No. 841,882. PATENTED JAN. 22, 1907.

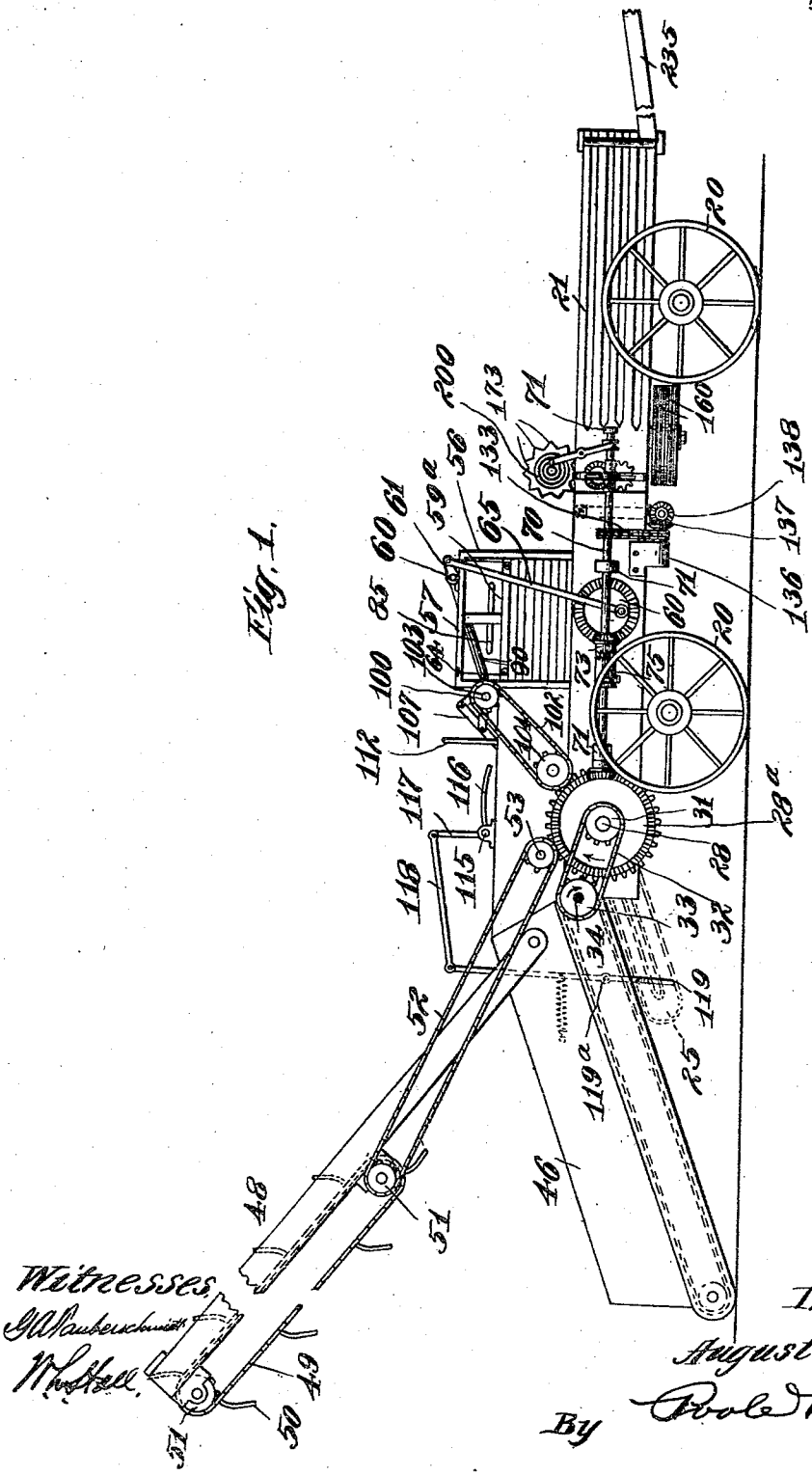
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HAY PRESS.

APPLICATION FILED APR. 9, 1906.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses.

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APPLICATION FILED APR. 9, 1906.

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Fig. 2.

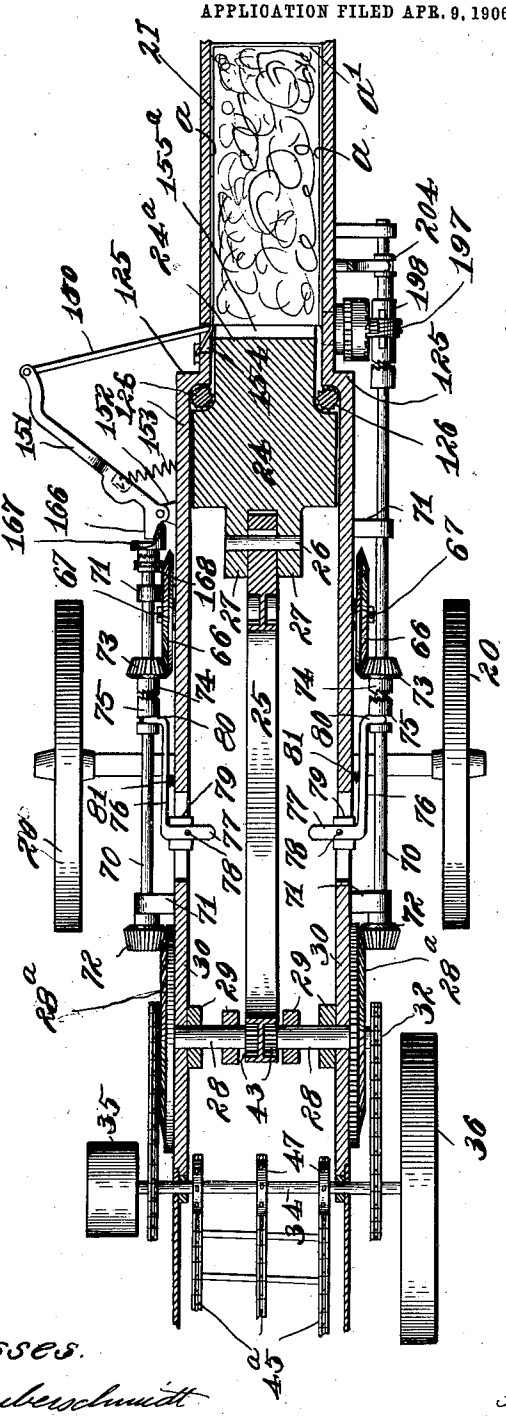


Fig. 7.

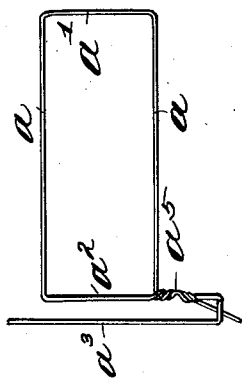
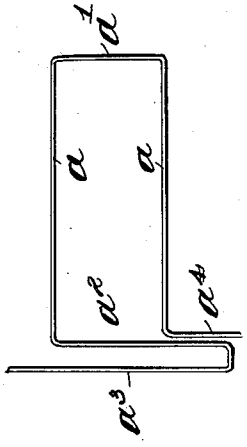


Fig. 6.



Witnesses.

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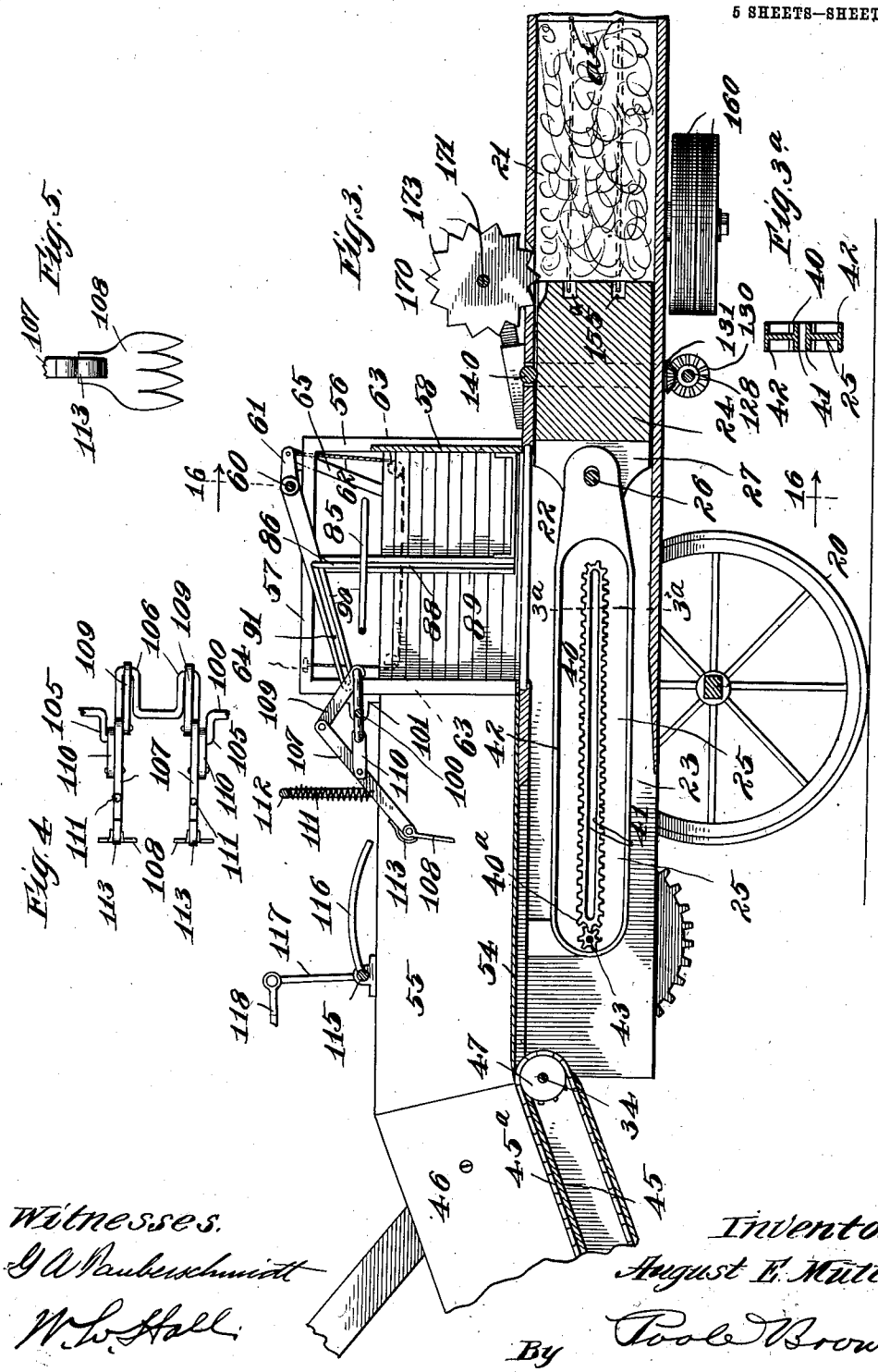
No. 841,882. PATENTED JAN. 22, 1907.

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5 SHEETS—SHEET 3.



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Fig. 8.

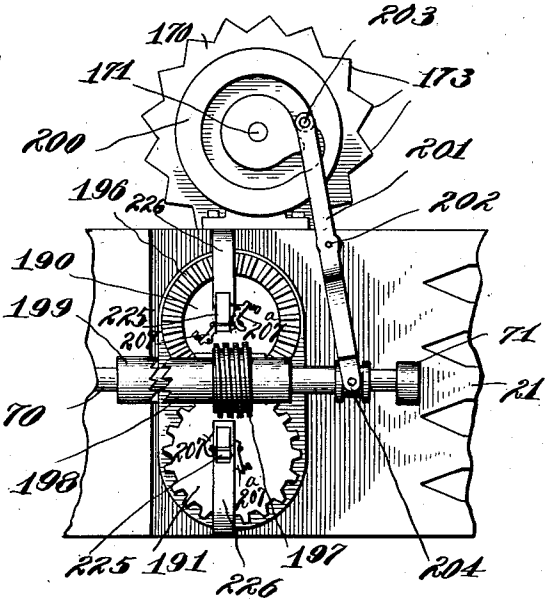
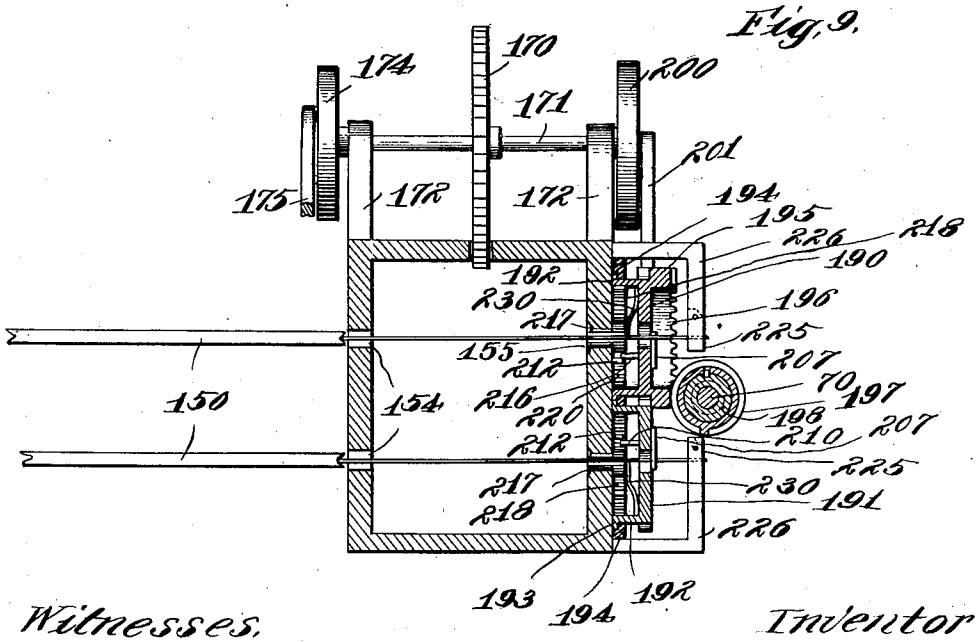


Fig. 9.



Witnesses,

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No. 841,882. PATENTED JAN. 22, 1907.

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APPLICATION FILED APR. 9, 1906.

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Fig. 10.

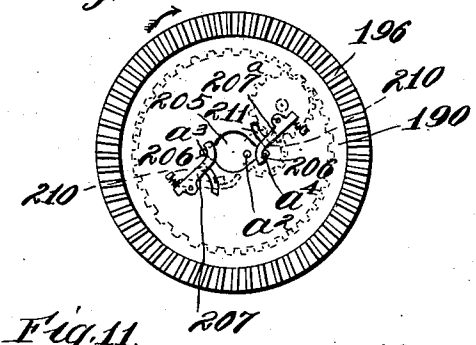


Fig. 11.

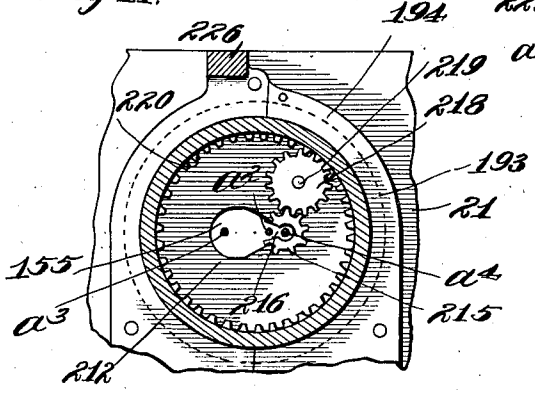


Fig. 12.

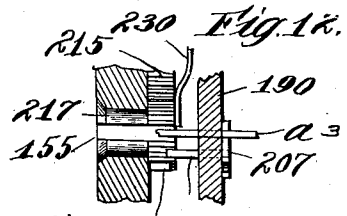


Fig. 13.



210
212

Fig. 14.

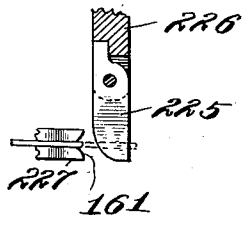


Fig. 15.

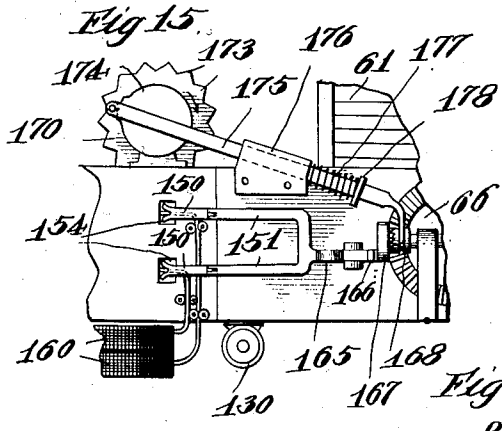


Fig. 16.

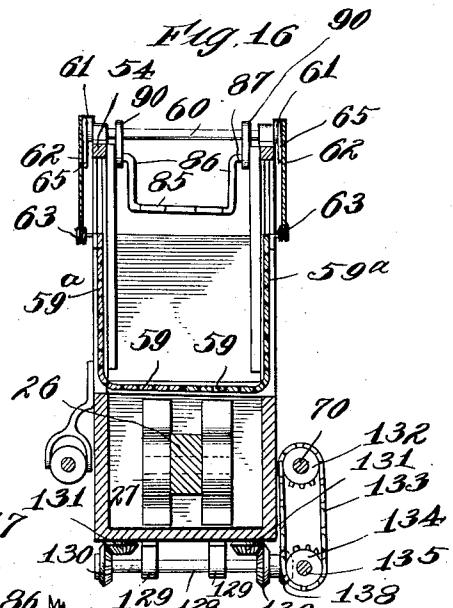
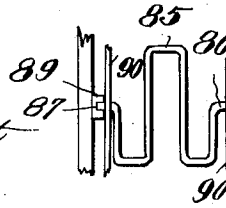


Fig. 17.



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UNITED STATES PATENT OFFICE.

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HAY-PRESS.

No. 841,882. Specification of Letters Patent. Patented Jan. 22, 1907.

Application filed April 9, 1906. Serial No. 310,825.

To all whom it may concern:

Be it known that I, AUGUST E. MÜLLER, a citizen of the Argentine Republic, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hay-Presses; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention relates to improvements in baling-presses for baling hay, straw, and the like; and the invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

Among the objects of my invention is to provide novel mechanism for continuously feeding the hay or like material from a pile or stack to the machine, to provide a novel feed-hopper and means for operating the same to intermittently deliver the material to the feed-chamber of the machine, to provide novel means for actuating the pressing-plunger, to provide a novel feedway through which the material to be baled is delivered to the hopper, to provide novel mechanism for directing the material to be baled through said feedway, to provide novel means for retarding the feed of the said material through the feedway when a charge of the material is being delivered from the hopper to the feed-chamber, to provide means for automatically tying each bale as it is formed, thereby avoiding the necessity of manual labor for this purpose and avoiding the use of separation-blocks to separate the bundles of hay constituting the bales, and to provide other improvements in baling or pressing chambers, as will hereinafter more fully appear.

In the drawings, Figure 1 is a side elevation of a baling-machine, partially broken away, showing my improvements. Fig. 2 is a horizontal section thereof. Fig. 3 is a vertical section of the principal portion of the machine. Fig. 3ª is a section taken on line 3ª 3ª of Fig. 3. Fig. 4 illustrates the mechanism for advancing the material to the feed-hopper. Fig. 5 illustrates one of the fingers or claws constituting part of said mechanism. Figs. 6 and 7 are diagrammatic views illustrating the manner of forming the tie-wire around the bale and the manner in which said wire is twisted. Fig. 8 is a detail illustrating the twisting mechanism and the means for intermittently operating the same. Fig. 9 is a cross-section taken through the baling-chamber, showing the means for threading the wire across the baling-chamber to the twisting mechanism. Fig. 10 illustrates one of the disks carrying the mechanism for holding one end of the binding-wire. Fig. 11 is a section illustrating the twisting mechanism. Fig. 12 is a detail section illustrating the wire-holding disk, the twisting-plate, and the knot-severing knife. Fig. 13 is a detail view illustrating the manner of holding the looped end of the wire preparatory to twisting the same. Fig. 14 is a side elevation of said parts, illustrating in side elevation the wire-holding detent. Fig. 15 is a detail illustrating the mechanism for threading the binding-wire through the baling-chamber and the means for operating the same. Fig. 16 is a vertical transverse section taken on line 16 16 of Fig. 3. Fig. 17 is a partial plan view of the feed-hopper, showing the plunger for forcing the material from the hopper to the receiving-chamber.

The frame of the machine comprises an elongated horizontal open chamber or casing open on both ends and supported on wheels 20 20. Said casing is longitudinally divided into a baling-chamber 21, a receiving-chamber 22, open at its top and through which material to be baled is delivered from a superjacent feed-hopper, and a chamber 23, which incloses a portion of the plunger-actuating mechanism. The baling-plunger 24, which compresses and gives form to the material in the baling-chamber, is actuated by a novel mechanism having the form of a ratchet-pinion mechanism, which embraces one feature of my invention and is made as follows:

25 designates a bar that is pivoted at its forward end to the plunger by means of a pivot-pin 26, extending through an opening in said forward end of the rack-bar, and lugs 27, extending forwardly from said plunger. Said rack is provided with a double row of teeth or cogs adapted for alternate engagement by a rotative pinion fixed to the driving-shaft, and the rack-bar is provided with suitable guides for guiding the pinion from the upper to the lower (and vice versa) of said double row of gear-teeth, whereby rotation of said pinion causes the rack-bar and plunger to re-

ciprocate forwardly and backwardly toward and from the baling-chamber. The particular form of mechanism herein illustrated as embodying this feature of my invention is made as follows:

28 28 designate two parts of a divided driving-shaft, which are mounted in suitable bearings 29 29 and extend through the side walls 30, Fig. 2, of that part of the casing which incloses the plunger-actuating mechanism. The said divided shaft 28 is provided at its ends with sprocket-wheels 31, driven by a sprocket-belt 32 from a sprocket-wheel 33, fixed to the main or power shaft 34, that has suitable bearing in the frame of the machine. Said power-shaft is provided at one end with a belt-pulley 35 and at its other end with a balance-wheel 36. The upper and lower gear-teeth comprising the double row of teeth referred to are designated as 40 40, Figs. 3 and 3ª, and are formed on the upper and lower faces of laterally-directed longitudinal flanges 41, located centrally of the rack-bar. Said upper and lower row of teeth are connected at the ends of the series by curved series of teeth or cogs 40ª, whereby the pinion may pass from one row of teeth to the other. Inasmuch as the arrangement herein shown provides for a divided driving-shaft 28, two sets of upper and lower gear-teeth are provided, one on each side of the rack-bar, and are engaged by pinions 43 43 on the inner ends of the two members of the shaft. In order to maintain said gear-pinion in mesh with the gear-teeth at all times, the said double row of gear-teeth is inclosed or surrounded by guide-flanges 42. (See Fig. 3ª.)

It will be understood that the construction of the rack-and-pinion mechanism described embracing the double row of oppositely-directed teeth, and with which the pinion has alternate engagement, may be varied in its construction so long as the main operative features mentioned are retained.

The material to be baled is fed to the machine through a feed-chute, comprising a bottom wall 45 and side walls or guards 46, by means of an endless conveyer or belt 45ª, trained about pulleys at the ends of the chute, the upper ones 47 of which are the driving-pulleys and are fixed to the power-shaft 34. In the event that the material to be baled is taken from a stack or pile located above the level of the supporting-surface of the machine an inclined feeding device (indicated as a whole by 48) may be employed, comprising a suitable frame that is hinged to the side walls of the conveyer, in which travels an endless conveyer 49, having fingers 50, that are adapted to pull the material from the stack or pile and drop it upon the conveyer 45ª. The conveyer 49 is trained about upper and lower pulleys 51 51, mounted in the frame, and is driven by a sprocket-belt 52, trained about the lower pulley 51, and a sprocket-wheel 53, which is herein shown as rotated from a disk 28ª, fixed to one of the members of the driving-shaft by direct gear or other suitable connections.

The material to be baled is delivered from the conveyer 45ª to a centrally-located feedway comprising a bottom wall 54 and side walls 55, and from said feedway the material is directed to a suitable hopper located over the receiving-chamber of the press. The hopper comprises a suitable frame located over the opening in the top wall of the receiving-chamber 22, consisting of upright and horizontal members 56 57, respectively open at its side toward the runway and closed at the opposite side thereof by a stationary wall 58.

A feature of my invention embraces a suitable floor for the hopper upon which the material to be baled is delivered from the runway, and said floor or hopper is so constructed as to be shifted to open the bottom of the hopper to permit the bundle of material thereon to drop into the receiving-chamber, the plunger 24 at this time being located in rear of the hopper-opening in position to force said material into the baling-chamber in its next forward movement. As herein shown, and as a further feature of the invention, the said bottom wall of the hopper comprises integral parts of flexible side walls, one portion of said bottom being made part of one side wall and the other portion thereof being made part of the other side wall, and said side walls are connected with means whereby they may be drawn upwardly, thereby drawing the members of the bottom wall outwardly away from each other to open the hopper to the receiving-chamber. When the side walls are released from the mechanism that draws them upwardly, they may be returned to their lower positions to close the bottom of the hopper by gravity, and such means of return are herein shown. The hopper-frame is provided with suitable guides to guide the flexible side and bottom walls in their movement.

As more clearly shown in Fig. 16, 59 59 designate the two members of the bottom walls of the hopper described, and 59ª 59ª the side walls thereof, which are made parts of said bottom walls. In other words, the two side walls and the two bottom walls are made of flexible members which meet at the center of the hopper, and by drawing the side walls upwardly in the guides referred to said bottom walls move outwardly to permit the material being baled to drop into the receiving-chamber below. The construction of the flexible walls, as herein shown, comprises slats connected together in any suitable manner, as by means of a webbing to which the slats are attached. The means herein shown for thus raising the flexible members constituting the side and bottom

walls of the hopper are made as follows: 60 designates a rock-shaft that extends transversely across the top of the hopper-frame and is mounted in suitable bearings thereon. Said rock-shaft is provided at its ends with radial arms 61 61, which are connected, by means of cords or cables 62, with the said flexible side walls of the hopper. As shown, said cables are trained about pulleys 63 63, attached to the upper margins of said walls, and said cables are fixed at their other ends at 64 to the upper horizontal members of the hopper-frame, Fig. 3. The rock-shaft 60 is rocked in its bearings through the medium of connecting bars or links 65, Fig. 1, connected at their upper ends with the rock-shaft arms 61 and at their lower ends with crank-disks 66, rotatively mounted on studs 67, Fig. 2, fixed to the sides of the casing. The said crank-disks 66 are intermittently rotated at the proper times to raise said flexible side walls and open the bottom of the hopper through the medium of the following mechanism.

70 70, Figs. 1 and 2, designate horizontal shafts mounted in suitable bearings 71 at the sides of the machine and provided at their forward ends with beveled pinions 72 72, which mesh with beveled gear-teeth on the outer faces of the disks 28^a 28^a, fixed to the ends of the divided shaft 28, one of which has been hereinbefore referred to. The said crank-disks 66 are formed with beveled gear-teeth which are adapted for engagement with beveled pinions 73 73, that are rotatively mounted on the shafts 70. Said beveled pinions 73 are normally loose on said shafts, but are adapted to be temporarily locked thereto by suitable clutch devices for the purpose of intermittently rotating the disks 66. As herein shown, said pinions are formed on sleeves 74 74, Fig. 2, which are rotatively mounted on the shaft 70.

75 75 designate sleeves which are fixed non-rotatively on the shafts 70 and designed to slide endwise thereon, and said sleeves 75 and the pinion-sleeves 74 are provided on their adjacent ends with clutch-teeth adapted to be brought into mesh by endwise movement of the clutch-sleeves 75 to temporarily lock the pinions to the shafts. The means herein shown for sliding said clutch-sleeve 75 into engagement with the toothed ends of the pinion-sleeves 74 consists of levers 76 76, Fig. 2, located outside the side walls of the receiving-chamber and provided at their forward ends with inwardly-turned parts 77 77. Said clutch-actuating levers are hinged to the side walls of said receiving-chamber by means of pins 78 78, extending through said inwardly-turned parts 77 thereof and into bearing-blocks 79 79, carried by said walls. The rear ends of said clutch-actuating levers outside of said walls are provided with outwardly-turned parts 80, which engage grooves in the clutch-sleeves 75, thereby imparting endwise movement to the clutch-sleeves while permitting them to rotate. The inwardly-turned ends 77 of said clutch-levers are located in the path of the rear end of the plunger, so that when said plunger is in its rearmost position it acts upon said inwardly-turned parts of the levers to throw the clutches into operation for operating the flexible walls of the hopper, as described. Springs 81 81 are interposed between the said clutch-operating levers and the side walls of the receiving-chamber which act to restore the clutch devices to their inoperative positions as soon as the plunger again starts forwardly, thereby permitting the flexible walls to return to their normal positions by gravity, as before stated. At the time the plunger is in its rearmost position and the hopper is open the charge of the material being baled falls into the receiving-chamber in front of the plunger to be pressed into the baling-chamber in the next advance movement of the plunger. The passage of the pinion 43 from one row of gear-teeth 40 to the other provides a dwell of a sufficient length to permit the required operation of the flexible side and bottom walls of the hopper for the purpose set forth.

As a further improvement means are provided for positively forcing the charge of material from the hopper into the receiving-chamber at the time the hopper is open. As herein shown, said means comprise a vertically-movable plunger device 85, herein shown as made of wire bent in zigzag form and provided at its ends with arms 86, having oppositely-extending end portions 87, which have guiding engagement with grooves 88, formed in vertical bars 89, located one at each side of the hopper and fixed to the frame thereof in any suitable manner. The said plunger 85 is operated to be depressed at a time when the bottom of the hopper is open by mechanism made as follows.

90 90 designate bars which are fixed at their rear ends to the rock-shaft 60 and extend rearwardly and downwardly and are provided with slots 91, through which extend the outwardly-directed guide ends 87 of the plunger-arms. With this construction when the rock-shaft arms 61 are swung upwardly the rear ends of said bars are swung downwardly, thereby depressing said plunger for the purpose set forth. Said plunger is automatically returned to its uppermost position when the flexible walls drop downwardly to close the hopper.

Means are provided for positively raking the material being baled from the runway into the hopper during the feeding operation of the said material through the feedway. This mechanism is illustrated more clearly in Figs. 3, 4, and 5 and is made as follows: 100 designates a transverse shaft mounted in

suitable bearings 101, extending forwardly from the hopper-frame. The said shaft is rotated through the medium of a sprocket-chain 102, Fig. 1, trained about a sprocket-wheel 103, fixed to one end of said shaft, and another sprocket-wheel 104, rotatively mounted on a stud extending laterally from the frame of the machine and connected by gear connections with one of the toothed or cogged disks 28ª, before referred to. The said shaft 100 is provided with two short crank portions 105, located in the same plane, and with two other longer crank portions 106, located in the same plane with each other and at an angle of one hundred and eighty degrees from the crank portions 105. 107 designates rake-bars, which are provided at their forward ends with rake teeth or claws 108 and are hinged at their upper rear ends to the forward ends of links 109, which latter are hinged at their rear ends to the longer crank portions 106 of the rotative shaft 100. 110 110 designate shorter links which are pivoted at their rear ends to the shorter crank portions of said shaft and at their forward ends to the said rake-bars intermediate to the ends of the latter. 111 111 designate springs which are attached at their lower ends to said rake-bars 107 in front of the connections thereof with the shorter links 110 and at their upper ends to a bale-like frame 112, rising upwardly from the side boards of the feedway. Said springs exert an upward stress or pull on the rake-bars. With this construction when the shaft 100 is rotated the connection of said rake-bars with the crank-shaft, through the medium of the links 109 and 110 thereof with the longer and shorter crank portions, respectively, of said shaft, operates to swing the lower or raking ends of said bars downwardly and rearwardly to rake the material from the feedway to the hopper and upwardly and forwardly to reëngage the same with the body of material passing through the feedway. The rake members or claws 108 are shown as pivoted to the lower ends of the rake-bars, and springs 113, fixed to said bars and bearing on said claws, serve to hold the same in a proper raking position relatively to the bars, while permitting the rake members or claws to yield under the stress of the raking movement.

As a further improvement in machines of this character means are provided for temporarily retarding the movement of the material through the feedway at the time the hopper is open to discharge its contents into the feed-chamber of the machine. The mechanism herein shown for producing this result is illustrated more clearly in Figs. 1 and 3 and is made as follows: 115 designates a rock-shaft extending transversely across the feedway and supported in bearings fixed to the side walls of the feedway. Said rock-shaft is provided with rigidly-affixed retarding-bars 116, normally occupying a substantially horizontal position, and is provided also with a crank-arm 117. Hinged to the upper end of said crank-arm 117 is a link 118, which extends forwardly and is hinged or loosely connected with an actuating-bar 119, Fig. 1, that extends downwardly at one side of the inclined feed-chute, is pivoted thereto at 119ª, and is then turned under said chute into the path of the plunger-actuating rack 25 when the latter occupies its rearmost position, as indicated in dotted lines in Fig. 1. When, therefore, said rack and plunger are in their retracted positions, the retarding-bars will be thrown downwardly to temporarily retard the feed of the hay so long as the hopper is opened and the plunger retracted. The rear end of the baling-chamber is laterally narrowed, as shown at 125, Fig. 2. Located in the angle between the narrow and wider portions of said chamber are vertical compressing or concentrating rollers 126, journaled in any suitable manner in the upper and lower walls of the baling or pressing chamber. Said rollers project slightly inside the planes of the walls of the narrower portion of said chamber. The plunger 24 is provided with a reduced advance end 24ª, which enters between said concentrating-rollers into the narrower portion of the baling or pressing chamber. As herein shown, the said rollers are longitudinally corrugated and are rotated in a direction to compress the material that is forced between the same and direct it to the narrower portion of the chamber. The means for driving said rollers is shown more clearly in Figs. 1 and 16 and is made as follows: 128 designates a rotary shaft located beneath the baling-chamber, mounted in suitable bearings 129, depending from the lower side of said chamber. Fixed to said transverse shaft are beveled pinions 130 130, that mesh with beveled pinions 131 131, attached to the lower ends of the shafts of said concentrating-rollers 126. Said shaft 128 is driven from one of the horizontal operating-shafts 70 at the side of the machine (the shaft at the right hand of the machine as herein shown) through gear connections arranged as follows: The said shaft 70 is provided with a sprocket-wheel 132, and power is transmitted therefrom through a sprocket-chain 133 to a sprocket-wheel 134, fixed to a short rotative shaft 135, that is rotatively mounted in a bearing 136, Fig. 1, attached to the side of the baling-chamber. The said shaft 135 is provided with a beveled gear-pinion 137, that meshes with a beveled gear-pinion 138, fixed to the transverse shaft 128, before described. Preferably, also, a transverse horizontal roller 140 extends across the top of the baling-chamber at the narrowed portion thereof, Fig. 3, and is mounted so as to be free to rotate in any suitable manner,

said roller operating in connection with the vertical concentrating-rollers to facilitate the passage of the material being baled from the wider to the narrower portion of the baling-chamber.

As a further and separate improvement in a device of this character I provide mechanism for automatically tying or binding the bales as they are formed in the baling-chamber, and said tying mechanism operates to automatically separate one bale from another without the employment of separation-blocks, as heretofore common. The operation of this mechanism includes the threading of the binding-wire horizontally across the baling-chamber in the path of the material as it is formed in a bale. The wire is fastened at one end at one side of the baling-chamber and is wound about a suitable reel at its other end. As the material being baled is accumulated and forced rearwardly by the plunger and takes the form of a bale the wire which extends across the baling-chamber is forced ahead of the forming bale and the slack end of the wire is drawn into the chamber to form a loop inclosing the bale and whose side members *a a*, Figs. 2, 6, and 7, lie against the inner sides of the baling-chamber wall, while the end member extends transversely across the advance end of the bale. In the present instance the bale is confined by two vertically-separated binding-wires. Inasmuch, however, as the manner of applying both wires is identical, the description of one will serve for the description of both.

After the first bale has been practically completed the compressed material and the binding-wire surrounding the same occupy the position indicated in Fig. 2. After the bale has been thus formed mechanism is set in motion to force the slack portion of the wire between the formed bale and the plunger to provide the transverse end portion a^2, Figs. 6 and 7, which completes the bale-tie. The forcing or threading of the slack part of the wire between the formed bale and the plunger to produce the transverse end portion that completes the tie forms a loop, one member of which comprises the part a^2 and the other member the part a^3 parallel therewith, which when severed from the part a^2 in a manner to be described is held at its free end and constitutes the fast end of the tie or loop for the next bale to be formed. The member a^2 when threaded through the baling-chamber is disposed for a portion of its length parallel with the fast end of the wire constituting the tie or loop for the bale just formed, and mechanism is provided for twisting the said parallel portions of the members a^2 and a^4 to produce the twist a^5, Fig. 7, which completes the bale-tie. Associated with the twisting mechanism hereinafter to be described and which, so far as other features of the mechanism are concerned, may be made of any suitable type is the means for grasping and holding the free end of the member a^3, so that when said member a^3 is severed from the twisted part the severed end of the member a^3 becomes the fixed end of the wire. Thereafter as the next bale is being formed the completed bale is pushed rearwardly through the chamber to be discharged therefrom, and the member a^3 of the wire accommodates itself to the forming bale to produce a loop or tie that surrounds three sides of the bale and is completed after the formation of such bale by again threading the slack portion of the wire across the bale-chamber and thereafter twisting the ends of the completed tie in the manner before stated.

In preparing the machine for forming the first bale the wire is threaded across the bale-chamber by hand and the end thereof fastened by the means hereinafter to be described. The means for thereafter threading the slack portions of the wire between a formed bale and the plunger consists of threading-bars 150 150, hinged at their outer ends to horizontally-swinging levers 151 151, which are pivoted to brackets 152, extending laterally from the side wall of the baling-chamber. The said levers are held normally in the position shown in Fig. 2, swung away from the baling-chamber, by springs 153, interposed between said levers and the side wall of said chamber. The side walls of the baling-chamber are provided with horizontally-alined openings 154 155, and the threading-fingers 150 are adapted to be thrust inwardly through said openings by mechanism operating on the levers 151 to thread the slack portion of the wire across the baling-chamber, as described. The advance end of the plunger is provided with horizontal grooves or recesses 155^a, through which the threading-fingers and the wire carried thereby pass, thereby preventing interference of said wire with the adjacent end of the completed bale and avoiding the use of separating-blocks to properly separate the bales preparatory to the tying or binding operation. It will be observed that this operation occurs at a time when the plunger is at the limit of its stroke, and the rack-and-pinion actuating mechanism is such as to provide a suitable dwell at this time to afford the time required to thread the wire through the baling-chamber.

It will be observed by reference of Figs. 1 and 15 that the wire is led from two reels 160 160, rotatively mounted below the baling-chamber, as herein shown, upwardly through the lateral openings 154, above referred to, and that at a time a bale is being formed the slack portion of the wire extends across the path of the threading-fingers, Fig. 2. The ends of the fingers are formed with V-shaped notches 161, Fig. 14, to insure

proper engagement thereof with the wire and to insure the threading of the slack portion of the wire through the chamber. Any suitable mechanism may be employed to operate the threading-finger levers for the purpose set forth. The mechanism herein shown for this purpose is made as follows: Said levers are joined to a shank 165, which is pivoted to the bracket 152, before referred to. The heel 166 is adapted for engagement with a cam 167, formed on a sleeve that is normally free to rotate on the adjacent shaft 70 and is locked thereto by a clutch 168, which slides endwise of the shaft toward and from the cam-sleeve, and said sleeves are provided on their adjacent ends with clutch-teeth, which are brought into mesh at the appropriate time to lock the cam to the rotative shaft, and thereby operate said threading-fingers. As a further and separate improvement in my improved machine the said clutch is thrown into action by mechanism controlled by the completion of the bale, the same being made as follows: 170 designates a timing-wheel fixed to a shaft 171, that extends transversely above the baling-chamber and has bearing in standards 172, rising therefrom. The said timing-wheel or disk is provided with peripheral teeth 173 and extends through a slot in the top wall of the baling-chamber for engagement of said teeth with the compressed material being baled. Fixed to one end of said shaft 171 at the side of the machine adjacent to the threading-fingers is a cam-disk 174. Said cam is engaged by the bearing-roller of an endwise-reciprocating cam-bar 175, that has guiding engagement with a guide 176, fixed to the baling-chamber, and said bar is turned downwardly at its other end for engagement with a groove of the cam-sleeve 168. The cam operates to bring said clutch into action, and a spring 177, surrounding said bar and interposed between a shoulder 178 thereon and the guide-bearing, operates to restore the clutch to its normal inoperative position. The timing-wheel is operated step by step by engagement of the pressed material with the peripheral teeth thereof, and when a given quantity of the compressed material passes thereunder the wheel and its shaft 171 are rotated to bring the cam-disk 174 in position to actuate the cam 167, which controls the operation of the wire-threading fingers 150. The parts referred to are so timed that the fingers are forced inwardly to thread the tie-wire across the baling-chamber just before the plunger has completed its inward stroke, and the cam 174 releases the cam-bar 175 just after the threading operation, at which time the spring 153 returns the parts to their normal inoperative positions. The timing wheel or disk 170 also controls the operation of the twisting mechanism, which latter mechanism will now be described. 190 191 designate rotative disks located at the right-hand side of the machine, one opposite to each of the openings 155 on this side of the machine. The said disks are provided with inwardly-extending annular rims 192, provided at their inner margins with narrow radial annular flanges 193, which bear against the adjacent wall of the baling-chamber. The said disks are mounted on said chamber-wall by means permitting them to rotate about their axes by a two-part plate 194, which overlaps said flanges 193 and are formed to provide annular bearings for the flanges 193 to permit the disks to rotate, as stated. The disks are provided with intermeshing peripheral gear-teeth, whereby one of the disks is rotated from the other. One of said disks (the disk 190 as herein shown) is driven from the adjacent horizontal shaft 70 by the following device: The said disk 190 is provided with an outwardly-directed annular flange 195, having laterally-facing annularly-arranged gear-teeth 196, Figs. 8, 9, and 10. The said gear-teeth mesh with a worm-gear 197, non-rotatively fixed to a sleeve 198, mounted on and sliding endwise of the shaft 70. The said worm-gear 197 is keyed to said sleeve, as shown in Figs. 8 and 9, whereby the sleeve may slide endwise therein. The sleeve 198 is provided at one end with clutch-teeth which mesh with clutch-teeth formed on a collar 199, fixed to the shaft. When the sleeve is clutched to said collar, therefore, rotary movement of said shaft is imparted to the disk 190 through the worm-and-gear-connection described. The clutch-sleeve is moved endwise to bring the clutch elements into engagement through the medium of a cam 200, fixed on the shaft 171, Fig. 9, and a cam-lever 201, pivoted at 202 to the adjacent side wall of the baling-chamber. The upper end of said lever is provided with a pin 203, that travels in the groove of said cam, and the lower end of the lever is forked and hinged to a grooved collar 204, formed on a reduced part of the sleeve 198. The cam 200 is so timed relatively to the cam 174, that controls the operation of the stringing-fingers, that the said fingers are operated in advance of the disks 190 and 191. The said disks are provided with central openings 205, Fig. 10, located in lateral alinement with the openings 155 of the side wall of the baling-chamber. The said openings 205 are horizontally elongated and are formed with lateral recesses 206. Pivoted to the outer faces of said disks are spring-pressed holding-dogs 207 207^a, located one hundred and eighty degrees apart and having inner curved ends which extend across the lateral extensions or recesses 206 of the openings 205 and between which and the walls of said recesses the members of the binding-wire are held, as shown in Fig. 10 and as hereinafter described. The said dogs are provided with pins 210 210, which extend inwardly through curved slots

211, formed in said disks. Said pins are adapted during the rotation of the disks to engage tripping-lugs 212 212, extending laterally from the adjacent wall of the baling-chamber, whereby at a certain period during the rotation of each disk the dogs are swung away from the lateral extension of the opening. Located laterally inside said disks are the wire-twisting devices. The form of twisting device herein shown embraces a plate 215, having a general circula contour and provided at one side with a V-shaped notch 216. The said twisting-plates are formed with hollow shanks 217, Fig. 12, rotatively mounted in recesses or lateral extensions of the openings 155. The V-shaped notches open normally toward the openings 155. Said twisting-plates are peripherally toothed and mesh with gear-pinions 218, rotatively mounted on studs 219, fixed in the side walls of said baling-chamber. Said pinions mesh with internal annular racks 220, formed on the inner cylindric faces of the flanges 192 of the disks 190 191. Rotation of said disks therefore imparts relative movement to the twisting-plates.

Preparatory to forming the first bale one end of each wire is inserted through the bale-chamber and through the opening 155 and the opening 205 of the holding-disks and the end of the wire is inserted between the curved end of the holding-dog 207^a and the walls of its associated lateral extension or recess. Such engagement of the wire fixes one end thereof, and in the subsequent forming of the bale the slack portion of the wire forms the looped tie in the manner stated. When the bale is formed, the fingers 150 thread the loop consisting of the members a^2 a^3 through the baling-chamber and through the openings 155 and 205. The parts are so timed that at this time the holding-dog 207^a is swung down by engagement of the pin 210 thereof with the tripping-stud 212. The wire a^3 therefore passes into one of the lateral extensions of the opening 205 of the holding-disk. The position of said members of the wires relatively to the twisting-plate is shown in Fig. 11, the member a^4 being in the bottom of the V-shaped notch of said plate, the member a^2 in the open part of said notch, and the member a^3 at the side of the opening 155 remote from the twisting-plate.

The looped wire composed of the members a^2 a^3 is thrust beyond the rotating disks 190 191 and are engaged with holding-detents 225, pivoted to the vertical parts of overhanging arms 226, Figs. 9, 14, and 15. The said detents swing outwardly when engaged by the ends of said fingers or the wire carried thereby. The said fingers are provided at their ends with recesses 227, and when the wires stretched across the ends of said fingers and the notches thereof reach the outward limit of their movement the detents drop backwardly into the said recesses 227 and behind the transverse member of said wire loop, whereby the loop is held in place while permitting the fingers to retire. After the fingers have retired from said disks the clutch mechanism is set in operation to rotate the disks from the positions shown in Figs. 10 and 11 in the direction indicated by the arrow in Fig. 10, with the result of twisting the member a^2 around the member a^4 to produce the twist a^5. As the disk 190 rotates the member a^3 of the wire is moved to the position formerly occupied by the member a^4, while the lateral extension or recess formerly occupied by the member a^4 is angularly moved to the position formerly occupied by the recess engaged by the member a^3. During such rotation of the disk the twisting-plate is rotated a number of times to effect the required twisting of the wire to produce the twist a^5. During such rotation of the disks the pin 210 of the dog 207^a, carried thereby, strikes the coacting tripping-lug 212, which throws the end of the dog away from the central opening of said disk, as shown in dotted lines in Fig. 10. At this time another loop of the tie is threaded through the baling-chamber and disk and the member a^3 of said loop is free to enter the lateral recess of the opening 205, located in position to receive the same, and after said members of the loop have been placed and the threading-finger retires the locking-dog is released from the stud 212 and swings to the position shown in full lines in Fig. 10 to lock the member a^2 between the same and the walls of the associated notch or recess 206. It will thus be seen that what has been termed the "fixed" end of the wire is held in place during the formation of the bale, while the slack end thereof is drawn into the baling-chamber to form the looped-shaped bale-tie.

In Fig. 10 the parts are shown in full lines in the position which they occupy just before the twisting operation takes place. The mechanism is so timed that the disks 190 191 will always stop in the position shown in Fig. 10.

The twist a^5 is severed by knives 230, fixed to and rotating with the disks 190 191 and bearing against the outer faces of the twisting-plates 215, thereby acting with a shearing effect against said plates. After the twist has been severed in the manner stated the tied bale is free to be pushed ahead of the next bale as it is formed.

As a further improvement the bales are discharged from the baling-chamber through a chute 235, extending rearwardly and upwardly from the rear end of said chamber. This arrangement effects a back pressure of the bales in the chute, which may be made as long as desired, which supplements the baling pressure of the plunger.

It will be understood that the construction

of my improvements in the various parts of the machine described and that said invention is not limited to such construction except as hereinafter made the subject of specific claims hereto appended.

I claim as my invention—

1. In a baling-press, the combination with the baling-chamber, the receiving-chamber and the plunger, of a hopper located above the receiving-chamber, a feedway arranged centrally of the machine and opening into the hopper, a conveyer for continuously feeding material to be baled through said feedway to the hopper, a hinged retarding-arm mounted on a pivot located above the feedway in front of the hopper and means for swinging said retarding-arm downwardly into the feedway in the path of the material through said feedway for the purpose set forth.

2. In a baling-press, the combination with the baling-chamber, the receiving-chamber, the plunger, a rack-bar pivoted to the plunger and extending forwardly therefrom, and a pinion engaging the rack-bar to reciprocate the plunger, of a hopper located above the receiving-chamber, a feedway arranged centrally of the machine and opening into the hopper, a conveyer for continuously feeding material to be baled through said feedway, a hinged retarding device mounted above the feedway and means operated by the rack-bar when the plunger is in its retracted position for swinging said retarding device into the feedway for the purpose set forth.

3. In a baling-press, a hopper provided with flexible side walls, the latter provided with lower terminal parts which constitute the bottom of the chamber, and are adapted to be separated to open the hopper-bottom by movement of the flexible walls upwardly, means for moving the side walls upwardly and guides for said flexible walls and terminal parts thereof.

4. In a baling-press, the combination with a baling-chamber, a receiving-chamber and a plunger, of a hopper located above said receiving-chamber and provided with a bottom to temporarily close the hopper comprising two members arranged to slide horizontally away from each other to open the hopper, horizontal guides for said members, and means for actuating the members to slide the same away from each other.

5. In a baling-press, the combination with the baling-chamber, the receiving-chamber and the plunger, of a hopper located above said receiving-chamber and provided with a movable bottom to close the lower end of the hopper, means for feeding material to be baled into said hopper, and means controlled by the plunger for moving the bottom wall of the hopper outwardly for opening the hopper to the receiving-chamber.

6. In a baling-press, the combination with herein shown is illustrative of the application the baling-chamber, the receiving-chamber and the plunger, of a hopper located above said receiving-chamber provided with flexible side walls having guiding engagement with the frame of the hopper, said flexible side walls having terminal parts which constitute the bottom of the hopper and mechanism for raising said side walls and thereby shifting the terminal parts thereof to open the hopper to the receiving-chamber.

7. In a baling-press, the combination with the baling-chamber, the receiving-chamber and the plunger, of a hopper located above said receiving-chamber provided with flexible side walls having guiding engagement with the frame of the hopper, said flexible side walls having terminal parts which constitute the bottom of the hopper, mechanism for raising said side walls and thereby shifting the terminal parts thereof to open the hopper to the receiving-chamber, and means for forcing the material from the hopper to the receiving-chamber when the hopper is open.

8. In a baling-press, the combination with the baling-chamber, the receiving-chamber and the plunger, of a hopper located above said receiving-chamber provided with flexible side walls having guiding engagement with the frame of the hopper, said flexible side walls having terminal parts which constitute the bottom of the hopper, mechanism for raising said side walls and thereby shifting the terminal parts thereof to open the hopper to the receiving-chamber, and a plunger operatively connected with said wall-raising mechanism and designed to be lowered into the hopper when said walls are raised.

9. In a baling-press, the combination with a horizontal baling-chamber and its plunger, of a rack-bar loosely connected at its rear end with the plunger and having a rising-and-falling movement at its forward end, and a pinion engaging the rack for reciprocating said plunger in both directions of its movement.

10. In a baling-press, the combination with a horizontal baling-chamber and its plunger, of means for reciprocating the plunger comprising a bar loosely connected at its rear end with the plunger and having rising-and-falling movement at its forward end, said rack-bar being provided with upper and lower rows of teeth which are connected at the ends of the bar by curved connecting series of teeth, and a rotative pinion meshing with said teeth and designed for engagement alternately with said upper and lower rows.

11. In a baling-press, the combination with a horizontal baling-chamber and its plunger, of means for reciprocating the plunger comprising a bar loosely connected at its rear end with the plunger and having a rising-and-falling movement at its forward end, said

bar being provided with upper and lower rows of gear-teeth connected at their ends by curved series of teeth, a rotative pinion meshing with said teeth and designed for engagement alternately with said upper and lower rows, and curved guides for maintaining the pinion in mesh with said gear-teeth to guide the same from one row thereof to the other.

12. In a baling-press, the combination with the baling-chamber, the receiving-chamber and the plunger, of a hopper located above the receiving-chamber, a centrally-located feedway leading to the hopper and a rack located beneath the feedway and loosely connected with the plunger for reciprocating the latter, and a pinion engaging said rack.

13. In a self-binding baling-press, means for forming the bale, means for forming the binding-wire about the bale as it is being formed, and means for twisting the wire ends together comprising an apertured rotative disk, means for holding the wire ends engaged with the disk at the aperture thereof, and a notched rotative twisting-plate located laterally inside of said disk for twisting one end of the wire upon the other.

14. In a self-binding baling-press, means for forming the bale, means for forming the binding-wire about the bale as it is being formed, and means for twisting the wire ends together comprising an apertured rotative disk, means for holding the wire ends engaged with the disk at the aperture thereof, a notched rotative twisting-plate located laterally inside of said disk for twisting one end of the wire upon the other, and means for severing the twisted parts of the wire.

15. In a self-binding baling-press, means for forming the bale, means for forming the binding-wire about the bale as it is being formed, and means for twisting the wire ends together comprising a rotative apertured plate, means for holding the wire ends engaged with said plate at the apertured thereof, and a rotative twisting plate located laterally inside of said disk and provided with a notch adapted to receive one of the wire ends for the purpose set forth.

16. In a self-binding baling-press, means for forming the bale, means for forming the binding-wire about the bale as it is being formed including a rotative apertured disk through which a loop of the tying-wire is passed, means carried by the disk for holding the ends of the binding-wire, a threading-bar for threading the wire through the aperture of said disk, means for holding the threaded wire passed by said bars laterally outside of the disk, means located laterally inside of said apertured disk for twisting the looped threaded wire with the fast end of the wire, and means for severing the twisted part of the wire.

17. In a self-binding baling-press, means for forming the bale, an apertured rotative disk located at one side of the baling-chamber, means for threading a looped wire across the path of a forming bale comprising a threading-bar having a notch at its end engaging said wire and which passes through the aperture of said disk, a detent outside of said disk for holding the looped portion of the wire after the threading-bar has retired, means carried by the rotative disk for holding fixed one end of the tying-wire, means for twisting one member of the threaded loop portion, and the fixed end of the wire, and means for severing the wire at the twisted portion thereof.

18. In a self-binding baling-press, means for forming the bale, a rotative apertured disk located at one side of the baling-chamber and provided with oppositely-disposed notches at the aperture thereof, means carried by the disk for holding fixed one end of the wire, means for threading a looped portion of the wire across the path of the bale through said aperture in the disk, means whereby one member of said loop is held engaged with said disk at its aperture, means for twisting one member of the loop with the fast end of the wire, and means for thereafter severing the wire at the twist thereof.

19. In a self-binding baling-press, means for forming the bale in the baling-chamber, a rotative apertured disk located at one side of the baling-chamber and provided with oppositely-disposed notches or recesses, a dog carried by said disk and operating to hold one end of the wire fast in one of said notches, means for threading a looped portion of the slack end of the wire through the aperture of the disk, a second dog acting to hold one member of said loop fixed to the rotative disk in the other notch, a twisting device for twisting one member of the loop with the fast end of the wire, and means for severing the wire at the twist thereof.

20. In a baling-press, the combination with a baling-chamber, an inclined conveyer for conveying the material to be baled to said chamber, and a plunger in the baling-chamber, of a rack loosely connected with the plunger for reciprocating the plunger in both directions, and a pinion engaging said rack, said conveyer being inclined downwardly and rearwardly from the press, and the rack when swung backwardly extending at its rear end below said conveyer.

21. In a baling-press, the combination with the baling-chamber and its plunger, of a shaft extending transversely of the press in rear of said chamber, a drive-shaft operatively connected with said first shaft at its end outside of the frame of the press for rotating the latter, a pinion carried centrally by said first shaft and a rack-bar hinged to the plunger and provided with two sets of teeth adapted for alternate engagement by said rack for reciprocating the plunger.

22. In a baling-press, the combination with a baling-chamber, a receiving-chamber and a plunger, of a hopper located above the receiving-chamber, a feedway arranged centrally of the machine and opening into the hopper, a rack hinged to the plunger and located centrally of the machine below said feedway, a shaft extending across the machine in front of the baling-chamber and a pinion on the shaft engaging said rack.

23. In a self-binding baling-press, means for forming the bale in the bale-chamber thereof, a rotative apertured disk located at one side of the bale, means for holding one end of the binding-wire fast to said disk at the aperture thereof, means for threading the slack portion of the wire in the form of a loop through the aperture of the disk, means for engaging one member of said loop to hold it fast to said disk, a rotative twisting-plate located between the baling-chamber and said apertured disk provided with a notch for engaging said fast end of the wire and one of the members of said loop for twisting the wire, and means for severing the wire at the twist thereof.

24. In a self-binding baling-press, means for forming the bale in the baling-chamber thereof, means for making fast one end of the binding-wire extending across the path of the forming bale, a threading-bar provided at its end with a horizontal and a vertical notch adapted to engage the slack end of the binding-wire to thread the wire in looped form through the chamber, a swinging detent located at the side of the chamber for engaging the looped part of the wire to hold the same after the threading-bar has retired, means for twisting the fast end of said wire to one member of the loop, and means for severing the twisted portion of the wire.

25. In a baling-press, a baling-chamber which is reduced between its ends, combined with a reciprocating plunger that has a rigidly united reduced advance end that extends into the reduced portion of the chamber.

26. In a baling-press, a baling-chamber which is reduced between its ends, combined with a reciprocating plunger that has a reduced advance end that extends into the reduced portion of the chamber, and rollers located in said chamber at the reduced portions thereof for the purpose set forth.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 2d day of April, A. D. 1906.

AUGUST E. MÜLLER.

Witnesses:
A. M. BURR,
GEORGE R. WILKINS.