R. S. CORLETT.

AUTOMATIC REVERSING MECHANISM.

APPLICATION FILED JUNE 20, 1918.

1,358,294. **Patented Nov. 9, 1920.**

4 SHEETS—SHEET 1.

Fig. 1

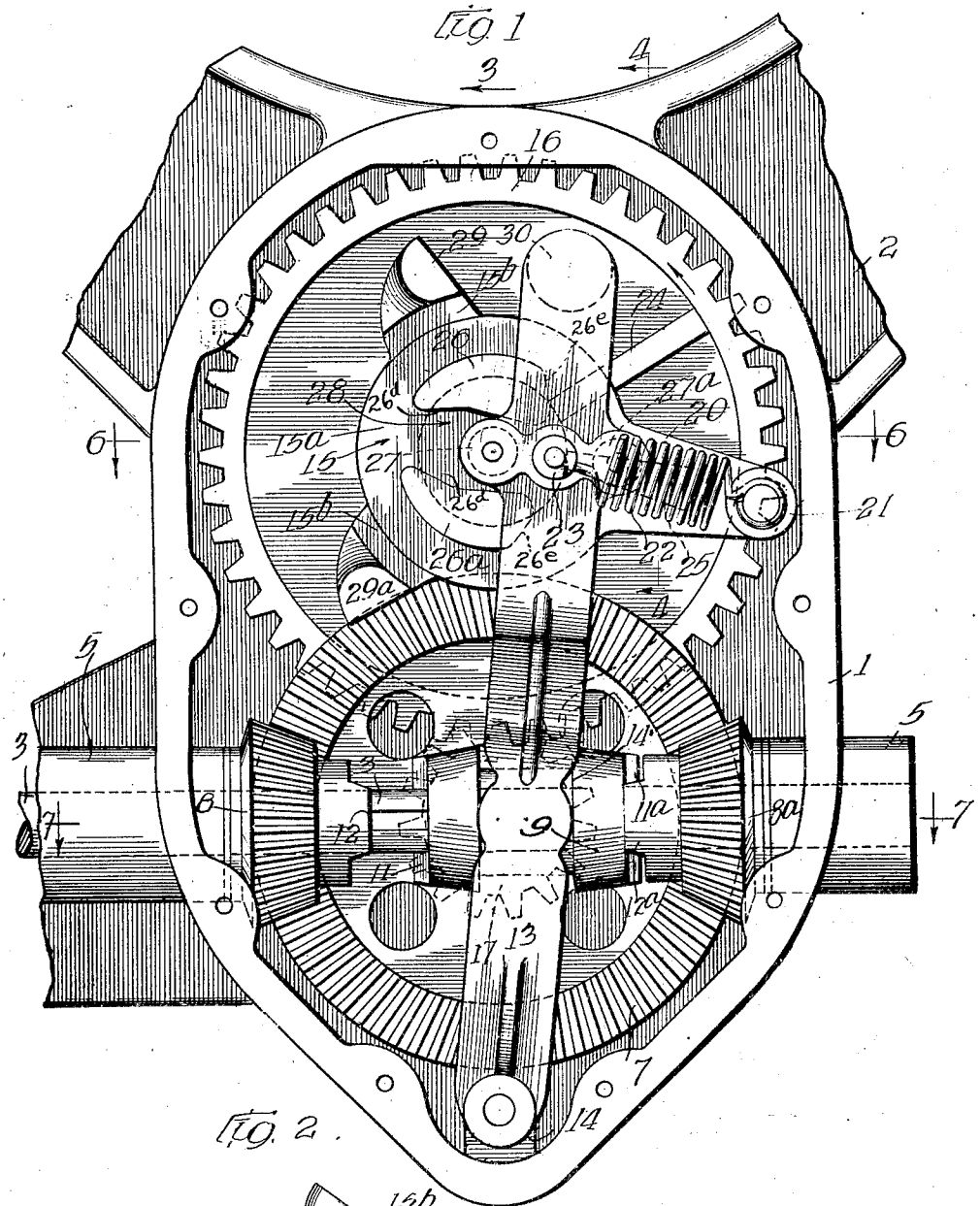
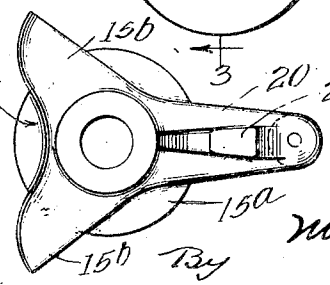


Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 3

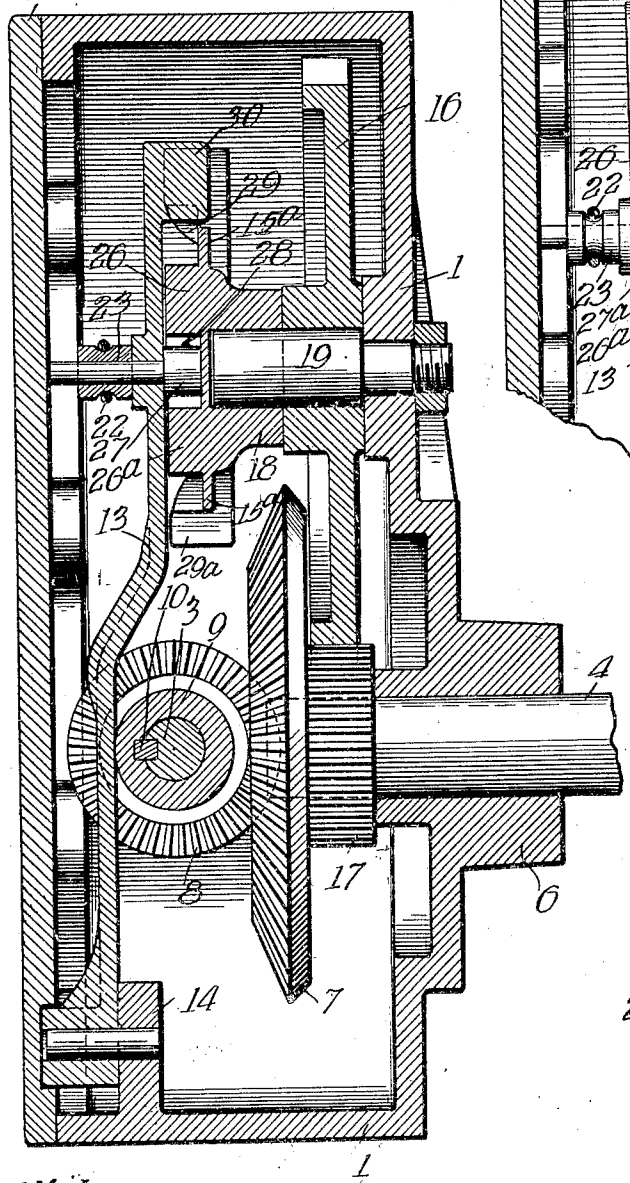


Fig. 4.

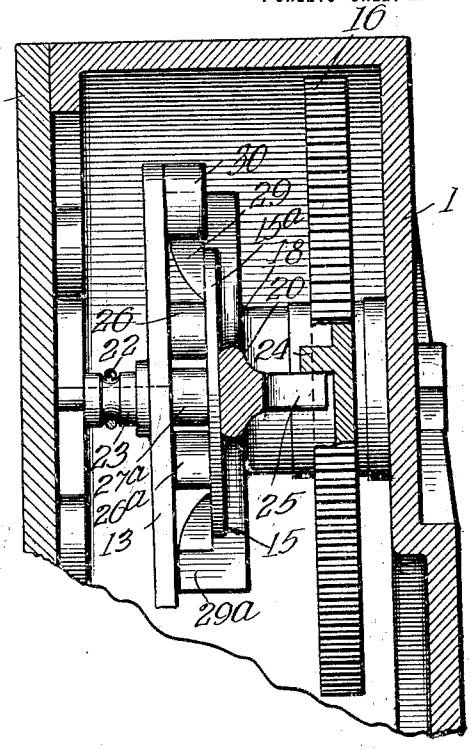
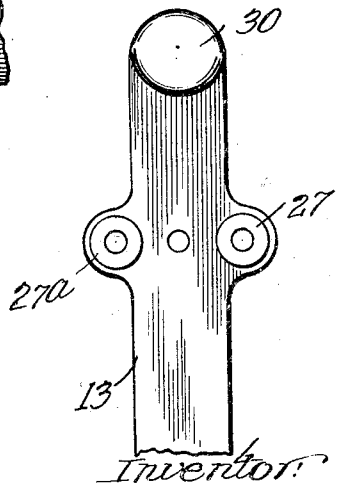


Fig. 5.



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4 SHEETS—SHEET 3.

Fig. 6.

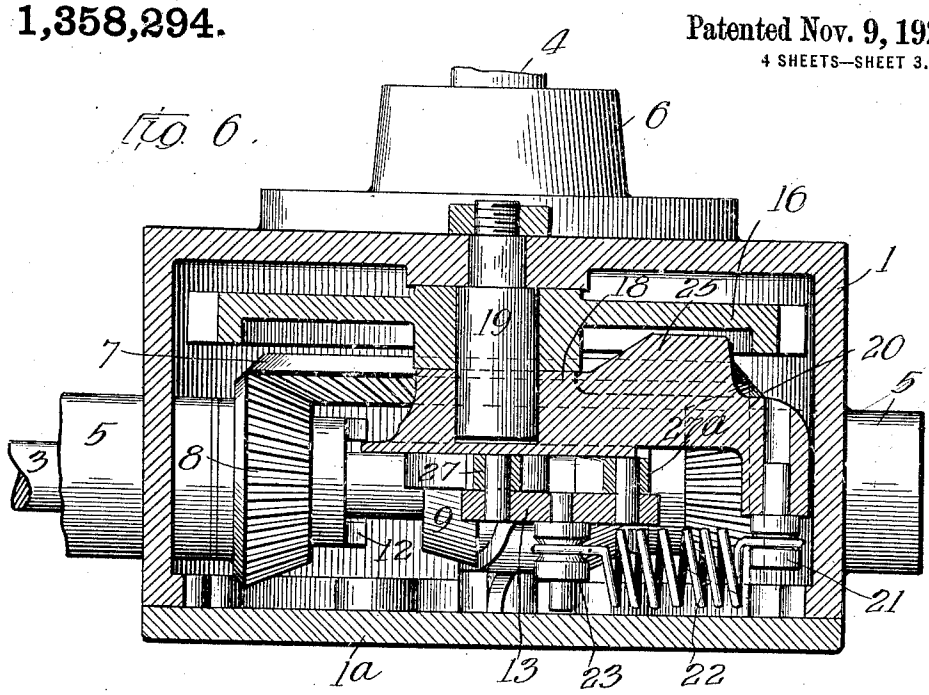
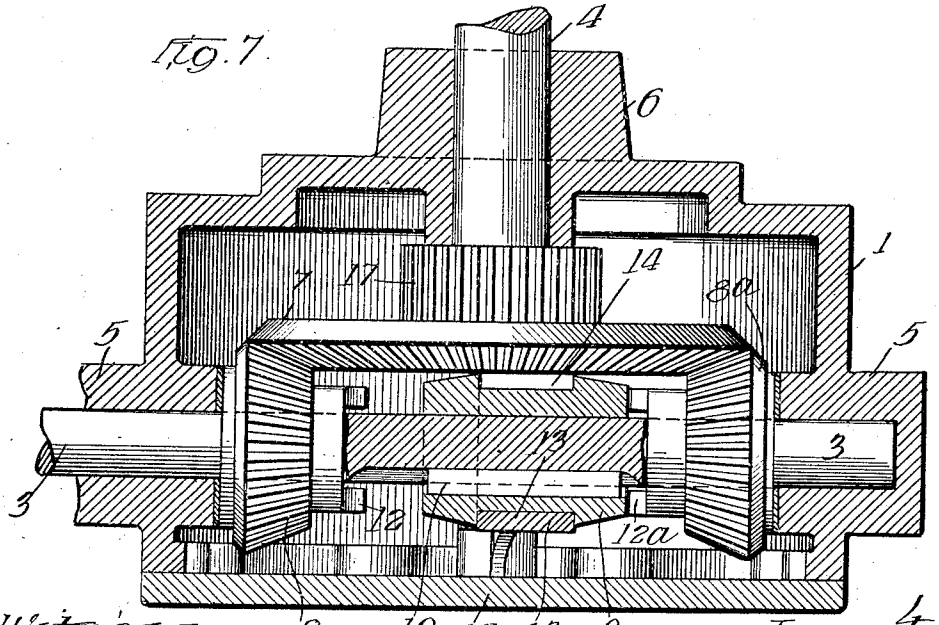


Fig. 7.



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4 SHEETS—SHEET 4.

Fig. 8.

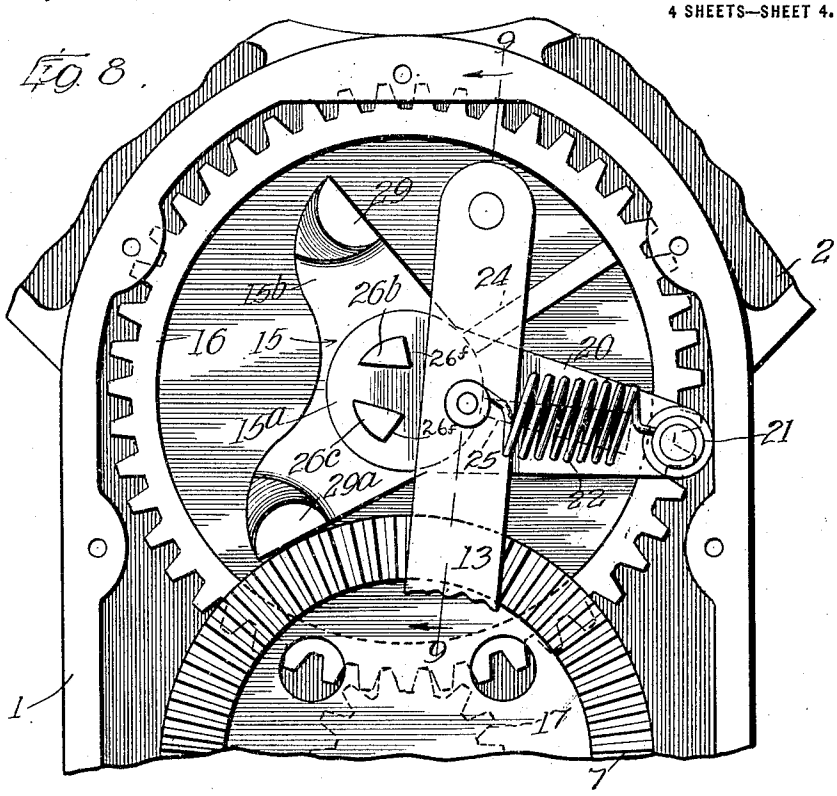
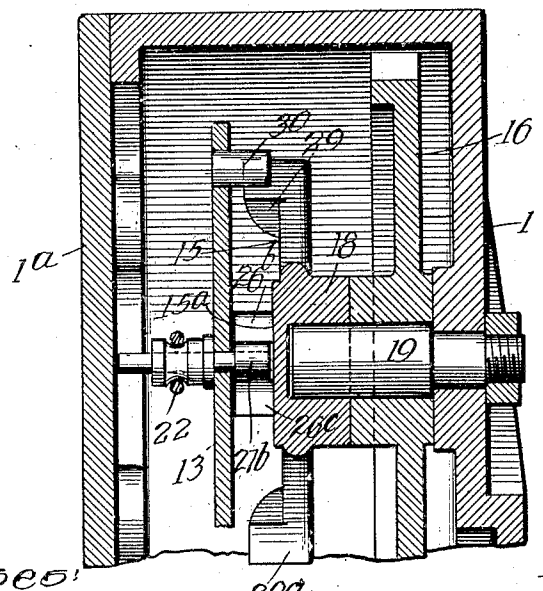


Fig. 9



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UNITED STATES PATENT OFFICE.

ROBERT S. CORLETT, OF EVANSTON, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO EDWARD E. BERTHOLD AND GUSTAVE W. BERTHOLD, OF CHICAGO, ILLINOIS, DOING BUSINESS AS BERTHOLD ELECTRICAL MFG. CO.

AUTOMATIC REVERSING MECHANISM.

1,358,294. Specification of Letters Patent. Patented Nov. 9, 1920.

Application filed June 20, 1918. Serial No. 240,910.

To all whom it may concern:

Be it known that I, ROBERT S. CORLETT, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Reversing Mechanisms, of which the following is a specification.

The invention relates to automatic reversing mechanism adapted for use where it is desired to alternately actuate a rotary element, as, for example, the cylinder or drum of a washing machine, a number of revolutions in opposite directions; and the general object of the invention is to provide improved mechanism of the type indicated which is of a very practical character and which will positively insure that the driven element may be operated at all times by the driving element in either one direction or the other.

More specifically one object of the invention is to provide an improved construction wherein the reversing spring will be alternately moved into diametrically opposed positions so as to exert its force in the direct line of movement of the element to be shifted.

Another object of the invention is to provide a construction which will absolutely prevent a premature operation of the reversing devices.

A further object is to provide positively actuated means as distinguished from spring means for disengaging the shiftable clutch element from its coacting elements.

The objects of the invention thus generally stated, together with other and ancillary advantages, are attained by the construction and arrangement illustrated in the accompanying drawings forming part hereof, in which Figure 1 is a fragmentary front view of a preferred embodiment of my invention. Fig. 2 is a detached view of the reversed side of the rocker which forms part of the means for operating the clutch-shifting lever. Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 1 showing the cover of the housing for the reversing mechanism in place. Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 1 with the parts in a slightly different position. Fig. 5 is a fragmentary rear side view of the upper end of the clutch-shifting lever. Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 1. Fig. 7 is a similar view taken on line 7—7 of Fig. 1. Fig. 8 is a fragmentary front elevation of a slightly different form of reversing mechanism. Fig. 9 is a vertical sectional view taken on line 9—9 of Fig. 8.

The reversing mechanism is preferably mounted within a housing 1 formed on a supporting bracket 2 and arranged to be closed by a cover plate 1ª, and said mechanism comprises a drive shaft 3 extending horizontally through the lower portion of the housing and a driven shaft 4 which may form one of the journals of a washing machine drum (not shown). Suitable bearings 5 are provided in the opposite side walls of the housing 1 for the drive shaft 3 and a bearing 6 is provided in the rear wall of the housing for the driven shaft 4. Said shaft 4 extends into the housing and has fixed thereon a bevel gear 7 which meshes at all times, at diametrically opposite points, with two bevel pinions 8 and 8ª rotatably mounted within the housing on the drive shaft 3, but fixed against longitudinal movement thereon. Said pinions are arranged to be alternately driven from the drive shaft 3 through a shiftable clutch sleeve 9 splined upon the shaft 3 by means of a key 10. The clutch sleeve 9 is provided on its opposite ends with clutch faces 11 and 11ª arranged to engage respectively, when the clutch sleeve 9 is properly shifted, with clutch faces 12 and 12ª formed on the hubs of the bevel pinions 8 and 8ª.

The means for shifting the clutch sleeve 9 to alternately connect with the pinions 8 and 8ª whereby to alternately rotate the bevel gear 7 in opposite directions, comprises a lever 13 pivoted at its lower end to the housing 1 upon an upstanding rib 14 (Fig. 3). Said lever is connected just above its lower end with the clutch sleeve 9 in any suitable manner as by means of an annular groove 14′ in the sleeve in which the lever is adapted to ride; and near its upper end the lever is connected with a shifting member or rocker 15 which is arranged to be oscillated to shift the lever by means of a rotary element such as spur gear 16 which meshes with a spur pinion 17 fixed on the driven shaft 4.

The rocker 15 has a central disk portion 15ª provided with a hub 18 mounted on a stud shaft 19, which shaft is in turn suit-

ably supported in the rear wall of the housing 1. The spur gear 16 is also rotatably mounted on this stud shaft. An arm 20 extending radially from said disk portion of the rocker has a grooved roller 21 mounted on its free end, which is connected, by means of a coiled tension spring 22, with a similar roller 23 mounted on the forward face of the shifting lever 13. It will be seen that the spring 22 thus tends to pull the lever to the right or to the left (Fig. 1) according to the position of the rocker 15.

The spur gear 16, which is driven from the driven shaft by means of the spur pinion 17, is provided on its forward face with a projection such as a radially extending rib 24, and the rocker arm 20 is provided on its rear face with a projection or lug 25 which, in the rotation of the gear, is arranged to be engaged by the rib 24. The rocker is thus oscillated by the rotation of the spur gear 16, to change the direction of pull of the spring 22 on the lever 13.

Means are provided, however, to prevent the spring from acting to reverse the mechanism except at the proper predetermined time and after the spring has been tensioned to exert its maximum strength upon the part to be moved. In this instance said part is the lever 13 and the spring is caused to act in the direct line of movement of said lever. The means for accomplishing these results comprises a pair of cam members or projections 26 and 26^a formed on the forward face of the disk portion 15^a of the rocker 15 and coöperating with a pair of rollers 27 and 27^a (Fig. 6) mounted on the rear face of the shifting lever 13. Said cam projections are spaced apart as shown in Figs. 1 and 3 to form between them a passageway 28 arranged to permit the rollers 27 and 27^a on the lever to pass therethrough when the rocker arm is in substantially horizontal position. In this position of the arm the spring is tensioned to exert its maximum strength upon the lever 13 and in the direct line of movement of the lever. It will be seen, however, that while the rocker is being moved to swing the arm 20 from one side to the other, the projections 26 and 26^a serve to prevent a premature movement of the lever. To this end, the parts are so proportioned and arranged that during the movement of the rocker the projections 26 and 26^a move into substantially upright position and straddle the roller farthest from the free end of the rocker arm 20, while the other roller is engaged by the outer edge of the intermediate projection. Thus only when the passageway 28 formed by the projections has been moved into substantially horizontal position can the spring act to move the lever 13 and thereby the clutch sleeve 9.

Should the spring 22, for any reason, fail to shift the clutch sleeve 14 into complete engagement with a given bevel pinion, it will be seen that the lever 13 and also the rollers 27 and 27^a would not be in the proper position to permit the projections to move into their upright positions, but, on the contrary, such rollers might be disposed directly in the path of movement of one or both of the projections. In order to obviate such a possibility, the projections are shaped to engage with the rollers 27 and 27^a to move them with a cam action into their proper position, forcing the clutch sleeve home into engagement with the proper pinion. Thus, the inner side edge of each projection at the rear end thereof is provided with a cam face 26^d arranged to engage with the roller farthest from the free end of the rocker arm 20; and the outer side edge of each projection at the forward end thereof is provided with a cam face 26^e arranged to engage with the roller nearest the free end of said rocker. The cam face 26^d is adapted to engage with its roller a short interval before the cam face 26^e engages with its roller. Assuming the lever 13 to be, for example, in substantially vertical position with the rollers out of their proper position, and the clutch sleeve only partially engaging with the pinion 8^a, the parts are so arranged that with the rocker moving in a counterclockwise direction (Fig. 1) the cam face 26^d at the inner rear edge of the uppermost projection 26^a will engage with the roller 27 and move the lever 13 slightly to the left. Thereupon the cam face 26^e on the outer forward edge of the lowermost projection 26^a will engage with the roller 27^a and complete the movement of the lever, forcing the clutch sleeve 9 home into engagement with the pinion 8^a and holding it there until disengaged by the means to be now described.

Preferably the spring 22 is not depended upon to disengage the clutch sleeve 9 from the bevel pinions 8 and 8^a but the rocker-arm in its swinging movement is arranged to positively engage with the lever to swing it just as the cam projections 26 and 26^a are moved into position to permit the lever to shift. To this end the rocker is provided with a pair of radially extending arms 15^b having on their forward faces a pair of bosses 29 and 29^a adapted in the oscillation of the rocker to engage with a rearwardly projecting stud 30 on the upper end of the shifting lever 13 (Fig. 4). It will be seen that, in order to change the direction of pull of the spring 22 and to position the cam projections so as to permit the spring to act, the rocker has been moved through an arc of substantially 180°. Near the completion of such rocking movement of the rocker in one direction or another the bosses 29 or 29^a are arranged to strike the stud 30 a sharp blow to shift the lever just as

the rocker approaches the end of its movement in either direction. Thus the frictional engagement of the clutch faces 11 and 11ª of the sleeve 9 with the clutch faces 12 and 12ª of the pinions 8 or 8ª is positively overcome by the spur gear driven directly from the driven shaft. When the sleeve is thus disengaged from one bevel pinion, the spring 22 quickly swings the lever to snap the sleeve into engagement with the opposite bevel pinion, whereupon the direction of rotation of the driven element is immediately reversed.

It will be seen that immediately upon the shifting of the clutch sleeve from one bevel pinion to the other, the direction of rotation of the driven shaft is changed, and accordingly the spur gear 16 is reversely rotated to carry its rib 24 into engagement with the opposite side of the lug 25 on the rocker-arm. While the spur gear is thus rotating to effect a reversal of the driven shaft, said shaft is rotated a number of revolutions, as determined by the ratio between the spur pinion 17 and the spur gear 16. During such rotation the rib on the spur gear is carried into engagement with the projection on the rocker and swings the rocker through an arc of substantially 180° to change the direction of pull of the spring. As before, the cam projections operate to prevent a premature shifting of the lever and to positively hold it and thereby the clutch sleeve in one of its operative positions in engagement with one of the bevel pinions. When the shifting of the lever is finally permitted and the stud 30 has been struck by the boss 29 or 29ª, as the case may be, to disengage the clutch sleeve from one of the bevel pinions, the spring exerts its maximum force in the direction of movement of the lever 13 and swings the lever quickly to move the clutch sleeve so that it engages with the opposite bevel pinion. It will be seen that the use of a tension spring for actuating the clutch sleeve is advantageous in that it may be tensioned to exert a greater and more positive force than the compression springs usually employed.

While the operation of the reversing mechanism will be readily understood from the foregoing description, the following is a brief summary thereof:

As shown in Fig. 1, the clutch sleeve 9 is being held by the spring 22 in engagement with the pinion 8ª and the spur gear 16 is rotated through the bevel gear 7 and spur pinion 17, counterclockwise. During this rotation of the spur gear the driven shaft 4 rotates a number of revolutions, and at the same time the rocker 15 is oscillated to change the direction of pull of the spring 22 upon the shifting lever 13, such oscillation of the rocker 15 being accomplished by the rib 24 on the forward face of a spur gear engaging with the under-side of the rearwardly projecting lug 25 on the rocker-arm 20 (Fig. 4). During such swinging movement of the rocker the lever 13 is prevented from shifting by the cam projections 26 and 26ª engaging with the rollers 27 and 27ª upon the lever, but when the rocker has been swung through an arc of substantially 180°, the passageway 28 formed by said projections is again in substantially horizontal position, so as to permit the passage of the rollers 27 and 27ª and therefore the movement of the lever 13 to the left (Fig. 1). As soon as the rocker has thus been properly positioned, the stud 30 is engaged by the boss 29ª on the rocker 15 and the lever is shifted to the left to disengage the clutch sleeve from the clutch face 12ª on the hub of the pinion 8ª. Thereupon the spring 22 acts in the direction of movement of the lever to swing it quickly to the left and thus carry the clutch sleeve into engagement with the clutch face 12 of the pinion 8. Thereupon the direction of rotation of the rotating parts is reversed for operation for a period in the opposite direction. If, for any reason, the spring 22 should fail to completely move the clutch sleeve 14 into engagement with the pinion 8ª, the cam faces 26ᵈ and 26ᵉ on the projections 26 and 26ª engage respectively with the rollers 27 and 27ª and move them into their proper position, forcing the clutch face 11ª of the clutch sleeve home into engagement with the clutch face 12ª of said pinion.

In Figs. 8 and 9 I have illustrated another embodiment of my invention. In this instance the projections 26ᵇ and 26ᶜ on the rocker 15 are of slightly different form and coöperate with only one roller 27ᵇ upon the lever 13. Said projections and roller are arranged to prevent a premature shifting of the lever and if the clutch sleeve should not, for any reason, be forced home by the spring 22, one of the projections will force it home. To this end, the projections are each provided with a cam face 26ᶠ arranged to engage with the roller to move it into position to permit the projection to move into its shift-preventing position.

It will be seen that I have provided an automatic reversing mechanism which is relatively simple in construction which is very positive in operation, and which is otherwise of a very practical character; and while I have illustrated and described the invention with considerable particularity, it will be understood that I do not intend to be limited to the construction and arrangement set forth except as may be necessitated by the state of the prior art, since various changes may be made without departing from the spirit and scope of my invention.

I claim as my invention:

1. An automatic reversing mechanism having, in combination, a driven element, a clutch member, a coiled tension spring operatively connected at one end with said clutch member, means operatively connected with the other end of said spring and with the driven element to change the direction of pull of the spring upon the clutch member and means to prevent a premature operation thereof.

2. An automatic reversing mechanism having, in combination, a driven element, a clutch member, a coiled tension spring operatively connected with said clutch member, and means operatively connected with said spring and said driven element to change the direction of pull of the spring and to initially shift the clutch member.

3. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a projection thereon adapted to prevent a movement of the lever until the spring can exert its maximum strength.

4. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a pair of projections thereon adapted to prevent a movement of the lever in either direction until the spring can exert its maximum strength.

5. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm and said lever having projections thereon coöperating to prevent a premature shifting of the lever.

6. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a pair of projections thereon and said lever having a pair of rollers thereon coöperating with the projections to prevent a premature shifting of the lever in either direction.

7. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a cam device thereon adapted to positively move the lever and thereby the clutch member.

8. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a pair of cam devices thereon and said lever having a pair of rollers thereon coöperating with said cam devices to complete the movement of the lever in either direction.

9. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a boss thereon adapted to engage with the lever to move it and thereby to initially move the clutch member.

10. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a pair of bosses thereon and said lever having a projection thereon arranged to be engaged by either of said bosses and moved thereby to initially operate the clutch member.

11. An automatic reversing mechanism having, in combination with a clutch member and a lever for shifting the clutch member; a rocker arm, a spring connecting the free end of said arm with said lever, and means for moving said arm to change the direction of exertion of the spring upon said lever so as to shift the clutch member, said rocker arm having a pair of projections and a pair of bosses thereon arranged to coöperate with the lever to prevent a premature shifting of the lever and to operate the clutch member.

12. An automatic reversing mechanism having, in combination, a clutch member, and means for shifting the clutch member comprising a tension spring and an oscillatory device operatively connected by said spring to said clutch member and movable to change the direction of pull of said spring and provided with means to prevent a premature operation thereof.

13. An automatic reversing mechanism having, in combination, a clutch member, a tension spring operatively connected at one end with said clutch member, and means operatively connected with the other end of the spring to change its direction of pull, said means being provided with a device for preventing a premature operation of the spring.

14. An automatic reversing mechanism having, in combination, a clutch member, a tension spring operatively connected at one end with said clutch member, and means operatively connected with the other end of said spring to change the direction of pull thereof and to initially shift the clutch member.

15. An automatic reversing mechanism having, in combination, a clutch member, a tension spring operatively connected at one end with said clutch member, and means operatively connected with the other end of said spring to change the direction of pull thereof and to complete the operation of the clutch member if the spring fails to do so.

16. An automatic reversing mechanism having, in combination, a clutch member, a driven element, and means operatively connected with said clutch member and said driven element comprising a device for initially moving said clutch member in either direction and a different positively actuated device for completing the movement of the clutch member in either direction.

17. An automatic reversing mechanism having, in combination, a clutch member, a driven element, and means operatively connected with said clutch member and said driven element comprising coöperating devices for initially moving said clutch member in either direction and devices for completing the movement of said clutch member in either direction but positively preventing a premature shifting thereof.

18. In an automatic reversing mechanism, a rocker, a movable member, and means for moving said member, said rocker having a pair of spaced projections each provided with a cam face arranged to engage with said member.

19. In an automatic reversing mechanism, a rocker, a pair of movable members, and means for moving said members, said rocker having a pair of spaced projections provided with cam faces arranged to engage with said members.

20. An automatic reversing mechanism having, in combination with a reversing clutch, a rocker arm for controlling said clutch, an operative connection between said rocker arm and said clutch comprising resilient means tending to operate said clutch, and additional cam means for positively actuating said clutch.

21. An automatic reversing mechanism having, in combination with a reversing clutch, a rocker arm for controlling said clutch and an operative connection between said rocker arm and said clutch comprising a resilient connection tending to operate said clutch, and additional contact means adapted during part of the cycle of operation to render such resilient means inoperative and prevent premature operation of said clutch.

22. An automatic reversing mechanism having, in combination with a reversing clutch, a rocker arm for controlling said clutch and operative connections between said rocker arm and said clutch comprising a resilient connection tending to operate said clutch, contact means for positively preventing premature actuation of said clutch by said resilient means, additional contact means for positively producing initial movement of said clutch and additional contact means for positively completing the actuation of said clutch.

23. An automatic reversing mechanism having, in combination with a reversing clutch, a rocker arm for controlling said clutch, a resilient connection between said rocker arm and said clutch tending to operate said clutch upon movement of said rocker arm, and additional cam means for positively producing an initial movement of said clutch.

24. An automatic reversing mechanism having, in combination with a reversing clutch, a rocker arm for controlling said clutch, a resilient connection between said rocker arm and said clutch tending to operate said clutch upon movement of said rocker arm, and additional contact means for positively completing the actuation of said clutch.

25. An automatic reversing mechanism having, in combination, two parallel shafts, a drive shaft extending across the end of one of said shafts at right angles thereto, a clutch member adapted to connect said drive shaft to the adjacent driven shaft, a lever adapted to shift said clutch member, a tension spring adapted to actuate said lever, means operatively associated with the second of said parallel shafts for changing the direction of action of said spring, and a gearing connection between said parallel shafts.

26. An automatic reversing mechanism having, in combination, a drive shaft, a

driven shaft and a countershaft, a reversing clutch adapted to connect said drive shaft to said driven shaft for actuation thereof in either direction, a lever for controlling said reversing clutch, a tension spring having one end connected to said lever, a rocker arm pivoted on said countershaft and connected to the other end of said spring, a gear on said countershaft meshing with a gear on said driven shaft, and a lost motion connection between said gear and said rocker arm.

27. An automatic reversing mechanism having, in combination, a drive shaft, a driven shaft and a countershaft, a reversing clutch adapted to connect said drive shaft to said driven shaft, a rotatable member on said countershaft actuated by said driven shaft, a resilient lost motion connection between said rotatable element and said clutch, and an additional lost motion connection adapted to positively actuate said clutch.

28. An automatic reversing mechanism having, in combination, a drive shaft, a driven shaft, a reversing clutch adapted to connect said drive shaft to said driven shaft for actuation thereof in either direction, resilient means having a lost motion connection with said driven element for operating said clutch, and additional means also having a lost motion connection with said driven element for positively actuating said clutch.

In testimony whereof, I have hereunto set my hand.

ROBERT S. CORLETT.