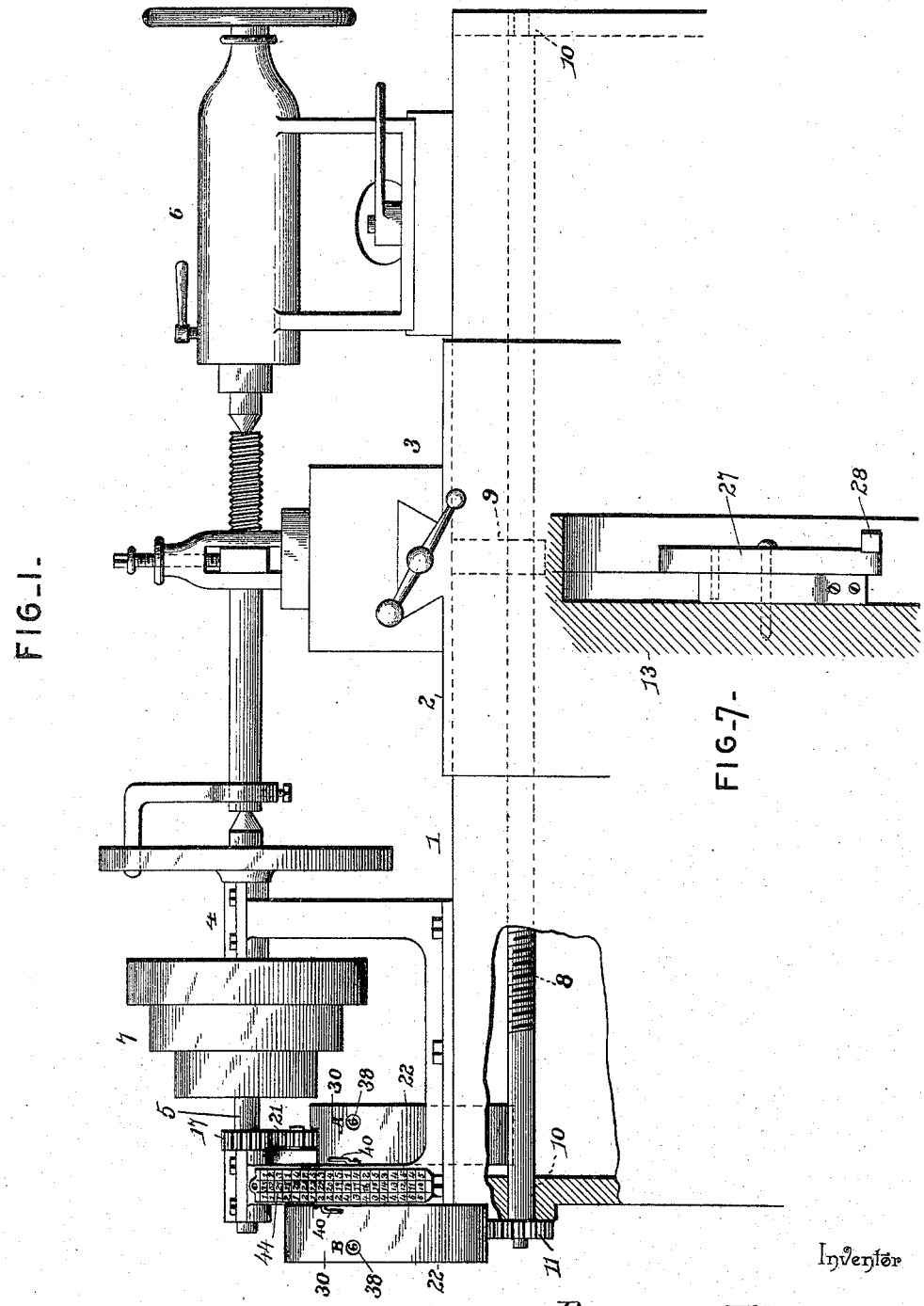
(No Model.) 3 Sheets—Sheet 1.

B. F. BURDICK.

MULTIPLE SPEED GEARING.

No. 537,816. Patented Apr. 23, 1895.



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(No Model.) 3 Sheets—Sheet 2.

B. F. BURDICK.

MULTIPLE SPEED GEARING.

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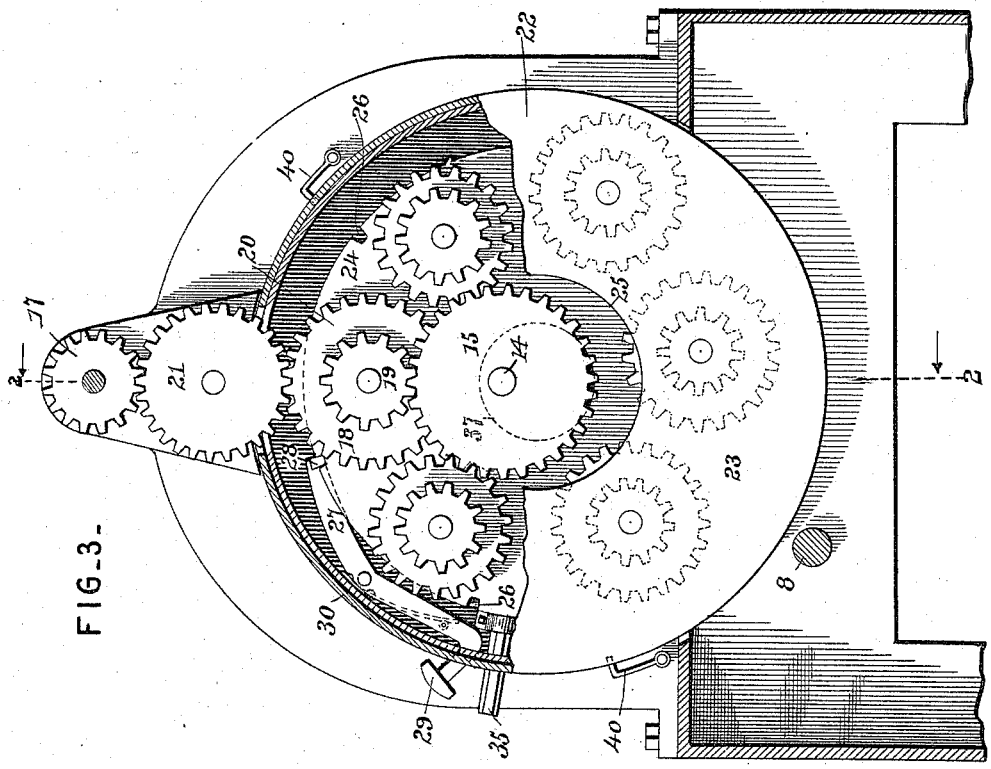

FIG. 3.

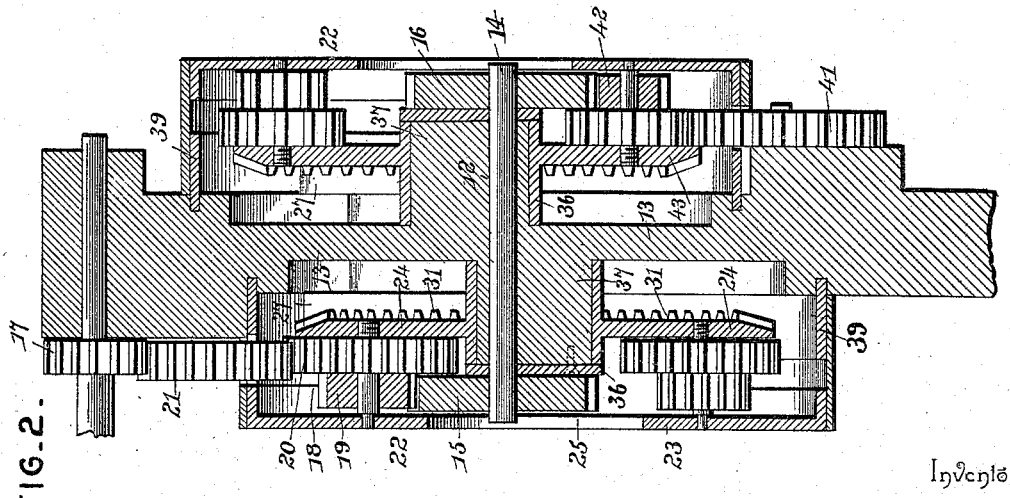

FIG. 2.

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(No Model.) 3 Sheets—Sheet 3.

B. F. BURDICK.

MULTIPLE SPEED GEARING.

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FIG. 4.

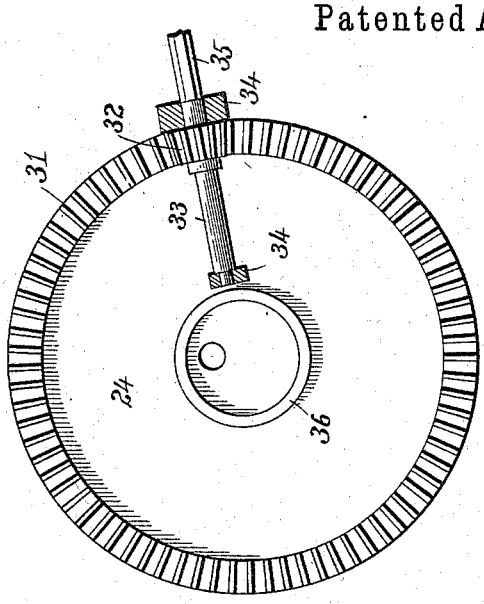


FIG. 6.

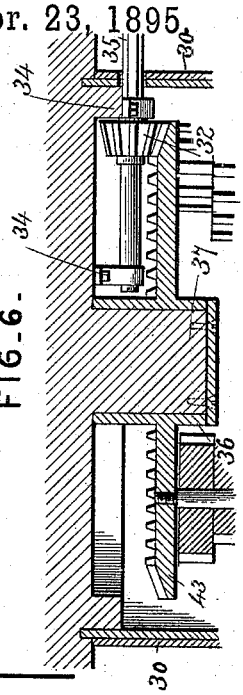
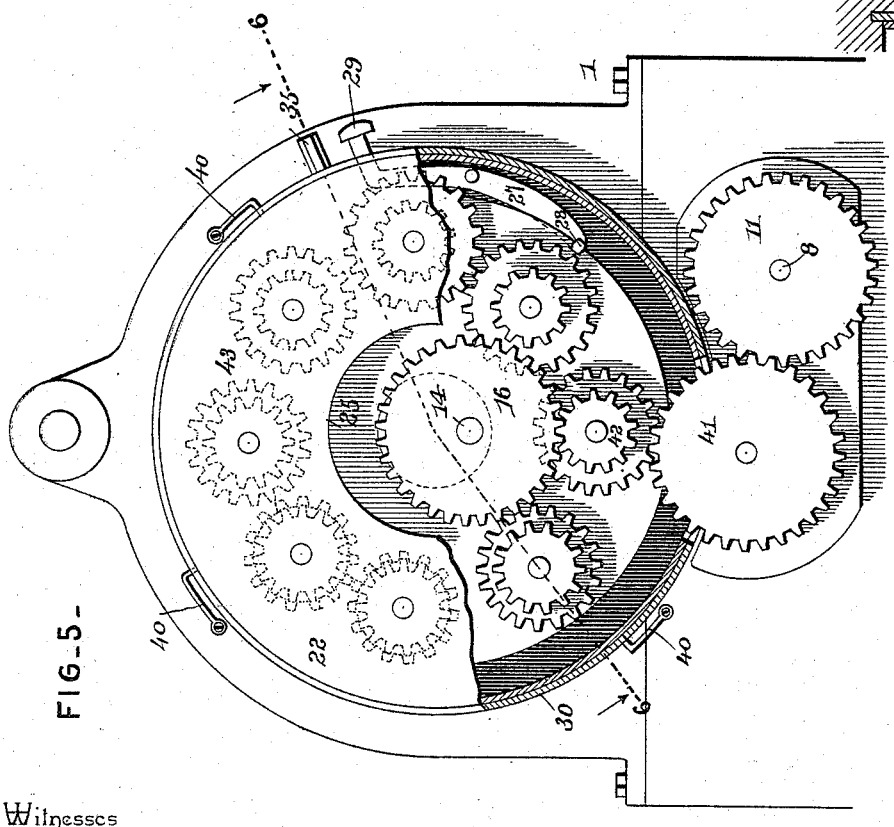


FIG. 5.



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UNITED STATES PATENT OFFICE.

BENJAMIN F. BURDICK, OF LITTLE GENESEE, NEW YORK.

MULTIPLE-SPEED GEARING.

SPECIFICATION forming part of Letters Patent No. 537,816, dated April 23, 1895.

Application filed October 19, 1894. Serial No. 526,376. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN F. BURDICK, a citizen of the United States, residing at Little Genesee, in the county of Allegany and State of New York, have invented a new and useful Multiple-Speed Gearing, of which the following is a specification.

My invention relates to multiple speed gearing designed for use in connection with wood and metal working machinery, requiring variable feed movement, the objects in view being to provide means for communicating motion from a continuously rotating shaft or member having a uniform speed to feed mechanism for operating a carriage or feed rolls adapted to support or co-operate with cutting or shaping devices, a single multiple gearing being employed for wood working machines while double gearing is desirable for metal working apparatus.

Further objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings—Figure 1 is a side view of a multiple speed gearing apparatus embodying my invention, applied in the operative position to a lathe. Fig. 2 is a central longitudinal section of the same, taken parallel with and in the plane of the axes of the adjustable disks, on the line 2—2 of Fig. 3. Fig. 3 is a front view of the device showing the outer disk of the table partly broken away. Fig. 4 is a view of the inner disk of the table to show the annular gear whereby motion is communicated thereto from the operating pinion. Fig. 5 is a rear view of the device with the outer disk of the table partly broken away. Fig. 6 is a transverse section of the rear table on the line 6—6 of Fig. 5. Fig. 7 is a detail view of the disk locking mechanism.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

I have shown the apparatus embodying my invention applied in operative position to a lathe, wherein 1 designates a bed, upon suitable guides 2, of which, is mounted a carriage 3. 4 represents the head-stock in which is mounted a mandrel 5, and 6 represents a tail-stock of the usual or any preferred construction. The mandrel is provided with the usual cone-pulley 7, to which motion is communicated through a belt, (not shown.) The means for operating the carriage consists, in the construction illustrated, of a feed-screw 8, operating in a nut 9 on the carriage, and arranged in a suitable bearing or bearings 10, adjacent to the head-stock, said feed-screw being provided at the end adjacent to the head-stock with a gear 11.

The head-stock is recessed or chambered in its opposite sides, and in a bearing 12 formed in the web 13 separating said chambers is mounted the intermediate shaft 14, arranged parallel with and between the mandrel and the feed screw. This intermediate or counter shaft is provided at its opposite extremities with large gears 15 and 16, arranged respectively in front and in rear of the head stock and adapted to be connected, respectively, by suitable means, hereinafter described, to the mandrel and the feed screw. Such means of connection preferably consist of trains of gears interposed respectively between the mandrel and the gear 15 and between the feed screw and the gear 16.

The gearing for communicating motion from the mandrel to the gear 15, preferably comprises a pinion 17 fixed to the mandrel, a double gear 18 comprising the gear members 19 and 20, which are of different sizes, and one of which is in mesh with the gear 15, and an intermediate gear 21 which communicates motion from the pinion on the mandrel to that member of the double gear which is not in mesh with said gear 15. This intermediate gear is permanently in engagement with the pinion on the mandrel, and, therefore, rotates at a uniform speed, the relation of which, to that of the mandrel is in a ratio regulated by the relative sizes of said pinion and gear. Inasmuch, however, as the members of the double gear, above described, are of different sizes or diameters, and rotate synchronously, the gear 15 will be rotated at a different speed from the intermediate gear, and hence from the mandrel, the difference being in accordance with the various relative diameters of the several gears forming the train by which motion is communicated from the mandrel to the gear 15.

In order to provide for changing the speed

of the gear 15, or of the shaft to which it is fixed, with relation to that of the mandrel, I employ a series of double gears, the members of which have different relative sizes, and this series of double gears I arrange upon a rotatable table 22, which is mounted eccentrically with relation to the intermediate shaft, whereby either of the double gears may be arranged in position between the gear 15 and the mandrel, whereby its members will mesh, respectively, with the said gear 15 and the intermediate gear.

The table preferably consists of parallel disks 23 and 24, of which the outer disk 23 is provided with a central opening 25, as shown clearly in the drawings, to expose the main gear 15. The double gears are mounted upon spindles between the planes of the inner and outer plates or disks, and the inner plate or disk is provided with a series of peripheral notches 26, for engagement by a catch or locking device 27, to hold the table in any one of its various adjusted positions. This catch may consist, as shown in the drawings, of an intermediately pivoted lever provided at one end with a stud 28, to engage said notches in the inner plate or disk, and provided at the other end with a knob 29, which projects outward beyond the cylindrical casing or shell 30, which extends around the edges of the plates or disks and protects the double gears from accumulation of dust. The inner disk is also provided with an annular gear 31, with which meshes a pinion 32, on the end of a spindle 33, said spindle being mounted in suitable bearings 34 in a plane parallel with that of the disk, and being provided at its outer extremity with a wrench seat 35, whereby it may be rotated to adjust the table. The table is provided with a central sleeve 36, which is mounted rotatably upon a boss 37, in which is formed the bearing for the counter shaft, said boss being eccentric with relation to the said bearing. Said cylindrical casing or shell is provided at a suitable point with an opening 38, and the periphery of the rotary table is provided with a series of numerals or other characters which designate the various double gears carried thereby, and the character relating to a given double gear is exposed through said opening in the cylinder or shell when said double gear is in operative relation with the gears of the counter shaft and the mandrel. In this way the desired adjustment of the mechanism may be attained with facility. The casing or shell is removably fitted upon a flange 39, projecting from the head stock, and is temporarily secured thereto by means of pivotal catches or hooks 40, engaging registering perforations in the shell and the flange.

The means for communicating motion from the counter shaft to the feed screw consists of a main gear 16 on the counter shaft, the gear 11 on the feed screw, and the intermediate train of gears comprising an intermediate gear 41, meshing with said gear 11, and mounted upon a fixed spindle, and one of a series of double gears 42, corresponding in general construction, arrangement, and function with those hereinbefore described, and carried by a rotary table 43, also corresponding in construction with that above described.

The means for mounting and operating the table 43 are similar to those described in connection with the table carrying the double gears which communicate motion from the mandrel to the counter shaft, and therefore a specific description thereof is unnecessary.

The object in employing substantially duplicate sets of gearing for communicating motion, respectively, from the mandrel to a counter shaft, and from the counter shaft to the feed screw, consists in the fact that a greater variety of relative speeds of the feed screw may be attained. With only a single series of double gears such as that carried by one of the rotary tables, the feed screw may be turned at a certain speed for each double gear, and hence the number of different speeds will be in accordance with the number of double gears in use, but when two sets of double gears, arranged upon independently rotatable tables and adapted to be used in any desired combination, are employed, the feed screw may be rotated at any one of a number of relative speeds equal to the multiple of the number of gears carried by the two tables.

In connection with the above described apparatus, I preferably employ a scale or index 44, showing the relative speed of the feed gear with different combinations of the double gears carried by the rotary tables.

The multiple gearing as above described may be applied to a great variety of wood and metal working machines, including turning and screw-cutting lathes, planing, milling, drilling and other machines, and it will be obvious that in practice various changes in the form, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Inasmuch as the apparatus, as described, may be applied to a number of different classes of machines in which different terms are applied to the various shafts or spindles, I have not confined myself in the claims to those which are used in connection with a lathe. For instance, the mandrel may be replaced by any "driving" shaft which receives motion from a source of power, while the counter shaft and feed-screw occupy the positions and perform the functions of "driven" shafts. When only one "driven" shaft is employed a single train of gearing is necessary, as hereinbefore indicated, but when a greater variety of changes in the speed of the "driven" shaft is required, a second driven, or an "intermediate," shaft is employed between the driving and driven shafts. This

intermediate shaft is driven by the driving shaft through the first train of gears, and communicates motion through the second train of gears to the driven shaft.

Having described my invention, what I claim is—

1. In combination with a driving shaft and a driven shaft provided with gears, of a series of double gears for communicating motion from the gear on the driving shaft to the gear on the driven shaft, a rotary table carrying said series of double gears and consisting of parallel spaced disks or plates between which said gears are arranged, the rotary table being mounted eccentrically with relation to the driven shaft, and means for locking the table at the desired adjustment, substantially as specified.

2. The combination with a driving and a driven shaft carrying gears, of rotary tables mounted eccentrically with relation to the driven shaft and provided with series of double gears to mesh with the gears on the driven shaft, the gears on one of the tables being adapted to mesh also with the gear on the driving shaft, and a second driven shaft having a gear to mesh with the double gears on the other table, substantially as specified.

3. The combination with a driving and a driven shaft having gears, of a rotary table mounted eccentrically with relation to one of said shafts and carrying a plurality of double gears, either of which may be arranged in operative relation with the gears of the driving and driven shafts, to communicate motion from the former to the latter, and annular gear on the table, a spindle arranged parallel with the plane of the table and having a pinion to mesh with the annular gear thereof, and means for locking the table at the desired adjustment, substantially as specified.

4. The combination with a driving and a driven shaft having gears, a rotary table mounted eccentrically with relation to one of said shafts and provided with a series of double gears, either of which may be arranged in operative relation with the gears of the driving and driven shafts, for communicating motion from the former to the latter, said table being provided with a peripheral series of characters representing the several double gears, a shell or casing inclosing the table and provided with an opening through which one of said characters on the table may be viewed, said opening being arranged in such a position as to expose the character of a given double gear when said gear is in operative position, and means for locking the table at the desired adjustment, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

BENJAMIN F. BURDICK.

Witnesses:

S. D. WELLS,

J. B. PRINDLE.