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J. KELLER.

GRAIN BINDING HARVESTER.

No. 441,168. Patented Nov. 25, 1890.

Fig. 1

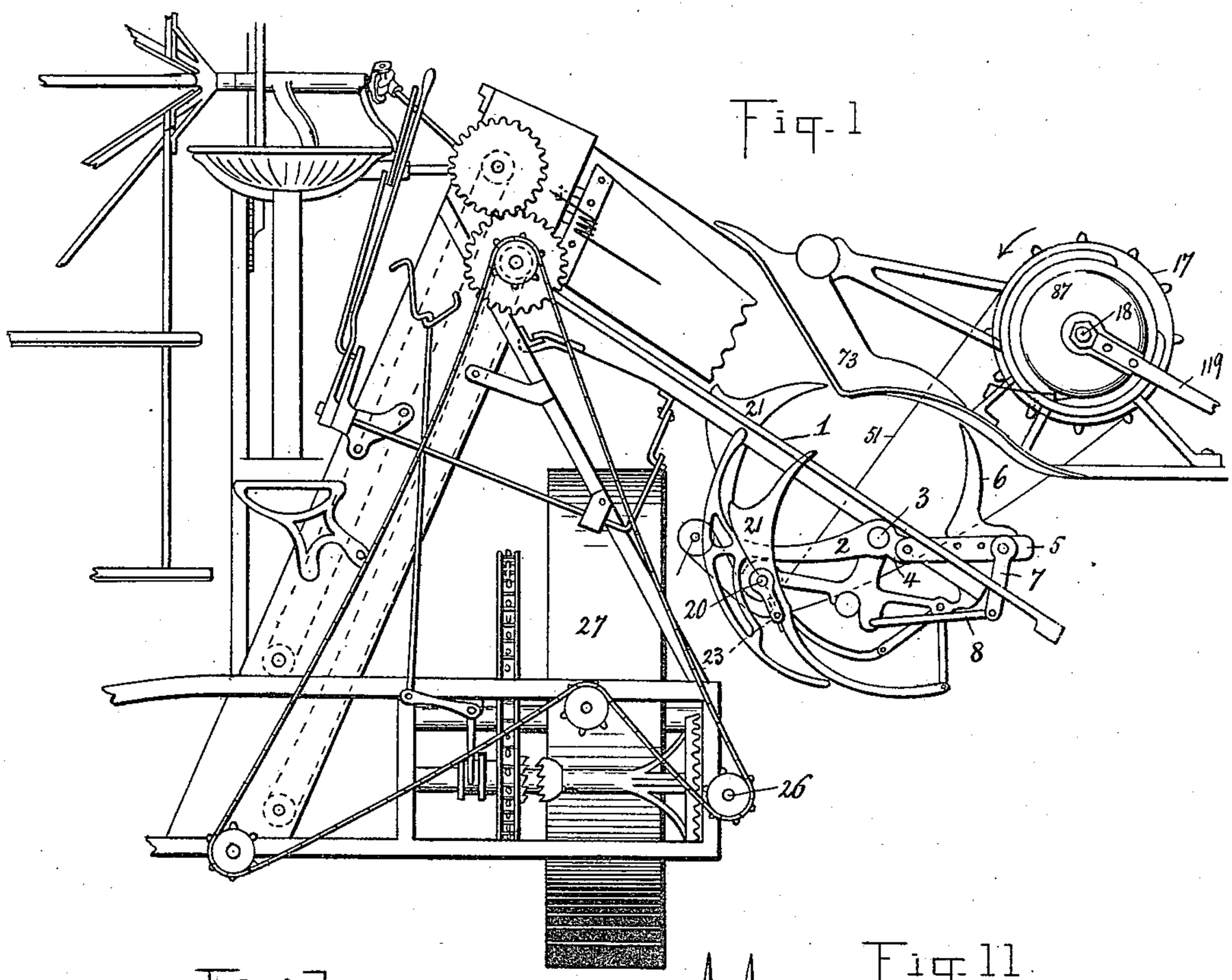


Fig. 2

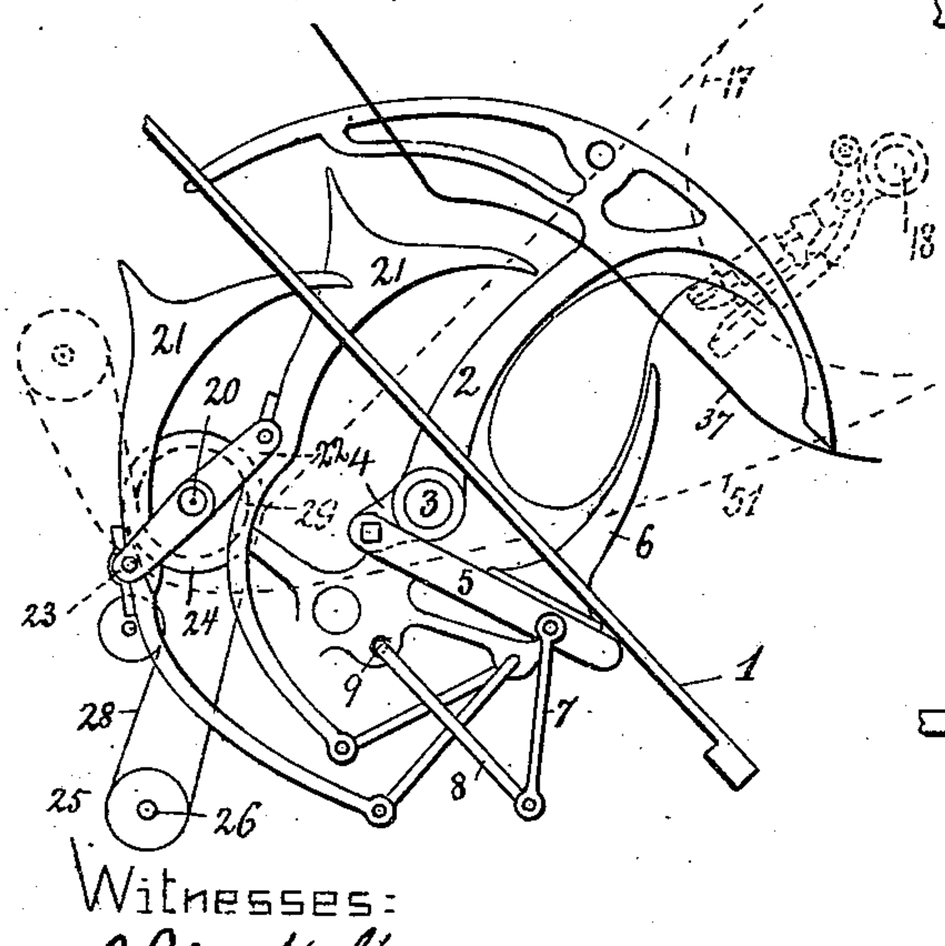
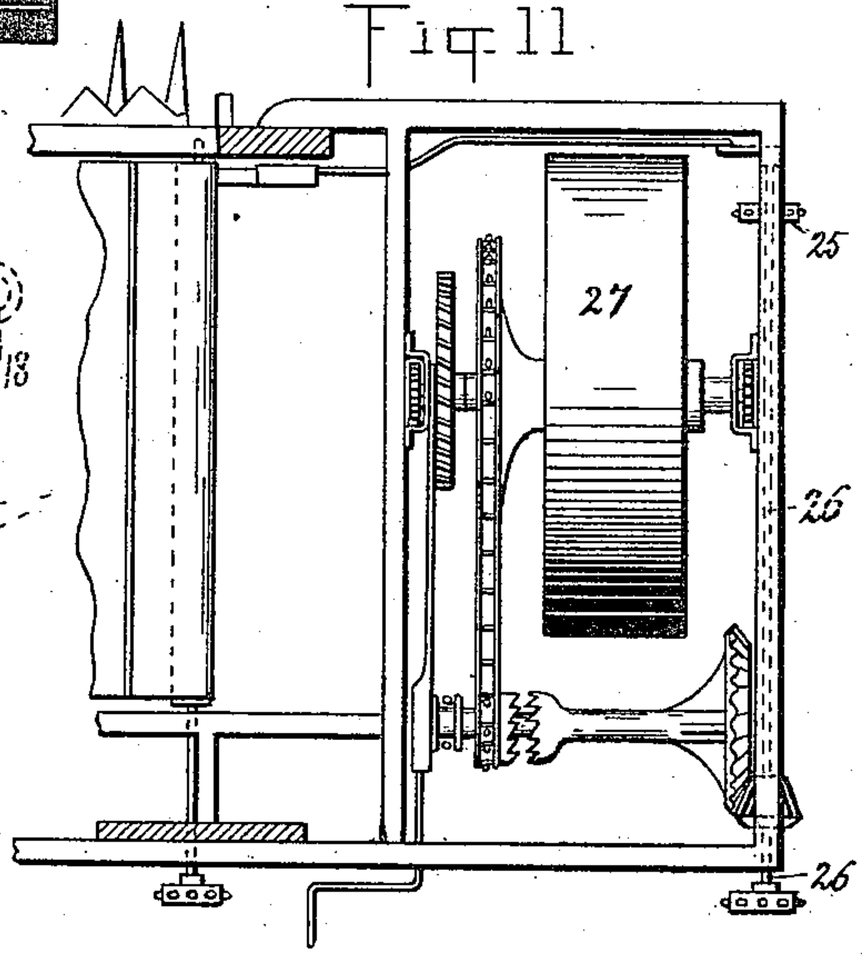


Fig. 11



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GRAIN BINDING HARVESTER.

No. 441,168. Patented Nov. 25, 1890.

Fig. 12

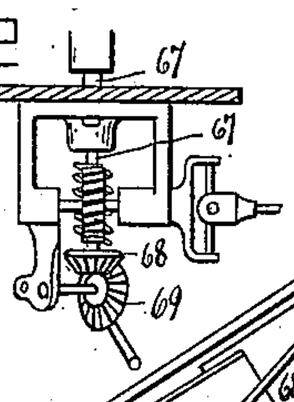

Fig. 13

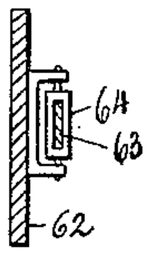

Fig. 3

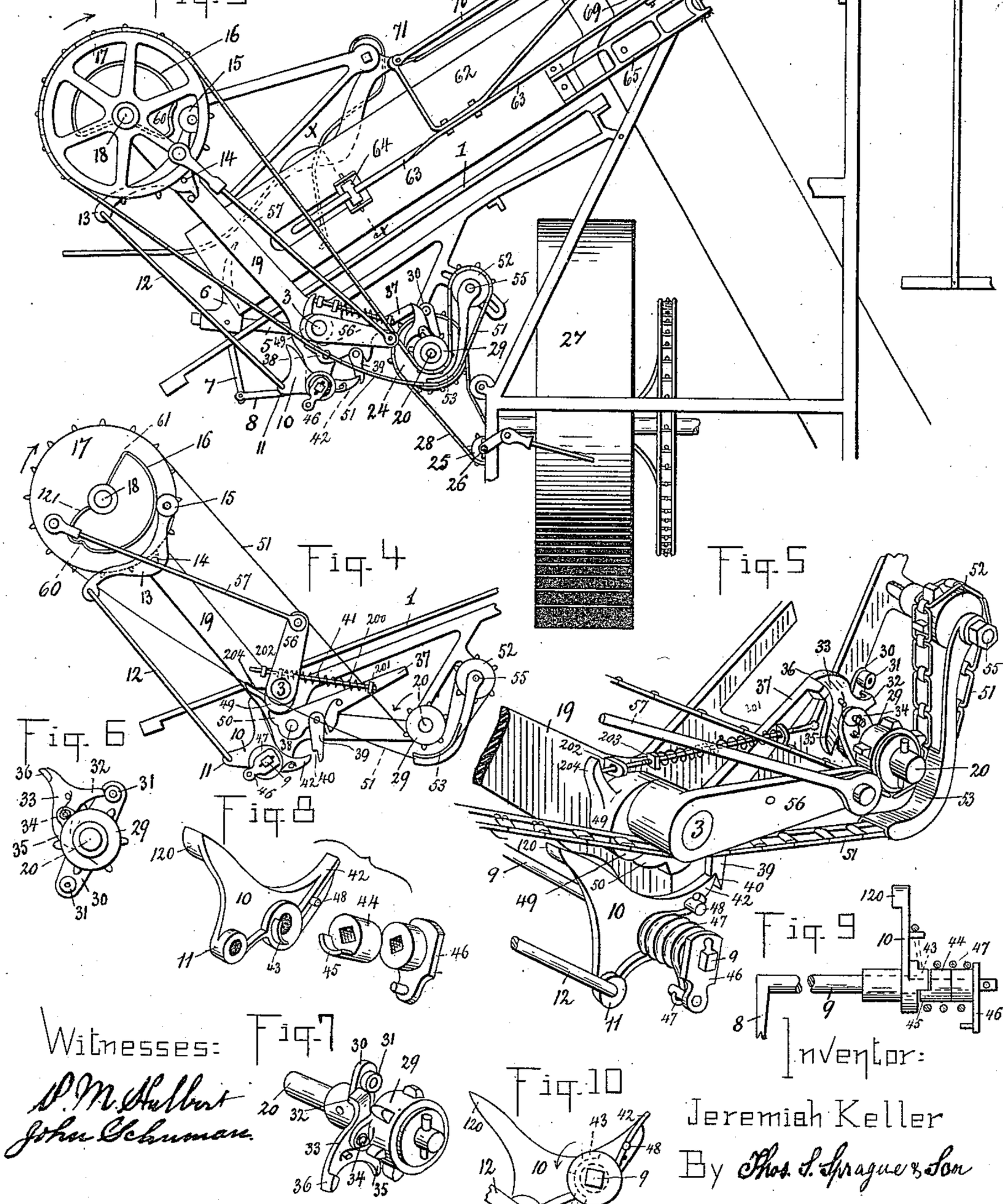

Fig. 4

Fig. 5

Fig. 6

Fig. 8

Fig. 9

Fig. 7

Fig. 10

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GRAIN BINDING HARVESTER.

No. 441,168. Patented Nov. 25, 1890.

Fig. 14

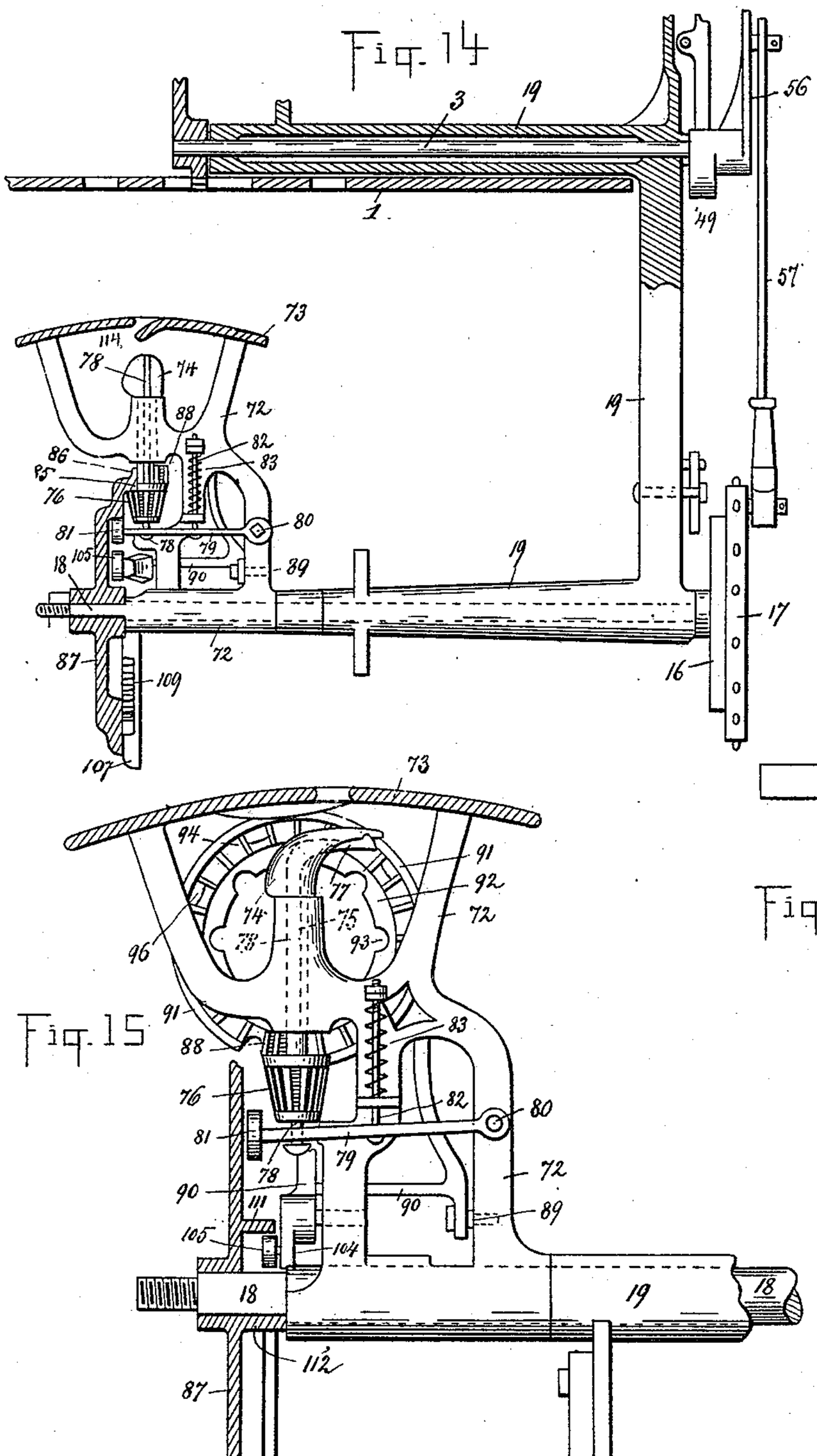


Fig. 17

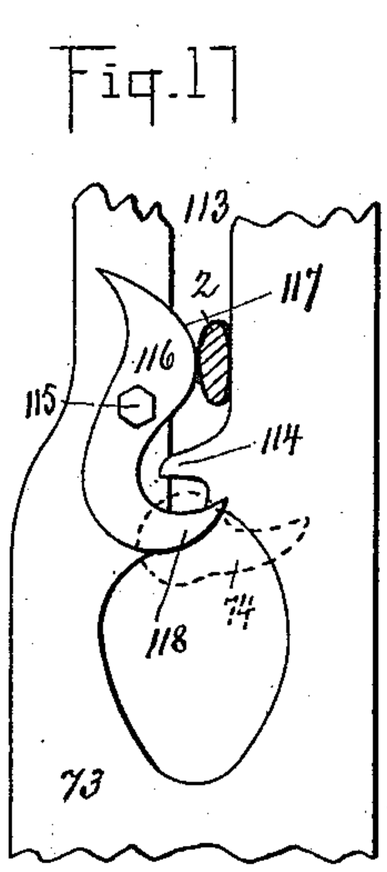
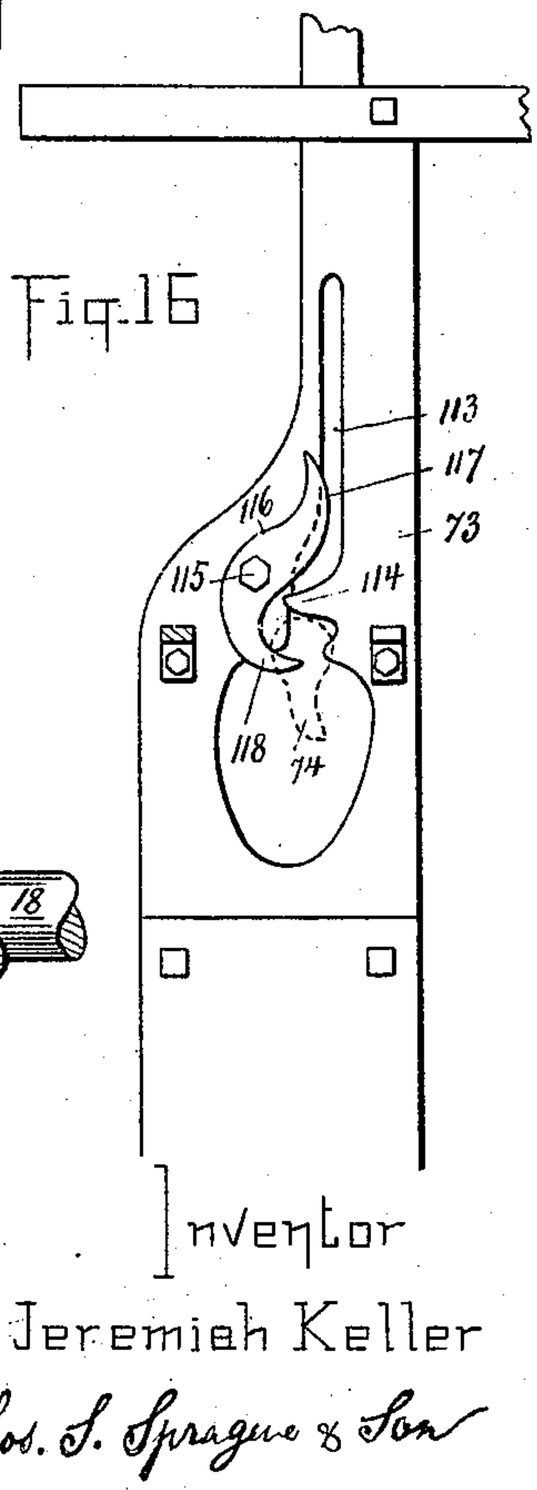


Fig. 15

Fig. 16



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GRAIN BINDING HARVESTER.

No. 441,168. Patented Nov. 25, 1890.

Fig. 18

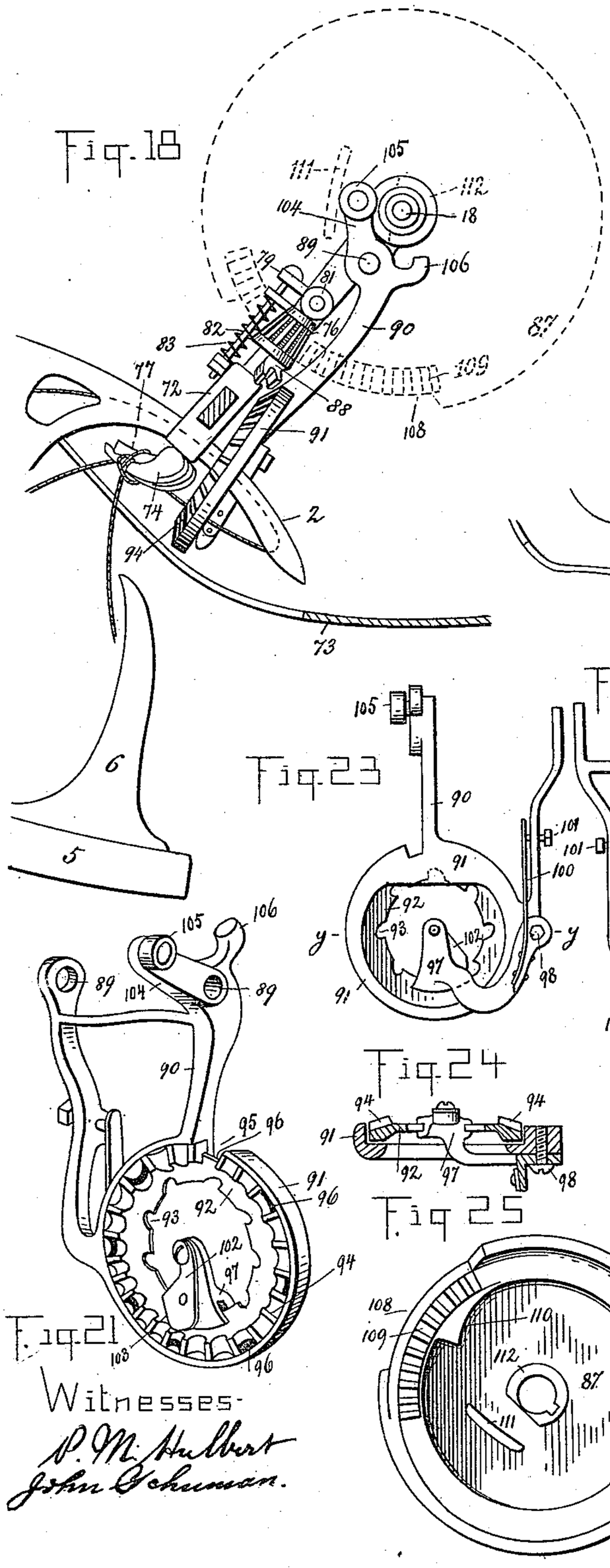

Fig. 20

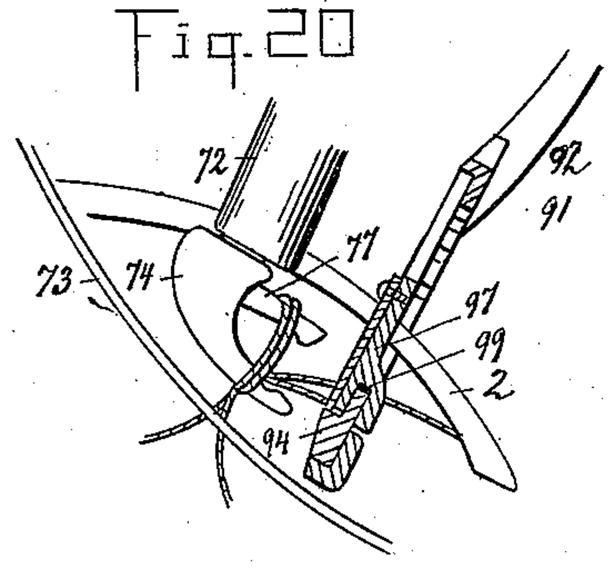

Fig. 19

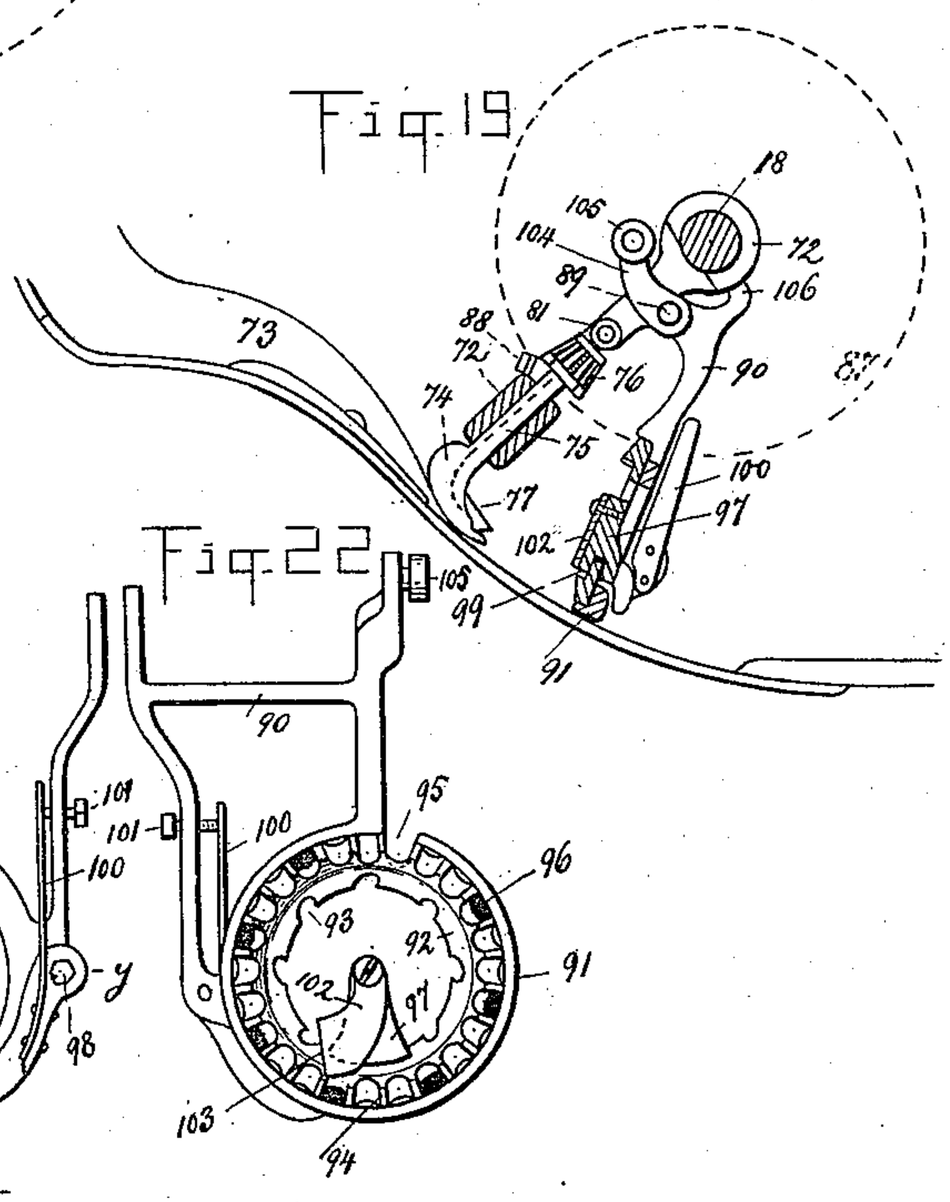

Fig. 23

Fig. 22

Fig. 21

Fig. 24

Fig. 25

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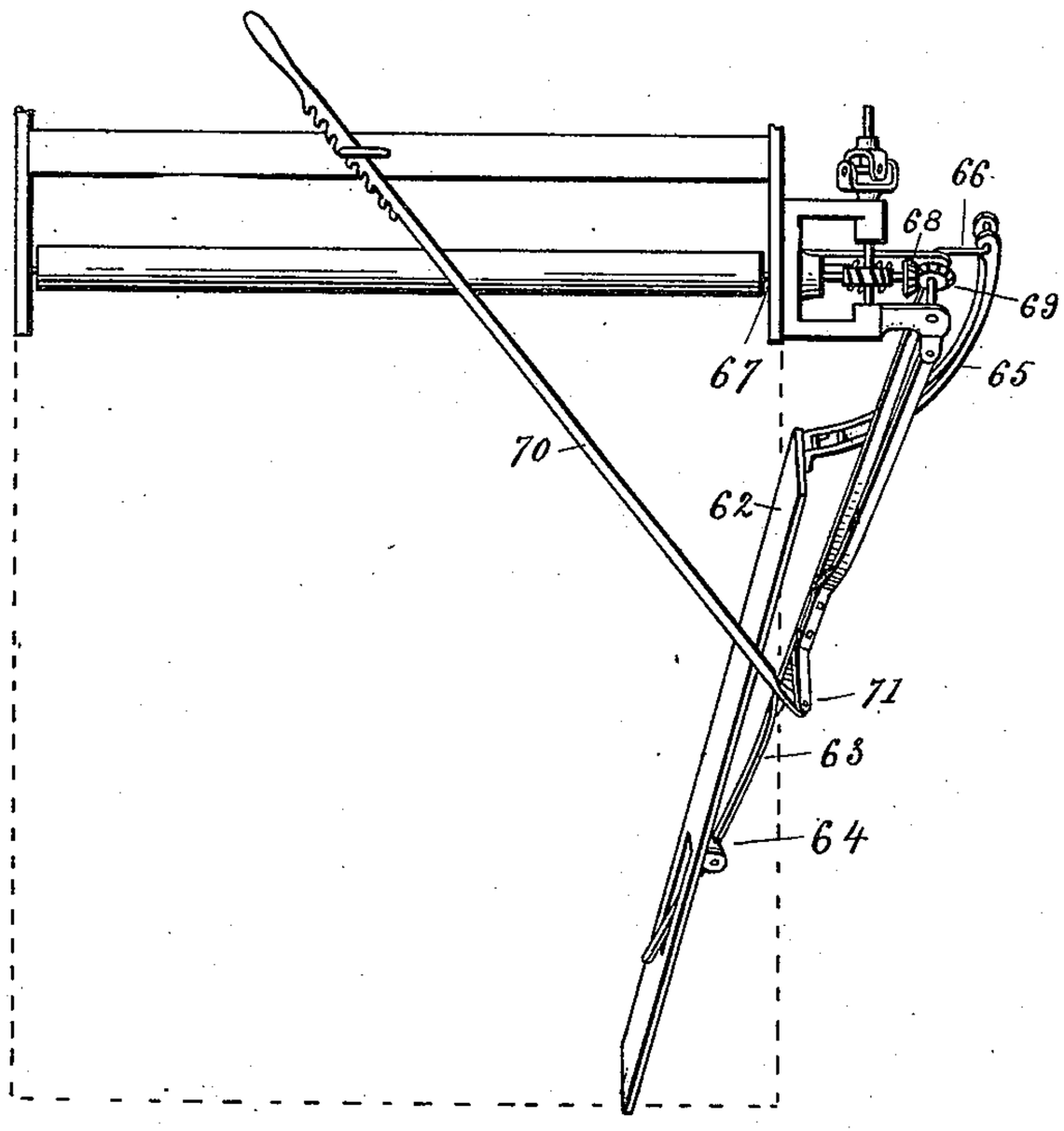
GRAIN BINDING HARVESTER.

No. 441,168. Patented Nov. 25, 1890.

Fig. 26



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UNITED STATES PATENT OFFICE.

JEREMIAH KELLER, OF SANDUSKY, OHIO, ASSIGNOR TO OTTO KROMER, OF SAME PLACE.

GRAIN-BINDING HARVESTER.

SPECIFICATION forming part of Letters Patent No. 441,168, dated November 25, 1890.

Application filed October 17, 1888. Serial No. 288,306. (No model.)

To all whom it may concern:

Be it known that I, JEREMIAH KELLER, a citizen of the United States, residing at Sandusky, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in Grain-Binding Harvesters, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to new and useful improvements in grain-binders; and the invention consists in the improved construction, arrangement, and combination of different parts, all as more fully hereinafter described.

In the drawings which accompany this specification, Figure 1 is a rear elevation of the binder as attached to a harvester of known construction. Fig. 2 is a diagram of a portion of the binder mechanism in elevation, as shown in Fig. 1 on a larger scale and as in operation. Fig. 3 is a front elevation of the binder as attached to a harvester of known construction. Fig. 4 is a diagram elevation of a portion of the binder mechanism, as shown in Fig. 3 detached and as in operation. Fig. 5 shows in perspective a portion of the mechanism represented in Fig. 4. Figs. 6 and 7 represent the trip-clutch in detached elevation and in perspective view. Figs. 8, 9, and 10 are detail views illustrating the construction of the combined tripping and compressing crank. Fig. 11 is a plan of the harvester main wheel, showing its connection with the binder mechanism for imparting motion thereto. Fig. 12 is a plan of the drive-connection for the butting device, as shown in Fig. 3 in elevation. Fig. 13 is a cross-section on line *x x* in Fig. 3. Fig. 14 is a plan, partly in section, of the frame which carries the knot-tying mechanism. Fig. 15 is a portion of Fig. 14 on a larger scale. Fig. 16 is a plan of the breast-plate. Fig. 17 is a plan of a portion of the breast-plate. Fig. 18 is a side elevation of the knot-tying mechanism as in operation. Fig. 19 is a vertical section through the knot-tying mechanism. Fig. 20 is a similar view to Fig. 19, with the parts in a different position. Figs. 21 and 22 are detached front views of the cord-holder. Fig. 23 is a detached rear elevation of the twine-holder. Fig. 24 is a cross-section of the twine-holder on line *y y* in Fig. 23, and Fig. 25 is a detached elevation of the cam-disk of the knot-tying mechanism. Fig. 26 is a detached plan of the butter and its operating mechanism.

In the drawings all like parts are referred to by the same numerals, of which—

1 is the binding-platform, on which the grain is delivered from the harvester in the usual manner.

2 is the oscillating binding-arm.

3 is the needle-shaft.

4, Fig. 2, is an ear formed on the hub of the binder-shaft.

5 is the arm of the compressor, hinged at one end to the ear 4 and having adjustably secured to it near the other end the compressor 6.

7 is a link pivotally secured at one end to the arm 5 and at the other end to the free end of the crank 8 on the compressor-shaft 9, which is journaled in suitable bearings below the binding-platform and has secured to its free end the crank-lever 10, as shown in Figs. 3, 4, and 5.

12 is a connecting-rod pivotally secured at one end to the arm 11 of the crank-lever and at the other end to the compressing-lever 13, which is fulcrumed at 14 to the frame, and is provided at its free end with the anti-friction roller 15, which is adapted to travel on the compressing-flange 16 of the sprocket-wheel 17. The sprocket-wheel is secured upon the shaft 18, which actuates the knot-tying mechanism, and is journaled in the overhanging arm of the U-shaped frame 19, rigidly secured to the binder-frame and for the purpose of supporting the binding mechanism above the binding-platform, as in the ordinary construction of binders.

Below the binding-platform is suitably journaled in the frame of the binder the packer-shaft 20, which actuates the packers 21 by means of suitable cranks 22 and 23 in the well-known manner. This packer-shaft derives its motion by suitable drive-connection with the harvester-gear—as shown, for instance, in the drawings, wherein 24, Fig. 3, is a sprocket-wheel on the packer-shaft, and 25, Figs. 2, 3, and 11, a sprocket-wheel on

the shaft 26, which actuates the cutter-bar of the harvester and which derives its motion by suitable intermediate gearing from the drive-wheel 27 of the harvester. A chain 28 transmits the motion from the sprocket-wheel 25 to the sprocket-wheel on the packer-shaft.

The front end of the packer-shaft carries a sprocket-pinion 29, which forms the loose member, and the cross-head 30 the fast member, of a clutch, which is constructed, preferably, as shown in detail in Figs. 5, 6, and 7, and wherein 31 are pins carried by the fast member 30 and adapted to normally engage with the arm 32 of the dog 33, which latter is pivotally secured at 34 to the loose sprocket-pinion 29. This dog has an arm 35, which normally rides on the hub of the sprocket-pinion, and also an arm 36, which projects outwardly and is adapted to strike in the revolution of the packer-shaft the tripping-lever 37 when the latter is in the position shown in Figs. 3 and 5 and thereby trip the clutch.

The tripping mechanism, of which the tripping-lever 37 forms a part, is constructed and arranged as follows: The tripping-lever 37 is pivotally secured at 38 below the end of the binder-shaft, and carries the dog 39, which at its free end is provided with a shoulder 40, on which the arm 42 of the crank-lever 10 engages when the binding mechanism is thrown out of gear, as shown in Fig. 5. The tripping-arm is further provided with the heel-extension 50, which is adapted to be depressed during the operation of the binding mechanism by a cam 49 on the binder-shaft. A spring 41 bears with its tension against the free end of the tripping-lever, and this spring is preferably sleeved upon a rod 200, which slidingly engages near one end into a guide-bearing 201 on the tripping-lever, and near the other end into a similar guide-bearing 202 on the binding-frame, and has an adjusting-nut 203 secured upon it. In connection with this rod an arm 204 is placed on the needle-shaft, which arm bears, during a certain period of the operation of the binding mechanism, against the free end of the rod 200, whereby the spring 41 is compressed, for the purpose hereinafter more fully described.

The crank-lever 10 is loosely sleeved upon the free end of the compressor-shaft 9, and has formed upon its hub a circular segmental flange 43. The portion of the compressor-shaft projecting beyond this crank-lever is squared and has sleeved upon it the thimble 44, which also has a corresponding circular segmental flange 45, similar to the flange 43 of the crank-lever, as hereinafter described. A little crank 46 is secured upon the outside of the compressor-shaft to secure the parts together and form means of attaching one end of the compressor-spring 47, which is coiled around these parts, and has its other free end secured to the pin 48 on the crank-lever.

The parts being thus arranged, as described and shown, they are intended to operate as follows: The crank-lever 10 forms the loose member of a clutch, while the thimble 44 and the crank 46 together form the fast member, the latter being made in two pieces for the purpose of adjusting the tension of the spring to any desired degree by merely changing the position of the crank 46 on the squared end of the compressor-shaft. The segmental circular flanges 43 and 45 on the loose and fast members, respectively, of the clutch, permit a limited play between the two clutch members for the purpose of tripping the clutch on the packer-shaft and compressing the bundle, as hereinafter described. The compression-flange 16 forms a variable abutment for the loose member or crank-lever 10. In operation the pressure of the grain against the compressor-arm is transmitted to the compressor-shaft 9 in the direction of the arrow shown in Fig. 10. This carries the thimble 44 and crank 46 in the same direction, and through the medium of the compressor-spring the crank-lever 10 is carried in the same direction. This brings the pressure of the grain to bear against the shoulder 40 of the dog 39 on the tripping-lever. This tripping-lever resists the pressure by the tension of the spring 41; but as this spring is inferior to the compressor-spring it will be compressed and the tripping-lever 37 be lifted out of interference with the dog 33 of the tripping-clutch of the packer-shaft, which clutch will immediately serve to start the binding mechanism.

The retripping of the clutch during the prescribed interval in which the binding mechanism has to operate is prevented by the cam 49 on the binder-shaft, which is adapted to bear against the heel-extension 50 of the tripping-lever, as shown in Fig. 4, when the needle has risen to encircle the bundle. The motion is carried from the packer-shaft to the binding mechanism by means of the chain 51, which passes around the sprocket-wheel 17 and idler-pinion 52 at an angle to engage with the pinion 29 on the packer-shaft, as shown in Figs. 3, 4, and 5.

The lower course of the chain, which may be provided with any reasonable slack, is guided below the upper course of the chain by means of the curved guiding-flange 53, which is secured below the pinion 54 from the stub-shaft 55 of the idler-pinion, and to permit a proper adjustment of the chain the idler-pinion 52 is adjustably secured in position to the binder-frame in any suitable manner. The motion of the packer-shaft being in the direction shown by the arrows in Fig. 4 is thereby transmitted to the shaft 18, which actuates the knot-tying mechanism in the reverse direction. Motion is communicated to the binder-shaft by means of a crank 56, secured upon the front end of the binder-shaft, and a connecting-rod 57, connected with the wrist-pin on sprocket-wheel 17.

The compression of the bundle is produced by the operation of the compression-flange 16, which, during the proper portion of the

revolution of the sprocket-wheel 17, forms an abutment for the anti-friction roller 15 on the compressing-lever, and through the connection described locks the crank-lever 10 in place, so that the pressure of the grain against the compression-arm, as produced by the pressure of the binder-arm in encircling the bundle, has to be taken up or resisted by the compressor-spring, which is free to contract on account of the play between the loose and fast members of the clutch between which it is secured.

To permit the free operation of the tripping mechanism, the compression-flange 16 is provided with the depression 60 at its starting-point, which at the normal position of the binding mechanism allows a limited free play to the compressing-lever 13. The tripping-lever 37 is held in its normal position, as shown in Fig. 5, by the spring 41, which at one end presses against the guide-bearing 201 on the tripping-arm 37 and with its other end against the adjustable nut 203 of the sliding rod 200, which latter at its free end passes through another guide-bearing 202 and rests against the oscillating arm 204, carried by the needle-shaft. The tension of the spring through the medium of the tripping-lever 37, dog 39, arm 42 of crank-lever 10, and shaft 9 holds the compressor forward against the grain until the binding mechanism is tripped into gear.

To permit the ejectors to withdraw the bundle when completed, the compressor-arm has to be withdrawn below the platform. This is accomplished by the compressor-flange 16 turning abruptly at 61, thus depriving the crank-lever 10 of its abutment and rendering the compressor-arm free to withdraw below the platform. The compressor-arm is restored to its normal position by the eccentric portion 121 of the compressor-flange, and the stop 120 on the crank-lever 10 strikes against the binder-frame and arrests the crank-lever 10 in its proper normal position, while at the same time the tripping-lever 37, being freed from the action of the cam 50 on the binder-shaft, drops into normal position under tension of the spring 41. While the tripping-lever 37 drops back into its normal position, Figs. 3 and 5, the arm 204 pushes against the end of the rod 200, and thereby increases the tension of the spring 41, which thereby enables the tripping-lever 37 to withstand the shock of the dog 33 in striking against it much better than if the tension of the spring 41 were allowed to spend itself while the tripping-lever 37 drops into its normal position, and thus becomes too weak to firmly hold the tripping-lever against the face of the dog 33 in the act of tripping the clutch.

At the front end of the binding-platform is mounted the end board 62, which forms a butting device for the known operation of butting the grain upon the binding-platform, and to this end it is provided with the following mechanism: the arm 63, which consists of two bars riveted together and pivotally secured at 63^a to the binder-frame, so as to swing in a plane parallel with the binding-platform. The lower end of this arm slidingly engages in a slot of the roller 64, which is journaled near the lower end of the butter, as shown in Fig. 13. Near the upper end of the butter is secured the bracket 65, which engages upon the crank 66, to which motion is communicated by intermediate gearing from any suitable part of the operating mechanism of the harvester, preferably as shown in the drawings, wherein 67, Figs. 3 and 12, is the shaft of one of the rollers over which the elevating-aprons pass, which, as in the usual constructions, elevate the grain onto the binding-platform. This shaft is extended through the binder-frame and carries on its free end the bevel-pinion 68, which engages with the bevel-pinion 69, which drives the crank 66, thereby imparting an oscillating motion to the butter. To adjust the butter laterally upon the binding-platform, a lever 70, extending in proximity to the driver's seat, is pivotally secured at 71 to an upward extension of the arm 63.

Upon the inner end of the shaft 18, which actuates the knot-tying mechanism, is sleeved the upper end of a knotter-frame 72, the lower end of it being secured to the breast-plate 73, which latter is secured above the binder-platform and is of the ordinary construction, except as hereinafter described. The frame 72 carries the knotter, which consists of the bill-shaped knotter-head 74, mounted upon the end of the knotter-shaft 75, which is journaled in the frame 72 and carries on its free end the knotter-pinion 76.

77 is a movable jaw, which is slidingly secured in the knotter-head by means of the shank 78, sliding in a suitable slot formed in the knotter-shaft, and, projecting beyond the knotter-shaft, engages with its free end the lever 79. This lever 79 is pivotally secured at 80 to the knotter-frame, and carries upon its free end a roller 81, and is connected to the tension-rod 82, which carries the tension-spring 83. The knotter-pinion is cut away at its inner end, as at 85, to form a flat face or delay-shoe, which is adapted to prevent the rotation of the knotter-pinion while traveling in contact with the delay-flange 86 of the cam-wheel 87, and the knotter-pinion also carries the mutilated pinion 88, which has two teeth only.

To the knotter-frame is pivotally secured at 89 another frame 90, which carries the oscillating twine-holder, which is constructed as follows: The frame 90 carries at its free end the ring bearing 91, in which the notched annulus 92 is loosely seated and adapted to revolve around its center. This annulus is provided upon its inner edges with the notches 93 and upon its upper face with the cogs 94, which are adapted to mesh into the cogs of the mutilated pinion 88 when the parts are brought in contact, as shown in Fig. 18, by the swinging of the twine-holder toward the

knotter. A notch 95 is cut into the ring-bearing 91 of the frame, and notches 96 are cut in the outer periphery of the annulus. They are cut between the teeth at intervals of three teeth. 97 is a shoe pivotally secured at 98 (see Fig. 23) to the ring-bearing 91. This shoe is provided upon its inner end with the groove 99, which loosely engages with the inner edge of the notched annulus and is held in engagement therewith by means of the spring 100, secured to the shoe and bearing with its free end against the set-screw 101, by which means the tension of the spring can be adjusted. A knife 102, provided with the cutting-edge 103, is secured on top of the shoe, whereby the twine which is engaged in the notch nearest to the cutting edge of the stationary knife is necessarily forced against the cutting-edge whenever the annulus makes its partial revolution. The frame 90, which carries the twine-holder, is provided with the arm 104, which carries at its free end the roller 105, and with the stop 106. The cam-wheel 87 is secured to the inner end of the shaft 18 and is provided with the rim 107, which engages into the notch 95 of the twine-holder and thereby locks the annulus of the twine-holder in position. A portion of this rim is cut away at 108 for the purpose of unlocking the annulus, as will be hereinafter described in the operation. The side of this rim forms the delay-flange 86, which, as before described, travels in contact with the delay-shoe 85 of the knotter-pinion, except where such rim is cut away to unlock the knotter-pinion, and at this interval the cam-wheel is provided with the cogs 109, which are adapted to engage with the knotter-pinion to impart two complete revolutions to said knotter-pinion in one revolution of the cam-wheel. The cam-wheel is formed with an interior cam 110, upon which the anti-friction-roller 81, which controls the movable jaw, travels. Another interior cam 111 is formed within the dished or concaved portion of the cam-wheel, by which the anti-friction roller 105 of the twine-holder frame is controlled, for the purpose of oscillating that frame to impart to it an oscillating movement toward the knotter at a certain stage in the operation of tying the knot, as shown in Fig. 18, while the stop 106 normally rests against the hub 112 of the cam-wheel and thereby holds the twine-holding frame in the position shown in Fig. 19. The breast-plate 73 is provided with the slot 113, through which the binder-arm is free to move in and out of position. Near the lower end of this slot the breast-plate is provided with a horn 114, which projects from one side of the slot to the opposite side, but does not come in contact therewith, but projects above. In proximity to the lower end of this slot is pivotally secured to the breast-plate at 115 the oscillating-lever twine-guide 116, one arm of which is provided with the incline 117, while the other arm is provided with the horn 118, which is adapted to close the lower end of the slot 113 in the breast-plate below the horn 114 in the position of said twine-guide shown in Fig. 17.

Having now described the construction of the knot-tying mechanism, I will now proceed to describe the operation of the whole binding mechanism.

The grain being delivered in the usual manner upon the binding-platform by the elevating devices, the packers feed it down against the compressor-arm, which is then in the normal position shown in Fig. 3. At the same time the butter operates against the butt-end of the grain and assists the packers to feed it and also to collect it in regular order, being adjusted by the operator by means of the lever 70, according to the length of the straw. The pressure of the grain is brought to bear from the compressor-arm through the medium of the crank-lever 10 against the dog 39 and tends to lift up the tripping-lever out of its normal position, in which it holds the clutch on the packer-shaft tripped. As soon as a large enough bundle is collected and the pressure against the compressor-arm is sufficient to overcome the tension of the spring 41 (which holds the tripping-lever in its normal position and which may be adjusted for greater or lesser pressure) the tripping-arm is lifted up out of engagement with the dog 33 of the tripping-clutch. Immediately the clutch is perfected, and the movement of the packer-shaft is imparted to the sprocket-pinion 29 of the packer-shaft, which transmits it through the medium of the sprocket-chain 51 to the sprocket-wheel 17, which imparts motion to the knot-tying mechanism through the shaft 18, and at the same time oscillates the binder-arm on the binder-shaft 3. The movement of the latter shaft carries the cam 49 down against the heel of the tripping-lever, and thereby prevents the retripping of the clutch during the operation of tying the bundle. As the binding-arm moves into position for binding, the anti-friction roller 15 on the compressing-lever rides on the compression-flange 16, and thereby locks the crank-lever 10 in position. Therefore the strain of the bundle against the compression-arm is resisted by the tension of the compressor-spring 47, and the compression of the bundle is therefore governed by the tension of the spring, which may be increased or lessened by adjusting the crank 46 in a different position upon the squared end of the compressor-shaft. By making the segmental flange 43 and 45 each about one-quarter of a circle, as shown in the drawings, it will be seen that there is a play of about one-half a circle in which the tension of the compressor-spring can be made effective to compress the bundle. The forward movement of the binder-arm encircles the bundle in the usual manner with the twine and carries the twine through the annulus, where it will be engaged into the lowest notch of said annulus in proximity to the shoe 97. Meanwhile the delay-flange of the

cam-wheel 87 releases the delay-shoe on the knotter-pinion, and the cogs 109 on the cam-wheel engage with the knotter-pinion to impart to the knotter two revolutions, during which the loop upon the knotter-head is formed, as in the usual manner. During the same interval the roller 81 on the lever 79, which controls the movable jaw, rides over the inwardly-projecting portion of the cam 110 on the cam-wheel, and thereby through the connections described opens the jaw of the knotter, at the proper moment, as shown in Fig. 20, to receive the ends of the twine. The cam 111 strikes the roller 105 of the twine-holding frame and oscillates it toward the knotter, as shown in Fig. 18. At the same time the cut-away portion of the rim of the cam-wheel, unlocking the annulus, permits the two teeth of the mutilated pinion to impart to the annulus a partial revolution, which carries that portion of the twine engaged into a notch of the annulus between the annulus and the shoe and thereby nips it fast, while at the same time the knife severs the band, which is now completely tied around the bundle.

The oscillating movement of the twine-holder toward the knotter provides, also, the necessary slack in the twine for tying the bundle. As the binder-arm withdraws after the knot-tying is complete, the twine, being nipped fast on its end by the twine-holder, is drawn through the binder-arm and placed in position and across the binding-platform ready for the next bundle, as in the usual operation of the knot-tying mechanism.

The twine is prevented from slipping off the knotter-head by the horn 114 in the breast-plate; but the rotary movement of said knotter-head disengages it at the proper time from said horn and lets it drop onto the horn 118, which is held in the position shown in Fig. 17 by the binder-arm impinging against the inclined face 117 of the oscillating-lever twine-guide. As soon as the binder-arm is withdrawn to its normal position the horn 118 of the oscillating-lever twine-guide is free to move out of the way to release the band, and the bundle is thrown off by the ejectors 119, which have now moved in position. One of the ejectors is preferably secured to the cam-wheel and the other to the actuating-shaft 18 of the knot-tying mechanism. The power exerted by the ejectors against the bundle strips the knot off the knotter-head and tightens it. After one revolution of the shaft 18 is completed all the parts are again in their normal position, and the tripping-clutch has been tripped to discontinue the movement until a fresh bundle is gathered upon the platform.

The construction and arrangement of the driving mechanism I have described and claimed in a prior application, filed December 19, 1887, Serial No. 258,265.

What I claim as my invention is—

1. The combination, with the compressor-arm and the oscillating compressor-shaft actuated thereby, of a compressor-spring mounted on such shaft and secured at one end to a loose member and at the other end to a fast member on said shaft, a crank on the shaft for regulating the tension of the spring, and a clutch formed between such loose and fast members and having a limited play, substantially as described.

2. The combination, with the compressor-arm and the compressor-shaft 9 actuated thereby, of the crank-lever 10, provided with a clutch-tooth 43 and forming the loose member of a clutch on said shaft, the thimble 44, provided with the clutch-tooth 45, the crank 46, mounted on a squared portion of the compressor-shaft and forming the fast member of the clutch, and the compressor-spring 47, secured to the loose and fast members of said clutch, the parts being arranged to operate substantially as described.

3. The combination, with the compressor-arm and the compressor-shaft actuated thereby, of the loose and fast members of the clutch on said shaft, the clutch-teeth 43 and 45 on said members, provided with a limited loose play, a compressor-spring secured to the loose and fast members to take up the play between such members, and the compression-flange 16, which controls the loose member of the clutch, substantially as described.

4. The combination, with the compressor-arm and the compressor-shaft actuated thereby, of a compressor-spring adjustably mounted on said shaft between a loose and fast member on said shaft, a clutch formed between the adjoining faces of said loose and fast members and provided with a limited play in one direction, a clutch on the packer-shaft, a tripping device for said clutch, a spring in said tripping device inferior in tension to the compressor-spring, and an arm on the loose member on the compressor-shaft for actuating said tripping device, substantially as described.

5. The combination, with the compressor-arm and the compressor-shaft, of a loose and fast member on said shaft, a clutch formed between the adjoining faces of said members and provided with a limited play, a clutch on the packer-shaft, a tripping device for said clutch actuated by the loose member on the compressor-shaft, a spring in said tripping device inferior in tension to the compressor-spring, and a flange 16, which controls the loose member on the compressor-shaft, substantially as described.

6. The combination of the compressor-arm, the compressor-shaft 9 actuated thereby, the crank-lever 10, loosely mounted thereon, the segmental circular flange 43 on said crank-lever, the thimble 44, fast in the compressor-shaft, the segmental circular flange 45 on said thimble, the crank 46, adjustably secured on the compressor-shaft, the compressor-spring 47, the revolving compressing-flange 16 on the actuating-shaft of the knot-tying mechanism, the compressor-lever 13, and the connecting-

rod 12, the parts being arranged to operate substantially as described.

7. The combination of the compressor-arm, the compressor-shaft 9 actuated thereby, the crank-lever 10, loosely mounted thereon, the tripping-arm 42 on said crank-lever, the segmental circular flange 43 on said crank-lever, the thimble 44, fast on the compressor-shaft, the segmental circular flange 45 on said thimble, the crank 46, adjustably secured on the compressor-shaft, the compressor-spring 47, the compressing-flange 16, interrupted at 61 and provided with the depression 60 and the eccentric portion 121, the compression-lever 13, and the connecting-rod 12, the parts being arranged to operate substantially as described.

8. The combination of the compressor-arm, the compressor-shaft actuated thereby, the crank-lever 10, loosely mounted on said shaft, the thimble 44 and crank 46, fast on said shaft, the clutch formed between said crank-lever and thimble and having a limited play, the compressor-spring 47, the tripping-arm 42 of the crank-lever, the tripping devices actuated thereby, the arm 11 of the crank-lever, the compression-flange 16 on the revolving shaft of the knot-tying mechanism, interrupted at 61 and provided with the depression 60 and the eccentric portion 121, the compressing-lever 13, and the connecting-rod 12, and the stop 120 on the crank-lever, substantially as described.

9. The combination, with the revolving trip-clutch on the packer-shaft, provided with the dog 33, of the oscillating trip-lever 37, carrying the dog 39, the tripping-arm 42 on the crank-lever 10, bearing against said dog under the action of the grain on the compressor, the tripping-spring 41, sleeved upon the rod 200, the rod 200, the stationary guide-bearing 202, and the movable guide-bearing 201, on which said rod is movably secured, and the crank 204 on the binder-shaft, adapted to bear against the rod 200, substantially as described.

10. The combination, with the dog 33 of the revolving trip-clutch on the packer-shaft, of the oscillating tripping-lever 37, carrying the dog 39, the crank-lever 10, provided with the tripping-arm 42 and actuated by the compressor, the tripping-spring 41, sleeved upon the rod 200, the rod 200, provided with the adjusting-nut 203, the stationary and movable guide-bearings 202 and 201, in which said rod loosely engages, the crank 204 on the binder-shaft, adapted to bear against said rod, the heel-extension 50 on the tripping-lever, and the cam 49 in the binder-shaft, the parts being arranged and constructed to operate substantially as described.

11. The combination, in a binder mechanism, of the compressor, the binder-arm provided with a heel-extension to which the arm of said compressor is pivotally secured, the compressor-shaft provided with a crank, the link connecting said crank and compressor, the crank-lever forming a loose member on the compressor-shaft, the fast member on said shaft, the clutch formed between the said loose and fast members and having the limited play, the compressor or spring mounted thereon and secured at one end to the loose member and at the other end to the fast member, the compression-flange on the revolving shaft of the knot-tying mechanism, the compression-lever riding upon said flange, and the connecting-rod connecting said lever with the crank-lever on the compressor-shaft, substantially as described.

12. The combination, with the compressor and the compressor-shaft actuated thereby, of the crank-lever mounted thereon and forming the loose member of a clutch, the fast member of the clutch, the clutch-teeth affording a limited play between said members, the compressor-spring mounted thereon to take up said limited play, the trip-clutch on the packer-shaft, the tripping-lever, adapted to trip said clutch, the dog on the tripping-lever, the tripping-arm on the crank-lever, adapted to engage with said dog, and the spring acting on the tripping-lever, substantially as described.

13. The combination of the compressor, the binder-arm provided with the heel-extension to which said compressor is pivotally secured, the compressor-shaft actuated by the compressor, the clutch on said shaft having a limited play, the crank-lever forming the loose member of said clutch, the compressor-spring mounted thereon to take up such play, the interrupted circular compression-flange on the revolving shaft of the knot-tying mechanism, provided with the depression 60, the compression-lever riding upon said flange, the connecting-rod connecting said compression-lever with the crank-lever, the tripping-arm on the crank-lever, and the tripping mechanism actuated thereby to trip the clutch on the packer-shaft, substantially as described.

14. The combination, in a knot-tying mechanism, of the revolving knotter journaled in a stationary knotter-frame, the interrupted pinion on the knotter-shaft, the sliding jaw of the knotter, the actuating-lever of said jaw, the tension-spring of said lever, the oscillating twine-holder hinged to the knotter-frame, the notched annulus of the twine-holder, the shoe engaging therewith, the knife carried by said shoe, the cogs on the annulus adapted to engage with the interrupted pinion on the knotter-shaft, and the revolving cam-wheel actuating said knot-tying mechanism, substantially as described.

15. The combination of the stationary knotter-frame, the revolving knotter journaled therein, the pinion on the knotter-shaft, the delay-flange on the pinion, the sliding jaw of the knotter, the actuating-lever of said jaw, the tension-spring of said lever, the revolving cam on the actuating-shaft of the knot-tying mechanism, the delay-flange on said wheel for the knotter-pinion, the knotter-actuating gear on said cam-wheel, the interior cam on said

wheel on which the lever of the sliding jaw engages, the oscillating frame of the twine-holder, the cam on the cam-wheel controlling the movement of said frame, the notched annulus seated in said frame, the gear on said annulus, and the interrupted pinion on the knotter-shaft adapted to engage with said gear, substantially as described.

16. The combination, with the revolving knotter journaled in a stationary knotter-frame, of an oscillating twine-holder pivotally secured to said frame and carrying a revolving annulus internally notched and provided with a stationary shoe forming a twine-holder device, a bevel-gear on said annulus, and an interrupted bevel-pinion on the knotter-shaft adapted to engage during the revolution of the knotter with the bevel-gear of the annulus, substantially as described.

17. The combination, with the actuating cam-wheel of the knot-tying mechanism, of the revolving knotter journaled in a stationary knotter-frame and provided with the knotter-pinion and the interrupted pinion on the knotter-shaft, the oscillating twine-holder frame carrying the movable annulus of the twine-holding device, provided with the cog-gears 94, engaging therewith, the recess 95 in the twine-holding frame, the corresponding recesses 96 in the annulus, the locking-rim 107 of the cam-wheel, the cut-away portion 108 on said rim, the delay-flange 86 of the cam-wheel, and the delay-flange on the knotter, substantially as described.

18. The combination, with the actuating cam-wheel of the knot-tying mechanism and the revolving knotter, of the oscillating twine-holder consisting of the frame 90, provided with the ring-bearing 91, the notched annulus 92, adapted to revolve therein, the grooved shoe engaging with said annulus and provided with the adjustable tension 100, and the knife 102, secured to said shoe, substantially as described.

19. The combination, with the revolving knotter provided with the interrupted pinion 88, of the oscillating twine-holder frame 90, the ring-bearing 91 formed thereon, the annulus 92, adapted to revolve thereon, the notches 93 on the inner circle of the annulus, the grooved shoe 97, pivotally secured to the twine-holding frame and provided with the adjustable tension-spring 100, the knife 102, secured to said shoe, the gear 94 on the annulus, the recess 95 in the ring-bearing of the twine-holding frame, and the recesses 96 in the annulus adapted to register therewith, substantially as described.

20. The combination, with the stationarily-journaled revolving knotter, of the breast-plate provided with the slot 113 and the horn 114, projecting across and above said slot, and the twine-guide 116, pivotally secured to the breast-plate and provided with the incline 117 and the horn 118, substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses, this 4th day of June, 1888.

JEREMIAH KELLER.

Witnesses:
CH. ROEDER,
J. ERCKENER.