No. 706,186. Patented Aug. 5, 1902.

R. K. LE BLOND.

VARIABLE SPEED MECHANISM.

(Application filed May 13, 1902.)

(No Model.) 3 Sheets—Sheet 1.

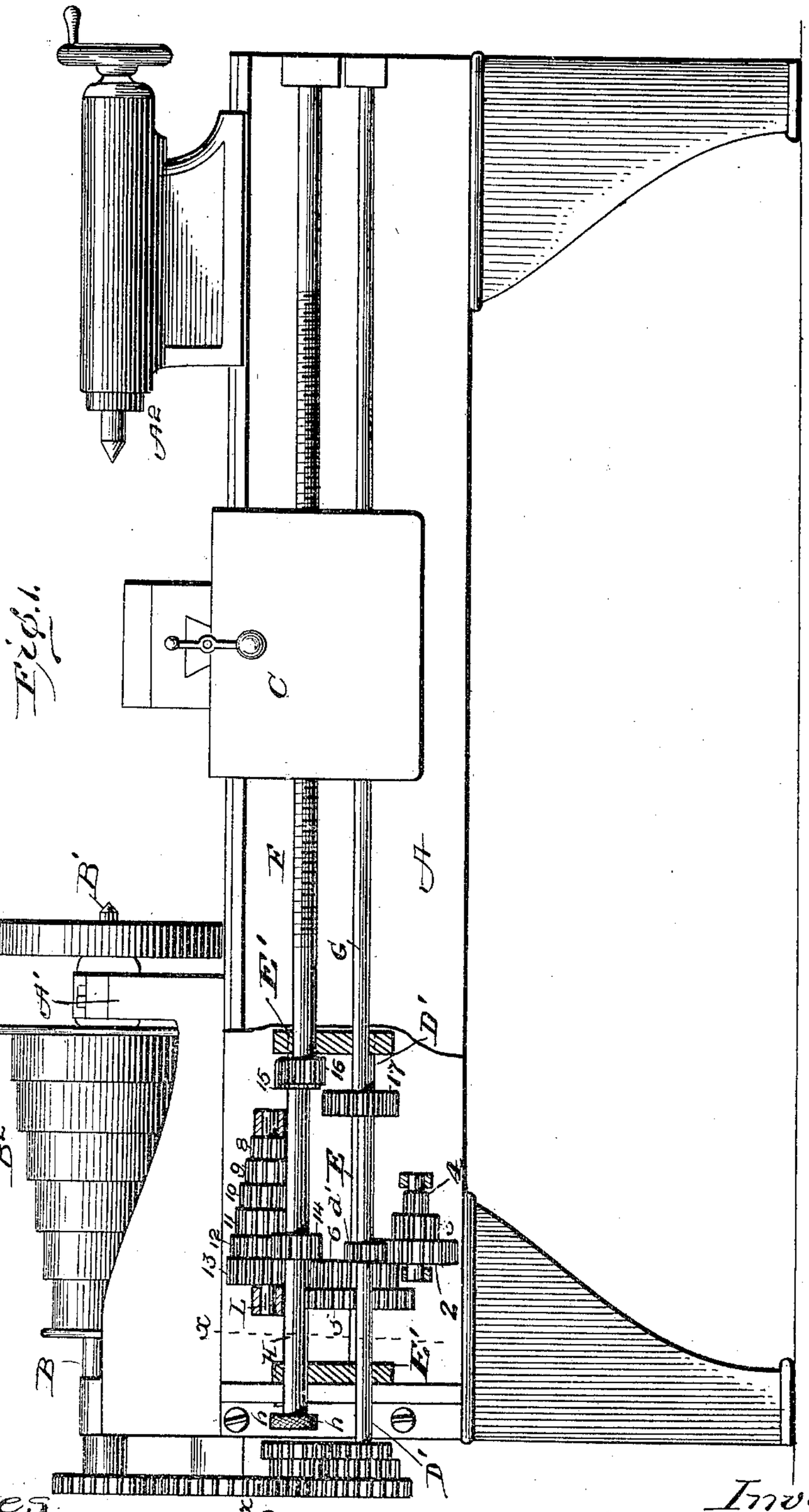

Fig. 1.

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Fig. 2.

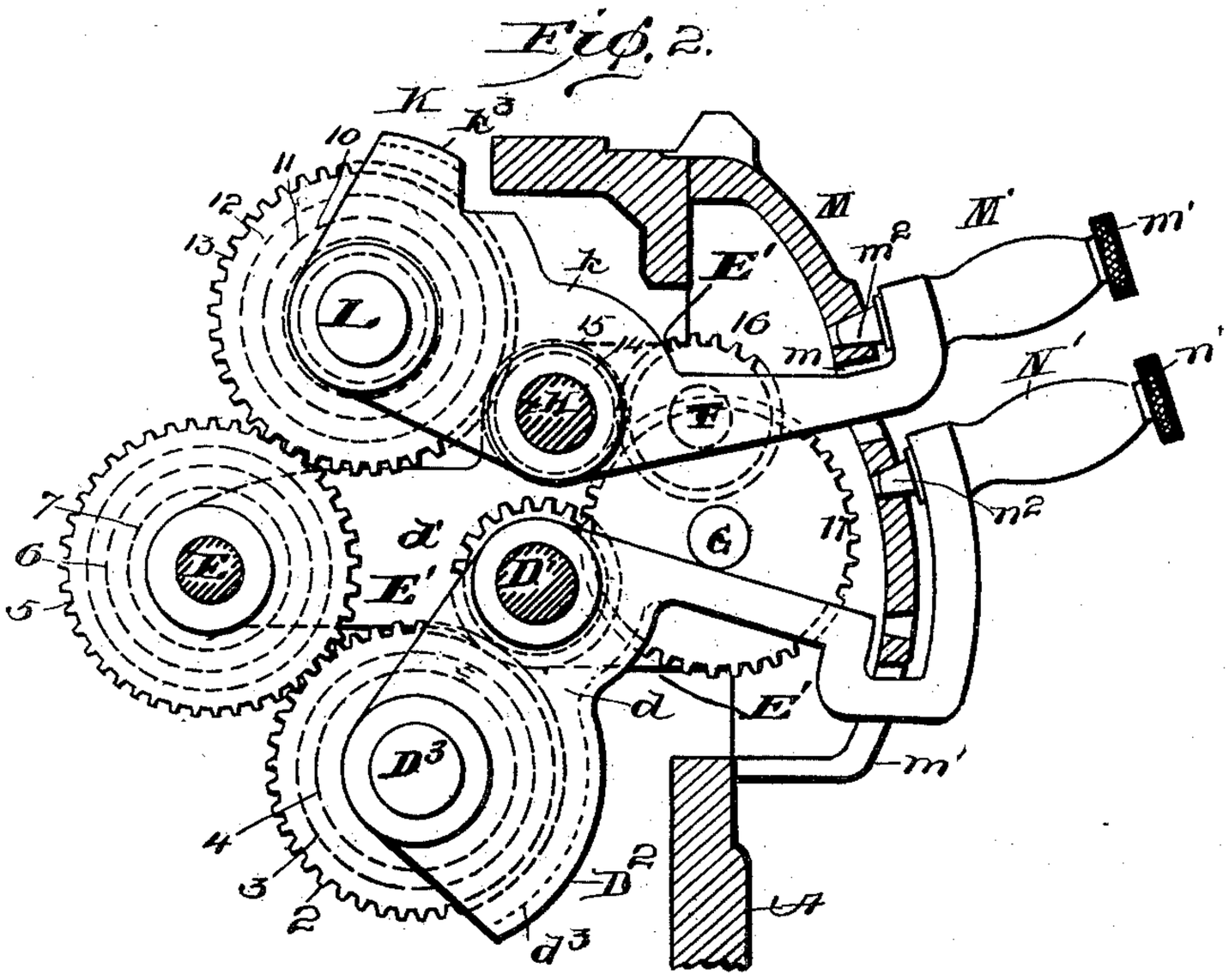
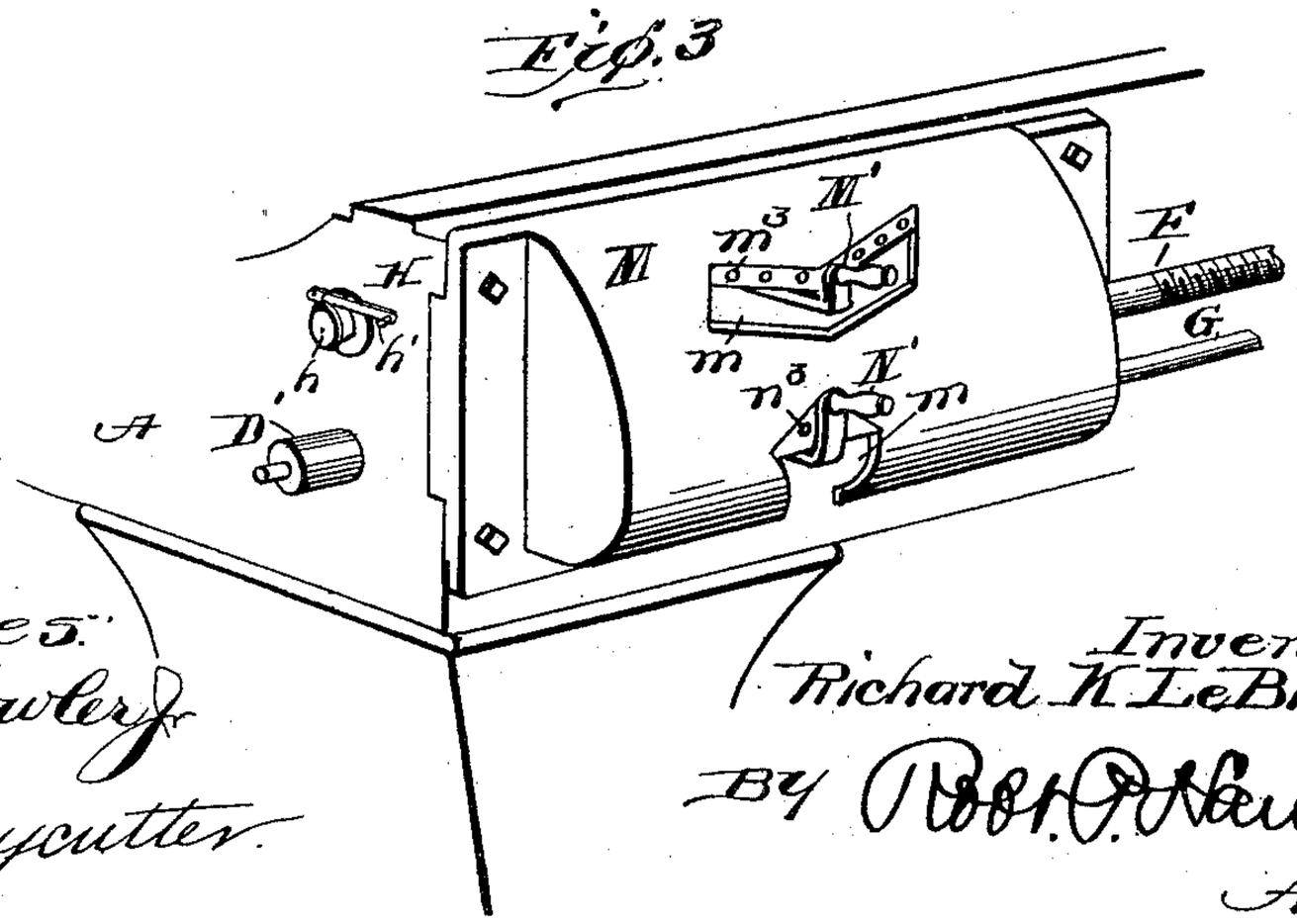


Fig. 3



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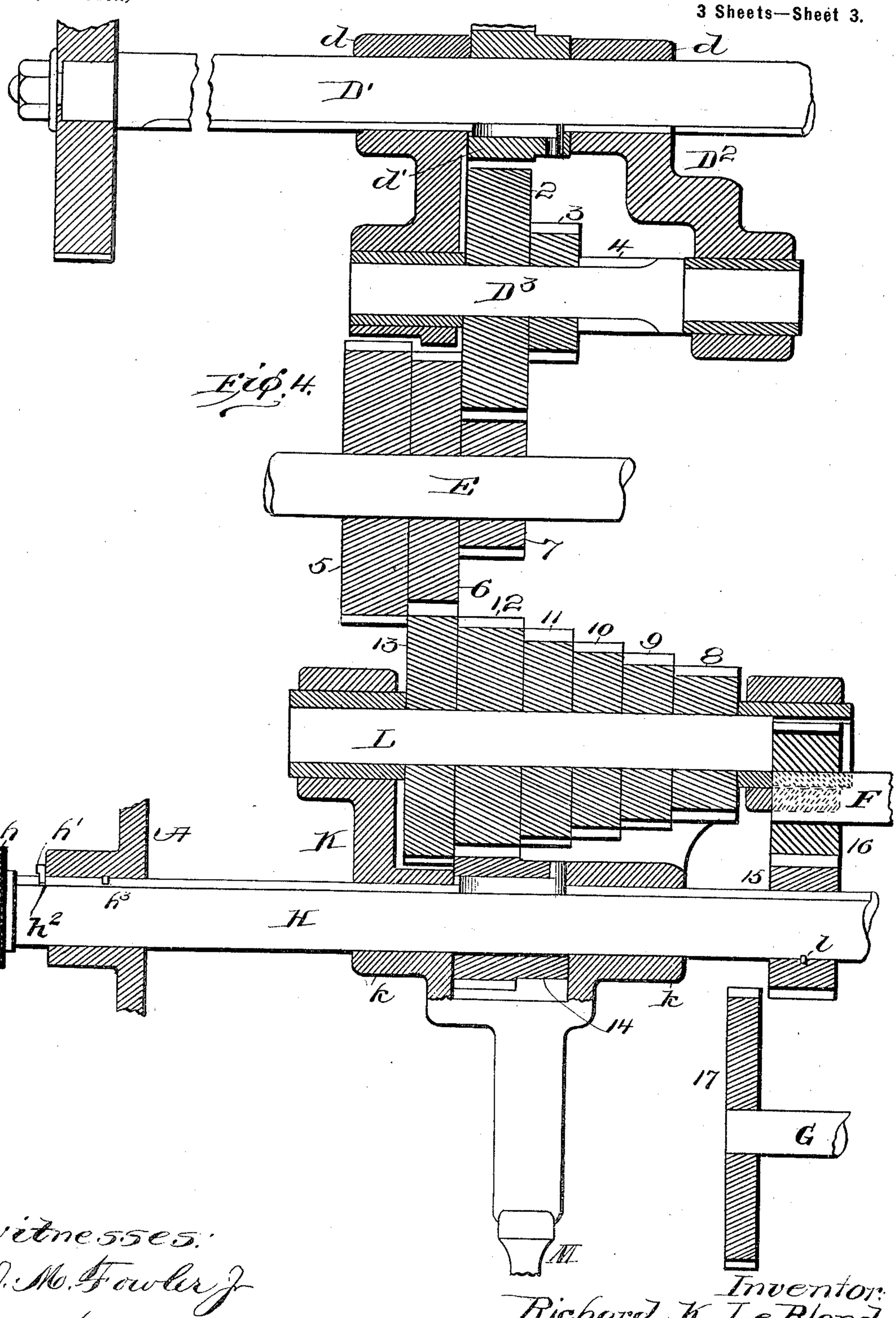

Fig. 4.

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UNITED STATES PATENT OFFICE.

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VARIABLE-SPEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 706,186, dated August 5, 1902.

Application filed May 13, 1902. Serial No. 107,108. (No model.)

To all whom it may concern:

Be it known that I, RICHARD K. LE BLOND, a citizen of the United States, residing at Cincinnati, county of Hamilton, and State of Ohio, have invented certain new and useful Improvements in Variable-Speed Mechanisms; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The invention to be hereinafter described relates to variable-speed mechanisms adapted for engine-lathes and other machines for working upon metal, and more particularly to a type of such machines wherein a great variety of different feeds are necessary to adapt the machine to a large range of work.

In the present embodiment of my invention I have illustrated the same as affixed to a lathe more particularly adapted for cutting screw-threads, in which the cutting-tool is supported to its work upon a carriage movable lengthwise upon the lathe bed or frame, preferably by a lead-screw. In such form of lathe it will be understood that the character or pitch of the screw-threads being cut will depend upon the speed or rate of travel of the carriage along the bed or frame of the machine; and it is therefore the object of my present invention as thus applied to provide a simple and easily-operated lathe in which the adjustments for cutting screw-threads of different pitch may be made quickly without removing or dismembering the parts or substituting different gears, in which all the threads, as well as all the feeds regularly used, may be instantly obtained by the simple manipulation of two handles, preferably disposed under the head-stock at the front of the lathe.

In the drawings, Figure 1 is a front elevation of an ordinary engine-lathe embodying my invention, parts thereof being broken away and parts shown in section under the head-stock to better illustrate the application of my invention thereto. Fig. 2 is a section as on the line x, Fig. 1. Fig. 3 is a perspective view of the parts at the front of the lathe beneath the head-stock, and Fig. 4 is a development of the gearing beneath the head-stock to better show the connection and relation of the parts embodying my invention.

The bed or frame A of the lathe, the head-stock A′, the tail-stock A^2, spindle B, live center B′, the cone-pulleys B^2, to which motion is applied by the usual belting, the carriage C, supporting the cutting-tool, the lead-screw F, and the feed-rod G are and may be all of the usual or any preferred form and construction and being well known in the art need no further description.

Suitably mounted to rotate in the machine bed or frame below the head-stock, as in brackets E′, is a shaft D′, which I will hereinafter designate the "primary" shaft for the purpose of identification and which may be driven in any suitable manner, as by a train of change-gears $D^\times$, from the lathe-spindle B. Swiveled upon the primary shaft D′ is a yoke D^2, carrying a shaft D^3, having a cone of gears 2, 3, and 4 and which for future identification may be termed the "primary" cone-shaft. The arms d of the yoke D^2 turn loosely upon the primary shaft D′ and contain between them the gear d', which is suitably splined to the primary shaft D′ and is in mesh with one of the gears, as 2, on the primary cone-shaft D^3, whereby as the yoke D^2 is moved lengthwise of the shaft D′ to change the position of the primary cone of gears, as will hereinafter appear, the said gear d' may also be moved on the said shaft D′ without disengagement from gear 2.

Mounted in suitable fixed brackets E′, supported by the machine bed or frame, is an intermediate or fixed shaft E, carrying a cone of gears 5, 6, and 7, with any one of which the gear 2 of the primary cone is adapted to engage. By the relative disposition of the primary and intermediate cones of gears it will be obvious that by proper manipulation and movement of the yoke D^2 upon and around the primary shaft D′ the large gear 2 of the primary cone can be engaged with any one of the gears of the intermediate cone and that the large gear of the intermediate cone can be engaged with any one of the gears of the primary cone, thus imparting to the intermediate shaft E and its cone a wide range of speeds, as will be obvious. While I have shown the primary and intermediate cones as each formed of three separate gears of different sizes, it is to be understood that any desired number of such gears may compose the cones.

Mounted to rotate in suitable bearings in

the brackets E′ E′ is the transmitting-shaft H, having splined upon it, so as to be rotatable therewith, yet movable longitudinally thereon, a gear 14. Swiveled upon the transmitting-shaft is the yoke K, the arms *k k* of which embrace the shaft H on opposite sides of the gear 14 and carry at their free ends the transmitting cone-shaft L, on which is mounted the cone of gears 8, 9, 10, 11, 12, and 13, adapted to be intermeshed with the gears of the intermediate cone. From this construction it will be evident that by proper movement of the yoke K longitudinally of the transmitting-shaft and more or less rotatably around the same the large gear 13 of the transmitting cone of gears may be brought into mesh with any one of the gears of the intermediate cone or the large gear 5 of the intermediate cone can be brought into mesh with any one of the gears of the transmitting cone of gears and the various motions thus derived be transmitted through the gear 14 to the shaft H.

Secured to the transmitting-shaft H, as by the key *l*, is a gear 15, and disposed adjacent the gear 15 are the ends of the lead-screw F and feed-rod G, carrying the gears 16 and 17, respectively, either one of which may be engaged with the gear 15 by proper movement of the transmitting-shaft. The necessary movement of the transmitting-shaft H to effect engagement of the gear 15 with either the gear 16 on the lead-screw F or the gear 17 on the feed-rod G is secured by mounting said transmitting-shaft in its bearings with capacity for a limited longitudinal movement, to effect which I provide the exposed end of the transmitting-shaft with a knob *h* or like device, and by pulling or pushing on said knob the shaft H may be moved longitudinally to effect the disengagement from one of the gears 16 or 17 and engagement with the other. It may be desirable also to provide a lock to hold the shaft in its longitudinally-adjusted position, one form of which may consist of a finger, as *h′*, mounted to swing into engagement with the notches h^2 or h^3 made in the transmitting-shaft H, as shown in Figs. 3 and 4, although, as will be apparent, I may use any usual or preferred form of lock for this purpose when desirable.

The yokes D^2 and K, carrying the primary and transmitting cones of gears, are mounted to swing about the primary and transmitting shafts, respectively, to bring the primary and transmitting cones of gears into any desired geared relation with the cone of gears carried by the intermediate shaft E, as hereinbefore specifically described, from which it will be evident that with my improved mechanism applied to a lathe the lathe is adapted to a very wide range of work and that all the screw-threads regularly used can be cut by a simple change in the relation of the primary and transmitting cones of gears, or both, with the intermediate cone, and to effect this in the most simple and efficient manner and at the same time to secure a compact structure I have disposed these cones of gears at the head-stock end of the lathe, preferably covering them with a hood, as M, Figs. 2 and 3, provided with slots *m m*, through which the handles M′ N′, connected to the yokes D^2 and K, project. Each of the handles M′ and N′ is provided with a knob *m′ n′*, by which a retaining-pin m^2 n^2, carried by each, may be manipulated to be engaged with and disengaged from retaining-notches m^3 n^3 in the hood M, whereby the primary and transmitting cones of gears may be readily and quickly changed in their relation to the intermediate cone of gears and securely held in such changed relation.

In order that the yokes carrying the primary and transmitting cones of gears may have the desired rigidity to thereby secure at all times a positive and firm engaging connection between the cones of gears, I have connected the arms *d d* of the yoke D^2 by a web d^3 (shown in dotted lines in Fig. 3) and the arms *k k* of the yoke K by the similar web k^3.

It will be noted that the primary, intermediate, and transmitting cones of gears are each similarly arranged—that is, the largest gear of each cone of gears is disposed at the same end in all the cones, the result of which is that the large gear of each of these cones can be engaged with all of the gears of the other cones, whereby a wide range of different speeds may be imparted to the lead-screw or feed-rod.

While I have shown my improved speed-changing mechanism as applied to lathes to illustrate its operation, it is to be understood that I do not desire to limit my invention in this respect, as it may be applied to various forms and types of machines where a great variety of speeds are necessary to adapt the machine to different characters of work.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a variable-speed mechanism, the combination of a primary shaft, a transmitting-shaft, and a train of speed-changing gearing connecting said shafts, said gearing comprising an intermediate cone of gears, a swinging primary cone of gears between the primary shaft and the intermediate cone of gears, and a swinging transmitting cone of gears between the transmitting-shaft and the said intermediate cone of gears.

2. In a variable-speed mechanism, the combination of a primary shaft, a yoke mounted upon said shaft and carrying a primary cone of gears, a transmitting-shaft, a yoke mounted upon said transmitting-shaft and carrying a transmitting cone of gears, gearing connection between the primary shaft and the primary cone of gears, and between the transmitting-shaft and transmitting cone of gears, an intermediate shaft disposed between the primary and transmitting cones of gears, and a cone of gears carried by said intermediate

shaft and adapted to be engaged by both the primary and transmitting cone of gears.

3. In a feeding mechanism for lathes, the combination of a primary shaft, a transmitting-shaft, and a train of speed-changing gearing connecting said shafts, said gearing comprising an intermediate cone of gears, a primary cone of gears between the primary shaft and the intermediate cone of gears, and a transmitting cone of gears between the transmitting-shaft and the said intermediate cone of gears, a lead-screw and gearing connections between said lead-screw and the transmitting-shaft.

4. In a feeding mechanism for lathes, the combination of a primary shaft, a transmitting-shaft, and a train of speed-changing gearing connecting said shafts, said gearing comprising an intermediate cone of gears, a primary cone of gears between the primary shaft and the intermediate cone of gears, and a transmitting cone of gears between the transmitting-shaft and the said intermediate cone of gears, a lead-screw, a feed-rod, and means for operatively connecting either the lead-screw or feed-rod to said transmitting-shaft.

5. In a variable-speed mechanism, the combination of a primary shaft, means for operating said shaft, a yoke mounted to swing upon said shaft and carrying a primary cone of gears, a transmitting-shaft, a yoke mounted to swing upon said shaft and carrying a transmitting cone of gears, an intermediate shaft carrying a cone of gears disposed between the primary and transmitting cones of gears and in engagement therewith, each of said yokes being provided with a handle disposed in convenient relation to each other to afford a ready and convenient means for changing the relation of both the primary and intermediate cones of gears with respect to the intermediate cone of gears.

6. In a variable-speed mechanism, the combination of a primary shaft, a yoke, the arms of which are hung upon said shaft, a gear splined to said shaft between the arms of the yoke, a primary cone of gears carried by said yoke and in operative engagement with said gear, a transmitting-shaft, a yoke, the arms of which are hung upon said transmitting-shaft, a gear splined to said shaft between the arms of the yoke, a transmitting cone of gears carried by said last-named yoke and in operative engagement with said gear, an intermediate shaft and a cone of gears carried by said intermediate shaft and in operative engagement with both the primary and transmitting cone of gears.

7. In a variable-speed mechanism, the combination of a primary shaft, a transmitting-shaft, a yoke hung to each of said shafts and movable thereon, each of said yokes carrying a cone of gears, a shaft disposed intermediate said primary and transmitting shafts and carrying a cone of gears, said cones of gears being similarly arranged and disposed so that the largest gear of the primary and transmitting cones of gears may be engaged with each of the gears on the intermediate shafts, and the largest gear of the cone of gears on the intermediate shaft may be engaged with each of the gears of the primary and transmitting cones of gears.

8. In a feeding mechanism for lathes, the combination of a primary shaft, a transmitting-shaft having a gear fixed thereto, a lead-screw and a feed-rod each provided with a gear, means for longitudinally moving the transmitting-shaft to engage and disengage the gear carried thereby with or from either the lead-screw or feed-rod gear, and speed-changing mechanism disposed between the primary and transmitting shafts and comprising a primary cone of gears, a transmitting cone of gears, and an intermediate cone of gears adapted to be engaged by both the primary and transmitting cone of gears to transmit variable speed from the primary to the transmitting shafts.

9. In variable-speed mechanism, the combination of a driving cone of gears and a transmitting cone of gears, separate rocking yokes on which said cones are mounted, an intermediate cone of gears between said driving and driven cones, all the cones arranged step-like with the largest gear of the respective cones at the same end of the cones, for selectively engaging the gears of the driving-cone and the gears of the driven cone with the gears of the intermediate cone, and means for securing said rocking cones in adjusted positions.

10. In variable-speed mechanism, the combination of a stationarily-positioned cone of intermediate gears, a cone of driving-gears mounted on a rocking yoke selectively meshing therewith and imparting motion thereto and a cone of driven gears mounted on a rocking yoke selectively meshing therewith and receiving motion therefrom, and means for securing the rocking yokes in adjusted positions.

11. In variable-speed mechanism, the combination with a lathe-bed, of a stationarily-positioned cone of intermediate gears, a cone of driving-gears mounted on a rocking yoke meshing therewith and imparting motion thereto, a cone of driven gears mounted on a rocking yoke also meshing therewith and receiving motion therefrom, all the cones having gears arranged step-like with the largest gear of the respective cones at the same end of the cones, in the lathe-bed, and means for securing the rocking yokes in adjusted positions.

RICHARD K. LE BLOND.

In presence of—
A. F. HERBSLEB,
H. F. HARDEN.