

Aug. 2, 1966

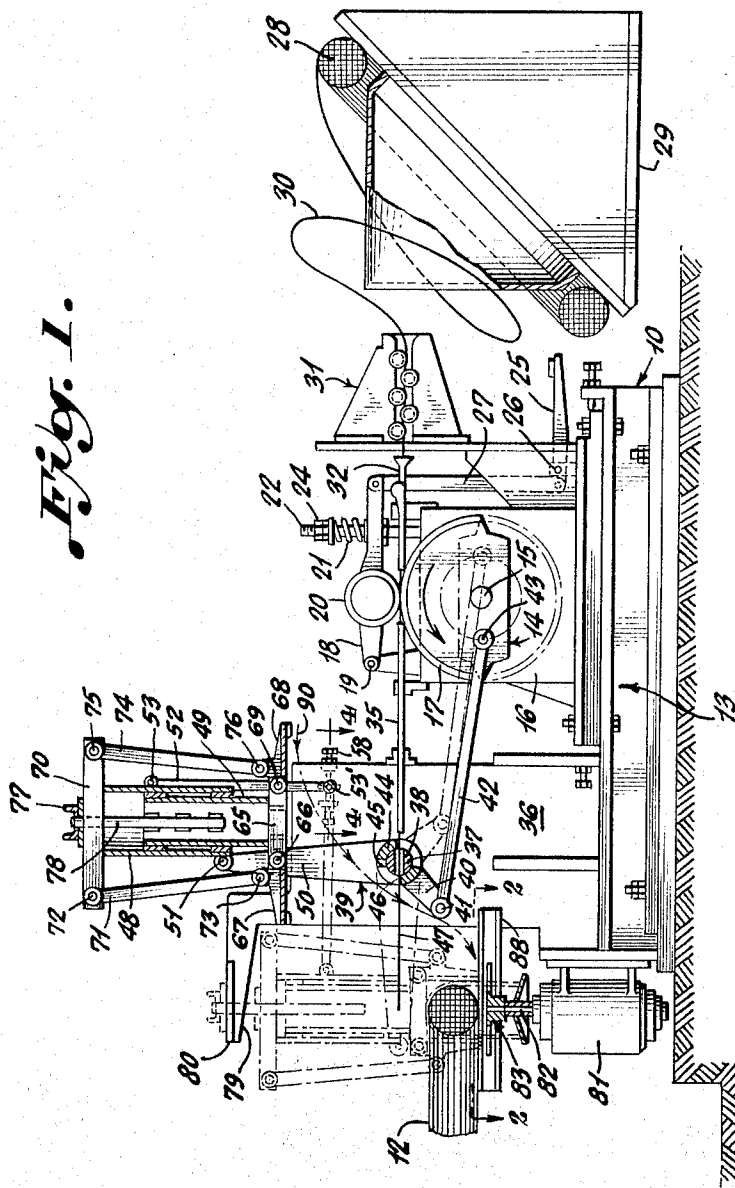
L. P. STYCHINSKY ETAL

3,263,597

MACHINE FOR BINDING WIRE COILS

Filed Jan. 7, 1963

5 Sheets-Sheet 1



INVENTORS

L. P. STYCHINSKY
V. P. ZBOOKARIOV
V. N. SVIATCHENKO

BY *Glascow, Darning & Subold*

ATTORNEYS

Aug. 2, 1966

L. P. STYCHINSKY ETAL
MACHINE FOR BINDING WIRE COILS

3,263,597

Filed Jan. 7, 1963

5 Sheets-Sheet 2

Fig. 2.

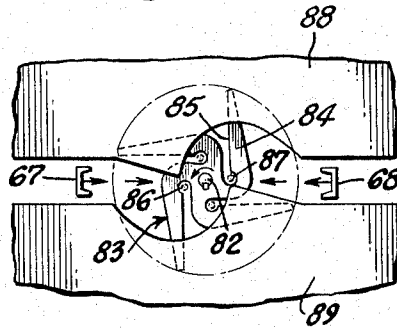
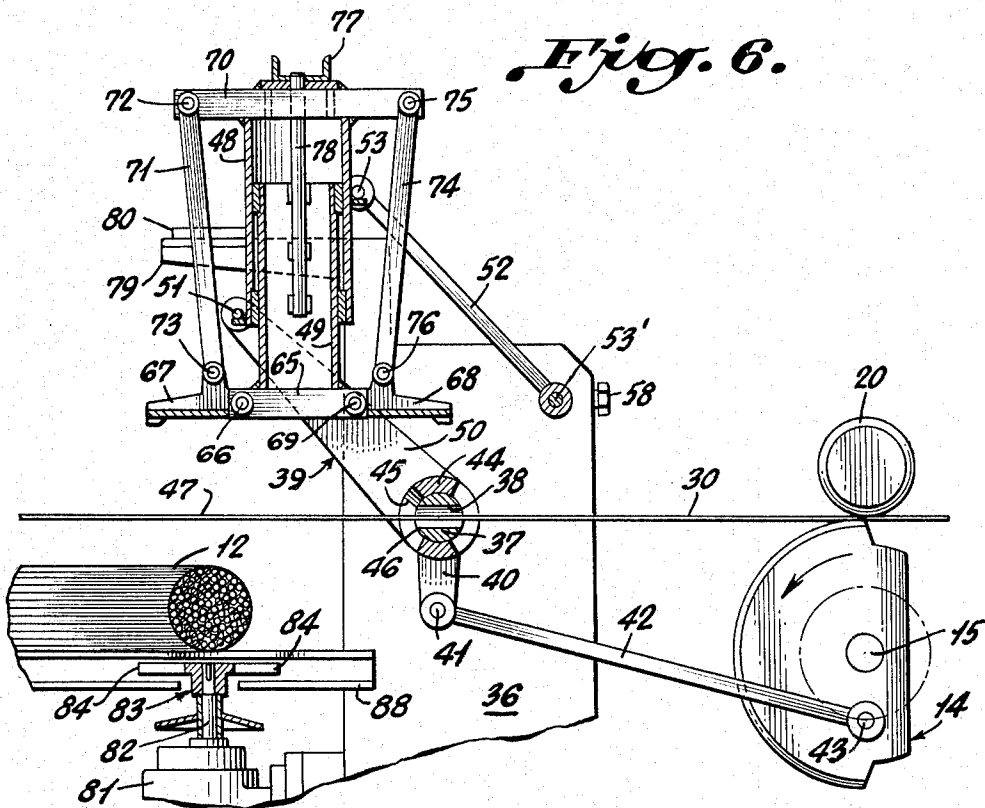


Fig. 6.



INVENTORS
L. P. STYCHINSKY
V. P. ZBOOKARIOV
V. N. SVIATCHENKO

BY *Glascock Downing & Seibold*

ATTORNEYS

Aug. 2, 1966

L. P. STYCHINSKY ETAL
MACHINE FOR BINDING WIRE COILS

3,263,597

Filed Jan. 7, 1963

5 Sheets-Sheet 3

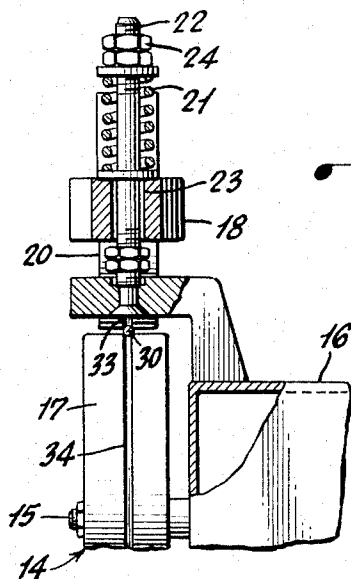


Fig. 3.

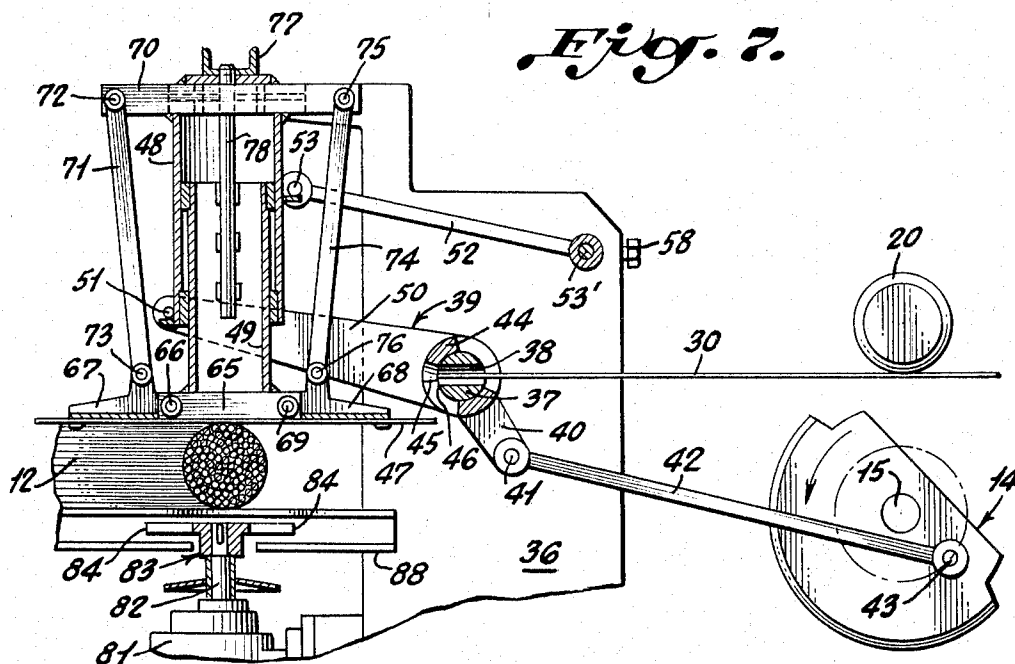


Fig. 2.

INVENTORS

L. P. STYCHINSKY
V. P. ZBOUKARIOV
V. N. SVIATCHENKO

BY *Harold Downing & Subold*

ATTORNEYS

Aug. 2, 1966

L. P. STYCHINSKY ET AL

3,263,597

MACHINE FOR BINDING WIRE COILS

Filed Jan. 7, 1963

5 Sheets-Sheet 4

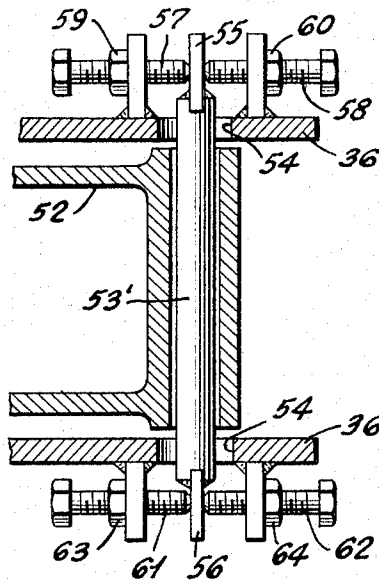


Fig. 4.

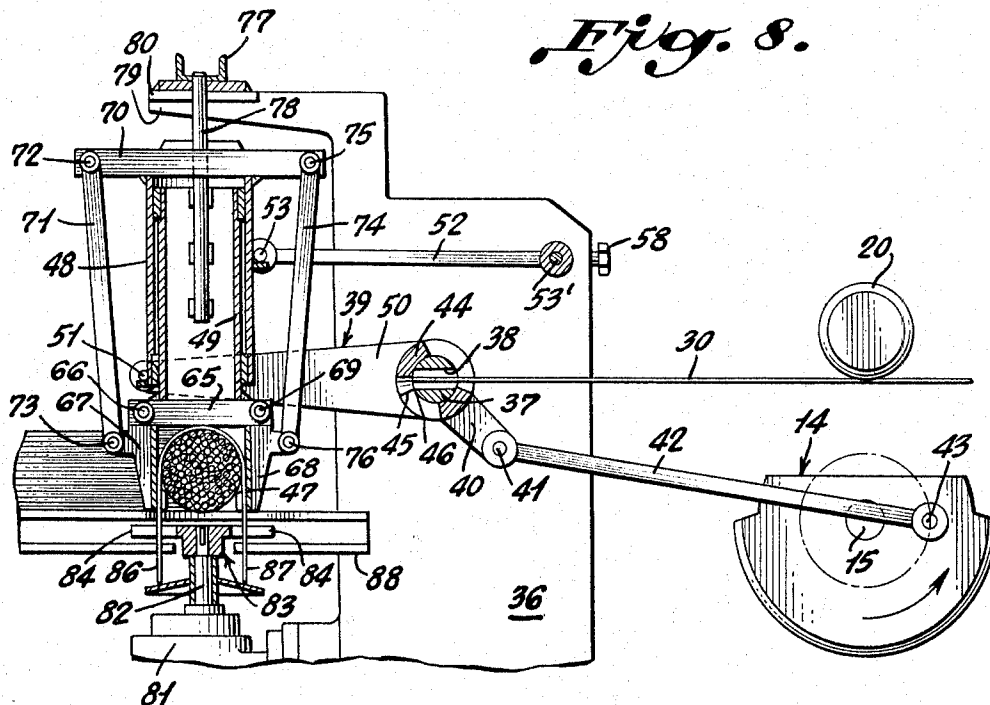


Fig. 8.

INVENTORS
L. P. STYCHINSKY
V. P. ZBOUKARIOV
V. N. SVIATCHENKO

BY *Glenn D. Downing & Subodh*

ATTORNEYS

1

2

3,263,597

MACHINE FOR BINDING WIRE COILS

Leonid Pavlovich Stychinsky, Donetskoy Obl., 11 Line, 9 Prospect 49, Apt. 30; Veniamin Pavlovich Zbookariov, Donetskoy Obl., 12 Line, 11 Prospect 13; and Valery Nickitovich Sviatchenko, Donetskoy Obl., 12 Line, 11 Prospect 16/79, all of Makeievka, U.S.S.R.

Filed Jan. 7, 1963, Ser. No. 254,535

4 Claims. (Cl. 100—10)

This invention relates to the handling of material and more particularly to a machine for binding coils of hot rolled wire, such coils being carried on a conveyor.

Previously the binding of coils of hot wire was done manually thereby materially increasing the cost of production and furthermore, this represented extremely unpleasant work, since the same must be carried out under high temperature conditions.

It is accordingly an object of the present invention to provide a machine for automatically binding coils of hot wire, such coils being transported on a conveyor.

A further object of the invention is the provision of a machine for automatically binding coils of hot wire, which machine includes mechanism for feeding binding wire and cutting the same into predetermined lengths which are automatically fed to the binding apparatus and thereafter wrapped around a coil of wire and twisted to securely hold the turns of wire in the coil together.

A still further object of the invention is the provision of a machine for binding coils of hot wire carried on a conveyor and without necessitating removal of the coils from the conveyor during the binding operation.

Another object of the invention is the provision of the machine for binding coils of hot wire carried on a conveyor, which machine may be conveniently utilized in connection with wire rolling mills thereby materially reducing the cost of production of such wire.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevational view of a wire coil binding machine constructed in accordance with this invention;

FIG. 2 a fragmentary sectional view taken substantially on the line 2—2 of FIG. 1 and showing the binding wire twisting mechanism;

FIG. 3 a fragmentary view in elevation with parts broken away and in section for greater clarity and showing a portion of the wire feeding means, including an adjusting mechanism;

FIG. 4 a fragmentary sectional view taken substantially on the line 4—4 of FIG. 1 and showing the adjusting means for tilting the wire clamping head;

FIG. 5 a top plan view showing the relationship of the coil binding machine to the conveyor for transporting the coils;

FIG. 6 a fragmentary longitudinal sectional view of the machine shown in FIG. 1 and showing the binder wire clamping head at an intermediate position displaced from the inoperative position shown in FIG. 1;

FIG. 7 a view similar to FIG. 6 and showing the binder wire clamping head in operative position immediately prior to wrapping the binder wire around the coil;

FIG. 8 a view similar to FIG. 7 and showing the binder wire clamping head and associated parts in position after partially wrapping the binder wire around the coil; and

FIG. 9 a view similar to FIG. 6 and showing the binder wire clamping head moving toward inoperative position after completion of the binding operation with the binder wire encircling the coil and twisted to hold the same in place.

With continued reference to the drawings and particu-

larly FIGS. 1 and 5, there is shown a machine constructed in accordance with this invention for binding coils of wire and in which the machine 10 is disposed adjacent a conveyor 11 of any suitable type for conveying coils of wire 12 to be bound by the machine of this invention. As shown in FIG. 5, a plurality of binding machines 10 may be disposed adjacent the conveyor 11, but since all of the binding machines are identical and operate in the same manner, the structure and operation of only a single binding machine will be described in detail.

With particular reference to FIG. 1 there is shown a coil binding machine comprising a frame 13 on which is mounted a binder wire feeding means, including a half disk fixed to a drive shaft 15 rotatably mounted on a bracket 16 carried by the frame 13 and the shaft 15 may be driven by an electric motor, not shown, or by any other suitable drive means. The half disk 14 is provided with a binder wire engaging peripheral portion 17 which as shown in FIG. 1 is approximately one hundred eighty degrees in length, but the length of this portion 17 may be selected to provide the desired length of binder wire in a manner to be presently described. One end of a lever 18 is pivotally mounted at 19 on the bracket 16 and intermediate the length of the lever 18 is rotatably mounted an idler roll 20 which is normally held in engagement with the peripheral surface 17 of the half disk 14 by a compression spring 21 disposed around a stud 22 projecting upwardly from the bracket 16 through an aperture 23 in the lever 18. As clearly shown in FIGS. 1 and 3, the compression spring 21 engages the upper surface of the lever 18 and the opposite end of the spring 21 is adjustably positioned by means of nuts 24 threadedly received on the upper end of the stud 22. Thus, the pressure of the spring 21 may be varied, as a result of which the force with which the idler roll 20 engages the peripheral surface 17 of the half disk 14 may be varied. Under normal operating conditions, the idler roll 20 will be urged downwardly into engagement with the peripheral surface 17, but if for any reason it is desired to disengage the idler roll 20 from the peripheral surface 17 there is provided a foot pedal 25 pivotally mounted at 26 on the frame 13 and connected by a link 27 to the end of the lever 18 opposite the pivotal mounting thereof 19.

A coil of binder wire 28 may be mounted on a suitable support 29 and a strand 30 from the coil 28 feeds therefrom and passes through a conventional wire straightening mechanism 31 and thereafter through a suitable tubular guide 32 and between the idler roll 20 and the half disk 14. The idler roll 20 may be provided with a peripheral groove 33 for receiving the binder wire strand 30 and the peripheral surface 17 of the half disk 14 may be provided with a similar peripheral groove 34 for receiving the binder wire strand 30 from the idler roll 20 and half disk 14, the binder wire strand 30 passes through a tubular guide 35.

The bracket 36 extends upwardly from the frame 13 and mounted on the bracket 36 in alignment with and transverse direction of movement of the wire strand 30 through the guide 35 is a stub shaft 37 having an aperture 38 extending therethrough and the wire strand 30 serves to pass from the guide 35 through the aperture 38 in the stub shaft 37. Pivotally mounted on the stub shaft 37 is a bell crank lever 39, one arm 40 of which is pivotally connected at 41 to a link 42 which at the opposite end connects to a crank pin 43 on the half disk 14. Consequently, upon rotation of the half disk 14 the bell crank lever 39 will oscillate on the stub shaft 37. The hub of the bell crank lever 39 is provided with an axially extending jaw 44 and such jaw is provided with a cutting edge 45 which serves to cooperate with the edge 46 of the aperture 38 removed from the half

3

disk 14 to cut the binder wire strand 30 and provide a cut length 47 thereof as shown in FIG. 1.

The cut length 47 of the binder wire strand 30 will be of a length determined by the angular length of the peripheral surface 17 on the half disk 14, since during rotation of the half disk 14, the binder wire strand 30 will only be fed during contact thereof with the peripheral surface 17 and during the remaining portion of the rotation of the half disk 14 no feeding of the binder wire strand 30 will take place. Since the operation of the bell crank lever 39 is in accordance with the rotation of the half disk 14, there is a times relationship therebetween which results in actuating the cutting edge 45 on the jaw 44 in accordance with the rotation of the half disk 14 and, therefore, upon completion of the feeding movement of a length of the binder wire strand 30 the cutting edge 45 in conjunction with the edge 46 of the aperture 38 will operate to cut a predetermined length of the binder wire strand 30 as shown at 47 in FIG. 1. As shown in FIG. 1, the feeding movement of the binder wire strand 30 is approximately half completed and consequently, the actual length of the cut length of wire 47 will be somewhat longer than that shown in FIG. 1, but it is believed that this showing adequately illustrates the manner of operation of the wire feeding and cutting mechanism.

In order to position and partially wrap the cut wire length 47 around the coil 12 there is provided a binder wire clamping and wrapping head which may comprise outer and inner telescopically related slidable members 48 and 49 respectively, and the arm 50 of the bell crank lever 39 is pivotally connected at 51 adjacent the lower end of the outer member 48. A link 52 is pivotally connected at one end 53 to the opposite side of the outer member 48 at a point upwardly of the pivotal connection 51 and the opposite end of the link 52 is pivotally mounted on a pivot pin 53' which, as clearly shown in FIG. 4, extends through clearance apertures 54 in the bracket 36. As shown in FIG. 4, each end of the pivot pin 53' is provided with a vertically disposed lug 55 and 56 which may be secured to the end of the pivot pin 53' by welding or the like, and the lug 55 is clamped between opposed adjusting screws 57 and 58 threadedly mounted on the bracket 36 and lug nuts 59 and 60 may be provided on the screws 57 and 58 to lock the same in adjusted position. In a similar manner, the lug 56 on the opposite end of the pivot pin 53' is clamped between adjusting screws 61 and 62 threadedly mounted on the bracket 36 and lock nuts 63 and 64 may be provided on the screws 61 and 62 to lock the same in adjusted position. The purpose and operation of the adjustable mounting of the pivot pin 53' will be later described.

A cross arm 65 is secured to the lower end of the inner member 49 of the clamping and wrapping head and pivotally mounted on one end of the cross arm 65, as at 66, is a wire engaging and wrapping claw 67. In a similar manner, a second wire engaging wrapping claw 68 is pivotally mounted at 69 on the opposite end of the cross arm 65. A second cross arm 70 is secured to the upper end of the outer member 48 of the wire clamping and wrapping head and a link 71 is pivotally connected at one end 72 to an end of the second cross arm 70, while the opposite end of the link 71 is pivotally connected at 73 to the claw 67. In a similar manner, a link 74 is pivotally connected at 75 to the opposite end of the second cross arm 70 and is pivotally connected at 76 to the claw 68. A cross head 77 is disposed above the second cross arm 70 and is mounted by means of a rod 78 on the inner member 49. A bracket 79 extends outwardly from the bracket 36 above the position occupied by the coil 12 carried on the conveyor 11 and the upper surface of the bracket 79 is provided with a yieldable pad 80, the purpose of which will be presently described.

4

Disposed below the position occupied by the coil 12 during the binding operation and mounted on the frame 13 is a motor 81 having a vertically extending drive shaft 82 and fixed to the upper end of the drive shaft 82 is a windlass 83. As best shown in FIG. 2, the windlass 83 comprises a plurality of angularly spaced fingers 84 having slots 85 therebetween and such slots 85 serve to receive the opposite ends 86 and 87 of the binding wire lengths 47 and the windlass 83 operates to twist these ends together in a manner to be later described. Spaced guides 88 and 89 are secured to the bracket 36 and extend below the coil 12 on opposite sides of the windlass 83 and these guides 88 and 89 serve to assist in directing the ends 86 and 87 of the binding wire length 47 into engagement with the fingers 84 of the windlass 83.

In describing the operation of the above wire coil binding machine, it is assumed that a wire coil 12 to be bound is disclosed on the conveyor 11 in a position opposite the binding machine, as shown in FIGS. 1 and 5 and at this time the wire lamping and wrapping head is in the position shown in FIG. 1 with the binding wire strand 30 being fed by rotation of the half disk 14 to provide the correct wire length 47 for binding the coil 12. Rotation of the half disk 14 through the link 42 serves to actuate the bell crank lever 39 and at the appropriate time, the cutting edge 45 will sever the wire strand 30 to provide the cut length 47 for binding the wire coil 12. Also, during movement of the bell crank lever 39, by reason of the pivotal connection 51 thereof with the outer member 48 of the wire clamping and wrapping head, the entire head will move generally in the direction of the dot-dash line ninety shown in FIG. 1, through the position shown in FIG. 6, the head being supported in such movement, both by the arm 50 of the bell crank lever 39 and by the link 52 pivotally connecting the outer member 48 with the bracket 36 on the frame 13. Continued movement of the bell crank lever 39 will move the head outwardly and downwardly from the position shown in FIG. 6 to the position shown in FIG. 7 and during such movement, the lower cross arm 65 of the head, as well as the claws 67 and 68 will engage the cut wire length 47 and move the same into engagement with the upper surface of the coil 12 as clearly shown in FIG. 7. Engagement of the lower cross arm 65 and cut wire length 47 with the upper surface of the coil 12 will prevent further downward movement of the lower cross arm 65 and inner member 49 of the head, but continued movement of the bell crank lever 39 will result in moving the outer member 48 of the head downwardly with respect to the inner member 49 and such movement will, of course, cause downward movement of the second cross arm 70 and the links 71 and 74 connected thereto, to cause downward and inward movement of the claws 67 and 68 which will result in partially wrapping the cut wire lengths 47 about the coil 12 to bring the ends 86 and 87 of the cut wire lengths 47 into the position shown in FIG. 8. At the completion of the downward movement of the head carrying the cross head 77 to the position shown in FIG. 7, such cross head 77 will engage the yieldable pad 80 on the upper surface of the bracket 79 and this pad serves to cushion the shock occasioned by stopping of the downward movement of the head. With the opposite ends 86 and 87 of the binder wire lengths 47 in the position shown in FIG. 8 and with the windlass 83 rotating, it is understood that the ends 86 and 87 will be received in the slot 85 between two of the fingers 84 and rotation of such fingers will serve to twist the ends 86 and 87 together to tightly bind the wire length 47 about the coil 12 as clearly shown in FIG. 9. At this time, the half disk 14 has rotated a sufficient distance to cause movement of the bell crank lever 39 in the opposite direction which movement will, of course, operate to return the head through the posi-

tion shown in FIG. 9 back to the original inoperative position shown in FIG. 1.

As shown in the various figures during operation thereof, the wire clamping and wrapping head is disposed in a vertical position, but should it be desired to tilt such head in order to properly align the binding wire lengths with the coil to be bound, this may be accomplished by adjusting the position of the pivot pin 53' toward or away from a plane extending vertically through the axis of the stub shaft 37 on which the bell crank lever 39 is mounted and since, such movement of the pivot pin 53' will result in changing the relationship between this mounting for the head supporting link 52 and the bell crank lever 39 which is also connected to the head, will result in tilting the head in one direction or the other in accordance with the adjustment in position of the pivot pin 53'.

It is also to be noted that in the event the diameter of the coil 12 to be found is slightly smaller than normal, the lower or first cross arm 65 on the head will not directly contact the coil 12, since downward movement of the head is limited by engagement of the cross head 77 with the yieldable pad 80 on the bracket 79. However, even under these conditions the machine will operate properly since downward movement of the inner member 49 of the head will be prevented upon engagement of the cross head 77 with the pad 80 and further downward movement of the outer member 48 will result in operation of the claws 67 and 68 to wrap the ends 86 and 87 of the binding wire lengths 47 partially about the coil 12 as described above.

By the above described invention, there has been provided a relatively simple, yet highly effective machine for automatically binding wire coils and since, such coils are normally at a relatively high temperature this operation may be carried out without necessitating the close proximity of operating personnel and furthermore, this operation has been materially simplified and the time required therefor radically reduced as compared to the previously utilized manual operations with the result, that the cost of production of bound wire coils has been materially reduced.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. A machine for binding coils of wire with a binder wire, said machine comprising a frame, means to support a coil of wire to be bound adjacent said frame, means for feeding binder wire comprising a half disk rotatably mounted on said frame, means including a drive shaft to drive said disk, and a spring pressed idler roll for holding said binder wire in frictional engagement with the surface of said disk, the circumferential length of the surface of said disk determining the length of binder wire fed during one revolution of said disk, cutting means mounted on said frame, drive means connecting said disk and said cutting means to operate said cutting means in timed relation to said feeding means to cut a length of binder wire fed during one revolution of said disk, a binder wire clamping and wrapping head movably mounted on said frame, drive means connecting said cutting means and said head for moving said head in timed relation to said feeding and cutting means from an inoperative retracted position to an operative position above and in contact with said coil, means on said head for clamping said cut wire lengths in engagement with the upper side of said coil transversely thereof, a

pair of claws pivotally mounted on said head for engaging the ends of said wire length projecting on opposite sides of said coil, means for actuating said claws to bend and partially wrap said wire lengths round said coil, a windlass rotatably mounted on said frame below said coil, means to drive said windlass, and fingers on said windlass for engaging and twisting the ends of said wire lengths to secure the same on said coil in binding relationship.

2. A machine as defined in claim 1 in which said head comprises a pair of vertically disposed telescoping slidably related members, a cross arm on the upper end of one member, a second cross arm on the lower end of the other member, a link pivotally connecting said one member and said frame, said claws being pivotally mounted on the opposite ends of said second cross arm, links connecting said first cross arm and said claws, and actuating means for said head connected to said one member and said cutting means, whereby upon operation of said cutting means said head will swing downwardly about the pivotal mounting of said first mentioned link on said frame from an inoperative position to an operative position with said members moving as a unit to bring said second cross arm and claws into engagement with said cut wire lengths to clamp the same in engagement with the upper side of said coil and prevent further movement of said second cross arm and other member, further movement of said actuating means serving to move said one member and said first cross arm downwardly with respect to said other member and second cross arm thereby causing said second mentioned links to pivot said claws downwardly to bend and wrap the ends of said wire lengths about a portion of said coil.

3. A machine as defined in claim 1, in which a stub shaft is fixed on said frame, said stub shaft having an aperture extending diametrically therethrough through which binder wire passes from said disk, the end of said aperture remote from said disk being defined by a sharp edge, a bell crank lever pivotally mounted on said shaft, a knife on said lever cooperating with said edge of said aperture to provide said cutting means, a crank pin on said disc, a connecting rod connecting said crank pin and one end of said lever, the opposite end of said lever being connected to said head, whereby said cutting means and said head operate in timed relation to the rotation of said disc.

4. A machine as defined in claim 1, and including adjusting means for tilting said head with respect to said coil.

References Cited by the Examiner

UNITED STATES PATENTS

872,176	11/1907	Grimes.	
1,261,589	4/1918	Mogan et al.	100—12 X
1,412,098	4/1922	Anthony	100—12 X
1,417,329	5/1922	Jones	100—10
1,719,732	7/1929	Schwab	100—10
2,972,294	2/1961	Lecocq	100—10

FOREIGN PATENTS

75,844	3/1919	Austria.
615,650	2/1961	Canada.
1,098,884	3/1955	France.

WALTER A. SCHEEL, *Primary Examiner.*

CHARLES W. LANHAM, *Examiner.*

WILLIAM H. JUST, BILLY J. WILHITE,
Assistant Examiners.