J. H. HAMILTON.

MACHINE TOOL.

APPLICATION FILED NOV. 22, 1909.

1,023,203.

Patented Apr. 16, 1912.

3 SHEETS—SHEET 1.

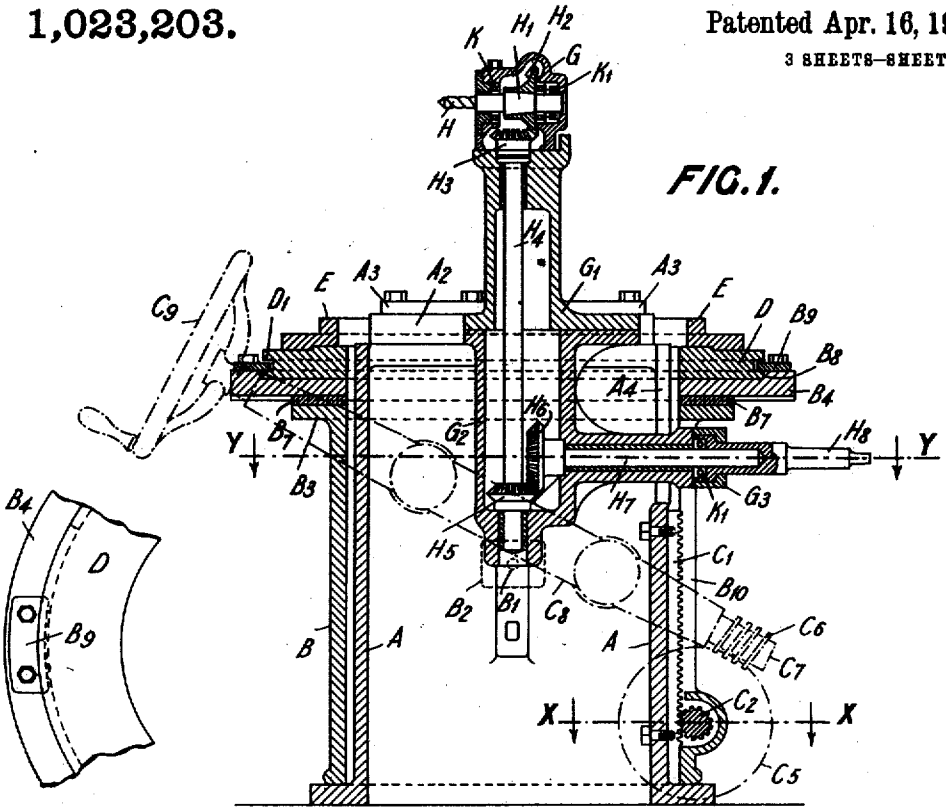

FIG. 1.

FIG. 4.

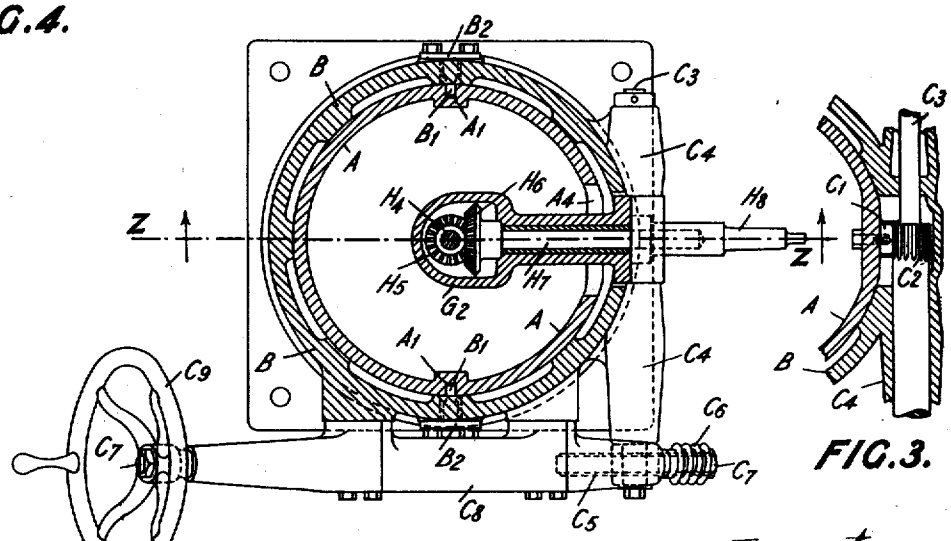

FIG. 2.

FIG. 3.

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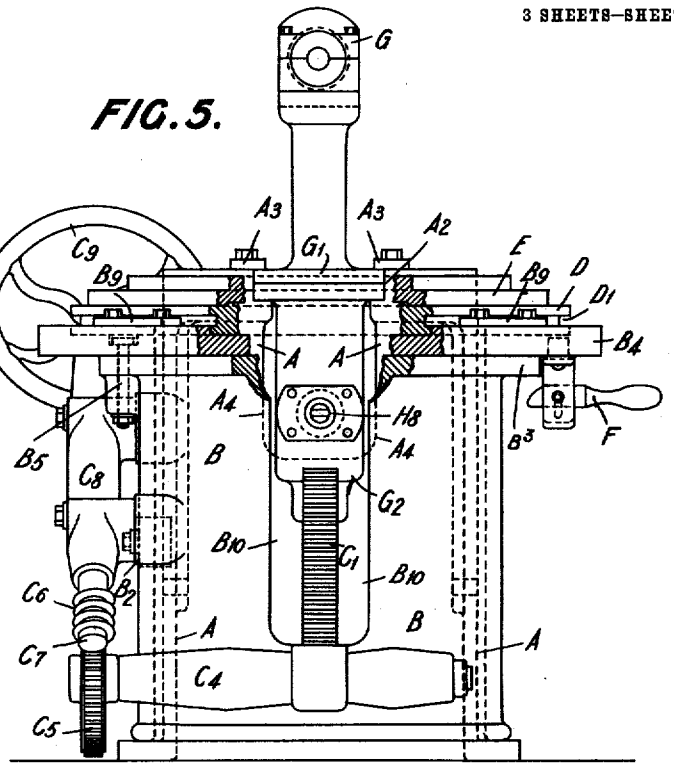
3 SHEETS—SHEET 2.

FIG. 5.



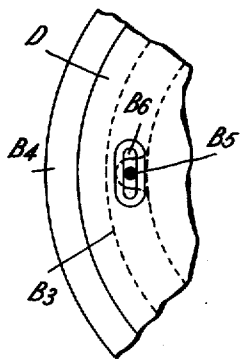


FIG. 7.

FIG. 8.

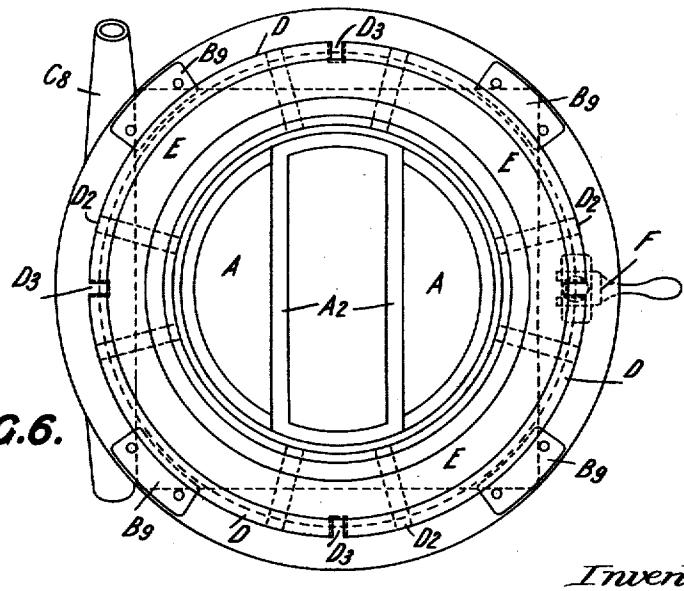


FIG. 6.

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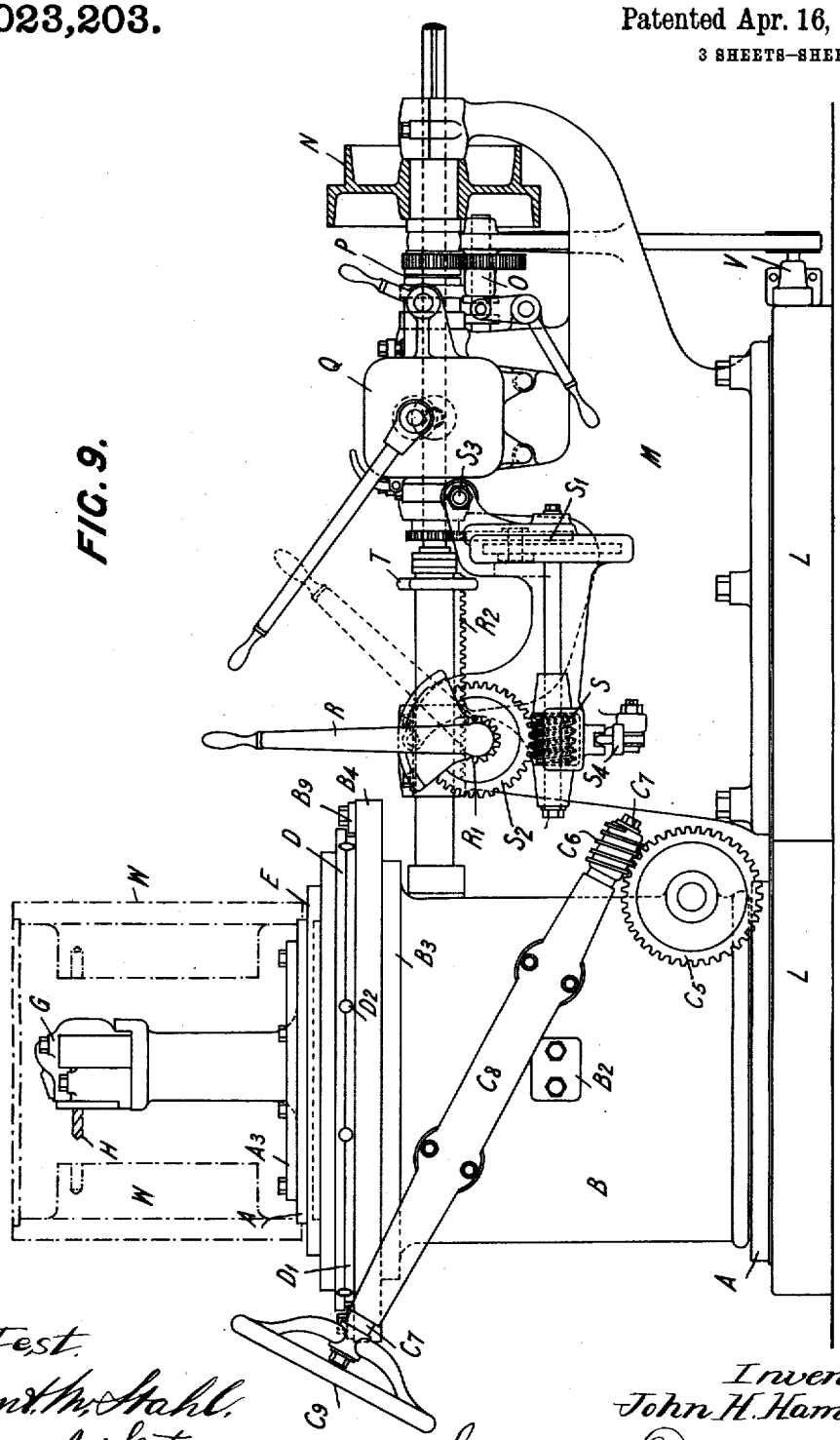
3 SHEETS—SHEET 3.

FIG. 9.



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UNITED STATES PATENT OFFICE.

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MACHINE-TOOL.

1,023,203. Specification of Letters Patent. Patented Apr. 16, 1912.

Application filed November 22, 1909. Serial No. 529,467.

To all whom it may concern:

Be it known that I, JOHN HENDERSON HAMILTON, a subject of the King of Great Britain, and residing in Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Machine-Tools, of which the following is a specification.

This invention relates to machine tools, and in particular to tools for drilling and tapping holes from the inside of frames or shells; such holes, for example as those in the faces of the magnets extending inwardly from the usual type of electro-motor case, cannot be drilled with an ordinary drilling machine, and the present practice is to employ for this purpose ratchet braces or portable drills, the use of which involves considerable expenditure of time and makes it difficult to insure standardization.

The invention is illustrated in the accompanying drawings in which,

Figure 1 is an elevation of the machine in section on the line Z Z of Fig. 2; Fig. 2 is a plan partly in section on the line Y Y of Fig. 1. Fig. 3 is a fragmentary view partly in section on the line X X of Fig. 1 and Fig. 4 is a fragmentary plan, Fig. 5 is an elevation viewed in a direction at right angles to the plane Z Z, with a portion of the front parts removed to show the drill head; Fig. 6 is a plan with the drill head removed; Fig. 7 is a fragmentary elevation of the table; and Fig. 8 a fragmentary plan. Fig. 9 is an elevation showing the machine coupled to suitable driving and feeding means.

The machine comprises a fixed frame A on which is mounted a rising and falling shell B which carries a turntable D on which is mounted a stepped face plate E. Projecting through the face plate is a drill head G carrying a drill H which is mounted on slides on the frame A so that it can be fed across on a diametral line. The work to be internally drilled or tapped is centered on the face plate; it can be adjusted vertically and angularly as hereinafter described so that holes can be drilled or tapped in desired positions absolutely to gage and without any setting out. In addition to this the machine can be used for milling slots and the like on the inside faces of such cases, such slots for example as are used for interpoles.

A is the main fixed frame, preferably of cylindrical configuration, which is adapted to be attached to a horizontal drilling machine or the like tool, the driving and feed motions of which latter are used to operate the machine as hereinafter described. On the fixed frame there is an outer movable shell B, which is adapted to slide axially on the fixed frame, but which is prevented, by the keys B^1, from turning thereon; the keys B^1 are held in position in slots in the shell B by cover plates B^2 and they engage in longitudinal keyways A^1 in the frame A.

A suitable mechanism is provided for raising and lowering the shell B; in the arrangement illustrated a rack C^1 is fitted to the fixed frame A, and a pinion C^2 gearing with the rack is carried by a shaft C^3 supported in a bearing bracket C^4 attached to the shell B, at one end the shaft has keyed to it a worm wheel C^5 which is operated by a worm C^6 on a worm shaft C^7 carried in a bracket C^8 fixed to the shell B and operated by a hand wheel C^9.

The shell B has a flange B^3 at its upper end to which the top plate B^4 is bolted by bolts B^5 which may enter slot holes B^6 in the top plate B^4 (as shown in the fragmentary view Fig. 8) so as to allow the top plate B^4 to be moved eccentrically relatively to the shell B. and fixed keys B^7, guide B^4 relatively to B.

The top plate B^4 carries a turn-table D which is located concentrically relatively to B^4 by the shoulder B^8 (Fig. 1); the edge of the table has a groove D^1 into which fit four keep plates B^9 (Fig. 4) secured to the top plate B^4. Attached concentrically to the turn table is a stepped face-plate E which serves to center the motor casing or other work which has to be drilled in the machine; there would be a series of such face plates of different sizes, but all are made interchangeable. Holes D^2 (Figs. 7 and 9) are provided in D for the insertion of a lever to move the table angularly and a locating lever F (Fig. 6) attached to the

top plate B^4 actuates a locating pin adapted to enter any one of a series of locating notches D^3, and so locate the table in any desired angular position determined by the positions of the notches D^3.

The part of the machine now described enables the workman, when the part to be operated upon is centered by the face plate and fixed in position thereon, to raise and lower the face-plate to any vertical height within the limits of the machine, and locate it in predetermined angular position about a fixed vertical axis.

The drill head G is carried up inside the face plate E, from a carriage G^1, the horizontal axis of the drill H being fixed, but the drill-head being so carried as to permit the feed movement of the drill along the said axis. The fixed frame A has slides A^2 formed across the top thereof and in these slides the saddle or carriage G^1 which is kept in position by the keep plates A^3 secured to the slides A^2; below the carriage G^1 is an extension bracket bearing G^2 which carries the lower end of the vertical spindle H^4 (Fig. 1) and the horizontal spindle H^7. The horizontal extension of G^2 and the bearing block G^3 attached thereto pass out through a suitable opening A^4 in the frame A (see Fig. 5) and the shell B has a suitable opening B^{10} which permits B to rise clear of G^2 and G^3.

The drill socket H^1 is carried in the drill head G by suitable bearings to take the thrust; these may be ball bearings K, and ball thrust bearings K^x, as shown. The bevel wheel H^2 (Fig. 1) on the drill spindle H^1 gears with the bevel wheel H^3 on the vertical spindle H^4, and the bevel wheel H^5 on H^4 gears with the wheel H^6 on the horizontal spindle H^7; the latter spindle has a collar and ball thrust bearing K^1 carried in the bearing block G^3 attached to G^2, and the projecting part of the spindle H^8 has a standard taper shape to take a standard drill socket.

G^3, G^2, G^1, and G are all secured together and they and the drill and its driving spindles move across the slides A^1, being fed by the horizontal drill or other suitable tool used to operate the machine.

Fig. 9 shows the internal drilling machine described coupled to a suitable type of driving and feeding mechanism adapted to render such machine suitable for drilling or tapping, in which latter case a suitable tap takes the place of the drill H. In this arrangement the fixed frame or casing A is bolted to a base-plate L to which the main frame M of the driving and feeding mechanism is also bolted. This mechanism comprises the usual drill socket (which is coupled to the spindle H^7 by means of the taper end H^8) which is rotated by power supplied to the cone pulleys N; the usual sliding side shaft O for speed reduction gear, clutch P for direct gear, and friction gearing Q for low speed tapping and quick reversing are provided. The usual feed mechanisms are also fitted, viz; a quick return hand feed R operating through a pinion R^1 and rack R^2; and a fine automatic feed through the feed worm S driven by gearing S^1 and actuating the worm wheel S^2, which drives the pinion R^1; the automatic feed gear S, S^1 is pivoted at S^3 and the worm S can be lowered clear of the worm wheel S^2 by the lever S^4. An automatic feed knock-off T, and a tool-lubricant pump V are also fitted.

The mode of operation of the tool is as follows:—Assuming that, say, a motor casing having four poles, is located on the face plate circumferentially so that the drill is in correct position for drilling, say, one of the holes in one of the poles, suitable distance pieces being employed to insure that the outer shell is at that height which brings the casing into such axial position that the hole will be correctly drilled. By now driving the horizontal shaft and feeding it and the carriage together with the drill head across the machine, this hole is drilled radially and in the correct position. The drill may be put into correct position for drilling the corresponding holes in the other three poles by rotating the table, and with it the stepped face plate and motor casing through successive right angles, by means of the locating lever F and notches D^3, and any other series of similar holes in other transverse planes can be similarly drilled by raising the outer shell, face plate and motor casing, to the correct axial positions in relation to the drill, such position being determined by suitable distance blocks inserted between the flanges of the outer shell and the fixed frame. Instead of a drill, a milling tool may in the same way be used; or, if the holes have to be tapped the drill may be replaced by a tap, in which case a corresponding slow motion and feed must be provided, together with a quick withdrawing motion.

It will be seen that no setting out whatever is required, and that no jigs or the like are required to drill to standard dimensions.

The details of the machine may be modified to meet various requirements, while still retaining the main features of my invention.

The invention has been described as specially applied to a machine for drilling, tapping and milling motor cases, for which purpose it is primarily intended, but it is to be understood that, with slight modifications, which can be readily made by those skilled in such matters, the invention can be applied to deal generally with this class of interior drilling, tapping, milling and the like.

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

1. In a machine tool, in combination;—a fixed frame having cross guides; a tool head carrying a rotary tool socket, a supporting pillar therefor, a carriage carrying the pillar and adapted to slide across said guides; means for rotating the said socket and for traversing its carriage; a shell adapted to slide relatively to the fixed frame in a direction normal to the guides; means for so sliding it; a turntable rotatably carried by the said shell and through which the drill head protrudes; and means for locating and holding the part to be machined concentrically on the turntable; substantially as described.

2. In a machine tool, in combination;—a fixed cylindrical frame having cross guides; a tool head carrying a rotary tool socket, a supporting pillar therefor, a carriage carrying the pillar and adapted to slide across the said guides; means for rotating the said socket and for traversing its carriage; a shell fitting the fixed frame and adapted to slide axially thereon; means for so sliding it; a turntable rotatably carried by the said shell and through which the pillar protrudes; a stepped face plate for receiving the part to be machined attached to the turntable; and means for locating the turntable in any predetermined angular position relatively to the axis of the tool socket; substantially as described.

3. In a machine tool, in combination;—a fixed cylindrical frame having cross guides; a tool head carrying a rotary tool socket, a supporting pillar therefor, a carriage carrying the pillar and adapted to slide across the said guides; means for rotating the said socket and for traversing its carriage; a shell fitting the fixed frame and adapted to slide axially thereon; a rack on the fixed frame, and a pinion and worm gear for rotating it, on the shell; a turntable rotatably carried by the said shell, a stepped face plate attached to the turntable and means for locating the turntable in any desired angular position relatively to the axis of the tool socket; said pillar protruding through the turntable and face plate; substantially as described.

4. In a machine tool in combination with the fixed frame having horizontal cross guides, the shell surrounding the fixed frame and adapted to slide axially on the same, means for so sliding it, and the turntable on the shell;—a carriage adapted to slide on the cross guides, a pillar supported on the carriage, a tool head on the pillar, a tool socket rotatably carried by the head, a drive shaft journaled in the carriage gearing connecting the shaft to the socket; and means for rotating said shaft and feeding the carriage along the cross guides said pillar protruding through the turntable; substantially as described.

5. In a machine tool, in combination;—a fixed cylindrical frame having cross guides at the top thereof; a cylindrical shell surrounding said frame and capable of axial movement only relatively thereto; means for giving the said axial movement; a top plate attached to the shell; a turntable concentrically and rotatably mounted on the top plate and having a peripheral groove therein, keep plates engaging in said groove for holding the turntable in position; and means for rotating the turntable to any predetermined angular position on the top plate, a carriage slidingly mounted on the cross guides, a pillar on said carriage and protruding through the turntable, and a cutter head on said pillar; substantially as described.

6. In a machine tool, in combination;—a fixed cylindrical frame having cross guides; a tool head carrying a rotary tool socket, a carriage adapted to slide across said guides and carrying said head, a cylindrical shell fitting the exterior of the fixed cylindrical frame, and having keys which fit key-ways in the said frame, which prevent its rotation relatively to the frame, and having an annular top adapted to move eccentrically relatively to the fixed shell; means for moving the cylindrical shell axially relatively to the fixed frame, comprising a rack attached to the fixed frame, a pinion journaled on the cylindrical shell, a worm wheel connected with the pinion, a shaft journaled on the cylindrical shell, a worm on said shaft engaging with the worm wheel, a hand wheel on said shaft, the cylindrical shell being slotted to permit engagement between the pinion and rack; an annular turn table pivotally secured concentrically with the annular top and having a series of grooves therein and a peripheral groove, keep plates engaging in the peripheral groove to hold the turntable in position; and means for locating the turntable in predetermined angular positions, comprising a locating lever pivoted to the top plate and engaging with the series of grooves in the turn table; substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN HENDERSON HAMILTON.

Witnesses:
GEORGE WEAVER,
ERNALD SIMPSON MOSELEY.