J. HAUK.

WIRE HOOP MACHINE.

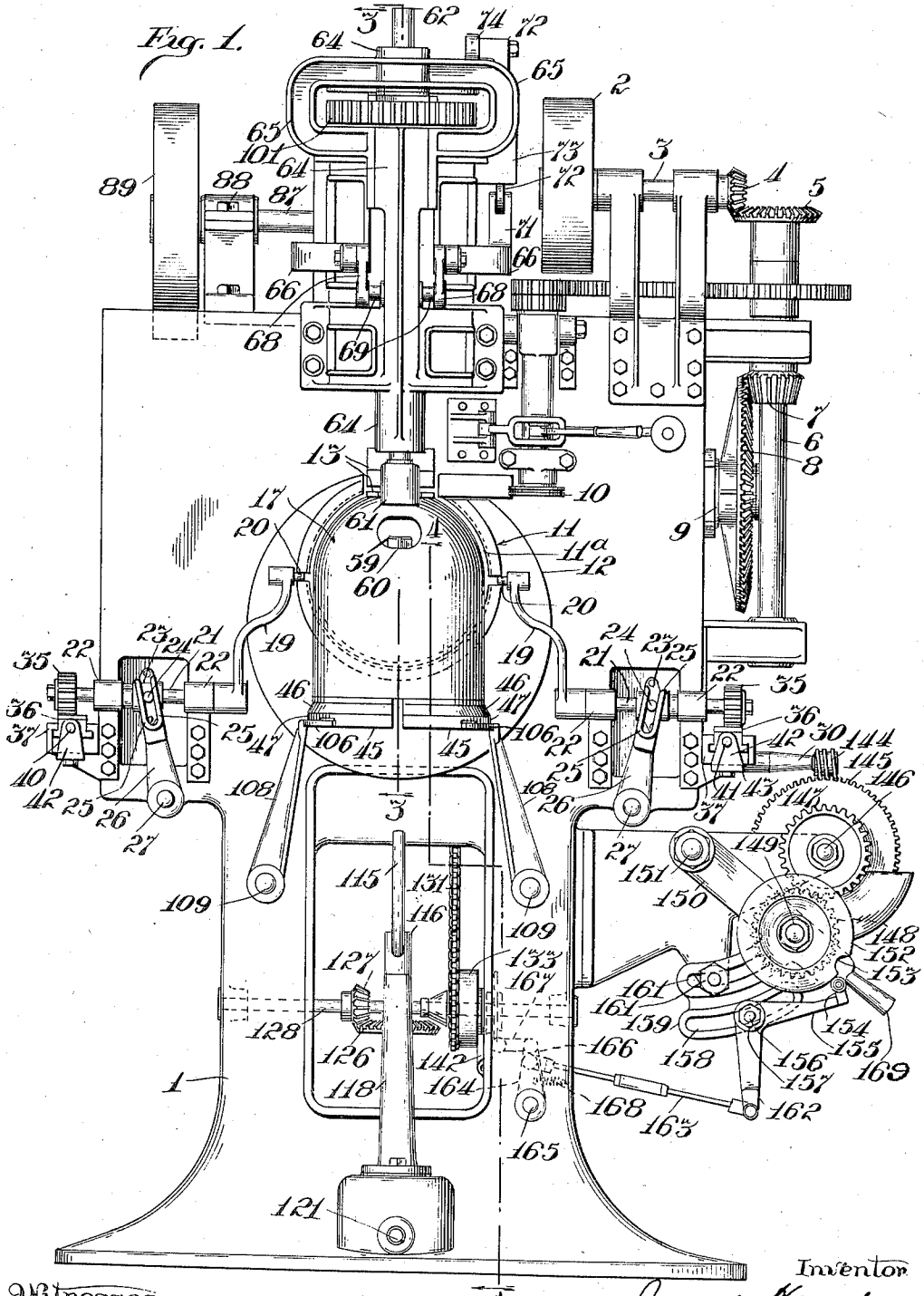
APPLICATION FILED JUNE 11, 1918.

1,307,735.

Patented June 24, 1919.

8 SHEETS—SHEET 1.

Fig. 1.



Witnesses
Milton Spencer

Inventor
Joseph Hauk
By J. M. Roberts
his Attorney

J. HAUK.

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8 SHEETS—SHEET 2.

Fig. 15.

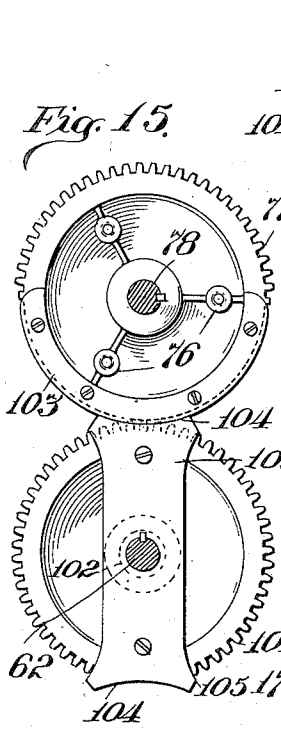


Fig. 2.

Witnesses
Milton Lenoir

Inventor
Joseph Hauk
By J. M. Roberts
His Attorney.

J. HAUK.

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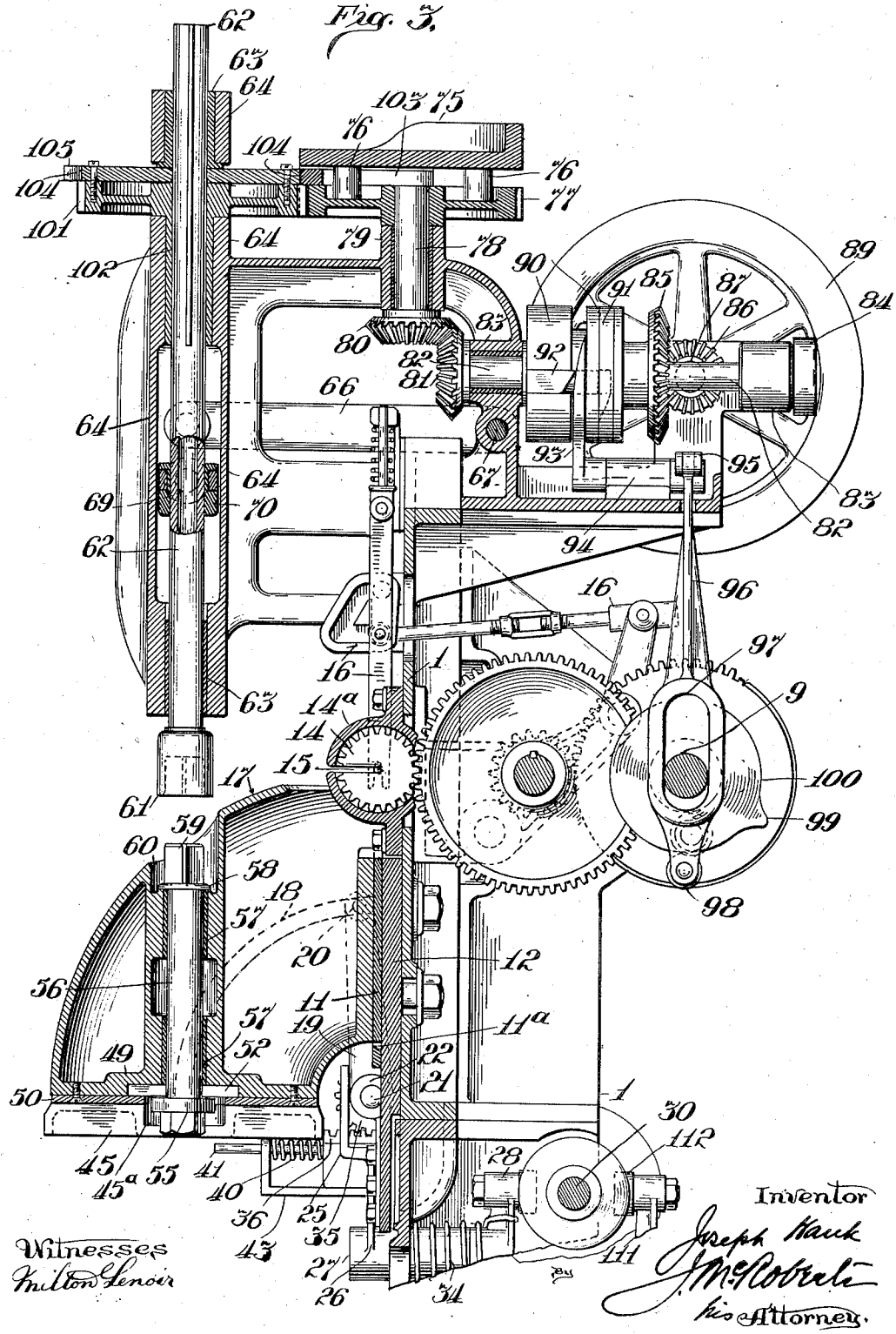
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8 SHEETS—SHEET 3.

Fig. 3.



Witnesses
Milton Senoir

Inventor
Joseph Hauk
by McCobrele
his Attorney.

J. HAUK.

WIRE HOOP MACHINE.

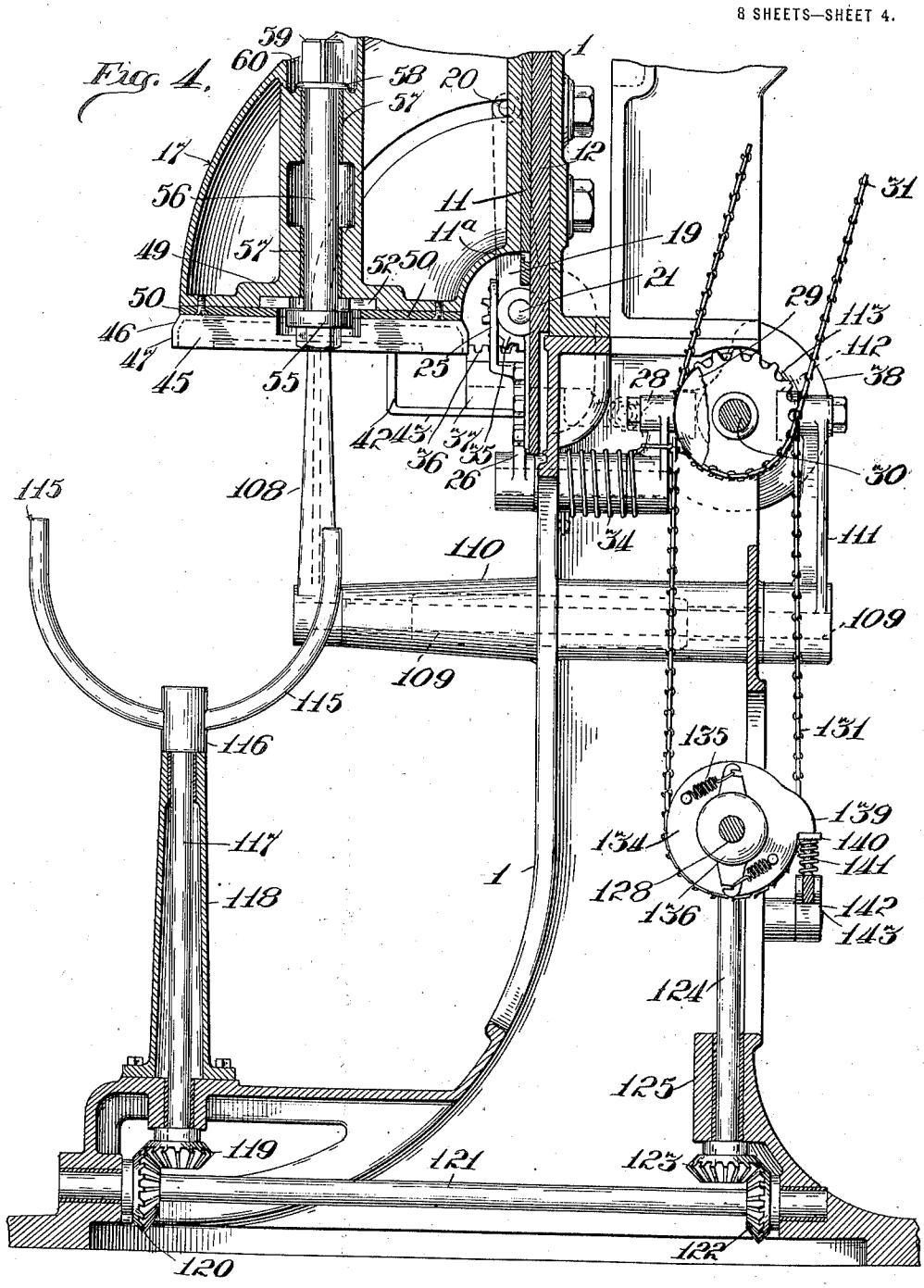
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8 SHEETS—SHEET 4.

Fig. 4.



Witnesses
Milton Lenoir

Inventor
Joseph Hauk
By J. M. Roberts
his Attorney.

J. HAUK.

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8 SHEETS—SHEET 5.

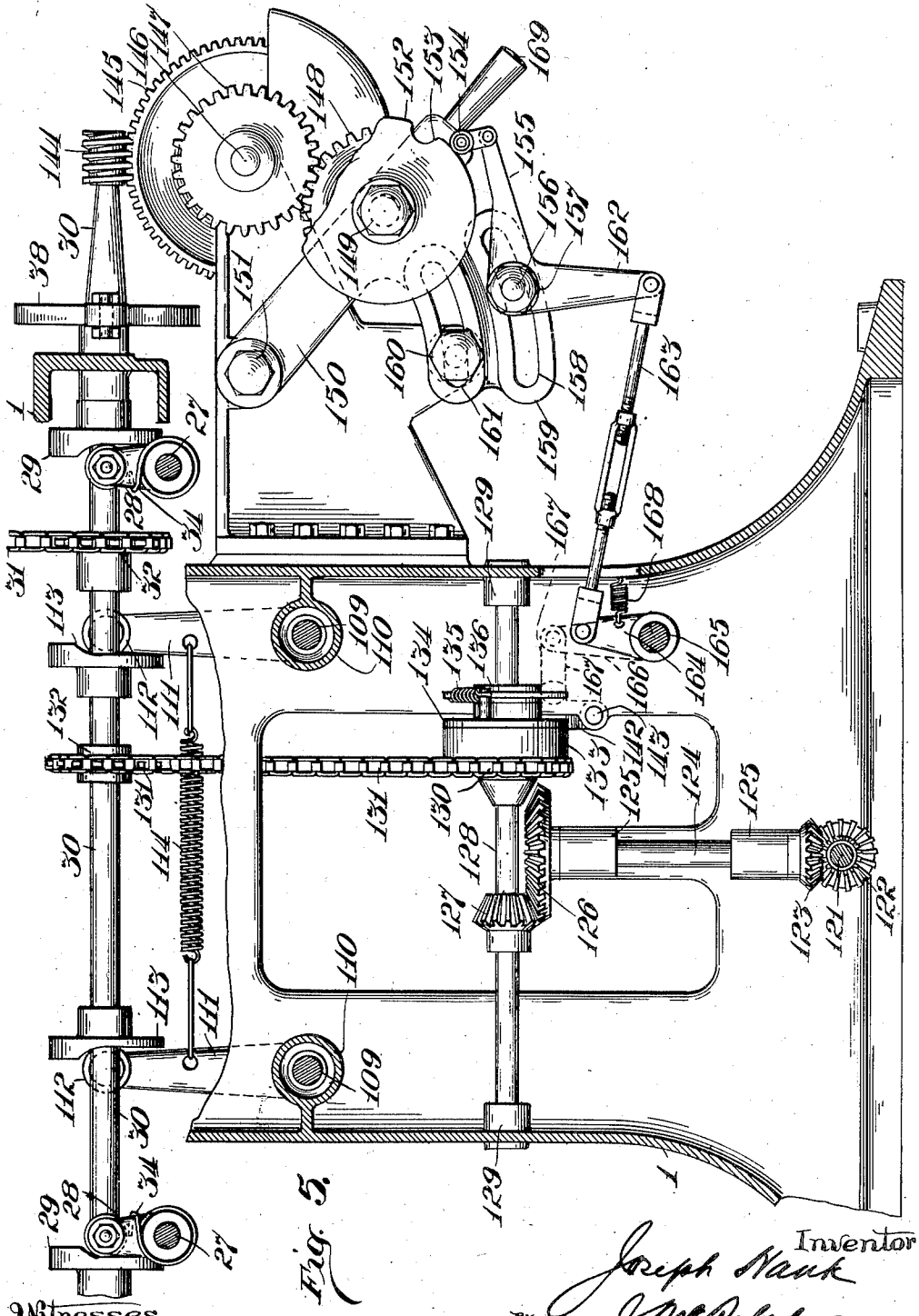


Fig. 5.

Witnesses
Milton Lenoir

Inventor
Joseph Hauk
by J. McRobbie
his Attorney

J. HAUK.

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8 SHEETS—SHEET 6.

Fig. 6.

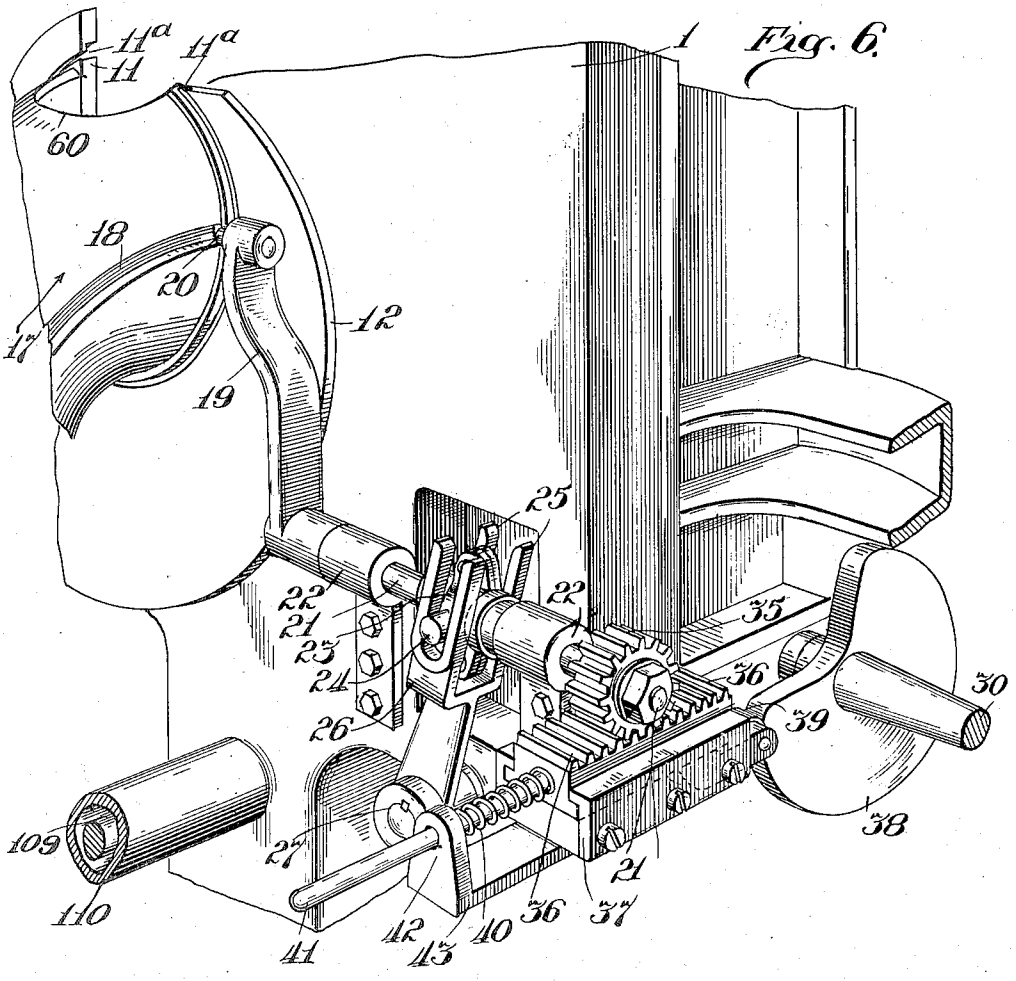
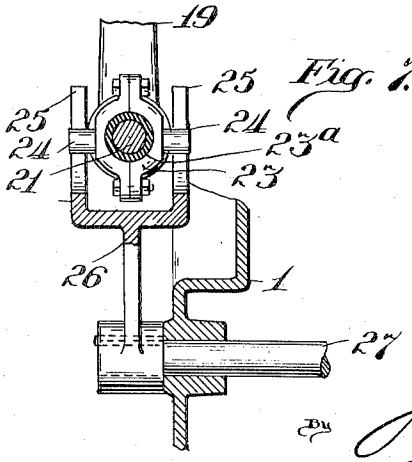


Fig. 7.



Witnesses
Milton Lenoir.

Inventor
Joseph Hauk
By J. McRoberts
his Attorney

J. HAUK.

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8 SHEETS—SHEET 7.

Fig. 8.

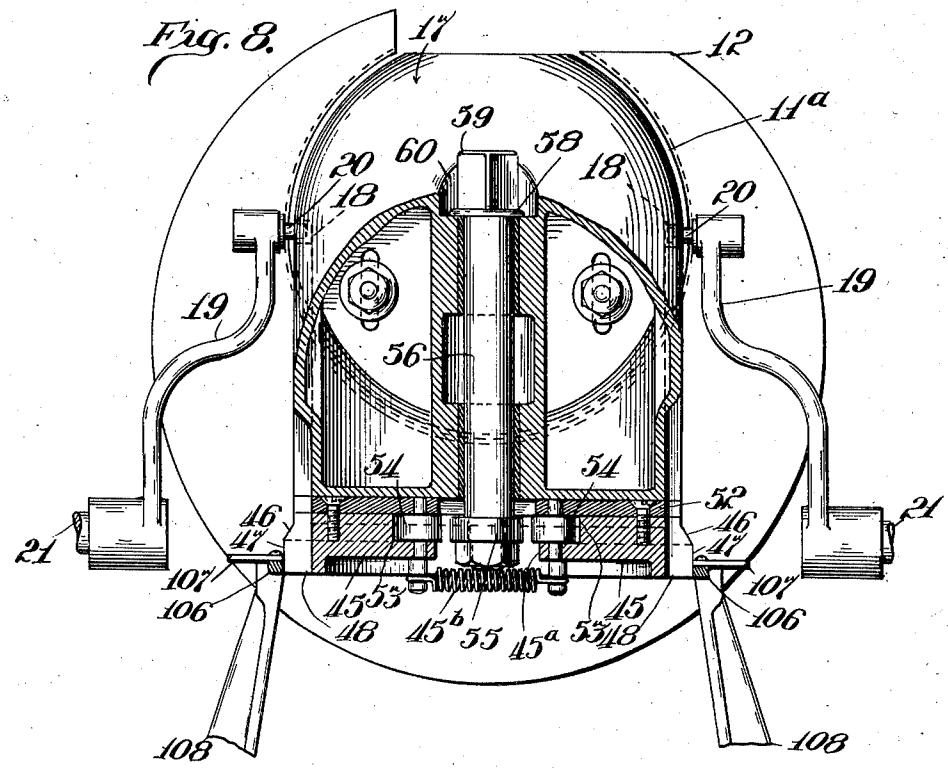
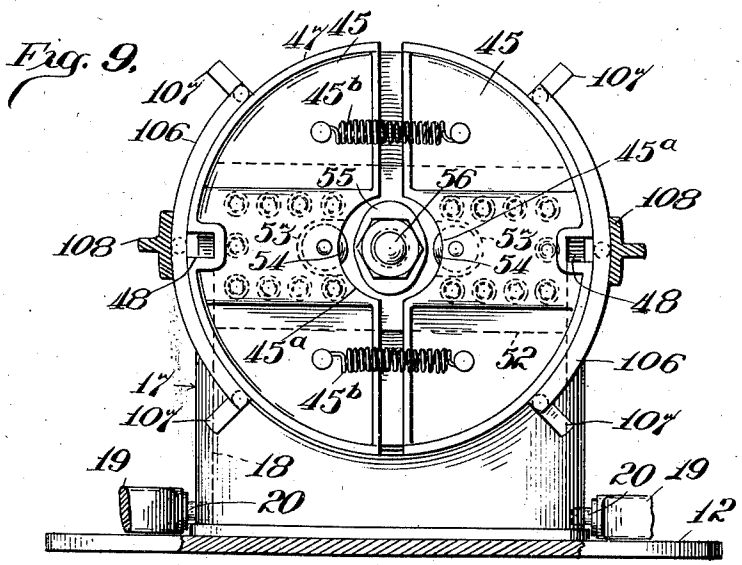


Fig. 9.



Witnesses
Milton Lenoir

Inventor
Joseph Hauk
By J. McRoberts
His Attorney

J. HAUK.

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8 SHEETS—SHEET 8.

Fig. 10.

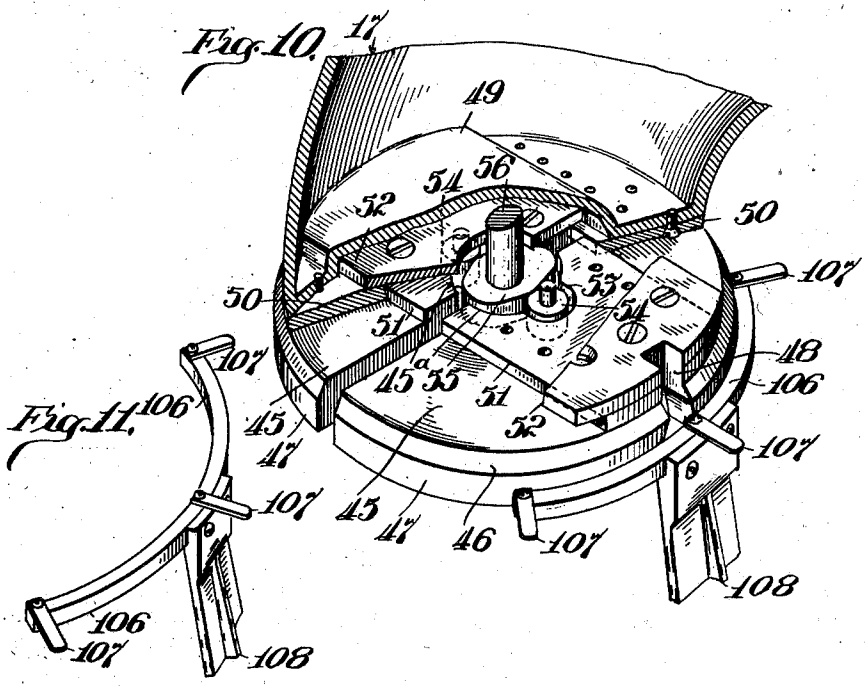


Fig. 11.

Fig. 13.

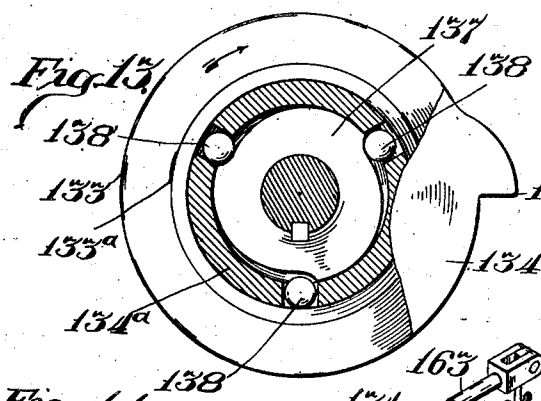


Fig. 12.

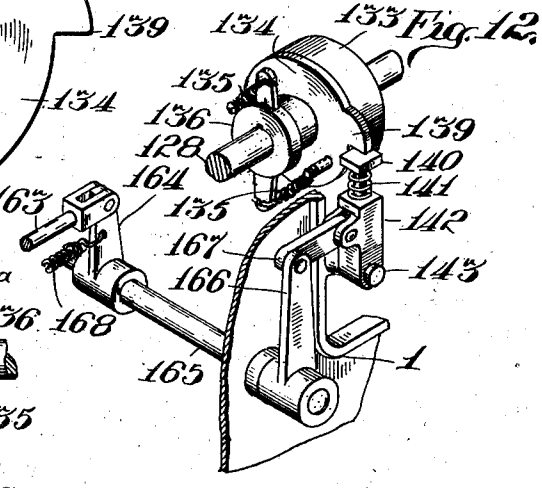
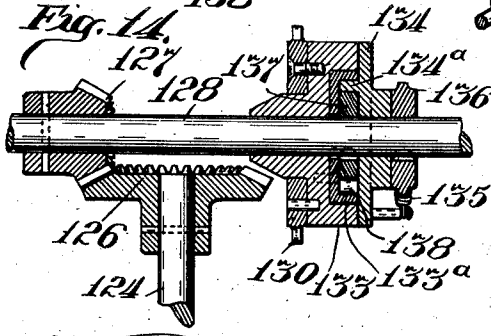


Fig. 14.



Witnesses
Milton Lenoir

Inventor
Joseph Hauk
By J. McRoberts
his Attorney

UNITED STATES PATENT OFFICE.

JOSEPH HAUK, OF CHICAGO, ILLINOIS, ASSIGNOR TO INTERSTATE IRON AND STEEL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

WIRE-HOOP MACHINE.

1,307,735. Specification of Letters Patent. Patented June 24, 1919.

Application filed June 11, 1918. Serial No. 239,370.

To all whom it may concern:

Be it known that I, JOSEPH HAUK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Wire-Hoop Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to machines for manufacturing wire hoops for barrels and other containers, and its primary object is to provide a machine by which the hoops are made and uniformly curved throughout their extent to the circular bend designed for them in a continuous operation. A further object is to provide a combined counting and delivering mechanism by which the hoops are counted off in batches or bunches of any desired number upon an arm of a receiving reel which is periodically operated to remove the batch from the zone of the machine and present an empty arm in the zone for a new bunch or batch.

In machines for making wire hoops heretofore employed the forming devices which bend the wire into hoop-like form impart to the main portion of the wire the circular bend designed for the hoop but leave certain irregularities, especially at the lapped ends which are spliced to form the joint, and the hoop is then lifted from the machine by the operator and placed between bending jaws to give the proper curvature to all portions of the hoop including the twisted or spliced portions. These prior machines also are defective in that the hoops frequently are not uniform in size when made from uniform lengths of wire.

By my invention the hoops are made and uniformly curved throughout their extent to the bend designed for them by a continuous mechanical operation, the machine containing mechanism to transfer the spliced hoops from the hoop-forming mechanism to an expander which curves them uniformly throughout their extent, mechanism to hold the hoops on the expander and mechanism to operate the expander, so that the manual operations of lifting the hoops from the machine and passing them between bending jaws or other curving devices to conform their irregularities to the proper curvature are avoided. Also, the expander insures that the hoops of any given batch are uniform in size, and drops them off after they are finished. Further, the machine contains mechanism to count off a batch of any given number of hoops to an arm of a receiving reel, and mechanism to periodically turn the reel to remove the batch of finished hoops from the zone of the machine and present an empty arm in this zone for a new bunch or batch.

The invention consists in the matters hereinafter described and then pointed out in the appended claims.

In the accompanying drawings which illustrate a practical application of mechanism to attain my various objects,

Figure 1 is a view in front elevation of a machine embodying the several features of my invention;

Fig. 2 is a view in side elevation of the same taken at the right hand side of Fig. 1 and with part of the casing in section and parts of the power-transmitting mechanism omitted;

Fig. 3 is a transverse vertical sectional view on an enlarged scale of the upper portion of the machine on the line 3—3 of Fig. 1;

Fig. 4 is a similar view on the same scale as Fig. 3 and showing the lower portion of the machine on the line 4—4 of Fig. 1;

Fig. 5 is a detail sectional view on the line 5—5 of Fig. 2 with parts broken away;

Fig. 6 is a detail perspective view of a portion of the mechanism to operate the hoop-carrying arms with parts broken away and others in section;

Fig. 7 is a detail sectional view of part of the mechanism of Fig. 6;

Fig. 8 is a detail view partly in section on the line 8—8 of Fig. 2;

Fig. 9 is an inverted plan view of the expander with other parts shown in Fig. 8;

Fig. 10 is a detail perspective view of the expander and one of the hoop-holders with parts in section;

Fig. 11 is a detail perspective view of one of the holders for the hoop on the expander;

Fig. 12 is a detail perspective view of parts of the trip and clutch mechanism for periodically operating the hoop-reel;

Fig. 13 is a detail sectional view of the clutch of Fig. 12;

Fig. 14 is a detail view partly in section showing part of the mechanism for periodically operating the hoop-reel, and Fig. 15 is

a perspective view of the intermittent or mutilated gear for the expanded cam.

In the drawings the reference numeral 1 represents a suitable upright frame on which the various parts are carried, and 2 the main drive-pulley on a shaft 3 journaled in bearings at the top of the frame and to which power is applied from any suitable source and from which it is transmitted through bevel-gears 4 and 5 to a vertical shaft 6 mounted in bearings on one side of the frame and thence by bevel-gears 7 and 8 to the main shaft 9 upon which the gear 8 is secured. The machine contains suitably driven feed-rolls 10 for feeding the wire from a coil to the hoop-former 11 having a circular raceway 11ª to bend the wire into hook-like form and vertically supported upon a circular vertical plate 12 on the frame, suitable wire gripping and cutting mechanism 13, a rotating floating twister 14 confined in its circular casing 14ª for twisting or splicing the lapped ends of the severed wire and having the usual radial discharge slot 15, and suitably operated hoop-stripping mechanism 16, controlled by the main shaft 9, and as these devices are old and well-known, for example in the patent to A. F. Dice, No. 689,578, dated Dec. 24, 1901, they are shown in conventional form and require no detailed description, it being understood that the parts are so arranged that a hoop is spliced by the twister 14 and discharged by the stripper 16 at each revolution of the shaft 9.

A curved horn 17 is fastened to the plate 12 at its upper vertical end in alinement with the hoop-forming raceway to receive the hoop as it is stripped from the latter, the diameter of the horn being such that the hoop easily slides thereon. The top portions of the horn, supporting plate and hoop-former are suitably cutaway (Fig. 6) to accommodate the associated parts. The horn extends outwardly and downwardly and is provided in its opposite sides with curved slots 18 extending from near its top to its bottom and conforming to the curvature of the horn, and a pair of hoop-carrier or transfer arms 19 having inwardly facing studs 20 in line with the slots are mounted on opposite sides of the horn on shafts 21 which have longitudinal reciprocating motion to shift the studs into and out of the slots and rocking motion to cause the studs to travel down the slots and return outside the slots when their shafts are rocked while shifted inwardly and outwardly respectively. The shafts 21 are mounted to reciprocate and rock in bearings 22 on the frame, and they are in their outward position when a hoop is discharged upon the upper end of the horn by the stripper 16 so that the studs 20 are in their retracted position out of their slots and out of the path of the hoop as shown in Fig. 1 to allow the hoop to pass to position on the horn beyond the path of the closing-in movement of the studs, so that the latter lie behind the hoop on the horn when they are moved into their slots. Each shaft 21 carries a collar 23 in a peripheral channel of a fixed sleeve 23ª and provided with a pair of opposite pins 24 engaged by elongated yokes 25 on the upper portion of a rocking-arm 26 keyed to the front end of a rock-shaft 27 journaled in suitable bearings on the frame and whose rear end carries a wiper-arm 28 in the path of a crown cam-wheel 29 on a shaft 30 (Fig. 5) which is rotated in unison with the rotation of shaft 9 by a sprocket-chain 31 connecting equal sized sprocket-wheels 32 and 33 respectively on these shafts so that the shaft 30 makes a revolution for each hoop delivered upon the horn by the stripping-devices 16. The wiper-arms 28 are held by torsion springs 34 against the cam-wheels 29 so that when the arms are in contact with the dwells of the wheels the shafts 27 are rocked by the springs to the position shown in Fig. 1 with the shafts 21 shifted outwardly and the studs 20 withdrawn from their slots 18 to allow a hoop to pass onto the horn, and the cam portions of the wheels rock the arms 28 reversely to shift the shafts 21 inwardly and close the arms 19 to their inner positions with their studs 20 projecting into the slots as shown in Fig. 8 and back of the hoop on the horn, the cams being timed to close the studs into their slots when a hoop is delivered to the horn by the stripper 16 and to retain them in this position while the arms 19 are rocked to make their hoop-carrying downstroke in their slots and then the springs 34 reversely rock the shafts 27 to retract the shafts 21 and withdraw the studs from their slots. The rocking motion of the shafts 21 to rock the arms 19 is permitted by the collars 23 engaging the channels in the fixed sleeves 23ª and is provided by each shaft carrying at its outer end a fixed pinion 35 meshing with a reciprocating rack 36 which is of sufficient width to engage its pinion in both of the positions of the latter when its shaft 21 is shifted longitudinally and is reciprocated in a guide-box 37 mounted on the frame. Each rack is moved forwardly to rock its associated arm 19 upwardly to carry its stud to the top of its idle stroke by a cam-disk 38 mounted on the shaft 30 and bearing against a friction-roller 39 carried on the adjacent end of the associated rack, and is moved rearwardly to rock its associated arm 19 downwardly to make its hoop-carrying stroke by the expansion of a coil-spring 40 mounted on a rod 41 fixed at one end in the rack and passing freely through an abutment 42 formed by the upper end of a bracket 43 fixed at its opposite end to the

guide-box 37, the spring being put under tension by the outward movement of its rack by its cam 38 and reacting between the rack and abutment to move the rack inwardly when the roller 39 enters the dwell in the cam-disk. The arms 19 are moved on their downstroke by their springs 40 to carry the studs 20 on their downstroke in their slots 18 so that in case a hoop carried over the horn by these studs binds on the horn the springs will yield to avoid breakage of any of the parts. When the arms 19 are in their closed position under the influence of the cam-wheels 29 with their studs in the upper ends of the slots 18 the dwells in the cam-disks 38 permit the springs 40 to retract the racks 36 to turn the pinions 35 and shafts 21 to rock the arms forward and downward in their slots to deliver a hoop to the expander at the lower end of the horn, and when the arms 19 reach the end of their downstroke the springs 34 shift the shafts 21 outwardly to move the arms to their open position to retract their studs from the slots, and the cams 38 rock the arms upwardly to position at the top of their idle stroke as shown in Figs. 1 and 2.

The expander is attached to the lower end of the horn and consists of a pair of segmental heads 45 whose upper edges are normally flush with the lower end of the horn and are then outwardly beveled as at 46 to center and level the hoop and provided with a vertical skirt 47 on which the hoop is brought to rest by the arms 19, each of the heads having a clearance passage 48 in extension of the slot 18 for the stud 20 on its corresponding side of the horn. The heads 45 are slidably supported on the underside of the horn; for this purpose the horn is provided with a transverse upwardly projecting central bridge 49 having a guide-plate 50 secured along the base of each of its sides with its inner edge projecting into the space below the bridge as shown clearly in Fig. 10, and each head 45 carries a top guide-plate 51 which slides freely between the opposite inner edges of the guides 50 providing a way therefor, and also carries on top of its guide-plate 51 a wider retaining-plate 52 which fits and freely reciprocates within the bridge and whose outer edges overlie the inner edges of the guides 50. Each head has an inner central recess 45^a, and each guide-plate 50 has a recess 53 in extension of the corresponding recess in its head, and a wiper-roller 54 is carried in each recess 53 being mounted in its head and associated retaining plate 52 in the path of a double expander cam 55, which expands the heads when turned from its normal inoperative position shown in Fig. 10, and puts their return springs 45^b under tension.

The expander cam is carried on the lower end of a shaft 56 rotatably mounted in central bearings 57 in the horn and held against longitudinal displacement by the cam and a top flange 58. The upper end of the shaft 56 is squared as at 59 in line with an opening 60 in the top of the horn to receive the correspondingly squared hollow plunger-wrench 61 which is carried on the lower end of a plunger 62 which is rotatably and slidably mounted in bearings 63 in a guide-box 64 fixed to the upper portion of the frame. The guide-box overhangs and is spaced above the horn and its upper portion is divided as shown in Fig. 1, its upper end being supported by a closed yoke 65 which is horizontally elongated as shown for a purpose hereinafter described. The plunger is reciprocated longitudinally by an open frame composed of a pair of opposite arms 66 fixed at one end to a pintle 67 mounted to rock in the frame and straddling the box 64 at their free ends where they are connected to the plunger by the links 68 which are pivoted at their upper ends to the free ends of the arms and at their lower ends to lateral pins 69 fixed in a collar 70 which engages the plunger to reciprocate it longitudinally but allows it to rotate or turn. The guide-box 64 is cut away on each side as shown in Figs. 2 and 3 to allow clearance for the plunger-pins 69 when the frame is operated by its operating link 71 which is pivoted at its lower end to one of the arms of the frame and at its upper end to the lower end of a reciprocating rod 72 passing up through a vertical guide 73 on the frame above which its free end is provided with a roller 74 engaged by a crown cam-wheel 75 to raise and lower the frame. The cam-wheel 75 is mounted by spacing studs 76 on the upper face of the mutilated gear 77 which is keyed to the upper end of a short vertical shaft 78 mounted in a bearing 79 on the frame and driven by miter gears 80 and 81 from a short shaft 82 which is journaled in bearings 83 and has a friction-brake 84 and carries a loose bevel-gear 85 constantly rotated by a bevel-gear 86 keyed on a shaft 87 journaled in bearings 88 and having a driving pulley 89 to receive motion from any suitable source of power. The clutch members 90 and 91 fixed respectively on the shaft 82 and the sleeve of the gear 85 are connected and disconnected by a spring-actuated pin 92 slidable in the normally stationary member 90 to engage the constantly rotating member 91 and disengaged by a beveled latch 93 which enters a peripheral channel in the member 90 in the path of a beveled projection on the pin, the brake 84 then stopping the shaft 82. The latch is keyed to a short rock-shaft 94 having a rocker-arm 95 which is connected at its free end to the upper end of a link 96 which carries at its lower end an elongated closed yoke 97 inclosing the shaft 9 and having a wiper-roll 98 operated by a cam 99 on

a disk 100 on the latter shaft, the clutch-pin connecting its members when the latch 93 is raised by cam 99 out of the path of its projection and retracted when the latch is lowered into its path. The cam 99 is timed to trip the latch and allow the clutch to close to rotate the shaft 82 when the carrier-arms 19 are at the end of their downstroke to deliver a hoop to the expander, which occurs once for each revolution of shaft 9, and then the shaft 78 is rotated to move the cam portion of the wheel 75 out of the path of the roll 74 to allow the frame 66 to lower the plunger 62 to engage the plunger-wrench 61 with the squared end of the shaft 56, and while the parts are in this relation the mutilated driving gear-wheel 77 engages the driven gear-wheel 101 of the intermittent gear to turn the expander cam a half revolution. The gear-wheel 101 is located in the yoke 65 and has a sleeve 102 revolubly mounted in the guide-box 64 and splined to the plunger to turn the latter but allow it to reciprocate longitudinally therein. The mutilated driving gear-wheel 77 of the intermittent gear is provided with teeth along one half of its perimeter, and its opposite half is of reduced diameter and carries a projecting convex plate 103 which interlocks with either concave end 104 of a locking plate 105 fixed transversely across the top of the driven gear 101, as shown in Fig. 15, the arrangement being such that during each revolution of the gear 77 its teeth turn the gear 101 a half revolution and then the plates 103 and 104 interlock and the gear 101 is locked against turning until the gear 77 again revolves, the center line of the concavity 104 of the plate being on the center line of the teeth of the driven gear 101 so that when the driving gear 77 is again turned its teeth mesh with the teeth of the driven gear to turn the latter a half-revolution. Each half revolution of the gear 101 gives the plunger 62 a half turn which is sufficient to operate the double expander-cam 55 to move the expander heads 45 outwardly to act on the hoop, and the parts are so related that the dwell of the cam wheel 75 is sufficient to allow the plunger to engage the shaft 56 and the mutilated gear to operate the expander-cam 54, and the cam portion of the wheel 75 then raises the plunger to disengage the shaft 56 and the pin 92 is retracted by the latch 93 and disconnects the clutch members, when the mutilated gear locks the parts against further operation until the cam 99 again trips the latch. The clutch controls the expander-mechanism, and the cam 99 is timed to close this clutch after the arms 19 are rocked down to deliver a hoop in position on the expander, and while this clutch remains closed the cam 75 is timed to lower the plunger to engage its wrench with the upper end of the cam-shaft 56, and the mutilated gear is timed to then rotate the plunger and the connected cam-shaft to spread the expander-heads 45.

The hoops are held in position on the expander-heads by opposite supporting-plates 106 in the form of segments conforming to the curvature of the skirts 47 of the expander-heads. The plates 106 have hoop-retaining wings 107 and are mounted on laterally movable rocking-arms 108 keyed on the forward ends of transverse rock-shafts 109 which are mounted in bearings 110 on the frame and are provided at the rear ends with rocker-arms 111 each carrying at its free end a wiper-roll 112 in the path of a crown cam-wheel 113 on the shaft 30 to rock the arm 108 away from its expander-head, and a spring 114 reversely rocks the arms 108 when the rolls 112 are in the dwell of the cams, the organization of the parts being such that the spring closes the supporting-plates on the expander to receive the hoop before the expander is operated and to support it while the latter is operated, and the cams then rock the plates away from the expander to allow the hoop to drop off the expander when its heads are retracted after the stroke of their cam 54. The cams 29 and 113 are respectively timed to allow the carrier-arms 19 when they have reached the end of their downstroke to be moved outwardly by their actuating springs 34 before the plates 106 are withdrawn from their position to support the hoop.

When a hoop drops off the expander it is caught by an arm of a receiving reel located below the expander. The reel is in the form of a bifurcated yoke having arms 115 and is revolubly operated so that the arms alternately stand in the zone of the expander to receive the hoops dropping therefrom. The reel is carried on a head 116 fixed to the upper end of a shaft 117 revolubly mounted in a standard 118 projecting upwardly from the base-plate of the frame and rotated through miter gears 119 and 120 by a through-shaft 121 journaled in end-bearing in the frame and in turn rotated through miter gears 122 and 123 by a vertical shaft 124 journaled in bearings 125 and in turn rotated through bevel gears 126 and 127 by a cross-shaft 128 journaled in end-bearings 129 on the frame. A sprocket-wheel 130 loosely mounted on the shaft 128 is constantly driven by the sprocket-chain 131 from a sprocket-wheel 132 on the shaft 30, and is coupled and uncoupled with the shaft 128 by a friction clutch to periodically rotate the latter shaft. The hub 133 of the wheel 130 carries a friction-cup whose flange 133^a surrounds the flange 134^a of a second cup 134 loosely mounted on the shaft and connected by coil-springs 135 to a spool 136 keyed to the shaft, and a cam-disk 137 located in the cup 134 is keyed to the shaft

and engages the rollers 138 movably confined in openings in the flange 134ª, the springs 135 being put under tension and the rollers moved into the reduced portions of the cam-disk to clear the flange 133ª when the peripheral lug 139 of the cup 134 engages its stop 140 carried yieldingly by a spring 141 in the upper end of a socket-block 142 pivoted to the frame at 143. When the block is moved to withdraw the stop from the path of the lug 139 the springs 135 turn the cup 134 to move the rollers upon the high portions of the cam-disk into frictional engagement with the flange 133ª, and the shaft 128 is rotated. The movement of the stop-block 142 is controlled by a trip-device and counting wheel operated from the shaft 30 which makes a revolution with the shaft 9 for each hoop delivered to the expander. A worm 144 is keyed to one end of the shaft 30 and meshes with a worm-wheel 145 on one end of a short shaft 146 journaled in a suitable bearing in a lateral bracket on the frame to turn the worm-wheel 145 the distance of one tooth for each revolution of the shaft 30. The shaft 146 is provided at its other end with a fixed gear-wheel 147 meshing with a gear-wheel 148 removably mounted on a stub-shaft 149 carried by an arm 150 pivoted to the frame at 151. The worm 144 makes one revolution and the gear 145 moves the distance of one tooth for each hoop delivered, and the ratio of the gears 147 and 148 is such that the latter makes a complete revolution for a given number of hoops so delivered, say seventy-five, and by changing the ratio of these gears the number of hoops discharged during each revolution of the gear 145 will vary accordingly, the interchange of different gear-wheels at 148 being provided for by their removability on the stub-shaft 149. Each gear-wheel 148 is a counting wheel and carries a revolving drum 152 which is provided with a peripheral recess 153 to receive the free inwardly projecting end of a spring-actuated trigger or latch 154 which is carried on one arm 155 of a bell-crank lever pivoted to freely swing on a bolt 156 which is adjustably held by lock-nut 157 in the curved slot 158 of a sector-plate 159 which is integral with the arm 150 and is in turn adjustably locked in position on the frame by the lock-bolt 160 passing through its upper curved slot 161. The opposite end 162 of the bell-crank is connected by an adjustable link 163 to a rock-arm 164 fixed on one end of a rock-shaft 165 journaled in the frame and carrying at its other end a fixed arm 166 which is connected by a pivoted link 167 to the socket-block 142. When the counting-gear 148 completes a revolution a number of hoops corresponding to the number of its teeth has been discharged from the expander upon the adjacent arm 115 of the receiving reel, and the recess 153 in the drum 152 then comes into the path of the trigger 154 which is snapped into the recess by the force of a retracting spring 168, which is connected to the frame and the arm 164 and withdraws the stop 141 from the path of the lug 138 to allow the clutch to couple the revolving sprocket-wheel 130 to the shaft 128 to turn the latter for a complete revolution and through the ratio of the bevel gears 126 and 127 turn the reel-shaft 117 a half-revolution to rotate one arm 115 with its bunch of hoops out of the zone of the expander and present the empty arm into position below the expander to receive a fresh batch of hoops. The arm 150 is provided with a handle 169 to adjust the plate 159 for counting-disks 148 of various sizes, it being understood that the adjustment of the bell-crank 155 is correspondingly made for the variations in the size of the associated drums 152, the slots 158 and 161 being concentric, and struck on a radius whose center is at 151.

In the operation of the machine, the drive shaft 9 controls the operation of the devices to make the hoops, the stripping-mechanism 16 delivering a hoop to the horn at each revolution of the shaft, the carrier arms 19 then occupying the position shown in Fig. 1. These arms then are closed in to enter their studs in the slots behind the hoop on the horn and are rocked downwardly to carry the hoop along the horn and deliver it to the expander. The supporting plates 106 are closed in to their position against the expander while the arms 19 are carrying the hoop along the horn, and when the hoop reaches the supporting plates the arms 19 are withdrawn from their slots to their outward position and rocked upwardly to their initial position the plates continuing to support the hoop on the expander. While the plates 106 support the hoop on the expander the cam 99 trips the latch 93 and the clutch members 90 and 91 governing the expander are coupled to rotate the cam-wheel 75 and operate the intermittent gears 77 and 101, so that the plunger-wrench is lowered to engage the shaft 56 and is turned to operate the expander cam 55, the plunger-wrench then being immediately restored to its inoperative position and the supporting plates being rocked outwardly and the expander heads retracted so that the finished hoop drops from the expander upon the receiving arm 115 of the hoop-reel. For each hoop discharged on the receiving arm the shaft 30 completes a revolution and moves the counting wheel 148 one tooth, and upon the completion of the revolution of the counting wheel upon the discharge of the number of hoops corresponding to the number of teeth on this wheel the counting drum 152 completes a revolution to bring its recess into the

path of the trigger 154 which is snapped therein by the spring 168 to trip the block 141 and permit the clutch 131 to couple the shaft 128 to the constantly driven sprocket 133 so that this shaft is revolved to turn the shaft 117 a half-revolution to swing the active receiving arm 115 from its position below the expander and present an empty arm in its place to receive a new batch of completed hoops.

The horn and the skirt 47 of the expander when retracted are smaller than the hoop, and the expander is slightly oval when retracted and when expanded is circular and slightly pulls the twist or splice of the hoop to draw the hoop to a fixed circumference. The wings 107 of the expander prevent the hoops from falling off the supporting-plates while the latter are in position against the retracted heads of the expander.

I claim;

1. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a horn having one end adjacent the hoop-former, an expander adjacent the horn, a pair of movable arms on opposite sides of the horn, and mechanism to move the arms to carry a hoop along the horn to the expander.

2. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn, a pair of rocking-arms in alinement with the slots in the horn, means to rock the arms to carry a hoop along the horn to the expander, and means to operate the expander.

3. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn composed of movable heads, a pair of rocking-arms in alinement with the slots in the horn, mechanism to rock the arms to carry a hoop along the horn to the expander, and means to operate the expander-heads.

4. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop former, an expander at the other end of the horn composed of a pair of oppositely movable heads, means to move a hoop along the horn to the expander, cam mechanism to operate the expander-heads, and means to periodically operate said cam mechanism.

5. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, a pair of rocking-arms in alinement with the slots in the horn, mechanism to shift the free ends of the arms alternately into and out of the slots, and mechanism to rock the arms in one direction while their ends are in the slots and in the opposite direction while out of the slots.

6. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having its upper end adjacent the hoop-former and having opposite curved slots, a pair of rocking-arms in alinement with the slots in the horn, mechanism to shift the free ends of the arms alternately into the tops of the slots and out of their lower portions, and mechanism to rock the arms in opposite directions while their ends are respectively in and out of the slots.

7. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, a pair of rocking-arms having their free ends in alinement with the slots in the horn, a pair of shafts carrying said arms, mechanism to shift the shafts to alternately move the free ends of the arms into and out of the slots, pinions on the shafts, reciprocating racks engaging the pinions, springs to move the racks to rock the arms while their ends are in the slots, and cams to move the racks to rock the arms while their ends are out of the slots.

8. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, a pair of rocking-arms having their free ends in alinement with the slots in the horn, a pair of shafts carrying said arms, yokes having pin and slot connections with the shafts, mechanism to rock the yokes to reciprocate the shafts to alternately move the free ends of the arms into and out of the slots, pinions on the shafts, reciprocating racks engaging the pinions, springs to move the racks when the shafts project the ends of the arms into the slots, and cams to move the racks when the shafts retract the ends of the arms from the slots.

9. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, a pair of rocking-

arms having their free ends in alinement with the slots in the horn, a pair of shafts carrying said arms, yokes having pin and slot connections with the shafts, rock-shafts carrying said yokes, spring-actuated arms on the rock-shafts, cams for moving the latter arms against their spring-pressure, and mechanism to shift the first pair of shafts to engage and disengage the free ends of said rocking-arms with the slots in the horn.

10. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, a pair of rocking-arms having their free ends in alinement with the slots in the horn, a pair of shafts carrying said arms, yokes having pin and slot connections with the shafts, rock-shafts carrying said yokes, spring-actuated arms on the rock-shafts, cams for moving said latter arms against their spring-pressure to project the free ends of the rocking-arms into the slots, pinions on the said first shafts, reciprocating racks engaging the pinions, springs to move the racks when the rock-shafts are moved to project the free ends of the arms into the slots, and cams to move the racks when the rock-shafts are moved to retract the free ends of the arms from the slots.

11. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn composed of movable heads, a pair of rocking-arms in alinement with the slots in the horn, means to operate the arms to move a hoop along the horn to the expander, a double cam to operate the expander-heads, a shaft carrying said cam, and means to periodically turn the shaft.

12. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former, an expander at the other end of the horn composed of a pair of oppositely movable heads, means to move a hoop along the horn to the expander, a double cam to operate the expander-heads, a shaft carrying said cam, a plunger having longitudinal and rotating motions, means to shift the plunger longitudinally to engage and disengage the cam-shaft, and an intermittent gear to turn the plunger while engaged with the cam-shaft.

13. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn composed of movable heads, a pair of rocking-arms in alinement with the slots in the horn, a drive-shaft, means to operate the arms from the drive shaft to move a hoop along the horn to the expander, a double cam to operate the expander-heads, a shaft carrying said cam, a plunger having longitudinal and rotating motions, a shaft carrying a cam-wheel to shift the plunger longitudinally to engage and disengage the cam-shaft, an intermittent gear operated by said cam-wheel shaft to turn the plunger while engaged with the cam-shaft, a second drive-shaft, a clutch between said second drive-shaft and said cam-wheel shaft, and a trip device for said clutch operated by said first drive-shaft.

14. In a hoop machine, an expander comprising movable heads, an expander-cam, a shaft carrying said cam, a plunger having longitudinal and rotating motions, means to shift the plunger longitudinally to engage and disengage the cam-shaft, an intermittent gear to turn the plunger while engaged with the cam-shaft, and mechanism to periodically operate the intermittent gear and plunger-shifting means.

15. In a hoop machine, an expander comprising movable heads, a guide-way for said heads and retaining plates between the heads and way, an expander-cam, a shaft carrying said cam, a plunger having longitudinal and rotating motions, means to shift the plunger longitudinally to engage and disengage the cam-shaft, an intermittent gear to turn the plunger while engaged with the cam-shaft, and mechanism to periodically operate the intermittent gear and plunger-shifting means.

16. In a hoop machine, an expander comprising a pair of oppositely movable heads, a guide-way for said heads and retaining plates between the heads and way, a double cam to expand said heads, a shaft carrying said cam, a plunger having longitudinal and rotating motions, means to shift the plunger longitudinally to engage and disengage the cam-shaft, an intermittent gear to turn the plunger while engaged with the cam-shaft, and mechanism to periodically operate the intermittent gear and plunger-shifting means.

17. In a hoop machine, an expander comprising movable heads, a guide-way for said heads and retaining plates between the heads and way, an expander-cam, a shaft carrying said cam, a plunger having longitudinal and rotating motions, a pivoted frame to shift the plunger longitudinally to engage and disengage the cam-shaft, a shaft having a cam to operate the frame, an intermittent gear operated by said last shaft to turn the plunger, a drive-shaft, and a clutch to periodically couple the drive-shaft and frame-operating shaft.

18. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn, a pair of rocking-arms in alinement with the slots in the horn, means to operate the arms to move a hoop along the horn to the expander, a pair of supporting plates on opposite sides of the expander, means to move the plates toward and away from the expander, and means to operate the expander.

19. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn, a pair of rocking-arms in alinement with the slots in the horn, means to operate the arms to move a hoop along the horn to the expander, a pair of supporting plates on opposite sides of the expander, rock-shafts carrying said plates, means to rock the shafts to move the plates toward and away from the expander, and means to operate the expander.

20. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former, means to move a hoop along the horn, a drive-shaft, a counting wheel operated by the drive-shaft, a receiving reel, means to periodically turn the reel, and means controlled by the counting wheel to operate the reel-turning means upon the completion of a revolution of said wheel.

21. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former, a pair of movable arms on opposite sides of the horn, means to operate the arms to move a hoop along the horn, a drive-shaft, a counting wheel operated by the drive-shaft, a receiving reel, means to periodically turn the reel, and means controlled by the counting wheel to operate the reel-turning means upon the completion of a revolution of said wheel.

22. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, a pair of rocking-arms in alinement with the slots in the horn, means to operate the arms to move a hoop along the horn, a drive-shaft, a counting wheel operated by the drive-shaft, a receiving reel, means to turn the reel including a clutch, and means operated by the counting wheel to trip the clutch upon the completion of a revolution of said wheel.

23. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former, means to move a hoop along the horn, a drive-shaft, a counting wheel operated by the drive-shaft, a pivoted arm, means for removably mounting said counting wheel on the arm, means for locking said arm in position, a receiving reel, and means controlled by the counting wheel to turn the reel upon the completion of a revolution of said wheel.

24. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former, means to move a hoop along the horn, a drive-shaft, a removable counting wheel operated by the drive shaft, a receiving reel, and means controlled by the counting wheel to turn the reel upon the completion of a revolution of said wheel.

25. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former and having opposite curved slots, an expander at the other end of the horn, a pair of rocking-arms in alinement with the slots in the horn, means to operate the arms to move a hoop along the horn to the expander, means to operate the expander, a drive shaft, a counting wheel operated by the drive shaft, a receiving reel having an opposite pair of upwardly directed arms, and means controlled by the counting wheel to turn the reel a half-revolution upon the completion of a revolution of said wheel.

26. In a hoop machine, a drive shaft, a counting wheel, connections between the shaft and wheel to move the latter a predetermined distance for each revolution of the former, a reel having receiving arms, a second shaft, connections between the second shaft and reel to turn the latter a half revolution for each revolution of the second shaft, connections between the driving shaft and second shaft including a clutch, and a trip-device for the clutch governed by the counting wheel.

27. In a hoop machine, a drive shaft, a counting wheel, connections between the shaft and wheel to move the latter a predetermined distance for each revolution of the former, a reel having receiving arms, a second shaft, bevel gears connecting the second shaft and reel to turn the latter a half revolution for each revolution of the second shaft, connections between the driving shaft

and second shaft including a clutch, and a trip-device for the clutch governed by the counting wheel.

28. In a hoop machine, a drive shaft, a counting wheel, connections between the shaft and wheel to move the latter a predetermined distance for each revolution of the former, a reel having receiving arms, a second shaft, connections between the second shaft and reel to turn the latter a half revolution for each revolution of the second shaft, a clutch on the second shaft, connections between the driving member of the clutch and the drive-shaft, a trip-device governed by the counting wheel, and connections between the trip device and the driven member of the clutch to couple the clutch when the trip-device is operated.

29. In a hoop machine, an expander comprising movable heads, means to expand and retract the heads, movable hoop-supporting plates adjacent the expander, and means to operate the plates to positions to hold a hoop upon the heads during their expansion and to drop the hoop when the heads are retracted.

30. In a hoop machine, an expander comprising movable heads, means to expand and retract the heads, hoop-supporting plates adjacent the expander, rocking-arms carrying said plates, and means to rock the arms to move the plates to positions to hold a hoop upon the heads during their expansion and to drop the hoop when the heads are retracted.

31. In a hoop machine, an expander comprising movable heads each being outwardly beveled on its upper edge and having a lower vertical skirt, means to expand and retract the heads, movable hoop-supporting plates adjacent the expander, a spring to close the plates against the expander before its expanding stroke, and means to open the plates to drop the hoop on the retraction of the expander.

32. In a hoop machine, an expander comprising movable heads each being outwardly beveled on its upper edge and having a lower vertical skirt, an expander-cam, means to operate the cam to expand the heads, means to retract the heads, movable hoop-supporting plates adjacent the expander, rocking-arms carrying said plates and spring-actuated to close the plates against the expander before its expanding stroke, and a cam to rock the arms to open the plates to drop the hoop on the retraction of the expander.

33. In a hoop machine, mechanism to form and splice a length of wire into hoop-like form, mechanism to strip a spliced hoop from the hoop-former, a curved horn having one end adjacent the hoop-former, an expander at the other end of the horn composed of a pair of oppositely movable spring-retracted heads, means to move a hoop along the horn to the expander, and cam mechanism to operate the expander-heads to draw the hoop to a fixed circumference.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH HAUK.

Witnesses:
KATHERINE V. BERLANEY,
J. MCROBERTS.