June 21, 1932. O. WITTE 1,863,737

BUTTON DRILLING MACHINE

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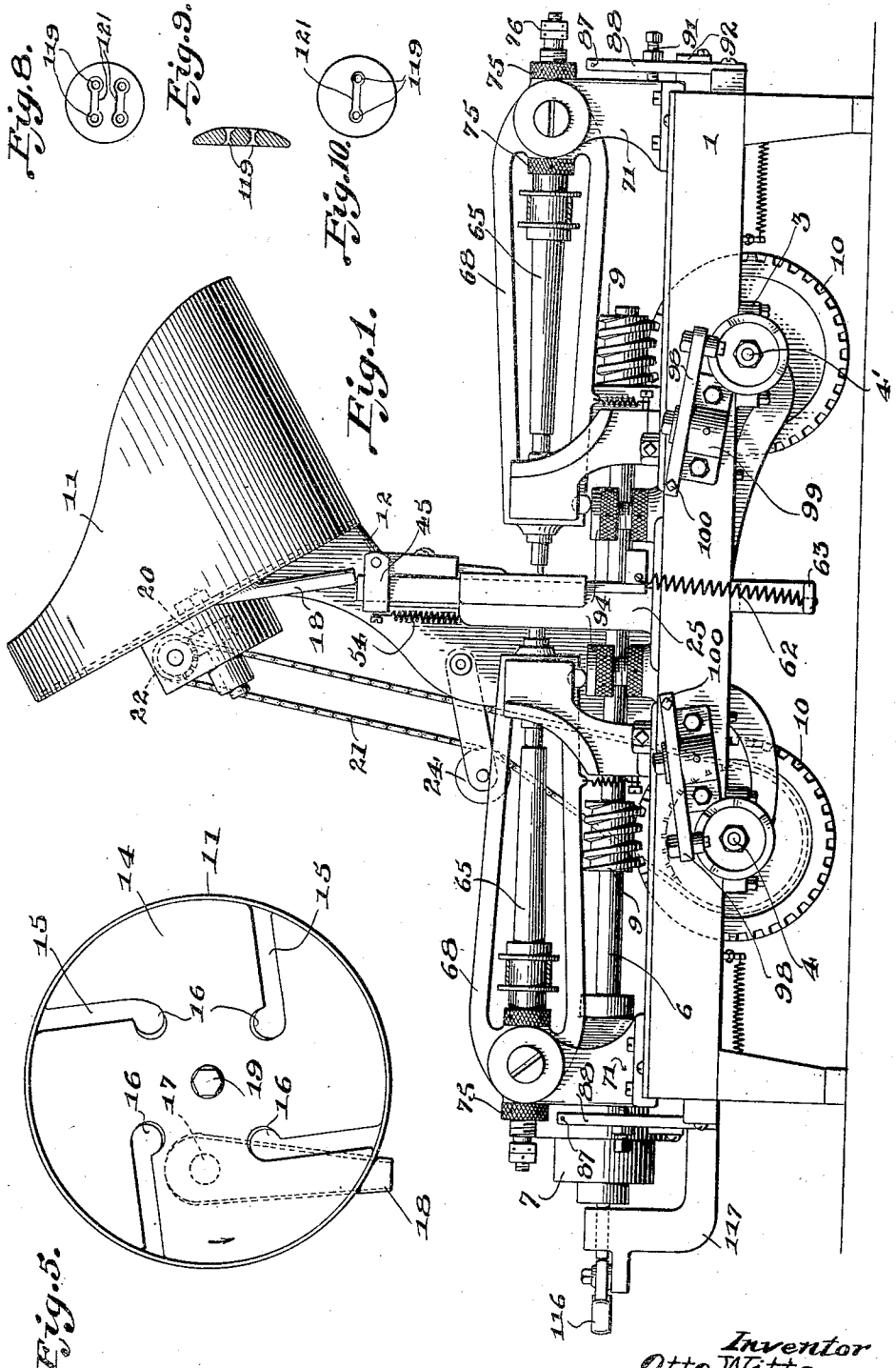


Fig. 1.

Fig. 5.

Fig. 8.

Fig. 9.

Fig. 10.

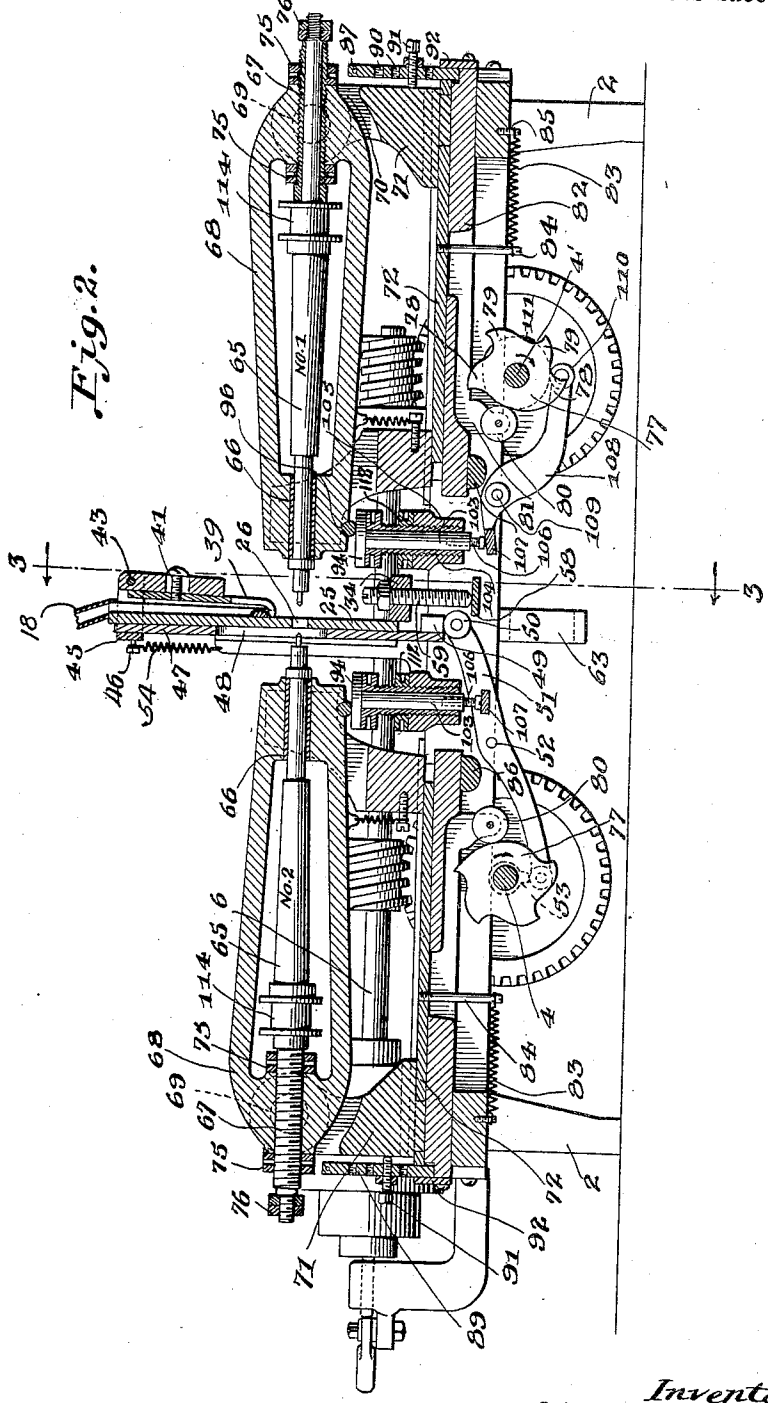
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BUTTON DRILLING MACHINE

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Fig. 2.



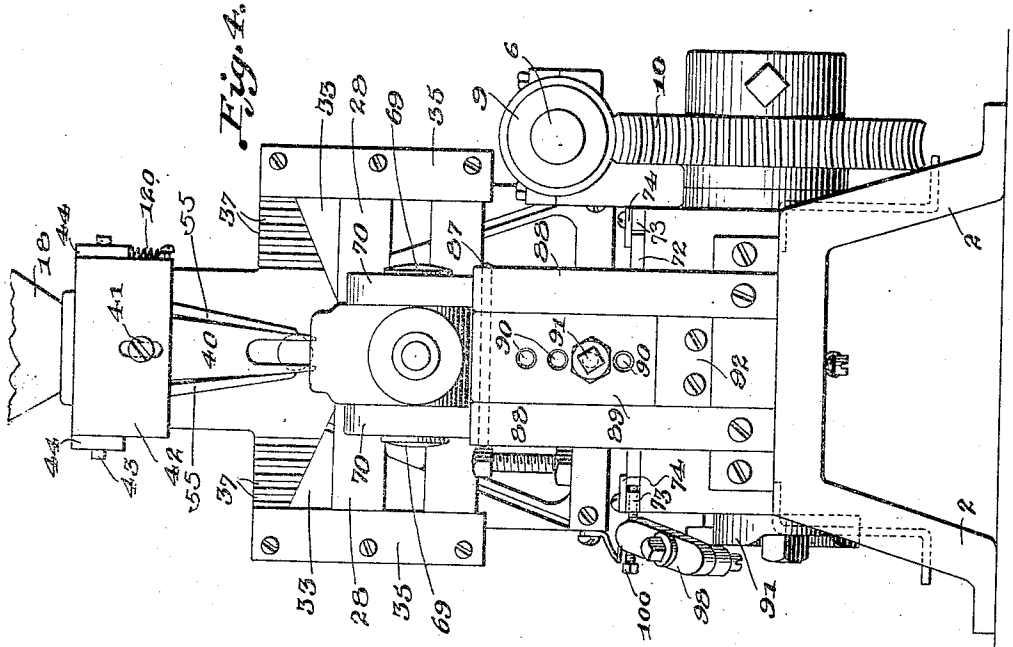
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BUTTON DRILLING MACHINE

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Fig. 4.



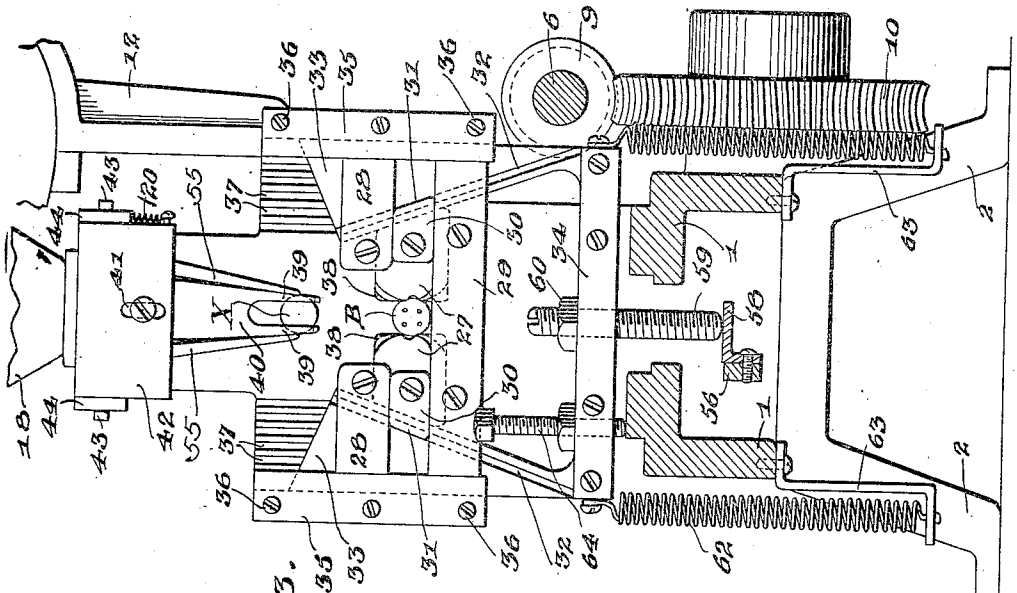


Fig. 3.

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BUTTON DRILLING MACHINE

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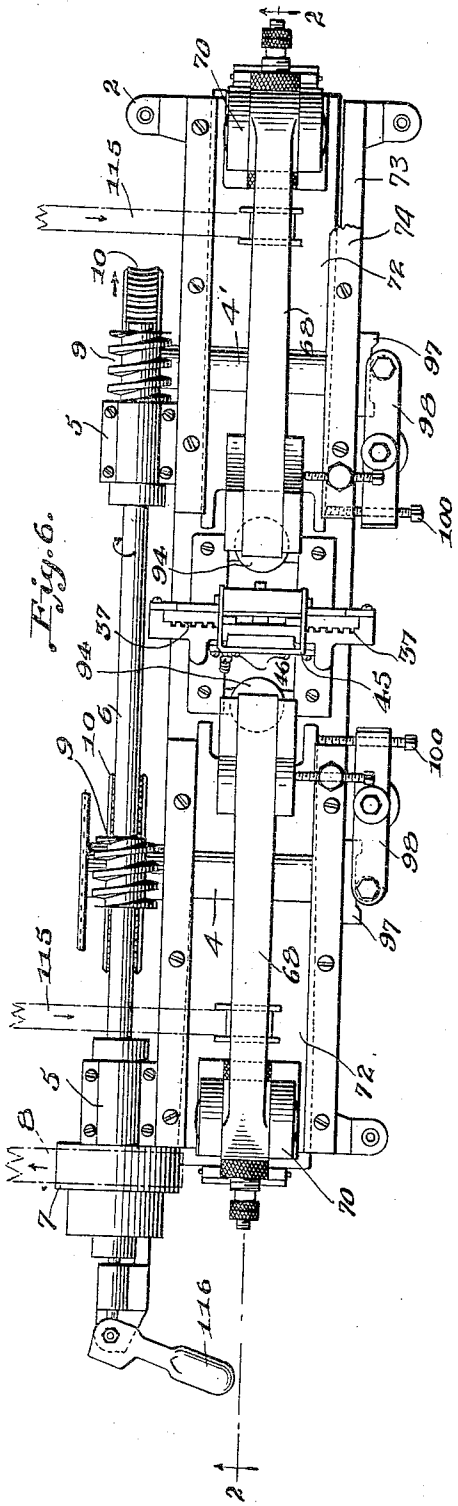


Fig. 6.

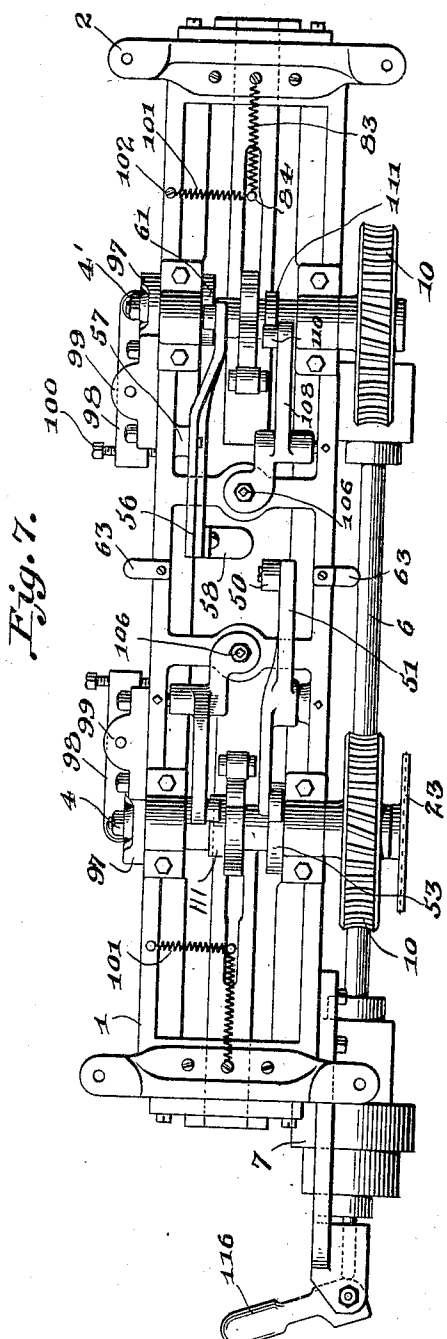


Fig. 7.

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UNITED STATES PATENT OFFICE

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BUTTON DRILLING MACHINE

Application filed August 27, 1929. Serial No. 388,676.

This invention relates to button drilling machines, particularly of the horizontal type, wherein a pair of opposed rotary drills operate upon the button from opposite sides thereof, and drill, ream and countersink the same automatically.

One of the objects of this invention is to produce a drilling machine which is automatic throughout its operation, and in which the button blank is fed to the automatically operating chucking jaws, released thereby from the feeding mechanism, drilled, and ejected from the machine when the drilling operation is completed.

Another object of the invention is to produce an automatic machine by which either a two-hole or a four-hole button may be produced.

Another object of the invention is to produce a button drilling machine in which one, or either of the drills, is utilized for cutting a transverse kerf on the face of the button, from hole to hole for the purpose of providing a thread groove.

Another object of the invention resides in means whereby the range of horizontal longitudinal movement of one, or either of the drills may be adjusted, whereby one of said drills may be utilized for countersinking the button from one side thereof, while the other drill is utilized for penetrating the button and countersinking the hole upon the opposite side of the button, in registry with the countersink produced by the first said drill.

It is a further object of the invention to provide a blank drilling machine in which a single hole may be drilled to produce such articles as game pieces.

It is a further object of the invention to produce a machine in which the various operating elements thereof are readily adjustable, whereby certain of the functions of the machine may be dispensed with, or altered to suit conditions, dependent upon the type or size of button being drilled.

These and further objects and advantages of the invention will appear and become readily apparent, especially to those skilled in the art of button drilling machines, upon reference to the following specification.

In the accompanying drawings, forming a part of this specification,

Figure 1 is a side elevation of the machine embodying the invention;

Figure 2 is a central longitudinal section of the machine, taken on the line 2—2 of Figure 6;

Figure 3 is a vertical sectional view taken on the lines 3—3 of Figure 2, looking in the direction of the arrows;

Figure 4 is an end view of the machine, viewed from the right in Figure 1;

Figure 5 is a top plan view of the button blank hopper;

Figure 6 is a top plan view of the machine without the button hopper;

Figure 7 is a bottom view of the machine;

Figures 8 and 9 are front and vertical sectional views respectively of a four-hole type of button which may be drilled with the machine; and

Figure 10 is a front view of a two-hole type of button.

Referring now more particularly to the accompanying drawings by numerals of reference:—The bed 1 of the machine is provided with a central longitudinal slot and is supported through the medium of legs 2, arranged in pairs at opposite ends thereof, said bed having journaled transversely upon the bottom thereof through bearing blocks 3, a pair of cam-carrying shafts 4, 4′, arranged respectively upon opposite sides of the longitudinal center of the said bed 1. Since the drill operating mechanism, including the drills and their supports are duplicated to a major extent upon opposite sides of the button feeding and chucking mechanism, to be hereinafter described, reference will be made to each of such mechanisms by like reference characters, except as to those elements of the construction which, however, are not common to both.

Journaled in bearing blocks 5 upon the rear of the bed 1, is a power shaft 6, having upon one end, a pulley 7 through which it may be driven by a suitable drive belt 8 from a source of power, not shown. Splined to the power shaft 6 are a pair of worm gears 9, which mesh with worm wheels 10 keyed on

the transverse cam-carrying shafts 4 and 4', and through which the drills are adjusted to cutting position with relation to the button in the chucking mechanism, to be later described, and to which said buttons are delivered from a hopper 11, supported from the bed of the machine by an arm 12. The buttons are fed from the hopper, through the medium of a rotary disk 14, having a plurality of diagonal slots 15, the inner ends of which terminate in circular pockets 16, registering progressively with an opening 17 in the upper end of a button chute 18, carried by and beneath the hopper 11.

It will be understood that buttons or button blanks are usually sharp and flat, or concave on one side and rounded or convex on the other side, and when the button presents its convex face to the pocket, it will slide out as the disk rotates and lifts it because the pocket cannot hold it, but if the button presents its sharp side to the pocket, it will catch on the edge of the pocket and be carried up by the disk 14. The pockets are only made deep enough to hold the buttons when the sharp edges of the buttons are presented thereto, and are not deep enough to hold the button when the rounded edge is presented thereto. It will also be noted that each of the pockets 16 is beveled on one side and has its other side left straight, as shown in Figure 5.

The rotary disk 14, which is rotatable on the axis 19, is driven through the medium of a worm and gear arrangement 20, shown in dotted lines in Figure 1 by a sprocket chain 21, trained over a small sprocket wheel 22, the shaft of which drives the worm and gear arrangement 20, and a relatively larger sprocket wheel 23, fast on the transverse cam carrying shaft 4, an idle pulley 24 being provided to maintain said chain 21 taut.

Referring now more especially to Figures 3 and 4, in connection with the button feeding and chucking mechanism, which presents the button and holds it securely against movement during the drilling operation, a vertical transversely disposed stationary plate 25 is mounted upon and secured to the bed of the machine at a point midway between its ends, and intermediate the drilling mechanism to be later described, said plate being provided with an opening 26, over which the button will register when in position for drilling.

The button chucking mechanism, shown more clearly in Figure 3, comprises a pair of jaws 27, suitably recessed upon their opposed faces to accommodate the button indicated at B, and movable transversely of the stationary plate 25 in upper and lower guides 28 and 29 respectively, which cooperate with guide plates 30 carried by the chuck jaws 27, the guide plates 30 being in turn provided with ribs 31 which are received within inwardly and upwardly inclined cam slots 32 formed in cam plates 33, carried by a vertically movable frame 34, the cam plates being guided in their vertical movements with the frame 34 by guide plates 35, fixed to the side edges of the stationary plate 25 by screws 36. It will be observed that the face of the stationary plate 25 is provided with vertical slots 37 which effectively clear the contacting faces of the cam plates 33 and stationary plate 35 of any accumulation of button dust, and prevent clogging by such dust, which would eventually necessitate stopping of the machine and removing the parts to clean the same. A machine provided with these clearance slots will run indefinitely without clogging, whereas, without the slots, it is necessary to shut down the machine every few days and remove the dust which packs between the contacting working faces of the parts in question and results in binding of said parts. The opposed edges of the chucking jaws 27, are further provided with bevelled or rounded portions 38 which serve the function of cams cooperating with the terminals of the button-blank-feeding spaced fingers 39, formed on the lower end of a plate 40, mounted for vertical adjustment, by means of a slot and screw connection 41, on a swinging bar 42, pivotally mounted at 43 upon the forward ends of the arms 44 of a yoke 45 embracing the upper reduced end of the stationary plate 25.

The frame 34, which carries the cam plates 33 for operating the chucking jaws 27 is moved upwardly to release said jaws, and consequently the button, through the medium of a lever 56, shown more clearly in Figure 7, said lever being pivoted intermediate its ends on a stud 57 formed on the inner side of the bed frame, and to the right side of the machine, as viewed in Figures 1, 2 and 7. The free end of the lever 56, is provided with a laterally extending plate 58, disposed beneath the lower end of an adjustable lifting screw 59 threaded into the frame 34 and secured by a lock nut 60, and so designed that, when said lever 56 is rocked on its pivot by means of a cam 61 keyed on transverse cam carrying shaft 4', the frame 34 with the cam plates 33 will be elevated to cause the chuck jaws to release the button, the frame being returned to its lowermost position through a pair of relatively heavy coil tension springs 62, connected at their ends respectively to the sides of the frame 34 and arms 63 supported from the underside of the bed 1, a stop screw 64 being adjustably threaded into the frame to limit the lower extent to which said frame will be moved. It will be understood that as the frame is moved into its lowermost position by the heavy springs 62, the chuck jaws 27 will be cammed inwardly and grip the button in working position. By vertical adjustment of the stop screw, it will readily be seen that the chucking position of the jaws, to accommodate larger or smaller buttons, may be regu-

lated. The cam 61 on shaft 4′, and 53 on shaft 4, are so timed that the button feeding fingered plate 40 will be in elevated position when the chuck jaw camming mechanism is in lowered position to grip the button, as shown in Figure 3, and the fingered plate in lower, button-positioning position when the cam plates 33 are in elevated position to separate the chuck jaws.

The yoke 45 is secured by screws 46 at the upper end of a vertically slidable plate 47, having a vertical elongated drill clearance slot 48, said plate terminating at its lower end in a lug 49, which in turn cooperates with a roller 50 on one end of a lever 51 pivoted at 52 intermediate it ends to the bed of the machine. Splined upon the transverse shaft 4 as shown in Figure 2, that is, on the left of the machine, is a cam 53, having a single elevation, which is arranged and so timed with the cycle of operations of the machine, that the lever is operated to elevate the vertically movable plate 47, and to permit it to be lowered once for every button which is drilled. The plate 47 is returned to its lower position, wherein it feeds a button to the chuck jaws, through the medium of a tension spring 54, the ends of which are attached respectively to the yoke through the medium of the screws 46 and a fixed part of the bed frame. The lower end of the button chute 18 discharges onto the stationary plate 25, the button blank being properly centered with respect to the feed fingers 39 through guide strips 55.

Referring now to the button drilling and countersinking mechanism shown more particularly in Figures 1 and 2, I have shown two drill spindles 65 each of which is mounted in bearings 66 and 67 at the forward and rear ends respectively of a vertically oscillatory spindle frame 68, provided with trunnions 69, having their bearings in a pair of spaced plates 70, formed integral with a standard 71 and carried by a slide plate 72, which is adapted to reciprocate longitudinally of the machine on the bed 1. between guide bars 73 having upper guide ledges 74 which restrain the slide plate 72 against vertical movement on said bed.

Longitudinal adjustment of the drill spindle in its bearings is made possible through a series of collars 75 and lock nuts 76, which of themselves do not constitute the major features of my invention, since various means may be employed for permitting the longitudinal adjustment of the drills.

The slide plate 72 is slightly less in width than the distance between the guide plates 73, the side edges being inclined inwardly and toward the center of the machine to a small degree, to permit said plate to oscillate on the bed, as occasion may require, and depending upon whether a button with a single center aperture, or a two or four hole button is being drilled. This slight inclination of the sides of the slide plate is shown in Figure 6, being indicated by dotted lines. For the purpose of transmitting reciprocatory movements to each slide plate 72 and to the drilling mechanism, a cam 77 is provided with a series of elevations 78 and 79, the elevations 78 being of one radii and the elevations 79 being of a different radii, for purposes which will be later explained.

These cams 77 which are suitably keyed on the transverse shafts 4 and 4′, during rotation, engage a roller 80, journaled on an arm 81 carried by a longitudinally reciprocatory plate 82 which in turn functions as the support upon which the slide plate 72 carrying the drill operates. The cams 77 function to reciprocate the plate 82, four times in one direction for every four hole button being drilled, the plate being returned to initial position each time by a coil tension spring 83, connected at its ends respectively, with a post 84 on the oscillatory plate 72, and a fixed part 85 on the machine frame. A transverse bar 86 serves as the forward support for the reciprocatory plate 82, while the rear rests upon the frame of the machine as shown in Figure 2. For the purpose of transmitting reciprocatory movement from each of the plates 82 to the oscillatory plates 72, there is pivotally supported at its upper portion at each end of the machine, at 87, between a pair of uprights 88, a swinging plate 89 provided with a vertical series of threaded apertures 90, in any one of which is adapted to be received, an adjustable thrust screw 91, the position of which in any one of said holes 90, determines the extent of movement of the drill in a longitudinal direction. The outer end of the slidable plate 82 is provided with a plate 92, which extends upwardly over the lower end of the swinging plate 89, in such manner, that, when the slidable plate moves in either direction, it simultaneously swings the swinging plate 89 upon its pivot, transmitting movement through the thrust screw to the standard 71 which supports the drill mechanism. Each of the spindles is provided with a pulley 114 driven by a belt 115 from a suitable source of power.

When the machine is employed for drilling a four-hole button, it is necessary to provide means for first oscillating the drill spindle laterally and for then moving the spindle vertically, and to this end means are provided for separately performing each of these functions, the mechanism for transmitting an oscillatory motion to each of the plates 72 and to the drill spindle 65 being first described. The forward end of the spindle frame 68 rests upon a hardened metal pilot 94 having a plane upper circular face, the under side of the spindle frame being pro-

vided with a hardened metal wear strip 96. Keyed on each of shafts 4 and 4′, is a cam 97 having a pair of facial cam elevations, suitably spaced apart, and cooperating with a roller on the free end of a lever 98 pivoted intermediate its ends in a bearing block 99 fixed on the side of the bed frame. At its other end, said lever is provided with an adjustable set screw 100, which passes through a registering opening in the guide plate 73 on the bed frame, and engages one side of the oscillatory plate 72 to move it laterally of the machine and properly direct the drill carried thereon with respect to the button blank, the said plate 72 being urged in the opposite direction by a tension coil spring 101, connected at its ends respectively, with the post 84 and with a fixed part 102 on the bed frame.

In the drilling of a four-hole button, of the type shown in Figures 8 and 9, it is necessary in my machine to not only drill holes at two points in a horizontal plane, but also to drill holes at two points in a vertical plane, this feature necessitating the employment of mechanism for periodically raising and lowering the drill spindle and its frame so that the drill point is properly located with respect to the button.

At this time, with particular reference to Figures 2 and 7, there will be described a mechanism, through which the functions of the machine just stated, are performed. Arranged at the forward end of each of the drill frames is the pilot 94, previously referred to, this pilot having a round stem 103 mounted for vertical movement as well as rotary movement in a bushing 104, threaded upon its exterior, and vertically adjustable in a cross-bar 105, forming a part of the bed frame. Into the lower end of the stem 103 is threaded a screw 106, the head of which may be engaged by the inner end 107 of a lever 108 pivoted at 109 to the bed frame 1. The other end of the lever 108 is provided with a friction roller 110 which cooperates with a cam 111 splined or keyed on the transverse shaft 4′, said cam being so formed that the pilot 94 is raised and lowered once for every four reciprocations of the drill. The bushing 104 is provided with a lock nut 112 through which it may be locked in proper elevation. In connection with the pilot feature, it is, of course, unnecessary to bring the drill elevating mechanism into operation when drilling a two-hole button of the type shown in Figure 10, and when such a button is being drilled, it is desired that the pilot control mechanism be thrown out of operation, and to this end, the screw 106, is either removed from the pilot stem, or else screwed down far enough into the stem that the inner end of the lever 108 does not engage therewith, during its rocking movements. Thus, the pilot is idle at such times. Within the main drive pulley 7 is a suitable clutch mechanism, not shown, which is controlled by a clutch lever 116 carried on a bracket 117 on the bed of the machine.

In each of the forms of buttons shown in Figures 8, 9 and 10, it will be observed that the holes 119 are not only countersunk from both sides, but that the openings transversely of the button on the flat side are joined by kerfs 121, which serve as recesses for and to prevent cutting of the sewing thread, and also result in the thread being below the plane of the button face when sewed upon the garment, and it is one of the functions of my machine to automatically cut this kerf from hole to hole, in the manner which will be set forth in the following description of the operation of the machine.

Operation

Assuming that the elements of the machine are in the position shown in Figure 2, and that a button blank has been delivered from the hopper 11 into the feeding mechanism where it is held by the feed fingers 39 on plate 40: cam 53 on shaft 4 rotates until the low point thereon permits the lever 51 to be rocked, thus allowing the vertically slidable plate 47 under the action of tension spring 54 to be lowered, said plate carrying with it the yoke 45 bringing the button blank X intermediate the chuck jaws 27. During this movement of the yoke and the feeding plate 40, the chuck jaws are moving inwardly under the action of the cam plates 33, and as they approach the button gripping position, the beveled portions thereof engage the tips of the feeding fingers 39, and cam or wedge them outwardly with the swinging plate 42 on the yoke against the action of the tension spring 120 releasing the button blank, the action of the cam plates 33 being controlled by the action of the rotary cam 61 on shaft 4′, and lever 56 acting on the frame 34. The button blank is now held in fixed position by the chuck, and while thus held, drill 65 (No. 1) is caused through the cam mechanism 77 to be moved toward the button, being rotated by the pulley and belt 114—115, the drill penetrating the button blank only about one-half its depth, and forming a countersink; the drill now recedes under the action of the spring 83, and the opposing drill 65 (No. 2) on the other side of the button comes into action through the cam on shaft 4, and due to a certain adjustment of the screw 91 on the swinging plate 89, will have a greater extent of lineal movement than the first mentioned drill (No. 1), penetrating the button through the countersink made by the first drill, and countersinking the button on this side also. The second drill (No. 2) now recedes, and the first drill, through the action of the cam 97 on the side of the machine frame, causes the drill frame to be oscillated to bring drill No. 1 opposite a new drilling

position at which time the cam 77 again comes into operation moving the drill forwardly again and causing the drill to countersink the button laterally of the first hole. The first drill (No. 1) again recedes clear of the button, but the second drill (No. 2) while receding to withdraw the drill point, does not entirely clear the button, but in its lateral movement to a new drilling position in which it drills through the button where the opposing drill (No. 1) had just countersunk, drags across the button face, cutting a kerf from the first hole drilled to the second hole which it is about to drill.

Both of the drills are now permitted to be lowered to a new drilling position, due to the action of the cams 111 on levers 108 and pilots 94, at which time both drill points are under the first holes drilled. Operation of each of the drills (Nos. 1 and 2) is now repeated, and when the button is fully drilled, the cam plate carrying frame 34 is raised by the cam mechanism described, and the button released when it drops into a receptacle below the machine. The cycle of operation is now repeated, it being understood that, with relation to the drills, the cam operating mechanism is so arranged and timed that the operation of drill No. 2 is always slightly in the rear of No. 1. It is to be understood that the extent of movement of the drills may be readily adjusted by adjustment of the screws 91 in the swinging plate, and that the timing of the operations of the several elements of the machine may be readily changed by substitution of different forms of cams. When drilling a two hole button, it is, of course, understood that the pilot operating mechanism is dispensed with in the manner earlier explained.

Many slight changes might be made without in any way departing from the spirit and scope of the invention.

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

1. In a button drilling machine, button feeding means, button chucking means, a pair of opposed button drills, means for longitudinally reciprocating said drills in alternation, in one horizontal plane, means for reciprocating said drills in alternation in a second horizontal plane, means for oscillating said drills in alternation, longitudinal reciprocation and the oscillation being so timed as to cause one of said drills to cut a kerf transversely of the button during the oscillating movement thereof.

2. In a button drilling machine, button feeding means, button chucking means, a pair of opposed button drills, means for longitudinally reciprocating said drills in alternation, means for transversely oscillating said drills in alternation, means for vertically oscillating said drills in alternation, longitudinal reciprocation and the oscillation being so timed as to cause one of said drills to cut a kerf transversely of the button during the oscillating movements thereof.

3. In a button drilling machine, button feeding means, button chucking means, a pair of opposed drills, means for longitudinally reciprocating said drills, means for adjusting the range of longitudinal movement of either of said drills, means for transversely oscillating said drills, and means for vertically oscillating said drills.

4. In a button drilling machine, button feeding means, button chucking means, a pair of opposed drills, means for longitudinally reciprocating said drills in alternation, means for transversely oscillating said drills in alternation, means for vertically oscillating said drills in alternation, and means for disconnecting said vertically oscillating means.

5. In a button drilling machine, button feeding means, button chucking means, a pair of opposed drills, means for advancing and retracting said drills, one in advance of the other, means for controlling the range of longitudinal movement of one of said drills, means for transversely oscillating said drills, one in advance of the other, one drill being reciprocated farther than the other and varying in range of longitudinal movement timed to the oscillation so as to cut a kerf during the transverse oscillation thereof in one direction.

6. In a button drilling machine, a machine frame, button feeding means, button chucking means, a pair of opposed drills, a pair of transverse rotary shafts, journaled in said machine frame, a series of cams on each of said shafts for each of said opposed drills, means intermediate each of said cams and said drills for longitudinally reciprocating the drills in a plurality of horizontal planes, and transversely oscillating said drills in alternation.

7. In a button drilling machine, a machine frame, button feeding means, button chucking means, a pair of opposed drills, a pair of transverse rotary shafts journaled in said frame, a series of cams on each of said shafts for each of said drills, means operated by each of said series of cams for longitudinally reciprocating said drills, transversely oscillating said drills, and vertically oscillating said drills in alternation.

8. In a button drilling machine, a machine bed frame, button feeding means, button chucking means, a pair of drill frames mounted upon said bed frame, a pair of transverse rotary shafts journaled in said frame, a pilot for supporting the forward end of each of said drill frames, a rotary drill journaled in each of said drill frames, cam mechanism on said shaft for longitudinally reciprocating each of said drill frames, cam mechanism on said shaft for oscillating each of said

drill frames, cam mechanism on said shaft for vertically oscillating each of said pilots, and means intermediate each of said drill frame reciprocating means and said drill frame for adjusting the range of longitudinal reciprocatory movement of said drill frames.

9. In a button drilling machine, a machine frame, button feeding mechanism, button chucking mechanism, means on said button chucking mechanism for releasing said button from the feeding mechanism to the chucking mechanism, means for adjusting the degree of movement of the jaws of said chucking mechanism, a pair of opposed drills, supporting frames for said drills, means for longitudinally reciprocating said supporting frames in alternation, means for transversely oscillating said drill supporting frames in alternation in a plurality of horizontal planes in succession, means for vertically oscillating said drills in alternation, a pilot mechanism in connection with said vertically oscillating mechanism for supporting the forward ends of the supporting frames, means for connecting or disconnecting said pilot mechanism, and means for governing the range of longitudinal movement of either of said drills.

In testimony whereof I have affixed my signature.

OTTO WITTE.