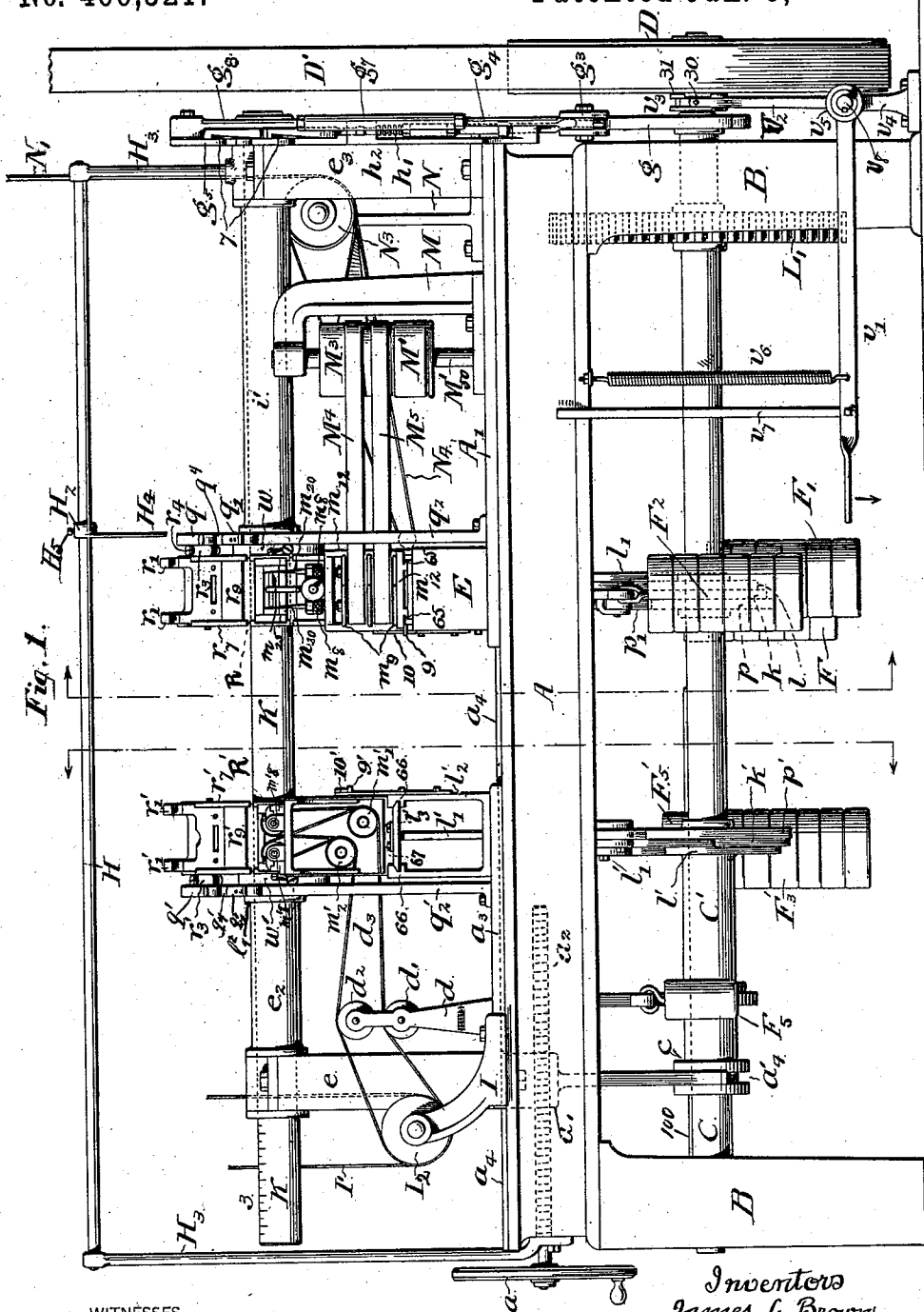


(No Model.)

7 Sheets—Sheet 1.

J. L. BROWN, H. D. WALTON & G. RICH.
MACHINE FOR SLOTTING, BORING, AND CUTTING UMBRELLA STICKS.
No. 466,321.

Patented Jan. 5, 1892.



WITNESSES:
M. S. Shapleigh.
W. O. Harvey.

Inventors
James L. Brown
Henry D. Walton
George Rich
BY Mark Wilkes Collier
ATTORNEY.

(No Model.)

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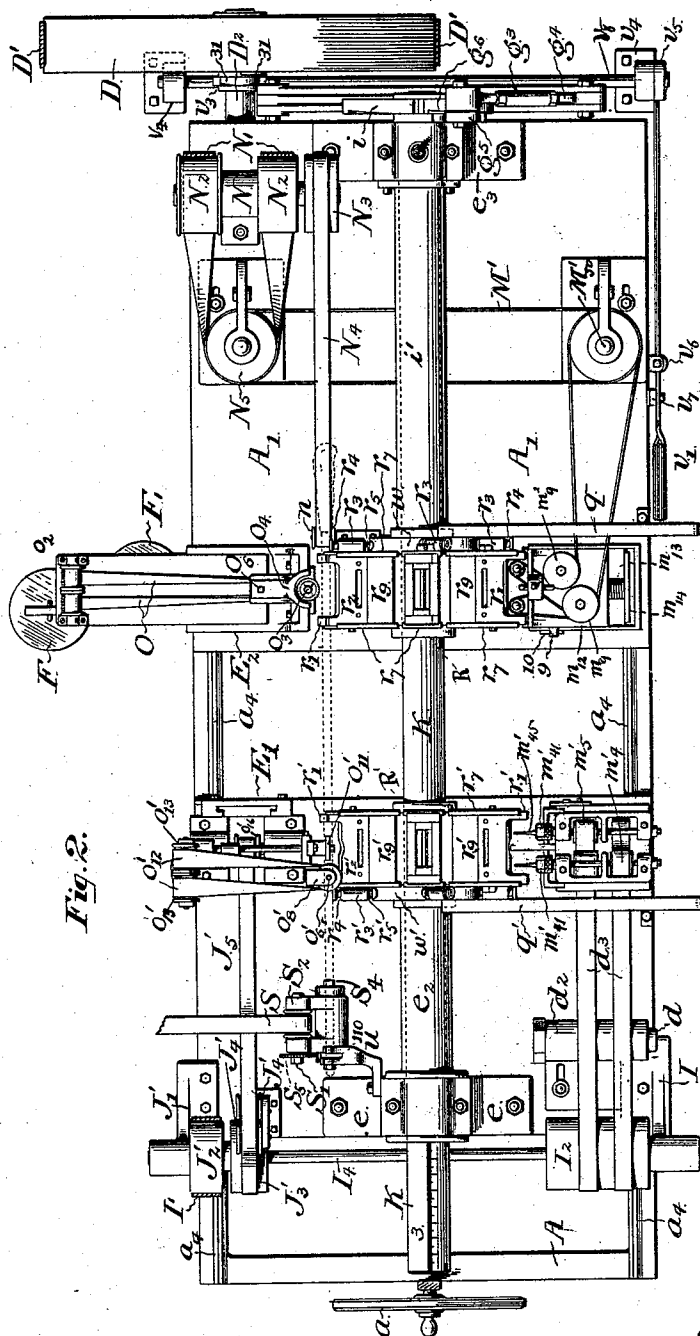


Fig. 2.

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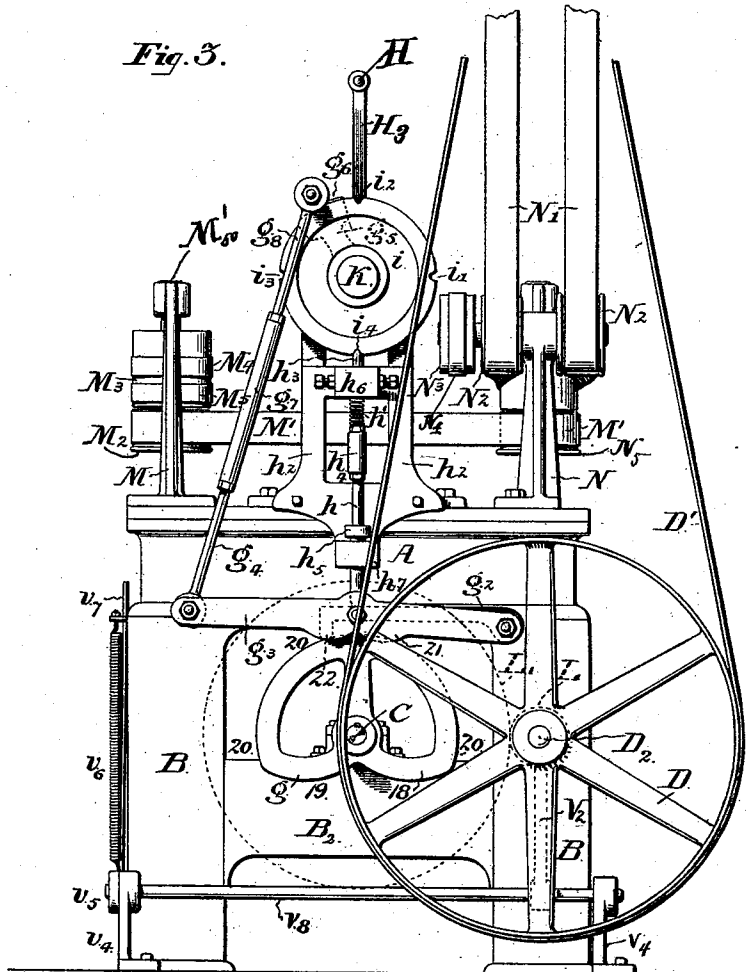
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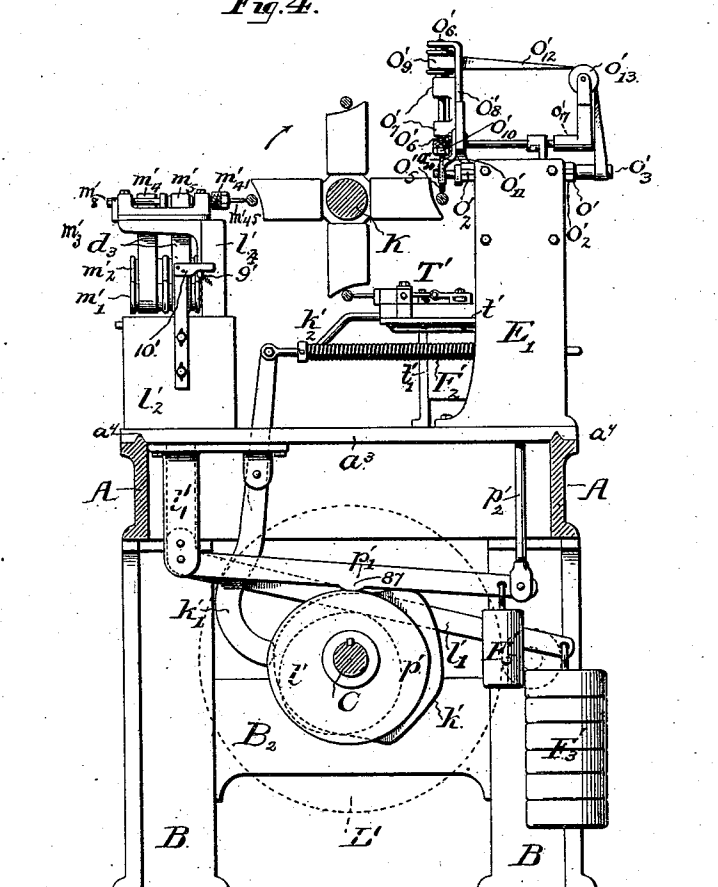
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Fig. 4.

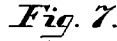


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7 Sheets—Sheet 5.

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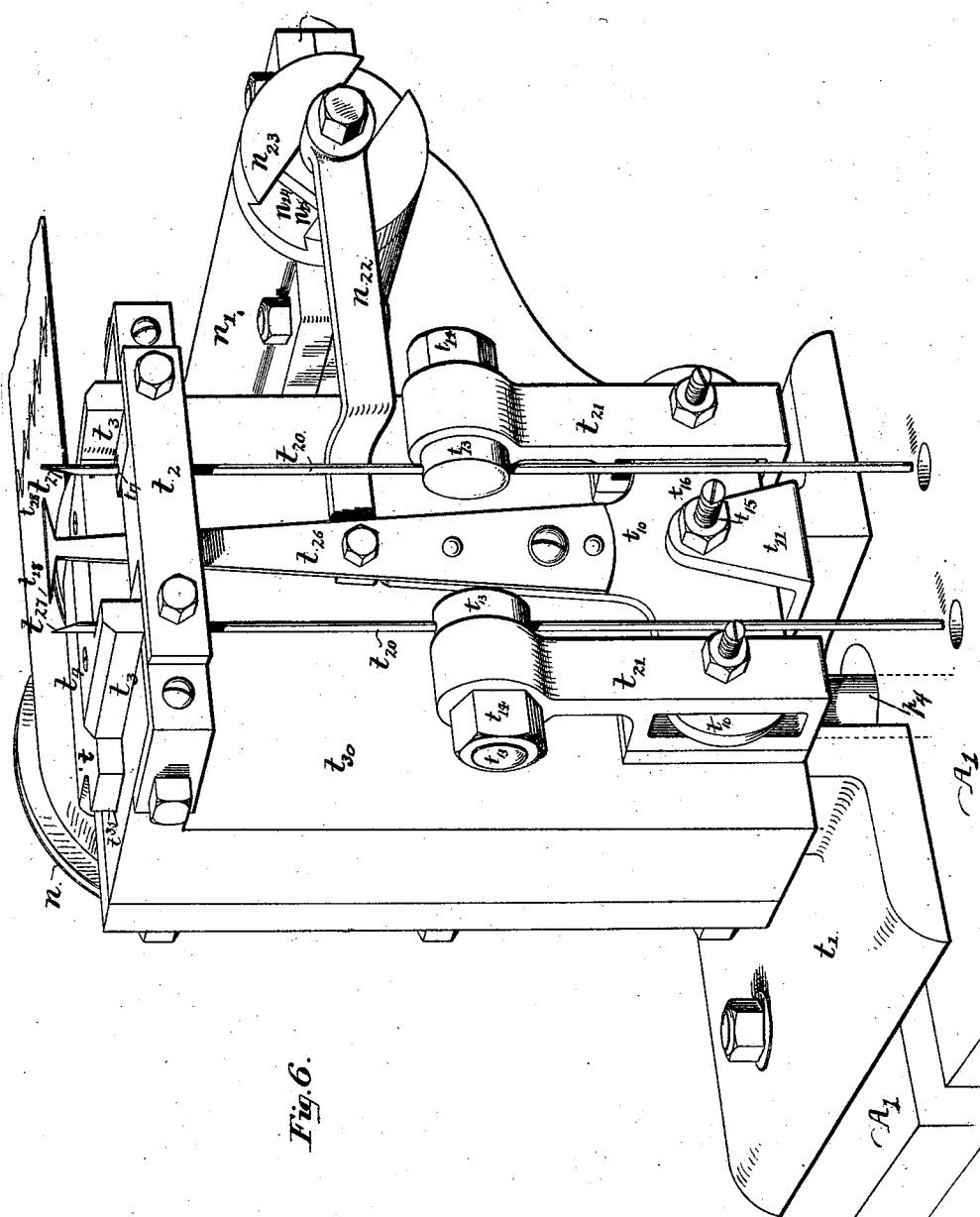
(No Model.)

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WITNESSES:

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M. S. Shapleigh.
W. S. Harvey.

Inventors

James L Brown
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Mark Wilkes Collet

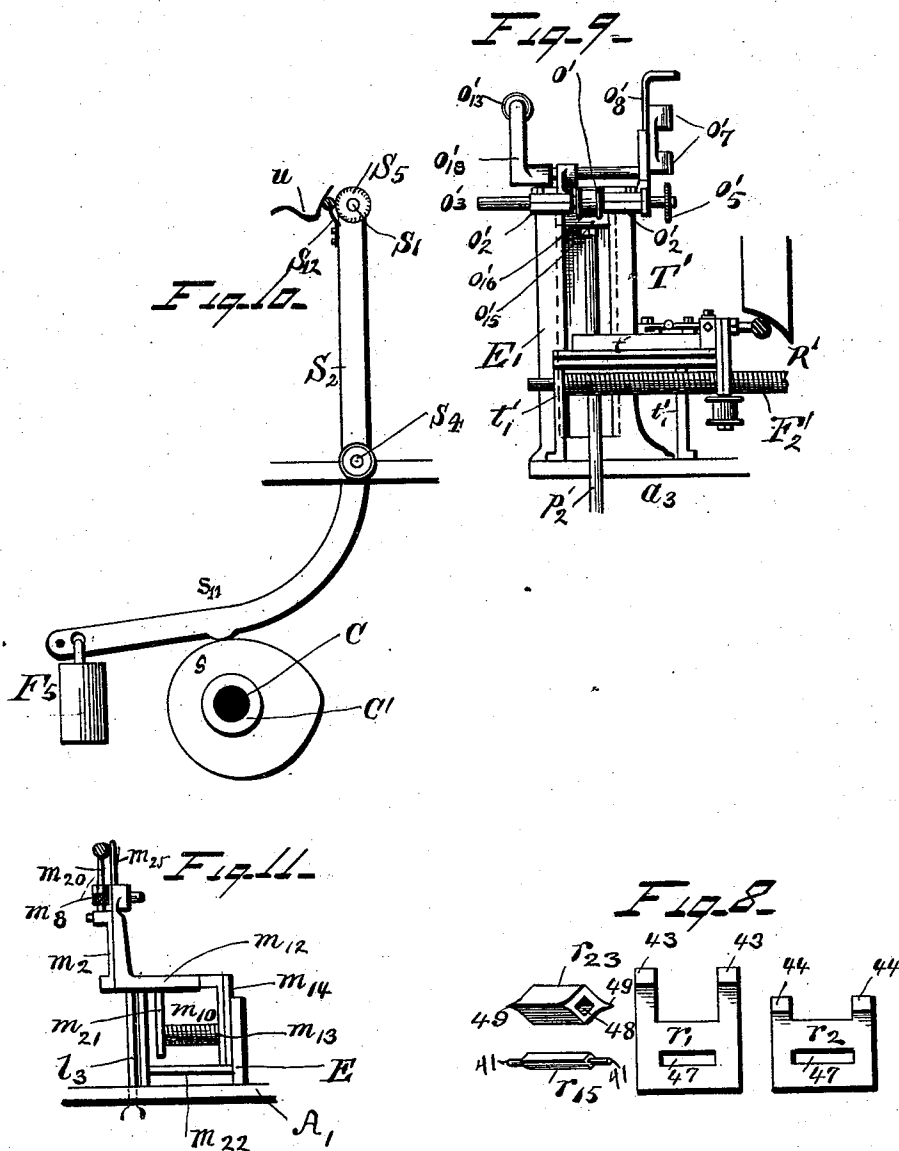
BY

ATTORNEY.

(No Model.)

7 Sheets—Sheet 7.

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MACHINE FOR SLOTTING, BORING, AND CUTTING UMBRELLA STICKS.
No. 466,321. Patented Jan. 5, 1892.



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UNITED STATES PATENT OFFICE.

JAMES L. BROWN, OF PHILADELPHIA, PENNSYLVANIA, HENRY D. WALTON,
OF MOORESTOWN, NEW JERSEY, AND GEORGE RICH, OF PHILADELPHIA,
PENNSYLVANIA, ASSIGNORS TO FOLLMER, CLOGG & CO.

MACHINE FOR SLOTTING, BORING, AND CUTTING UMBRELLA-STICKS.

SPECIFICATION forming part of Letters Patent No. 466,321, dated January 5, 1892.

Application filed January 24, 1890. Serial No. 338,025. (No model.)

To all whom it may concern:

Be it known that we, JAMES L. BROWN, of the city of Philadelphia and State of Pennsylvania, HENRY D. WALTON, of Moorestown, New Jersey, and GEORGE RICH, of Philadelphia, Pennsylvania, citizens of the United States, have invented certain new and useful Improvements in Machines for Slotting, Boring, and Cutting Umbrella-Sticks, of which the following is a specification, reference being had to the drawings annexed.

The main object of our invention is to bore, slot, and cut at the ferrule end umbrella or parasol sticks in an automatic manner, the stick once placed in the stick-holder by the operator being clasped therein, presented to the operative devices, held before them while the operation is performed upon it, and removed from this position when the operation is completed without the interference of the operator.

A second object is to cut the slot and bore the holes placed in its neighborhood without removing the stick from the carrier, which will automatically carry it from one device to another, and a third to cut the slots and holes at the top as well as the bottom of the stick at the same time and at an adjustable distance from each other.

A fourth object is to actuate relatively the tools and stick-carrying mechanism in such a manner that the active stroke or movement whereby the cut is made in the stick is made in such a manner that it will be spring controlled or yielding, and the fifth object is to regulate the range of this stroke or movement by stop devices which may be, if desired, adjustable, and may also be adapted to impinge directly upon the stick.

Among the other objects are to cut a square slot—a thing not previously done in umbrella-making, except by hand—to remove the stick automatically from the stick-carrier after its revolution, and to cut off at the same time with making the slots the end of the stick.

Figure 1 shows a side elevation of the machine on the side occupied by the operator. Fig. 2 shows a plan view of same, the bar H and its appendices being removed. Fig. 3 is an end elevation showing the means of ro-

tating the shaft K and centering the stick-carriers. Fig. 4 shows a section of the machine viewed from the center, looking toward the movable table a_3 . Fig. 5 shows a corresponding view looking toward the side of the motive power, drawn much more in detail. Fig. 6 is a view of the mortising-tool used to square out the saw-kerf. Figs. 7, 8, and 9 show details of construction. Figs. 10 and 11 show the cut-off saw and the drills and their attachments.

Similar letters and numerals refer to similar parts in all the figures, a single letter sometimes appearing, however, in the large drawings to designate a part as a whole, while in the detail drawings other letters are used to indicate the parts.

In a machine adapted to cut the slots and drill holes both at the handle end and at the runner-stop simultaneously it is necessary, if these cuts are to be made simultaneously and sticks of more than one size of umbrella are to be used in the machine, that means should be employed to adjust relatively the distance apart of the points of operation of the cutting-tools. To accomplish this end we prefer to make our frame-work in the following manner:

We make the frame-work of our machine of supports B B B B, upon which we place a frame A A A A, at one end of which we place a stationary bed-plate A_1 and cut upon the top of the longitudinal pieces of the frame A projecting ways $a_1 a_1$. Upon this part of the frame A we place a sliding bed-plate a_3 , cut in its under surface to fit upon the projecting ways $a_1 a_1$ and movable horizontally thereon. On cross-pieces $B_2 B_2$, extending between the supports B B, we mount on bearings the shaft C, and supported upon standards e_3 , secured to the stationary bed-plate A_1 , and standard e , secured to the movable bed-plate a_3 , is the shaft K. Upon the shaft C we place a keyway 100 and a sleeve C_1 , fitted on the keyway so as to move freely longitudinally on the shaft C, but compelled to rotate with it. Upon this sleeve we place a collar c , in which is fitted a hanger a'_4 , extending downward from the movable bed-plate a_3 . Upon the shaft K is placed the sleeve e_2 , secured to the standard e . On the

upper part of the hanger a'_1 is placed a female screw a_1 , in which works a male screw a_2 , which terminates in a shaft which works in the frame A and is attached to a wheel a , by the rotation of which the movable bed-plate a_3 and the sleeves C_1 and e_2 are moved along the ways a_4 and shaft C and K, respectively.

To hold the sticks while being operated upon by the tools, we place upon the shaft K the stick-carriers R R', which revolve therewith, the stick-carrier R being keyed thereon and the stick-carrier R' being attached to the sleeve e_2 by a loose-fitting collar P_4 and moving on a keyway on the shaft K, whereby, as is plain to any mechanic, the portion R' of the stick-carrying mechanism will be enabled to revolve with the revolution of the shaft K and will be adjustable longitudinally thereon with the sleeve e_2 . We consider the best mechanical construction of this stick-carrying mechanism to consist of a sleeve r_{12} , having projections r_9 and r'_9 , respectively, set at equal angles with each other. (We make them right angles.) To the sides of each one of these projections are screwed plates r_7 , cut out to contain the sliding blocks r_1 r_2 . On each end of the side of these blocks, away from the sleeve r_{12} , are jaws 43 44, extending outward from the body of the block and bent over toward the other block, the jaws 44 falling beneath the jaws 43 and having their ends sliding toward the block r_2 . These blocks slide also toward the bottom against the sides of the projections from the sleeve r_{12} , and are thus held in sliding contact. In each of these pieces (see Fig. 8) is cut a slit 47, and between these pieces when they are placed in position we place a rocker r_{23} , having projections 49 49, which fit into the slits 47 47, and a square perforation 48, through which is placed the square spindle r_{15} , turned round at the ends 41, which penetrate the side plates r_7 and are secured by nuts or other suitable devices. The motion of the two blocks r_1 and r_2 is by this means made reciprocal. The motion downward of one by pressing down the projection 49 in its own slit 47 produces an upward motion of the other projection 49 of the rocker r_{23} , which acts as a lever fulcrumed on the line of the end 41 of the spindle r_{15} . On the inner side of the jaw 43 we cut to center the stick exactly a V-shaped notch 46 and opposite it on the outside of the jaw 44 a similar V-shaped notch 45.

To clamp the jaws upon the stick automatically and to release them when the stick is to be removed, we consider the following a preferable form of mechanism: On the outside of one of the plates we place a piece r_3 , which we secure immovably to an end 41 of the spindle, so that it moves with it and the corresponding motion of the rocker r_{23} and the blocks r_1 r_2 , and we place at its end toward the lower block r_2 a socket, in which is placed a stud r_4 , the extremity of which rests on an immovable cam w , attached to an immovable sleeve i' on the shaft K, attached to the standard e_3 .

A corresponding stud r'_4 is placed in a socket r'_3 , attached to the plate r'_7 , and is connected with the same by the spring r'_5 and has its extremity resting on the cam w' , attached to the sleeve e_3 . By means of these devices the jaws 44 and 43 are forced toward each other when the stud r_4 rests upon the part of the cams having a larger radius. These studs are attached to the sockets of the piece by means of a spring r_5 , so as to enable sticks of different sizes to be held by the stick-carrier and to prevent the sticks from being bruised.

We prefer to mount the cutting-tools with reference to the stick-carrying mechanism in the following manner: On the bed-plate A, opposite the arms of the stick-carrier R and similarly on the sliding bed-plate a_3 we place the various boring and slotting mechanisms, each being placed so that it will be in front of an arm of the stick-carrier when they are locked in their various positions, as will hereinafter be described. We make the set to operate upon the slot near the handle usually to consist of a saw, a mortising device to square out the kerf of the saw, and a pair of drills cutting the holes for the wires to retain the springs, and the set to operate upon the upper slot of a saw to cut the slot, and a drill to cut the hole for the runner-stop, a mortising device, and a pair of drills to cut the holes to retain the top spring. We place them in this order to avoid the risk of destroying the saws and the mortising devices by broken pieces of the drills that might be left in the stick.

Describing the best way which we know of arranging the tools in a machine cutting both slots simultaneously in the ordinary type of umbrella, beginning with the tools operating near the handle, a very good way to mount the saw designed to cut the slot is as follows: Upon the bed-plate A₁ we place the upright E₂, having sliding in ways on its top the carriage k_2 , at the end of which toward the shaft K are the uprights k_{15} , to which are secured the bearings o o , in which revolves the spindle. On this spindle is placed near the top a small circular saw o_3 , and farther down the pulley-wheel o_5 , by means of which the rotation is given by the belt O, passing round the two idlers O_2 , placed on the extension k_3 of the carriage k_2 to the shafting of the mill. This upright E₂ is placed on the side of the bed-plate A₁ toward which the stick-carrier moves the stick last inserted and is of sufficient height to bring the saw to a level with the stick when it is locked in its first position, as will be described, and of a longitudinal distance on the table sufficient to bring the saw to the center of the space between the jaws 44 44 43 43 of the stick-carrier.

After the saw-kerf has been made we prefer that the stick should be presented to a mortising device, by means of which the rounded edges of the kerf may be squared out. In practice this device is mounted as

follows: Upon the bed-plate A_1 , by means of plate t_1 , we place an upright t_2 to which are secured bearings n_1 , containing a spindle, on the end of which is a pulley-wheel n and having sliding in ways T_{35} (see Fig. 6) the mortising device T . A most excellent form of this mortising device consists (see Fig. 6) of a plate t_{30} , to the front of which is pivoted, by means of an arm t_{11} and the screw t_{15} and nut t_{16} , the three-armed vibrating lever t_{10} , to two of whose arms we pivot holders t_{21} , through which are passed the bolts t_{13} t_{13} , having a hole bored through them in the end toward the center and a screw and nut on the other side. Through the holes in the bolts t_{13} t_{13} are passed the chisels t_{20} t_{20} , which are secured to the holder by turning the nuts t_{14} , the chisels thus being adjustable to any desired length and easily replaceable when worn out or broken. These chisels pass through guides t_{17} , which allow of motion only in the direction of their length. To the middle arm of the vibrating lever t_{10} , which extends upward between the chisels t_{20} t_{20} , we rivet the T-headed chisel t_{26} , having the extremities t_{28} t_{28} of its head sharpened. Pivoted to the chisel t_{26} is a link n_{22} , eccentrically pivoted to the disk n_{23} , by which the sidewise motion is given to the chisel t_{26} and an in-and-out motion in the guides t_{17} to the chisels t_{20} t_{20} ; the chisel toward which the vibrating T-headed chisel is moving withdrawing and standing at its lowest point when the chisel t_{26} has moved farthest in its direction, the other meanwhile advancing until it stands at its highest point.

To regulate the throw of the T-headed chisel t_{26} , we attach the link n_{22} to an adjustable crank-plate n_{25} within a slide n_{24} , so that the decrease in size of the chisel t_{26} by sharpening can be counterbalanced by increasing the throw. We attach the disk n_{23} to the extremity of a spindle which is contained in bearings n_1 and which carries the pulley-wheel n , by which motion is communicated to the device. We place the upright t_2 upon the bed-plate A_1 on a line with the standard E_2 at a sufficient distance from the sides and ends of the bed-plate A_1 to bring the points t_{27} t_{27} when the plate t_{30} is pushed upward into contact with the rounded kerf left by the saw when the stick-carrier has removed a stick from the saw and locked it in the second position, as will hereinafter be explained.

We prefer to mount and drive the drills which cut the holes for the wires used to retain the springs in the slots in the ordinary type of umbrellas, and which consequently should cut the stick at right angles with the direction of the saw-cut in the following manner: Upon the bed-plate A_1 on a line with these other devices we place a frame E , most conveniently made four-sided, in which is placed (see Fig. 11) an interior frame, which we usually make to consist of side pieces secured to each other by pieces m_{14} and m_{22} . Sliding in ways 65 in the top of this frame is

a carriage m_{12} , on which is erected a standard m_2 , which contains two spindles on which are placed the pulleys m_3 and m_6 and chucks m_3 m_3 , in which are screwed drills m_{20} m_{20} . These spindles are placed parallel, and they have their centers as far apart from each other as it is desired the holes for the wires set to hold the springs should be cut in the stick. On the carriage m_{12} are placed spindles on which rotate the pulleys by means of which and of the pulleys m_3 m_6 the rotary motion is given to the drills. The frame E is placed on the bed-plate A_1 on a line with the other operative devices. We communicate motion to the mortising and boring mechanism by means of a belt N_1 , which passes around the shafting of the mill and beneath two coaxial idlers N_2 N_2 , which are supported from the bed-plate A_1 by the standard N , and around the pulley N_5 . Upon the same shaft as the pulleys N_2 we place a pulley N_3 , around which and the pulley n we place a belt N_4 , by means of which the mortising device is driven, and around the pulley N_5 and a pulley M_2 , placed on a shaft M'_{50} , which is supported between the curved uprights M and the bed-plate, we pass the belt M' . On the shaft M'_{50} are also placed two pulleys M_3 , around which are passed two belts M_4 M_5 , each of which passes around the idlers m_9 m_9 and m'_9 m'_9 , respectively, upon the carriage m_{12} , and which intermediately passing, the one around the pulley m_3 , the other around the pulley m_6 , communicate motion to the drills. It can readily be seen that a mechanic of ordinary skill can make many changes in these devices for procuring motion, it being merely necessary that the plane of the belt connecting the stationary with the moving pulley run at right angles to the plane of motion of the latter, and that the two pulleys be far enough apart to enable the belt not to be stretched or slackened too much by the motion of the movable pulley.

On the movable bed-plate a_3 , opposite the arms of the stick-carrier R' , as heretofore described, we place the set of tools designed to operate upon the upper slot and to make the hole for the stop. We make this set to consist, when the stick of an umbrella of the ordinary type is to be cut, of a saw and a drill that cuts a hole above the slot to admit the runner-stop, a mortising device, and a pair of drills similar in their operation to the mortising device and drills that operate on the lower slot. An excellent way to mount these various devices is as follows: Upon the movable bed-plate a_3 we erect an upright E_1 , and moving in vertical ways thereon (see Fig. 9) we place a carriage o'_{15} , to which are secured bearings o'_2 o'_2 , which contain a spindle o' , lying parallel to the table and perpendicular to the stick as presented by the stick-carrier. Upon this spindle directly over the center of the stick, when held, as before mentioned, by the stick-carrier, we place a circular saw o'_5 , and also place upon it the pulley-wheel o'_{10} .

by which motion is communicated to the device. We place on a line with and at a distance above the saw corresponding to the distance of the stop from the top spring-slot of an umbrella a drill, which is secured by means of a chuck o'_{10} to the bottom of a spindle o'_6 , contained in bearings o'_7 , attached to an upright o'_8 , erected on the bearings o'_2 and being perpendicular to the bed-plate a_3 . Attached to the upright o'_8 we place an elbow-piece o'_{18} , which is suitably supported from the bearings o'_2 , and which bears two coaxial idlers o'_{13} o'_{13} . Around these idlers and the pulley o'_9 and the pulley o'_3 we place a belt o'_{12} , by which the motion of the spindle o' is communicated to the drill. The upright E_1 is placed longitudinally on the movable bed-plate a_3 , so as to bring the spindle o' , and consequently the saw, at a convenient position between the jaws of the pieces r'_1 r'_2 of the stick-carrier R' high enough to let the carriage move upward enough to let the saw easily clear the stick.

Upon the movable bed-plate a_3 , by means of uprights or supports t'_1 , we place a horizontal bed-piece t' , in which are cut ways in which slides a mortising device T' , made of the same parts and in the same manner as the mortising device T , placed on the bed-plate A_1 . The bed-piece t' rests on its supports t'_1 , which are high enough to bring the chisels of the mortise on a level with the stick when held in the second position by the stick-carrier, and is placed so as to bring them into the kerf left by the saw o'_5 . On a line with these two devices on the movable bed-plate a_3 we place a two-sided frame l'_2 , in the top of which we cut lugs 66 66, in which slides a carriage l'_3 , having at one end an upright projection l'_4 , in vertical ways in which slides a carriage with a horizontal projection m'_3 . Upon this horizontal projection we place in bearings the spindles m'_8 m'_8 , on which are placed the chucks m'_{41} to hold the drills m'_{45} , and the pulleys m'_4 m'_5 . Upon the vertical portion of the carriage are placed the coaxial idlers m'_1 m'_1 and m'_2 m'_2 to aid in conveying the power to the drills.

It will be noticed that the saw o'_5 , the mortising device T' , and the drills are all moved in their ways in planes at the same angle with the planes of motion in their ways of the saw o_3 , mortising device T , and drills m_{20} m_{20} , respectively, which angle is the angle (which we make a right angle) between the direction of the upper slot and the lower.

To give motion to the cutting and boring tools on the sliding bed-plate a_3 , we place a shaft I_1 , revolving in bearings placed upon the standards J'_1 I_1 , placed thereon. On this shaft we place a pulley J'_2 , on which runs a belt I' , communicating with the shafting of the mill. Upon this shaft we place a pulley J'_3 , and in a line with it and the pulley o'_{16} on the spindle o' we place on a standard erected on the bed-plate a_3 and sufficiently high to bring them on a level with the spindle

o' the pulleys J'_4 J'_4 . Around all these pulleys we place the belt J'_5 , by which the spindle o' is rotated. Upon the shaft I_1 we place pulleys I_2 , around which pass belts d_3 , which pass over pulleys d_2 d_1 , placed upon a standard d , which is high enough to raise the belts to a level with the idlers m'_2 m'_1 beneath these pulleys and around, respectively, the pulleys m'_5 m'_4 upon the drill-spindles.

We sometimes, to cut the sticks off either to a suitable length or to insure them from catching in the machine, place an automatically-operated saw where it will come into contact with the ferrule end of the stick. A good way of managing it with respect to the other parts is as follows: Nearer the end of the movable bed-plate a_3 we pivot on a stud S_4 , a vibrating arm S_2 , in which runs in bearings on the top a shaft S_1 , bearing a circular saw S_5 and a pulley, around which is passed a belt S , communicating with the shafting overhead. This arm is placed beneath the place at which the stick will be held by a horizontal arm of the stick-carrier at a distance long enough to bring the saw to the level of the stick so held and is pivoted so that the saw moves in a plane perpendicular to the stick. Opposite the saw to hold the stick we place an arm u , having a slit cut therein, into which the saw can pass when the end of the stick is cut off. We find it convenient to attach the arm u to the standard e , and to the arm S_2 we generally attach a spring S_{12} , which holds the stick firmly against the arm u .

The relative motion of the cutting-tools with reference to the stick upon which they are adapted to operate while it is held in the carrier is now to be considered. While it is in different, so far as the action of the tools upon the stick is concerned, in what manner the withdrawal stroke of the tool is made, it is for many reasons greatly advantageous that the active stroke or movement—the movement, that is, that brings the tools into operative contact with the sticks—should be yielding—that is, the mechanism controlling this stroke should be such as does not compel a certain and fixed range or velocity of stroke. If this active stroke should be positive—that is, should pass absolutely to a certain range and with a certain velocity—the tools would be forced into the much larger and more difficult cut that would be made by such a device in a thick hard stick, or a stick offering some obstruction to the passage of the tool—for instance, a small knot—as rapidly as through a stick presenting none of these obstructions, whereby a splintering or breaking of the stick and breaking of the tools would often occur unless power was wasted in driving their cutting motions at an excessive speed. Besides, unlike most other fiber-cutting, the slots in an umbrella-stick penetrating a fixed distance below the surface, the active stroke should bring the tool into action upon the stick until the tool has penetrated to a certain depth and no farther, and

not until the tool has cut down the material operated upon to a fixed size. To accomplish this result the active stroke is preferably regulated by stop devices, which can be either adjustable by a set-screw impinging on some part of the machine or automatically adjustable by being adapted to impinge on the stick in the stick-carrying mechanism.

What we consider the best mechanisms by which to actuate relatively the tools and stick-carrying mechanism to give the active stroke its yielding motion and to regulate the range of this stroke will now be described. We find it most convenient to make the withdrawal stroke positive, and in practice use the following mechanism for this purpose: To get the best effect of the slotting and boring tools upon the stick, we generally cause the cams to be shaped in such a way that the tools will be brought into action upon the stick, then slightly withdrawn in the cut (though this withdrawal need not extend to more than "easing them" in said cuts) and then allowed to go into action a second time before being finally withdrawn. The manner in which we prefer to accomplish this result we will describe below.

Upon the shaft C and the sleeve C', keyed thereon, we place a series of cams k, l, p, k', l', p' , which revolve with the shaft and sleeve. To give a yielding stroke, we preferably employ the levers k, l, p, k', l', p' , and S_{11} , each of which has one end resting on its respective cam, and to the opposite ends of the levers or to arms attached or connected thereto, except the lever k' , are hung weights $F_2, F_1, F, F', F_3, F_5$, and F_5 . These cams are all so shaped and placed on the shaft C and sleeve C' that the levers will be raised and lowered synchronously. In practice it is found, also, that if, instead of a single uniformly-moving active stroke or movement being employed to complete the cut in the stick, such stroke be interrupted and resumed one or more times, the tool being either withdrawn or eased up more or less from the cut at each interruption, a much better and more satisfactory cut can be obtained. To perform this a reciprocating device of any usual or convenient form or of any form that would be devised by a skillful mechanic can be employed. Preferably, however, we use a revolving cam operating to give a lever engaging therewith a double backward-and-forward motion during the time the stick is held motionless in the stick-carrying mechanism and means conveying this motion to give a double relative motion to the stick-carrying mechanism and the cutting tool or tools. An advantageous manner of regulating this operation is to produce a yielding active stroke interrupted by a slight movement of withdrawal and resumed by a final active movement to complete the cutting. The description of what we consider the best mechanism that can be employed to accomplish this result will be given for convenience with that of the rest of

the mechanism which we prefer to employ in giving the relative movements of the cutting-tools and carrying mechanism, and as the details vary in the case of each tool we will describe it in connection with each tool employed.

We fulcrum the lever k , by which motion to and from the stick is given to the saw o_3 , to the pivot K_1 in the hanger k_{41} , attached to the bottom of the bed-plate A_1 . We attach the vertical arm of this lever to the bottom of the carriage, on which the saw and auxiliary mechanism are placed, as has been described, and to make it always touch the cam k on nearly the same point we make on the horizontal arm a projection 81 . We find the best shape of the cam to be to make it gradually to decrease after passing its point of greatest radius 84 to a point of much less radius, thence to swell slightly with another decrease to point 85 and a rapid increase to 84 again.

To stop the forward motion of the saw o_3 under the pressure of the weight F_2 , we place a stop o_4 , having two arms projecting in the plane of and to each side of the saw o_3 , leaving a portion of the saw corresponding to the desired length and depth of the slot extending beyond them. We secure this top by means of the screw-bolt o_6 to the arm o_{200} , which we bolt to the rear of the upright k_{15} . This stop can be made adjustable by cutting a longitudinal slot either in the stop or in the arm o_{200} for the bolt o_6 .

To bring the mortising device T into contact with the stick, we attach to an arm of the lever p_1 , which is also pivoted by the pivot K_1 to the hanger k_{41} and has the arm pressing against the cam p held in contact therewith by the weight F on the branch arm p_{10} , a rod p_4 , attached to the bottom of the mortising device. We make the cam p with a very decided double swell in order to present the mortising device twice to the stick, and we use the projections as a stop, though the cut of the mortise will not as a rule run appreciably below the saw-cut.

It will be noticed that the holes bored to contain the wires for holding in place the springs run at right angles, or nearly so, with the slot for the springs, and that as the holes are bored to pass across the bottom of the slot and extend completely through the stick they must be regulated to strike the stick at a constant distance from the plane of the side in which the slot is cut, and ordinarily need not be limited in their forward motion. To do this we place in the frame E an interior frame consisting of two side pieces m_{10} and connecting-pieces m_{21}, m_{14} . On top of this interior frame slides in guides the drill-bearing carriage m_{12} , which is actuated toward the stick-carrier R by the spring m_{13} , which is placed between the piece m_{14} and the piece m_{21} , attached to the bottom of the carriage m_{12} . To the bottom of this carriage m_{12} we attach a link l_3 , pivoted at the bottom to an arm of the lever l , pivoted to the hanger at k_5 and having

its other arm resting against the cam l and pressed against it by the weight F_1 , attached to the auxiliary arm l_2 . This cam l has double depressions 83 83 and parts of greater radius 82 82, one of them being sufficient to withdraw the drills completely out of the way of the stick, the other serving to move the drill backward to clear the holes. To the side of the drills m_{20} m_{20} we erect at a distance 10 from them equal to the distance back in the slot it is intended the holes bored by them shall lie a stop m_{25} . This stop must extend a short distance beyond the points of the drills. To one side of the frame E we secure 15 a vertical bar 10, having just above the top of the side piece of the frame a portion sloping upward greater than the distance from the stick to the top of the stop m_{25} , but less than to the top of the drills and continuing 20 upward vertically as high as the upward motion of the carriage. Upon the carriage m_{12} we place a projection 9, sliding on the vertical guide 10, which when the interior framework is raised by sliding upward on the inclined edge of the rod 10 allows the side of the 25 the stop m_{25} to come into contact with the side of the stick, and thus to guide the drills to a constant distance from the side of the stick.

To bring the saw o'_5 and the drill o'_{20} into operation upon the stick, we attach to the bottom of the carriage o'_{15} a link p'_2 , attached at its other end to the lever p'_1 , which we pivot 30 to the hanger l'_{15} , and on which we make a projection 87 where it rests on the cam p_1 . It is moved downward by the weight F'_5 . To regulate the cut of the saw o'_5 , we use a stop o'_{11} similar to the stop o_4 , which also regulates the depth of penetration of the drill o'_{20} . The 40 motion of the mortising device T' to and from the stick is regulated by the lever k'_1 , having its lower arm resting on a cam k' , which is shaped, as is the cam p , to give a double motion of the tool. The lever is pressed 45 against the cam and the tool moved forward by the spring F'_2 .

The drills used to drill the holes in which to place the wires to hold the top spring are moved under nearly the same conditions as those used to drill similar holes at the lower 50 spring-slot. To the bottom of the sliding carriage l'_3 we attach an arm of the lever l'_1 , the other arm resting upon the cam l' and impelled into contact by the weight F'_3 . To the top of the carriage l'_3 is secured a spring 67, pressing upward against the bottom of the vertically-moving carriage m'_3 . To the side 55 piece of the frame we attach a vertical bar having a horizontal guide 10', having a portion sloping upward not shorter than the greatest distance between the stick held in position by the stick-carrier and the end of the stop and a horizontal portion extending beyond the inclined portion, and on the carriage we place a 65 projection 9', sliding against the lower side of the cross-piece 10', so that when the carriage l'_3

is moved forward the carriage m'_3 is allowed to rise until the stop touches the lower side of the stick and guides the drills into the stick. It will be noticed that the motions of the 70 frames bearing the tools, as above described, are in planes perpendicular to the axis of the stick-carrying mechanism, and that the motions of each set of tools adapted to operate at each end of the stick are in the same 75 plane, whereby these cuts at each end are made at the same distance from the handle or from the ferrule end, and that the directions of the motions of the active strokes or movements of the different tools of each 80 set are arranged at suitable angles with each other, whereby the tools are adapted to make these cuts into the said stick in the direction desired. In practice we have found this more 85 convenient than to adjust the stick-carrying mechanism to present the stick, so that the motions of the active strokes of all the tools can be made in one direction. To move the saw against the stick, we continue the arm S 90 below the sliding bed-plate a_3 and bend it over a cam s , placed on the sleeve C' , and attach to its extremity a weight F'_5 . This cam S is shaped and placed on the sleeve C to allow the arm extending over it to fall and allow the weight F'_5 to bring the saw S_5 in contact with the stick at the same time the other 95 cutting-tools are moved forward and to retract it synchronously with their withdrawal from action upon the stick.

To make the saw adjustable, we can attach 100 it to a sleeve placed on the spindle S_1 and place in the sleeve a set-screw by means of which the saw can be set at any desired distance from the stick-carrier R' , and the arm u can have cut therein a slot in which a bolt 105 can be placed by which an adjustment of the arm can be made, so that the slit 110 will lie opposite the saw S_5 . We give motion to the shaft C rotating these cams by means of a wheel D, moved by the belt D' , set loosely on 110 a shaft D_2 , which is journaled in one of the uprights B. On the other end of this shaft is a pinion L , meshing into a pinion L_1 on the shaft C. Upon the shaft D_2 we place a clutch 31, fitting against the shoulder 30 of the wheel. 115 In the collar of this clutch fits the upper part of an arm V_2 , which is secured at its lower end to a shaft v_8 , which is journaled in bearings v_5 on standards v_1 at each side of the machine. To the end of this shaft on the side 120 of the operator we secure a lever v_1 convenient to his foot and held up by a spring v_6 . To hold this lever after being pressed down by the operator, we secure an arm v_7 , which rests against the side of the frame A when 125 the lever is up, but slips beneath it when the lever is pressed down. It is seen that by means of this clutch the operator can by a single movement of his foot stop almost instantly all the motions caused by the shaft C, 130 which are generally slow, leaving in motion the other more rapidly-moving parts, which

could not be stopped readily without a shock to the machine in case of any accident to the machine.

To give the shaft K, on which are placed the stick-carriers, its appropriate motion to turn each arm of them through an angular distance equal to the angular distance between any two operating mechanisms while these mechanisms are withdrawn and to hold them motionless and in proper position during the time they are moved forward, we make use of the following devices: Upon the shaft K, at its extremity, we attach a disk i , having on one face notches 7 7, having their sides in the direction of the motion cut down at right angles with the surface of the disk i and beveled gradually upward on the other sides. These notches are placed at an angular distance from each other equal to the angular distance moved by an arm of the stick-carrier at each motion. Concentrically with the disk i , fitting loosely around the shaft K, we place an arm g_5 , having a spring g_6 on its side springing into the notches and turning the disk i and shaft K when pressed against the perpendicular side of the notches by the motion of the arm g_5 and sliding out of them over the beveled sides when the arm g_5 is moved in the opposite direction, leaving the wheel meantime stationary. To give this alternating motion to the arm g_5 , we pivot to its extremity a compound link composed of the two links g_4 g_8 , screwed into the sleeve g_7 , by which means the link may be lengthened or shortened. The link g_4 is pivoted at its lower end to the end of the lever g_3 , which rests at the point 21 upon the cam g , which is keyed to the end of the shaft C, and the circumference of which is composed of an arc of equal radius 20 20 20 and two arcs of varying radius 19 18, the cam g being keyed on the shaft C, so that the lever g_3 will be held up by the arc 20 when the levers k_1 , l_1 , p_1 , k'_1 , l'_1 , p'_1 , and S_{11} are allowed to fall by coming into coincidence with the smaller part of their cams k , l , p , k' , l' , p' , and S and will fall on the arc 19 and rise on the arc 18, moving down and up the arm g_5 , and moving the disk i , while the levers k_1 , l_1 , &c., are supported on the larger parts of their respective cams and the boring, mortising, and cutting tools held away from the stick.

To prevent the chance of the disk-wheel moving after being turned by the action of the arm g_5 and spring g_6 to hold it firmly in one position and to center the stick in the stick-carrier, we cut in the rim of the disk i the triangular notches i_1 i_2 i_3 i_4 , each two neighboring notches being placed at an angle with each other equal to the angle the disk i passes in one revolution of the shaft C. Upon a frame-work h_2 h_3 , secured to the side of the bed-plate A, we place two boxes h_6 h_7 , through which passes a compound link made up of a link having its top end cut to a triangular index h_5 , a link h , resting at its lower extremity upon a lever g_2 , resting upon the cam g at its point

22, and a screw-sleeve h_4 , regulating the length of the compound link. We place upon the link h , to prevent the link h_3 falling below the box h_6 , a shoulder h_5 , which rests upon the top of box h_7 , and between the sleeve h_4 and the box h_6 a spring h' , which presses the link down and frees the disk i when the lever g_2 falls. We make the point 22 of the lever g_2 to rest upon the cam g some degrees of an arc in the direction of the cam's motion from the point 21 of the lever g_3 , so that the lever g_3 will both rise and fall before the lever g_2 , and consequently the motion backward of the arm g_5 will have begun before the disk-wheel is released, (which, however, is not necessary,) and the disk-wheel will have been moved forward to the extent of its motion before the lever g_2 raises the triangular point of the link h_3 into its corresponding notch in the disk i . The disk i is placed on the shaft C, so that when it is held and steadied by the triangular end of the link h_3 , coming into one of the V-shaped notches the arms of the stick-carriers R and R' will be opposite the various boring and cutting mechanisms, and, as the motion of the disk is through an angle equal to the angular distance between each of those cutting devices referred to on the shaft K, it is evident that an arm of the stick-carriers containing a stick will be presented to each mechanism in turn and locked and centered in position before it, so that the tool is sure to strike every stick in the same place.

To make the stick-carriers receive the stick and clasp and hold it while being moved and standing before the cutting and boring mechanisms and unclasp and release it when the slot has been cut and holes bored, we make the greater diameter of the cams w and w' to be where the studs r_4 r'_4 will move while the corresponding arms of the stick-carriers R R' are moving from one cutting or boring tool to another, or stopping before one of them, and the lesser diameter to begin where the corresponding arm has passed the tool that finishes the work upon the stick and has not yet passed in front of the tool which performs the first operation, during which time the jaws 43 44 may be pushed apart and the finished stick removed and a fresh one inserted. To facilitate this insertion and removal, we place about on a level with the jaws of the arm of the stick-carriers where the pressure of the jaws together is released, as above described, and most conveniently at the point where the empty arm is standing stationary during one of the operations of the cutting and boring tools upon the stick, other arms q q' , having an S curve, in the concave part of which rest the sticks intended to be cut and the downward part facilitating the placing of the sticks between the jaws 43 44 of the carrier. We support the arms q and q' by means of upright pieces q_4 q'_4 to the stationary sleeve i' and the movable sleeve e_2 , respectively, the arms q q' being thus always in the same

position with relation to the stick-carrying mechanism R R'.

To automatically remove and collect the sticks from the carrying mechanism, we construct a collecting device on which the completed sticks are collected and means for automatically removing the sticks from the carrying mechanism. We place between the arms q q' and the cutting-tool last acting on the stick two arms shaped and adapted to receive the finished sticks and support the one q'_1 from the movable bed-plate a_3 by the support q'_2 , and the other, which we have designated by q_1 by the supports q_2 q_3 to the bed-plate A_1 . As one of the arms is the counterpart of the other, one only of them is shown in side view in Fig. 5. The arm q_1 is made to terminate at a distance from the shaft K a little greater than the distance which the carrying mechanism holds the sticks from the shaft K. This arm terminates in a spring q_5 , which crosses the path described by the stick in its revolution. When the stick has passed the spring q_5 , the studs which operate to close the jaws of the clamps 43 44 come upon the portion of the cam w of smaller radius. The pressure of the jaws upon the stick is therefore removed. At or about the time the pressure of the jaws of the clamps on the stick is released the stick strikes an incline 60. The stick is pulled outward and the jaws thereby separated and the stick removed from them by the incline. The same operation is simultaneously performed upon the other end of the stick, the studs r'_4 working on the cam w' . In the meanwhile the springs have sprung back again, and the stick, when released from the clamps, rolls down over the springs to the receiving-arms, from which they can be removed from time to time.

Neither gages to determine the place where the slots are to be cut or the holes bored nor marking of the places are necessary, because the slots both at top and bottom and the end of the stick are cut at the same time, and the boring is done while the stick is held in the same position in the stick-carriers as when it was presented to the cutting mechanisms, so that the length between the slots and between the top slot and the end of the stick is constant under all circumstances, the length of the stick being the only thing that can vary, and that being capable of sufficiently accurate determination by the eye of the workman. To secure this length accurately, we sometimes place above the machine a rod H, extending horizontally above the shaft K and supported on vertical rods H_3 H_3 , and place on this rod gages, as H_4 , only one of which is shown, and which we make to slide on the bar and secure them at any desired point by screws, as H_5 , by means of which the length of the stick and the position of the slots with reference to the lower end can be accurately determined. This mechanical construction can be greatly changed without changing our invention.

The operation of the machine is as follows: If the machine is made so that the size of the slots is adjustable, the stops o_4 o'_{11} are set so as to leave a sufficient segment of the saws to project to cut a kerf of the size desired. The stops regulating the drills are then set so as to bring the drills to the requisite depth in the slots. The distance between the slots is then determined upon and the wheel is rotated, moving the bed-plate a_3 until the cutting mechanisms are shown to be a distance apart equal to the distance desired by referring to the scale 3, the saw S, if adjustable, set at desired distance, a number of sticks to be cut placed on the arms q q' , and the machine is started. While the stick-carrier is stationary the operator presses apart the jaws 43 and 44 of the stick-carriers and inserts a stick, the revolution of the shaft C meanwhile moving the cutting and boring mechanisms toward and away from the stick-carriers, which, however, do not touch anything in their motion. The cam g then brings its smaller part 19 into contact with the lever g_3 , which falls, drawing the spring g_6 back out of one of the notches 7 in the inner surface of the stick-carrier and into another, the lever g_2 , supporting the index-bearing link h_3 , to be withdrawn from its notch in the disk i . The part of increasing radius 18 of the cam g then comes into contact with the lever g_3 , raising it, the spring g_6 meanwhile acting on the perpendicular side of the notch 7, into which it has slipped, and turning the disk i , so as to bring the arm of the stick-carrier containing the stick in front of the saw o_3 , the saw o'_5 , and the drill cutting the hole for the runner-stop. The cutting and boring devices are again moved forward by the weights and spring, the saws and drill above mentioned penetrating into the stick until their further progress is stopped by the stops o_4 o'_{11} coming into contact therewith, and the saw S being brought into contact with the stick and cutting off the end thereof, the operator meanwhile inserting a fresh stick and the other tools moving idly forward, as before. The cams then withdraw the tools from the stick, the disk i is rotated as before, and the new stick comes in front of the saw o_3 , the saw o'_5 , and the drill, and the first stick is brought before the mortising-tools T T'. The cams then allow the weights to move the operating devices forward. The saws o_3 o'_5 S₅ and the drill operate as before in a direction at right angles to the slot and make holes through it at a constant depth. At the same time the carriage l'_3 , in which slides vertically the drill-bearing carriage m'_3 , is pressed upward by the spring 67, making it, in connection with the cross-piece 10' and the projection 9', describe a motion in the direction of the incline on the cross-piece until the stop regulating the cut touches the side of the stick, when the motion becomes horizontal and holes are drilled of the same kind and in the same manner as in the lower slot. The

tools are then withdrawn, as before, the shaft K is rotated, the now finished stick held in the stick-carriers pushes aside the spring q_5 and its corresponding spring, the studs of the arms containing it pass onto the parts of the cams $w w'$ of smaller radius, the jaws 43 44 are separated, and the stick extracted by the action of the slope 60, the completed stick falling back upon the arms $q_1 q'_1$ and the arm of the stick-carrier into which the new stick is to be placed coming into the position in which the stick is inserted with the jaws 43 44 separated ready for the insertion of the fresh stick, and the mortising devices are pressed forward into the kerf left by the saws $o_3 o'_5$ in the first stick, the points $t_{27} t_{27}$ striking perpendicularly to the stick against the rounded portions of the kerfs and the points $t_{28} t_{28}$ cutting out the portions cut into by the chisel-points $t_{27} t_{27}$, thus making the slot square instead of a segment of a circle. The cams then withdraw the tools, the operator having inserted a fresh stick, as before, the disk i is rotated, and the first stick is brought before the drills. The cams then allow the weights to move forward, as before, the saws $o_3 o'_5 S_5$ and the runner stop-drill and the mortising-tools T and T' upon the fresh stick in the same manner as has been described, and the drills are brought into action upon the first stick. The frame-work in which slides the carriage bearing the drills is raised by the spring m_{13} , which presses it in the direction of the stick-carrier R and in connection with the projection 9 and the inclined vertical piece 10 makes it describe a motion in the direction of the incline of the piece 10 until the stop m_{20} touches the side of the stick.

We do not limit ourselves to the precise instrumentalities we have shown in our drawings and described minutely in the foregoing portions of our specification, as many well-known mechanical means could be adopted and many familiar mechanisms employed to perform the various operations. Moreover, although we consider all the elements of our machine essential to its most advantageous operation, yet if only a part of the results is desired many elements may be omitted—for instance, the duplicating of the sets of tools—whereby a machine cutting only one slot at a time is produced—a form which might be advantageous on account of the smaller cost of the machine in mills where the output is small.

In place of the devices shown many well-known mechanisms adapted to give an intermittent or "stop" motion can be used without departing from the spirit of our invention.

In the matter of omission the particular stop adapted to stop the motion of the parts toward the stick-carrier can be omitted and the ordinary stop substituted, and indeed the entire mechanism adapted to give the positive away and yielding toward motion of the tools can be left out where other novel features of

my invention are retained, and any mechanism adapted to bring the tools and the stick-carrier together employed. The same remark may be made as in the case of the substitution, as many other parts can be omitted without destroying totally the practicability of our machine.

What we claim, and desire to secure by Letters Patent, is—

1. The combination, in an umbrella-stick-fashioning machine, of stick-carrying mechanism, a cutting-tool mounted with its cutting portions in operative relation to the position of the stick as held in the stick-carrying mechanism, automatic mechanism moving said stick-carrying mechanism and tool toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and a stop device in the path of movement of said mechanism, substantially as described.

2. The combination, in an umbrella-stick-fashioning machine, of stick-carrying mechanism, a cutting-tool mounted with its cutting portions in operative relation to the position of the stick as held in the stick-carrying mechanism, automatic mechanism moving said stick-carrying mechanism and tool toward and away from each other and containing yielding provisions acting during said active stroke imparted by said mechanism, and an adjustable stop device in the path of movement of said mechanism, substantially as described.

3. The combination, in an umbrella-stick-fashioning machine, of stick-carrying mechanism, a cutting-tool mounted with its cutting portions in operative relations to the position of the stick as held in the stick-carrying mechanism, automatic mechanism moving said stick-carrying mechanism and cutting-tool toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and a stop device impinging directly upon the stick to be cut, substantially as described.

4. The combination, in an umbrella-stick-fashioning machine, of stick-carrying mechanism, a cutting-tool mounted with its cutting portions in operative relation to the position of the stick as held in said carrying mechanism, automatic mechanism moving said cutting tool and stick-carrier toward and away from each other and containing yielding provisions acting during the active stroke imparted by said mechanism, and an adjustable stop device in the path of movement of said mechanism and impinging directly upon the stick to be cut, substantially as described.

5. The combination, with an intermittently-moving revolving stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation to the stick as held in one of the positions of rest of said stick-carrying mechanism, of automatic mech-

anism moving said stick-carrying mechanism and cutting-tool toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and a stop device situated in the path of movement of said mechanism, substantially as described.

6. The combination, with a revolving stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation to the positions of rest of said stick-carrying mechanism, of automatic mechanism moving the said stick-carrying mechanism and cutting-tool toward and away from each other and containing yielding provisions operating during said active stroke imparted by said mechanism, and an adjustable stop device situated in the path of movement of said mechanism, substantially as described.

7. The combination, with an intermittently-revolving stick-carrying mechanism and a cutting-tool mounted with its cutting portion in operative relation to the positions of rest of said stick-carrying mechanism, of automatic mechanism moving said stick-carrying mechanism and cutting-tool toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and a stop device situated in the path of movement of said mechanism and impinging directly upon said stick to be cut, substantially as described.

8. The combination, with an intermittently-revolving stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation to the position of rest of said mechanism, of automatic mechanism moving said stick-carrying mechanism and cutting-tool toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and an adjustable stop device situated in the path of movement of said mechanism and impinging directly upon the stick to be cut, substantially as described.

9. The combination, in a stick-fashioning machine, with stick-carrying mechanism provided with arms set at an equal angle with each other, stop-motion mechanism revolving said stick-carrying mechanism, and cutting-tools mounted with their cutting portions in operative relation with the positions of rest of the sticks as held in said stick-carrying mechanism and having a free motion toward and away from said stick-carrying mechanism at right angles with the length of the stick to be cut, of automatic mechanism moving said stick-carrying mechanism and cutting-tool toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and a stop device in the path of said mechanism, substantially as described.

10. The combination, with stick-carrying

mechanism and a cutting-tool mounted with its cutting portion in operative relation thereto, of automatic mechanism moving said cutting-tool and stick-carrying mechanism toward and away from each other and containing reciprocation devices acting upon one of said elements during the movement of the same toward each other and automatically interrupting and resuming the said movement, and a stop in the line of motion of said automatic mechanism, substantially as described.

11. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation with the stick as held in the stick-carrying mechanism, of automatic mechanism moving the said stick-carrying mechanism and cutting-tool toward and away from each other and containing tool-reciprocating devices operating during the active stroke, yielding provisions acting also during the active stroke, and a stop device, substantially as described.

12. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation with the stick as held in the stick-carrying mechanism to be cut, of automatic mechanism moving said tool and stick-carrying mechanism toward and away from each other and containing tool-reciprocating devices and yielding provisions, both operating during the active stroke imparted by said automatic mechanism, and an adjustable stop device, substantially as described.

13. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation with the stick as held in its position to be cut, of automatic mechanism moving said tool and stick-carrying mechanism toward and away from each other and containing yielding provisions operating during the active stroke imparted by said mechanism and containing also tool-reciprocating devices also operating during the active stroke imparted by said automatic mechanism, and a stop device in the path of movement of said mechanisms and impinging directly upon said stick to be cut, substantially as described.

14. The combination, with a revolving stick-carrying mechanism, stop-motion mechanism, cutting-tools mounted with their cutting portions in operative relations to the stick as held in the stick-carrying mechanism, synchronously-acting automatic mechanism moving said tools and stick-carrying mechanism toward and away from each other and containing tool-reciprocating devices acting upon said tools during the movement of same under the impulse of said automatic mechanism toward the sticks as held in the stick-carrying mechanism and interrupting and resuming this movement, and a stop device in the line of movement of said automatic mechanism, substantially as described.

15. The combination, with a revolving stick-

carrying mechanism, stop-motion mechanism rotating said stick-carrying mechanism, and cutting-tools mounted with their cutting portions in operative relation to the stick as held in said stick-carrying mechanism, of automatic mechanism containing tool-reciprocating devices operating during the active stroke imparted by said automatic mechanism and also containing yielding provisions also operating during the active stroke imparted by said automatic mechanism, said automatic mechanism moving said tools and stick-carrying mechanism toward and away from each other, substantially as described.

15 16. The combination, with stick-carrying mechanism, a circular saw mounted with the blade parallel to the length of the stick as held in the stick-carrying mechanism and in operative relation thereto, and drilling-tools
20 mounted with their spindles substantially at right angles with the saw-kerf in the stick when said stick is held in position to be operated upon by said drills, of automatic mechanism moving said saw and said drills toward and away from said stick-carrying mechanism and containing yielding provisions acting during the active stroke imparted to said saw by said mechanism, and a stop device in the line of motion of said mechanism, substantially as described.

17. The combination, with an intermittently-moving stick-carrying mechanism provided with stick-holding devices set at equal angles with each other, of a circular saw mounted
35 with the blade thereof parallel to the length of the stick as held in the stick-carrying mechanism, drills mounted with their spindles substantially at right angles with the saw-kerf in the stick when said stick is held in position to be operated upon by said drills, and automatic mechanism moving said saw and drills toward and away from said stick-carrying mechanism and containing yielding provisions acting during the active stroke imparted to said saw, and a stop device in the line of motion of said mechanism, substantially as described.

18. The combination, with stick-carrying mechanism and automatic stop-motion mechanism rotating the same, of a saw mounted with its cutting parts in operative relation with said stick as held in said stick-carrying mechanism and with its blade parallel to the length of the said stick, a mortising device mounted
55 with its cutting parts in operative relation with said stick and adapted to square out said saw-kerf, and drills mounted with their points in operative relation to said stick and with their spindles at right angles with said saw-kerf in said stick, and automatic mechanism moving said tools toward and away from said stick-carrying mechanism, and a stop device in the line of motion imparted by said mechanisms, substantially as described.

65 19. The combination, with stick-carrying mechanism and automatic stop-motion mechanism rotating the same, of a circular saw set

with the blade parallel to the length of the stick as held in the stick-carrying mechanism, a mortising device mounted with its cutting portions in operative relations with position of rest of the stick as held in said stick-carrying mechanism, automatic mechanism moving said stick-carrying mechanism and tools toward and away from each other, and a stop device in the path of motion of said mechanism, substantially as described.

20. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation to the stick as held in said stick-carrying mechanism, of automatic mechanism moving said tool and stick-carrying mechanism toward and away from each other, consisting of cam-operated devices positively moving said tool and stick-carrying mechanism away from each other, and mechanism moving said tool and stick-carrying mechanism toward each other and containing yielding provisions acting during the active stroke or movement of said tool and stick-carrying mechanism toward each other, and a stop device in the line of motion of said automatic mechanism, substantially as described.

21. The combination, with stick-carrying mechanism, of a cutting-tool mounted with its cutting portions in operative relation with the stick as held in the stick-carrying mechanism, automatic mechanism moving said tool and stick-carrying mechanism toward and away from each other, consisting of cam devices, levers provided with arms resting against said cam devices and fulcrumed to convert the positive stroke or movement imparted thereto into a withdrawal stroke separating said tool and carrying mechanism, and yielding provisions acting upon said levers to produce the active stroke or movement moving said tool and stick-carrying mechanism toward each other, and a stop device in the line of motion of said automatic mechanism, substantially as described.

22. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting-edges in operative relation to the stick as held in the stick-carrying mechanism, of automatic mechanism moving said cutting-tool and stick-carrying mechanism toward and away from each other, consisting of cam devices, levers provided with arms resting against said cam devices and fulcrumed to convert the positive movement imparted to said cam devices to a movement of said tool and carrying mechanism away from each other, and yielding provisions acting upon said lever to effect the stroke moving said tool and carrying mechanism toward each other, and a stop device impinging directly upon the stick to be cut, substantially as described.

23. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation to the stick to be cut and movable toward and away

from the said mechanism, of a lever, operative connections connecting an arm of said lever with one of said tools, said lever having an arm resting against a cam and being fulcrumed to convert the positive movement imparted to it by said cam into a movement moving said tool away from the stick as held in the stick-carrying mechanism, and a weight holding the arm against said cam and moving said tool yieldingly toward the stick as held in the stick-carrying mechanism, and a stop situated in the path of movement of said mechanism, substantially as described.

24. The combination of stick-carrying mechanism, a cutting-tool mounted with its cutting portions in operative relation with the stick as held in the stick-carrying mechanism and movable toward and away from said stick-carrying mechanism, a lever provided with operative connections connecting an arm of said lever with said tool and having an arm resting against a cam, said lever being fulcrumed to convert the movement of said lever into a movement of said tool away from said stick-carrying mechanism, and a weight holding the lever-arm resting against said cam against the same and imparting a yielding movement of said tool toward the stick-carrying mechanism, and a stop device impinging directly upon the stick to be cut, substantially as described.

25. The combination, with stick-carrying mechanism, of a circular saw mounted with its cutting portion in operative relation to the stick to be cut as held in the stick-carrying mechanism and having its blade parallel to the stick thus held, a drill situated parallel to said saw-blade and at a distance above the same corresponding to the distance between the slot for the top spring and the runner-stop, automatic mechanism moving said tools and stick-carrying mechanism toward and away from each other and containing yielding provisions acting during the active stroke, and a stop device impinging directly upon the stick to be cut, substantially as described.

26. The combination, with stick-carrying mechanism, of a circular saw mounted with its cutting portions in operative relation to the stick as held in said stick-carrying mechanism and having its blade parallel to the length of the stick to be cut as held in said stick-carrying mechanism, a drill situated parallel to said saw-blade and at a distance between the slot for the top spring and the runner-stop, automatic mechanism moving said tools and stick-carrying mechanism toward and away from each other and containing yielding provisions operating during the active stroke imparted by said automatic mechanism, and a stop device in the line of motion of said mechanism and impinging directly upon the stick to be cut, substantially as described.

27. The combination, with revolving stick-carrying mechanism, of stop-motion mechanism giving an intermittent movement to said

carrying mechanism, and a stationary rod parallel to the length of the stick as held in said stick-carrying mechanism and secured to the immovable portion of its frame and provided with a gage movable thereon in the direction of the length of the rod, substantially as described.

28. The combination, with stick-carrying mechanism and a cutting-tool mounted with its cutting portions in operative relation to the stick as held in said stick-carrying mechanism, of automatic mechanism for moving said tool and stick-carrying mechanism toward and away from each other, and a stop in the line of movement of said mechanism and impinging directly upon the stick to be cut, substantially as described.

29. The combination, with a revolving stick-carrier provided with arms set at equal angles with each other and provided with clasps in which the sticks are held, a circular saw, a separate and independently-moving frame on which said saw is placed, drills, and a separate and independently-moving frame on which said drills are placed, the motion of said frames being in the same plane and the direction of motion of each frame being at an angle with the direction of motion of the other frames and being each provided with guiding mechanism, of mechanism bringing said tools into contact with the sticks as held in the stick-carrier at substantially the same distance from their ends, stop-motion mechanism moving said stick-carrier, and mechanism moving said tools away from said stick-carrier, substantially as described.

30. The combination, with the frame-work of a machine for fashioning umbrella-sticks, of a frame bearing cutting-tools operating on the stick at one end thereof and having fixed positions on said frame relatively to each other in the direction of the length of the stick, a frame bearing cutting-tools that operate on the other end of the stick and have fixed positions on the frame relatively to each other in the direction of the length of the stick, and mechanism moving said frames toward and away from each other in the direction of the length of the stick on the frame-work of the machine, substantially as described.

31. The combination of a frame bearing an intermittently-moving and a continuously-moving shaft, a movable bed-plate on which are placed cutting and boring tools, a sleeve to which is attached a stick-carrier fitting loosely on the intermittently-moving shaft, a sleeve on which are placed cams giving the positive motion to the tools from the stick-carrier moving on a keyway on the continuously-moving shaft, and arms connecting the bed-plate to the sleeve, substantially as and for the purpose set forth.

32. The combination, with the frame-work of a machine for fashioning umbrella-sticks, of a frame bearing cutting-tools operating on the stick at one end thereof and having fixed po-

sitions on the frame relatively to each other in the direction of the length of the stick, a frame bearing cutting-tools operating on the other end of the stick and having fixed positions on the frame relatively to each other in the direction of the length of the stick, and mechanism moving said frames toward and away from each other in the direction of the length of the stick, and a scale, substantially as described.

33. The combination of a cam set on a constantly-rotating shaft having an arc of substantially-constant radius-levers resting upon said cam, the point of contact of the one with the cam being farther in the direction of the cam's motion than the point of contact of the other, an index, and a vibrating arm, and mechanism connecting the first lever with the vibrating arm, substantially as described.

34. In a machine for slotting and boring umbrella-sticks, having an intermittently-moving stick-carrier holding two or more sticks an equal distance apart and moving an equal distance in each interval of movement, the combination of the following tools: a saw, a mortising-tool, and drills, all said tools having a positive backward and yielding forward motion and stops, substantially as described.

35. A stick carrier or carriers having arms to which are attached clamps and mechanism for tightening and relaxing said clamps according to the position of the arms of the stick-carrier, in combination with arms having an outward incline thereon intersecting the line of motion of the stick held in the stick-carrier, and a receptacle to receive the sticks, all substantially as and for the purpose described.

36. The combination of a stick-carrier or stick-carriers having clamps, mechanism adapted to bring the jaws of said clamps together when the arms of the stick-carrier are in certain positions and relaxed when they are in other positions, with arms to hold the sticks to be operated upon on a level with said jaws at a point where they are relaxed, outwardly-inclined arms intersecting the line of motion of the stick in the stick-carrier at a point where the jaws are relaxed, and arms terminating in springs at their inner extremities which intersect the line of motion of the sticks in the stick-carrier at a point prior to the relaxing of the jaws, substantially as and for the purpose set forth.

37. In a machine for fashioning umbrella-sticks, provided with a stick-carrier and cutting-tool mounted with its cutting portions in operative relation with said stick as held in said stick-carrier, the combination, with an arm of said stick-carrier, of a clamp consisting of the following instrumentalities: reciprocally-moving clamp-jaws, guiding devices regulating the movement of said clamp-jaws, reciprocating mechanism giving the movement of reciprocation to said clamp-

jaws, an arm operatively connected to said reciprocating mechanism and reciprocating the same, a cam on which the arm rests, and mechanism moving said arm along said cam, substantially as described.

38. In a machine for fashioning umbrella-sticks, provided with a stick-carrier and a cutting-tool mounted with its cutting portions in operative relation with the stick as held in said stick-carrier, the combination, with an arm of said carrier, of a clamp consisting of the following instrumentalities: a pair of reciprocally-moving blocks provided with two jaws set at the upper corners thereof and having the intermediate portions of the said blocks cut away, guiding devices regulating the movement of said blocks, reciprocating mechanism giving a movement of reciprocation to said blocks, and an arm attached to and operating said reciprocating mechanism, a cam on which said arm rests, and mechanism moving said arm along said cam, substantially as described.

39. The combination, with a stick-carrier and a tool mounted with its cutting-edges in operative relation thereto, of a clamp consisting of the following instrumentalities: a pair of plates between which move two blocks having projecting jaws at the upper corners of said blocks, slits cut in said blocks, a lever fulcrumed between said blocks and provided with tongues fitting into said slits, and a lever attached to said tongued lever and working on a cam, substantially as described.

40. In a machine for slotting and boring umbrella-sticks, a device consisting of the following instrumentalities: a sidewise reciprocally-vibrating T-headed chisel provided with two cutting-edges opposite to each other, a pair of lengthwise-vibrating chisels, and mechanism giving simultaneously their said movements to the said T-headed chisels and to the lengthwise-vibrating chisels and withdrawing the one of the latter toward which the T-headed chisel is moving before the latter reaches the end of its stroke, substantially as described.

41. In a machine for slotting and boring umbrella-sticks, a mortising device consisting of the following instrumentalities: a sidewise reciprocally-vibrating T-headed chisel provided with two cutting-edges opposite each other, a pair of reciprocally alternately lengthwise-vibrating chisels, operative connections connecting said vibrating chisels and said T-headed chisel and independently giving their motions to the same and withdrawing the lengthwise-vibrating chisel toward which the T-headed chisel is moving, substantially as described.

42. In a mortising device to square out the round kerfs left by the saw, the combination of a three-armed lever having secured to the center arm thereof a T-headed chisel and connected to each side arm a clamp in which is adjustably contained an in-and-out vibrat-

ing chisel, guides for said in-and-out vibrating chisels, and mechanism oscillating said three-armed lever, substantially as described.

43. In a drilling device, the combination of
5 a frame primarily actuated in the direction of the length of the drills, a carriage on which are placed the drill-spindles yieldingly actuated toward the stick-carrier at an angle with the said primary motion, a guide inclined toward
10 said stick-carrier, and a stop placed behind the drills at a distance corresponding with their distance back in the stick and extending beyond the points of the drill, substantially as and for the purpose described.

44. The combination, with a stick-carrier,
15 of a drill-bearing frame, mechanism provided with yielding or springing provisions impelling said frame toward the stick-carrier in a direction at an angle with the direction of the
20 length of the drills, mechanism reciprocating said frame in the direction of the length of the drills, mechanism co-operating with said reciprocating mechanism and containing yielding provisions, and a stop device, sub-
25 stantially as described.

45. The combination of a stick-carrier, a vibrating arm bearing a circular saw, and mechanism yieldingly actuating same in the direction of a stick held in the stick-carrier
30 when held in position to be cut, with a cam moving said arm away from said position when the stick is moved by said stick-carrier, an arm steadying said stick, and a spring attached to the vibrating arm pressing against
35 the stick and holding it against the arm, substantially as and for the purpose set forth.

46. In a machine for slotting and boring umbrella-sticks, having the stick held in an intermittently-moving stick-carrier, a circular saw
40 adjustable in the direction of the length of the stick and yieldingly impelled toward the same, in combination with a rest against which the stick is held while being cut, a cam, and mechanism by which the saw is moved
45 away from the stick, all substantially as and for the purpose described.

47. The combination of a revolving stick-carrier, automatic stop-motion mechanism revolving said carrier, a circular saw set in a
50 plane parallel to the stick as held in said stick-carrier, mechanism moving said saw backward and forward during the interval said stick is held stationary in said stick-carrier, a mortising device set to operate in and
55 square out the saw-kerf, and a pair of drills set to impinge at right angles with the saw-kerf, and mechanism moving said drills toward and away from said stick, substantially as described.

48. The combination, with slot-cutting and boring tools placed in operative relation to the stick-carrier, a stick-carrier, and automatic mechanism moving the tools and stick-carrier toward and away from each other, of
60 a spring operating to produce a yielding motion of said parts toward each other, and stop

devices in the path of movement of said automatic mechanism impinging directly upon the stick to be cut, substantially as described.

49. The combination, with a revolving stick-
70 carrier, of automatic stop-motion mechanism revolving said carrier, a circular saw set in a plane parallel to the stick as held in the stick-carrier, mechanism moving said saw backward and forward during the interval
75 said stick is held stationary in said carrier and containing yielding provisions acting during the active stroke imparted by said mechanism, a pair of drills set to impinge upon said
80 stick substantially at right angles with the saw-kerf in the stick when said stick is presented and held for their action, mechanism moving said drills toward and away from the stick as held in said stick-carrier, and stops
85 in the line of motion of said mechanism, substantially as described.

50. The combination, in a stick-fashioning machine in which the cutting motions of the tools are given thereto independently of their
90 movements toward and away from the stick-carrier, of automatic mechanism moving said tools and stick-carrying mechanism toward and away from each other, a shaft driving said automatic mechanism, a clutch connecting
95 said shaft with a pulley receiving the movement from the power-shaft of the mill, the lever V_2 , the rod v_5 , supported by the standards v_4 , the foot-lever v_1 , the rod v_7 , and the spring v_6 , all substantially as described.

51. The combination, with a stick-carrying
100 device, of a tool mounted with its cutting portions in operative relation to the stick as held in the stick-carrying device, mechanism moving said tool toward and away from said stick-carrying device, a stop impinging directly
105 upon the stick to be cut, and operative connections connecting said stop to said tool and moving it proportionately therewith, substantially as described.

52. The combination, with a stick-carrying
110 device, of a tool mounted with its cutting portions in operative relation to the stick as held in the stick-carrying mechanism, a frame-work containing said tool, mechanism moving said tool-frame and stick-carrying device toward
115 and away from each other, and a stop attached to said frame-work and in position to impinge directly upon said stick to be cut, substantially as described.

53. The combination, with stick-carrying
120 mechanism, of the automatically opening and closing stick-holding clamps, a cutting-tool mounted with its cutting portions in operative relation with the stick as held in said stick-carrying mechanism, mechanism moving
125 said tool and stick-carrying mechanism toward and away from each other, a stop device in the line of motion of said mechanism, and the automatic mechanism removing said sticks from the stick-carrying mechanism,
130 substantially as described.

54. The combination, with stick-carrying

mechanism, of a circular saw mounted with the blade parallel to the length of the stick as held in the stick-carrying mechanism and in operative relation thereto, drilling - tools 5 mounted with their spindles substantially at right angles with the saw - kerf, automatic mechanism containing yielding provisions acting during its active stroke moving said saw toward and away from said stick-carrying 10 mechanism, the stop impinging directly upon the stick and in the line of motion of said mechanism, automatic mechanism moving said drilling-tools toward and away from said stick, and a stop device in the line of motion 15 of said mechanism, substantially as described.

55. The combination, with a stick-carrying device, of stop-motion mechanism giving an intermittent rotation to the same, a saw mounted with its blade parallel to the length of the 20 stick as held in the stick-carrying device, automatic mechanism moving said saw toward and away from the stick as held in the stick-

carrying mechanism and containing yielding provisions acting during the active stroke, and an adjustable stop device impinging directly upon the stick to be cut and situated in the line of motion of said automatic mechanism, substantially as described. 25

56. The combination, with a stick-carrier and tools mounted with their cutting-edges 30 in operative relations thereto, of a clamp consisting of the following instrumentalities: a pair of reciprocally-moving clamp-jaws, guiding devices regulating the movement of said clamp-jaws, mechanism operatively connected 35 to and reciprocating said clamp-jaws, and the automatic devices operating said mechanism, substantially as described.

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Witnesses:

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