No. 877,894. PATENTED JAN. 28, 1908.

G. L. KELLEY.

ROUTING MACHINE.

APPLICATION FILED JULY 23, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

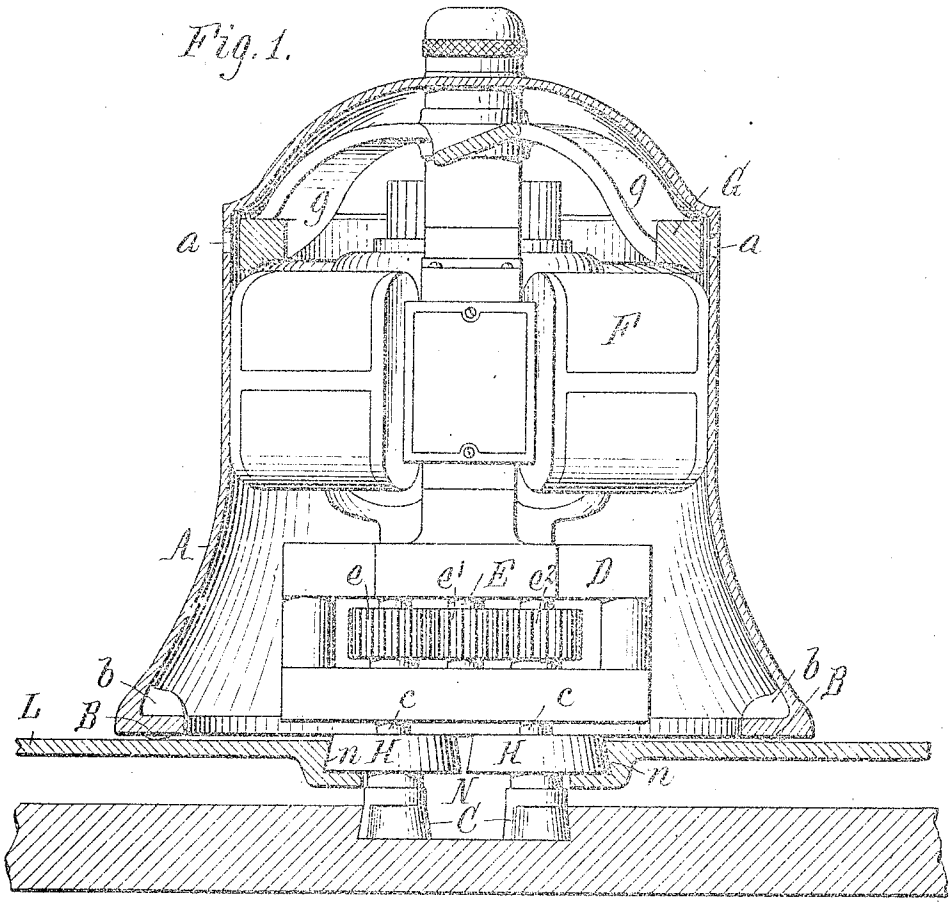


Fig. 9.

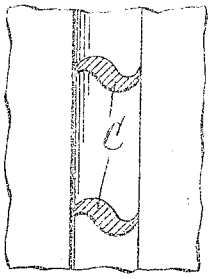
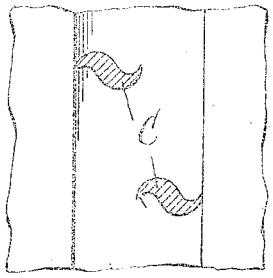


Fig. 10.



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3 SHEETS—SHEET 2.

Fig. 2.

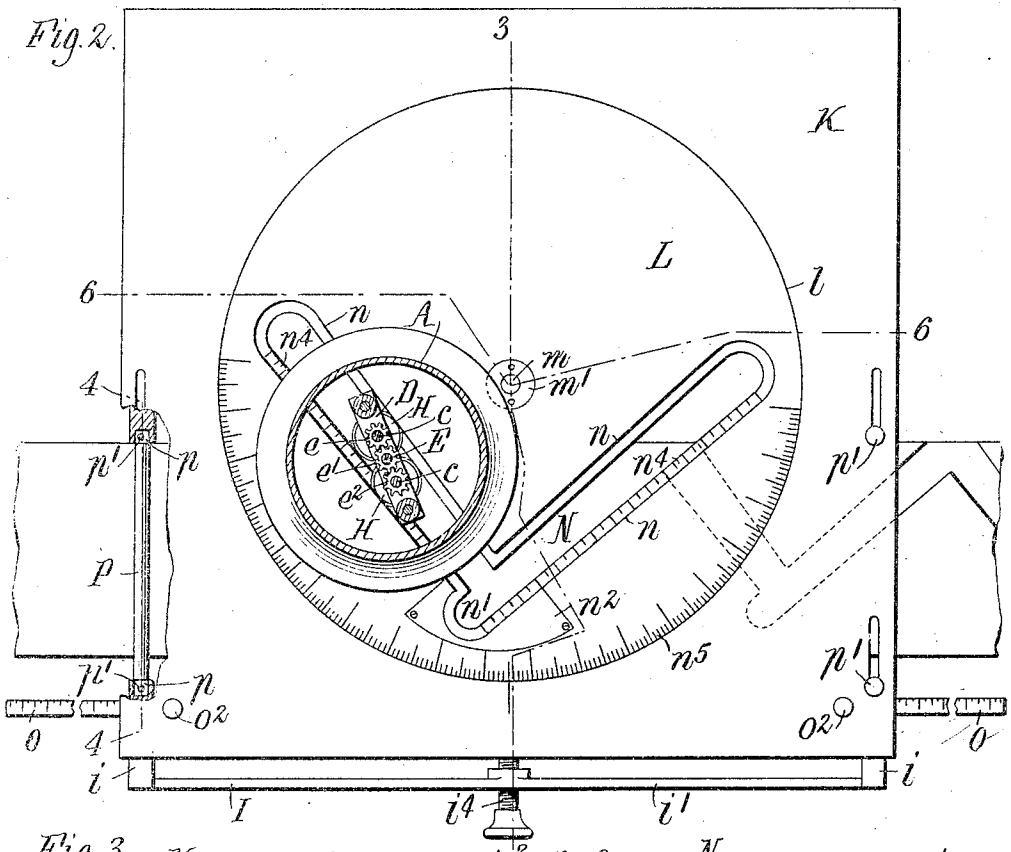


Fig. 3.

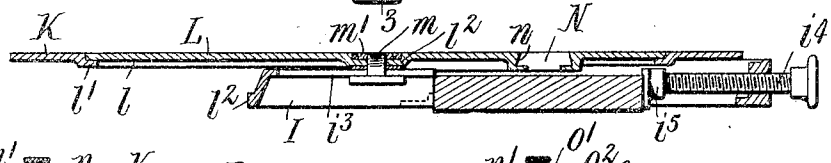
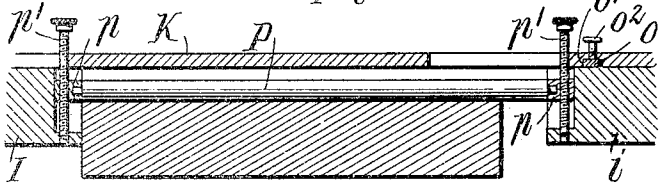


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

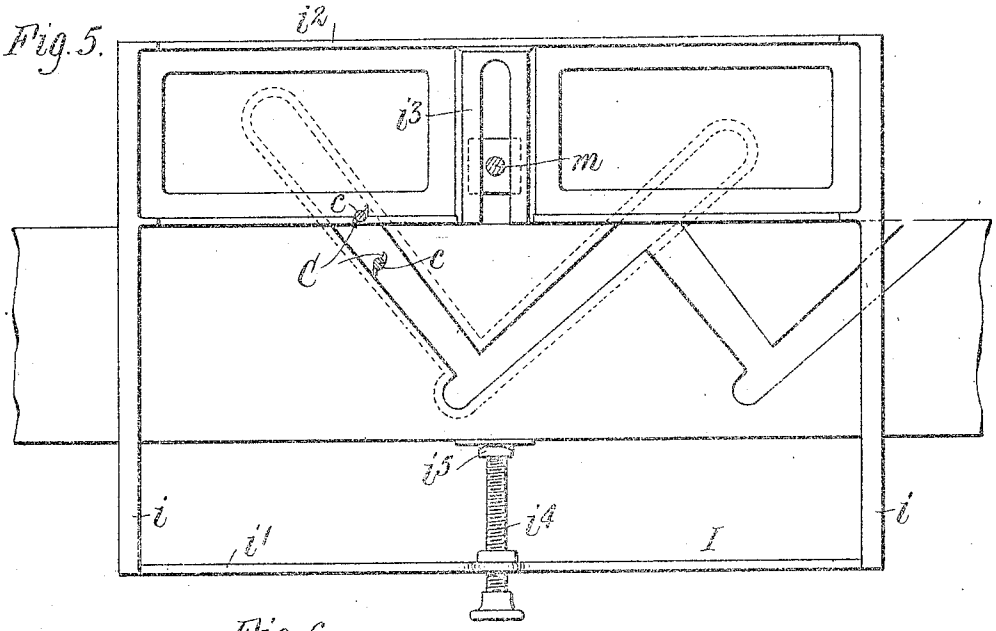


Fig. 6.

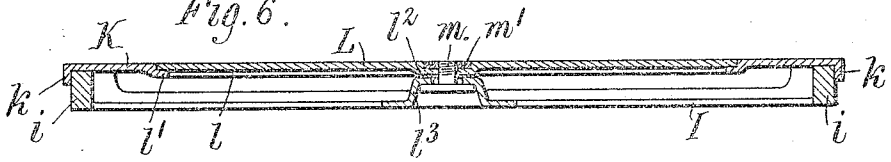


Fig. 7.

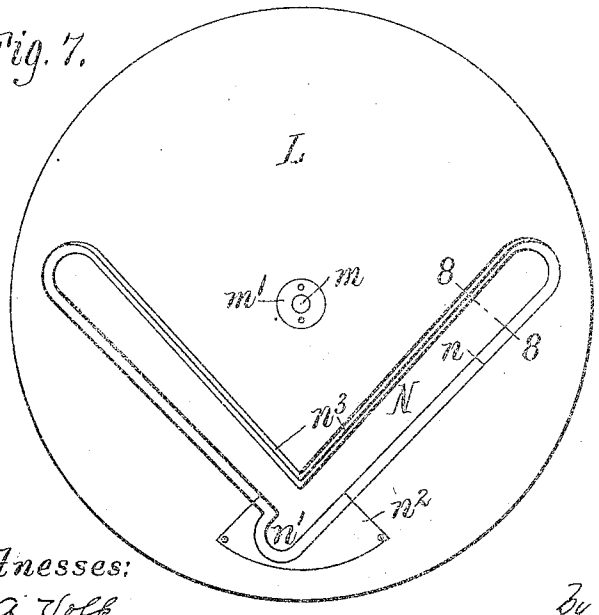
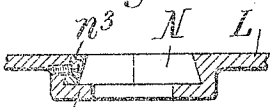


Fig. 8.



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UNITED STATES PATENT OFFICE.

GEORGE L. KELLEY, OF BUFFALO, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO STEVENSON MACHINE COMPANY, OF BUFFALO, NEW YORK.

ROUTING-MACHINE.

No. 377,894 Specification of Letters Patent. Patented Jan. 28, 1908.

Application filed July 23, 1906. Serial No. 327,292.

To all whom it may concern:

Be it known that I, GEORGE L. KELLEY, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Routing-Machines, of which the following is a specification.

This invention relates more particularly to portable routing machines for working in wood.

The machine forming the subject of the invention is capable of a great variety of uses, such, for instance, as cutting regular and irregular grooves or channels of different dimensions and shapes in the surfaces of boards for different purposes, but the machine is especially suited to cutting the grooves in stair stringers to receive the stair risers and treads, and the machine as constructed for this purpose will be herein described.

The primary object of the invention is to produce a practical, efficient and highly desirable portable routing machine capable of being moved about and used on work benches, or elsewhere, where the work can be done to the best advantage, and which can be operated to produce work of various kinds with rapidity and accuracy by unskilled labor.

Other objects of the invention are to improve routing machines in the particulars hereinafter described and set forth in the claims.

A machine embodying the invention comprises a supporting frame or structure adapted to be moved about in any direction, and a plurality of driven cutters, which are mounted on the frame and project therefrom so as to enter or engage the work, the cutters bearing a fixed relation to each other when in operation but being capable of having their relation to the work changed by shifting the supporting frame, whereby the cutters can be made to travel in the same path or in different paths, whether parallel with each other or not, whereby parallel sided or irregular-shaped cuts can be made varying in width from the diameter of one cutter to approximately the distance between the farthest sides of the cutters.

The machine is preferably portable, carrying a driving motor of any suitable kind for the cutters, and is adapted to rest upon and moved about on a supporting or pattern plate or surface having guide openings through which the cutters work and by which they are guided as the machine is moved about. The pattern plate is adjustable to enable the cuts to be made in the desired location and relation on the work, and the pattern plate is also preferably provided with means for clamping or securing it on the work.

In the accompanying drawings, consisting of three sheets: Figure 1 is a sectional elevation of a routing machine embodying the invention, showing portions of the supporting table therefor and the work. Fig. 2 is a plan view, on a reduced scale, of the machine table and work, showing the routing machine in horizontal section. Fig. 3 is a transverse sectional elevation of the machine table in line 3—3, Fig. 2. Fig. 4 is a fragmentary transverse sectional elevation, on an enlarged scale, in line 4—4, Fig. 2, showing the means for adjusting the machine table vertically toward and from the work. Fig. 5 is a plan view, partly in section, of the base frame for the table shown, the cutters in section. Fig. 6 is a longitudinal sectional elevation of the machine table in line 6—6, Fig. 2. Fig. 7 is a plan view of a pattern plate provided with separate guide or gage strips for the cutters. Fig. 8 is a fragmentary section, on an enlarged scale, of the pattern plate in line 8—8, Fig. 7. Figs. 9 and 10 are diagrammatic views, showing different positions of the cutters for producing cuts of different kinds.

Like letters of reference refer to like parts in the several figures.

A, Fig. 1, represents the frame of the routing machine. This frame may be of any suitable form and construction but is preferably in the form of a bell-shaped casing, having a flaring open bottom and provided at the upper portion thereof with air inlet opening *a*. The machine is intended to be moved about upon a supporting surface or plate and the frame is therefore provided with roller supports B to insure greater freedom of movement of the machine. The roller supports shown consist of balls confined in ball sockets *b* at the base of the frame. The frame or casing supports the cutters and their driving motor or mechanism and also incloses these parts to protect them and guard the operator from injury by contact with the cutters or driven parts of the machine.

C represents the driven cutters or routing

knives. There are a plurality of these cutters, two being preferably employed in the machine shown in the drawings, journaled to rotate about vertical axes and they extend far enough below the bottom of the frame of the machine to enter or engage the work arranged below the same. These cutters are secured to the lower ends of vertical shafts *c* which are journaled in suitable bearings in a yoke or part D which is inclosed within and supported by the main frame A. The cutter shafts are driven from a common drive shaft E through suitable gear wheels *e e' e²*, and the drive shaft is also journaled in suitable bearings in the yoke or part D of the frame and constitutes the armature shaft of an electric motor F of any usual or approved type supported by and inclosed within the main frame A. The described manner of mounting and driving the cutters is not of the essence of the invention and they could be mounted in any other suitable way and driven by any other suitable motor or driving mechanism. The cutters, however, bear a substantially fixed or constant relation to each other and to the machine, but the machine is capable of being moved and turned in any direction, so that the relation of the cutters to the work can be variously changed.

A balance wheel G is secured to the upper portion of the armature shaft above the commutator of the motor, in the machine shown, and the spokes *g* of this wheel are shaped to form fan blades, or fan blades are secured to the balance wheel in any suitable manner, so that in the rotation thereof a downward draft is created in the machine around the motor and the bearings for the same and the cutter shafts. Dust from the cutters is thus prevented from rising in the casing and collecting on the bearings, and the working parts are kept cool. This wheel can be used or omitted as desired.

The portable machine above described is used in connection with a portable support, or table upon which the machine rests and is moved about, and the support has openings through which the cutters extend to the work and guiding surfaces against which parts of the machine bear to direct the cutters as the machine is moved about on the support. In the machine shown the cutter shafts are provided above the cutters with loose rollers or collars H for this purpose and adapted to roll against guide edges surrounding the openings in the table or pattern plate through which the cutters extend.

The machine support or table shown in the drawings, see Figs. 2, 3, 5 and 6, comprises a base frame I which is secured to the work or board to be cut and which is adjustable longitudinally thereon, a top or plate K which is adjustable transversely on the base frame, and a pattern plate L which is provided with the guide openings for the cutters and which is rotatably or angularly adjustable on the top or plate K. The base frame, see Fig. 5, is rectangular, having end bars *i* connected by a front bar *i'*, a rear bar *i²*, and an intermediate or clamping bar *i³*. The end bars *i* are adapted to rest upon the top of the work or board to be cut, and their undersides are recessed or cut away to receive the work or board so that the clamping bar and front bar of the frame will extend down opposite the edges of the work or board. The recesses of the end bars are wide enough to receive the widest board to be operated upon. A clamp screw *i⁴* passes through a threaded opening in the front bar of the base frame, being provided at its outer end with an operating knob or handle and at its inner end with a clamp head *i⁵* to engage the edge of the board or plank. By tightening up the clamp screw *i⁴* the work or board is clamped between the clamp bar and screw, and the frame is securely fixed to and supported by the work or board. It can thus be secured to the board or plank at any desired portion of the length thereof. The top or plate K rests and is movable transversely, or forwardly and rearwardly upon the end bars of the base frame and has end flanges *k* depending beside the end bars of the base frame to guide the plate and hold it from twisting on the base frame. The pattern or guide plate L is preferably circular and is located and rotatable in a circular opening *l* in the top of plate K with its upper surface flush with the upper surface of the top or plate K. The plate rests at its edge upon a depressed flange *l'* around the opening of the top or plate K and its center has a thickened or depressed bearing *l²* which rests upon a horizontal bearing bar or portion *l³* of the base frame. This bearing bar or portion is slotted transversely of the frame, see Fig. 5, and a center bolt *m*, Figs. 3 and 6, passes through this slot and a center hole in the pattern plate and is provided with a nut *m'* for clamping the pattern plate to the base frame. This bolt serves to hold both the circular pattern plate and the table top in the position to which they are adjusted. When the nut is loosened the pattern plate can be rotatably adjusted about the bolt to any desired angle, and the table top K can be moved transversely on the base frame to locate the guide opening of the pattern plate in the required position and relation over the work. The nut *m'* for the bolt is preferably seated in a depression in the pattern plate with its top flush with the upper surface of the pattern plate so as not to form an obstruction and prevent the free movement of the machine over the pattern plate.

The pattern plate can be provided with one or more guide slots or openings similar in shape to the cuts or grooves to be made. The pattern plate shown in the drawings is

intended for cutting the angular grooves in stair stringers to receive the stair risers and treads, and the slot N is of right angular form and is surrounded by guide edges n on which the guide rollers H on the cutter shafts roll. These guide edges converge from the outer ends of the legs of the slot toward the angle thereof to produce tapering or wedge-shape grooves in the stringer, and as shown, they are beveled or undercut, see Fig. 1, to hold the cutters down to the work.

The slot N can be located in the proper position over the stringer by the required adjustment of the table base frame, top and pattern plate, to give any desired length of the tread and riser portions of the grooves and angularity thereof on the stringer. After the pattern plate is adjusted and secured the machine is placed thereon with the cutters depending through one end of one leg of the slot and is turned horizontally until the guide rollers bear against the opposite guide edges. After starting the motor the machine is moved along over the pattern plate, being pressed or turned as required to hold the guide rollers firmly against the guide edges. When the angle of the slot is reached the machine is turned so that the cutter shafts will enter the other leg of the slot and is moved along this leg of the slot and the rollers pressed against the guide edges as before. The machine being free to turn and shift on the pattern plate the rollers will follow the guide edges and cause the cutters to cut in corresponding paths whether the guide edges diverge, as shown in Fig. 2, are parallel, or bear other relation to each other. The guide slot N has the usual nosing extension n' at its angle in line with one of its legs, for cutting the nosing grooves, and this extension is preferably formed in a separate piece n^2 detachably secured in the pattern plate and adapted to be replaced by another piece in which the nosing extension will be in line with the other leg of the slot for routing the grooves in the opposite stringer. Separate nosing pieces n^2 can be provided for different shaped nosings. For cutting stringer grooves of different widths interchangeable pattern plates can be provided having guide slots of proper widths, or if preferred, the guide slot can be made wide enough for the widest grooves and separate templet strips n^3 provided to be secured in the legs of the slot, as shown in Figs. 7 and 8, when it is desired to cut narrower grooves. Preferably each leg of the guide slot is provided along one edge with a scale n^4 to indicate the lengths of the corresponding groove which will be cut in different positions of the pattern plate, and the circular edge of the pattern plate is provided with graduations n^5 or is otherwise provided with a protractor scale to enable the pattern plate and guide slot to be set at a desired angle. The table top is also provided at opposite ends with adjustable scale bars O for aiding in correctly positioning the table for successive grooves in the stringer. The scale bars shown are slidable in and out in grooves O′ in the table top and are secured by set screws O^2.

The support or pattern plate shown in the drawings is for use in grooving stair stringers but the machine is not limited to this use, and by providing pattern plates with openings and guide edges or faces of proper shape it can be employed for performing many different kinds of work. The cutters can be made to travel one behind the other and cut a path with parallel sides of a width equal to the diameter of one cutter, as indicated in the diagram, Fig. 9, or they can be shifted by turning the machine on the supporting surface, to cut paths of different widths and shapes, as indicated in Figs. 5 and 10. Thus by providing cutters of different sizes and kinds, and guiding means of different forms or arrangement a great variety of work can performed.

The supporting surface for the machine, or the cutters can be made adjustable toward and from the work to regulate the depth of cut of the cutters. In the machine shown, the entire table with the pattern plate is adjusted vertically on the work, for which purpose a roller P, Figs. 2 and 4, is arranged in the recess or cut away portion of each end bar of the base frame and is journaled in boxes p which are adjusted vertically on the end bars by adjusting screws p' or other means with which the table is provided. The rollers P support the table on the board or work, and the distance of the pattern plate from the latter and consequently the depth to which the cutters enter the work can be regulated as desired, by adjusting the rollers up and down. The rollers P rest crosswise on the board or work and when the table is unclamped it can be readily rolled along the board to the desired position.

The described construction of the table with the adjusting and securing means for the same and the pattern plate is desirable, but these parts can be modified without departing from the principle of the machine, which will operate in a similar manner regardless of the means whereby the pattern plate or guiding means for the cutters are secured to and adjusted relative to the work.

The invention furthermore is not limited to the particular construction and manner of supporting the frame or part carrying the cutters, so long as such frame or part is capable of being freely turned and moved about over the work to vary the relation of the cutters thereto and thus adapt them to cut in the same or different paths.

I claim as my invention:

1. In a routing machine, the combination of a plurality of cutters, driving means there-

for, a support in which said cutters are mounted and which is freely movable with respect to the work to change the relation of said cutters to the work, and means for guiding said cutters in the movement of said support, whereby said cutters will cut in paths parallel with each other or bearing any desired relation to each other depending upon the movements of said support, substantially as set forth.

2. In a routing machine, the combination of a plurality of cutters, driving means therefor, and a frame in which said cutters are mounted in substantially fixed relations to each other and which is freely movable and rotatable with respect to the work to change the relation of the cutters to the work, substantially as set forth.

3. In a routing machine, the combination of a plurality of rotary cutters, means for driving the same, a frame in which said cutters are mounted and from which they extend downwardly to enter the work, and said frame being freely movable to change the relation of the cutters to the work, and means for guiding said cutters in the movements of the frame, substantially as set forth.

4. In a routing machine, the combination of a plurality of cutters journaled to rotate about vertical axes, driving means therefor, a supporting frame for said cutters which is movable freely and rotatable to change the relation of the cutters to the work, and guide means for said cutters, substantially as set forth.

5. In a routing machine, the combination of a frame which rests upon and is freely movable on a supporting surface, a plurality of cutters which are mounted in said frame and project below the same to enter the work, means for driving said cutters, and means for guiding said cutters in the movements of said frame, substantially as set forth.

6. In a routing machine, the combination of a supporting frame which rests upon and is freely movable and rotatable on a supporting surface, a plurality of cutters which are mounted in said frame and project below the same to enter the work, and a motor supported by said frame for driving said cutters, the relation of said cutters to each other being substantially constant but their relation to the work being changed by the movements of said frame, substantially as set forth.

7. In a routing machine the combination of a supporting frame which rests upon and is freely movable and rotatable on a supporting surface, a plurality of cutters journaled on said frame to rotate about vertical axes and projecting below said frame to enter the work, a motor supported on said frame for driving said cutters, and means for guiding said cutters, substantially as set forth.

8. In a routing machine, the combination of a plurality of cutters, a frame in which said cutters are mounted in substantially fixed relation and which is movable and rotatable to change the relation of the cutters to the work, guide faces, and parts on said machine which travel against said guide faces to direct said cutters as the machine is moved with respect to the work, substantially as set forth.

9. In a routing machine, the combination of a plurality of cutters, a supporting frame therefor, means for driving said cutters, and a pattern plate on which said frame is freely movable and which is provided with an opening through which said cutters project to enter the work, said cutters being movable in said opening to change their relation to the work, by the movements of said frame, and guide faces on said pattern plate to direct said cutters, substantially as set forth.

10. In a routing machine, the combination of a supporting frame, a plurality of cutters, shafts therefor journaled in said frame, means for driving said cutters, a pattern plate provided with an opening through which said cutters extend to enter the work, guide faces on said pattern plate and parts surrounding said cutter shafts which bear against said guide faces to direct said cutters during the movements of said frame over said pattern plate, substantially as set forth.

11. In a routing machine, the combination of a pattern plate provided with an opening, a frame which is freely movable and rotatable on said pattern plate, a plurality of cutters, shafts for said cutters journaled in said frame, means for driving said cutters, rollers on said cutter shafts, and guide faces on said pattern plate against which said rollers bear to direct said cutters and change their relation to the work as the cutters are moved along in said opening, substantially as set forth.

12. The combination of a routing machine, and a portable support and guide table therefor comprising clamping means constructed to be secured to the work, and a pattern plate which is supported by said clamping means over the work and is provided with an unobstructed surface on which said machine is supported and freely movable, with an opening through which the machine cutters extend to the work, and with means for guiding the cutters, said pattern plate being adjustable in different directions on said clamping means, substantially as set forth.

13. The combination with a portable machine support having an unobstructed machine-supporting surface and provided with means for securing it over the work, of a portable machine which is supported by and is freely movable on said supporting surface and comprises a motor and a cutter driven by said motor and projecting below said sup-

porting surface to the work, and coöperating parts on said machine and support for guiding said cutter in the movements of said machine on said supporting surface, substantially as set forth.

14. The combination with a portable machine support adapted to be placed over the work and having an unobstructed machine-supporting surface, and means at the under-side of said support for securing it on the work, of a portable machine which is supported by and is freely movable on said supporting surface and comprises a motor and a cutter driven by said motor and projecting below said supporting surface to the work, and coöperating parts on said machine and support for guiding said cutter in the movements of said machine on said supporting surface, substantially as set forth.

15. The combination of a routing machine, and a supporting and guide table therefor comprising a base frame, means for securing the same to the work, a top which is adjustable horizontally over the work on said base frame, and a pattern plate which is rotatably adjustable on said adjustable table top and is provided with a guide opening for the cutters of said routing machine, substantially as set forth.

16. The combination of a routing machine, and a table comprising a base frame, means for securing the same to the work, a top which is adjustable transversely on said base frame, a pattern plate which is rotatably adjustable on said top, and a single securing device for said top and rotatable pattern plate, substantially as set forth.

17. The combination of a routing machine, and a table comprising a base frame constructed to be placed over the work, means for securing the same on the work, a pattern plate on which the routing machine is supported and which is transversely and rotatably adjustable on said base frame and is provided with a guide opening for the cutters of said routing machine, and means for adjusting the height of the pattern plate over the work to regulate the depth of cut of the cutters, substantially as set forth.

18. The combination of a routing machine, and a portable table comprising a base frame constructed to be placed over the work, means for securing the same on the work, a top which is adjustable transversely on said base frame, a pattern plate on which the routing machine is supported and which is rotatably adjustable on said table top and is provided with a guide opening for the cutters of said routing machine, and means for adjusting said base frame vertically to regulate the depth of cut of the cutters, substantially as set forth.

19. The combination of a routing machine, and a table comprising a base frame, means for securing the same to the work, vertically adjustable rollers which rest on the work and support said base frame, and a pattern plate which is rotatably and transversely adjustable on said base frame and is provided with a guide opening for the cutters of said routing, substantially as set forth.

Witness my hand, this 16th day of July, 1906.

GEORGE L. KELLEY.

Witnesses:
C. W. PARKER,
A. L. McGEE.