R. K. LE BLOND & W. F. GROENE.

GEARING FOR LATHES, &c.

APPLICATION FILED JUNE 18, 1909.

980,973. Patented Jan. 10, 1911.

5 SHEETS—SHEET 1.

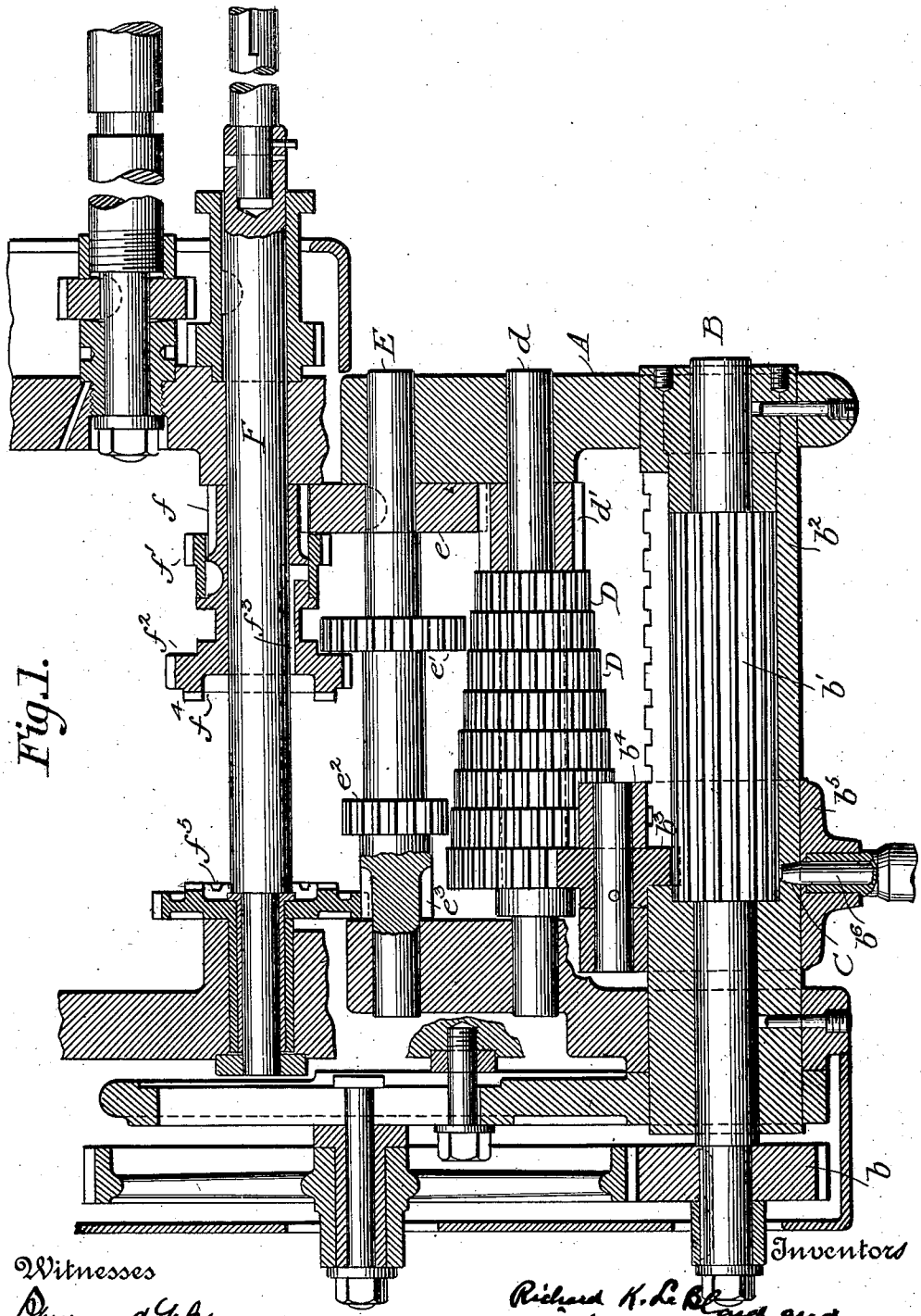

Fig. 1.

Witnesses

Raymond F. Barnes

E. J. Bowman

Inventors

Richard K. Le Blond and

William F. Groene

By Robt. P. Harris Attorney

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5 SHEETS—SHEET 2.

Fig. 3. Fig. 4. Fig. 5. Fig. 6.

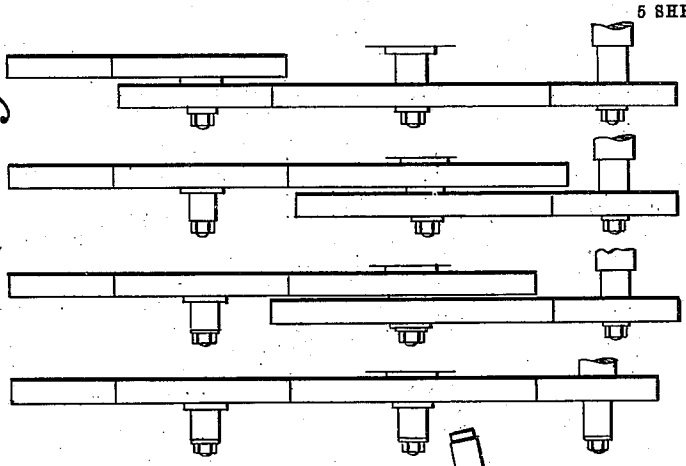
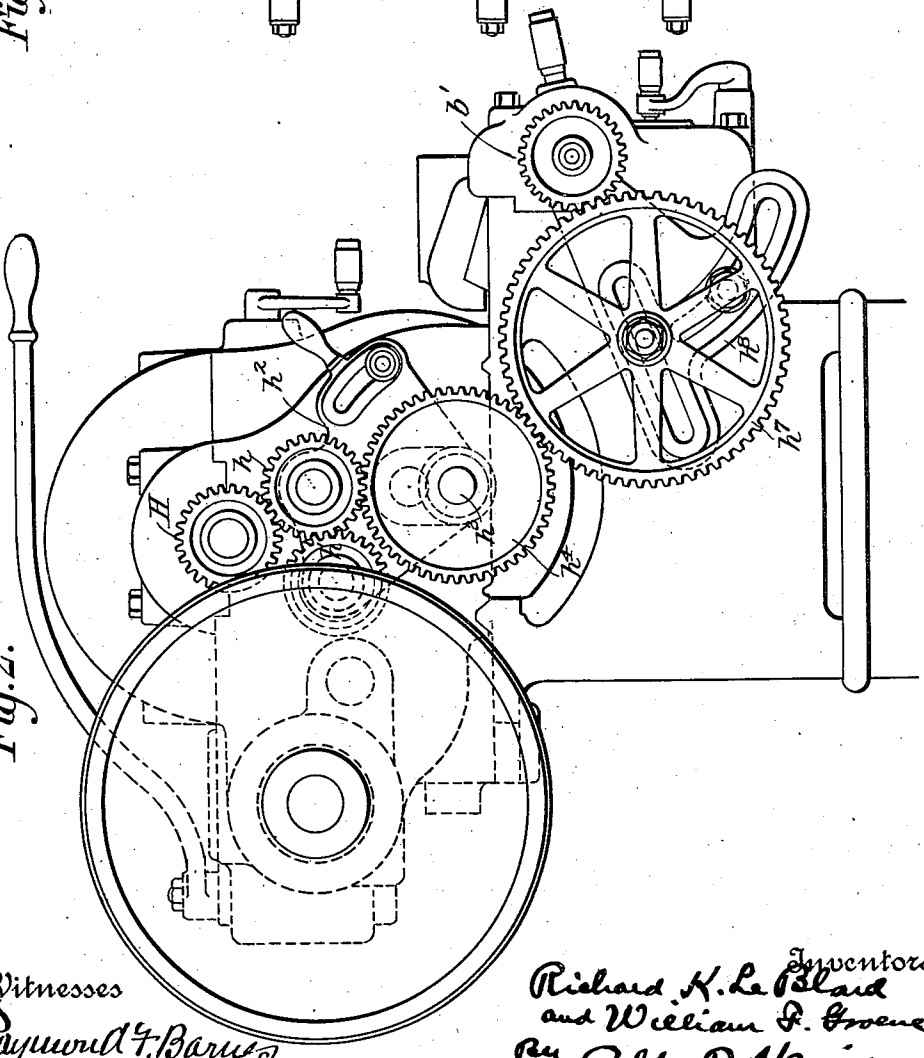


Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 7.

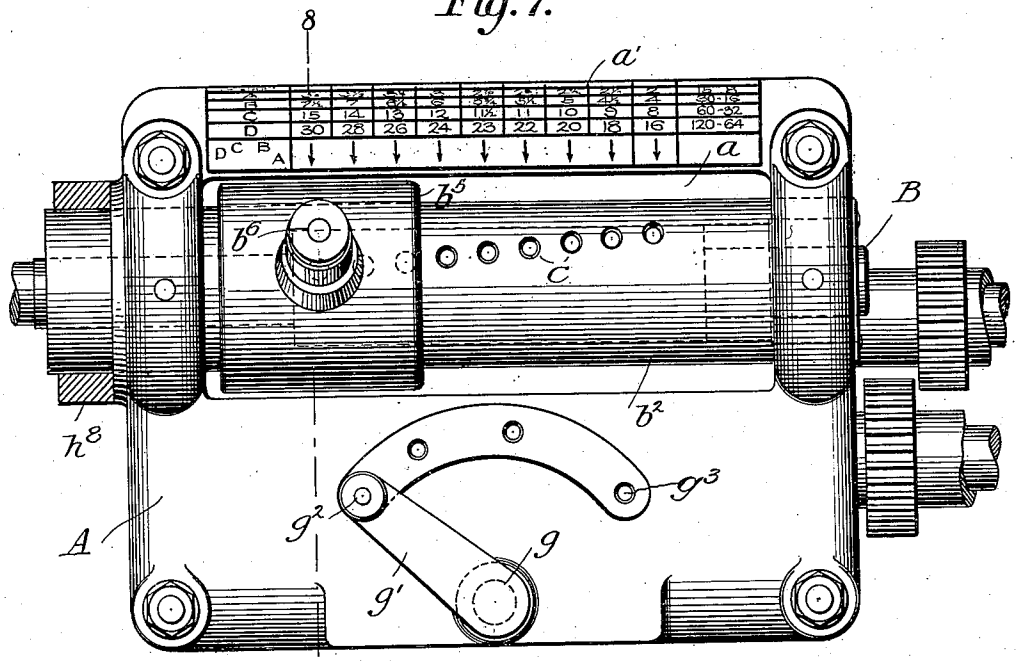
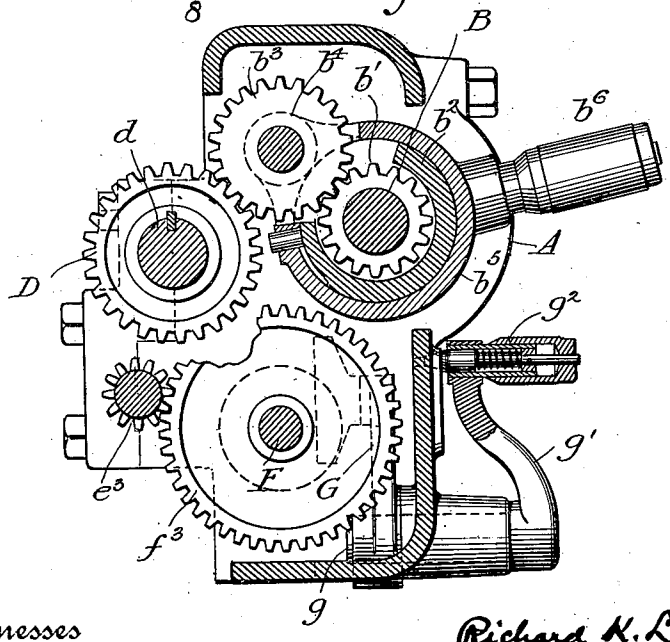


Fig. 8.



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Raymond F. Barnes.

E. J. Bowman.

Inventors

Richard K. LeBlond and

William F. Groene

By Robt. P. Hanes

Attorney

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5 SHEETS—SHEET 4.

Fig. 9.

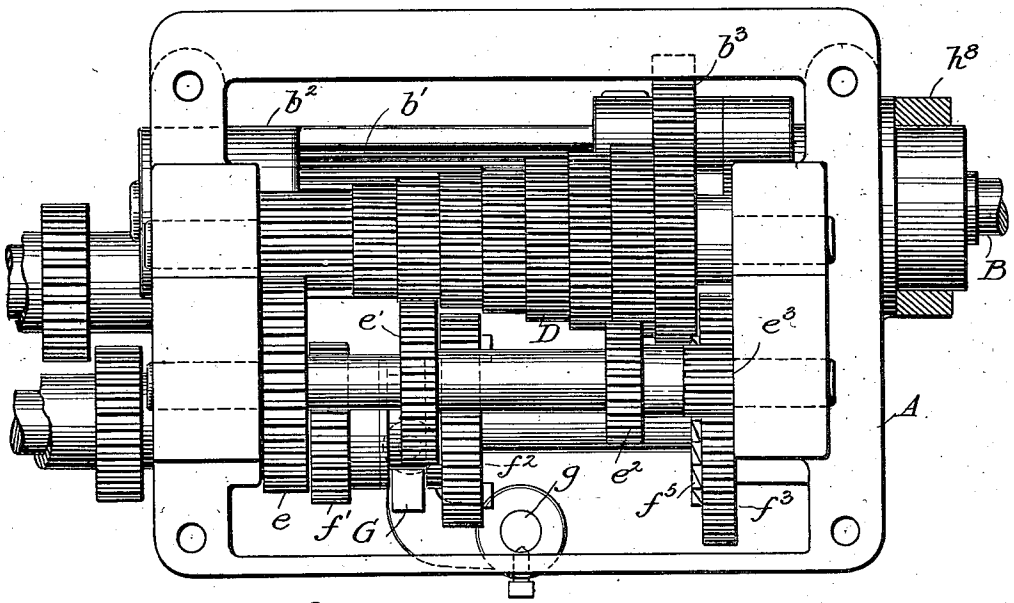

Fig. 10.

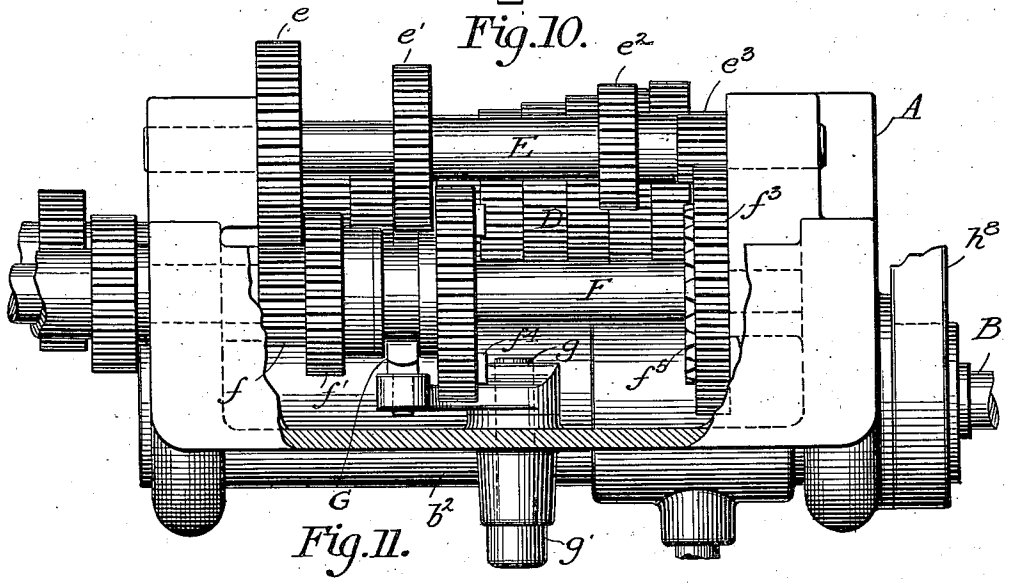

Fig. 11.

LEVER	FEED=4 TIMES THREAD THREADS PER INCH									FEEDS
A	3¾	3½	3¼	3	2⅞	2¾	2½	2¼	2	15-8
B	7½	7	6½	6	5¾	5½	5	4½	4	30-16
C	15	14	13	12	11½	11	10	9	8	60-32
D	30	28	26	24	23	22	20	18	16	120-64
D C B A	↓	↓	↓	↓	↓	↓	↓	↓	↓	

Witnesses

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E. J. Bowman.

Inventors

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By Robt. P. Hains Attorney

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5 SHEETS—SHEET 5.

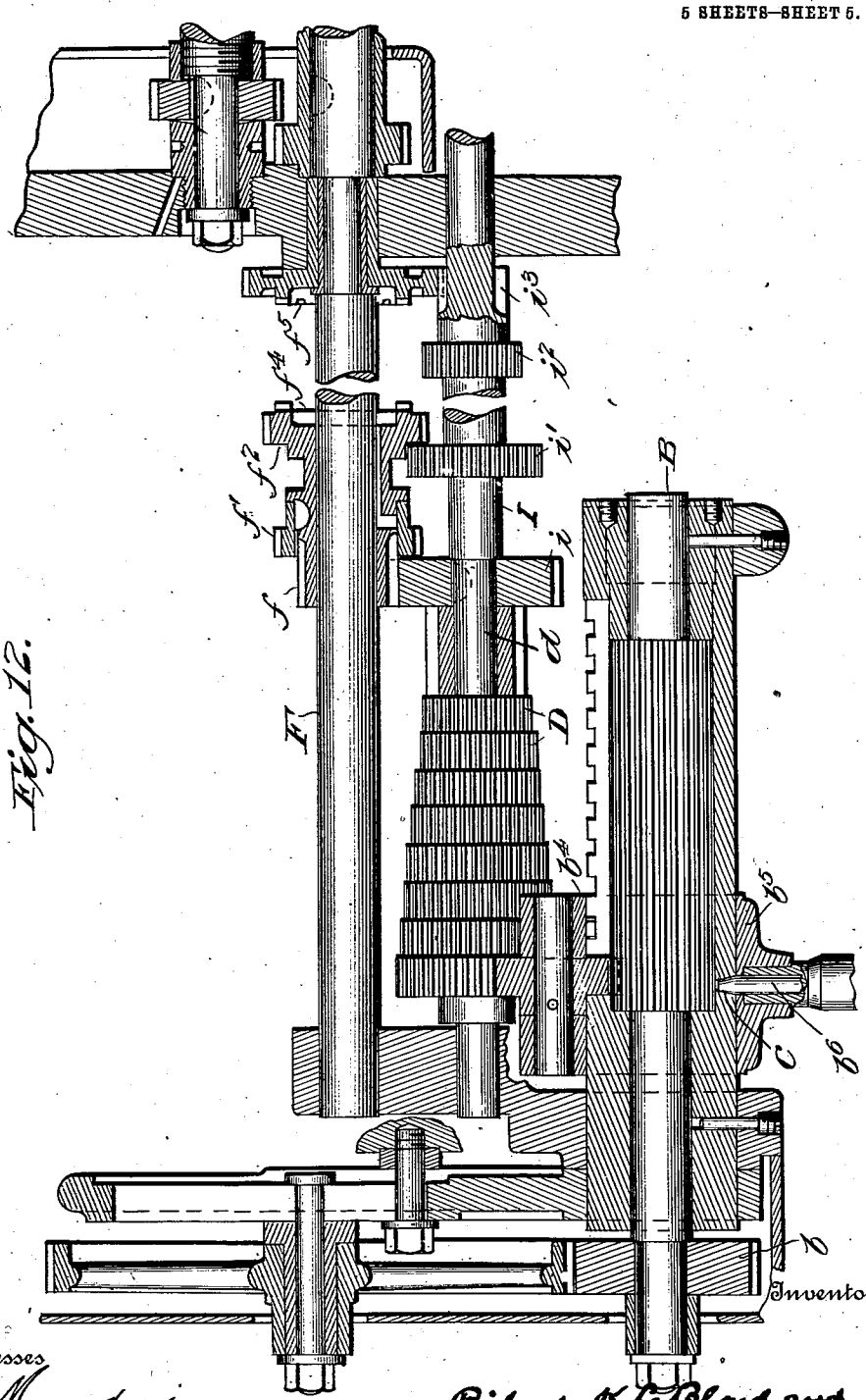

Fig. 12.

Witnesses

T. L. Mockabee

M. E. Smith.

Inventors

By Richard K. LeBlond and William F. Groene

Robt. P. Hains Attorney

UNITED STATES PATENT OFFICE.

RICHARD K. LE BLOND AND WILLIAM F. GROENE, OF CINCINNATI, OHIO, ASSIGNORS TO R. K. LE BLOND MACHINE TOOL CO., OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

GEARING FOR LATHES, &c.

980,973. Specification of Letters Patent. Patented Jan. 10, 1911.

Application filed June 18, 1909. Serial No. 502,863.

To all whom it may concern:

Be it known that we, RICHARD K. LE BLOND and WILLIAM F. GROENE, of Cincinnati, county of Hamilton, and State of Ohio, have invented a new and useful Improvement in Gearing for Lathes, &c., of which the following is a specification.

This invention relates to feed and speed changing mechanism for machine tools, and is particularly designed as an improvement on the devices covered by Letters Patent 763,770 and 788,657.

The invention has for its object the production of improved means for multiplying the transmission from the cone of gears directly and entirely within the feed box.

A further object is to provide an improved system of change gears between the spindle and the drive gear, whereby the feeds and threads can be compounded and both the metric and Whitworth systems of threads obtained.

In carrying out the present invention, we multiply the transmission from the cone of gears employed in the above mentioned patents four times; or in other words, we use this cone four direct ways, the mechanism for obtaining these results being entirely within the feed box. The result obtained by the present arrangement is a series of 36 changes in the feed, commencing at low speed and rising step by step to high speed, the said changes being controlled by a movable yoke carrying an intermediate gear whereby connection is made between a constantly driven pinion and any one of the series of stepped gears forming the cone, and by a lever and shifting mechanism which controls the intermeshing of a set of gears in such a manner as to obtain four differing speeds for each change in the cone gears.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings:—Figure 1 is a diagrammatic view illustrating the arrangement of gearing contained in the feed box together with the driving gear for the same. Fig. 2 is an end elevation of a lathe showing the arrangement of gearing from the spindle to the feed box. Figs. 3, 4, 5 and 6 are diagrams of different arrangements of gears between the spindle and feed box for cutting various threads. Fig. 7 is a front elevation of the feed box. Fig. 8 is a section on line 8—8, Fig. 7. Fig. 9 is a rear elevation of the feed box. Fig. 10 is a bottom plan view of the same. Fig. 11 is a view of the index plate. Fig. 12 is a view of a slight modification.

Referring to the drawings:—A designates the feed box which is in the form of a rectangular casing provided with a longitudinal opening a in its front, an index plate a' being secured above and adjacent said opening. Mounted in said casing is a shaft B carrying an elongated pinion b' and provided with a box-gear b which intermeshes with the gearing from the spindle of the machine in a manner to be later described. The pinion b' is located within a sleeve b^2 fixed in the ends of the box A and slotted at its rear side to permit of the engagement of a gear b^3 carried by an arm b^4 of yoke b^5 mounted to slide upon said sleeve b^2 and arranged to revolve in a limited arc around said sleeve. The motion of revolution and also the sliding movement of the sleeve are controlled by a handle b^6 provided with a spring locking pin adapted to enter openings C in said sleeve and to locate the yoke b^5 and gear b^3 in operative relation to a series of gears D, D upon and driving the shaft d.

Mounted adjacent shaft d is a countershaft E provided with four gears e, e', e^2 and e^3 of different sizes, the first mentioned gear e being constantly in mesh with a pinion d' secured to shaft d. The gear e meshes with a sliding pinion f on the feed shaft F, and formed with the said pinion f are gear wheels f', f^2 all constructed to slide on said shaft F and to drive the latter through a splined key f^3. The normal speed is obtained by meshing pinion f with gear e. The second speed by sliding the gear f' into mesh with gear e' and simultaneously disengaging gear e and pinion f. The third speed is obtained by engaging gear f^2 with gear e^2; and the fourth speed is obtained by bringing the clutch faces f^4 of gear f^2 into engagement with the corresponding faces f^5 of a pinion f^6 normally in mesh with the pinion e^3.

From the foregoing it will be understood that there are nine changes of speed brought about by shifting the gear b^3 with relation to the cone gears D, D, and that these

changes are multiplied by four by means of the pinions and gears e, e', e^2, e^3, f, f', f^2 and f^3. The carrier upon which pinions f, f' and f^2 are mounted is shifted by means of a yoke G secured to a rock-shaft g, said shaft being operated by means of a crank handle g'. Said handle is provided with a spring locking pin g^2 adapted to engage recesses g^3 in the casing, whereby said carrier is held in the desired position.

The spindle gear H is mounted upon the spindle in the usual manner, and the usual reversing gears h, h' are arranged adjacent thereto, being mounted in a reverse plate h^2. Said reverse plate is movable to bring either one of the gears h, h' into mesh with gear H. Journaled in the reverse plate is a stud h^3 upon which is secured a pinion h^4 which is in constant engagement with one of the reversing gears h, h', whereby movement is transmitted to said stud from said spindle. Stud h^3 projects through gear h^4 and is arranged to receive change gears for special threads. Meshing with the pinion b' is a quadrant gear h^7 mounted upon a suitable quadrant or carrier h^8, which is movable to bring said gear h^7 into mesh with gear h^4. It will be observed that the hubs on the quadrant gear h^7, the reverse gear and the box gear b are all elongated so that they take up the equivalent of twice the space of the face of the gear. This arrangement permits of the placing of change gears upon said hubs, or the reversing of the gears for compounding. In Fig. 3, we have illustrated the direct drive to the feed box for cutting standard threads and feeds as shown by the index plate. Fig. 4 illustrates the arrangement for obtaining English or Whitworth threads with a metric lead screw. Fig. 5 illustrates the combination for obtaining metric threads with an English lead screw. Fig. 6 shows the system of compounding for special leads.

In Fig. 12 we have shown a modification of the cone-gear arrangement. In this form the cone shaft d is elongated as indicated at l and provided with the pinions i, i', i^2, i^3, corresponding with the pinions e, e', e^2, e^3, of the countershaft E. The driving shaft B and the feed shaft F and their various gears and pinions retain the same arrangement as in the preferred form and the operation is identical.

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

1. In a feed or speed changing mechanism for machine tools, the combination of a feed box, a series of gears of different diameters mounted in said box, and forming a cone or stepped series, a driving gear, means for selectively engaging said driving gear and said series of gears, a feed shaft extended into said box, a countershaft driven by said stepped series of gears, said countershaft and said feed shaft, a plurality of gears of different sizes mounted on the countershaft and feed shaft respectively, and means for selectively engaging the gears of said feed shaft with the gears of said countershaft.

2. In a feed or speed changing mechanism for machine tools, the combination of a feed box, changeable speed gearing mounted therein, a feed shaft projected into said feed box, a countershaft mounted in said feed box and driven by said changeable speed gearing and speed changing mechanism carried by said countershaft and said feed shaft and coöperating to multiply the changes in speed of the first mentioned speed changing gearing.

3. In a feed or speed changing mechanism for machine tools, the combination of a feed box, changeable speed gearing mounted therein, a feed shaft projected into said feed box, a countershaft mounted in said feed box and driven by said changeable speed gearing, a plurality of gears of different sizes mounted on said countershaft, and selectively operated means for operatively connecting said gears with said feed shaft.

4. In a feed or speed changing mechanism for machine tools, the combination of a feed box, main changeable speed gearing mounted therein, a feed shaft, and supplemental speed changing gearing comprising a counter shaft driven by said main changeable speed gearing and gears carried by said counter shaft and said feed shaft, the gears on said feed shaft being slidably mounted.

5. In a feed or speed changing mechanism for machine tools, the combination of a feed box, main changeable speed gearing mounted therein, a feed shaft, and supplemental speed changing gearing comprising a counter shaft driven by said main changeable speed gearing and gears carried by said counter shaft and said feed shaft, the gears on said feed shaft being slidably mounted, and means for independently operating said main and supplemental change speed gearing.

6. In a feed or speed changing mechanism for machine tools, the combination of a feed box, main changeable speed gearing mounted therein, a feed shaft, and supplemental speed changing gearing comprising a counter shaft driven by said main changeable speed gearing and gears carried by said counter shaft and said feed shaft, said supplemental speed changing gearing also including a selectively operated slidable member mounted on said feed shaft and controlling said supplemental change speed gearing.

7. In a feed or speed changing mecha-

nism for machine tools, the combination of a feed box, main changeable speed gearing mounted therein, a feed shaft, and supplemental speed changing gearing comprising a counter shaft driven by said main changeable speed gearing and gears carried by said counter shaft and said feed shaft, said supplemental speed changing gearing also including a slidable member mounted on said feed shaft and controlling said supplemental change speed gearing, means for selectively adjusting said member, and means for locking said member in any selected position.

8. In a feed or speed changing mechanism for machine tools, the combination of a feed box, main changeable speed gearing mounted therein, a feed shaft, and supplemental speed changing gearing comprising a counter shaft driven by said main changeable speed gearing and gears carried by said counter shaft and said feed shaft, said supplemental speed changing gearing also including a slidable member mounted on said feed shaft and controlling said supplemental change speed gearing, a rock shaft, an arm carried by said rock shaft and engaging said slidable member, and an operating handle for said rock shaft.

9. In a feed or speed changing mechanism for machine tools, the combination of a feed box, main changeable speed gearing mounted therein, a feed shaft and supplemental speed changing gearing comprising a counter shaft driven by said main changeable speed gearing and gears carried by said counter shaft and said feed shaft, said supplemental speed changing gearing also including a slidable member mounted on said feed shaft and controlling said supplemental change speed gearing, a rock shaft, an arm carried by said rock shaft and engaging said slidable member, and an operating handle for said rock shaft, and a spring locking pin carried by said operating handle.

10. In a feed or speed changing mechanism for machine tools the combination of a spindle gear, a box gear, and gearing connecting said box gear and said spindle gear said gearing including reverse gears and a quadrant gear, said reverse gears, quadrant gear and box gear being each provided with elongated hubs to receive translating gears.

11. In a feed or speed changing mechanism for machine tools, the combination with a main speed changing mechanism, of a box gear driven thereby, a spindle gear, and gearing connecting said box gear and said spindle gear, said gearing including reverse gears and a quadrant gear, said reverse gears, quadrant gear and box gear being each provided with elongated hubs to receive translating gears.

12. In a feed or speed changing mechanism for machine tools, the combination with a main speed changing mechanism, means for multiplying the changes thereof, and a box gear for driving said speed changing mechanism, of a spindle gear, gearing connecting said spindle gear and said box gear, said gearing including reverse gears, and a quadrant gear for driving the box gear at variable speeds.

13. In a feed or speed changing mechanism for machine tools, the combination with a main speed changing mechanism, means for multiplying the changes thereof, and a box gear for driving said speed changing mechanism, of a spindle gear, and means interposed between the spindle gear and the box gear for driving the latter at variable speeds, the hub of said box gear being elongated.

14. In a feed or speed changing mechanism for machine tools, the combination with a main speed changing mechanism, means for multiplying the changes thereof, and a box gear for driving said speed changing mechanism, of a spindle gear, and gearing connecting said spindle gear and said box gear, said gearing including reverse gears and a quadrant gear for driving the box gear at variable speeds, the hubs of said reverse gear, said quadrant gear, and said box gear being elongated.

In testimony whereof we hereunto set our hands this 16th day of June 1909, in the presence of two attesting witnesses.

RICHARD K. LE BLOND.
WILLIAM F. GROENE.

Witnesses:
FRED LE BLOND,
WILSON KINSEY.