April 29, 1924.

1,492,242

F. W. CARPENTER

WASHING MACHINE

Filed Aug. 7, 1922

3 Sheets-Sheet 1

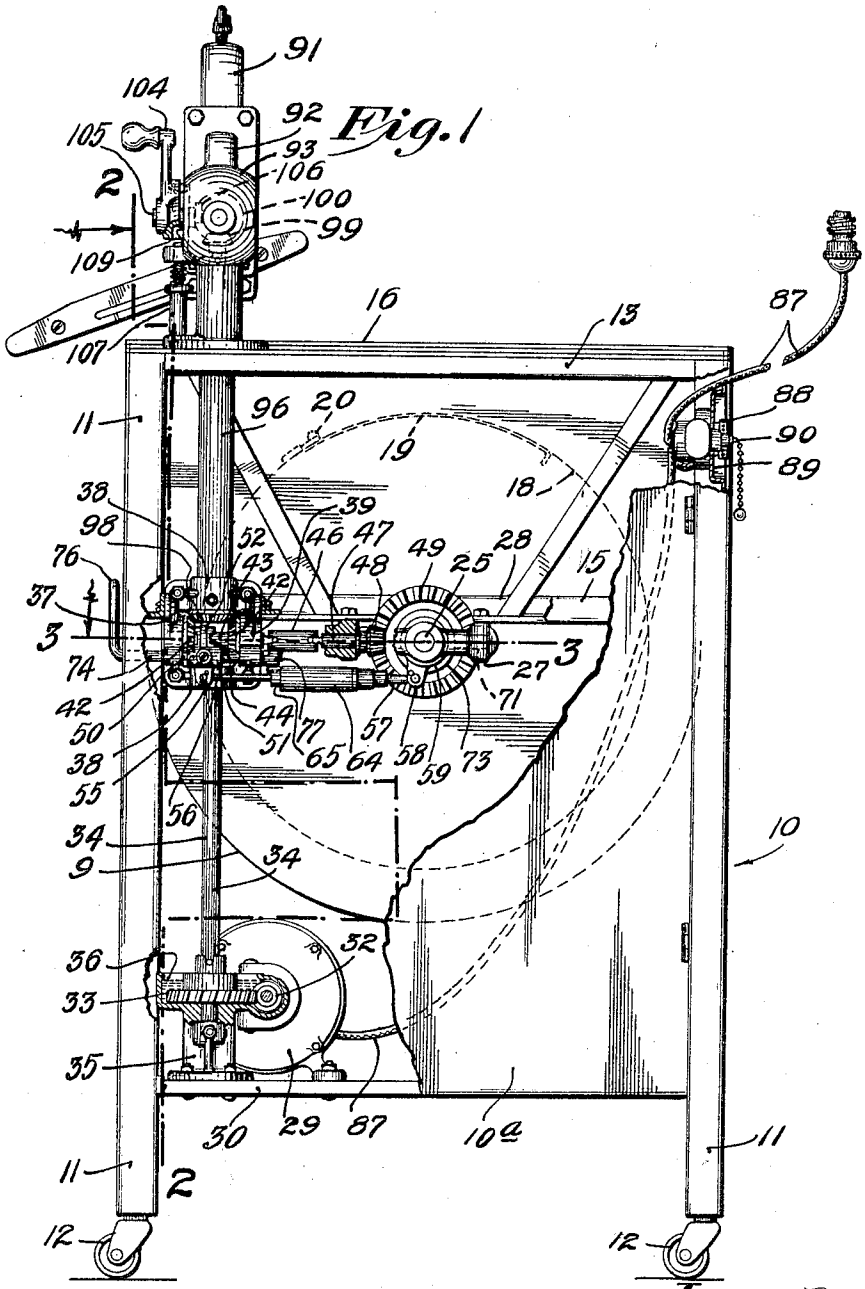

Fig. 1

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Fig. 2

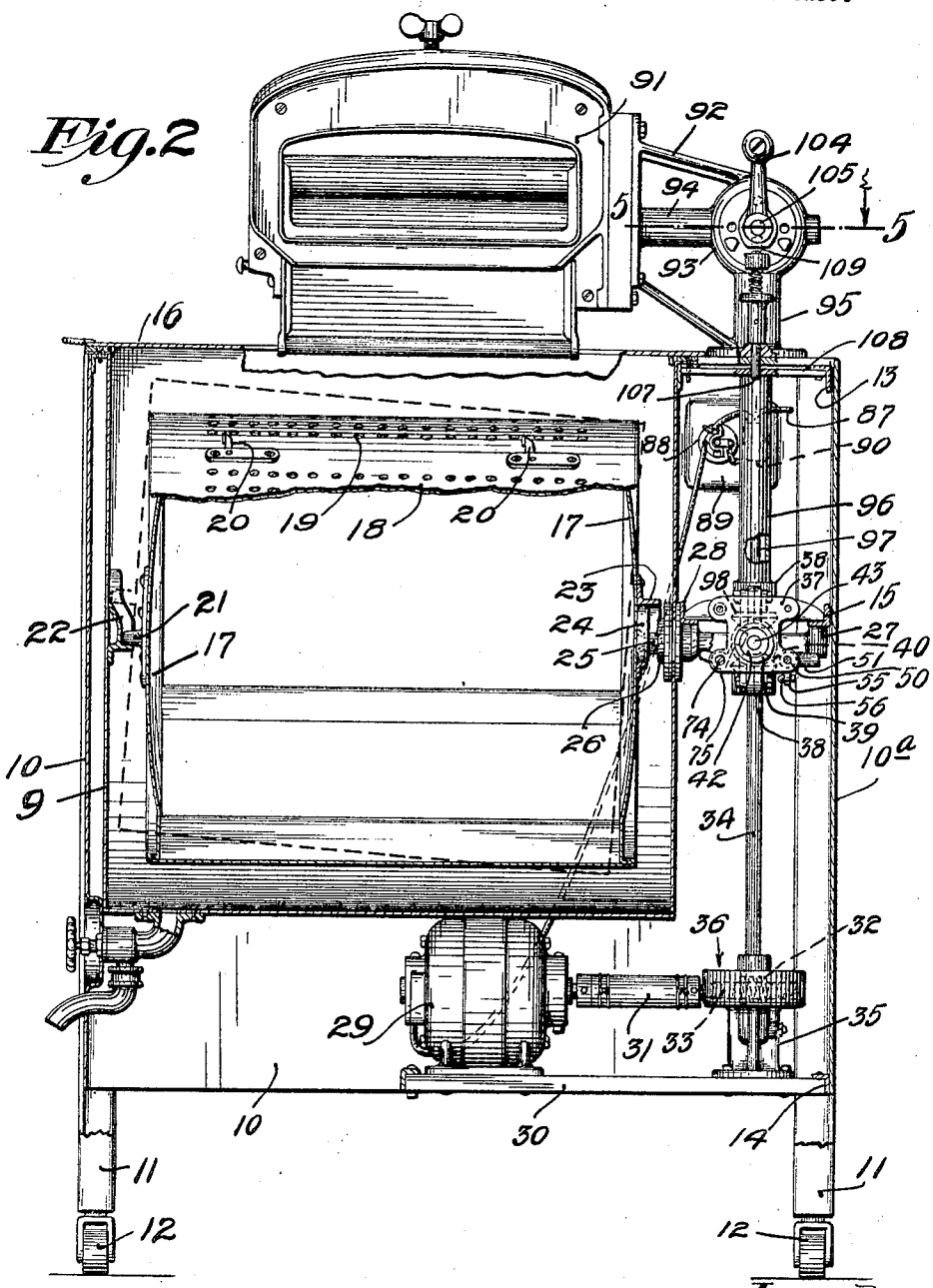

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Fig.3

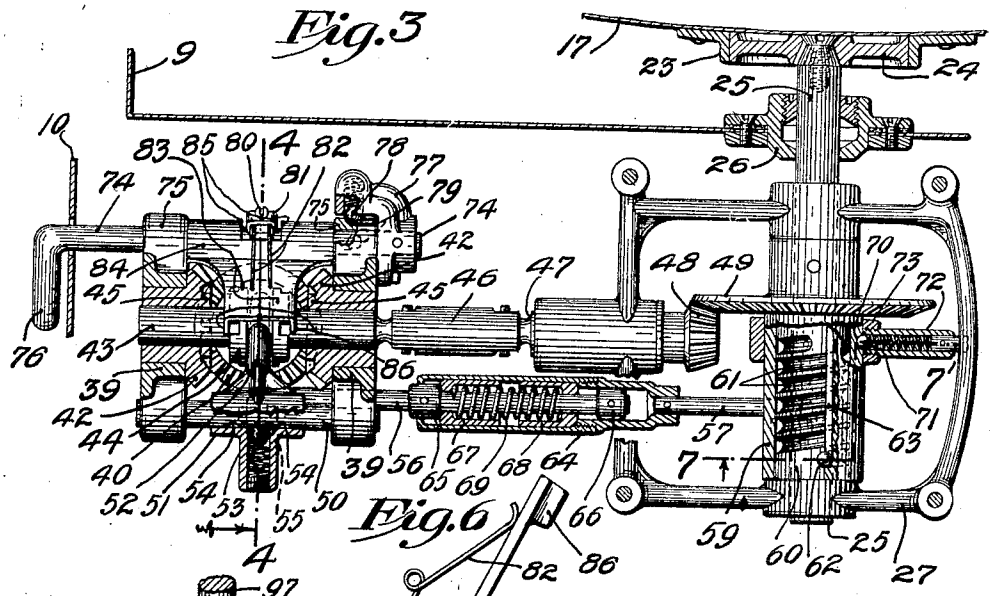


Fig.6

Fig.4

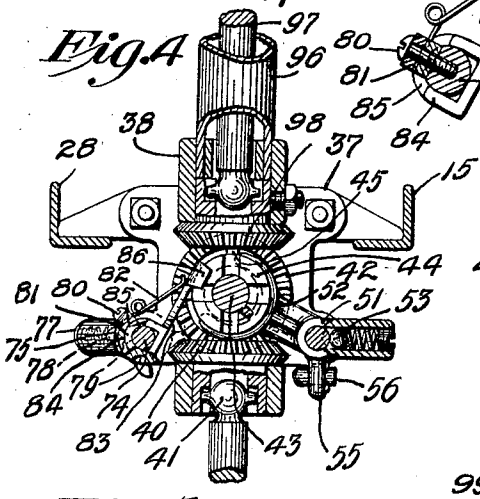


Fig.7

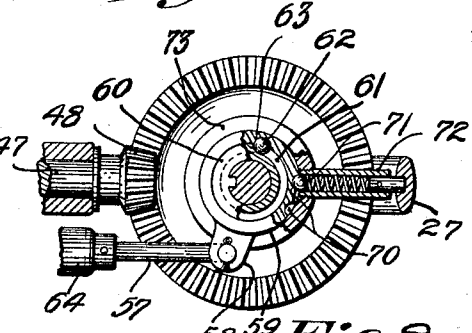


Fig.8

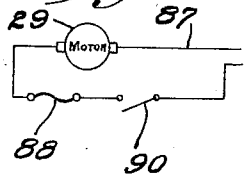
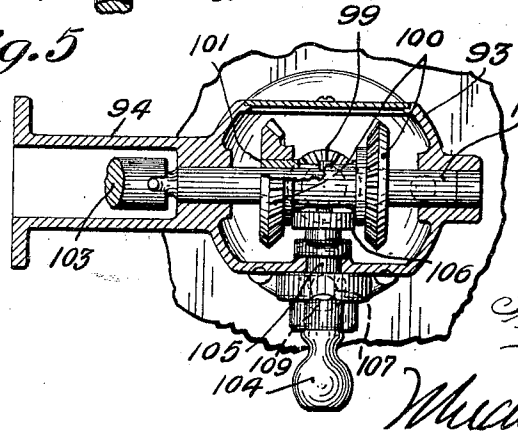


Fig.5



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Patented Apr. 29, 1924. 1,492,242

UNITED STATES PATENT OFFICE.

FRANCIS W. CARPENTER, OF ST. PAUL, MINNESOTA, ASSIGNOR TO PARAMOUNT MACHINE CO., OF ST. PAUL, MINNESOTA, A CORPORATION OF MINNESOTA.

WASHING MACHINE.

Application filed August 7, 1922. Serial No. 580,381.

To all whom it may concern:

Be it known that I, FRANCIS W. CARPENTER, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Washing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention is directed particularly to the provision of an improved washing machine of the type wherein a reversible motor drum is applied to work within a water tank, and the invention is directed chiefly to improved drum-driving mechanism operative to impart to the drum several rotations first in one direction and then in the other, and to perform certain other highly important functions, all as will hereinafter more fully appear. Generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The accompanying drawings illustrate my invention as incorporated in a commercial machine, the efficiency of which has been demonstrated in actual practice.

Referring to said drawings,

Fig. 1 is a right side elevation of the machine, some parts broken away and some parts sectioned;

Fig. 2 is a transverse vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal section taken substantially on the line 3—3 of Fig. 1, but with some parts shown in full;

Fig. 4 is a detail in vertical section on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal section taken approximately on the line 5—5 of Fig. 2, some parts being shown in full;

Fig. 6 is an enlarged detail in section showing elements of the so-called "neutral position clutch lock", shown in connection with other devices in Figs. 3 and 4:

Fig. 7 is a detail in section on the line 7—7 of Fig. 3; and

Fig. 8 is a diagrammatic view of the motor circuit.

For containing the water or suds, I preferably employ an approximately cylindrical tank 9 of sheet metal or other suitable material suitably connected at its upper edge to a casing or cabinet 10 which is also preferably of sheet metal and provided with a hinged side or door 10^a. This case or cabinet 10 is supported by corner posts 11 shown as mounted on caster wheels 12. The corner posts 11 are preferably cross-connected by upper tie-bars 13, lower tie-bars 14 and intermediate tie-bars 15, all of which parts are advisably of rolled steel. The tank is shown as provided with a removable cover 16.

Rotatably mounted within the tank 9 is a horizontally disposed drum, which may be of any suitable construction but is preferably of the construction and arrangement disclosed and claimed in my companion application filed of even date herewith, Serial Number 580,382, and entitled "Drum support and detachable driving connection for washing machines". As illustrated, this drum is made up of sheet metal heads 17 and a perforated cylinder 18, which latter has a hinged door section 19 adapted to be secured in closed position by pivoted lock levers 20, (see Figs. 1 and 2). One drum head 17 is provided with an axially projecting trunnion 21 that is detachably seated in the upwardly flaring open seat of a bearing 22 that is rigidly secured to the adjacent side of the tank. To the other head of said drum is rigidly secured an axially located triangular coupling flange 23, one of the three sides of which is made much more narrow than the other two sides. This triangular coupling flange 23 is detachably engaged with a triangular driving head 24 secured on the inner end of a short horizontal driving shaft 25 that extends through a stuffing box 26 in the adjacent side of the tank 9 and is journaled in bearings afforded by a rectangular bearing bracket 27. This bracket 27 is bolted or otherwise rigidly secured to one of the intermediate frame bars 15 and to an angular reinforcing bar 28 that is secured to the adjacent head of the tank 9 and thus forms a brace between the tank, the case and the framework.

When the shallow side of the triangular coupling flange 23 is turned downward as shown in Fig. 2, and the drum is tilted as indicated by dotted lines in that view, said flange 23 will clear the driving head 24 and the drum may then be lifted from working

position. This feature, however, constitutes no part of the present invention but is an important feature of my companion application above identified.

Drum-driving mechanism.

The power for driving the drum is preferably a small electric motor 29 suitably mounted on a shelf 30 secured to the framework of the machine. The rotor shaft of this motor is connected by a flexible shaft 31 to a worm 32 that runs in mesh with a worm gear 33 secured on the lower end of a vertical shaft 34. Said worm, worm gear and the lower end of said shaft are rotatably mounted in a bearing bracket 35 that is formed with an open oil-containing well 36, (see particularly Fig. 1), so that said parts run in the oil contained in said well. Here it may be further stated that the above arrangement of the oil well 36 permits the same to keep supplied with oil that will run down the shaft 34 from the other mechanism presently to be noted and to which the oil will be primarily applied. The above noted flexible shaft section 31 is preferably a section of rubber hose which will not only bend but will yield torsionally and thus afford a cushion to relieve the transmission mechanism shocks when the drum-driving motion is reversed in a manner presently to be described.

Bolted or otherwise rigidly secured to the intermediate frame bars 15, (see Figs. 3 and 4), is a gear housing or bearing bracket 37 which has vertically spaced bearing sleeves 38 and horizontally spaced bearing sleeves 39. Journaled in the lower bearing sleeve 38 is a bevel gear 40, with the depending hub of which the upper end of the driving shaft 34 is connected by a knuckle joint 41 afforded by diametrically projecting pins on said shaft and pin-engaging seats in said gear hub. The gear 40 runs constantly in mesh with reversely facing axially aligned bevel gears 42, the sleeve-like hubs of which are journaled in the horizontally spaced bearing sleeves 39 of the bracket 37. Said gears 42 will, of course, be simultaneously driven in reverse directions and are held against axial movements.

Extended axially through the gears 42 and journaled in the hubs thereof is a short horizontal shaft 43, and keyed to slide on but rotate with said shaft and located between the gears 42 is a double-ended sleeve-like clutch hub 44, which, when moved in either direction from its neutral position shown in Fig. 3, is engageable with one or the other of cooperating half-clutches 45 formed on the opposing faces of said two gears 42.

The shaft 43 is connected at one end by a flexible jointed shaft section 46 to one end of another short shaft 47 that is journaled in a bearing on the bracket 27 and is provided at its extended end with a bevel pinion 48. The bevel pinion 48 meshes with a bevel gear 49 located on the shaft 25 and pinned, keyed or otherwise secured to rotate therewith.

Clutch-reversing device.

As has already probably been premised, the rotation of the drum will be reversed by alternately engaging the clutch hub 44 first with one and then with the other of the opposing bevel gears 42. My invention provides a highly important novel clutch-reversing device which includes, as one of its most important novel features, a so-called "rotation timer". This rotation timer operates to determine the number of rotations that will be given to the drum by the reversals of the drum-driving action and, per se, it is of such novel construction that it is herein claimed broadly as a new mechanical motion.

As preferably designed and as embodied in the machine illustrated in the drawings, said clutch-reversing device including said rotation timer is constructed as follows: The numeral 50 indicates a guide rod secured in projections from the bearing sleeves 39 and extended parallel to the shaft 43. Mounted to slide on this rod is a shipper sleeve 51, which has a projecting fork 52 that works in an annular groove of the double-ended clutch hub 44. The sleeve 51 has a projection in which is mounted a spring-pressed latch-acting ball 53 that is engageable alternately with notches 54 in said rod 50. The sleeve 50 has a depending lug 55 into which is hooked one end of a thrust rod made up of rod sections 56 and 57 and certain other parts presently to be noted. The extended end of the rod section 57 is hooked into a depending lug 58 of an oscillatory sleeve 59. This sleeve 59 is journaled on an inner sleeve 60 that is secured to the drum-driving shaft 25 and is formed with large or well defined spiral thread 61 preferably cut with concave grooves to fit a clutch ball 62. The clutch ball 62 is held about one-half engaged with the thread grooves 61 and the other half engaged with a semi-cylindrical channel 63 cut in the interior of the sleeve 59 and extended transversely of the threads 61 and preferably parallel to the axis of said sleeve. The above noted parts 59, 60 and 62 constitute the main elements of the rotation timer and they will be further considered after having first completed the description of the preferred construction of the thrust rod 56—57.

The numeral 64 indicates a cylindrical casing rigidly secured at one end to the projecting end of the rod section 57. The

numerals 65 and 66 indicate stop collars or shoulders secured on the rod section 56 and working within the tube 64. The numerals 67 and 68 indicate reversely facing thimbles mounted on the rod section 56 between the collars 65 and 66. The numeral 69 indicates a coiled spring that surrounds the rod section 56 and is compressed between the thimbles 67 and 68.

For yieldingly holding the timer sleeve 59 in either one of its two extreme positions, I provide the same with notches or ball pockets 70 that are arranged to be engaged by a spring-pressed latch ball 71 mounted in a tubular projection 72 of a non-rotary collar 73 that is rigidly secured or anchored to the bracket 27

Neutral position clutch latch.

In the illustrated arrangement of this device, a short rock shaft 74 is mounted in suitable bearings 75 on the gear housing 37, (see Figs. 3 and 4). This rock shaft, at one end, has an operating crank or handle 76 and, at its other end, has a projecting arm 77 equipped with a spring-pressed retaining ball 78 that is engageable with approximately semi-spherical ball seats 79 formed in the adjacent bearing 75, (see Figs. 3 and 9), to yieldingly hold said rock shaft in either of two extreme positions. Rigidly secured to the intermediate portion of the rock shaft 74 by a screw 80 is a clamping block 81 that holds the ends of projecting spring fingers 82. The numeral 83 indicates latch or lock arms, the sleeve-like hubs 84 of which (see Fig. 6), are provided with notches 85 that co-operate with the clamp block 81 to permit said arms 83 limited independent oscillatory movements in respect to said rock shaft 74. The spring fingers 82 operate one on each arm 83 and yieldingly press the same downward. The two arms 83 constitute a two-part clutch latch or lock and, at the opposite outer sides of their free ends, they are provided with depending lock flanges 86. The important function performed by this neutral position latch will be fully given in the description of the operation.

Motor circuit.

As an important feature, the motor circuit 86, (see Fig. 8), is provided with a fuse 88 located in a combined fuse and switch-box 89 secured on and movable with the framework of the machine, (see Fig. 2). Also, said circuit 87 includes a controlling switch 90 preferably located on or within the box 89. This gives a self-contained structure in which the operating motor of the machine is protected by a fuse forming a part of the self-contained structure. The fuse 88 should be of slightly less current-carrying capacity than the fuse located in the fuse box of the house or place where the machine is used, so that if any blowout occurs, it will be within the machine where the fuse may be located with certainty and quickly replaced.

Wringer and driving mechanism therefor.

The wringer, indicated as an entirety by the numeral 91, may be of any approved type but it is preferably carried by a bracket 92 that is mounted to rotate on a vertical axis. As shown, this bracket 92, (see particularly Figs. 1, 2 and 5), comprises a gear housing 93, horizontal shaft bearings 94 and an upright tubular standard 95 that is journaled on the upper end of a tubular shaft casing 96. This casing 96, at its lower end, is rigidly secured to the top of the gear housing bracket 37 and an upright wringer-driving shaft 97 is journaled therein. At its lower end, said shaft 97 is connected preferably by a knuckle joint to a bevel gear 98, (see Fig. 1), that meshes with the reversely facing bevel gears 42. At its upper end, said shaft 97 has a bevel gear 99 that is adapted to be alternately engaged by reversely facing bevel gears 100 secured to a sleeve 101 that is mounted to slide on but to rotate with a short horizontal shaft 102 that is journaled in the bearings 94 of the wringer-supporting bracket 92, (see particularly Fig. 5). The inner end of the shaft 102, preferably by a knuckle joint, is connected to a shaft 103 that directly drives the wringer rolls.

For shifting the gears 100 alternately into mesh with the gear 99 to drive the wringer rolls in either direction, at will, or to set said gears 100 in neutral positions to stop the wringer-driving action, there is provided an operating crank or hand piece 104, the stem 105 of which is journaled in one side of the gear housing 93 and is provided at its inner end with a gear-shifting cam or eccentric 106.

The wringer is adapted to be swung on its vertical axis into different positions and to be secured in such positions by a downwardly spring-pressed lock bolt 107, (see Fig. 2, mounted in suitable bearings on the standard 95 and engageable with perforations in an underlying plate 108 secured to the top of one side of the machine frame. To prevent this lock bolt 107 from being raised at any time except when the gears 100 are in inoperative positions, the hub of the operating crank 104 is located immediately above the upper end of said lock bolt and is provided with a recess 109 that affords clearance for the upward movement of said lock bolt in the neutral position of said gears and crank.

Operation.

Certain operations have already been

stated or suggested, but the general operation of the drum-rotating mechanism may be summarized as follows:

When the motor is in action, the shaft 34 and, hence, the gear 40, will be rotated in a constant direction, but the reversely facing gears 42 will be rotated in opposite directions. When the double-ended clutch hub 44 is in a neutral position, the drum will not, of course, be rotated in either direction, even though the motor is running. When the crank 76 of the rock shaft 74 is raised, the neutral position lock arms 83 are both raised so that the clutch hub 44 may be freely moved in either direction and, in fact, when the said clutch hub 44 is in its neutral position, the spring 69 will be set under tension to move said clutch hub in the one direction or the other so as to cause its interlocking engagement with one of the reversely facing bevel gears 42, and this, as is obvious, will start the drum-driving mechanism into action. When the drum has been stopped in either position, the ball 62 of the rotation timer will be at the one extremity of its spiral runway 61 and the sleeve 60, which latter is secured to the drum shaft 25, and when the rotation of the drum is started, said ball will begin its travel in the channel 63 of the sleeve 59 and in said spiral runway until it reaches the opposite extremity of said spiral runway, and while this is taking place, the drum will be given a number of rotations represented by the number of complete threads or convolutions of said spiral runway. For instance, in the arrangement illustrated, the drum will be given six rotations in the one direction while the ball 62 is making the above noted travel. When the ball reaches an extremity of said runway, it locks the sleeve 59 to the sleeve 60 so that said sleeve 60 will be given a slight oscillatory motion sufficient to cause the push rod 56—57 to move the clutch sleeve 44 from engagement with the gear 42, with which it has just been engaged, into engagement with the opposite gear 42. This, of course, reverses the direction of rotation of the drum and the ball 62 will then begin its travel in the opposite direction, and when the drum has made its six rotations, it will reverse the above noted operation by shifting the clutch hub 44 back into engagement with the gear 42 with which it is engaged at the beginning of the description of this operation. Thus, it will be noted that the drum will be given a predetermined number of rotations first in the one direction and then in the other under complete automatic control.

When the clutch hub 44 is in either of its extreme or operative positions above noted, its latch ball 53 will be engaged with one or the other of the notches 54 in the fixed rod 50. Preferably, the tension of the spring 69 is not sufficient to disengage the ball 53 from its engaged notch 54, so that under oscillatory movements of the sleeve 59 and crank arm 58 in either direction, the spring 69 will be compressed before the clutch 44 has moved and then the adjacent ends of the thimbles 68 will be forced into engagement, causing the push rod to operate positively to disengage the ball 53 from its notch 54. When this takes place, the spring 69 becomes effective to very quickly throw the clutch hub 44 into its motion-reversing position without waiting for such movement to be completed by the relatively slow motion of the thrust rod.

When it is desired to automatically stop the rotation of the drum, it is only necessary to press down on the crank arm 76 of the rock shaft 74, thereby lowering the neutral position lock arms 83 into action. When these arms are thus released or lowered, one thereof will immediately drop to operative postion, but the other will drop onto the clutch sleeve 44 ready to go into action as soon as said clutch hub has been moved, in the manner already noted, past its neutral position and, thereupon, said hub will be automatically intercepted and locked in its neutral position.

It will be understood that the above noted intercepting of the clutch in its neutral position will take place only when the drum has completed its predetermined number of rotations in the direction in which it is moving at the time that the arms 83 will be pressed or released. For instance, if the drum has made three rotations at the time the said arms are dropped in position, the drum will make three more rotations before its motion will be stopped by locking of the clutch hub 44 in its neutral position. As already indirectly indicated, when the clutch hub is thus intercepted and locked in its intermediate position, the spring 69 will be compressed and set under such stress that it will shift the clutch hub 44 and automatically start the clutch-driving action in the proper direction whenever the arms 83 are raised.

The rotation timer described is herein considered and treated as broadly new even as a mechanical motion. It has already been pointed out that the number of rotations given to the drum or other rotary body may be varied by varying the number of threads or spiral convolutions of the ball runway 61. However, with the given number of threads and by the use of a second ball placed in said runway but spaced from the ball 62, the number of rotations that will be given to said drum or body may be varied, at will. For example, if this second ball be placed in said spiral runway 61, the latter having six convolutions, a distance two threads from said ball 62, then said drum

or body would be given four rotations, first in the one direction and then in the other. Thus, there is afforded an extremely simple and highly efficient rotation timer for very general use where it is desired to give a rotary body a certain number of rotations first in one direction and then in the other from a motor or prime mover running continuously in a constant direction.

From what has been said, it will be understood that the various novel features involved in this disclosure are capable of very considerable modification within the spirit of my invention as herein disclosed and claimed.

What I claim is:

1. A rotary timer comprising timer elements having lock runways extending transversely one of the other, one of said runways being a spiral of several convolutions, a lock element working in both of said runways, a reversible driving member, a reversible power-driven transmission mechanism operative to drive said reversible driven member and one of said timer elements, the other of said timer elements having a connection for reversing said transmission mechanism, said latter noted timer element having a limited oscillatory movement, and yielding means timed to hold the same in extreme positions.

2. A rotary timer comprising timer elements having lock runways extending transversely one of the other, one of said runways being a spiral of several convolutions, a lock element working in part in both of said runways, a reversible driven member, a reversible power-driven transmission mechanism operative to drive said reversible driven member and one of said concentric timer elements, the other timer element having a connection for reversing said transmission mechanism, and a neutral position lock for holding said transmission mechanism inoperative.

3. A rotary timer comprising timer elements having lock runways extending transversely one of the other, one of said runways being a spiral of several convolutions, a lock element working in part in both of said runways, a reversible driven member, a reversible power-driven transmission mechanism operative to drive said reversible driven member and one of said concentric timer elements, the other timer element having a connection for reversing said transmission mechanism, and a neutral position lock for holding said transmission mechanism inoperative, the connection for reversing said transmission mechanism including a yielding element arranged to be put under strain when said neutral position lock is operative and when released from said lock, operative to automatically render said transmission mechanism operative.

4. The combination with a prime mover operative in a constant direction and a driven member to be reversely rotated, of a reversible transmitting mechanism for reversely rotating said driven member from said prime mover, and a rotation timer for automatically reversing the driving action of said transmission mechanism and operative to cause said driven member to be given a predetermined number of rotations first in the one direction and then in the other, said rotation timer comprising two concentric elements having intersecting ball runways, one of said ball runways being spiral of several convolutions, and a lock ball or element working in said runway.

In testimony whereof I affix my signature.

FRANCIS W. CARPENTER.