(No Model.) 5 Sheets—Sheet 1.

C. H. TRASK.

MACHINE FOR SHAPING MILLING TOOLS.

No. 379,187. Patented Mar. 6, 1888.

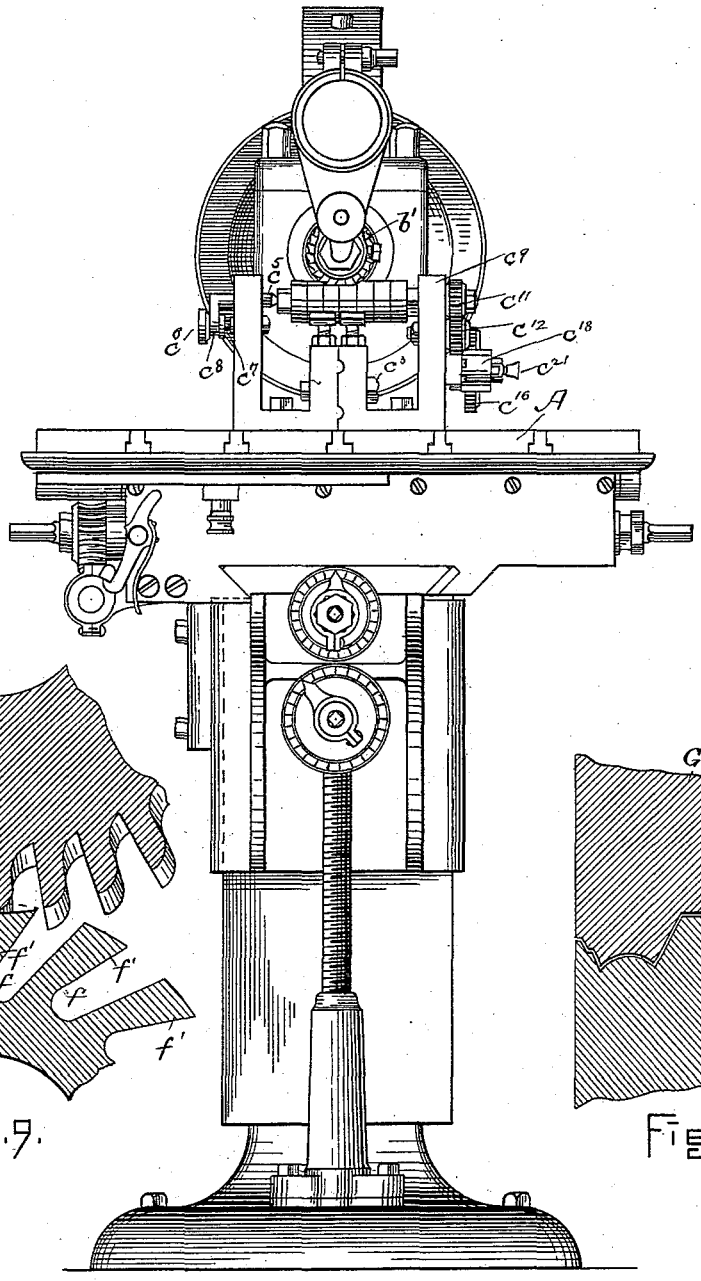

Fig. 1.

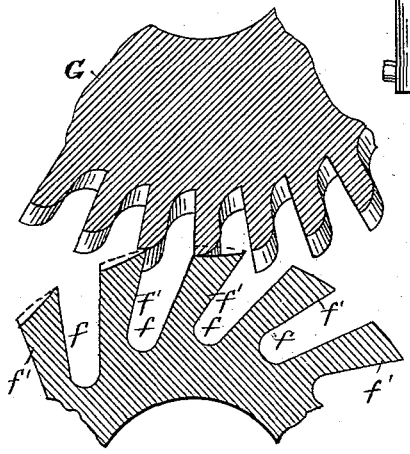

Fig. 9.

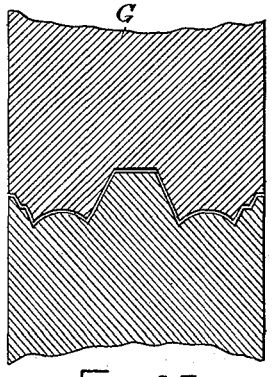

Fig. 10.

WITNESSES.
L. M. Dolan.
Fred. B. Dolan.

INVENTOR.
Chas. H. Trask.
by his atty
Clarke & Raymond.

(No Model.) 5 Sheets—Sheet 2.

C. H. TRASK.

MACHINE FOR SHAPING MILLING TOOLS.

No. 379,187. Patented Mar. 6, 1888.

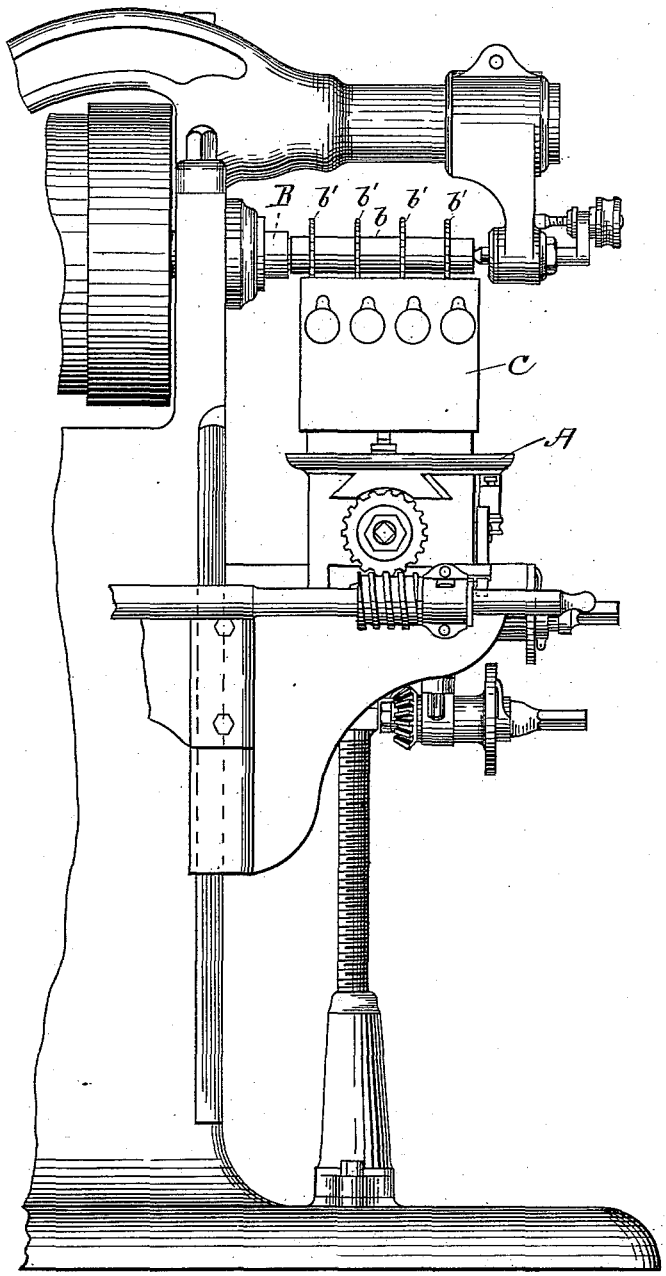

Fig. 2.

WITNESSES.
J. M. Dolan.
Fred. B. Dolan,

INVENTOR.
Chas. H. Trask.
by his atty
Charles L. Raymond.

(No Model.) 5 Sheets—Sheet 3.

C. H. TRASK.

MACHINE FOR SHAPING MILLING TOOLS.

No. 379,187. Patented Mar. 6, 1888.

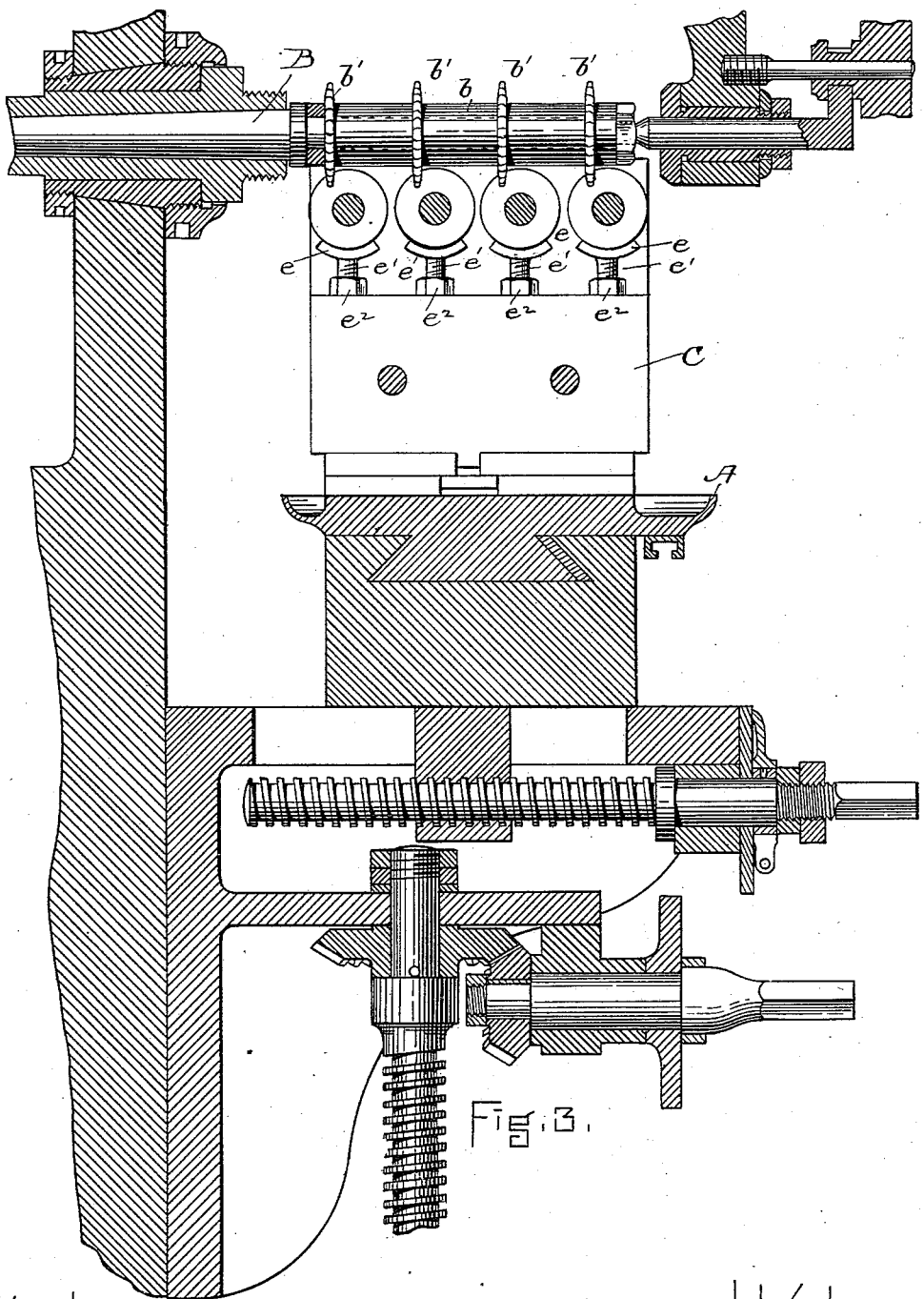

Fig. 3.

WITNESSES.
J. M. Dolan.
Fred. B. Dolan;

INVENTOR.
Chas. H. Trask,
by his attys
Clark & Raymond.

(No Model.) 5 Sheets—Sheet 4.

C. H. TRASK.

MACHINE FOR SHAPING MILLING TOOLS.

No. 379,187. Patented Mar. 6, 1888.

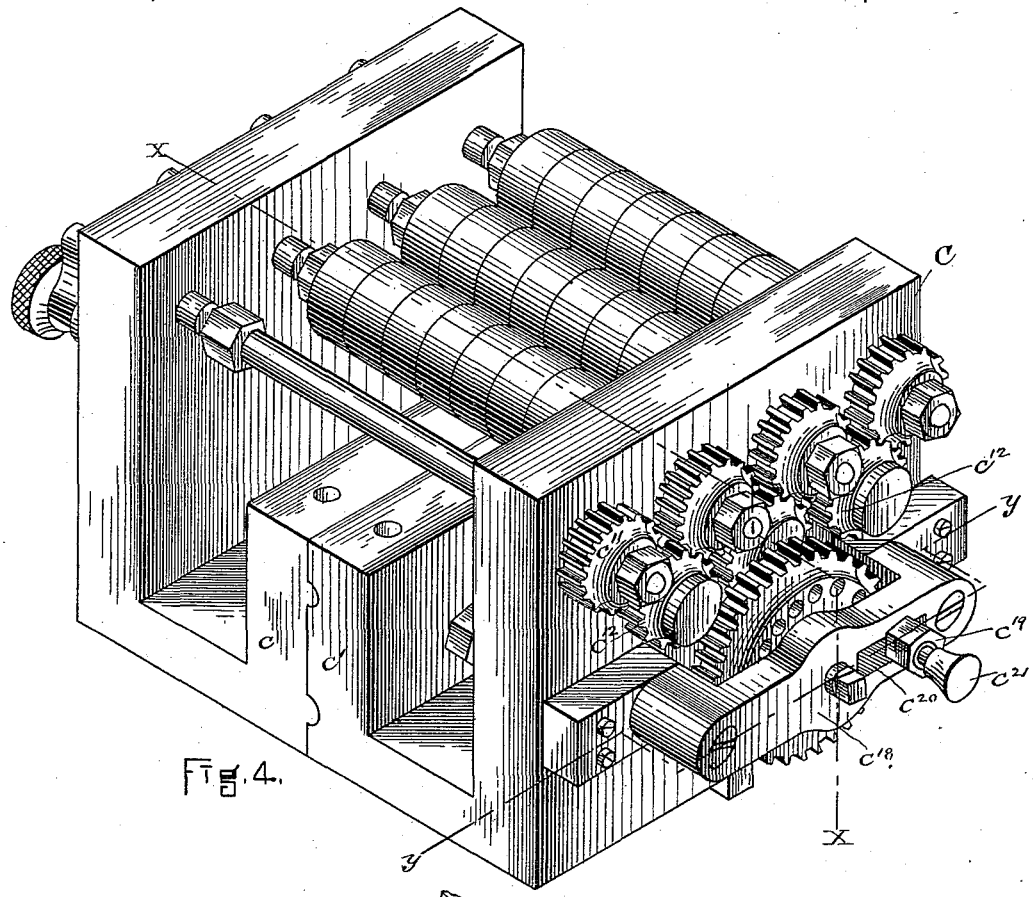

Fig. 4.

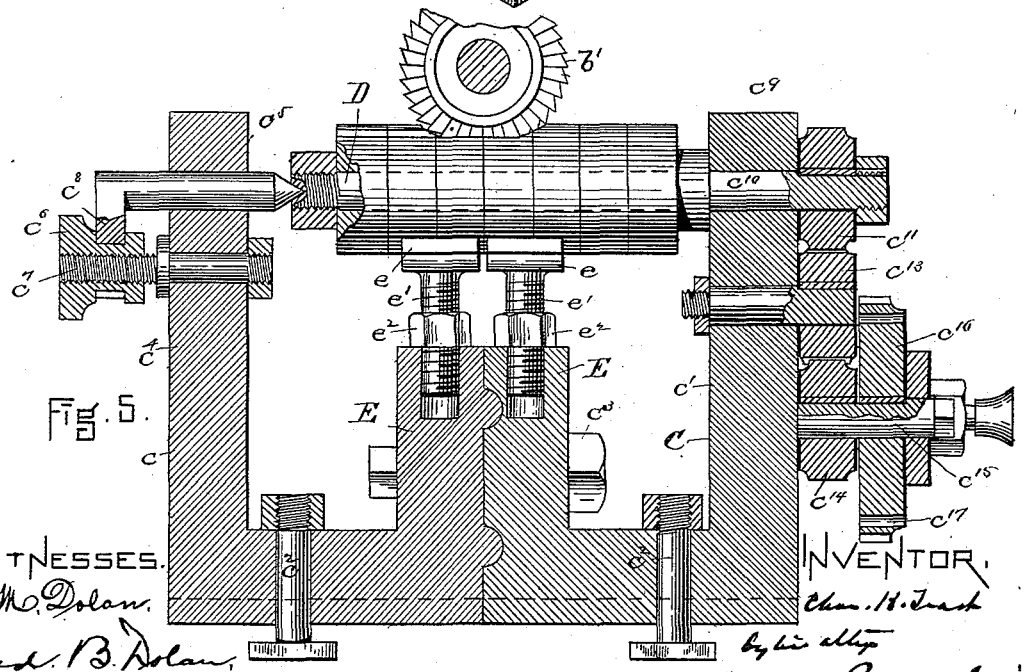

Fig. 5.

WITNESSES.
J. M. Dolan.
Fred. B. Dolan.

INVENTOR.
Chas. H. Trask
By his attys
Charles E. Raymond

(No Model.) 5 Sheets—Sheet 5.

C. H. TRASK.

MACHINE FOR SHAPING MILLING TOOLS.

No. 379,187. Patented Mar. 6, 1888.

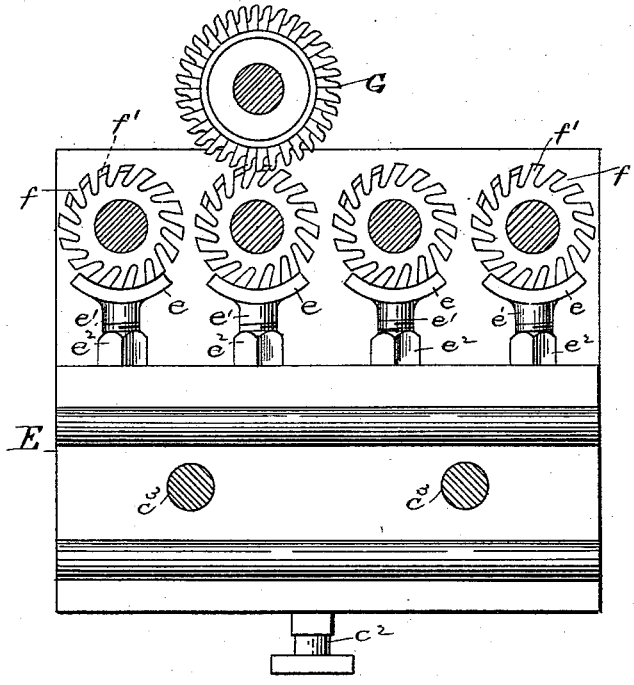

Fig. 8.

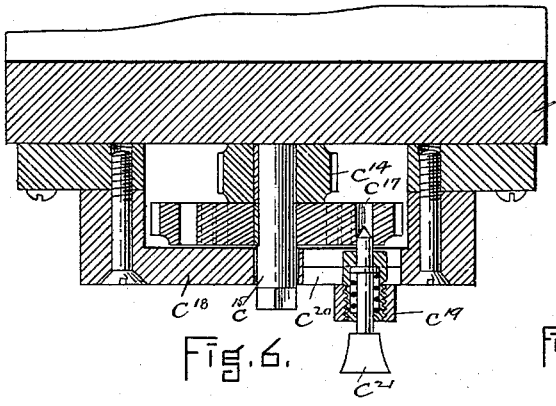

Fig. 6.

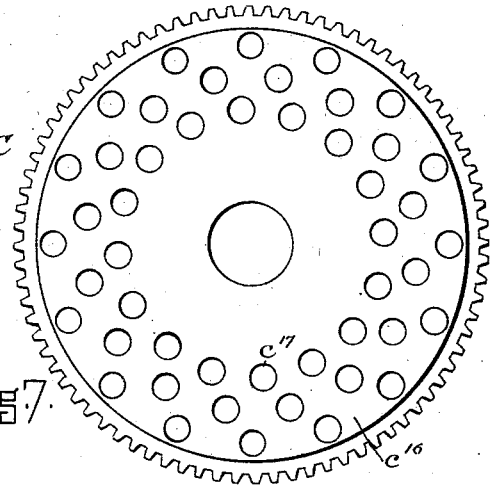

Fig. 7.

WITNESSES.

J. M. Dolan.

Fred. B. Dolan.

INVENTOR.

Chas. H. Trask.

by his atty

Clark & Bozeman.

UNITED STATES PATENT OFFICE.

CHARLES H. TRASK, OF LYNN, MASSACHUSETTS.

MACHINE FOR SHAPING MILLING-TOOLS.

SPECIFICATION forming part of Letters Patent No. 379,187, dated March 6, 1888.

Application filed March 28, 1887. Serial No. 232,795. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. TRASK, of Lynn, county of Essex, and State of Massachusetts, a citizen of the United States, have invented a new and useful Improvement in Machines or Devices for Milling Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The device which constitutes my invention is represented as applied to a milling-machine.

In the drawings, Figure 1 represents an end elevation of a milling-machine having my improved device attached thereto. Fig. 2 is a side elevation of a portion thereof. Fig. 3 is an enlarged vertical section of a portion thereof, reference to which will be hereinafter made. Fig. 4 is a view in perspective of a blank-holder. Fig. 5 is a view in vertical section upon the dotted line *x x* of Fig. 4, also representing a portion of a milling-tool to show its relation to the work. Fig. 6 is a view in horizontal section upon the line *y y* of Fig. 4. Fig. 7 is a view in elevation of an adjusting-wheel, which is also represented in position in Fig. 4. Fig. 8 is a view representing the blank-holder shown in Fig. 4 in a different position upon the bed of a milling-machine to present the work to a milling-tool of a different character from that represented in Figs. 1, 2, 3, and 5. Figs. 9 and 10 are detail views, to which reference will hereinafter be made.

The object of the invention is to provide means for rapidly and economically milling tools.

In the drawings I have illustrated the machine as provided with cutters adapted to be used in the manufacture of a rotary sole-edge trimmer.

A is the traveling bed of the milling-machine.

B is the shaft which carries the arbor *b*, upon which the milling-tools *b'* (see Figs. 2 and 3) are mounted. Arranged upon the bed A of the machine is the blank-holder C. (Shown in perspective in Fig. 4 and in section in Fig. 3.) This blank-holder C is preferably made in two parts, *c c'*, (see Figs. 4 and 5,) and so as to be movable toward and from each other, and they are adapted to be bolted to the bed of the milling-machine by the bolts c^2, (see Fig. 5,) and the two parts are secured to each other by the bolts c^3. (See Fig. 5.) The two sections or parts of the blank-holder C are supported upon the bed of the milling-machine, and they are made separable to permit the placing of the blanks upon and their removal from the arbors, but when in use the two parts are bolted together. This blank-holder has a support or bracket, c^4, at one end, which carries the pointed holders or centers c^5, which are horizontally adjustable by means of nuts c^6 upon the screw-studs c^7, fastened to the bracket or support c^4, the centers extending through holes in the supports, so that their pointed ends extend inwardly from the inner surface of said support, and their outer ends have a yoke or forked extension, c^8, which straddles the nut c^6 and enters the recess formed therein, so that the movement of the nut adjusts the position of the pointed end of the arbor-holder and locks it in that position.

There is also a support or bracket, c^9, upon the other side of the blank-holder, which supports carries the shafts c^{10}, which are in line with the pointed holders or centers c^5 upon the opposite bracket or support, c^4. The shaft c^{10} preferably is formed upon the end of the arbor to be integral therewith, and is so represented in Fig. 5, and any desired number of shafts c^{10} and centering-holders c^5 may be employed. I have represented in Fig. 4 the use of four sets, so that there may be four arbors carried or supported in line. Each shaft c^{10} has upon its outer end the gear-wheel c^{11}, (see Figs. 4 and 5,) and these are connected in pairs by gears c^{12} and are operated by the gear c^{13}, which meshes with the inner gears, c^{11}, and which is operated by the gear c^{14} upon the shaft c^{15}. This shaft c^{15} also has a setting or adjusting wheel, c^{16}, having the holes c^{17}. (See Fig. 7.) There is carried by the bearing-piece c^{18} a block, c^{19}, movable horizontally in a slot, c^{20}, formed therein and carrying the pin c^{21}, which is movable in said block, and which is adapted to engage one of the holes c^{17} and to lock or hold the wheel stationary while thus engaged. The blank-holder C also has the central supports or brackets, E E, each of which carries a holder, *e*, the upper surface of which has any desired shape, and which is supported

by a screw-stud, e', which enters the nut e^2, which rests upon the top surface of the supports E E. These supports are made vertically adjustable thereon to sustain the arbors during the operation of the milling-tool.

In Fig. 4 I have represented assembled upon three arbors a number of circular tool-blanks—that is, blanks from which the tools or trimmers are to be made. They are prepared by being cut from a bar of metal of the desired size, properly finished, and having central holes bored or punched in them, and they are then strung upon the arbors, as represented, and the arbors mounted upon their holding-shafts. The blank-holder C is then adjusted upon the bed A of the milling-machine to bring each line of blanks in proper relation to the milling-tool b', which is to form in the blanks cross-recesses f, (see Figs. 9 and 8,) which extend from the circumference of the blank inward upon a line which is substantially tangential to the hub of the tool, or very nearly so, and these recesses are a little wider at their outer ends than at their inner ends, and divide the blank into a series of extensions or projections, f'. (See Figs. 9 and 8.)

In operation the blank-holder C, having the blanks to be milled mounted therein, as above specified, and being bolted to the bed of the milling-machine, is moved by said bed horizontally past the cutting-edges of the gang of tools b' in a manner to bring each gang or set of tool-blanks in line with a cutting section or edge of one of the milling-tools, and the various sets or gangs of blanks are caused to be moved continuously in relation to the gang of milling-tools from one end of the arbors to the other, and this forms a recess in each line of blanks on each arbor and of any desired form or shape. It is then necessary to turn the tool-blanks to present other parts to the operation of the cutters b', and this is done by turning the adjusting-wheel c^{16} to any desired extent to cause the shafts c^{10} to be rotated sufficiently to bring such parts of the tool-blanks into place, and it is then locked in place by the locking-pin c^{21}, and the blank-holder C is then again presented to the tools b' and a second set of recesses formed simultaneously in each line of tool-blanks. This process continues until all the tool-blanks have been divided or cut by the tools into the uniformly-spaced teeth or projections f'.

To complete the cutters or trimmers, it is then necessary to provide them with cutting-edges, and this involves two things: first, the shape of the cutting-edge, and, second, the backing off of each tooth or projection, so that the cutting-edge shall stand at the greatest distance from the center of the trimmer. These things—namely, the shaping and backing off or removal of the metal from the cutting-edge—I accomplish by one tool, and of course the shape of the tool varies according to the shape which it is desired that the cutting-edge shall have; but I do not remove the partially-formed tool-blanks from the blank-holder. I simply remove the tools b' and substitute therefor the milling-tools G, (see Fig. 8,) they being mounted and operated in the same manner as the tools b'—that is, they are arranged as a gang upon their supporting-shaft. To bring the tool-blanks into proper position to be operated upon by these edge-forming and backing-off cutters, I now turn the blank-holder C upon the bed A a quarter and move it, as before, to present the outer end of each line of the projections or teeth f' in successive order to the tools G. The blank holder is given a movement sufficient to bring a row of partially-finished tool-blanks upon each arbor in line with the edge of each backing-tool, so that the blank-holder is moved its entire length to bring all the tool-blanks into the proper position to be formed and backed off by each backing-off milling-tool. This completes the shaping and backing off of one line of teeth upon each arbor. To bring the next line of teeth in position to be formed and backed off, I turn the tool-blanks by means of the arbor-shafts c^{10} and the wheel c^{16}, and, having turned them sufficiently to bring the next line of projections into position to be formed and backed off, they are locked by means of the pin c^{21} in that position, and the blank-holder is again caused to travel past or by the backing-off tools, and this process is continued until all the projections f' have been provided with the proper form of cutting-edge and backed off.

It will be necessary, of course, on account of the tangential position or relation of the teeth to the solid portion of the tools or trimmers which are being made, to construct or form the milling-cutters so that their cutting-edges shall not come in contact with the cutting-edges of the tool already shaped and backed off, and this involves, of course, the use of smaller milling-tools where the teeth are quite close together.

The form of milling-tool used in backing off the cutting edges of the trimmers or cutters is represented in section in Fig. 10. The relation which the edge of each uncompleted tooth bears to the edge when backed off is represented by dotted and full lines in Fig. 9, and the position which the tooth last completed bears to the tooth which is being operated upon by the milling-tool and the relation which these teeth as a whole bear to the milling-tool are also represented in detail in Fig. 9. By this means it is obvious that a large number of tool-blanks may be simultaneously operated upon by a gang of tools and that the cutting edges or teeth of the said tool-blanks may be quickly and economically formed and backed off—a very desirable result in the manufacture of any tools having teeth which are required to be formed and backed off.

I would say that I do not intend that the backing-off tool shall in every case entirely shape the teeth or projections of the tool-blanks from their round form to their ulti-

mate shape, as they may be partially shaped or "blocked out," as it is termed, upon a lathe before they are mounted in the blank-holder C.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination of a blank-holder, C, carrying two or more arbors for supporting two or more gangs of tool-blanks, with two or more milling-tools and means for moving the blank-holder to present simultaneously two or more lines of tool-blanks to the milling-tools, substantially as described.

2. The combination of a blank-holder, C, two or more arbors, each of which is adapted to carry or support a gang or group of tool-blanks, and devices for rotating said arbors and locking them in any desired position, with two or more milling-tools arranged to operate simultaneously upon each gang or group of tool-blanks upon the movement of the blank-holder in relation thereto, substantially as described.

3. The blank-holder C, having two or more arbor-holders, made in two parts, c c', and horizontally adjustable in relation to each other, as and for the purposes described.

4. The blank-holder C, having two or more arbors, D, with the gears c^{11}, and the adjusting-wheel c^{16}, connected with the said gears to move them simultaneously, as described, substantially as specified.

5. The blank-holder C, having two or more arbor-holders, made in two parts, c c', and horizontally adjustable in relation to each other, a locking device for locking them in any desired position, and the adjusting-wheel c^{16}, having the holes c^{17}, and a locking-pin, c^{21}, substantially as described.

6. The blank-holder C, having two or more arbor-holders, made in two parts, c c', and horizontally adjustable in relation to each other, and a locking device for locking them in any desired position, with the adjusting-wheel c^{16}, the bracket or support c^{18}, having the slot c^{20}, and a block, c^{19}, to slide therein, carrying the stop-pin c^{21}, substantially as described.

7. The blank-holder having the arbors D and means for locking them in any desired position, as and for the purposes described.

8. The blank-holder having the arbors D, carried by the supports or brackets c^4 c^9, respectively, and one or more adjustable supports, e, substantially as described.

9. The combination of the blank-holder C, having the bolts c^2, the brackets c^4 c^9, supporting the arbors D, and the said arbors D, as and for the purposes specified.

10. A blank-holder, C, carrying an arbor adapted to be intermittingly rotated and to be moved horizontally, in combination with a shaft carrying a milling-tool upon an axis parallel with the axis of the arbor, as and for the purposes described.

11. The combination of a blank-holder carrying one or more arbors, each of which is adapted to support a gang or group of tool-blanks, which arbors are adapted to be intermittingly rotated, which blank-holder has a horizontal movement, with a gang or group of teeth forming backing-off tools arranged upon a shaft parallel with the centers of the arbors, as and for the purposes described.

12. The combination, in a device for cutting tools, of a rotary shaft adapted to support a removable arbor carrying two or more milling or cutting tools, with a bed adapted to be reciprocated or moved horizontally, a blank-holder supporting one or more tool-blank-supporting arbors adapted to be intermittingly rotated or locked in any desired position supported by said bed and adapted to be turned thereon, whereby the tool-blank or tool-blanks are first adapted to be moved by the bed in one direction in relation to one form of milling cutter or cutters and are then turned to be moved in another direction in relation to the same milling tool or tools or other milling-tools rotated by said shaft, as and for the purposes specified.

13. The method of milling tools, embracing the forming of circular blanks, mounting the same in groups or gangs upon one or more arbors carried by a blank-holder, moving the blank-holder and blanks to one or more milling-tools arranged to cut on a line parallel with the arbors, then turning the blank-holder, and again presenting the blanks to one or more milling-tools mounted upon a shaft or arbor parallel with that of the arbor or arbors of the blank-holders, as and for the purposes specified.

CHARLES H. TRASK.

In presence of—
F. F. RAYMOND, 2d,
J. M. DOLAN.