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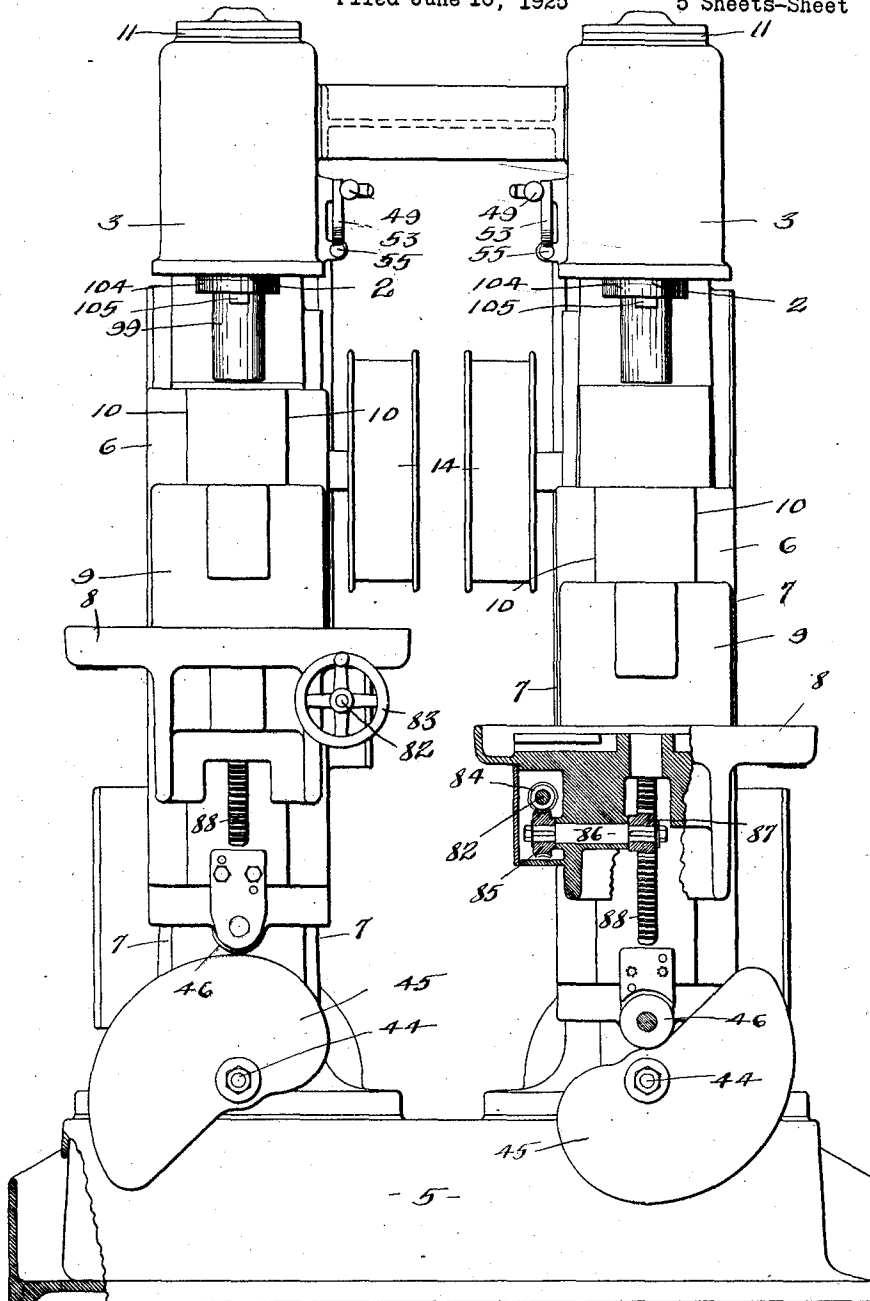
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1,679,027

DRILLING MACHINE

Filed June 16, 1925

5 Sheets-Sheet 1



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Fig. 1.

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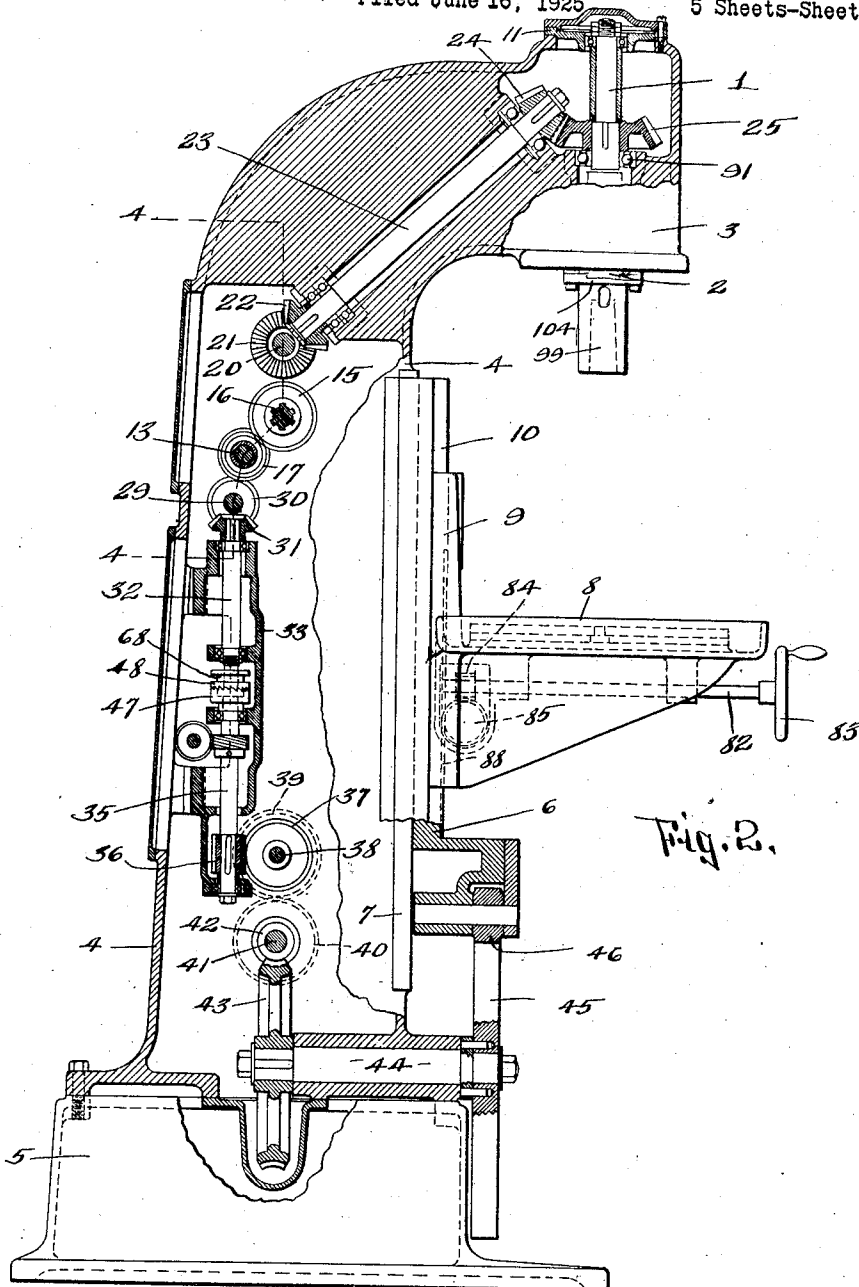


Fig. 2.

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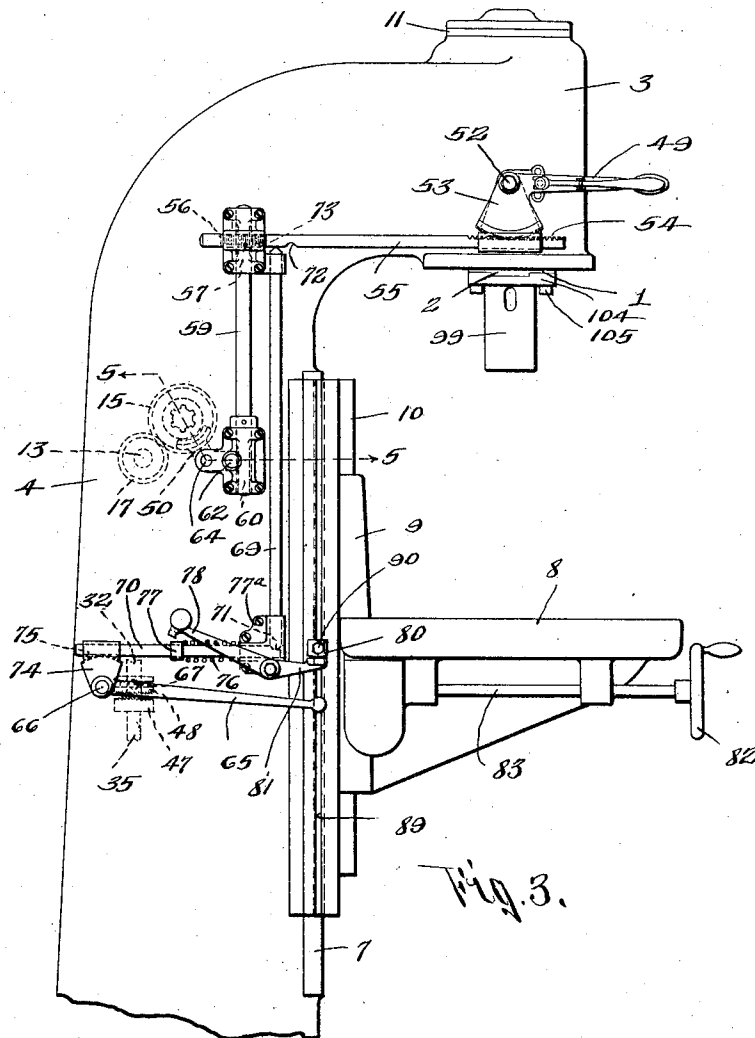
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DRILLING MACHINE

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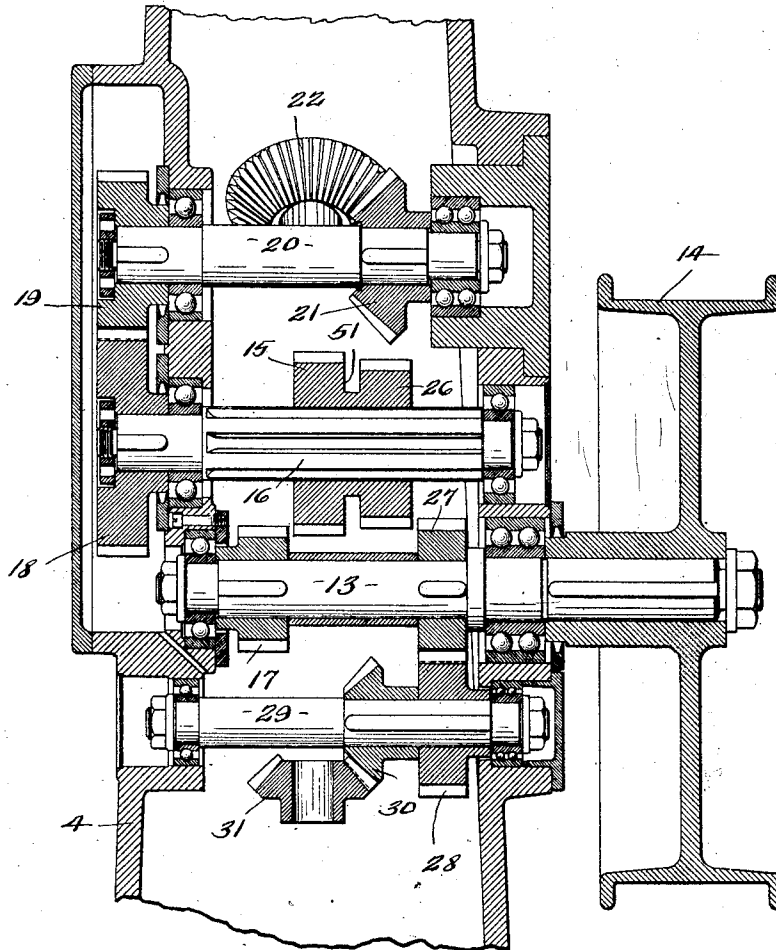


Fig. 4.

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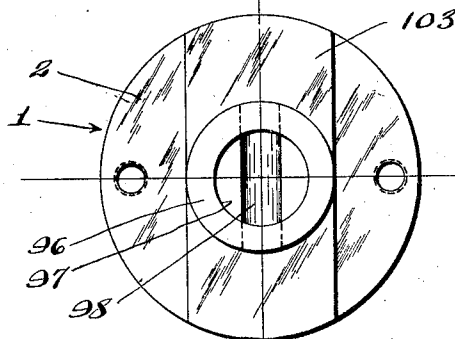
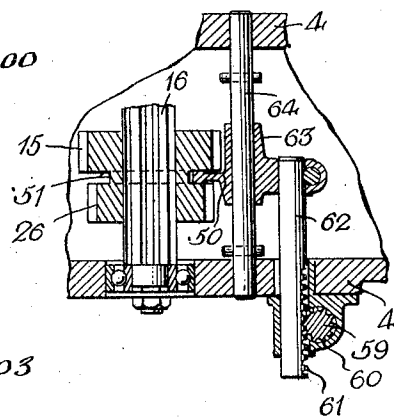
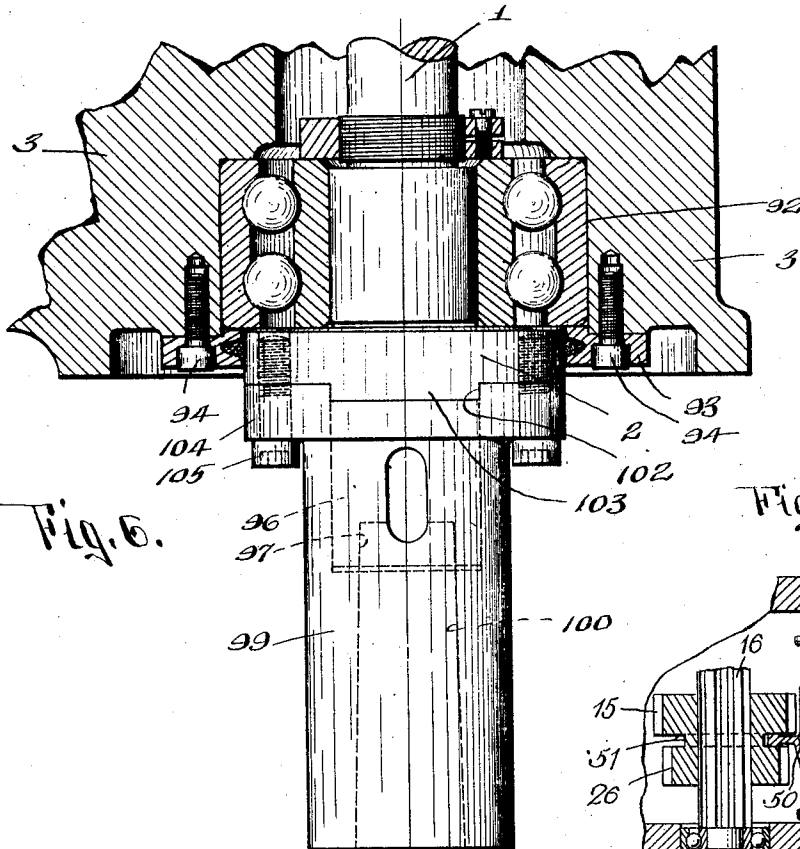
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DRILLING MACHINE

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UNITED STATES PATENT OFFICE.

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DRILLING MACHINE.

Application filed June 16, 1925. Serial No. 37,500.

This invention relates to machine tools and particularly to drilling machines, and has for its object a particularly simple and efficient mechanism for actuation and for controlling the actuation of the drill spindle and the work carriage.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a front elevation, partly in section of one of these machines.

Figure 2 is a vertical sectional view thereof.

Figure 3 is a fragmentary side elevation of the parts seen in Fig. 2.

Figure 4 is an enlarged sectional view on the plane of 4—4, Fig. 2.

Figure 5 is a sectional view on line 5—5, Fig. 3.

Figure 6 is an enlarged sectional view partly in elevation of the lower end of the spindle and contiguous parts of the supporting head.

Figure 7 is an end view of the lower end of the spindle.

This machine comprises generally a rotatable spindle, a work carriage movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a shiftable connecting member for controlling the actuating of the spindle, a second shiftable connecting member for controlling the operation of the carriage, manual operating means for the said members respectively, and an interlocking connection between the operating means for preventing the movement of the second member into its operative position, when the first member is in its inoperative position.

The invention further consists in a scroll cam for actuating the work carriage in one direction and permitting movement in the other direction by gravity.

1 designates the rotatable spindle, having a suitable head 2, for receiving a chuck, the spindle being arranged in vertical position and carried by the overhanging head 3 of the suitable frame 4. The frame 4 may be of any suitable form, size and construction, and comprises a hollow upright portion

from which the overhanging head projects, the upright portion being mounted upon a suitable base 5.

6 is the work carriage movable vertically along suitable ways 7, along the front side of the upright portion of the frame 4. This carriage also includes a table 8, having a base 9, adjustable vertically along ways 10, on the carriage 6, to different heights relatively to the carriage 6.

The spindle is suitably journaled in anti-friction bearings in the head 3 and in a cap 11, which closes the upper side of the cavity formed in the head 3.

The actuating means for the spindle and the carriage, comprises the drive shaft, motion transmitting connections between the drive shaft and the spindle, and between the drive shaft and the carriage, each connection including a shiftable member.

13 designates the drive shaft which is journaled in suitable bearings in the upright portion of the frame 4, the drive shaft having suitable means as a pulley 14 for connection to a power shaft.

The motion transmitting means between the shaft 13 and the spindle, as here illustrated comprises a shiftable member here shown as a shiftable gear 15, mounted on the shaft 16, journaled in the upright portion 4 of the frame, and meshing with the gear 17 on the shaft 13, a gear 18 on the shaft 16 and meshing with a gear 19 on the shaft 20, also journaled in the frame 4, the shaft 20 having a bevel gear 21 thereon, meshing with the bevel gear 22 on an inclined shaft 23, journaled to suitable bearings in the head 3, and shaft 23, also having a bevel gear 24 at its upper end which meshes with the bevel gear 25 on the spindle 1.

Usually there is a gear 26 paired with the gear 15 on the shaft 16, and the gear 26 is shiftable into mesh with the gear 27, on the drive shaft 13. Either one of these gears 15, 26, serves to clutch the driving shaft 13 to the shaft 16 and control the operation of the spindle. These gears 15 and 26 are of different diameter in order to change the rate of speed between the driven shaft 13 and the spindle. When the gears 15 and 26 are shifted from neutral position to the left, Fig. 4, so that, the gear 15 meshes with the gear 17, the spindle is driven at less

speed than when shifted to the right from neutral so that the gear 26 is in mesh with the gear 27.

The motion transmitting connections between the driving shaft 13 of the tool carriage comprises the gear 27, a gear 28 mounted on the shaft 29, journaled in the frame 4, a bevel gear 30 mounted on the shaft 29, and meshing with the bevel gear 31 on a vertical shaft 32, journaled in a bearing support 33 within the frame 4, a vertical shaft 35 in line with the shaft 32 and supported in said bearing support 33, and having a worm 36 meshing with the worm wheel 37, mounted on a shaft 38, journaled in the lower part of the frame 4, a gear 39 mounted on the shaft 38 and meshing with a gear 40 on a shaft 41, journaled in the frame 4, a worm 42 on the shaft 41 and meshing with the worm wheel 43 mounted upon a forwardly extending shaft 44, journaled in the lower part of the frame 4, and a scroll cam 45 mounted on the outer end of the shaft 44, and coacting with the follower as a roller 46, carried in the lower end of the carriage 6.

The shafts 32 and 35 are connected by means of a clutch including a section 47 fixed on the shaft 35 and a shiftable member section 48 movable with and shiftable axially of the shaft 32.

The means for shifting the gears 15 and 26, which controls the actuation of the spindle, as here illustrated comprises a handle 49 carried by the head, a fork 50 engaging a groove 51, in the hub of the gears 15, 26, and motion transmitting means between the handle and the fork. The handle is here shown as a lever pivoted at 52 to the outside of the head 3, and having a segment 53 for meshing with the rack 54 formed on an endwisely movable shifter rod 55 suitably guided on the side of the head, the rod also having a rack 56 meshing with a pinion 57 on the outside of the head 3, a vertical rock shaft 59 on the upper end of which the pinion is mounted, a gear 60 formed on the lower end of the shaft and meshing with a rack 61, formed on an endwise movable rod 62 extending into the frame 4 and fixed to the fork 50. The fork is here shown as having a hub 63 slidable upon a shaft 64, suitably mounted in the frame 4. Obviously upon moving the handle upwardly or downwardly the gear 15 or 26 will be shifted into mesh with the gear 17 or the gear 27. The clutch 48, as here shown is shifted by means of a lever 65, pivoted at 66 to the outside of the frame 4, and having a fork 67 which works in a groove 68 in the shiftable clutch section 48.

The interlocking connection between the shifting means for the gears 15, 26, and the clutch 48, as here shown comprises an endwisely vertically movable rod 69 engaging

at its upper end the underside of the shifter rod 55, and at its lower end with a rod 70, extending substantially parallel to the rod 55, and connected to the lever 65. The rod 70 has a notch 71 therein, normally in line with the rod 69, and also the rod 55 has a pair of notches 72 and 73 therein, normally out of line with the rod 69. The rod 70 is shifted from the handle 65 by any suitable means as here shown as a segment 74 mounted on the shaft 66 of the lever 65 and meshing with the rack 75 on the rod 70. The movement of the rod 70 to the right Fig. 3, by the handle 65 is against a spring 76 interposed between a shoulder 77 on the rod and a bracket 77^a in which one end of the rod slides.

The vertically movable lock rod 69 is normally arranged with its upper end between the notches 72, 73, and with its lower end in the notch 71 so that the rod 69 locks the clutch section 48 from being shifted. However, when the handle 49 is moved in one direction or another to shift the gear 15 into mesh with the gear 17 or the gear 26 into mesh with the shaft 27, the rod 55 moves to carry either the notch 71 or 72 into alignment with the upper end of the lock rod 69. Hence, upon movement of the handle 65 downwardly the clutch section 48 will be shifted downwardly to engage the section 47 and through the rod 70, moves the lock rod 69 upwardly into the notch 71 or 72 and thus locks the shifter rod 55 from movement while the table or carriage is being actuated. When the rod 70 is shifted to the right by the handle 65, against the action of its spring 76 a pivoted latch 78 automatically engages the shoulder 77 on the rod 70, and holds the clutch section 48 engaged with the clutch section 47.

Automatic means is provided for tripping the latch when the carriage 6 has returned to its lowermost or starting position. As here shown an adjustable stop 80 is provided on the carriage 6 for engaging the tail 81 of the latch 78 as the carriage 6 approaches its starting position. If for any reason it is necessary to stop the machine while the clutch 48 is engaged the clutch can be released by lifting up or tripping the latch 78 by hand.

The table 8 is adjustable along the carriage 6 to adjust it for different classes of work, in any suitable manner, and as here shown this adjustment is shown by means of a shaft 83 journaled in the table and having a hand wheel 82 at its outer end, and a worm 84 at its inner end meshing with the worm wheel 85 mounted on a shaft 86 journaled in the table. A gear 87 on the shaft 85 meshes with the rack 88, on the carriage 6.

The stop shoulder 80 is adjustable along a vertical way on the carriage and is here shown as sliding vertically in a groove 89

in the carriage 6 and as clamped at any point along in the groove by a clamping screw 90.

The spindle 1 is larger from its lower end toward its upper end and is constructed as to be inserted in the head 3 from the lower side thereof through the gear 25; and is provided with a thrust and journal bearing 91 in the head 3 below the gear 25 and with an antifriction bearing 92 at its lower end held in the head by a retaining ring 93 secured to the head 3 by screws 94. The spindle terminates at its lower end in the head 2 having an axial extension 96 formed with a tapering socket 97 in its end and a transverse groove 98 in the bottom of the socket. A tool holder or chuck 99 is detachably mounted on the head 2 and fits over the extension 96 and is interchangeable with other chucks. The chuck is formed with a tapering bore 100 alined with the groove 98. These slots are common in chuck construction and are to facilitate the detachment of the chuck by providing means in which a bar can be inserted for prying or knocking off the chuck. The chuck and head are provided with an interlocking groove and tongue 102, 103. The chuck is also formed with an annular flange 104 which is detachably secured to the head 95 as by screws 105.

As shown in Figure 1 these machines are usually arranged in pairs with the cams 45 arranged opposite to each other, so that while the carriage 6 of one machine is moving downwardly the other is being moved upwardly.

In operation, the work is placed on the work table 8, the lever 49 operated to engage either the gears 15 and 17 or the gears 26 and 27, such movement releasing the locking rod 69 which holds the clutch section 48, in its "out" position. The handle 65 is then depressed shifting the clutch 48 to its operative position, so that, the cam 45 starts and lifts the carriage 6 to carry the work to the drill or drills actuated by the spindle. Owing to the interlocking means between the operating mechanism for the spindle and the carriage, the carriage can not be actuated except when the drill is rotating.

What we claim is:

1. In a machine tool, the combination of a rotatable tool spindle, a work carriage movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a shiftable member for controlling the actuation of the spindle and a second shiftable member for controlling the actuation of the carriage, means for operating said members, and an interlocking connection between the operating means for said members to prevent the shifting of the second member into operative position when the first member is out of its operative position, substantially as and for the purpose described.

2. In a machine tool, the combination of a rotatable tool spindle, a work carriage movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a shiftable member for controlling the actuation of the spindle, a second shiftable member for controlling the actuation of the carriage, for operating the said member, and means operated by the operating means for the first shiftable member for controlling the shifting of the second member, substantially as and for the purpose specified.

3. In a machine tool, the combination of a rotatable tool spindle, a work carriage movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a shiftable member for controlling the actuation of the spindle and a second shiftable member for controlling the actuation of the carriage, a lock for normally locking the second member from moving into operative position and connections between the lock and the operating means for the first member, to disengage said lock when the operating means for the first member is actuated to shift the first member into operative position, substantially as and for the purpose set forth.

4. In a machine tool, the combination of a rotatable tool spindle, a work carriage movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a member for controlling the actuation of the spindle, a second member for controlling the actuation of the carriage, shifters for said members respectively, means for actuating the shifters, an endwisely movable rod extending at an angle to such shifters, and having one end engaged with the shifter for the first member and its other end arranged to be moved into and out of interlocking engagement with the shifter for the second member, the shifter for the first member having a passage for receiving the rod, and normally out of alinement with the rod permitting the unlocking movement thereof, when the shifter for the first member is shifted to move the first member into operative position and the passage into alinement with the rod, substantially as and for the purpose described.

5. In a machine tool, the combination of a rotatable tool spindle, a work carriage movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a shiftable member for controlling the operation of the spindle, a second shiftable member for controlling the operation of the carriage, means for shifting said members comprising rods arranged in parallelism to each other, the shifter rods being formed with notches, an endwisely movable locking rod extending in a direction transversely of the shifter rods, and having

one end engaged in the notch of one shifting rod while out of the notch of the other shifter rod, substantially as and for the purpose specified.

- 5 6. In a machine tool, the combination of a rotatable tool spindle, a work carriage, movable toward and from the spindle, mechanism for actuating the spindle and the carriage, comprising a drive shaft, motion transmitting connections between the drive shaft
10 and the spindle, including a shiftable member, motion transmitting connections between the drive shaft of the carriage, includ-

ing a shiftable member, operating means for said members and an interlocking connection between such operating means to control the timing and the operation of said members with respect to each other, substantially as and for the purpose specified. 15

In testimony whereof, we have hereunto signed our names, at Syracuse, in the county of Onondaga, and State of New York, this
20 10th day of June, 1925.

CARL GABRIELSON.
ALEXANDER MELDRUM.