No. 820,377. PATENTED MAY 8, 1906.

H. BAERBALCK.

GEARING.

APPLICATION FILED APR. 3, 1905.

3 SHEETS—SHEET 1.

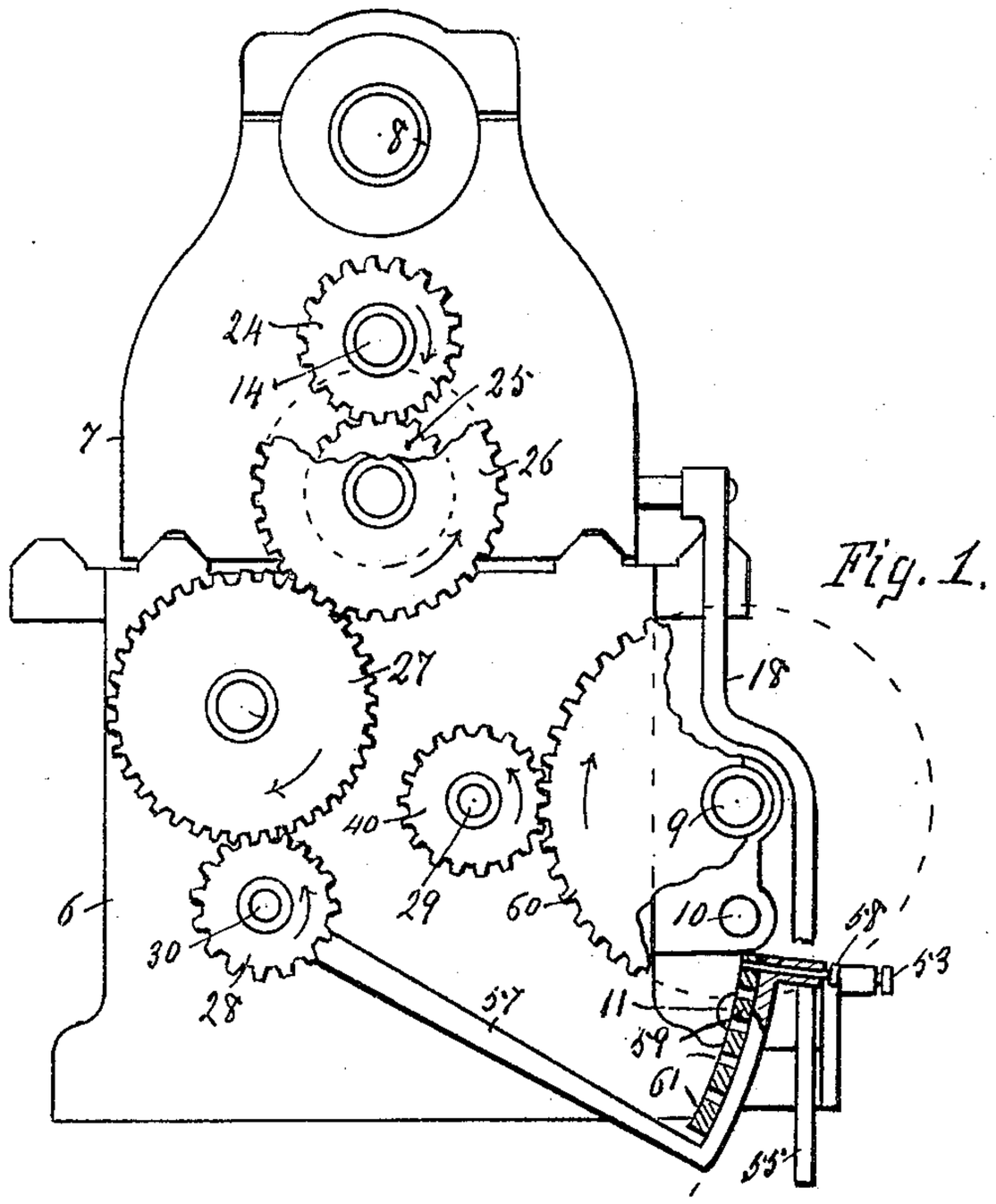

Fig. 1.

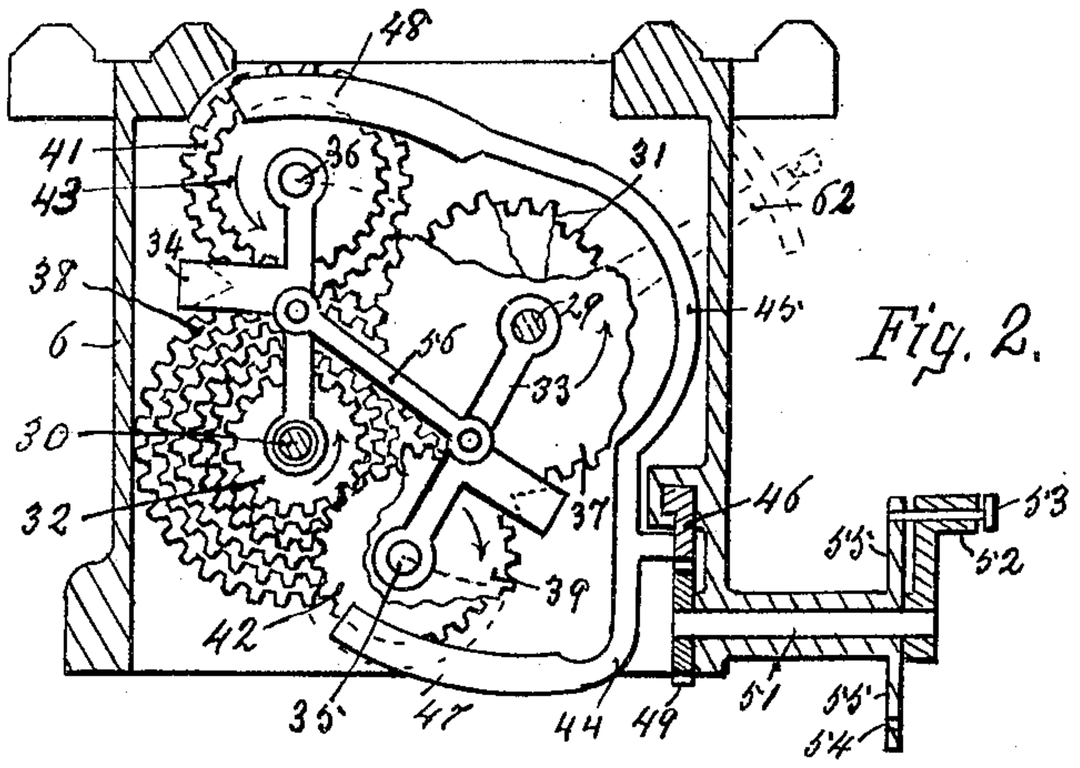

Fig. 2.

WITNESSES,

James J. Carr.
Samuel S. Carr.

Hans Baerbalck, INVENTOR,

By Robert S. Carr, Atty.

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3 SHEETS—SHEET 2.

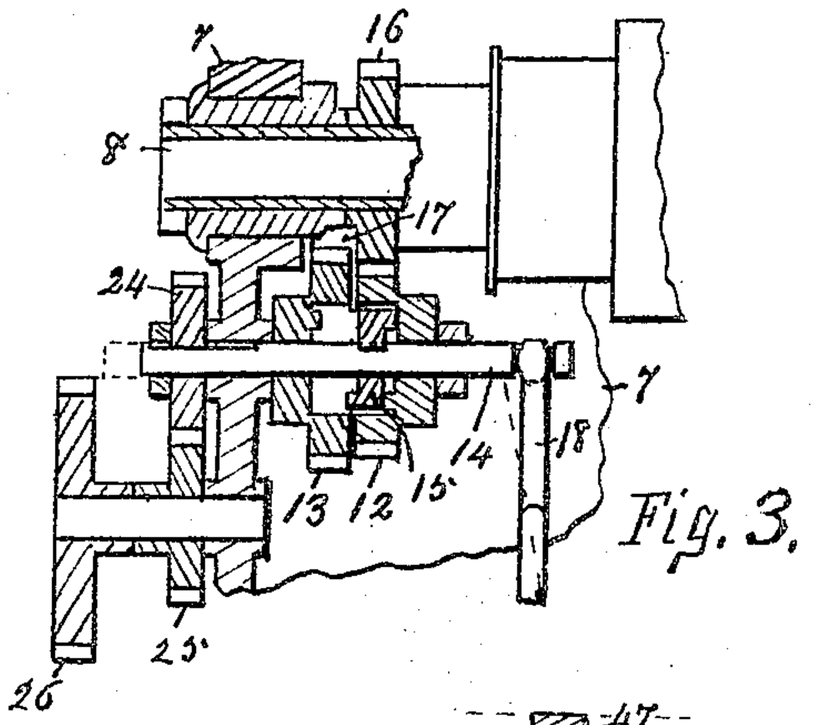

Fig. 3.

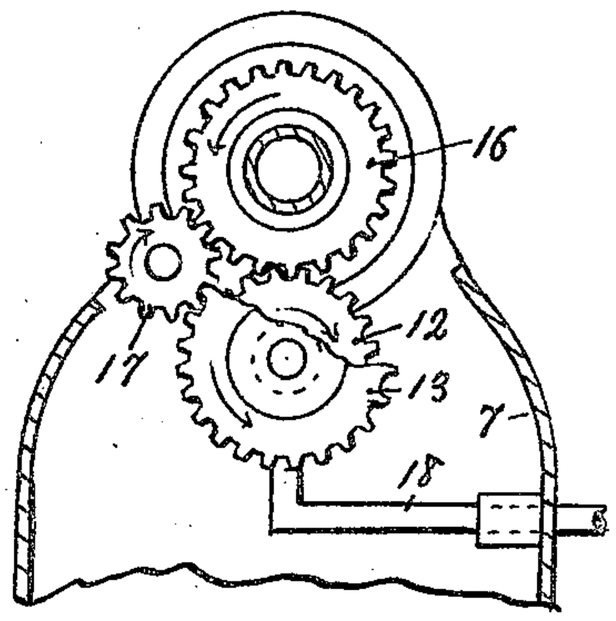

Fig. 4.

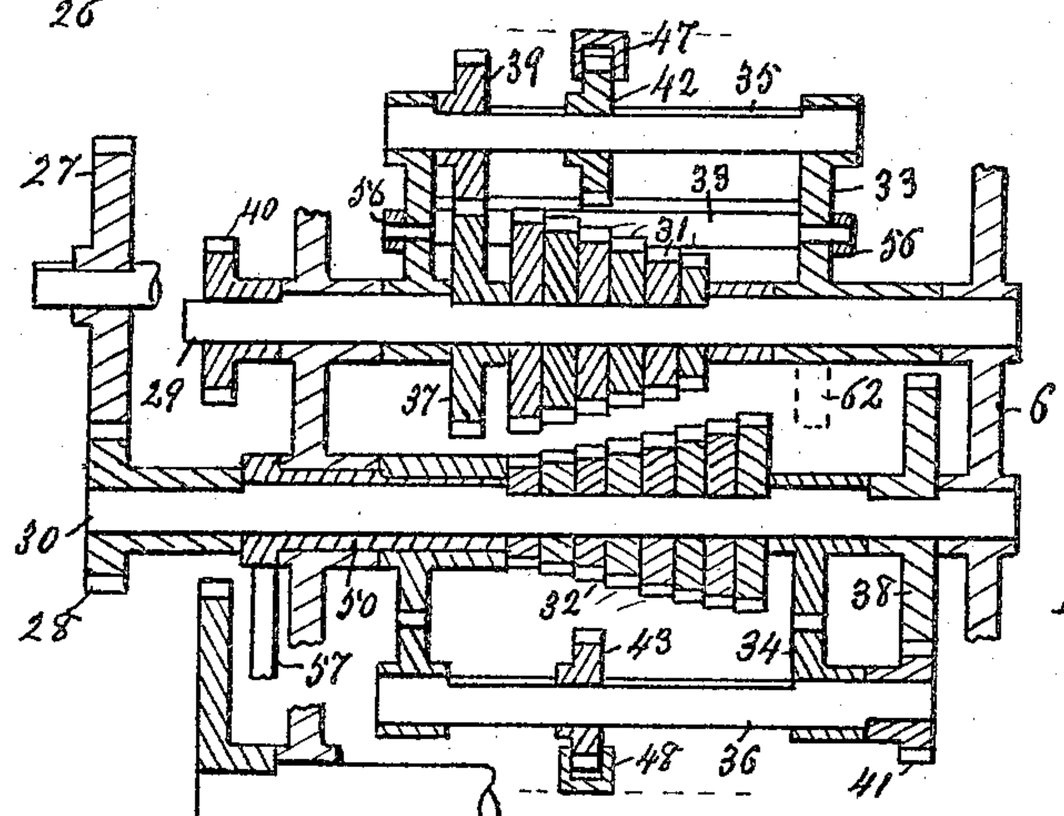

Fig. 5

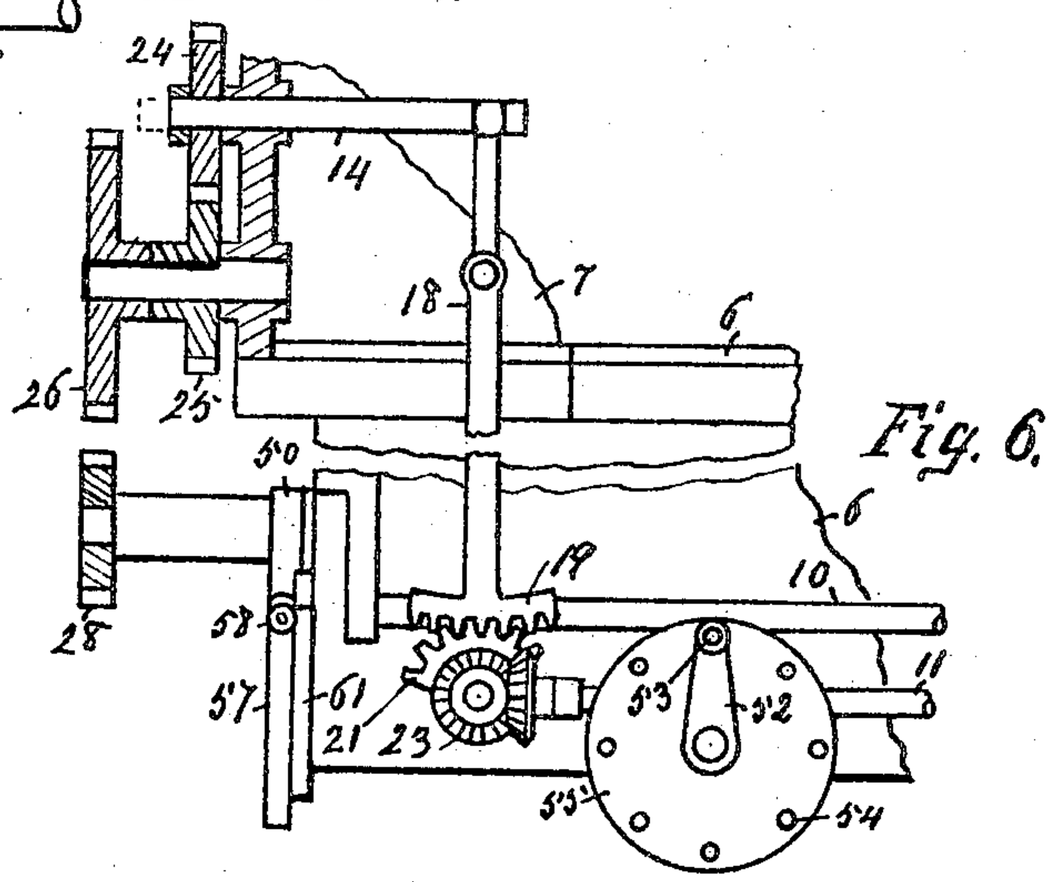

Fig. 6.

WITNESSES,

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3 SHEETS—SHEET 3.

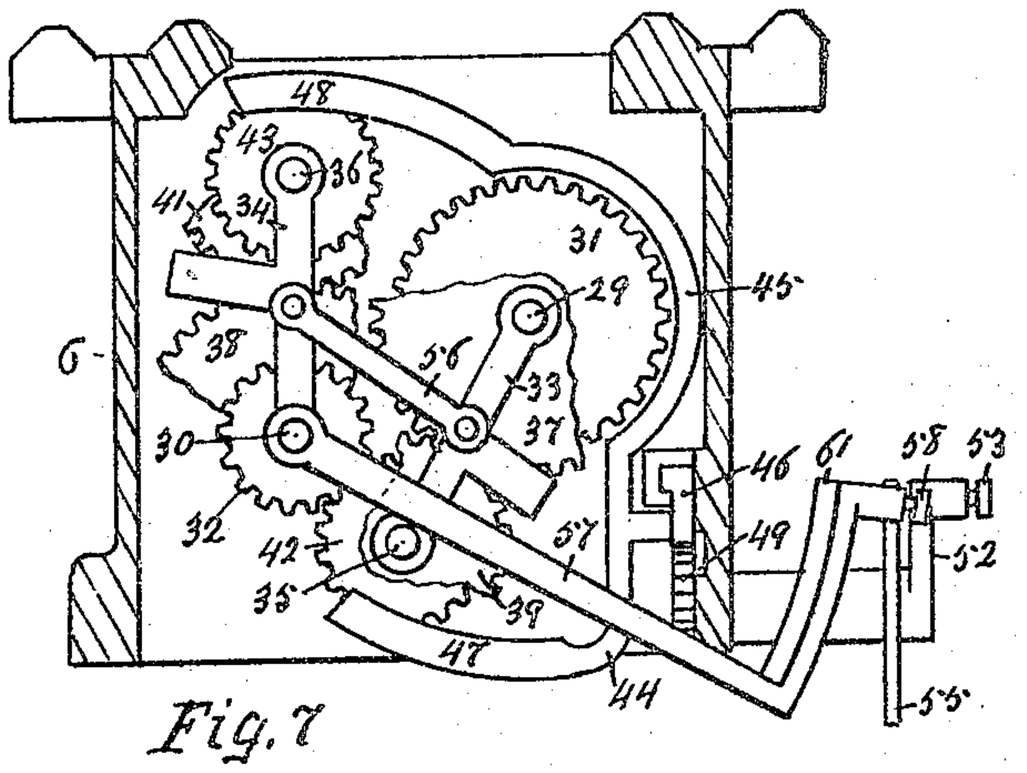

Fig. 7

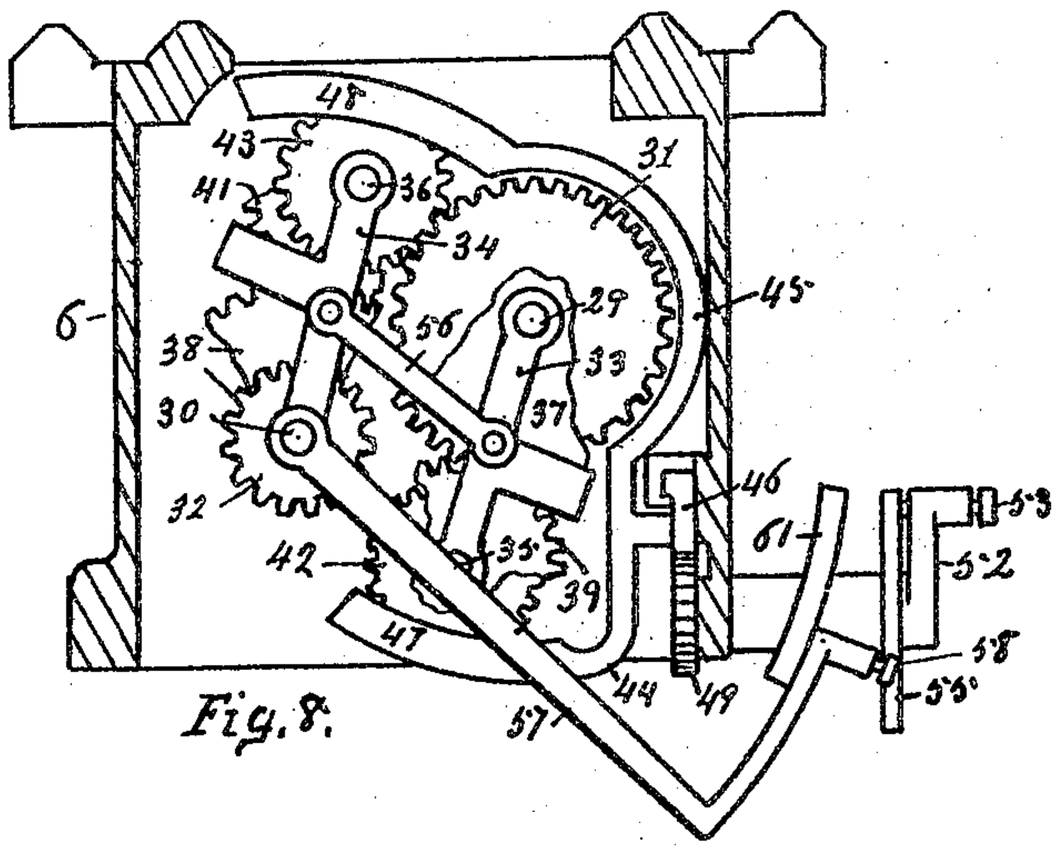

Fig. 8.

WITNESSES.

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Samuel S. Carr.

Hans Baerbalck, INVENTOR.
By Robert S. Carr. Atty.

UNITED STATES PATENT OFFICE.

HANS BAERBALCK, OF HAMILTON, OHIO, ASSIGNOR TO THE HAMILTON MACHINE TOOL COMPANY, A CORPORATION OF OHIO.

GEARING.

No. 820,377. Specification of Letters Patent. Patented May 8, 1906.

Application filed April 3, 1905. Serial No. 253,714.

To all whom it may concern:

Be it known that I, HANS BAERBALCK, a citizen of Germany, residing at Hamilton, Ohio, have invented a new and useful Improvement in Gearing, of which the following is a specification.

My invention relates to gearing of the class adapted to use in engine-lathes or elsewhere for cutting screws or for other purposes; and the objects of my improvement are to interpose between the live-spindle and the lead-screw interchangeable systems of gearing having predetermined ratios of differentiation to adapt the lathe for cutting screw-threads by either the metrical, the English duodecimal, or other system, to provide a clutch mechanism within the head-stock which is automatically actuated by the movement of the tool-carriage to either stop or reverse the lead-screw, and to provide such compact assemblage and construction of parts as to obtain maximum efficiency and durability together with facility of operation. These objects are attained in the following-described manner, as illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation, with parts broken away, of an engine-lathe embodying my improvement; Fig. 2, a transverse section of a lathe-bed, showing the speed-changing gears therein; Fig. 3, a front elevation of portions of the live spindle with parts in diametrical section; Fig. 4, a transverse section of portions of the head-stock, showing the reversing-gears therein; and Fig. 5, the speed-changing gears removed from the bed and unfolded in a plane; Fig. 6, a front elevation, with parts in section, of portions of a lathe-bed and head-stock; and Figs. 7 and 8, end elevations with parts in section, showing different positions of engagement of the gears.

In the drawings, 6 represents the lathe-bed, 7 the head-stock, 8 the live-spindle, 9 the lead-screw, 10 the carriage-feed shaft, and 11 the stop-rod, all constructed and arranged in the ordinary manner.

Reversing-gears 12 and 13, each formed with a clutch member, are idly mounted on sliding shaft 14, and clutch member 15, secured on said shaft, is movable thereby into engagement with either of said gears. Gear 12 engages directly with driving-gear 16 on the live-spindle, and gear 13 is driven in the opposite direction from gear 12 by means of an intermediate pinion 17 engaging therewith and with the said driving-gear. Shifting arm 18, fulcrumed in the head-stock, engages at one end with shaft 14 and terminates at the other end in segmental rack 19, which meshes with segmental pinion 21, mounted on the bed. Stop-rod 11 engages with and actuates said pinion by means of the usual bevel-gears 23, whereby the arm is actuated to move clutch member 15 in or out of engagement with either of the gears 12 or 13, whereby the rotation of shaft 14 may be discontinued or reversed.

Gear 24, splined on shaft 14, drives gear 28, secured on shaft 30, through intermediate gears 25, 26, and 27. Said shaft 30 and a similar shaft 29, parallel therewith, are journalled in fixed bearings within the lathe-bed, and respective series or cones of gears 31 and 32 are secured thereon with the gears of one series directly opposite to corresponding gears of the other series. The gears of the respective series being graduated in size to different predetermined ratios, the ratio of one series may be based on the decimal and that of the other series on the duodecimal system of changes or differentiation.

Frames 33 and 34, provided with shafts 35 and 36, are hinged on the respective shafts 29 and 30. Gears 37 and 38, secured on shafts 29 and 30, engage with the respective pinions 39 and 41, secured on the corresponding shafts 35 and 36. Planet-pinions 42 and 43, splined on shafts 35 and 36, are simultaneously adjustable thereon into registration with either gear of the corresponding series 32 or 31 by means of brackets 44 and 45, carried by toothed rack 46, terminating in curved shoes 47 and 48 in engagement with opposite sides of the respective pinions. Said rack is mounted in the lathe-bed and movable parallel with shafts 35 and 36 by means of toothed pinion 49, secured on shaft 51, which is journaled in the lathe-bed and provided with crank-arm 52. A movable stop 53, carried by the crank-arm, is adapted to engage with either of the holes 54, formed in a fixed contiguous disk-plate 55. Said holes are arranged to register with and engage stop 53 when pinions 42 and 43 register with corresponding gears of series 32 and 31, whereby they may be maintained in adjusted position.

Frames 33 and 34 are connected together by means of links 56, and arm 57 is rigidly

secured to frame 34 by means of sleeve 50, which movably encircles shaft 30. Said arm serves to turn said frames on their respective shafts simultaneously in opposite directions, whereby pinions 42 and 43 may be alternately engaged or disengaged with the corresponding gears of the respective series 32 and 31 which may be in registration therewith, as shown in Figs. 7 and 8. In this manner the speed of shaft 29 and pinion 40 thereon may be changed and transmitted to the lead-screw through the engagement of gear 60 with pinion 40, whereby pinion 40 is caused to actuate gear 60 and the lead-screw whereon it is secured.

Movable pin 58, carried by the end of said arm, is adapted to engage with either of a series of holes 59, formed in a fixed contiguous curved plate 61 in registration with the different positions of the pin corresponding with the engagement of either of the pinions 42 or 43 with either of the gears of the corresponding series of gears 32 and 31.

If it is desired, shoe 48 may be provided with an independent rack-and-pinion adjusting mechanism, and links 56 may be omitted and housing 33 provided with an independent adjusting-arm 62, as shown in dotted lines in Figs. 2 and 5.

In operation the reversing and stopping mechanism being located within the headstock near the initial point in the transmission of power to the lead-screw prevents any departure from the synchronous movement of said screw with the driving mechanism by the action of said reversing mechanism.

Frames 34 and 33 may be simultaneously turned on their respective shafts 30 and 29 by means of arm 57 to cause either of the pinions 43 or 42 to engage with a registering gear in the corresponding series of gears 32 or 31, whereby the speed of shaft 29 and of the lead-screw driven thereby may be changed in such different predetermined ratios from the constant speed of the live-spindle as to enable the same lathe to cut threads by different systems, as the English or the metric. This obviates the necessity for the manufacturer to provide different tools for the same purpose and substantially doubles the range of usefulness for the same tool and suits it to the export demands of different countries.

Having fully described my improvement, what I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The combination of a pivotally-supported frame, a shaft carried thereby, means to rotate the shaft, a pinion splined on the shaft, means to adjust and maintain the pinion longitudinally thereon, a second shaft journaled in fixed bearings and parallel with said first shaft, a cone of gears secured thereon to turn in unison, and means to move and maintain said pinion into engagement with either gear of the cone.

2. The combination of two primary shafts journaled parallel with each other in fixed bearings, a cone of gears secured on each shaft, a frame pivotally mounted on each shaft, respective secondary rotative shafts carried thereby in an arc concentric with the corresponding primary shafts, pinions splined thereon, a rack-and-pinion mechanism arranged to simultaneously move and maintain the pinions in the planes of the gears on the cones, and a lever mechanism arranged to alternately move and maintain the pinions in engagement with either gear of the opposite cone of gears.

3. The combination of two cones of gears, the gears of each cone arranged to turn in unison, two pinions in constant communication with the respective cones and movable longitudinally in registration with the gears of the opposite cone, and lever mechanism arranged to alternately engage said pinions therewith.

4. The combination of a driving and a driven cone of gears, respective pinions communicating therewith, rack-and-pinion mechanism arranged to simultaneously move and maintain the pinions longitudinally in registration with either gear of either cone, and lever mechanism arranged to engage either pinion with the gear of the opposite cone in registration therewith.

5. The combination of a cone of gears arranged to turn in unison, a pivotally-mounted frame, a driven shaft carried thereby parallel with the axis of the cone, a pinion splined thereon, means to move and maintain the pinion longitudinally in registration with either gear of the cone, and lever mechanism arranged to move the frame with the pinion in engagement with said gear.

6. The combination of parallel rotative shafts, respective series of gears secured thereon, each series being graduated in size to a different predetermined ratio from the other, a frame hinged on each shaft, respective pinions carried thereby and movable into engagement with the respective gears of the opposite series.

7. The combination of parallel rotative shafts, respective cones of gears secured thereon, frames hinged on the respective shafts, corresponding pinions thereon engaging with the respective shafts, means arranged to move and maintain the pinions in registration with either gear of the cones, and lever mechanisms arranged to move and maintain either pinion in engagement with either gear on the opposite shaft.

8. The combination of driven cone of gears, a primary shaft journaled parallel with the axis thereof in fixed bearings, a frame pivotally mounted thereon, a secondary shaft carried thereby, gears communicating there-

with and with the primary shaft, a pinion splined and movable longitudinally on the secondary shaft in registration with either gear of the cone of gears, and lever mechanism arranged to move and maintain the frame with the pinion in engagement with said gear.

9. The combination of a driven gear, two series of driving-gears, the gears of each series being differentiated in size in a ratio different from those of the other series, and appropriate mechanism arranged to communicate motion from either gear of either series to said driven gear.

10. The combination of a driving and a driven series of gears each graduated in size to a different ratio, the gears of each series arranged to turn in unison, pinions communicating with the respective series and movable longitudinally in registration with either gear of the opposite series, and lever mechanism arranged to move and maintain said pinions alternately in engagement with corresponding gears in the respective opposite series.

HANS BAERBALCK.

Witnesses:
ARTHUR T. LETHERBY,
R. S. CARR.