C. A. FISCHER.

END PLAY DEVICE.

APPLICATION FILED OCT. 14, 1911.

**1,023,245.** Patented Apr. 16, 1912.

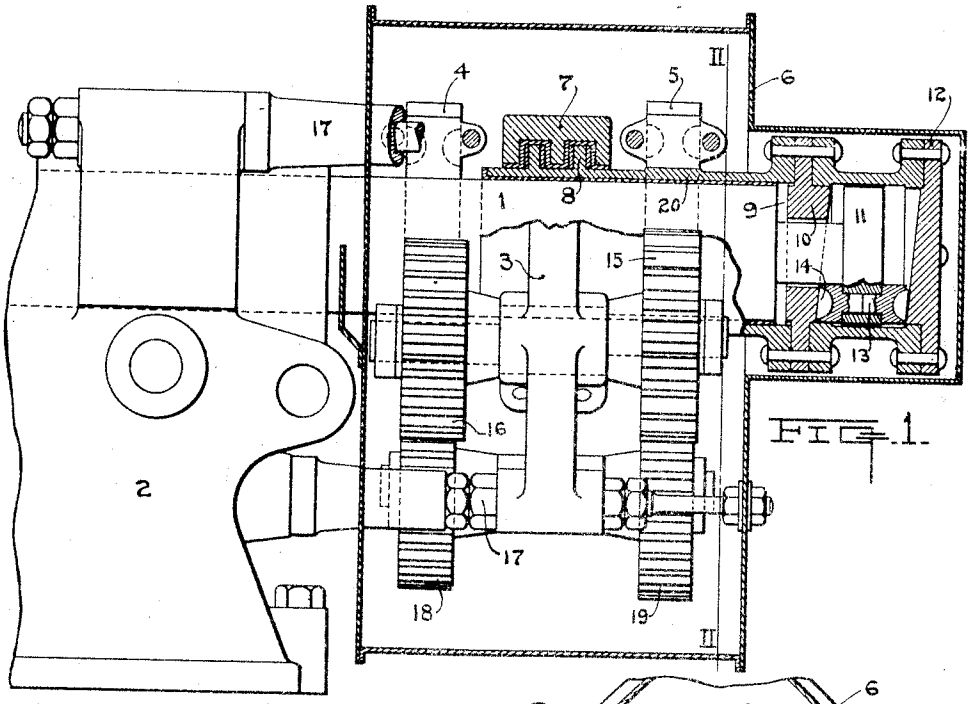



FIG. 1.

FIG. 2.

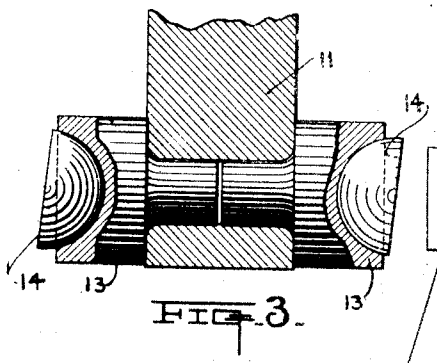
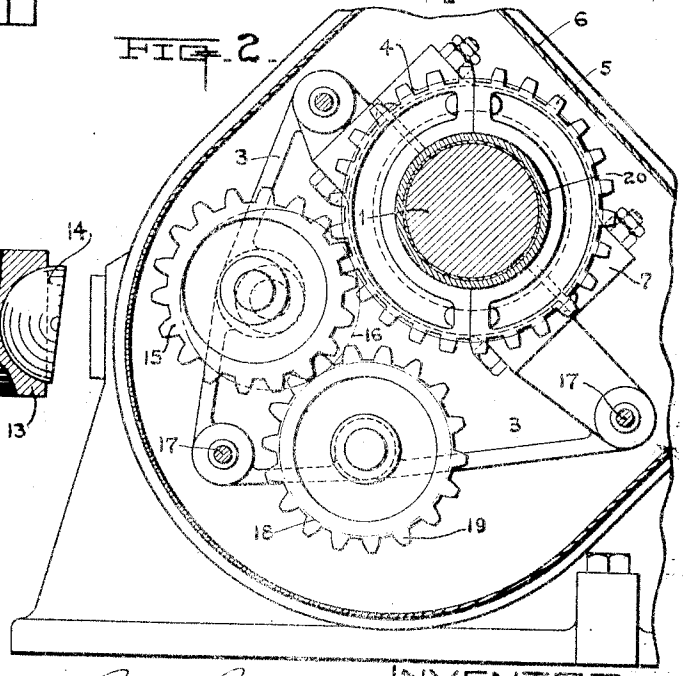



FIG. 3.




WITNESSES-

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# UNITED STATES PATENT OFFICE.

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## END-PLAY DEVICE.

1,023,245. Specification of Letters Patent. Patented Apr. 16, 1912.

Application filed October 14, 1911. Serial No. 654,719.

*To all whom it may concern:*

Be it known that I, CHARLES A. FISCHER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in End-Play Devices, of which the following is a specification.

This invention relates to improvements in the construction of end-play devices for imparting end motion to rotating shafts, and is particularly applicable to the shafts of crushing rolls, dynamos or like apparatus.

The object of the invention is to provide a means for imparting end play or motion to a rotating shaft, which is simple in construction and efficient in operation.

In the use of end play devices on the shafts of crushing rolls, it is not desirable to have the relative reciprocation between the rolls occur at frequent intervals, the desired rate of relative reciprocation being approximately once in twenty minutes for ordinary classes of work.

With this requirement as a basis, it is the object of the present invention to provide an end play device or means for shifting the shaft, which will give a very slow lateral reciprocation to a rotating shaft.

A clear conception of an embodiment of the invention can be had by referring to the drawing accompanying and forming part of this specification, in which like reference characters designate the same or similar parts in the various views.

Figure 1 is a central vertical section through an end play device showing same applied to a fragment of the frame. Fig. 2 is a transverse vertical section through an end play device, the inclosing casing thereof being partly broken away. Fig. 3 is an enlarged side view, partly in section, of part of the mechanism forming the means for imparting reciprocating motion to a shaft.

The shaft 1, which may be that of either a dynamo, crushing roll, or other similar machine, is supported in bearings formed in the frame 2, a fragment of which is shown. The gear 4 is fastened or secured directly to the shaft 1 and meshes with a gear 16 which is rotatably mounted on the overhanging end of a stationary countershaft projecting outwardly from the frame member 3. A second countershaft, which carries the gears 18, 19, fixed to it at either of its ends, is adapted for rotation within the frame member 3. The gear 18 at one end of the second countershaft meshes with the gear 16, while the gear 19 at the opposite end of the second countershaft meshes with a gear 15 which is free to rotate upon a stationary countershaft projecting outwardly from the frame 3. The sleeve 20 surrounds the end of the shaft 1 and is prevented from displacement longitudinally of the sleeve axis by means of outwardly projecting thrust collars 8 formed integral with and projecting outwardly from the sleeve 20. The thrust collars 8 coact in corresponding circular grooves formed in the frame member 3 and cap 7. The gear 5 which is secured to the sleeve 20, meshes with the gear 15 which gear 15 is adapted to rotate on the stationary countershaft which projects from the frame 3. The frame 3 is stationarily supported by means of standards 17 which project away from the frame 2. The casing 6, which is formed of sheet metal, is also supported by the standards 17 and incloses the mechanism carried by the end of the shaft 1.

It should be noted that the construction of the various gears should be such that the gear 4 contains a greater number of teeth than the gear 5. The gear 16 should contain less teeth than the gear 15, while the gear 18 also should contain less teeth than the gear 19, the pitch of all these gears, however, being the same. It should also be noted that the gear 16 is of somewhat greater width than the gears 4, 18. The relative number of teeth of the various gears is, however, dependent upon the relative motion desired between the shaft and frame and will vary for different classes of apparatus.

The shaft 1 has a circular groove or recess formed therein some distance short of its end, thus providing an enlarged portion 11 which projects outwardly in the form of a circular flange. A two-piece disk 10 projects inwardly into the groove or recess formed in the shaft 1 and is secured to the sleeve 20. One of the surfaces of the disk 10 is formed perpendicular to the axis of the sleeve 20 and shaft 1 and is adapted to coact against an end surface of the shaft 1. The opposite surface of the disk 10 is formed at an angle to the axis of the shaft and sleeve and approaches the enlarged portion 11 at one side thereof, see Fig. 1. The disk 12 which incloses the outer sleeve 20, also has an angular surface formed on its side adja-

cent the end of the shaft 1, this angular surface being parallel to the angular surface of the disk 10.

Cylindrical blocks or members 13 are formed with stub ends which coact in a hole formed through the flange portion 11. The outer extremities of the members 13 are provided with semispherical recesses in which the buttons or hemispheres 14 coact, see Fig. 3. The outer plane surfaces of the hemispheres 14 coact with the parallel inclined surfaces formed on the disks 10, 12. The longitudinal distances between corresponding points on the plane surfaces of the hemispheres 14 are approximately equal to the corresponding distances between corresponding points on the angular surfaces of the disks 10, 12, there being just sufficient play to permit free sliding between the contacting elements.

The chamber inclosed within the sleeve by the disk 12 is adapted to be filled with oil. The lower portion of the inclosing casing 6 is also adapted to contain oil thereby furnishing lubrication for all running parts through the medium of the revolving gears which act as pumps for elevating the oil to the various running parts.

During the operation of the device the main shaft 1 is rotated by any suitable means not shown. The rotation of the shaft 1 is transmitted through the gear 4 to the gear 16, from the gear 16 through the gear 8 and countershaft to the gear 19, from which the motion is further transmitted through the gear 15 to the sleeve 20 through the gear 5. The proportioning of the number of teeth of the various gears is such that there will be a slight difference in the relative numbers of revolutions made by the shaft 1 and sleeve 20, and a slight relative angular advancement between the parts for one revolution. This proportioning of the number of teeth in the gears for crushing rolls might, for example, be such that during twenty-one hundred revolutions of the sleeve 20, the shaft would make two thousand and ninety nine revolutions or vice versa. As the shaft 1 and sleeve 20 shift angularly relative to each other, it will be noted that the hemispheres 14 and blocks 13 which are carried by the shaft 1 will change their relative positions along the angular surfaces formed on the disks 10, 12 of the sleeve 20. This changing of the relative position of the hemispheres 14 causes the shaft 1 to move longitudinally within the sleeve 20 and relative to the frame 2. In the position shown, see Fig. 1, the shaft 1 is to the extreme left position of its travel. As the hemispheres 14 approach the upper portions of the angular surfaces in the position of the elements as shown in Fig. 1, the shaft 1 approaches a position to the extreme right within the sleeve 20. During the angular shifting of the shaft 1 within the sleeve 20, the member 13 adjacent the disk 10 rolls upon the portion of the shaft 1 having smallest diameter and also upon the adjacent cylindrical surface formed on the interior of the sleeve 20. The member 13 adjacent the disk 12 rolls upon the cylindrical surface formed on the interior of the sleeve 20. Since the hemispheres 14 which connect the members 13 with the parallel angular surfaces, have spherical bearings, they can adjust themselves to any angular position which they may be called upon to take due to the angular advance of either of the members.

It will be noted that by proper proportioning of the driving gears between the shaft 1 and sleeve 20, the rate of reciprocation of the shaft 1 within the sleeve 20 can be varied to any desired degree. Since the sleeve 20 is locked against longitudinal movement by the thrust collars 8 co-acting within the member 3, the motion of the shaft 1 must be relative to the frame 2, thus giving the members carried by the shaft a reciprocating motion in addition to the rotary motion thereof.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent,—

1. In an end play device, a rotary shaft, a sleeve adjacent said shaft, means for rotating said sleeve at a different speed from that of said shaft, means for preventing axial displacement of said sleeve, and means between said shaft and said sleeve and co-acting with said means for rotating said sleeve to move said shaft longitudinally relative to said sleeve.

2. In an end play device, a rotary shaft, a sleeve around said shaft, means for rotating said sleeve with said shaft and at a different speed, means for preventing axial displacement of said sleeve, and means between said shaft and said sleeve and coacting with said means for rotating said sleeve to reciprocate said shaft within said sleeve.

3. In an end play device, a rotary shaft member, a sleeve member around said shaft member, one of said members having a cam surface formed thereon, means for rotating said members at different relative speeds, means for preventing axial displacement of one of said members, and means between said members and coacting with said cam surface and with said means for rotating said members to reciprocate one of the members relative to the other.

4. In an end play device, a rotary shaft member, an abutment member adjacent said shaft member, one of said members having

a plane surface inclined relative to the axis of said shaft member and located opposite an end surface of the other of said members, means for rotating said members at different relative speeds, means for preventing axial displacement of one of said members, means between said opposed surfaces for spacing said members, said spacing means including a spherical segment the plane surface of said spherical segment being slidable on said inclined surface, and means for axially moving one of said members so as to cause said spacing means to maintain contact with said opposed surfaces.

5. In an end play device, a rotary shaft member, an abutment member adjacent said shaft member, one of said members having a plane surface inclined relative to the axis of said shaft member and located opposite an end surface of the other of said members, means for rotating said members at different relative speeds, means for preventing axial displacement of one of said members, means for spacing said members, said spacing means comprising a spherical segment, the plane surface of said segment being slidable on said inclined surface, a member rotatable on an axis eccentric to said shaft axis and recessed for coaction with the spherical surface of said segment, and means for axially moving one of said first members so as to cause said spacing means to maintain contact with said opposed surfaces.

In testimony whereof, the signature of the inventor is affixed hereto in the presence of two witnesses.

CHAS. A. FISCHER.

Witnesses:
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