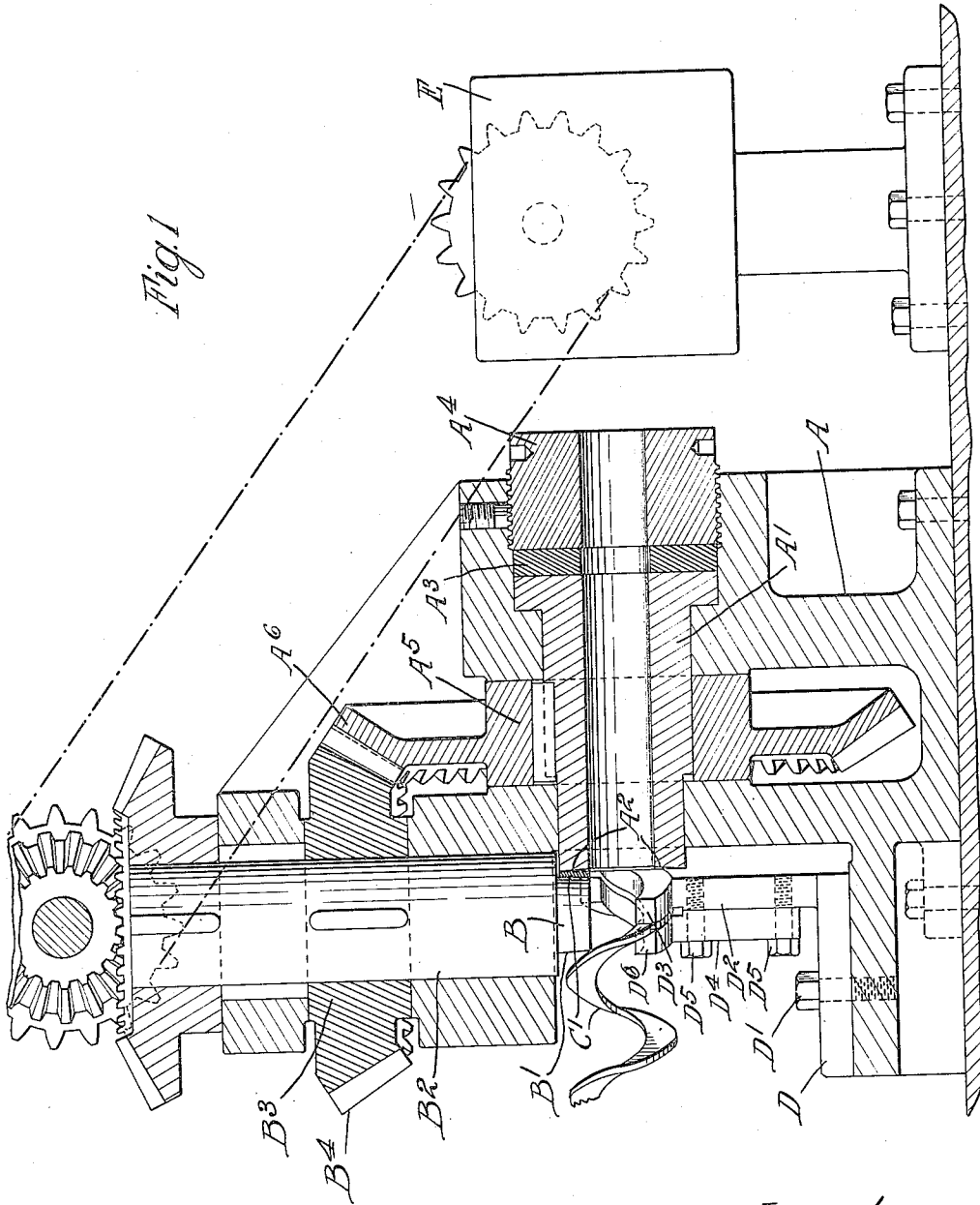


March 22, 1932.

J. L. LANE ET AL
METAL ROLLING MILL

1,850,885

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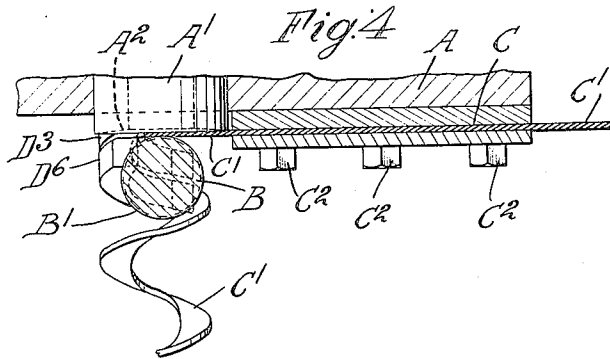
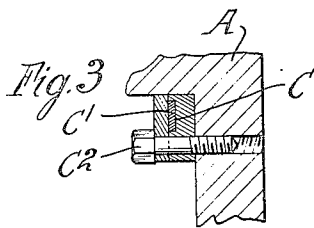
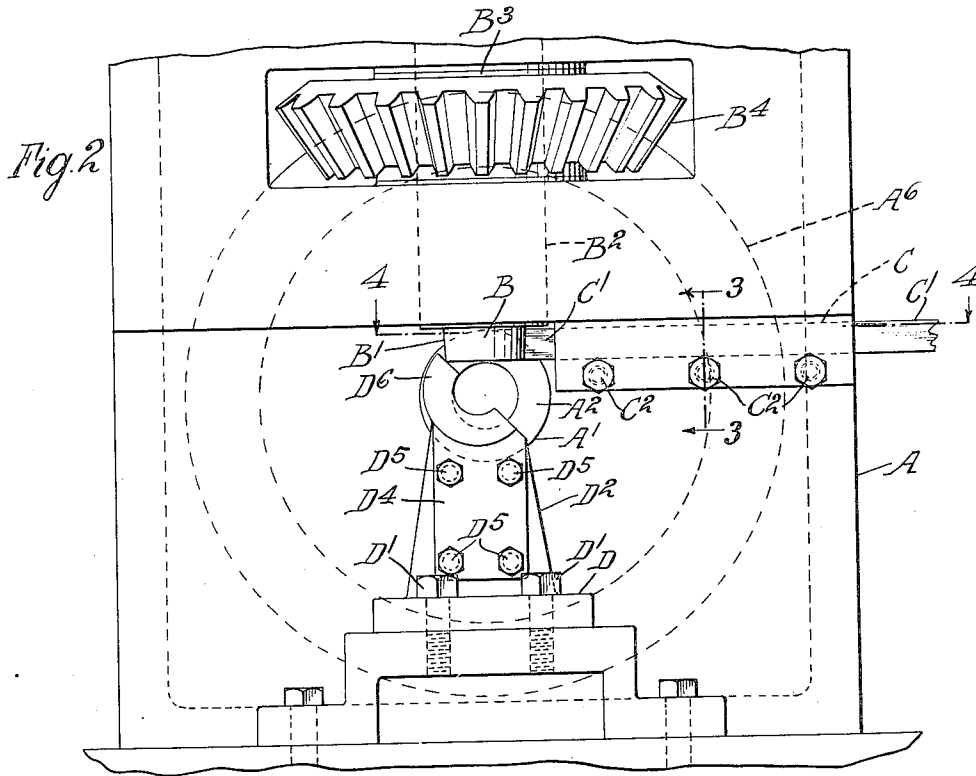
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UNITED STATES PATENT OFFICE

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METAL ROLLING MILL

Application filed April 13, 1928. Serial No. 269,715.

Our invention relates to metal rolling machines and has for one object to provide a new and improved apparatus for rolling or forming metal. It is particularly designed as an apparatus for rolling helical strips of metal such as may be used in connection with spiral conveyors from flat bar or strip stock but can be used for other purposes where that is desirable.

One object of the invention is to provide a metal forming or rolling apparatus wherein it is not necessary to use pre-cut blanks and wherein a continuous blank may be fed into the apparatus and cut off after the desired length has been reached and still leave the work in the machine ready to start up again when more of the same product is desired.

Another object of the invention is to provide a type of roll wherein the rolls or forming elements which form the blank are so disposed that they cover a minimum area so as to make it possible for other operations to be performed on the blank simultaneously with the rolling or forming of the blank itself such as for instance, the insertion of a central shaft in the helical coil and the like.

Another object is to provide a forming device where the forming rolls or members are arranged generally at right angles to each other. Other objects will appear from time to time throughout the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein—

Figure 1 is a longitudinal vertical section through a machine adapted to carry out the invention;

Figure 2 is a front elevation of the machine;

Figure 3 is a section along the line 3—3 of Figure 2;

Figure 4 is a section along the line 4—4 of Figure 3.

Like parts are indicated by like characters throughout the several figures.

A is a supporting frame. In it is mounted for rotation the hollow cylindrical roll A¹. This roll is supported at both ends in the frame as indicated and has at one end a

cupped or concave working face A². A³ is a thrust bearing. The frame A is associated with an adjustable thrust block A⁴ to prevent longitudinal movement of the roll. A⁵ is a hub mounted on the roll A¹ between its two bearings in the frame A and this hub carries a bevel gear A⁶.

B is a generally cylindrical or very slightly tapered roll. Its axis of rotation is generally at right angles to the axis of rotation of the roll A¹ and its cylindrical working face B¹ is in opposition to the working face of the roll A¹, the end of the roll being substantially tangential to the inner diameter of the roll A¹. This roll B is located at the end of a drive shaft B² mounted for rotation in the frame A, being supported in bearings at both ends thereof. B³ is a hub on the shaft B² between said bearings and it carries a bevel gear B⁴ in mesh with the gear A⁶. The shaft B² extends upwardly and may be driven by any suitable means not here shown in detail, the driving of this shaft resulting in driving the rolls A¹ and B in unison.

Projecting laterally from the frame is a stock guide. This stock guide takes the form of a solid or channeled pocket C through which a strip of bar stock C¹ may be fed and guided into the space between the opposed working faces of the rolls. This stock guide is removable, being held in place by the cap screws C² so that different or adjustable guides may be provided for the various sizes of bar stock required for the different sizes of conveyor flights. No feeding means are provided in connection with the stock guide. Once the stock has been passed through the guide and has engaged the roll, the rolls A and B themselves draw in the stock at the rate at which it is to be worked in the manner usual to rolling mill practice.

The flight guide comprises a base D bolted to the frame A by means of cap screws D¹. From it projects upwardly the bracket D² which carries a guide head D³ located in front of the roll A¹. Associated with the bracket D² is a removable bracket D⁴ which bracket is held on the member D² by the cap screws D⁵. D⁶ is a guide head on the member D⁴ in opposition to the guide head D³. These two guide

heads cooperate to form a helical guide slot so positioned as to receive the flight after it has been passed between and been formed by the rolls and guide it along a helical path
5 away from the rolls, giving it the desired pitch.

It is a shaft feeding and rotating mechanism located in line with the hollow cylindrical roll and adapted to feed the shaft longitudinally through the roll to cause the rate of rotation and rate of longitudinal feed of the shaft to correspond to the rate of feed and rotation of the finished flight. The details of this shaft feeding mechanism form no
10 part of the present invention and I have therefore neither disclosed or described them.

In commercial practice spiral conveyors have their spiral flights mounted on pipe or shafts and they are so referred to in the trade.
20 In this specification I refer only to shaft using that in its generic sense as applied to any element whether such as a cold rolled shaft or hollow as a pipe which serves as a central supporting shaft about which spiral flights
25 are wound.

The contours of the opposed faces of the rolls are fixed empirically. In general the solid roll is cylindrical or very slightly conical or tapered. The hollow or tubular roll
30 is concave and it might be conical but preferably the surface is a curved surface, the radius of curvature of the surface decreasing outwardly. When these contours are established different thickness of metal may be
35 formed by changing the distance between the working faces of the rolls, which is done by unscrewing or screwing in the holding sleeve. The forward movement of the hollow roll is limited by the shoulder as indicated. When
40 the holding sleeve is backed off the roll clears the shoulder but is held in place by the metal squeezed between the two rolls and no separate means are needed for holding it back against the sleeve.

45 The use and operation of this invention are as follows:

The operator feeds a strip of stock and it may be bar stock in straight lengths or strip stock wound in rolls as the case may be. The
50 end is fed in through the stock guide into engagement with the working face of the rolls. As the rolls rotate they draw the flat flight forming stock in between their working faces. It will be noted that the distance between the
55 faces decreases outwardly so that the flight as it is formed is thicker toward the center than toward the periphery. This gives an elongation of the outer periphery of the flight and causes it to form an approximate spiral. The spiral flight thus formed is guided through the fixed guides to give it proper
60 pitch. As this flight travels out through the guide it rotates about a central axis being supported on a carrier bar which holds the

flight generally in line with the axis of rotation of the hollow roll.

We claim:

1. In a forming machine, two rolls mounted for rotation about axes substantially perpendicular to each other and having opposed
70 working faces, one on the end, the other on the side of its roll, the distance between the opposed working faces decreasing outwardly along the radius of the end face.

2. In a forming machine, two rolls mounted for rotation about axes substantially perpendicular to each other and having opposed
75 working faces, one on the end, the other on the side of its roll, the lines formed by the intersection of the two working faces with the plane in which both axes of rotation are located being inclined to each other.

3. In a forming machine, two rolls mounted for rotation about axes substantially perpendicular to each other and having opposed
80 working faces, one on the end, the other on the side of its roll, the working face on the end of the roll being concave.

4. In a forming machine, two rolls mounted for rotation about axes substantially perpendicular to each other and having opposed
85 working faces, one on the end, the other on the side of its roll, the working face on the end of the roll being concave, the working face on the side of the roll being generally conical.

5. In a forming machine, two rolls mounted for rotation about axes substantially perpendicular to each other and having opposed
90 working faces, one on the end, the other on the side of its roll, the working face on the end of the roll being concave, the diameter of the working face on the side of the roll varying along its axis of rotation.

6. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other, one of the rolls being solid, the other tubular, the tubular opening extending longitudinally throughout the
95 entire length of the roll and its support, the solid roll terminating adjacent the periphery of the tubular aperture through the other roll whereby a bar may be introduced through the tubular roll without interference by the solid roll.

7. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other, one of the rolls being solid, the other tubular, working faces on
100 the side of the solid and the end of the tubular roll.

8. In a forming machine, two rolls one of them solid the other tubular, working faces on the side of the solid and the end of the tubular roll, the solid roll terminating adjacent the periphery of the tubular aperture through the other roll whereby a bar may be introduced through the tubular roll without
105 interference by the solid roll.

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9. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other, one of the rolls being solid, the other tubular, working faces on the side of the solid and the end of the tubular rolls, the working face on the solid roll terminating generally in line with the inner periphery of the working face on the tubular roll.

10. In a forming machine, two rolls one of them solid, the other tubular, working faces on the side of the solid and the end of the tubular rolls, the working face on the solid roll terminating generally in line with the inner periphery of the working face on the tubular roll.

11. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other and means for guiding a blank between them along a line perpendicular to both axes, means for guiding the helical strip of material formed from the blank and discharged from between the rolls along a helical path, the axis of which is generally parallel with the axis of one of the rolls.

12. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other and means for guiding the helical strip of material formed from a blank and discharged from between the rolls along a helical path the axis of which is generally parallel with the axis of one of the rolls.

13. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other, one of the rolls being solid, the other tubular, means for guiding the helical strip of material formed from a blank and discharged from between the rolls along a helical path, the axis of which is generally parallel with the axis of the tubular roll.

14. In a forming machine, two rolls one of them solid, the other tubular, means for guiding the helical strip of material formed from a blank and discharged from between the rolls along a helical path, the axis of which is generally parallel with the axis of the tubular roll.

15. In a forming machine, two rolls mounted for rotation on axes substantially perpendicular to each other, one of the rolls being solid, the other tubular, the tubular opening extending longitudinally throughout the entire length of the roll and its support, the solid roll terminating adjacent the periphery of the tubular aperture through the other roll whereby a bar may be introduced through the tubular roll without interference by the solid roll, and guide means associated with the rolls adapted to bend and guide a strip passed between them and wind it about a bar passing through the tubular roll.

16. In a forming machine, two rolls one of

them solid the other tubular, working faces on the side of the solid and the end of the tubular roll, the solid roll terminating adjacent the periphery of the tubular aperture through the other roll whereby a bar may be introduced through the tubular roll without interference by the solid roll, and guide means associated with the rolls adapted to bend and guide a strip passed between them and wind it about a bar passing through the tubular roll.

17. A machine for making spiral conveyors comprising a hollow roll having an annular working face on the end thereof, a roll mounted for rotation on an axis generally perpendicular to, and terminating substantially in line with the inner periphery of the hollow roll, and a support therefor out of line with the working face of the hollow roll.

18. A machine for making spiral conveyors comprising a hollow roll having an annular working face on the end thereof, a roll mounted for rotation on an axis generally perpendicular to, and terminating substantially in line with the inner periphery of the hollow roll, and a support therefor out of line with the working face of the hollow roll, means for guiding a strip of material into the space between the working face of the rolls and means for guiding a conveyor flight formed from such strip by the action of the rolls along a spiral path, the axis of which is parallel with the axis of the hollow roll.

19. A machine for making spiral conveyors comprising a hollow cylindrical roll having a working face on the end thereof and adapted to permit longitudinal feed of a shaft therethrough, a roll having a working face on the side thereof in opposition to the working face of the hollow roll and terminating adjacent the periphery of the shaft which is fed through the hollow roll.

20. A machine for making spiral conveyors comprising a hollow cylindrical roll having a working face on the end thereof and adapted to permit longitudinal feed of a shaft therethrough, a roll having a working face on the side thereof in opposition to the working face of the hollow roll and terminating adjacent the periphery of the shaft which is fed through the hollow roll, the space between the working face of the two rolls decreasing from the shaft outwardly.

21. A machine for making spiral conveyors comprising a hollow cylindrical roll having a working face on the end thereof and adapted to permit longitudinal feed of a shaft therethrough, a roll having a working face on the side thereof in opposition to the working face of the hollow roll and terminating adjacent the periphery of the shaft which is fed through the hollow roll, a guide associated with said rolls and adapted to conduct material as it is discharged from between the rolls

and direct it in a spiral path around the shaft.

22. A machine for making spiral conveyors comprising a hollow roll having an annular working face on the end thereof, a roll mounted for rotation on an axis generally perpendicular to, and terminating substantially in line with the inner periphery of the hollow roll.

23. A machine for making spiral conveyors comprising a hollow roll having an annular working face on the end thereof, a roll mounted for rotation on an axis generally perpendicular to, and terminating substantially in line with the inner periphery of the hollow roll, means for guiding a strip of material into the space between the working face of the rolls and means for guiding a conveyor flight formed from such strip by the action of the rolls along a spiral path parallel with the axis of the hollow roll.

Signed at Chicago, in the county of Cook and State of Illinois, this 24th day of March, 1928.

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JAMES L. LANE.
ALFRED H. MOORE.

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