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W. KÖHLER

2,158,286

WEB CUTTING AND REWINDING MACHINE

Filed Nov. 20, 1937

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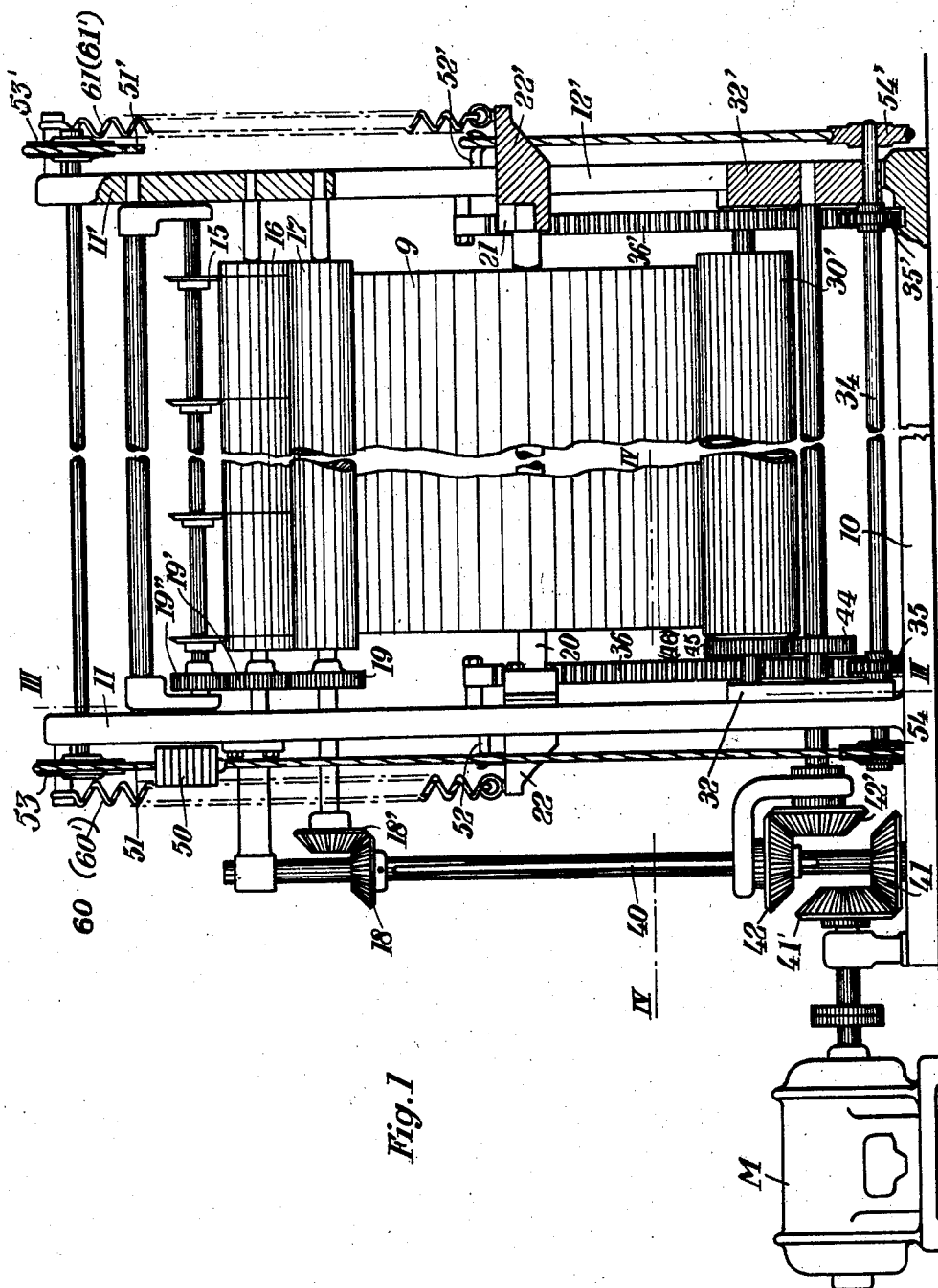


Fig. 1

Inventor:
Wilhelm Köhler

By *Karl Viertel*
Attorney

May 16, 1939.

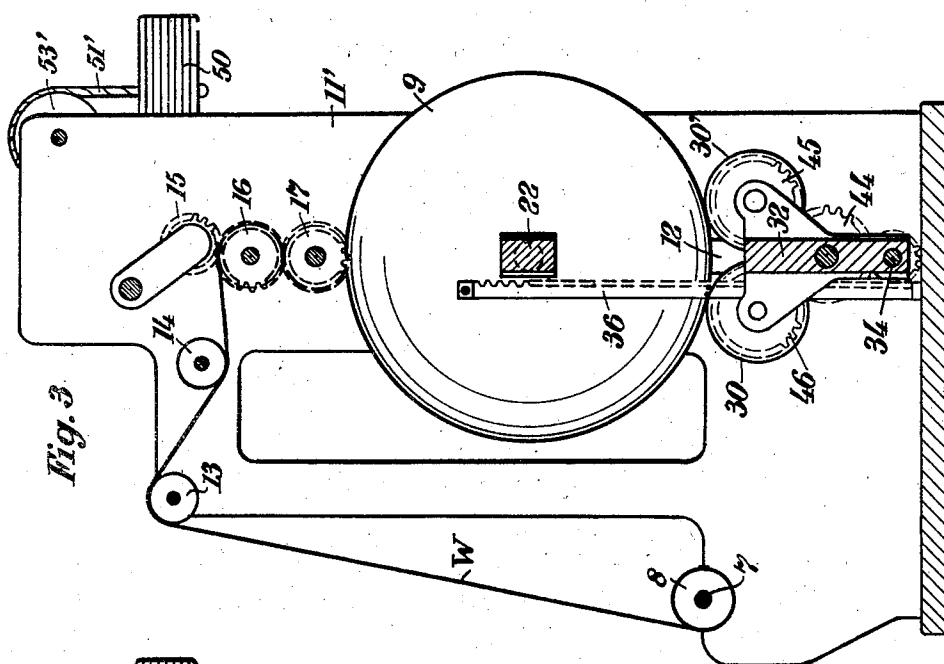
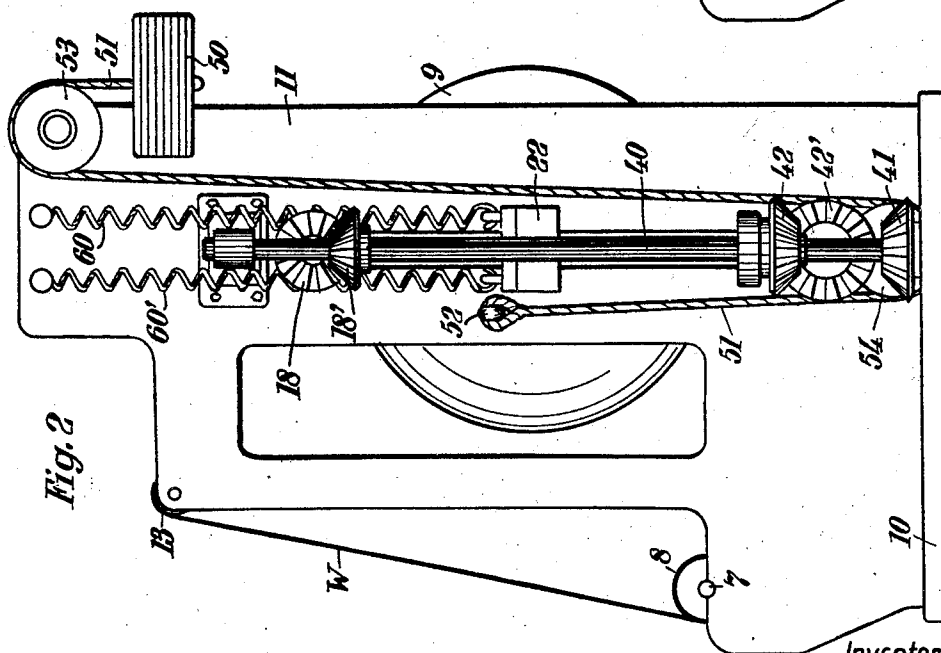
W. KÖHLER

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3 Sheets-Sheet 2



Inventor:
Wilhelm Köhler

By *Karl Viertel*
Attorney

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Fig. 4

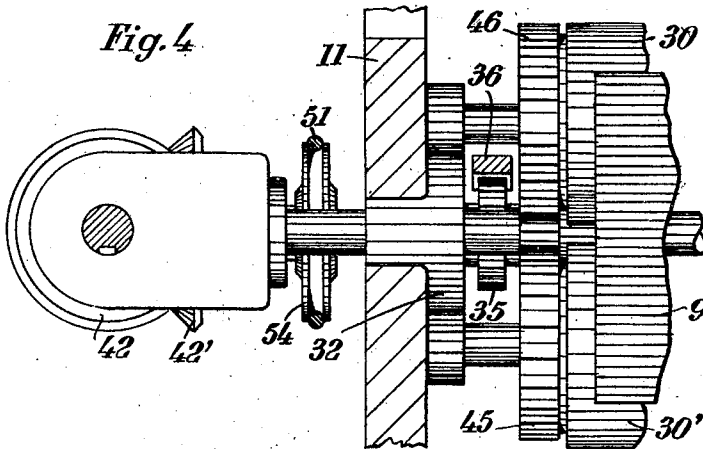


Fig. 5

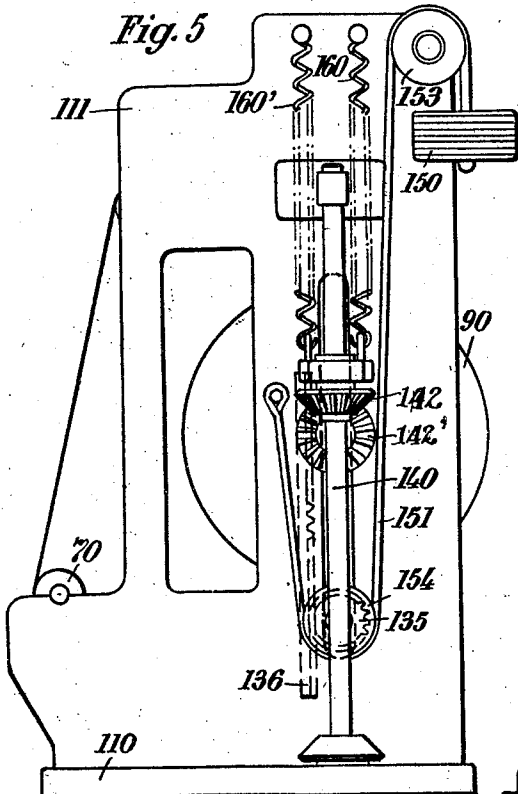
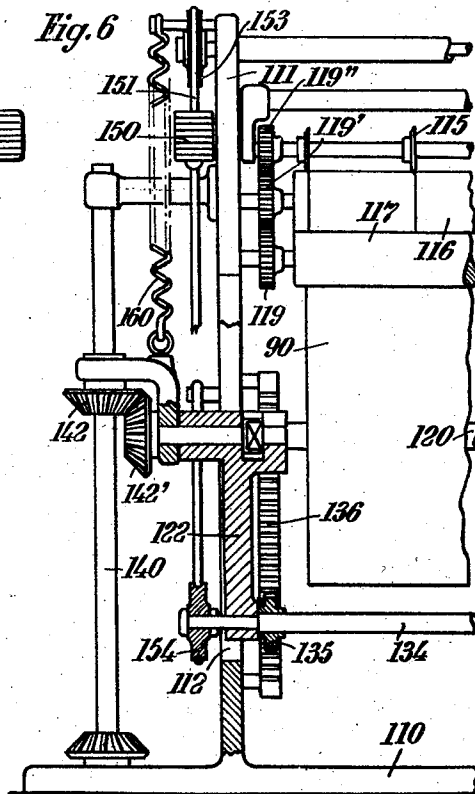


Fig. 6



Inventor:
Wilhelm Köhler

By *Karl Viertel*
Attorney

UNITED STATES PATENT OFFICE

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WEB CUTTING AND REWINDING MACHINE

Wilhelm Köhler, Darmstadt, Germany, assignor
to Goebel Aktien-Gesellschaft, Darmstadt,
Germany

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10 Claims. (Cl. 242—66)

My invention in its broad aspects deals with various problems in the art of re-winding flat material in the form of continuous webs; the invention relates more particularly to structural improvements in web re-winding machines of the type, wherein the web—usually after having been longitudinally cut or slit into a number of strips, by cutting means—is passed around a deflecting roll arranged in the upper portion of the machine frame closely to said cutting means, and is then rewound on a rotary winding shaft or tube arranged underneath said deflecting roll and forming the core of the rewound coil or coils.

With machines of this type briefly called hereinafter re-winding machines the deflecting roll and the cutting means cooperatively associated therewith are generally slidably mounted in the upper portion of the machine frame in such manner, that they can move upwardly from their lowermost position in accordance with the growing diameter of the rewound coil or coils upon which the deflecting roll rests; as a rule the winding shaft is likewise slidably mounted in the machine frame, while the lowermost rolls provided underneath the rewound coils for supporting and positively rotating the latter have stationary bearings and remain in a fixed position.

As a matter of fact known to experts in this field, the point where the rewound material leaves the deflecting roll is the most convenient and appropriate place for visibly supervising the working of the machine, namely, for controlling the proper tensioning of the individual strips, into which the web has been cut, for ascertaining whether the strips in transit have been cleanly separated from each other and making sure that they are accurately wound up without folding, creasing, wrinkling or overlapping each other at their opposed edges.

A drawback inherent to re-winding machines of the type described and known to practitioners in this field consists in that the visual supervision of the working of the machine is greatly impeded by the shifting of the deflecting roll and of the cutting means associated therewith.

Another serious drawback attached to re-winding machines of the type described consists in that in consequence of the growing weight of the rewound coils resting upon the driving and supporting rolls the pressure under which the individual layers of material are rewound and assembled upon each other constantly grows from the center towards the periphery of the finished coil; as the result of excessive pressure under which the outer layers of the material engage

each other, wrinkles and furrows will often be produced more especially in the case of coils of paper or other hygroscopic material rewound on machines of the type described.

To wit: Coils of rewound flat material of hygroscopic nature such as paper are usually subject to attract moisture from the atmosphere during storage and transportation or to become accidentally moistened through the outer peripheral layers of the material.

In consequence of the excessive pressure under which the layers of the material are rewound and engage each other over the whole width of the coil as explained above their hygroscopic expansion in lateral direction is prevented with the result that the expansion occurs within the coil proper and that furrows and wrinkles of a permanent and lasting character are produced therein, which are very objectionable and greatly impair the value of the rewound material.

The principal object of this invention is to overcome the above described drawbacks by providing an improved re-winding machine of the type set forth and of relatively simple construction.

One of the salient features of the invention consists in that the deflecting roll, over which the material under treatment passes to the winding shaft, remains in a fixed position being preferably arranged at a height where it can be comfortably inspected by the operator.

Another equally important feature of the invention consists in that the winding shaft arranged underneath the deflecting roll and the rollers provided for rotating and supporting the rewound coil are free to downwardly recede as the rewound coil grows larger in diameter.

Other objects aimed at by the invention and advantages obtained will become incidentally apparent to practitioners in this field as the description proceeds.

The nature and scope of this invention are briefly outlined in the appended claims and will be more fully understood from the following specification taken together with the accompanying drawings, in which

Fig. 1 is a front elevation—partly in section—of a slitting and re-winding machine designed according to this invention and shown by way of an example;

Fig. 2 is a side elevation of the machine;

Fig. 3 is a section through the machine taken on line III—III in Fig. 1;

Fig. 4 is an enlarged fragmentary section of

the machine horizontally taken on line IV—IV in Fig. 1;

Fig. 5 is a fragmentary side elevation made in a smaller scale and diagrammatically showing a structurally modified re-winding machine designed according to this invention;

Fig. 6 is a fragmentary front elevation of the machine shown in Fig. 5.

The rewinding machine re-designed with the objects in view stated above and shown by way of an example in Figs. 1 to 4 comprises:

(1) A machine frame comprising a bed plate 10 and two upright standards 11, 11' mounted thereon; in the latter guide slots 12, 12' are formed in symmetric disposition relatively to the median plane of symmetry vertically intersecting the machine;

(2) A rotary shaft 7 carrying the supply roll 8, which is removably mounted at the back portion of the machine frame, its preferred location being shown in Figs. 2 and 3,

(3) Guide rolls 13, 14 journaled in the upper section of the machine frame, over which the web W to be slit and rewound passes to rotary cutting disks 15 and to a grooved roller 16 of conventional design cooperating therewith, and thence to the deflecting roll 17; the latter is positively rotated by means of bevel gear wheels 18, 18' and is according to this invention stationarily mounted in the upper portion of the machine frame, preferably at a height, where it can be comfortably inspected by the operator of the machine; a train of gear wheels 19, 19', 19'' being provided for rotating the cutting roller 16 and disks 15 jointly with the deflecting roll 17,

(4) A winding shaft 20 carrying the rewound coil 9, which according to this invention is slidably mounted in the machine frame underneath the deflecting roll 17 so as to be capable of descending in response to the growing diameter of the rewound coil 9; the winding shaft is removably journaled at both ends in the open bearings 21 of primary guide blocks 22, 22', which slidably engage said guide slots 12, 12', and are rigidly connected with each other by crossbeams (not shown) so as to form a structural unit,

(5) Means for supporting and positively revolving the rewound coil 9, which comprises coil supporting rolls 30, 30' slidably arranged underneath the winding shaft 20 so as to be capable of descending jointly with the latter as the rewound coil 9 grows larger in diameter; the said coil supporting rolls 30, 30' are journaled in secondary or lower guide blocks 32, 32', which slidably engage said guide slots 12, 12' and are rigidly connected with each other by crossbeams (not shown) so as to form a structural unit.

Means should be provided for guiding the supporting rolls 30, 30' on descending so as to prevent accidental tilting and ensure a uniform diameter of the rewound coil or coils; said guiding means comprise in the embodiment of the invention shown in Figs. 1-4:

A rotary shaft 34 journaled in said secondary guide blocks 32, 32', a pair of gear wheels 35, 35' keyed on said shaft, and tooth racks 36, 36' fixed at the machine frame in upright position substantially parallel to the guide slots 12, 12' for engagement with said gear wheels 35, 35'.

The means for rotating the said coil supporting rolls 30, 30' and in turn positively revolving the rewound coil 9 comprise:

A rotary shaft 40 journaled in the machine frame in substantially vertical disposition, which is driven by a pair of cog wheels 41, 41' and a

prime mover M, another pair of cog wheels 42, 42', of which wheel 42 is splined on the shaft 40 so as to be capable of ascending and descending thereon, and a train of gear wheels 44, 45, 46 driven by interengaging said cog wheels 42, 42' and driving the supporting rolls 30, 30' in such manner, that the latter are both revolved in the same direction of rotation,

(6) Lifting means for keeping the rewound coil 9 in cooperative engagement with the deflecting roll 17 which comprise: Balance weights 50, 50' composed of a number of disks exchangeably assembled upon each other and having ropes 51, 51' attached, of which the lower ends are secured on the machine frame at 52, 52', said ropes running over fixed pulleys 53, 53' and loose pulleys 54, 54', mounted on the projecting ends of the shaft 34; by the cooperation of the said fixed and loose pulleys the weights 50, 50' are capable of counterbalancing double their own weight. Their counterbalancing power should in general exceed the total weight of the masses to be lifted including the maximum weight of the finished rewound coil 9 and making an allowance for frictional resistance,—except in cases where delicate materials, for instance webs sensitive to pressure such as crepe paper, carbon paper for duplicating purposes, gummed tape or the like are under treatment, as will be explained hereinafter.

It will be noted, that by the provision of said balance weights 50, 50' as lifting means the pressure under which the rewound coil 9 bears against the deflecting roll 17 gradually drops in proportion to the growing weight of the rewound coil 9; this is most desirable since the pressure and the frictional contact under which the individual layers of material of the coil 9 are rewound will decrease towards its outer periphery—as against increasing with machines of known design as used in various trades heretofore.

Supplemental lifting means may be provided for controlling and conveniently re-adjusting the pressure of contact between the rewound coil 9 and the deflecting roll 17; according to this invention said supplemental lifting means which are particularly useful in re-winding delicate materials referred to above comprise:

Extension springs 60, 60', 61, 61' which are fixed at their upper ends on the machine frame and at their lower ends on the primary guide blocks 22, 22' carrying the winding shaft 20 and the rewound coil 9.

It will be noted, that the lifting power of said springs 60, 60', 61, 61' on being extended will grow in direct proportion to the length of the descent of the winding shaft 20, namely being commensurate to the increasing diameter and weight of the rewound coil 9,—thereby complementing the lifting power of the balance weights 50, 50' in such manner, that (if desired) substantially uniform pressure will prevail at the deflecting roll 17 during the whole re-winding operation from start to finish.

Various other changes and modifications may be conveniently made in the structural details of re-winding machines of the improved design shown and described hereinbefore with reference to Figs. 1 to 4, without departing from the spirit and the salient ideas of this invention:

For instance the supporting and driving rolls 30, 30', by which the rewound coil 9 is indirectly rotated on the order of so-called surface re-winding machines, may be dispensed with to advantage under specific working conditions consistent with the toughness, pliability, thickness and

other physical properties of the material under treatment and with the size of the finished coils rewound.

A re-winding machine embodying the salient features of this invention and working according to the direct winding principle is shown by way of another example in Figs. 5 and 6, namely comprising:

(1) A machine frame 110, 111 on the back portion of which the supply roll 70 is accommodated, and wherein guide slots 112 are formed; in the upper section of the machine frame guiding rolls (not shown), rotary cutting disks 115, a grooved roller 116 cooperating therewith, and a deflecting roll 117 are journaled,

(2) A winding shaft 120 carrying the rewound coil 90 and being journaled in guide blocks 122, which slidably engage the said guide slots 112, the winding shaft 120 is rotated by a pair of bevel gear wheels 142, 142', of which wheel 142 is splined on the rotary shaft 140 so as to be capable of ascending and descending jointly with the winding shaft 120,

(3) Means for uniformly guiding the winding shaft 120 and preventing tilting thereof on descending, which comprise a rotary shaft 134 journaled in said guide blocks 122 and having gear wheels 135 keyed thereon, which engage tooth racks 136 fixed in upright position on the machine frame,

(4) Lifting means for keeping the rewound coil 90 in frictional engagement with the deflecting roll 117, thereby positively rotating the latter and in turn revolving the cutting rollers inter-engaged by gear wheels 119, 119', 119''; said lifting means are substantially identical as to their operation to those described with reference to Figs. 1 to 4, and comprise balance weights 150 having ropes 151 attached, which run over fixed pulleys 153 and loose pulleys 154, the latter being free to rotate on the projecting ends of shaft 134.

Extension springs 160, 160' may be likewise conveniently provided as additional or complementary lifting means and with the same objects in view described above with reference to the machine shown in Figs. 1 to 4.

What I claim is:

1. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil, and lifting means for keeping the latter in cooperative engagement with the said deflecting roll.

2. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said revolving means comprising coil supporting rolls slidably arranged underneath the winding shaft so as to downwardly recede jointly with the latter as the coil grows larger in diameter, and means for revolving said supporting rolls.

3. Re-winding machine of the type set forth

comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said revolving means comprising coil supporting rolls slidably arranged underneath the winding shaft so as to downwardly recede jointly with the latter as the coil grows larger in diameter, means for revolving said supporting rolls, and means for guiding the latter on rising and descending.

4. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said revolving means comprising coil supporting rolls slidably arranged underneath the winding shaft so as to downwardly recede jointly with the latter as the coil grows larger in diameter and means for revolving said supporting rolls, said lifting means comprising counterweights and flexible tension members attached thereon and engaging said supporting rolls.

5. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said revolving means comprising coil supporting rolls slidably arranged underneath the winding shaft so as to downwardly recede jointly with the latter as the coil grows larger in diameter and means for revolving said supporting rolls, said lifting means comprising counterweights and flexible tension members attached thereon and engaging said supporting rolls, and extension springs fixed with their upper ends at the upper section of the machine frame and engaging said winding shaft with their lower ends.

6. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said revolving means comprising coil supporting rolls slidably arranged underneath the winding shaft so as to downwardly recede jointly with the latter as the coil grows larger in diameter, means for revolving said supporting rolls, and means for guiding the latter on rising and descending, said guiding means comprising two guide blocks sliding in guide slots, formed on the machine frame in symmetric disposition to each other, and carrying said supporting rolls, a rotary shaft journaled in said guide blocks, gear wheels keyed on said

shaft and tooth racks fixed on the machine frame in upright position substantially parallel to said guide slots for engagement with said gear wheels.

7. Re-winding machine of the type set forth
 5 comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound
 10 coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said revolving means comprising coil supporting rolls slidably arranged under-
 15 neath the winding shaft so as to downwardly recede jointly with the latter as the coil grows larger in diameter and means for revolving said supporting rolls, said latter means for revolving the supporting rolls comprising guide blocks
 20 carrying said supporting rolls and sliding in guide slots formed in the machine frame in symmetric disposition to each other, a rotary shaft journaled in the machine frame in upright disposition, a prime mover for rotating said shaft, a primary
 25 gear wheel splined thereon so as to be free to ascend and descend in response to the motions of the supporting rolls, and a train of gear wheels cooperatively interengaging said primary gear wheel and supporting rolls.
8. Re-winding machine of the type set forth
 30 comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted in the machine frame underneath the deflecting roll so
 35 as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with the said deflecting roll, said lifting means comprising
 40 counterweights having flexible tension members

attached thereon for engaging said winding shaft.

9. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted
 5 in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil and lifting means for keeping the latter in cooperative engagement with
 10 the said deflecting roll, said lifting means comprising counterweights having flexible tension members attached thereon for engaging said winding shaft, and means for positively and uniformly guiding the winding shaft at both ends
 15 on ascending and descending.

10. Re-winding machine of the type set forth comprising a machine frame, a deflecting roll stationarily mounted therein, a winding shaft carrying the rewound coil and slidably mounted
 20 in the machine frame underneath the deflecting roll so as to downwardly recede as the rewound coil grows larger in diameter, means for revolving the rewound coil, lifting means for keeping the latter in cooperative engagement with the
 25 said deflecting roll, said lifting means comprising counterweights having flexible tension members attached thereon for engaging said winding shaft, and means for positively and uniformly guiding the winding shaft at both ends on ascending and
 30 descending, said guiding means comprising guide blocks carrying the winding shaft and sliding in guide slots formed in the machine frame in symmetric disposition to each other, a rotary shaft journaled in said slide guide blocks, gear wheels
 35 keyed to said rotary shaft, and tooth racks fixed on the machine frame in upright disposition substantially parallel to said guide slots for engagement with said gear wheels.

WILHELM KÖHLER. 40