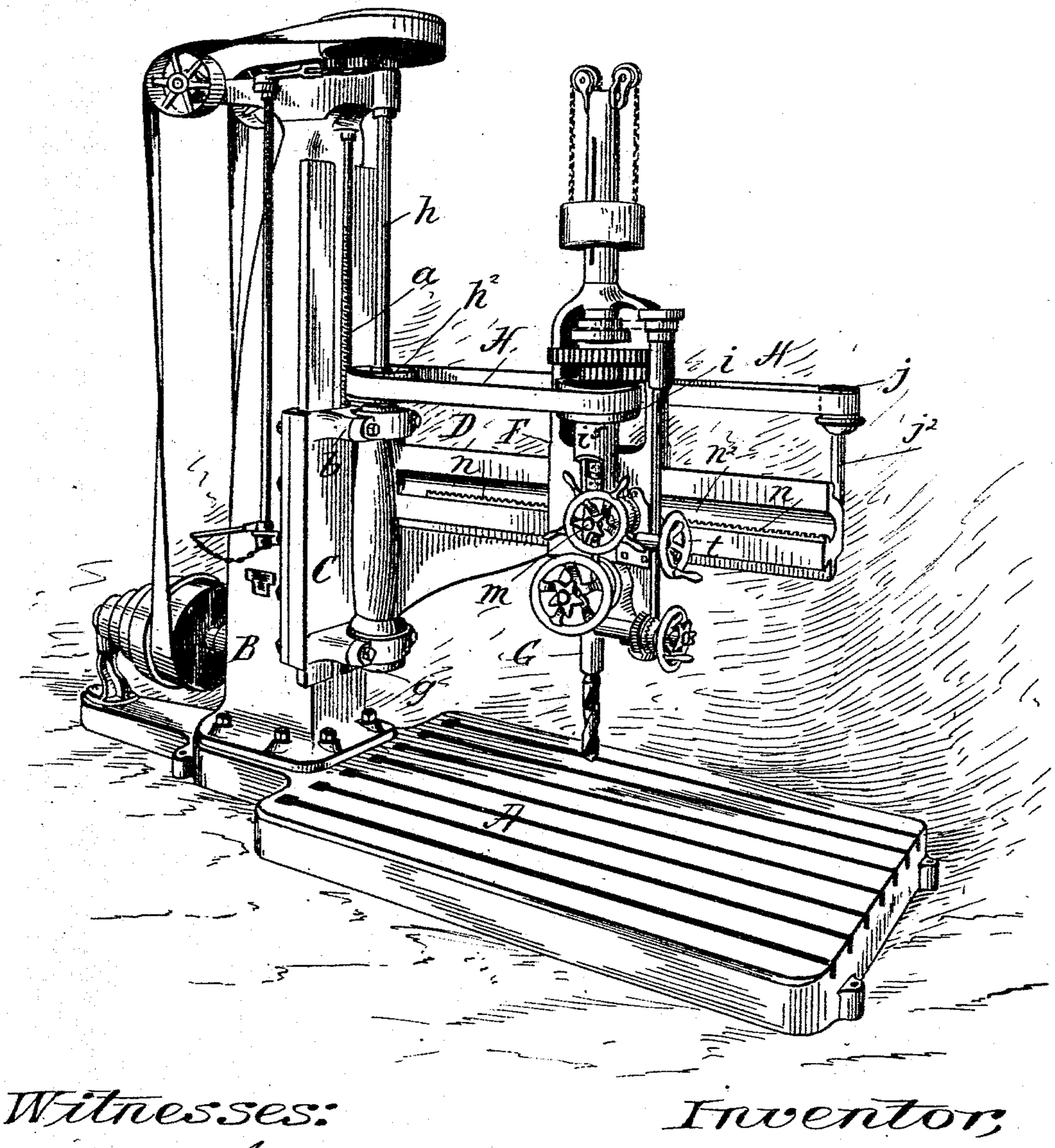
(No Model.) 2 Sheets—Sheet 1.

C. H. BAUSH.

DRILLING MACHINE.

No. 515,989. Patented Mar. 6, 1894.

Fig. 1.



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(No Model.)

2 Sheets—Sheet 2.

C. H. BAUSH.

DRILLING MACHINE.

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Fig. 2.

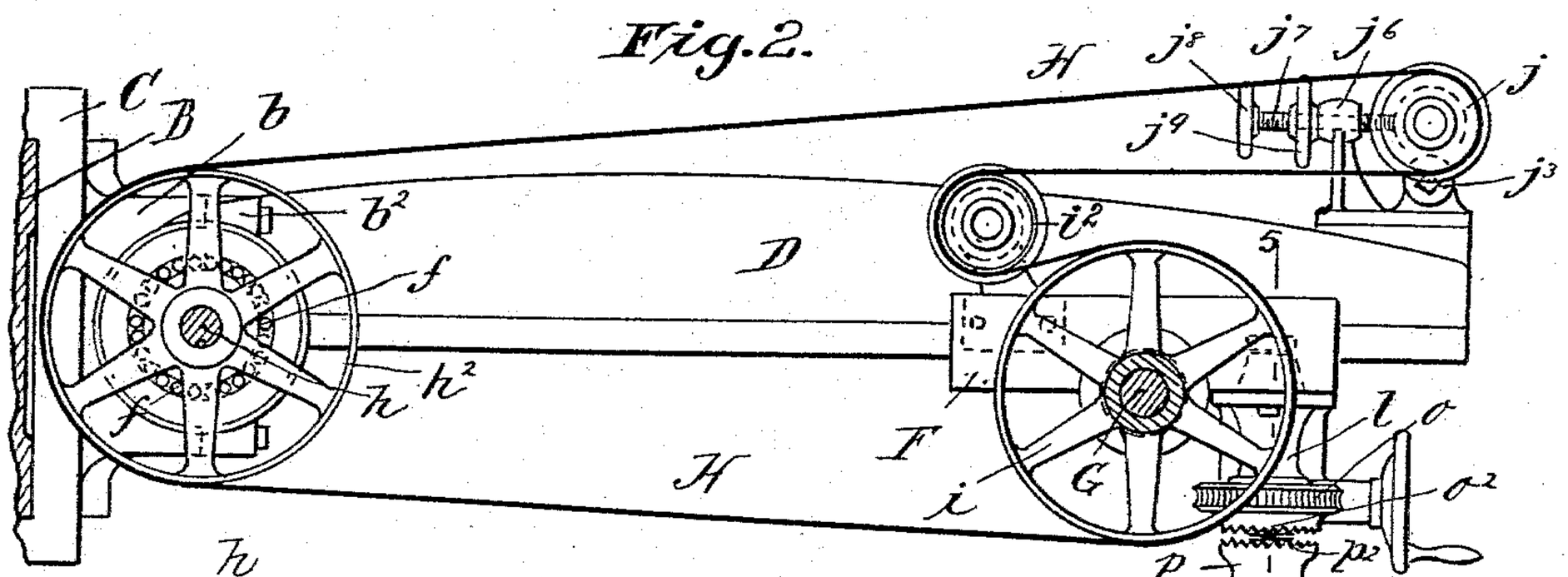


Fig. 3.

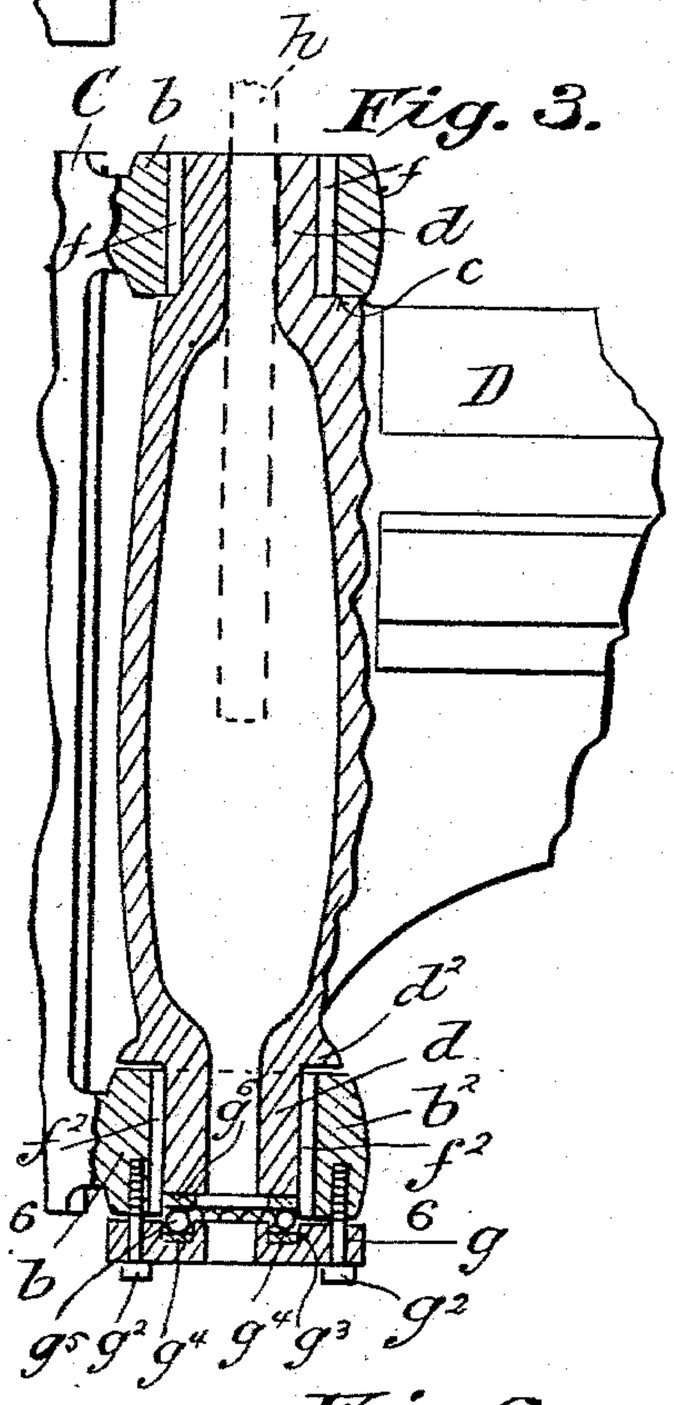


Fig. 4.

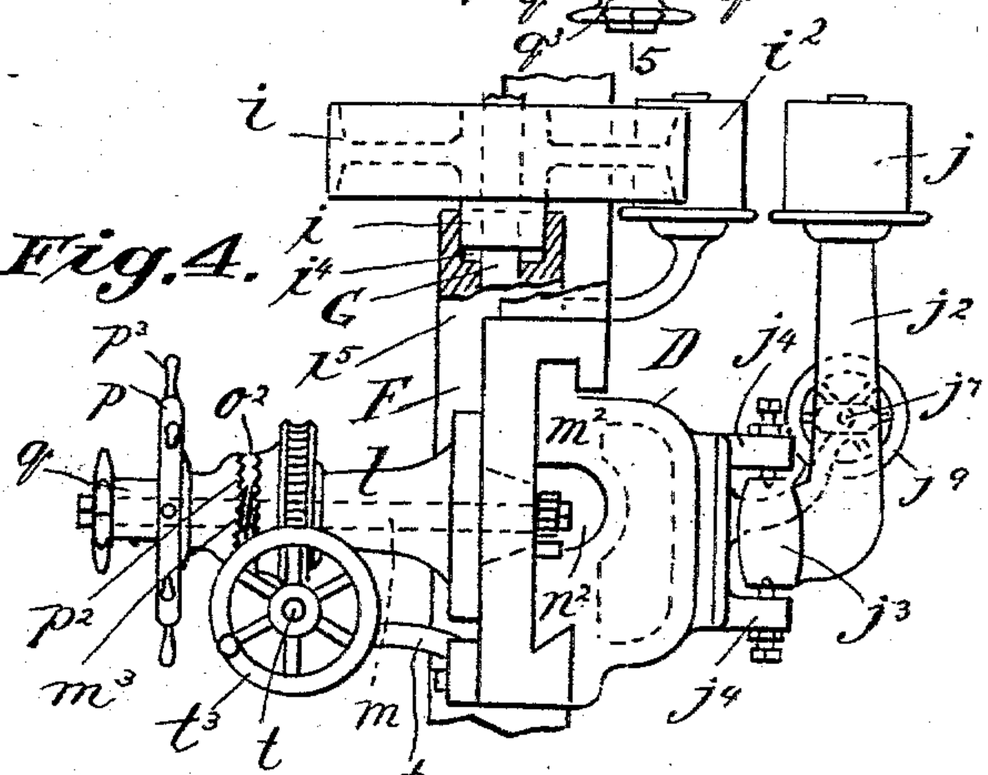


Fig. 5.

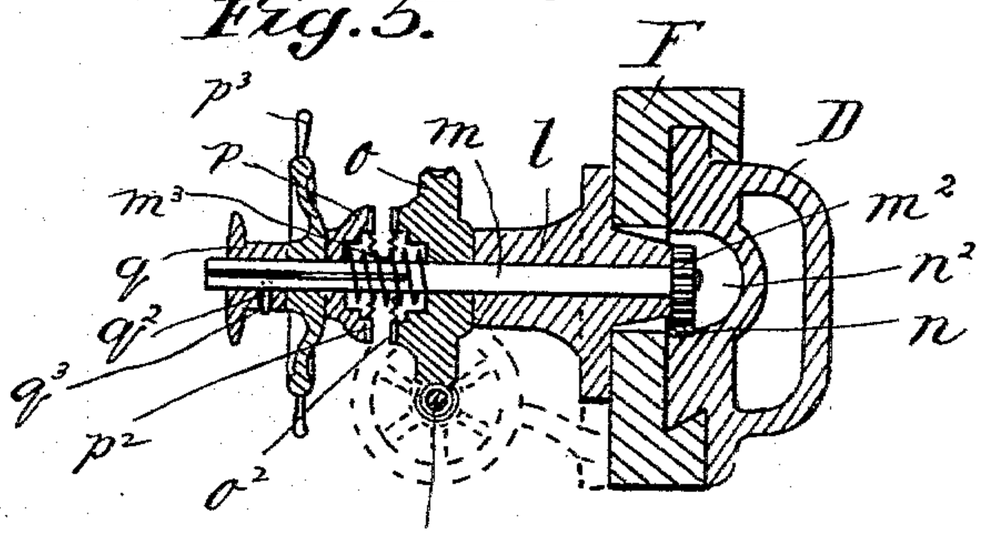
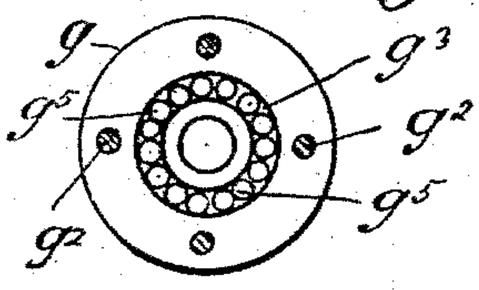


Fig. 6.



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CHRISTIAN H. BAUSH, OF HOLYOKE, MASSACHUSETTS.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 515,989, dated March 6, 1894.

Application filed May 2, 1893. Serial No. 472,820. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN H. BAUSH, a citizen of the United States, residing at Holyoke, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to improvements in drilling machines more particularly to the description known as the post-radial drill in which there is an arm having a horizontal swinging movement upon a vertically adjustable support, there being a carriage mounted for an adjustment or feed movement longitudinally of the arm; the drill spindle and part of the driving connections therefor are mounted on the carriage.

The present improvements pertain to the means of pivotally mounting the arm upon the aforesaid vertically adjustable support; to the feeding devices for moving the carriage in and out upon the arm; and to the supporting engagement of the spindle-driving pulley upon and with the carriage.

The advantages of the improved constructions will be hereinafter made manifest.

The invention consists in constructions and combinations of parts, all substantially as will hereinafter fully appear and be set forth in the claims.

Reference is to be had to the accompanying drawings in which similar characters of reference indicate corresponding parts in all of the views.

In the drawings Figure 1 is a perspective view of the drilling machine embodying the present improvements. Fig. 2 is a plan view of the vertically movable support and the horizontally swinging arm, the carriage for the drill spindle with the carriage-feed devices, the driving-belt and pulleys, and the belt-tightening device. Fig. 3 is substantially a vertical sectional view through the inner end of the arm and the portions of the arm-support with which the arm has engagements, this view also showing the ball and roller devices. Fig. 4 is an end elevation of the part seen in Fig. 2, a portion being broken away in vertical section for clearer illustration. Fig. 5 is a vertical cross section taken on the plane indicated by the line 5—5, Fig. 2, this view particularly showing the novel feed mechanism for the carriage. Fig. 6 is a plan view of the parts as seen below the plane indicated by the line 6—6, Fig. 3.

In the drawings, A represents the bed or base of the machine, B the standard or post, C the support which is vertically movable on the post, as controlled by the screw-shaft, *a*, as usual in drilling machines, D being the arm which is pivotally mounted for its horizontal swinging movement on said arm-support, C, while F is the carriage mounted for its feed movement longitudinally of the arm, the drill spindle, G, being rotatably and vertically mounted in and through the carriage in a suitable manner. The said arm-support, C, has the upper and lower horizontally extended brackets or arms, *b*, *b*, with semi-circular openings therein which, together with the caps or straps, b^2, have the circular openings for the reception concentrically therewithin of the cylindrical hubs or bosses, *d*, which are upwardly and downwardly extended from the top and bottom of the inner extremity of the arm, D.

The construction of the brackets by the inclusion of the detachable and bolt-connected caps is for practicability of the assemblage of the parts.

It will be noticed that there is a ledge or shoulder, *c*, at the base of the upper boss, *d*, upon which rest the lower ends of the series of rollers, *f*, which fit within and fill the annular space between the periphery of the said boss and the circular wall of the bracket-socket. A like series of rollers, f^2, fills the annular space between the lower boss, *d*, and the bracket-socket. The end of the lower boss does not extend downwardly to the lower face of the bracket, *b*, b^2. An annular plate or ring, *g*, of iron is supported next below, but usually not in actual contact with the under face of the lower bracket, its maintenance being derived by the heads of the durable bolts, g^2, the shanks of which pass upwardly through the ring-plate and with a screw-engagement into the bracket. The upper face of the ring has an annular groove, g^3, which is under the end of the lower boss, *d*, and in which is sunk a hardened steel ring, g^4, while the series of balls, g^5, rest upon this ring with their tops protruding above the surface of the ring-plate, *g*, and support the weight of the arm,

D, usually and preferably through the medium of the hardened steel ring, g^6, which is interposed between the tops of the balls and the bottom of the lower boss. Wear, which takes place in the ball-bearing support for the arm, may be automatically taken up by the setting of the bosses, d, d, of the arm within the bracket-socket, it being perceived that the shoulder, d^2, above the lower boss, and which covers the socket in the lower bracket, is not in contact with said bracket.

In a fourteen-ton drill constructed with the arm mounted with the ball support and roller bearings substantially as described, it is possible for a person with one hand to swing the arm and its equipments with very little exertion.

There is a vertical shaft, h, axially coincident with the bosses, d, d, suitably belt-driven, and having the pulley, h^2. The pulley, i, is mounted on the carriage,—there is a pulley, j, at the end of the arm and an idler, i^2, on the carriage back of the pulley, i. The belt, H, is around pulley, h^2, a bight going around drill-spindle-pulley, i, another bight going around the said pulley, i^2 on the carriage, and still another bight passes around the pulley, j, having its course thence to the aforesaid pulley, h^2. The hub i' of the aforesaid pulley, i,—which is keyed or otherwise secured to the drill-spindle,—as seen in Fig. 4, is set within a socket, i^4, in a hub-like part, i^5, of the carriage, F.

The aforementioned pulley, j, is mounted at the upper end of a post, j^2, which is an upward extension of a horizontally swinging arm, j^3, which has journal-supports in the horizontal bracket-arms, j^4, j^4, which are secured to the extremity of the arm, D. There is another bracket-arm, j^6, supported by the arm, D, adjacent the said swinging arm, j^3, through which is passed, with a screw engagement, the screw-shaft, j^7, having the hand-wheel, j^8, whereby it may be turned to derive endwise movements in the one or other direction, working against the swinging arm carrying the pulley, j, and serving to insure any desired degree of tension upon the belt. If the work in hand is heavy, using a large drill, the pulley, j, is forced to the right, as viewed in Fig. 2, and the belt-tension is correspondingly increased; if on the other hand the work requires a smaller drill, or is comparatively light, the screw is reversely turned and the pulley, j, assumes such a position as permits the belt to run comparatively slack. The part indicated by j^9, is substantially a nut having a screw-engagement upon the screw-shaft and having its face or hub-end in bearing against the contiguous face of the bracket arm, j^6; this serves as a lock-nut. Of course, the greater the tension upon the belt the greater the strain upon the pulleys, especially the drill-spindle-pulley, i, but in the construction described and shown the lateral strain upon the pulley is not transmitted to the drill spindle so as to throw it "out of true," but is resisted by the socketed part of the carriage into which the extended hub of the pulley is set.

The mechanism comprised in this invention for feeding the carriage endwise along the arm, D, is changeable so that the carriage may have a quick movement for long traverses of the drill-spindle or a slow movement for short and accurate adjustments of the drill-spindle, as will now appear. The carriage has the journal-bearing, such, for instance, as indicated at l, for the shaft, m, which is loosely rotatable therein, both extremities of the said shaft projecting inwardly and outwardly beyond said bearing support, l; the shaft, upon its inner end, has the pinion, m^2, fixed thereon which is in mesh with the teeth of the rack, n, longitudinally mounted upon the arm,— this rack, as shown, being within a channel-like recess, n^2, of the arm. The worm-wheel, o, is loose upon the shaft and has upon its hub the clutch-serrations, o^2; the sleeve p, is spline-engaged with the shaft, m, and has the clutch-serrations p^2 to engage the serrations of the worm-wheel; of course the sleeve may slide endwise to move into or out of clutch-engagement with the worm-wheel, but the sleeve, unlike the worm-wheel, cannot turn independently of the shaft. The spring, m^3, exerts the tendency to force the sleeve, p, axially out of clutch with the worm-wheel. The hand-wheel, p^3, is as one with the sleeve moving endwise therewith on the shaft but only rotating as the shaft rotates. Outside of the clutch-sleeve, p, and the hand-wheel, and surrounding a part of the shaft at which there is no spline-feather is a sleeve, q, with suitable spokes for turning it; this sleeve, q has the cam-groove, q^2, (see Fig. 2) and the shaft has the pin or stud, q^3, which enters the said cam-slot, all so that by turning the said sleeve, q, the clutching sleeve, p, may be forced into engagement with the worm-wheel.

t represents a worm-shaft which is mounted under the worm-wheel in the bracket, t^2, of the carriage; this worm-shaft has the hand-wheel, t^3, for its rotation.

Now, when the clutch-sleeve, p, is out of clutch the rotation of the worm-shaft will turn the worm-wheel, but without effect, to rotate the shaft to feed the carriage, but when the clutch-sleeve is out of clutch the direct and quick feed movement may be imparted to the carriage by turning the shaft, m, through means of the hand-wheel, p^3, the worm-wheel remaining stationary; and again, when the clutch-sleeve is in clutch the carriage is locked on the arm, because the shaft having its bearings in the carriage has the pinion engagement with the rack of the arm, and because the shaft can not be turned with the worm-wheel against the worm. However, the purposed rotary movement of the worm will, of course, insure the movement, very slowly, of the carriage along the arm, as desirable for bringing the drill-spindle to close adjustment for its work. And it will be apparent that

while the drill is working and no change being permitted to the adjustment as effected by the worm, by rotating the worm-shaft, the carriage will be positively held, so that the tapered point of the drill, for instance, when working into a hole could not serve to force the carriage laterally of the length of the drill.

A machinist may most quickly and easily change the feed from the quick to slow while using the drill by merely employing one hand to turn the cam-slotted sleeve, *q*, and the other to turn the worm-shaft.

By employing a rotary mill upon the end of the drill-spindle and using the slow-feed such work as grooving or slotting may be readily performed.

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

1. In a drilling machine in combination, the upper and lower vertically apertured horizontal brackets of the main support, and the arm having upper and lower cylindrical hubs or bosses, *d*, *d*, extended within said apertured brackets, and with the widened ledge, *c*, at the base of the upper boss, and the two series of rolls between the peripheries of the bosses and the walls of said apertures, the upper series having their lower ends supported by said ledge, the plate detachably secured to the under side of the lower arm and supporting a series of balls on which the lower boss of the arm rests, and the said lower series of rollers having their lower ends at rest also upon the said plate, substantially as described.

2. In a drilling machine the combination with the arm-support having the circularly apertured bracket-arm, of the arm, D, having the downwardly extended circular boss, the plate, *g*, with the circular groove and hardened ring therein and also the series of balls, and the hardened ring, g^6, interposed between the balls and the lower end of the boss, all substantially as described.

3. In a drilling machine, the arm having a rack longitudinally thereon, a carriage for the drill-spindle movable along the arm, a shaft rotatable on the carriage and having a pinion engaging the rack, a worm-wheel loose upon the shaft, a sleeve spline-engaged and movable longitudinally along the shaft, and constructed to have a clutch-engagement with the worm-wheel, means for moving said sleeve longitudinally, and a shaft rotatably mounted on the carriage and having a worm which engages the worm-wheel, and means for rotating the shaft when the worm-wheel and sleeve are out of clutch, substantially as and for the purposes set forth.

4. In a drilling machine, the combination with the arm having the longitudinally arranged rack, the slide-carriage having the drill-spindle mounted thereon and having the rotary shaft, *m*, with the pinion m^2, engaging the rack, the worm-wheel having the serrated hub, the clutch-sleeve, *p*, and hand-wheel spline-engaged with the shaft and the spring, m^3, the sleeve *q*, adapted for a rotational movement on the shaft and having the cam-slot, q^2, the pin or stud, q^3, of the shaft extended within the cam-slot, and the shaft, *t*, rotatably supported by the carriage and having the worm which engages the worm-wheel and having the hand-wheel, all substantially as described.

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