

No. 753,878.

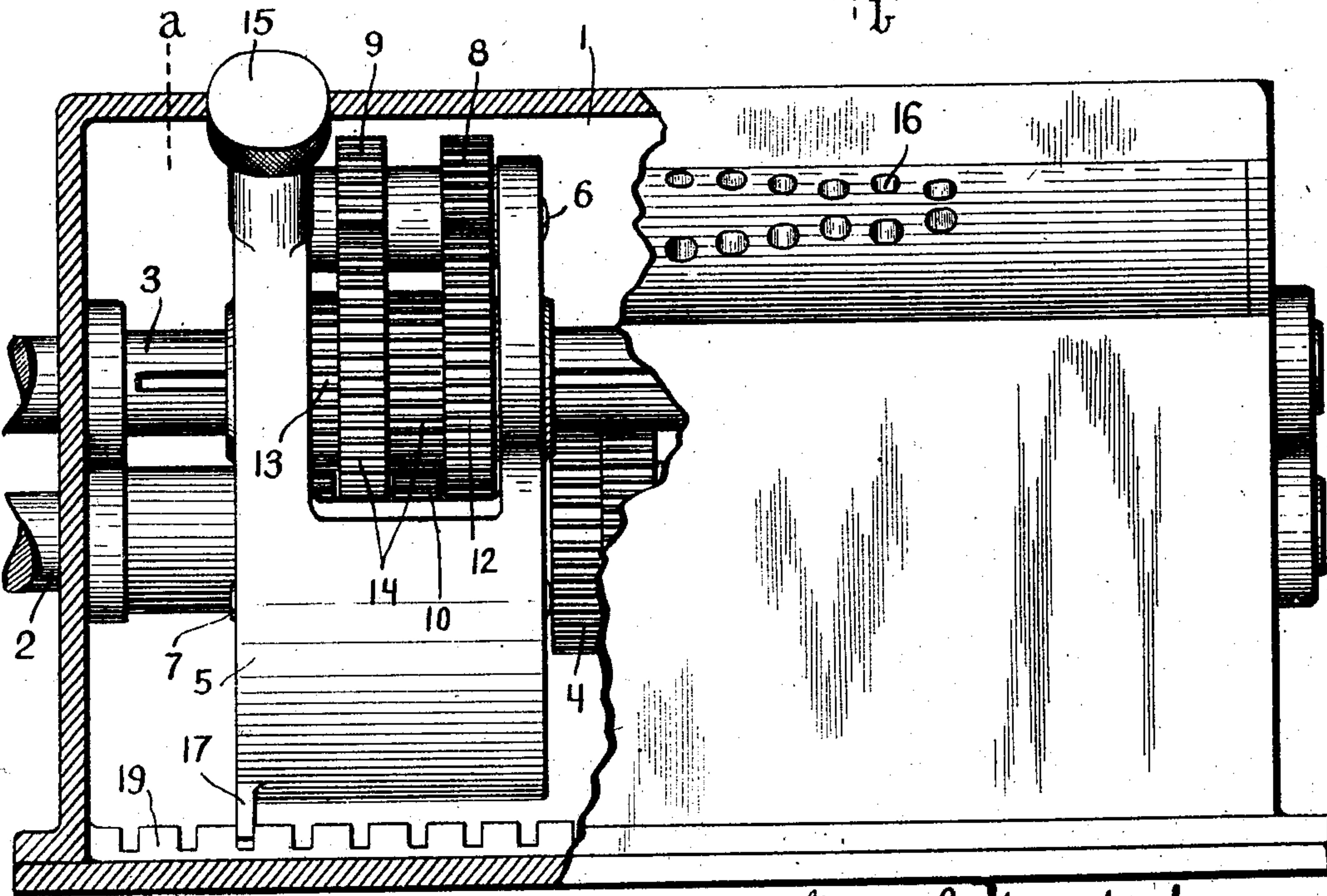
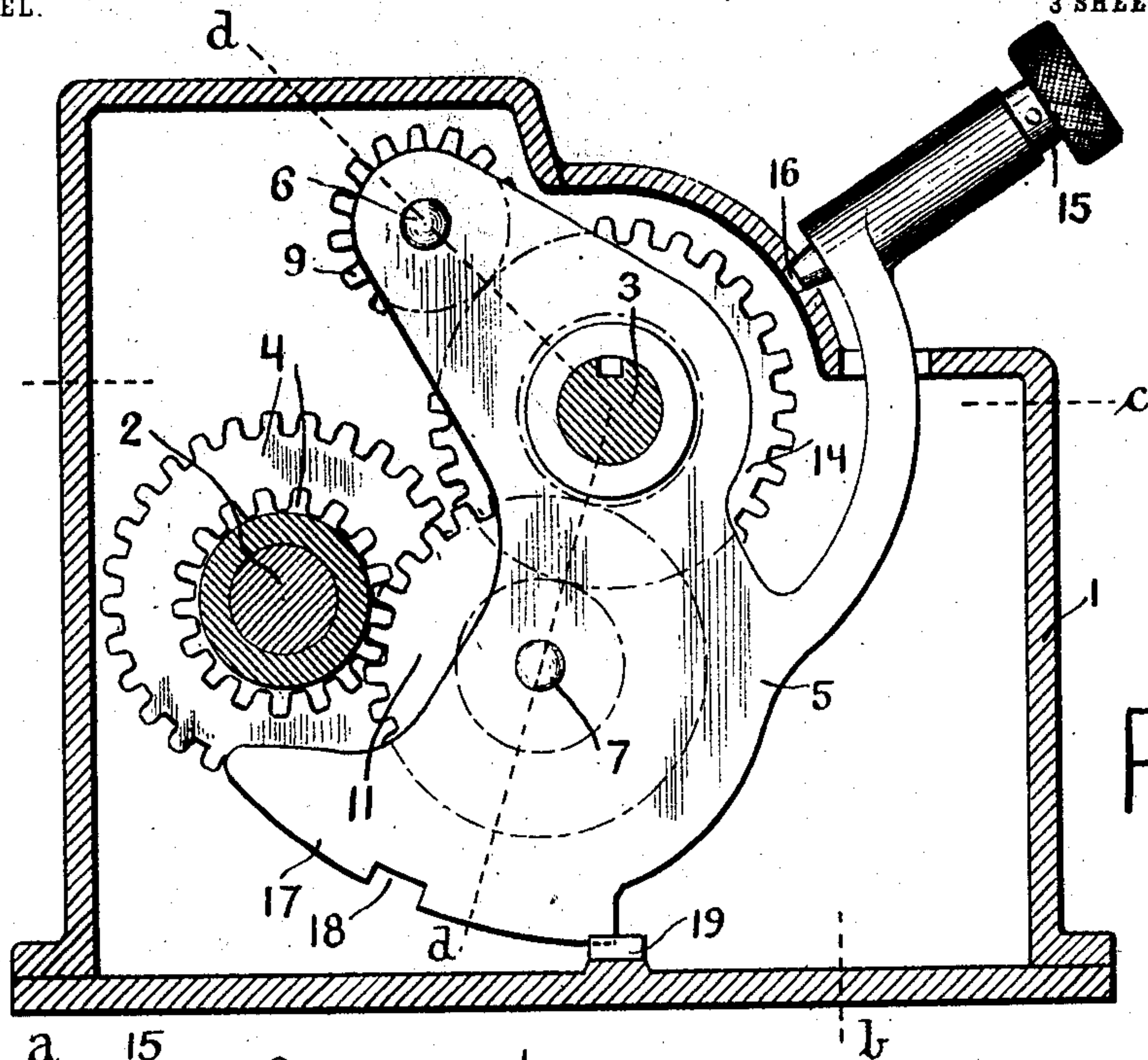
PATENTED MAR. 8, 1904.

G. E. GREENLEAF & H. R. KENNEDY.
SPEED CHANGER.

APPLICATION FILED DEC. 28, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses:
Elmer R. Shipley.
M. S. Belden.

Fig. 1.

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Henry R. Kennedy
Inventors
by James W. See
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3 SHEETS—SHEET 2.

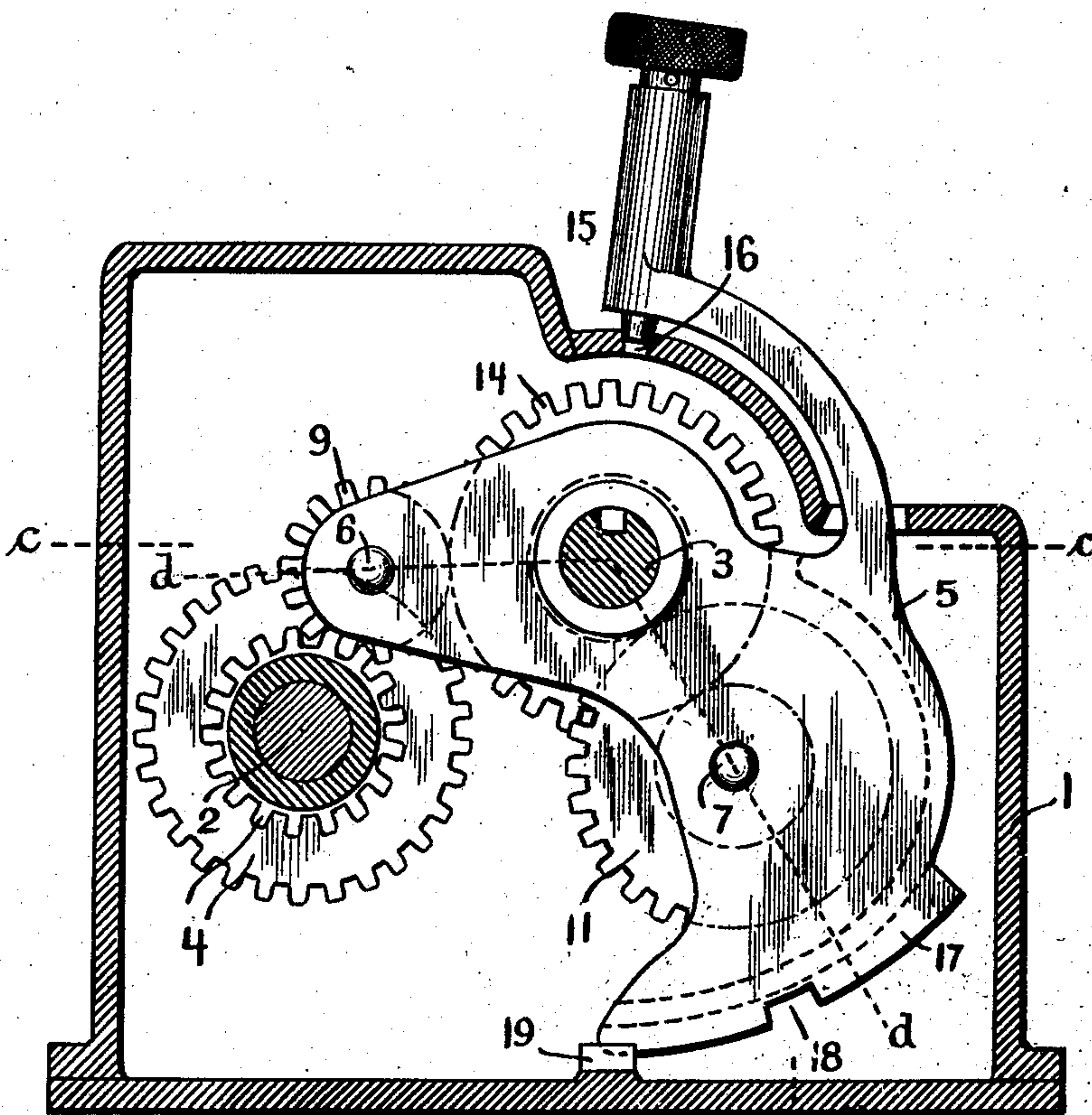


Fig. 3.

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3 SHEETS—SHEET 3.

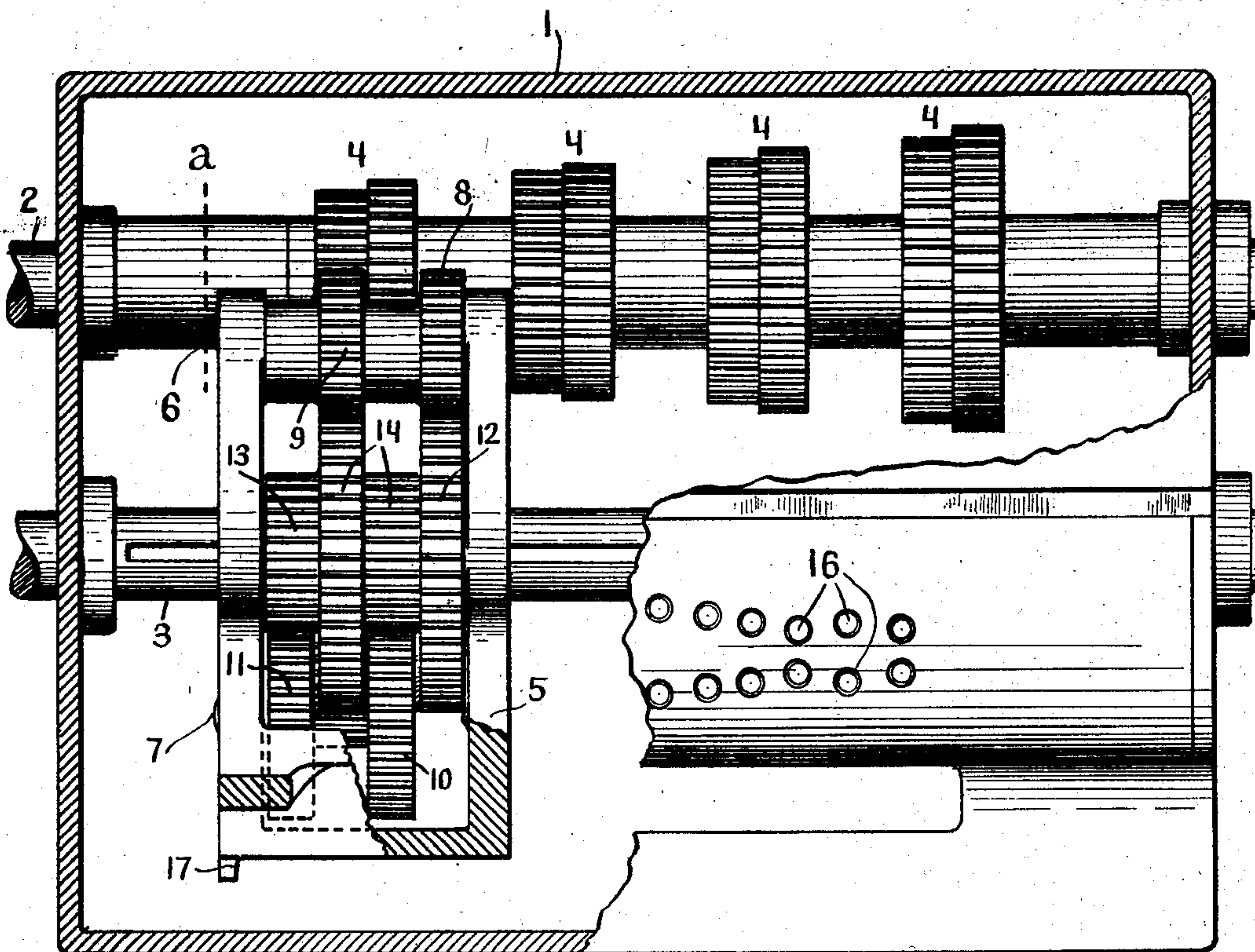


Fig. 4.

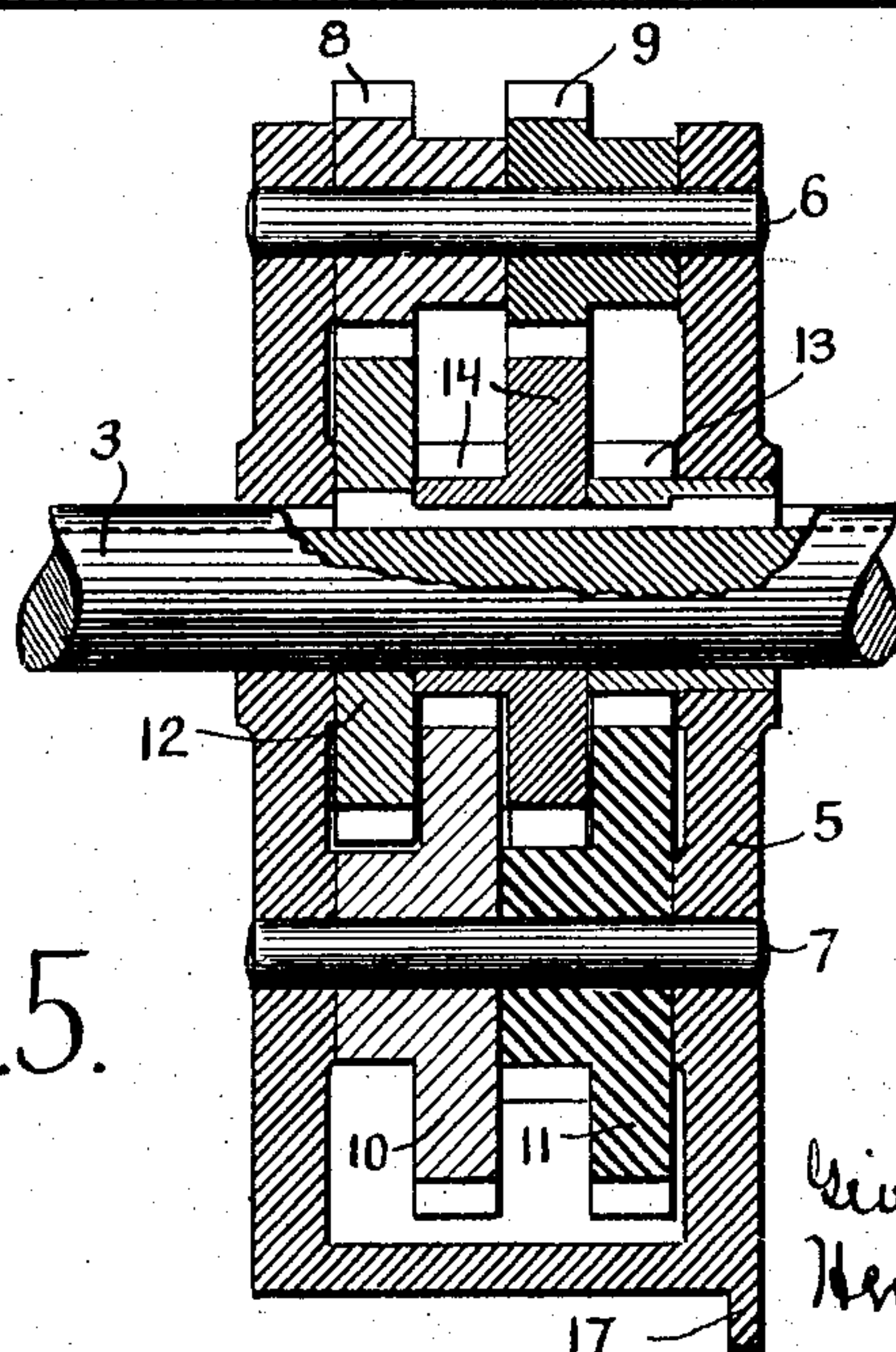


Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE E. GREENLEAF AND HENRY R. KENNEDY, OF PLAINFIELD, NEW JERSEY, ASSIGNORS TO NILES-BEMENT-POND COMPANY OF JERSEY CITY, NEW JERSEY.

SPEED-CHANGER.

SPECIFICATION forming part of Letters Patent No. 753,878, dated March 8, 1904.

Application filed December 28, 1903. Serial No. 186,788. (No model.)

To all whom it may concern:

Be it known that we, GEORGE E. GREENLEAF and HENRY R. KENNEDY, citizens of the United States, residing at Plainfield, Union county, New Jersey, (post-office address Plainfield, New Jersey,) have invented certain new and useful Improvements in Speed-Changers, of which the following is a specification.

This invention, pertaining to improvements in speed-changers, will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of a device exemplifying our invention, parts appearing in vertical section in the plane of line *b* of Figs. 2 and 3; Fig. 2, a vertical transverse section of the same in the plane of line *a* of Figs. 1 and 4; Fig. 3, a similar transverse section, but showing the tumbler in a different position; Fig. 4, a plan of the device, parts appearing in horizontal section in the plane of line *c* of Figs. 2 and 3; and Fig. 5, a section of the tumbler and its gears in the planes of line *b* of Figs. 2 and 3, the section shown in Fig. 5 being somewhat distorted in order to bring the axis of the tumbler and the two studs carried by the tumbler into a common plane for purposes of clear delineation.

In the drawings, 1 indicates a casing whose form is immaterial, so long as it gives proper support to the moving parts of the speed-changer, this casing being merely typical of any suitable casing designed specially for the speed-changer or formed by incasing features of the frame of a machine in connection with which the speed-changer may be employed; 2, a first shaft mounted in the casing; 3, a second shaft mounted in the casing parallel with the first shaft, these two shafts being the ones between which the speed-changer is to serve in causing rotary motion at constant rate imparted at one shaft to be transmitted at selective rates to the other shaft; 4, a series of dissimilar sized gears fast upon shaft 2, these gears being arranged in pairs, the two gears of a pair being placed near each other, while the distance between contiguous pairs is about equal to the face width of a pair of the

gears, Figs. 2 and 3 showing only the smallest and largest of these gears, the others being omitted for the sake of clearness; 5, a tumbler arranged to rock and slide upon shaft 3, this tumbler having two arms at an angle to each other and giving to the tumbler the general aspect of a bell-crank; 6, a stud carried by one arm of the tumbler; 7, a stud carried by the other arm; 8, a gear loose on stud 6 and adapted for engagement when the tumbler is properly adjusted with any selected one of gears 4; 9, a second similar gear on stud 6, the distance between the two gears 8 and 9, which are swinging gears, being somewhat in excess of the thickness of the individual gears 4; 10, a swinging gear loose on stud 7 and disposed in the plane of the space between gears 8 and 9; 11, a compound swinging gear loose on stud 7, its smaller member being in the plane of gear 9 and its larger member to the side of that plane and opposite gear 10; 12, a gear carried by the tumbler and splined on shaft 3 and meshing with gear 8; 13, a gear carried by the tumbler and splined on shaft 3 and engaging the larger member of compound gear 11; 14, a compound gear carried by the tumbler and mounted loose on shaft 3 between gears 12 and 13, the smaller member of this gear 14 meshing with gear 10, while its larger member meshes with gear 9 and with the smaller member of compound gear 11; 15, a detent-pin carried by the tumbler; 16, a double series of detent-holes in the casing to coöperate with the detent-pin and lock the tumbler in its various positions incident to the engagement of any one of its planet gears with any selected one of the gears 4; 17, a segmental flange carried by the tumbler concentric with shaft 3; 18, a notch in this flange, and 19 a longitudinal rib carried by the casing in the path of flange 17 and provided with transverse notches through which the flange may work, the width of the rib being such that notch 18 when brought to proper position may slide along the rib, the position of notch 18 being such as to coincide with the rib when all of the swinging gears carried by the tumbler are free from all of gears 4.

First, as to the adjustment of the tumbler.

By swinging the tumbler so that notch 18 coincides with rib 19 the tumbler can be moved endwise on splined shaft 3, the swinging gears of the tumbler being at this time free from all of gears 4. The tumbler while thus free to move longitudinally can be moved angularly only when flange 17 coincides with one of the notches in the rib, and this coincidence occurs only when some swinging gear is in line with some one of gears 4. The tumbler having been shifted longitudinally to bring a selected one of its swinging gears into the plane of a selected one of gears 4, the tumbler is then moved angularly to bring the two selected gears into mesh, and in this position the tumbler may be locked by means of the detent-pin. The tumbler is to be rocked one way from the neutral position to engage gear 8 or 9 with one of gears 4, and it is to be rocked the other way when gear 10 or 11 is to engage with one of gears 4.

It will be observed that notwithstanding the extended range of speed changes provided for in the device no very extended angular movement of the tumbler is required in effecting the changes and a single detent-pin performs the locking. There are two rows of the detent-holes 16, one row appropriate to each arm of the tumbler. These detent-holes are in a segmental plate concentric with splined shaft 3, and this plate may well be a portion of the casing of the apparatus, as illustrated. The detent-pin is carried by a concentric arm on the tumbler, and the gap between this arm and the hub portion of the tumbler permits the arm to play exterior to the plate, so that the detent-pin may readily reach any of the detent-holes.

Second, as to the speed-changing effects. Refer to Fig. 5 and assume shaft 3 to be the driving-shaft of the system and assume that the larger gears carried by the tumbler are twice the size of the smaller gears carried by it. It will be obvious that the difference in the rate of peripheral speed of gears 8, 9, 10, and 11 may be nicely graduated with a large range between extremes. Any of these swinging gears may be put to engagement with any selected one of the gears 4, and if gears 4 were all the same size or if there were but one of them a fairly-graduated range of speeds could be obtained, four graduated variations in transmitted speed being thus obtainable as an incident to the selective adjustment of the tumbler relative to a single gear upon shaft 2; but the employment of a plurality of gears 4 of dissimilar sizes permits not only of an increase in the number of speed changes, but also a regular or irregular modification of the graduations in the changes.

We claim as our invention—

1. In a speed-changer, the combination, substantially as set forth, of a first shaft, a gear fast thereon, a splined second shaft parallel

with the first shaft, a tumbler mounted for longitudinal and angular adjustment upon the second shaft, swinging gears carried by the tumbler and adapted to engage selectively with the gear on the first shaft, a gear splined on the second shaft and carried by the tumbler and engaging and driving one of said swinging gears, a gear loose on the second shaft and engaged and driven by said driven swinging gear and engaging and driving another one of said swinging gears, and means for locking the tumbler in position.

2. In a speed-changer, the combination, substantially as set forth, of a first shaft, a gear fast thereon, a splined second shaft parallel with the first shaft, a tumbler mounted for longitudinal and angular adjustment upon the second shaft, two pairs of swinging gears carried by the tumbler and adapted to engage selectively with the gear on the first shaft, a gear splined on the second shaft and carried by the tumbler and engaging and driving one of said swinging gears, a gear splined on the second shaft and carried by the tumbler and engaging and driving another one of said swinging gears, a gear loose on the second shaft and engaged and driven by one of said driven swinging gears and engaging and driving the other two swinging gears, and means for locking the tumbler in adjusted position.

3. In a speed-changer, the combination, substantially as set forth, of a first shaft, a plurality of diversely-sized gears fast thereon, a splined second shaft parallel with the first shaft, a tumbler mounted for longitudinal and angular adjustment upon the second shaft, two pairs of swinging gears carried by the tumbler and adapted to engage selectively with the gears on the first shaft, a gear splined on the second shaft and carried by the tumbler and engaging and driving one of said swinging gears, a gear splined on the second shaft and carried by the tumbler and engaging and driving another one of said swinging gears, a gear loose on the second shaft and engaged and driven by one of said driven swinging gears and engaging and driving the other two swinging gears, and means for locking the tumbler in adjusted position.

4. In a speed-changer, the combination, substantially as set forth, of a first shaft, a plurality of diversely-sized gears fast thereon and arranged in pairs separated from each other, a splined second shaft parallel with the first shaft, a tumbler mounted for longitudinal and angular adjustment upon the second shaft, two pairs of swinging gears carried by the tumbler and adapted to engage selectively with the gears on the first shaft, a gear splined on the second shaft and carried by the tumbler and engaging and driving one of said swinging gears, a gear splined on the second shaft and carried by the tumbler and engaging and driving another one of said swinging gears, a

gear loose on the second shaft and engaged and driven by one of said driven swinging gears and engaging and driving the other two swinging gears, and means for locking the tumbler in adjusted position.

5 5. In a speed-changer, the combination, substantially as set forth, of a first shaft, a plurality of diversely-sized gears fast thereon, a splined second shaft parallel with the first shaft, a tumbler mounted for longitudinal and angular adjustment upon the second shaft, means for locking the tumbler in adjusted position, gears carried by the tumbler for cooperation with the gears on the first shaft, a rib rigidly supported parallel with said shafts and having a transverse notch in correspondence with each gear on the first shaft, and a segmental flange carried by the tumbler and cooperating with the notches in said rib and having a transverse notch arranged to permit the flange to move along the rib when no tumbler-

gear is in engagement with a gear upon the first shaft.

6. In a speed-changer, the combination, substantially as set forth, of a first shaft, diversely-sized gears fast thereon, a splined second shaft parallel with the first shaft, a tumbler mounted for longitudinal and angular adjustment upon the second shaft, gears carried by the tumbler and cooperating with the gears on the first shaft, a segmental plate rigidly supported parallel with the second shaft and provided with two rows of detent-holes, a segmental arm carried by the tumbler exterior to said plate, and a detent-pin carried by said arm and projecting inwardly for engagement with said detent-holes.

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