G. H. BLAXTER.

AUTOMATIC ADJUSTMENT FOR REELERS.

APPLICATION FILED OCT. 10, 1911.

1,040,862.

Patented Oct. 8, 1912.

3 SHEETS—SHEET 1.

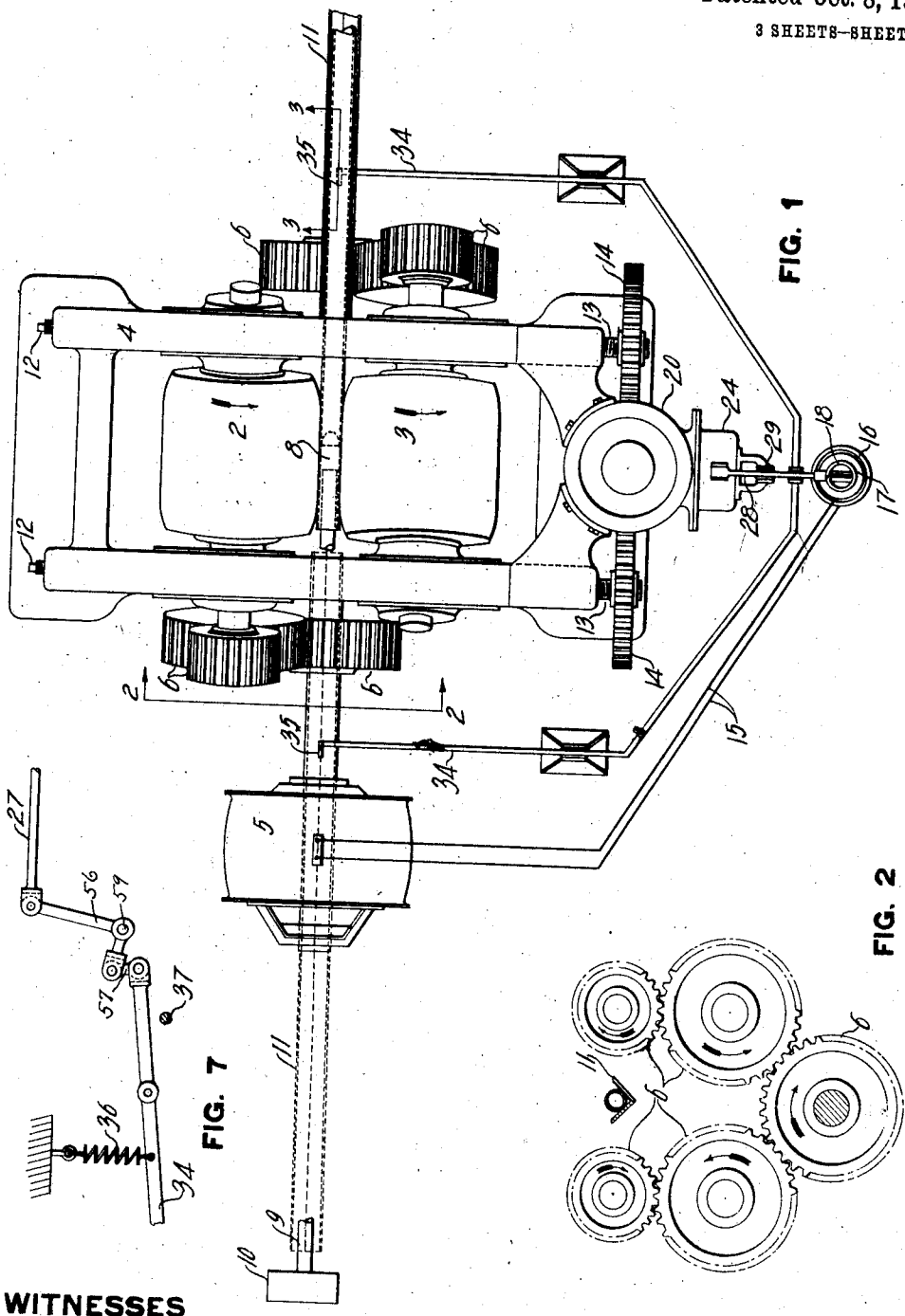

FIG. 1

FIG. 2

FIG. 7

WITNESSES

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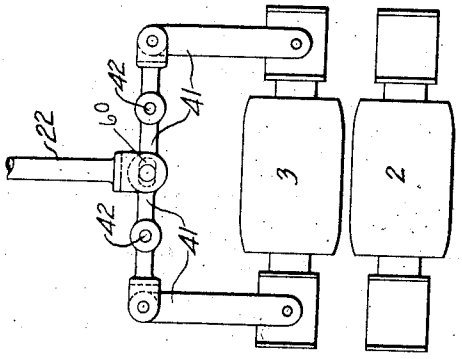

FIG. 5

FIG. 3

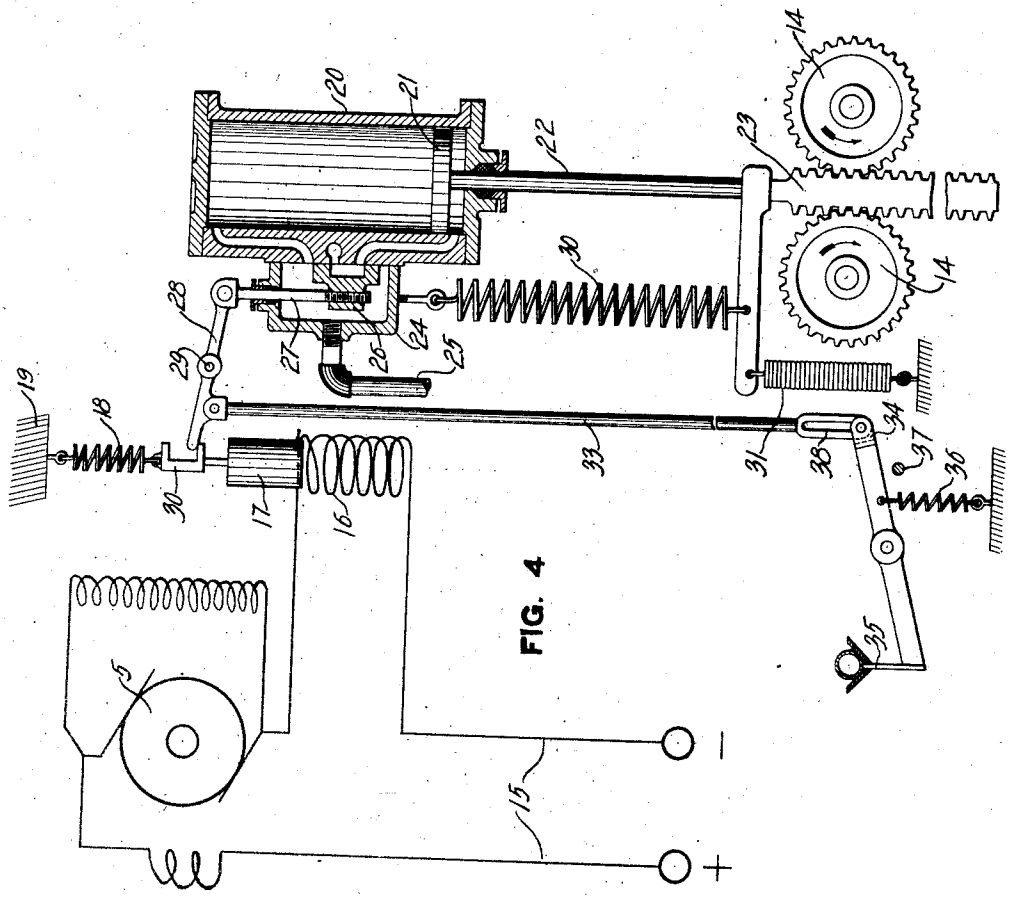

FIG. 4

WITNESSES

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3 SHEETS—SHEET 3.

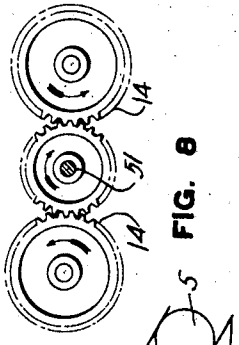

FIG. 8

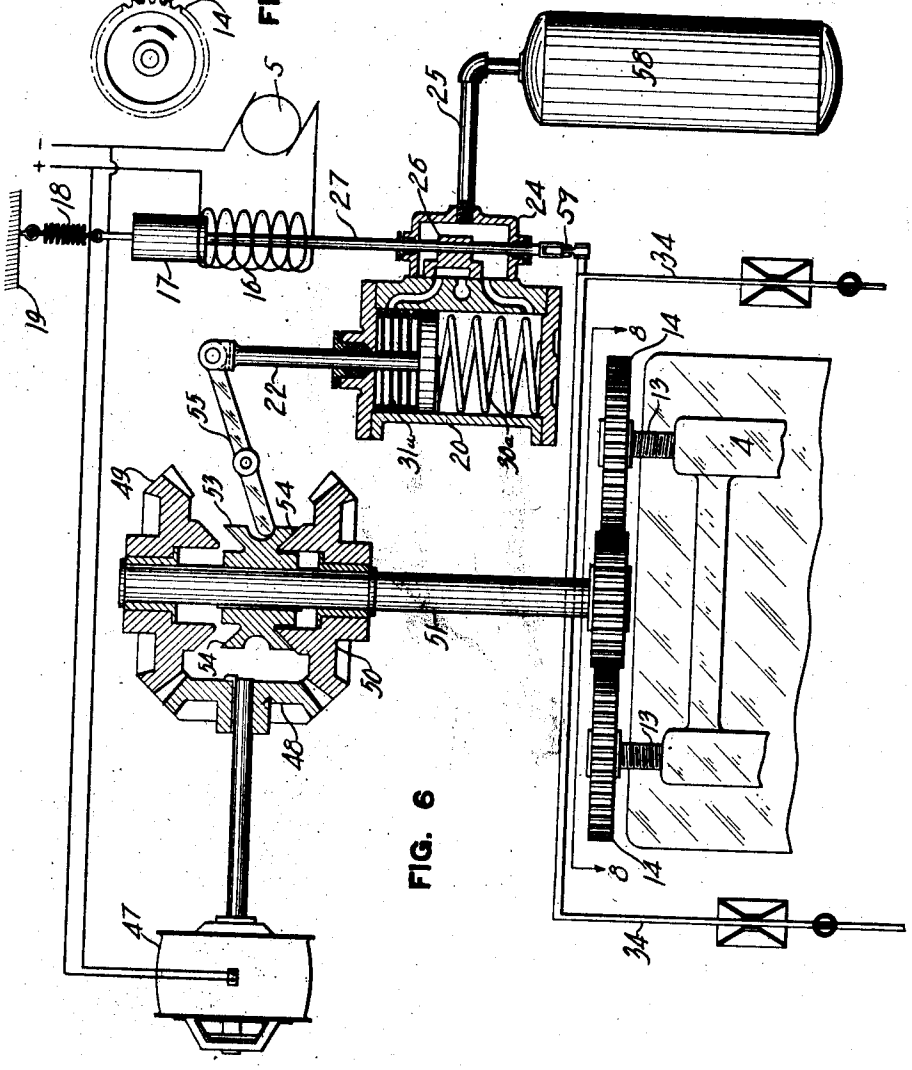

FIG. 6

WITNESSES

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UNITED STATES PATENT OFFICE.

GEORGE H. BLAXTER, OF BEAVER FALLS, PENNSYLVANIA, ASSIGNOR TO PITTSBURG SEAMLESS TUBE COMPANY, OF BEAVER FALLS, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

AUTOMATIC ADJUSTMENT FOR REELERS.

1,040,862. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed October 10, 1911. Serial No. 653,847.

To all whom it may concern:

Be it known that I, GEORGE H. BLAXTER, a resident of Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Automatic Adjustment for Reelers, of which the following is a specification.

This invention relates to an apparatus for reeling tubes.

The object of the invention is to provide apparatus for reeling tubes to a uniform diameter and in a manner to reduce labor and attention on the part of the workmen.

In the manufacture of seamless tubing the hollow blank or tube as it leaves the rolling mill varies considerably in diameter, the walls vary in thickness and the tube is more or less rough both exteriorly and interiorly. When such tube or blank is reeled in the ordinary way it results in a tube of varying diameter due to the rolls performing different amounts of work on the walls of the tube at different points along the length thereof, which in turn is due to the inequalities in the wall thickness of the rough tube. The reeling is generally done over a plug and consequently the thicker portions of the tube walls, in being reduced to the desired gage, expand to a greater extent than the thinner portions. Inequality in diameter of the product is of course objectionable.

The present invention provides an apparatus for reeling tubes over a mandrel in which the inequality in wall thickness is substantially reduced, the irregularities of the inner and outer surfaces are substantially removed, and the tube given the necessary finish, and at the same time producing a tube of uniform diameter. This is accomplished without the addition of extra labor cost and without any particular attention being given thereto by the workmen.

The present application relates to and claims only an apparatus, the method of reeling tubes involved in this case forming the subject matter of a divisional application filed January 11, 1912, Serial No. 670,652.

In the accompanying drawings Figure 1 is a general plan view, partly diagrammatic, of one form of the apparatus; Fig. 2 is a vertical transverse section on the line 2—2, Fig. 1; Fig. 3 is a vertical longitudinal section on the line 3—3, Fig. 1; Fig. 4 is a diagrammatic view of the driving and adjustment controlling apparatus; Figs. 5 and 6 are diagrammatic views of other forms of the invention; Fig. 7 is a detail view of the slide valve operating means shown in Fig. 6; and Fig. 8 is a cross section on the line 8—8, Fig. 6, showing the roll adjusting gearing.

The reeler may be of any desired type. That shown comprises a pair of barrel-shaped rolls 2 and 3 mounted in a suitable frame or housing 4 and driven from an electric motor 5 which is connected to the roll neck by suitable intermediate gears 6, or by any other suitable connecting means now well known in the art. Between the rolls is the usual mandrel head or plug 8 supported by the usual mandrel bar 9 and back rest 10. A trough 11 or other guiding means for the tube is provided as usual.

Either or both of the rolls 2 and 3 may be mounted for adjustment during the reeling operation, but as shown, the roll 2 is not intended to be adjusted during the reeling operation but is adjustable by set screws 12 adapted to be manipulated by hand. The roll 3 is adjustable during the reeling operation and to this end adjusting screws 13 bear against the journal boxes of the roll necks, and at the outer ends are provided with gears 14 for actuating the same. These screws are controlled automatically by the amount of current consumed by the main motor 5. When the rolls are acting upon the relatively thick portions of the tube walls the amount of current consumed is considerable, while when the rolls are acting upon the relatively thin portions of the tube walls the amount of current consumed by the main motor is less. I take advantage of this to effect the adjustment of the rolls, the parts being so arranged that when the current consumed rises, the adjusting screws 13 are slacked off to enlarge the roll pass, and when the current consumed by the main motor decreases the screws 13 are set up to reduce the roll pass. This may be accomplished in various ways, but as shown, there is placed in the mains 15 of the motor 5, a solenoid or other magnet 16 provided with a core or other armature 17 which is nor-

mally drawn out of the solenoid by spring 18 connected to a suitable fixed member 19. This spring is of such strength that when no current is flowing through the solenoid 16, or when the motor 5 is running under light load, the core 17 is drawn out of the solenoid. As the current to the motor increases, the core 17 is drawn into the solenoid to an extent depending upon the amount of current being used, and as the latter varies directly with the load on the motor or the amount of reduction being effected by the reeler, it is obvious that the solenoid core can be utilized as a means for regulating the adjustment of the rolls.

The connections between the solenoid core 17 and the roll adjusting means can vary within wide limits. In the present application, several means for this purpose are shown, all operated by a fluid pressure medium, such as compressed air, steam or water.

As shown in Figs. 1 and 4, the adjustment of the rolls is effected directly by a double acting power cylinder 20, piston 21 of which is connected to piston rod 22, which in turn is connected to or carried by a suitable rack member 23 working between the gears 14 of the roll adjusting screws 13. The cylinder 20 is double acting and constitutes in effect a reversible fluid pressure motor. It is obvious that the reciprocation of the rack back and forth will actuate the adjusting screws 13 in reverse directions.

Admission and exhaust ports lead to both ends of the cylinder from a suitable chest 24 to which the fluid pressure pipe 25 is connected. The admission of the fluid pressure to the opposite ends of the cylinder is controlled by a slide valve 26 actuated by a rod 27 connected to one end of a lever 28 fulcrumed at 29 and having its opposite end extending within a yoke 30 secured to or formed on the solenoid core 17.

When the slide valve 26 is in the position shown in Fig. 4, the fluid pressure medium is admitted to the outer end of the cylinder 20 and forces the piston 21 outwardly and through the rack 23 and gears 14, rotates the screws 13 in the direction to close the rolls together. When the slide valve 26 is moved to its reverse position, the fluid pressure is exhausted from the outer end of the cylinder and is admitted underneath the piston 21 to reverse the same, and this through the rack and gears rotates the adjusting screws in the reverse direction to slack off the rolls. When the valve is in the middle or neutral position, fluid pressure is admitted to neither end of the cylinder and the rolls will be held in whatever position they may have been previously adjusted. Springs 30 and 31 are provided to accelerate the movement of the piston 21 to the middle of the cylinder and to make the device more quickly and readily responsive and delicate in operation.

In the use of the apparatus described, as long as the work in the rolls is uniform, the solenoid core is in such position as to hold the slide valve 26 in its middle position, in which position the piston 21 is at rest in its neutral position and produces no change in the roll adjusting means. When, however, the work entering the rolls is relatively small, so that the power necessary to reduce it is decreased, the amount of current consumed by the motor 5 drops, thereby permitting the spring 18 to partly withdraw the core 17 from solenoid 16. This moves the slide valve 26 to admit fluid pressure to the outer end of cylinder 20 to drive the piston 21 outwardly and cause rotation of the screws 13 in a direction to close up the rolls, the spring 30 tending to prevent such movement. If, however, the reduction of the tube becomes more difficult, more current flows to the motor 5, thereby strengthening the solenoid 16 and thus draws the core 17 inwardly and causes the slide valve to move in the reverse direction. Should the size of the tube increase still more, the increasing amount of current flowing to the motor 5 will draw the core 17 still farther into the solenoid, thereby moving the slide valve 26 into position to admit pressure into the lower end of cylinder 20 and force the piston to the opposite end of the cylinder and slack off the rolls. A movement of the piston away from middle or neutral position is resisted by the springs 30 and 31, which always tend to return the piston to middle position in its cylinder and hold it there, and thereby turn the screws 13 in proper direction to close up or slack off the rolls as the case may be.

It will thus be observed that by the means described the rolls of the reeler are adjusted toward and from each other according to the variation in the walls of the tube passing between the rolls and that this is effected entirely automatically, being controlled by the load on the motor which drives said rolls.

Provision is made for holding the valve in the middle or neutral position when no work is passing through the rolls, as otherwise the screws 13 would be rotated until the rolls were entirely closed together. This is effected by means of rod 33 connected at one end to the lever 28 and at its other end to a yoke or forked lever 34 having beveled ends 35 projecting into the path of the tube in the reeler. The lever 34 is forked to provide two controlling members, one at the exit and the other on the entrance side of the reeler, so as to insure the roll adjusting means being in operative condition as long as there is a tube in the reeler. The lever 34 is normally held by spring 36 against a stop 37, in which position the slide valve

26 is in neutral position. When, however, a tube passes through the guide trough 11 it contacts with one of the ends of lever 34 and swings the lever against the tension of spring 36, thereby (on account of the slot and pin connection 38) relieving the rod 33 and lever 28, so that as long as the tube is in the reeler the slide valve 26 is controlled exclusively by the solenoid core 17. The piston 20 instead of adjusting the rolls by rack and gear connection, may adjust the same through the intervention of levers 41 fulcrumed at 42 and at one end being engaged by the piston rod 22 and at their other ends engaging the journal bearings of roll 3, as shown in Fig. 5.

The fluid pressure motor instead of directly adjusting the rolls may be used to control the same indirectly as shown in Fig. 6. In this modification, the adjusting screws 13 are adapted to be actuated from some suitable source of power, such for instance as the small electric motor 47, but which may be replaced by a counter shaft or some mechanical connection from the main rolls. As illustrated the armature shaft of motor 47 is provided with a gear 48 meshing with a pair of reversely set bevel gears 49 and 50 loose upon a shaft 51 which is suitably geared to the gears 14 of the adjusting screws 13. Keyed to the shaft 51 and sliding thereupon between the gears 49 and 50, is a double face clutch member 53, having its opposite faces 54 shaped to coöperate frictionally with corresponding clutch faces 54 on the gears 49 and 50 respectively. The clutch member 53 is actuated by the power cylinder 20, the piston rod whereof is connected to the clutch member in any suitable way, such as through the clutch shifting lever 55. The motor 47 is adapted to run continuously in the same direction but it is obvious that through the clutch 53 the adjusting screws 13 can be driven in either direction or allowed to remain stationary, dependent upon the position of the clutch 53. When there is no variation in the thickness of the tube walls, the clutch member is in its neutral position, in which position the screws are neither advanced nor slacked off, but should variation occur the clutch member is shifted into engagement with either one of the gears 49 or 50, to either advance or slack off the adjusting screws. The fluid pressure cylinder provides the necessary power to hold the clutch member in good frictional contact with either one of the gears 49 or 50. The solenoid core need exert only sufficient force to move the slide valve 26. In this form the springs 30^a and 31^a for holding the piston in its neutral position are located within the cylinder 20. The tank 58 represents any suitable source of fluid pressure.

Various other forms of mechanism, than those described, for securing the adjustment, will readily suggest themselves to those skilled in the art and no limitations upon the terms of the claims hereinafter made are to be imposed thereon either by the specific illustration or specific description herein. The essential feature of the invention is the automatic control of the adjustment of electrically driven rolls by the use of a solenoid or other form of magnet connected with the power circuit of the motor for driving the rolls, whether such mechanism be in the form of a solenoid as shown or whether in series or otherwise connected to the main circuit.

In a companion application, Serial No. 653,848, filed October 10, 1911, is shown and described electrical controlling means for the adjusting mechanism, which electrical means are specifically claimed in said companion application but are covered by or included within the broad claims herein made.

The device described can also be used as a safety device against serious overloads. The specific mechanism illustrated may also be used for adjusting machines other than tube reelers.

What I claim is:—

1. Regulating means for electrically driven rolls comprising in combination with the rolls, electric driving means therefor, adjusting means for the rolls, and means controlled by and in synchronism with variations in the current supplied to the driving means for operating said adjusting means and varying the adjustment of the rolls.

2. Reeling apparatus comprising in combination, rolls, electric driving means therefor, adjusting means therefor, and means controlled by the power consumed by the driving means and controlling the roll adjusting means, whereby the power consumed in successive reeling operations is equalized and a product of uniform diameter produced.

3. Reeling apparatus comprising in combination, rolls, electrical driving means therefor, adjusting means therefor, a magnet connected to the main driving circuit, and means actuated by said magnet and controlling the roll adjusting means, whereby the power consumed in successive rolling operations is equalized and a product of uniform diameter produced.

4. Reeling apparatus comprising in combination, rolls, a mandrel therebetween, adjusting means for the rolls, electrical driving means for the rolls, a magnet in the main driving circuit, and means actuated by the magnet and controlling the roll adjusting means and including reversing means for said roll adjusting means.

5. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, ad-

justing means for the rolls, a magnet in the driving circuit, and means actuated from said magnet for controlling the roll adjusting means and comprising a reversing motor and means actuated by said magnet for controlling said motor and reversing the same.

6. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, a magnet in the driving circuit, a motor for actuating said roll adjusting means, and means actuated by said magnet for controlling and reversing the action of said motor on said roll adjusting means.

7. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, roll adjusting means, power driven mechanism for actuating said roll adjusting means, electrical roll driving means, a magnet in circuit therewith, and means actuated by said magnet for controlling the roll adjusting means, said means having a neutral and reverse active positions.

8. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical roll driving means, roll adjusting means, a motor for actuating said adjusting means, a solenoid in the main driving circuit, a core therefor, means arranged to draw said core out of said solenoid, and means actuated by said core for controlling and reversing the action of the adjusting motor on the adjusting means.

9. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, driving means for said rolls, adjusting means for said rolls, and fluid pressure means controlled by variations in the power consumed by the roll driving means for actuating said roll adjusting means and reversing the same.

10. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, driving means for said rolls, adjusting means for said rolls, fluid pressure mechanism for actuating said roll adjusting means, and means actuated by variation in the power consumed by the roll driving means for controlling and reversing the action of the fluid pressure mechanism on the roll adjusting means.

11. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, fluid pressure means controlling said adjusting means, a magnet in the main driving circuit, and means actuated by said magnet and actuating said fluid pressure means for controlling and reversing the action of the roll adjusting means.

12. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, a magnet in the main driving circuit, a motor for actuating said roll adjusting means, and fluid pressure means actuated by said magnet for controlling and reversing the action of the motor on said roll adjusting means.

13. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, roll adjusting means, electrical roll driving means, a magnet in the driving circuit, power actuated mechanism for actuating the roll adjusting means, and a clutch controlled from said magnet and controlling the roll actuating means, said clutch having a neutral and reverse active positions.

14. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, roll adjusting means, electrical roll driving means, a magnet in the main driving circuit, power driven roll actuating means including a clutch having neutral and reverse active positions, and fluid pressure means controlled from said magnet and arranged to actuate said clutch.

15. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, adjusting means for the rolls, driving means for the rolls, means controlled by the power consumed by the driving means and controlling the roll adjusting means, and means arranged to throw said controlling means out of operation when no work is passing the rolls.

16. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, adjusting means for the rolls, electrical driving means for the rolls, a magnet in the main driving circuit, means actuated by said magnet and controlling the roll adjusting means and including reversing means for said roll adjusting means, and means for throwing said adjusting controlling means out of operation when no work is passing the rolls.

17. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, a magnet in the main driving circuit, and means actuated from said magnet for controlling and reversing the roll adjusting means and comprising a fluid pressure motor and a valve therefor actuated from the magnet to control and reverse said fluid pressure motor.

18. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, a magnet in the main driving circuit, power means for actuating said adjusting means, and means actuated by said magnet for controlling and reversing the action of said power means on the roll adjusting means.

19. Reeling apparatus comprising in com-

bination, rolls and a mandrel therebetween, roll adjusting means, electrical roll driving means, a magnet in the main driving circuit, and means actuated thereby for controlling the roll adjusting means and comprising a clutch and coöperating means having a neutral and reverse active positions of the clutch.

20. Reeling apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, a magnet in the main driving circuit, and means actuated from said magnet for controlling and reversing the roll adjusting means and comprising a fluid pressure motor and a valve therefor actuated from the magnet to control and reverse said fluid pressure motor, and a clutch and coöperating means providing a neutral and reverse active positions of the clutch.

21. Automatic regulating means for electrically driven machines comprising in combination with the working element of the machine, adjusting means therefor, an electric motor for operating said working element, a magnet in circuit with the motor, and means operated from said magnet and arranged to actuate the adjusting means in either direction according to the load on the motor to thereby equalize the power consumed.

22. Rolling apparatus comprising in combination rolls, means for driving said rolls so arranged that the supply of power thereto varies with the resistance to the action of the rolls, and means whereby said supply of power varies the adjustment of the rolls and equalizes the load.

23. Rolling apparatus comprising in combination adjustable rolls, means for driving said rolls so arranged that the supply of power thereto varies with the resistance to the action of the rolls, and means whereby the rolls are automatically adjusted in synchronism with the variations in the supply of power for driving the same.

24. Rolling apparatus comprising in combination rolls, electrical means for driving said rolls so arranged that the current supplied thereto varies with the resistance to the action of the rolls, and means whereby said supply of current varies the adjustment of the rolls and equalizes the load.

In testimony whereof, I have hereunto set my hand.

GEORGE H. BLAXTER.

Witnesses:
F. W. WINTER,
MARY E. CAHOON.