Hartshorne & Shaw,

Turning Irregular Forms.

No. 6,869. Patented Nov. 13, 1849.

Fig. 1.

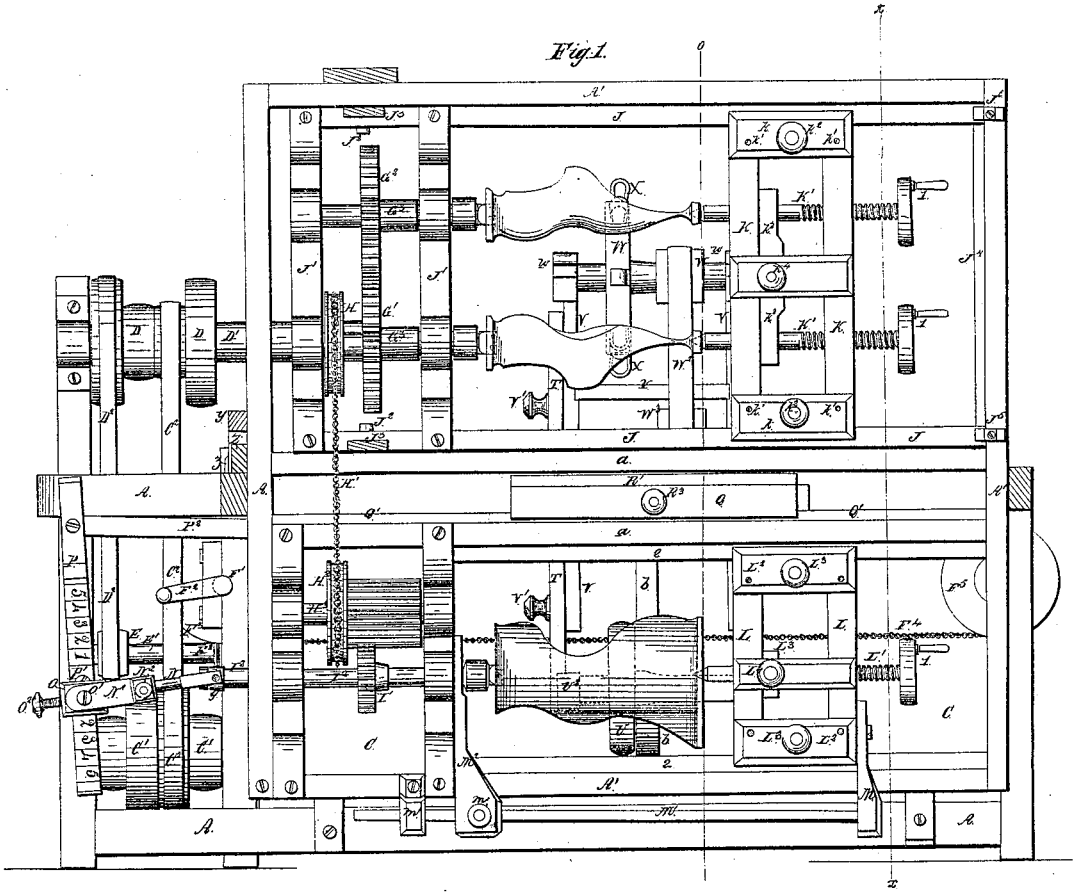
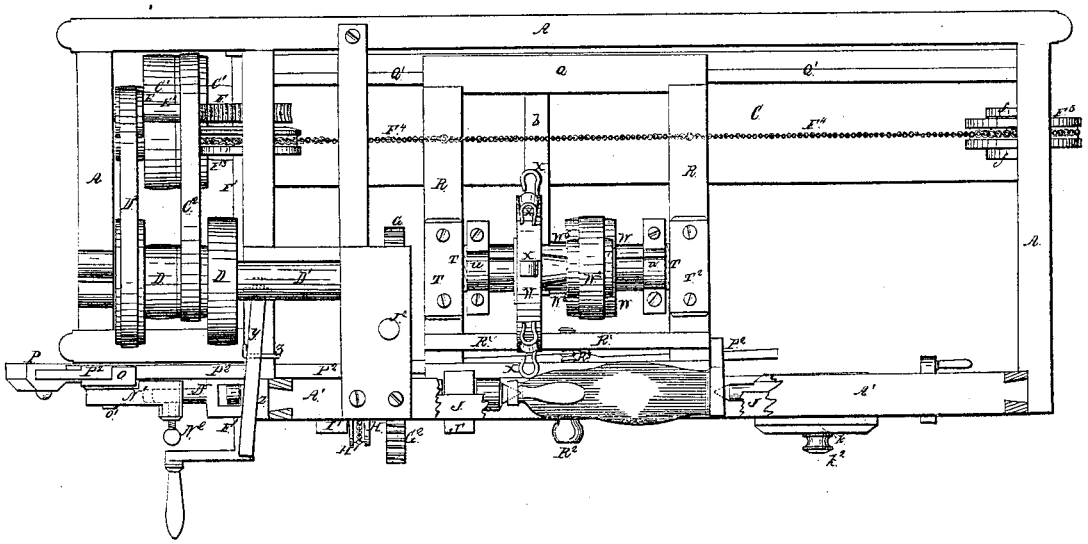


Fig. 2.



UNITED STATES PATENT OFFICE.

CHARLES HARTSHORNE AND WILLIAM B. SHAW, OF GARDINER, MAINE.

MACHINERY FOR TURNING RIGHT AND LEFT LASTS.

Specification of Letters Patent No. 6,869, dated November 13, 1849.

To all whom it may concern:

Be it known that we, CHARLES HARTSHORNE and WILLIAM B. SHAW, of Gardiner, in the county of Kennebec and State of Maine, have invented certain new and useful improvements in machines for turning right and left shoe lasts simultaneously from a single reverse pattern, which we denominate the "Twin Turning Machine," and do hereby declare that the following is a full and exact description thereof, reference being had to the annexed drawings, making part of this specification.

Figure 1, is a front elevation of the machine, the reverse pattern being represented in the proper relative position to the right and left lasts, which are represented as having been turned. Fig. 2 is a plan or top view of the same. Fig. 3, is a vertical transverse section through the machine at the dotted line *x x* of Fig. 1. Fig. 4 is a vertical transverse section at the dotted line *o*, *o*, of Fig. 1. Fig. 5, is an elevation of the turning beams and cutting and tracing wheels.

Similar letters in the several figures refer to corresponding parts.

The nature of our invention consists in the arrangement and combination of certain mechanical devices, by which from a single reverse pattern, (say of a shoe last) a corresponding pair of right and left lasts shall be produced simultaneously, by the employment of a single rotary wheel of cutters, secured in a vertical adjustive frame made to move longitudinally with a carriage, and having secured to its opposite end a tracing wheel which bears against the reverse pattern and causes the cutter wheel to be moved nearer to, or farther from, the centers on which the lasts turn, in a corresponding degree to the curvatures or inequalities of the surface of the reverse pattern touched by the tracer; the blocks from which the right and left lasts are to be formed being made to turn toward each other and in contact with the cutters.

To enable others skilled in the art to make and use our invention we will proceed to describe its construction and operation.

The main supporting frame A is of a rectangular form, of sufficient size, strength and material to contain and support the several parts of the machine.

A′, is an upright rectangular frame, composed of two vertical timbers connected together at their extremities by longitudinal timbers, and at near their centers by longitudinal rails *a*, *a*, and secured to the front part of the main frame A, extending to near its bottom and projecting above the top of the same a distance about equal to the height of the main frame, and being nearly as long as the same. Between the end and upper timbers of this frame A′ and the upper rail (*a*), is secured a hinged frame J, made to move or swing horizontally, and containing a sliding frame K, having horizontal shafts or arbors K′, turning in the same, between which and the shafts G^3, the blocks from which the right and left lasts to be turned, are secured.

C, is the propelling drum, arranged horizontally at the lower and back portion of the main frame A, and turning in suitable bearings therein, having pulleys C′, C′, at the left end of its shaft around one of which is passed a band C^2, leading around one of a series of pulleys D of different diameters, secured on a horizontal shaft D′, turning in uprights rising from the main frame A, near the front of the same. From the outer large pulley of the series D, a band D^2, leads to a small pulley E fixed on a short horizontal shaft E′, arranged longitudinally immediately above the drum (*c*) and turning in boxes in the main frame, on whose inner end there is fixed a worm or spiral grooved wheel E^2, which meshes in gear with and gives motion to a cogged wheel F fastened on a horizontal transverse shaft F′, near the back end thereof, said shaft being secured and turning in suitable boxes in the main frame, and extended beyond the front of the frame to receive a crank F^2, by which the operator reverses the motion of the cutter carriage when the feed lever is thrown out of gear. In front of the cog wheel F and on the same shaft F′, is secured a grooved notched wheel F^3, the notches being of a curved form and made in the groove around which an endless chain F^4, passes secured to the cutter carriage, for giving motion to the same, also passing around a similar grooved notched pulley or

wheel F^5, secured on a horizontal transverse shaft turning in boxes in an upright *f*.

G is a cogged wheel fixed on the inner end of the horizontal shaft D′, and meshing in gear with a cog wheel G′, secured on a horizontal shaft or arbor G^3, turning in boxes in uprights J′ of the hinged frame J, said cog wheel G′ meshing in gear with a similar sized cog wheel G^2, arranged immediately above the same and secured on a horizontal shaft or arbor G^3, similar to the one below, the inner ends of said shafts or arbors G^3, serving as holding centers, to which the heel portion of the blocks to be turned to the form of lasts are secured.

H is a grooved notched wheel on one end of the lower horizontal shaft or arbor G^3 around which is passed an endless chain H′ leading to a similar grooved notched pulley or wheel H^2 secured on a horizontal shaft H^3 turning in boxes in uprights at the left and lower portion of the vertical frame A upon this shaft and next this wheel or pulley is secured a long pinion or trundle wheel I, into which meshes a cog wheel I′ on a horizontal shaft or arbor I^2 arranged immediately below the same, and likewise turning in boxes in the uprights of the frame.

The grooved notched pulleys or wheels H H^2 are of the same diameter, and the long pinion or trundle wheel I and cog wheel I′ are of such relative diameters as to impart to the reverse pattern, which is secured to the shaft or arbor I^2, the proper proportionate speed to that given to the blocks from which the lasts are to be turned.

J, is a hinged frame, composed of two rails connected at their left ends by two upright timbers J′, J′, and inserted in the space between the end and upper timbers, and the upper center rail *a* of the upright frame A′, which it exactly fits, having horizontal timbers or arms J^3 projecting from near its left end, and extending toward the back part of the machine a short distance, through which and parts of the frame bolts or pins are passed on which said swinging frame moves horizontally outward from the cutters, to allow of the removal of the lasts, or of the blocks from which they are formed being secured to the shafts or arbors.

K is a sliding frame composed of two upright parallel timbers, connected together at top and bottom by horizontal timbers, and arranged between the upper and lower rails of the hinged frame J, the upper and lower horizontal timbers of said sliding frame having oblong planks *k* secured to their sides which project some distance above the upper surface of the upper timber, and below the lower surface of the lower timber, so as to form grooves in which the horizontal timbers of the hinged frame J are inserted for guiding the sliding frame K, over said timbers. The oblong planks *k*, on the inner side of the hinged frame are secured permanently, and those *k* on the outer side of the same, are secured by dowel pins *k*′ projecting from their sides, and entering corresponding openings in the horizontal timbers of said frame, and a thumb screw k^2, passing through an opening in the center of the oblong planks *k* and entering the horizontal timbers, in such a manner as to allow of the sliding frame K being clamped at any point desired in the hinged frame.

K′, are horizontal shafts or arbors, turning in suitable boxes in one of the upright timbers of the sliding frame, on the same horizontal line as the shafts or arbors G^3 and having screws formed on them near one of their ends, which pass through corresponding female screws in the other upright of said frame K and provided with wheels and cranks 1, at these ends for turning the same.

k^3 is a beam or bar for clamping the shafts or arbor K′, made round at either end and having openings near its ends, through which the shafts or arbors pass, having a female screw at its center through which passes a thumb clamp screw k^4 passing through an opening in a horizontal timber secured to the sliding frame, and having a shoulder near its head, which rests against said timber.

L is another sliding frame, made in every respect similar to the sliding frame K, except that it is only provided with one horizontal shaft or arbor L′, at its center, and with a block L^3 with a single opening through which the shaft or arbor L′ passes, and by which and the screw L^4 attached, said shaft or arbor is clamped, instead of two as the frame K. This lower sliding frame L, is arranged immediately below the sliding frame K, between the upright and lower horizontal timbers of the upright frame A′ and the lower rail (*a*), and is guided in its longitudinal movement by tongues 2 projecting from the upper surface of the lower horizontal timber of the upright frame A′ and from the lower surface of the rail *a*, which are embraced by the oblong planks L^2 on the inner and outer sides of the horizontal timbers of the sliding frame, and against which the outer planks are pressed by the thumb clamp screws L^3 when it is desired to clamp the sliding frame L at any point. To this sliding frame L is secured a vertical arm M, having a notch or oblong space formed in its inner side in which the lower horizontal timber of the upright frame A′ fits as seen in Fig. 3, and projecting a short distance below the same, where it is secured to the end of a horizontal bar M′ for connecting the shaft or arbor I^2 with the sliding frame L, and thus caus-

ing their movements to be simultaneous and of the same distance back and forth, when turning a pair of lasts of greater or less length than the pattern. This connecting rod M′ extends parallel to the lower timber of the frame A′ toward the left end of the same, and passes loosely through an opening in an arm M^2, which is secured to the connecting rod by a clamp screw *m*, passing through the arm M^2 and pressing against the rod M′, said arm extending upward and made forked at its upper end, the prongs of which embrace the shaft or arbor I^2 and fit against a shoulder thereon, by which arrangement of parts the arm M^2 and sliding frame L, are made to move with the movement of the shaft or arbor I^2. The connecting rod M′ also passes through an opening in a short arm *m*′ secured permanently to the frame A′ which supports and allows it to move back and forth.

The horizontal shaft or arbor I^2 to which the heel portion of the reverse pattern is fixed, extends parallel with the shaft of the long pinion I, and beyond the left end timber of the upright frame A′ a suitable distance to allow of its longitudinal movement, and is connected to an adjustive bar or rod N, forked at one end, by means of pins or bolts passing through the prongs of the forked end into a thimble or ring 3, moving loosely in a circular groove formed at the end of the shaft or arbor I^2, in such a manner as to permit said shaft or arbor to rotate, and also allow the outer or shank end of the bar or rod N to be moved up and down. The bar or rod N is attached to a short connecting bar N′, by its shank end being inserted in the end of the said bar N′, and secured by a clamp screw N^2, which bar N′ has a grooved rectangular casting or box O secured to its rising and falling end, on the inside, by means of a bolt O′, upon which it turns, which casting is provided with a clamp screw O^2 passing through a female screw in the casting or box, and pressing against a graduated vibrating gage bar or lever P turning on a pin or fulcrum P′, about one third its length from its lower end, and inserted in the groove of the casting or box, in such a manner as to allow of said casting or box being moved up or down over the graduated vibrating gage bar or lever, and clamped at any required distance from its fulcrum, according to the length of the pair of lasts to be turned, without reference to the reverse pattern. Said vibrating gage bar being graduated with the Figs. 1, 2, 3, 4 and 5, commencing at points above and below the fulcrum, and continued at points equi-distant from the fulcrum toward the ends, for the purpose of indicating the extent of the movement of the casting or box O, over the graduated bar P, when it is desired to turn a pair of lasts of greater or less length than the reverse pattern. This graduated gage bar P, is secured to the main frame A, by a screw P′, and upon which it vibrates alternately to and from the frame A′, its upper end being the farthest from its fulcrum P′, and connected to a longitudinal rod P^2, attached to ears P^4 Fig. 3 projecting downward from a carriage Q, by a bolt, P^3, by which attachment the several parts for varying the length of the lasts are operated. The end of the longitudinal rod P^2, attached to the carriage, being provided with a series of holes by which its attachment thereto may be altered and governed to suit the movement of the turning gage bar P, and traversing movement of carriage. Q is the cutter carriage, extending horizontally from the rear of the main frame to the front of the vertical frame A′, and made to move back and forth upon longitudinal ways Q′, Q′, secured in the main frame by the propelling chain F^4, attached thereto, and is composed of two transverse parallel timbers, connected and braced by two longitudinal timbers, in the lower sides of which are corresponding grooves, for the ways Q′, Q′, and sustains and carries with its traversing movement the rotating cutting and tracing wheels. Upon this traversing carriage there is secured an adjustive frame R, composed of two side timbers placed upon and parallel with the transverse timbers of the carriage, and connected at their front ends by a longitudinal timber R′, in the center of which is confined the inner end of an adjusting screw R^3, passing through a female screw formed in the front longitudinal timber of the carriage Q, for the purpose of moving the said frame R, and with it the cutter wheel, to or from the blocks to be turned, to vary the size or reduce the thickness of the lasts, without reference to the pattern.

S, S, are mortises formed lengthwise the transverse timbers of the carriage, through which project upward the shanks of screws S′, S′, which screw into the under side of the frame R, and allow it to be moved to, or from, the blocks by the adjusting screw R^3, and clamped and held securely during operation.

T, T, are two vibrating beams secured to and between the adjustive frame R, by two horizontal studs or axles T′, T′, projecting therefrom upon which they turn; said axles turning in bearings formed in boxes T^2, T^2, screwed to the frame R. To the lower ends of these turning beams is secured the tracing wheel U, whose shaft turns in boxes U′, U′, which are screwed to the beams, and which may be adjusted vertically in order to bring the tracing wheel properly

in contact with the pattern, the ends of the beams being provided with slots for that purpose through which the screws *u u* to confine the boxes pass.

V, V, are two other adjustive beams secured to, and parallel with the insides of the upright beams T, by screws V′, V′, two to each beam, pasing through vertical slots V^2, V^2, in the outer beams, and into the inner beams, by which the said adjustive beams, with the cutter wheel, are permitted to rise and fall in order to bring the cutters in contact with the rotating blocks from which the lasts are to be formed, equally and alike, or equidistant between the two, so that their proportion shall be exactly the same. These vertical adjustive beams, V are connected together by a timber *v* and to their upper ends is secured the shaft of the cutter wheel W, turning in suitable boxes *w*, *w*, on which shaft there is a pulley W′, from which a band W^2, leads to a pulley W^3, on a horizontal shaft W^4, arranged between the adjusted beams about their center, and turning in bearings therein. On the shaft W^4, there is also a long pulley W^5, from which a band *b* leads to the main driving drum *c* by which the cutter wheel W, is made to receive its motion from the driving drum; the band leading from this driving drum, to the pulley W^5, being made to slip over its periphery to compensate for the traversing movement of the carriage.

X are the cutters of the ordinary form, arranged at equal distances apart around, and projecting equally alike from the periphery of the wheel, and confined by screws *x*. The cutters are arranged in a spiral line upon the face of the wheel, so that they shall cut and pare the article being turned, equally at all parts and in the proper proportion with the rotating speed of the blocks, and longitudinal movement of the carriage.

Y is a transverse lever for engaging and disengaging the feeding worm or spiral grooved wheel E^2 with the cog wheel F, on the propelling shaft F′, to give the longitudinal movement to the cariage, Q, and allow it to be reversed. This lever Y is arranged on top of the main frame A, and is connected to a horizontal transverse beam Z, in which the inner end of the shaft of the feeding worm E^2 turns by a rod (*z*) and is secured to the frame by a screw Z^2, so that by raising the outer end of the lever Y over an inclined block Z′, the worm E^2, will be engaged with the cog wheel F of the propelling shaft F′.

Heretofore lasts have been turned separately and single, both right and left, and hence the great uncertainty of equal and alike proportions in the two (or pair) they having been turned apart and independent of each other.

Our machine is designed, and effectually obviates these difficulties and turns twice the number of lasts in a given time, to that produced by any other machine, and with the greatest accuracy in every particular.

Operation: When it is desired to turn any number of right and left lasts in pairs the same length as the pattern, the longitudinal connecting rod, P^2, is disconnected from the carriage Q, and the reverse pattern U^2, previously turned from a last pattern, is then secured between the adjustive shaft or arbor L′, and shaft or arbor I^2, which is prevented from having any longitudinal movement by disconnecting its attachment M′, with the sliding frame L. The sliding frame L, is then clamped to the frame A′, and the screw shaft or arbor L′ is also secured by the clamp screw L^4, which confines the reverse pattern. The vertical frame J is then swung upon its studs or hinges J^2, J^2, out or from the frame A′, and the blocks from which the lasts are to be turned are properly secured between the center shafts or arbors G^3, K′ which are adjusted thereto, and clamped together with the sliding center frame K. The swing frame J, is then moved in its place, and confined by the buttons J^5, the horizontal frame R, which sustains the cutting wheel W, and turning beams T, V, are then adjusted toward or from the blocks, to increase or diminish the size or thickness of the lasts as desired, independently of the pattern, which is effected by the adjusting screw R^3, secured in the carriage Q. The propelling drum C is then put in motion, and the feeding spiral grooved wheel or worm E^2 is engaged with the cog wheel F on the propelling crank shaft F′ when the reverse pattern will be caused to rotate from the frame, in the direction indicated by the arrow 4 in Fig. 3 and the last blocks with their centers simultaneously therewith, toward each other, at the same speed. The carriage Q being at the left extreme of its movement, with the cutting and tracing wheels V, W, will be moved forward slowly, simultaneously with the rotation of the blocks, from the heel portion of the same, till the cutters X reach the toe of the blocks, the cutters X cutting and paring the blocks regularly and exactly. A pair of lasts turned in this manner will be of the same proportion and form, in every respect, except that one will be right, and the other left, the right and left form being given and produced by their reverse motion toward each other. The lasts are then removed, by moving the hinged frame J outward, and the feeding worm or screw E^2, is disengaged from the cog wheel F of the propelling shaft F′, and the attendant lays hold of the crank F^2, thereon and reverses the motion of the propelling chain wheels

F^3, F^5 which causes the carriage Q to be drawn to the extreme of its back movement. In this manner the operation is continued till the required number of pairs of lasts shall be turned.

In order to turn pairs of lasts of greater length from the same reverse pattern the long connecting rod P^2 must be connected with the carriage Q, and the sliding frame L unclamped from the frame A′, and connected with the center shaft I^2 by the vertical arm M^2 and longitudinal rod M′ and with which it is made to move back and forth, and the metallic box O moved upward over the vibrating graduated bar P, a sufficient distance above the fulcrum of said bar and there clamped to give the required traverse or longitudinal movement to the reverse pattern which in proportion to its longitudinal movement increases the length of the lasts being turned, (they having no longitudinal movement) in the following manner. When a longitudinal movement is given to the carriage and the cutting and tracing wheels with the same are caused to move from the toes toward the heel parts of the lasts being turned and reverse pattern, the vibrating graduated bar or lever P is moved on its fulcrum by the connecting rod or bar P^2 attached to its upper end and to the carriage Q and the horizontal shaft or arbor I^2 being attached to said graduated vibrating bar or lever P above its fulcrum by means of the ring or collar (3) forked rod or bar N, short bar N′, and rectangular casting or box O, and said shaft or arbor I^2 and the sliding frame L containing the center shaft or arbor (I^2) between which and the shaft or arbor I^2 the reverse pattern is secured, being attached by means of the arm M, horizontal bar or rod M′ and forked arm M^2 against the prongs of which the shoulder of said shaft or arbor I^2 rests said shaft or arbor I^2 and sliding frame L with the reverse pattern will be caused to move longitudinally with the carriage Q, and cutting and tracing wheels with a greatly decreased speed commensurate with the distance from the center or fulcrum on which the graduated bar or lever vibrates to the point where the metallic box O, is clamped.

The toe portion of the reverse pattern being situated immediately below the intended toes of the lasts to be cut and the sliding frame L and shaft or arbor I^2 clamped together by the screw *m* pressing against the bar M′, when the operation of cutting is commenced, with a proportionate speed until said tracing wheel reaches or overtakes its heel portion thus enabling the operator to set a reverse pattern or model to indicate and direct the wheel of cutters to cut lasts of any length, without regard to their thickness, and otherwise exactly corresponding in form and with the reverse pattern or model, the increase in the length of the lasts cut being equal to the longitudinal movement of the reverse pattern.

When it is desired to turn pairs of lasts of a less length from the same reverse pattern the metallic box O is moved down over the graduated gage bar P a sufficient distance below the fulcrum on which it turns, governed by the decrease required in the length of the lasts, from the length of the reverse pattern and indicated by the scale on the bar P and there clamped. The reverse pattern confined as described above will be caused to move in opposite directions to the simultaneous longitudinal movement of the tracing wheel and will consequently decrease the length of the lasts being turned precisely the distance of its longitudinal movement.

Two vertical stationary rests may be substituted for the turning beam T, V, secured to the carriage Q, and extending above and below the same to the ends of which, upright adjustive frames, are secured, which contain the cutting and tracing wheels, which are secured in horizontal frames, that extend back and connect with the upper and lower ends of turning beams, secured to the rear portion of the carriage Q, and turning upon axles on whose shaft, there is a pulley, around which a band leads to a pulley on a horizontal shaft at the top of the turning beams, on which there is also a pulley, from which a band leads horizontally to a pulley on the shaft of the cutter wheel, the whole being operated by the band (*b*) of the drum C. By this arrangement the cutting and tracing wheels are permitted to move to, and from, the blocks, and reverse pattern, in horizontal lines, instead of swinging in the arcs of circles.

It is not necessary that the cutting and tracing wheels should be of equal diameters as in all other machines for turning irregular forms, but may be of different diameters as represented, to produce the desired result.

We do not claim to be the original inventors of the principle of cutting and turning lasts or other irregular formed bodies by means of a series of revolving cutters guided by a pattern or model corresponding in form with the article to be cut or turned as this principle is common property and has been for many years, but

What we do claim as our invention and desire to secure by Letters Patent is—

The mode of cutting a right and left last (or other article simultaneously from a single reverse pattern and two blocks of wood) by the before described combination and arrangement of a reverse model tracer wheel, and single wheel of rotary cutters, moving

in opposite directions, the tracer wheel being in contact with the reverse model while the cutters turn between the two pieces of wood to be turned into a right and a left last, the latter turning simultaneously in opposite directions, inward, or outward, against the cutter wheel.

In testimony whereof we have hereunto signed our names before two subscribing witnesses.

CHARLES HARTSHORNE.
WM. B. SHAW.

Witnesses:
P. O. MICHELL,
CHARLES DANFORTH.