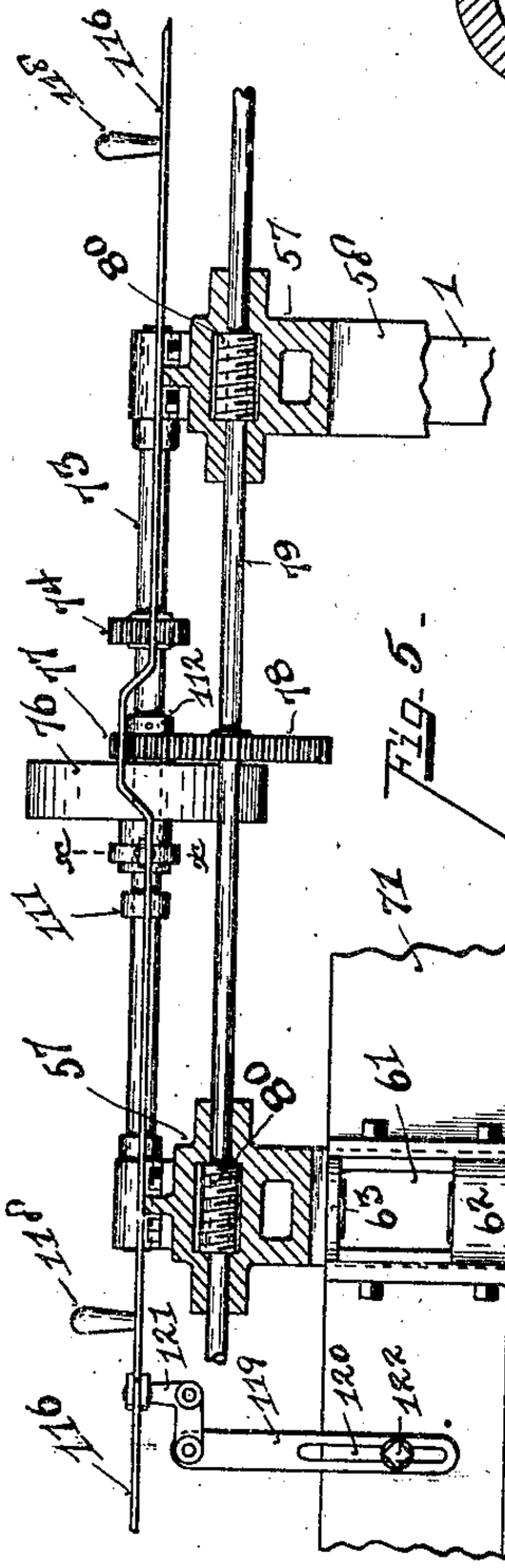

Fig. 5.

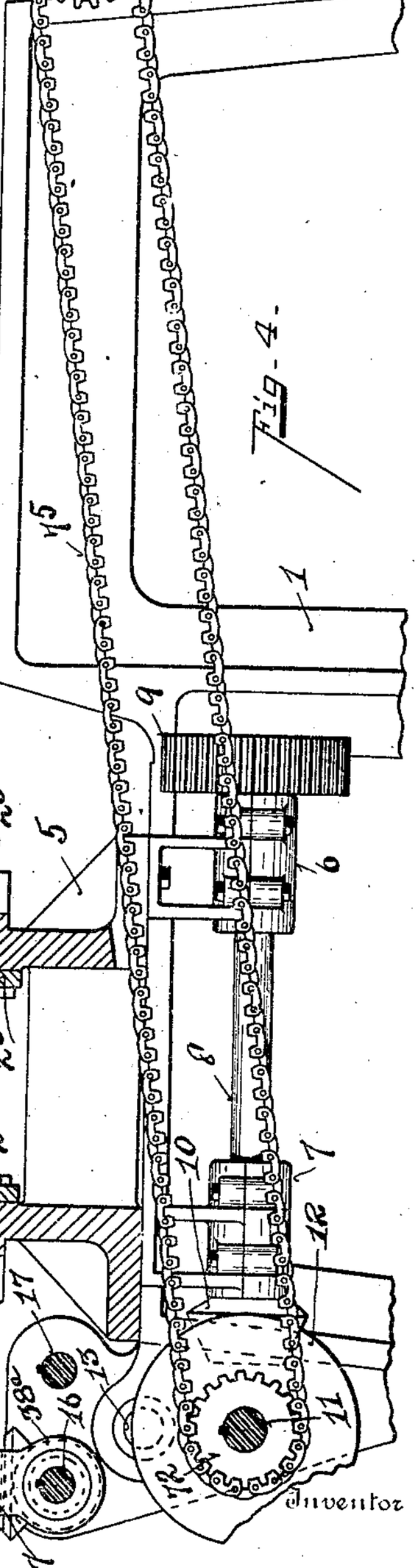

Fig. 4.

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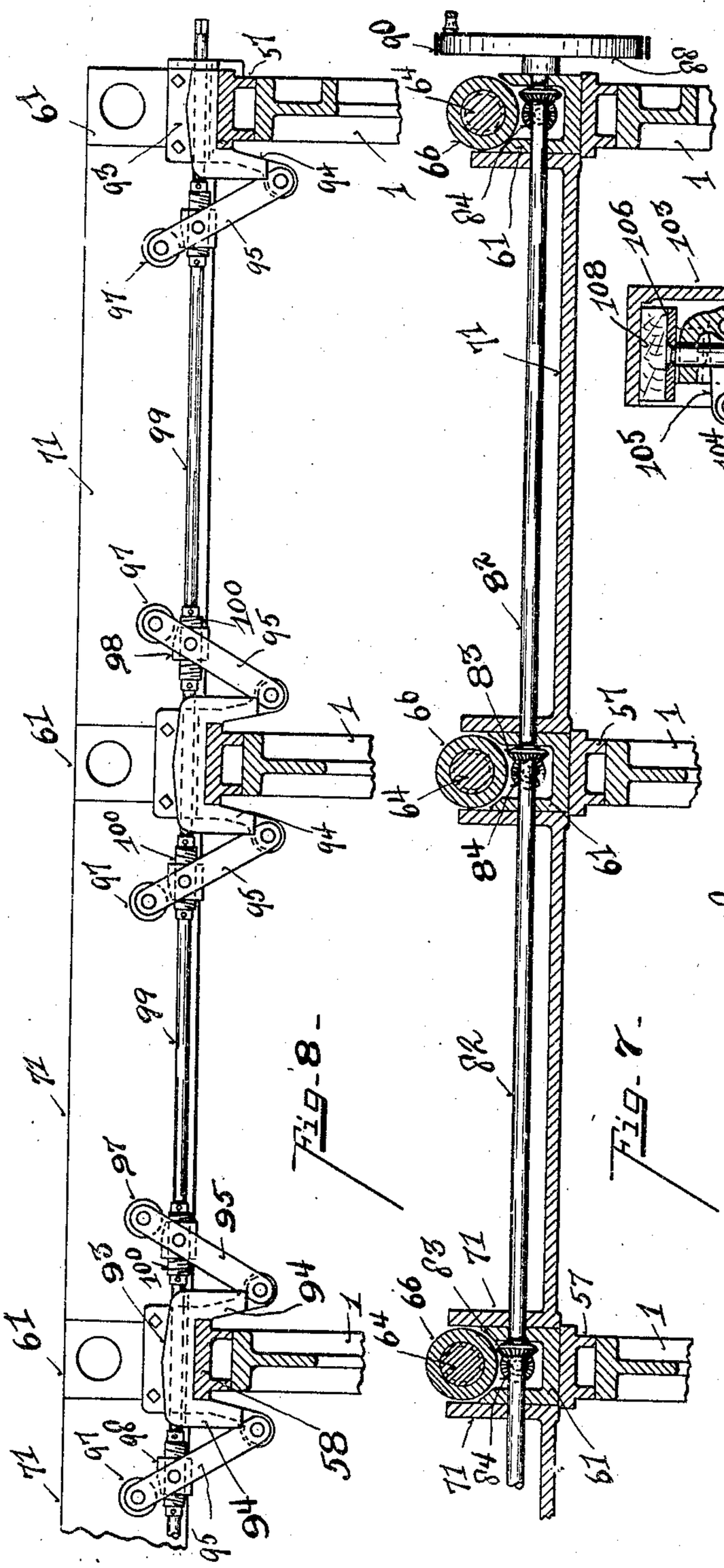
6 SHEETS—SHEET 4.



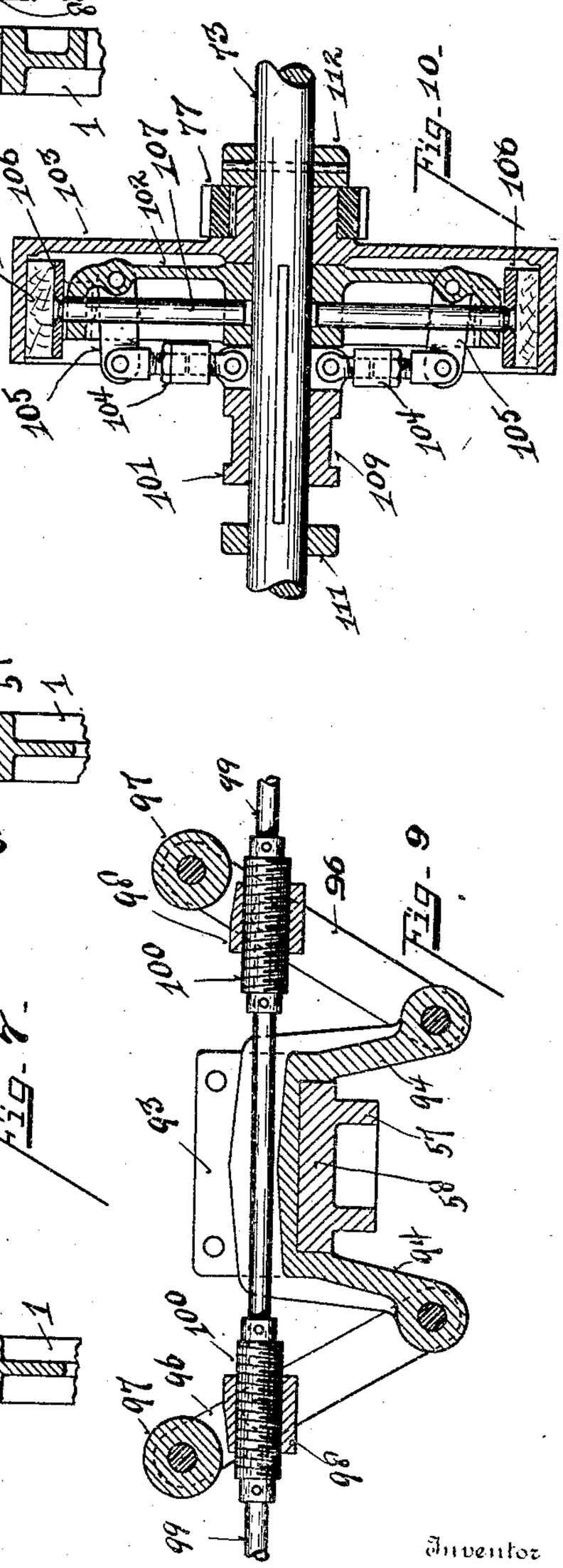


Fig. 10.



Fig. 8.



Fig. 7.



Fig. 9.

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6 SHEETS—SHEET 5.

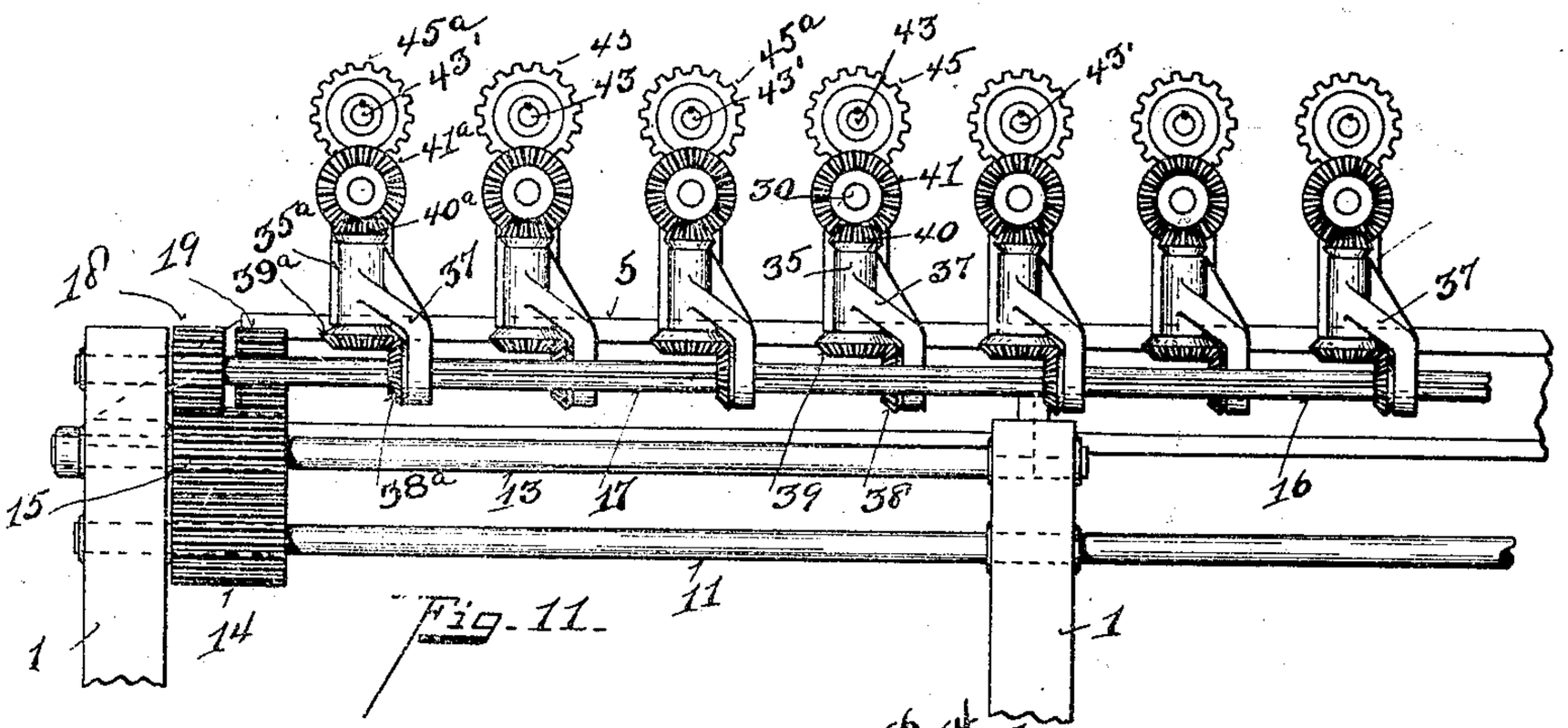


Fig. 11.

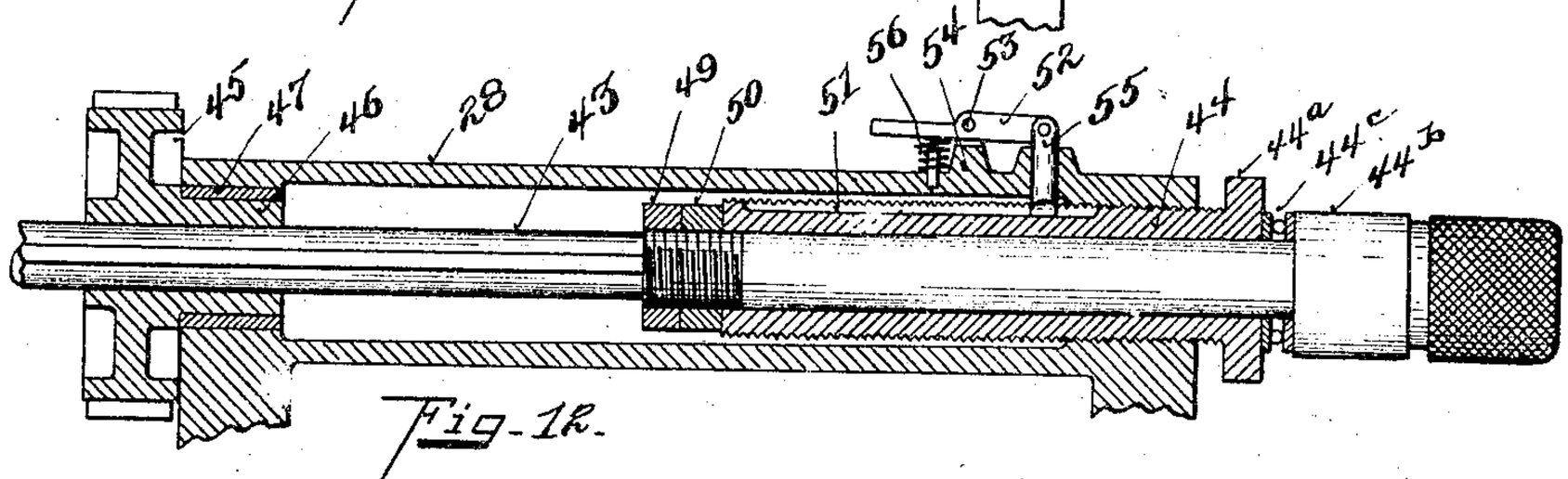


Fig. 12.

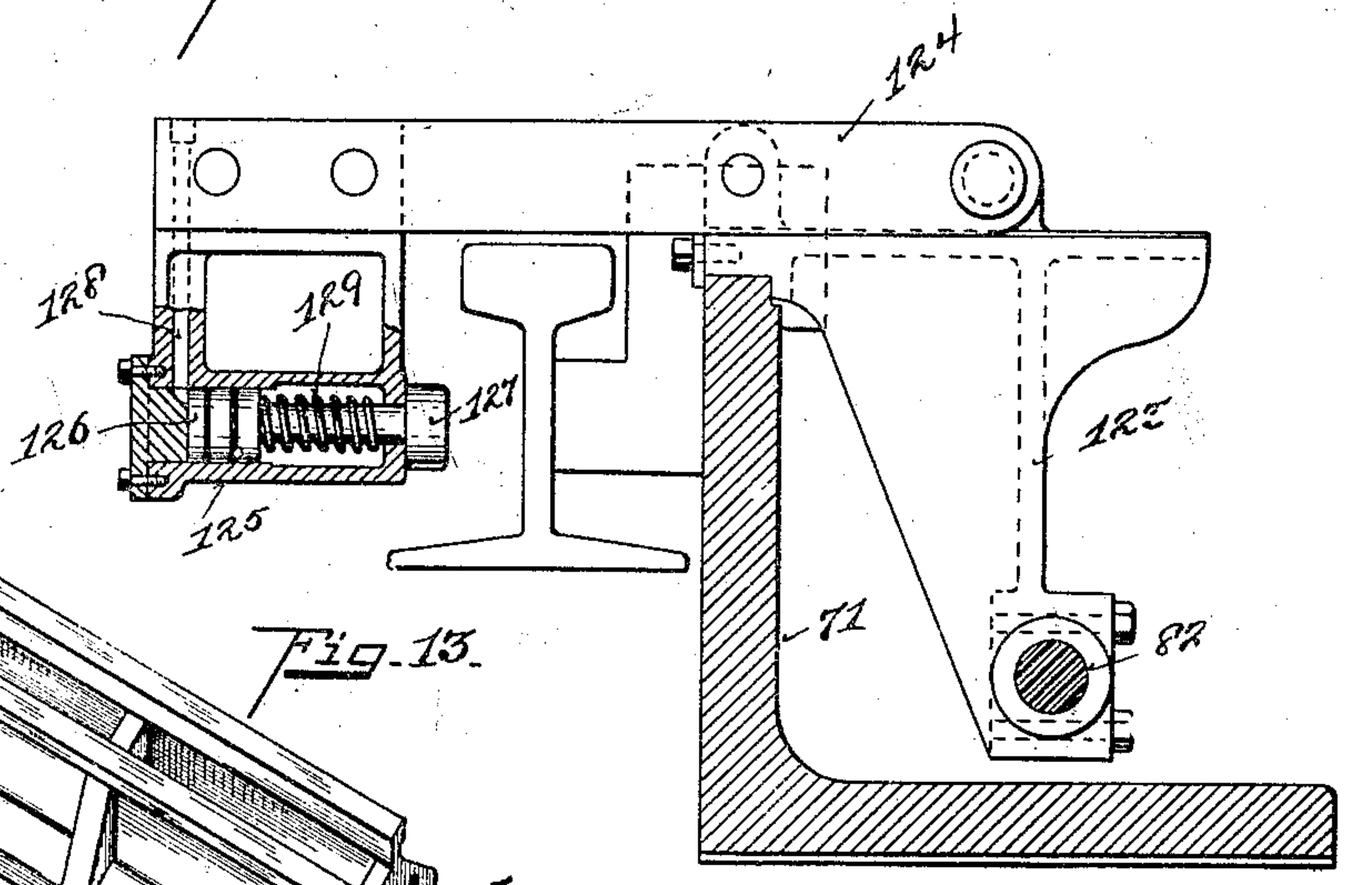


Fig. 13.

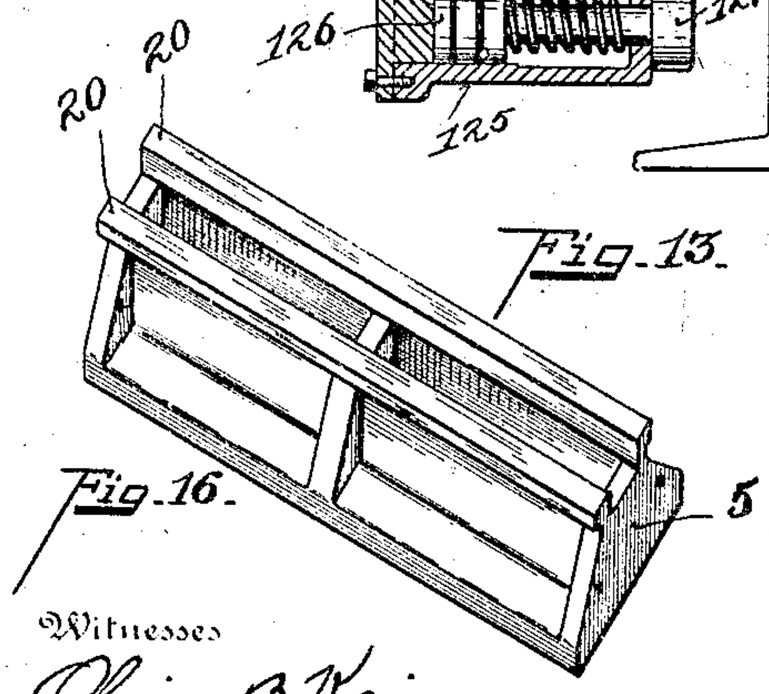


Fig. 16.

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6 SHEETS—SHEET 6.

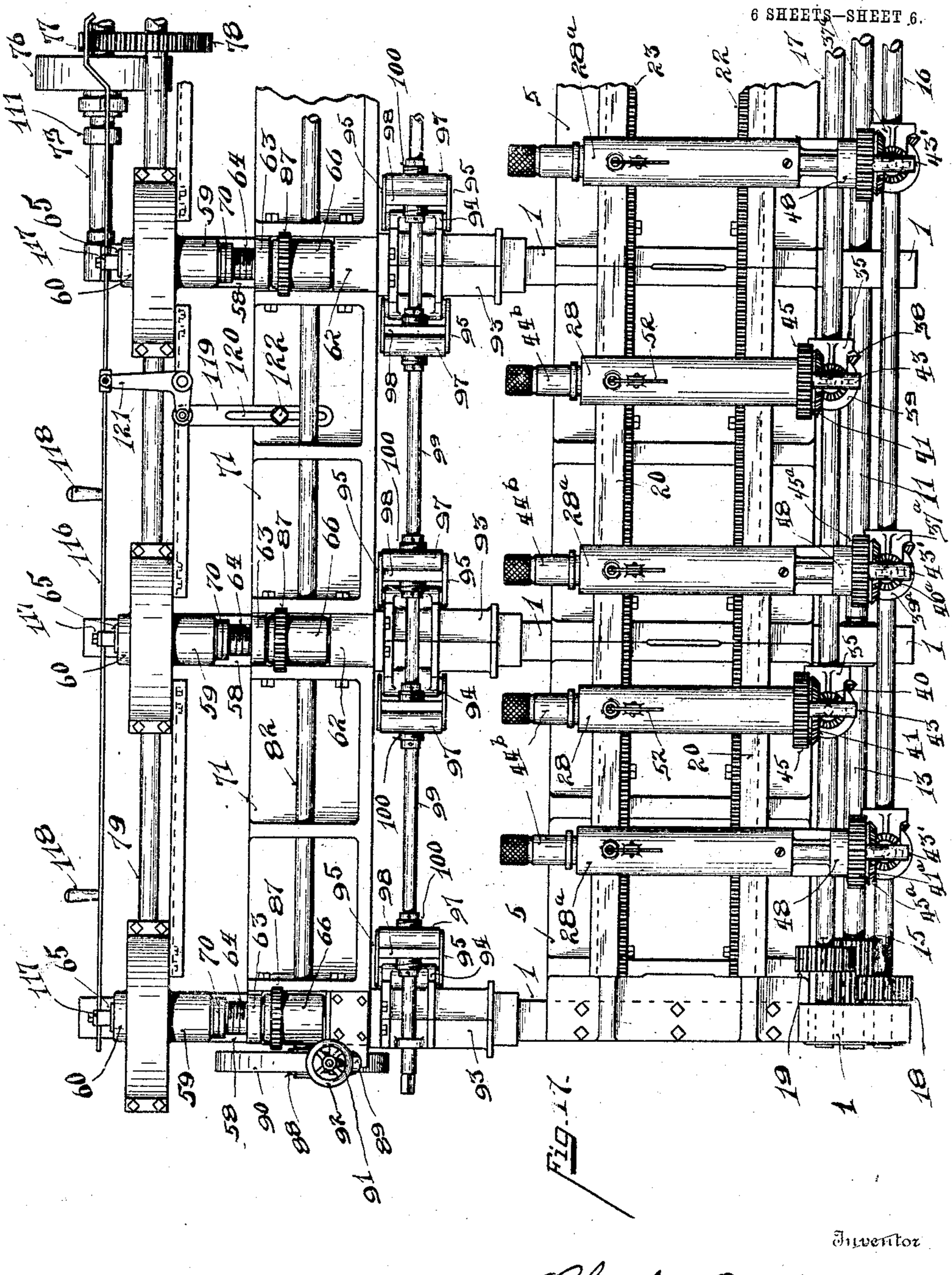

Fig. 17.

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# UNITED STATES PATENT OFFICE.

CHARLES PARTINGTON, OF CINCINNATI, OHIO, ASSIGNOR TO THE WEIR FROG COMPANY, OF CINCINNATI, OHIO, A CORPORATION.

## DRILL.

No. 845,372. Specification of Letters Patent. Patented Feb. 26, 1907.

Application filed June 25, 1904. Serial No. 214,206.

*To all whom it may concern:*

Be it known that I, CHARLES PARTINGTON, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Drills, of which the following is a specification.

My invention relates to a multiple drill, principally designed for drilling such work as steel rails. In the preferred form shown the drill is of horizontal type.

One of the objects of my invention is to provide stationary or non-traveling drill-stocks adjustably mounted upon a common base or support, in which instance a powerful and uniform drive can be imparted to a plurality of drill-spindles and to which the work is fed forward against the action of the drilling-tools.

Another object of my invention is to provide an equalization of drive to two staggered sets of drill-spindles in order to relieve the driving-shafts of any undue strain, which would otherwise affect the drilling operation of some of the drills.

Another object of my invention is to provide a series of work-feeding carriages simultaneously controlled in both forward feed and in the return.

Another object of my invention is to provide work-supporting means secured to and carried by the various carriages adapted to adjust the work throughout its entire length to a common working plane.

Another object of my invention is to provide automatic means for disengaging the feeding-drive at various positions on the carriage-feed.

Another object of my invention is the construction of the various parts of the drill-frame in sections, adapting the same to be interchangeable as regards length and number of drills desired—that is, the length of the drill can be extended by mere addition or duplication of parts to any desired size.

The features of my invention are more fully set forth in the description of the accompanying drawings, forming a part of the specification, in which—

Figure 1 is a central vertical section of my improved drill, partly in elevation. Fig. 2 is a central vertical section of one of the carriages, tail-stock, and feeding mechanism. Fig. 3 is an end elevation of a carriage-return hand-wheel, shaft, and brake for locking the same rigid during the forward feed. Fig. 4 is a similar section as that of Fig. 1 with the carriage mechanism omitted and illustrating the intermediate transmission means between the main power-distributing shaft and carriage-driving shaft. Fig. 5 is a detail top plan view, partly in section, of a carriage-driving shaft with clutch mechanism and transmitting devices of the carriage-feed. Fig. 6 is a section on line *x x*, Fig. 5. Fig. 7 is a section on line *v v*, Fig. 1, through three of the carriages in the series. Fig. 8 is a front elevation of the work supporting and adjusting mechanism, with the frame in section. Fig. 9 is a section on line *w w*, Fig. 1. Fig. 10 is an enlarged section of the clutch mechanism mounted on the carriage power-shaft. Fig. 11 is an end elevation of a portion of the drill, showing the position of drill-stocks and their connections to the driving-shafts. Fig. 12 is an enlarged central section of the drill-chuck support. Fig. 13 is a side elevation, partly in section, of the work-clamping mechanism mounted to travel with the carriages. Fig. 14 is a perspective view of a supporting-plate for the drill-chuck-supporting member for rigidly maintaining the drill in its adjusted position. Fig. 15 is a section on line *y y*, Fig. 1. Fig. 16 is a perspective view of one of the frame-sections and ways on which the head-stocks of the drills are mounted. Fig. 17 is a top plan view of one end of the drill, showing upon one side the carriage-section in position for use, upon the opposite side drill-spindles variously spaced with the drills removed.

1 represents the base-frame sections for supporting the various parts of the drill and of any suitable number desired to properly support a given length of a drilling-machine.

2 represents a motor suitably mounted in the central portion of the drill between two of the supporting-frames.

3 represents the motor-shaft, to which is fixed a gear 4.

5 represents several drill-stock bases respectively secured upon the supporting-frames, and, if the drill is of considerable length, these bases made up of sections secured together at their abutting ends, each end resting upon the top face of the supporting-frames.

6 7 represent journal-boxes secured to the under face of the drill-stock base 5 in a plane with the motor-shaft 3.

8 represents the main driving-shaft, journaled in boxes 6 and 7. To one end of shaft 8 is fixed a gear 9, meshing with the gear 4 of the motor-shaft 3. To the opposite end of said shaft 8 is fixed a bevel-gear 10.

11, Figs. 1–4, represents a shaft extending the entire length of the drill and journaled in bearings secured to the frames 1. To this shaft is fixed a bevel-gear 12, (see Fig. 4,) meshing with bevel-gear 10 for driving the shaft 11. At each end of the drill is mounted an intermediate shaft 13, (see Fig. 11, showing the same mounted at one end,) duplicate arrangement being at the opposite end. These shafts drive the work-shafts 16 and 17 at each end respectively and relieve the shafts from the strain incident to a drive from one end only.

14 represents a gear fixed to shaft 11 in mesh with a gear 15 fixed to shaft 13. These gears are wide-faced, so as to drive gears 18 and 19 on the work-shafts. The drill-spindles are arranged in two series, which are driven, respectively, by two separate work-shafts.

16 and 17 represent these work-shafts each extending the entire length of the drill, each being respectively provided with gears 18 and 19 at each end thereof, meshing with gear 15 on shaft 13 and forming the transmitting means to the series of drill-spindles respectively.

Upon the drill-base 5 are formed ways 20, to which are gibbed the longitudinally-adjusting drill-head-stock members 21 21ª. (See Figs. 1 and 4.)

In order that the drill-spindle may be adjusted laterally in their ways, I provide racks and gears. (See Fig. 4.) 22 23 represent racks secured to the base 5 and extending the entire length of the drill. 24 represents a shaft journaled in the head-stock member 21, to which are fixed rack-gears 25 and 26. Thus by turning shaft 24 the drill head-stocks may be adjusted longitudinally upon the base 5 and after which adjustment the head-stock is held secure in its adjusted position by the nut 27, screw-threaded on the free end of shaft 24, locking the gear 26 against its abutting end of the head-stock member 21.

In order to adjust the drill vertically, I provide a rocking member. 28 represents the drill-rocking member, pivoted to the head member 21 by means of the bolts 29 and stud-shaft 30. 31 represents a plate seated between the arms of the drill-supporting member and head member. This plate is provided with bosses 32, extending from each side of the bolt-orifice, through which bolt 29 passes, adapted to fit in a notch 33 in the arm 34 of the drill-supporting member 28. The lower face of the plate 31 is square and abuts the head member 21, preventing the same from having any revoluble action. Thus to whatever angle the drill-supporting member 28 is desired to be adjusted a plate is inserted with notches having the required angle. By this means a very rigid adjustment of the drill-supporting member can be secured.

In order that rotation may be imparted to the drill in its various adjusted positions, I provide the following devices: 35 represents a bracket-arm rearwardly extending from the drill-head member 21 and forms a journal-bearing for the stud-shaft 36. 37 represents a downwardly-projecting journal-bracket from the bracket 35, (see Fig. 11,) in which bracket is journaled the bevel-gear 38ª, revolubly fixed to the shaft 17, but adapted, by means of a feather, to be longitudinally slid thereon by the longitudinal adjustment of the drill-stock member upon the base 5. 39 represents a bevel-gear fixed to the stud-shaft 36 and meshed with the bevel-gear 38 of one of the series of staggered gears and drills receiving motion from shaft 17. 40 represents a bevel-gear fixed to the opposite end of the stud-shaft 36. 41 represents a bevel-gear fixed to a sleeve of spur-gear 42, which is loosely journaled upon the stud-shaft 30, gear 41 being in mesh with gear 40. Stud shaft or bolt 30 forms the axis for the rocking frame and allows bevel-gear 45 to travel on bevel-gear 42 when the rocking member 28 is moved to adjust the drill-spindle vertically. 43 represents the spindle or drill-shaft journaled in a sleeve 44, said sleeve being screw-threaded into the drill member 28, the function of which will be hereinafter described. 45 represents a gear splined to shaft 43, said gear being provided with a sleeve 46, acting as a journal-support. The parts 21ª 24ª 25ª 26ª 27ª 29ª 30ª 31ª 34ª 35ª 36ª 38ª 39ª 40ª 41ª 42ª 43′ 45ª (shown on Fig. 4) correspond to the parts marked with the same reference-figures shown in Fig. 1. 47 represents a bushing in the drill-head member 28, in which bushing the sleeve 46 of the spur-gear 45 is loosely journaled, the said gear 45 being in mesh with gear 42, loosely journaled on the stud-shaft 30. Thus the spindle drive is effected from shaft 17 through the train of gears and their respective shafts as follows: gears 38 39, stud-shaft 36, gears 40, 41, 42, and 45. This arrangement is followed out through the entire series of the drill-heads operated by shaft 17, but to relieve the strain incident to a shaft of considerable length driving a large number of drill-spindles the drill-heads are so arranged that one drill-spindle is driven by the shaft 17 and its next adjacent or alternate or staggered series of drill-spindles is driven by shaft 16, as shown in Fig. 4, in which the bracket 35ª has a greater rearward extension than the bracket 35 of the drill-head member supporting the drill operated by shaft 17, and in which necessarily requires a provision of an extended journal-bracket 48, cast integral

to the drill member 28ª, supporting their respective drill-shafts 43′, driven through a like train of gears and their respective shafts—to wit, gears 38ª 39ª, stud-shaft 36ª, gear 40ª, 41ª, 42ª, and 45ª of the other staggered series of drills.

The drill-stocks having no lateral adjustment, it is necessary to provide suitable means for such adjustment of drill-spindles to enable the same to be set up in proper relation with each other in order to form a uniform drilling throughout the series and which is accomplished as follows: 44 represents a sleeve screw-threaded into the drill-head member 28, the spindle-shaft 43 being loosely journaled within the bore. 44ª represents a flange on one end of the sleeve 44. 44ᵇ represents the chuck integral with shaft 43, being provided with what is known as "Morse" taper, into which the drills are inserted and secured. 44ᶜ represents ball-bearing rings between the chuck and flange 44ª of the sleeve 44 for a free operation of the drill-shaft against end thrust. 49 and 50 represent lock-nuts for securely holding the sleeve 44 to the shaft 43 against lateral movement, so that the forward or rearward adjustment of the sleeve will carry with it the spindle-shaft 43. In order to prevent the sleeve 44 from turning during the drilling operation, a lock is provided, the construction of which is as follows, (see Fig. 12:) 51 represents a groove in the sleeve 44. 52 represents a lever fulcrumed at 53 to the bearing or bracket 54, projecting from the drill-head member 28. To one end of the lever 52 is pivoted a lock-pin 55, passing through a slot in the drill-head 28 and engaging into the groove 51. 56 represents a spring for normally holding the pin in engagement with the groove. Thus in order to make a longitudinal adjustment of drill the free end of the lever 52 is depressed, disengaging the pin 55 from the groove 51, permitting the sleeve 44 to be turned, and, having screw-threaded engagement with the drill-head member 28, a forward or reverse adjustment can be made, as desired. by this construction of drill-head it will readily be seen that the drills can be run at a high speed, the carriage fed forward at a fast feed without any undue strain upon the drill-head, as the parts are all rigidly mounted when in their drilling operation, and which is very essential in the drilling of such material as steel.

The feeding of the work and properly supporting the same with relation to the drills is accomplished as follows, (see Figs. 1 and 2:) 57 represents a tail-stock mounted and secured upon one of the frames 1, as many tail-stocks being employed usually as there are supporting-frames for a given length of drill. 58 represents a way projecting from the tail-stock, upon which the carriage 61 slides, and is provided with flanges upon each side thereof for properly guiding the carriage upon its way. 59 60 represent journal-bearings upwardly projected from the tail-stock for supporting the carriage-feed shaft. 61 represents a carriage sliding upon the way 58 of the tail-stock 57 and is provided with the upwardly-extended bearings 62 63, through which the screw 64 of the feed-shaft 65 passes.

For a quick reverse I provide the following devices: 66 represents a revoluble nut having an internal screw-threaded engagement with the screw 64 of shaft 65. This nut is provided with a recess at each end into which is fitted the ball-bearing rings 67 68, and which rings have bearing against the journal-brackets 62 and 63 to provide a free movement of the nut. Likewise the feed-shaft 65 is provided with a flange 69 at the screw terminal forming an abutment for the ball-bearing ring 70 at one end and the journal-bracket 59 of the tail-stock 57 at the opposite end. 71 (see Fig. 5) represents connecting-plates secured between two of the carriages of a series for holding the same in position upon the way of the tail-stock 57, the end carriages of a series being gibbed to their respective ways.

The forward power-feed of the carriages is as follows: Upon the main power-shaft 11, Fig. 4, is fixed a sprocket-gear 72. 73 represents a shaft journaled upon brackets or journal-boxes secured to the frames 1, preferably of a length equal to two frames, as shown in Fig. 5. Upon this shaft 73 is fixed a sprocket-gear 74. 75 represents a driving-chain meshing with gear 72 and gear 74, transmitting power from the shaft 11 to shaft 73. Upon shaft 73 is mounted a clutch 76 for controlling the carriage-feed shaft. (See Figs. 5 and 10.) The details of construction will be more fully hereinafter described. 77 represents a gear fixed to the loose member of the clutch 76, in mesh with a gear 78, fixed to the transverse driving feed-shaft 79, said shaft being journaled in the respective tail-stock 57, Fig. 5, throughout the series and extending the entire length thereof. 80, Fig. 2, represents a worm fixed to the feed-shaft 79 and between the journal-brackets 59 60 of the tail-stock 57. 81 represents a worm-wheel fixed to the feed-shaft 65, mounted between the journal-bearings 59 and 60 and meshing with the worm 80, a like construction being carried on for each tail-stock in the series. In order to effect the power-feed of the carriage, it is necessary that the nut 66 be locked against revolution. This is accomplished by the following mechanism, which forms a two-fold function of locking the nut 66 for the forward feed and which nut when released serves as a quick-reverse driving mechanism of the carriage when the forward feed or the feed-shaft 65 is

at rest. The reverse of the carriage is preferably shown as manually operated. 82, Figs. 2 and 7, represents a transverse shaft passing through the carriages of the series below the nut 66. 83 represents bevel-gears fixed to the shaft 82, Fig. 7, in mesh with bevel-gears 84, loose on a stud-shaft 85, mounted on the carriage, as shown in Fig. 2. Fixed to said bevel-gear 84 is a spur-gear 86, in mesh with teeth 87, formed on the outer periphery of the nut 66. In light work this form of gear arrangement may be sufficient to lock the nut in the forward feed, but to insure the same against revolution further precaution is taken to effect a positive lock. Upon one end of the reverse shaft 82 is fixed a hand-wheel 88, Fig. 3. 89 represents a bracket mounted upon the end carriage of a series and projecting outward over the hand-wheel 88. 90 represents a steel strap fitting over the periphery of the hand-wheel 88, one end of said strap being secured to the bracket 89, the other end being secured to rod 91, having bearing in said bracket 89. The free end of said rod 91 is screw-threaded. The rod 91 is adapted to be loosely supported within the bore of the bracket 89, through which it projects. 92 represents a hand-wheel having screw-threaded engagement with the rod 91. Thus a forward revolution of the hand-wheel 91 upon the rod 92 will bring the same into abutting engagement with the bracket 89, drawing with it the rod 91, tightening the strap 90 around the periphery of the hand-wheel 88, and thereby positively locking the same from revolution during the forward feed of the carriage. As shown, the forward feed, or, rather, the working feed, is obtained by power. The reverse or adjusting forward feed of the carriage can be obtained manually and is accomplished by releasing the strap 90 from locking engagement with the hand-wheel 88, revolving the hand-wheel in the direction desired for the manipulation of the carriage, which will in turn revolve the shaft 82, gear-wheel 83 transmitting motion to bevel-gear 84, spur-gear 86, loosely mounted on shaft 85, revolving the nut 66 backward and forward upon the screw 64 of the screw-shaft 65. This feed can be accomplished regardless of the motion of the screw-shaft 65; but of course it is preferable to shut off the power to the screw-shaft 65, having the same idle during the hand-feed operation, in which instance the nut 66 travels on screw 64, that drives the carriages.

The supporting and presenting of the work to be drilled to the action of the drills is accomplished as follows: Secured to the forward end of the carriages are the forwardly-projecting bracket 93. (See Figs. 1 and 8 and enlarged view Fig. 9.) The lower face of the bracket rests and slides upon the ways 58 of the tail-stock 57. These brackets are provided with downwardly-projecting arms 94 upon each side of the ways 58 and frames 1. The upper face is inclined from its central portion for the purpose of conveying the grindings or chips downward and out of the way of the ways 58. To these arms 94 are pivoted the work-supporting links 95 96, swinging upwardly on axis at the foot of arms 94. 97 represents rollers journaled to the upper end of links 95 96, upon which the work rests. (See Fig. 1.) Between the links 95 96 is pivoted a nut 98, the nuts on the right-hand side being provided with a central bore having a right-hand screw-thread and the nuts on the left being provided with a bore having a left-hand screw-thread. To simultaneously adjust the height of all the rolls 97, I provide the following: 99 represents a shaft extending the entire length of the drill and passing between the links 95 and 96, one end of said shaft being provided, or both, if desirable, with a square head to which a hand wheel or crank may be inserted for operating the shaft 99. 100 represents worms fixed to the shaft 99, the threads of which engage with the internal threads of the nuts 98. Each pair of nuts is provided with right and left hand screws, according to the nut with which the respective worms engage. Thus it will be seen that by a manipulation in either direction of the shaft 99 the links, with their respective nuts, will be moved or swung to and from the center of the carriage, thereby raising and lowering the position of roller-level upon which the work is supported, thereby properly adjusting the same.

In order to automatically throw on and off the power of the feed-shaft 79, the following mechanism is provided: 76 is a clutch, as stated before, on shaft 73, consisting of two disk members, one fast and the other loose on said shaft, said clutch being provided with a sliding member 101, having splined engagement with the shaft 73. 102 represents the disk or member fixed to the shaft 73 within the loose clutch member 103, (see Fig. 10,) the hub of which is loosely journaled on shaft 73. 104 represents turnbuckles one end of which is pivoted to a sliding member 101 on shaft 73, the opposite end to a link 105, said link being in turn pivoted to the disk 102. 106 represents segmental-friction-plates within the member 103, having secured thereto and extending toward the shaft 73 pins 107. These pins are provided with a slot through which the links 105 pass. As many of these links and turnbuckles may be employed as desired, but four being sufficient. 108 represents segment-shoes secured to the plates 106. Thus it will be seen that a movement to the left of the sliding member 101 will change the angle of links 105, thereby pulling inward the pins 107, releasing the clutching engagement of the driving member of the clutch from the loose

driven member of the clutch, while a movement of the clutch member 101 in the opposite direction will bring the shoes into engagement with the inner portion of the flange of the clutch member 103, transmitting power from shaft 73 through gears 77, fixed to clutch member 103, gear 78, meshing with gear 77, to the feed-shaft 79. (See Figs. 5 and 10.) The sliding member 101 is provided with a groove 109, with which the yoke-arms 110 engage. (See Fig. 6.) 111 and 112 represent collars fixed to the shaft 73 for limiting the movement of member 101 at one end and the clutch member 103 at the other. 113 represents a lever having the looped portion 114, between which and to which the yokes 110 are pivotally secured, one end of said lever 113 being pivoted to a bar 115, secured to the frames 1. The opposite end of said lever is pivoted to a bar 116, said bar passing the entire length of the drill and seated in recesses in the tail-stocks 57 and held in position by the cap-plates 117. (See Fig. 5.) This bar 116 is provided with a number of handles 118, whereby the bar may be easily controlled by hand for operating the clutch 76 at convenient points along the drill. 119 represents a link having an elongated slot 120 at one end thereof, the opposite end being pivoted to a bell-crank lever 121, pivoted to the frame and to the bar 116. 122 represents a nut screw-threaded into one of the plates 71. Thus it will be readily seen that when the carriage has either traveled forward or backward to bring the nut 122 at either end of the slot a further feed will operate link 119, clutch-rod 116, and clutch 76, throwing off or on the power. The length of slot 120 limits the carriage-feed. In order to suitably hold the work to the carriage, I have preferably shown a clamp controlled by hydraulic pressure, (see Fig. 13;) but it is obvious that any well-known clamp may be substituted.

The clamp, as shown, is mounted and constructed as follows: 123 represents a bracket having gibbed engagement with the flange of the plate 71 at one end and to the shaft 82 at the lower end. 124 represents an arm pivoted to the bracket 123, adapted to be swung upwardly when the clamp is released. To the free end of the arm 124 is mounted piston-cylinder 125, having a downward projection therefrom. 126 represents a piston within the cylinder 125, having the boss 127. 128 represents a port leading to the piston-chamber and connecting with suitable piping for conveying compressed air to the piston-chamber. Thus as the compressed air is turned on, the piston 126 can be driven forward to bring its boss 127 into engagement with the work. 129 represents a coil-spring to bring the piston into its normal position when the compressed air is shut off. Any number of these clamps may be mounted throughout the drill as desired and which may be simultaneously or individually controlled.

It will thus be seen that I have provided a multiple drill made up of section-frames for adjustably supporting the individual drill-stocks seated on ways, on which frame are also supported on one side of the framework carriages traveling on ways, mechanism for feeding the carriages simultaneously forward to the drills, so that any desired number of holes may be bored at the same time and the work uniformly fed to the multiple drills. It will also be seen that each drill-spindle is journaled in its own head-stock, and that all the head-stocks may be adjusted laterally, and that each drill is adjusted vertically by rocking on its driving-gear as an axis, thus allowing the holes bored in the work to be staggered horizontally.

As the drill-spindles simply rotate in working and do not travel toward the work, and as there is a multiple number of drills used, it is necessary that the point of the different drills may be adjusted practically to the same vertical plane. For this reason each drill-spindle has a longitudinal adjustment of its own and means for locking it to its adjusted position, so that varying lengths of drill may be employed for the different spindles and yet may be separately adjusted to the same working line.

It will be observed that the different drill-stocks each being separately supported on ways, they may be adjusted to and from each other at liberty, so as to regulate the distance apart of the holes to be bored.

It will be observed that the several driving mechanisms of the series of drills are arranged in two series, each alternate drill being driven by a separate shaft from the next adjacent drill, thereby dividing the strain by employing a parallel pair of driving shafts, and which allows a closer adjustment of the several drills to each other than could be obtained if their respective driving-gears were side by side instead of staggered in two rows. The several parts of the machine, driving-gears, &c., being duplicates of each other and the frame being made in sections materially cheapens the cost of construction and transportation, combining at the same time economy, strength, and simplicity.

Having described my invention, I claim—

1. A multiple drill composed of a frame, ways formed along one side of the frame, a series of drill head-stocks seated on said ways, drill-spindles journaled in said head-stocks, transverse ways fixed to and on the opposite side of said frame, a work-carriage mounted on said transverse ways, independent adjustable work-supports mounted on said carriage, means for coöperatively adjusting said work-supports, mechanism for revolving the drill-spindles simultaneously,

and feeding mechanism for reciprocating said carriage to and from the drill-spindles, substantially as described.

2. A multiple drill composed of a frame, having longitudinal ways upon one side, laterally-adjustable head-stocks mounted on said ways, drill-spindle supports journaled on said stocks, means for adjusting said supports independent of the stocks, independent transmitting mechanism for each spindle, transverse ways upon the opposite side of the frame, work-supporting carriages mounted upon said ways, and mechanism for feeding the work-carriages to and from the drill-spindle simultaneously, substantially as described.

3. A multiple drill composed of a series of sectional frames attached side by side lengthwise of the drill, each section having a series of longitudinal ways on one side thereof, a series of head-stocks mounted and longitudinally adjustable thereon, a drill-spindle individually journaled in each head-stock, a transverse way on each frame-section opposite the drill-spindle, a work-supporting carriage seated on said ways, power-transmitting mechanism for simultaneously rotating the series of drills and power mechanism for feeding the work-supporting carriage to the drills, substantially as described.

4. In a multiple drill, a frame having oppositely-disposed longitudinal and transverse ways, one or more work-supporting carriages supported on said transverse ways, the combination therewith of a series of head-stocks mounted on said longitudinal ways opposite the said carriages, a main driving-shaft, intermediate driving-shafts, a pair of parallel driving-shafts receiving motion through a train of gears from the main shaft, a drill-spindle support mounted on each head-stock, means for adjusting said drill-spindle supports independent of their respective head-stocks, a drill-spindle journaled in each support, a train of gears for each drill-spindle connecting each alternate drill-spindle with one of said parallel shafts, a train of gears connecting each alternate drill-spindle to the opposite parallel shaft, substantially as described.

5. In a multiple drill, a frame having oppositely-disposed longitudinal and transverse ways, one or more work-supporting carriages mounted on said transverse ways, a series of head-stocks mounted on said longitudinal ways opposite said carriages, means for adjusting each head-stock laterally, mechanism for locking the head-stocks in their adjusted positions, a main driving-shaft, parallel transmitting-shafts, a train of gears connecting said main driving-shaft and parallel transmitting-shafts, a drill-spindle support pivotally mounted on each head-stock whereby the drill-spindle supports may be independently adjusted upon their respective head-stocks, a drill-spindle journaled in each support, trains of gears individually connecting each drill-spindle to one of said transmitting shafts in alternating series and mechanism for feeding the carriage to the drills, substantially as described.

6. In a multiple drill, a frame having oppositely-disposed ways on each side thereof, work-supporting carriages mounted on the ways on one side of the frame, a series of head-stocks mounted and laterally adjustable on longitudinal ways on the opposite side of said frame, drill-spindle supports pivotally mounted upon each head-stock for vertical adjustment, means for locking the drill-spindle supports independently in their adjusted positions, and a drill-spindle journaled in each support, substantially as described.

7. In a multiple drill composed of a frame, transverse ways on one side thereof, a work-supporting carriage slidably mounted on said ways, longitudinal ways on the opposite side of the frame, a series of head-stocks mounted on said ways, a drill-spindle support adjustably mounted upon each head-stock, mechanism for locking said drill-spindle supports respectively in a fixed position, a drill-spindle journaled in each support, a train of gears journaled upon said head-stocks and drill-spindle supports permitting of adjustment of the drill-spindle supports, and means for transmitting motion to said train of gears and drill-spindles, substantially as described.

8. In a multiple drill provided with longitudinal ways a series of head-stocks mounted on longitudinal ways, a drill-spindle journaled on each head-stock, a sleeve for respectively journaling each drill-spindle and provided with an external screw-thread, a supporting-sleeve interiorly screw-threaded engaging and supporting the journal-sleeve, means for locking the journal-sleeve against rotation whereby each individual drill-spindle may be adjusted longitudinally and locked against longitudinal movement when in rotation, means for simultaneously driving the drill-spindles and means for feeding the work forward to the series of drill-spindles, substantially as described.

9. In a multiple drill, ways for supporting the carriages, a plurality of work-supporting carriages, each mounted upon a way, mechanism for feeding said carriages to the drill, the combination with each carriage of a pair of outwardly-inclined arms pivoted thereto, a work-supporting roller mounted on the top of each arm, an adjusting-shaft common to each pair of the carriage-arms and adjusting mechanism connected to each pair of arms whereby said pairs of arms are simultaneously moved to and from each other for adjusting the height of the work-supporting rollers, substantially as described.

10. In a multiple drill employing a series of work-supporting carriages mounted upon ways in the plane opposite the drill-spindles, work-supporting arms adjustably mounted upon the carriages, means for adjusting the arms vertically, a back support for the work mounted on each carriage and pivoted overhanging arm on each carriage, a front clamp secured to said arm and supported in front of the work, and mechanism for moving the clamp in contact with the work-piece and forcing it against the back support, substantially as described.

11. In a multiple drill, a carriage, a plurality of work-supports mounted on said carriage, consisting of inclined link-arms upon the free ends of which the work rests, and means for adjusting the angular inclination of said arms simultaneously, substantially as described.

12. In a multiple drill, a carriage, a plurality of work-supports mounted on said carriage, consisting of alternately-inclined work-supporting arms, and means for adjusting the angular inclination of said arms simultaneously, substantially as described.

13. In a multiple drill, a series of carriages, means for feeding said carriages in unison, a plurality of work-supports mounted on said carriages, and means for simultaneously adjusting said work-supports at right angles to the plane of carriage travel, substantially as described.

In testimony whereof I have hereunto set my hand.

CHARLES PARTINGTON.

Witnesses:
OLIVER B. KAISER,
LUISE BECK.