No. 706,049. Patented Aug. 5, 1902.

B. M. W. HANSON & F. W. GORDON.

VARIABLE SPEED DEVICE.

(Application filed Mar. 24, 1902.)

(No Model.) 3 Sheets—Sheet 1.

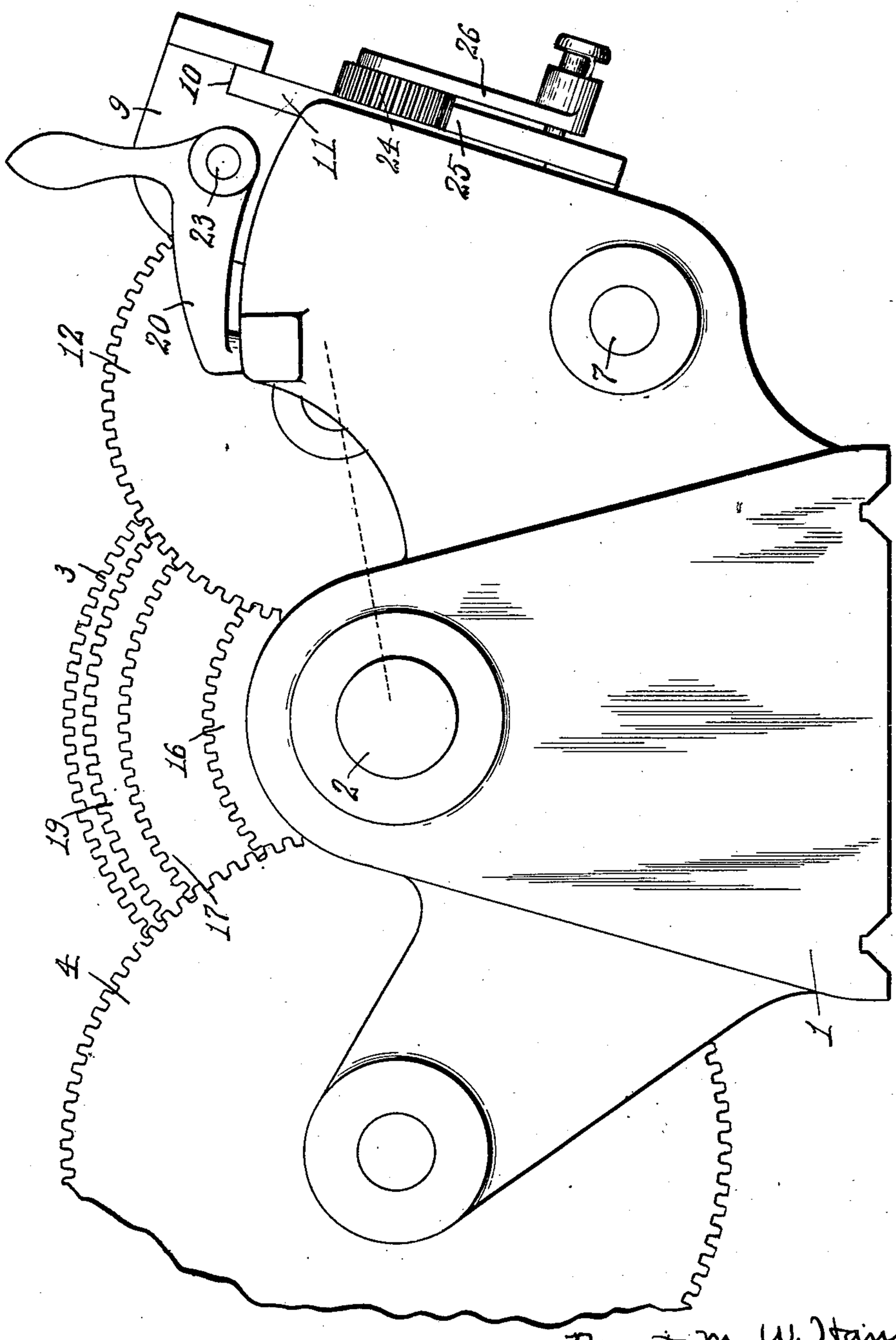

FIG. 1.

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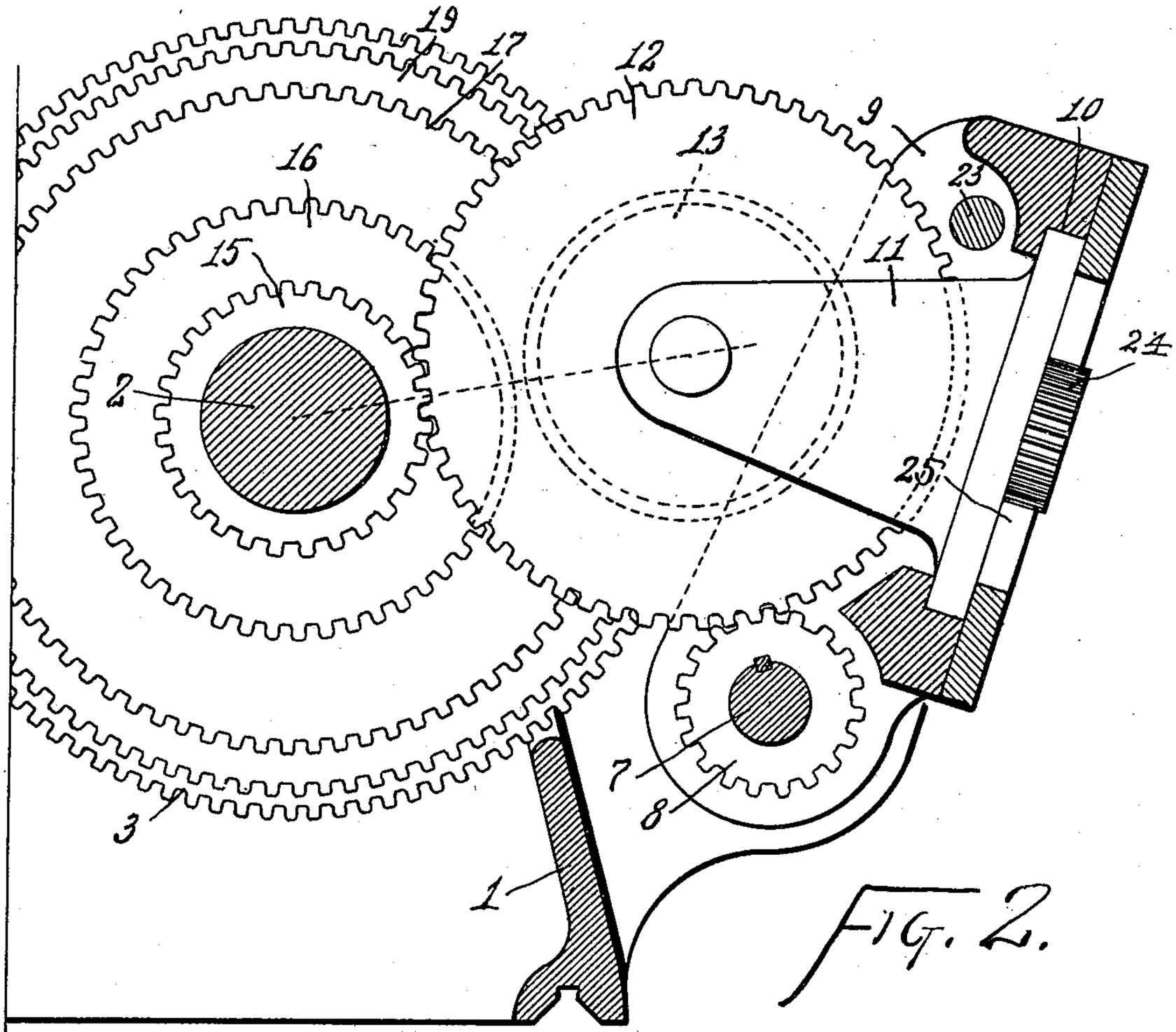

FIG. 2.

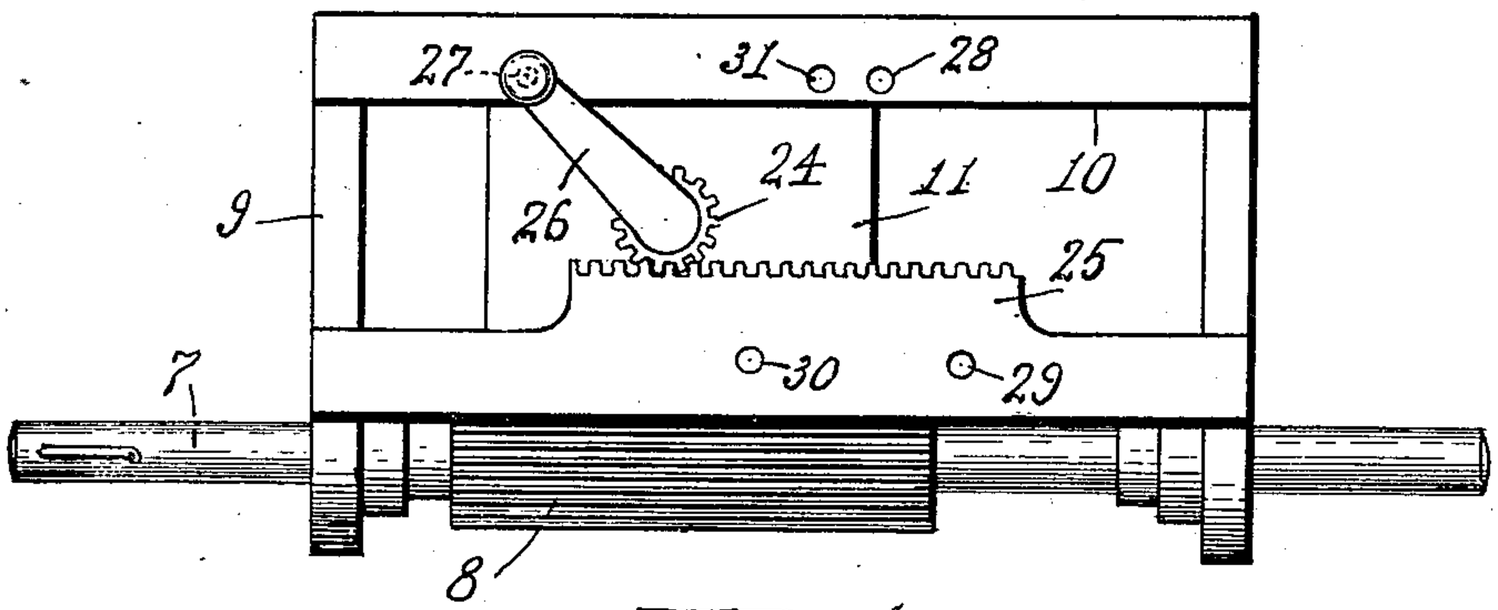

FIG. 4.

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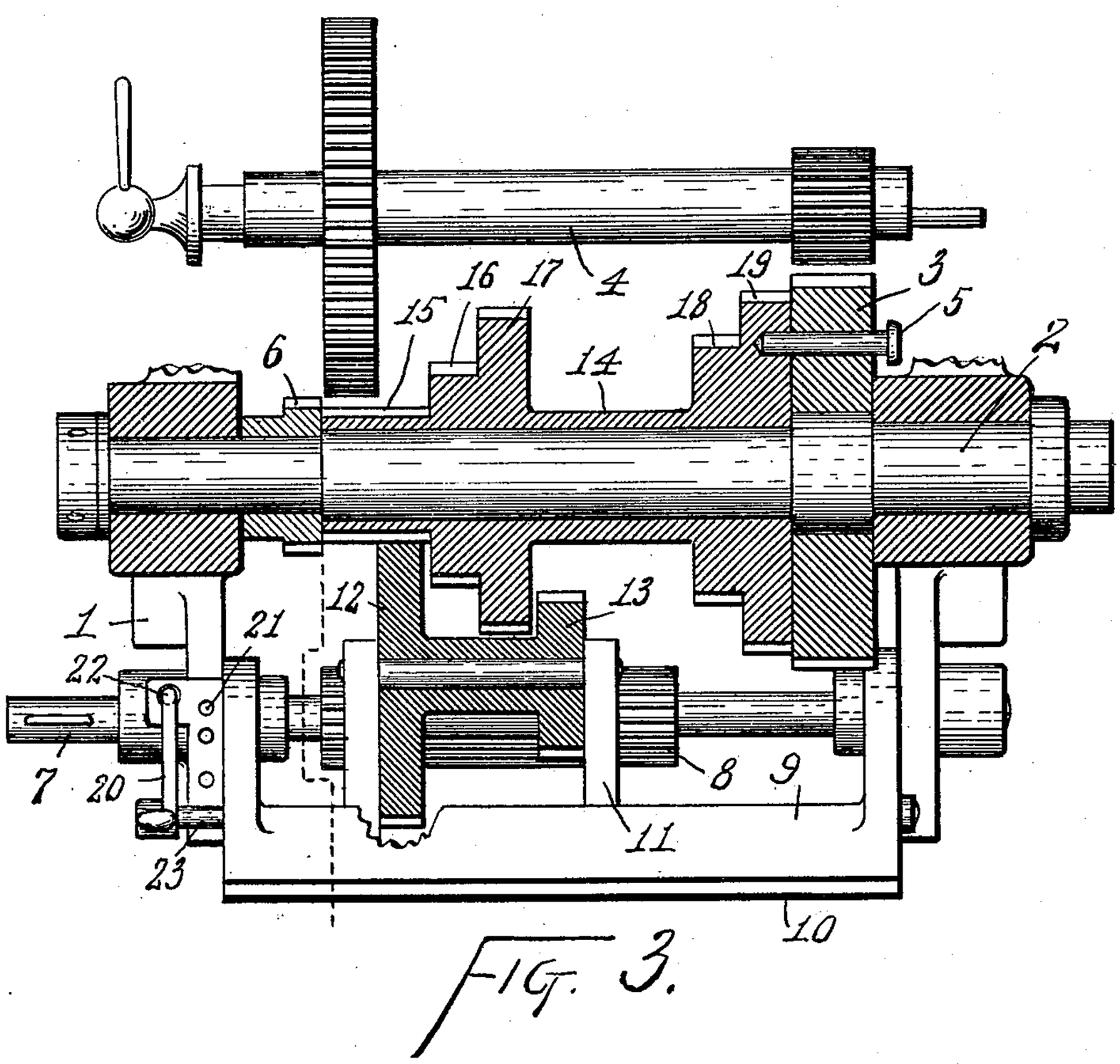

FIG. 3.

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UNITED STATES PATENT OFFICE.

BENGT M. W. HANSON AND FREDERICK W. GORDON, OF HARTFORD, CONNECTICUT, ASSIGNORS TO PRATT & WHITNEY COMPANY, OF HARTFORD, CONNECTICUT.

VARIABLE-SPEED DEVICE.

SPECIFICATION forming part of Letters Patent No. 706,049, dated August 5, 1902.

Application filed March 24, 1902. Serial No. 99,581. (No model.)

To all whom it may concern:

Be it known that we, BENGT M. W. HANSON, a citizen of Sweden, and FREDERICK W. GORDON, a citizen of the United States, both residing at Hartford, Hartford county, Connecticut, have invented certain new and useful Improvements in Variable-Speed Devices, of which the following is a specification.

This invention, pertaining to variable-speed devices, will be readily understood from the following description, taken in connection with the accompanying drawings, which illustrate the invention as exemplified in the driving-gearing of an engine-lathe designed to have ten different rates of driving speed imparted from a driving-shaft having a constant rate.

Figure 1 is an end elevation of the head-stock of an engine-lathe provided with an embodiment of our variable-speed devices; Fig. 2, a vertical transverse section of the same; Fig. 3, a plan of the same, part horizontal section; and Fig. 4, a front view of the tumbler.

In the drawings, 1 indicates the head-stock; 2, the arbor; 3, the face-gear, fast on the arbar; 4, the back gears considered as a whole; 5, the clutch-pin in the face-gear as usually employed in locking the face-gear to a belt-cone loose on the arbor; 6, the feed-pinion, fast on the arbor, all of the parts thus far referred to being of construction common in engine-lathes; 7, a driving-shaft mounted in the head-stock parallel with the lathe-arbor and adapted to have motion applied to it, as by means of a belt-pulley, gearing, or a direct motor; 8, a long pinion formed on or secured to this shaft; 9, a longitudinal guideway disposed parallel with shaft 7 and having journal-bearings at its ends, with their axes coincident with that of shaft 7; 10, the guiding-surfaces of the guideway; 11, a carriage arranged to slide in the guideway; 12, an intermediate gear mounted in the carriage and in constant engagement with long pinion 8; 13, a second intermediate mounted on the carriage concentric with and fast to intermediate gear 12; 14, a sleeve loose on the lathe-arbor; 15, a pinion fast with this sleeve and adapted to be engaged at pleasure with the large gear of the back gear and adapted to be also engaged at pleasure with intermediate gear 12; 16, 17, 18, and 19, four gears of dissimilar sizes fast with sleeve 14 and pinion 15; 20, a latch pivoted to the rocking guideway; 21, a line of recesses adapted to be engaged by the latch and hold the rocking guideway in selective positions of adjustment; 22, an additional detent-recess adapted to be engaged by the latch and disposed to one side of the line of recesses 21; 23, the spindle of the latch, by means of which the latch is pivoted to the guideway, the spindle having endwise motion in the guideway, so that the latch can be moved into alinement either with detent-recess 22 or with the line of detent-recesses 21; 24, a pinion journaled on carriage 11; 25, a rack supported by the guideway and engaged by pinion 24; 26, a crank upon pinion 24 and carrying a detent-pin, and 27, 28, 29, 30, and 31 detent-holes in the guideway, adapted to be engaged by the detent-pin of crank 26 when the carriage is in various selected positions along the guideway corresponding with the alinement of the intermediate gears with the gears upon the lathe-arbor with which they are to intermember.

In Fig. 4 the detent-pin of crank 26 is shown as engaging detent-hole 27 in the guideway, being the left-hand hole of the lot and corresponding with the extreme left-hand position of the carriage. When the carriage is thus positioned, intermediate gear 12 may gear with pinion 15 on the lathe-arbor. By carrying the detent-pin of crank 26 to detent-hole 28 the next rightward position is given to the carriage, bringing intermediate gear 12 into alinement with gear 16 on the lathe-arbor. With the detent-pin in hole 29 the next rightward position is given to the carriage and intermediate gear 12 lines with gear 17. In the next position of the carriage the detent-pin is at hole 30 and smaller intermediate gear 13 is in line with gear 18, and when the detent-pin is put to hole 31 then gear 13 is in line with gear 19. By adjusting the carriage properly along the guideway the intermediate gears can be placed in alinement with the proper selected gears upon the lathe-

arbor, and by angularly adjusting the guideway and latching it the intermediate gearing may be put and held in proper relationship to the gearing on the arbor. The angular position of the guideway will be controlled by the diameters of the gears in engagement, and it may happen, as it does in the exemplification, that the gear diameters are such as call for two angular positions of the guideway of such small difference as not to permit of suitable holes in the series 21 of detent-holes, the holes in such case cutting into each other. Therefore the hole 22, for which there is no room in the series 21, is placed to one side of the general series and the latch is made movable, so as to be adapted to any of the holes.

Turning to Fig. 3, it is to be observed that sleeve 14 and the five gears carried by it take the place of the usual driving-cone in an engine-lathe and that, like such driving-cone, it is loose upon the arbor, but adapted to be locked thereto by the clutch-pin 5. Driving-shaft 7, turning at constant speed and having its long pinion 8 always in gear with intermediate gear 12, drives the compound intermediate gears at constant speed. Gear 12 is shown as engaging pinion 15 on the lathe-arbor, and that pinion, by means of clutch-pin 5, is locked to the arbor and back gear 4 is thrown out. Under these conditions the fastest motion will be given to the lathe-arbor. Putting gear 12 to gear 16 gives the next slower speed; gear 12 to gear 17, the next slower one; gear 13 to gear 18, the next slower one; gear 13 to gear 19, the next slower one; gear 12 again to pinion 15, with the back gear thrown in and with clutch-pin 5 out, gives the next slower one; and so on, thus giving five changes of speed with the back gear out and five changes with the back gear in, or ten in all, the compounding of the intermediate permitting of a graduated range of speeds not attainable through a simple intermediate. The range of speeds without the back gear is graduated and so also is the range of speeds with the back gear, and the entire range is graduated throughout. The system is available wherever it is desired to secure a graduated range of speeds by the use of a single gear-tumbler and with gears of reasonable size.

We claim as our invention—

1. In a variable-speed device, the combination, substantially as set forth, of a first shaft, a series of diversely-sized gears thereon, a second shaft parallel with the first one, a gear thereon, a longitudinally and angularly adjustable geared tumbler, and a compound intermediate gear carried by said tumbler and driven by the gear on the second shaft and adapted to have one of its members engage with some of the gears on the first shaft and its other member alternatively engage with other gears on the first shaft.

2. In a variable-speed device, the combination, substantially as set forth, of a first shaft, a series of diversely-sized gears thereon, a second shaft parallel with the first one, a gear thereon, a longitudinally and angularly adjustable geared tumbler, a compound intermediate gear carried by said tumbler and driven by the gear on the second shaft and adapted to have one of its members engage with some of the gears on the first shaft and its other member alternatively engage with other gears on the first shaft, said diversely-sized gears being rigidly united with each other and being loose on the first shaft, a gear fast on the first shaft, a pair of gears united with each other on a common axis parallel with the first shaft and adapted to have one of its members engage one of said diversely-sized gears and its other member engage the gear fast on the first shaft, and means for locking said diversely-sized gears to the first shaft.

3. In a variable-speed driving device for engine-lathes, the combination, substantially as set forth, with the head-stock, arbor, face-gear, back gear, and face-gear clutch, of a series of diversely-sized unified gears loose on the lathe-arbor and adapted to be locked thereto by the clutch, a driving-shaft mounted on the head-stock parallel with the arbor, a gear on said driving-shaft, a longitudinally and angularly adjustable gear-carriage, a compound intermediate gear carried by said gear-carriage and driven by the gear on said driving-shaft and adapted to have one of its members engage with some of the diversely-sized gears on the lathe-arbor and its other member engage alternatively with other of the diversely-sized gears on the lathe-arbor, and means for locking said gear-carriage in selective position.

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