(No Model.) 4 Sheets—Sheet 1.

A. HENLEY.

MACHINE FOR MANUFACTURING BALE TIES.

No. 552,837. Patented Jan. 7, 1896.

Fig. 1.

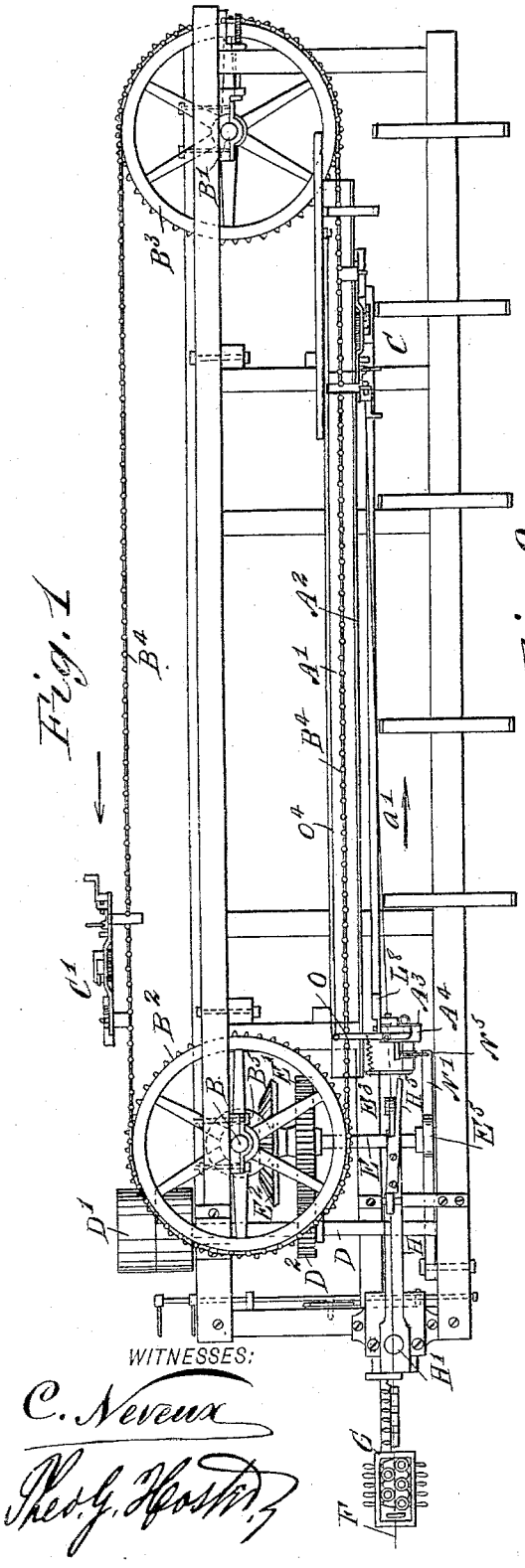
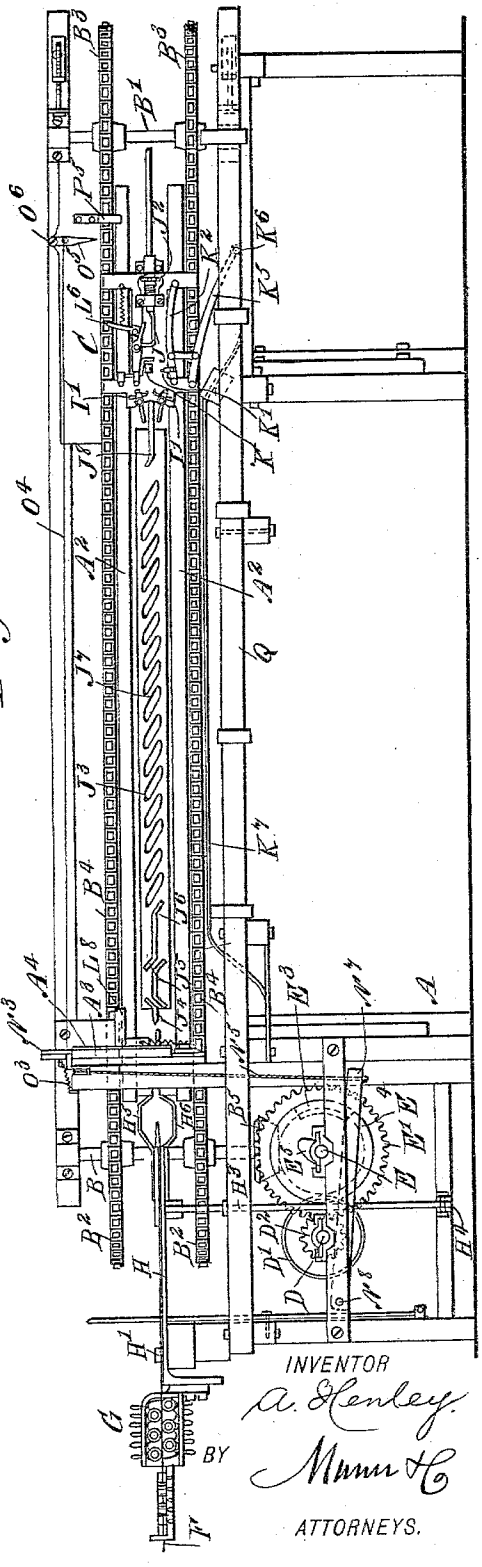


Fig. 2.



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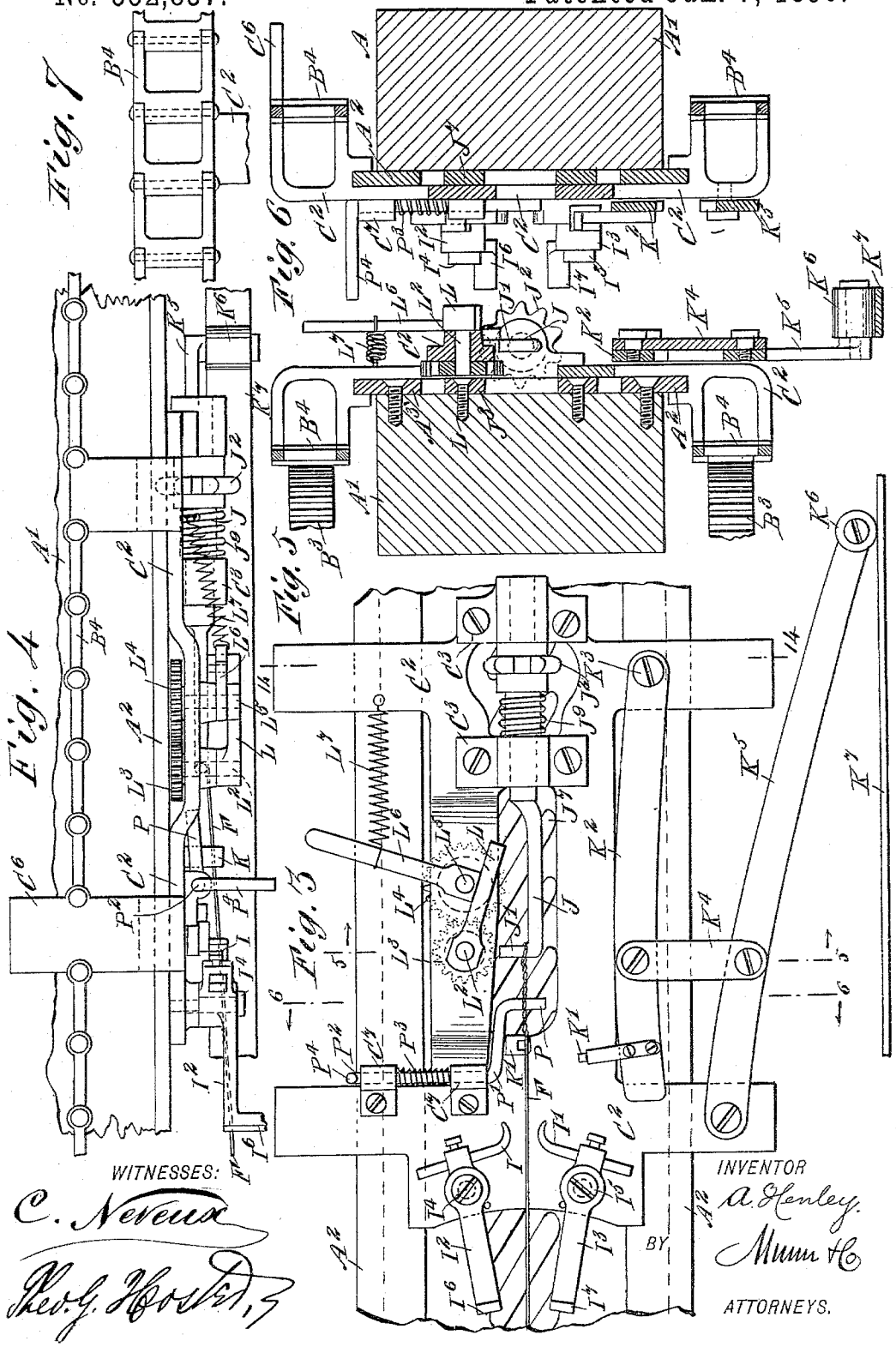
MACHINE FOR MANUFACTURING BALE TIES.

No. 552,837. Patented Jan. 7, 1896.



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A. HENLEY.

MACHINE FOR MANUFACTURING BALE TIES.

No. 552,837. Patented Jan. 7, 1896.

Fig. 8

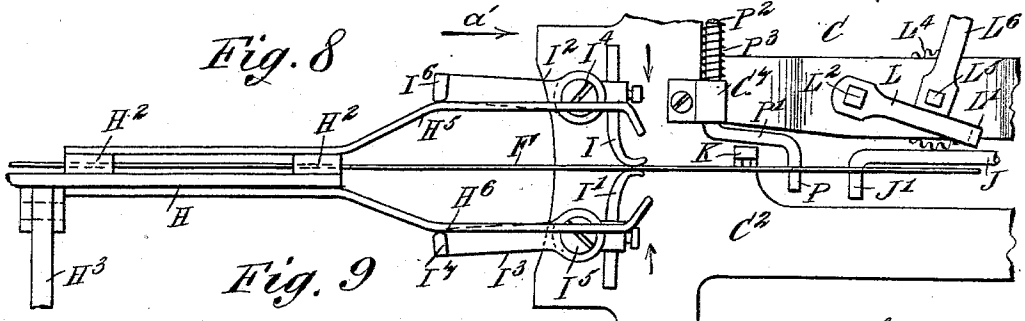


Fig. 9

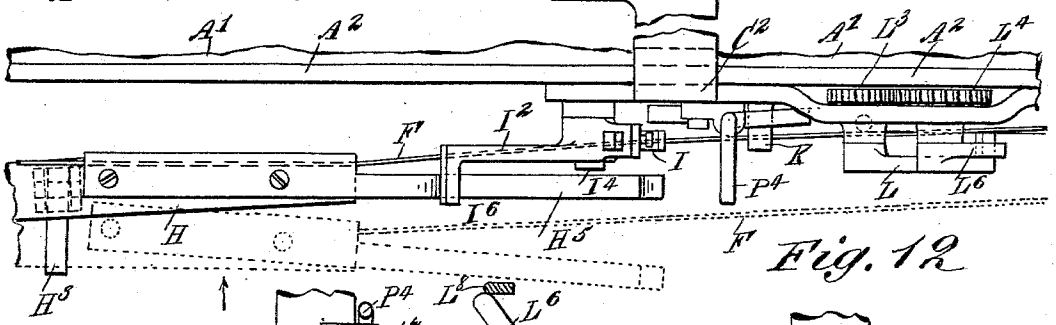


Fig. 12

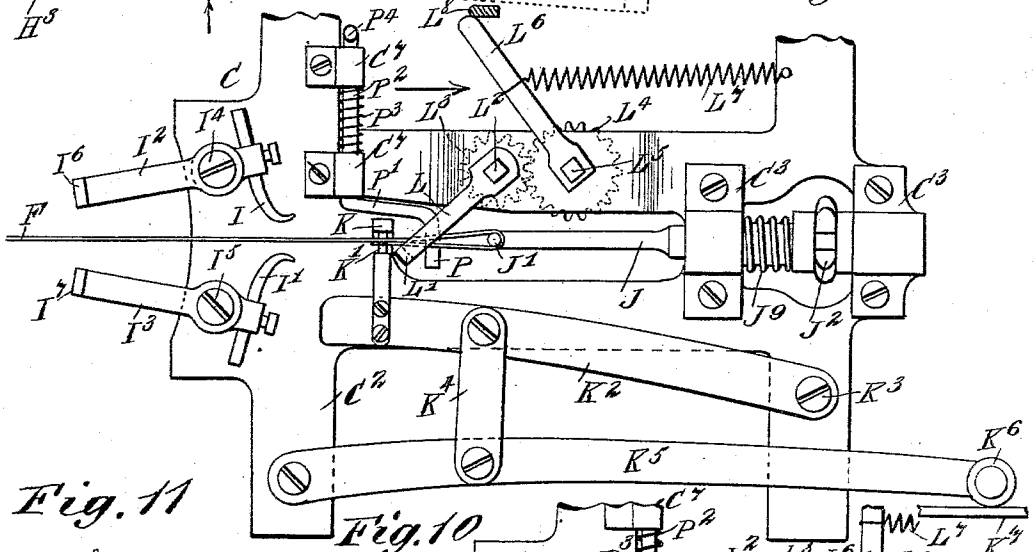


Fig. 11

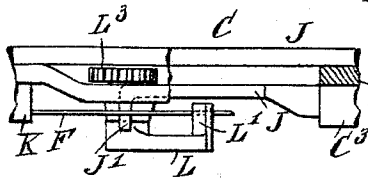
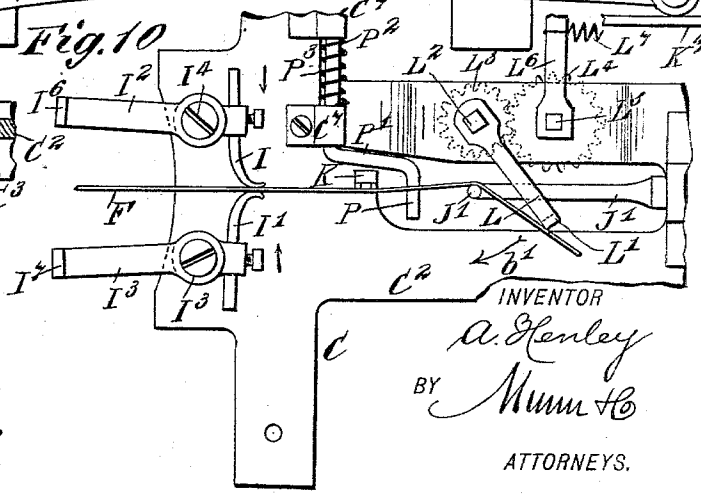


Fig. 10



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MACHINE FOR MANUFACTURING BALE TIES.

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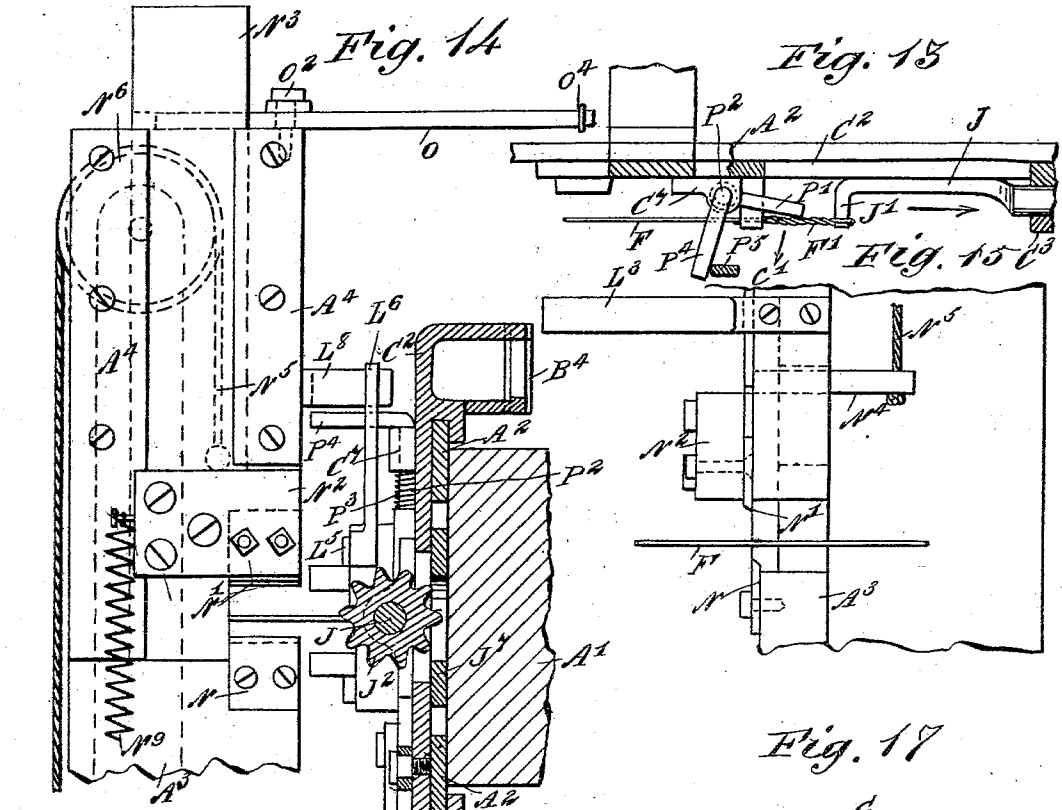


Fig. 14

Fig. 15

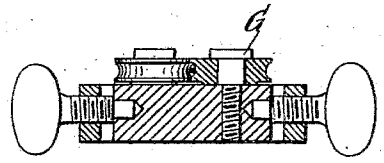
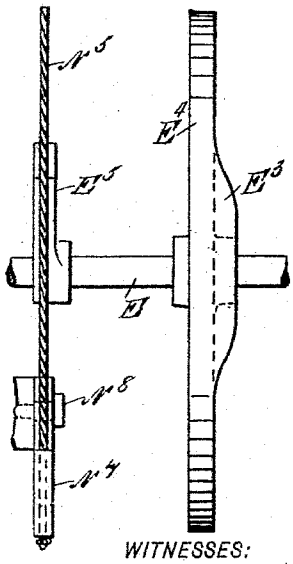


Fig. 17



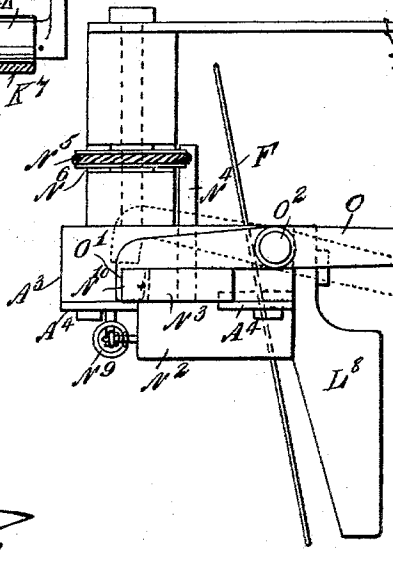


Fig. 16

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UNITED STATES PATENT OFFICE.

ALBERT HENLEY, OF LAWRENCE, KANSAS.

MACHINE FOR MANUFACTURING BALE-TIES.

SPECIFICATION forming part of Letters Patent No. 552,837, dated January 7, 1896.

Application filed August 14, 1895. Serial No. 559,280. (No model.)

To all whom it may concern:

Be it known that I, ALBERT HENLEY, of Lawrence, in the county of Douglas and State of Kansas, have invented a new and Improved Machine for Manufacturing Bale-Ties, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved machine for manufacturing wire bale-ties for baling hay, straw and other materials, and which is arranged to properly form the ties of a uniform length without waste of the material and without undue strain or wear on the various mechanisms of the machine.

The invention consists principally of a traveling head provided with a revoluble spindle for forming the twist in the end of the wire and a pair of gripping-jaws for holding the wire in place during the twisting of the loop by the spindle.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the improvement. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged side elevation of the traveling head. Fig. 4 is a plan view of the same. Fig. 5 is a cross-section of the same on the line 5 5 of Fig. 3. Fig. 6 is a similar view of the same on the line 6 6 of Fig. 3. Fig. 7 is an enlarged rear elevation of one of the chains. Fig. 8 is an enlarged side elevation of part of the head with the dogs in position for feeding the wire to the twisting-spindle. Fig. 9 is a plan view of the same. Fig. 10 is a side elevation of the same with the parts in position for bending the end of the wire to form the loop. Fig. 11 is a plan view of the same with parts broken out. Fig. 12 is a side elevation of the same with the gripping-jaws holding the wire for forming the twist by the revoluble twisting-spindle. Fig. 13 is a sectional plan view of part of the head with the device for pushing the twisted loop off the spindle. Fig. 14 is a cross-section of the head on the line 14 14 in Fig. 3, and showing the cutting mechanism in elevation and the means for operating the cutters. Fig. 15 is a plan view of the cutting mechanism. Fig. 16 is a plan view of the device for operating the cutting mechanism, and Fig. 17 is a cross-section of the wire-guide.

The improved machine is provided with a suitably-constructed frame A, in the ends of which are journaled the vertically-disposed shafts B and B′ carrying sets of sprocket-wheels B^2 and B^3, respectively, over which pass the sprocket-chains B^4, supporting two traveling heads C and C′, both alike in construction and each containing a wire-feeding mechanism, a gripping device, a bending device, a twisting device and a cutting mechanism for cutting the bail-ties to the proper length. The shaft B receives a continuous rotary motion from the main driving-shaft D, which latter is journaled in the front end of the frame A, and provided with fast and loose pulleys D′, connected by belt with other machinery for imparting a rotary motion to the main driving-shaft D.

On the main driving-shaft D is secured a pinion D^2 in mesh with a gear-wheel E′, secured on a cam-shaft E extending transversely and likewise journaled in suitable bearings in the main frame A. On this cam-shaft E is secured a beveled gear-wheel E^2 in mesh with a pinion B^5, secured on the lower end of the shaft B, so that the rotary motion transmitted from the main driving-shaft D to the cam-shaft E is transmitted by the said beveled gear-wheel E^2 to a pinion B^5 to rotate the shaft B. The sprocket-wheels B^2 on this shaft B impart a traveling motion to the two sprocket-chains B^4, so that the heads C and C′ are carried along, each of the heads being arranged to form a complete bale-tie, as hereinafter more fully described, the said heads being located at opposite ends of the chains, as will be readily understood by reference to Fig. 1. Each head C or C′ is provided with a frame C^2, fitted to slide longitudinally on guideways A^2 attached to a beam A′ of the main frame A. The sliding motion of the frame C^2 takes place during the time the heads travel on the front runs of the chains B^4.

The wire F to be formed into a bale-tie unwinds from the usual spool and passes through a wire-straightening device G of any approved

construction, to then pass over a guide-lever H mounted to swing laterally and fulcrumed at H′ on the front end of the frame A. This lever H extends with its free end to the front of the sprocket-wheels B^2 and midway between the same to guide the wire F to the heads as the latter pass to the front of the machine, coming around the sprocket-wheels B^2.

The lever H is provided on its top with guide-loops H^2, through which passes the end of the wire, (see Figs. 8 and 9,) to hold the wire away from the heads until the latter have passed to the front of the machine, the lever then swinging inwardly to deliver the projecting end of the wire to the corresponding head. For this purpose the lever H is pivotally connected at its under side with a downwardly-extending arm H^3, fulcrumed at its lower end at H^4 to the main frame A. (See Fig. 2.) This lever H is engaged by a cam-face E^3 of a cam E^4, secured on the shaft E, to hold the said lever H normally in the position shown in dotted lines in Fig. 9 and also to bring the lever H inwardly to deliver the projecting end of the wire to the head C or C′ as the same moves to the front of the machine. (See full lines in Figs. 8 and 9.)

In swinging the end of the wire F transversely upon the corresponding head C or C′, it is engaged thereon by a pair of dogs I and I′, arranged opposite each other to engage the top and bottom of the wire F, as is plainly shown in Fig. 8, to carry the wire along for a short distance as the head C or C′ moves forward on the front of the machine in the direction of the arrow *a′*. The dogs I and I′ are held adjustable in levers I^2 and I^3, respectively, fulcrumed at I^4 and I^5 on the frame C^2 of the head C or C′, and the rear ends of the said levers I^2 and I^3 are formed with lugs or projections I^6 and I^7, adapted to be engaged by the cam-arms H^5 and H^6, secured to the free end of the lever H′. Thus as the latter swings laterally, the said cam-arms H^5 and H^6 move in position for engagement with the lugs I^6 and I^7, and as the head C or C′ moves to the front of the machine the said lugs travel up the incline of the cam-arms H^5 and H^6 to impart a swinging motion to the levers I^2 and I^3 to close the dogs I and I′ upon the wire F. As the head C or C′ now moves forward, the wire F is drawn along by the said dogs with the free end of the wire extending in front of the lug J′ of the spindle J, mounted to revolve in suitable bearings C^3 secured on the frame C^2. The spindle J receives an intermittent rotary motion for forming the loop and twisting the latter a number of times, as hereinafter more fully described. The spindle J is for this purpose provided with a toothed wheel J^2, adapted to engage a longitudinally-extending rack-bar J^3, attached to the beam A′ between the guideways A^2 of the frame A. (See Fig. 2.) The rack-bar J^3 is provided at its forward end with an inclined tooth J^4 to give a quarter-turn to the lug J′ to move it from its horizontal forward position downward to permit the wire to be laid alongside the lug. Next to this inclined tooth J^4 is arranged a second tooth J^5 inclined in the opposite direction to give a quarter-turn to the spindle J to turn the lug J′ upward, back into a horizontal position with the wire on top of the lug J′. The wire is now bent to form the loop, as hereinafter more fully described. The tooth J^5 is of sufficient length to hold the lug J′ in the proper position during the bending operation, and at the end J^6 of the tooth J^5 the rack-bar J^3 is formed with a number of diagonal teeth J^7 for imparting a continuous rotary motion to the wheel J^2 to give the desired number of twists to the loop, the last tooth J^8 of the rack-bar being straight with the forward and rear ends curved upwardly and downwardly, respectively, for turning the spindle J back to its forward position—that is, with the lug J′ horizontally forward—so as to be in the proper position for again engaging the wire when the head C or C′ again moves to the front at the wheels B^2. A spring J^9 is coiled on the spindle J to permit the spindle to yield longitudinally, so as to compensate for the shortening the wire during the process of forming the twists.

The end of the wire F when passed to the head C or C′ also passes under a gripping-jaw K fixed on the frame C^2, and located somewhat in front of the lug J′ of the spindle J. Opposite this fixed gripping-jaw K is arranged a gripping-jaw K′, attached to a lever K^2, fulcrumed at K^3 on the frame C^2, and pivotally connected by a link K^4 with a lever K^5 also journaled on the frame C^2, and carrying at its free end a friction-roller K^6, adapted to engage a fixed cam-arm K^7, secured on the main frame and adapted to impart a swinging motion to the said lever K^5 in an upward direction, to cause the lever K^2 and the gripping-jaw K′ to move in a like direction. The gripping-jaw K′ is thus finally moved in engagement with the wire opposite the jaw K, so that the wire is securely clamped in position between the fixed jaw K and the movable jaw K′. This latter movement, however, does not take place until the end of the wire is bent around the lug J′ by the bending-arm L, having a lug L′ for engagement with the end of the wire. (See Figs. 10, 11 and 12.)

The arm L is secured on a short shaft L^2, journaled in the frame C^2 above the spindle J, and on this shaft L^2 is secured a gear-wheel L^3 in mesh with a gear-wheel L^4, secured on a shaft L^5 also journaled in the frame C^2. On the outer end of this shaft L^5 is secured an arm L^6, pressed on by a spring L^7, and adapted to be engaged by a fixed arm L^8, secured on the main shaft A. (See Fig. 16.) Now when the head C moves along, the arm L^6 finally engages the fixed arm L^8, so that the shaft L^5 is turned and the gear-wheel L^4, by meshing with the gear-wheel L^3, causes a revolution of the shaft L^2, so that the bending-arm L swings downward in the direction of the arrow *b′* (see Fig. 10) to engage with its lug L′ the end of

the wire F, and bend the latter around the lug J′ of the spindle J and double up the wire to bring the extreme end under the gripping-jaw K to be then engaged by the gripping-jaw K′ as the latter moves into its final uppermost position, as shown in Fig. 12. A loop is thus made in the wire, and the wire is now twisted by the spindle J being revolved a number of times by the wheel J^2 engaging the teeth J^7 of the rack-bar J^3. Previous to this movement, however, the spindle J receives a quarter-turn by the wheel J^2 engaging the tooth J^5, so that the lug J′ is turned from its downward position into a horizontal position to permit the arm L to form a loop by bending the end of the wire downward and forward around the lug J′, the wheel J^2 traveling during this operation along the straight part of the tooth J^5, so that the wheel and spindle remain at a standstill. When the operation of bending is completed the wheel J^2 engages the end J^6 and is given another quarter-turn to bring the lug J′ into an upright position.

When the arm L^6 leaves the fixed bar L^8 (see Fig. 12) after the wire is clamped between the jaws K and K′, the spring L^7 forces the said arm L^6 back to its normal position, thereby returning the bending-arm L to the position shown in Fig. 8. After the wire is twisted and carried forward at the same time by the forward movement of the head C or C′ until the desired length of tie is reached, then the wire is cut by a cutting mechanism to form a tie of the desired length. This cutting mechanism (shown in detail in Figs. 14, 15, and 16) is provided with a fixed knife N, secured on an extension-frame A^3, forming part of the main frame A, and located opposite the front wheels B^2 directly in the rear of the free end of the lever H, as will be readily understood by reference to Figs. 1 and 2. On the fixed cutting-knife N operates a movable knife N′ for cutting off the wire passed between the two knives. The movable knife N′ is secured on a block N^2 having an arm N^3 fitted to slide in suitable bearings A^4 held on the extension-frame A^3. The block N^2 is also provided with a longitudinally-extending arm N^4, engaged by one end of a rope N^5 extending upwardly and passing over a pulley N^6, journaled in the upper portion of the extension-frame A^3. The rope N^5 then extends downward to connect at its lower end with the free end of a lever N^7, fulcrumed at N^8 on the frame A, the said lever being adapted to be engaged by a cam E^5 secured on the shaft E. A spring N^9 is connected with the block N^2, so as to press the latter normally downward, the said spring being extended at the time the cam E^5 swings the lever N^7 downward to raise the block N^2, and consequently the knife N′.

In the upper end of the bar N^3 is formed a notch N^{10} adapted to be engaged by a lug O′ formed on a lever O fulcrumed at O^2 on the top of the extension-frame A^3, so as to engage the lug O′ with the notch N^{10} when the block N^2 is drawn downward by the rope N^5 at the time the cam E^5 presses on the lever N^7. The free end of the lever O is connected by a link or rope O^4 with a tripping-lever O^5 fulcrumed at O^6 on the main frame A near the wheels B^3, and this lever O^5 is adapted to be engaged by an extension-arm C^6 forming part of the frame C^2 of the head C or C′. Now it will be seen that when the head C or C′ has moved to the wheels B^3 at the front of the machine, and the desired length of wire has been drawn for forming a tie of the proper length, then the projection C^6 comes in contact with the lever O^5, and swings the latter to the right and causes the link O^4 to pull on the lever O and move the lug O′ out of engagement with the notch N^{10}. As soon as this takes place the spring N^9 in pulling on the block N^2 draws the latter suddenly downward to cause the knife N′ to shear off the wire and form a bale-tie of the proper length.

In order to push the twisted loop F′ of the wire F out of the lug J′ of the spindle J, the latter is turned into a horizontal and outward position, as shown in Fig. 3, by the action of the wheel J^2 on the tooth J^8 located on the right hand of the rack-bar J^3. The lug P in the rear of the loop F′ now receives a swinging motion, to engage the loop F′ and push the latter off the lug J′, so that the finished bale-tie drops and falls in a trough Q supported on the main frame A. (See Fig. 2.) The pushing-lug P extends vertically, and is formed on an arm P′ secured or formed on a shaft p^2 journaled in suitable bearings C^7 of the frame C^2. This shaft p^2 is pressed on by a coil-spring P^3 to hold the arm P′ and lug P in a rearmost position during the time the gripping and twisting of the wire takes place, as previously described.

On the upper end of the shaft A^2 is secured or formed an arm P^4, adapted to be engaged by a lug P^5 forming part of the main frame, and arranged near the wheels B^3, so that the arm P^4 engages the fixed lug P^5 at the time the cutting off of the wire takes place between the knives N and N′, and consequently a swinging motion is given to the arm P′ in the direction of the arrow c' (see Fig. 13) to cause the lug P to engage the loop F′ and push the same off the lug J′, now extending horizontally and forwardly, as shown in Fig. 13.

The head C or C′, after the wire is released and has dropped into the trough Q, passes around the wheels B^3, and at this time the other head C′ or C has passed around the front wheels B^2 to receive the cut-off end of the wire F by the action of the lever H, as previously explained.

The operation is as follows: When the head C or C′ passes to the front of the machine on the wheels B^2, then the lever H swings inwardly to bring the end of the wire F in front of the lugs J′ and P and between the dogs I and I′ and the jaws K and K′, of which the two latter are both in an open position. The

dogs I and I′ are now closed by their levers I^2 and I^3 traveling on the cam-arms H^5 and H^6, as previously explained, so that the wire now moves with the head C or C′. The wheel J^2 now comes in contact with the end J^4, so that the spindle J is given a quarter-turn (see Figs. 8 and 12) to bring the lug J′ under the end of the wire F. The arm L^6 now moves in contact with the fixed arm L^8, so that on the forward movement of the head the arm L^6 receives a swinging motion, and by the gear-wheels L^4 and L^3 imparts a swinging motion to the bending-arm L, to force the lug L′ thereof to bend the end of the wire downward against the under side of the remaining piece of wire and against the fixed jaw K, over which the bending-arm L is returned by the action of the spring L^7, and as soon as the arm L^6 leaves the end of the bar L^8 the friction-roller K^6 travels up the inclined end of the cam-arm K^7, so that the jaw K′ closes upon the extreme end of the wire to clamp the doubled-up wire in position between the two jaws K and K′. A further quarter-turn is given to the spindle J, to bring the lug J′ into a vertical position and out of the way of the cam L, to permit the latter to return, as previously explained, and after the wire is gripped between the jaws K and K′ then the wheel J^2 engages the rack-teeth J^7 and receives a number of revolutions, so that the previously-formed loop of the wire is given a number of twists to form the loop, as shown in Fig. 13. When the wheel J^2 leaves the rack-teeth J^7 on the further forward motion of the head C or C′, the said wheel finally comes in contact with the tooth J^8, to give a quarter-turn to the spindle J, and swing the lug J′ thereof into a forward horizontal position. The head C on its further forward movement engages the arm C^6 with the lever O^5, so that the cutting-knife N′ is released, as previously explained, to cut off the wire by the spring N^9 pulling the block N^2 downward, the knife N′ acting in conjunction with the knife N, as before explained. At the same time the arm P^4 engages the fixed bar P^5, so that the loop F′ is pushed out of the lug J′ of the spindle J, to permit the finished bale-tie to drop into the trough Q. The wheel J^2, when leaving the downwardly-curved rear end of the tooth J^8, receives a final quarter-turn to move the lug J′ outward into the position shown in Fig. 10.

It is understood that the gripping-jaws K and K′ remain closed until the time the wire is cut off, and at this time the friction-roller K^6 of the lever K^5 travels down the right-hand end of the cam-arm K^7 and swings the jaw K downward into an open position, to release the wire F. By the arrangement described a positive motion is given to each of the several devices, so that bale-ties are produced of a uniform length, without the slightest variation, and all undue strain or wear on the individual mechanisms is reduced to a minimum, owing to the positive movement.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A machine for manufacturing bale ties, comprising a traveling head provided with a revoluble spindle for forming a twist in the end of the wire, and with a pair of gripping jaws for holding the wire in place during the twisting operation and means for operating said spindle and jaws during the travel of said head, substantially as shown and described.

2. A machine for manufacturing bale ties, comprising a traveling head, a revoluble spindle in the said head and formed with a projection, a bending arm also in the head for bending the end of the wire around the said projection of the spindle and means for operating the spindle and arm during the travel of the head, substantially as shown and described.

3. A machine for manufacturing bale ties, comprising a traveling head, a pair of dogs for holding the wire on the said head, a revoluble spindle in the head and provided with a projection over which is passed the wire, a bending arm also in the head having a swinging motion for bending the wire around the said projection and means for operating the dogs, spindle, and arm during the travel of the head, substantially as shown and described.

4. A machine for the manufacture of bale ties, comprising a traveling head, a clamping device held on the said head and adapted to engage and hold the wire to carry the latter along with the said head, and means substantially as described, on the head for forming the end of the wire into a loop and then twisting the same all during the travel of the head, substantially as shown and described.

5. A machine for the manufacture of bale ties, provided with a traveling head, dogs held on the said head for gripping the wire, a spindle having an intermittent rotary motion and provided with a lug for engagement with the wire, and a pair of gripping jaws held on the said head, to securely clamp the wire in place after the end is bent, substantially as shown and described.

6. A machine for manufacturing bale ties, comprising a traveling head, a spindle having an intermittent rotary motion in the said head, and formed with a lug around which the wire is bent to form a loop, a pair of gripping jaws for engaging the bent end of the wire, and means for closing the said gripping jaws, substantially as shown and described.

7. A machine for the manufacture of bale ties, provided with a traveling head, and a spindle mounted to revolve in the said head and on which the loop is formed, the said spindle being mounted to turn and fitted to

slide longitudinally and means for operating the spindle during the travel of the head, substantially as shown and described.

8. A machine for the manufacture of bale ties, provided with a traveling head, a spindle mounted to turn and fitted to slide in the said head, and a spring engaging the said spindle, to permit the latter to yield longitudinally, substantially as shown and described.

9. A machine for the manufacture of bale ties, provided with a wire guide lever having a lateral swinging motion, and a traveling head provided with gripping dogs adapted to engage the wire carried laterally by the said lever, substantially as shown and described.

10. A machine for the manufacture of bale ties, provided with a wire guide lever having a lateral swinging motion, a traveling head provided with gripping dogs adapted to engage the wire carried laterally by the said lever, and cam arms on the said lever for closing the said dogs upon the wire, substantially as shown and described.

11. A machine for manufacturing bale ties, provided with a traveling head, a revoluble spindle carried by the said head and having a projection on which the wire is bent and by which the wire is twisted, and a pushing arm mounted to swing on the said head, and adapted to engage the twisted loop and push the latter over the said spindle, substantially as shown and described.

12. A machine for manufacturing bale ties, comprising a traveling head having gripping jaws for drawing the wire along to the proper length, and a cutting mechanism for cutting off the wire after the proper length of tie is reached, the said cutting mechanism being provided with a fixed knife, a spring-pressed movable knife, and a releasing device for tripping the said movable knife, substantially as shown and described.

13. A machine for manufacturing bale ties, the combination with a fixed cam arm, of a traveling head carrying a fixed gripping jaw, a movable gripping jaw, and levers for actuating the said movable jaw and controlled from the said fixed cam arm, substantially as shown and described.

14. In a machine for manufacturing bale ties, the combination with a wire guide lever, and means for imparting a lateral movement thereto, the said guide lever carrying cam arms, of a traveling head, and dogs pivoted thereon and formed with lugs, and adapted to engage the said cam arms, to close the dogs upon the wire, substantially as shown and described.

15. A machine for manufacturing bale ties, comprising a main frame provided with guideways, heads having frames mounted to slide on the said guideways, each head carrying a wire feeding device, a gripping device, a bending device and a twisting mechanism, endless chains for carrying the said heads, sprocket wheels over which pass the said chains, and means for imparting motion to the said sprocket wheels, substantially as shown and described.

16. In a machine for manufacturing bale ties, the combination with a head mounted to travel and provided with a revoluble spindle carrying a toothed wheel, of a fixed rack bar formed at its ends with arms having curved ends, and adapted to engage the said toothed wheel on the spindle, substantially as shown and described.

17. A machine for manufacturing bale ties, provided with a bending mechanism comprising an arm having a projection for engaging the wire, a shaft carrying the said arm and provided with a gear wheel, a second shaft carrying a gear wheel in mesh with the first named gear wheel, a second arm held on the said second shaft, a spring pressing on the said second shaft, and a bar adapted to engage the said second arm, to impart a swinging motion thereto, substantially as shown and described.

18. A machine for manufacturing bale ties, comprising a traveling head adapted to engage the wire, to form a twisted loop thereon and to feed the wire along, and a cutting mechanism for cutting off the wire and comprising a fixed knife, a spring-pressed movable knife, means for drawing the movable knife into an uppermost, open position, a spring-pressed lever for locking the knife in an uppermost position, a tripping lever connected with the said locking lever, and a lug on the said head for engaging the said tripping lever, to move the locked lever out of engagement and release the spring-pressed movable knife, substantially as shown and described.

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Witnesses:
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A. H. SYMONS.