Oct. 31, 1950

W. S. PRAEG

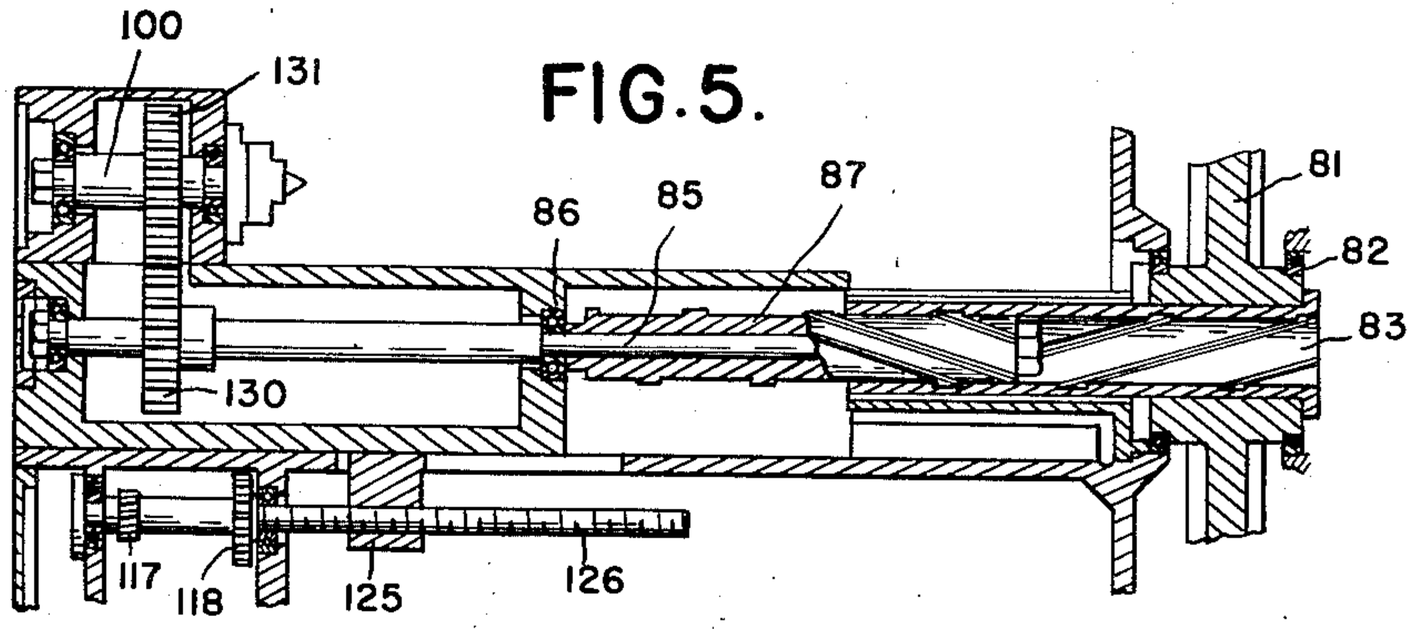
2,528,242

HOBBING MACHINE

Filed June 7, 1948

3 Sheets-Sheet 1

FIG.5.



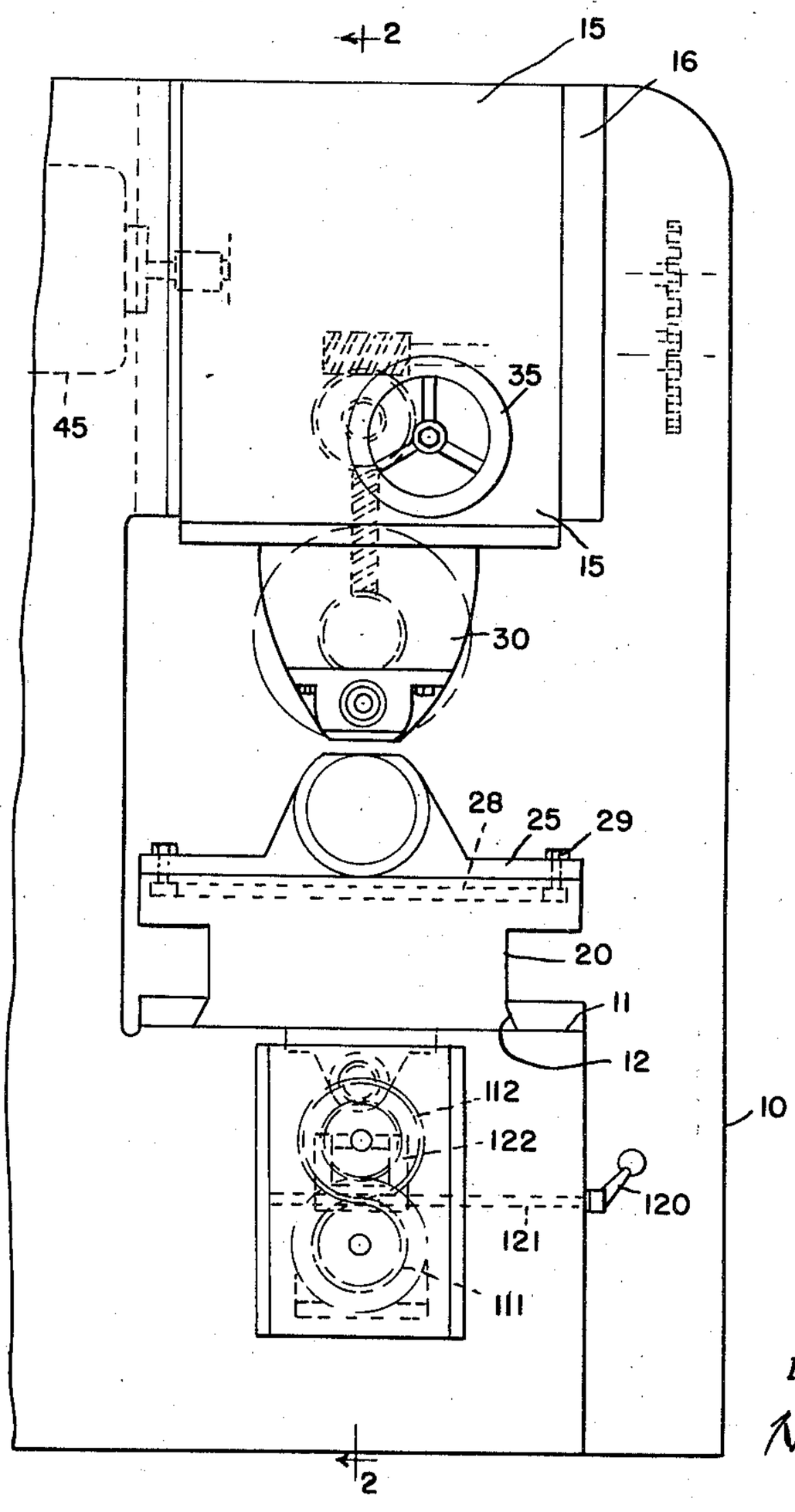


FIG.1.

INVENTOR.
WALTER S. PRAEG
BY Whittemore Hulbert & Belknap
ATTORNEYS

Oct. 31, 1950 W. S. PRAEG 2,528,242

HOBBING MACHINE

Filed June 7, 1948 3 Sheets-Sheet 2

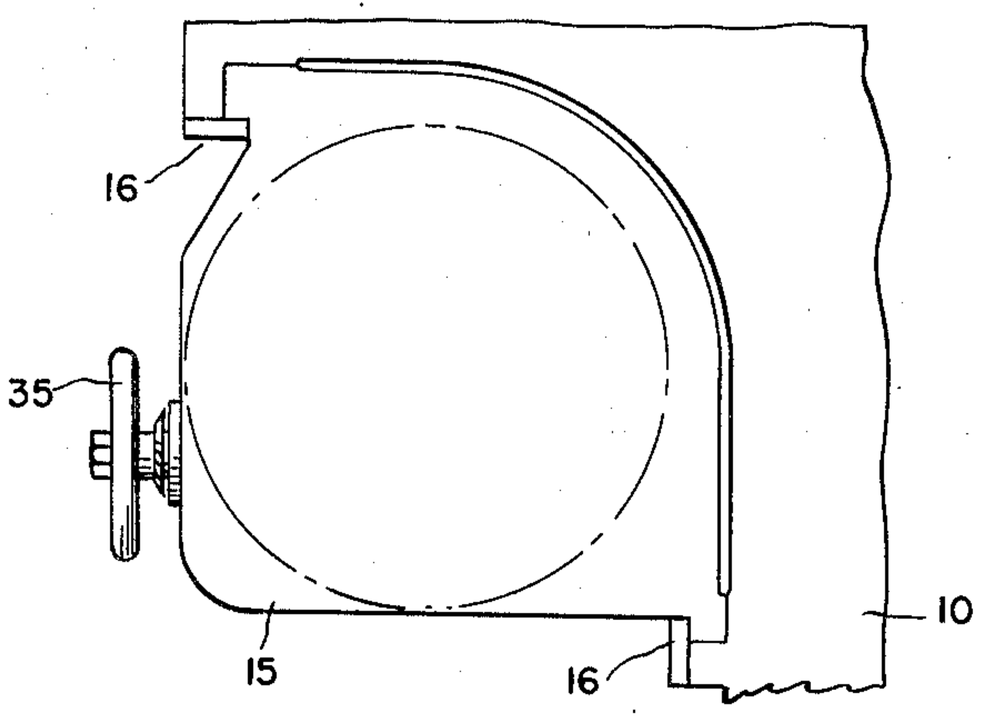


FIG.4.

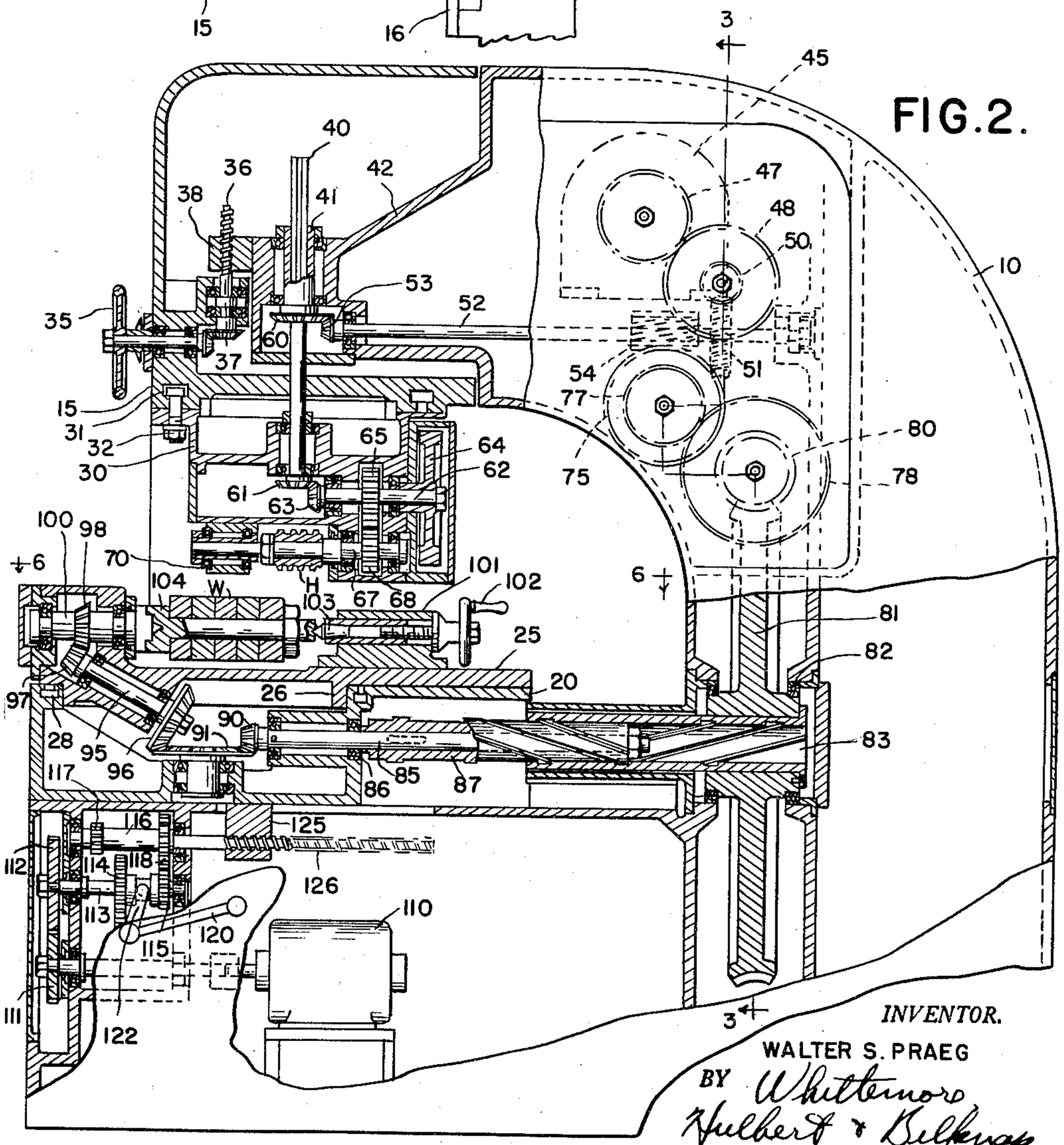


FIG.2.

INVENTOR.
WALTER S. PRAEG
BY Whittemore Hulbert & Belknap
ATTORNEYS

Oct. 31, 1950 W. S. PRAEG 2,528,242

HOBBING MACHINE

Filed June 7, 1948 3 Sheets-Sheet 3

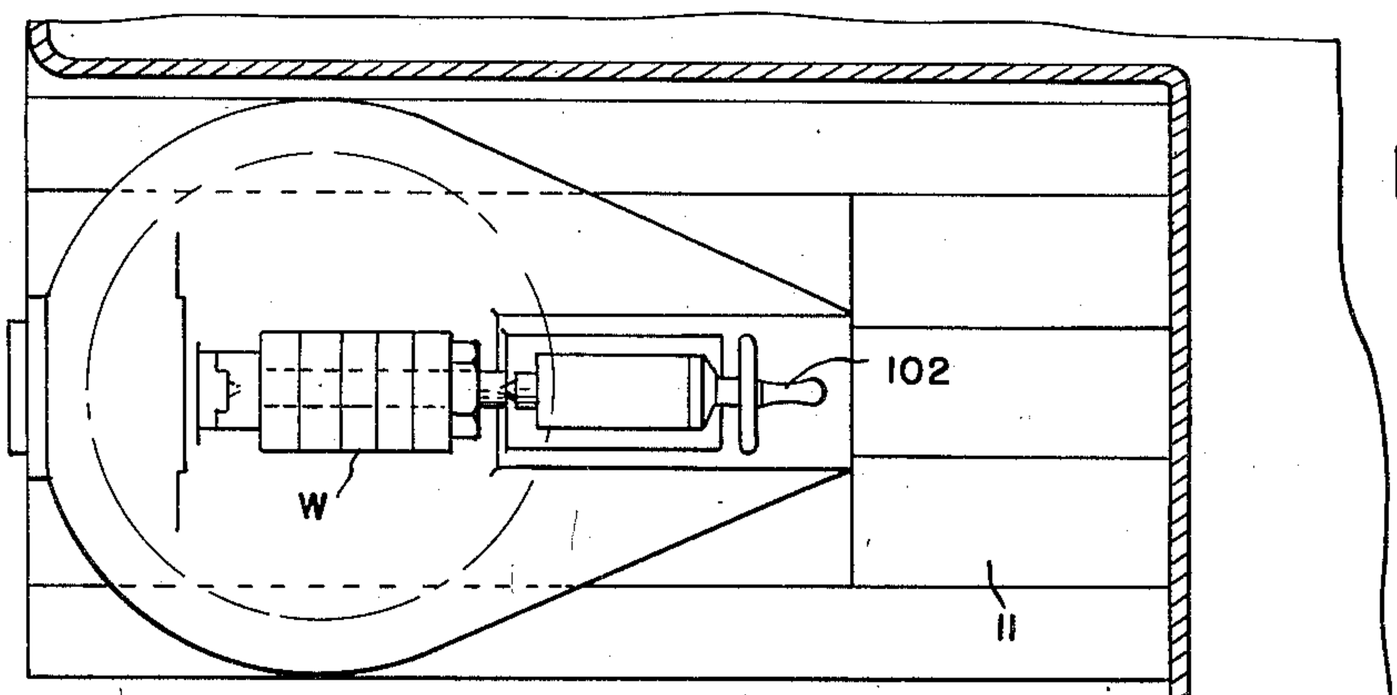


FIG. 6.

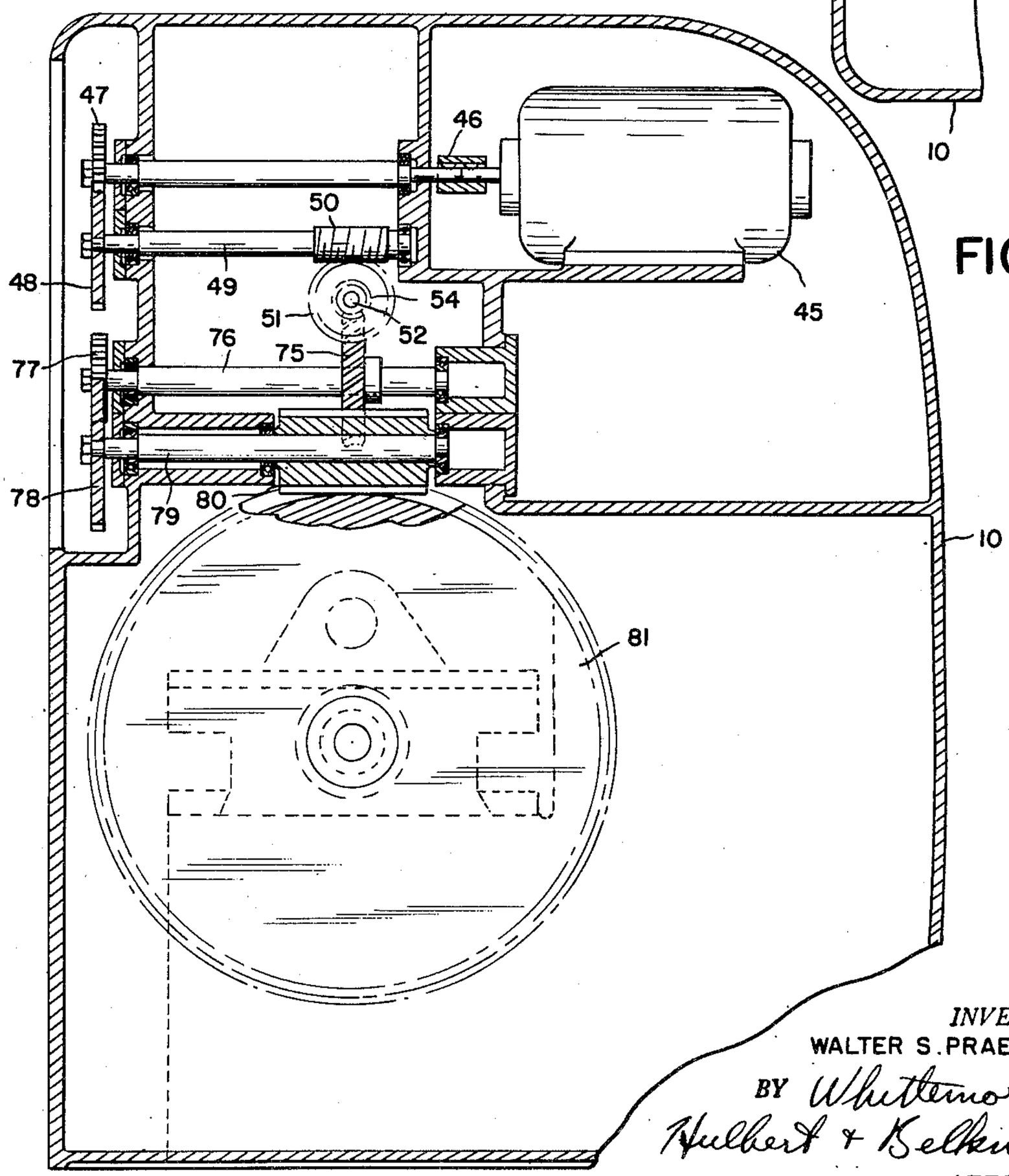


FIG. 3.

INVENTOR.
WALTER S. PRAEG
BY Whittemore, Hulbert & Belknap
ATTORNEYS

Patented Oct. 31, 1950

2,528,242

UNITED STATES PATENT OFFICE

2,528,242

HOBBING MACHINE

Walter S. Praeg, Detroit, Mich., assignor to National Broach & Machine Company, Detroit, Mich., a corporation of Michigan

Application June 7, 1948, Serial No. 31,421

24 Claims. (Cl. 90—4)

1

The present invention relates to a hobbing machine.

It is an object of the present invention to provide a hobbing machine characterized by sturdy construction, the economy with which it may be built, and the accuracy and ease of setup change for hobbing helical gears and spur gears.

It is a further object of the present invention to provide a hobbing machine including means responsive to relative traverse between the gear and hob for imparting a compensating relative rotation thereto.

It is a further object of the present invention to provide a hobbing machine in which angular adjustments may be made between the direction of the axes of the gear and hob and the direction of relative traverse between the gear and hob.

It is a feature of the present invention to provide a hobbing machine including interconnected drive means for rotating the hob and a work gear, independent means for effecting relative traverse between the hob and work gear, and compensating means automatically operable in response to relative traverse between the hob and work gear for compensating for such relative traverse.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a front elevation of a hobbing machine constructed in accordance with the present invention.

Figure 2 is an enlarged fragmentary section on the line 2—2 of Figure 1.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a fragmentary plan view.

Figure 5 is a sectional view through the work spindle transmission of a simplified form of the machine, and

Figure 6 is a fragmentary section on the line 6—6 of Figure 2.

Hobbing machines generally are provided with means for driving the hob and the work gear and for effecting relative traverse between the hob and work gear all in definitely timed relation. Accordingly, it has been impossible to effect rapid return traverse after the hobbing cut has been taken or to substantially vary the hobbing speed. However, hobbing machines are known which include a differential in the train of gears driving the work gear, this differential including a gear driven in accordance with the

2

rate of relative traverse between the gear and hob. Such differential hobs, however, are unduly complicated and expensive to manufacture, require involved computations when seeking changes in setup, and necessarily introduce inaccuracies in the finished gear as a result of a long train of driving gears which serve to introduce backlash.

In accordance with the present invention rotary drive to either the hob or the gear includes a rotating drive element having helical surfaces thereon and adapted to slide axially along a correspondingly formed element in accordance with relative traverse between the gear and hob. As the helical surfaces referred to may be of the same effective lead as the gear being hobbed, it will be apparent that relative traverse between the gear and hob may be at any rate desired and that completion of a rough hobbing stroke may be followed by rapid traverse to starting position followed by a relatively rapid finishing hobbing operation. The machine is designed to facilitate change-over by substitution of the parts providing the mating helical surfaces, and it is also contemplated that the parts having the mating helical surfaces need not be changed but that change gears may be introduced into the train so as to compensate for gears of different helix angles.

Referring now to the drawings the hobbing machine is illustrated as a horizontal spindle machine in which relative traverse between the hob spindle and the work spindle takes place in a horizontal plane. It will be appreciated, however, that the only important consideration is to maintain relative motions between the hob spindle and the gear spindle constant.

As best seen in Figures 1–4, the hobbing machine comprises a main frame or casting 10 providing a horizontal bed 11 having ways indicated at 12 formed thereon. Overlying the bed 12 is a vertically adjustable hob slide 15 which is mounted in ways indicated at 16 on the frame 10. As best seen in Figure 4 the hob slide 15 is located at a corner of the frame 10 so that access to the space between the hob slide 15 and the bed 11 is provided at two adjacent sides of the machine. This construction contributes to the rigidity of the parts and hence to the accuracy of the finished gears. At the same time, it affords convenient access to the manually adjustable parts as will subsequently be described.

Mounted for traverse in the ways 12 is a work carriage 20, upon which a work support 25 is

mounted for angular adjustment about a vertical axis. The work support **25**, as best seen in Figure 2, includes a depending circular portion **26** received within a correspondingly shaped opening formed in the top of the work slide **20** to guide the work support **25** in its angular adjustment. Circular T slots indicated at **28** are provided to which clamping bolts **29** are seated, so that the work support **25** may be locked in angularly adjusted position with respect to the work carriage **20**.

In like manner, a hob support **30** is secured to the hob slide **15** in angularly adjustable relation with respect thereto. A circular T slot **31** is provided which cooperates with clamping bolts **32** so that the hob support **30** may be locked in angularly adjusted position.

The hob slide **15**, as previously noted is vertically adjustable in the ways **16** and to effect this vertical adjustment a handwheel **35** is provided which drives a vertical adjusting screw **36** through bevel gearing indicated generally at **37**. The screw **36** is received in a threaded block **38** rigidly secured to the upper portion of the frame **10**, so that rotation of the handwheel **35** effects vertical adjustment of the hob slide **15** as will be readily apparent. In order to permit the vertical adjustment of the hob to be made without affecting the drive gearing for the hob, this gearing includes a vertically extended splined shaft **40** which is slidable in a splined sleeve **41** mounted in a forwardly extending portion **42** of the frame **10**.

Means are provided for effecting rotation of hob and work spindles in timed relation, and in the present machine this mechanism is employed to rotate the hob and work spindles at the relative rates which would be appropriate for gearing having the same number of teeth as the hob and work gear. In other words, no change in relative speed of rotation of the hob and work spindles is provided for in this driving mechanism to compensate for relative traverse, this compensation being introduced by independent mechanism as will subsequently be described. The drive mechanism comprises a motor **45** carried in the hollow upper portion of the frame **10** which is connected by a suitable coupling **46** to a gear **47**. The gear **47** meshes with a gear **48** mounted on a shaft **49** which in turn carries a worm **50**. The worm **50** meshes with a worm gear **51** which is mounted on a shaft **52**. The shaft **52** carries a bevel gear **53** which eventually transmits rotation to the hob spindle and also carries a worm gear **54** which eventually transmits rotation to the work spindle. Thus the means for rotating the work and the hob spindles comprises trains of gearing which include a common gear member, this member being the worm **50**. Accordingly, the relative rate of rotation of the work spindle and hob spindle is definitely timed and the rate of rotation may be altered by substituting change gearing for the gears **47**, **48**

Referring first to the gear train for rotating the hob spindle the bevel gear **53** meshes with a bevel gear **60** provided on the sleeve **41**, the bevel gear **60** transmitting rotation to the splined shaft **40** previously referred to. At the lower end of the splined shaft **40** is a bevel gear **61** which is coaxial with the axis of adjustment of the hob support **30**. The angularly adjustable hob support **30** is provided with a shaft **62** carrying a bevel gear **63** meshing with the bevel gear **61**, so that the meshed relationship of the bevel gears **61**, **63** is maintained during angular adjustment of the hob support **30**. At the outer end of the

shaft **62** is a balance wheel **64** and intermediate of its length the shaft **62** is provided with a gear **65**. The hob spindle is indicated at **67** and is provided with a gear **68** meshing with the gear **65**. Preferably the outer end of the hob spindle **67** is supported as by bearing means indicated at **70** and the spindle supports the hob H.

The mechanism for rotating the work spindle includes a worm gear **75** meshing with the worm **54** and mounted on a shaft **76** which carries a first change gear **77**. A second change gear **78** mounted on the shaft **79** is provided and the shaft **79** carries a driving worm **80** which drives a large worm gear **81**. The worm gear **81** is mounted in bearings indicated at **82** and has keyed or otherwise secured thereto an internally helically splined sleeve **83** which extends parallel to the ways **12** provided on the bed **11**. The work carriage **20** is provided with a shaft **85** mounted in suitable bearings indicated at **86**, the shaft **85** having keyed or otherwise secured thereto an externally helically splined member **87** which is slidably received within the internally helically splined sleeve **83**.

At its end the shaft **85** is provided with a bevel gear **90** which meshes with a bevel gear **91** mounted on the work carriage **20**. The bevel gear **91** is disposed with its axis extended vertically and coaxial with the axis of adjustment of the work support **25** relative to the work carriage **20**.

The angularly adjustable work support **25** is provided with a short shaft **95** carrying a first bevel gear **96** which meshes with the bevel gear **91** and carrying at its opposite end a second bevel gear **97** meshing with a bevel gear **98** carried by the work spindle **100**. The arrangement is such that the driving relationship is maintained to the work spindle while the work support **25** is angularly adjusted about a vertical axis. A tail stock indicated at **101** is provided including a handwheel **102** and a center **103** for engaging work supporting means such as the arbor **104** on which the work W is mounted.

From the mechanism just described, it will be apparent that traverse of the work carriage **20** on the bed **11** will superimpose a compensating rotation upon the rotation of the work piece W in accordance with the lead of the splined members **83**, **87**.

Means entirely independent from the mechanism for rotating the work and hob spindles is provided for effecting relative traverse of the work carriage **20**. This means comprises a motor **110** carried in the base **10** which drives change gears **111** and **112** and hence the shaft **113**. Keyed on the shaft **113** for axial sliding movement thereon is a speed change gear comprising a relatively large gear **114** and a relatively small gear **115**. Parallel to the shaft **113** is the traverse shaft **116** on which is secured a relatively small gear **117** and a relatively large gear **118**. A shifting lever **120** is provided for shifting the gears **114** and **115** longitudinally on the shaft **113** so that the relatively small gear **115** may mesh with the relatively large gear **118** or alternatively the relatively large gear **114** may mesh with the relatively small gear **117**. The lever **120** is connected to a shaft **121** which carries a shifter fork **122** which engages an annular groove provided between the gears **114** and **115**. This permits a substantial change of speed by shifting the lever **120** as will be readily apparent.

Depending from the underside of the work carriage **20** is a traverse nut **125** in which is received the traverse screw **126** provided as an extension

of the traverse shaft 116. The motor 110 causes traverse of the carriage 20 through the gearing described above and the traverse nut and screw. The rate of traverse may be varied by the gear shifting mechanism described above. Suitable means (not shown) are provided for reversing the motor 110 to effect return means for effecting traverse of the carriage 20. It will be observed that the traverse of the carriage 20 by the motor 110 is entirely independent of the means for effecting relative timed rotation of the hob and work spindles by the motor 45, but that this traverse introduces a compensating rotation to the work spindle 110 by virtue of the helical splined relationship of the members 83 and 87. This permits traverse to be carried out at different rates and specifically will permit the hobbing operation to be carried out at a desired slow rate, after which return traverse to initial position may be carried out rapidly.

In the specific embodiment of the hobbing machine illustrated relative traverse is in a fixed horizontal direction as is determined by the location of the ways 12. However, both the work spindle and the hob spindle are independently angularly adjustable about a vertical axis so that the direction of relative traverse between the spindles may be at any desired angle with respect thereto. This permits the employment of a method of hobbing which I refer to as "diagonal traverse." In the past the conventional method of hobbing has been to provide relative traverse between the work gear and the hob in a direction parallel to the axis of the work. By employing a relative traverse which extends at an oblique angle to the axes of both the work spindle and the hob spindle, it is possible to provide a hobbing action which will produce accurately finished gears at a high rate of speed and with increased hob life, since the cutting action is distributed longitudinally over a predetermined portion of the hob during each hobbing stroke. This is to be contrasted with the prior conventional method in which for each setting of the hob the most severe cutting action was concentrated at a specific zone of the hob. In the past efforts have been made to overcome this difficulty which included provision for shifting the hob axially between hobbing operations or for providing an almost imperceptibly slow axial feed of the hob. The present machine obtains improved results over either of these two methods by automatically introducing a distribution of the wear longitudinally of the hob during each cutting cycle. In addition to the foregoing advantage the present hobbing machine permits a very accurate control of lead since with a single splined assembly made up of the parts 83 and 87, it is possible to produce slight variations in lead on the work gear by changing the angle between the direction of relative traverse and the axis of the work spindle. Thus while relatively large changes in relative speed between the hob and work piece will be made by substituting different sets of change gears for the gears 111, 112, such gears are not provided to take care of an infinite number of ratios. Thus a particular set of change gears may produce a ratio between the hob spindle and the work spindle which is not precisely that desired. This ratio may be modified by substituting different helically splined members for the members 83 and 87 and fine variations in lead may be accomplished by angular adustments of the work support 25 and the hob support 30 relative to the direction of ways 12.

Reference is now made to Figure 5 which illustrates a simplification of the hobbing machine which may be made in the event that the feature of angular adjustability of the work support 25 is not required. In this case the shaft 85 instead of carrying the bevel gear 90 illustrated in Figure 2 is provided with a cylindrical gear 130 which meshes with a second cylindrical gear 131 mounted directly on the work spindle 100. In this case the bevel gears 90, 91, 96, 97 and 98 are not required, since there is no necessity for preserving continuity of a train of gears during angular adjustment of the work table.

The drawings and the foregoing specification constitute a description of the improved hobbing machine in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A gear hobbing machine comprising a frame, having a bed thereon, a work carriage slidable on said bed, a hob support overlying said carriage and angularly adjustable about a vertical axis, a hob spindle on said hob support, gearing for rotating said hob spindle including a gear whose axis coincides with the axis of adjustment of said hob support to drive said hob spindle in all positions of angular adjustment, a work support angularly adjustable about a vertical axis on said carriage, a work spindle on said work support, gearing for rotating said work spindle including a gear whose axis coincides with the axis of adjustment of said work support to drive said work spindle in all positions of angular adjustment, said gearing including common drive means to effect timed rotation of said hob and work spindles, means independent of said gearing for effecting traverse of said carriage, and helically splined means in said work spindle gearing relatively axially slidable upon traverse of said carriage to superimpose a compensating rotation on said work spindle in accordance with traverse.

2. A gear hobbing machine comprising a frame, having a bed thereon, fixed ways on said bed, a work carriage slidable on said ways, a hob support overlying said carriage and angularly adjustable about a vertical axis, a hob spindle on said hob support, gearing for rotating said hob spindle including a gear whose axis coincides with the axis of adjustment of said hob support to drive said hob spindle in all positions of angular adjustment, a work support angularly adjustable about a vertical axis on said carriage, a work spindle on said work support, gearing for rotating said work spindle including a gear whose axis coincides with the axis of adjustment of said work support to drive said work spindle in all positions of angular adjustment, said gearing including common drive means to effect timed rotation of said hob and work spindles, means independent of said gearing for effecting traverse of said carriage on said ways, and helically splined means in said work spindle gearing relatively axially slidable upon traverse of said carriage to superimpose a compensating rotation on said work spindle in accordance with traverse.

3. In a hobbing machine including a hob spindle and a work spindle and connected gear trains for rotating said spindles, a carriage mounting said work spindle for traverse in a direction which occupies a plane parallel to the axes of said spindles, said carriage carrying a helically splined gear included in the train for rotating the work spindle, a splined drive shaft

parallel to the direction of traverse of said carriage, said gear being splined to said shaft and movable along said shaft as said carriage is traversed, change gears between said splined gear and said work spindle to provide for hobbing gears of different helix angle with a single splined shaft and splined gear, and drive means independent of said gear trains for traversing said table.

4. A gear hobbing machine comprising a work carriage, a work spindle thereon, a hob support relatively adjustable toward and away from said carriage, a hob spindle on said support angularly adjustable thereon with respect to said work spindle, a motor, a train of driving gears interconnecting both of said spindles with said motor for driving said spindles, drive means independent of said motor for effecting traverse of said carriage in a plane parallel to the axes of said spindles, compensating means responsive to traverse of said carriage to superimpose an additional rotation of said work spindle upon the motor-driven rotation thereof in accordance with the lead of the work gear being hobbed and the rate of traverse of said carriage, said compensating means comprising a pair of helically splined members in the gear train connecting said work spindle with said motor, said splined members being relatively movable axially upon traverse of said carriage.

5. A gear hobbing machine comprising a work carriage, a work spindle thereon, a hob support relatively adjustable toward and away from said carriage, a hob spindle on said support angularly adjustable thereon with respect to said work spindle, a motor, a train of driving gears interconnecting both of said spindles with said motor for driving said spindles, drive means independent of said motor for effecting traverse of said carriage in a plane parallel to the axes of said spindles, compensating means responsive to traverse of said carriage to superimpose an additional rotation of said work spindle upon the motor-driven rotation thereof in accordance with the lead of the work gear being hobbed and the rate of traverse of said carriage, said compensating means comprising a pair of splined members in the gear train connecting said work spindle with said motor, said splined members being relatively movable axially upon traverse of said carriage, said splined member having a lead corresponding to the lead of the gears being hobbed.

6. A gear hobbing machine comprising a work carriage, a work spindle thereon, a hob support relatively adjustable toward and away from said carriage, a hob spindle on said support angularly adjustable thereon with respect to said work spindle, a motor, a train of driving gears interconnecting both of said spindles with said motor for driving said spindles, drive means independent of said motor for effecting traverse of said carriage in a plane parallel to the axes of said spindles, compensating means responsive to traverse of said carriage to superimpose an additional rotation of said work spindle upon the motor-driven rotation thereof in accordance with the lead of the work gear being hobbed and the rate of traverse of said carriage, said compensating means comprising a pair of splined members in the gear train connecting said work spindle with said motor, said splined members being relatively movable axially upon traverse of said carriage, said splined members having a lead equal to the lead of helix of the gears being hobbed.

7. A gear hobbing machine comprising a work carriage, a work spindle thereon, a hob support relatively adjustable toward and away from said carriage, a hob spindle on said support angularly adjustable thereon with respect to said work spindle, a motor, a train of driving gears interconnecting both of said spindles with said motor for driving said spindles, drive means independent of said motor for effecting traverse of said carriage in a plane parallel to the axes of said spindles, compensating means responsive to traverse of said carriage to superimpose an additional rotation of said work spindle upon the motor-driven rotation thereof in accordance with the lead of the work gear being hobbed and the rate of traverse of said carriage, said compensating means comprising a pair of splined members in the gear train connecting said work spindle with said motor, said splined members being relatively movable axially upon traverse of said carriage, and change gears in said gear train whereby gears of different lead may be hobbed with the same splined member and gear.

8. A gear hobbing machine, comprising a work carriage, a work spindle thereon, a hob support relatively adjustable toward and away from said carriage, a hob spindle on said support angularly adjustable thereon with respect to said work spindle, a motor, a train of driving gears interconnecting both of said spindles with said motor for driving said spindles, drive means independent of said motor for effecting traverse of said carriage in a plane parallel to the axes of said spindles, compensating means responsive to traverse of said carriage to superimpose an additional rotation of said work spindle upon the motor-driven rotation thereof in accordance with the lead of the work gear being hobbed and the rate of traverse of said carriage, said compensating means comprising a rotary shaft in the gear train connecting said work spindle with said motor, an externally splined sleeve removably mounted on said shaft, and a removable, internally splined sleeve on said externally splined sleeve, said splined sleeves being relatively axially movable upon traverse of said carriage.

9. A gear hobbing machine comprising a frame, a carriage slidable on said frame, a work spindle on said carriage, a tool spindle on said frame, drive means for said spindles comprising a motor and gearing connecting said motor to each of said spindles, master lead control compensating means in the gearing connecting said motor and said work spindle comprising a pair of coaxial helically splined members relatively axially slidable upon sliding movement of said carriage, and feeding means for traversing said carriage.

10. A gear hobbing machine as defined in claim 9 in which said feeding means comprises a separate motor and feed screw mechanism between said frame and carriage.

11. A gear hobbing machine as defined in claim 9 in which said work spindle is parallel to the direction of traverse of said carriage.

12. A gear hobbing machine as defined in claim 11 in which said tool spindle is mounted for angular adjustment about an axis perpendicular to the axes of both of said spindles.

13. A gear hobbing machine as defined in claim 9 in which said tool spindle and said work spindle are each independently adjustable about an axis perpendicular to both of said spindles.

14. A gear hobbing machine for machining the teeth of gears comprising a frame, a carriage slidable on said frame, a work spindle on said carriage, a tool spindle on said frame for a worm-

like tool, means mounting said tool spindle for angular adjustment about an axis perpendicular to the axes of both of said spindles to bring a worm-like hobbing tool and work piece into a crossed and non-parallel operating relationship equivalent to the meshing relationship of a worm and worm gear, drive means for said spindles comprising a motor and gearing connecting said motor to both of said spindles, said gearing being effective to rotate said spindles in the timed relationship proper for meshed rotation of a worm and worm gear having the same number of teeth as the tool and work piece, feeding means for traversing said carriage in a direction to cause the action of the tool to progress from one side to the other of the work piece, and master lead control compensating means comprising a pair of coaxial helically splined members included in the gearing connecting said motor with said work spindle, said members being relatively axially slidable upon feeding traverse of said carriage.

15. A gear hobbing machine as defined in claim 14 in which said work spindle is parallel to the direction of traverse of said carriage.

16. A gear hobbing machine as defined in claim 14 in which said work spindle is mounted for angular adjustment in the plane containing its axis and parallel to the direction of traverse of said carriage and parallel to said tool spindle.

17. A gear hobbing machine as defined in claim 14 in which said feeding means comprises a feed screw mechanism for traversing said carriage, and a separate motor drive for said mechanism.

18. A gear hobbing machine comprising a frame, a carriage mounted for horizontal sliding movement on said frame, a work spindle on said carriage having its axis parallel to the direction of traverse of said carriage, a tool spindle overhanging said carriage, means mounting said tool spindle for angular adjustment in a horizontal plane, drive means for said spindles comprising a motor and gearing connecting said motor to both of said spindles, feeding means for traversing said carriage, and master lead control compensating means comprising a pair of coaxial helically splined members in the gearing connecting said motor to said work spindle, said members being relatively axially slidable upon traverse of said carriage.

19. A gear hobbing machine as defined in claim 18 in which said splined members are located in said gearing closely adjacent to said work spindle.

20. A gear hobbing machine as defined in claim 18 in which said feeding means comprises a feed screw mechanism, and means for changing the speed of said feeding means independent of the geared rotation of said spindles.

21. A gear hobbing machine as defined in claim 18 in which said feeding means comprises a separate motor and feed screw mechanism between said frame and carriage.

22. A gear hobbing machine comprising a frame, a work carriage slidable on said frame, a work spindle on said carriage, a hob spindle on said frame, a motor, driving gears interconnecting both of said spindles with said motor including a separate train of gears for driving each of said spindles in definitely timed geared rotation, feed means for effecting traverse of said carriage, the train of gears for driving said work spindle including a worm and worm gear in which the worm drives the worm gear, said worm and worm gear being located in the gear train relatively close to the work spindle, master lead compensating means responsive to traverse of said carriage to superimpose an additional rotation on said work spindle upon the geared rotation thereof in accordance with the lead of the work gear being hobbed and the rate of traverse of said carriage, said compensating means comprising a pair of coaxial helically splined members in the gear train for driving the work spindle and located therein intermediate said worm and worm gear and said work spindle, said splined members being relatively slidable axially upon traverse of said carriage.

23. A gear hobbing machine as defined in claim 22 in which said work spindle and said helically splined members are parallel to the direction of traverse of said carriage.

24. A gear hobbing machine as defined in claim 23 in which the means for effecting traverse of the carriage comprises a separate motor and feed screw mechanism.

WALTER S. PRAEG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,037,571	Zimmermann	Sept. 3, 1912
1,049,350	Fawcus	Jan. 7, 1913
1,082,533	Lees	Dec. 30, 1913
1,103,851	Sykes	July 14, 1914

FOREIGN PATENTS

Number	Country	Date
480,247	Great Britain	Feb. 14, 1938