Sept. 23, 1941. L. EDDY ET AL 2,256,975

APPARATUS FOR MANIPULATING METAL COILS

Filed Oct. 11, 1939 4 Sheets-Sheet 1

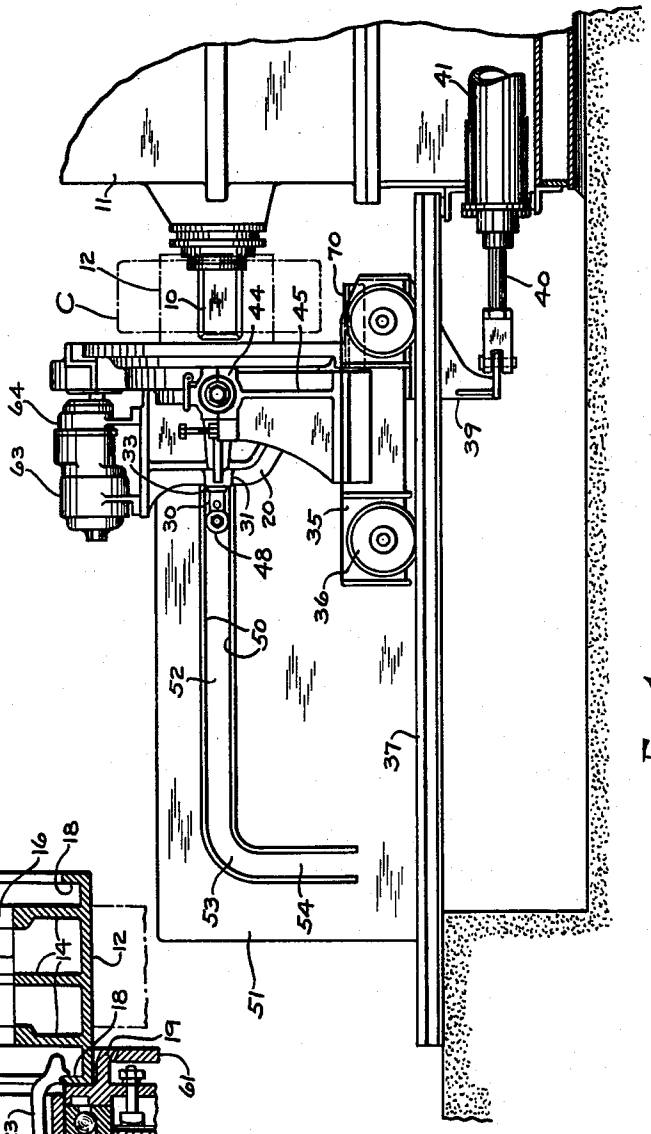


Fig. 1

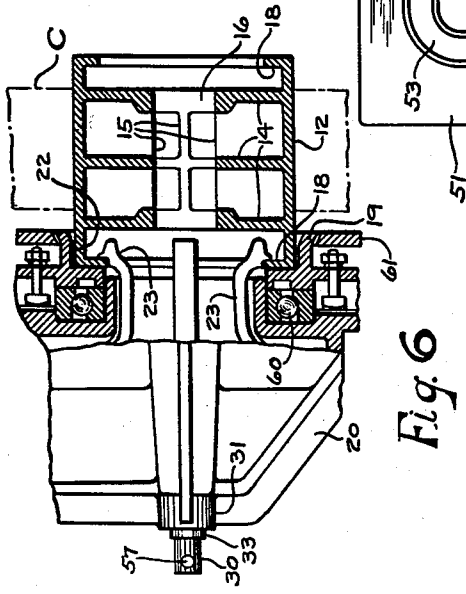


Fig. 6

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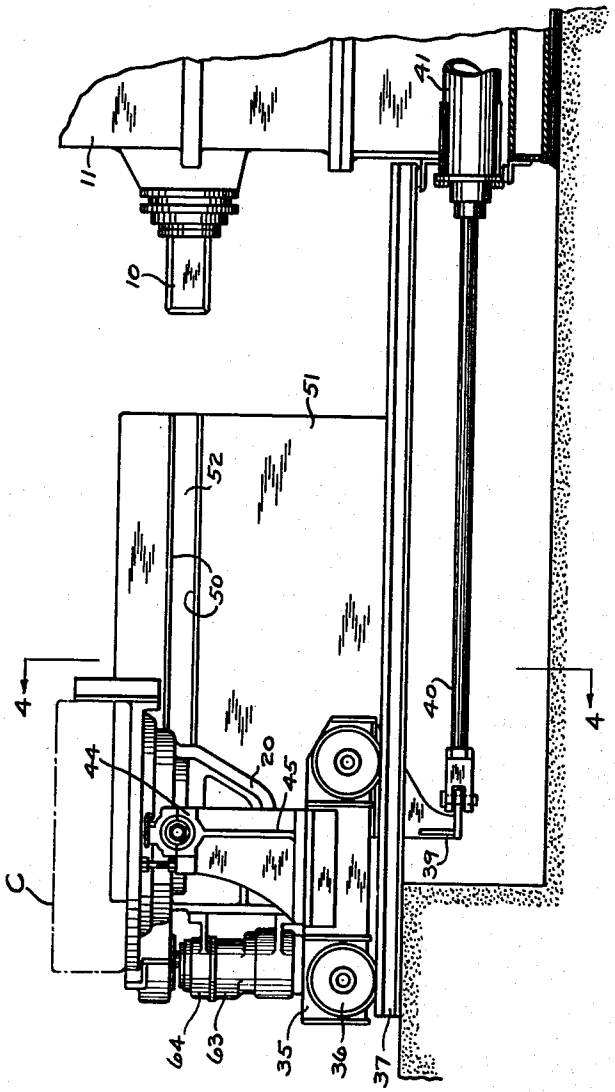


Fig. 2

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APPARATUS FOR MANIPULATING METAL COILS

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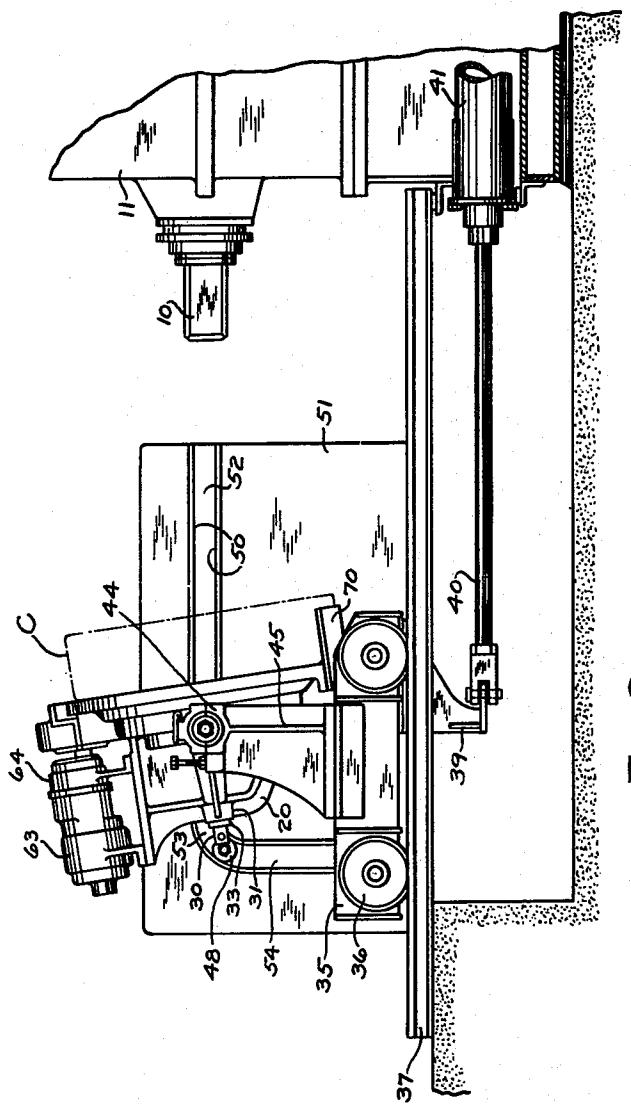


Fig. 3

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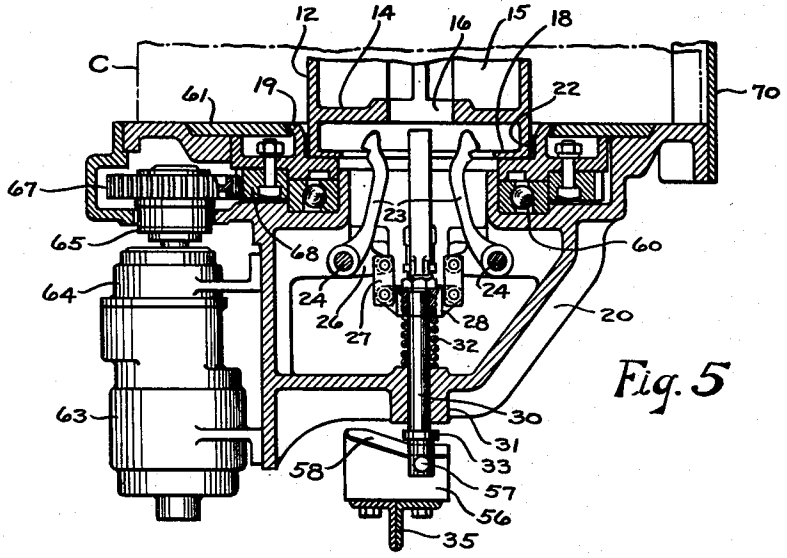


Fig. 5

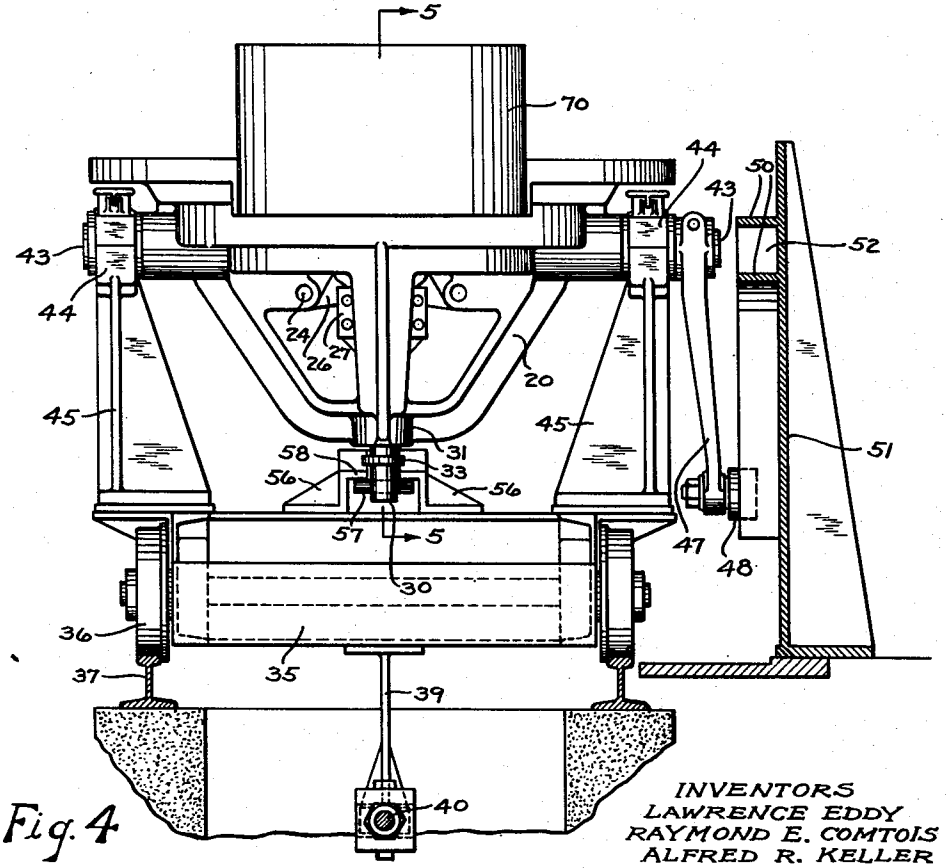


Fig. 4

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UNITED STATES PATENT OFFICE

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APPARATUS FOR MANIPULATING METAL COILS

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Application October 11, 1939, Serial No. 299,044

11 Claims. (Cl. 242—81)

This invention relates to apparatus for manipulating metal coils, and more particularly to apparatus for stripping, upending and spinning coils of flat metal stock.

It is a common practice to form such coils by winding the stock under tension on a cylindrical drum or "block" which is supported and rotated by means of an overhung horizontal arbor. When the coil has been completed, the block and coil are withdrawn axially from the arbor by hand and "up-ended" on a horizontal table to bring the axis of the block vertical. This table is provided with a so-called "spinning" section which makes it possible to bring about a relative rotation between the block and the outer portion of the coil. This serves to loosen the convolutions of the coil and frees the block so that it can be withdrawn from the coil. Such a procedure is feasible with coils of comparatively small size, but it becomes too laborious to be practical with large heavy coils. As a result, attempts have been made to construct power-actuated apparatus which would serve to facilitate the stripping, upending, and spinning of the coil. However, the prior mechanisms have been complicated and expensive, they have required several separate motors for their operation, and they have left the spun coils in such a position as to render subsequent handling thereof difficult.

It is accordingly one object of the invention to overcome these difficulties and to provide a comparatively simple and dependable apparatus for stripping, up-ending and spinning metal coils.

It is a further object of the invention to provide an apparatus which can be actuated by a single motor and which will serve both to strip the loaded block from the arbor and to up-end the block for the subsequent spinning operation.

It is a further object of the invention to provide an improved up-ending and spinning apparatus which will serve to place the spun coils in a position such as to facilitate the subsequent handling thereof.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention and in which like reference numerals indicate like parts.

Fig. 1 is a side elevation of a coil manipulating apparatus in position to strip a loaded block from its supporting arbor;

Fig. 2 is an elevation similar to Fig. 1 showing the parts in position to spin the coil;

Fig. 3 is an elevation similar to Fig. 2 showing the parts in position for the removal of the spun coil;

Fig. 4 is an enlarged view in section on the line 4—4 of Fig. 2;

Fig. 5 is a section on the line 5—5 of Fig. 4; and

Fig. 6 is a fragmentary view similar to Fig. 5 but showing the parts in position for stripping the block from the arbor.

The embodiment illustrated comprises a horizontal rotatable overhung arbor 10 which projects from a supporting casing 11 in which a suitable driving mechanism (not shown) may be enclosed in known manner. This arbor 10 is preferably of non-circular cross-section (for example, a square with the corners rounded), and it serves as a supporting and driving means for a block 12. As shown particularly in Fig. 6, this block is shaped as a hollow cylinder having internal transverse webs 14 and longitudinal ribs 15 which provide an axial bore 16 of the same size and shape as the arbor 10. With the block 12 in position on the arbor, flat metal stock may be wound under tension on the outside of the block to form a coil C in a well-known manner. Ordinarily the stock will be delivered directly to the block from a rolling mill (not shown) as is customary in this art.

Upon completion of the coil, the block and coil are removed in the axial direction from the arbor, and this is preferably accomplished by a stripping mechanism arranged to grasp the block adjacent its outer end and apply an outward pull thereto. To facilitate this action, the block is provided near its outer end with an inwardly-turned flange 18 (Fig. 6) forming a shoulder, and in the preferred construction a similar flange is provided near the inner end of the block, so that the block will be symmetrical and the operator can make no mistake in mounting it on the arbor. The stripping mechanism illustrated comprises an annular member 19 mounted on a frame 20 and formed with a circular recess 22 of the proper size to receive the outer end portion of the block. In order to retain the block in this recess, four hook-shaped fingers or latches 23 are pivotally secured to the frame 20 by means of pins 24, these fingers being arranged to extend through the annular member 19 and into engagement with the inner surface of the flange 18, as shown in Fig. 6. The fingers 23 are urged yieldingly outward, away from the axis of the block, and for this purpose

they are provided with inwardly projecting lugs 26 which are connected by links 27 to a central hub 28 mounted on one end of a rod 30. This rod is slidably supported in a bearing 31 in the frame 20. A coiled compression spring 32 surrounds the rod 30 between the bearing 31 and the hub 28 and urges the rod axially, such axial movement imparting the desired outward movement to the fingers 23. A flange 33 is provided on the rod 30 to form a shoulder which will engage the bearing 31 and thus limit the axial movement of the rod under the influence of the spring 32. The frame 20 is mounted on a carriage 35 which is arranged to reciprocate in a direction parallel with the arbor 10. For this purpose the carriage is provided with wheels 36 which rest on rails 37 therebeneath. An arm 39 extends downwardly from the carriage 35 between the rails, and this arm is connected to the end of a horizontal reciprocable piston rod 40 which forms a part of a fluid-pressure actuated motor 41.

It will now be apparent that as the carriage 35 and frame 20 are moved toward the arbor 10 by means of the motor 41, the fingers 23 will be forced inwardly by their engagement with the flange 18 at the outer end of the block. As soon as the bottom of the recess 22 reaches the end of the block, the fingers will snap outwardly under the influence of the spring 32 into position to retain the block in the recess, as shown in Fig. 6. Thereupon, the carriage 35 and frame 20 will be moved away from the arbor by means of the motor 41, and the block will be stripped from the arbor.

Upon completion of the stripping operation, the frame 20 is moved into a position such as to up-end the block and coil, and bring the axis thereof vertical. This is preferably brought about by means responsive to a continuation of the movement of the carriage 35 along the rails 37. For this purpose the frame 20 is provided with a pair of aligned trunnions 43 (Fig. 4) which are supported in bearings 44 on the upper ends of two spaced upstanding brackets 45 on the carriage 35. The axis of the trunnions 43 is in the same horizontal plane as the axis of the arbor 10 and perpendicular thereto. To one of the trunnions there is secured an arm 47 which extends substantially parallel with the rod 30 and carries on its free end a follower in the form of an idler roller 48. This roller is located between a pair of spaced flanges 50 which extend toward the arm 47 from a vertical plate 51 and form a guideway for the roller. As shown particularly in Fig. 1, this guideway is shaped to provide a long horizontal portion 52, a portion 53 which curves downwardly from the end of the portion 52 remote from the arbor, and a short vertical portion 54 which extends downwardly from the curved portion. It will be apparent that as the carriage moves along the rails 37 and away from the arbor 10, the roller 48 will follow along between the flanges 50. While the roller is in the horizontal portion 52 of the guideway, the axis of the block 12 will remain horizontal, but as the roller enters the curved portion 53 the frame 20 will begin to swing in its trunnion bearings 44. Continued movement of the carriage will force the roller downwardly along the vertical portion 54 of the guideway until the axis of the block is vertical, whereupon the carriage will be brought to a stop in the position shown in Fig. 2.

As the frame 20 approaches the position in which the axis of the block is vertical, the fingers 23 are automatically withdrawn from their engagement with the block. For this purpose, two spaced brackets 56 (Figs. 4 and 5) are mounted on the top of the carriage 35 beneath the frame 20 in such a position that the end portion of the rod 30 may pass between them. This portion of the rod is provided with a transverse pin 57, and the brackets are provided with flanges 58 which form cam surfaces adapted to be engaged by this pin. These parts are so constructed and arranged that as the frame 20 swings in its bearings 44 and approaches the position shown in Fig. 5, the pin 57 will make contact with the lower surfaces of the flanges 58 and thereby be forced downwardly, pulling the rod 30 downwardly against the pressure of the spring 32, and withdrawing the fingers 23.

After the block and coil have been up-ended in this manner, the coil is spun by effecting a relative rotation between its inner and outer convolutions in such a direction as to loosen the coil. In the embodiment illustrated, this spinning is brought about by rotating the block 12, the outer convolutions of the coil being prevented from turning by their frictional engagement with a stationary surface therebeneath. As shown particularly in Fig. 5, the annular member 19 which forms the recess 22 for the block is rotatably supported in the frame 20 by means of an antifriction bearing 60, and this member is surrounded by a flat annular member 61 which is fixed to the frame 20. The frame 20 and the members 19 and 61 form a table arranged to swing from a vertical plane to a horizontal plane as the block and coil are up-ended. The block 12 and member 19 can be rotated manually, but we prefer to utilize a motor for this purpose. We have shown an electric motor 63 mounted on the frame 20 and connected through a speed-reducing unit 64 and an over-running clutch 65 to a gear 67 which meshes with an annular gear 68 fastened to the member 19. At one side of the table we preferably provide an arcuate member 70 which projects at right angles therefrom, for a purpose which will be explained hereinafter.

The operation of the invention will now be apparent from the above disclosure. A block 12 will be mounted on the arbor 10, and a coil C of flat stock will be wound under tension on the outside of the block in known manner. Upon completion of the coil the arbor will be stopped from rotating and preferably a band will be placed about the coil. This will preferably be a relatively loose band of the diameter which the coil is to assume when the spinning is completed. The operator will then admit pressure fluid to the motor 41 and cause the carriage 35 to move along the rails 37 toward the arbor and into the position shown in Fig. 1. The fingers 23 will snap into engagement with the flange 18 of the block and hold the block in the recess 22. The motor 41 will now be reversed, and the carriage 35 will move in the opposite direction, stripping the block with the coil thereon from the arbor, so that another block can be placed on the arbor and a new coil started. As the carriage continues to move, the roller 48 will reach the curved portion 53 of its guideway, and the arm 47 will turn the frame 20 in its trunnion bearings 44 until the axis of the block is vertical, whereupon the carriage will be stopped. Just before this turning movement of the frame

is completed, the pin 57 will engage the flanges 58, pulling the rod 30 downwardly and disengaging the fingers 23 from the block. The block will now be rotated either manually or by means of the motor 63, the direction of rotation being such as to loosen the coil and cause its outside diameter to increase to that of the surrounding band. Upon completion of this spinning operation the block will be free from engagement with the coil and can be readily removed therefrom in an upward direction. Thereupon the carriage 35 will be moved by the motor 41 into the position shown in Fig. 3, with the roller 48 in the curved portion 53 of its guideway. This will swing the frame 20 in its trunnion bearings and cause the table to assume a position slightly inclined from the vertical. The coil will rest on the member 70, which forms a supporting shelf, and a crane or other suitable means may be used to lift the coil therefrom. Upon completion of the next coil the cycle will be repeated.

It will be noted that the single motor 41 provides the power required for both the stripping operation and the up-ending operation. In fact the up-ending is brought about by a smooth continuation of the motion which begins with the stripping, and the coil does not cease to move until it is ready for spinning. Upon completion of the spinning operation, the same motor 41 places the coil in a convenient position for removal. The apparatus is comparatively simple, rugged and dependable.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, the block having a flange on the interior thereof, and stripping mechanism mounted adjacent said arbor for reciprocation in a direction parallel therewith, said stripping mechanism including parts arranged to engage the flange and withdraw the block axially from the arbor.

2. In combination with a horizontal rotatable overhung arbor, a hollow block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, and a group of spring-loaded fingers mounted on the carriage and arranged to grip the block internally, and thereby withdraw the same axially away from the arbor.

3. In combination with a horizontal rotatable overhung arbor, a hollow block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, the block having an inwardly-turned flange formed therein, a carriage arranged to reciprocate in a direction parallel with the arbor, and a group of spring-loaded fingers mounted on the carriage and arranged to engage the flange and thereby withdraw the block axially away from the arbor.

4. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, and means mounted on the carriage to strip the block and coil from the arbor and up-end the block and coil as the carriage moves away from the arbor.

5. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, a table pivotally supported on the carriage about a horizontal axis transverse to the arbor, means to swing the table into a substantially vertical plane when the carriage is adjacent the arbor and into a substantially horizontal plane when the carriage is remote from the arbor, and means to secure the block to the table when the carriage is adjacent the arbor.

6. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, a table pivotally supported on the carriage about a horizontal axis transverse to the arbor, means to swing the table into a substantially vertical plane when the carriage is adjacent the arbor and into a substantially horizontal plane when the carriage is remote from the arbor, means to secure the block to the table when the carriage is adjacent the arbor, and means to release the block from the table when the carriage is remote from the arbor.

7. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, a table pivotally supported on the carriage about a horizontal axis transverse to the arbor, the table having a recess therein shaped to receive the end portion of the block, means to swing the table into a substantially vertical plane when the carriage is adjacent the arbor and a substantially horizontal plane when the carriage is remote from the arbor, spring-loaded fingers arranged to grip the block internally and secure the same in the recess when the carriage is adjacent the arbor, and means to release the fingers from the block when the table is swung into the substantially horizontal plane to up-end the block.

8. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a table located adjacent the arbor and having a spinning section, means to releasably secure the block to the table, and means to move the table away from the arbor to strip the block and coil and thereafter up-end the same, whereby the coil may be spun and the block removed therefrom.

9. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a table located adjacent the arbor and having a spinning section, means to releasably secure the block to the table, means to move the table away from the arbor to strip the block and coil and thereafter up-end the same, whereby the coil may be spun and the block removed therefrom, a shelf projecting from the table, and means to tilt the table after the coil has been spun and cause the coil to rest on the said shelf.

10. In combination with a horizontal rotatable

overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, a table pivotally supported on the carriage about a horizontal axis transverse to the arbor, the table having a spinning section and a projecting shelf, means to swing the table into a substantially vertical plane as the carriage moves toward the arbor, means to releasably secure the block to the table, and means to swing the table into a substantially horizontal plane as the carriage moves away from the arbor, whereby a block and coil are stripped and up-ended to allow the coil to be spun and the block removed therefrom, the shelf serving to support the spun coil as the table again approaches a vertical plane upon the return movement of the carriage toward the arbor.

11. In combination with a horizontal rotatable overhung arbor, a block arranged to be mounted on the arbor and rotated thereby for the formation of a coil of strip metal on the outside of the block, a carriage arranged to reciprocate in a direction parallel with the arbor, a motor connected to the carriage to reciprocate the same, two spaced bearings on the carriage, a frame located between the bearings and having two aligned horizontal trunnions which rest in the bearings, the axis of the trunnions being transverse to the arbor, an annular member rotatably mounted in the frame and providing a recess shaped to receive the end portion of the block, spring-loaded fingers located in the recess and arranged to engage the interior of the block to retain the block in the recess, an arm secured to one of the trunnions, a follower mounted on the arm, a guideway for the follower to control the swinging movements of the frame in its trunnion bearings, the guideway being so shaped that as the carriage approaches the arbor the fingers will move into engagement with the block and as the carriage leaves the arbor the block and coil will be stripped from the arbor and then up-ended, and means to release the fingers from the block as the up-ending is completed.

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