W. F. McCARTY.

INDEPENDENT FEED RAIL DRILL,

APPLICATION FILED OCT. 3, 1919.

1,382,433.

Patented June 21, 1921.

6 SHEETS—SHEET 1.

Fig. 1.

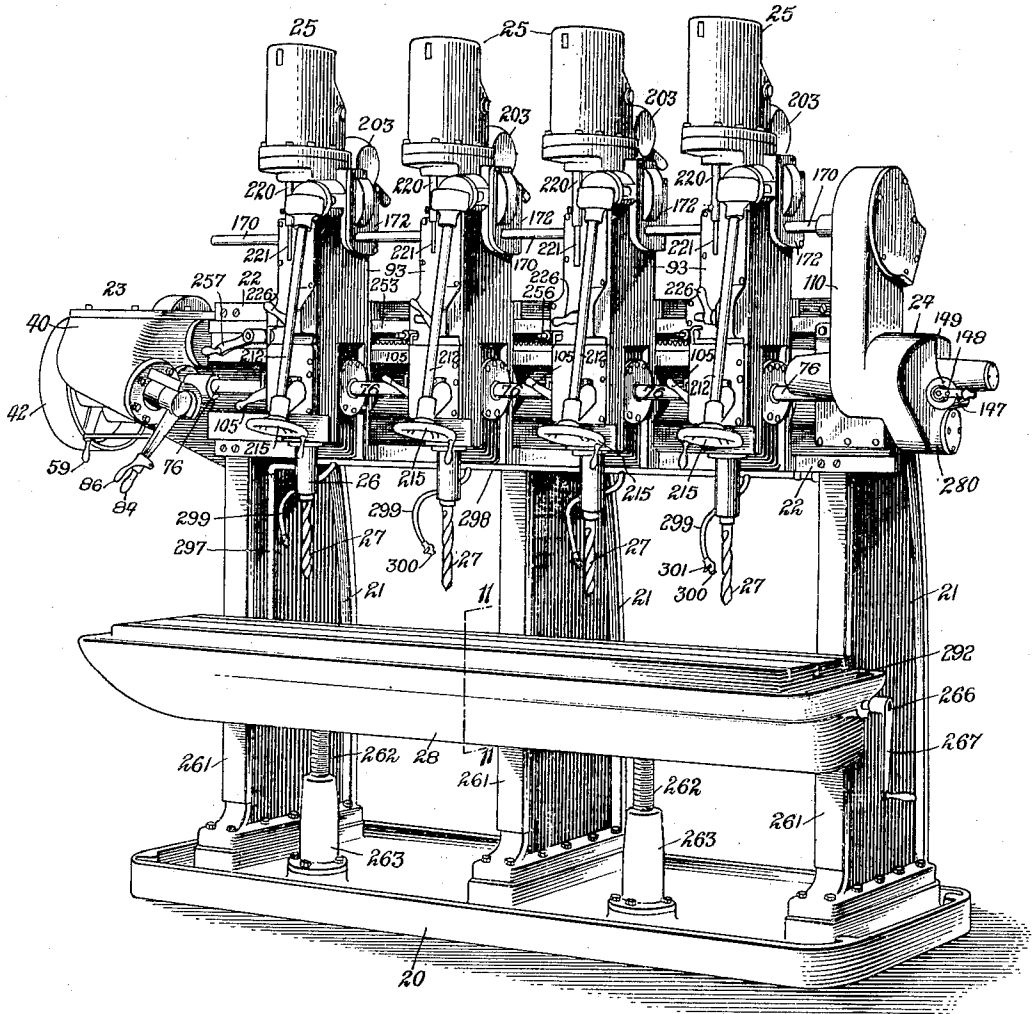
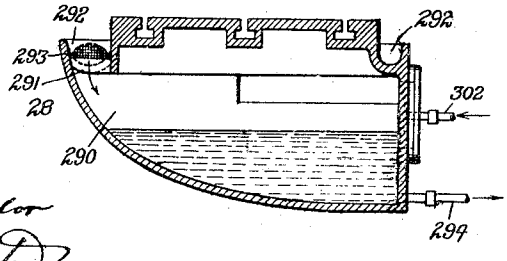


Fig. 11.



WITNESSES

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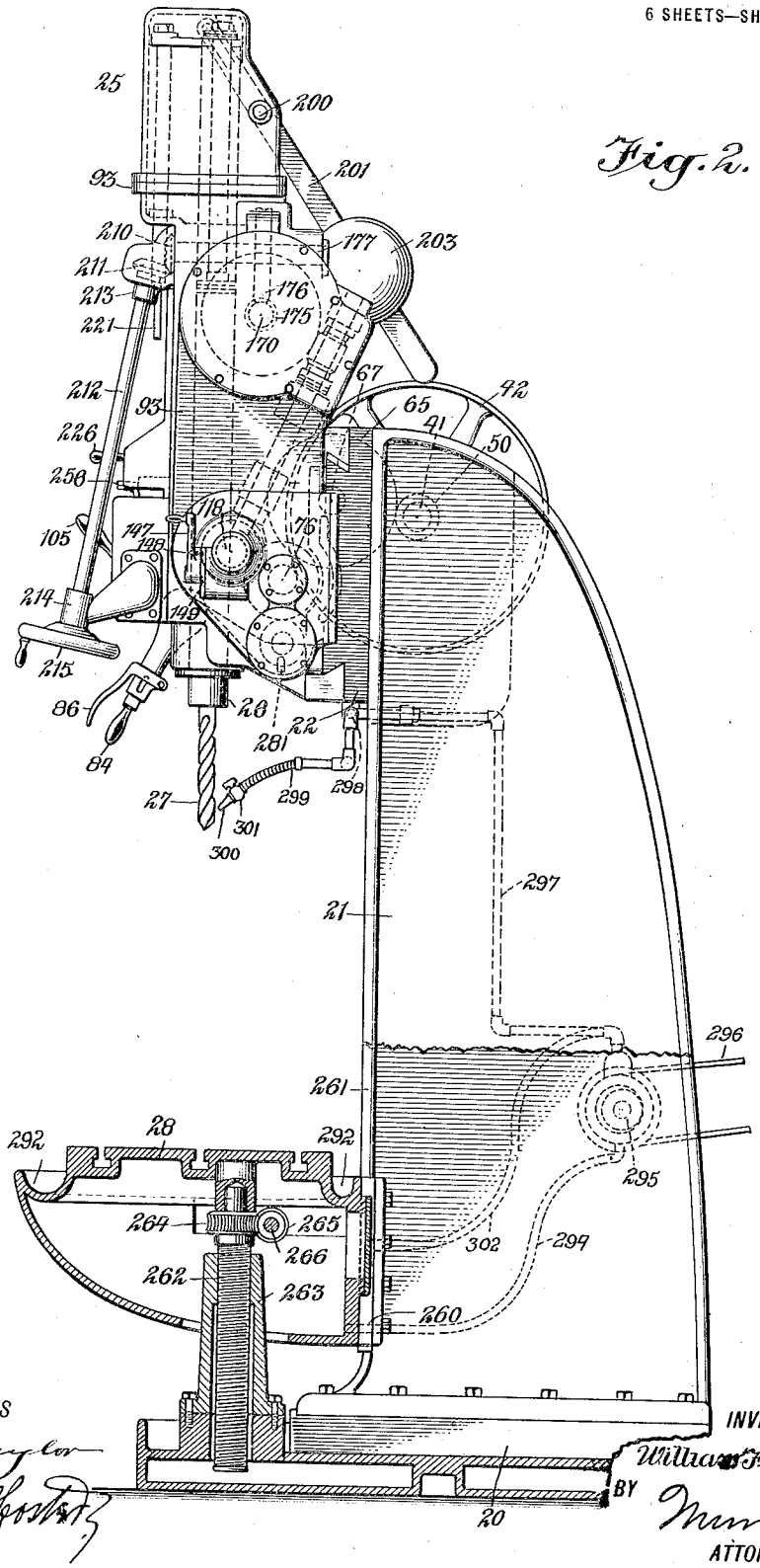
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6 SHEETS—SHEET 2.

Fig. 2.



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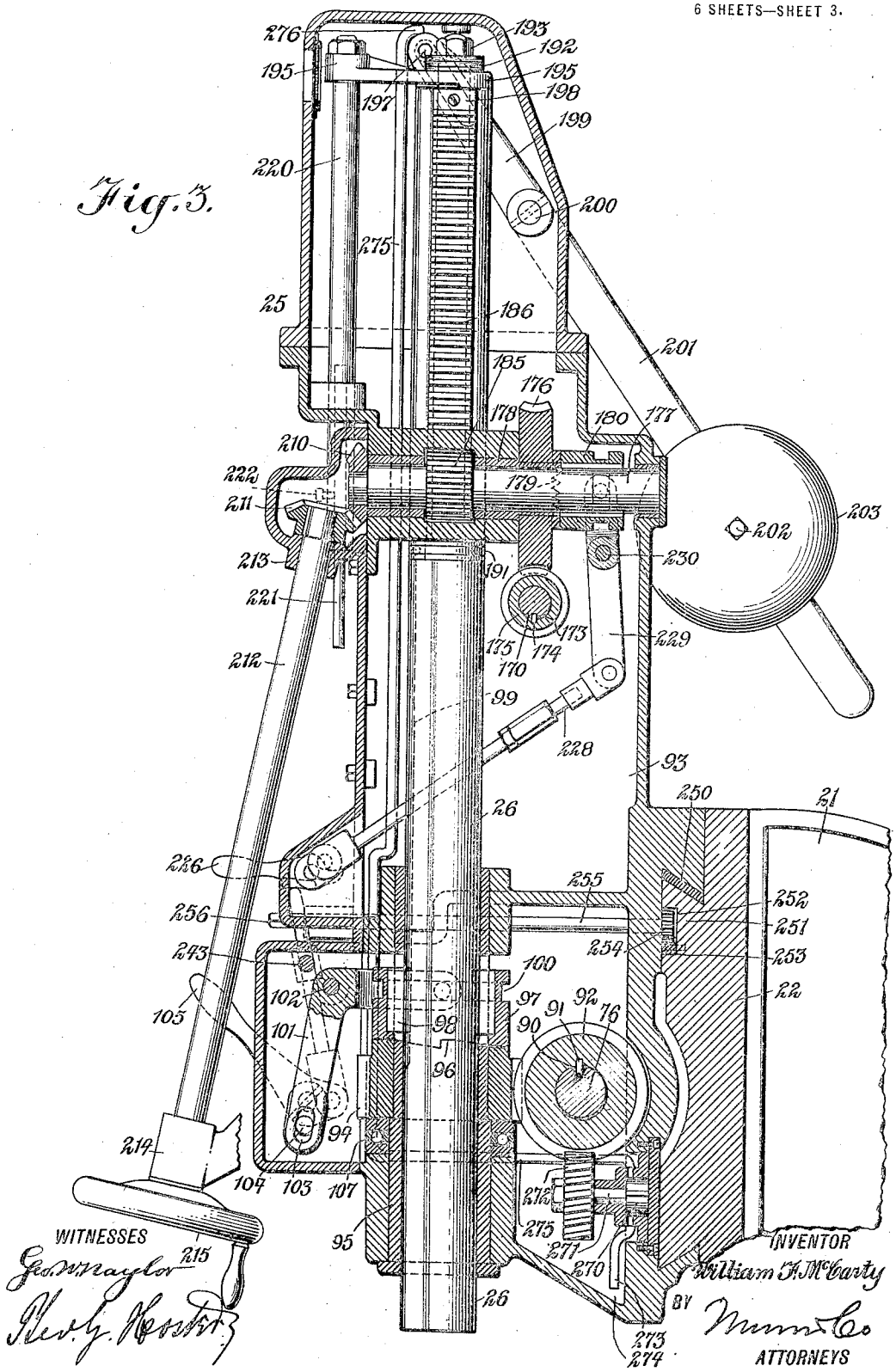
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6 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 4.

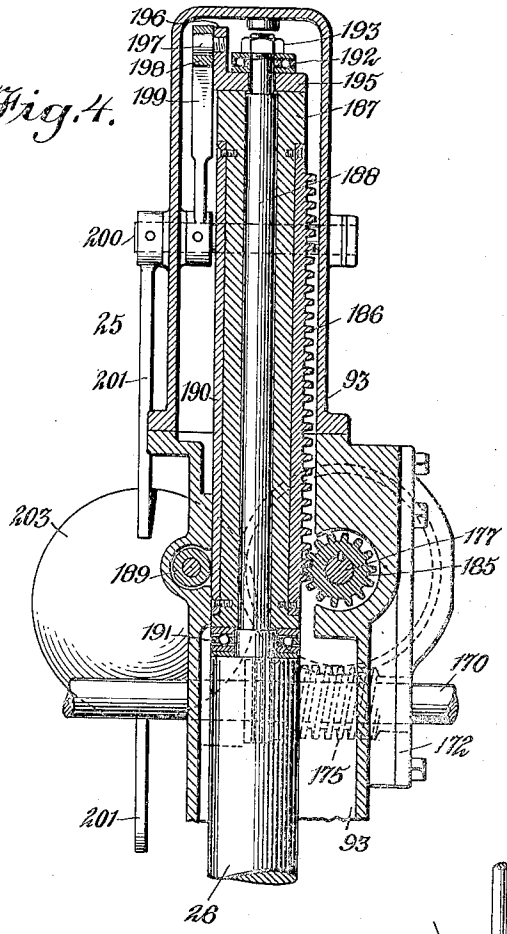
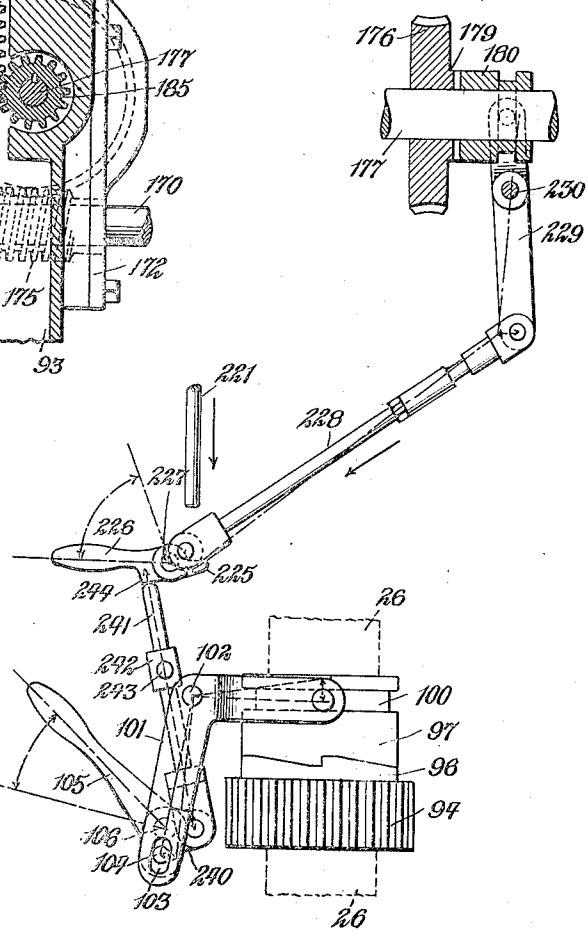


Fig. 5.



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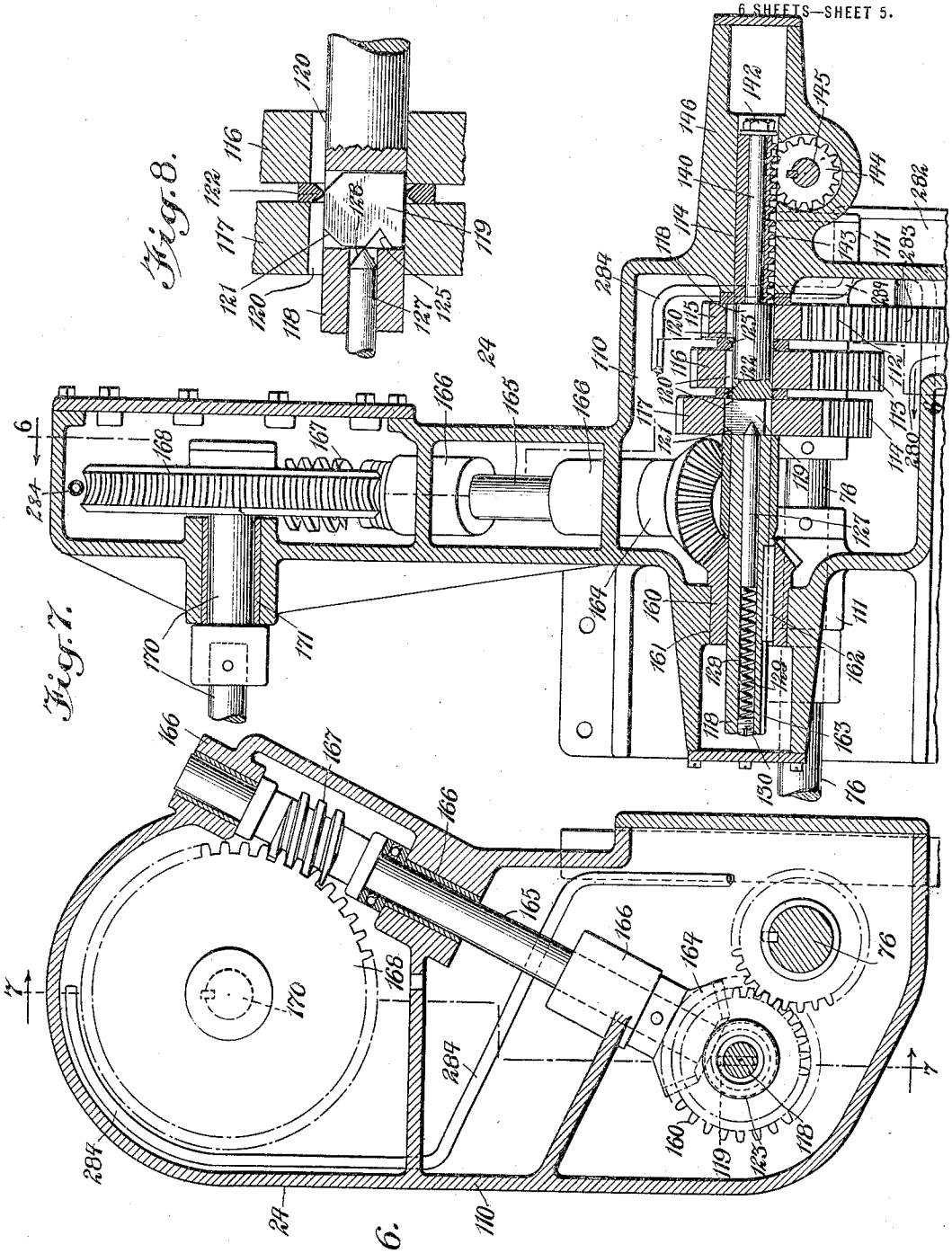


Fig. 8.

Fig. 7.

Fig. 6.

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6 SHEETS—SHEET 6.

Fig. 9.

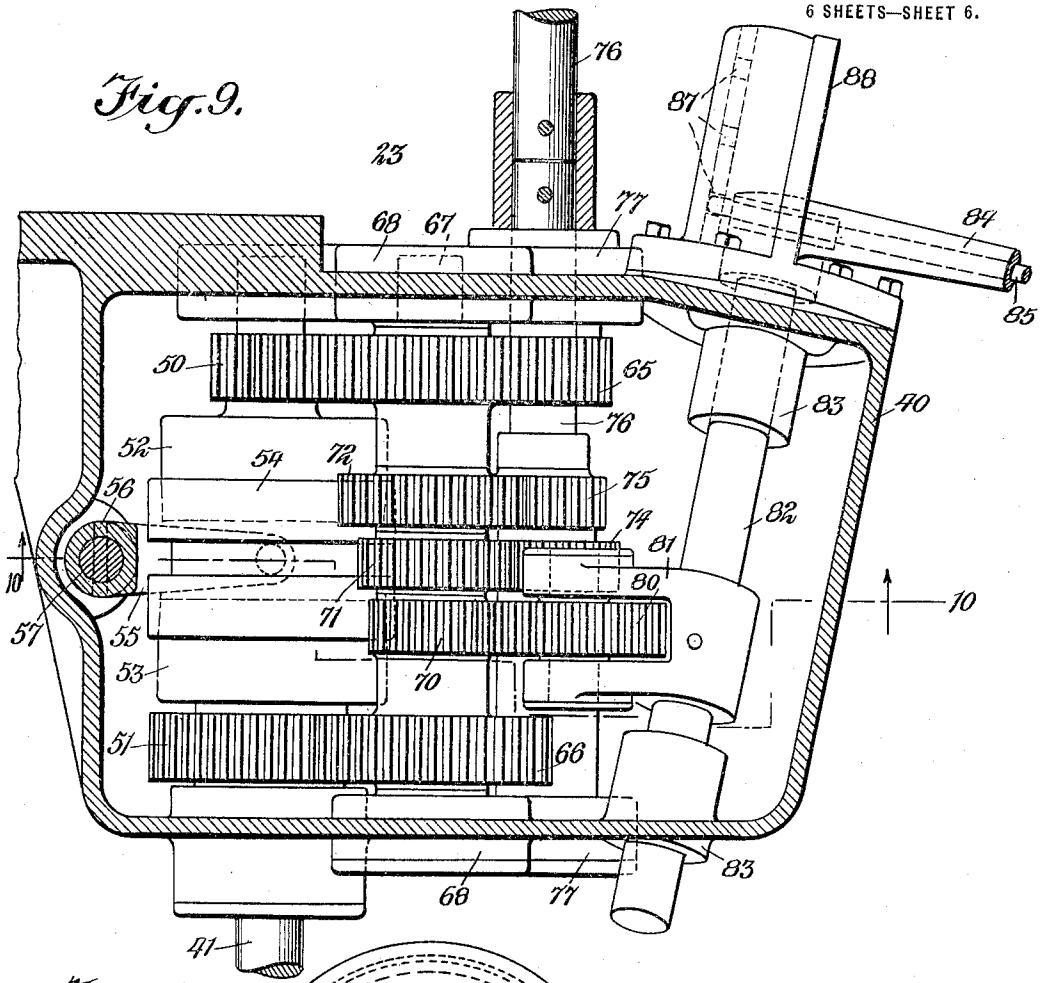
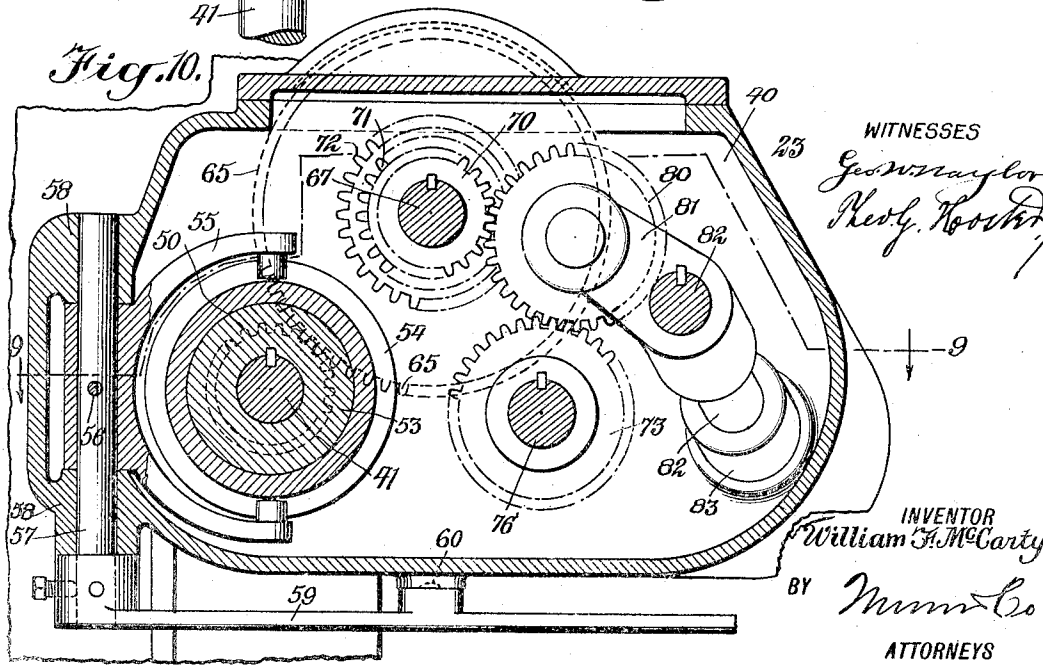


Fig. 10.



WITNESSES

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UNITED STATES PATENT OFFICE.

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INDEPENDENT FEED RAIL DRILL.

1,382,433. Specification of Letters Patent. Patented June 21, 1921.

Application filed October 3, 1919. Serial No. 328,202.

To all whom it may concern:

Be it known that I, WILLIAM F. McCARTY, a citizen of the United States, and a resident of Defiance, in the county of Defiance and State of Ohio, have invented a new and Improved Independent Feed Rail Drill, of which the following is a full, clear, and exact description.

The invention relates to metal working machines of the heavy service type, and its object is to provide a new and improved independent rail drill more especially designed for use in locomotive and railway shops, gas engine and automobile factories, general machine shops and similar establishments, and arranged to permit of heavy gang drilling or heavy jig drilling.

Another object is to provide a rail drill which is exceedingly compact and thus enables a single operator to keep a number of drill spindles, either singly or in groups, in operation and with a view to enable the operator to reload the jigs while a group of drills is in operation.

Another object is to provide a speed mechanism, a feed mechanism and spindle heads of unit construction, each of which is readily accessible without disturbing or interfering with the other.

Another object is to enable the operator to quickly and conveniently adjust or set the several spindle heads independently one of the other according to the work in hand.

Another object is to conceal the actuating mechanism and thereby protect the same against dust and other extraneous matter, at the same time preventing the operator from becoming accidentally entangled and injured.

With these and other objects in view, the invention consists of certain novel features of construction as hereinafter shown and described and specifically pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a perspective view of the independent feed rail drill;

Fig. 2 is an elevation of one end of the same with the work support in the base of the frame in cross section;

Fig. 3 is an enlarged cross section of one of the spindle heads;

Fig. 4 is a sectional front elevation of the same;

Fig. 5 is a side elevation, partly in section, of the automatic stop, the mechanism for the feed mechanism of the drill spindle, and the manually controlled means for stopping the rotation of the drill spindle;

Fig. 6 is an enlarged cross section of the variable feed mechanism for the drill spindle, the section being on the line 6—6 of Fig. 7;

Fig. 7 is a sectional front elevation of the same on the line 7—7 of Fig. 6;

Fig. 8 is an enlarged sectional front elevation of a portion of the variable feed mechanism with the parts in different position from the one shown in Fig. 7;

Fig. 9 is a sectional plan view of the variable speed mechanism, the section being on the line 9—9 of Fig. 10;

Fig. 10 is a cross section of the same on the line 10—10 of Fig. 9; and

Fig. 11 is a cross section of the work support on the line 11—11 of Fig. 1, and showing more particularly the oil well containing the oil for lubricating the drilling tool.

General construction.

The framework of the machine consists essentially of a base 20 from which arise standards 21 connected with each other at their upper end by a dovetail shaped rail 22. On the left-hand standard 21 is secured a variable speed changing mechanism 23, and on the right-hand end of the rail 22 is arranged a variable feed mechanism 24. On the rail 22 between the variable speed mechanism 23 and the variable feed mechanism 24 are slidably mounted a plurality of spindle heads 25, alike in construction, and each provided with a drill spindle 26 carrying a drilling tool 27 adapted to drill a hole in the work supported on the work support 28 arranged in front of the standards 21 below the rail 22.

Variable speed mechanism.

The variable speed mechanism 23, shown in detail in Figs. 9 and 10, is practically of the same construction as the one disclosed in the Letters Patent of the United States for a drill press No. 1,303,089, granted to

me on May 6, 1919. In the casing or housing 40 of the variable speed mechanism 23 is journaled a main shaft 41 provided at its outer end with a pulley 42 (see Fig. 1) connected by a belt with other machinery for imparting a rotary motion to the main shaft 41. On the main shaft 41 within the housing 40 are mounted to rotate loosely two gear wheels 50 and 51 of different diameters and provided with clutch members 52, 53 adapted to be engaged by a double clutch 54 mounted to turn with and to slide lengthwise on the main shaft 41. Thus when the double clutch 54 is in engagement with the clutch member 52 then a rotary motion is transmitted from the main shaft 41 to the gear wheel 50, and when the double clutch 54 is shifted into engagement with the clutch member 53 then a rotary motion is transmitted from the main shaft 41 to the gear wheel 51, and when the double clutch 54 is shifted out of engagement with both clutch members 52 and 53 then it is in neutral or intermediate position and hence does not rotate the gear wheel 50 or 51.

In order to shift the double clutch 54 lengthwise on the shaft 41 for the purpose mentioned, use is made of a shifting fork 55 engaging the double clutch 54 and secured by a pin or other fastening means 56 to a rock shaft 57 journaled in suitable bearings 58 forming part of the housing 40, as plainly shown in Fig. 9. On one outer end of the rock shaft 57 is secured a hand lever 59 within convenient reach of the operator to permit the latter to impart a swinging motion to the said lever 59 with a view to rock the shaft 57 to shift the double clutch 54 into engagement with either the clutch member 52 or the clutch member 53, as above explained. Suitable means 60 may be employed for holding the lever 59 in either of the three positions.

Normally the loose gear wheels 50 and 51 are in mesh with gear wheels 65 and 66 keyed or otherwise secured on a shaft 67 journaled in roller bearings 68 arranged on the housing 40. The gear wheels 65 and 66 are of different diameters and hence the shaft 67 can be rotated at a higher or lower rate of speed according to which of the gear wheels 50 or 51 is driven at the time from the main shaft 41 by the double clutch 54, as above explained. On the shaft 67 is secured a series of step gear wheels 70, 71, and 72, and opposite the same is arranged a second set of step gear wheels 73, 74 and 75 arranged in reverse order from the step gear wheels 70, 71 and 72, as plainly shown in Fig. 8. The step gear wheels 73, 74 and 75 are keyed or otherwise secured on a variable speed shaft 76 journaled in suitable roller bearings 77 arranged on the housing 40. The variable speed shaft 76 extends through the several spindle heads 25 into the variable feed mechanism 24 to rotate the spindles 26 and to drive the variable feed mechanism 24, as hereinafter more fully explained.

Either pair of gear wheels 70—73, 71—74, and 72—75 is adapted to be engaged by an intermediate connecting gear wheel 80 journaled on a bracket 81 secured on an inclined shaft 82 mounted to rock and to slide lengthwise in bearings 83 arranged on the housing 40. The lower end of the shaft 82 extends through the housing 40 to the outside thereof and on the lower end of the shaft 82 is secured a hand-operated shifting and turning lever 84 under the control of the operator in charge of the machine. In the hand lever 84 is mounted to slide a locking rod 85 connected at its lower end with a hand lever 86 fulcrumed on the hand lever 84 to permit the operator to conveniently manipulate both levers 84 and 86. The locking rod 85 is adapted to engage a series of recesses 87 formed in a semi-circular or trough-like retainer or guide 88 bolted or otherwise fastened to the outside of the housing 40. By the arrangement described the operator having hold of the hand levers 84 and 86 can withdraw the end of the locking rod 85 from the corresponding recess 87 and then impart a transverse swinging motion to the lever 84 with a view to move the intermediate connecting gear wheel 80 out of mesh with the corresponding pair of step gear wheels 70—73, 71—74, and 72—75. The lever 84 is now pushed to the right or to the left thus moving the shaft 82 lengthwise and with it the connecting gear wheel 80 until the latter is opposite the desired pair of the pairs of step gear wheels 70—73, 71—74, and 72—75. The operator now swings the lever 84 transversely and releases the lever 86 to allow the end of the locking rod 85 to engage the corresponding recess 87, thus locking the lever 84 against further movement in either a sidewise or a transverse direction. The rocking movement of the lever 84 causes a rocking of the shaft 82 to engage the connecting gear wheel 80 with the corresponding pair of step gear wheels 70—73, 71—74, or 72—75. From the foregoing it will be seen that by the arrangement described the intermediate connecting gear wheel 80 cannot be shifted into mesh with any one of the pairs of step gear wheels unless said intermediate connecting gear wheel 80 is first moved out of mesh with the pair of step gear wheels with which it is in mesh at the time so that stripping of the gear teeth of the gear wheels mentioned is completely avoided. It will be noticed that the speed changing mechanism described provides for six different speeds according to the position of the double clutch 54 relative to the gear wheels

50, 51 and that of the intermediate connecting gear wheel 80 relative to the pairs of step gear wheels 70—73, 71—74, and 72—75.

Spindle Driving Mechanism.

Each of the spindles 26 is driven from the variable speed shaft 76, as previously mentioned, and for this purpose the following arrangement is made, special reference being had to Fig. 3: On the variable speed changing shaft 76 is formed a keyway 90 engaged by keys 91 secured in spiral gear wheels 92, one for each spindle head 25, and arranged within the housing 93 of such spindle head to move with the spindle head when the latter is adjusted on the rail 22. The spiral gear wheel 92 is in mesh with a spiral gear wheel 94 mounted to rotate loosely on a bushing 95 forming one of the bearings for the corresponding drill spindle 26. The upper end of the spiral gear wheel 94 is provided with a clutch member 96 adapted to be engaged by a clutch member 97 provided with a key 98 engaging a key slot 99 formed on the spindle 26. Thus when the clutch member 97 is in engagement with the clutch member 96 and the latter is driven from the shaft 76, as above mentioned, a rotary motion is given to the drill spindle 26. The clutch member 97 is provided with an annular groove 100 engaged by a shifting lever 101 fulcrumed at 102 in the housing 93 of the corresponding drill head 25. The shifting lever 101 is provided with a slot 103 engaged by a pin 104 held on a hand lever 105 fulcrumed at 106 on one side of the housing 93 and extending within convenient reach of the operator in charge of the drill (see Figs. 1, 3 and 5). Normally the clutch member 97 is in engagement with the clutch member 96, but when it is desired to stop the rotation of the drill spindle 26, the operator swings the hand lever 105 downwardly thereby imparting a swinging motion to the shifting lever 101 whereby the clutch member 97 is moved out of engagement with the clutch member 96, and further rotation of the drill spindle 26 ceases. A thrust bearing 107 is mounted on the sleeve bearing 95 and supports the spiral gear wheel 94.

Variable Feed Mechanism.

The variable feed mechanism, shown in detail in Figs. 6, 7 and 8, is practically of the construction shown and described in the Letters Patent of the United States for a drill press, No. 1,303,089, granted to me on May 6, 1919. The variable speed shaft 76 extends into the housing 110 of the variable speed mechanism 24 and is journaled in suitable bearings 111 arranged in the said housing. On the shaft 76 within the housing 110 is secured a series of step gear wheels 112, 113 and 114 in mesh with step gear wheels 115, 116 and 117 mounted to rotate loosely on a slip shaft 118 mounted to slide sidewise within the housing 110. In the slip shaft 118 is mounted to slide diametrically a key 119 adapted to engage a keyway 120 formed in each of the step gear wheels 115, 116 and 117 to rotate the shaft 118 at the corresponding speed from the variable speed shaft 76. The key 119 is provided with inclines 121 adapted to engage the inner V-shaped edges 122 of cam washers 123 and 124 interposed between the corresponding step gear wheels 115, 116 and 117. The left-hand side of the key 119 is provided with a V-shaped notch 125 engaged by the conical end 126 of a pin 127 mounted to slide in a recess 128 formed centrally in the left-hand portion of the slip shaft 118. The pin 127 is pressed toward the key 119 by a spring 129 held in the recess 128 and abutting with its left end against a plug 130 screwed in the left-hand side of the slip shaft 118. The spring-pressed pin 127 serves to hold the key 119 in engagement with the keyway 120 of the corresponding step gear wheel 115, 116 or 117 to cause such gear wheel to rotate the slip shaft 118 at a corresponding speed. When the slip shaft 118 is moved to the right or to the left then the corresponding bevel 121 engages the wedge-shaped inner edge 122 of the corresponding cam washer 123 or 124 thus retracting the key 119 from the corresponding keyway 120 to allow of moving the slip shaft 118 to the right or to the left, as the case may be. It is understood that when the key 119 is retracted, the spring pressed pin 127 is pushed to the left, and as soon as the key 119 is moved into register with the corresponding keyway 120 then the spring pressed pin 127 forces the key 119 into engagement with such keyway 120. It will be noticed that when the variable speed shaft 76 is rotated, as above explained, then a rotary motion is transmitted by the variable speed shaft 76 to the slip shaft 118 according to which of the gear wheels 115, 116 or 117 is locked to the slip shaft 118 by the key 119, it being understood that all the gear wheels 115, 116 and 117 are simultaneously driven from the gear wheels 112, 113 and 114 keyed on the variable speed shaft 76.

The right-hand end of the slip shaft 118 is provided with a reduced portion 140 on which is held a sleeve 141 by the use of a nut 142 screwing on the right-hand end of the reduced portion 140. The sleeve 141 is provided with a rack 143 in mesh with a pinion 144 secured on a transverse shaft 145 journaled in suitable bearings arranged in the housing 110. The sleeve 141 forms a continuation of the slip shaft 118 and is mounted to slide in a bearing 146 forming an integral part of the housing 110, as

plainly shown in Fig. 7. The forward end of the shaft 145 is provided with a handle 147 (see Fig. 1) under the control of the operator in charge of the drill, and this handle is provided with a spring pressed pin 148 adapted to engage any one of a series of recesses 149 formed in the face of the housing 110 (see Fig. 1). When the operator imparts a swinging motion to the handle 147 then the slip shaft 118 is shifted to the left or to the right according to the direction in which the handle 147 is turned at the time, and when the pin 148 engages a desired recess 149 then the key 119 is in register with the keyway 120 of the corresponding gear wheel 115, 116 or 117. Thus the handle 147 is used by the operator for shifting the slip shaft 118 to the right or to the left and its position indicates which one of the gear wheels 115, 116 or 117 is locked to the slip shaft 118 at the time.

The left-hand end of the slip shaft 118 is mounted to slide in a bevel gear wheel 160 journaled in a bearing 161 arranged within the housing 110. The bevel gear wheel 160 is provided with a key 162 engaging a keyway 163 formed in the left-hand end of the slip shaft 118, and hence the bevel gear wheel 160 rotates with the slip shaft 118. The bevel gear wheel 160 is in mesh with a bevel gear wheel 164 mounted on the lower end of an upwardly inclined shaft 165 journaled in suitable bearings 166 arranged on the housing 110. On the upper end of the shaft 165 is secured a worm 167 in mesh with a worm wheel 168 secured on a variable feed shaft 170 journaled at its right-hand end in a suitable bearing 171 arranged on the housing 110. The variable feed shaft 170 extends through the several housings 93 of the spindle heads 25 and is slidably journaled in suitable bearings 172 on the said housings 93. The feed shaft 170 is provided with a keyway 173 engaged by keys 174 attached to worms 175, one for each spindle head 25, and arranged within the corresponding housing 93 thereof to move with the housing when adjusting the spindle head 25 on the rail 22. Each worm 175 is in mesh with a worm wheel 176 mounted to rotate loosely on a transversely extending shaft 177 journaled in suitable bearings 178 arranged on the housing 93. The worm wheel 176 is provided with a clutch member 179 adapted to be engaged by a clutch member 180 mounted to slide on and to turn with the shaft 177. Normally the clutch member 180 is in mesh with the clutch member 179 and hence the shaft 177 is driven from the variable feed shaft 170. On the shaft 177 is secured a pinion 185 in mesh with a rack 186 bolted or otherwise fastened to a sleeve 187 in which the upper reduced end 188 of the drill spindle 26 is mounted to rotate. In the housing 93 is journaled a thrust roller 189 (see Fig. 4) located directly opposite a pinion 185 and engaging a wearing strip 190 attached to the sleeve 187. Between the lower end of the rack sleeve 187 and the drill spindle 26 is arranged a ball bearing 191, and a similar ball bearing 192 is arranged on the upper end of the reduced spindle portion 188 and is held in place by a nut 193 screwing on the upper threaded end 194 of the reduced portion 188. An arm 195 is interposed between the bearing 192 and the upper end of the sleeve 187 and this arm is provided with an integral flange 196 provided with a friction roller 197 extending into a slot 198 formed in the arm 199 attached to a transverse shaft 200 journaled in the upper portion of the housing 93. On one outer end of the shaft 200 is secured an arm 201 on which is adjustably secured by a set screw 202 a weight 203 to counterbalance the drill spindle 26.

Hand feed.

The rotatory motion given to the shaft 177 from the shaft 170 is in one direction only to feed the spindle 26 downward, and in order to move the drill spindle 26 upward and the drilling tool 27 out of the work, use is made of the following arrangement: On the forward end of the shaft 177 is secured a bevel gear wheel 210 in mesh with a bevel gear wheel 211 secured on the upper end of a downwardly and forwardly inclined shaft 212 journaled in suitable bearings 213 and 214 forming part of the housing 93. The lower end of the shaft is provided with a hand wheel 215 under the control of the operator in charge of the machine, to permit the operator to turn the shaft 212 with a view to rotate the shaft 177 in a reverse direction to move the drill spindle 26 upwardly thus retracting the drilling tool 27 from the hole drilled in the work.

Automatic spindle stop.

In order to automatically stop the feeding of the drill spindle 26 in a downward direction after the hole in the work has been drilled to the desired depth, the following arrangement is made: The arm 195 on the upper end of the drill spindle 26 is provided with a depending trip rod 220 provided at its lower end with an adjustably extending rod 221 removably secured in place by screws 222. The lower end of the rod 221 is adapted to engage a heel 225 formed on a hand lever 226 fulcrumed at 227 on the front of the housing 93. The hand lever 226 is pivotally connected by a sectional link 228 with a shifting lever 229 fulcrumed at 230 on the housing 93, and this shifting lever 229 engages the clutch member 180 to move the latter out of engagement with the clutch member 179 whenever the rod 221 strikes the heel 225 and imparts a swinging

motion to the lever 226 in an upward direction, as will be readily understood by reference to Fig. 5. It is understood that the extension rod 221 is adjustably mounted on the rod 220 to permit of tripping the lever 226 whenever the drilling tool 27 has been fed downward into the work to the desired depth. It is further understood that when the clutch member 180 is thrown out of engagement with the clutch member 179 then the rotary motion of the shaft 177 ceases whereby further downward feeding of the drill spindle 26 ceases.

In order to throw the clutch member 180 out of engagement with the clutch member 179 at the time the clutch member 97 is thrown out of engagement with the clutch member 96, the following arrangement is made: The hand lever 105 is provided with an arm 240 (see Fig. 5) pivotally connected with an upwardly extending rod 241 mounted to slide in a bearing 242 provided with a trunnion 243 journaled in the housing 93. The upper end of the rod 241 is adapted to engage a lug 244 formed on the hand lever 226 to throw the latter upward on swinging the hand lever 105 downward whenever it is desired to throw the clutch member 97 out of mesh with the clutch member 96, as above described. It is understood that the downward swinging movement of the hand lever 105 causes an upward swinging movement of the hand lever 226 whereby the clutch member 180 is thrown out of engagement with the clutch member 179 to stop the downward feeding of the spindle 26 at the time the latter ceases to rotate.

Spindle head adjustment.

The back of the housing 93 of each spindle head 25 is provided with a dovetail groove 250 slidably engaging a dovetail tongue 251 formed on the front face of the rail 22. The rail is provided in its front face with a recess 252 (see Fig. 3) in which is held a rack 253 engaged by a pinion 254 secured on the rear end of a transverse shaft 255 journaled in suitable bearings arranged in the housing 93 of the corresponding spindle head 25. The front end 256 of this shaft is made polygonal for the application of a wrench or other suitable tool 257 (see Fig. 1) to permit the operator to turn the shaft 255 with a view to cause the pinion 254 to travel on the fixed rack 253 thus moving the housing 93 of the corresponding drill head 25 to the left or to the right according to the direction in which the shaft 255 is turned at the time. It will be noticed that by the arrangement described each spindle head 25 can be adjusted sidewise on the rail 22 independently of the other spindle heads and consequently the several spindles 26 and their tools 27 can be set the same or unequal distances apart according to the work in hand at the time.

Work support.

The work support 28 is in the form of a bed common to all the drilling tools 27, and the said support is provided with bearings 260 mounted to slide up and down on vertical guideways 261 arranged on the front faces of the standards 21. The support 28 is supported on the upper ends of a plurality of screw rods 262 screwing in nuts 263 attached to the base 20 of the frame, and on the said screw rods are secured worm wheels 264 (see Fig. 2) in mesh with worms 265 secured on a longitudinally extending shaft 266 journaled in suitable bearings arranged in the support 28. One end of the shaft 266 is provided with a suitable handle 267 under the control of the operator for turning the shaft 266 with a view to rotate the screw rods 262 simultaneously thus screwing the same up or down in the nuts 263 according to the direction in which the shaft 266 is turned at the time. It is understood that the up or down movement of the screw rods 262 causes a raising or lowering of the work support 28 to move the work in proper relation relatively to the drilling tools 27.

Oiling system.

Each spindle head 25 is provided with an oiling system arranged as follows: An oil pump 270, preferably of the rotary type, is mounted on the back of the housing 93 and is provided with a shaft 271 on which is secured a spiral gear wheel 272 in mesh with the corresponding spiral gear wheel 92 slidable on the speed shaft 76. Thus when the speed shaft 76 is rotated, a rotary motion is transmitted by the spiral gear wheel 92 to the spiral gear wheel 272 whereby the pump 270 is actuated. The pump 270 is provided with a suction pipe 273 which extends into an oil well 274 formed in the bottom of the housing 93. The discharge pipe 275 of the pump 270 extends upward within the housing 93 and its upper end terminates in a nozzle 276 adapted to discharge the oil onto the upper end of the drill spindle 26. It will be noticed that when the pump 270 is in operation, oil is sucked up from the oil well 274 and is discharged through the nozzle 276 of the discharge pipe 275 into the upper end of the housing 93 above the upper end of the drill spindle 26. The discharged oil can readily run down the drill spindle and to the various actuating parts to lubricate the same and to finally again reach the oil well 274 to be used over again by the pump for lubricating purposes. It is understood that some of the oil discharged onto the upper end of the drill spindle 26 lubricates the bearings 192, 191 and

the sleeve 187 in which runs the reduced portion 188 of the drill spindle 26. Other portions of the oil lubricate the rack 186 and its pinion 185. Other portions lubricate the spiral gear wheels 175, 176 and the clutch members 179, 180 as well as the shaft 177 and the gear wheels 210, 211. Other portions of the oil lubricate the spindle 26 in its leaf bearing 95, the clutch members 96 and 17, the spiral gear wheels 94, 92 and 272 and the thrust bearing 107 as well as the other parts contained within the housing 93. From the foregoing it will be seen that the various mechanisms in the spindle head are kept thoroughly lubricated without requiring the slightest attention on the part of the operator, and as each spindle head 25 has its own lubricating system it can be readily adjusted on the rail 22 without requiring any attention while making the adjustment.

The lubricating system for the variable speed changing mechanism 23 is of the splash type, that is, the housing 40 is charged with a lubricating oil readily splashed about by the revolving parts mounted in the housing 40. The lubricating system for the variable feed mechanism is arranged as follows: In the lower portion of housing 110 is formed a well 280 into which extends the suction pipe 281 of a pump 282, preferably of the rotary type and driven by a gear wheel 283 from the gear wheel 112 secured on the variable speed shaft 76. The discharge pipe 284 of the pump 282 extends upward in the housing 110 and its upper end discharges onto the top of the worm wheel 168. It will be noticed that by the arrangement described the oil discharged onto the worm wheel 168 can readily flow down to lubricate the worm 167 and the gearing arranged in the lower portion of the housing 110.

In order to lubricate each of the drilling tools 27 during the drilling operation thereof, the following arrangement is made: The work support 28 is provided at its middle portion intermediate the screw rods 262 with an oil well 290 connected by an opening 291 (see Fig. 11) with a marginal groove or channel 292 arranged on the top of the support to drain the lubricant flowing from the work into the groove 292 back into the oil well 290. The opening 291 is covered with a screen 293 to strain the lubricant prior to its return to the oil well 290. From the bottom of the oil well 290 leads a suction pipe 294 to a pump 295 preferably of the rotary type and driven by a belt 296 from other machinery. The pump 295 is preferably mounted on one of the standards 21 and its discharge pipe 297 connects with a distributing pipe 298 provided with flexible branch pipes 299 terminating in nozzles 300 directing the lubricant onto the drilling tools 27. Each branch pipe 299 is provided with a valve 301 to close the corresponding branch pipe 299 in case its drilling tool is not in use at the time. A pipe 302 connects the discharge pipe 297 with the upper portion of the oil well 290 to allow surplus lubricant to flow directly to the oil well 290 in case one or more drilling tools 27 are not working at the time and the corresponding valves 301 are closed. It is understood that the pump 295 has a capacity to furnish sufficient lubricant to all the branch pipes 299 at the time their valves 301 are open to properly lubricate the drilling tools 27 while drilling holes in the work. The pipes 299 are made flexible to locate the nozzles 300 close to the drilling tools 27 on adjusting the spindle heads 25 on the rail 22, as above explained.

The operation is as follows:

The article to be drilled is fastened on the top of the work support 28 in the usual manner, and then the work support is raised or lowered according to the height of the article, and the drill spindles 26 and their drilling tools 27 are then quickly lowered by the operator manipulating the hand wheels 215 until the points of the drilling tools 27 are adjacent the article or articles to be drilled. When this has been done, the levers 105 and 226 are moved into operative position to engage the clutch members 96 and 97 with each other and likewise the clutch members 179 and 180 to cause the simultaneous rotation and downward feeding of the several drill spindles 26 and their drilling tools 27. In order to obtain the desired speed the operator correspondingly adjusts the lever 84 with a view to shift the gear wheel 80 into engagement with the corresponding set of gear wheels 70 73, 71 74, or 72 75, and in order to obtain the desired feed of the drill spindles 26, the operator manipulates the hand lever 147 to shift the slip shaft 141 to the right or to the left to set the feed mechanism to the desired speed, as previously explained. The operator also adjusts the rod 221 up or down in the trip rod 220 according to the depth of the holes to be drilled in the work so that when this depth is reached, the rod 221 actuates the lever 226 with a view to throw the clutch member 180 automatically out of engagement with the clutch member 179 to stop the downward feeding of the corresponding drill spindle 26. It will be noticed that holes of different depth can be drilled simultaneously by the different drill spindles and the downward feed of the drill spindles ceases as soon as the corresponding holes have been drilled to the desired depth. When this has been done, the operator actuates the corresponding hand lever 105 by throwing the same downward thus moving the clutch member 97 out of engagement with the clutch member 96 and

thereby stopping turning of the corresponding feed spindle 26. The operator now turns the wheel 215 to raise the corresponding spindle 26 by hand thereby retracting the corresponding drilling tool 27 from the work.

From the foregoing, it will be seen that by the arrangement described, the drill spindle 26 can be rotated independently one of the other both as to turning and to feeding, and the drill spindles can be driven at any one of the six different speeds, and the drill spindles can be fed downward at any one of the six different speeds.

It will further be noticed that a single operator can keep a number of spindles, either singly or in groups, continually in operation thereby enabling the operator to reload the jigs while a group of drills is in operation.

It will further be noticed that the operator can quickly and conveniently adjust or set the spindle heads independently one of the other according to the work in hand.

The speed mechanism, the feed mechanism and the spindle heads are of unit constructions and hence each is readily accessible without disturbing the other.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a rail drill, a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each spindle head, a variable speed mechanism, a variable feed mechanism, the said spindle heads being located intermediate the said speed mechanism and the said feed mechanism, speed driving connections connecting the said speed mechanism with the several drill spindles, and feed driving connections connecting the said feed mechanism with the several spindles, the said speed mechanism having a shaft common to the said speed driving connections and the said variable feed mechanism.

2. In a rail drill, a frame provided with a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each spindle head, a variable speed mechanism mounted on one end of the said frame and having a driven shaft extending through the several spindle heads, driving connections connecting the said shaft with the several drill spindles to rotate the latter, a variable feed mechanism mounted on the other end of the said frame and having a driven shaft extending through the several spindle heads, driving connections connecting the said shaft of the feed mechanism with the several spindles to impart a feeding movement thereto, and automatic tripping devices controlled by the drill spindles and connected with the said feed driving connections to automatically disconnect the said shafts from the said spindles to stop individually the feeding and rotating of the corresponding drill spindles.

3. In a rail drill, a frame provided with a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each spindle head, a variable speed mechanism mounted on one end of the said frame and having a driven shaft extending through the several spindle heads, driving connections connecting the said shaft with the several drill spindles to rotate the latter, a variable feed mechanism mounted on the other end of the said frame and having a driven shaft extending through the several spindle heads, and driving connections connecting the said shaft of the feed mechanism with the several spindles to impart a feeding movement thereto, the said shaft of the speed mechanism forming the driving shaft for the said variable speed mechanism.

4. In a rail drill, a frame having a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each head, a variable speed mechanism mounted on one end of the said frame and having a driven speed shaft extending through the several spindle heads, a clutch controlled gearing connecting each spindle with the said shaft to rotate the spindle, a variable feed gear mounted on the other end of the said frame and driven from the said speed shaft, a feed shaft driven by the said feed gear and extending through the said spindle heads, and a clutch controlled feed mechanism connecting each spindle with the said feed shaft to feed the spindle downward.

5. In a rail drill, a frame having a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each head, a variable speed mechanism mounted on one end of the said frame and having a driven speed shaft extending through the several spindle heads, a clutch controlled gearing connecting each spindle with the said shaft to rotate the spindle, a variable feed gear mounted on the other end of the said frame and driven from the said speed shaft, a feed shaft driven by the said feed gear and extending through the said spindle heads, a clutch controlled feed mechanism connecting each spindle with the said feed shaft to feed the spindle downward, and a tripping device controlled by each of the drill spindles and connected with the clutch of the said clutch controlled feed mechanism.

6. In a rail drill, a frame having a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each head, a variable speed mechanism mounted on one end of the said frame and

having a driven speed shaft extending through the several spindle heads, a clutch controlled gearing connecting each spindle with the said shaft to rotate the spindle, a variable feed gear mounted on the other end of the said frame and driven from the said speed shaft, a feed shaft driven by the said feed gear and extending through the said spindle heads, a clutch controlled feed mechanism connecting each spindle with the said feed shaft to feed the spindle downward, a tripping device controlled by each drill spindle and connected with the clutch of the said clutch controlled feed mechanism, a manually controlled clutch actuating mechanism for the clutch of the said clutch controlled gearing, and a connection between the said clutch controlled feed mechanism and the said manually controlled clutch actuating mechanism to intermittently stop feeding of the drill spindle on stopping the rotation thereof.

7. In a rail drill, a frame having a rail, a plurality of spindle heads adjustably mounted on the said rail, a spindle mounted in each head, a driven shaft extending through the said spindle heads, a gearing connecting each spindle with the said shaft to rotate the spindle, a variable feed gearing driven from the said shaft, a feed shaft extending through the said spindle heads, a spiral gear connecting the said feed shaft with the said variable feed gearing, and a spindle feed device connecting each spindle with the said feed shaft.

8. In a rail drill, a frame having a rail, a plurality of spindle heads adjustably mounted on the said rail, a drill spindle mounted in each head, a variable speed mechanism mounted on one end of the said frame and having a driven speed shaft extending through the several spindle heads, a clutch controlled gearing connecting each spindle with the said shaft to rotate the spindle, a variable feed gear mounted on the other end of the said frame and driven from the said speed shaft, a feed shaft driven by the said feed gear and extending through the said spindle heads, a clutch controlled feed mechanism connecting each spindle with the said feed shaft to feed the spindle downward, and a manually controlled return mechanism connected with the said feed mechanism for returning the spindle to uppermost position.

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