No. 647,249. Patented Apr. 10, 1900.

R. N. CHAMBERLAIN.

GRID SPINNING MACHINE.

(Application filed Mar. 3, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

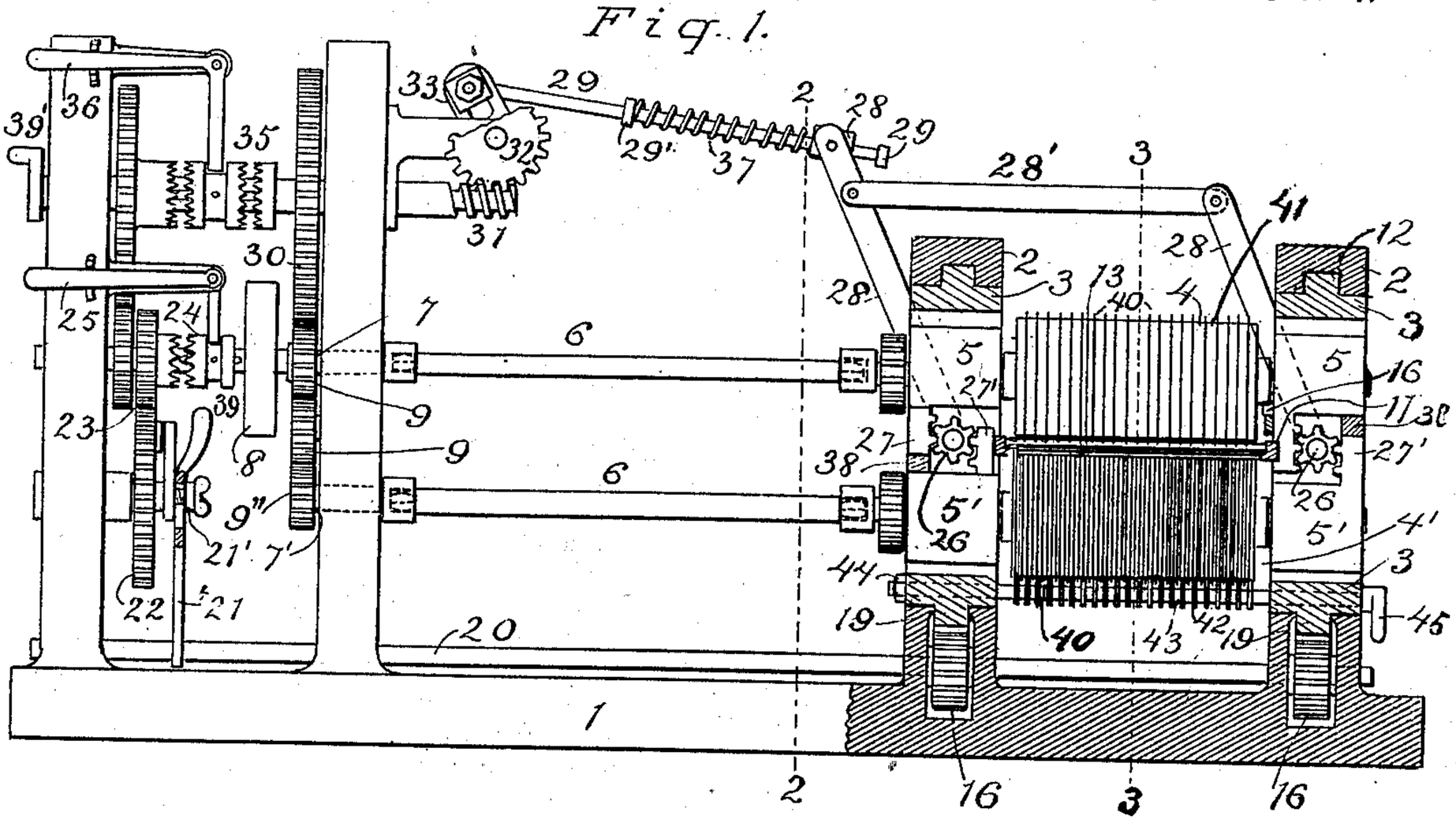

Fig. 2.

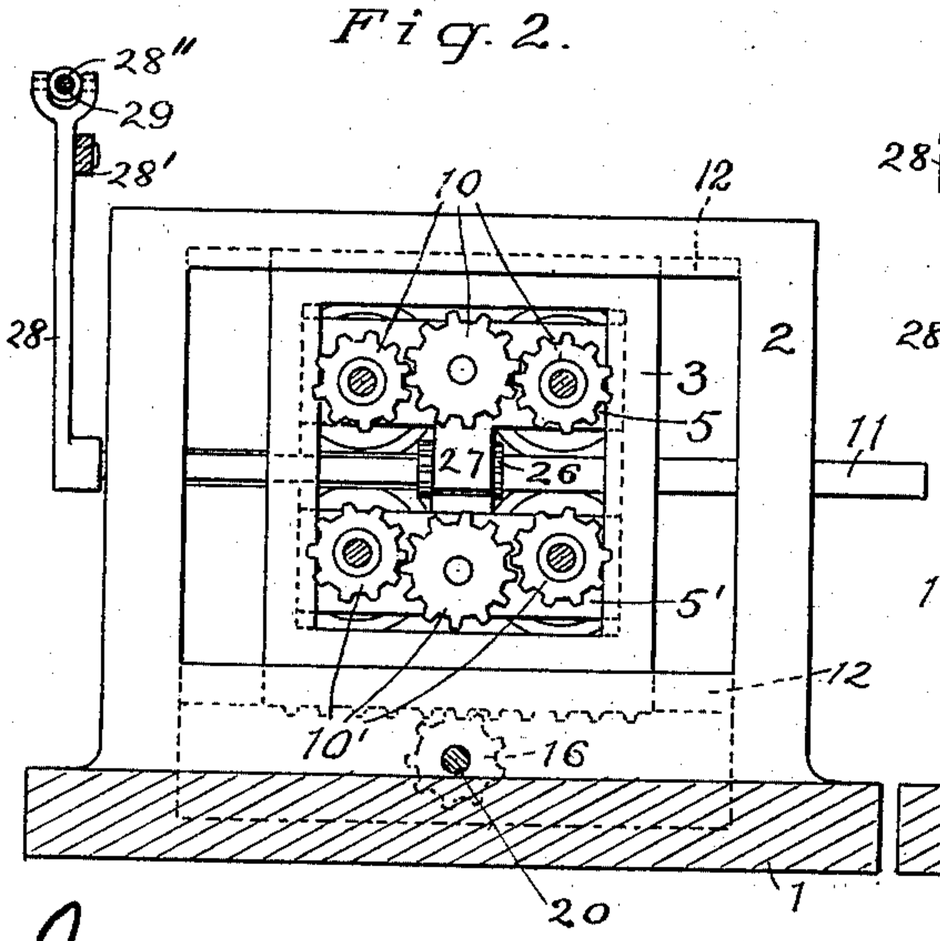

Fig. 3.

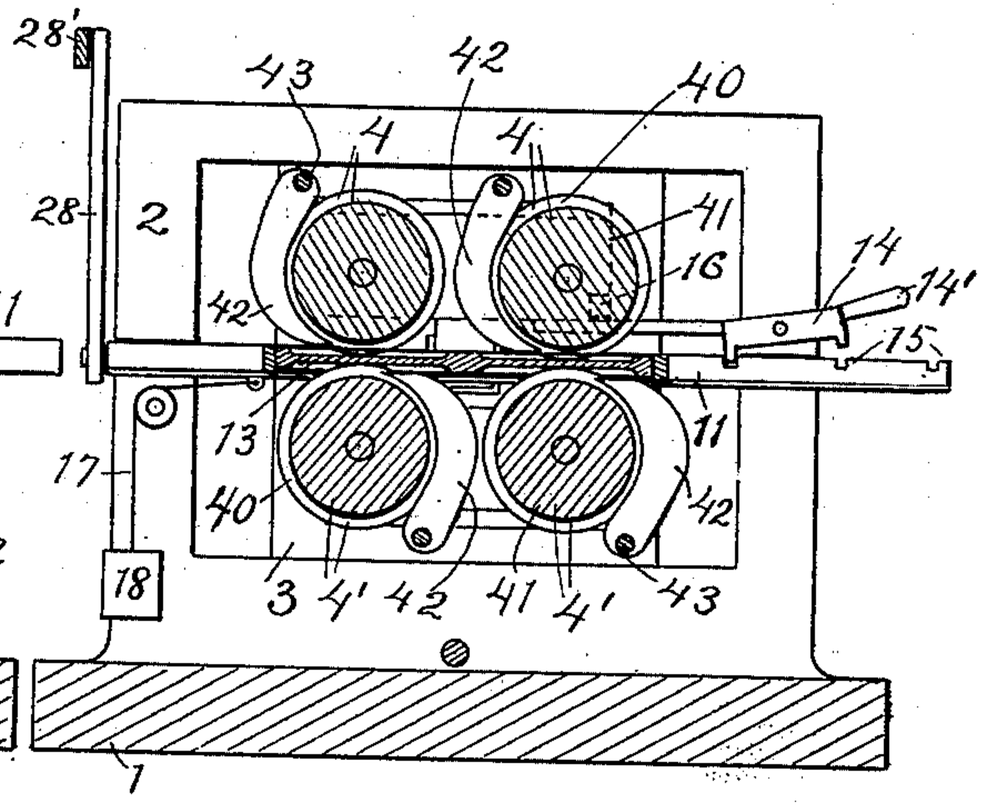

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Fig. 4.

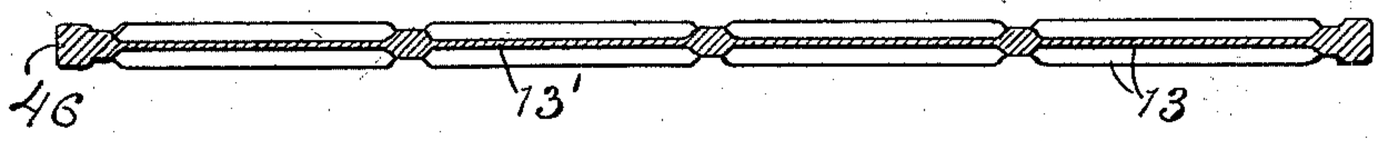


Fig. 5.

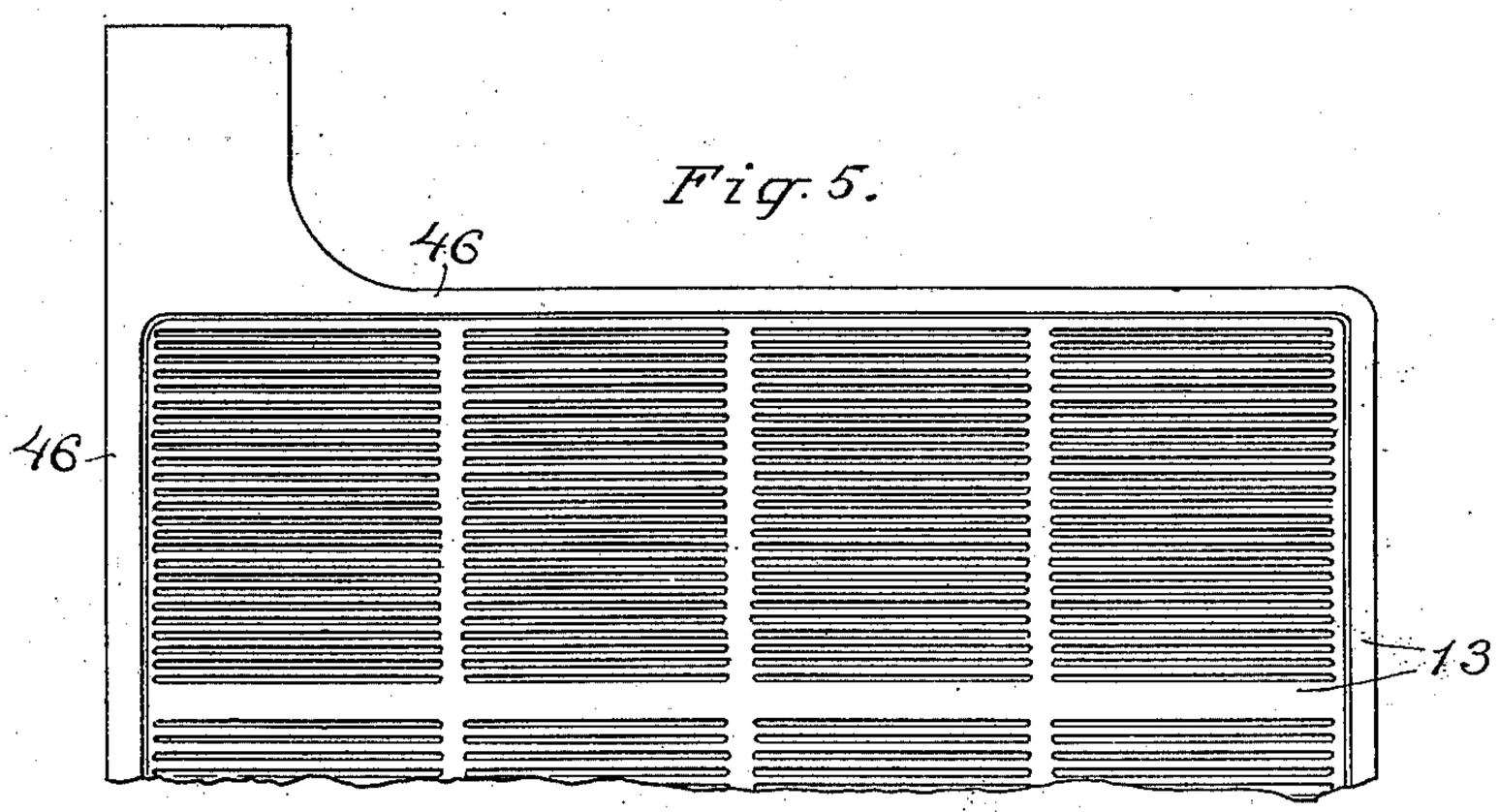
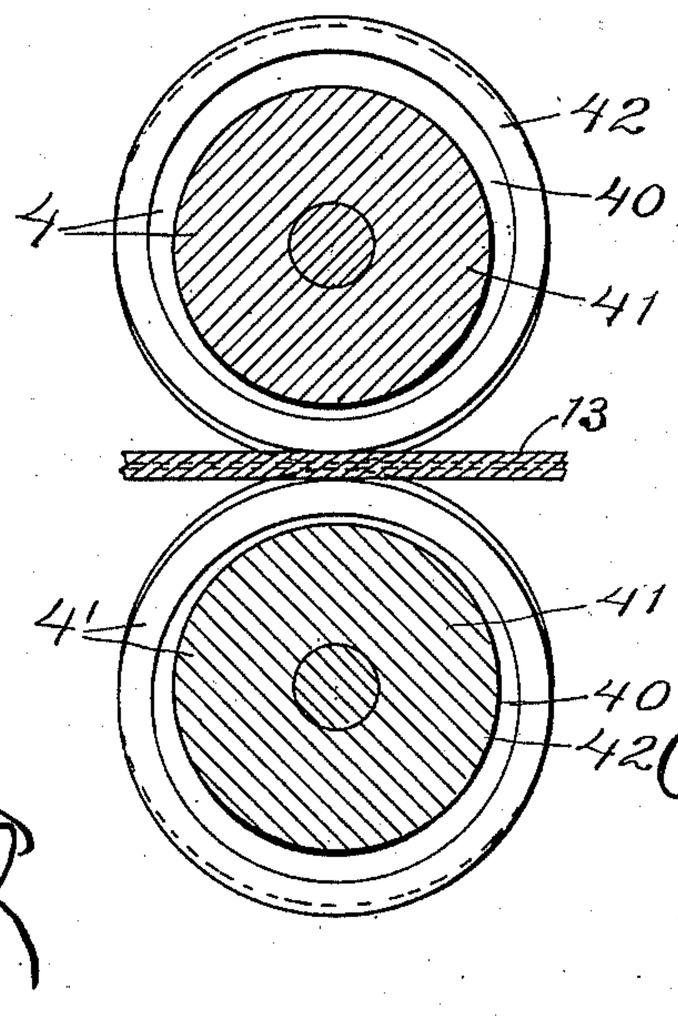


Fig. 6.



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GRID-SPINNING MACHINE.

SPECIFICATION forming part of Letters Patent No. 647,249, dated April 10, 1900.

Application filed March 3, 1899. Serial No. 707,593. (No model.)

To all whom it may concern:

Be it known that I, RUFUS N. CHAMBERLAIN, a citizen of the United States, residing at New York, county and State of New York, have invented certain new and useful Improvements in Grid-Spinning Machines, of which the following is a specification.

This invention relates to improvements in grid-spinning machines, and particularly to improvements on the machine disclosed in Patent No. 572,363, granted to A. F. Madden December 1, 1896. The machine forming the subject of said patent comprised a pair of rolls each provided with a series of parallel spinning-knives adapted to enter the surface of the lead blank plate and by their rapid rotation to spin or form the metal into ridges or ribs with intervening grooves. In said patent the plate is described as adapted to be fed between the rolls, and while this may be effected, as shown in said patent, by causing the plate to travel while the roll-axes remain stationary much the same effect may be produced by causing the rolls to travel over the plate, the latter being held stationary. The latter method of operation presents the advantage that the plate being stationary the progress of the work is apparent at each moment, so that any defect in the operation can at once be detected. Thus, for example, if any one of the knives happens to deflect slightly, and thus to cut sidewise into the ribs, the defective operation is at once apparent and the machine can be stopped in time to save both the knife and the blank plate from serious injury.

An important feature of my present improvement is the provision of means for preventing, as far as possible, deflection or bending of the spinning-knives where they enter the plate. For this purpose I prefer to form the washers which are interposed between the knives on the rolls of sufficient diameter to extend almost or substantially into contact with the grid-plate when the knives are fully inserted. In addition to this, however, I prefer to provide special knife-separating means independent of the rolls, interposed between the knives and separating and guiding same where they enter the plate.

For forming a grid with a plurality of spun sections with intermediate cross-ribs I provide a plurality of pairs of spinning-rolls, simultaneously operated, so as to spin two or more of such sections at once. I may, however, provide, either as auxiliary or alternative to such a construction, means for shifting the relative positions of the spinning-rolls and the blank plate, such means being independent of the feeding devices for causing relative reciprocation of the rolls and the blank plate during the spinning operation. Such shifting means may be manually or automatically controlled. In general several reciprocations will be required to complete any one spinning operation, and to insure that the action shall be uniform and equal in both directions of reciprocation I arrange to drive the spinning-rolls in the same rotative direction, so that their tangential motions relatively to the plate will be oppositely directed and the frictional or dragging effect will be the same in both directions of movement.

I prefer to apply pressure to the rolls to cause their knives to enter the blank plate by means of a manually-controlled pressure-applying device. The power for applying such pressure may be supplied by the operator or it may be supplied by a mechanical power-driven mechanism controlled by the operator. In either case it is desirable to provide a yielding connection, such as a spring connection, between such pressure-applying means and the rolls, so as to enable the rolls to yield or adjust themselves to unusual conditions, such as abnormal hardness of the plates, and thus to prevent breakage of the knives under such conditions.

I find that it is preferable not to make the grooves extend through the plate from side to side, as the ribs are thereby left with too little support, and, moreover, it is very difficult to arrange that the knives shall just meet without interfering with one another. To insure that the knives shall always penetrate to the same depth and shall leave between them a web of definite thickness, I provide means for limiting the approach of the rolls, such means consisting, for example, of spacing-blocks interposed between the bearings of the rolls.

My invention also covers certain features

of the plate and details of the machine mechanism, as hereinafter set forth.

In the accompanying drawings, which form a part of this specification, Figure 1 is a sectional view, partly in elevation, of a machine embodying my present invention. Figs. 2 and 3 are sections on the lines 2 2 and 3 3 in Fig. 1. Fig. 4 is a section of a plate formed by my machine. Fig. 5 is a plan view of a portion of such plate. Fig. 6 shows a modification of the knife-supporting means.

Referring to Figs. 1 to 3, the machine comprises a bed-frame 1, provided with open frame-standards 2, within which slide horizontally the bearing-supports 3 for the spinning-rolls 4 4′, the bearing-blocks 5 5′, in which said rolls are journaled, being adapted to slide vertically in the bearing-supports 3. The rolls 4 4′ are therefore capable of a certain amount of movement in both a vertical and a horizontal direction, and to enable such movement to be effected while maintaining the driving connection I provide a flexible shaft connection consisting of shafts 6 6′, engaging by head and socket connections, permitting lateral, but not rotative, relative movement with the rolls 4 4′ and the driving-shafts 7 7′. One of such shafts carries the main driving-pulley 8, and the two shafts 7 7′ are connected by gearing 9 9′ 9″, so as to turn in the same rotative direction. I have shown two sets of spinning-rolls 4 4′, journaled in parallelism in the bearing-blocks 5 5′ and connected from set to set by gears 10 10′, so as to operate simultaneously on different parts or sections of the blank plate.

A frame or carrier 11 is adapted to slide horizontally in longitudinal grooves 12 in the frame-standards 2 and is adapted to support the blank plate (indicated at 13) for forming the grid. Means are provided for shifting this plate either manually or automatically. I have shown for this purpose an escapement-anchor 14, engaging with teeth 15 in the carrier 11 and engaged by a projection 16 on the bearing-block to release the carrier at each complete advance and retractile movement of the bearing-block. When so released, the carrier is drawn by a cord 17 and weight 18 to bring a different portion of the blank plate between the spinning-rolls. The escapement 14 may have a handle 14′ for manual control.

The handle end of escapement-anchor 14 is of sufficient weight to enable it to descend when the projection 16 rises, so as to cause the tooth at that end of the anchor to fall against a tooth 15 on the carrier and to ride over same until it comes to the notch in advance of the next tooth, whereupon it falls into such notch and stops the carrier.

Means are provided for moving the two side bearing-supports 3 3 simultaneously along the guiding-frame standards 2 2, so as to cause the rolls to traverse the surface of the blank plate. Such means may consist of racks 19 on said bearing-supports 3, pinions 16, engaging with said racks and carried by a rock-shaft 20, and means, such as crank-connection 21, for rocking such shaft, such crank connection being connected to a gear 22, driven by a pinion 23 on the main driving-shaft 7. The crank connection 21 may be adjustable, as by a clamp 21′, so as to give any desired stroke of feed. A clutch 24, controlled by manual controlling device 25, may be interposed in this operating connection, as shown, so as to throw the roll-reciprocating means into or out of operation.

The means for moving the rolls to and from one another comprises pinions 26, engaging with vertical racks 27 27′ on the respective bearing-blocks 5 5′, such pinions being journaled in the side bearing-supports 3 3 and connected together by rock-arms 28 and link 28′, so that both ends of the spinning-rolls are moved simultaneously. One of the rock-arms 28 is connected by a connecting-rod 29 to operating mechanism for effecting and controlling this movement of the rolls. Such operating mechanism is preferably manually controlled and power-driven, the same comprising, for example, a reduction-gearing 30, connected to the main driving-gearing, a worm 31, driven thereby, a worm-wheel 32, operated by said worm and having a crank and link connection 33 29 with the rock-arm 28, and a reversing-clutch 35 for disconnecting and reversing this operating mechanism. The clutch 35 is manually controlled by handle 36. A spring 37 is interposed in this operating connection, being placed, for example, between a collar 29′ on rod 29 and a swivel-collar 28″, which slides on rod 29 and is pivoted to arm 28. A stop-collar 29″ may serve to draw the arm 28 back on the back movement of the crank. It will be noted that such back movement may be effected either by the manual control of the reversing-clutch, or it may take place automatically after full stroke of the crank 33 by reason of said crank passing beyond the dead-point, the movement or stroke of this driving member therefore being definite in length, or if adjustable, as by means of the slot-and-bolt connection shown on the crank 33, it is still definite for any given adjustment. The spring 37 enables such full stroke of the mechanism to be effected, while allowing the approach of the rolls to be limited by suitable stop devices, such as spacing-blocks 38, interposed between the bearing-blocks 5 5′, whose thickness determines the thickness of the web that is left in the grid between the spinning-knives. The spring 37, as it constitutes a yielding connection, also prevents any injury to the knives, such as might result from forcing them too rapidly into the metal.

Handles 39 39′ may be provided for enabling direct manual operation of the horizontal and vertical feeding device in cases of emergency.

Each of the rolls 4 4′ comprises parallel spinning-knives 40, consisting of disks of sheet

metal separated by washers 41 of sufficient diameter to extend almost or substantially into contact with the blank plate when the knife-blades are fully inserted in the said plate. By this means the knives are laterally supported against deflection as far as is possible without the use of supports independent of the rolls. To further support the knives against lateral displacement or deflection, I provide blades, plates, or supports 42, which enter between the rotary spinning-knives 40 and separate and guide same when they enter the plate, said blades extending as close as possible to those parts of the knives which are adjacent to the plate. The blades are shown as arranged only on the "entering" side of the rolls, it being apparent that if the knife is guided and supported as it passes into the metal there will be little danger of its deflection afterward. The plates 42 are shown as mounted rigidly on a rock-shaft 43, provided with a set-nut 44 and handle 45, whereby it may be locked in position or thrown back out of the way. These plates 42 also serve as cleaning-fingers to scrape off any particles of dirt or metal chips or flakes that may lodge on the knives, and on turning these fingers out from between the knives they may be readily cleaned of such particles.

My invention may be applied to the corrugation by spinning of any shape of plate. For some purposes I prefer to use a plate such as indicated in Figs. 5 and 6, having an enlargement or rib 46 or otherwise of an irregular contour, and in such cases it is most convenient to cast the plate with such ribs, the rest of the plate being plain. Such a plate or an ordinary rolled plate is placed in the carrier 11, which is arranged in the side frames 2 in such position as to bring the proper portion of its surface between the rolls 4 4′, the said rolls being fully separated, and the carrier is held in such position by means of locking devices. The machine is then set in motion by means of belt-pulley 8 and the usual starting mechanism, so as to cause the rolls 4 4′ to rotate. The roll-approximating mechanism is then thrown into operation by means of the clutch 36 and manual controlling device 36′, so as to cause the rolls to gradually approach one another. The manual controlling device is also operated to bring the roll-reciprocating mechanism into operation, and the rolls are thereby caused to travel back and forth over the surface of the plate, at the same time rotating, so as to cause their knives 40 to draw or spin the lead of such plate into a ribbed or corrugated form, as indicated in Figs. 4 and 5, but leaving a continuous central web 13′. In this operation there is no metal actually cut away or removed from the plate; but the material that is removed from the grooved portions is drawn up into the intervening edges, so as to leave the latter somewhat above the original surface or body of the plate, as represented by the marginal portion 47, (see Fig. 5,) which has not been operated upon.

As above described, the machine shown has two sets of spinning-rolls, which are adapted to operate simultaneously on two sections of the plate. In case, however, a greater number of sections is to be operated upon the carrier is shifted either manually or automatically, as above explained, to bring different parts of the plate between the rolls.

The guiding or supporting devices for the knives may be variously modified without departing from my invention, provided that the principle of lateral support to the knives is retained. Thus in Fig. 4 I have shown these supports in the form of loose washers which are interposed between the knives on the rolls and tend to continually come in contact with the tops of the ribs on the plate as the rolls rotate. When the knives first enter the plate, the washers extend out to the periphery of the knives; but they are pushed inwardly by the plate as the knives enter the latter. In this form, as well as in that shown in Fig. 1, the supporting devices 42 are independent of the rolls—*i. e.*, are not in fixed mechanical connection with the rolls—so that the rolls can move independently of such devices. Thus while the knife-blades move toward and away from the blank plate these devices 42 remain in close proximity to the plate, so as to support the knives just where they enter the plate.

The transmitting mechanism for the reciprocating relative feed of the rolls and plate may be varied to give any desired number of reciprocations during the spinning of any one part of the plate to full depth and may even give such a slow relative movement that the full depth of groove is formed in one movement of feed.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a machine for spinning battery-plates, the combination with parallel thin spinning-knives, of knife sustaining and alining means interposed between the knife portions which enter the battery-plate, and preventing bending thereof; substantially as explained.

2. In a machine for spinning battery-plates, the combination with parallel spinning-knives, of knife-sustaining means impinging opposite sides of the portions of the knives that enter the metal, and alining said portions of the knives previous to their entering the metal.

3. In a machine for spinning battery-plates, the combination with parallel spinning-knives, movable knife-sustaining means alining the knives in the line of penetration, and receding from the metal as penetration advances.

4. In a machine for spinning battery-plates, the combination of a stationary blank-support, a group of parallel spinning-knives,

shiftable to bring them to bear upon different portions of the blank, means for producing relative feeding movement between the blank and the knives, and means for imparting spinning movement to the knives independent of the feeding movement.

5. In a machine for spinning battery-plates, the combination of a plate-support, and a plurality of spinning-knives operating simultaneously upon the same side of the plate, and means to shift the knives and plate relatively and independently of the feeding movement to cause the knives to successively finish different portions of the plate.

6. In a machine for spinning battery-plates, the combination with parallel spinning-knives, of a stationary blank-support, means for feeding the spinning-knives relatively to the blank-support, and driving mechanism imparting a spinning movement to the knives at a higher rate of speed than the feeding motion thereof.

7. In a machine for spinning battery-plates, the combination of means for supporting a blank plate, a plurality of pairs of spinning-rolls adapted to operate simultaneously upon different portions of such plate, means for effecting relative feeding motion of said rolls and plate, means for rotating said pairs of rolls simultaneously at a higher rate of speed than the relative feeding motion of the rolls and the plate, and means for causing the said sets of rolls to approach the plate.

8. In a machine for spinning battery-plates, the combination with a spinning-roll having a plurality of spinning-knives, means for supporting a blank plate, means for causing relative feed of such plate and roll, and shifting means independent of such feeding means for changing the relative position of such plate and rolls by a movement parallel to the feeding movement to subject different parts of the plate to the action of the roll.

9. In a machine for spinning battery-plates, the combination with a spinning-roll, means for supporting a blank plate, means for causing relative feed of such plate and roll, shifting means independent of such feeding means for changing the relative position of such plate and roll by a movement parallel to the feeding movement to cause different portions of the plate to be operated upon, and means connected to such shifting means and to the roll-operating devices to automatically operate the shifting means when the operation of the roll is completed.

10. In a machine for spinning battery-plates, the combination with a pair of spinning-rolls and means for supporting a blank plate between them, means for producing a relative feeding movement between the blank and rolls, and means for driving said rolls in the same rotative direction, whereby their adjacent portions move in opposite directions and the tangential effect of the respective rolls on the blank plate is balanced and the feed not affected in either direction.

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