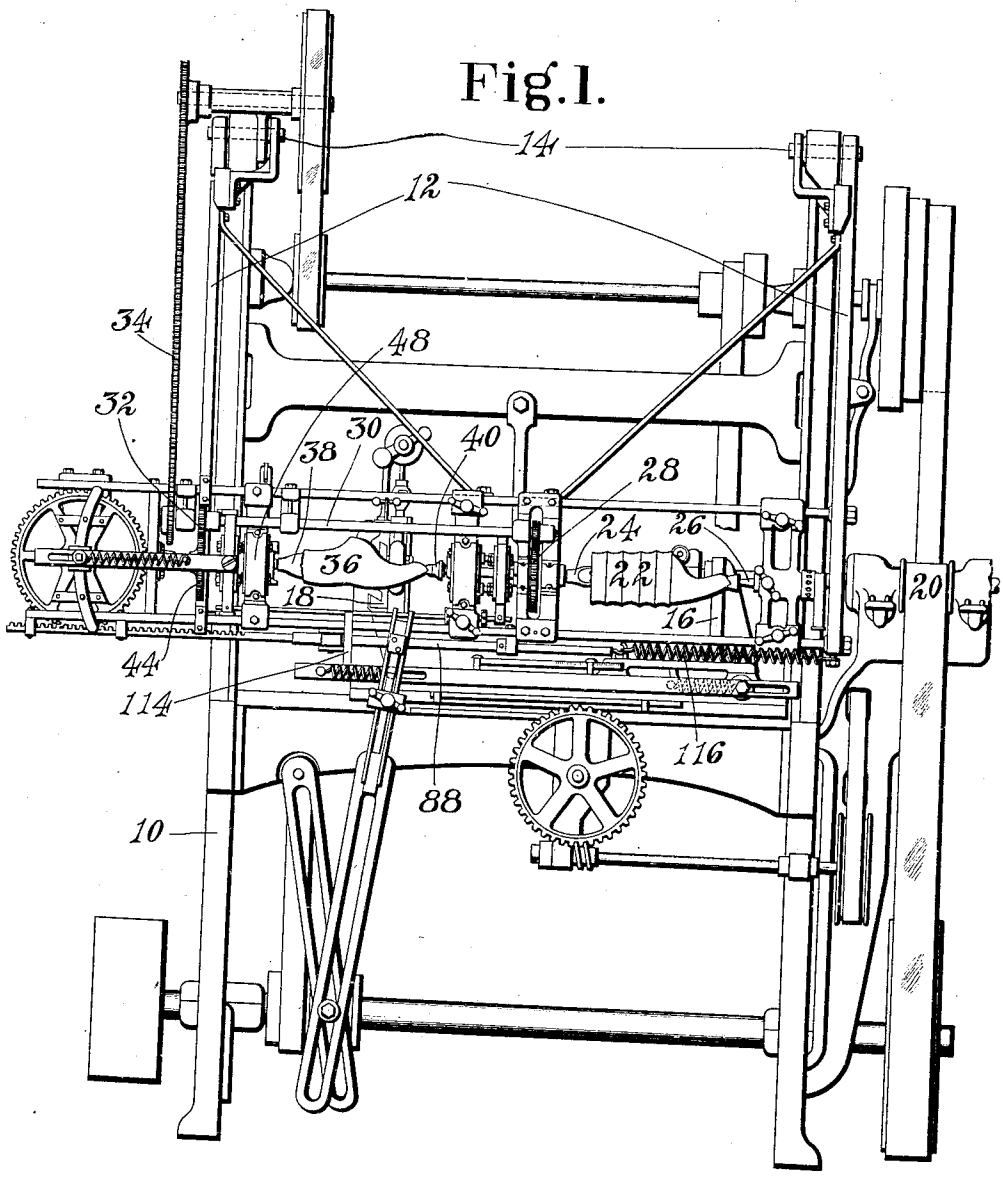
Oct. 29, 1929. G. F. RYAN ET AL 1,733,207

PATTERN COPYING MACHINE

Filed Oct. 29, 1926 4 Sheets-Sheet 1

Fig. 1.



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PATTERN COPYING MACHINE

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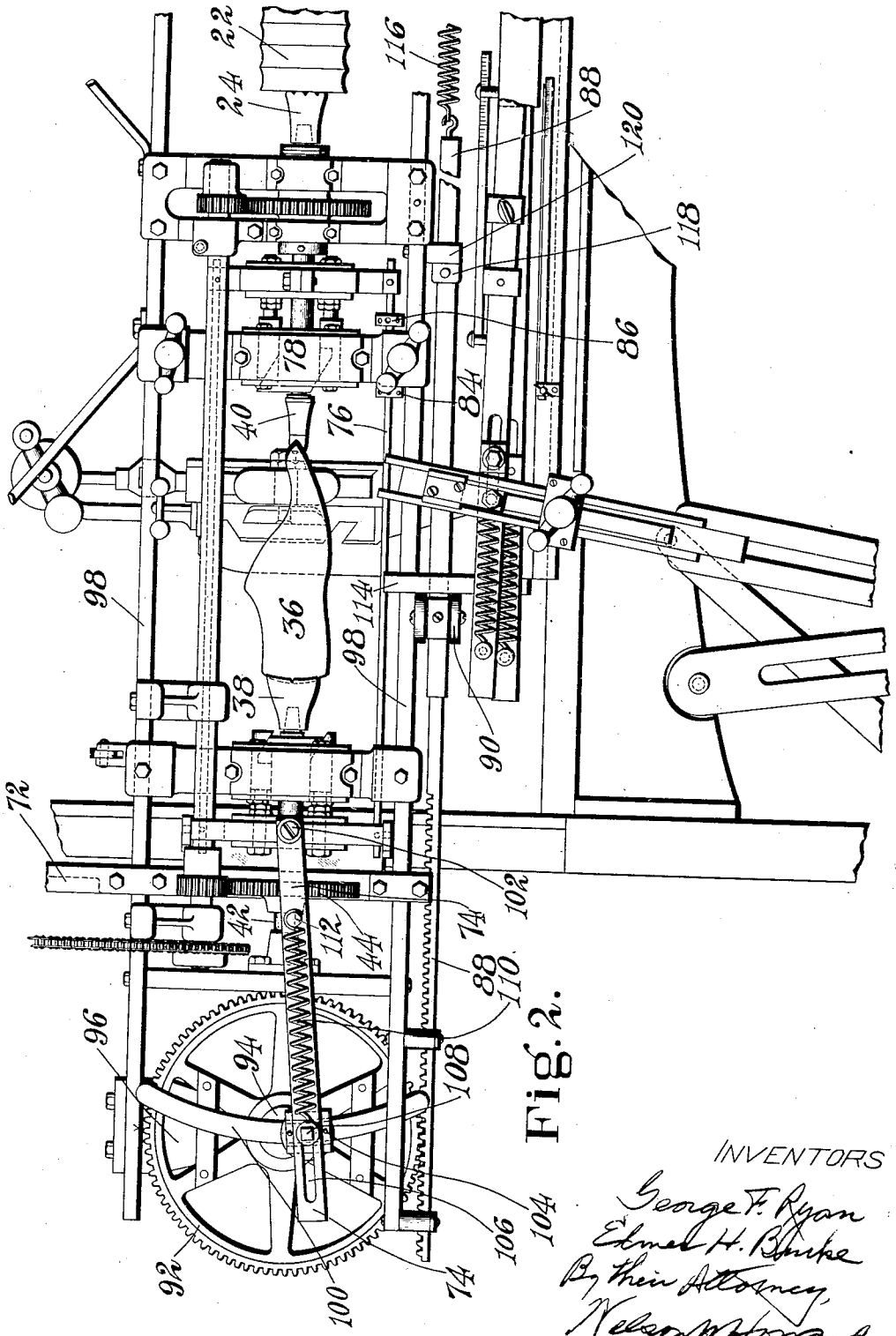


Fig. 2.

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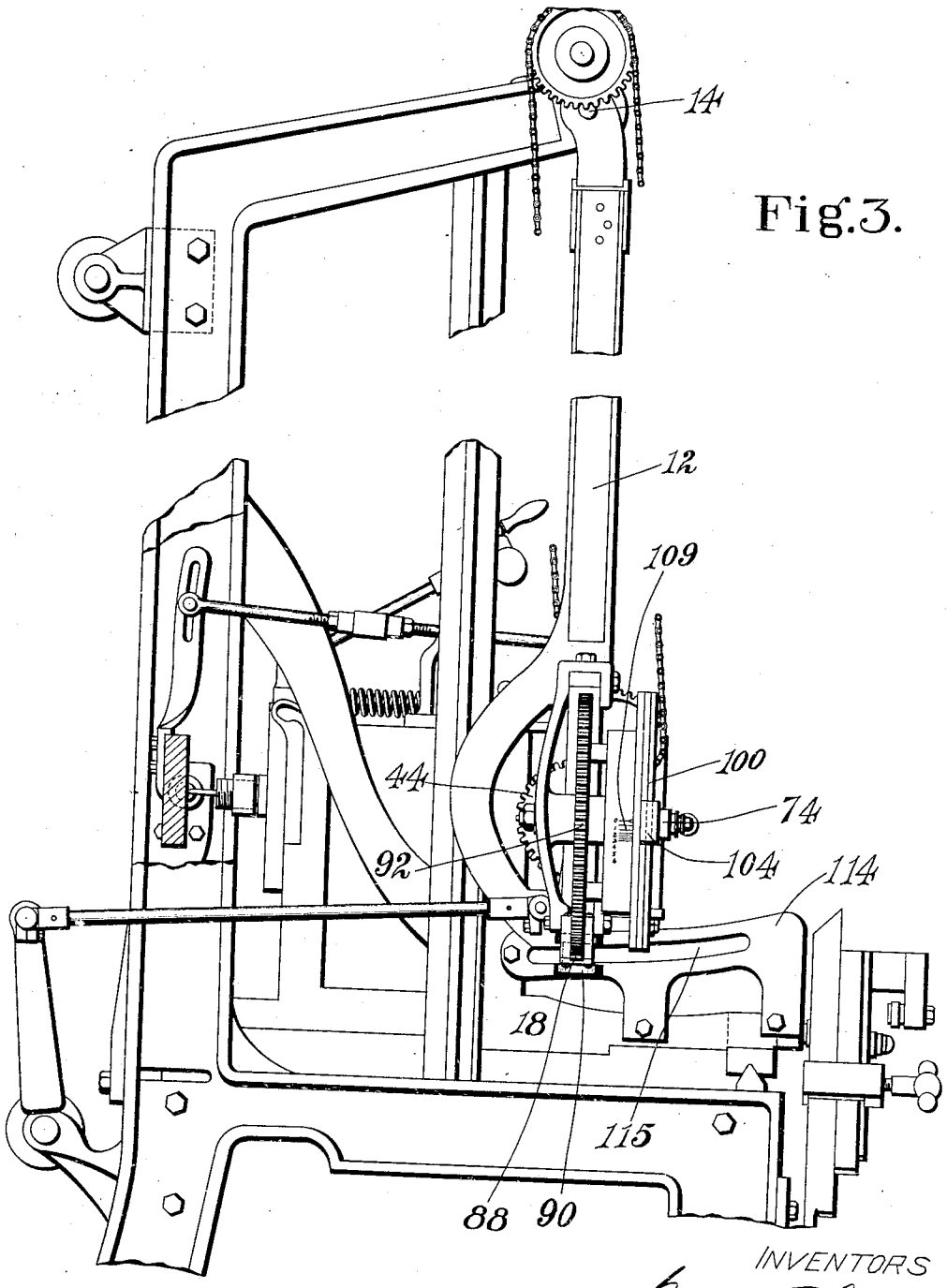


Fig.3.

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PATTERN COPYING MACHINE

Filed Oct. 29, 1926 4 Sheets-Sheet 4

Fig. 4.

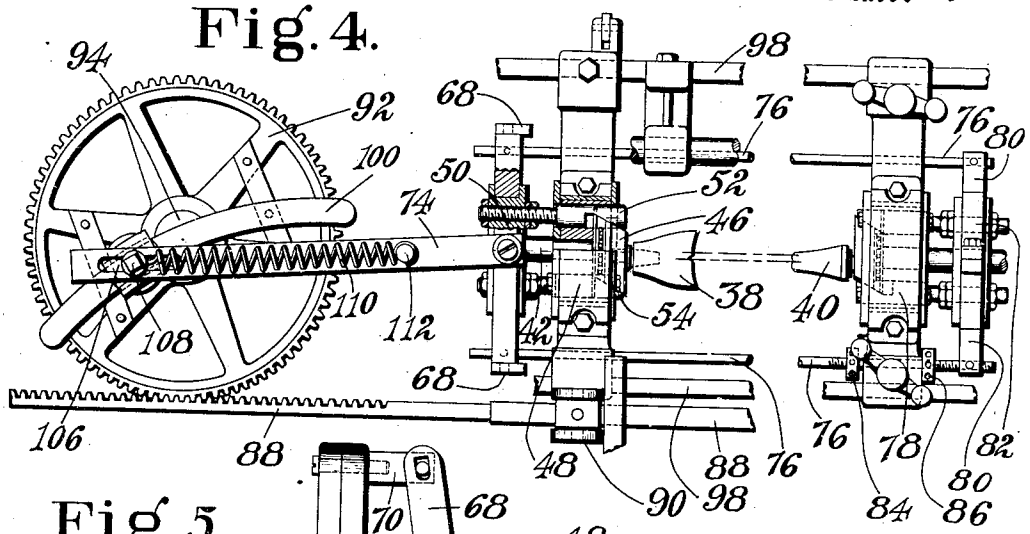


Fig. 5.

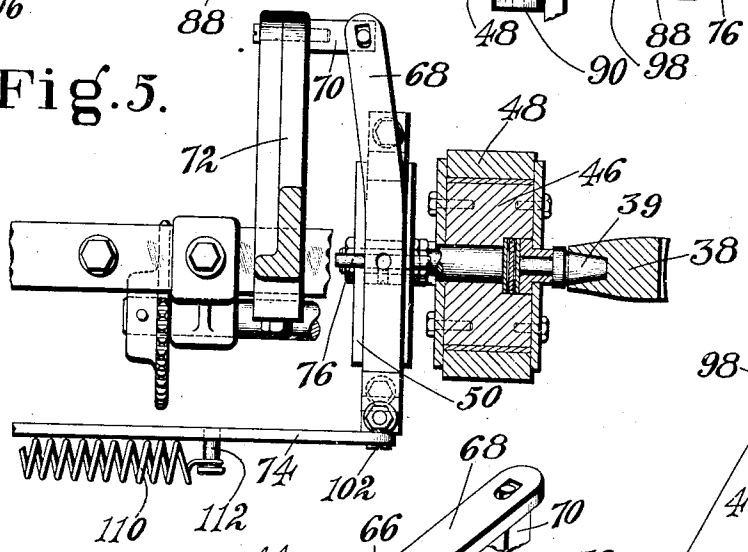


Fig. 6.

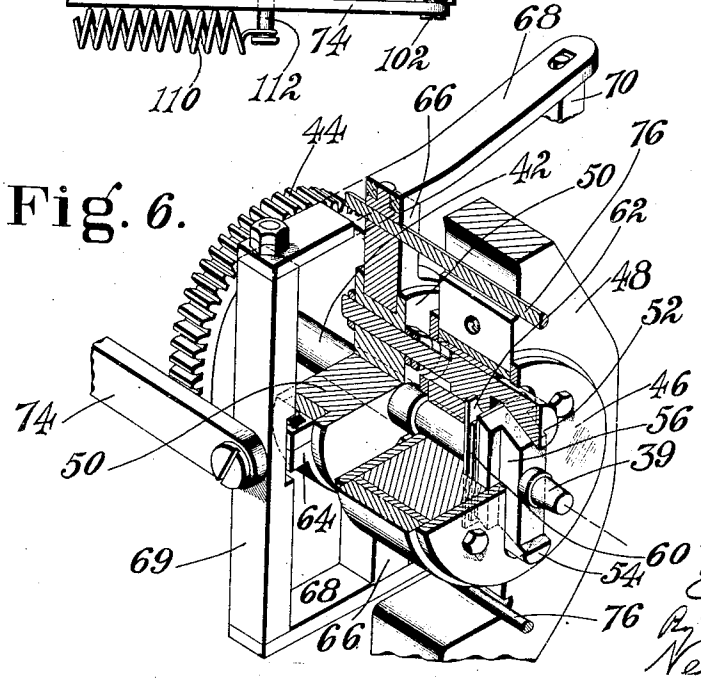
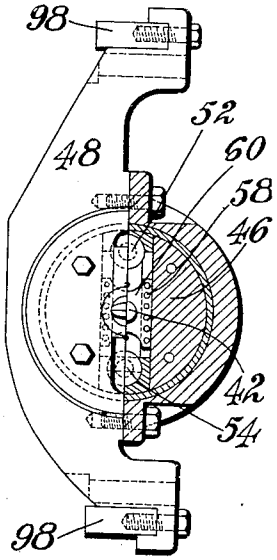


Fig. 7.



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UNITED STATES PATENT OFFICE

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PATTERN-COPYING MACHINE

Application filed October 29, 1926. Serial No. 145,085.

This invention relates to pattern copying, that is, to the production of objects having a systematic resemblance to a pattern used as a guide or templet, and is illustrated as embodied in a lathe of the type disclosed in United States Letters Patent No. 544,891, granted August 20, 1895, on application of W. F. Gilman, for turning lasts. Many of the principles and features of the invention are of broad application to the entire class of pattern copying machinery including the production of objects having less than three dimensions, such, for example, as patterns for soles, shoe uppers, clothing, etc., and accordingly we do not intend that all of the appended claims shall be limited in scope to pattern reproducing machinery of the last making or even of the three-dimensional type. We have therefore in many of the claims used words and terms in a generic sense as applying to the broad class of machinery of the patern reproducing type.

It is well known that width grading mechanisms of last lathes of the type set forth in said Letters Patent have been substantially pantographic in their action, multiplying all perpendicular distances from a grading axis, (which, in a last lathe, is the axis of rotation of the model), to the surface of the model by a factor constant throughout the turning. From this pantographic action there arose in the use of last lathes of the type referred to a problem of considerable importance. In such last lathes, the model is suspended on centers engaging its heel and toe tip, and in cutting lasts wider than the model the toe spring, which is the vertical distance between the bottom of the ball and the toe tip, is increased progressvely as the last being cut becomes wider.

For instance, the 4B model is 7½ inches in perimeter at the ball. The 4EE last is 8½ inches in perimeter, and therefore about ⅓ inch greater in thickness, at this point. Since the axis of rotation passes through the ball portion near the top of the last, the greater part of this ⅓ inch is added on the bottom of the last, that is, the last "drops" below the model at this point by nearly ⅓ inch. This causes a certain variation in the bottom profile of the last as compared with that of the model. The toe tip, being on the axis of rotation, does not drop at all, the heel drops a certain amount and the ball drops (absolutely) more than any other point since it is farther below the axis than any other point. A distinct downward bend in the bottom profile thus results, on the whole, from the widening. This is especially noticeable in the forepart, giving rise, as stated, to an exaggerated "toe spring" or distance from the floor line to the toe tip. The reverse difficulty occurs in the case of lasts narrower than the model.

Such variations in lasts do not correspond to any natural variations in the feet they are intended to fit, since the toes of wide feet do not "turn up" in correspondence with the increasing toe spring of wide lasts, and vice versa.

This problem of producing a desired bottom profile in a last graded wider or narrower than the model was successfully solved by the inventions of L. B. Whipple (U. S. Letters Patent No. 1,362,183, granted December 14, 1920) and S. E. Boynton (U. S. Letters Patent No. 1,362,185, granted Dec. 14, 1920); by the use of which the bottom profile is controlled by shifting the model (or work block)- dogs up or down on their mechanical axes of rotation during the last cutting.

In view of the foregoing, it is an object of the present invention to provide a pattern copying machine specially designed for last turning, which will be as successful in solving the toe spring problem above analyzed as the machines disclosed in the Letters Patent referred to, and which will at the same time be further simplified and otherwise improved. To this end, the invention provides a last lathe mechanism which is rendered more compact than last lathes as heretofore constructed by placing the dog shifting mechanism on the swing frame, where it is more easily accessible to the operator, and where it can be more directly related to its driving mechanism. The dog-shift, being related to the instant point of cut on the work, is operated as an incident of the relative traverse of the model and model wheel, and is conveniently actuated by the

movement of the model wheel carriage. In accordance with another feature of the present invention, the illustrated machine is provided with an improved, positively acting and smoothly working dog shifting mechanism, comprising sliding wedges, holding the dog holders between them.

These and other features of the invention comprising certain combinations and arrangements of parts will be apparent from the following description of a preferred embodiment of the invention shown in the drawings, in which

Fig. 1 is a front elevation;

Fig. 2 is an enlarged front elevation of the lower part of the swing frame;

Fig. 3 is a side elevation;

Fig. 4 is a front elevation of the dog shifting means;

Fig. 5 is a plan view of a portion of the mechanism shown in Fig. 4;

Fig. 6 is a sectional detail of a portion of the mechanism shown in Fig. 4; and

Fig. 7 is an end elevation of the lower part of the swing frame.

As above stated, the illustrated machine is of the general type set forth in United States Letters Patent No. 544,891, and reference may be had to said Letters Patent for a complete disclosure of parts not herein fully shown and described, except in respect to certain mechanisms, as hereinafter stated.

The main frame 10, swing frame 12, pivoted at 14, cutter carriage 16, and model wheel carriage 18 are arranged substantially in the manner already well known in the art and shown in United States Letters Patent No. 544,891 above referred to, and need not be further described in detail. The driving mechanism 20 for the cutter is substantially as shown and claimed in our co-pending application, Serial No. 52,036, filed Aug. 24, 1925, to which reference may be made if desired.

The block 22 is hung in dogs 24, 26 in the swing frame and is rotated by gearing 28, 30, 32, 34 in the ordinary manner. The model 36 is hung in the swing frame and dogs 38, 40 are arranged on tapers 39 to rotate the model and are arranged also to be shifted laterally of their mechanical axis of rotation 42 during the progress of the cutting of the last, as will be seen. The shaft 42 (see Fig. 6) is rotated by the gear 44 which is driven by the gearing 32, 34 above mentioned. This shaft is integral with a rotating head or dog carrier 46 carried in a bearing 48 in the swing frame. Slidably mounted on the shaft 42 is a flanged collar 50 which turns with the shaft so that it and the head 46 move together.

Fixedly mounted in the collar 50 and extending slidably through the head 46 are two sliding wedges 52, 54. The beveled faces of these wedges are parallel, as shown in Fig. 6, and embrace between them a dog carrying slide 56 which has mounted on its front face the dog taper 39 and dog 38. The rear face of this slide is perpendicular to the axis 42 and has behind it two parallel rows of balls 58 mounted in a spacing plate 60, the balls running between the rear faces of the slide 56 and a hardened plate 62 mounted parallel with this face in the head 46. Movement of the sliding wedges 52 and 54 backward or forward through the head 46 will lower or raise the dog slide 56, as shown in Fig. 6. These wedges are moved by sliding the collar 50 along the shaft 42, which is accomplished by a collar 64 having two arms 66 extending upwardly and downwardly to engage pivotally two levers 68 midway of their length. The inner ends of these levers, that is the ends farthest from the operator toward the end of the machine, are pivoted on lugs 70 which are mounted on a bracket 72 fixedly mounted on the swing frame itself. The levers 68 have a pin and slot connection with the lugs 70 so that swinging them to the right or left by means of the link 74 connected to a post 69 joining the levers, will shift the sliding wedges in the head 46 without binding. The collar 50 rotates continuously with the shaft 42 within the collar 64 which does not rotate and this construction permits the sliding wedges 52, 54 to be slid in and out of the head 46 irrespective of the rotational position of the head 46.

The arms 66 have mounted in them rods 76 which extend through the bearing 48, across the model and through the bearing 78 which contains a toe dog shifting mechanism exactly like the one described for the heel dog. These rods engage arms 80 on a collar 82 which corresponds exactly to the collar 64 and which operates dog shifting sliding wedges in the toe dog head rotating within the bearing 78 in exactly the same way as already described in regard to the heel dog 38. Thus these sliding wedges are arranged to shift the dogs 38 and 40 in the same direction by the same means simultaneously.

The lower rod 76 has adjustable stops 84, 86 one on each side of the bearing 78 which will limit the movement of both sets of dog shifting wedges in either direction. A rack 88 is slidably mounted in guides in the lower part of the swing frame to slide longitudinally in the frame. On it are mounted two anti-friction rollers 90 for a purpose which will appear. The rack engages a pinion 92 mounted on a stud 94 which is mounted on a bracket 96 carried by the two main swing frame bars 98 on the lower end of the swing frame. The pinion carries a segmental bar or lever 100 fixedly mounted upon it, which is so arranged as to be generally vertical when the machine is in the position corresponding to the beginning of the cutting of the last, and the center of the circle from which the bar 100 is cut is then at the pivot

102 where the link 74 joins the standard 69 which joins the two levers 68. It is thus possible at this time to swing the link 74 into different positions along the segmental bar 100 without causing any movement in the dog shifting mechanism.

This adjustment of the link 74 is accomplished by means of a slide 104 which slides along the segmental bar 100 and can be clamped thereto and which also has a sliding relation with the link 74 at all times by means of a slot and stud 106, 108. A scale and pointer 109 (Fig. 3) are conveniently provided for this adjustment. A spring 110 is connected to the stud 108 which is set into the segmental bar 100, and also to the stud 112 which is set into the link 74. This spring tends to hold the right-hand end of the slot 106 up against the stud 108 at all times, making the effective length of the link 74 equal to the distance between the studs 108 and 102, as shown in Fig. 2.

The rollers 90 are engaged by an arm 114 (see Figs. 2 and 3), having a slot 115 to receive the rackbar 88, said arm 114 being fixedly mounted on the model wheel carriage 18 and carried along to the left with it as the last cutting proceeds. As the swing frame 12 swings in and out the rollers 90 roll back and forth along the arm 114, the bar 88 running back and forth in the slot 115, without interfering with the swinging action of the frame, and the movement of the model wheel carriage to the left thus, by the engagement of the am 114 with the rollers 90, drives the rack bar 88 to the left, rotating the pinion 92 with its segmental bar 100 and pulling on the link 74 unless the stud 108 has been mounted over the center of the stud 94. This movement of the link pulls the collar 50 to the left (with the adjustment shown in Fig. 4) and thus draws the wedges 52, 54 to the left which will lower the dogs 38 and 40 with regard to their mechanical axis of rotation. This is indicated by two parallel broken lines in Fig. 4, the upper of which is collinear with the mechanical axis of rotation 42 and the lower of which is collinear with the axis of the dogs 38, 40, the distance between these two lines indicating the distance through which the dogs have been moved by the rotation of the pinion 92 from the position shown in Fig. 1 to that shown in Fig. 4. (It should be noticed that in Fig. 1 the stud 108 has been adjusted to the center of the pinion so that the rotation of the pinion would have no effect on the dogs. The machine so adjusted will work just as the ordinary last lathe does without any dog shifting or toe spring control.)

A spring 116 is provided to pull the bar 88 into its extreme rightmost position, this position being controlled by an adjustable stop 118 on the bar which engages the dog 120 mounted on the swing frame. The stop 118 can thus be used to hold the anti-friction wheels 90 out of contact with the arm 114 at the beginning of the last cutting when the model wheel carriage is set back to the toe of the model.

The operation of the dog shifting mechanism can thus be regulated as follows: We will suppose that the stop 118 has been set so that the arm 114 will first come in contact with the wheels 90 when the model wheel has moved to the ball of the last, somewhat beyond the position shown in Fig. 2. From the toe to this point the machine will work exactly as the ordinary last lathe does, reproducing the model from the toe to the ball point without any unusual characteristic. At this point the arm 114 picks up the wheels 90 and begins to drive the bar 88 to the left in Fig. 2. The pinion 92 then begins to turn, together with its bar or lever 100. This will draw the link 74 to the left, the right end of the slot 106 being drawn up against the stud 108, and the dogs will shift downwardly from the position shown in Fig. 2 until the stop 86 has been drawn up against the bearing 78 by the lower rod 76. This locks the dog shifting mechanism and further rotation of the pinion 92 stretches the spring 110 allowing the stud 108 to move out in the slot 106, as shown in Fig. 4, without any effect on the dog shifting wedges. Thus, the action of the dog shifting mechanism can be confined to any selected portion of the last and we have found it advantageous to confine it to the middle third of the last between the ball portion and the heel breast portion. This in effect shifts the heel portion on the model directly downward with regard to the forepart portion changing the angular relation between the shank and the heel bottom and forepart bottom and will result in a flatter bottom profile in a last graded wider than the model. An extended discussion of the theory of this distortion will be found in Letters Patent Nos. 1,362,183 and 1,362,185 above referred to.

The illustrated length and width grading mechanisms are of the type shown and described in our co-pending application Serial No. 145,086, filed October 29, 1926, in which application the novel features of these mechanisms are claimed.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In a last lathe, a model wheel carriage, a cutter carriage, an oscillating frame carrying a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the

model and the block respectively, and means wholly mounted on the oscillating frame for shifting one of the said holders laterally of its axis of rotation, operated by the model wheel carriage.

2. In a last lathe, a model wheel carriage, a cutter carriage, a swing frame carrying a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a contact member mounted on the swing frame and a second contact member mounted on one of the said carriages and arranged to co-operate with the first-named contact member in any position of the swing frame.

3. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a member on one of the said holders and a second member on one of the said carriages, arranged to contact with each other to drive the shifting means.

4. In a last lathe, a model wheel carriage, a cutter carriage, an oscillating frame carrying a model dog and a block dog arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model dog and between the cutter carriage and the block dog generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said dogs laterally of its axis of rotation, comprising a member connected to one of the said dogs and arranged to be driven along the oscillating frame and a second member on one of the said carriages, arranged to contact with each other to drive the shifting means.

5. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a member adjustable on one of the said holders and a second member on one of the said carriages, arranged to contact with each other to drive the shifting means during an arbitrarily selected portion of the turning of a last.

6. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a dog actuating member, a main actuating member mounted on one of the holders, and a contact member mounted on one of said carriages arranged to engage said main actuating member to drive said dog actuating member, there being a lost motion connection between said actuating members to permit the cessation of the dog actuation at any predetermined point in the last cutting.

7. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a dog actuating member, a lever on one of the said holders to which said dog actuating member is adjustably connected, a main actuating member arranged to drive the lever and a member on one of the carriages arranged to drive said main actuating member.

8. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of

its axis of rotation, comprising a dog actuating member, and a lever on one of the said holders to which said dog actuating member is adjustably connected.

9. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a dog actuating member, a segmental lever on one of said holders to which the said dog actuating member is adjustably connected, and means for driving the segmental lever, the point of connection to the dog actuating member being at the center from which the arc of the segmental lever is struck at the beginning of the last turning operation.

10. In a last lathe, a model wheel carriage, a cutter carriage, a model holder and a block holder arranged to hold and rotate a model and block respectively, and to carry them toward and from the model wheel and cutter carriage, means for producing relative traverses between the model wheel carriage and the model holder and between the cutter carriage and the block holder generally parallel to the respective axes of rotation of the model and the block respectively, and means for shifting one of the said holders laterally of its axis of rotation, comprising a dog actuating member, a segmental lever on one of said holders, a link connecting the lever to the dog actuating member, and means for driving the lever, the length of the link being equal to the radius of the segmental lever, and the link being adjustable along the segmental lever.

11. A dog shifting mechanism for a last lathe comprising a rotating head, a pair of oppositely facing wedges in said head, a dog mounted between the wedges, and means for moving the wedges.

12. A last lathe having a sliding carriage, a rotating head, a pair of oppositely facing wedges in said head, a dog mounted between the wedges, and a member for shifting the wedges, operatively connected to the carriage.

13. A last lathe having a sliding carriage, an oscillating frame having dogs arranged to hold and oscillate a last-like body, a rack and pinion mounted on the frame, a dog shifting means arranged to displace the dogs laterally from their normal position, and means for adjustably connecting the dog shifting means to the pinion.

14. A last lathe having a sliding carriage, an oscillating frame having dogs arranged to hold and oscillate a last-like body, a rack and pinion mounted on the frame, a dog shifting means arranged to displace the dogs laterally from their normal position, and means for connecting the dog shifting means to the pinion at varying distances from its center.

15. A last lathe having a sliding carriage, an oscillating frame having dogs arranged to hold and oscillate a last-like body, a rack and pinion mounted on the frame, a dog shifting means arranged to displace the dogs laterally from their normal position, and means for connecting the dog shifting means to the pinion at varying distances from its center comprising a tension spring.

16. A last lathe having a sliding carriage and an oscillating frame, dogs on the frame arranged to hold and rotate a last-like body, dog shifting means comprising a sliding member mounted in the oscillating frame and a stop to limit the movement of the sliding member, and means for operating the sliding member comprising a spring, said means being operated by the sliding carriage, the movement communicated from said carriage being taken up by said spring when the said stop is operative.

17. A last lathe having a sliding carriage, an oscillating frame having dogs arranged to hold and oscillate a last-like body, a rack and pinion mounted on the frame, a dog shifting means arranged to displace the dogs laterally from their normal position, a slide in the frame arranged to operate the dog shifting means, a link connecting the slide to the pinion at any desired distance from its center, means for locking the dog shifting means at any desired point of the last cutting, and a spring in said link to absorb the movement of the pinion when the locking means is operative.

In testimony whereof we have signed our names to this specification.

GEORGE FRANCIS RYAN.
ELMER HUNTON BURKE.