(No Model.) 2 Sheets—Sheet 1.

G. CROWELL & F. W. GESSWEIN.

MACHINE FOR BORING BRUSHES.

No. 342,285. Patented May 18, 1886.

Fig. 1.

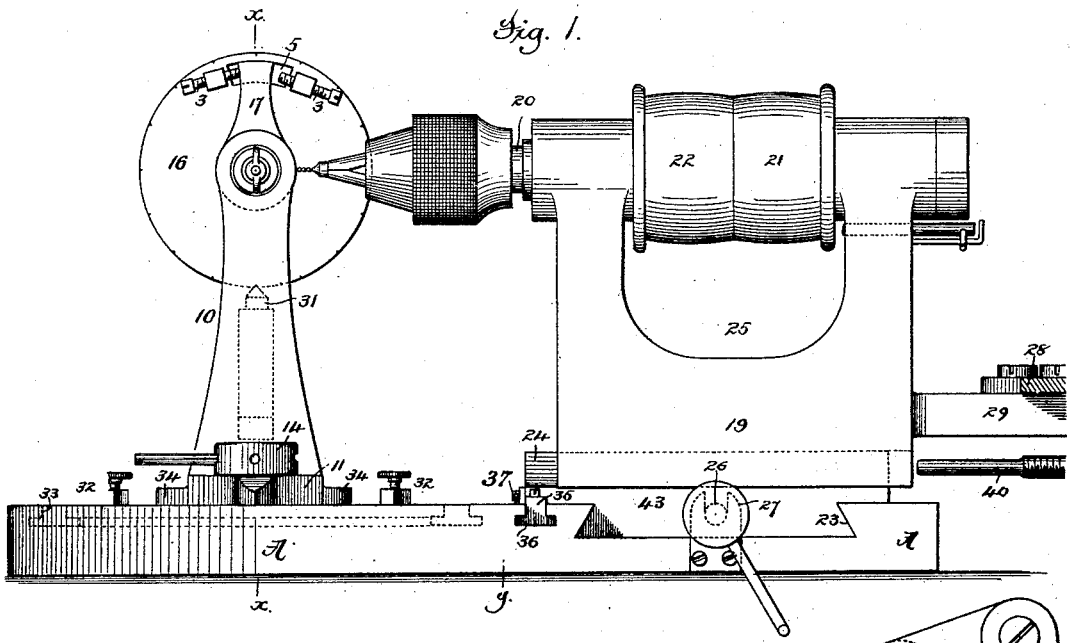
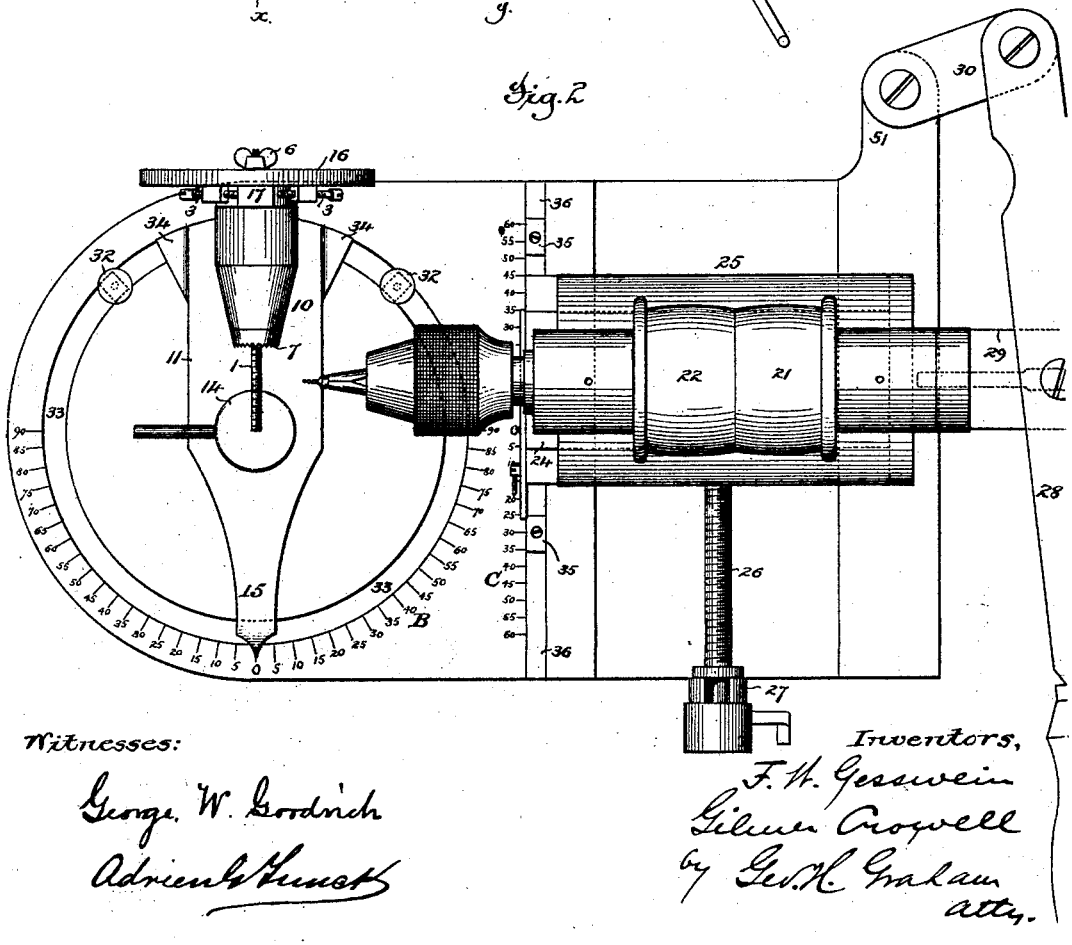


Fig. 2.



Witnesses:

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Adrien B. Hunt

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

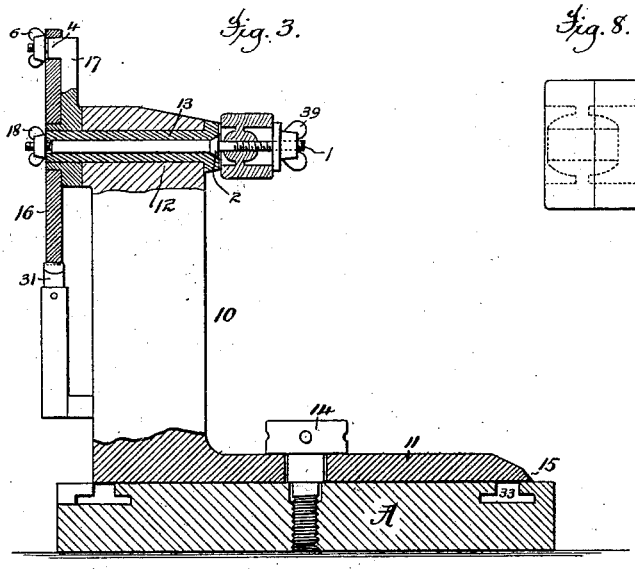


Fig. 8.

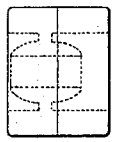


Fig. 9.

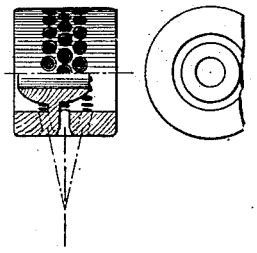


Fig. 10

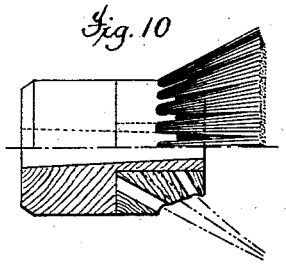


Fig. 7.

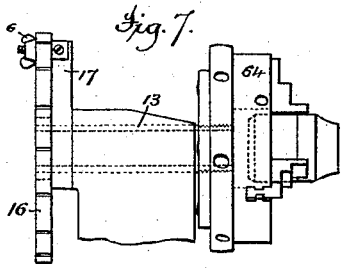


Fig. 4.

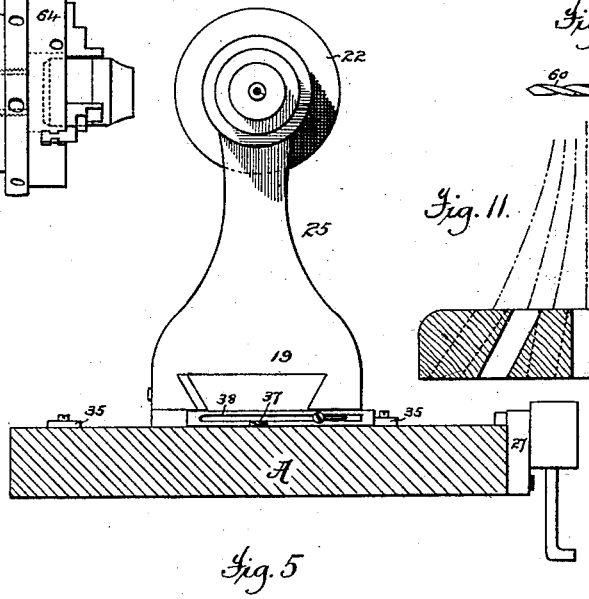


Fig. 6.

Fig. 11.

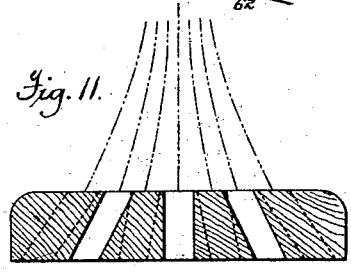
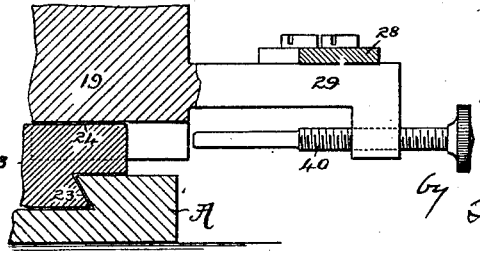


Fig. 5



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UNITED STATES PATENT OFFICE.

GILMER CROWELL AND FREDERICK W. GESSWEIN, OF BROOKLYN, N. Y.

MACHINE FOR BORING BRUSHES.

SPECIFICATION forming part of Letters Patent No. 342,285, dated May 18, 1886.

Application filed April 9, 1883. Serial No. 91,085. (No model.)

To all whom it may concern:

Be it known that we, GILMER CROWELL and FREDERICK W. GESSWEIN, citizens of the United States, residing in the city of Brooklyn, Kings county, and State of New York, have invented certain new and useful Improvements in Brush-Drilling Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to machines for drilling holes in circular blocks, hubs, or centers for the reception of bristles, wires, &c., in making circular brushes for polishing, finishing, and various other purposes. Such circular blocks, hubs, and centers have usually been provided with holes by mounting the block to be drilled in any ordinary lathe-head having a revolving drill, the distance between the holes and the angles at which they are drilled being regulated by the eye of the workman. These operations necessarily required an experienced operator to run the machine, and at the best were slow and inaccurate, and resulted in much waste and in imperfectly-drilled blocks, and therefore imperfect brushes, which consequently made them expensive to produce. Blocks for this class of brushes require holes drilled in them at equal distances apart, and in many cases have only a thin (paper thickness) division between them, thus providing for closely-made brushes and of even stiffness. It is also necessary in blocks having two or more rows of holes that they should be drilled so that the bristles in each of the holes shall incline toward each other, making a compact mass at their outer circumference that will wear down evenly and close to the block. Furthermore, the drilling-machine should be capacitated to drill the blocks automatically, so that the completed brushes will always be uniform.

Our invention therefore has for its object the construction of a machine that will automatically drill all forms of circular blocks, hubs, or centers in a perfect and accurate manner at any angle desired, upon which blocks can be drilled exactly alike by simple and positive means, and that will be capable of drilling any size or style of block desired, with as many holes as necessary, and as close as they can be drilled, and without the aid of a skilled operator.

To this end our improvement consists, first, in means for supporting and holding the block rigidly during the action of a drill moved up to it; second, in a block-supporting head capable of angular adjustment, whereby the block may be held at any angle it may be desired to drill the holes; third, in providing an index or gage whereby the block is intermittently moved at regular distances between each drilling operation; fourth, in means for slightly changing the position of the block on its supporting-head, whereby the next or subsequent row of holes will lap or fall a little behind those in the preceding row; fifth, a drill-carrying head capable of horizontal adjustment on its bed and provided with means for presenting the drill to and withdrawing it from the block; sixth, in various combinations of parts and details of construction, all of which will be hereinafter too fully described and claimed to need further preliminary description.

In the drawings, Figure 1 is a side elevation of our improved machine. Fig. 2 is a plan view of the same. Fig. 3 is a sectional elevation on the line *x x*, Fig. 1, showing particularly the block-supporting head. Fig. 4 is a cross-sectional elevation on the line *y y*, showing a front end elevation of the drill carrying head. Fig. 5 is a sectional elevation of a portion of the drill-carrying head. Fig. 6 is an enlarged view of the drill and conical stop and countersink. Fig. 7 shows a modified form of the block-holding device. Figs. 8 and 9 are full-sized views of one form of block before and after being drilled, known as a "three-row" block. Fig. 10 is an elevation and partial sectional view of a finished brush and block called a "cup-brush;" and Fig. 11 is a sectional view of one side of a "seven-row" block, showing the different angles at which the holes are drilled, the dotted lines representing the position of the bristles or wires.

The machine consists of two heads supported upon a table, a block supporting and indexing head, 10, and a drill-supporting head, 25. The block supporting and index head 10 is constructed with a foot-like projection or base, 11, which extends over and rests on the

bed-plate A of the machine, and is held thereto by a friction-bolt, 14, so as to prevent it from shifting its position accidentally and yet permit it to be turned around said bolt without loosening the latter, and has its projecting end shaped to provide a pointer, 15, that overlies a scale, B, arranged on the surface of the bed-plate, and its vertical projecting portion providing a bearing, 12, for a loosely-fitting hollow spindle, 13. This hollow spindle 13 is provided at one end with a shoulder, 7, that bears against one face of the bearing 12, and is serrated or roughened on its front face, and at the other end of which spindle is fastened a shifting-finger, 17, that is provided with an extended bearing-surface or short sleeve, upon which is supported an index or gage plate, 16, and from its upper end a short stud projects into a slot, 5, cut in said plate, and is held therein by a thumb-nut, 6, by which the index-plate is adjustably secured to the finger 17, so that when the index-plate is rotated the spindle 13 moves with it. The index-plate 16 is provided with notches or depressions on its circumference that coact with a spring-seated pin, 31, arranged at the side of the supporting-head 10 and under the index-plate, so that the latter can be stopped and held at regular points as it is intermittently rotated. These notches will correspond to the number of holes to be drilled in the blocks, and may be of sufficient number to suit all sizes of blocks; but we find it preferable to make the index-plate interchangeable with others having notches corresponding in number with the holes to be drilled in the block, so that the operator has nothing more to do after adjusting the proper index-plate than to move it the distance between each notch. The adjustable feature of the connection between the index-plate 16 and the shifting-finger 17 allows the latter to be loosened from the former and slightly moved until its stud 4 is carried to the other end of the slot 5, whereby the spindle 13 and a pin, 1, are moved slightly, while the index-plate is held stationary by the spring-seated pin 31. In the hollow spindle is carried the central pin, 1, that is screw-threaded on its long projecting end and provided with a conical-shaped collar, 2, that enters a similarly-shaped recess in the shoulder 7 of the hollow spindle. A thumb-nut, 18, tightly screwed on its short projecting end, bears against the index-plate end of the spindle and jams the conical collar 2 in the recess in said shoulder 7, whereby it is fixed to the spindle and caused to move with the latter. This central pin, 1, upon which the block to be drilled is supported, is thus held to the spindle, so that it may be readily changed for similar pins having different thicknesses and lengths to suit the varying diameters of the central holes of the different sizes of blocks. The supporting-head 10, when turned on the friction-bolt 14 to the angle at which the drill is to bore holes in the block, (and said angle is determined according to the particular row of holes in the block the drill is to bore,) the nearer the center of the block the hole the less will be the angle at which the head is turned, said angle increasing at each row of holes past the center. In order to render this angular adjustment of the head 10 accurate and quickly accomplished, and obviate the necessity of the operator looking at the graduations B each time the head is turned, we provide adjustable stops 32, which slide in a groove, 33, concentric with the center of movement of the head 10, cut in the face of the bed-plate A, which stops, when said head is turned, come in contact with projections 34 on either side of its base 11, and thus determine the position of the block in relation to the drill. The drill-supporting head 25 is arranged at one side of and a suitable distance from the head 10, and consists of a base, 19, from which rise two supports that hold and provide bearings for a spindle, 20, which carries a drill-holding chuck of any known pattern, and having mounted on it between the two bearings fast and loose pulleys 21 22, by the former of which the spindle and drill are driven. This drill-supporting head rests on two dovetailed ways, 24 23, which allow it to be moved and adjusted in two directions in relation to the supporting-head 10. The way 24 projects from the top of a base-plate, 43, into a groove corresponding thereto in the under side of the base 19, and is in a line parallel with the axis of the spindle 20. The other dovetailed way, 23, projects from the under side of the base-plate 43 into a groove corresponding thereto cut in the bed-plate A, and is in a line at right angles to the one on its top surface. The drilling-head 25 is caused to move back and forth over its way 24 by a lever, 28, centrally pivoted to a projection, 29, of the base 19 and fulcrumed at the point 51 to the bed-plate A through a connecting-link, 30. By this lever the drilling-head is withdrawn from the block-supporting head 10 to the required distance on its way 24, so that the block it is drilling may be manipulated or replaced by another, as desired, by the operator, and also to allow the head 10 to be turned to any angular position. The sidewise adjustment on the way 23 is imparted to the drilling-head through a screw-threaded spindle, 26, that is suitably held at one end by a bracket, 27, and engages with a screw-threaded socket in the base-plate 43, whereby the position of the drill may be readily adjusted to the desired point on the block it is drilling. This adjustment of the drill is regulated and the accuracy of its position determined by an adjustable pointer, 37, attached to the front of the base-plate 23, coacting with a series of division-marks or scale, C, on the face of the bed-plate A, arranged in line with the path of travel of the base-plate 43.

In drilling blocks of varying widths the position of the drill and its carrying-head 25 will in most cases be at one side of the center of its path of travel on the bed-plate A; and in order to render its sidewise adjustment al-

ways the same in relation to certain predetermined marks on the scale C, whether it starts from the center of the path of travel or not, the pointer 37 is made adjustable on the base-plate 43, through a slot extending the greater part of the length of its plate 38, so that whatever the position of the drilling-head may be in the ways 23 when the drill is pointing at the center line of a block (with which most all blocks are provided beforehand) the pointer 37 can be adjusted to zero on the scale C through its set-screw, (seen in Fig. 4,) so that when the drill is moved to either side of said position it may be adjusted to the same predetermined marks on the scale; and in order to render this sidewise adjustment quickly accomplished when a number of the same size blocks are being drilled, we provide adjustable stops 35, placed on either side of the base-plate 43 set in a groove, 36, so that when once the sidewise adjustment is ascertained the stops may be moved to the proper position and there secured, and thus allow the operator in moving the position of the drill to simply move the screw-threaded spindle 26 until one side of the base-plate comes in contact with one of the stops and obviate the necessity of looking at the pointer and scale C.

The operation of the machine is as follows: To drill a block, take, for instance, a block an inch in diameter, requiring three rows of holes. An index-plate, 16, having notches corresponding to the number of holes to be drilled—in this case twenty-four—is secured to the shifting-finger 17, with its stud 4 at one end of the slot 5 in the index-plate, in the manner before described. A central pin, 1, having its projecting screw-threaded portion of suitable size to fit the central hole in the block, is inserted in the hollow spindle 13 and held firmly thereto by the nut 18. The block is then placed over the projecting end of the pin 1 and against the serrated or roughened end of the shoulder 7, and a thumb-nut 39 is screwed up to the block and secures it tightly thereon, said serrated end preventing the block from turning or moving on the pin during the drilling operations. After thus securing the block the drilling-head having first been withdrawn to its backmost position, the supporting-head 10 is then turned so that its indexing or pointing end 15 stands at zero on the scale B, and is held firmly in such position by the friction-bolt 14, presenting the axis of the block at right angles to that of the drill. The drill is then set in motion by a belt on the pulley 21, and the drilling-head moved forward by the lever 28 up to the block, when, should the drill not point at the center of the block, its carrying-head 25 is moved through its adjusting-screw 26 until the drill is centered, after which its pointer 37 is adjusted so as to stand at zero on the scale C. A further movement of the lever 28 will push the drill into the block, and after drilling the desired depth it is withdrawn therefrom by moving the lever in the opposite direction. The operator then partially rotates the block by moving the index-plate 16 the distance of one notch, when the drill is again advanced, another hole drilled, and the operations repeated until a row of holes is completed. The supporting-head 10 is now turned until its pointer 15 stands over the division-mark—in this case being fifteen—on the scale B. The thumb-nut 6 is loosened and the finger 17 moved to the opposite end of the slot 5 or up to the adjusting screw 3 at said end, by which movement the spindle 13 and block are slightly rotated a distance equal to one-half the distance between the center of two holes, (the index-plate remaining stationary during such movement,) when the said thumb-nut is tightened and said index-plate secured to the finger 17, as before. The drill is then moved up to the block and its position so adjusted that it will drill another row of holes at one side of that just completed. Such position, if previously experimented with, would be when the pointer 37 reached the division-mark five on the scale C. The holes resulting from this adjustment will all be drilled obliquely in the block and between and a little to one side of those in the row first made. The second row being completed, the supporting-head is turned until its pointer stands over the duplicate number, fifteen, on the other side of the zero on the scale B, (the finger 17 not being adjusted this time,) and the drilling-head adjusted until its pointer 37 points to the duplicate number, five, on the opposite side of the zero on the scale C, when the drilling operations are repeated and a third row of holes completed and the block finished. It will thus be seen that when the adjustments of the supporting-head 10 and drilling head 25 are once determined, the stops 32 32 and 35 35 can be secured in proper position at once, so that they will operate to stop the extreme movements of their respective heads, and innumerable number of blocks can be drilled in a comparatively short space of time, each of which will be drilled alike, and no adjustment other than moving the finger 17 is required in drilling each block.

In drilling a greater number than three rows of holes it will be necessary, as is obvious, to adjust the stops 32 and 35 to meet the greater movement of their respective heads; but in this case it will be found to be desirable to bore the first three rows of holes—in case the number of rows to be drilled is an odd number, as five or seven—in a number of the blocks, and then after adjusting the heads 10 and 25 for another set of holes, at a different angle to those made before, the blocks can be placed in the machine again, and so on.

In order to control the depth at which the drill is required to bore, an adjustable stop, 40, (see Fig. 5,) is suitably held in a depending portion of the projection 29 of the base 19, which, when the hand-lever 28 pushes the drilling-head and advances the drill into the block, the said stop 40 will come into contact

with the end of the base-plate 43 and arrest the forward movement of the head 25, and thus prevent the drill from going too far into the block, boring into its core and damaging it.

In blocks in which wire is used, instead of bristles, it has been found when the wires are unduly bent in use that they will in bending over the sharp corners of the holes break off at those points. To remedy this, the holes are countersunk, so that when the wires are bent they have a short bearing or supporting surface instead of the edge of the hole. To accomplish this in the same operation with drilling the hole, we provide the drill 60 with a short sleeve or projection, 61, (or it may be made solid with the drill,) having a conical point and slightly concave, so that when the drill has nearly reached the required depth in the block the conical portion of the drill is pushed in with it, and compressing the fibers of the wood the hole will be countersunk. As illustrated in the drawings, this countersinking projection consists of the sleeve 61, supported on the drill 60 and made to turn with it by a pin, screw, or teat, 62, let into it and projecting into one of the grooves in the drill, its rear end bearing against the chuck-jaws 63. This conical projection may also serve, as can be readily seen, as a stop to prevent the drill from penetrating the block too far, in which case the adjustable stop 40 may be dispensed with; but we find its use preferable where good even work is desirable. It is obvious that the spindle 13 might be made solid, with a pin, as 1, projecting from it, and the spindle thus made be interchangeable with others having different-sized pins. The hollow spindle might be provided with spring-jaws, instead of a pin, as 1, and the block be grasped thereby; or, it might be provided with what is known as a "universal chuck," as 64, (see Fig. 7,) having a central hole corresponding to that in the spindle, so that the block may be grasped and held on its circumference, leaving its center or face unobstructed, and in case the handle or projection on its back is made integral with the block portion, said handle may be inserted in the central hole of the chuck and spindle, and the jaws of the chuck may in this instance grasp the handle, leaving the entire block portion unobstructed. It may also be readily seen that the drilling-head might be made stationary, and not be moved up to and withdrawn from the block; but instead thereof the block-supporting head might be arranged to be moved back and forth, to and from the drill, in precisely the same way as the drilling-head is arranged in the drawings. We do not therefore limit ourselves to the precise construction and arrangement herein described, as they may be departed from within wide limits.

What we claim as new is—

1. In combination, a reciprocating head, as 25, carrying a rotating drill, a head, as 10, mounted so as to co-operate with said head 25, and provided with a horizontally-mounted spindle, as 13, angularly arranged across and in front of said rotating drill and capable of being rotated in said head 10, and serving to support and present the block to be drilled to said rotating drill, both of said heads 25 10 being supported in co-operative relation upon a suitable bed-plate, substantially as described.

2. In combination, a reciprocating head, as 25, carrying a rotating drill, a head, as 10, pivotally mounted so as to be capable of horizontal angular adjustment with respect to said head 25 and to co-operate therewith, and provided with a horizontally-mounted spindle, as 13, angularly arranged across and in front of said rotating drill and capable of being rotated in said head 10, and serving to support and present the block to be drilled to said rotating drill, both of said heads 25 10 being supported in co-operative relation upon a suitable bed-plate, substantially as described.

3. In combination, a reciprocating head, as 25, carrying a rotating drill, a head, as 10, pivotally mounted so as to be capable of horizontal angular adjustment with respect to said head 25 and to co-operate therewith, and provided with a horizontally-mounted spindle, as 13, capable of being rotated in said head 10, and serving to support and present the block to be drilled to said rotating drill, and an index-plate, as 16, carried by said spindle 13, whereby the latter may be rotated step by step, substantially as described.

4. In combination, a head, as 10, carrying a horizontally-mounted rotating spindle, as 13, by which the block to be drilled is supported and rotated, which head is pivotally mounted on its base-plate, so as to be capable of a circular horizontal adjustment thereon, and is provided with a pointer, 15, arranged to co-operate with the scale B, provided on the base-plate, and the adjustable stops 32, co-operating with said head in regulating and determining its horizontal adjustment, whereby the block to be drilled is presented to a rotating drill at any desired angle in a horizontal plane, substantially as described.

5. In combination, a reciprocating head, as 25, carrying a rotating drill and capable of lateral adjustment on its base-plate with respect to its reciprocations, a head, as 10, carrying a horizontally-mounted spindle, 13, angularly arranged across and in front of said rotating drill and by which the block to be drilled is supported and presented to said rotating drill, and which spindle is capable of rotative movement in said head 10, whereby the block may be rotated and another portion of it presented to the drill, substantially as described.

6. In combination, a pivotally-mounted head, as 10, carrying a horizontally-mounted spindle, 13, for supporting the block to be drilled and that is capable of being rotated in said head, an index-plate, 16, carried by said

spindle, and a shifting-finger, as 17, the whole operating to support the block to be drilled and rotate the same step by step after each drilling operation, and co-operating with a rotating reciprocating drill, substantially as described.

7. In combination, a head, as 10, carrying a rotative spindle, 13, for supporting the block to be drilled, an index-plate, 16, carried by said spindle, and a shifting-finger, as 17, the whole operating to support the block to be drilled and rotate the same step by step after each drilling operation, and co-operating with a rotating reciprocating drill, substantially as described.

8. In combination, a head, as 10, carrying a rotative spindle, 13, for supporting the block to be drilled, an index-plate, 16, carried by and adjustably secured to said spindle, and a shifting-finger, as 17, rigidly secured thereto, the whole operating in connection with a rotating reciprocating drill, substantially as described.

9. In combination, a reciprocating drill-carrying head, as 25, capable of lateral adjustment parallel with respect to its reciprocations, a pointer, 37, carried by said head and adjustably mounted thereon, and a scale, as C, the whole operating in connection with a suitably-mounted block-supporting spindle, as 13, substantially as described.

10. In combination, a head, as 25, carrying a rotating drill, and capable of being reciprocated to and from the block to be drilled, and a co operating head, as 10, provided with a horizontally mounted spindle, 13, for supporting the block to be drilled and capable of being rotated step by step, the said head and its spindle being constructed and arranged to present the longitudinal axis of the spindle across and in front of said rotating drill, whereby said drill may operate upon the periphery of the block, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

GILMER CROWELL.
F. W. GESSWEIN.

Witnesses:
WILLIAM DIXON,
GEO. H. GRAHAM.