Fig. 5.

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his attorneys.
This invention relates to rod coiling apparatus such as is used at the delivery end of a rod mill to coil the rapidly traveling rod into rod bundles which may be easily handled, one of the objects being to improve such apparatus so that it coils the rod into a plurality of parallel layers of concentric convolutions whereby the resulting bundles are of rectangular cross-section. Other objects may be inferred.

A specific example of a rod coiling apparatus embodying the present invention is illustrated by the accompanying drawings, in which:

Figure 1 is a top view of the apparatus.
Figure 2 is a section from the line II—II in Figure 1.
Figure 3 is a wiring diagram.

This apparatus includes a pouring reel 1, a rod delivery pipe 2 which guides rod tangentially into the reel 1, a motor 3 for revolving the reel and automatic means 4 for alternately powering the motor 3 to operate to revolve the reel 1 at a speed which is synchronized to the linear speed of rod delivered to the latter by the pipe 2 respecting the smallest rod convolutions carried by this reel and a speed which is so synchronized respecting the largest rod convolutions carried by this reel. This automatic means alternately functions in this manner with time intervals between alternations which are the same as the theoretical time required for the rod convolutions being formed by the reel 1 to change from the smallest to the largest convolutions carried by the latter. This automatic means further powers the motor 3 to operate to revolve the reel 1 at a speed synchronized to the linear speed of rod delivered to it by the pipe 2 respecting automatically sized rod convolutions and functions in this last named manner at periods intermittently between the just described time intervals.

As is well known, a pouring reel is usually revolved only at a speed synchronized to the linear speed of rod delivered to it respecting immediately sized rod convolutions, the rod therefore pulling when the larger convolutions are building and pushing when the smaller convolutions are building. The result is a bundle of triangular cross-section and of a rather loose nature, this interfering with its handling which is necessary during its subsequent working.

The apparatus just described obviously eliminates these troubles, the bundles being of rectangular cross-section and of a compact nature. It follows that they are much more easily handled than are the ordinary rod bundles.

To further promote the formation of bundles of the desired character, the rod delivery pipe 2 is mounted on a swinging carriage 5 which permits reciprocation of the delivery end of this pipe so that it may point toward the various peripheral rod carrying portions of the reel 1. A motor 6 operates through a gear box 7, crank 8 and connecting-rod 9 to oscillate the pipe 2 in synchronism with the alternate functioning of the automatic means 4 and in proper sequence with the same. That is to say, the pipe 2 is oscillated so that it points toward the outer peripheral rod carrying portion of the reel 1 when the latter is being driven at its slowest speed, and toward the smallest peripheral rod carrying portion when the reel is revolving at its highest speed. It follows that the rod is guided so that the various convolutions are positively formed in their proper places and that, due to the oscillatory movement, the rod is guided towards the smallest and largest peripheral rod carrying portions for sufficient time intervals to permit the building of the double rod convolutions of the same sizes which is necessary for the beginning of each new coil layer.

The speed of the motor 8 and the ratio of the gear box 7 are so proportioned that the gear box shaft 7A which turns the crank 8 revolves a half turn during each interval of time equal to that theoretically required for the rod convolutions being formed by the reel 1 to grow from the smallest to the largest, or vice versa, convolutions carried by the latter. This is obviously necessary since this shaft controls the oscillations of the delivery pipe 2. In the interests of simplicity, this shaft is used to render the automatic means 4 responsive to such time intervals and, at the same time, to assure the desired synchronization between the delivery pipe oscillations and this automatic means.

As shown by Figure 3, the automatic means includes a drum 11 fixed to the shaft 7A. This drum carries three circumferential bands of interconnected electrical contact segments 12 through 17 which close with stationary contacts 16, 19 and 20. The motor 3 includes a shunt field 13 by means of which its speed may be controlled through rheostats 14, 15 and 16.

When none of the segments are closed with the stationary contacts the motor circuit is through line 21, rheostat 15 and shunt field 13. This provides the maximum motor speed and this speed may be adjusted by the rheostat 15.

As the drum turns segments 13 and 14 close with contacts 19 and 20 and through lines 21 and 22 place rheostats 14 in parallel with rheo-
stat 3°. This tends to make the motor 3 decelerate to its slowest speed. Since segment 13 is short the motor does not have time to decelerate to this slowest speed, the continued turning of the drum 11 soon breaking the just mentioned circuit.

Then segments 12 and 14 will be closed with contacts 18 and 20 and rheostats 3° and 3" will all, through lines 21, part of 22 and 23, be connected in parallel with rheostat 3°. This causes the motor 3 to operate at its intermediate speed.

Continuing to turn the drum 11 through segment 15 again establishes the circuit placing only rheostat 3" in parallel with rheostat 3°. This segment 15 is somewhat longer than segment 13 since it functions to hold the motor at its slowest speed while the larger coil convolutions are being formed by the reel 1.

As segments 14 and 15 leave contacts 18 and 20 a gap is encountered. This causes the motor 3 to tend to accelerate to full speed but before it can do this segments 16 and 17 close with contacts 18 and 20 so as to hold the motor at its intermediate speed. When segments 16 and 17 leave contacts 18 and 20 the motor 3 again operates at full speed.

The pouring reel 1 is of the conventional type and it is not considered necessary to describe it in detail.

Although a pouring reel has been used as an example of the invention, it should be understood that the principles of the invention may also be applicable to laying reels. Also, other forms of control means may be used. Therefore, the scope of the invention should not be limited to the specific example herein described, except as defined by the following claims.

I claim:

1. Rod coiling apparatus including the combination of a pouring reel, a rod delivery pipe arranged to reciprocate from one peripheral rod-carrying portion of said reel to another, a variable speed motor for revolving said reel, means for varying the speed of said motor and positively synchronized means for reciprocating said pipe and controlling the first named means so that the same causes said motor to operate at slower speeds when said pipe points toward the larger of said rod-carrying portions and at faster speeds when said pipe points toward the smaller of said portions.

2. Rod coiling apparatus including the combination of a pouring reel, a rod delivery pipe arranged to reciprocate from one peripheral rod-carrying portion to another, an electric motor having a shunt field for controlling its speed, means for gearing said motor to said reel, means for controlling the current through said shunt field, means for reciprocating said pipe and means positively synchronized with the third named means for controlling the second named means so that it increases the current through said shunt field when said delivery pipe points toward the larger of said rod-carrying portions and decreases the current when said pipe points toward the smaller of said portions, said motor being constructed so that its speed decreases when said current increases and vice versa.

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