T. H. PHILLIPS, Jr.

AUTOMATIC REVERSING MECHANISM.

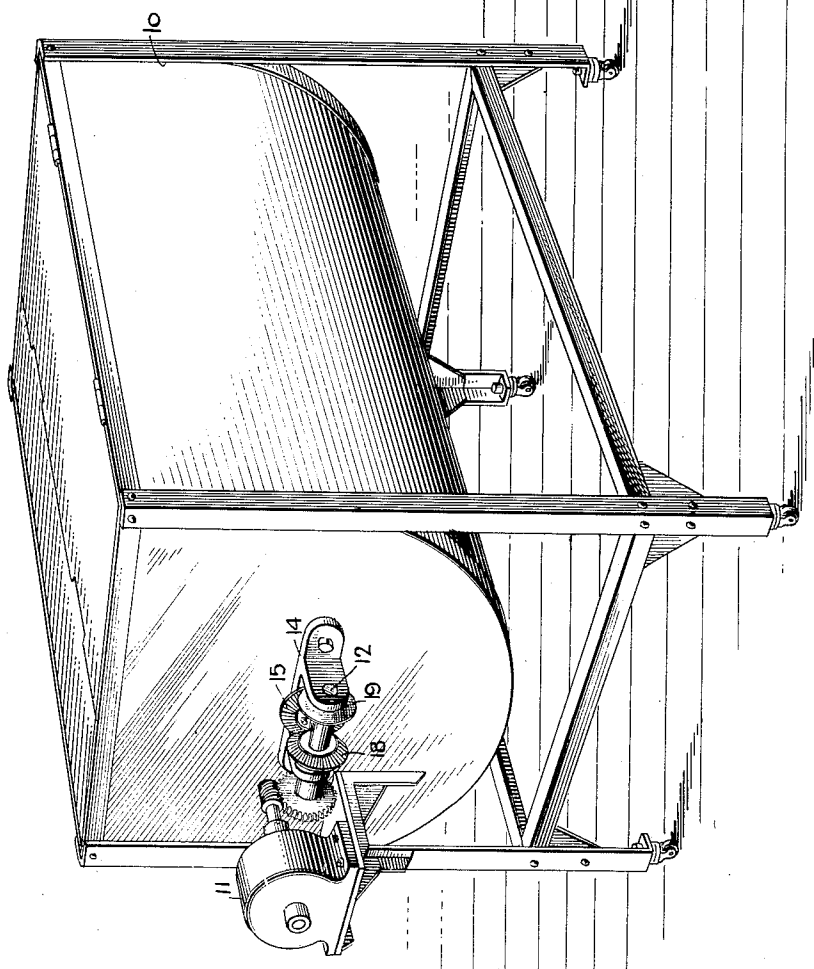
APPLICATION FILED DEC. 13, 1912.

1,077,748.

Patented Nov. 4, 1913.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

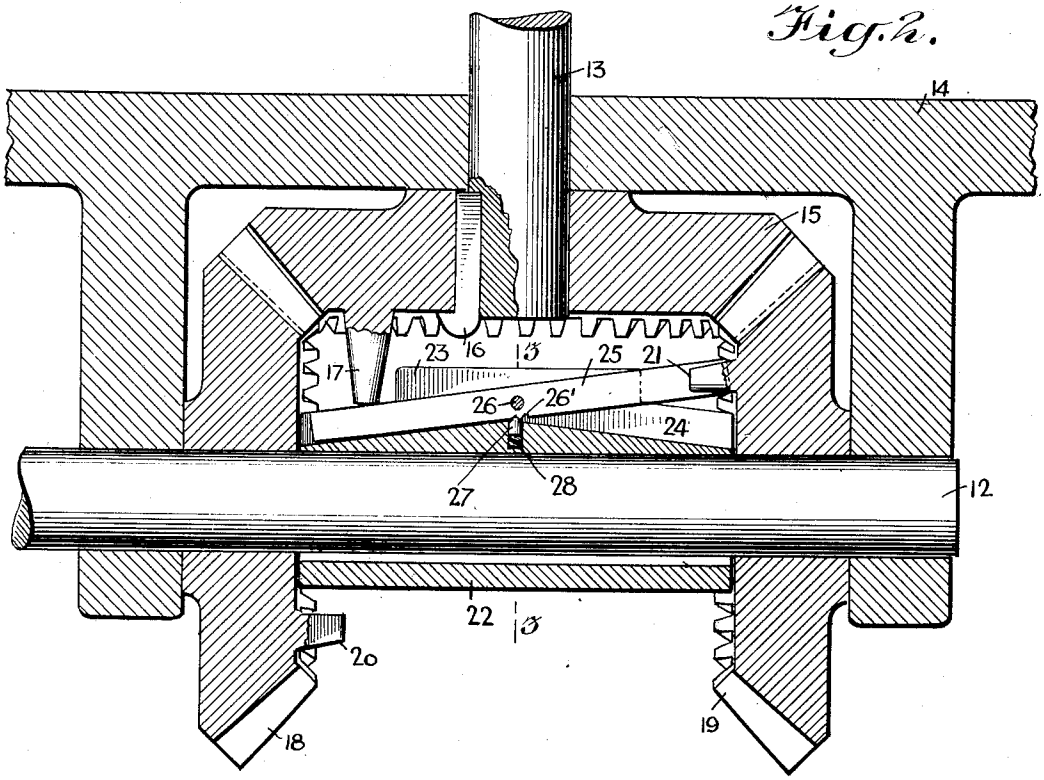


Fig. 3.

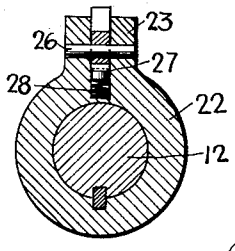


Fig. 4.

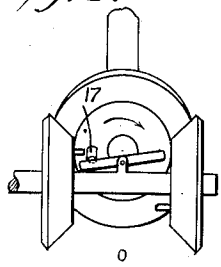


Fig. 5.

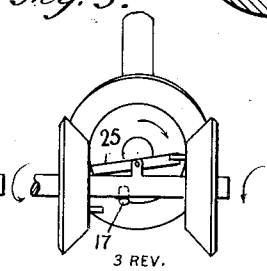


Fig. 6.

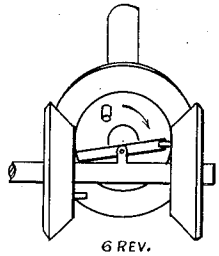
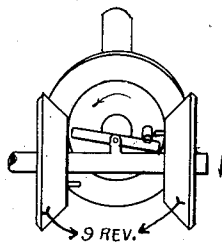


Fig. 7.



WITNESSES

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AUTOMATIC REVERSING MECHANISM.

1,077,748. Specification of Letters Patent. Patented Nov. 4, 1913.

Application filed December 13, 1912. Serial No. 736,516.

To all whom it may concern:

Be it known that I, THOMAS HENLEY PHILLIPS, Jr., a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Automatic Reversing Mechanism, of which the following is a full, clear, and exact description.

The object of the invention is to provide an inexpensive, simple and durable automatic reversing mechanism which will reverse the direction of rotation of a driven shaft, and means carried by the shaft every predetermined number of revolutions or with a fraction thereof.

I obtain the above-outlined object by providing a driving shaft, a driven shaft, and transmission means connecting the shafts, whereby the driven shaft is reversed, and in which the reversing of the driven shaft at a predetermined number of revolutions is obtained by the relative ratio of the diameters of the transmission means on the shafts and any desired number of revolutions with a fraction thereof within this maximum by the relative displacement of the transmission means.

Reference is to be had to the accompanying drawings forming a part of this specification, in which the same characters of reference indicate the same parts in all the views.

Figure 1 is a perspective view of a washing machine embodying my invention; Fig. 2 is a horizontal central section through the device; Fig. 3 is a section on the line 3—3 of Fig. 2; Fig. 4 is a diagrammatic view showing the position of the reversing pin at the moment of reversing; Fig. 5 is similarly a diagrammatic view showing the position of the reversing pin after three revolutions of the driving shaft; Fig. 6 is a similar view showing the relative position of the reversing pin and the driving lever after six revolutions of the driving shaft; and Fig. 7 is a diagrammatic view showing the mechanism at the moment of reversion after nine revolutions of the driving shaft.

Referring to the drawings, 10 represents a washing machine of a well-known type driven by an electric motor 11 attached to the side of the machine. By means of the motor the main driving shaft 12 is driven, from which the washing drum of the washing machine, not shown in the drawing, is driven. The drum is positioned on the shaft 13 which receives its rotating motion through the medium of beveled gears provided on the main shaft 12 and the shaft 13. The driven shaft 13 projects through a bracket 14 constituting the frame of the reversing mechanism and attached to the side of the washing machine. The end of the shaft 13 projecting into the frame 14 is provided with a beveled gear 15 rigidly secured thereto by a key 16 or in any other suitable way. The face of the gear 15 below the toothed surface is provided with a projection 17, the purpose of which will appear hereinafter.

The driving shaft 12 bearing also in the brackets of the frame 14 is provided with two equal loosely-mounted beveled gears 18 and 19 meshing with the gear 15. The beveled gears 18 and 19 are similarly provided on their faces below the toothed surface with projections 20 and 21, respectively. One side of projections 20 and 21 is flattened and with this flattened portion the driving member comes in engagement. The purpose of this will appear hereinafter. Intermediate the beveled gears 18 and 19 and rigidly secured to the shaft by means of a key or in any other suitable way is a support or sleeve 22. The sleeve 22 is provided with a projection 23 extending longitudinally of the sleeve, but the length of it being such as to clear the projection 17 of the beveled gear 15 when said gear 15 is rotating. A slot 24 is also provided in the sleeve 22 central with the projection 23 and extending through the entire length of the sleeve, as best seen in Fig. 2. The bottom of the slot 24 converges toward the center portion of the sleeve. A lever 25 is centrally and pivotally mounted in the slot 23 by means of a pivot 26 projecting through the sleeve and constituting the pivot. The bevel of the converging bottom of the sleeve 22 is such that when the lever 25 is placed about its pivot 26 the lower surface of the lever at one side is contacting with the beveled bottom through the entire length of this beveled portion of the bottom of the slot 24. As the shaft 12 rotates, the sleeve 22 is carried by the shaft 12, and, as shown in Fig. 2, the lever 25 engages the projection 21 on the beveled gear 19, and therefore carries it with it, the lever 25 being snugly fitted in the groove sidewise, and the groove extending nearly to the end of the

member 25 reduces the bending moment of same to a minimum. During the rotation of the sleeve 22 it rotates the beveled gear 19, as above stated, by means of the lever 25 contacting with the flattened portion of the projection 21 on the gear 19, thus, the lever 25 being the driving lever. In consequence of the rotation of the gear 19 the gear 15 rotates as meshing with the gear 19, and the projection 17 is therefore rotating about its axis, and after a certain number of revolutions the projection 17 comes in contact with the end of the driving lever 25, which acts on the projection 21 on the beveled gear 19, and during a certain part of its revolution it forces the lever 25 into the adjacent end of the groove 24, thereby forcing the opposite end of the driving lever 25 out from the groove. Thereby the driven shaft 13 becomes stationary while the driving shaft 12 continues to rotate until the sleeve 22 with the driving lever 25 comes in contact with the projection 20 on the beveled gear 18 and rotates the same. The rotation of the beveled gear 18 rotates the beveled gear 15 in a direction opposite of the gear 19, and again until the projection or shifter 17 comes in contact with the end of the lever 25 and forces it back again into the groove, etc. The action of the shifter 17 on the lever 25 begins always below or above the central axis, that is, the contact begins above or below the axis and terminates substantially on a central line.

To maintain the lever 25 positively in contact with the projections 20 and 21, respectively, and prevent any tendency of the driving lever 25 to disengage from these projections without the action of the shifter 17, and thereby engage the two projections simultaneously, a notch 26′ is provided at each side of the center on the lower surface of the lever 25. Engaging the notches 26 is a plunger 27 positioned in a hole formed in the bottom of the sleeve and central with the pivot of the driving lever. A spring 28 is positioned in the hole below the plunger so as to normally force the plunger against the lever 25. It can be easily seen that when the driving lever is displaced in either one or the other direction, either of the notches engages the plunger 28 positioned on the sleeve 22. It can be easily seen that by varying the pitch diameter of the gears 15 and 18 and 19 the number of revolutions before the shaft 13 will reverse can be varied, and not only after a complete number of revolutions can this reverse be obtained but with addition of any desired fraction of a revolution. The relation of the projections 20 and 21 on the beveled gears 18 and 19 can be made relatively such that, when the shaft 13 is to be reversed the distance the driving lever 25 will have to travel before it reaches the opposite projection will be as much as a complete revolution, thereby it will give sufficient time for the rotating mass positioned on the shaft 13 to reduce its momentum before it is reversed. This is very important, as it will prolong the life of the mechanism.

In Figs. 4 to 7 are shown different positions of the shifter 17 during the revolutions before it is reversed, and the position of the driving lever during those revolutions. The position of the shifter 17 is shown when the driving lever 25 is in horizontal position, lying on the side toward the beveled gear 15.

From Figs. 4 to 7 it can be seen that within the fixed ratio of the diameter of the gears the number of revolutions before the driven member reverses can be reduced by one or more revolutions by turning one of the loose beveled gears through a predetermined angle in reference to the other loose beveled gear. For example, as indicated in Fig. 4, the driving shaft makes 9 revolutions while the driven makes 7½ and the loose gears 8½ revolutions, half of a revolution being lost due to the relative position of the projections 20 and 21. This allows the reduction of momentum of the mass carried by the driven shaft, as before described. The ratio of the gears, for example, being 9/8, that is, the loose gears having 24 teeth each and the fixed one 27, from the above it follows that for every nine revolutions of the driving shaft the shifter 17 will displace the driving lever 25 once. By dividing one of the loose beveled gears into eight equal parts, taking as a point of reference the projection on the gear, every part will contain three teeth. For example, by disengaging the left loose gear and turning the same through ⅜ of its circumference, that is, through three teeth, while the other gears remain unmoved and then engaging again with it the shifter 17 of the fixed gear will come in contact with the driving lever one revolution of the driving shaft sooner. That is, after every eight revolutions of the driving shaft reverses of the driven shaft will take place, that is to say, the reverse will take every 6½ revolutions of the driven shaft. By turning same through 4/8 of its circumference in the same direction the reverse will take place every four revolutions of the driving shaft or 3½ of the driven shaft. One revolution of the driving shaft is lowest between 7 revolutions of the driven shaft and 5 revolutions, due to the position of the projections 20 and 21 of the loose beveled gears. In this case there is more time for the reduction of the momentum, as previously described. By turning the left wheel in the direction stated through ⅜ of its circumference the reverse will take place

for every single revolution of the driving shaft or every half revolution of the driven shaft.

While my reversing device is principally intended for washing machines, it can be easily seen that it can be used for any other machine that requires a reversing mechanism for every predetermined number of revolutions or with fractions thereof.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A device of the class described, comprising a driving shaft, a driven shaft, transmission means from the driving shaft to said driven shaft, said transmission means including means to cause the reverse of said driven shaft at a predetermined number of revolutions, which number can be varied by changing the relation of said transmission means.

2. A device of the class described comprising a driving shaft, a driven shaft, a pair of facing bevel gears loosely mounted on said driving shaft, a bevel gear meshing with said facing gears and rigidly secured to said driven shaft, a sleeve on the shaft intermediate said facing gears and rigidly secured to said driving shaft, a driving member on said sleeve adapted to engage said facing gears, and means on said rigidly secured bevel gear for causing said member on said sleeve to engage alternately each of said facing gears after a predetermined number of revolutions.

3. A device of the class described comprising a driving shaft, a driven shaft, a pair of facing bevel gears loosely mounted on one of the shafts, a bevel gear meshing with said facing gears and rigidly secured to the other shaft, a sleeve on the shaft intermediate said facing gears and rigidly secured to said shaft, a pivoted member on said sleeve, and means on said bevel gear meshing with said facing gears for causing said member on said sleeve to engage alternately each of said facing gears after a number of predetermined revolutions.

4. A device of the class described comprising a driving shaft, a driven shaft, a pair of facing bevel gears loosely mounted on said driving shaft, a bevel gear meshing with both of said facing gears and rigidly secured to said driven shaft, a member on said driving shaft rigidly secured thereto intermediate said facing gears and having means for engaging said facing gears, and shifting means on said rigidly secured bevel gear whereby said means on said member are made to engage alternately each of said facing gears after a predetermined number of revolutions of said rigidly secured bevel gear, the number of revolutions of said secured gear being controlled by the ratio of the pitch diameters of said facing and secured gears.

5. A device of the class described comprising a driving shaft, a driven shaft, a pair of oppositely rotating members on one shaft, a member intermediate said oppositely rotating members rigidly secured to said shaft and having means for alternate engagement with said oppositely rotating members, and a driven member rigidly secured to the other shaft engaging both of said oppositely rotating members and having shifting means coöperating with said means on said secured member, whereby said oppositely rotating members are made to become alternately driving members.

6. A device of the class described comprising a driving shaft, a driven shaft, a bevel gear rigidly secured to said driven shaft, a pair of facing driving bevel gears meshing with the above said gear, said facing gears being loosely mounted on said driving shaft, a sleeve rigidly secured to said driving shaft intermediate said facing gears, said sleeve having a longitudinal projection on the lateral surface thereof and a lateral longitudinal groove extending to the ends of said sleeve and central with said projection, a driving lever pivotally mounted in said groove and normally having one end projecting out of said groove and out of said projection, means in said lever and said sleeve to maintain said lever in normal position, said facing gears having means for engaging alternately the ends of said driving lever, said rigidly secured bevel gear having shifting means projecting toward said sleeve and adapted to contact with the projecting end of said driving lever after a predetermined number of revolutions of said gear and thereby forcing said lever into the said groove of said sleeve and thereby forcing the opposite end of said lever out of said groove, causing the same to engage the adjacent facing gear to cause the reverse of the driven shaft.

7. A device of the class described comprising a driving shaft, a driven shaft, a pair of facing bevel gears loosely mounted on one of said shafts, a bevel gear meshing with said facing gears and rigidly secured to the other of said shafts, a sleeve rigidly secured to the shaft carrying said loosely mounted gears, a member on said sleeve, and means on said rigidly secured bevel gear for causing said member on said sleeve to engage alternately each of said facing gears after a predetermined number of revolutions.

8. A device of the class described comprising, a driven shaft; a pair of oppositely rotating members loosely mounted on one of said shafts; a member rigidly secured to the other of said shafts engaging both of said oppositely rotating members; means inter-

mediate said oppositely rotating members and secured to said shaft on which said oppositely rotating members are loosely mounted; all of said members having means for coöperating with said secured means whereby the reverse of said driven shaft is made after a predetermined number of revolutions of said shaft, which number may be varied by the relative position of said pair of oppositely rotating members with reference to the means thereon.

9. A device of the class described comprising, a driving shaft; a driven shaft; a bevel gear rigidly secured to said driven shaft; a pair of facing driving bevel gears meshing with the above said gear, said facing gears being loosely mounted on said driving shaft; a sleeve rigidly secured to said driving shaft intermediate said facing gears, said sleeve having a longitudinal projection on the lateral surface thereof and a lateral longitudinal groove extending to the ends of said sleeve and central with said projection; a driving lever pivotally mounted in said groove and normally having one end projecting out of said groove and out of said projection; means in said lever and said sleeve to maintain said lever in normal position, said facing gears having means for engaging alternately the ends of said driving lever, said rigidly secured bevel gear having shifting means projecting toward said sleeve and adapted to contact with the projecting end of said driving lever after a predetermined number of revolutions of said gear and thereby forcing said lever into the said groove of said sleeve and thereby forcing the opposite end of said lever out of said groove, causing the same to engage the adjacent facing gear to cause the reverse of the driven shaft, said number of revolutions of said rigidly secured bevel gear before it reverses being controlled by the relative position of said engaging means on said loosely mounted bevel gears with reference to said shifting means.

10. A device of the class described comprising a driving shaft; a driven shaft; transmission means from the driving shaft to the driven shaft; a support rigidly secured to said driving shaft; and means on said support coacting with said transmission means whereby said driven shaft is made to reverse at a predetermined number of revolutions, which number can be varied by changing the relation of said transmission means.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS HENLEY PHILLIPS, JR.

Witnesses:

BENEDICT JOFFE,

PHILIP D. ROLLHAUS.