No. 680,909. Patented Aug. 20, 1901.

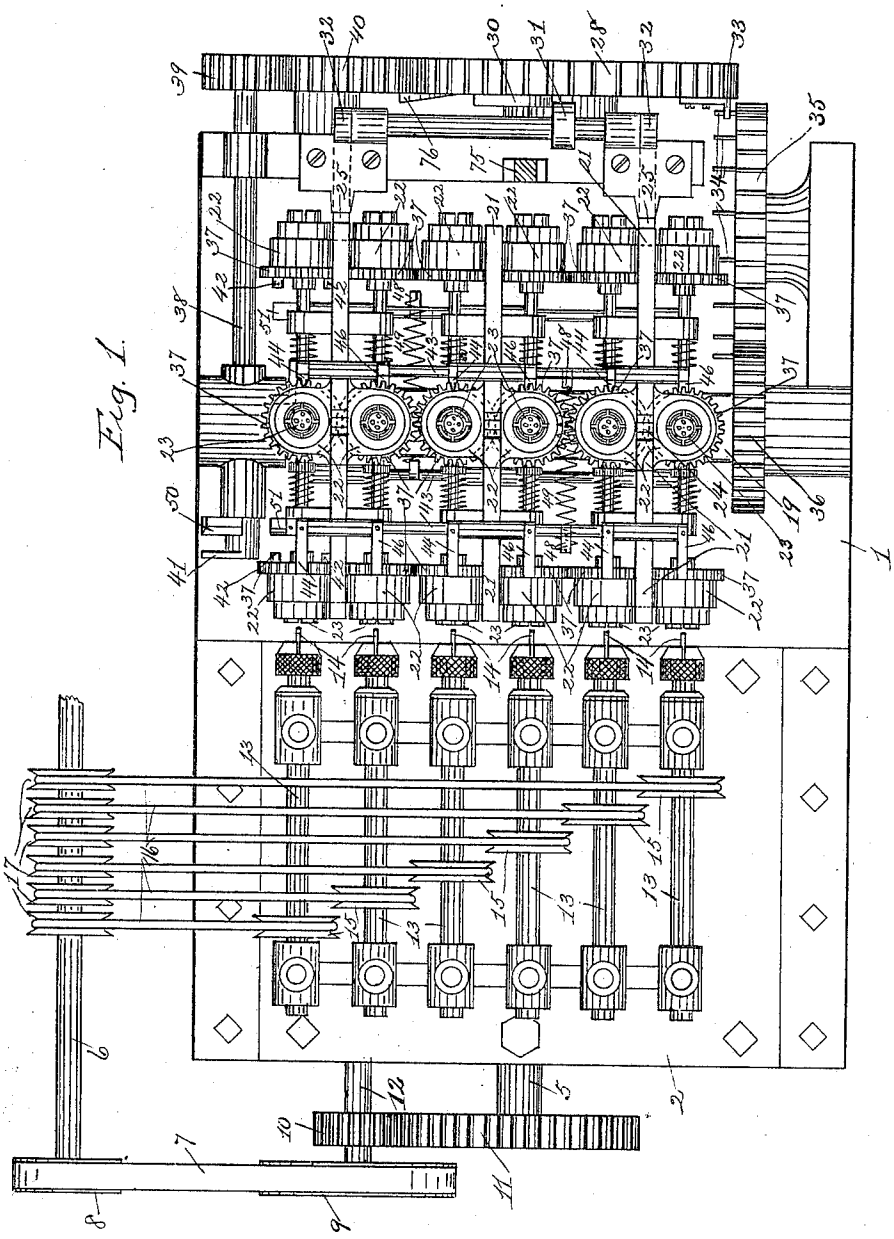
H. CHALMERS.

BUTTON DRILLING MACHINE.

(Application filed Apr. 4, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



WITNESSES
Wm. J. Greer
E. M. O'Reilly

INVENTOR
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attys.

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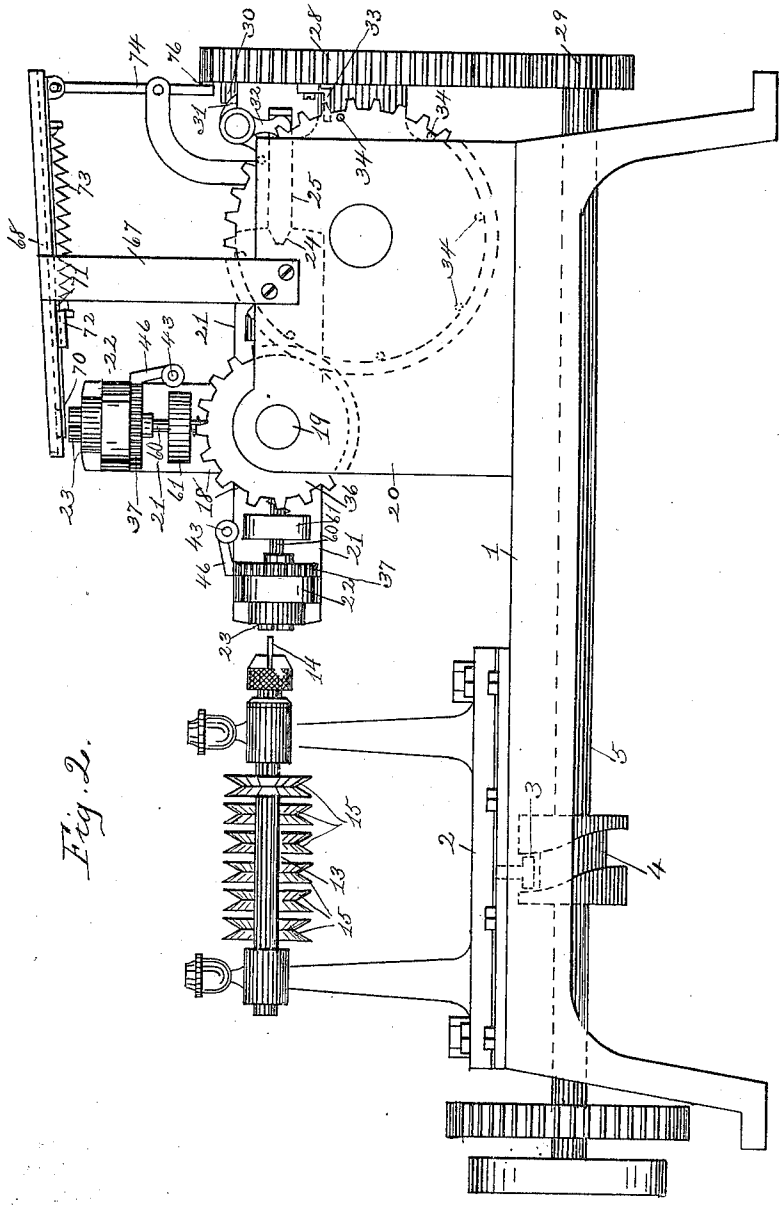

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

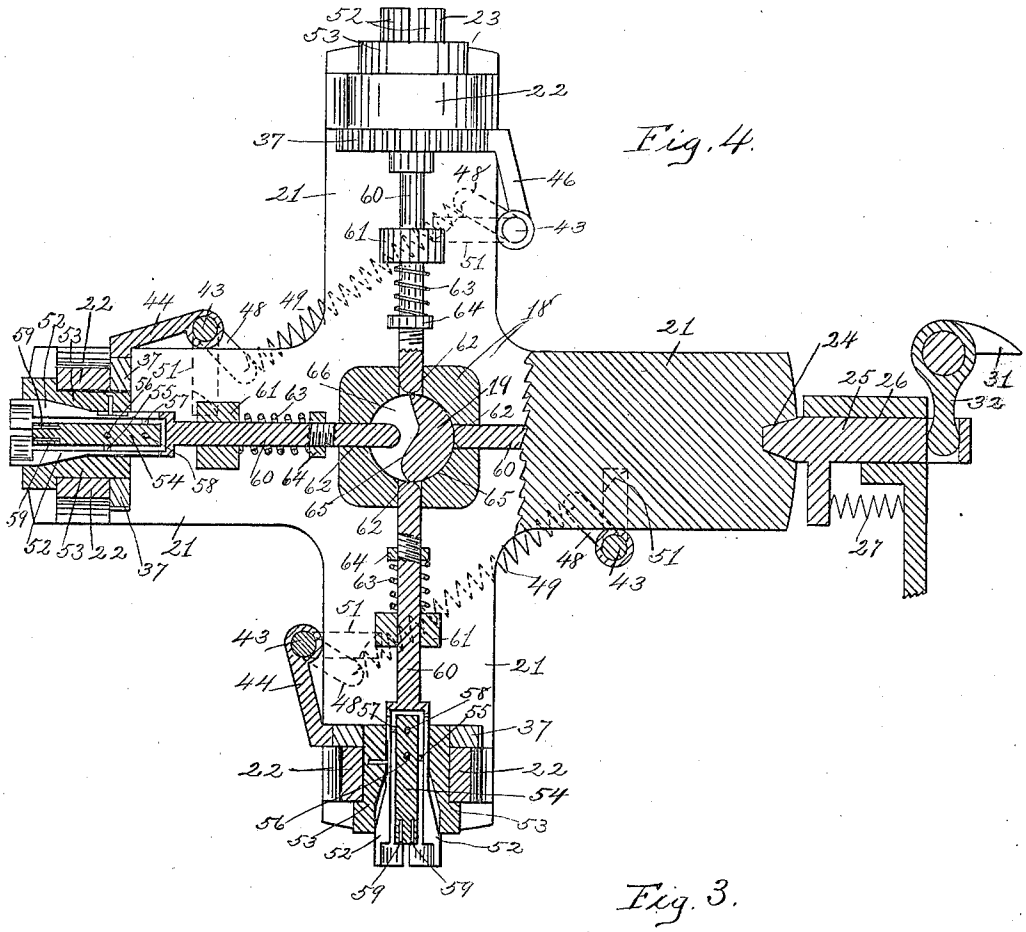

Fig. 4.

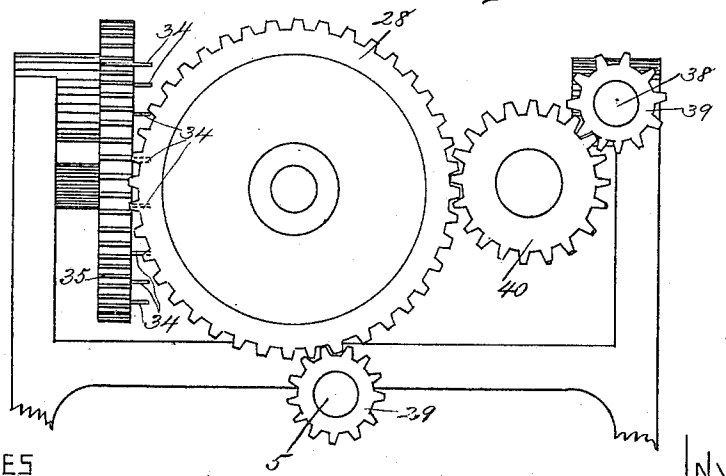

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

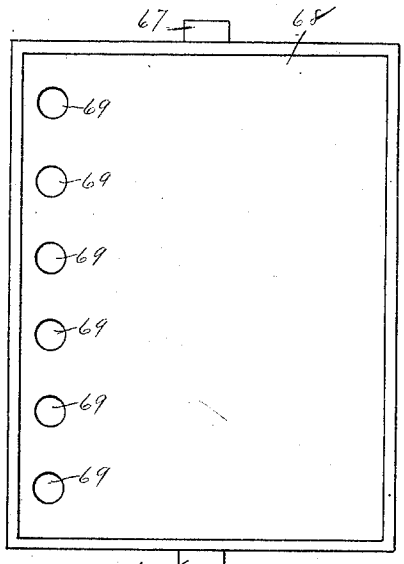

Fig. 5.

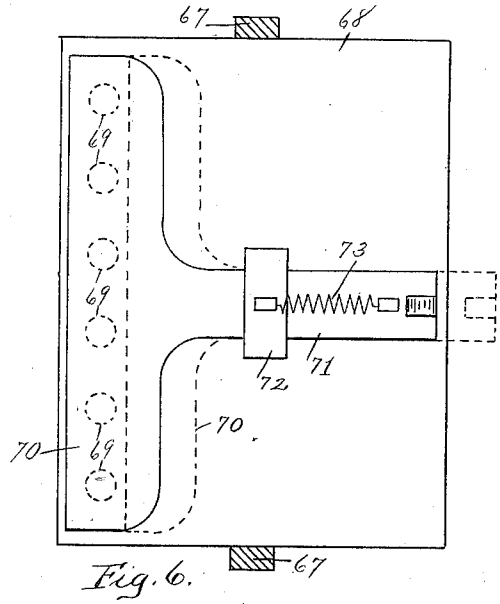

Fig. 6.

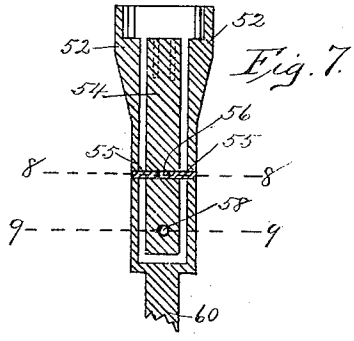

Fig. 7.

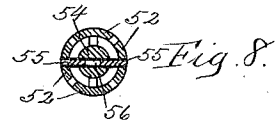

Fig. 8.

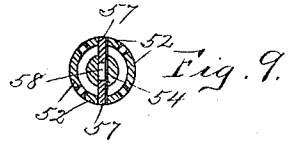

Fig. 9.

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UNITED STATES PATENT OFFICE.

HARVEY CHALMERS, OF AMSTERDAM, NEW YORK, ASSIGNOR TO HARVEY CHALMERS & SON, OF SAME PLACE.

BUTTON-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 680,909, dated August 20, 1901.

Application filed April 4, 1901. Serial No. 54,247. (No model.)

To all whom it may concern:

Be it known that I, HARVEY CHALMERS, a citizen of the United States, residing at Amsterdam, county of Montgomery, and State of New York, have invented certain new and useful Improvements in Button-Drilling Machines, of which the following is a specification.

The invention relates to such improvements; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings and the reference characters marked thereon, which form a part of this specification.

Similar characters refer to similar parts in the several figures.

Figure 1 of the drawings is a top plan view of my improved button-drilling machine. Fig. 2 is a view in side elevation of the same. Fig. 3 is a view in elevation of the gear mechanisms shown at the right-hand end of Figs. 1 and 2. Fig. 4 is a view, partly in elevation and partly in cross-section, taken transversely of the chuck-supporting head. Fig. 5 is a top plan view of the feed-tray. Fig. 6 is a bottom plan view of the same. Fig. 7 is a central vertical section of one of the chucks. Fig. 8 is a cross-section of the same, taken on the broken line 8 8 in Fig. 7. Fig. 9 is a similar section taken on the broken line 9 9 in Fig. 7.

The principal object of my invention is to provide for the rapid and accurate drilling of buttons, and more particularly to provide for the simultaneous drilling of a plurality of buttons and also to prevent breakage of buttons by the drills.

Referring to the drawings, 1 represents the bed of my improved machine, and 2 the drill-stand, which is capable of reciprocating slide movements thereupon in the usual well-known manner.

Reciprocating slide movements may be imparted to the drill-stand in any known manner, as by means of a cam-follower 3, fixed on the bottom of the stand and adapted to engage a grooved cam 4 on the shaft 5, rotary in bearings in the bed or frame of the machine. Power may be transmitted to the shaft 5 from the main drive-shaft 6 in any known manner, as by belt 7, belt-pulleys 8 and 9, pinion 10, and gear 11, said gear being fixed on the shaft 5 and said pinion on the shaft 12, provided with the driven belt-pulley 9.

Mounted in bearings upon the drill-stand are a plurality of drill-spindles 13, each provided at its inner end with a drill 14. These drill-spindles and drills may be rotated in any known manner, as by providing each spindle with a belt-pulley 15, adapted to be connected by belt 16 with a similar pulley 17 on the main drive-shaft, said belt connections being adapted to permit the reciprocating slide movements of the drill-stand without interfering with the rotary movement of the drill-spindles.

The button-chuck-supporting rotary head 18 is rotatively mounted upon the cross-shaft 19, supported in a fixed position by means of the uprights 20, erected from the bed of the machine. This head is provided with four chuck-supports, forming radial projections 21, occupying positions ninety degrees apart on the head. Each of these angularly-arranged chuck-supporting projections comprises a skeleton frame containing in its outer end bearings 22 for a plurality of chucks 23, rotatively mounted therein. In the drawings six chucks are shown thus supported by each of said radial projections, said chucks forming a series extending longitudinally of the axis of the rotary head. The parts are so arranged that when the head is rotated each series of chucks thus supported can be brought opposite to and in line with the gang of drills, so as to support button-blanks inserted in said chucks in position to be acted upon by said drills as the drill-stand is reciprocated toward and from the head. Means are provided for accurately maintaining the head in this position at certain times to permit of the proper application of the drills to the button-disks. For this purpose each of the radial projections 21 is provided with a socket 24, adapted to receive a latch 25, movable in a slideway 26 on the frame of the machine and adapted to be yieldingly forced toward and held in said socket by the spring 27. So long as said latch is inserted in the socket the rotary head 18 is maintained

in a fixed position. By releasing this latch the head can be rotated by hand or in any known manner to successively bring its several series of chucks opposite the drills.

As a means for automatically releasing the latch I provide a gear 28, meshing with and driven by pinion 29 on the shaft 5, said gear being provided with a cam 30, adapted at each revolution of said gear to engage and operate the tappet 31, which operates the rock-arm 32, operatively connected with the latch, causing the latch to be withdrawn from its socket against the force of its controlling-spring 27. This same gear 28 also serves as a means for imparting intermittent rotary movements to the head, being provided with a cam 33, adapted as said gear continuously rotates to engage successively with several pins 34 on the gear-wheel 35, which meshes with a gear 36, fixed upon the rotary head.

The parts are so arranged and proportioned that each complete rotation of the gear 28 will cause a quarter-rotation of the rotary head and that the latch 25 will be withdrawn from its socket just before said rotary movement of the head commences and will be released just as the head completes its quarter-rotation, its spring 27 thereupon forcing said latch into its socket to lock the head in a fixed position. The several series of chucks can thus be brought successively opposite the drills.

For the purpose of adapting the machine to insert a plurality of apertures in the buttons the parts are so arranged that when the head is maintained in a fixed position by the latch 25 each chuck in the series presented to the drills will be slightly eccentric to the drill adapted to coöperate therewith, and it will be seen that while the head is maintained in this position if intermittent partial rotary movements are imparted to the several chucks different portions of the button-disks will be brought into line with the respective drills, permitting the insertion of a plurality of apertures disposed about the center of each button-disk.

I have shown means whereby intermittent partial rotary movements can be simultaneously imparted to all the chucks in the same series, said means comprising gears 37, fixed upon the respective chucks and arranged to intermesh in series, whereby a rotative movement imparted to any one of said gears will be transmitted to all of the series. It is therefore only necessary to provide means for imparting intermittent partial rotary movements to one of this series of gears to secure the presentation of different parts of the button-disks to the drills for the formation of a plurality of holes in all the buttons supported in that series of chucks. For this purpose I provide the shaft 38, rotatively mounted in bearings on the frame of the machine and extending at right angles to the axis of the rotary head, which shaft is provided on its outer end with a pinion 39, rotatively connected with the gear 28 through the intermediate gear 40. The other end of this shaft is provided with a cam projection or arm 41, adapted at each rotation of its supporting-shaft to engage one of a series of four pins 42, fixed upon the adjacent end gear of the series of gears 37 and by engagement with such pin to cause a quarter-rotation of said gear, as well as of the gears intermeshing in series therewith. The pins are so located that each movement of the gear caused by engagement of said arm 41 with one of the pins brings the next pin of the series into position to be similarly engaged by said arm in its next rotary movement. Each complete reciprocating movement of the drills is accompanied by a complete rotary movement of the shaft 5 and pinion 29. The pinions 29 and 39 being of the same size it will be seen that for each reciprocating movement of the drills there is caused a quarter-rotation of each chuck presented to the drills and of the button-disks supported by said chucks. It is therefore only necessary to so locate the arm 41 on the shaft 38 that it will cause the intermittent rotary movements of the chucks to occur at the proper time in the intervals between successive applications of the drills to the button-disks in order to secure the formation of four holes in each disk, said holes being ninety degrees apart and symmetrically disposed about the center of the disk.

The mechanism above described for imparting intermittent rotative movements to the rotary chuck-supporting head is adapted to impart to said head a quarter-rotation for every four rotations of the pinion 29, every four complete reciprocating movements of the drills, and each complete rotation of the button-chucks. It will thus be seen that the rotary head having been brought into a position such that a series of chucks is opposite the gang of drills, if power is applied to continuously rotate the shaft 5, the drills will be moved into engagement with the respective chuck-supported button-disks to form the first of the series of holes therein. Then the drills will recede and a quarter-rotation will be imparted to each chuck and button-disk. The drills will again be moved into engagement with the disks to form the second hole of the series ninety degrees from the first hole. The drills will again recede. Another quarter-rotation will be imparted to the chucks and button-disks. The drills will be again moved into engagement with the disk to form the third hole of the series diametrically opposite the first hole. The drills again recede. The chucks and disks are given another quarter-rotation. The drills are again brought into engagement with the disks to form the fourth hole of the series diametrically opposite the second. As the drills again recede the cam 30 on the gear 28 engages one of the pins 34 on the gear 35 to cause a partial rotation of said gear 35, with a resultant quarter-rotation of the rotary head,

the latch 25 being operated in the manner above described. This quarter-rotation of the head brings the next series of chucks opposite the drills, whereupon the several operations are successively repeated.

It is of great importance that the chucks should be accurately positioned with reference to the drill and maintained in such position throughout each drilling operation. To secure such accuracy in the position of the chucks, I provide a series of dogs adapted to severally engage and lock the respective gears 37. I prefer to have a separate dog for each member of the series of gears 37, and I have shown each of the radial head projections 21 provided with a cross-shaft 43, upon which are fixed three dogs 44, each provided on its gear-engaging end with a single tooth adapted to enter and fit the groove between two adjacent teeth on the engaged gear and alternating with three other dogs 46, each provided on its gear-engaging end with a groove adapted to receive and fit a tooth on the engaged gear 37. Each shaft 43 is provided with an arm 48, connected by spring 49 with a suitable resistance, which may be the similar arm 48 on the neighboring shaft 43, whereby said dogs are yieldingly held in engagement with their respective gears 37 to effectually prevent rotative variation of said gears. As a means for releasing said dogs when it is desired to impart partial rotary movements to the chucks I provide the shaft 38 with a cam 50, adapted at each rotation of said shaft to engage an offsetting arm 51 on the shaft 43 to cause a rocking movement of said shaft just in advance of the engagement of the arm 41 with the pin 42 on the gear 37, which rocking movement causes the dogs to release the gears 37 to permit them to be rotated in the manner above described. The cam 50 passes out of engagement with the arm 51 just as the quarter-rotation of the gears 37 is completed, permitting the springs 49 to force said dogs into engagement with the gears 37 to lock the same before the drills are brought into engagement with the button-disks.

The rotary head may be provided with any desired number of radial projections 21, it only being necessary to vary the relations of the cams and gears to secure the proper rotative movements of the head to present its several series of chucks successively to the drills.

Any desired number of apertures may be formed in the button-disks, it only being necessary to vary the relations of the arm 41 and pins 42 to secure the desired angular movement of the button-disks between successive engagements of the drills therewith.

In making buttons from disks of shell or other brittle material great difficulty is experienced in providing such buttons with a plurality of holes by drilling, due to the fact that the formation of a number of holes in close proximity to its center is apt to so weaken the central portion of the disk that it is unable to withstand the final drilling operation, the pressure of the drill being sufficient to break and force out the whole central portion of the disk. The breakage resulting from this cause is a serious item of loss to the manufacturer.

An important feature of my invention consists in a novel form of chuck whereby I am able to support the central portion of the disk against the force of the drills without interfering with the drilling operation.

My improved chuck comprises the split hollow body forming the jaw members 52, the chuck-head 53, and the core 54, located interiorly of the hollow jaw-body and provided on its outer end with a disk-supporting face. The chuck-head is provided with a conical socket adapted to receive the conical exterior of the jaw members, whereby when the jaw members are drawn into said socket the same are contracted to cause the chuck-jaws to clamp an inserted button-disk. The core 54 is supported within the hollow jaw members by means of a plurality of pins projecting in radial lines interiorly from the jaw members into radial apertures formed in said core adapted to receive and fit said pins, respectively, and permit the same to slide therein as the jaw members expand and contract. Certain of these pins are arranged out of line one with another, and I have shown two sets of such pins, one set (55) inserted in opposite directions in the diametrical aperture 56 and the other set (57) at right angles to the first set and at some distance from the same measured longitudinally of the core, inserted in opposite directions in the diametrical aperture 58 in the core, the sliding-pin connections thus occupying different radial and transverse planes. The pins 55 prevent a lateral movement of the core longitudinally upon the pins 57, and in like manner the pins 57 prevent lateral movement of the core longitudinally upon the pins 55, whereby the core is always supported centrally of the jaw members whether the same are contracted or expanded. Any desired number of such pins and apertures may be employed. This core being at all times located centrally of the chuck, I am able to provide the same in its outer face with a plurality of recesses 59, corresponding in number and location with the number and location of holes it is desired to form in the button-disk, each of said recesses being adapted to receive the drill as the same penetrates the button-disk, and the end or face of the core between said recesses being adapted to support the center of the disk against the thrust of the drill, so that the same cannot be broken or forced out by the drill.

The button-disks may be inserted in and removed from the several chucks in any known manner, as by hand. I have shown my machine, however, provided with means for automatically operating the chucks to expand and contract the chuck-jaws and also with means for automatically inserting a button-

disk in each member of a series of chucks while expanded. The jaw members of each chuck are provided with a spindle 60, which passes through bearings 61 and 62 on the rotary head, the inner bearing being formed through the central portion of the head and opening interiorly thereof. This spindle is provided with an inclosing spring 63, which bears at its outer end upon the bearing 61 and at its inner end upon a nut 64 on a screw-threaded portion of said spindle. This spring tends to force the spindle toward the center of the head, causing the jaw members to be drawn firmly into the conical seat in the chuck-head to contract the chuck-jaws. The cross-shaft 19 is cut away or recessed to form a cam-surface 65, adapted as the head is rotated to engage the several angularly-arranged chuck-spindles successively. The recess 66 in said shaft is sufficiently deep to permit each spindle at certain times to be forced by its spring 63 interiorly of the rotary head a sufficient distance to cause the desired contraction of the chuck-jaws by the conical seat in the chuck-head. The recess 66 is so located in the shaft 19 that when the chucks are in position to be presented to the drills their spindles will be opposite said recess, in which position the disks are firmly clamped by the contracted chuck-jaws. As rotary movement is imparted to the head 18, the inner end of the drill-spindle is brought into engagement with the cam-surface 65, which forces said spindle outwardly against the force of its spring 63, permitting the chuck-jaws to expand and release the button-disk and also permitting the insertion of another button-disk therein. Supported by the brackets 67 is a feed-tray 68, having its inner end located above the head 18 and in close proximity to the uppermost radial head projection 21 when the head is locked by the latch 25. The inner end of this tray overhangs the series of chucks mounted in said uppermost radial head projection 21 and is provided with a series of apertures 69, arranged concentrically with the respective chucks, each of said apertures being of a size to loosely receive a button-disk. The slide-plate 70 on the under side of said tray serves as a valve to close the several apertures 69, said apertures being adapted to be opened by a slide movement of said plate, as indicated by dotted lines in Fig. 6. Button-disks may be inserted in the apertures 68 when closed by said slide-plate and will be retained therein until said apertures are opened by a movement of the slide-plate, which simultaneously releases all of said disks and permits them to pass downwardly by gravity through said apertures into the subjacent chucks.

The cam-recess 66 is so formed that while the chucks are supported in their uppermost position adjacent to the feed-tray the chuck-jaws are maintained in an expanded condition, so that the chucks are free to receive the button-disks as the same drop through the tray-apertures when released by the movement of the slide-plate.

It will be seen from an inspection of Fig. 3 that only a slight rotative movement of the head 18 is necessary to carry the spindle of the uppermost chuck beyond the higher portion of the cam-surface 65, so that the spindle is released by the cam and forced by its spring 63 to securely clamp the button-disk before the chuck is sufficiently inclined to permit the button-disk to change its position therein. As the chucks approach their lowermost position the engagement of the chuck-spindles with the cam 65 causes the chucks to be expanded and the disks to be released to fall by gravity from the chucks. The slide-plate 70 is provided with a shank 71, fitting in a slideway 72 on the under side of the tray, and is also provided with a controlling-spring 73, which tends to maintain such plate in a position to close the apertures 69. This slide-plate may be automatically operated to open the apertures 69 at the proper time by means of a lever 74, fulcrumed upon a fixed bracket 75 and having its upper end pivotally connected with the shank 71 of said slide-plate and its lower end adapted to be engaged by a cam 76 on the gear 28. It is therefore only necessary for an attendant to insert button-disks in the apertures 67 in the feed-tray during the intervals between successive intermittent rotary movements of the head 18.

It is characteristic of the feeding mechanism of my machine that a flat feed-tray is employed in which the valved apertures are formed, which tray is adapted for the arrangement and distribution of button-blanks thereupon and their insertion in such apertures by hand, as each disk must be placed in its aperture with its front side uppermost and its arrangement cannot be left to chance.

The valve-operating mechanism is constructed and arranged to both open and close the valve while the chuck is in line therewith and stationary, thus allowing more than the mere interval of movement of the chuck and head for the insertion of blanks in the valved apertures. One operator can thus fill a large number of such holes, and each row of chucks extending longitudinally of the axis of the head may contain as many individual chucks as the number of holes the operator can keep supplied with blanks.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a button-drilling machine, the combination with a drill and means for rotating the same; of a rotary head opposed to said drill; a plurality of button-chucks located in different angular positions about the periphery of said head; each with its axis radial to the head; means for imparting to said head intermittent, partial rotary movements corresponding in amplitude with the angular distance between said chucks; means for main-

taining the head at certain times in a stationary position with one of said chucks opposite, and eccentrically disposed to, said drill; means for imparting to said chuck, when so disposed and while the head is maintained stationary, intermittent, partial rotary movements; and means for causing reciprocating movements between said drill and head, alternating with said intermittent, partial rotary movements of said chuck.

2. In a button-drilling machine, the combination with a plurality of drills and means for rotating the same; of a rotary head; a plurality of series of button-chucks located in different angular positions about the periphery of the head, the chucks in each series corresponding in number with said drills, and being arranged longitudinally of the axis of said head with the axis of each chuck radial thereto; means for imparting to said head intermittent, partial rotary movements; means for maintaining the head stationary at certain times with a series of said chucks opposite, and severally eccentrically disposed to, said drills respectively; means for imparting to said chucks intermittent, partial rotary movements while the head is stationary, and means for causing reciprocating movements between said head and drills.

3. In a button-working machine, the combination with a plurality of button-working tools, of a like plurality of button-chucks separately rotatively mounted upon a support opposite the respective drills; and mechanism directly interconnecting said chucks whereby independent rotation is prevented; and means for imparting rotative movements simultaneously to all of said chucks, each on its own axis.

4. In a button-working machine, the combination with a plurality of button-working tools; of a like plurality of button-chucks separately rotatively mounted upon a support opposite said tools; intermeshing gears fixed upon the several chucks; and means for imparting rotative movements to one of said gears and chucks, whereby all are operated.

5. In a button-drilling machine, the combination with a plurality of drills and means for rotating the same; of a like plurality of button-chucks separately rotatively mounted upon a support opposite the respective drills and directly interconnected to rotate in unison; means for imparting to one of said chucks intermittent, partial rotary movements whereby all are similarly operated; and means for causing reciprocating movements between said chucks and drills alternating with the intermittent, partial rotary movements of the chucks.

6. In a button-drilling machine, the combination with a plurality of drills and means for rotating the same; of a like plurality of button-chucks separately rotatively mounted upon a support opposite the respective drills; gears on the several chucks intermeshing with one another in series; means for imparting to one of said chucks and toothed gears intermittent, partial rotary movements, whereby all are simultaneously operated; and means for causing reciprocating movements between said chucks and drills alternating with the intermittent, partial rotary movements of the chucks.

7. In a button-drilling machine, the combination with a plurality of drills and means for rotating the same; of a rotary head opposite said drills; a plurality of sets of button-chucks individually rotatively mounted upon said head, the members of each set of chucks being adapted to be brought opposite the respective drills by rotative movement of the head, and being interconnected to rotate in unison; means for imparting to said head intermittent, partial rotary movements whereby the several sets of chucks are successively brought opposite said drills; means for imparting to one of said chucks in each series, when opposite the drills, intermittent, partial rotary movements; and means for causing reciprocating movements between said drills and head, alternating with the intermittent, partial rotary movements of said chucks.

8. In a button-drilling machine, the combination with a drill and means for rotating the same; of a button-chuck rotatively supported opposite said drill; a gear on said chuck; means for positively imparting to said chuck and gear intermittent, partial rotary movements of definite amplitude; a dog engageable with said gear to prevent rotative displacement thereof; means for positively holding said dog out of engagement with said gear during its positively-imparted partial rotary movements and releasing said dog and forcing the same into engagement with said gear at the end of each such movement; and means for causing reciprocating movements between said drill and chuck, alternating with said intermittent, partial rotary movements of the chuck, substantially as described.

9. In a button-drilling machine, the combination with a plurality of drills and means for rotating the same; of a like plurality of button-chucks each separately rotatively mounted upon a support, opposite and eccentric to one of said drills; gears on the respective chucks intermeshing with one another in series; a plurality of dogs engageable with a like plurality of said gears respectively; means for simultaneously disengaging said dogs from their respective gears and imparting partial rotary movements to one of said gears and thereby to all of said chucks; and means for causing reciprocating movements between said drills and chucks alternating with the partial rotary movements of the chucks, substantially as described.

10. In a button-working machine, the combination with a button-working tool, a flat feed-tray provided with an aperture adapted to receive a button-disk placed therein by hand; and a valve adapted to close said aperture; of a button-chuck located beneath

said feed-tray; means for moving said chuck into and out of line with the aperture in the feed-tray and toward and from said tool; means for expanding the chuck when in line with said aperture and for contracting the chuck when presented to said tool; and means for opening said valve when the chuck is in line, and closing the same when the chuck is out of line, with said aperture.

11. In a button-working machine, the combination with a button-working tool; a rotary head opposite said tool; a flat feed-tray above said head provided with an aperture adapted to receive a button-disk placed therein by hand; of a plurality of button-chucks mounted upon said head and adapted by rotation of the head to be successively brought into axial line with said aperture and successively presented to said tool; a valve for closing said aperture; means for imparting to said head intermittent, partial rotary movements, and means for operating said valve in the intervals between successive movements of the head.

12. In a button-working machine, the combination with a series of button-working tools; a rotary head opposite said tools; and a flat feed-tray supported above said head and provided with a series of apertures adapted to receive buttons placed therein by hand; and a valve for said apertures; of a series of chucks arranged on said head parallel with the axial line thereof and adapted to be brought by rotation of the head opposite the respective apertures in the feed-tray and opposite the respective tools; means for imparting intermittent partial rotary movements to said head; and means for operating said valve to both open and close the same while the chucks remain beneath their respective apertures, substantially as described.

13. In a button-drilling machine, a button-chuck comprising expansible and contractible jaw members; and, within said jaw members, a core having a disk-supporting face provided with a drill-receiving recess and means for positively supporting said core centrally of the jaw members and on all sides free from contact therewith.

14. In a button-drilling machine, a button-chuck comprising expansible and contractible jaw members; and, within said jaw members, a core having a disk-supporting face provided with a plurality of drill-receiving recesses disposed about the center thereof and means for positively supporting said core centrally of the jaw members and on all sides free from contact therewith.

15. In a button-drilling machine, a button-chuck comprising expansible and contractible jaw members and on all sides free from contact therewith; and, centrally supported within said jaw members, a core having a disk-supporting face provided with a plurality of drill-receiving recesses disposed about the center thereof; in combination with a rotary drill; and means for bringing said drill into engagement with portions of a chuck-supported disk opposite the several core-recesses successively.

16. In a button-drilling machine, a button-chuck comprising in combination expansible and contractible jaw members; a core within said jaw members having a disk-supporting face provided with a plurality of drill-receiving recesses disposed about the center thereof; and a plurality of radial, sliding connections between said core and the respective jaw members, said connections occupying different radial and transverse planes.

In testimony whereof I have hereunto set my hand this 25th day of March, 1901.

HARVEY CHALMERS.

Witnesses:
W. S. DOUGALL,
D. D. HUBBS.