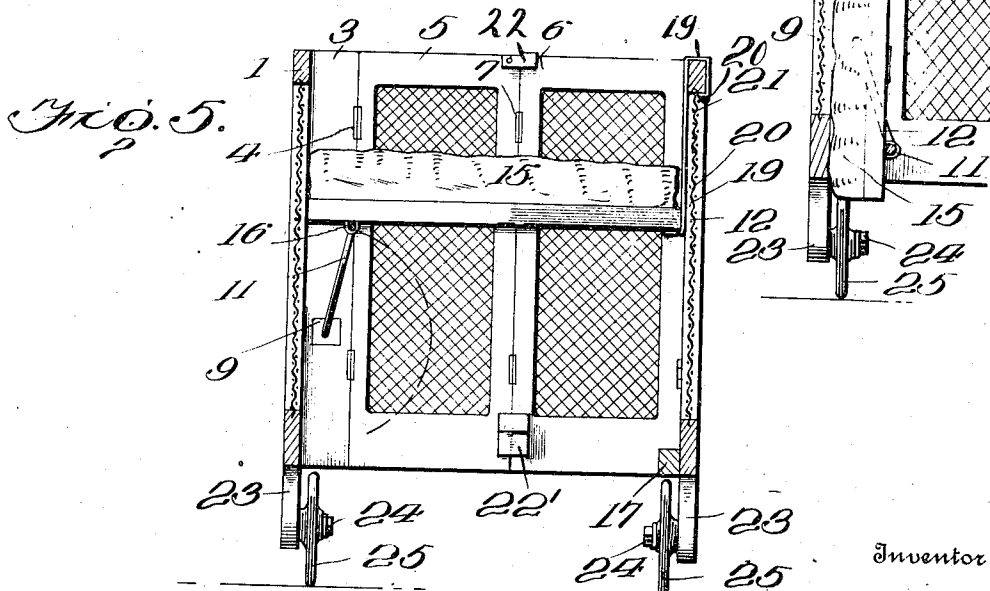
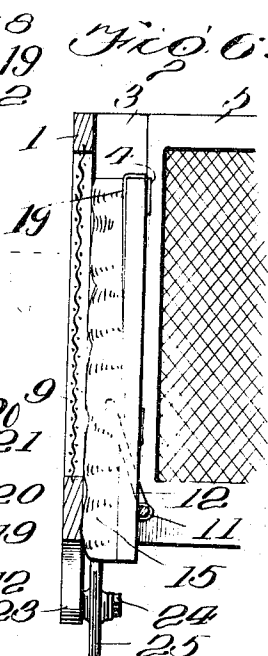
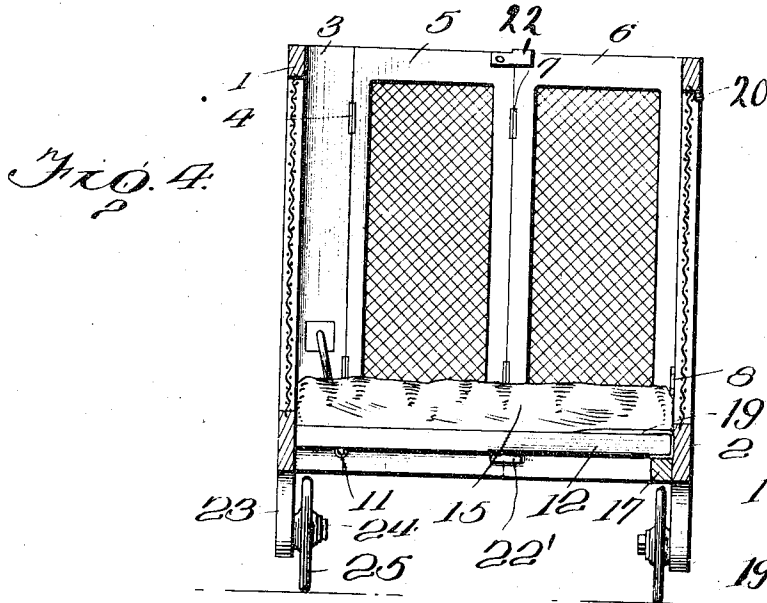


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FOLDING COOP AND CRIB.
APPLICATION FILED MAY 17, 1916.

1,223,257.

Patented Apr. 17, 1917.
2 SHEETS—SHEET 2.



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PLANETARY SPEED REDUCING MECHANISM.
APPLICATION FILED DEC. 28, 1915.

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UNITED STATES PATENT OFFICE.

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PLANETARY SPEED-REDUCING MECHANISM.

1,223,259.

Specification of Letters Patent.

Patented Apr. 17, 1917.

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To all whom it may concern:

Be it known that I, GEORGE COTTAM, a citizen of England, residing at Saginaw, in the county of Saginaw and State of Michigan, have invented certain new and useful Improvements in Planetary Speed-Reducing Mechanism, of which the following is a specification.

My invention relates to improvements in power transmitting mechanism of that type designed to secure a reduction in speed between the driving and driven elements, the amount of said reduction being obtainable by employing gear members of proper ratios according to the character of work to be performed.

The invention consists in the combination with a driving member and a driven member, of speed reducing elements therebetween and means for imparting planetary movement to the speed reducing elements including means for fixing the relationship of said planetary means with respect to the operating means.

One of the characteristic features of my apparatus is the provision for interchanging the gear members whereby it is possible to obtain a reduced speed movement of the driven member in the direction of movement of the driving member, or in the reverse direction, depending upon the utilization of power taken from the prime mover.

These and such other objects as may hereinafter appear are attained by the novel construction, combination and arrangement of parts to be hereinafter specifically described and claimed. Reference will now be had to the accompanying drawings forming a part of this specification, wherein:—

Figure 1 is a perspective view of an embodiment of this invention.

Fig. 2 is a vertical sectional view taken about on the plane indicated by the line 2—2 of Fig. 1.

Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of a bushing used in this construction.

Fig. 5 is a perspective view of a spacing member for the gear frame.

Figs. 6 and 7 are sectional views on the lines 6—6 and 7—7 respectively of Fig. 2;

and Fig. 8 is a vertical sectional view of a modification of the device.

Referring to the drawing and specifically describing my apparatus, the numeral 1 designates a high speed driving shaft which is operatively connected to a prime mover of any desired type (not shown). This shaft is journaled in one side of a casing 2 and extends into said casing as shown most clearly in Fig. 2 of the drawing. On the inner end of the shaft 1 is fixed the driving pinion 3 which is arranged substantially centrally of the casing before mentioned. At the opposite side of the casing is journaled the driven element consisting of the shaft 4 which is designed to be driven at reduced speed by means to be more clearly set forth as this description proceeds. The shaft 4 is coaxial with the shaft 1 and carries at its inner end the driven gear 5 detachably connected to the end of its shaft by suitable fastening means 6. It will be noted that the driving and driven members are arranged end to end and they are operatively connected by transmission gear members now to be described.

Within the casing 2 is arranged a revoluble frame comprising the side plates 7 disposed in spaced relation and held in such spaced relation by means of the spacing blocks or members 8, one of which is clearly disclosed in Fig. 5 of the drawing. The spacing elements are provided with lateral pins or projections 9 which engage with the side plates 7. Meshing with the driving pinion 3 are relatively large gear members 10 keyed upon the shafts 11. Upon the shafts 11 at one side of the gears 10 are smaller gear members 12. These gears mesh with a relatively stationary planetary gear 13 which corresponds in size to the gears 10. The stationary gear member 13 is detachably connected by means of fastening members 14 to the inner end of a lateral extension or sleeve 15, said sleeve constituting the bearing for the driving shaft 1 and being supported by the lateral journal support 16 projecting from the casing 2. The sleeve 15 is provided with a suitable bushing 17 for the shaft 1 and said sleeve is designed to be held in fixed relation by clamping means co-operating with the journal support 16, said

clamping means comprising the cap 18 removably attached to said support by fastening members or bolts 19. On the shafts 11 at the opposite side of the gear members 10 are disposed gears 20 which are smaller in size than the gear members 10 but slightly larger in diameter than the opposite gears 12, and these gears 20 mesh with the driven gear 5 on the driven shaft 4.

It will be understood that the driven gear is of smaller diameter or gear ratio than the relatively stationary or planetary gear 13. From this construction it will be apparent that upon actuation of the driving shaft 1 its pinion 3 will drive the larger gears 10 and owing to the operative connection of their respective shafts with the planetary gear 13 through the gear members 12, the frame in which these shafts 11 are journaled will be caused to walk around the planetary gear 13. It follows from the fact that the gears 20 are larger than the gears 12 and the driven gear 5 is of a smaller pitch diameter than the planetary gear 13 that a very slow speed is imparted to the driven gear and its driven shaft 4. A very great reduction in speed may be obtained by properly proportioning these gear members.

In the embodiment of the invention shown in Fig. 2 it may be assumed for purposes of illustration that the driving gear 3 has fifteen teeth; the gear 10, forty-five teeth; the gear 12, similar in size to the driving pinion 3, fifteen teeth; and the planetary gear 13, similar in size to the gear 10, forty-five teeth. If then the gear 20 is provided with sixteen teeth, the driven gear 5 will be moved the distance of three teeth for each revolution of the frame about the driving pinion 3 so that with a prime mover operating at fourteen hundred revolutions a minute, a movement of substantially twelve and one-half revolutions per minute will be imparted to the driven shaft 4. This movement imparted to the driven gear in the relation of the gear members disclosed in Fig. 3 will be in the same direction as the driving shaft 1.

Further describing the details of construction of this apparatus, it will be noted that each of the shafts 11 is provided with suitable bushings 21 at each end, one of said bushings being shown in Fig. 4 of the drawing, from which it will be observed that each is provided with a transverse groove 22 with which a pin 23 mounted in the side plate of the frame engages to hold the bushing in place. All of the gears on these shafts are keyed by a common key and may be readily removed by displacement of the bushings and the said key whenever desired.

The casing 2 in which the transmission mechanism hereinbefore described is mounted is provided with a cover 24 held in place

by means of fastening means or bolts 25. This cover has connected thereto at its topmost portion an I-bolt 26 by means of which the cover is lifted when detached from the casing.

The driven shaft 4 is journaled similarly to the driving shaft 1 upon a bearing extension 16' and said extension is provided with a detachable cap 18', between which parts is arranged a suitable bushing 17' for the shaft. In apparatus of high speed operations of this character it becomes necessary to renew the bushings for the operating parts and it will be obvious from this description that said bushings may be readily replaced by reason of the detachability of the retaining members therefor.

The casing 2 is designed to hold a lubricant and the bearings are all provided with suitable feed passages so that the rotating parts may be effectively lubricated. The bearings for the driving and driven shafts have conduits 27 communicating therewith leading from the upper portion of the casing 2, and excess lubricant is returned to the casing by the lower conduits 28 leading from the outer end of the bearing extensions to the lower portion of the casing.

In Fig. 8 is shown a slightly modified form of the apparatus in that a train of the transmission gears is dispensed with. In other words, the driven shaft 4^a in this form of the apparatus has secured to its inner end the plate or disk 5^a constituting one of the side members of the inner frame spaced from its opposite side member 7^a by means of the interposed blocks 8^a. Secured upon the axes 11^a, detachably connected to the disk 5^a, are the gear members 10 and the gear members 12 meshing with the relatively stationary gear 13. The remaining structure of this form is substantially identical with the preferred form and need not be further described. It will be obvious to those skilled in the art to which the apparatus appertains that this simplified construction may be utilized where the speed is to be proportionately changed.

Reverting to the preferred construction it will also be obvious that a reverse movement at reduced speed may be imparted to the driven shaft by an interchange of the transmission gears. In other words the gear member 3 may be replaced by the gear member 5 and the intermeshing gears 12 and 20 accordingly interchanged. With the interchangeability of parts such as just described, the utility of my apparatus will be greatly enhanced inasmuch as it may be employed to operate mechanisms in either of two directions, that is, forwardly or reversely, as may be found requisite in respect to the work to be performed.

Having thus described the invention, what is claimed as new is:—

1. A planetary speed changing mechanism consisting of a driving member, a driven member associated therewith, speed reducing means intermediate the driving and driven members, a relatively stationary element with which the speed reducing means cooperate to produce planetary movement consisting of a gear member having a lateral extension, a bearing supporting said extension, and means coacting with the bearing and clamping the extension to hold said gear member relatively fixed.

2. In combination, a casing, a driving member journaled at one side thereof, a driven member journaled at the opposite side thereof and arranged end to end with respect to the driving member and operably connected thereto, a frame journaled at one side on the driving member and at the other side on the driven member, a relatively stationary gear element operatively connected to the driving member, and clamping means cooperating with the bearing for the driving member and holding said gear element stationary.

3. Speed reducing mechanism of the class described comprising a driving shaft, a driven shaft, a gear member carried by said driven shaft, gearing intermediate the said gear member and the driving shaft, and a relatively stationary planetary gear of different diameter and interchangeable with

the gear on the driven shaft whereby to provide for driving the latter in the same or reverse directions with respect to the driving shaft.

4. Speed reducing mechanism of the class described comprising a driving member, a driven gear, a relatively stationary gear, transmission gears intermediate the driving member and the aforesaid driven and stationary gears, all of said gear members being removably arranged for interchanging positions to obtain different directions of movement of the driven element.

5. Speed reducing mechanism of the class described comprising a driving shaft, a driving pinion carried thereby, relatively large gear members meshing with said driving pinion, supporting means for said gear members, a stationary gear member meshing with the last mentioned gear elements operatively connected to the supports therefor, a driven shaft, and a driven gear detachably connected thereto and of relatively smaller gear diameter than the stationary gear member aforesaid and operatively connected to the supports for the first mentioned gear elements, the stationary gear member being detachable for interchange with the driven gear member.

In testimony whereof I affix my signature.

GEORGE COTTAM.