March 25, 1952 G. CLAUSING 2,590,378

TURNING LATHE FOR SHOE LASTS

Filed Dec. 26, 1946 4 Sheets-Sheet 1

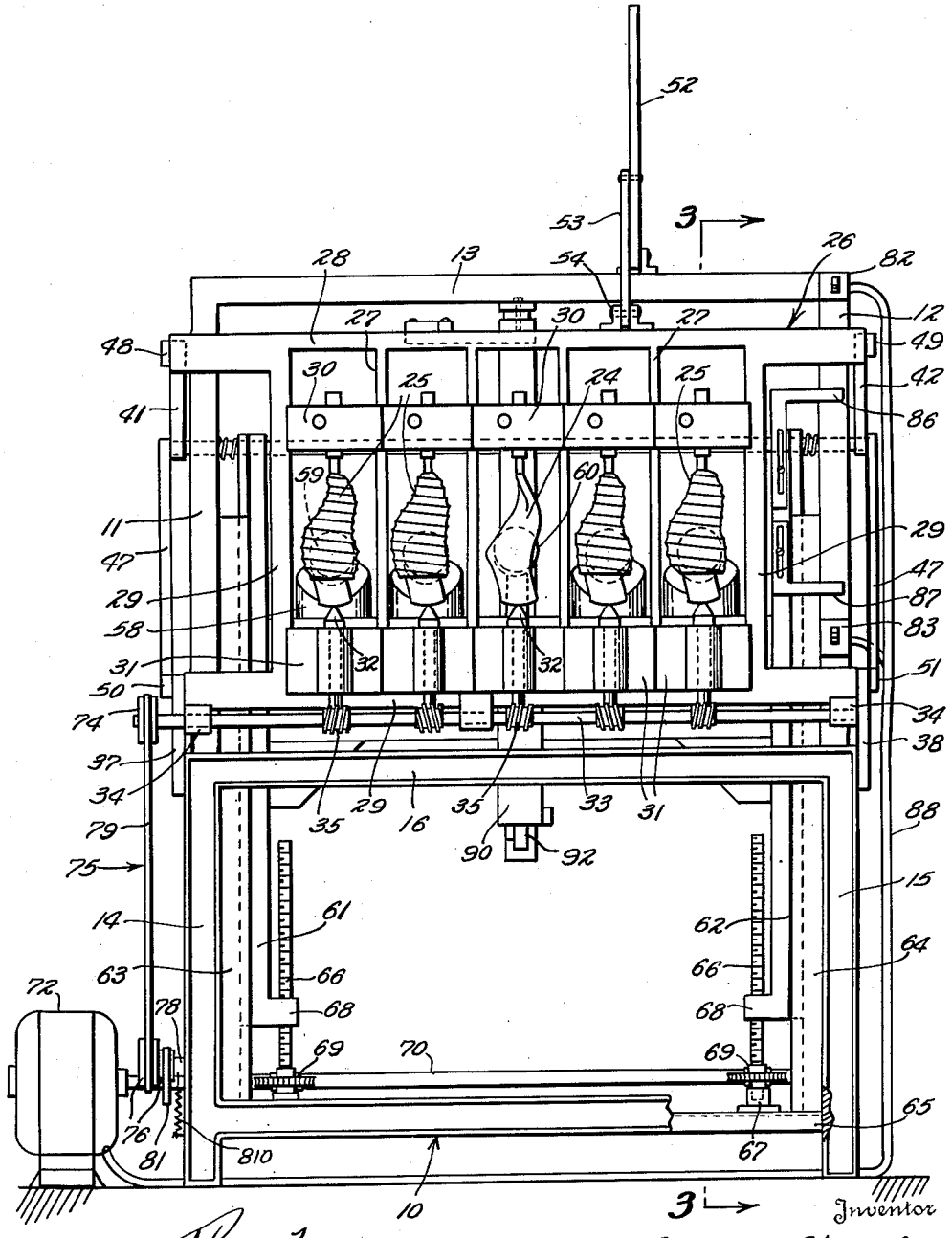


Fig. 1

By Murray, Sackhoff & Paddack
Attorneys

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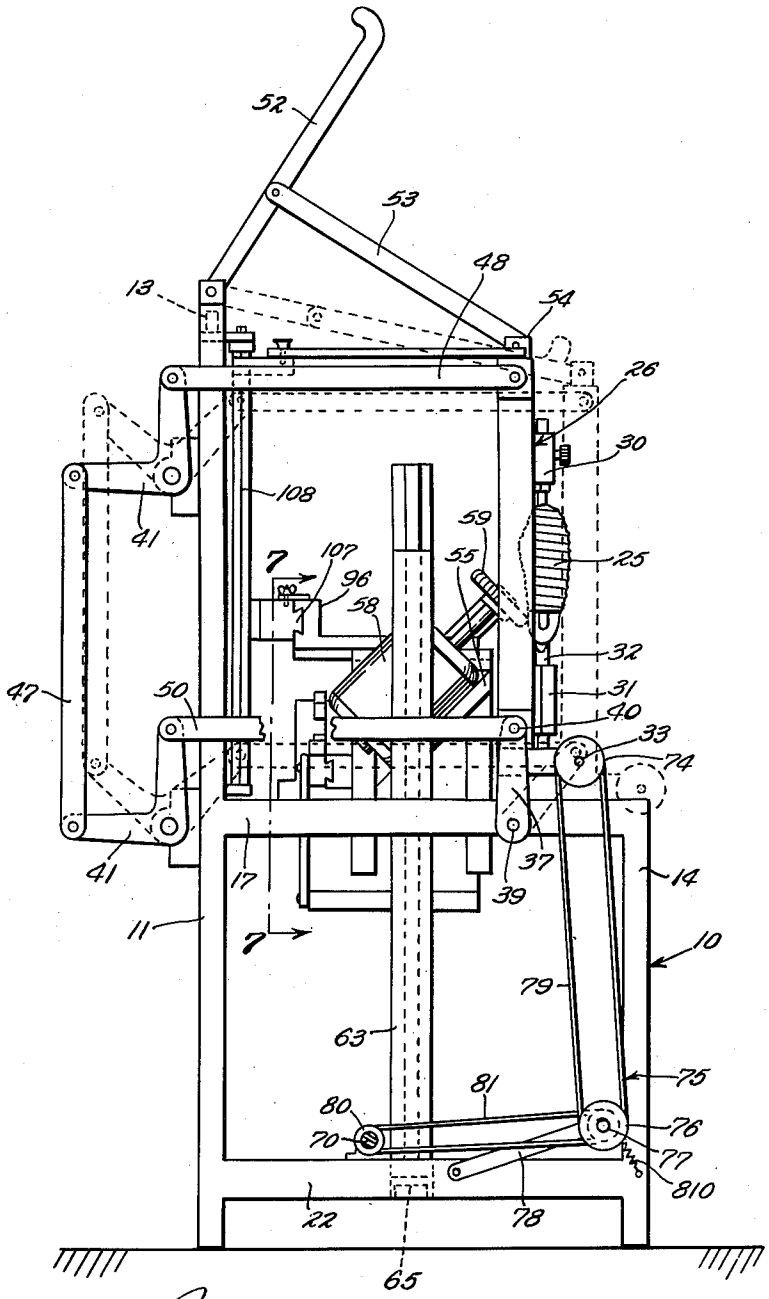


Fig. 2

Inventor
George Clausing

By Murray, Sackhoff & Paddock
Attorneys

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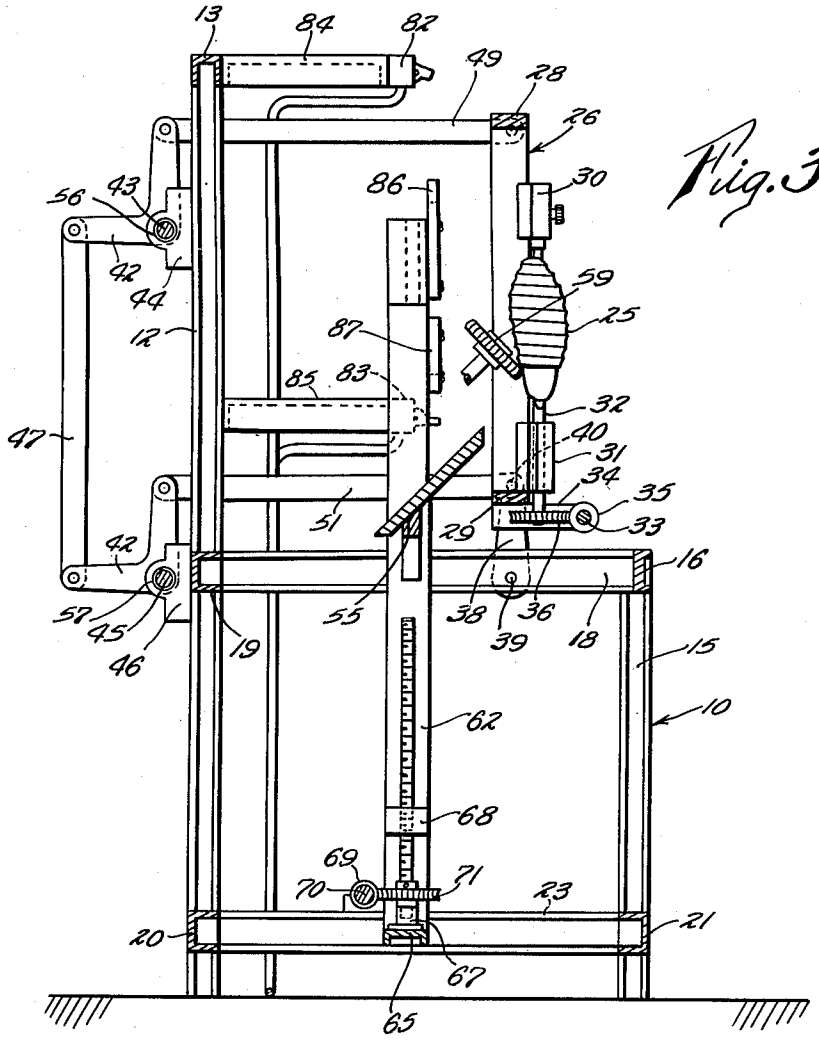


Fig. 3

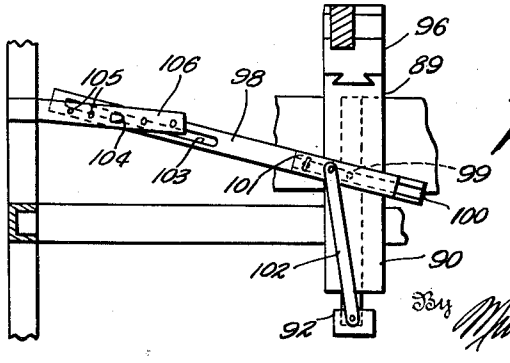


Fig. 7

Inventor
George Clausing

By Murray, Sackhoff & Paddock
Attorneys

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TURNING LATHE FOR SHOE LASTS

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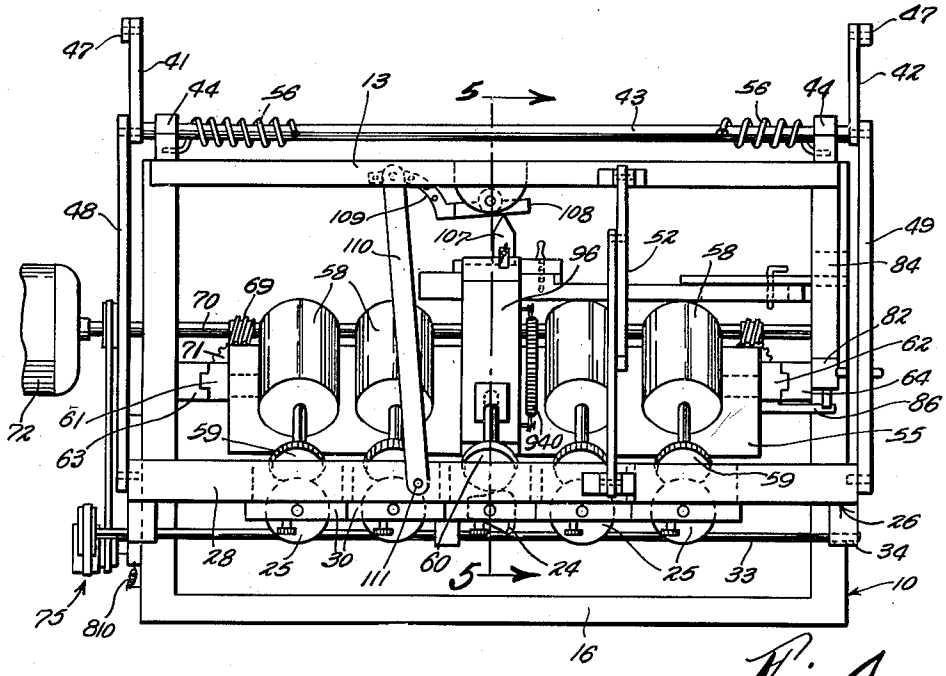


Fig. 4

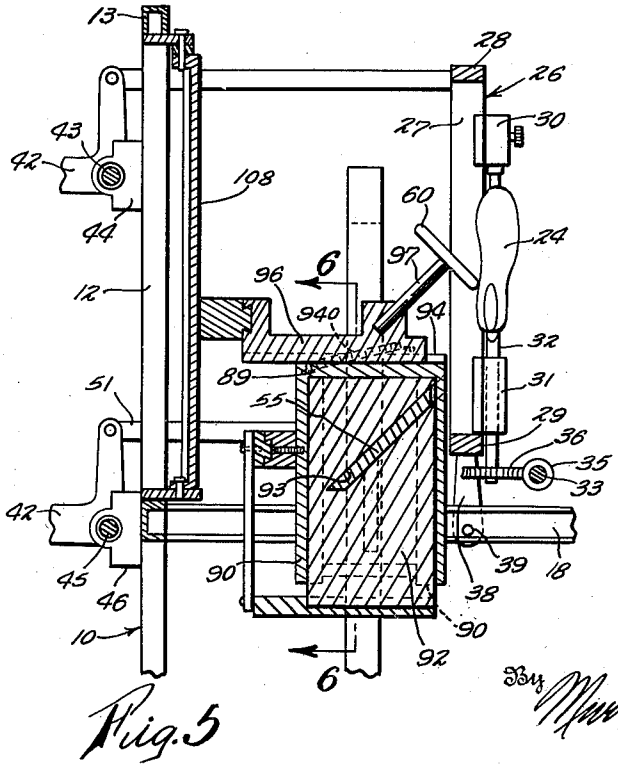


Fig. 5

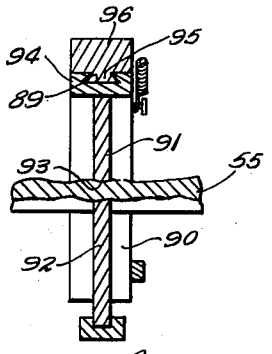


Fig. 6

Inventor

George Clausing

By Murray, Jackshaft & Paddock

Attorneys

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UNITED STATES PATENT OFFICE

2,590,378

TURNING LATHE FOR SHOE LASTS

George Clausing, Portsmouth, Ohio, assignor to Vulcan Corporation, Portsmouth, Ohio

Application December 26, 1946, Serial No. 718,535

3 Claims. (Cl. 142—15)

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The present invention relates to improvements in turning lathes for shoe lasts and other articles having irregular forms and is particularly directed to a copying lathe for quickly and efficiently turning out, in one operation, a number of pairs of shoe lasts which have the exact contour or proportionate shape of the model last.

An object of the invention is to provide in a shoe last lathe a novel means for supporting a comparatively heavy vibratile mass which includes the model last and a number of rough blocks or work pieces, so that said mass is sensitive to the impulses transmitted thereto by a vibrating mechanism with a consequent conservation of energy and a closer conformity of the finished lasts to the contour of the model last.

Another object of the invention is to provide in combination with a shoe last lathe having the foregoing features a novel mechanism for actuating the vibratile mass, said mechanism having a differential system for producing pairs of shoe lasts with proportionate measurements from a single model last.

A further object of the invention is to provide a copying lathe having novel devices and combinations of devices, illustrated in the drawing, described in the following specification, and defined in the appended claims.

In the accompanying drawings which show a preferred embodiment of my invention, like characters indicate like parts throughout the several views, wherein:

Fig. 1 is a front elevational view of my turning lathe for shoe lasts.

Fig. 2 is a side elevational view of the left hand side of the lathe illustrated in Fig. 1, the motor being omitted therefrom.

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a top plan view of the last turning lathe.

Fig. 5 is a fragmental, cross-sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a fragmental, cross-sectional view taken on line 7—7 of Fig. 2.

My invention generally contemplates the provision of a vertical frame supported for substantially horizontal, reciprocating movement upon a pair of upstanding spaced links pivoted to the machine base, said frame carrying work pieces and a model last which are rotated thereon in timed relation about vertically positioned, longitudinal axes. Furthermore I provide means for yieldably forcing the frame toward a work cutter and copying disc table mounted on the machine base for vertical movement in timed relation with the rotating work pieces and the model last, said copying disc being mounted on the table for independent, relative movement in a vertical and in a horizontal direction. Certain novel differential connections are made between the work and model frame and the copying disc and between said disc and the cutter table for grading the widths and lengths respectively of shoe lasts made on my machine.

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With reference to the drawing a detailed description of my last lathe will now be made, and to this end the numeral 10 indicates the machine base which has at least two rear standards 11 and 12 extending upwardly to the complete height of the machine and which are joined at their upper ends by a cross-bar 13. The base also has two short standards 14 and 15 at the front thereof which are joined together at their upper ends by a cross-member 16, said front and rear standards being interconnected by an upper transverse member 17 extending between the standards 11 and 14 and a member 18 extending between the standards 12 and 15. The lower portions of the standards 11 and 12 are connected by cross-members 19 and 20 (Fig. 3) whilst the standards 14 and 15 are connected by a lower cross-member 21, said cross-members 20 and 21 being interconnected by transverse members 22 and 23.

A vertical frame for carrying a model last 24 and a number of work pieces 25 is generally indicated in the drawings by the reference numeral 26 and is constructed from a series of vertical support members 27 joined along their upper and lower edges by cross-members 28 and 29 respectively, said cross-members having their ends extending beyond the end support members 29 of the frame (Fig. 1). The model last and work piece tail-stocks 30 are secured between the vertical supports 27 and the end tail-stocks positioned between said supports and the end supports 29 of the frame in any suitable manner whilst the model last and work piece head-stocks 31 are mounted in a similar position to the frame. Each of the head stocks has its spindle 32 in axial vertical alignment with its respective tail-stock spindle. The head-stock spindles are rotated by means of a drive shaft 33 extending crosswise of the frame and rotatably mounted thereon by journal blocks 34. The drive shaft has secured thereto a number of worm gears 35

which, as most clearly shown in Figs. 3 and 5, mesh with worm-wheels 36 fixed to the depending portions of the spindles 32. It will be noted that the pair of work pieces positioned adjacent the model last in Fig. 1 have the worm-gears for driving their spindles threaded in one direction whilst the outermost work pieces have their driving worm gears threaded in the opposite direction so that upon rotation of the drive rod 33 one pair of the work pieces will be rotated around vertical axes in one direction whilst the remaining pair of work pieces are rotated around vertical axes in the opposite direction thereby turning a pair of right and a pair of left lasts from the single model 24.

The model last and work piece carrying frame 26 is mounted on the base in a vertical position for substantially horizontal, reciprocating movement and is solely positioned on the base by a pair of oppositely disposed frame supporting bars 37—38 pivoted at 39 to the upper transverse members 17 and 18 respectively of the machine base. The upper free ends of the supporting bars are pivotally connected at 40 to the outer ends of the extensions of the lower frame member 29. My lathe has a linkage for controlling the reciprocating motion of the last block and model carrying frame which is substantially like the torque mechanism described in Patent No. 2,449,878, dated September 21, 1948. With particular reference to Fig. 2 of the accompanying drawings the motion coordinating linkage is mounted on the base 10 for maintaining the frame 26 in a vertical position during its reciprocating movement and to this end a pair of bell cranks 41—41 and 42—42 are provided for each end of the frame, the upper bell cranks of each pair being fixed to a cross-rod 43 which is rotatably mounted on the base between fixed journal bearings 44. The lower bell crank of each pair is similarly fixed to a cross-rod 45 journaled in bearings 46 on the base. The common, horizontally disposed arms of each pair of bell cranks are interconnected by a vertically extending link 47, the upper arms of the bell cranks of each pair 41 and 42 being connected to the adjacent ends of the cross-member 28 of the frame 26 by links 48 and 49 respectively. The upper arms of the lower bell cranks of the pairs 41—42 are connected by links 50 and 51 respectively to the pivot 40 which connects the outer ends of the lower frame member 29 to the bar supports 37 and 38. The model last and work carrying frame is illustrated in the drawings in its operative last turning position and it will be noted that the sole support of the frame upon the machine base is the spaced apart pair of pivoted bars 37 and 38 and that said bars are disposed in operative vertical positions. The inoperative position of the frame and its motion coordinating system of linkage is illustrated in dotted lines in Fig. 2, the frame being moved to said inoperative position by means of a manual lever 52 pivoted to the cross-member 13 of the machine base and having a pivotal connection at its mid-portion with a link 53 in turn pivotally connected to a bracket 54 mounted on the upper member 28 of the model last and the work piece carrying frame.

The frame is yieldingly urged toward a work cutter and a copying disc table 55 by means of coil springs 56 and 57 encircling the cross-rods 43 and 45 for the bell cranks, the outer ends of said springs being secured to the rods whilst the inner ends are anchored in the respective journal bearings 44 and 46 for said rods. These springs continuously urge the rods 43 and 45 and the associated bell cranks 41—41 and 42—42 respectively in a counterclockwise direction as the device is illustrated in Figs. 3 and 5 which creates a yieldable, inward pull on the bell crank arms 48—49 and 50—51 respectively pivotally connected at their outer ends to the frame 26. The inward pull of said arms therefore yieldingly urges the frame toward the copying disc table 55. With reference to Figs. 2, 3 and 5 it will be noted that the table 55 is inclined and has mounted thereon a number of electric motors 58 which have fixed to the outer ends of their armature shafts individual work cutters 59 that cut stock from the rotating work pieces. The table also carries the copying disc 60 which is yieldably urged against the model last on the frame by the force of the yieldable frame which varies the horizontal reciprocating movement of the frame by its contact. As most clearly illustrated in Fig. 4 the ends of the table 55 are secured to vertical guide members 61 and 62 which are received in vertical standards 63 and 64 respectively resting upon a frame cross-member 65 (Fig. 1) and secured intermediate their ends to the transverse members 17 and 18 respectively of the machine base. The table is vertically reciprocated by means of a pair of vertically extending feed screws 66—66, rotatably mounted in bearings 67 positioned upon the cross-member 65, said feed screws cooperating with the threaded apertures formed on lugs 68 extending inwardly from the lower ends of the guides 61 and 62. The feed screws are driven by worm-gears 69 fixed to a drive shaft 70 and meshing with worm-wheels 71 fixed to said screws.

The work cutter and copying disc table is vertically raised and/or lowered in timed relationship with the rotation of the work pieces and the model last by a reversible motor 72 which may be directly connected with the drive shaft 70 and which drives a pulley 74 fixed to the drive shaft 33 through a drive connection generally indicated by the reference numeral 75 (Figs. 1 and 2). Said drive may comprise a pair of idler wheels 76 fixed to a stub shaft 77 rotatably secured to the outer end of an arm 78 pivoted to the machine base. One idler drives the pulley 74 by a belt connection 79 whilst the other idler is driven by pulley 80 fixed to the shaft 70 and connected thereto by a belt 81. As clearly indicated in Fig. 2 a spring 810 connected to the base and the outer end of the arm 78 functions to place the flexible drive 75 under sufficient tension when the frame 26 is in operative position so that power is transmitted from the motor drive shaft 70 to the model last and work piece driving rod 33. However when the frame 26 is moved to inoperative position the pulley 74 and consequently arm 78 moves downwardly thereby relieving the tension on spring 810 and the flexible drive whereby the belt 79 is allowed to run free in its pulley 76.

The upper and lower limits of motion of the frame are determined by electric switches 82 and 83 respectively (Figs. 1 and 3), said switches being fixed to arms 84 and 85 extending from the standard 12 of the machine base. It will be noted that a pair of arms 86 and 87 are adjustably mounted for vertical movement upon the upper end of the guide member 62 for the work cutter and copying disc table and extend into the vertical extension lines of the operating arms for the switches 82 and 83 respectively. The switches are electrically connected in any suitable manner to the reversible motor by armored cable 88.

I have provided for my lathe for turning lasts

a longitudinal last grading device whereby lasts proportionally larger or smaller than the model last may be turned from the work pieces, said last grading device comprising a copying disc platform 89 mounted on the table for relative vertical movement. Said platform has spaced, downwardly extending guide arms 90 having central grooves 91 formed therein for freely receiving the vertical edges of a guide member 92 fixed to the central portion of the table 55. As most clearly shown in Figs. 5 and 6 the means for mounting the guide member on the table comprises an inclined slot 93 formed in the guide member which receives the mid-portion of the table, said guide member being fixed to the table by any suitable means such as welding, or the like. The upper surface of the platform has formed therein a groove 94 which slidably receives a tongue 95 formed on the lower end of a copying disc block 96. A spring 940 extends between the block 96 and the platform 89 and yieldingly urges the block rearwardly against a follow board to be described hereinafter. As indicated in Figs. 4 and 5 the block 96 has a horizontal sliding movement on the platform in the direction of frame reciprocation, said block having a shaft 97 extending upwardly therefrom for carrying the copying disc 60.

A differential length grading connection is made between the guide member 92 fixed to the table 55 and the copying disc platform 89 so that vertical movement of the platform relative to the table may be varied to vary the proportionate length of the lasts turned on my machine from a single model last, and as indicated in Figs. 2 and 7, said connection comprises a grading lever 98 pivoted at 99 to the guide arm 90 of the platform, said lever having a groove 100 formed therein for slidably receiving an adjustable block 101. The block is pivotally connected to a link 102 which in turn is pivotally secured at its lower end to the guide member 92 fixed to the table 55. The outer end of the lever 98 has an elongated slot 103 formed therein for receiving a fulcrum pin 104 adjustably mounted in any one of a number of apertures 105 formed in an horizontal arm 106 secured to the machine base.

It will therefore be noted that the ratio of the simultaneous, vertical movements of the table 55 and the copying disc platform 89 is varied through the differential length grading mechanism, provided the pivot connection 99 between the grading lever 98 and the platform guide 90 is out of alignment with the pivotal connection between the sliding block 101 and the link 102 (Fig. 7). When said pivots are in the position illustrated in Fig. 7 the copying disc platform moves at a faster speed relative to the table resulting in a finished last which is proportionally shorter than the last model whilst when the pivotal connection between the sliding block 101 and the link 102 is to the right of pivot 99 (Fig. 7) the speed of the platform relative to the table is at a slower rate thus producing lasts which are proportionally longer than the model last. The variable fulcrum pin 104 between the grading lever 98 and the base is provided for making fine adjustments after the sliding block 101 has been set in position on the lever.

My device also has a transversely operable last width grading device which comprises a follower 107 slidably secured to the copying disc block 96 for horizontal movement at right angles to the movement of said block. The follower engages a vertically disposed follow board 108 pivoted to

extensions formed on the upper and intermediate cross-members 13 and 19 of the machine base, said follow board having extending from its upper end a width grading lever 109 (Fig. 4) which is adjustably pivoted to a link 110 pivoted to the frame at 111 for making rough adjustments between the link 110 and the lever 109. Fine adjustments are thereafter made between the follower 107 and the copying disc block 96. Other sizes and widths, either up or down from a particular model, may be quickly and accurately made with my machine by adjusting the differential mechanism just described it being understood that said adjustment devices may be calibrated in any suitable manner so that they may be positively operated by inexperienced persons.

In operation therefor a number of work pieces 25 are rotatably mounted in the frame 26 between the vertically aligned tail-stocks and head-stocks provided for said purpose whilst the model last 24 is mounted between its vertically disposed head-stock and tail-stock located centrally of the frame 26. The model last and the work pieces are fixed in their proper chucks while the frame is in the position illustrated in dotted lines in Fig. 2. The longitudinal last grading device is then adjusted to obtain predetermined, proportionate lengths for the lasts turned on the lathe by making a rough adjustment between the lever 98 and the arm 106 and following it, if necessary, with fine adjustments by moving the block 101 in the groove 100 formed in the lever 98. The transverse last grading device is then manipulated by adjusting the connection between the link 110 and the arm 109 and if necessary following with a fine adjustment between the follower 107 and the copying disc block 96. The motors 58 for the work cutters are thereafter energized from a suitable source of electricity and the work piece and model carrying frame moved by manual operation of lever 52 from its inoperative dotted line position in Fig. 2 to its operative position where it is yieldingly urged by means of springs 56 towards the cutters and the copying disc with the model 24 in contact with the copying disc 60. The work cutter and copying disc table 55 is preferably in its lower limit of motion prior to the last turning operation wherein it is vertically traversed from its lowermost position and it is now therefore only necessary to throw the upper control switch 82 to start the motor 72 which in turn initiates upward feed movement of the table and also rotates the last model and work pieces in timed relationship through the flexible drive connection 75. When the work cutter and copying disc table has reached its upper limit of motion arm 86 trips the switch 82 which shuts off the reversible motor 72 and stops the feed motion of the table and also the rotary movements of the last model 24 and the finished work pieces 25. The lever 52 is then grasped and the frame 26 moved to its inoperative dotted position illustrated in Fig. 2 in which position the tension is removed from the spring 810 and consequently the drive belt 79 to permit the finished work pieces to be removed from their head stocks and new work blocks inserted therein whilst the motor is actuated to return the copying disc and cutter table to its lowermost position in readiness for the next last turning operation. The feed table is returned from its uppermost position by manually throwing the arm of the electric switch 83 to its uppermost position.

What is claimed is:

1. In a lathe for turning lasts a base, a model last and work piece carrying frame, means for mounting the frame on the base in a vertical position for substantially horizontal, reciprocating movement, a work cutter and copying disc table mounted on the base for vertical movement in a plane parallel to, and spaced from the frame, a guide member fixed to the table, a copy disc platform slidably mounted on the member for vertical movement relative to said table, a copying disc block on the said platform, and a differential, length grading connection between the member and the platform, and means for yieldably urging the model last and work piece carrying frame toward the table.

2. In a lathe for turning lasts, a base, a model last and work piece carrying frame, means for mounting the frame on the base in a vertical position for substantially horizontal, reciprocating movement, a work cutter and copying disc table mounted on the base for vertical movement in a plane parallel to, and spaced from the frame, a copying disc block slidably mounted upon the table for horizontal movement in the direction of frame reciprocation, a vertical follow board pivotally mounted on the base and in engagement with the block, a grading bar pivoted to the frame, an adjustable connection between the free end of the grading bar and the follow board, and means for yieldably urging the frame toward the table.

3. In a lathe for turning lasts, a base, a model last and work piece carrying frame, means for mounting the frame on the base in a vertical position for substantially horizontal, reciprocating movement, a work cutter and copying disc table mounted on the base for vertical movement in a plane parallel to, and spaced from the frame, a guide member fixed to the table, a copying disc platform slidably mounted on the member for vertical movement relative thereto, a copying disc block slidably mounted on the platform for horizontal movement in the direction of frame reciprocation, a differential, length grading connection between the platform and the member, a vertical follow board pivotally mounted on the base and in bodily contact with the block, a width grading bar pivotally mounted to the frame, an adjustable means connecting the free end of the bar to the board, and means for yieldably urging the frame toward the table.

GEORGE CLAUSING.

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