No. 868,051. PATENTED OCT. 15, 1907.

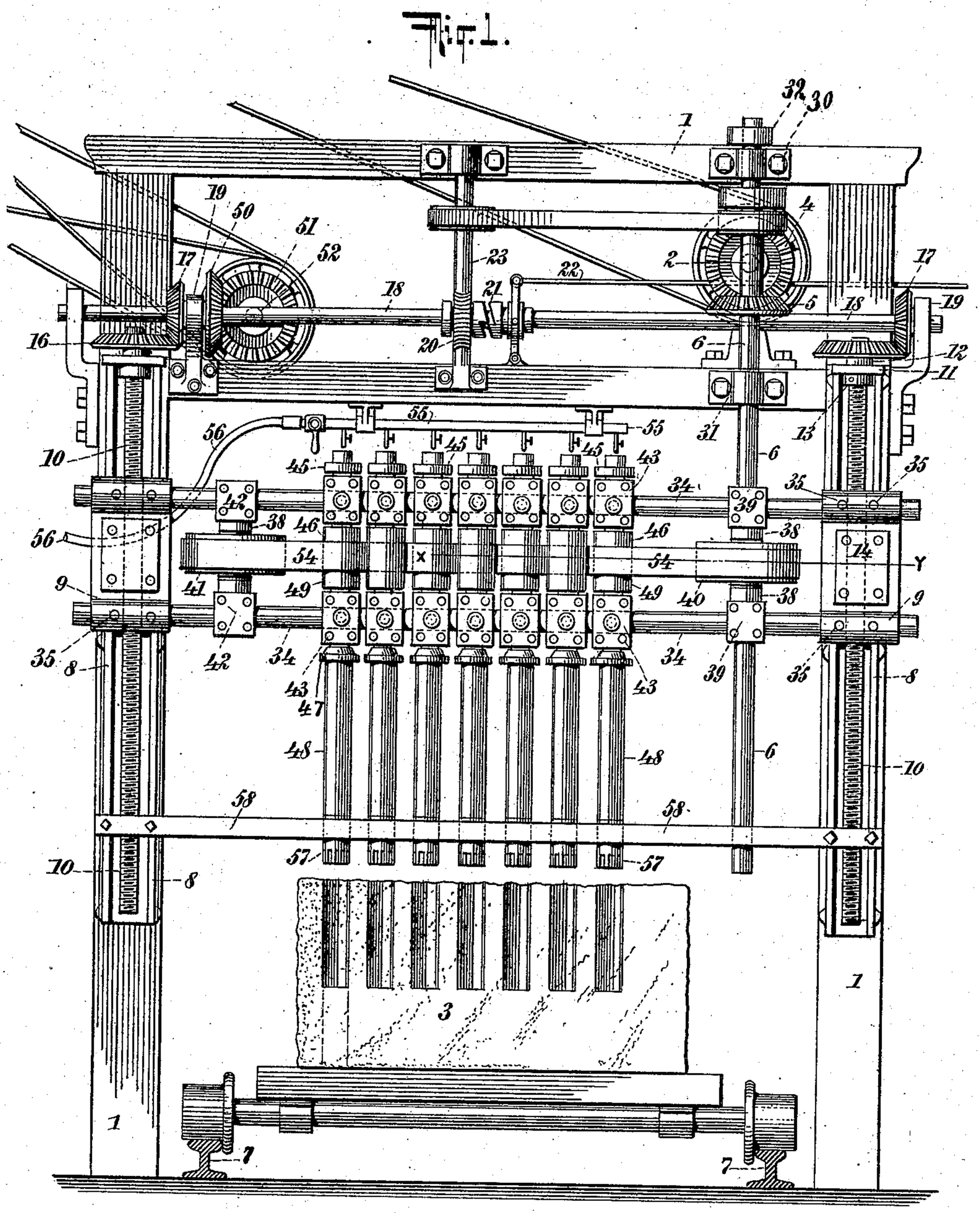
G. N. WILLIAMS, Jr.

STONE FLUTING MACHINE.

APPLICATION FILED APR. 6, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Gustave Dieterich.

Edwin H. Dieterich.

INVENTOR

George N. Williams Jr.

BY

Chas. C. Thornburg

ATTORNEY

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3 SHEETS—SHEET 2.

Fig. 1. a

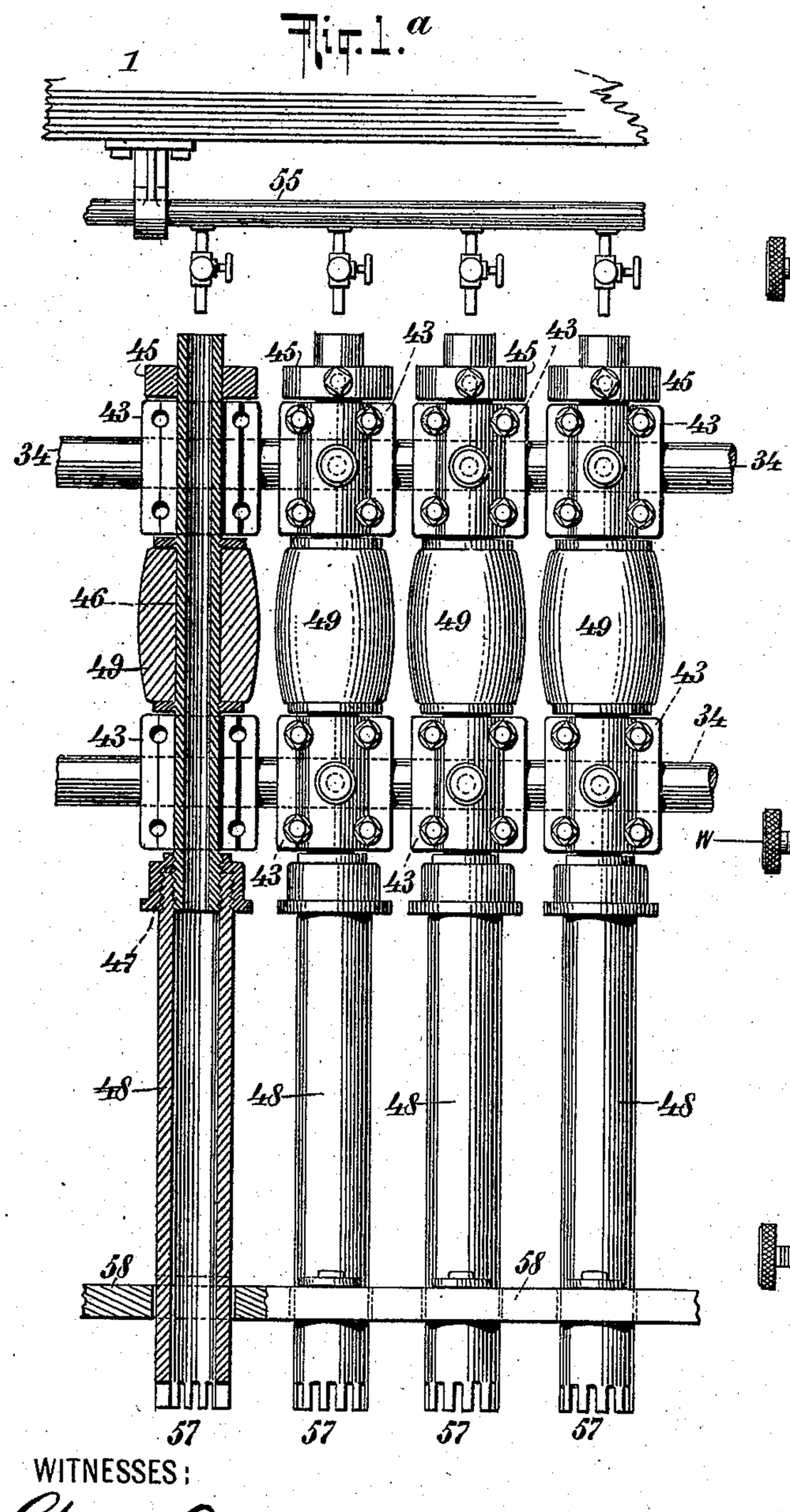


Fig. 4.

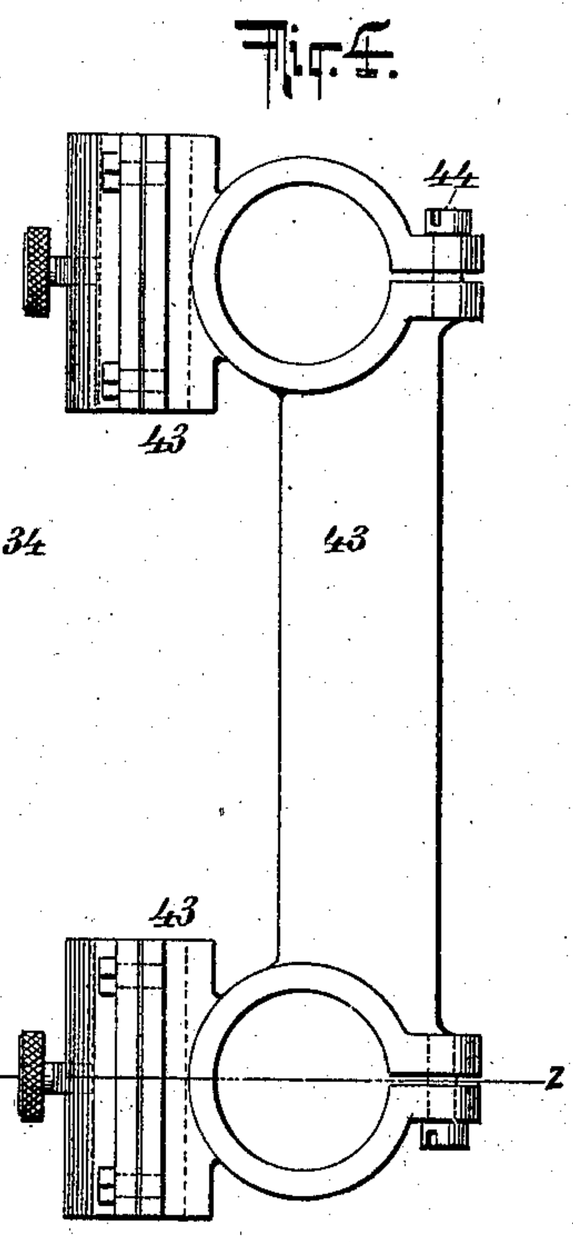
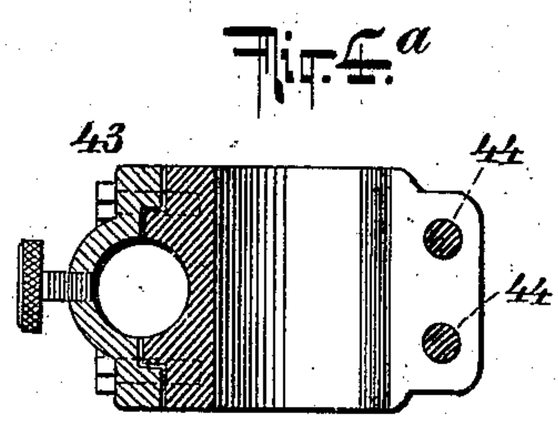


Fig. 4. a



WITNESSES:

Gustave Dieterich.

Edwin W. Dieterich.

INVENTOR

George N. Williams Jr.

BY

Chas. C. Prochroe

ATTORNEY

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G. N. WILLIAMS, JR.

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3 SHEETS—SHEET 3.

Fig. 2.

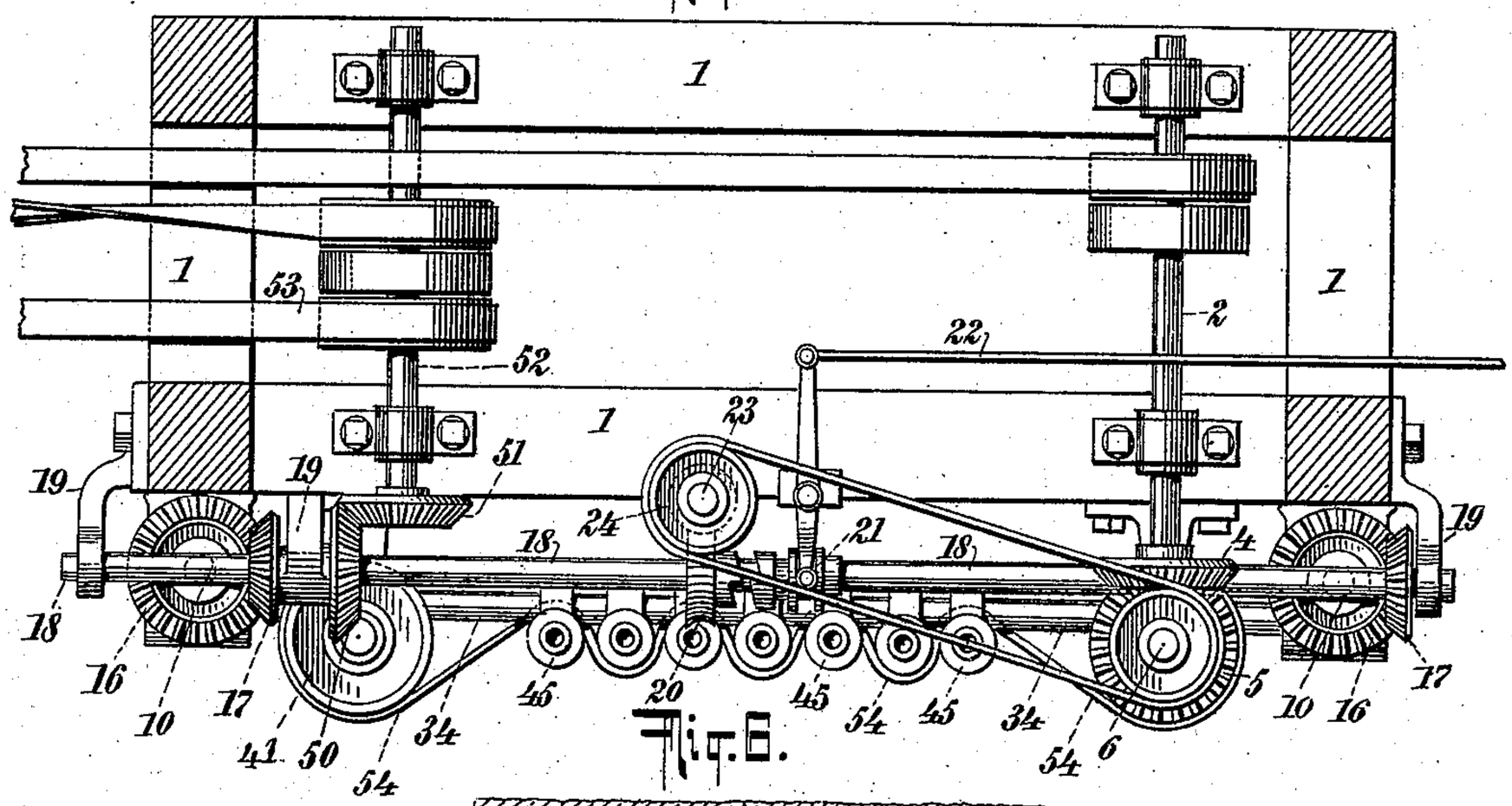


Fig. 6.

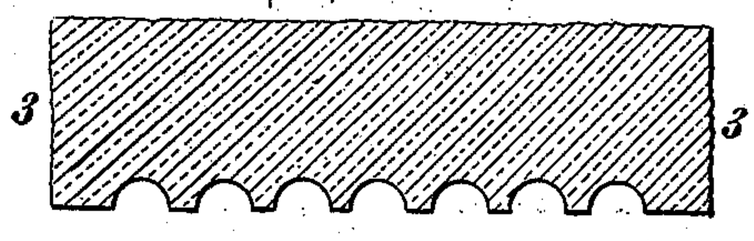


Fig. 3.

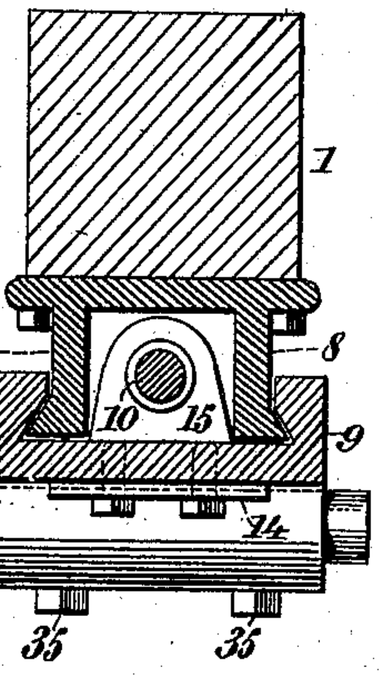


Fig. 4.

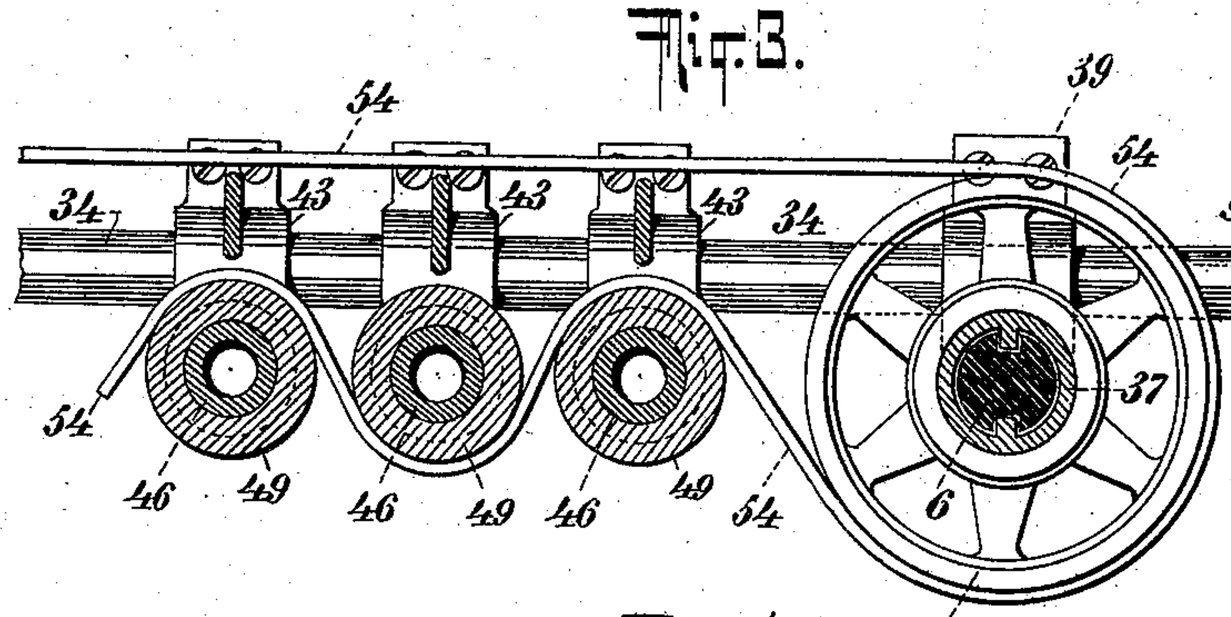
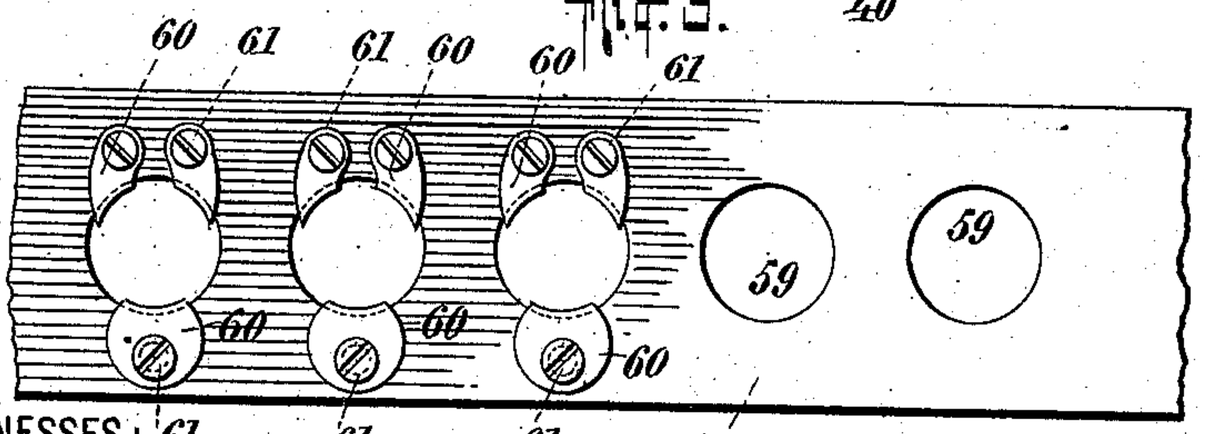


Fig. 5.



WITNESSES:

Gustave Dieterich

Edwin K. Dieterich.

INVENTOR

George N. Williams Jr

BY

Chas. G. Fairbrother

ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE N. WILLIAMS, JR., OF NEW YORK, N. Y.

STONE-FLUTING MACHINE.

No. 868,051. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed April 6, 1906. Serial No. 310,375.

To all whom it may concern:

Be it known that I, GEORGE N. WILLIAMS, Jr., a citizen of the United States, residing in the borough of Manhattan, city and State of New York, have invented a certain new and useful Stone-Fluting Machine, of which the following is a specification.

Heretofore the fluting of the surface of blocks of stone for building purposes has been ordinarily performed by hand or by use of the planer whereby but one flute or partly cylindrical channel in the surface could be made at one time.

My invention consists in a machine whereby the entire surface of an ordinary block of building stone may be fluted or channeled in one operation and whereby also, by reason of the easy interchangeability and the ready adjustment of parts, the machine is adaptable to making a variety of different styles or patterns in fluting.

My invention consists also of the several other constructions and combinations hereinafter described and claimed.

In the accompanying drawings which form part of this specification, Figure 1 is a vertical elevation of my machine. Fig. 1ª is an enlarged view of a portion of the tool-carrying frame showing parts of one of the cutting tool spindles taken away to illustrate internal construction. Fig. 2 is a plan view showing the upper parts of the machine, a portion of the frame work having been broken away for better illustration of the parts. Fig. 3 is an enlarged cross section through the line X Y of Fig. 1, showing the construction and position of vertical guideways, blocks of the tool carrying frame and other parts. Fig. 4 is an enlarged side view of the bearing support which I employ for the hollow spindle tool carrier and Fig. 4ª is a cross section of the same through the line W Z of Fig. 4. Fig. 5 is a plan view of the guide plate which I employ to prevent vibration of the cutting tools and Fig. 6 is a view in cross section of the surface of fluted stone.

1, 1, 1, 1 is a strong vertical frame of wood or other material, firmly seated in a proper foundation or bed and extending rearward (Fig. 2) where it provides proper support for the horizontal shafts 2 and 52 hereafter described. Both these shafts 2 and 52 derive their rotary motion by means of belts and pulleys, (shown in Fig. 2) from the main power shaft which drives the machine. This latter it has not been deemed necessary to illustrate in the drawings.

Upon the foundation and between the uprights of the vertical frame 1, 1, 1, 1 are tracks or ways 7, 7, adapted to receive the platform or truck (Fig. 1) on which the stone 3 to be operated upon is placed. These tracks, as shown, run at right angles to the face of the frame 1, 1, 1, 1.

Firmly secured to the face of the frame 1, 1, 1, 1 are the vertical guideways 8, 8, one at each side of the machine, adapted to maintain and guide the tool carrying frame at all times in its vertical position in the operation of cutting the flutes or channels in the stone. These guideways form in cross section (Fig. 3) three sides of a square, the outer edges being thickened and beveled externally as shown to receive the blocks or carriers 9, 9, which form, with bars 34, 34, hereafter described, said tool carrying frame. Blocks 9, 9, are adapted to slide up and down the guideways 8, 8. They are of sufficient material and strength when firmly connected by bars 34, 34, to give substantial rigidity to said tool carrying frame.

10, 10 are the feed screws. As shown in Fig. 3, the feed screws are placed within the guideways 8, 8, and they are securely journaled at the top of said guideways in plate 11 (Fig. 1) and are provided above and below said plate 11 with collars 12 and 13 securely fastened at the upper end of said feed screws, whereby vertical motion of said screws in either direction is prevented and the said screws are permitted only the rotary motion requisite to raise or lower the tool-carrying frame. Firmly secured to the blocks or carriers 9, 9 by means of plate 14 are the female nuts 15, 15, one adapted to each feed screw 10, 10. At the top of each feed screw are beveled gears 16, 16, which mesh with beveled gears 17, 17 on feeding shaft 18 as shown. Feeding shaft 18 is journaled at the upper part of frame 1, 1, 1, 1, in bearings 19, 19 (Figs. 1 and 2). Obviously rotary motion of the feed screws will simultaneously raise or lower the blocks or carriers 9, 9.

Feeding shaft 18 is provided with a worm gear 20 adapted to convey rotary motion to shaft 18 when clutch 21, connected therewith, is brought into play by means of hand lever 22. Said clutch 21 is of the ordianry construction. Hand lever 22 is suitably adapted to the frame of the machine in manner to be readily moved by the operator in throwing the clutch 21 in or out of operation. The worm 24 on vertical shaft 23 (Figs. 1 and 2) is in mesh with the worm gear 20 and conveys the rotary motion of shaft 23 to feeding shaft 18 when the clutch 21 is brought into play. Shaft 23 receives its rotary motion by means of belt and pulleys from vertical shaft 6 (Figs. 1 and 2) hereafter described. Power from shaft 6 is thus conveyed through worm, worm-gear, gears, feeding shaft and feed screws to blocks or carriers 9, 9, which form part of the tool-carrying frame, for the purpose of feeding the tools of that frame to their work. Any other means than worm and worm-gear, such as pawl and ratchet, sprocket and chain may be employed to convey feed motion to the feeding shaft 18. It is important, however, for the regularity of the product, that such feed motion shall be positively applied as by one of the means mentioned, although a belt and pulley feed may be employed. The feeding parts above described including the blocks 9, 9, guideways, feed screws and the parts which oper-

ate them are in common use on various kinds of stone machinery, especially in some forms of gang saws. They will therefore need no further description here. Feeding shaft 18 is also provided with beveled gear 50 in mesh with beveled gear 51 on horizontal shaft 52, journaled, on the upper part of the frame (Figs. 1 and 2). Shaft 52, as before stated, receives its rotary motion from the power shaft of the machine. When shaft 52 is rapidly rotated—by means of beveled gears 51 and 50, feeding shaft 18 and connecting parts, the feed screws are rapidly rotated in either direction for easy adjustment of the tools of the tool carrying frame to the work. Shaft 52 is provided with one fast and two loose pulleys and is connected with the main driving shaft with direct and cross belts as shown in Fig. 2, so that motion in either direction may be given to said shaft 52, thus either raising or lowering the tool carrying frame as desired.

An important feature of my invention consists in form of construction of what I have heretofore termed the "tool carrying frame". Blocks 9, 9, above described are provided with sockets or recesses to receive and firmly hold horizontal bars 34, 34 which are firmly fastened at each end to the blocks 9, 9 in such sockets by the set screws 35, 35. I prefer that these bars 34, 34 shall be steel shafts, circular in cross section: They are of sufficient strength when secured to blocks 9, 9 as described, to constitute the tool carrying frame—a substantially rigid support for the cutting tools in order that these latter may be firmly held in their vertical movements while rapidly rotating. Other forms of bars 34, 34 may be employed, as square or oblong in cross section but, I prefer that form circular in cross-section on account of the interchangeability of parts hereafter referred to whereby my machine may be readily adapted to the production of flutes of different styles or patterns. In Fig. 6 I show a view in cross section of the fluted surface of stone. As will hereafter appear, these flutes or channels in the surface of the stone may be both wider and deeper and the plain surface between each of the different flutes wider or narrower in accordance with the style or pattern to be produced. To horizontal bars 34 34 of the tool-carrying frame are secured the bearing supports for the tool-carrying spindles with their tools and the mechanism for operating the same as hereafter described.

Vertical shaft 6 is employed to transmit rotary motion from horizontal shaft 2 (Figs. 1 and 2) to the moving tool-carrying frame and thus to the cutting tools. It also provides motion for vertical shaft 23 as heretofore stated. Shaft 6 is supported in bearings 30, 31 (Fig. 1) at the face of the frame 1, 1, 1, 1 and is provided at its upper end with a collar 32 firmly secured to shaft 6, whereby any downward vertical motion of said shaft is prevented. Bevel gear 4 on shaft 2, in mesh with bevel gear 5 on shaft 6, transmits the motion. The lower portion of said shaft 6 is grooved at opposite sides as shown in Fig. 3 and provided with a sleeve or hollow shaft 37, internally feathered or ribbed, thus adapting it to the grooves of shaft 6. Sleeve 37 provided with collars 38, 38 to prevent vertical movement relatively to the tool-carrying frame is journaled in bearings 39, 39 which are removably secured to bars 34, 34 at one side of the frame as shown in Fig. 1. Bearings 39, 39 are removably attached to bars 34, 34 in order that these bars may be shifted to right or left or wholly removed and replaced by others as desired. Sleeve 37 is also provided between the collars 38, 38 with active pulley 40. Rotary motion of shaft 2 is thus transmitted by means of gears, vertical grooved shaft and feathered sleeve to the active pulley 40, while at the same time said active pulley 40 with its sleeve is permitted to move up or down vertically along grooved shaft 6 as the tool carrying frame moves up or down vertically along guideways 8, 8, propelled either by the slow motion of the feed screws given by the worm gear feed, or by the rapid motion above described of said screws, given by the gears 50 and 51 up or down for adjustment purposes. Any other means may be employed to convey rotary motion to active pulley 40 on the tool carrying frame, the means above described being one in common use. At the other side of the tool carrying frame also secured to bars 34, 34 is similarly journaled idle pulley 41 in bearings 42, 42. The shaft on which idle pulley 41 rotates is provided with collars 38, 38, adapted to maintain said pulley in proper position at all times. I provide that bearings 42, 42 (as in the case of bearings 39, 39 of the active pulley) shall be removably secured to bars 34, 34, in order that their position may be changed. Thus idle pulley 41 may be moved nearer to or further from the active pulley 40 for purpose of adapting the length of the belt to the varying number of cutting tools carried by the tool carrying frame. In Fig. 1 are shown seven of these tools in position in their bearings, each adapted to cut a flute or channel in the stone. Obviously the number of these cutting tools may be increased or decreased,—their distance apart may be varied, so also the size of these cutting tools may be changed in accordance with the style or pattern to be produced. In Fig. 3 is illustrated the position of the belt operating upon the tool spindles between active pulley 40 and idle pulley 41. The cutting tools are each centered upon substantially the same line and the belt passes alternately in front of and behind the spindles. Thus while the position of active pulley 40 is necessarily fixed relatively to the guideways 8, 8 and grooved shaft 6, the position of the idle pulley 41 is conveniently made removable along bars 34, 34 of the tool-carrying frame to accommodate the varying conditions of the work.

The construction of the bearings for the cutting tools and their adaptation to the tool-carrying frame is as follows: As will be seen (Figs. 4 and 4ª), the support for bearings 43, 43 is formed in a single piece or casting which is adapted by tightening of the bolts 44, 44 to grip tightly both the upper and lower horizontal bars 34, 34 of the tool carrying frame. Thus by loosening bolts 44, 44, the position of each tool bearing relatively to active pulley 40, or to the other tool bearings may be adjusted or varied or upon loosening bars 34, 34, entirely from the blocks 9, 9, the tool bearing supports may be removed and replaced by others of wider or narrower construction as desired. The number of tool bearing supports on the tool-carrying frame may thus be varied and their distance apart regulated. So also the tightening of bolts 44, 44 has the effect to give additional strength and rigidity to the tool-carrying frame itself by reason of the particular construction which I have adopted, viz., that of having the support

for the double bearing for each tool spindle made in one piece as shown in Fig. 4. Even though these tool bearing supports be removable at will and interchangeable for others, when in place tightly fastened—they serve to brace the tool-carrying frame and add to its rigidity.

In the tool bearing supports 43, 43 is journaled the hollow tool-carrying spindle 46. In Fig. 1ª the bearing and the pulley of one tool-carrying spindle is broken away—also part of the spindle itself, in order to illustrate internal construction. As there shown, spindle 46 consists of a hollow shaft to the upper end of which collar 45, 45 is firmly secured to prevent vertical descent. It is provided with flanges as illustrated, to maintain it in position relatively to its upper and lower bearings 43, 43. It is threaded at 47 to receive the hollow cutting tool 48 and it is provided between the two bearings 43, 43 with an elongated pulley 49 to receive driving belt 54. Belt 54 passes around active pulley 40 and idle pulley 41 and alternately in front of and behind the pulleys of the tool spindles as illustrated in Figs. 1 and 3, thus giving to each tool the necessary rotary motion.

The cutting tool 48 consists in a hollow annular drill or a hollow or solid pointed drill and is firmly held by spindle 46 by means of screw thread and cap nut 47 as shown the shoulder at the upper part of said cap nut 47 (Fig. 1ª.) acting as a collar and bearing against the lower side of bearing support 43 to prevent upward vertical movement of the cutting tool. At 55 (Fig. 1) I have shown the water pipe to which is attached flexible hose 56. By means of its several taps or faucets indicated in Fig. 1, a proper quantity of water is supplied to the inside of the hollow tool carrying spindle and thus to the inside of the tool. I also provide supply of water from above to the outside of the cutting tool as it descends into the stone. This I have not illustrated in the drawings. The water may be fed to the top of the stone by any proper means. In my machine I employ rectangular teeth inserted in rectangular notches 57 at the lower edge of each cutting tool (Fig. 1ª), said teeth being riveted in place in notches 57 57 in the ordinary manner. Said teeth are not indicated in the drawings but they are of the ordinary construction and have diamonds or other hard substance embedded therein for the purpose of cutting the stone. In case where the tool employed is a hollow or solid pointed drill, I use a tool having diamonds inserted therein for rapid cutting purposes. Any other form of teeth, however, may be employed adapted to cut the stone, under the action of the rotary motion provided for the tools in my machine.

To guard as far as possible against vibration in the rotating cutting tool during the operation, I provide a guide plate 58 which is securely bolted as shown in Fig. 1 to the lower part of the fixed frame 1, 1, 1, 1. This guide plate 58 is perforated at 59 as shown in Fig. 5 for passage of the cutting tool. Each perforation is provided with three adjustable fingers 60, 60, 60 as indicated, made of wood or other material and held in place by screws 61, 61, 61. When the tool is in place, each finger is brought in close contact with the tool on opposite sides and fastened by the screws. They thus serve to guide and steady the tool as it descends into the stone. This guide plate, with its adjustable fingers, I regard as important because it tends, when properly gripping the rotating tools, to prevent vibration and thus reduce the possibility of fracture of the stone.

The operation of the machine is as follows: The dressed surface of stone is placed in position on its platform on the car or truck, immediately under the cutting tools. The operator, with the hand, shifts the belt to the active pulley on shaft 52, thus rapidly rotating the feed screws through gears and feeding shaft above described, and the tool carrying frame is lowered until the edges of the cutting tools are in position to work upon the upper surface of the stone to be cut. Shaft 52 is then thrown out of operation by shifting the belt to the idle pulley thereon. Shaft 2 is now brought into operation by the operator in like manner, shifting the belt applicable to that shaft and the rapid rotary motion of the tools begins through the intervention of feathered shaft 6 as described. The slow feed is then thrown into operation by the operator by means of lever 22, acting upon the clutch 21 and the tool carrying frame with its rotating tools is caused to slowly descend and cut the desired flutes or channels from the surface of the stone, the water supplied to the surface of the stone and by hose 56 within the hollow tool spindles as described, having been turned on at the commencement of the operation and continued throughout. At the close of the operation, that is, when the cutting tools have descended through the stone to the lower edge thereof, the slow feed is thrown off by lever 22, releasing the clutch 21. Belt on shaft 2 is shifted, thereby stopping the rotary motion of the tools and the rapid movements of shaft 52 are again brought into play to raise the tool carrying frame with its tools out of and away from the work. By my invention, I am enabled to produce considerable surface of stone fluted with much more rapidity by than any of the earlier methods known to me. By the interchangeability of parts I am also enabled to produce a variety of styles or patterns of fluting upon the same machine.

I claim:

1. In a stone fluting machine the combination of a number of rotating cutting tools supported therein, means for conveying rotary motion to the said cutting tools and a guide plate secured in fixed position relative to the upper surface of the stone to be fluted, said guide plate having perforations for passage of the cutting tools, said perforations provided with adjustable fingers for guiding and steadying the cutting tools when in operation.

2. In a stone fluting machine, the combination with a stationary frame provided with vertical guideways, of a horizontal tool-carrying frame adapted to move along said guideways and provided with two or more rotating cutting tools, means for feeding said tool-carrying frame toward the work, means for conveying rotary motion from the stationary frame to the cutting tools of the tool-carrying frame, and, a stationary guide plate having perforations for passage of the cutting tools, said perforations provided with adjustable fingers for guiding and steadying the cutting tools when in operation.

3. In a stone fluting machine, the combination with a stationary frame provided with vertical guideways and a horizontal tool-carrying frame adapted to move along said guideways and provided with two or more rotating cutting tools, of a screw mechanism positively feeding said tool-carrying frame and tools toward the work, means operating said screw mechanism, means for conveying rotary motion from the stationary frame to the cutting tools of the tool carrying frame, and, means supported upon the stationary frame for steadying the tools of the tool-carrying frame when in operation.

4. In a stone fluting machine, the combination with a stationary frame provided with two vertical guideways and a horizontal tool-carrying frame adapted to move along said guideways, said tool-carrying frame being composed of two blocks or carriers one adapted to each of said vertical guideways and two horizontal bars each removably attached to said blocks or carriers, of two or more rotating cutting tools carried in bearings by said tool carrying frame, two or more bearing supports for the bearings of each of said cutting tools, said bearing supports being horizontally movable along the horizontal bars of said tool-carrying frame, means for feeding said tool-carrying frame toward the work and means for conveying rotary motion from the stationary frame to the cutting tools of the tool-carrying frame.

5. In a stone fluting machine, the combination with a stationary frame provided with two vertical guideways and a horizontal tool-carrying frame adapted to move among said guideways, said tool-carrying frame being composed of two blocks or carriers one adapted to each of said vertical guideways and two horizontal bars secured to said blocks or carriers, of two or more rotating cutting tools carried in bearings by said tool-carrying frame, bearing supports for the bearings of each of said cutting tools, said bearing supports being horizontally movable along the horizontal bars of said tool carrying frame, means for feeding said tool-carrying frame toward the work, means for conveying rotary motion from the stationary frame to the cutting tools of the tool-carrying frame, and a stationary guide plate having perforations for the passage of the cutting tools, said perforations provided with adjustable fingers for guiding and steadying the cutting tools when in operation.

6. In a stone fluting machine, the combination with a stationary frame provided with two vertical guideways, and a horizontal tool carrying frame adapted to move along said guideways, said tool-carrying frame being composed of two blocks or carriers one adapted to each of said vertical guideways and two horizontal bars secured to said blocks or carriers, of two or more rotating cutting tools carried in bearings by said tool-carrying frame, bearing supports for the bearings of each of said rotating cutting tools each of said bearing supports being constructed in one piece horizontally movable along and secured to both of the horizontal bars of said tool-carrying frame, means for feeding said tool-carrying. frame toward the work and means for conveying rotary motion from the stationary frame to the cutting tools of the tool-carrying frame.

7. In a stone fluting machine, the combination with a stationary frame provided with two vertical guideways, and a horizontal tool-carrying frame adapted to move along said guideways, said tool-carrying frame being composed of two blocks or carriers one adapted to each of said vertical guideways and two horizontal bars secured to said blocks or carriers, of two or more rotating cutting tools carried in bearings by said tool-carrying frame, bearing supports for the bearings of each of said rotating cutting tools, each of said bearing supports being constructed in one piece horizontally movable along and secured to both of the horizontal bars of said tool-carrying frame, means for feeding said tool-carrying frame toward the work, means for conveying rotary motion from the stationary frame to the cutting tools of the tool-carrying frame and a stationary guide plate having perforations for passage of the cutting tools, said perforations provided with adjustable fingers for guiding and steadying the cutting tools while in operation.

8. In a stone fluting machine, the combination with a stationary frame provided with vertical guideways, and a horizontal tool carrying frame adapted to move along said guideways, said tool-carrying frame being composed of two blocks or carriers one adapted to each of said vertical guideways and two horizontal bars each attached to both of said blocks or carriers, of an active pulley supported in bearings on said tool-carrying frame, an idle pulley supported in bearings adjustably attached to said tool-carrying frame, two or more rotating cutting tools supported in bearings by said tool-carrying frame, pulleys for each of said cutting tools, bearing supports for the bearings of each of said cutting tools each of said bearing supports being horizontally adjustable along said tool carrying frame, means for conveying rotary motion from the stationary frame to the active pulley, the idle pulley and the tools of the tool carrying frame.

9. In a stone fluting machine, the combination with a stationary frame provided with vertical guideways, and a horizontal tool carrying frame adapted to move along said guideways, said tool carrying frame being composed of two blocks or carriers one adapted to each of said vertical guideways and two horizontal bars each attached to both of said blocks or carriers, of an active pulley supported in bearings on said tool carrying frame, an idle pulley supported in bearings adjustably attached to said tool carrying frame, two or more rotating cutting tools supported in bearings by said tool carrying frame, pulleys for each of said cutting tools, bearing supports for the bearings of each of said cutting tools each of said bearing supports being horizontally adjustable along said tool carrying frame, means for feeding said tool carrying frame toward the work, means for conveying rotary motion from the stationary frame to the active pulley, the idle pulley and the tools of the tool carrying frame, and means supported upon the stationary frame for guiding and steadying the tools of the tool carrying frame while in operation.

GEORGE N. WILLIAMS, JR.

Witnesses:
A. H. BOWIE,
A. C. BACKUS.