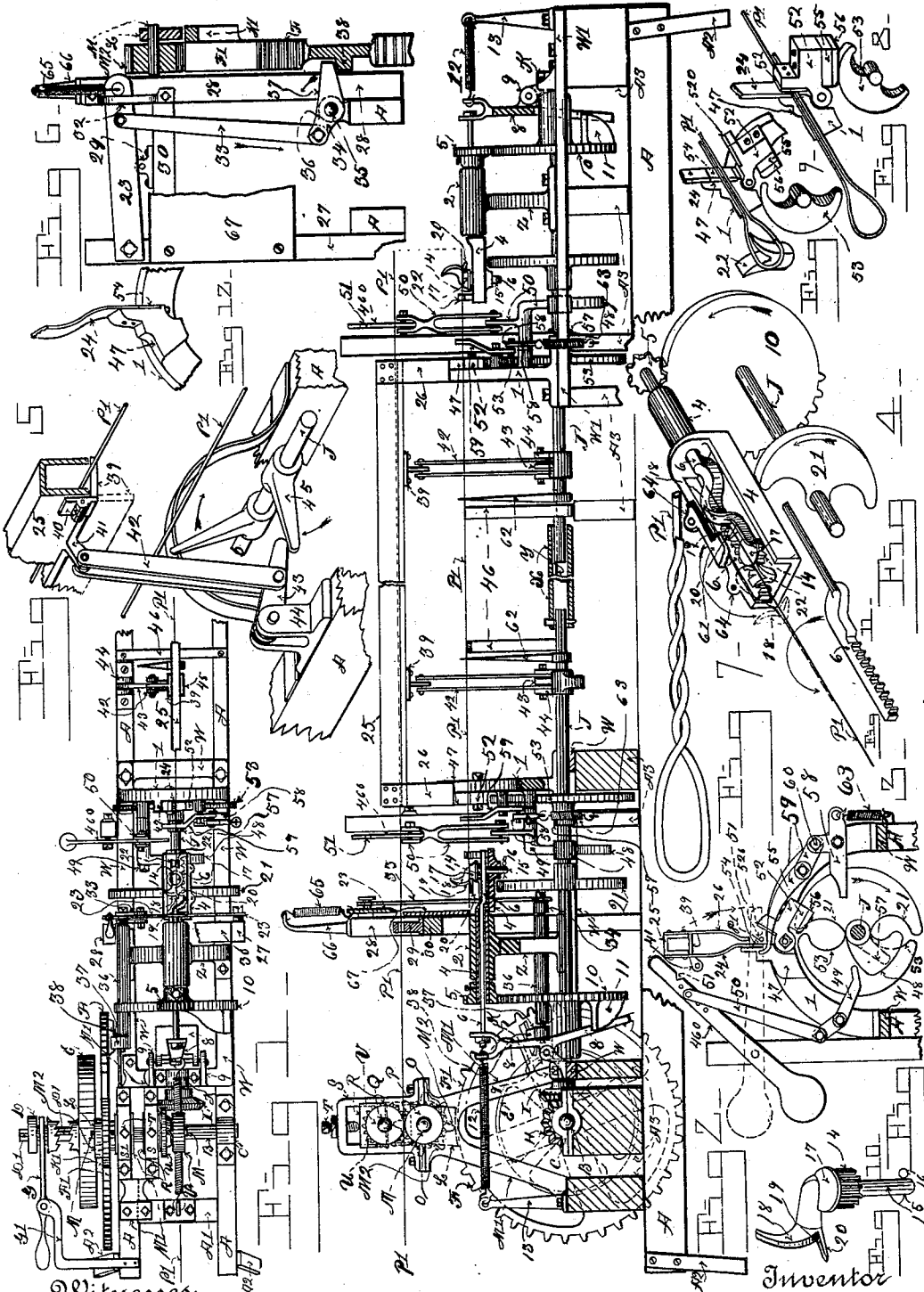


(No Model.)

G. JOHNSON.
BALE TIE MACHINE.

No. 544,762.

Patented Aug. 20, 1895.



Witnesses

William O. Perry
A. Wood & Hale

By his Attorney Gustaf Johnson
A. S. Bailey

UNITED STATES PATENT OFFICE.

GUSTAF JOHNSON, OF DENVER, COLORADO.

BALE-TIE MACHINE.

SPECIFICATION forming part of Letters Patent No. 544,762, dated August 20, 1895.

Application filed May 17, 1895. Serial No. 549,647. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF JOHNSON, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Bale-Tie-Making Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention embodies a machine for manufacturing bale-ties for baling hay, straw, and cotton.

The object of my invention is to provide a machine for making various lengths of bale-ties with a loop at each end formed by turning the ends of the wire upon itself and then twisting the ends adjacent to the loop a number of times, thereby securely forming the loops on the ends of the wires. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a plan view of a part of my bale-tie-making machine. Fig. 2 represents a side elevation of the entire machine, showing some of the parts in section. Fig. 3 represents a fragment in perspective showing a portion of the loop-twisting mechanism. Fig. 4 represents a fragment in perspective showing the loop-forming mechanism. Fig. 5 represents a fragment in elevation showing the conduit door-opening mechanism. Fig. 6 represents a fragment of the knife-operating mechanism. Fig. 7 represents a full-size view of the loop formed by the machine on the ends of the bale-tie. Fig. 8 represents a fragment of the tie-gripping mechanism. Fig. 9 represents a fragment also of the tie-gripping mechanism. Fig. 10 represents a fragment of the loop-forming mechanism. Fig. 11 represents a fragment of the loop-forming mechanism. Fig. 12 represents a fragment of the auxiliary frame.

Similar letters and figures refer to similar parts throughout the several views.

The supporting-frame of the machine comprises two longitudinal parallel timbers A,

connected together by transverse timbers A' at suitable points and supported by legs A². In Figs. 1 and 2 I have dropped the frame considerably lower than in practice in order not to confuse the various parts by too many lines, and have placed blocks A³ upon the frame upon which the several parts requiring support are secured.

B designates a transversely-arranged driving-shaft. It is journaled in bearings C and extends beyond the machine-frame on one side and supports on that part of it a clutch D, a driving-pulley E, which has a clutch-hub adapted to register with the clutch, and a gear F. The pulley and gear are secured to the shaft. The clutch is feathered to it by the key D'. A shipping-lever G, which is supported by a bracket G', is arranged to operate the clutch. A bevel-gear H is secured to the shaft and meshes with and drives a similar gear I. This latter gear is secured to the end of the shaft J, which shaft is journaled in boxes K centrally in the frame and extends the entire length of the machine.

The gear F is mutilated for a short space F' of its circumference, and on its outer side is a short concentric lateral projection K', registering with the mutilated portion. A block L is adapted to bear on said projection. The said block is secured to the end of shaft M, which is journaled in a raised bearing M', which is arranged above the frame high enough to allow a pinion M², which is secured to shaft M, adjacent to block L, to mesh with the gear centrally over its axis. The shaft M extends through the bearing and has secured to its inner end a pinion-gear O and a feed-roller P. A second shaft Q is journaled in boxes R, which are supported by the two yoke-pieces S and S'. The boxes R are divided at the center horizontally, and they are adjustable by means of set-screws T. This shaft carries a pinion-gear U and a roller V. The pinion U meshes with and is driven by the pinion O, and the roller V is arranged directly over the roller P. These rollers are adapted to feed the bale-tie wire P' into the machine.

Two auxiliary frames W and W', made preferably of cast-iron, rest on the blocks A³ of the main frame. These frames support boxes K and the main shaft J. One auxiliary frame

W is arranged adjacent to the transverse shaft and the other at the opposite end of the machine. The mechanism supported by one of these auxiliary frames is a duplicate of that of the other, except that one is right-handed and the other is left-handed, or oppositely arranged. Consequently a description of one will suffice for both. The frame W' is adjustable longitudinally by means of a division made in the main shaft at the center of the machine, which is as follows: The main shaft is made in two lengths, which when the rear auxiliary frame W' is at the extreme end of the main frame leave space enough between their inner ends to admit of sufficient longitudinal adjustment of the rear frame to make all the various lengths of bale-tie desired. To the end of the front length of the main shaft I rigidly secure a tubular piece X, which extends some distance over the adjoining end of the rear length. I secure a key Y inside the tube and cut a keyway in the shaft for a short distance from the end large enough to enable the shaft to slide on it, thus feathering the rear length of shafting to the tube and consequently to the front length. The auxiliary frames may be secured to the main frames or blocks by any suitable means. Each auxiliary frame has two cross-yokes Z and 1. The yoke Z is provided with a long bearing 2, which stands centrally over the shaft. In this bearing is journaled a sleeve which forms an integral part of the guide-block 4. The sleeve projects beyond the front end of the bearing and to it is secured a pinion 5. A rod which forms an integral part of the rack 6 (see Fig. 4) extends freely through the sleeve of the block 4 and is freely connected to one side of a yoke which forms a part of the lever 8. This lever is pivoted to two ears 9, which are cast on the auxiliary frames. The lever 8 surrounds the hub of the mutilated gear 10 freely below its pivoted support. Its lower end is adapted to engage the cam projection 11, formed on the side of the gear 10. A spring 12 is connected to the other side of the yoke formed on the top of the lever 8, and is connected at its opposite end to an arm 13, which is secured to a part of the main frame. The gear 10 is mutilated one-half of its diameter, or is devoid of teeth. It meshes with the pinion 5 periodically, which it rotates together with the guide-block 4 and its contents. The rack 6 is seated in one side of the guide-block to reciprocate in it, and through the sleeve by means of the cam 11 on the mutilated gear engaging the lower end of the lever 8, causing it to swing on its pivots and push the rack and rod through the sleeve and in the block longitudinally of the axis of the bearing 2. As soon as the cam leaves the lever 8 the rack is returned to its normal position by the spring 12. A pinion 14 is pivoted in the guide-block to mesh with the rack. I provide this pinion with a hub 15, which I journal in a hub in the bottom of the guide-block and secure it

by a pin 16. A flange 17 forms the top end of the pinion. This flange is larger than the diameter of the pinion through the teeth and extends a little over the teeth of the rack. The top of the flange forms a table-surface on which the tie-wire drops from the knife above. From one side of the flange of the pinion a finger 18 projects upward, which has at its base, even with the top of the flange, an inwardly-curved notch 19, formed by the junction with it of a second finger 20, which stands approximately at right angles to the finger 19. A cam 21, which is a semicircular cam, and consequently operates through one-half of each revolution of the main shaft, is secured to the main shaft and is adapted to engage the bottom of the guide-block 4 and hold it against rotative movement when the pinion 5 registers with the mutilated part of the gear 10. During this period the guide-block is held by the cam 21 in a horizontal position, (see Fig. 4,) and the rack is reciprocated in the block by the cam on the gear 10 and lever 8. The reciprocation of the rack is timed to rotate the finger-pinion one-half a revolution in the direction of the arrow. A projecting crotch-stud 22 is secured to the guide-block in a position which will enable the finger-pinion to revolve in a semicircle around it, a fragment of the finger being shown in dotted lines in Fig. 4 in the position it assumes when rotated on its axis by the outward stroke of the rack.

When the bale-wire drops from the knife 23, which is located above it, it is guided by the support 24 of the conduit 25 and the guide-strip 26 to fall in the crotch of the stud 22 and across the top of the pinion-flange and in the path of the crotch between the fingers, which prevents its riding out of the crotch-stud and holds the end of the wire in axial alignment while the loop is being formed by the reciprocating of the rack and the partial rotation of the finger-pinion, which loops the wire, as shown in Fig. 4. The knife 23 is supported by the posts 27 and 28, which are secured to the main frame. An end elevation on a larger scale is shown in Fig. 6. The knife is arranged in line with the friction feed-rollers P and V, which feed the wire P' into the machine from a skein or a suitable reel, neither of which is shown. A block 29 is secured to a cross-piece 30. Through this block a hole is made suitable to guide the wire between the knife and knife shearing-plate 67. This block also serves to guide the wire into the trough or conduit 25. The knife is pivoted to post 27 and arranged to move vertically in a guide-piece 32, secured to post 28. A rod 33 connects it to a rock-arm 34, which is secured to a shaft 35, journaled in a suitable bearing 36, attached to or forming a part of the auxiliary frame W. A second rock-arm 37 is secured to the opposite end of said shaft, which extends beyond the bearing. This second rock-arm is adapted to be engaged by a projecting lug 38, which is formed on one of the

spokes of the driving-gear and thus moves the rock-arm in the direction of the arrow, which will pull the knife quickly down cutting the wire. A spring 65, which is secured to the knife's free end and to support 66, attached to post 28, then raises it again to its normal position. A knife shearing-plate 67 is secured to the posts and its upper edge is adapted to cut in opposition to the edge of the knife. Before the wire is cut, however, it is fed through the conduit to the opposite looping mechanism a predetermined length, which length of wire fed is governed by the diameter of the gears driving the feed-rollers P and V in relation to the diameter of the driving-gear.

As several lengths of the tie are necessary to supply the trade I make the different lengths by changing the diameters of the feed-rolls and gears, which thereby feeds the wire into the machine either fast or slow, and consequently in different lengths in relation to each revolution of the large driving-wheel F, and by moving the rear auxiliary frame and mechanism to the position necessary to make the respective lengths into ties. The instant a sufficient length of wire has fed into and through the conduit 25 to make a tie the rolls stop feeding. This stop is caused by the block L engaging the projecting portion of the gear F while the pinion M² is in the mutilated portion of the gear, which locks the rolls, the gears O and U, and shaft M against rotative motion in either direction. Consequently when the pinion enters the mutilated part of the driving-gear the pawl-block L at the same time engages the surface of the projection K', and thereby prevents the rolls from feeding in either direction until the pinion again engages the teeth of the gear, which does not occur until the knife has cut the wire. It then resumes feeding and runs another length into the conduit while the loop is being made. After a loop is made, as shown in Fig. 4, it remains to be twisted, as shown in Fig. 7, which represents a full-size loop exactly as made by my machine. As before stated, the wire is fed into the conduit 25 by the rolls and a predetermined length is cut off intermittently, the rolls stopping during the cutting operation. The conduit 25 comprises a box made preferably of sheet-iron. To the under side of it is hinged a door 39 at 40, but one hinge being shown and that in Fig. 5. As only a fragment of the conduit is shown in Figs. 1 and 2 they would appear in dotted lines.

Ears 41 are secured to near each end of the conduit-door and levers 42 are pivoted to them. These levers extend to and pivot to the rock-arm 43, which is pivoted in a bearing 44, secured to the frame or portion of it. This rock-arm is adapted to be engaged by the arm 45 in the direction of the arrow or to move it up, which is secured to the main shaft J, (see Fig. 6,) which the instant a tie is cut operates to open the door, swinging it downward to its position in dotted line. This al-

lows the tie to fall onto the support 46. In falling it is guided by the supports 24 and the guide-strips 26 at each end of the conduit to fall in the crotch-stud 22 and across the finger-pinion. As soon as the arm 45 leaves the rock-arm 43 the door is closed by the weight of the lever and rock-arm. The supports 24 are secured to the blocks 47, which form an integral portion of the cross-yoke 1 and 1 of each auxiliary frame, Figs. 3, 8, 9, and 12 showing this yoke and fragments of it larger than in Figs. 1 and 2.

In Fig. 12 a support is shown riveted to an upwardly-extending projection of the block. These supports are secured to and sustain the conduit above the center of the machine. The instant a tie falls from the conduit the door closes and the feeding mechanism again starts up. The next instant the weighted holding-lever 46° (see Fig. 3) is moved down onto it by the quadrant-cam 48, which engages a rock-arm 49, which is pivoted to a boss on the cross-yoke 1 and also to levers 50, which are adjustably secured to the holding-lever 46°. The cam is adapted to bring the holding-lever down onto the wire with a sudden and quick movement. A notch 51 is cut in the ends of these levers, which registers over the wire and thereby holds each end of the tie down in the crotch of the stud, thus preventing its jumping or moving out of the crotch-stud 22 while it is being looped and until the gripping-block 52 grips it between itself and the block 47. An instant after the holding-levers engage the wire the loop is formed on each end of the tie by the looping mechanism, as above described. The instant a loop is made at each end of the wire the gripping-block 52, which is pivoted to the cross-yokes in a position which will enable its face to swing squarely against the face of the block 47, is moved by a semicircular cam 53 to grip the wires adjacent to the loops—that is, the body of the wire and the returned ends, as shown in Figs. 8 and 9. The block 52 is provided with a renewable steel face-plate 52°, which is secured to it by screws or rivets. The face of the block 47 is likewise provided with a similar block 54. These blocks have to be frequently renewed, as they wear out rapidly. To the under side of the block 52 I secure a rubber cushion-block 55 and a metal plate 56, which latter is engaged by the face of the cam 53. Normally the cam carries the block 52 against the face of the block 47; but it cannot do so with the wires between them. Consequently a yielding element is required between the cam and the block. The cam 53 is secured to the main shaft, but is set directly opposite to the cam 21, as shown in Fig. 3, which allows it to engage the block the instant the cam 21 leaves the guide-block 4, which is the instant the loop is formed. The next instant block 52 is forced to grip the ends of the tie, holding them rigidly. At the same time the pinion 5 engages the teeth of the gear 10, and the guide-block, rack-fingers,

pinion, and crotch-stud are rotated, preferably three complete revolutions, this being the preferable proportion of the pinion 5 to the teeth on one-half of the circumference of the gear

5 10. The loop is of course rotated with the guide-block and its parts, as it still rests in and around one side of the crotch-block, as shown in Figs. 4 and 9, and three complete twists are given the ends between the loop and
10 the gripping-block, as shown in Fig. 7. As soon as the cam 53 leaves the gripping-block it falls back and the tie is released. The next instant the arm 57 (shown more clearly in Fig. 3 than in Figs. 1 and 2, where it is partially hidden by the rock-arms 58 and 59, and
15 in Fig. 3 it is shown in dotted lines, as it is behind the cam 48) contacts with the rock-arm 58, which is pivoted to a boss on the yoke. This arm is also pivoted at 60 to the end of a
20 rock-arm 59, which is also pivoted to a boss on the yoke. The rock-arm 59 extends under the ties. Its end is turned upward and extends above the wire. The arm 57 carries the arm 58 downward and moves the free end of
25 the rock-arm 59 upward and outward away from the machine. These arms work in unison with the arms 62, which are secured to the main shaft near its center and revolve with it to discharge the ties from the machine, the
30 tie being acted on at four points of its length by these arms.

To a projecting end of the rock-arm 58, I attach a spring 63, the opposite end of which is secured to the frame. This spring throws
35 the levers 58 and 59 back to their normal position after the arm 57 leaves the lever 58. The end arms 58 are the principal ones in discharging the ties, as the central ones are employed to prevent the central portion of the ties from lagging behind. The supports 46
40 are adapted to support the central portion of the tie in alignment with its ends. They are secured in any convenient manner to the sides of the frame. I have shown the rack and finger-pinion of the looping mechanism separately in Figs. 10 and 11. In Figs. 1 and 2
45 the flange of the finger-pinion is shown thicker than in Fig. 10. This is done to raise the ends of the wire high enough above the guide-block
50 to be distinctly seen. I secure a strip 61, of which I only show a fragment in Fig. 4, to ears 64 on the guide-block. This strip extends over the edge of the rack and holds it down against the block, the under side of this
55 strip and the bottom of the block forming the guide-surface between which the rack reciprocates.

The essential functions of my machine are, first, the automatic and intermittent feeding
60 of a wire to predetermined bale-tie lengths into the machine; second, mechanism for cutting the predetermined lengths from the wire; third, mechanism for forming a loop on each end of said lengths; fourth, mechanism for
65 twisting the ends adjacent to the loops to sustain the loop, and, fifth, mechanism for discharging the ties from the machine.

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

1. In a bale-tie making machine, the combination of means for feeding a predetermined length of wire intermittently into the machine, a conduit to receive the wire having a door adapted to open intermittently and discharge
70 said wire, and a cutting device arranged substantially as shown for cutting the in-feeding wire into predetermined lengths suitable for bale ties.

2. In a bale tie making machine, the combination with the driving shaft, of a friction
80 feed roll mechanism comprising a driving gear secured to said shaft and having a mutilated portion, a sliding way projection on the side of said gear registering with said mutilated portion, a pinion journaled to mesh
85 with said gear, a shaft supporting said pinion, a pawl block secured to said shaft adjacent to said pinion and arranged to engage said slide way, a second pinion secured to the opposite side of the journal of the first named
90 pinion, a roller secured to said shaft adjacent to said second named pinion, a second shaft journaled in adjustable bearings above the first named shaft, a pinion secured thereto
95 meshing with the second named pinion, a roller secured to the end of the last named shaft in engagement with the first named roller, and means for interchanging said pinions and rollers for pinions and rollers of
100 larger or smaller diameter, whereby the wire is fed intermittently into the machine in different predetermined lengths, as set forth.

3. In a bale tie making machine, the combination with the frame and driving shafts, of
105 means substantially as shown for intermittently feeding from a source of supply a wire into the machine and for cutting the same into predetermined lengths, a conduit adapted to receive said wire, a door hinged to its bottom upon which said wire rests, means for
110 intermittently opening said door and discharging said cut lengths of wire, means for guiding the wire to suitable supports, and a duplicate looping mechanism comprising a guide
115 block, a sleeve hub thereon, a bearing support for said sleeve, a pinion secured to the end of said sleeve, a mutilated gear secured to said driving shaft and in engagement with said pinion, a rack seated to reciprocate in
120 said guide block and having a stem extending through said sleeve and pinion, a rocking lever having a yoke end, pivoted at one side of said yoke to said stem, a cam projection on said mutilated gear adapted to engage the
125 lower end of said lever and reciprocate said rack in said guide block, a spring connected to said lever for retracting said rack, a pinion journaled in said block in mesh with said rack, fingers projecting from said pinion at
130 right angles to one another and adapted to receive the ends of said wire at their junction with one another, a crotch stud secured to said block adapted to receive said wire from

said conduit and guides, a lever adapted to periodically hold said wire in said crotch, and a cam secured on said driving shaft adapted to periodically hold said guide block against rotation while said rack and finger pinion is reciprocated, the combination operating to feed the wire to cut it into suitable lengths and to form a loop at each end, substantially as described.

4. In a bale tie making machine, the combination of the frame and driving shafts and the means substantially as shown for feeding periodically from a source of supply different lengths of wire into the machine, means for cutting said wire into specified lengths, means for confining the lengths in the longitudinal center of the machine and for periodically discharging the same, means substantially as shown for forming a loop on each end of said separated lengths of wire, and a gripping, twisting and discharging mechanism comprising a stationary jaw, a pivotal jaw adapted to swing against said stationary jaw, a cam on said driving shaft adapted to engage said pivotal jaw and move it against said stationary jaw, a yielding cushion between said cam and block, means for guiding said predetermined lengths of wire between said jaws, an arm on said driving shaft, a system of rock arms adapted to be engaged by said shaft arm and arranged to discharge said bale ties from said jaws and machine, substantially as described.

5. In a bale tie making machine, the combination with the frame, of a driving shaft transversely arranged in said frame, an extensible main shaft longitudinally arranged in said frame and adapted to be driven by said transverse shaft, and the auxiliary frames having the cross yokes adapted to support the looping, twisting and discharging mechanism, one of which is adjustable longitudinally in respect to the other, substantially as described.

6. In a bale tie making machine the combination with the frame and driving shafts, of the clutch controlled driving pulley, the mutilated gear, the pinion meshing therewith, the slide-way projection thereon, the raised journal bearing for said pinion shaft, the pawl block adapted to engage said slide-way, the feeding rolls, the additional shaft and pinions for supporting and rotating said rolls to frictionally contact with the supply wire and feed the same to the machine, the adjustable bearings for the upper shaft and roll, whereby rolls and pinions of varying diameters are interchangeable on said shafts, the combination operating to intermittently feed from a source of supply lengths of wire to the machine, which lengths are predetermined by the respective diameters of said rolls and pinions in respect to the diameter of said mutilated gear, as specified.

7. In a bale tie making machine, the combination of the knife block, the rock-arms, the engaging projections, the driving gear, the

lever connecting said rock-arms to said knife, and the spring for returning said knife to its normal position.

8. In a bale tie making machine, the combination of the duplicate auxiliary frames, one of which is adjustable in relation to the other, having the cross-yokes, the guide-block having a sleeve journaled in one of said cross-yokes, the rack having a stem journaled in said sleeve, the pinion on said sleeve, the mutilated gear in engagement therewith, the lever connected to said rack stem, the cam on said mutilated gear adapted to engage said lever and reciprocate said rack, the finger pinion in engagement with said rack, the crotch stud secured to said guide block, and the semicircular cam adapted to periodically engage said guide block, substantially as described.

9. In a bale tie making machine, the combination of the driving shafts, the wire receiving trough or conduit, the door, the levers pivoted thereto, the rock-arm pivoted to said levers, the arm secured to one of said driving shafts and adapted to engage said rock-arm and periodically open said door and discharge said wires, the supports and cross yokes for sustaining the conduit above, and the guides for leading the wires from said conduit to the looping and twisting devices, as set forth.

10. In a bale tie making machine, the combination of the duplicate weight-holding levers having a notch therein adapted to register over the bale tie wire, the levers adjustably connected thereto, the rock-arm pivoted to said lever, and the quadrant cam secured to the main driving shaft and adapted to engage one end of said rock-arm, whereby said lever is moved by said shaft arm to periodically engage said tie wires and hold them against displacement and by its weighted end to return it to its normal position, as set forth.

11. In a bale tie making machine, the combination of the driving shafts and the main and auxiliary frames, of the duplicate tie discharging levers pivoted to said auxiliary frames, the spring controlled rock-arms, and the shaft arm for periodically engaging one end of said rock-arm to operate said discharging levers, as set forth.

12. In a bale tie making machine, the combination with the main and auxiliary frame and the driving shafts, of the cross yokes of said frames, one of each of which has a rigid block, a gripping block pivoted to said cross yokes to engage in opposition the said rigid jaw, the steel face blocks secured to said blocks, the yielding cushion and contact plate secured to said pivotal block, and a cam secured to one of said driving shafts adapted to engage said pivotal block, as set forth.

13. In a bale tie making machine, the main and duplicate auxiliary frame, one of which is adjustable on said frame and the transverse and main driving shafts, of the cross yokes having a block, a gripping block pivoted in

opposition to said block and having a rubber cushion and a cam contact plate secured thereto, a semicircular cam adapted to periodically engage said pivotal gripping block, 5 and renewable steel face plates on the contacting surfaces of said blocks, substantially as described.

14. In a bale tie making machine, a loop forming device consisting of a periodically 10 reciprocated rack and a pinion meshing therewith having a flanged top, a vertical finger arranged laterally to one side of the said pinion, but forming a part thereof, a second finger arranged at right angles to the first to 15 form at the junction of the two an inwardly projecting crotch, means for reciprocating said rack to rotate said pinion a semicircular distance on its axis, and a crotch stud adapted to receive the tie wires and around which

the end of the wire is carried by said pinion 20 fingers, substantially as described.

15. In a bale tie making machine, the combination of the main frame, the transversely arranged driving shaft, the main drivingshaft 25 having power connection therewith by means of bevel gears, and having said main shaft divided into two parts at the center of the machine and having the rear part extensibly feathered to the other part, and the auxiliary 30 frames, one of which is adjustable on the said main frame, as set forth.

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

GUSTAF JOHNSON.

Witnesses:

WILLIAM O. PERRY,
AMOS C. HALE.