(No Model.)

4 Sheets—Sheet 1.

C. O. MOOK.

BALE TIE MACHINE.

No. 493,279. Patented Mar. 14, 1893.

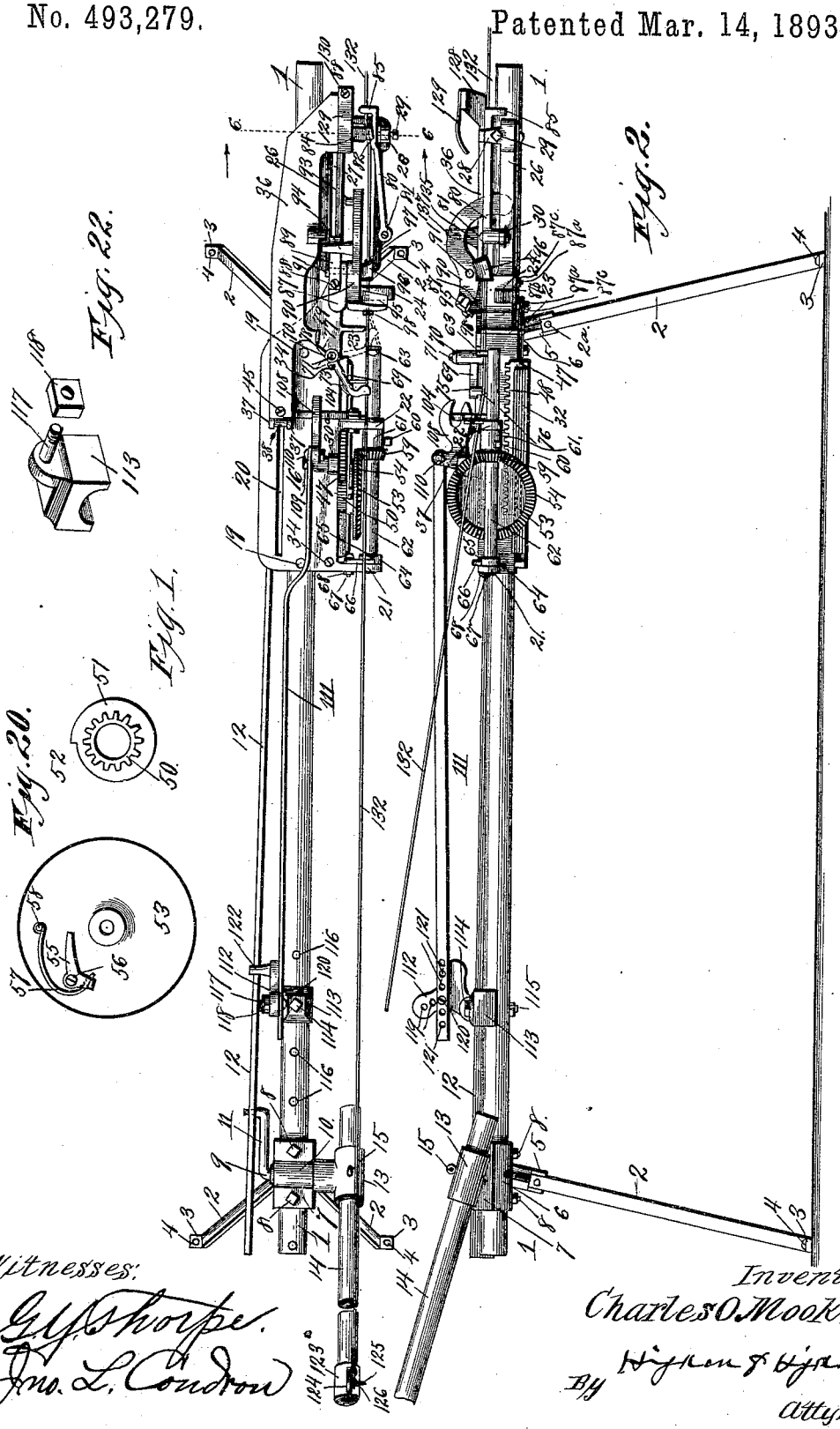


Fig. 2.

Fig. 2a.

Fig. 1.

Fig. 2b.

Witnesses:
G. F. Thorpe.
Jno. L. Condron

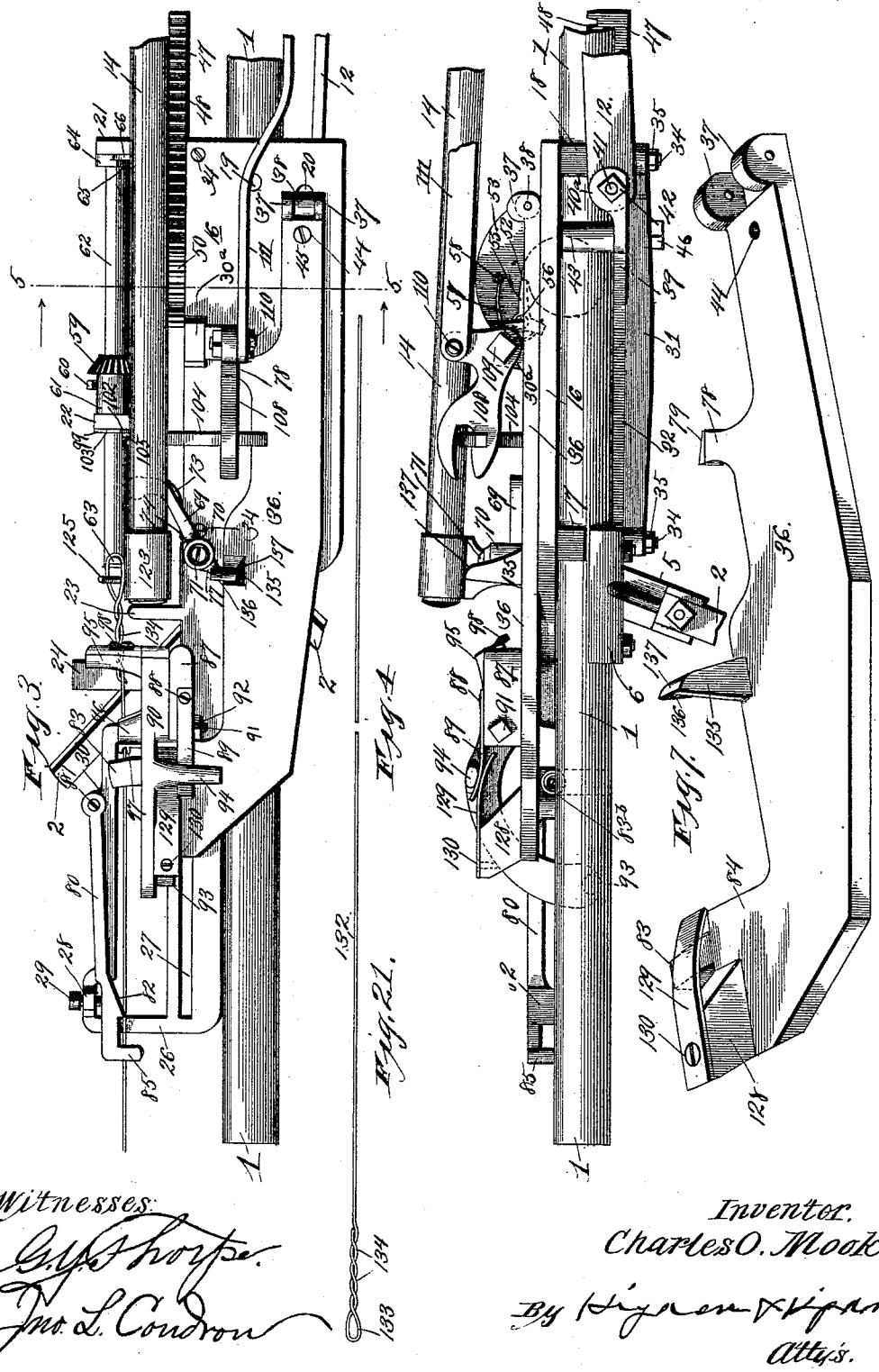
Inventor:
Charles O. Mook.
By Higdon & Higdon
Atty's.

(No Model.) 4 Sheets—Sheet 2.

C. O. MOOK.

BALE TIE MACHINE.

No. 493,279. Patented Mar. 14, 1893.



Witnesses:
G. H. Thorpe.
Jno. L. Condron

Inventor.
Charles O. Mook
By Higdon & Higdon
Atty's.

(No Model.) 4 Sheets—Sheet 3.

C. O. MOOK.

BALE TIE MACHINE.

No. 493,279. Patented Mar. 14, 1893.

Fig. 5.

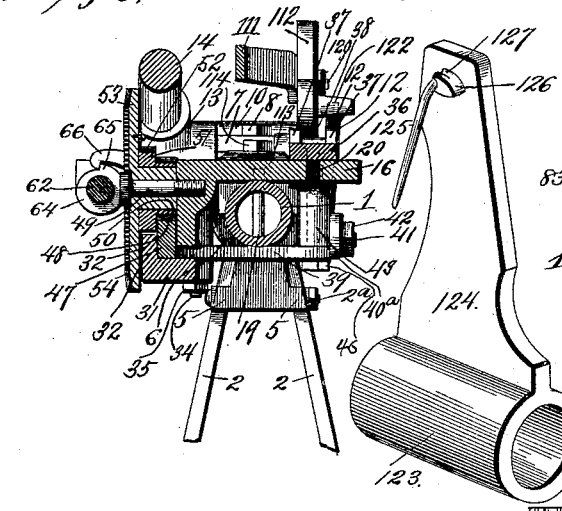


Fig. 12.

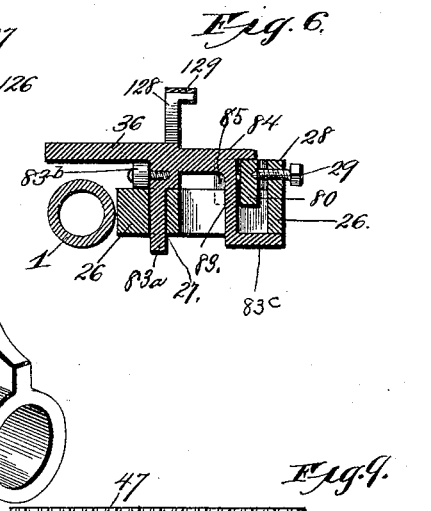


Fig. 6.

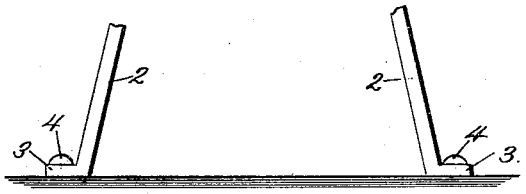


Fig. 9.

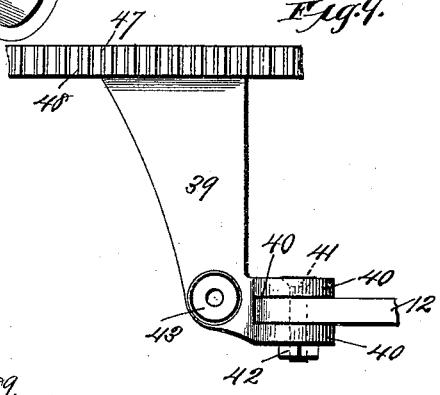


Fig. 8.

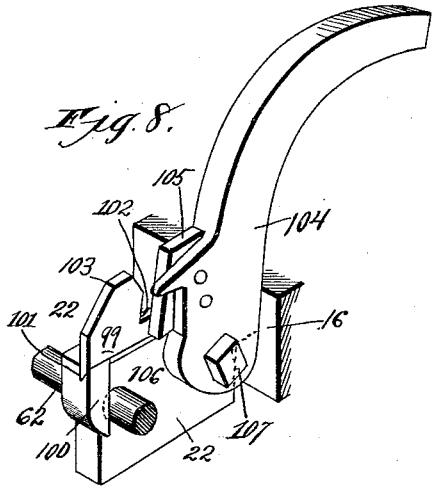


Fig. 10.

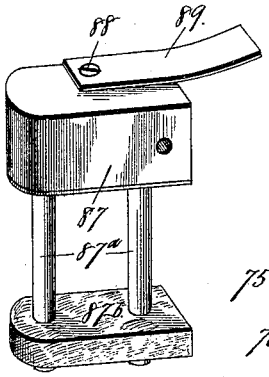
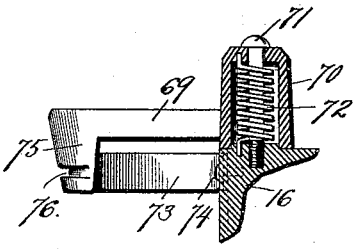


Fig. 11.



Witnesses:
Geo. H. Thorpe
Jno. L. Condon

Inventor:
Charles O. Mook
By Higdon & Higdon
Atty's

(No Model.) 4 Sheets—Sheet 4.

C. O. MOOK.

BALE TIE MACHINE.

No. 493,279. Patented Mar. 14, 1893.

Fig. 13.

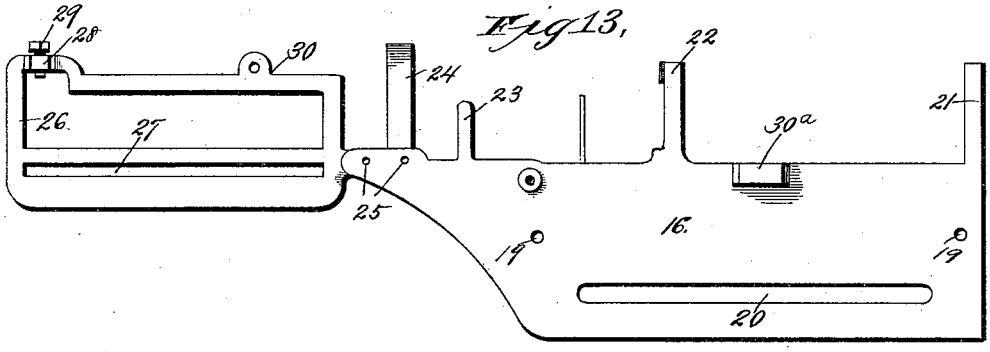


Fig. 14.

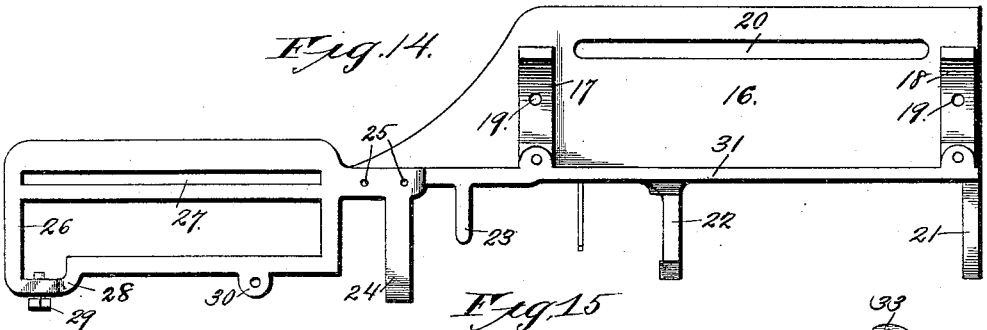


Fig. 15

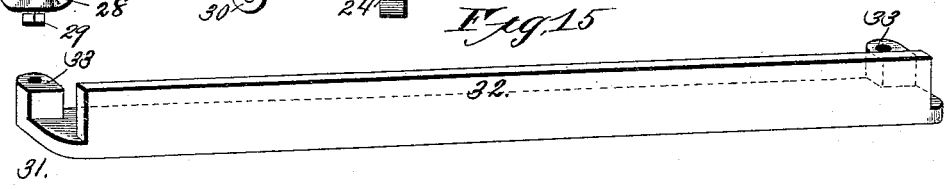


Fig. 16.

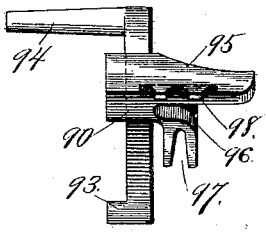


Fig. 18.

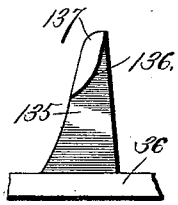


Fig. 17.

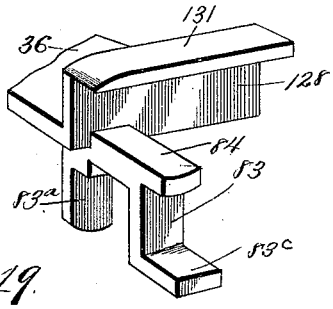
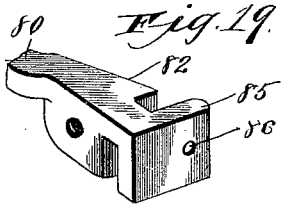


Fig. 19.



Witnesses
G. W. Hoppe.
Jno L Condron

Inventor.
Charles O. Mook
By Higman & Higman
Attys.

UNITED STATES PATENT OFFICE.

CHARLES O. MOOK, OF KANSAS CITY, MISSOURI.

BALE-TIE MACHINE.

SPECIFICATION forming part of Letters Patent No. 493,279, dated March 14, 1893.

Application filed June 24, 1892. Serial No. 437,917. (No model.)

To all whom it may concern:

Be it known that I, CHARLES O. MOOK, of Kansas City, Jackson county, Missouri, have invented certain new and useful Improvements in Bale-Tie Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to machines for making wire bale-ties for use in binding bales of hay, cotton, straw, and various other materials which are shipped or transported in the form of bales.

The objects of my invention are to produce a machine which shall be simple, strong, durable, and inexpensive in construction, and entirely automatic and also very rapid in its operation, and which shall be easy to operate. Furthermore to produce a machine which in addition to the advantages above enumerated, shall take the wire from continuous reels, straighten the same, cut off the required length of the wire for making the tie, and also bend and twist the same so as to form the loop or eye and the twist of the eye, all successively and automatically and at one operation of the machine.

To the above purposes, my invention consists in certain peculiar and novel features of construction and arrangement, as hereinafter described and claimed.

In order that my invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a machine embodying my invention; the parts of the machine being shown as in the positions which they occupy just after a length of wire has been drawn into the machine and clamped, in readiness for the straining operation and the subsequent bending, twisting, and severing operations. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view on an enlarged scale, of the mechanism at the receiving end of the machine; the parts being shown in the positions which they occupy at the completion of the operation of the machine, the direction of view being toward the opposite side of the machine from that exposed in Fig. 2. Fig. 4 is a side elevation of the same also on an enlarged scale. Fig. 5 is a transverse vertical section of the machine on the line 5—5 of Fig. 3, the direction of view being toward the discharge end of the machine. Fig. 6 is a transverse vertical section of the machine, on the line 6—6 of Fig. 1; the direction of view being toward the receiving end of the machine. Fig. 7 is a detached perspective view of the main-slide of the machine. Fig. 8 is a detached perspective view of the movable cutter-arm and its immediate operative connections. Fig. 9 is a detached plan view of a portion of the rack-bar, the bracket-arm thereof, and the adjacent end of the link-bar for actuating said rack bar. Fig. 10 is a detached perspective view of the pivot-standard for the wire-clamping arm and the immediate operative-connections thereof. Fig. 11 is a transverse vertical section of the machine on the line 11—11 of Fig. 3 looking toward the delivery or discharge end of the machine. Fig. 12 is a detached perspective view, on an enlarged scale, of the attachments carried by the outer end of the operating-bar. Fig. 13 is a detached plan view of the main bearing-plate of the machine. Fig. 14 is a detached inverted plan view of the same. Fig. 15 is a detached perspective view of the guide for the rack-bar. Fig. 16 is a detached view of the wire guiding and gripping arm, looking toward the receiving end of the machine. Fig. 17 is a detached perspective view of one end of the main slide of the machine, showing a modified form of the standard for engaging the wire gripping and guiding arm. Fig. 18 is a detached perspective view of a portion of the main-slide, showing the outer side of the cam-standard for engaging the wire gripping and guiding arm. Fig. 19 is a detached perspective view of the outer end of the wire-clamping bar. Fig. 20 comprises two inner side elevations of the beveled gear-wheel and of the gear-pinion for actuating the twister-bar; said wheel and pinion being in detached position. Fig. 21 is a detached plan view of a complete bale-tie, such as is produced by the machine. Fig. 22 is a detached perspective view of the supporting block for the bell crank lever, located near the delivery end of the machine.

In the said drawings, 1 designates the main bar of the machine-frame, this bar being of elongated cylindrical form and also preferably hollow or tubular in construction. This extends horizontally from one end of the machine to the opposite end thereof, and is supported at its ends by legs or supports 2 which may be of wood or of metal, as preferred, and

the lower ends of which are shown as formed with extensions or feet 3 which are bolted, as at 4, or otherwise securely attached to the floor of the apartment in which the machine is placed. These legs or standards 2 are shown as arranged in two pairs, each of which supports one end of the main-bar of the machine-frame, and the upper ends of which are inserted into laterally divergent pendent sockets 5 which are formed integrally on the under sides of the half-bearings 6; the legs being bolted into said sockets, as at 2^a, and the ends of the main-bar lying longitudinally in the said half-bearings. At the delivery end of the machine, is located a bearing-box 7 which rests upon the upper side of the corresponding end of the main-bar 1, and which is bolted to said main-bar by through-bolts 8; said bolts extending downwardly through the main-bar and also through the half-bearing 6, as shown, and the arrangement being such that the main-bar is retained rigidly against movement in any direction. The under side of the block 7 constitutes the upper part of the retaining-bearing for the end of the main-bar 1, and at its upper side, this block is formed with a transverse half-bearing in which is journaled a short rock-shaft, so as to retain the latter in its required operative position. At one end, this rock-shaft 9 is formed with a crank-arm 11 to the outer end of which is connected the corresponding end of a link-bar 12, this link-bar being hereinafter more fully described, and its purposes explained. Upon the opposite end of this rock-shaft 9 is formed, or otherwise secured, a cross-socket 13 into which is inserted one end of an operating-bar 14; this operating-bar being shown as retained in the socket by a split cross-key 15, which presses transversely through the socket 13 and also through the corresponding end of the bar 14. This bar may be either of wood, as shown, or of metal, if preferred, and the bar is nearly but not quite equal in length to the length of the machine-frame, as hereinafter also fully explained.

At the opposite or receiving end of the machine, is located a main-plate 16 which supports and guides the principal operative parts at this end of the machine. The body-portion of this plate is of approximately oblong rectangular form, and rests longitudinally upon the main-bar 1 of the machine-frame. Near the ends of its body-portion, this plate is formed with pendent inverted U-shaped lugs 17 and 18 which embrace the upper side of the main-bar 1, and said plate is retained in position upon said main-bar by two pins or bolts 19, which extend downwardly through the plate near its ends, and also downwardly through the main-bar. Extending longitudinally of the plate 16, near one side or margin of the same, is a longitudinal slot 20, for a purpose to be hereinafter explained. At its opposite side this bearing-plate is formed with four horizontal lateral outward extensions 21, 22, 23, and 24; the extension 21 being formed on that end of the plate which is toward the delivery end of the machine. The extension 22 is formed at some distance away from the projection 21 toward the receiving end of the machine, and the extension 23 is formed some distance farther toward the receiving end of the machine, from the extension 22, while the extension 24 is formed at that extremity of the body-portion of the bearing-plate which is toward the receiving end of the machine. Projecting forwardly from plate 16, and in a slightly lower horizontal plane than said plate, is an extension frame 26, which is shown as, and preferably is, cast integral with the plate 16, but which may be secured thereto by bolts if desired. This extension-frame 26 is of skeleton or open form, and is preferably of oblong rectangular shape, and also extends longitudinally outward from the end of the bearing-plate. At one side said extension-frame is formed with a longitudinal slot 27 which extends from one end of the frame to the other and parallel with and also near to one margin of the frame. At the outer corner of the frame 26 which is opposite from the slot 27, is formed an upwardly extending bearing-lug 28 through which extends a regulating-screw 29, the purpose of which will be hereinafter explained. Upon the same side of the frame 26 as that at which the bearing-lug 28 is located, but near the opposite end of said frame, is formed an outwardly extending offset 30 upon which the wire clamping arm is pivoted, as hereinafter described. That side of the bearing-plate 16 which is formed with the extensions 21, 22, 23, and 24, is also provided on its under side with an outwardly extending horizontal and longitudinal guide-plate 31 the outer edge or margin of which is formed with an upwardly extending longitudinal flange 32; the said guide-plate being designed to receive a rack-bar to be hereinafter fully described, and to guide the movements of said rack-bar. At its ends, this guide plate 31 is formed with vertical enlargements or bosses 33 through which pass vertical attaching-bolts 34; the said attaching-bolts passing also through the corresponding parts of the bearing-plate 16, and having their heads countersunk in the upper side of the bearing-plate, and the lower ends of said bolts receiving retaining-nuts 35, as shown.

36 designates the main slide of the machine, this slide being of irregular elongated form, as is clearly shown in Fig. 7. That end of the slide 36 which is toward the delivery end of the machine is formed with two ears 37 between which is journaled an anti-friction roller 38 which runs upon the upper side of the bearing-plate 16; the roller being of such length as to extend beyond the sides of the slot 20 in said bearing-plate. To that end of the slide 36 which is toward the delivery end of the machine is connected one end of the operating link-bar 12 above referred to. The connection of this end of the link-bar 12 to the slide 36 is as follows: A horizontal brack-

et-arm 39 extends directly beneath the bearing plate 16, and its outer extremity is bifurcated, as at 40. A pin or bolt 41 extends transversely through the lugs or ears 40, and also through the corresponding end of the link-bar 12, and is provided with a retaining-nut 42, as shown. Near this bifurcated extremity, the upper side of the bracket-arm 39 is provided with an upwardly extending boss 43 through which extends a connecting-bolt 45; this bolt being passed downwardly through the corresponding end of the slide 36, through an opening 44 therein, and having a retaining-nut 46 screwed upon its lower end. It will thus be seen that as the rock-shaft 9 and its crank-arm 11, above described, are oscillated, the link-bar 12 will cause the slide 36 to reciprocate longitudinally of the machine, for purposes to be hereinafter explained. The opposite end of the bracket-arm 39 from that which is connected to the link-bar 12 projects and reciprocates through the space between the upper side of the guide-plate 31 and the under side of the bearing-plate 16, and this end of the bracket-arm 39 is formed or otherwise provided with a transverse rack-bar 47, which rests and works longitudinally in the guide-plate 31, and the rack-teeth 48 of which are formed upon the upper side of the bar; the arrangement being such that the rack-bar 47 and the slide 36 shall reciprocate simultaneously, for purposes to be also hereinafter explained.

From that side of the bearing-plate 16 which carries the guide-plate 31 projects horizontally outward a stub-shaft 49 which is preferably in the form of a screw-bolt as shown, inserted into the bearing-plate. Upon this stub-shaft is mounted a gear-pinion 50, which is located immediately above the rack-bar 32 and the teeth of which mesh with the teeth of said rack-bar, the gear-pinion having an enlarged hub 51 upon which is formed a single radial tooth 52, and said pinion being arranged to turn freely upon the stub-shaft 49. Upon the outer end of this stub-shaft 49 is mounted a beveled crown-gear wheel 53 the teeth 54 of which are formed in circular series upon the outer side of the wheel at the margin thereof. This wheel 53 is mounted so as to turn freely upon the stub-shaft 49, and upon its rear side said wheel carries a pawl or dog 55. This pawl or dog is of straight elongated form—and is pivoted at one end upon a pin or stud 56 which projects rearward from the wheel; this end of the dog being preferably split, as shown, so as to embrace the stud or pin 56. The pawl or dog 55 is held in engagement with the margin of the hub 51 of the gear-pinion 50 by a segmental spring 57 the outer end of which is secured to a pin 58 projecting from the rear side of the wheel 53, and the opposite end of which is passed vertically through two lugs 59 which extend laterally from the split end of the dog or pawl 55. The arrangement is such that the pinion 50 rotates in one or another direction according to the movement of the rack-bar 47, while the beveled gear-wheel 53 remains idle or is rotated periodically according as the pawl 55 is engaged with or disengaged from the tooth 52 of the pinion-hub, as will be hereinafter explained. The teeth 54 of the beveled gear-wheel 51 mesh with the teeth of a beveled gear-pinion 59 the hub 61 of which surrounds the twister-bar 62 and is secured to said twister-bar, by a set-screw 60, or in any other suitable manner, so that the beveled gear-pinion 59 shall rotate the twister-bar. This twister-bar extends horizontally and longitudinally of the bearing-plate 16, and at one end, this twister-bar is journaled in the outer end of the extension or bracket 21 above referred to. This twister-bar is also journaled in the extension or bracket 22, and extends horizontally a considerable distance beyond the extension or bracket 22, toward the receiving end of the machine. That extremity of the twisting-bar which is toward the receiving end of the machine is provided with a radial stud or twisting-arm 63, the operation of which will be hereinafter explained, and the opposite end of said twisting-bar carries a disk 64 which is rigidly mounted upon the twisting-bar so as to cause the latter to turn with it, and which is also formed with a single radial marginal tooth 65. This tooth 65 is engaged at times by a drop-hook or gravity-pawl 66 which is pivoted upon a bolt 67 passing transversely through the inner part of the bracket 21, and provided with a retaining-nut 68; this drop-hook or pawl serving to prevent any possible retrograde rotation of the twisting-bar, after said bar has completed its operative movement, as hereinafter explained.

Upon the bearing-plate 16, at a point adjacent to that margin which carries the extensions or brackets 21, 22, 23, and 24, and at a point slightly away from the extension or bracket 23 (in direction toward the delivery end of the machine) is located a horizontal bending-arm 69 which is provided at its inner end with a hollow vertical hub or boss 70. Through this boss or hub extends vertically a pivot-screw 71 which is inserted into the corresponding portion of the bearing-plate 16. A spiral spring 72 surrounds the pivot-screw 71, and is inclosed within the hollow boss or hub 70; the lower end of this spring being inserted into the bearing-plate 16, and the upper end of said spring being inserted into the upper end of the boss or hub 70 (see Fig. 11.) The spring 72 thus serves to retain the bending-arm 69, normally in such position that said arm extends obliquely outward and toward the delivery end of the machine, and in this normal position, the bending-arm rests against the outer end of a segmental buffer-spring 73 which is secured, by screws 74, or in any other suitable manner, to the corresponding margin of the bearing-plate, 16. The outer or free end of this bending-arm 69 is formed with a vertical pendent stud 75, the outer side of the lower end of which is formed

with a horizontal groove 76 to receive the end of the bale-tie wire, as hereinafter explained. The lower end of the hollow boss or hub 70 is formed with a stud 77, which projects diametrically opposite from the bending-arm 69 and which is engaged at times by a lateral horizontal projection or extension 78 of the main slide 36 of the machine; this extension projecting outward from the adjacent margin of the slide, and being preferably provided with a wear-plate 79, as shown. The arrangement is such that the stud 77 is engaged at times by the extension 78 so as to throw the bending-arm 69 laterally toward the receiving end of the machine, and against the tension of the spring 72, for the purpose of making the first bend for the tie-loop or eye, as will be hereinafter more fully explained.

Upon the outer side of the extension-frame 26 near that end of said frame which is toward the delivery end of the machine, is pivoted one end of a wire-clamping arm 80, this end of the arm loosely embracing a vertical pivot-screw 81 which extends upward from the offset 30 previously referred to. Near its opposite extremity and at its inner side, this clamping-arm 80 is formed with an inwardly inclined clamping-extension 82 which operates at times in conjunction with the inclined outer end of an outward extension 83 of the slide 36, as hereinafter more fully explained. This extension 83 is formed integrally upon the outer end of a lateral extension or offset 84 of that end of the slide 36 which is toward the receiving end of the machine, and the said extension 83 and the inclined extension 82 serve to clamp the wire between them while the wire is being strained and severed, as hereinafter fully explained. From the under side of the extreme receiving or forward end of slide 36 depends a lug 83^a which extends and works through the slot 27 in the bearing-plate 16, and thus properly guides this end of the slide 36. On its under side this extension 84 carries a roller 83^b which runs upon the upper part of the bearing-plate 16 and thus lessens the friction between the slide and plate at this point to the minimum. At its free end or extremity, the clamp-arm 80 is formed with an inward extension or head 85 which extends at right angles from the arm, and which is formed with an eye or opening 86 through which the entering wire passes. The free end of this arm 80 moves laterally over the extension frame 26, and the outer side of said free end of the arm comes at times into contact with the inner end of the regulating-screw 29, previously mentioned, and for a purpose to be hereinafter explained.

Upon the upper side of the bearing-plate 16, near that margin of said plate from which project the extensions 21, 22, 23, and 24, and slightly to that end of the extension 26 which is toward the delivery end of the machine, is located a vertical standard 87 upon the upper end of which is secured, by screws 88, or in other equivalent manner, a segmental leaf-spring 89; this spring extending longitudinally toward the receiving end of the machine, for a purpose to be hereinafter explained. This standard 87 is secured in its described position upon the bearing-plate 16 by two pendent bolts 87^a preferably integral therewith and which extend downward through the vertical openings 25 of the bearing-plate and which carry at their lower ends a retaining-plate 87^b; this plate abutting against the under side of the bearing-plate and being retained in position by suitable nuts 87^c, which are screwed upon the lower ends of the bolts 87^a. Upon the outer side of the standard 87 is pivoted a wire guiding and gripping arm 90; a horizontal bolt 91 which passes transversely through the standard 87, carrying said arm upon its outer end, and being held in position by a retaining-nut 92 which is screwed upon the inner end of said pivot-bolt. This wire-guiding and gripping arm extends longitudinally of the machine, and that end of the arm which projects toward the receiving end of the machine is of segmental or arched form, as shown, the outer extremity of this arm carrying an inwardly extending stud 93. From the inner side of this segmental arm, at a point near to its point of union with the body-portion of the guiding and gripping arm, said segmental arm is formed with an inwardly extending stud 94, while from the opposite extremity of the body-portion of the guiding and gripping arm, or in other words, that end of said arm which projects toward the delivery end of the machine, projects outwardly a third stud 95. Upon its outer side, just below the pivotal point of the arm, said arm is formed with an outwardly and downwardly extending enlargement 96, the under margin of which is formed with a longitudinal groove 97 to receive the guide wire. The purposes of the studs 93, 94, and 95 are hereinafter explained. Upon the under side of the stud 95 is also formed a bifurcated lug 98 which serves also to guide the wire and to prevent said wire from springing out of its position; the wire being similarly guided and retained by an outward L-shaped extension 83^c of the projection 83, above described.

Upon that side of the extension 22 which is toward the receiving end of the machine, is mounted a cutter-plate 99 which lies flat against the said side of the extension, and the lower margin of which lies within a notch 101 which is formed in an enlargement 100 of the side of the extension 22 (see Fig. 8). The cutting-edge 102 of this cutter-plate is formed on the upper side of the inner part of the plate, and an upwardly extending head 103 is formed at the outer end of the plate; this head serving to prevent dislocation of the wire before it is severed.

104 designates the movable cutter-arm; this arm being pivoted at its lower or outer portion upon a pivot-bolt 107 which extends transversely through the lower part of the cutter-arm, and which extends similarly

through the bracket 22. This arm 104 is of segmental form and extends upward and inward, as shown; its upper end entering between a pivoted fork 108 to be presently described. At its outer lower portion, the cutter-arm 104 carries a cutter-plate 105 the cutting-edge of which is formed on the lower part of the plate, and which is secured to that side of the cutter-arm which is toward the delivery end of the machine; the cutting-plate 105 working in conjunction with the cutting-plate 99, above described. As just stated the inner or upper end of the cutting-arm 104 engages between the arms of a fork 108; the fork or bifurcation extending toward the receiving end of the machine. This fork is of approximately V-form and is pivotally connected to the standard 30^a of the bearing-plate 16 by a pivot-bolt 109 which passes transversely through the angle of the fork and also through the standard 30^a. To the upper end of the companion arm of the fork is pivotally connected, by a transverse pivot-bolt 110, one end of a link-bar 111. This link-bar 111 extends longitudinally of the machine, toward the delivery end of the same, and at its opposite end said link-bar is pivotally connected to a bell-crank lever 112. This bell-crank lever 112 is pivotally mounted upon a supporting-block 113 which rests upon the main-bar 1 of the machine-frame near that end of said bar which is at the delivery end of the machine.

A number of holes or openings 116 are formed vertically through the main-bar 1 in longitudinal series, and through one or another of these holes is inserted a vertical bolt 114; said bolt passing downward through the supporting-block 113, and having a retaining-nut 115 screwed upon its lower end. The supporting block 113 and the bearing 6—7 for the operating-bar 14, are thus adapted to be adjusted longitudinally upon the main bar 1, and toward or from the base plate, supported upon the opposite end of said main bar 1. The bell-crank 112 is pivoted at its angle upon a pivot-bolt or stud 117 which projects outwardly from the outer side of the block 113; a retaining-nut 118 being screwed upon the outer end of the bolt or stud 117, so as to retain the bell-crank in its operative position. The upper arm of this bell-crank 112 is formed with a longitudinal series of holes 119 through one or another of which is inserted a cross-pin or screw, or bolt 120; said pin passing also through one or another of a longitudinal series of openings or holes 121 which are formed in the corresponding end of the link-bar 111. The opposite arm of the bell-crank is formed at the outer side of its outer extremity with an outwardly extending lug or stud 122 which is engaged from beneath, at times, by the link-bar 12, previously described, and for a purpose to be hereinafter explained.

The outer end of the operating-bar 14 of the machine is surrounded by a collar 123 from which projects downwardly an arm 124; an upwardly extending pin or hook 125 projecting obliquely outward from one side of the arm (see Fig. 12). At the point of juncture of this hook or pin 125 with the arm 124, said arm is formed, on its corresponding side, with a stud or lug 126, having a groove 127 formed in that side which is adjacent to the hook or pin, for a purpose to be hereinafter explained.

Upon that end of the lateral extension 84 of the slide 36 which is toward the receiving end of the machine, is formed a standard 128 which rises vertically from the said extension, and which carries at its upper end a longitudinally extending segmental spring 129; said spring being secured to the standard by any suitable number of screws 130, or equivalent means. If preferred, the spring 129 may be dispensed with, the top 131 of the standard 128 being curved, as shown in Fig. 17, the spring or curved top of the standard at times engaging the lug 93 of the gripping and guiding arm 90, as hereinafter explained. Upon the slide 36, at a point adjacent to that margin which is formed with the extension 78, and at a point about midway between the extensions 78 and 84, is formed a vertical standard 135, which is formed at the outer side of its upper end with a lateral cam-stud 136, and the upper end of which is formed with an oblique bearing-surface 137 for a purpose to be hereinafter described.

Now— when the machine is to be operated, the operating bar 14 is laid over the machine, so that the outer end of said bar shall extend toward the receiving end of the machine, and rest upon the cutter-arm 104, holding said arm in its depressed position with the two cutter plates separated. The twisting-bar 62 always occupies such a position that its twisting head or arm 63 extends vertically upward. The slide 36 is at the farthest limit of its movement toward the receiving end of the machine; the stud 94 of the gripping-arm 90 resting upon the spring 89 of the standard 87. The drop-hook or pawl 66 is also in engagement with the tooth 65 of the twisting-bar disk 64, and the free end of the clamping-bar 80 is in contact with the inner end of the regulating-screw 29. The parts being in these relative positions, the wire from which the bale-ties are to be formed is run off from a suitable reel which is placed adjacent to the receiving end of the machine, the entering end of the wire being inserted through the opening or eye 86 in the head 85, and thence along the outer side of the gripping and guiding arm 90, and also beneath and within its guiding-groove 97. From this point the wire is led inward over the extension 24, and it is to be understood that, at the commencement only of the operation, this laying of the wire 132 is accomplished by hand, and that as the operating bar 14 is thrown the first time toward the entering end of the machine, this end of the wire is bent and twisted to form the tie as hereinafter fully explained.

The operating arm or bar 14 is now thrown upward and over, its hook or pin 125 first entering the eye or loop 133 embracing the stud 126, and the bar is moved so as to extend nearly horizontally outward from the delivery end of the machine; the length of wire thus drawn through the machine being severed from the remainder of the wire from the reel, and a proper bale-tie being formed upon the entering end of the wire from the reel; this eye or loop being shown in Fig. 3, and the operating-bar being again thrown over backward so that its free end extends toward the receiving end of the machine, as before, and the several operative parts of the machine resuming the initial operative positions before described. As the operating-bar completes this back-stroke, the pin or hook 125 is carried below the eye or loop 133, which at this time is embracing the twisting-arm 63. The operating-bar 14 is now raised and thrown upward and over toward the delivery end of the machine, and at the commencement of this movement, the hook or pin 125 moves upward, entering the loop 133 of the tie, and causing the bend of said loop to enter the groove 127 of the stud 126. It is here to be observed that this stud 126 constitutes an important feature of my invention, inasmuch as it receives the loop of the bale-tie and endures all of the strains upon the wire resulting from the stretching, bending, twisting, and severing of the same; the hook or pin 125 being entirely relieved of all such strains, and serving only to lift the completed loop off of the twisting-arm. Now, as the operating-bar 14 continues to move upward, the rock-shaft 9 is oscillated and its crank-arm, acting through the connecting-bar 12, moves the slide 36 toward the receiving end of the machine. This movement of the slide first causes its clamping-extension 83 to engage the outer end of the gripping and guiding arm 90, raising said arm, and then permitting it to drop again. As the described movements of the operating-bar 14 and slide 36 continue, the lug 94 of the gripping and guiding arm 90 passes beneath the cam-lug 136 of the standard 135, depressing the free end of the guiding and gripping arm for an instant and then permitting the spring 89 to raise the arm again. These movements are not for any operative purpose, thus far, but during the forward movement of the slide 36, the rack-bar 47 has also been moving toward the receiving end of the machine, rotating the gear-pinion 50 independently of the beveled crown-gear wheel 53, and carrying the pawl or dog over the periphery of the hub 51 of the pinion, and just before the standard 135 comes into contact with the arm of the guiding and gripping bar 90, the dog or pawl 55 drops past the tooth 52; the pinion 50 continuing its rotation independently of the wheel 53. Furthermore, during this movement of the operating-bar 14, the extension 78 of the slide 36 momentarily engages the stud 77 of the bending-arm 69 and carries said arm slightly farther toward the delivery end of the machine for an instant, and instantly releases said arm, permitting its spring 72 to return the arm to its described normal position. At the last portion of the movement of the operating-bar 14, the slide 36 completes its travel toward the receiving end of the machine, bringing the inclined outer end of its extension 83 into close approach to the inclined surface 82 of the clamping-arm 80, and firmly clamping the wire between said inclined surfaces. The rest of the movement of the operating-bar 14, toward the delivery end of the machine, is now made for the purpose of stretching, straining and tightening the wire, for the purpose of straightening the same, and also for actuating the severing or cutting devices. Just as the operating-bar completes its movement in this direction, the stud 122 of the bell-crank 112 is engaged from beneath by the connecting-bar 12, tilting the bell-crank toward the delivery end of the machine, and correspondingly tilting the fork 108, through the action of the link-bar 111. This tilting of the fork 108 raises the upper end of the severing or cutting bar 104 and causes its cutting-plate 105 to approach the cutting-plate 99, and thus sever the wire. At this instant the movement of the operating-bar 14 toward the delivery end of the machine is completed, and the bale-tie wire drops by its own gravity off of the hook 125 of said operating-bar, the return movement of the operating-bar 14, toward the receiving end of the machine begins, and as soon as this return movement commences, the slide 36 moves backward toward the delivery end of the machine, bringing its extension 78 into engagement with the stud 77 of the bending-arm 69, and throwing said arm outward and toward the receiving end of the machine. This movement of the bending-arm causes said arm to engage the extremity of the entering part of the wire and to bend the said end of the wire backward around the twisting-arm 63, so as to form the eye or loop 133 of the tie. At the same moment in which the bending-arm 69 is making this movement, the continued backward movement of the slide 36 brings the standard 135 into engagement with the lug 94 of the gripping-arm 90, depressing that end of the arm which projects toward the delivery-end of the machine, and causing the bent extremity of the wire to be firmly clamped between the enlargement 95 of the gripping-arm and the upper side of the extension 24 of the bearing-plate 16. The stud 93 of the gripping-arm 90 now rides upon the upper end 131 of the standard 128 or upon the spring 130 of said standard, as the case may be, so as to preserve the clamping-action of the arm 90 and extension 24 throughout the twisting action of the machine. Now, as the operating-handle 14 continues to move toward the receiving end of the machine, the rack-bar, which during this time has been moving toward the delivery end of the ma-

chine, and has been rotating the gear-pinion 50 independently of the gear-wheel 53, causes the tooth 52 to engage the pawl or dog 55, and also causes the latter to rotate the gear-wheel 53 with the gear-pinion. The twister-bar 62 now begins to rotate, and the twister-arm revolves the loop or eye 133 axially so as to twist the end of the eye or loop around the adjacent portion of the wire 132, as shown at 134, thus completing the tie. As soon as the twisting operation is completed, the continued movement of the slide 36 toward the delivery end of the machine, causes the standard 128 to pass from beneath the stud 93 of the clamping and guiding arm 90 and releases the loop or tie. The operating-bar is now brought downward upon the upper end of the cutting-bar 104, depressing the same, and causing also the end of the pin or hook 125 to enter beneath the eye of the tie, and when the operating-bar 14 is again raised, the pin or hook enters the eye and lifts it off of the twisting-arm 63, as before. The subsequent operations of the machine are repetitions of those above described.

From the above description, it will be seen that I have produced a bale-tie making machine which is simple, durable, and complete in construction, and automatic in its action. Also that I have produced a bale-tie making machine which is very rapid and effective in its operation, and all of the parts of which are actuated directly and solely by the operating-bar of the machine. It is to be understood that I do not purpose to confine myself to the precise described forms of the several parts of the machine excepting as such forms are clearly and obviously essential to the described operations of the machine; it being my desire to vary the forms of the parts as the demands of particular work shall require.

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

1. A machine for making bale-ties, comprising a suitable supporting framework, a pivotally movable operating-bar mounted upon said framework, a longitudinally movable slide also mounted upon the framework and having a wire-clamping extension, and a wire-clamping arm pivotally mounted upon said framework and having also a wire-clamping extension to engage the extension of the slide, substantially as set forth.

2. A machine for making bale-ties, comprising a suitable supporting framework, a longitudinally movable slide mounted upon the framework and having a lateral extension, a pivotally operating bar also mounted upon the framework and operatively connected to the slide, and a pivotally operating bending-bar mounted upon the framework and engaged by the extension of the slide, substantially as set forth.

3. A machine for making bale-ties, comprising a suitable supporting framework, an extension or arm therefrom, a cutter blade secured to said arm, a cutter bar pivotally mounted upon the framework and adapted to work in conjunction with the cutter blade, a pivotal fork also mounted upon the framework and embracing the free end of the cutter bar, a bell-crank lever mounted near the delivery end of the machine, a bar connecting the bell-crank lever and the pivotal fork, and an operating bar for actuating the connecting bar, substantially as described.

4. A machine for making bale-ties, comprising a longitudinally extending and horizontal supporting bar, having vertical apertures therethrough, a horizontal base plate secured upon the supporting bar at one end, and a supporting bearing at the opposite end longitudinally adjustable upon said bar and carrying an operating bar, and a longitudinally adjustable block secured upon the supporting bar a suitable distance from the adjustable bearing by bolts passing through said base plate bearing and supporting block and through the apertures of the bar, a longitudinally movable sliding plate mounted upon the base plate, a bar pivotally connecting the crank arm of the shaft carrying the operating arm and the sliding plate, and a bell-crank lever having an outstanding stud or projection against which the slide plate actuating bar is adapted to operate, substantially as described.

5. A bale-tie making machine, comprising a pivotally acting operating-bar provided at one end with a laterally extended arm having a grooved stud at one of its sides, and a pin or hook extending obliquely from the arm and joining the arm at a point adjacent to the stud, substantially as set forth.

6. A bale tie machine, comprising a suitable framework, a base plate mounted upon said framework near one end, and a bearing mounted upon the framework near the opposite end thereof and adjustable toward or from the base plate, a rock-shaft mounted in said bearing having a crank arm at one end, an operating bar secured to the opposite end of the rock-shaft, a slide plate mounted on the upper side of the base-plate, and a link-bar connecting the crank-arm of the rock-shaft and the slide plate, substantially as described.

7. A bale-tie making machine, comprising a suitable supporting framework, a longitudinally movable slide mounted upon said framework and having at one end a vertical standard, a lateral extension of the framework, and a pivotal wire-clamping bar mounted upon the framework and having its free end engaged at times by the standard; the opposite end of the clamping-bar operating in connection with the extension of the framework, substantially as set forth.

8. A bale-tie making machine, comprising a suitable supporting framework, and a twister-bar journaled horizontally upon said framework and having a radial twisting-arm, and also carrying a beveled gear-pinion, a bev-

eled gear-wheel mounted upon the framework and carrying a dog or pawl, a gear-pinion mounted independently of the gear-wheel and having a marginal tooth, and a slide carrying a rack-bar the teeth of which mesh with the said gear-pinion, substantially as set forth.

9. A bale-tie machine, comprising a supporting framework and base plate, a pivotal operating arm or handle located at one end of the machine a sliding plate located upon the base plate at the opposite end of the machine and actuated through a connecting bar, and a pivotally acting bender-bar actuated by the sliding plate, substantially as described.

10. In a bale-tie machine, a base-plate, a bender-bar pivotally mounted upon the base plate, having a hollow hub or boss and a returning spring inclosed within said boss, and having also an outwardly extending arm provided near its lower end with a groove for the reception of the wire, and a buffer spring secured to the margin of the base plate and adapted to bear at the rear of the bender arm, and having also an inwardly projecting arm, and a slide mounted upon the base plate provided with a laterally extending arm adapted to engage the inwardly projecting arm and actuate the bender-bar, substantially as described.

11. In a bale-tie machine, a supporting framework and base plate having an extension frame, a laterally movable longitudinally extending clamping arm pivoted upon said extension and having a beveled inner face, and a regulating-screw mounted in an adjacent part of the extension and engaging the free outer end of the clamping bar, substantially as described.

12. A bale-tie machine, comprising a supporting framework and a base plate mounted thereon, a sliding plate mounted upon said baseplate, a standard mounted upon the base plate, a wire guiding and gripping arm pivotally mounted at the outer side of said standard, a spring mounted upon the standard and supporting normally the wire guiding and gripping arm, and a standard mounted upon the slide plate having a cam stud on its outer face and actuating at times the gripping and guiding arm to clamp the bent wire in combination with a stationary and lateral extension of the base plate, substantially as described.

13. In a bale-tie machine, comprising a supporting standard and a base plate, a sliding plate mounted upon the base plate, a standard mounted upon the base plate, a wire guiding and gripping arm pivotally mounted to the outer side of said standard, a spring secured upon said standard, and a standard located upon the sliding plate having a projecting cam-stud upon its outer face, and a standard mounted longitudinally upon the slide plate at its receiving end and adapted to engage and hold the guiding and gripping arm in its depressed and clamping position until the wire is twisted, substantially as described.

14. In a bale-tie machine, a base plate and a standard thereon, a wire guiding and gripping arm pivoted near its middle to the outer side of said standard, an inwardly projecting stud at its lower and receiving end, an inwardly projecting stud near its middle, and an outwardly projecting stud at its rear or delivery end having a depending and bifurcated lug therefrom to guide and retain the wire in its position, and an outwardly and downwardly extending enlargement near its pivotal point having a longitudinally extending groove in its under margin to receive and guide the wire, substantially as described.

15. In a bale-tie machine, a supporting framework, a base plate mounted upon said framework and having a skeleton extension frame, having a lateral extension at its receiving end, and a clamping arm pivotally mounted upon the extension frame and having a vertical and longitudinally rearward and outward beveled inner face, and an extension end having an aperture for the passage of the wire, and an adjusting bolt mounted upon the extension frame and adapted to clamp the wire between the beveled face of the arm and the lateral extension of the slide, substantially as described.

16. In a bale-tie machine, a supporting framework, a base plate mounted upon the supporting framework and having a skeleton extension frame, and also provided with the longitudinally extending slots, one in the base plate proper and one in the extension thereof, and a slide plate mounted upon the base plate and having a friction roller at its rear end, and a downwardly extending guide rib engaging and working in the forward slot in the extension frame, and a vertical bolt extending through and guided in the rear slot and through the laterally extending arm of the rack-bar, substantially as described.

17. The combination in a bale-tie machine, of a twister-bar having a radial twisting arm or pin adapted to engage an eye or loop in the end of the wire, with a pivotal actuating bar having a hook at its free end adapted to receive the wire eye or loop from the twisting arm or pin, and a stud at the inner end of said hook to receive the eye or loop of the wire from the hook, substantially as set forth.

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

CHARLES O. MOOK.

Witnesses:
HARRIET E. PRICE,
JNO. L. CONDRON.