(No Model.)

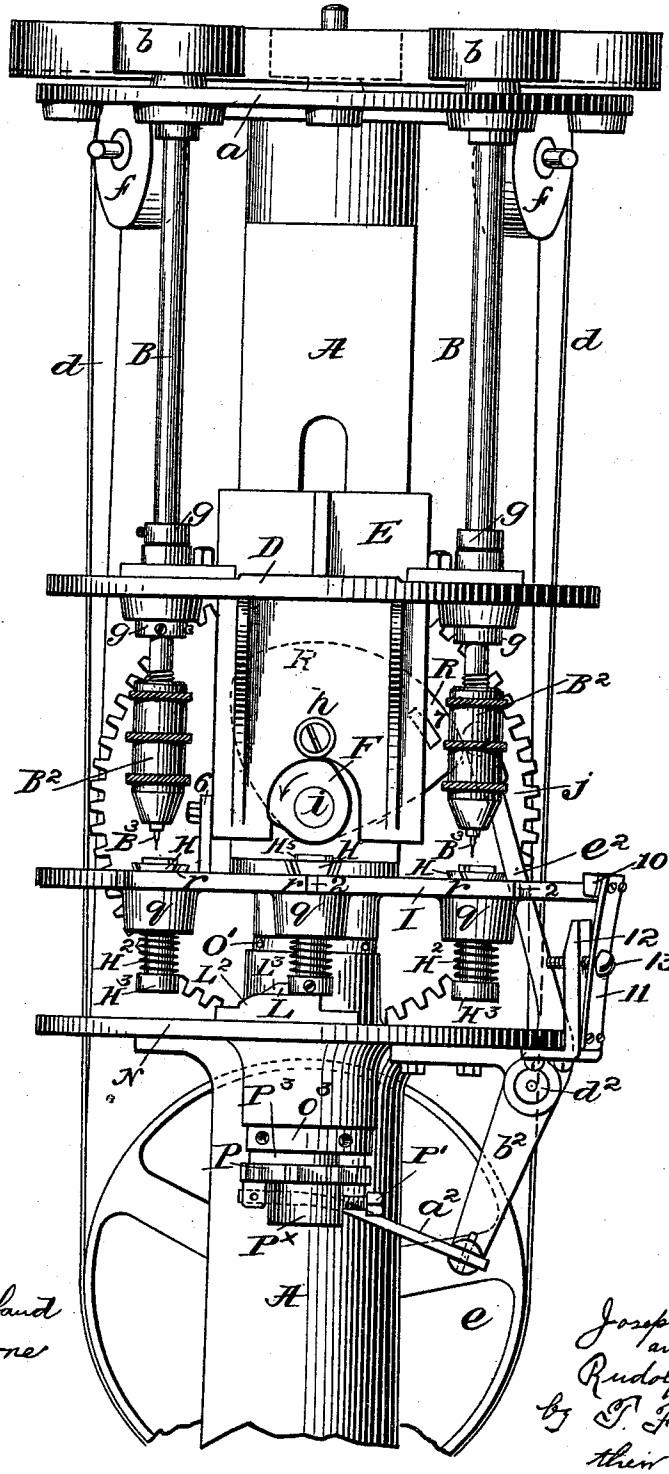
3 Sheets—Sheet 1.

J. & R. BÖHM.

DRILLING MACHINE.

No. 518,803. Patented Apr. 24, 1894.

Fig. 1



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DRILLING MACHINE.

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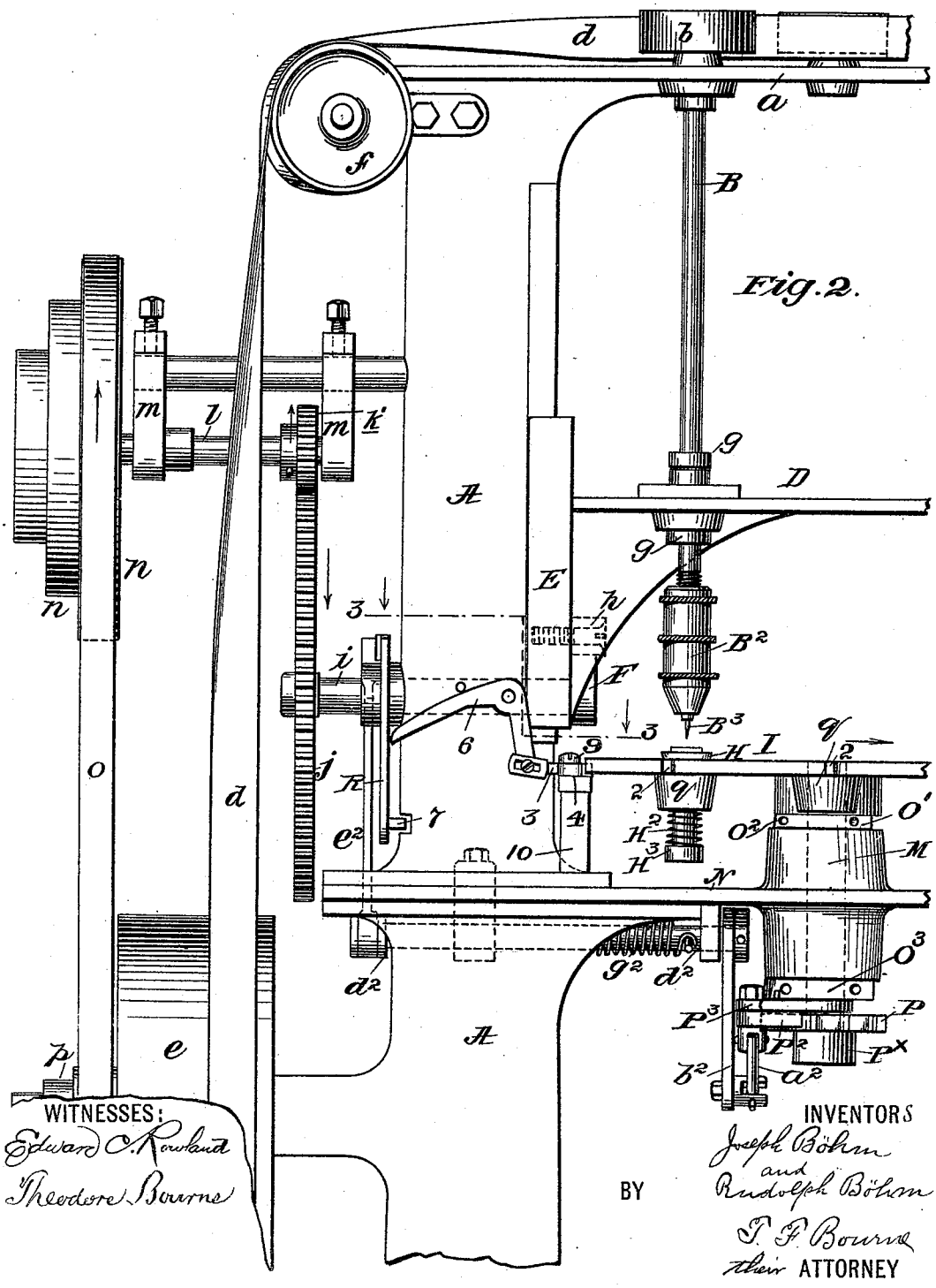

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

J. & R. BÖHM.

DRILLING MACHINE.

No. 518,803. Patented Apr. 24, 1894.

Fig. 3.

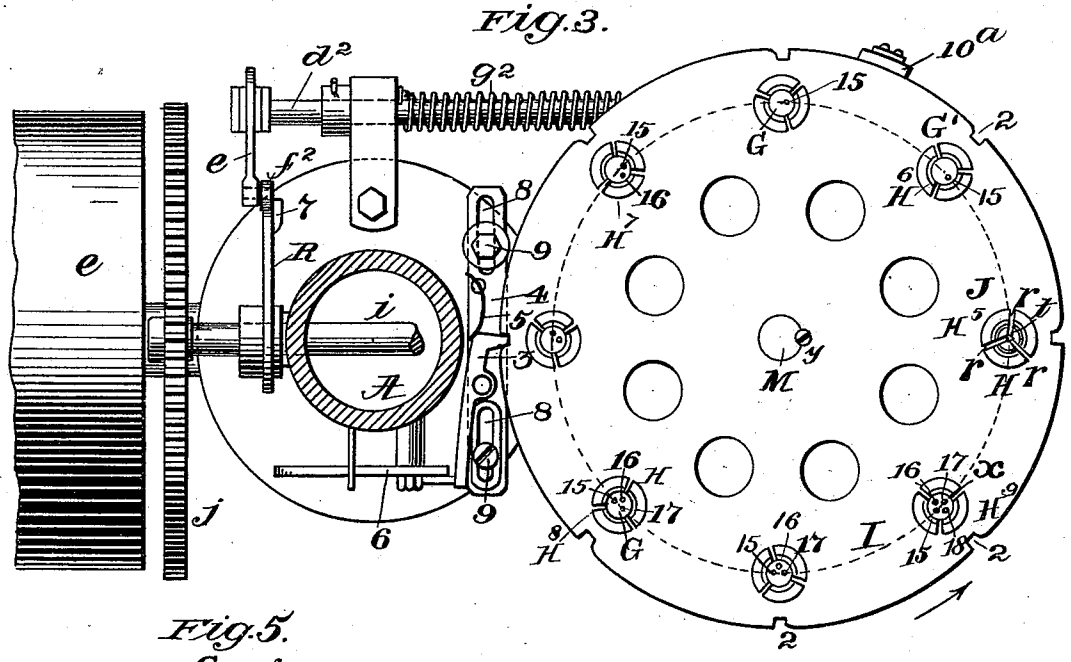


Fig. 5.

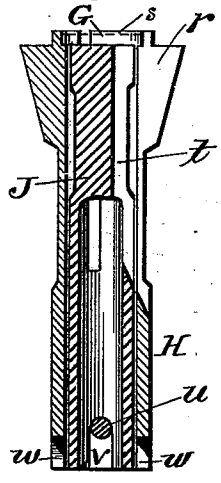


Fig. 4.

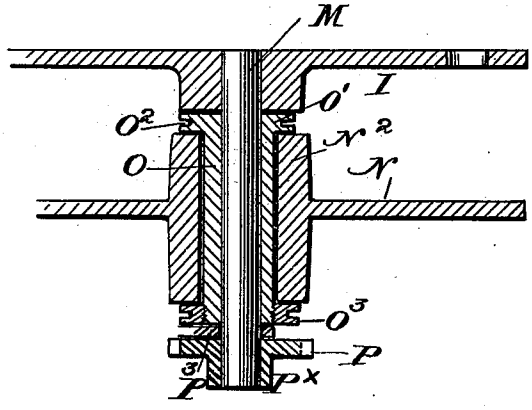
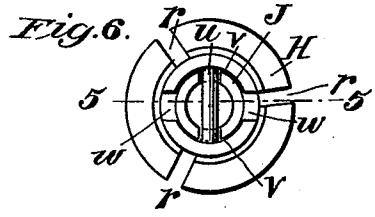


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH BÖHM AND RUDOLPH BÖHM, OF NEW YORK, N. Y.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 518,803, dated April 24, 1894.

Application filed May 22, 1893. Serial No. 475,025. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH BÖHM and RUDOLPH BÖHM, citizens of the United States, and residents of New York city, county of New York, and State of New York, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

Our invention relates to multiple drilling machines and more particularly to improvements on the class of machines shown in United States Patent No. 479,086, dated July 19, 1892, wherein a series of holes are drilled in buttons simultaneously.

The object of our invention is to provide a practically automatic machine of the class described, wherein after a button is placed in the machine it will be automatically brought to the several positions necessary to drill the holes in the desired positions. In this class of machine the button holders or chucks are placed in a circle that is eccentric to the circle in which the drills are located, and one of the objects of our invention is to provide means for adjusting said chucks relatively to the drills so as to permit the holes to be drilled in the buttons nearer together or farther apart as may be desired.

A further object of the invention is to provide means for automatically discharging the buttons from their holders or chucks after they have been properly drilled, as well as to cause the drills to automatically advance toward and recede from the buttons.

The invention consists in the novel details of improvement and the combinations of parts that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein—

Figure 1 is a front elevation, partly broken, of our improved machine. Fig. 2 is a partly broken side elevation of the machine looking from the left in Fig. 1. Fig. 3 is a sectional plan view, the section being taken on the plane of the line 3, 3, in Fig. 2. Fig. 4 is a sectional detail view of the means for changing the positions of the button holding chucks relatively to the drills. Fig. 5 is a longitudinal section, on the line 5, 5, in Fig. 6, enlarged, of the button holding chuck and the button discharger or ejector, and Fig. 6 is an end view thereof looking from the bottom of Fig. 5.

In the accompanying drawings the letter A indicates a suitable frame or standard upon which the mechanism of the machine is supported. The lower part of the frame or standard A is not shown, as it may be of any desired construction.

B, are a series of longitudinally movable drill spindles that are journaled at their upper ends in bearings on a suitable plate or bracket *a*, carried by frame A. The drill spindles B are provided with suitable chucks B^2, for the drills B^3, and they may be rotated by suitable means. They are shown provided with pulleys *b* that receive a belt *d*, from a main pulley *e*, (that may be suitably driven) said belt being shown passing over guide rollers *f*, on frame A, that guide it to the pulleys *b*. The belt *d* is shown passing along opposite sides of pulleys *b*, so as to drive them all in the same direction. The spindles B are arranged in a circle for a purpose hereinafter shown. The drill spindles are to have longitudinal movement in the pulleys *b*, and for this purpose they pass freely through the latter, a spline and feather (not shown) or other means being provided to permit said motion while causing the spindles to turn with the pulleys. The lower parts of the spindles B are journaled in bearings on a movable plate or bracket D arranged to slide on standard or frame A, collars *g*, *g*, being placed on said spindles to cause them to be raised and lowered by and with said plate or bracket D. The plate or bracket D is shown carried by a head or guide E, arranged to slide on the frame A. The plate or bracket D is raised at the proper moment by a suitably shaped cam F that bears on a friction roller *h*, carried by head E (see Fig. 1). The cam F is shown carried by a shaft *i*, journaled on frame A (see Figs. 2 and 3). The cam F is so arranged that while a button is being adjusted in its chuck (as hereinafter explained) the drills will be elevated as in Fig. 1, whereupon as said cam turns the drills will be lowered to the work. The shaft *i* may be turned by suitable means, in the drawings it being shown provided with a gear wheel *j*, that meshes with a pinion *k*, on a shaft *l*, hung

in suitable bearings m, carried by a frame A, The shaft l is provided with one or more pulleys n, driven by a belt o, from suitable pulleys p, on the shaft that supports the pulley e (see Fig. 2).

The buttons G to be drilled are placed in suitable chucks H carried by a rotative plate or disk I, supported from frame A. On the plate or disk I are preferably provided bearings q to receive the chucks H to hold them in proper positions. The chucks H are made substantially as shown in Figs. 3, 5 and 6, that is to say, they are split longitudinally as at r, in, say, three places, to permit them to spread and receive a button and grip it, and their outer sides at their upper parts are tapered or inclined as shown so that as they are drawn down into their bearings they will press upon the button held in the central bore s. The slits r in the chucks H are made wide enough to permit the particles from the drilling of the buttons to pass away.

Within the bore s of the chuck H is placed a button ejector or discharger J (see Fig. 5) that is adapted to have longitudinal movement in said chuck. The ejector J is grooved longitudinally at its upper part at t, said grooves registering with the slits r in the chuck H (see Figs. 3 and 5). These grooves also give clearance for the drills B^3. The lower part of the ejector J is about flush with the bottom of the chuck H, and the latter is shown provided with a pin u that enters recesses v in the end of ejector J, to hold the latter properly within chuck H, and sufficiently beneath the top of the latter to permit a button to rest within the chuck.

w, w, are recesses in the lower end of the chuck H, that permit the entrance of an inclined block L (see Fig. 1) that is adapted to press the ejector J upward within the chuck H, as hereinafter more fully explained. The inclined block L also raises the chucks H to permit them to spread at their split ends to release the buttons. The chucks H pass through apertures x in the disk or plate I, and said apertures are arranged in a circle corresponding in diameter to the circle in which the drills B^3, are placed. But said circles are placed eccentric to each other substantially corresponding to the arrangement of circles shown in the patent hereinbefore mentioned and for the same purpose, that is to say, to cause the drills to bore holes in the buttons in different positions according to the relative location of said circles and the corresponding positions of the drills and the chucks. The chucks H are normally pressed downwardly to grasp a button by springs H^2 that press against the bearing q and against a collar H^3 on chuck H.

The disk or plate I is to be turned step by step as the holes are drilled in the buttons, and it is also arranged to change the positions of the circle of the chucks relatively to the circle of the drills. For these purposes the plate or disk I is carried by a spindle M (see Fig. 4) that is journaled in bearings on a bracket or support N, on the frame A. The disk I and spindle M may be removably held together by a screw y. The spindle M passes through an eccentric stationary bearing or sleeve O, that is supported by bracket N. The spindle M is shown in Fig. 4 as passing through a vertical bore in the bearing or sleeve O, which bore is at one side of the longitudinal axis of said sleeve so that as the sleeve O is turned in its bearing N^2, the disk I will be moved more or less eccentrically to the circle of the drills. The bearing or sleeve O is shown provided with a rim O′ provided with apertures O^2 to receive a key to turn it by, but of course this may be changed if desired. The bearing or sleeve O is also provided with a jam nut O^3 to press upon bearing N^2, to hold said sleeve in proper position so that the spindle M may revolve in the bearing O. The center of the bearing N^2, is eccentric to the center of the circle of the drills so that as the bearing or sleeve O is turned the chucks will be moved more or less eccentric to the drills.

The spindle M is provided with a ratchet wheel P for moving disk I step by step. The ratchet P may be held in place by a set screw P′ entering a hub $P^\times$ surrounding spindle M. The ratchet P is engaged by a spring pressed pawl P^2, carried by a lever P^3 that is fulcrumed on spindle M. The lever P^3 moves the disk I the distance of one tooth on ratchet P each time the cam F makes a revolution, and for this purpose the following arrangement is provided:—The lever P^3 is connected by a link or rod a^2 with a crank arm b^2, that is carried by a rock shaft d^2 suitably journaled on frame A. The shaft d^2 also carries a crank arm e^2 that is actuated by a suitable cam R on shaft i, to turn shaft d^2 and thus move lever P^3, ratchet P and disk I. Arm e^2 preferably carries a friction roller f^2, that bears on cam R. A spring g^2 holds arm e^2, upon cam R and causes it to co-act therewith.

The disk or plate I should be held firmly while the chucks H are beneath the drills B^3, in position for drilling the buttons. For this purpose the disk I is provided on its periphery with notches 2, that are adapted to be engaged by a dog 3 (see Fig. 3). The dog 3 is pivoted on a support 4 carried by frame A, a spring 5 pressing said dog against disk I and into notches 2. The dog 3 is connected with a bell crank lever 6 that is pivoted on frame A. The lever 6 is rocked at the proper moment, to disengage dog 3 from disk I, by a cam or projection 7 carried by cam R. The arrangement of the parts is such and they so co-act that as the plate or bracket D is rising the dog 3 will release the disk I, and the ratchet P will be simultaneously actuated to turn disk I the distance between two chucks H.

As before stated the disk I can be moved by bearing O to change the relation of the circle of the chucks H to the drills, and said movement would naturally change the relation of notches

2 in disk I to dog 3. Therefore, said dog is made adjustable, and for this purpose the support 4 is arranged to be moved into various positions. Said support is shown having slots 8 that receive set screws or bolts 9, that are shown entering standards 10 in frame A. With this arrangement, as the disk I is moved eccentrically the support 4 can be readily adjusted so as to bring the dog 3 in position to enter notches 2 in disk I.

In order that the disk I will not overcarry when it is turned by ratchet P said disk is provided with a brake or friction device 10^a that is shown bearing upon the periphery of the disk I. Said brake or friction device is made adjustable to compensate for the change of center of disk I (with relation to the drills) and for this purpose the portion 11 of the brake is preferably made of spring metal carrying the brake or shoe 10^a. A support or standard 12 on the bracket N receives a screw 13 from the spring 11, whereby the brake can be adjusted relatively to the disk I, and the proper amount of pressure applied.

The operation is as follows:—Fig. 1 shows the front of the machine at which the operator sits to insert the buttons to be drilled, and Fig. 3 shows the drilling positions of the buttons. It will be understood that the drills B^3 in Fig. 1 are elevated and that the chuck at H^5 is open to receive a button. In the example shown four holes are to be drilled in the buttons G although eight chucks H are shown on the disk I. For facility of description it will be supposed that there are no buttons in the chucks H, to start with. The operator now places a button in the chuck at H^5 and starts the machine by applying power to pulley *e*. The cams F and R now turn in the direction of the arrow in Fig. 1, whereupon the bracket D descends and carries down drills B^3. The cams F and R next begin to rise, the cam F lifting the bracket D and drills B^3, and as soon as the latter are free from the chucks the cam R causes the crank e^2 to rock shaft d^2, and thus communicate motion to ratchet P, moving it the distance of one tooth to bring said button under the first drill B^3 to the right in Fig. 1, at the point H^6, whereupon the disk I comes to rest and is held by dog 3. The drills now descend and the drill at H^6 bores a hole at 15 in button G'. Each time the disk I comes to rest the operator places a button in a chuck that has been brought to the front of the machine at H^5. When the button G' reaches the point H^7 the descending drill at that point bores a hole at 16 in the button but at one side of the hole 15, because the circle of the drill is eccentric at that point to the circle of the chucks. While hole 16 is being bored a hole 15 is being bored in another button at H^6. When the first mentioned button G' reaches the point H^8 the descending drill will bore a hole at 17 in said button, which hole is in line with the hole 15, because the circle of the drills crosses the circle of the chucks at the point H^8 as well as at H^6, while said circles are eccentric at H^7 and H^9. When said button reaches the point H^9 the descending drill will bore a hole at 18, at which time four holes will have been drilled in the button. It will be understood that all the chucks are now supplied with buttons, the first inserted button having traveled nearly around the circle, and that henceforth each time the drills descend they will simultaneously bore holes in buttons at the respective points 15, 16, 17 and 18. By using more chucks than there are drills a chuck between the two front drills will be in position to be filled while other buttons are being drilled. When the disk I turns the button from the point H^9 to the initial position H^5, the chuck H in reaching said position encounters the part L^2 of incline L, whereby said chuck is raised to permit its upper part to spread and release the button. When the ejector J reaches the part L^3 of incline L it is raised and ejects the button from the chuck, whereupon said ejector passes from said incline and descends to permit entrance of a button within chuck H, while the chuck still remains on block L, and thus its upper part is spread to receive a button. As soon as the disk I begins to turn from the point H^5, the chuck H passes from block L and the spring H^2 forces it down to close its jaws upon the button and thus hold the latter firmly. It will be understood that each time the projection 7 on cam R reaches lever 6 the latter is operated to retract dog 3 from notch 2 in disk I to release the latter, this action taking place while the drills recede from the chucks, so that the disk will be positively held while the drills are boring into the buttons.

From the foregoing description it will be apparent that the action of the machine is practically automatic, and continuous in that each time a chuck reaches the front position H^5 a button will be fully drilled. By having more chucks than drills the capacity of the machine is increased, as while a number of buttons are being drilled another chuck can be filled, whereby the output of the machine is increased over what would be possible did the operator have to wait for a chuck to be emptied, after the last holes were drilled in a button, in order to obtain a chuck to fill. By having the disk I that carries the chucks more or less eccentrically adjustable with relation to the circle of the drill we are enabled to change the distance between the holes in buttons by altering the eccentricity of the circles of the chucks with relation to the circle of the drills without other change of location of parts.

While we have shown four drills it is evident that the number may be increased or diminished according to the work desired.

Having now described our invention, what we claim is—

1. In a drilling machine, drill holding chucks and means for actuating them, combined with article holding devices, a support for the latter, and means for adjusting one of said sets of devices laterally and eccentrically to the other, substantially as described.

2. In a drilling machine, drill holding chucks arranged in a circle and means for actuating them, combined with article holding devices arranged in a circle, a disk or plate carrying said devices, a pivot or spindle for said disk or plate, and an eccentrically adjustable bearing for said pivot or spindle, as and for the purpose specified.

3. In a drilling machine, drill holding chucks arranged in a circle and means for actuating them, combined with article holding devices arranged in a circle a disk or plate carrying them, means for adjusting said disk or plate eccentrically to the circle of said drill chucks, and an adjustable holder or dog for retaining the disk or plate in the operative position, substantially as described.

4. In a drilling machine a disk or plate adapted to hold chucks, a spindle for said disk, a bearing or sleeve O for said spindle, said bearing having a bore at one side of its longitudinal center to receive said spindle, a support for said bearing, and means for holding said bearing from turning in its support, substantially as described.

5. In a drilling machine, a rotative disk or plate having aperture *x*, a chuck or holding device within said aperture, said chuck having clamping jaws at its end, and a bore *s*, combined with an ejector within said chuck, means for moving said chuck sidewise, and an incline upon which said chuck can ride to raise it to open the jaws, and an incline upon which said ejector can ride to eject an article from the chuck after its jaws are open, substantially as described.

6. In a drilling machine, drill holding chucks, longitudinally movable spindles carrying them, means for turning said spindles, a bracket or support in which said spindles are journaled and a cam for actuating said bracket, said bracket being movable in one direction only, said chucks being arranged in a circle, combined with article holding devices also arranged in a circle that is eccentric to the circle of the drill chucks and means for carrying said article holding devices around in said circle, so that said devices will cross the circle of the drill chucks, and means for adjusting said article holding devices more or less eccentrically to said drill chucks substantially as described.

7. In a drilling machine, drill holding chucks arranged in a circle, means for rotating said chucks and means for raising and lowering said chucks, combined with article holding devices in line with said chucks and arranged in a circle eccentric to the circle of the drills, a disk or plate carrying said devices, and means for adjusting said disk or plate more or less eccentrically to said drills a cam and intermediate mechanism between said disk and cam for turning the former by the latter said cam being operated by and simultaneously with the mechanism that operates the drill chucks, whereby said disk is given an intermittent rotary motion, substantially as described.

8. In a drilling machine, the combination of drill holding chucks, a disk or plate arranged to carry said chucks, a spindle for said disk, a ratchet, pawl and lever connected with said spindle, crank b^2, connected with said lever, rock shaft d^2, crank e^2 and cam R, all arranged substantially as and for the purposes specified.

9. In a drilling machine, a rotative chuck-holding disk or plate, and means for changing its center of motion combined with an adjustable holding dog, a support for said dog, and means for actuating said dog to release said disk, substantially as described.

10. In a drilling machine, a rotative chuck holding disk or plate and means for changing its center of motion, combined with a holding dog 3, a slotted support 4, for said dog, screws for holding said support and means for actuating said dog, substantially as described.

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this 10th day of May, 1893.

JOSEPH BÖHM.
RUDOLPH BÖHM.

Witnesses:
LEOPOLD BÖHM,
HENRY H. DAVIS.