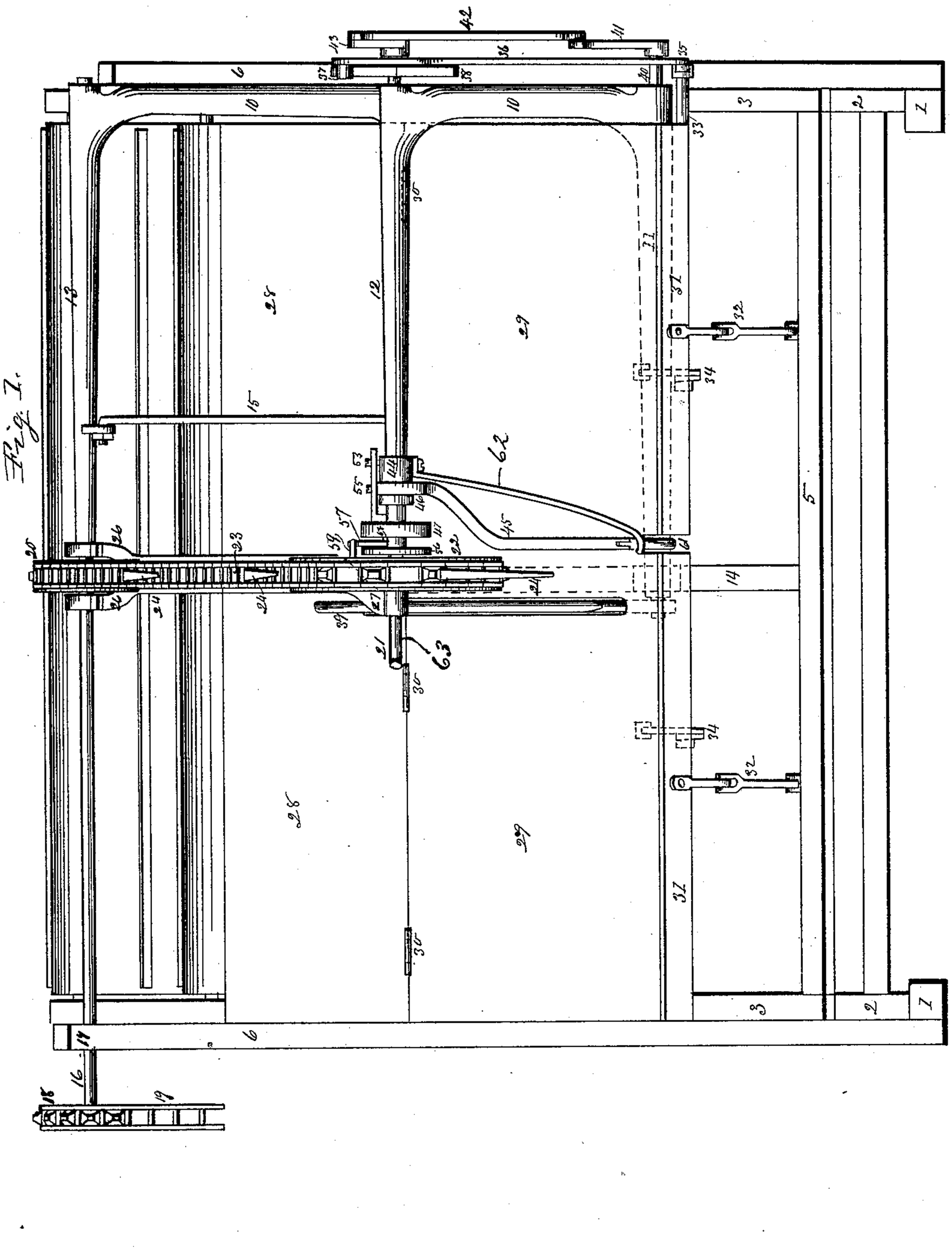
(No Model.) 5 Sheets—Sheet 1.

G. GREENLEE, Jr.

GRAIN BINDER.

No. 411,025. Patented Sept. 17, 1889.

Fig. 1.



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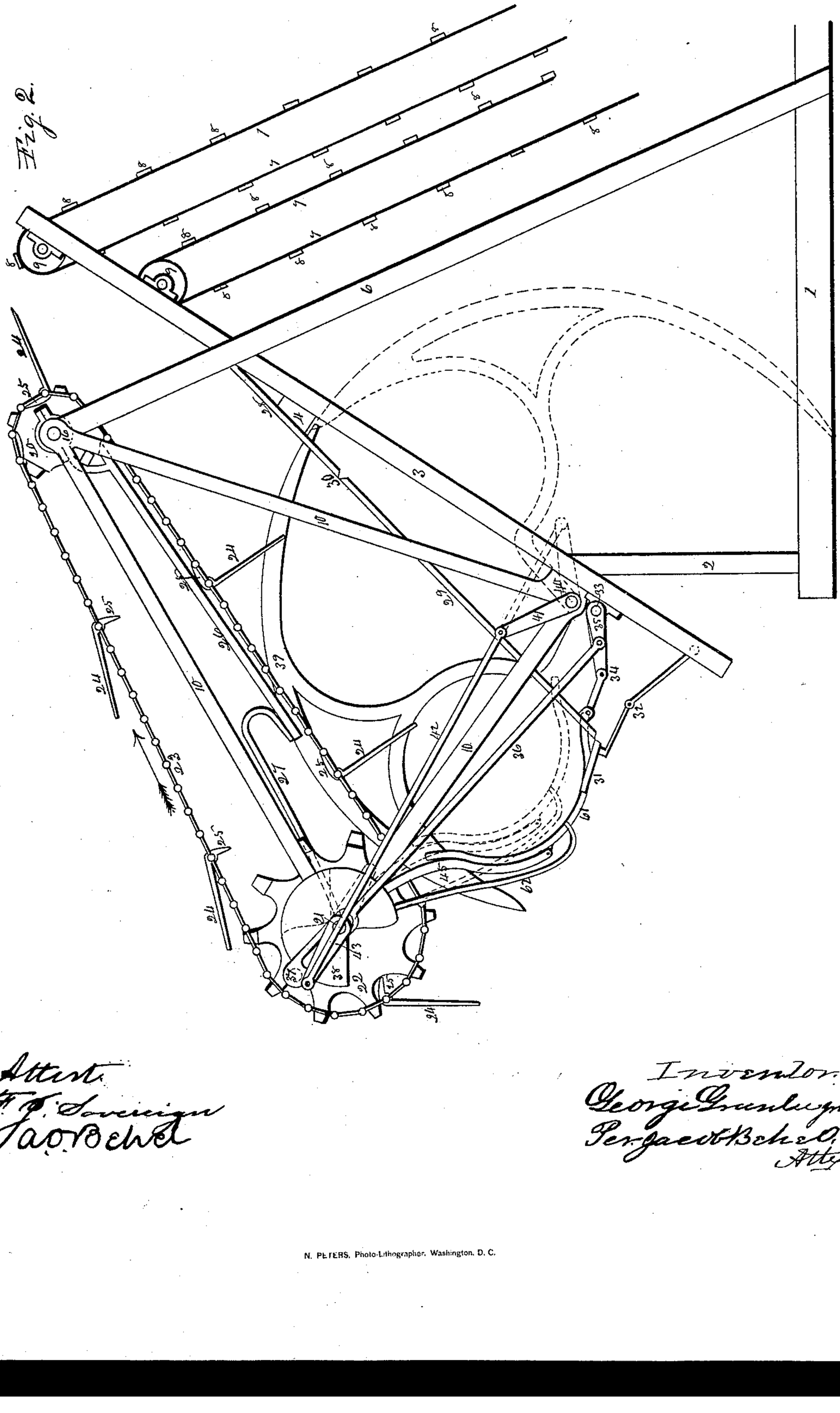

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GRAIN BINDER.

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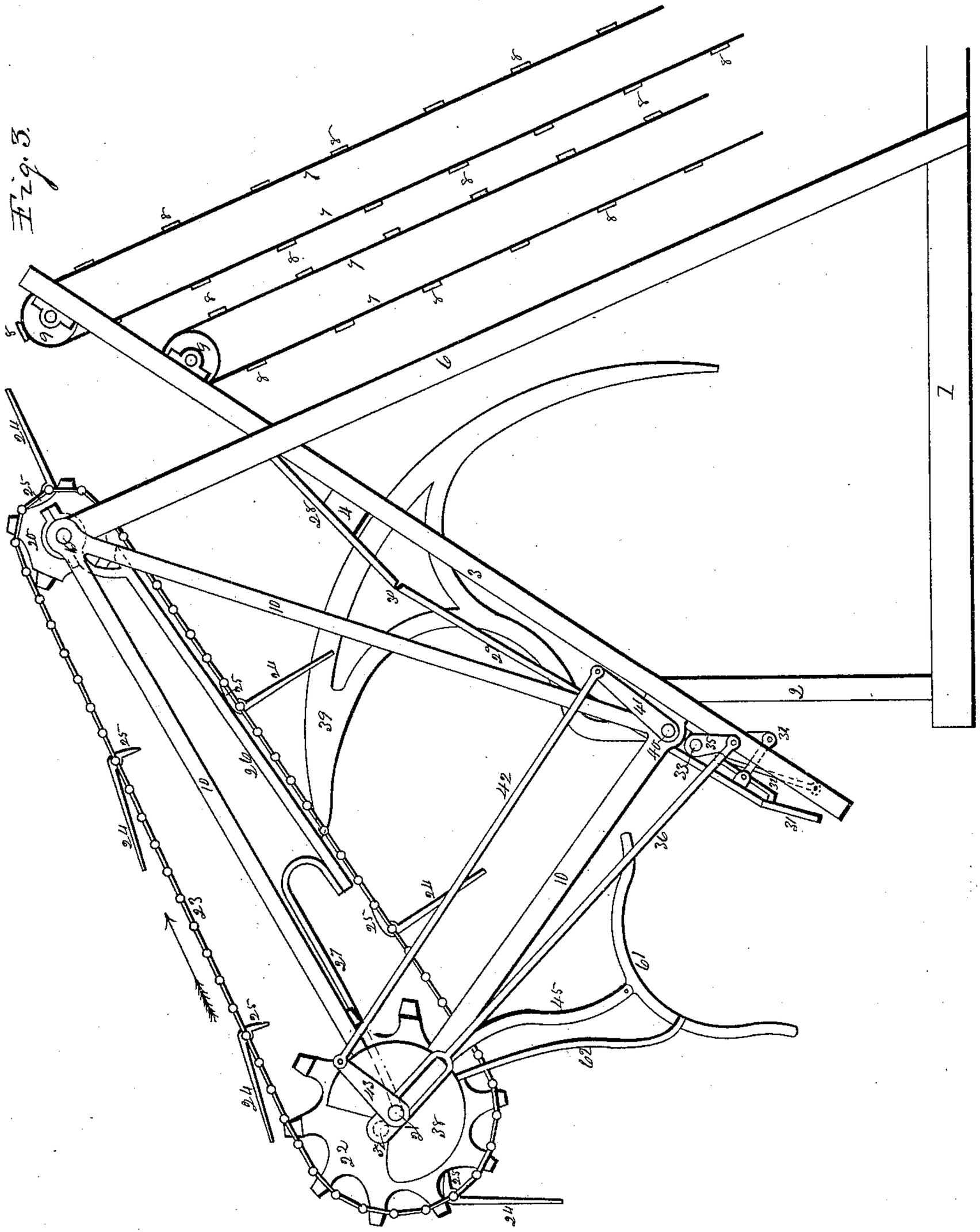
Fig. 5.



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5 Sheets—Sheet 4.

G. GREENLEE, Jr.

GRAIN BINDER.

No. 411,025. Patented Sept. 17, 1889.

Fig. 4.

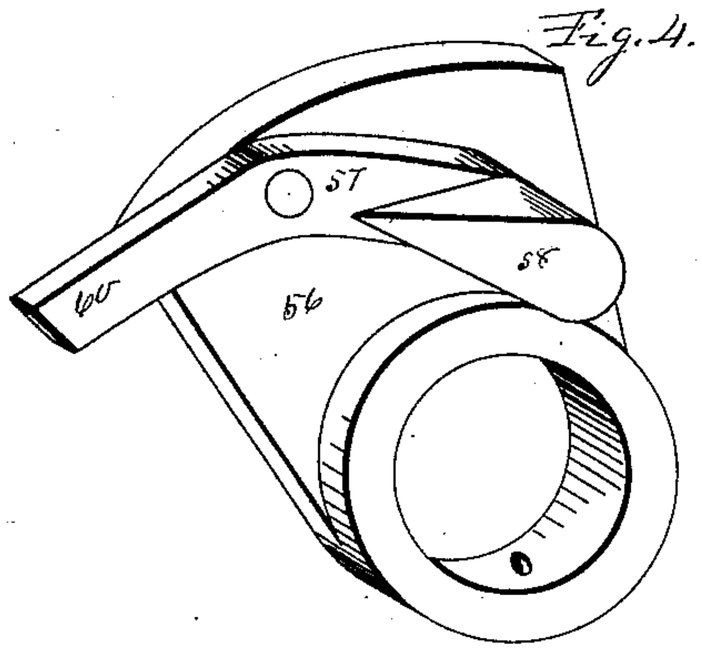


Fig. 5.

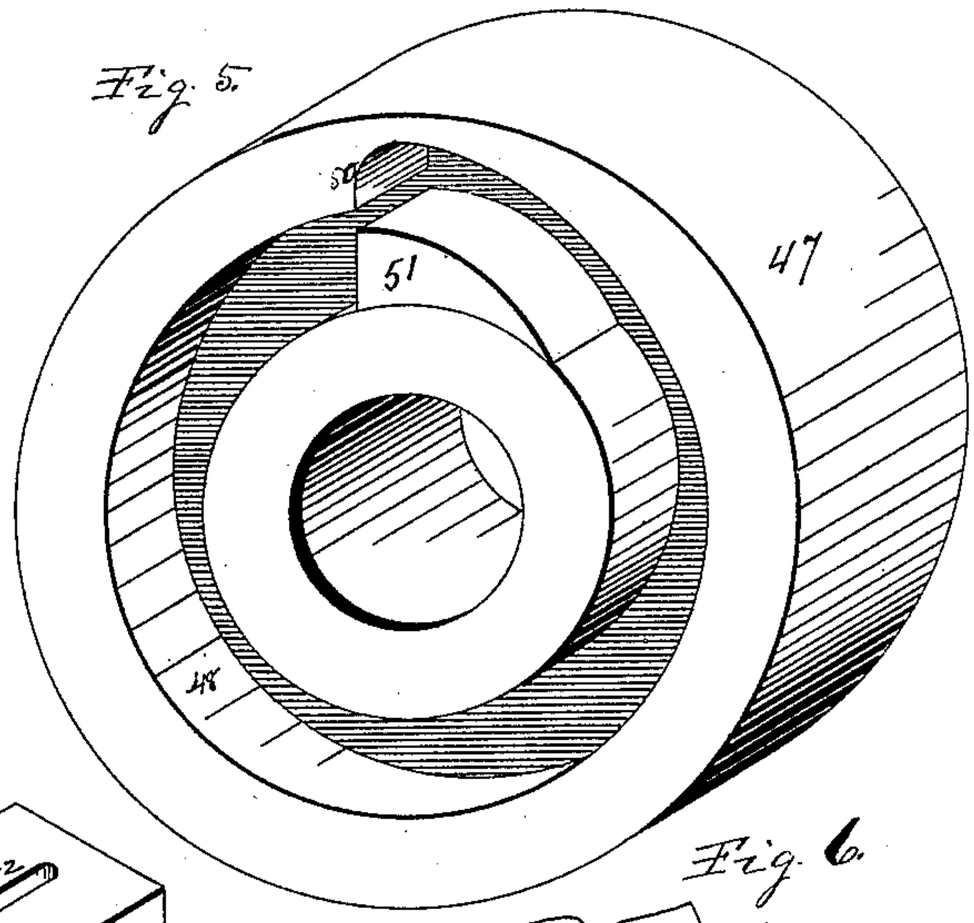


Fig. 7.

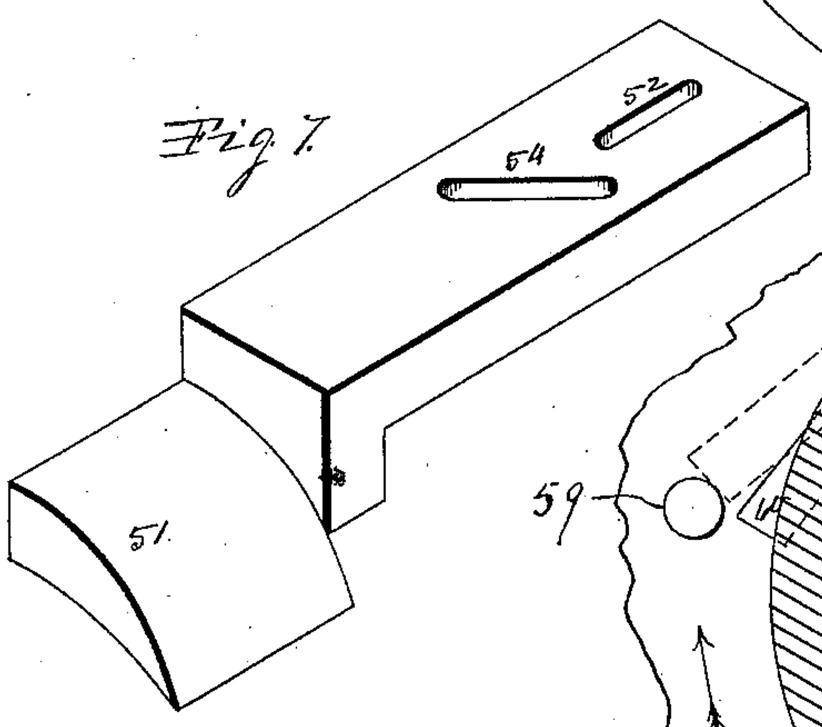


Fig. 6.

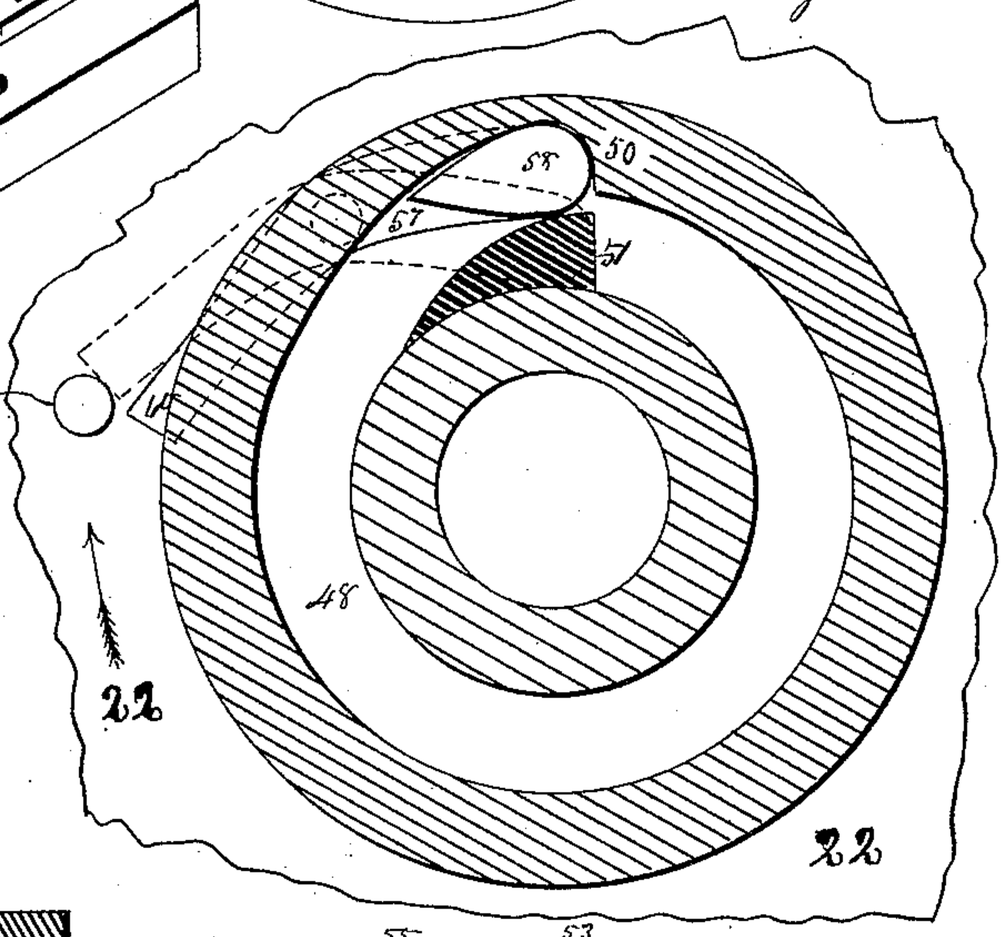
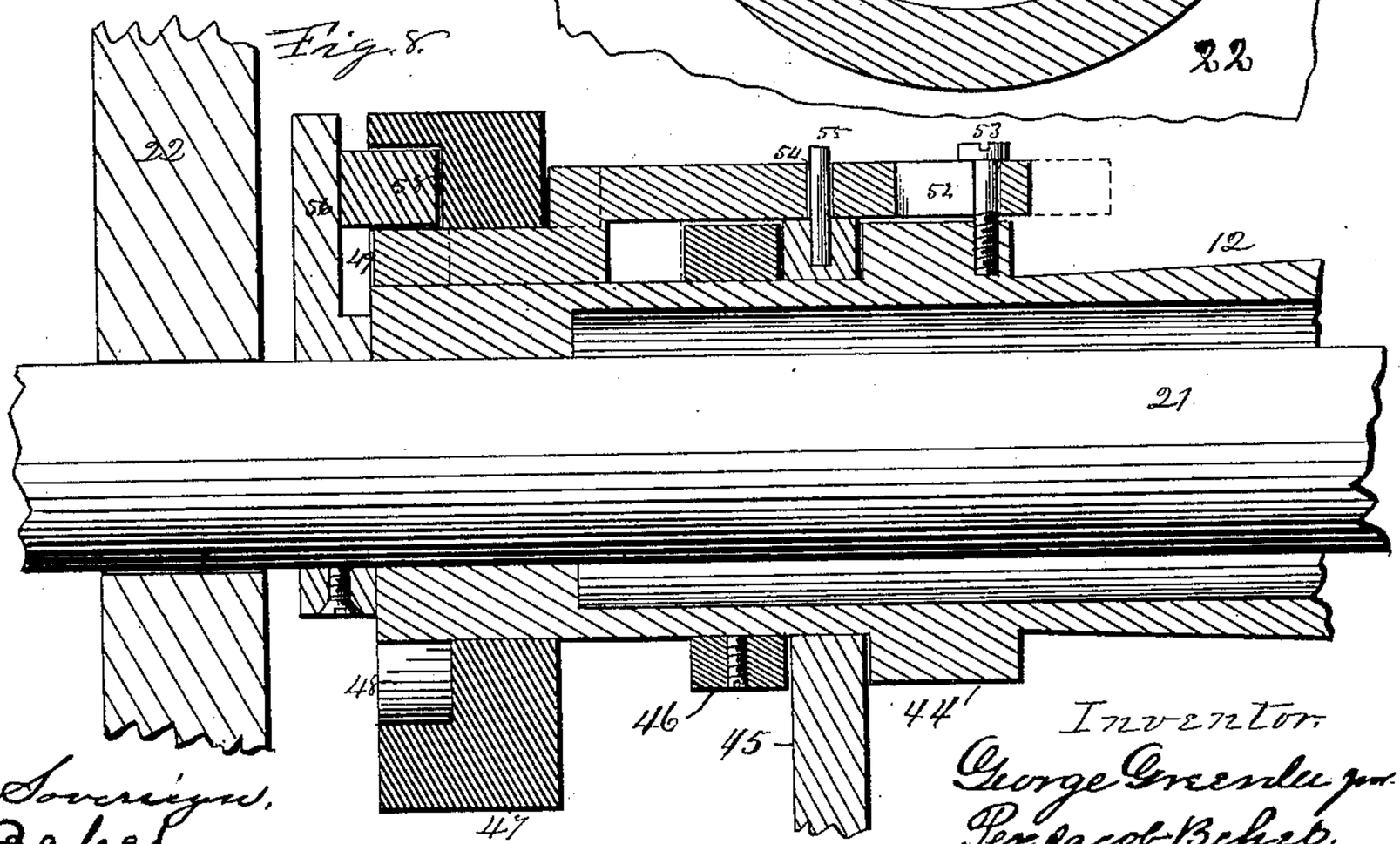


Fig. 8.



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(No Model.) 5 Sheets—Sheet 5.

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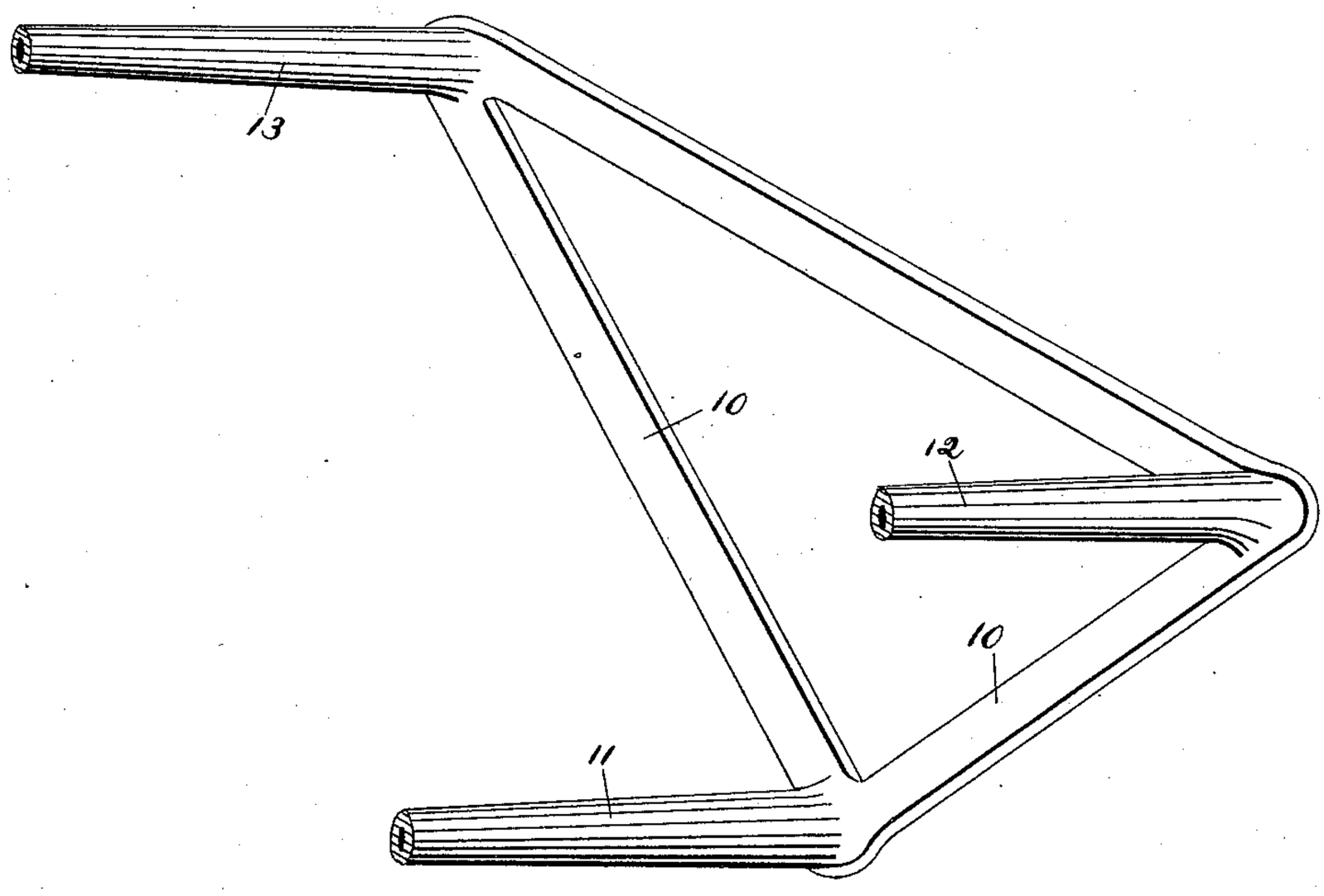
FIG. 5.



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UNITED STATES PATENT OFFICE.

GEORGE GREENLEE, JR., OF BELVIDERE, ILLINOIS.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 411,025, dated September 17, 1889.

Application filed April 21, 1887. Serial No. 235,700. (No model.)

To all whom it may concern:

Be it known that I, GEORGE GREENLEE, Jr., a citizen of the United States, residing at Belvidere, county of Boone, and State of Illinois, have invented certain new and useful Improvements in Grain-Binding Machines, of which the following is a specification.

This invention relates to a class of grain-binding machines known as the "automatic grain-binder."

The object of my invention is to produce a reliable grain-binding machine at a reduced cost, and in which the working parts of the machine are mainly placed above the binding-table and at one end of the machine, where their workings can be readily seen and as readily adjusted and repaired when required. To this end I have designed and constructed the apparatus represented in the accompanying drawings, in which—

Figure 1 is an elevation of the delivery side of a grain-binding machine embodying my invention. Fig. 2 is an end elevation showing the position of the parts at the time the knotting of the band on the bundle is performed. Fig. 3 is an end elevation showing the position of the parts when the bundle is being discharged. Fig. 4 is a perspective view of the pivoted dog portion of the clutching mechanism. Fig. 5 is a perspective view of the fixed cam forming a portion of the clutching mechanism. Fig. 6 is a face view of the pivoted dog and of the groove in the fixed cam, showing their connection. Fig. 7 is a perspective view of the endwise-sliding bolt constituting a portion of the clutching mechanism and controlling the pivoted dog, and Fig. 8 is a vertical lengthwise central section of the parts on the overhanging end of the driving-shaft of the knotter mechanism and its overhanging arm-support. Fig. 9 is a detail perspective of the triangular frame with its sleeve-bearings.

The several beams—to wit, the base-beams 1, vertical supports 2, inclined table-supporting beams 3, lengthwise beams 4 and 5, connecting the inclined beam-supports under the table, and the inclined end supports 6, framed or joined to each other in a secure manner—constitute the main supporting-frame of my improved grain-binding machine, which is substantially the same as supporting-frames for grain-binding machines heretofore in use.

The elevators, consisting of endless aprons 7, with slats 8 fixed thereto at proper intervals and mounted on carrying-rollers 9, supported to revolve in bearings on the supporting-frame, are substantially the same as like elevators employed in grain-binding machines for like purposes.

A triangular end frame consisting of the several end bars 10 is provided with tubular arms 11, 12, and 13, projecting from the inner face of the meeting ends of the several end bars 10. The triangular frame, with its tubular arms, is preferably produced in one piece of a single casting, and is mounted in place on the main frame, with its front end in substantially the same vertical plane as the front end of the main frame, with its tubular arms extending rearward to about the center of the frame. The triangular frame is fixed in place on the supporting-frame, with its base resting on one of the inclined table-beams, and the rear end of its tubular arm 11, extending from its lower angle, is supported on a central inclined beam 14, fixed to the horizontal beams 4 and 5 and secured in place thereon. The upper inner angle of the triangular frame is securely fixed in place to the upper end of one of the inclined end supports 6, and its tubular arm 13 extends over the binding-table to about its center. A brace-bar 15 is employed to connect the rear end of the overhanging tubular arm 12 with the rear end of the overhanging tubular arm 13 to hold them in their relative position. A driving-shaft 16 extends through the upper tubular arm 13 of the triangular frame, and is supported to revolve in bearings therein and in an end bearing 17 in the supporting-frame. A sprocket-wheel 18 is mounted on the projecting end of the driving-shaft to receive a driving chain belt 19, to connect it with some moving part of a harvesting-machine with which the binding-machine is connected to impart motion to the driving-shaft. A sprocket-wheel 20 is mounted centrally on the driving-shaft, to which it is fixed to revolve therewith. A shaft 21, to operate the binding mechanism, is supported to revolve in end bearings in the

tubular overhanging arm 12 of the triangular frame. A sprocket-wheel 22 is loosely mounted on the rearward-projecting end portion of shaft 21 of the binding mechanism, and a chain belt 23 connects the loose sprocket-wheel 22 with the sprocket-wheel 20 on the driving-shaft. The chain belt 23 is provided at proper intervals with conveyers or packing-teeth, consisting of arms 24 and 25, extending at about a right angle to each other, and having a pivotal connection with the chain belt at their angular point in a manner to permit the arms to fold onto the chain. A track-bar 26 is supported at its upper end on the driving-shaft 16, from which point it extends on the upper side of the lower branch of the chain belt, and a spring 27 connects its lower end with the shaft 21, which holds it in position to receive the short arm 25 of the packers in their passage under it to hold the packing-arms 24 thereof perpendicular to the belt to engage the grain delivered by the elevators and pack it in the bundle-receptacle, and when its short arm is carried over the lower end of the guard its packing-arm will be free to turn on its pivotal connection with the chain and override the grain in the receptacle.

The binding-table is composed of an upper fixed portion 28 and a lower hinged portion 29. The upper portion of the table is fixed to the main frame at its upper edge and extends downward over the horizontal beam 4, and the lower portion 29 is pivoted at its upper edge at 30 to the lower edge of the upper portion to permit it to rise to the position shown in Fig. 2, or to drop to the position shown in Fig. 3.

A guard-board 31, employed to prevent the wastage of grain, is pivoted to the lower outer edge of the hinged binding-table, and a hinged link 32 connects it to the lower horizontal beam 5 of the main frame in such a manner that the upward movement of the hinged binding-table will cause it to rise to the upward inclined position shown in Fig. 2, to prevent the grain in its descent over the inclined binding-table from passing over its outer edge, and in the descent of the binding-table to the position shown in Fig. 3 the guard-board will be carried to its downward inclined position therein shown to permit the free discharge of the bound bundle of grain.

A rock-shaft 33 extends across the machine under the binding-table, and is supported to oscillate in bearings on the main frame. The rock-shaft 33 is provided at proper intervals with a crank-arm and link-connection 34 with the binding-table in such a manner that the oscillatory movements of the shaft will raise and lower the binding-table, which movement will operate the guard-board, as hereinbefore stated. A crank-arm 35 is fixed on the front end of the rock-shaft 33, and a connecting-rod 36, pivoted at its lower end to the outer end of the crank-arm, is slotted at its upper end to receive the shaft 21, to permit an endwise-sliding movement of the rod thereon. A roller 37 is supported to revolve on a stud-journal projecting laterally from the side of the upper end of the slotted connecting-rod in position to engage the periphery of a cam-wheel 38, fixed on the end of the shaft 21. A cord-carrying arm 39 is fixed on the rear end of its supporting rock-shaft 40, which is supported to oscillate in end bearings in the lower tubular arm 11 of the triangular end frame. A crank-arm 41 is fixed on the front projecting end of the rock-shaft of the cord-carrying arm. A connecting-rod 42 is pivoted at its lower end to the crank 41 on the rock-shaft of the cord-carrying arm, and at its upper end to a crank 43, fixed on the front end of the shaft 21. These several parts, consisting of the crank-arms 41 and 43 and their connecting-rod 42, are of such proportions that one complete revolution of the shaft 21, employed to operate the binding mechanism, will cause the cord-carrying arm to move from its position shown in dotted lines in Fig. 2 to that shown in full lines and again return it to its former position. The cam 38 is of such conformation and is placed on its shaft-support in such position relatively to the needle-operating crank and the connecting devices that the binding-table shall descend to its position shown in Fig. 3 to permit the discharge of the bound bundle and rise again to its elevated position before the cord-carrying arm has descended in its return movement to a point to permit a flow of the grain into the bundle-receptacle.

The overhanging tubular arm 12 of the triangular end frame is provided near its overhanging end with a collar 44, and a trip-lever 45 is supported to oscillate on the overhanging tubular arm between the collar 44 and a collar 46, held in place on the tubular arm by means of a set-screw or otherwise. A cam 47 is fixed on the rear end of the overhanging tubular arm, and its free face is provided with an annular or concentric groove 48, and a curved wedge-shaped opening 49 is formed in the floor of the concentric groove and extends through the cam parallel to the axis of its tubular arm-support. The concentric groove 48 in the cam is enlarged immediately over the opening 49 in a manner to preserve the width of the groove parallel with the outer surface of the opening, and forms a shoulder or offset 50 in the groove immediately over the enlarged end of the opening 49. The end 51 of an endwise-sliding bolt is made wedge-shaped to enter and slide freely endwise in the opening 49 in the cam, and its main portion is provided with a longitudinal slot 52, which receives a screw 53, which connects the sliding bolt with the collar 44 in a manner to permit a limited free endwise movement of the bolt. The body of the endwise-sliding bolt is also provided with an oblique slot 54, through which a pin 55 upon the eye portion of the trip-lever 45 passes in such a manner that an oscillatory movement of the trip-lever

will impart an endwise movement to the bolt. A sector 56, with a hub bored to receive the shaft 21, is put in place thereon against the end of the overhanging tubular arm, and is fixed in place by means of a set-screw or otherwise to revolve with the shaft. A dog 57, having a lug 58 of a size and shape to enter the groove 48 in the cam freely, is pivotally connected to the segment in such position thereon that its end portion 58 will enter the groove. A stud-pin 59 projects from the side of the sprocket-wheel 22, in position to engage the outer end 60 of the dog 57 when its end portion 58 is in the annular or concentric portion of the cam-groove 48, and to override its outer end when in its rotation its end portion 58 is made to ascend the wedge end portion 51 of the endwise-sliding bolt to engage the shoulder 50 in the cam-groove. To the lower end of the trip-lever 45 is pivoted a gavel-receiving curved arm 61, capable of a swinging movement on its pivot. A spring 62 is fixed at its upper end to the overhanging tubular arm, and its lower free end engages the curved gavel-receiving arm at a point below its pivotal connection with the trip-lever, and its spring force tends to hold the curved gavel-receiving arm and the trip-lever to which it is pivoted in their inward position (shown in dotted lines in Fig. 2) to receive the grain carried by the packing-teeth into the bundle-receptacle against the curved arm, which, under the pressure of the accumulating grain, will yield outward to the position shown in the solid lines in Fig. 2. The curved arm 61 is also capable of yielding to the position shown in Fig. 3 to permit the discharge of the bound bundle when the table is lowered to the position shown in the figure, and to resume its position (shown in the dotted lines in Fig. 2) with the elevated binding-table after the bundle is discharged.

I have omitted to represent or describe a band-securing mechanism and a bundle-discharging mechanism to be supported and operated by the projecting end portion 63 of the shaft 21, and still other minor parts necessary to a complete binding-machine have been omitted, all of which may be any of the known varieties of apparatus capable of use in connection with my improvements to produce a complete grain-binding machine.

The grain cut by the harvester to which my improved binding-machine is attached is carried from the horizontal platform of the harvester by the inclined elevators and delivered onto the inclined binding-table substantially in the same manner as in grain-binding machines heretofore constructed.

The packing-teeth of my improved apparatus engage the grain as it is delivered by the elevators onto the inclined binding-table, and in their movement in the direction indicated by the arrows convey and press the grain in the gavel-receptacle against the curved arm of the trip-lever, causing it to yield under the pressure to its position in solid lines in Fig. 2. The yielding of the trip-lever under the pressure of the accumulating grain imparts to the sliding bolt an endwise movement and withdraws its wedge-shaped end from under the portion of the dog within the cam-groove and permits it to drop to its dotted-line position (shown in Fig. 6) to travel in the cam-groove. This dropping of the dog into the cam-groove will cause its free end to rise into position to receive the stud-pin 59, projecting from the side of the sprocket-wheel 22, which in its rotation will cause the shaft 21 to make one complete revolution, during which the binding-cord will be carried around the gavel within the receptacle in the upward movement of the cord-carrying arm, and after the binding-cord is secured around the bundle the onward movement of the shaft 21 will cause the descent of the binding-table. The descent of the guard-board, the discharge of the bundle, the return of the binding-table and the guard-board to their elevated position, the cord carrying arm to its depressed position, and the release of the spring on the trip-lever will return the trip-lever and the curved gavel-receiving arm thereto attached to their normal position and carry the wedge-shaped end of the endwise-sliding bolt into the cam-groove, elevate the dog to engage the shoulder in the cam-groove, depress its free end and disengage it from the stud-pin in the sprocket-wheel and stop the shaft, and hold the parts in position to receive the cut grain carried by the packers into the receptacle to form another bundle to be bound and discharged from the machine.

I claim as my invention—

1. The combination of the grooved cam fixed on the overhanging arm of the binder-supporting frame, a dog-carrying arm fixed on the binder-shaft, a constantly-driven wheel loosely mounted on said shaft, a pin on said wheel, a dog pivoted to the arm and adapted to traverse the groove in the cam, and a sliding bolt in the cam-groove for withdrawing the nose of the dog from engagement with the pin, and thereby unlocking the said arm, and hence the binder-shaft, from the driving-wheel, substantially as set forth.

2. The combination, with the binding mechanism, the binder-shaft, and a suitable support for the same, of a grooved cam located on the shaft-support, a dog secured to the shaft in position to traverse the cam-groove, a driven wheel loosely mounted on the shaft in position to engage the free arm of the dog, and thereby cause the shaft to rotate with the wheel, an endwise-sliding bolt mounted in the shaft-support to control the action of the dog, a gavel-receiving arm in engagement with the endwise-sliding bolt, and a spring to hold the gavel-receiving arm, substantially as set forth.

3. The combination, with the grooved cam fixed on the overhanging tubular arm, of the supporting-frame, the binder-shaft, a dog to traverse the cam-groove fixed to rotate with the shaft, a driven wheel loosely mounted on

the shaft, an endwise-moving bolt entering the cam-groove to control the movements of the dog to throw it into or out of engagement with the driven wheel, and the gavel-receiving arm, substantially as set forth.

4. The combination, with the trip-lever, a gavel-receiving arm pivoted centrally to the long arm of the lever, the upper end of the gavel-receiving arm having an engagement with the lever to limit the rearward movement of its upper end, and a spring in engagement with the gavel-receiving arm adapted to act directly upon the gavel-receiving arm and through the gavel-receiving arm on the lever, substantially as set forth.

5. The combination of a hinged binding-table, a guard-board pivoted to the lower edge of the binding-table and provided with an arm fixed thereto and depending below the hinge between the board and the table, as described, a link connecting said arm with the supporting-frame, so that as the table descends the link and the arm on the board fold inward, and means for raising and lowering the hinged binding-table, substantially as set forth.

6. The combination of a hinged binding-table, a guard-board pivotally secured to the lower edge of the table and provided with an arm fixed thereto and depending below the hinge between the board and the table, as described, a link connecting the depending arm with the supporting-frame, so that as the table descends the link and the arm on the board fold inward, a rock-shaft, a jointed connection between the rock-shaft and the free end of the hinged binding-table, and means for operating the rock-shaft, substantially as set forth.

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