E. F. HULBERT.

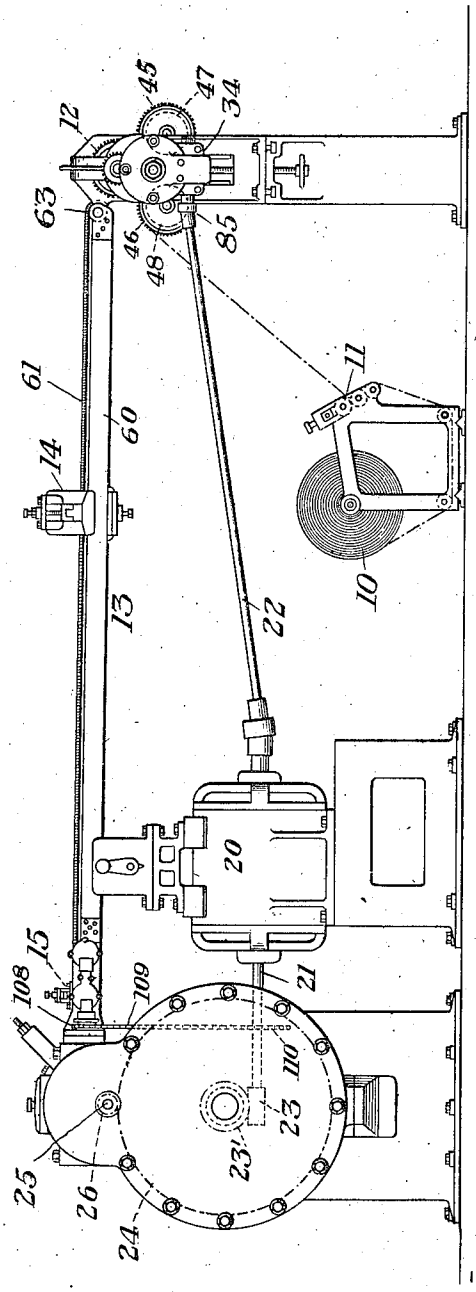
WINDING MACHINE.

APPLICATION FILED DEC. 27, 1917. RENEWED OCT. 25, 1920.

1,380,105. Patented May 31, 1921.

6 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

R. A. Balderson

F. W. Windridge

INVENTOR

E. F. Hulbert

by Bakewell, Byrnes & Parmelee

Attys.

E. F. HULBERT.

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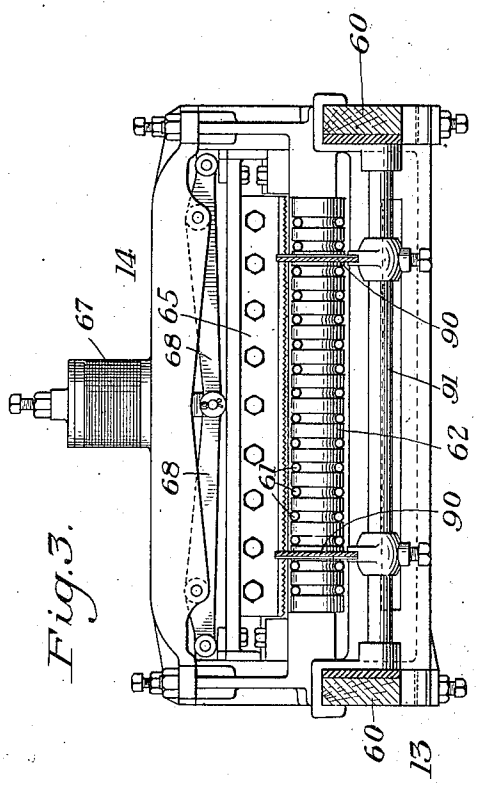


Fig. 3.

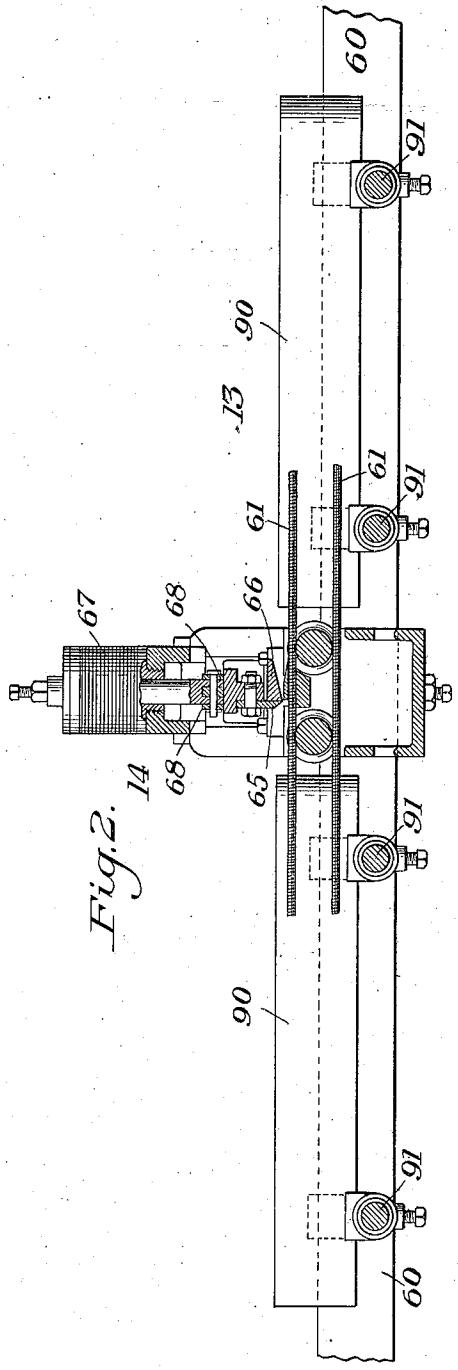


Fig. 2.

WITNESSES

R. A. Balderson

H. A. Windridge

INVENTOR

E. F. Hulbert

by Bakewell, Pigott & Parmele

Attys

E. F. HULBERT.

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6 SHEETS—SHEET 3.

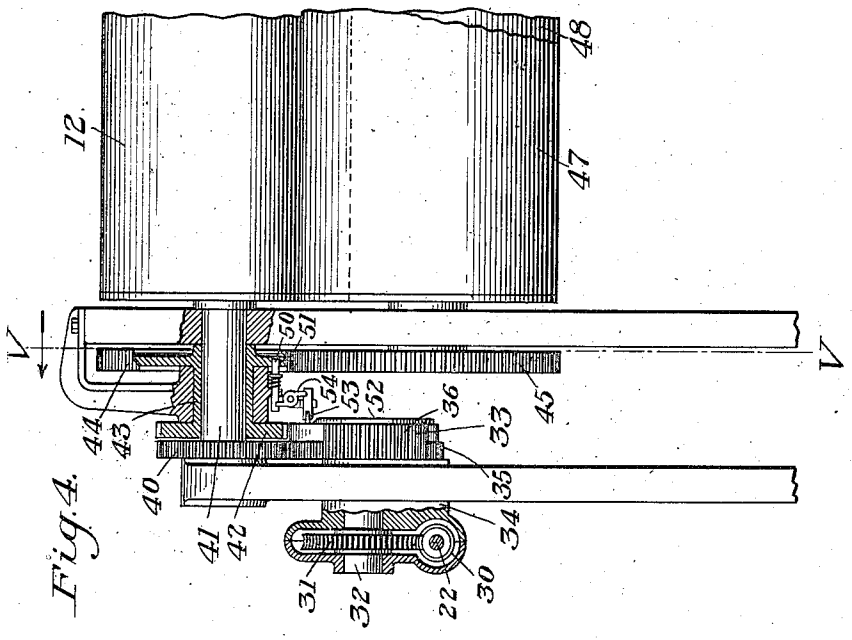


Fig. 4.

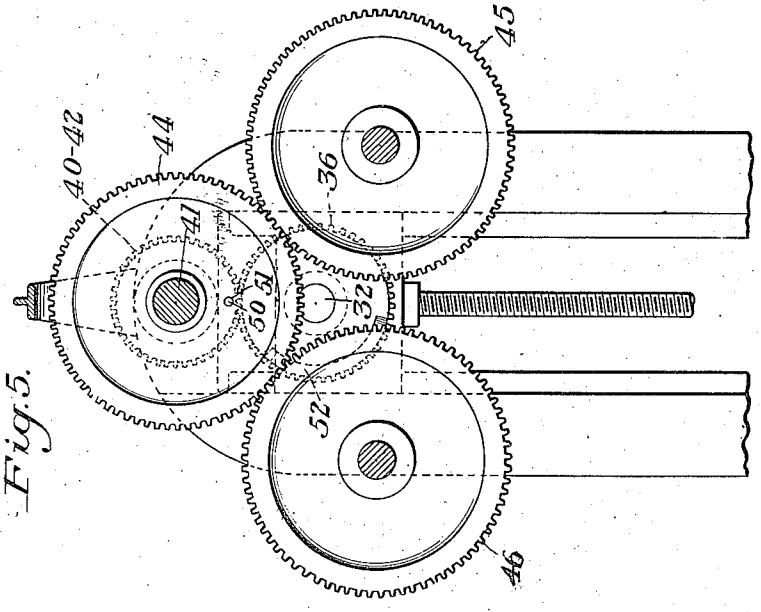


Fig. 5.

WITNESSES

R. A. Balderson

F. N. Windridge

INVENTOR

E. F. Hulbert

by Bakewell, Byrne & Lamb

Attys

E. F. HULBERT.

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1,380,105. **Patented May 31, 1921.**

6 SHEETS—SHEET 4.

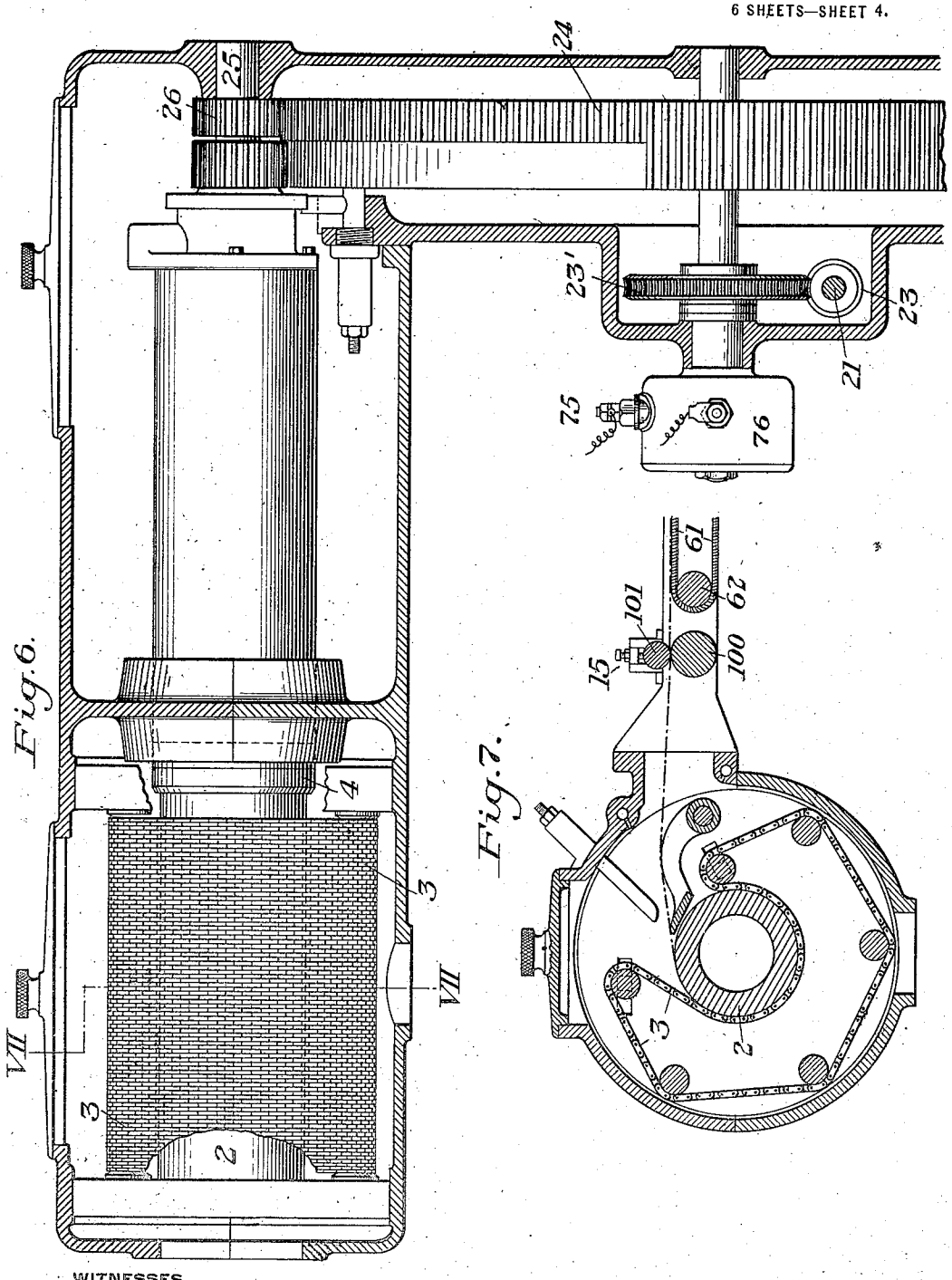


Fig. 6.

Fig. 7.

WITNESSES

R. A. Balderson

F. W. Woodridge

INVENTOR

E. F. Hulbert

by Bakewell, Byrnes & Parmele,

Attys.

E. F. HULBERT.

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6 SHEETS—SHEET 5.

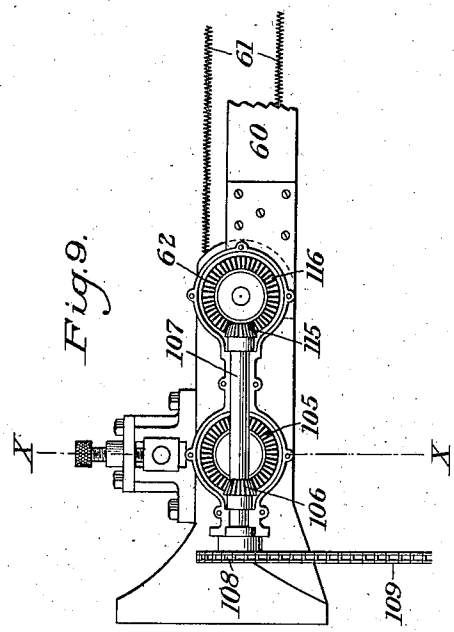


Fig. 9.

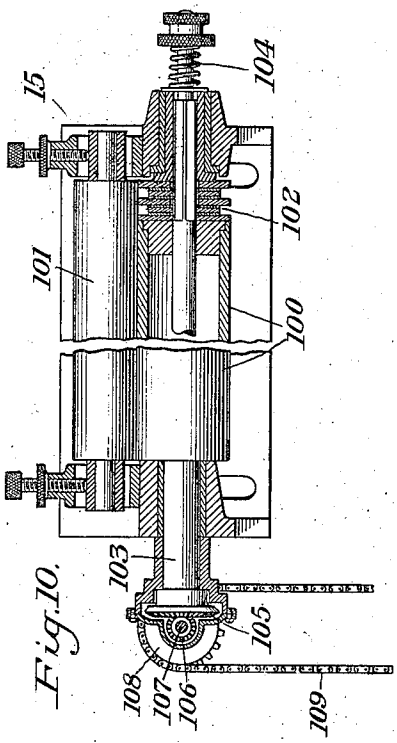


Fig. 10.

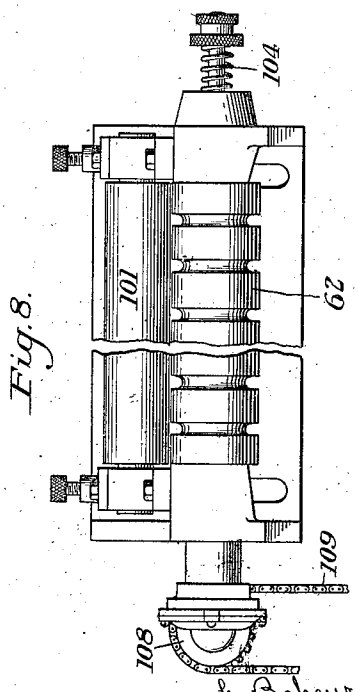


Fig. 8.

WITNESSES

R. A. Balderson

F. H. Windridge

INVENTOR

E. F. Hulbert

by Bakewell, Bymer & Cannday

Attys

E. F. HULBERT.

WINDING MACHINE.

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1,380,105. Patented May 31, 1921.

6 SHEETS—SHEET 6.

Fig. 12.

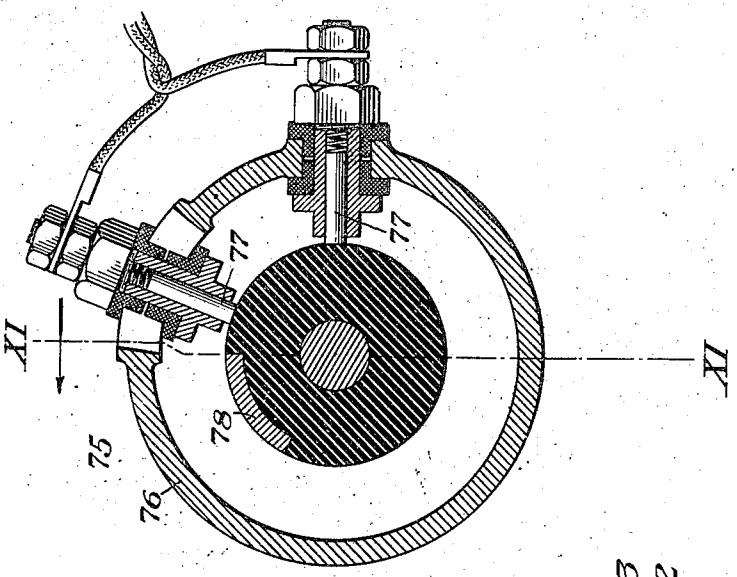
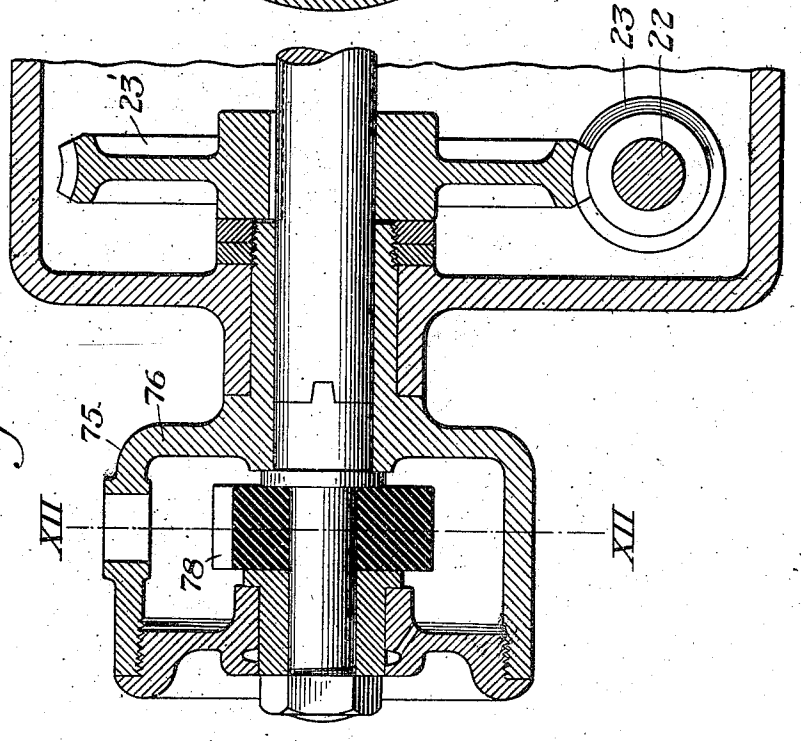


Fig. 11.



WITNESSES

R. A. Balderson

F. M. Windridge

INVENTOR

E. F. Hulbert

by Bakewell, Byrnes & Parmele

Attys

UNITED STATES PATENT OFFICE.

EDWIN F. HULBERT, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO NATIONAL PAPER CAN COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF DELAWARE.

WINDING-MACHINE.

1,380,105. Specification of Letters Patent. Patented May 31, 1921.

Application filed December 27, 1917, Serial No. 209,186. Renewed October 25, 1920. Serial No. 419,485.

To all whom it may concern:

Be it known that I, EDWIN F. HULBERT, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Winding-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which:

Figure 1 is a side elevation of the machine.

Fig. 2 is a side elevation, partly in section, of the conveyer and shear.

Fig. 3 is an end elevation of the shear.

Fig. 4 is a detailed end view, partly in section, showing the printing roll gear.

Fig. 5 is a vertical section along the line V—V of Fig. 4.

Fig. 6 is a sectional view through the winding head of the machine showing the mandrel.

Fig. 7 is a vertical section on the line VII—VII of Fig. 6.

Fig. 8 is an end elevation of the brake rolls and belt driving pulley.

Fig. 9 is a side elevation of the brake rolls and belt driving pulley.

Fig. 10 is a section on the line X—X of the Fig. 9.

Fig. 11 is a longitudinal section through the shear operating contactor box, and

Fig. 12 is a section on the line XII—XII of Fig. 11.

The present invention relates to winding machines and more particularly to machines for winding strips of paper or the like into shells. These shells are usually open-ended shells to be subsequently used in the manufacture of paper cans or cartons. The present invention relates particularly to the mechanism for properly supplying strips of paper to the mandrel or former upon which the shell is wound.

Referring to the embodiment of the invention illustrated in the drawings, the paper shell is wound on a mandrel 2. The mandrel is substantially surrounded by a chain 3 which serves to press the wraps of paper firmly together to form the shell. The layers of paper in the shell are cemented together preferably by a waterproofing material such as paraffin. After the shell is wound on the mandrel 2 it is ejected therefrom by a stripper 4 which moves lengthwise of the mandrel. The details of the mandrel, chain and ejecting mechanism are described in detail in my co-pending application Serial No. 209,184, filed on even date herewith.

The paper is fed to the winding mandrel in severed strips of variable length depending upon the diameter of the shell to be formed and the number of wraps or layers to be wound in the shell. The strips of paper fed to the winding mandrel may also have printing upon them. If the strip is printed, it is necessary that its end be severed with predetermined relation to the location of the printing thereon.

The paper is supplied in a roll 10 of the proper width. The roll 10 is carried on a roll stand provided with friction tension rollers 11. The paper then passes around a continuously driven roll 12 which also preferably serves as a platen for the printing mechanism. The strip of paper is fed from the roll 12 onto a conveyer 13 to a shear 14 which cuts the paper into strips of a predetermined length. These strips are carried by the conveyer to a pair of rolls 15 which feed it to the mandrel 2 and also act as tension rolls.

The machine is driven by an electric motor 20 which has two oppositely extending driveshafts 21 and 22 respectively. The driveshaft 21 drives the winding mandrel and its associated parts. Driveshaft 22 drives the feed roller or platen 12 and the printing mechanism. The driveshaft 21 has a worm 23 which meshes with a worm gear 23′ on the shaft of the main spur gear 24. The winding mandrel 2 is driven from the main spur gear 24 through a shaft 25 and pinion 26, the gear ratio being such that the mandrel 2 makes twelve revolutions for each revolution of the main spur gear 24. The twelve revolutions of the mandrel 2 constitute one cycle of the machine. During four of these twelve revolutions the ejector 4 which strips the completed shell from the mandrel, travels forward and back. This leaves eight revolutions during which it is possible to wind the shell. The chain 3 is driven by contact with the mandrel 2. During the shell ejecting operation the chain is freed from the mandrel and becomes greatly reduced in speed or becomes stationary. After the shell is ejected the chain is again tightened around the mandrel and picks up speed

therefrom. During about the first revolution of the mandrel after the chain is tightened, there is a considerable slip between the chain and mandrel. For some classes of work, and particularly for thin paper, it is desirable to introduce the end of the strip between the chain and mandrel as soon as possible after the chain has tightened on the mandrel. For other classes of work, and particularly for heavier grades of paper, it is preferable to delay introducing the end of the strip between the chain and the mandrel until the chain has picked up its speed from the mandrel. It is therefore necessary that the introduction of the end of the cut strip of paper into the winding head be properly timed with relation to the cycle of shell winding and stripping operations. Moreover different sized mandrels are employed in the machine. The shells for different diameters, and shells of the same diameter for different purposes require a different number of wraps. Therefore it is also necessary that the length of the strip fed to the winding mandrel 2 be varied. These requirements are met by the feeding and shearing mechanism which take the continuous strip of paper, feed it at the proper rate, cut it into proper lengths, and deliver it in proper timed relation to the cycle of shell forming operations.

The roll 12 which feeds the paper from the supply 10 to the shear 14 is continuously driven from the shaft 22 through intermediate gearing. A worm 30 on the driveshaft 22 meshes with a worm gear 31 on the short shaft 32. On the other end of the shaft 32 is carried removable gearwheel 33. The gear ratio of the worm drive is such that the shaft 32 and gear 33 rotate at the same number of revolutions per minute as the main spur gear 24. The shaft 32 is carried in a vertically adjustable box 34 to permit different sized gears 33 to be employed. The gear 33 has on one side a continuous series of teeth 35 and on the other side a mutilated gear having a fixed number of teeth 36. The number of teeth in 35 varies with the size of the gear wheel 33 but the number of teeth 36 remain the same for all sizes of gear wheels which are used in the machine. The teeth 35 mesh with a pinion 40 carried on the end of the driveshaft 41 of the cylinder 12. The teeth 36 of the mutilated side of the gear mesh with a pinion 42 formed on the hub extension 43 of the gear wheel 44. The hub 43 with its pinion 42 and gear 44 are mounted and are free to turn on the shaft 41. The gear 44 meshes with two gears 45 and 46 which are mounted on the shafts of and drive the printing cylinders 47 and 48. The printing cylinders 47 and 48 carry plates which print the strip of paper in two colors as it passes around the platen cylinder 12. The printing rolls 47 and 48 are supplied with ink by any suitable inking mechanism. (Not shown.)

By means of the mutilated gear 36 the printing cylinders 47 and 48 are intermittently rotated, and are given one revolution for each cycle of the shell winding operations. The gear 33 makes one revolution for each revolution of the main spur gear 24. The number of teeth in the mutilated gear 36 is the same for all sizes of gear wheels 33 which may be inserted in the machine, and the printing plate cylinders 47 and 48 make one complete revolution for each twelve revolutions of the mandrel 2. The number of teeth in the continuous part 35 of the gear 33 varies with the diameter of this gear. If larger cans or cans with a greater number of wraps are to be wound at the mandrel 2, gears 33 of larger sizes are used. The size of the gear 33 determines the amount of paper fed for each cycle of operations and by selecting a gear of the proper size, a strip of proper length is fed to the winding mandrel 2.

The printing cylinders are locked in their inoperative position by a spring pressed locking pin 50 which engages a hole 51 in the web of the gearwheel 44. The locking pin 50 is withdrawn during the time that the pinion 42 is driven by the mutilated gear 36, by means of the cam 52 on the side of the gear 36. The cam 52 engages a cam roll 53 and through the lever 54 withdraws the pin 50.

The strip of paper moves continuously from the platen cylinder 12 onto the conveyer 13. The strip has printed on it at the proper intervals the labels which the shells are to bear.

The conveyer 13 consists of two side rails 60 and between them an endless continuously traveling belt 61. The belt is formed of a number of spirally coiled wires passing over grooved end pulleys 62 and 63. The end pulley 62 is the driven pulley which drives the belt at a predetermined speed. The belt is driven out faster than the travel of continuous strip of paper from the platen cylinder 12 and serves to pull out and keep the free end of the paper straight. The strip of paper is carried by the belt to the shear or severing mechanism 14 which cuts off strips of the proper length.

The shear mechanism 14 is supported on the side rails 60 and is adjustable longitudinally thereof. The shear mechanism comprises a downwardly movable knife 65 cutting against knife block 66. The knife 65 is operated by means of a solenoid 67 through lever connections 68. When the solenoid is energized the knife is depressed to cut the strip. The position of the shear in the conveyer is determined by the length of the strip to be fed to the shell winding mechanism. If a short strip is to be cut

the shear is moved to about the middle of the conveyer while if a longer strip is to be cut, the shear is moved toward the platen cylinder 12. By properly positioning the shear along the conveyer 13, the time in the cycle when the end of the strip enters the winding mechanism may be properly adjusted.

After the shear is positioned on the conveyer, the printing mechanism is so timed that the printed label will come at the rear end of the severed strip, so that the label will appear on the outside of the cam. In order to permit the timed adjustment of the printing and winding mechanisms, the driving shaft 22 has an adjustable connection 85. This connection is such that the shaft 22 may be disconnected and the gear 33 of the printing mechanism and the gear 24 of the winding mechanism relatively adjusted so that the printing will appear in the proper place upon the severed strip.

The operation of the shear is timed by means of a contact device 75, carried on the shaft of the main spur gear 24. The contact device 75 consists of the contact box 76, rotatably adjustable about the shaft and carrying two brushes 77, which contact with a contacting segment 78, carried by the shaft so as to momentarily switch the current into the knife-operating solenoid 67, and give the knife a rapid cutting stroke. By turning the box 76, the knife stroke is timed.

After the strip is severed by the shear, it is carried forward by the belt conveyer. As the belt is running more rapidly than the movement of the unsheared strip, the sheared portion is drawn ahead and separated from the end of the unsheared strip following. The strip is guided by side guides 90 supported on bars 91 extending between the side rails 60 below the belt. The side guides 90 are laterally adjustable along the rods 91 to accommodate the different widths of strip.

The severed strip is delivered by the belt to the rolls 15 which serve as feeding-in and tension rolls.

These rolls indicated generally at 15 comprise a lower driven roll 100 and upper presser or idler roll 101. The lower roll is driven through a multiple disk friction clutch 102 to allow a certain amount of slip to the roll when the paper is dragged through it by the mandrel 2. The roll 100 is driven by a shaft 103 which extends through the roll and to which are locked the driven disks of the clutch 102. An adjustable spring 104 is provided for varying the pressure on the multiple disk clutch. The shaft 103 carries on its end a bevel gear 105 which is driven by a pinion 106 on a short shaft 107. The shaft 107 carries a sprocket wheel 108 driven by means of a chain 109 from a sprocket wheel 110 carried on the motor shaft 21. The shaft 107 also carries another bevel pinion 115 which, through the bevel gear 116 drives the belt pulley 62.

The roll 100 is driven at a peripheral speed less than that of the mandrel 2. When the end of the strip is engaged by the mandrel 2, it is dragged forward between the rolls 100 and 101 and these rolls serve as a brake to put a tension on the strip, since the friction clutch allows the roll 100 to be turned by the then more rapidly traveling strip. This keeps the paper taut between the brake rolls 100 and 101 and the mandrel 2, and assists in the smooth winding of the wraps around the mandrel.

The successive feeding means which operate on the paper successively increase in speed. The platen or strip feeding roll 12 feeds the paper at the lowest speed. When the strip is severed the more rapidly moving belt carries the severed strip forward at an increased speed. The more rapidly moving belt not only tends to pull out the uncut end of the strip and keep it straight, but also feeds the severed portion forward to separate it from the following uncut end. The mandrel which is moving at a still higher peripheral speed, drags the cut strip of paper rapidly along giving a proper separation between it and the following strip, so that the following strip does not enter the winding mechanism until the preceding strip is wound into a shell and ejected from the mandrel. This permits the continuous feeding of the paper by the roll 12.

While the preferred embodiment of the invention has been specifically illustrated and described, it is to be understood that the invention is not limited to its illustrated embodiment but may be embodied in other structures within the scope of the following claims.

I claim:

1. A machine of the character described, comprising means adopted to receive strips and wind them into shells, and means for supplying printed strips thereto, comprising a platen cylinder, a printing cylinder coöperating therewith, a gear for continuously driving the platen cylinder having a mutilated portion for intermittently driving the printing cylinder; substantially as described.

2. A machine of the character described, comprising means adapted to receive strips and wind them into shells, and means for supplying printed strips thereto, comprising a platen cylinder, a printing cylinder coöperating therewith, a gear for continuously driving the platen cylinder having a mutilated portion for intermittently driving the printing cylinder, and means for locking the printing cylinder in its inoperative position; substantally as described.

3. A machine of the character described, comprising means for continuously feeding

a strip of paper or the like of indeterminate length, a conveyer running at faster speed than the feeding means, means for severing the strip into predetermined lengths, and a winding mandrel rotating at a higher peripheral speed than the conveyer for winding the severed lengths into shells; substantially as described.

4. A machine of the character described, comprising means for feeding a strip of paper or the like of indeterminate length, means adapted to receive strips of paper and wind them into shells, a spring belt conveyer receiving the strip as it is fed and delivering it to the winding mechanism, a means on the conveyer for severing the strip into predetermined lengths; substantially as described.

5. A machine of the character described, comprising means for continuously feeding and printing a strip of paper or the like of indeterminate length, means for severing the strip into predetermined lengths, means adapted to receive the severed lengths for winding the severed lengths into shells, and means for relatively adjusting the time of the feeding and severing mechanism with relation to the winding mechanism; substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWIN F. HULBERT.