E. BOSTOCK.

COPYING LATHE.

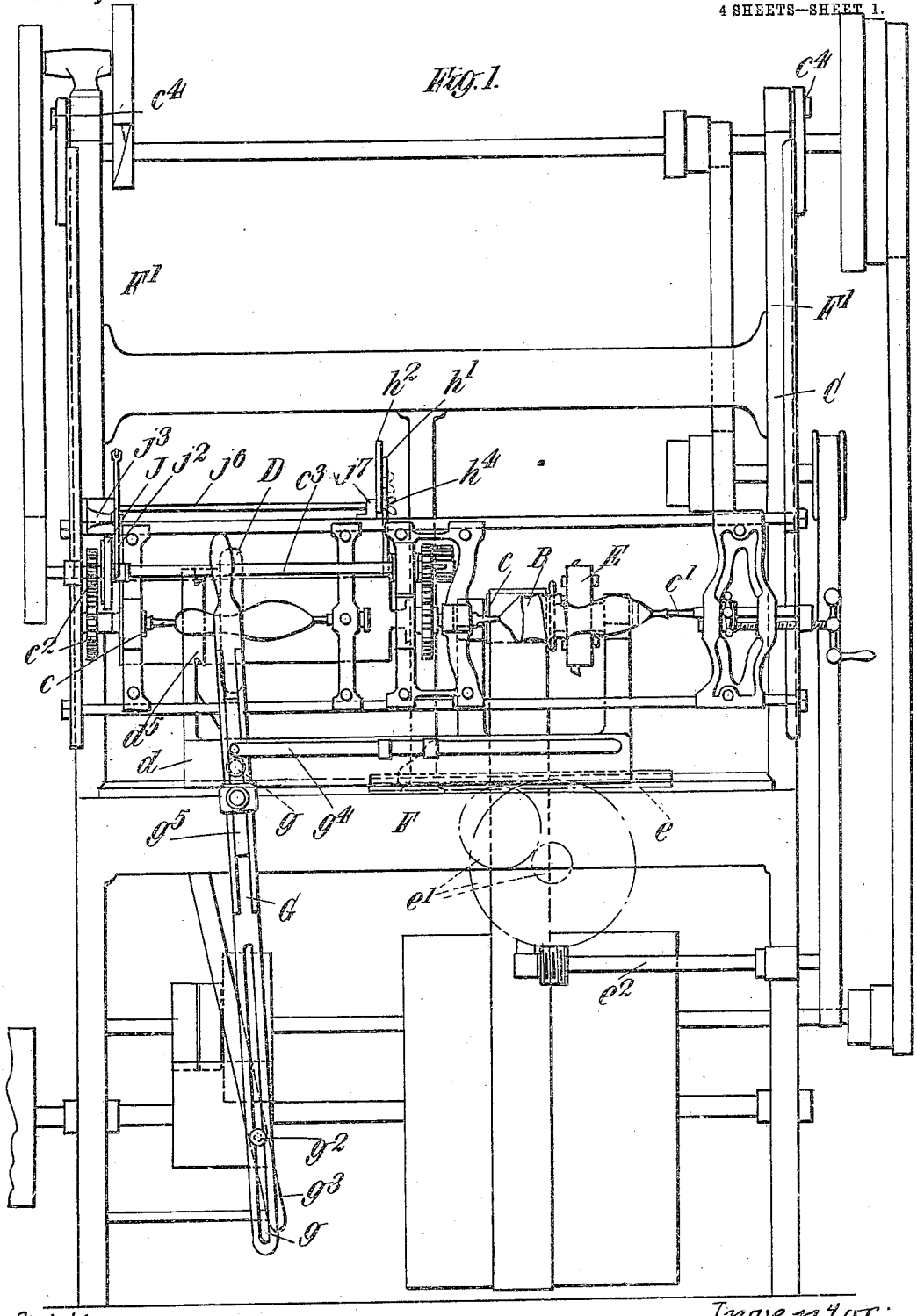
APPLICATION FILED DEC. 20, 1909.

961,580.

Patented June 14, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



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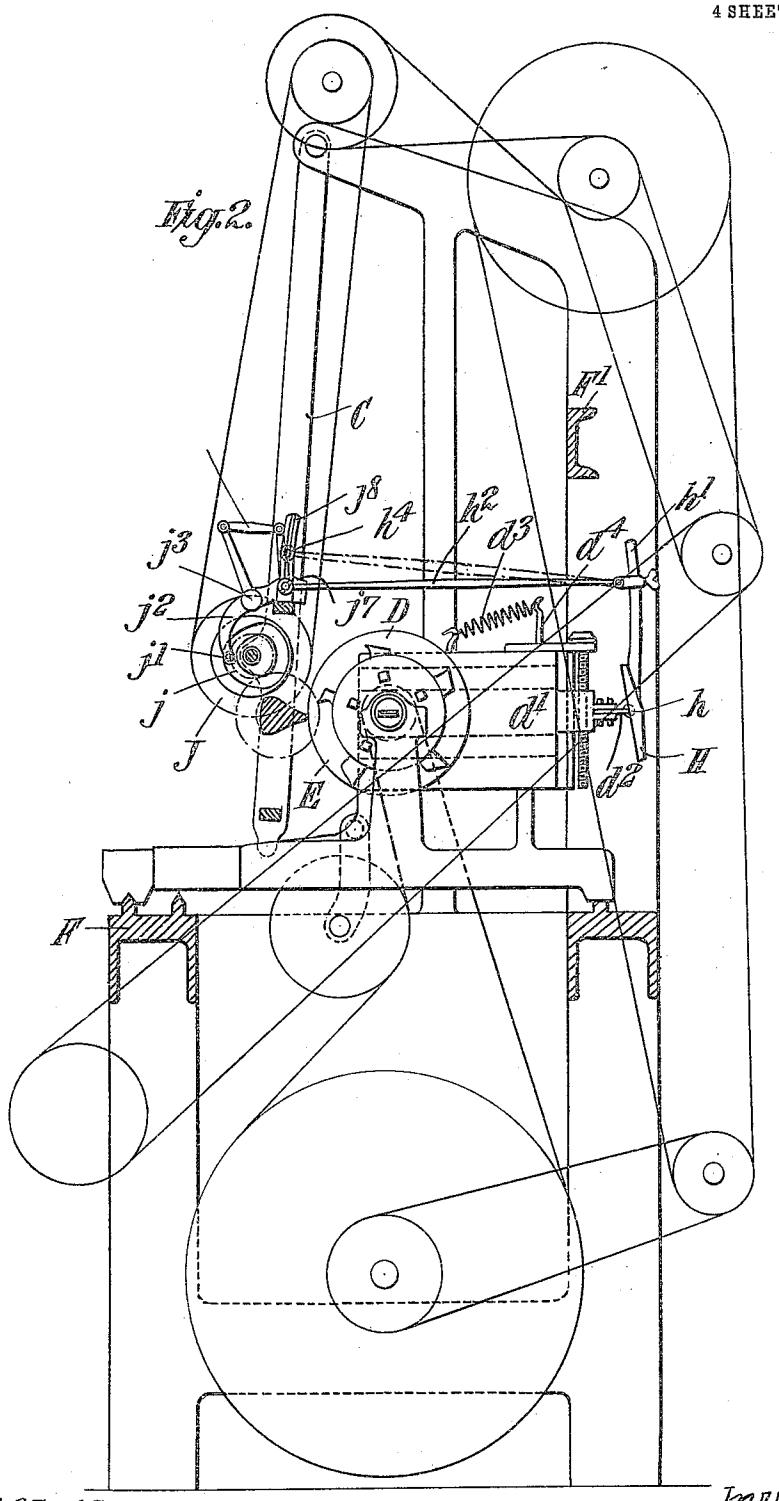
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

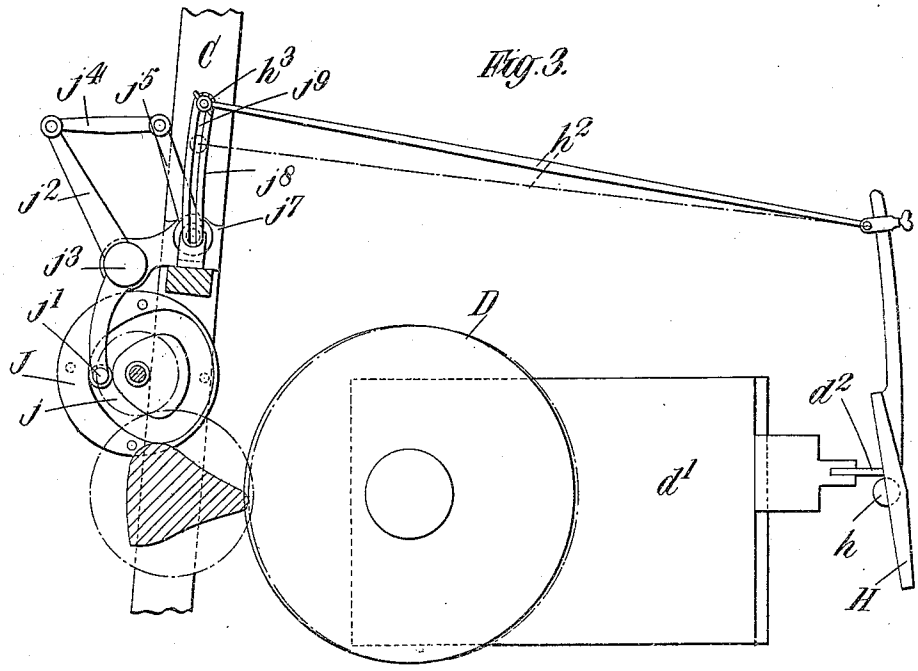

Fig. 5.

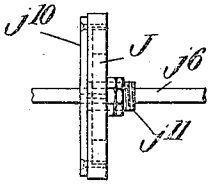

Fig. 4.

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4 SHEETS—SHEET 4.

Fig. 8.

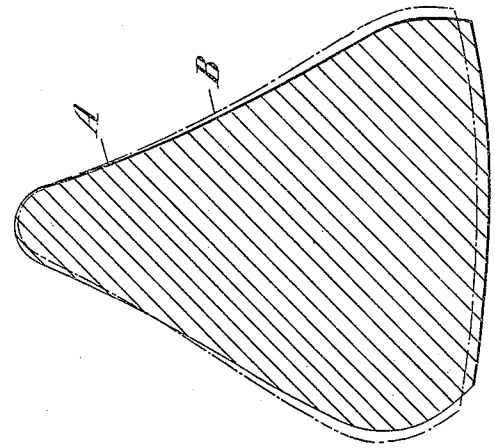


Fig. 7.

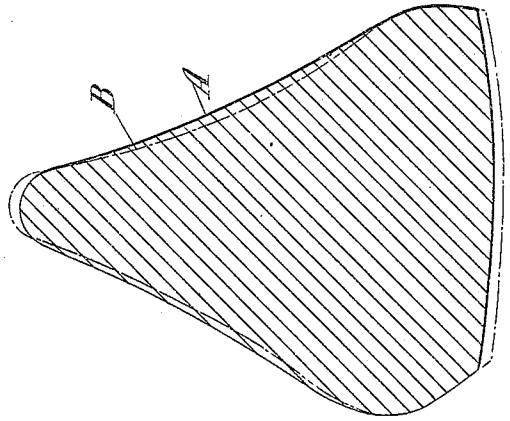
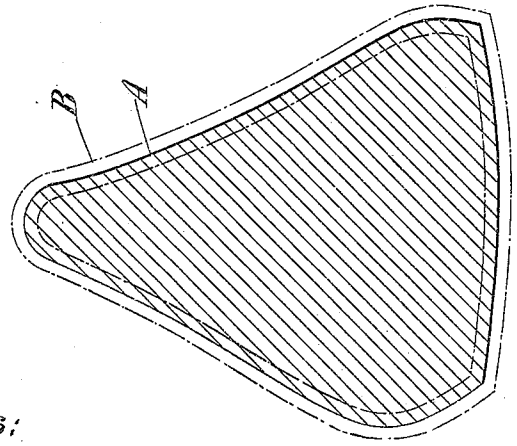


Fig. 6.



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UNITED STATES PATENT OFFICE.

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COPYING-LATHE.

961,580. Specification of Letters Patent. Patented June 14, 1910.

Application filed December 20, 1909. Serial No. 534,177.

To all whom it may concern:

Be it known that I, EDWIN BOSTOCK, a subject of the King of Great Britain, residing at Stafford, in the county of Stafford, England, have invented certain new and useful Improvements in Copying-Lathes, of which the following is a specification.

This invention relates to copying lathes such as are employed in the manufacture of lasts or trees for boots and shoes and has for its chief object to increase the capabilities of such machines.

A lathe of the above mentioned class as at present constructed will automatically form from a block of wood an exact copy of any model placed in the machine, and will also produce from the same model copies thereof varying either in length or in girth, or both in length and in girth according to requirements, the cross sectional shape of the copy in all cases remaining the same as that of the model whether the copy is manufactured on an enlarged or on a reduced scale, any subsequent alteration in its cross sectional shape requiring to be effected by hand.

The present invention resides in the addition to a copying lathe of this class of mechanism whereby lasts can be produced which vary in cross sectional shape from that of the model, that is to say they may be made narrower in width without being reduced in height, or vice versa, or be otherwise varied in their cross sectional shape according to requirements.

In order that the said invention may be clearly understood and readily carried into effect the same is described with reference to the accompanying drawings, in which:—

Figure 1 is a front elevation of a last turning lathe provided with mechanism constructed in accordance with this invention. Fig. 2 is an end elevation with parts in section. Fig. 3, is an end section of the improved mechanism drawn to a larger scale. Fig. 4 is a similar view showing the mechanism in a different position. Fig. 5 is a detached view of part of the additional mechanism. Fig. 6 is a section of a model the dotted lines indicating different sizes of lasts that can be produced from the model by the known type of machine. Figs. 7 and 8 are similar views, the dotted lines indicating some of the variations in shape that can be effected by the additional mechanism.

Referring firstly to the known mechanism, A represents the model of the last and B the block of wood that is to be transformed into a copy thereof. Both of these are mounted in a swinging frame C between driving centers c and fixed centers c^1 arranged on an axis that extends in front of and is parallel to the axes of a guide wheel D and cutter head E that are capable of being traversed longitudinally along a fixed bed F. The centers c are caused to revolve synchronously by gearing c^2 driven from a shaft c^3 that is rotatably mounted in the swinging frame and receives a rotary motion from any convenient part of the machine. The centers c^1 are capable of longitudinal adjustment in the swinging frame to accommodate models and blocks of wood of different lengths and also for securely holding the same in position. The swinging frame C is pivoted at c^4 to standards F^1 in such a manner that its weight at all times retains the model A in contact with the guide wheel D, and the block B with the cutter head E during their longitudinal traverse with the result that the wood block is transformed by the action of the cutters into an exact copy of the model.

When different sizes varying in length are to be produced from the same model, the rate of travel of the carriage d carrying the guide wheel D in relation to that of the cutter head E is accelerated or retarded, and in accordance therewith a longer or shorter block B is placed in the swinging frame C. The acceleration or retardation of the frame d is effected by a hand lever G that is pivoted at g to the carriage d the lower end of such lever being slotted at g^1 to receive a fulcrum pin g^2 projecting from a bar g^3 rigidly secured to the bed F. The connection between the lever G and the cutter head E is effected by a longitudinally adjustable connecting rod g^4 one end of which is pivoted to the cutter carriage and the other end to a connection piece g^5 that is capable of endwise adjustment upon the lever G with the result that the carriage d can be caused to move either faster or slower than the cutter carriage d^1. The latter is traversed at a

uniform speed along the bed F by means of a rack e carried by the cutter head carriage and driven from a train of wheels e' through a worm spindle e^2 that is rotated from any convenient part of the machine, the said gearing in the known mechanism so far referred to, usually being capable of being disconnected from the rack to enable the cutter head and the guide wheel to be returned by the hand lever to their original positions after their longitudinal traverse has been automatically effected.

In order to enable lasts proportionally larger or smaller in cross section to be produced from the same model, an oscillatory plate H is pivoted about its center on a horizontal axis h situated behind the guide wheel D and arranged parallel to the axis of rotation of the model and block, such plate being provided with a curved arm h^1 attached by a connecting rod h^2 to the aforesaid swinging frame C so that movement of the latter transmits an oscillatory movement to the plate about its axis. The guide wheel D is mounted on a horizontal transverse slide d^1 having a rearwardly projecting horizontal plate d^2 capable of vertical adjustment upon the slide and having its rear edge arranged parallel to the aforesaid oscillatory plate. The rearwardly projecting plate d^2 hereinafter referred to as the edge plate is continuously retained in contact with the oscillatory plate by a spring d^3 connected to the transverse slide d^1 and to a bracket d^4 secured to a bed d^5 in which the slide d is mounted. When the lathe is at work the oscillatory plate H oscillates in a plane that is more or less inclined toward the guide wheel.

To copy the model of the last exactly, the edge plate d^2 is set on the axis of the oscillatory plate H as shown in Fig. 1, with the result that the movement of the plate is not transmitted to the slide d^1. In this position the axis of the guide wheel becomes linable with the axis of the cutter head and as the finishing cutter is arranged to describe a circle of the same diameter as that of the guide wheel, the block is transformed into an exact reproduction of the model during the longitudinal traverse of the guide wheel and the cutter head.

To produce a last proportionally larger in transverse section than the model as shown for example by the outer one of the dotted lines in Fig. 6, the edge plate d^2 is raised above the axis of the oscillatory plate H, with the result that the guide wheel is advanced and moves the swinging frame C together with the wood block B farther away from the revolving cutters. Movement of the edge plate d^2 below the axis of the oscillatory plate H withdraws the guide wheel and enables the swinging frame C to approach more closely to the revolving cutters which consequently remove more material from the block and produce a last that is proportionally smaller in transverse section than the model as shown for example by the inner one of the dotted lines in Fig. 6.

The arrangement above described enables the cross section of the last to be varied in size only, the shape of the cross section in all cases remaining the same as that of the model whether the last is manufactured on an enlarged or on a reduced scale.

For the purpose of this invention means are provided for producing a differential motion between the swinging frame C and the oscillatory plate H with the result that the last is made narrower in width without being reduced in height, or vice versa, or is otherwise varied in its cross sectional shape from that of the model according to requirements. A convenient form of mechanism for producing the differential motion comprises a cam J carried by the swinging frame and adapted to receive directly or indirectly, rotary motion from the mechanism that rotates the model and the wood block. In the arrangement shown the cam is mounted on the shaft c^3 that imparts rotary motion to the model and block and such cam is formed with a cam groove j to receive a roller j^1, mounted on one end of a two-armed lever j^2 that is pivoted at j^3 to the swinging frame C. The opposite end of such lever is connected by a link j^4 to an arm j^5 projecting from an oscillatory shaft j^6 supported in bearings j^7 carried by the swinging frame and projecting from such shaft is a curved arm j^8 forming an arc struck from the point of attachment of the connecting rod h^2 with the oscillatory plate H. The opposite end of such connecting rod is adjustably mounted on the curved arm for which purpose the latter is conveniently formed with a T groove j^9 to receive a T head formed on a pin h^3 by means of which the connecting rod is attached to the curved arm j^8, a winged nut h^4 or other clamping device serving to retain the pin h^3 in its adjusted position in the groove j^9.

To produce an exact copy of the model of the last on the same or on an enlarged or a reduced scale, the aforesaid connecting rod end is secured co-axially with the oscillatory shaft j^6, so that the connecting rod h^2 assumes the position indicated by the full lines in Fig. 1. In this position the oscillations of the shaft j^6 due to its connection with the cam J impart no movement to the connecting rod h^2 and oscillatory plate H, the position of the edge plate in relation to the latter alone determining any alteration in the scale of the last produced. To alter the proportions of the cross sectional shape of the last, the connecting rod end is secured upon its arm j^8 at some distance away from the center of the oscillatory shaft j^6 with the re-

sult that the angular movement described by its point of connection with such arm is transmitted to the oscillatory plate H in addition to that which such plate receives from the movement of the swinging frame C due to the position of the edge plate above or below the axis of the oscillatory plate. The amount of the compound or combined movements that are transmitted to the guide wheel slide d^1 is regulated by the position of the connecting rod end upon the arm j^8 and by the position of the edge plate d^2 in relation to the axis of the oscillatory plate H, the alteration in the cross sectional shape of the last depending upon the formation of the cam and its angular position in relation to that of the model.

In Fig. 1 the mechanism for obtaining the differential motion is shown in its inoperative position and the edge plate is arranged on the axis of the oscillatory plate with the result that the last produced will be an exact copy of the model. In Figs. 3 and 4 the said mechanism is shown in operation, the positions of the edge plate and cam being adjusted to produce a last that will be somewhat narrower and higher than the model. The position assumed by the guide wheel is indicated by the full lines and the path described by the finishing cutter is indicated by the dotted lines. As the top or bottom of the model approaches the guide wheel, the latter is moved slightly in advance of the revolving cutters with the result that the swinging frame is moved outwardly to a corresponding extent and the last is formed higher than the model. As the sides of the model approach the guide wheel the oscillatory plate is caused by the combined action of the cam and swinging frame to incline away from the guide wheel, whereupon the spring d^3 withdraws such wheel slightly to the rear of the revolving cutters with the result that the swinging frame moves inwardly to a corresponding extent and the width of the last is reduced in relation to that of the model, the finished last possessing a cross section approximating to that indicated by the dotted lines in Fig. 7.

To produce a last possessing the cross section indicated by the dotted lines in Fig. 8 the cam J is rotated through an angle of 180° in relation to the model with the result that the last is formed somewhat flatter and wider than the model. A convenient arrangement for enabling this adjustment of the cam to be effected is shown in Fig. 5 and consists in bolting the cam J to a flange j^{10} extending from a sleeve j^{11} that is rigidly fixed on the oscillatory shaft j^6, the said sleeve or the cam having any suitable number of holes to permit of the cam being bolted to the flange in any required position.

If desired instead of the differential mechanism being mounted on the swinging frame in the manner above described, the rotation of any shaft on such frame may be transmitted by bevel or other gearing to a shaft situated at the rear of the machine and provided with a cam or eccentric acting through the intervention of a rocking shaft, on a lever connected to the oscillatory plate.

The aforesaid cam or eccentric whether mounted on the swinging frame or at the rear of the machine, may be mounted on the shaft that rotates either the model or block, or on any shaft that is driven by them, or that drives them either directly or indirectly.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A copying lathe or one in which the various cross-sections produced upon the work are governed by like cross-sections of a model, comprising connections which vary during the operation of the lathe so as to vary the effect of the model upon one cross-sectional dimension of the work from that upon another.

2. The combination with a last turning lathe provided with a swinging frame and an oscillatory plate operatively connected therewith, of means for producing a differential motion between the swinging frame and the oscillatory plate.

3. The combination with a last turning lathe provided with a swinging frame and an oscillatory plate operatively connected therewith, of means for intermittently producing a differential motion between the swinging frame and the oscillatory plate.

4. The combination with a last turning lathe provided with a swinging frame and an oscillatory plate operatively connected therewith, of means for automatically producing an intermittent differential motion between the swinging frame and the oscillatory plate, and means for regulating the amount of such motion.

5. The combination with a last turning lathe provided with a swinging frame and an oscillatory plate operatively connected therewith, of a cam arranged to impart movement to the oscillatory plate in addition to that which such plate receives from the swinging frame.

6. The combination with a last turning lathe provided with a swinging frame for the reception of a model and a block of wood, mechanism for rotating the same and an oscillatory plate operatively connected with the swinging frame, of a cam rotated by the mechanism that rotates the model and the block of wood, and mechanism actuated by such cam to impart movement to the oscillatory plate in addition to that which such plate receives from the swinging frame.

7. The combination with a last turning lathe provided with a guide wheel, a cutter head, a swinging frame for the reception of

a model and a block of wood, mechanism for rotating the same and an oscillatory plate operatively connected with the swinging frame for controlling the position of the guide wheel, of a cam rotated by the mechanism that rotates the model, a rocking shaft operatively connected with the cam and provided with an arm connected to the oscillatory plate.

8. The combination with a last turning lathe provided with a guide wheel, a cutter head, a swinging frame for the reception of a model and a block of wood, mechanism for rotating the same, and an oscillatory plate operatively connected with the swinging frame for controlling the position of the guide wheel, of a cam carried by the swinging frame and rotated by the mechanism that rotates the model, a lever pivoted to the swinging frame and operatively connected with the cam, an oscillatory shaft carried by the swinging frame and operatively connected with the lever, an arm projecting from such shaft, a connecting rod pivoted at one end of the oscillatory plate and at the other end to the aforesaid arm, and means for securing the latter end of the connecting rod in any desired position upon the arm.

9. The combination with a last turning lathe provided with a guide wheel, a cutter head, a swinging frame for the reception of a model and a block of wood, mechanism for rotating the same, and an oscillatory plate operatively connected with the swinging frame for controlling the position of the guide wheel, of a cam carried by the swinging frame and rotated by the mechanism that rotates the model, means for adjusting the angular position of the cam in relation to the model, a lever pivoted to the swinging frame and operatively connected with the cam, an oscillatory shaft carried by the swinging frame and operatively connected with the lever, an arm projecting from such shaft, a connecting rod pivoted at one end to the oscillatory plate and at the other end to the aforesaid arm, and means for securing the latter end of the connecting rod in any desired position upon the arm.

In testimony whereof I affix my signature in presence of two witnesses.

EDWIN BOSTOCK.

Witnesses:
WILLIAM FOXWELL,
T. LACEY WARDLE.