F. B. RAE.

VACUUM CLEANER.

APPLICATION FILED NOV. 12, 1917.

1,286,099.

Patented Nov. 26, 1918.

3 SHEETS—SHEET 1.

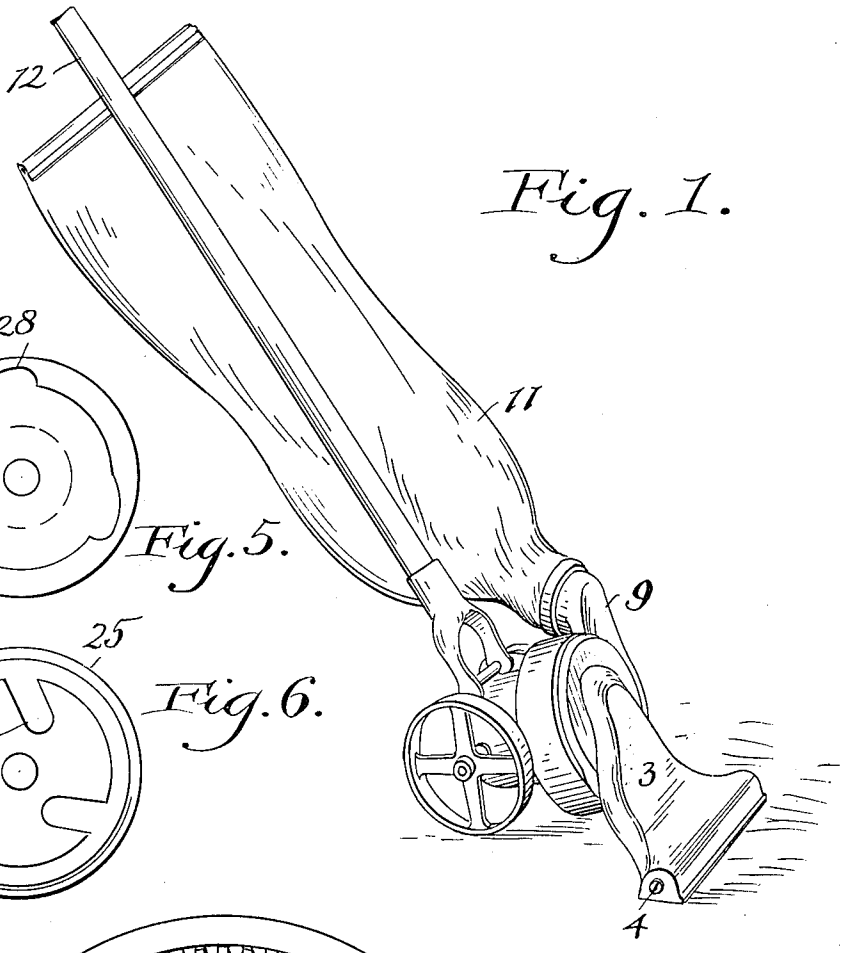


Fig. 1.

Fig. 5.

Fig. 6.

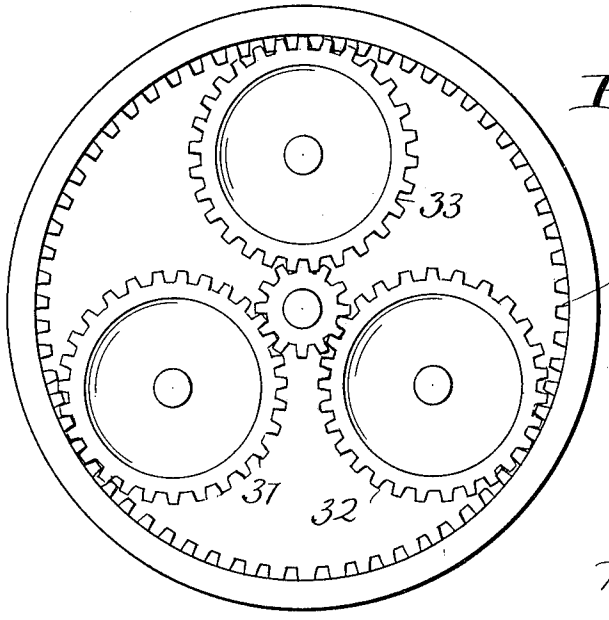


Fig. 4.

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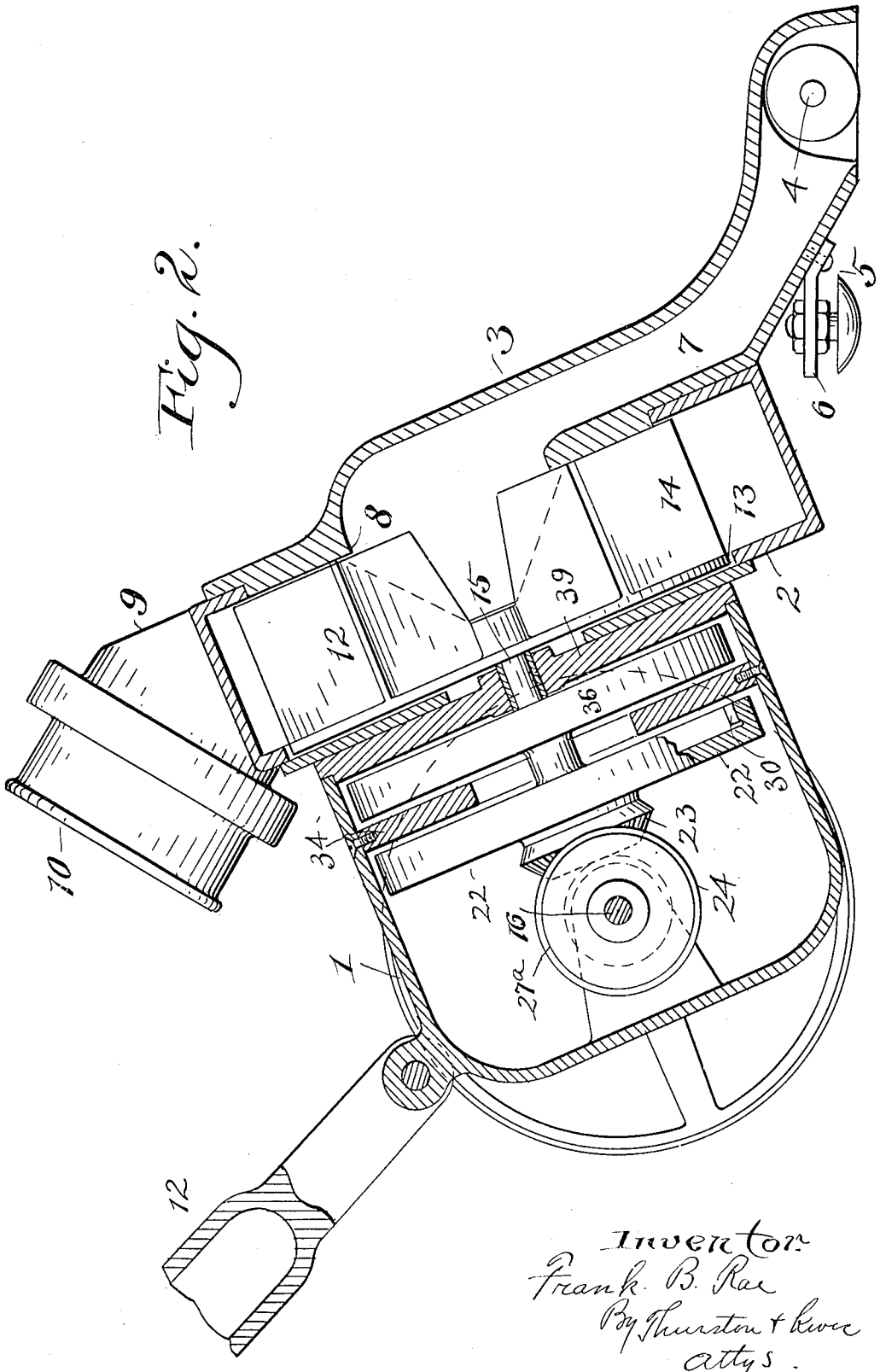
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

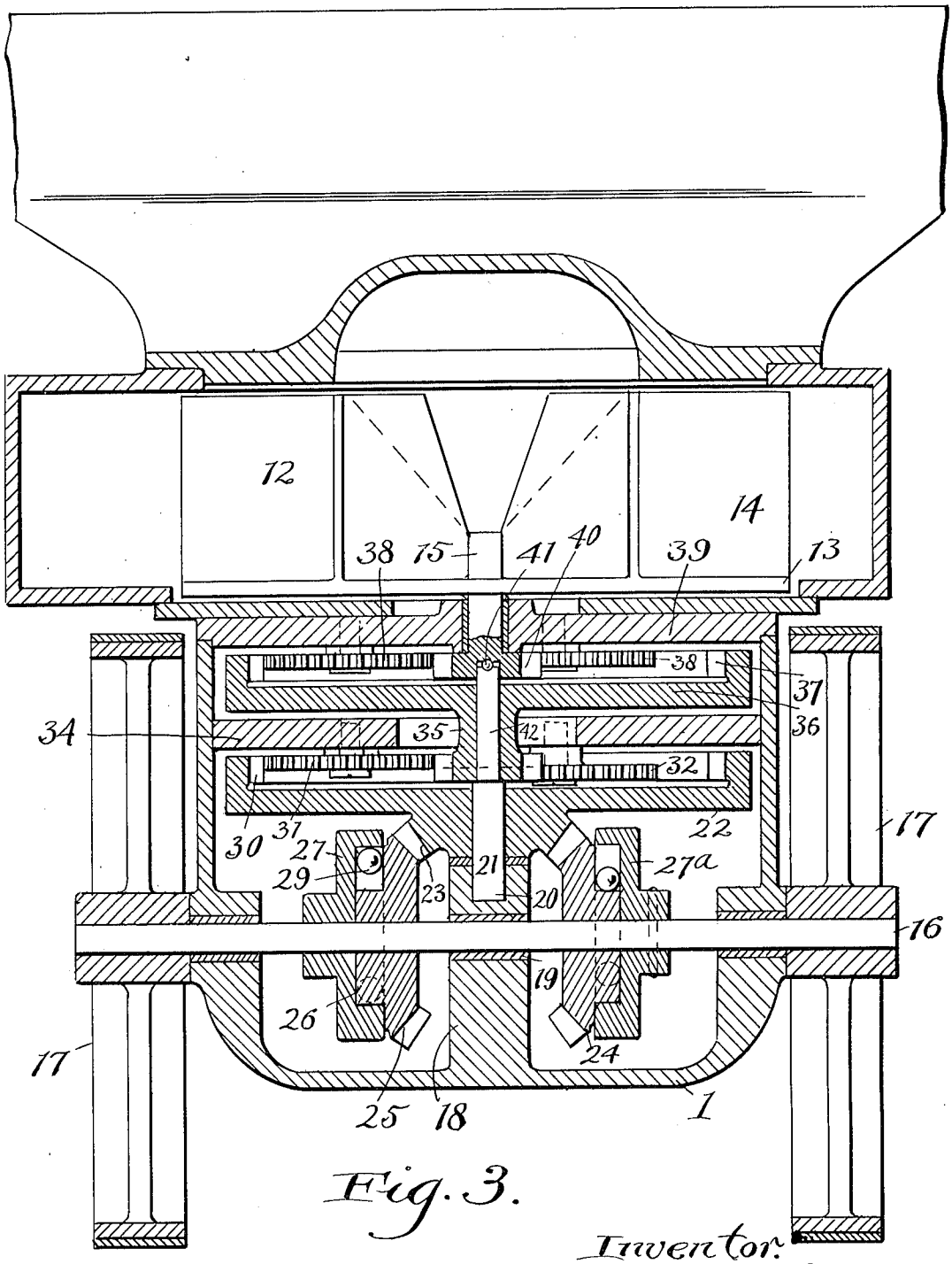


Fig. 3.

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UNITED STATES PATENT OFFICE.

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VACUUM-CLEANER.

1,286,099. Specification of Letters Patent. Patented Nov. 26, 1918.

Application filed November 12, 1917. Serial No. 201,654.

To all whom it may concern:

Be it known that I, FRANK B. RAE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Vacuum-Cleaners, of which the following is a full, clear, and exact description.

This invention relates to a hand power type of what is commercially known as a vacuum cleaner.

The object of the invention is to provide a device of the character which is operated by the force applied in pushing the cleaner over the surface to be cleaned, in which the suction produced is materially increased over hand power machines with which I am familiar, and by this increase of the suction a better machine is produced.

A further object is to provide an efficient operating gearing which is compactly arranged so that it takes up a small amount of space thereby especially commending itself for instant use.

The invention also consists in certain novel features of construction which enable the machine to be made at a low manufacturing cost.

Generally speaking, the invention may be said to comprise the elements and combinations thereof set forth in the accompanying claims.

Reference should be had to the accompanying drawings forming a part of this specification in which Figure 1 is a perspective view showing the complete machine; Fig. 2 is a sectional elevation of a portion of the machine; Fig. 3 is a top plan view with portions in section; Fig. 4 is a sectional plan view showing a portion of the operating mechanism; Figs. 5 and 6 are views showing a ball clutch which is used in the construction of the machine.

Referring to the drawings there is shown at 1 a mechanism casing which contains the power developing mechanism of the device. Secured to the casing 1, or formed integrally therewith, if desired, is a nozzle 3.

The nozzle is shaped at its forward end so as to be almost flush with the surface upon which the device is running, although slightly elevated so as to permit an easy running of the machine. Within the lower end of the nozzle there is an elongated brush mounted upon a shaft 4, which shaft finds bearing in the opposite walls of the nozzle. The provision of this brush is well understood in the art, and no further description need be given of it.

Upon the under side of the nozzle 3 there is secured an adjustable foot 5, this foot being carried by a bracket 6 which is secured to the nozzle.

The nozzle 3 is provided with an interior chamber 7 which is broad or flared at its lower portion and becomes more restricted at that portion which communicates with the fan casing 2. At the portion just mentioned, the opening 8 is substantially circular.

The fan casing 2 at one side thereof is formed with a hollow extension 9, this hollow extension communicating with the fan casing. The extension 9 is provided with a suitable portion indicated at 10, which is adapted to receive one end of a dust collecting bag 11, the opposite end of the bag being secured to the handle 12. The dust collecting bag is such a one as is commonly used in the art, and has sufficient porosity to allow air to escape through the meshes of the bag while retaining the dust and dirt delivered thereto within the bag.

Within the fan casing 2 there is a fan, generally represented at 12. This fan comprises a base plate 13 to which are secured fans or blades 14. The fan is mounted upon a shaft indicated at 15.

Extending through the casing 1 is a shaft 16. The ends of this shaft extend upon the outside of the casing, and to the ends of the shaft are secured wheels 17.

Within the casing and secured to, or formed integrally with the rear wall thereof, is a supporting post 18. This post 18 has a central opening through which the shaft 16 extends, and a suitable bush bearing 19 is provided for supporting the shaft 16.

At its end the projection 18 is provided with a socket 20 which is adapted to receive and form a bearing for a shaft 21. Upon this shaft there is secured a gear member 22. The gear member 22 has a hub portion which is provided with teeth forming a bevel gear 23. This bevel gear 23 coöperates with a bevel gear 24 carried upon the shaft 16 upon one side of the projection 18, and also coöperates with a bevel gear 25 carried upon the shaft 16 upon the other side of the projection 18. The bevel gears 24 and 25 have their similar faces toward each other.

Each bevel gear 24 has a hub portion

which is formed with a plurality of arms as indicated at 26 in Fig. 6. Coöperating with each of the hub portions of the gears just mentioned, is a cup shaped member 27 which overlies the arms carried by the gear, such as represented at 25. This cup shaped member is provided with depressions 28, the number of depressions being the same as the number of arms before mentioned. Each of these depressions varies in radial depth as indicated in Fig. 5. There are three balls, one of which is indicated at 29 in Fig. 3 associated with each of the arms 26, and in position to be moved into the grooves 28 to form a clutching connection when the cap 27 is moved in the proper direction to effect such a result.

The similar cap member 27ª which coöperates with the gear 24 is constructed and operated in the same manner with the exception that the balls become operative to make a clutching connection when the shaft 16 is rotated in the opposite direction. As will be obvious, one of the clutch members effects a driving relationship between the shaft 16 and its bevel gear when the shaft 16 rotates in one direction, while the other clutch effects a connection between its bevel gear and the shaft 16 when the shaft turns in the opposite direction. In other words, the shaft 16 effects a driving relationship with respect to the operating mechanism of the device when the device is moved on its forward or rearward stroke in the operation thereof.

The particular form of overrunning clutch arrangement shown and described, is not essential, as there are other well known forms of such clutches which could be adapted to the purpose.

Returning to a further consideration of the gear member 22. This member has an extending flange upon the inner circumference of which gear teeth are provided, forming an internal gear 30.

Coöperating with this internal gear 30 are a set of idler gears, three in number, indicated at 31, 32 and 33, as shown in Figs. 3 and 4. The idler gears are mounted upon a plate or partition member 34 which is secured in the casing in any desired manner. The plate 34 has a central opening through which extends the hub 35 of a gear member 36. This hub 35 at its lower end is provided with gear teeth which mesh with the idlers 31, 32 and 33. The gear member 36 has an upstanding flange upon the inner circumference of which are formed gear teeth forming an internal gear 37. This internal gear 37 meshes with another set of idler gears which are generally represented at 38. These gears coöperate with the internal gear 37 in exactly the same manner as that described with respect to the idler gears 31, 32 and 33 and the internal gear 30.

The idlers 38 are carried upon a cover 39 which forms a closure member for the gear containing casing 1. There is a central opening in the plate 39 which gives bearing to the fan shaft 15. This fan shaft upon its inner portion has a gear formed as indicated at 40, this gear meshing with the idlers 38. The inner end of the shaft 15 is provided with a hollow or depression into which extends the shaft 21, and between the end of the shaft 21 and the bottom of the depression formed in the shaft 15 there is a ball 41, which acts as a thrust bearing.

As before explained, the gear member 22 is carried upon the shaft 21. The gear member 36 is also mounted upon the shaft 21, but is not secured thereto. The shaft 21 is formed with a reduced portion, as indicated at 42, thereby forming a shoulder upon which hub 35 of the gear member 36 rests.

The operation of the gearing elements which have just been explained, is as follows:

Operation of either gear member 24 or 25 causes rotation of the gear member 22 in the same direction. The movement of the gear member 22 causes the idlers 31, 32 and 33 to be turned, thereby imparting turning movement to the gear member 36, which in turn imparts movement to the idler gears 38, and they in turn impart movement to the fan shaft 15.

Obviously the ratio of the various gears with respect to their stepping up of the speed from the driving shaft 16 to the fan shaft 15 may be varied within considerable limits, and in the instance shown, the speed relationship between the driving shaft and the fan is as 1 to 34.5. The average speed of the driving shaft as it is moved in the operation of the device is about ninety revolutions per minute. Therefore the speed of rotation of the fan shaft is about three thousand one hundred revolutions per minute.

This rapid rotation of the fan shaft is accomplished by virtue of the particular and convenient form of gearing which is shown, and the resultant effects of operating the fan at such a high speed is to move considerable quantities of air through the device, and therefore make it exceedingly effective in cleaning the surface over which it is passed. The speed attained by the fan shaft very closely approximates that which is obtained in similar types of machines in which the suction fan is motor driven, and therefore the efficiency with respect to the cleaning ability of the device herein shown is substantially the same as that of the motor driven cleaner.

The efficiency of the device, moreover, is maintained, due to the fact that a driving of the fan is secured upon both a forward push and a backward pull of the device as it is being operated over a surface to be cleaned, and if the operation of the device

be substantially continuous, the operation of the fan is substantially continuous as in the motor driven type of device.

Having described my invention, what I claim is:

1. The combination of a driving member, a gear member having a bevel gear portion formed thereon, and having an internal gear formed thereon, a bevel gear carried upon the driving member and meshing with the bevel gear portion of the first gear member, a second gear member having a hub portion formed with gear teeth thereon, idler gear members engaging with the internal gear of the first gear member said idler gear members also engaging with the gear teeth on the hub of the second gear member, said second gear member being formed with an internal gear, a driven shaft having a gear with teeth thereon, and idler members engaging with the internal gear of the second gear member and also engaging with the teeth on the driven shaft.

2. The combination of a driving shaft, a supporting shaft extending at right angles to the driving shaft, a first gear member upon said supporting shaft, driving connections between the first gear member and the driving shaft, a second gear member mounted upon the supporting shaft, driving connections between the first gear member and the second gear member, a driven shaft having a recessed portion which receives the end of the supporting shaft, and driving connections between the second gear member and the driven shaft.

3. The combination of a driving shaft, a supporting shaft extending at right angles to the driving shaft, a first gear member upon the supporting shaft, a bevel gear operatively connected with the first gear member, a beveled gear carried by the driving shaft and engaging with the bevel gear connected with the first gear member, said first gear member having a flange with gear teeth formed upon the interior surface thereof, said supporting shaft having a reduced portion, a second gear member supported upon the reduced portion of the supporting shaft, said second gear member being provided with an externally toothed portion, idler gears forming a driving connection between the internal gear teeth of the first driving member and the external teeth of the second driving member said second driving member having a flange with teeth formed upon the inner surface thereof, a driven shaft provided with a recessed portion, said recessed portion engaging the end of the supporting shaft, means in which the driven shaft is journaled, a gear associated with the driven shaft, idler gear members forming a driving connection between the internal gear teeth of the second gear member and the gear member connected with the driven shaft.

4. The combination of a casing, a support extending from an inner wall of said casing, a driving shaft supported in the side walls of the casing and in the said support, a supporting shaft having one end thereof journaled in said support, a first gear member having an external gear portion and an internal gear portion, means forming a driving connection between the external gear portion of the first gear member and the driving shaft, a second gear member having an external gear portion and an internal gear portion, means forming a driving connection between the internal portion of the first gear member and the external portion of the second gear member, a driven shaft having a recess in the end thereof said recess receiving an end of the supporting shaft, a gear operatively connected with the driven shaft, and means forming a driving connection between the said gear on the driven shaft and the internal gear of the second gear member.

5. The combination of a casing, a support extending from an inner wall of the casing, a driving shaft supported in the wall of the casing and said supporting member, a supporting shaft journaled in one end of said support, a first gear member having an external gear portion and an internal gear portion, a gear carried upon the driving shaft engaging with the external gear portion of the first gear member, a partition formed in said casing, said partition having a central opening, a second gear member having an external gear portion which extends through the opening in the partition, idler gears mounted upon said partition said idler gears forming a driving connection between the internal gear portion of the first member and the external portion of the second gear member said second gear member having an internal geared portion, a cover for the casing, said cover having an opening, a driven shaft journaled in said opening, a gear operatively connected with the driven shaft, idler gears carried by the cover and forming a driving connection between the internal gear portion of the second gear member and the said driven shaft, the said driven shaft being provided with a recessed portion which receives an end of the supporting shaft.

In testimony whereof, I hereunto affix my signature.

FRANK B. RAE.