(No Model.) 17 Sheets—Sheet 1.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Fig. 1

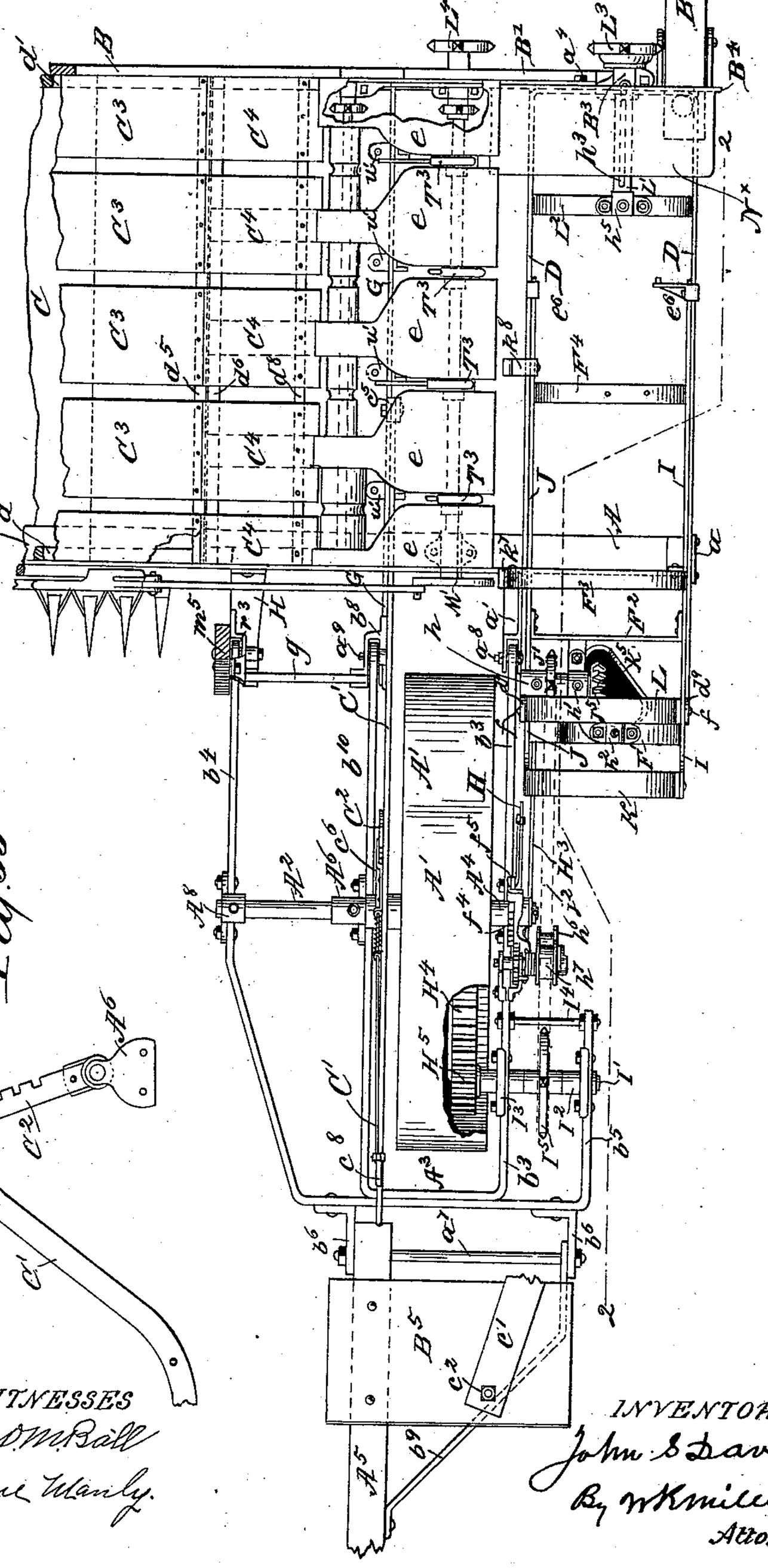

Fig. 55

WITNESSES

Chas. M. Ball

Wm. Manly.

INVENTOR

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By W. Knight

Attorney

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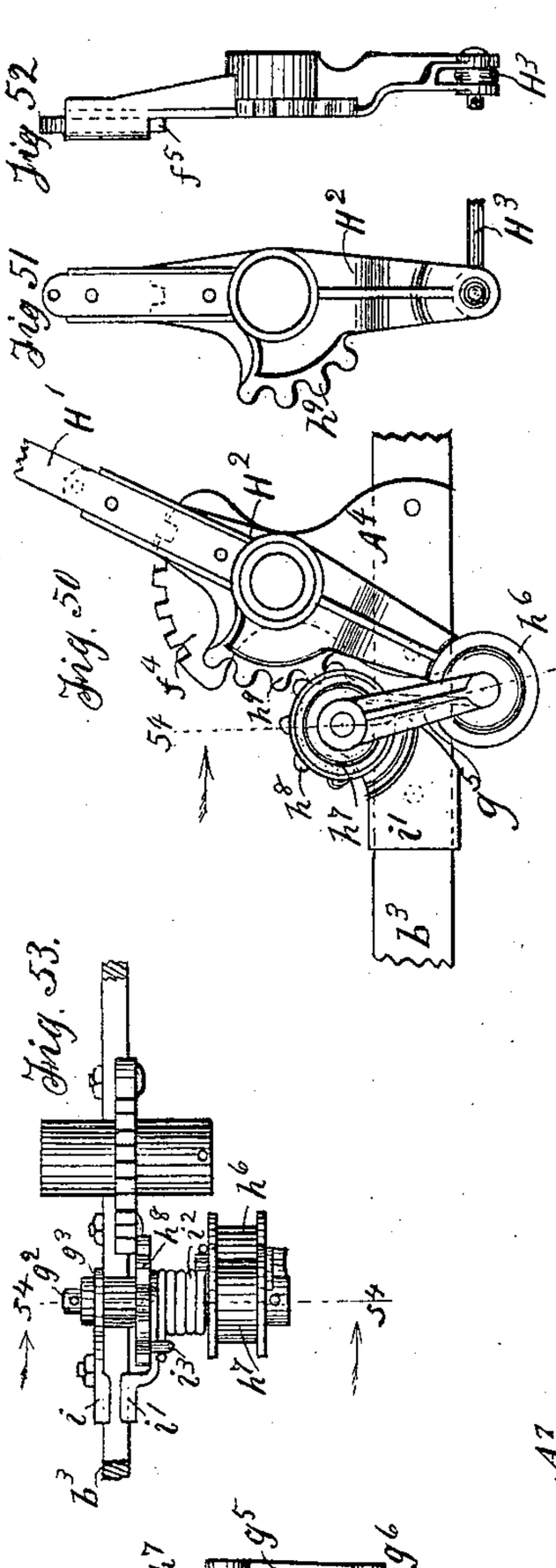
J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.



Witnesses
E. F. Dunfey
C. A. Dunfey

Inventor
John S. Davis

(No Model.) 17 Sheets—Sheet 3.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

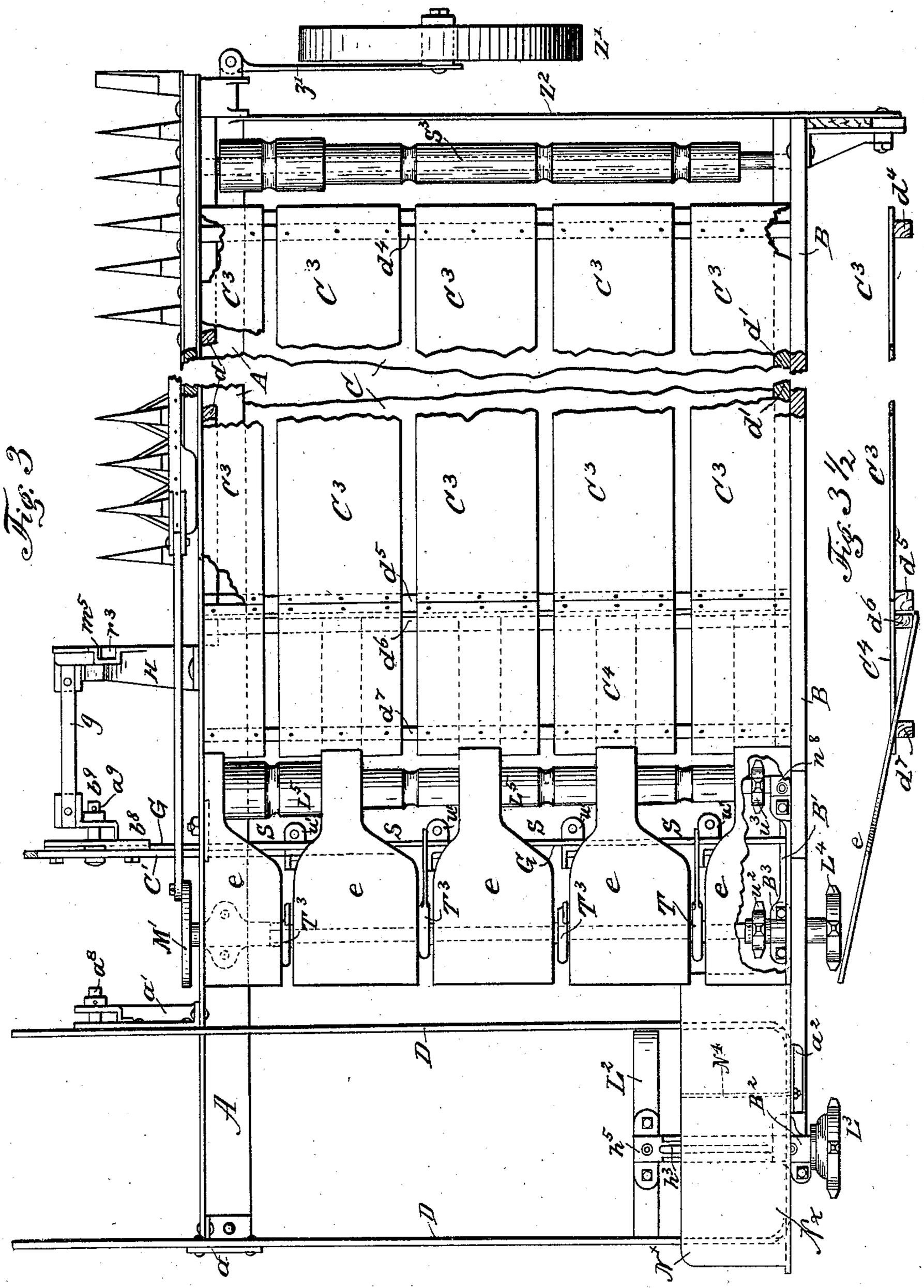


Fig. 3.

Fig. 3½.

WITNESSES
Chas. W. Ball
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By W. K. Miller
Attorney

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J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Fig. 1

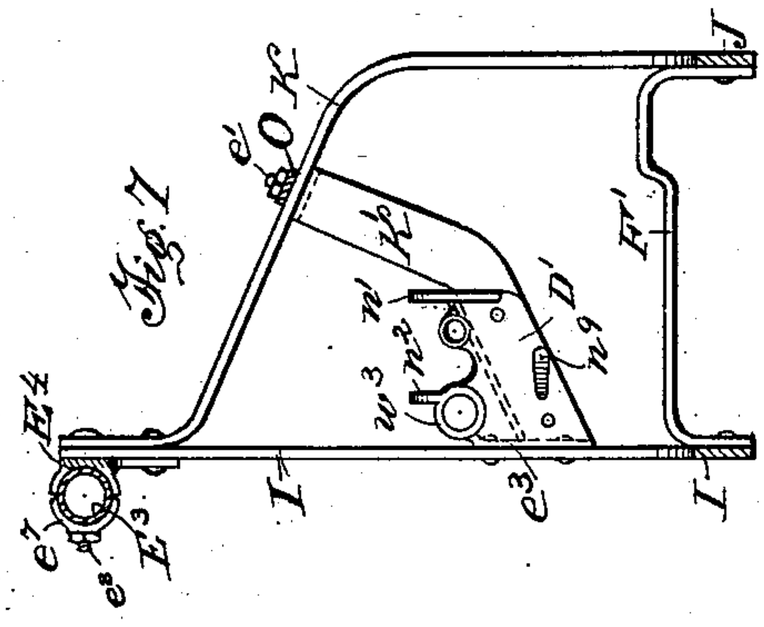


Fig. 6

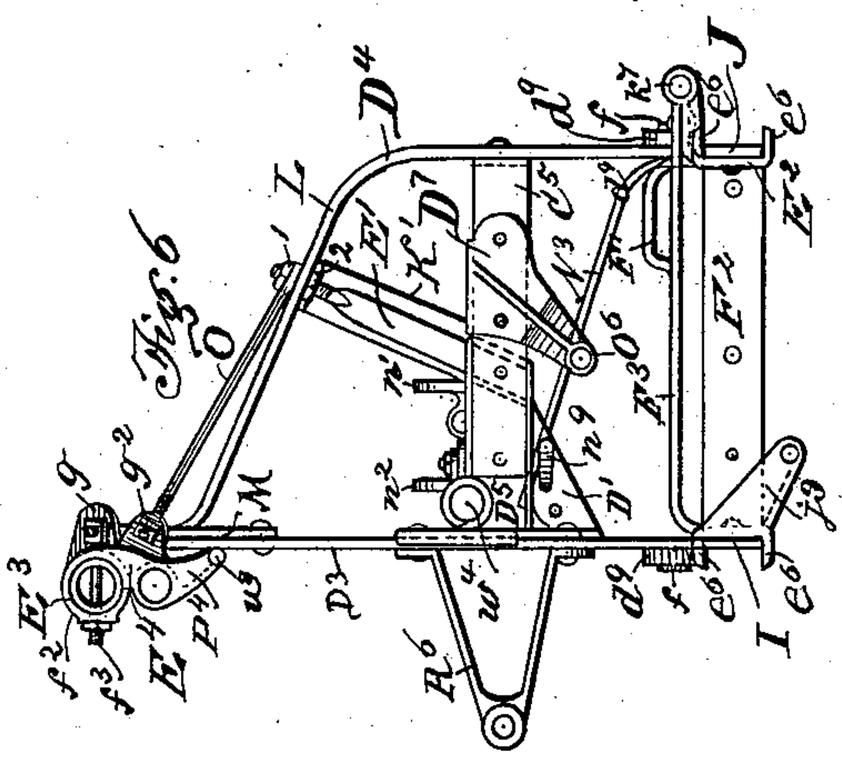


Fig. 4

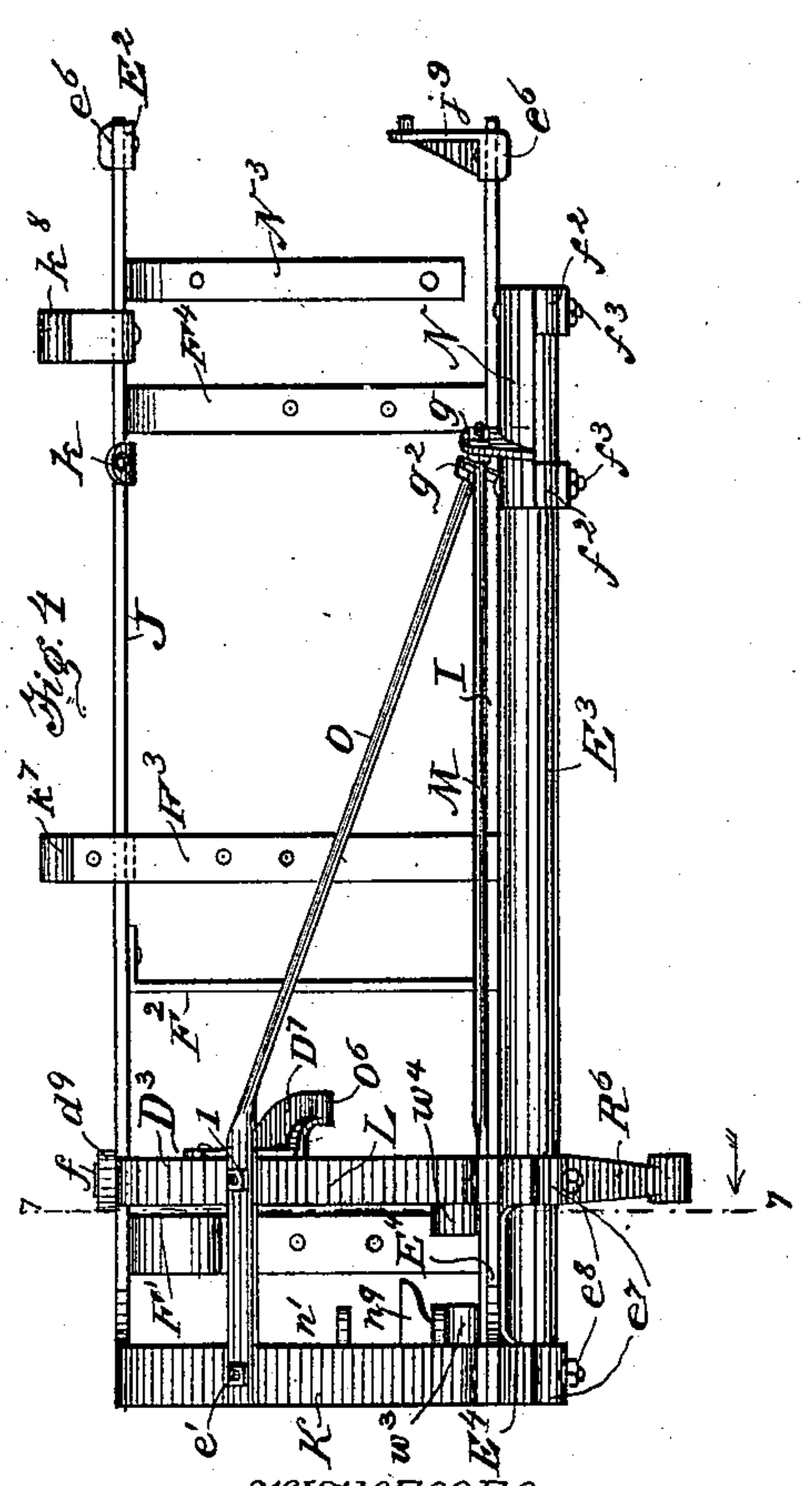
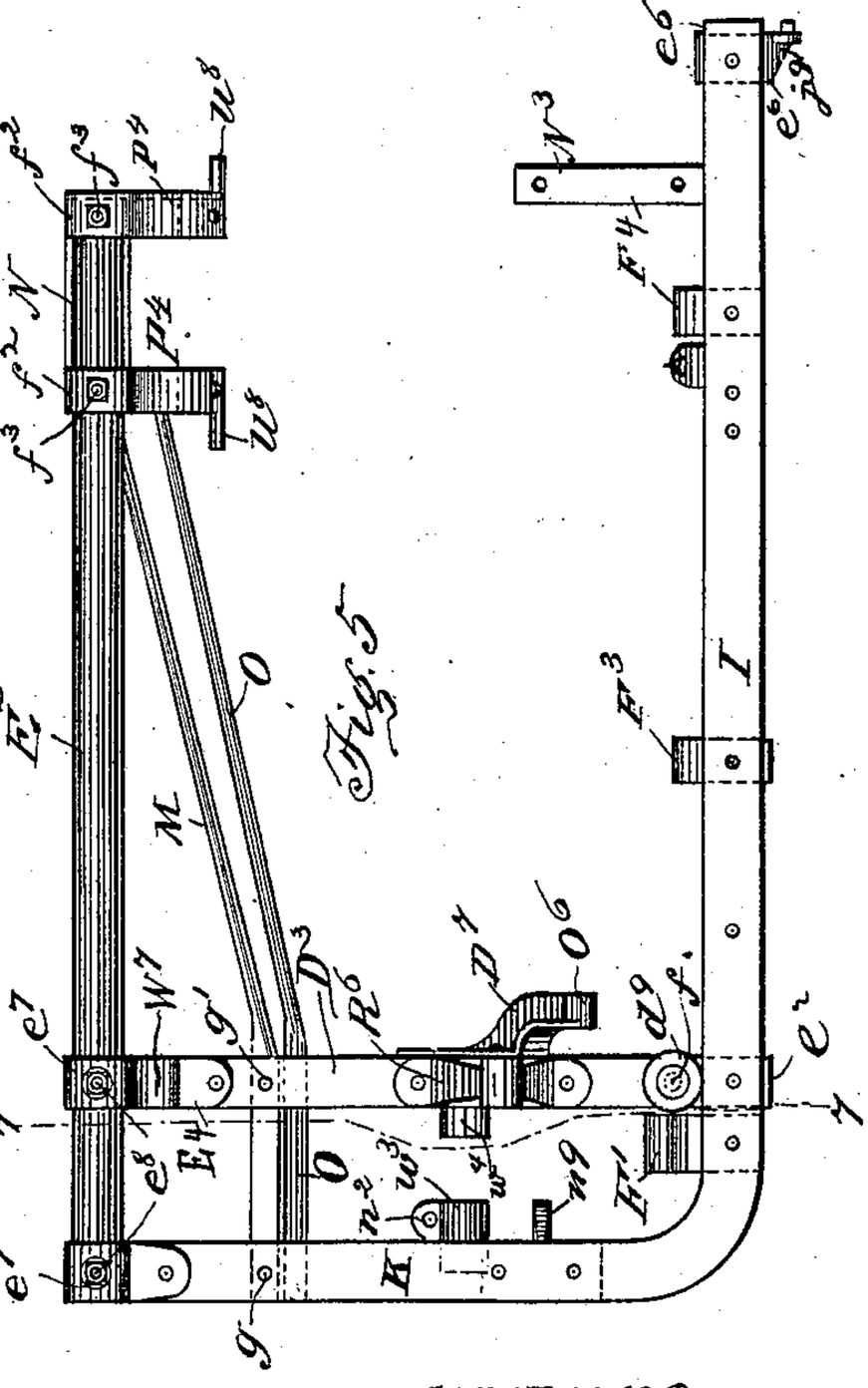


Fig. 5



WITNESSES

Chas. M. Ball

Wamie Wamby.

INVENTOR

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Attorney

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J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

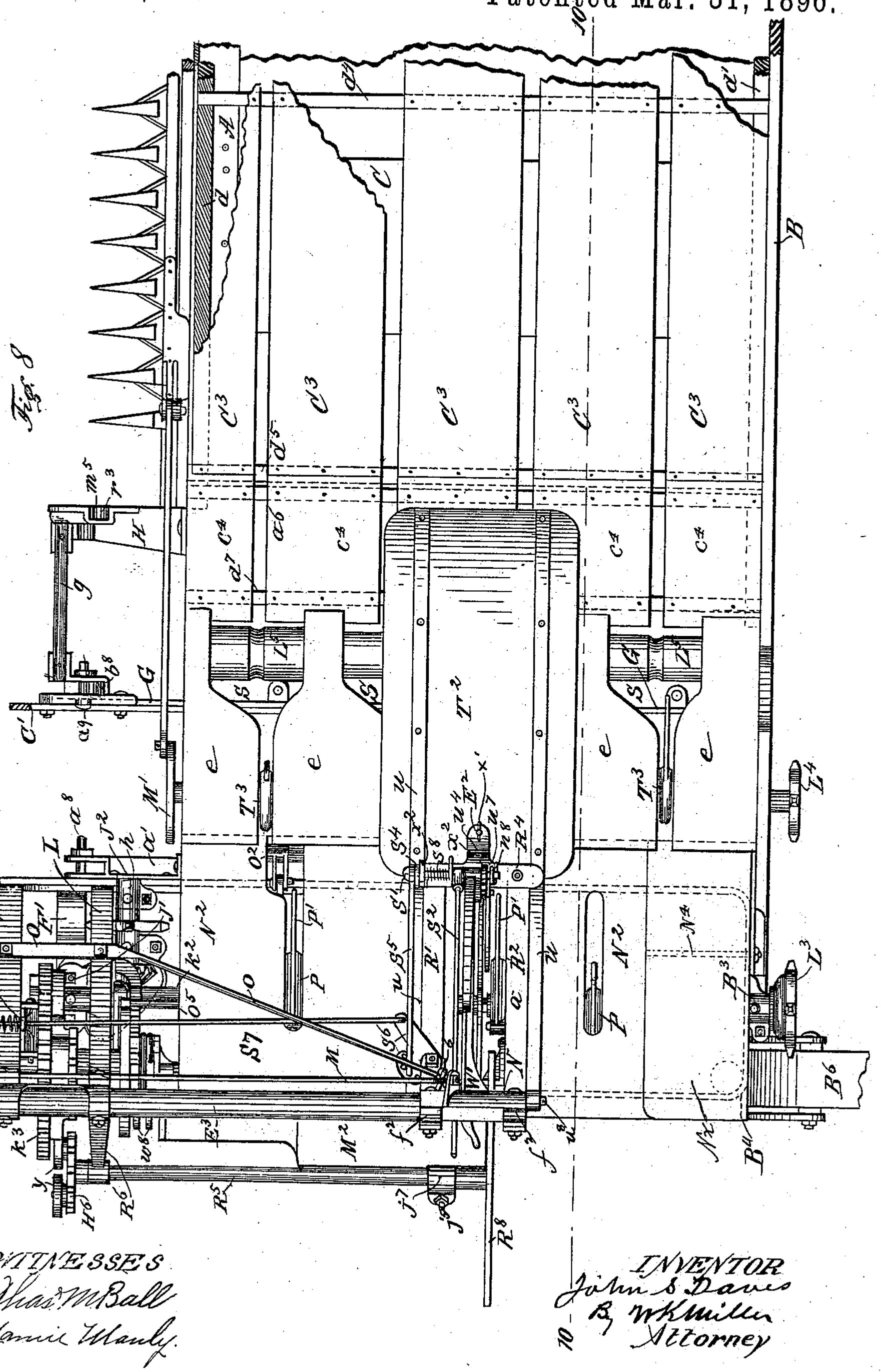

Fig. 8

WITNESSES
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J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193.

Patented Mar. 31, 1896.

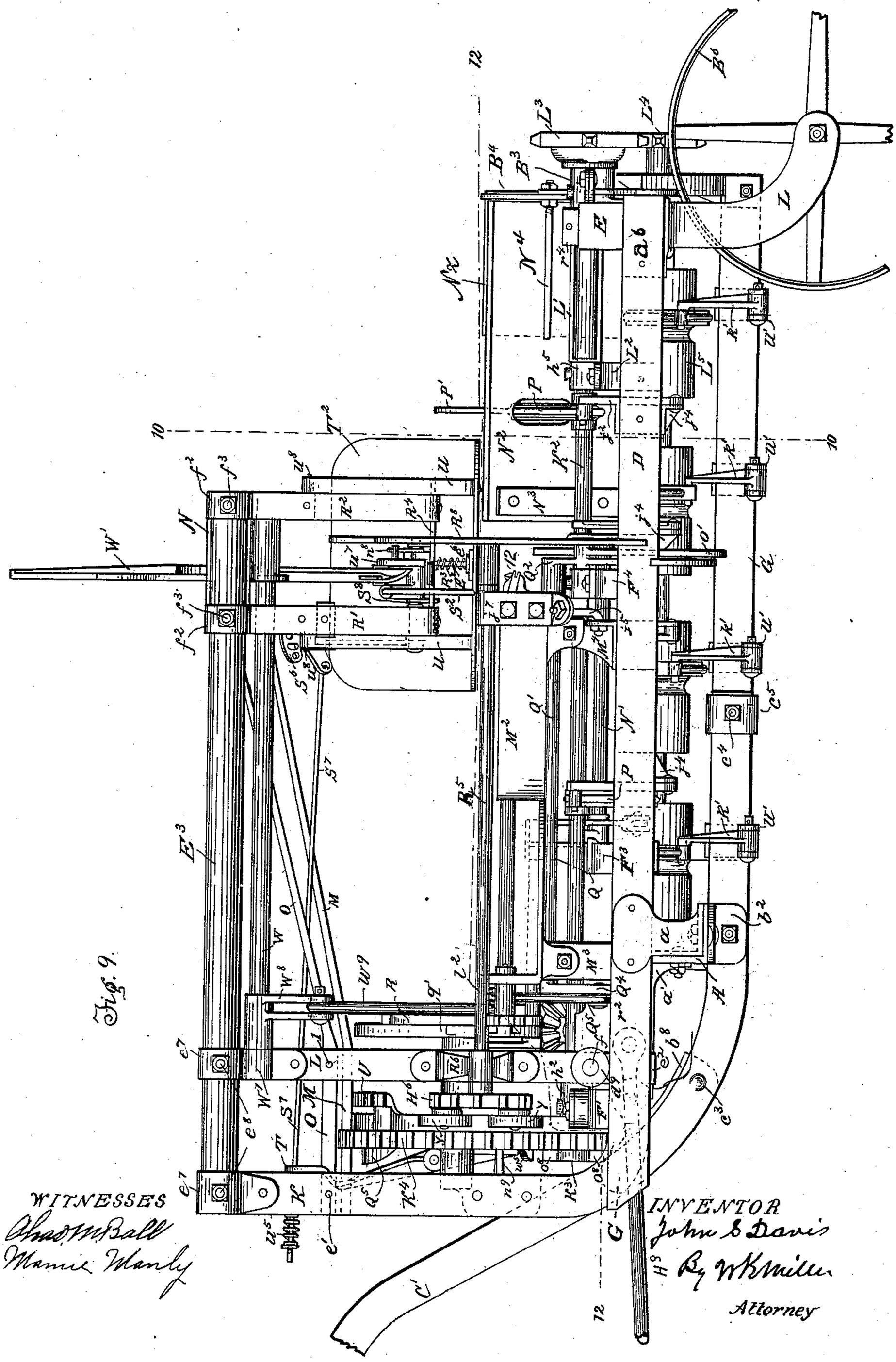

Fig. 9.

WITNESSES

Chas. W. Ball

Wamie Manly

INVENTOR

John S. Davis

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Attorney

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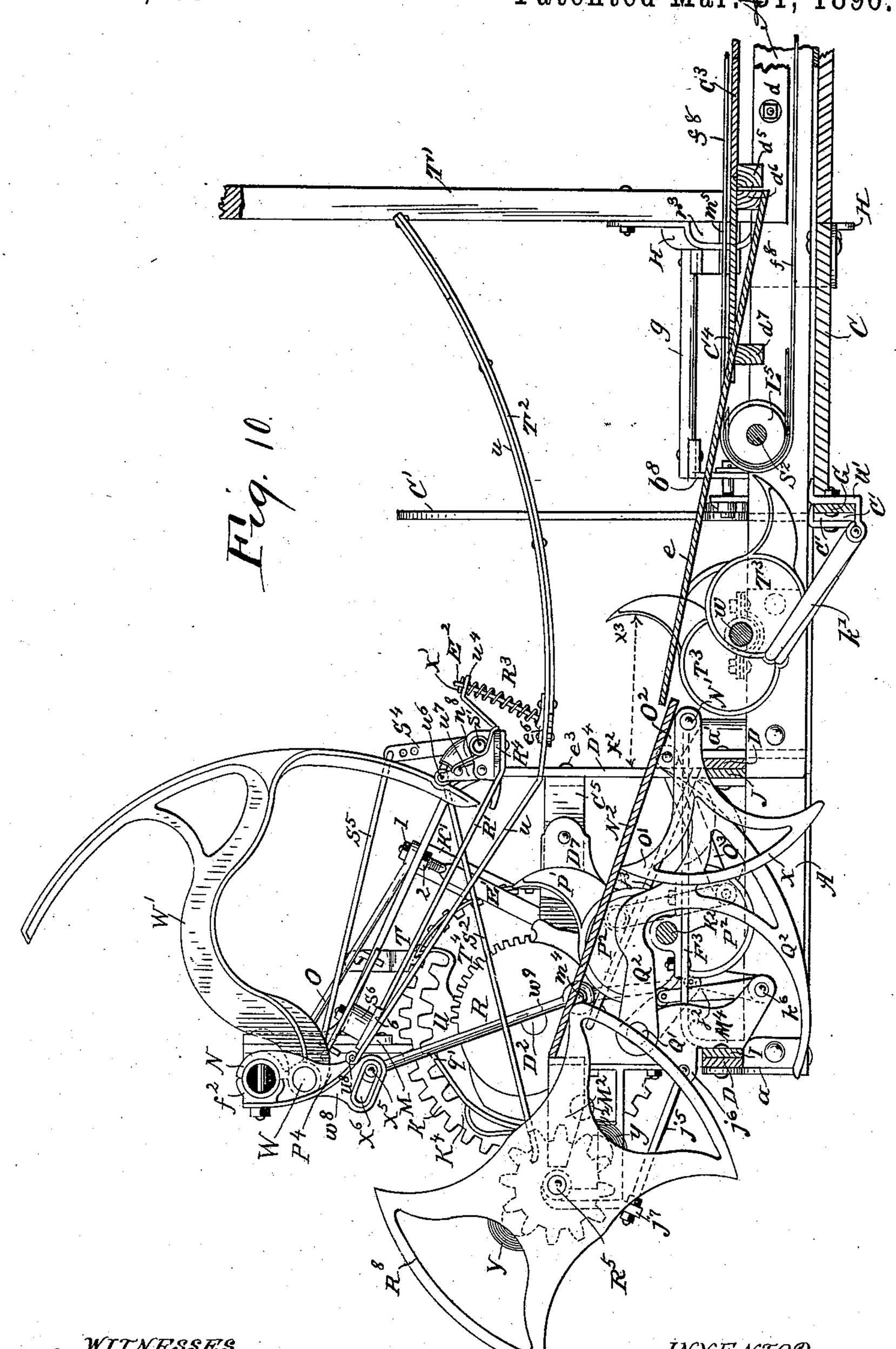
J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Fig. 10.



WITNESSES
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REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

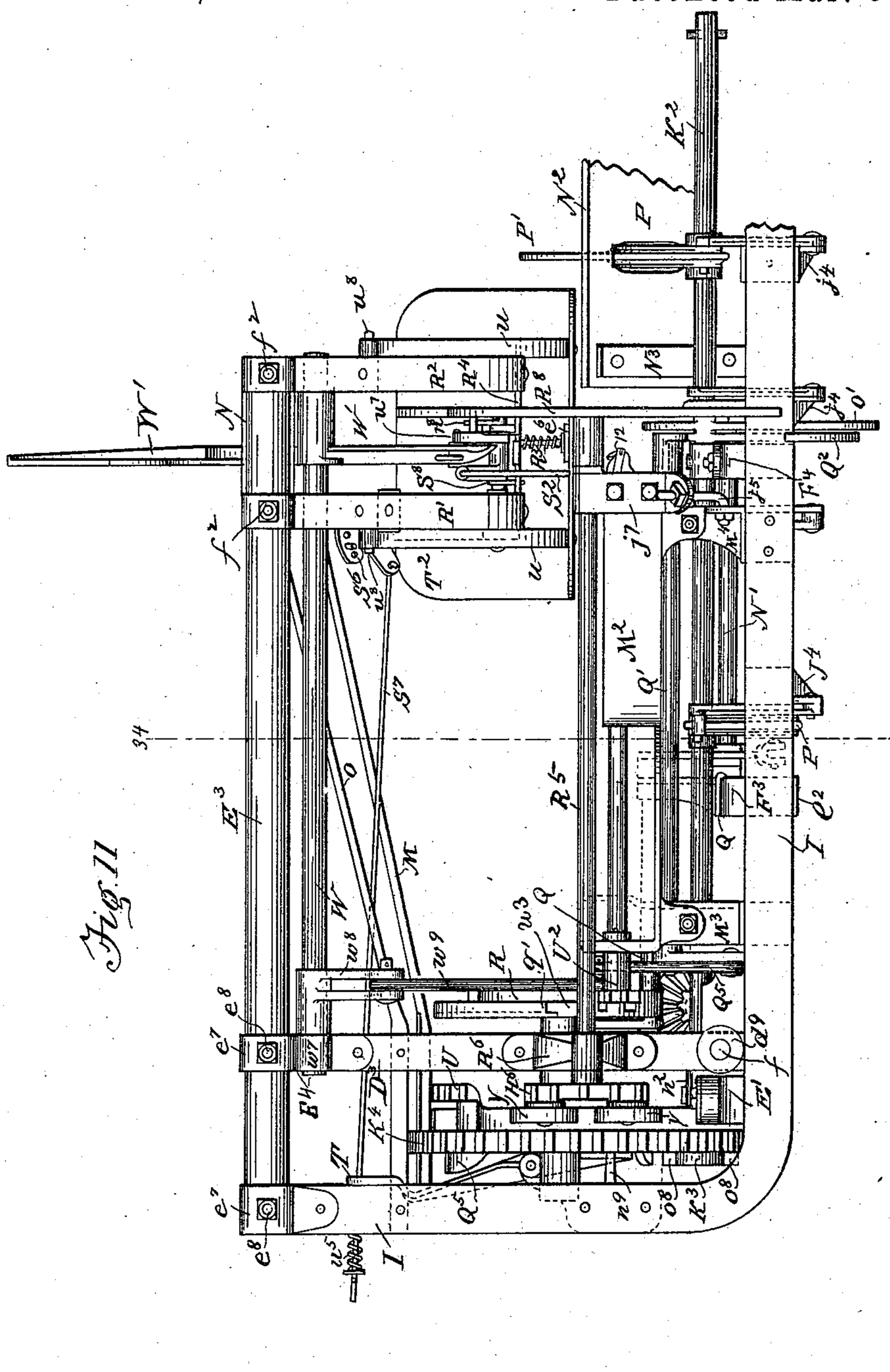

Fig. 11

WITNESSES
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By W. K. Miller
Attorney

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J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

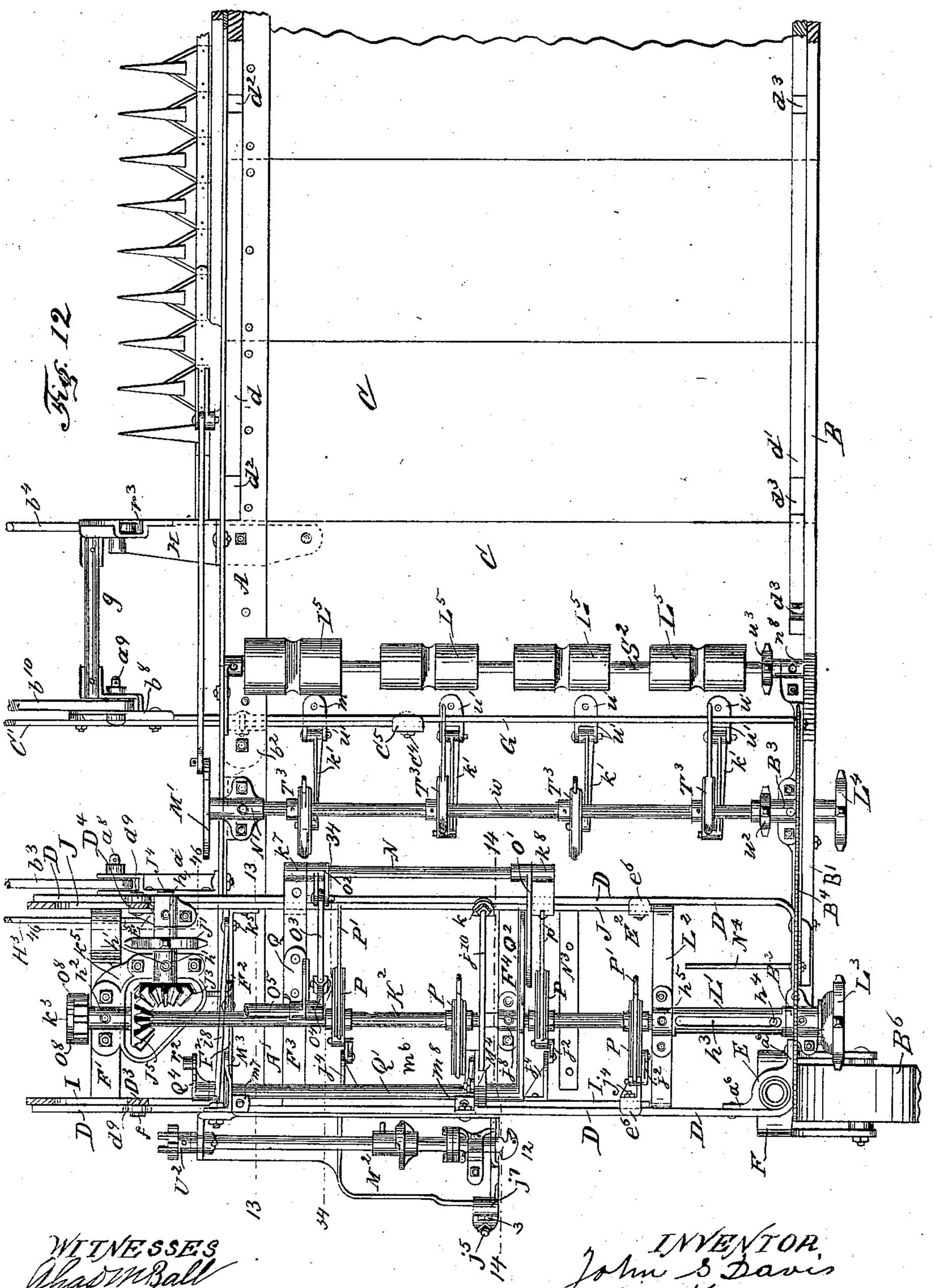

Fig. 12

WITNESSES
Chas. W. Ball
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By W. K. Miller
Attorney

(No Model.) 17 Sheets—Sheet 10.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

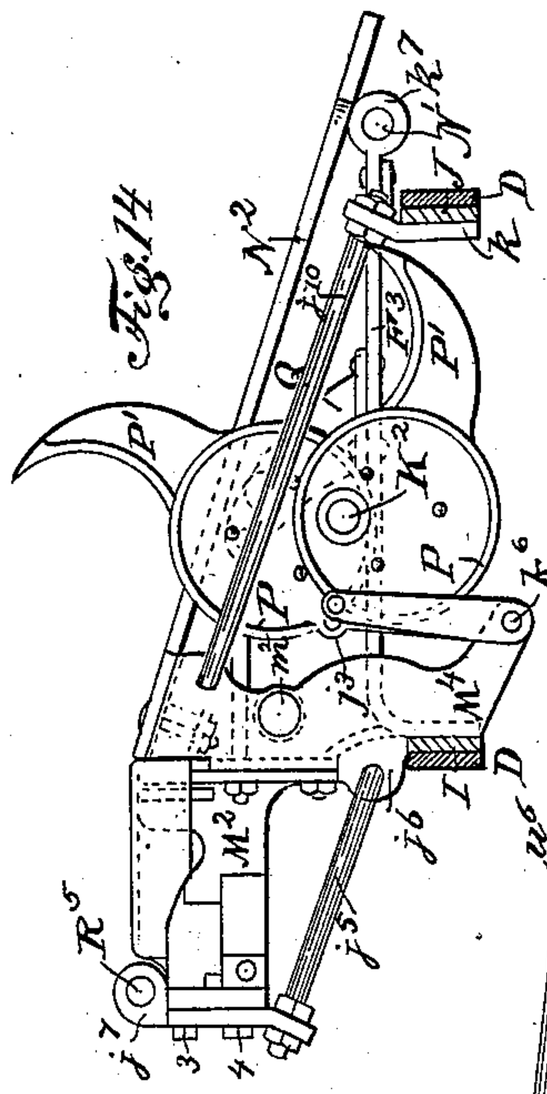

Fig. 14

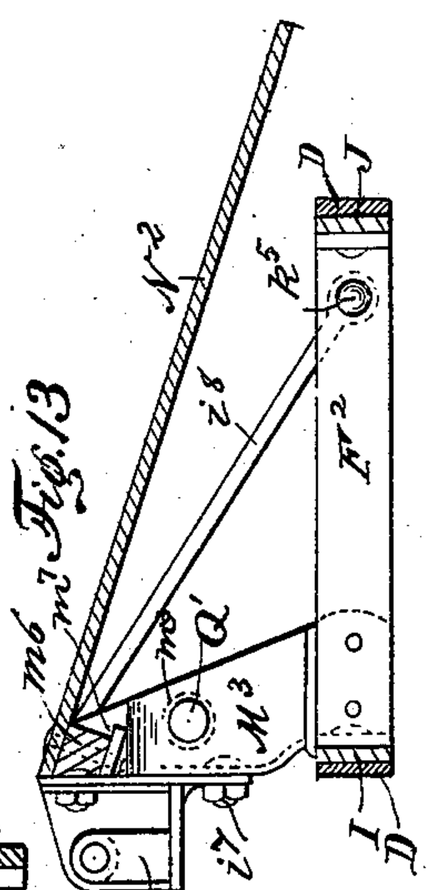

Fig. 13

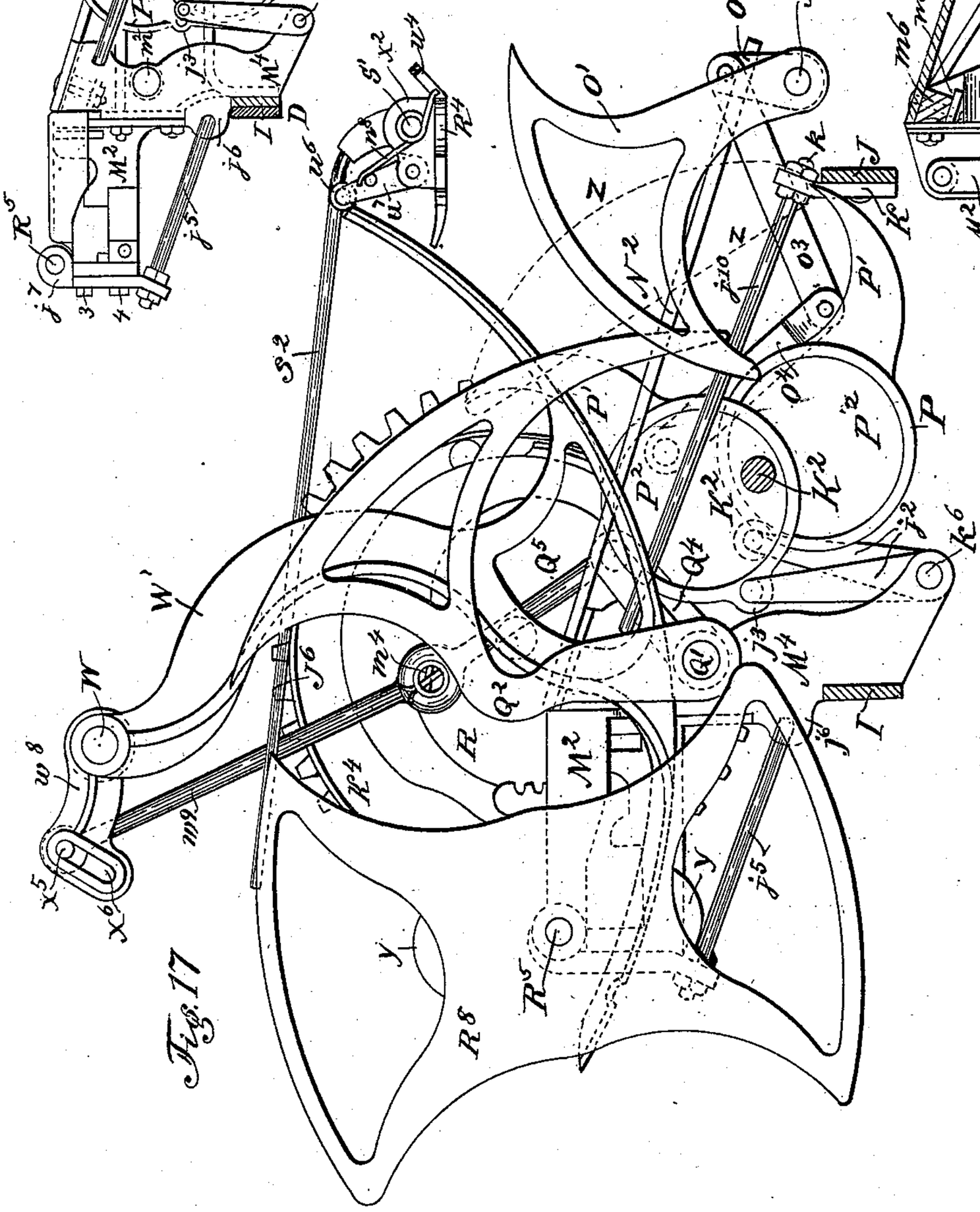

Fig. 17

WITNESSES
Chas. M. Ball
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J. S. DAVIS.

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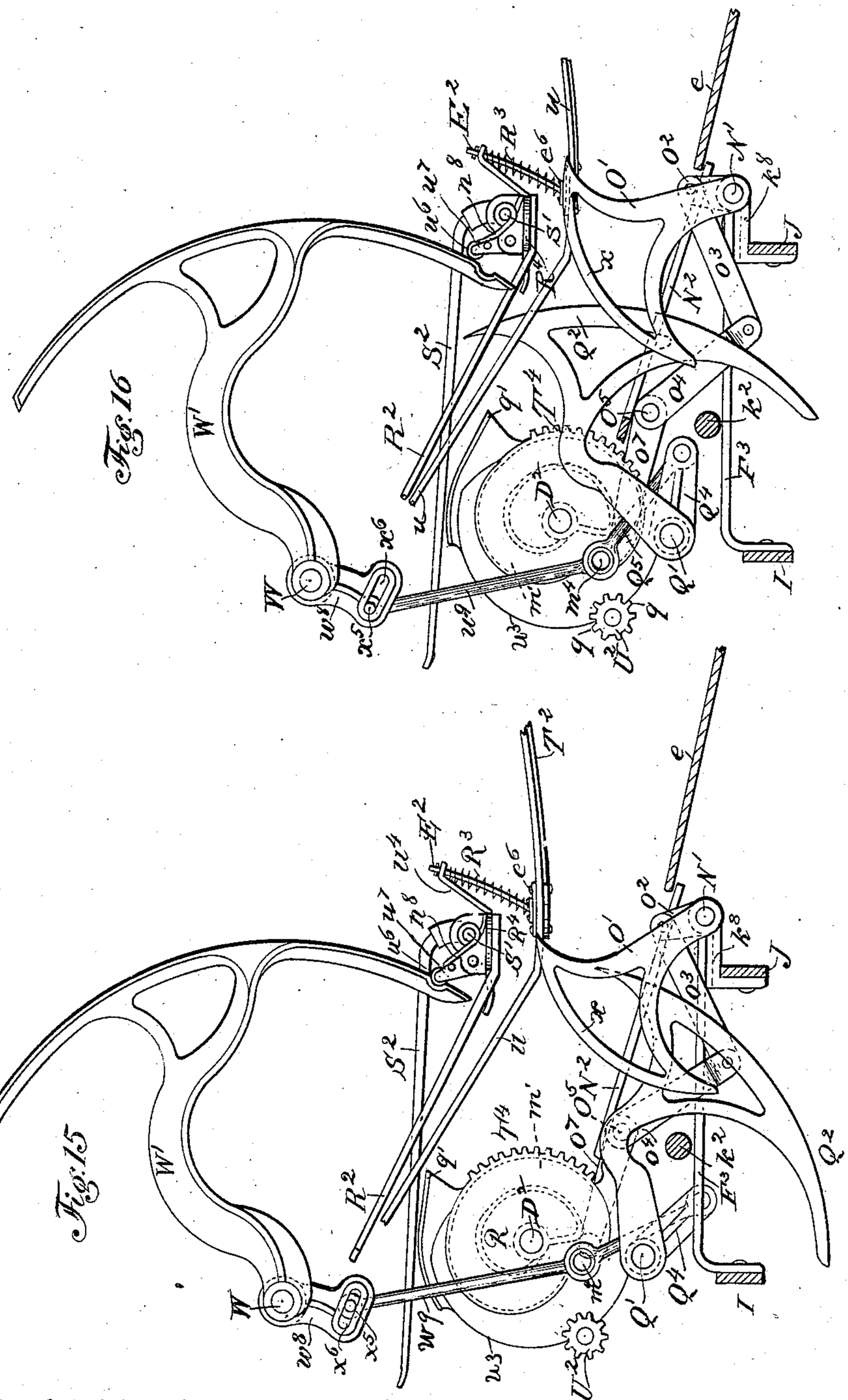

WITNESSES
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REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Fig. 31

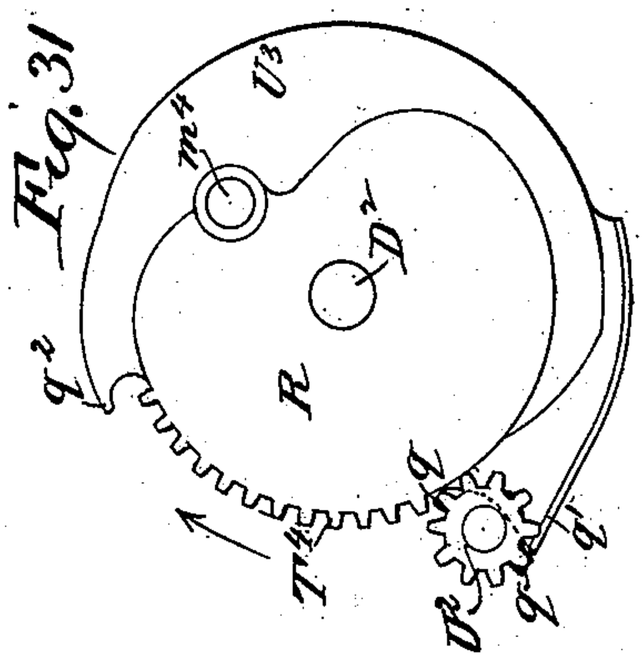

Fig. 19

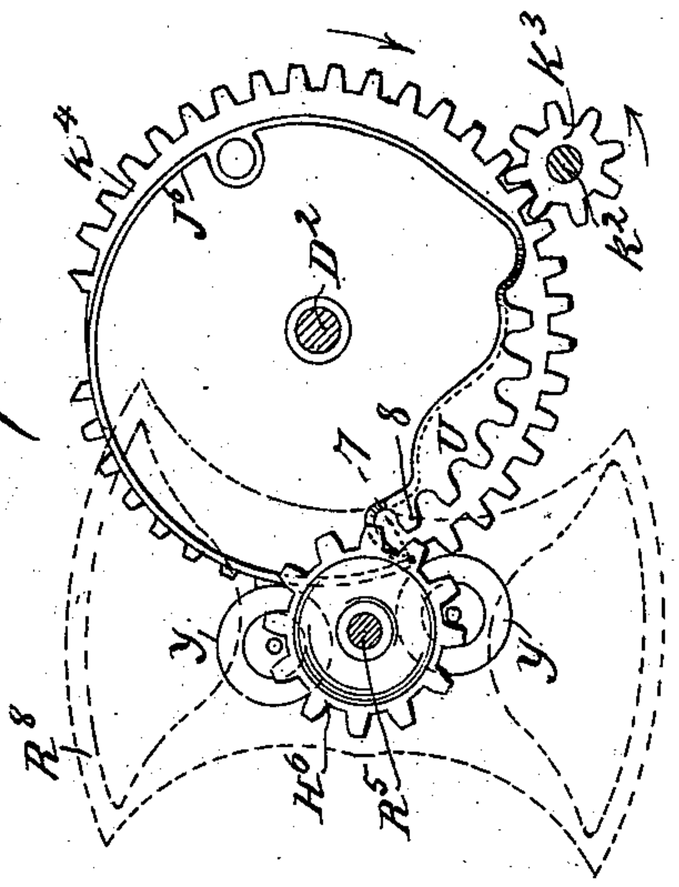

Fig. 30

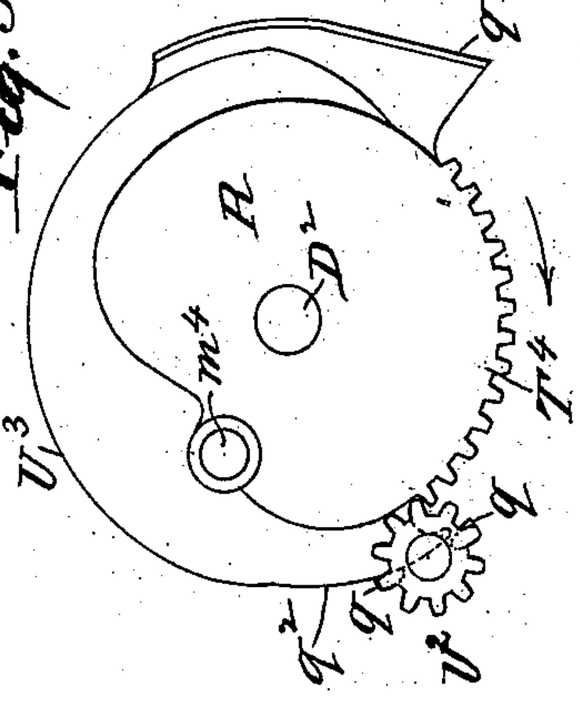

Fig. 18

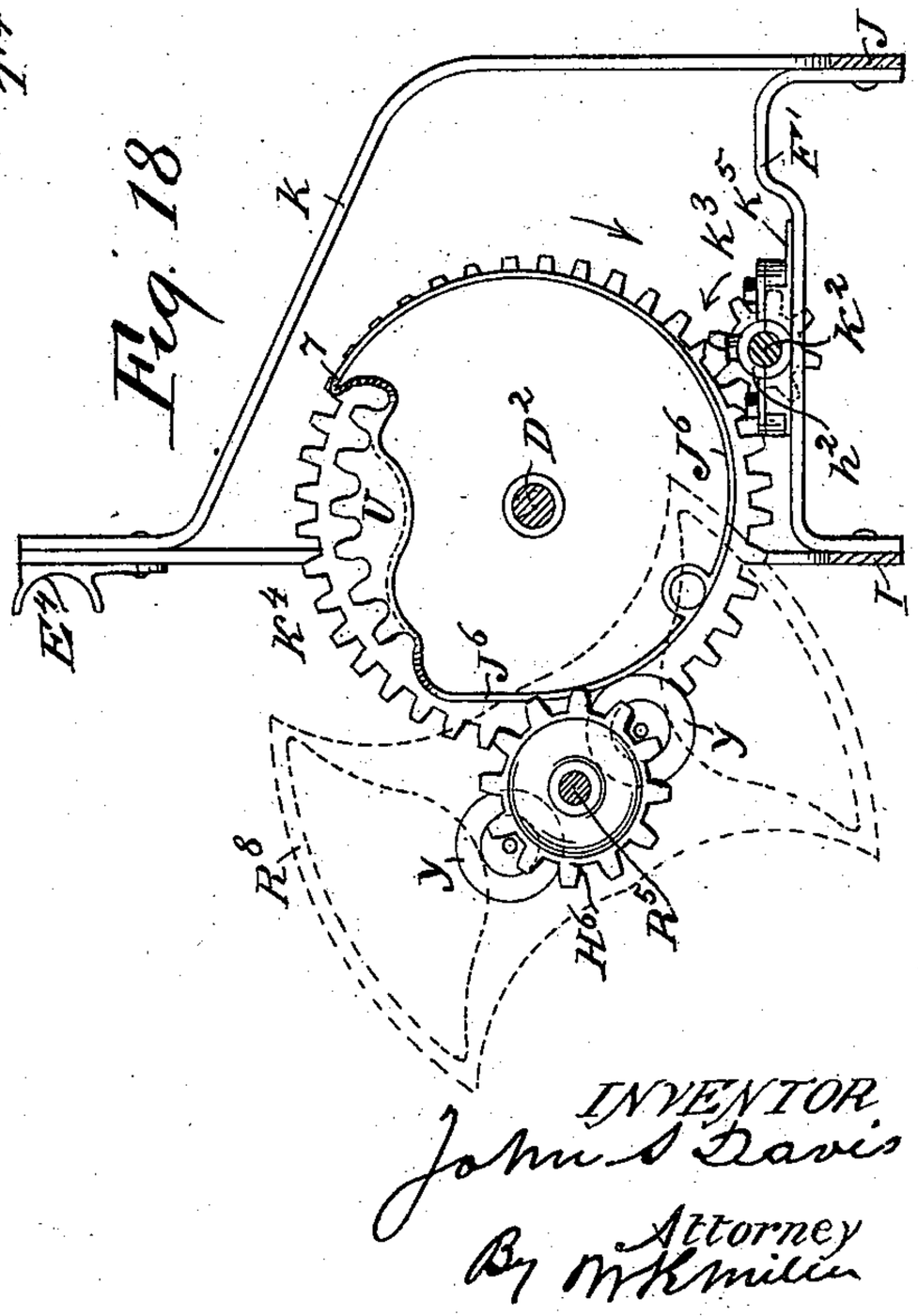

Fig. 32.

WITNESSES
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J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

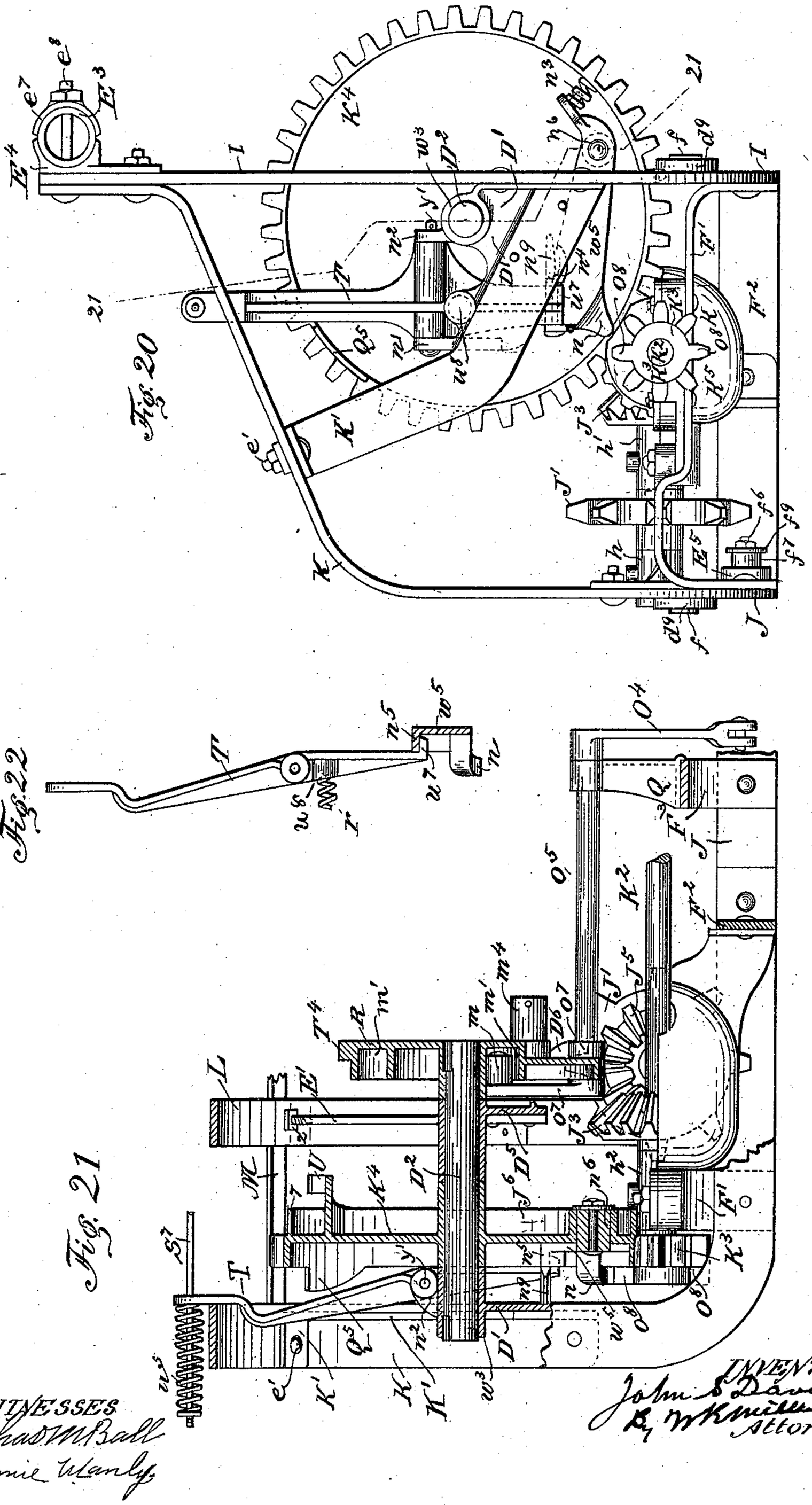

Fig. 20

Fig. 22

Fig. 21

WITNESSES
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Wm. Wanly

INVENTOR
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by Wm. Knight
Attorney

(No Model.) 17 Sheets—Sheet 14.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Fig. 45

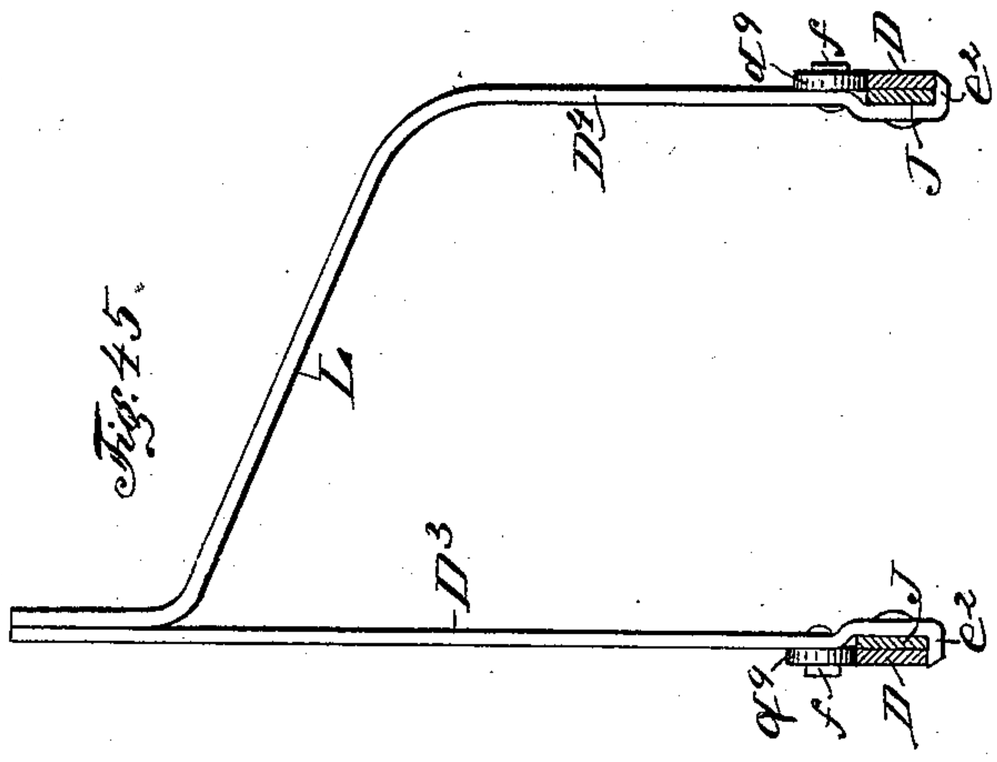


Fig. 36

Fig. 35

Fig. 38

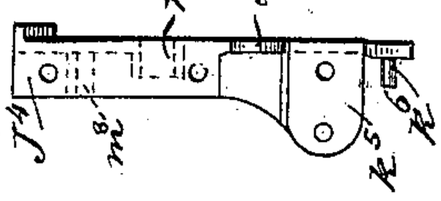


Fig. 37

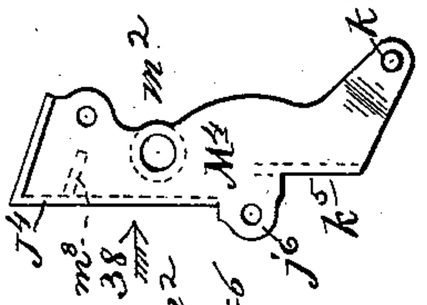


Fig. 29

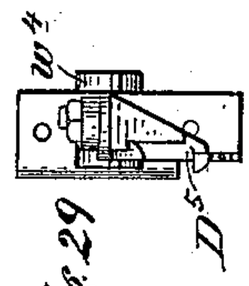


Fig. 24

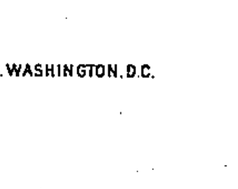


Fig. 23

Fig. 25

Fig. 26

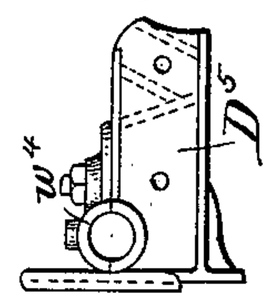
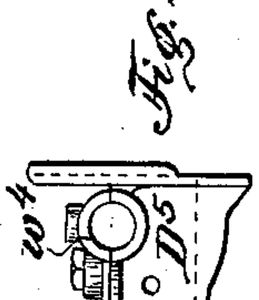


Fig. 28

Fig. 27



WITNESSES

Chas. M. Ball

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Attorney

(No Model.) 17 Sheets—Sheet 15.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

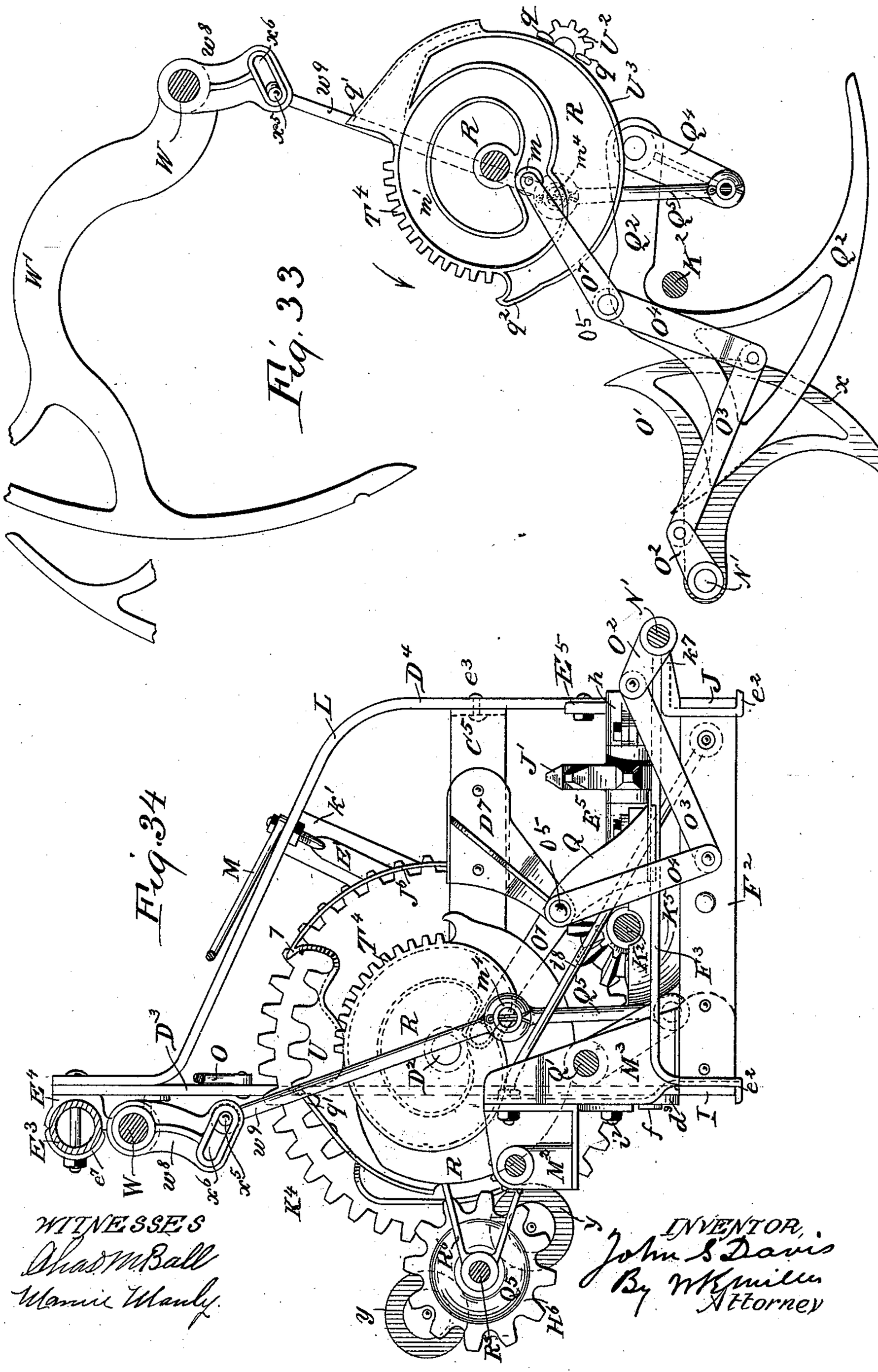

Fig. 33

Fig. 34

WITNESSES
Thad M. Ball
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Attorney

(No Model.) 17 Sheets—Sheet 16.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Fig. 39

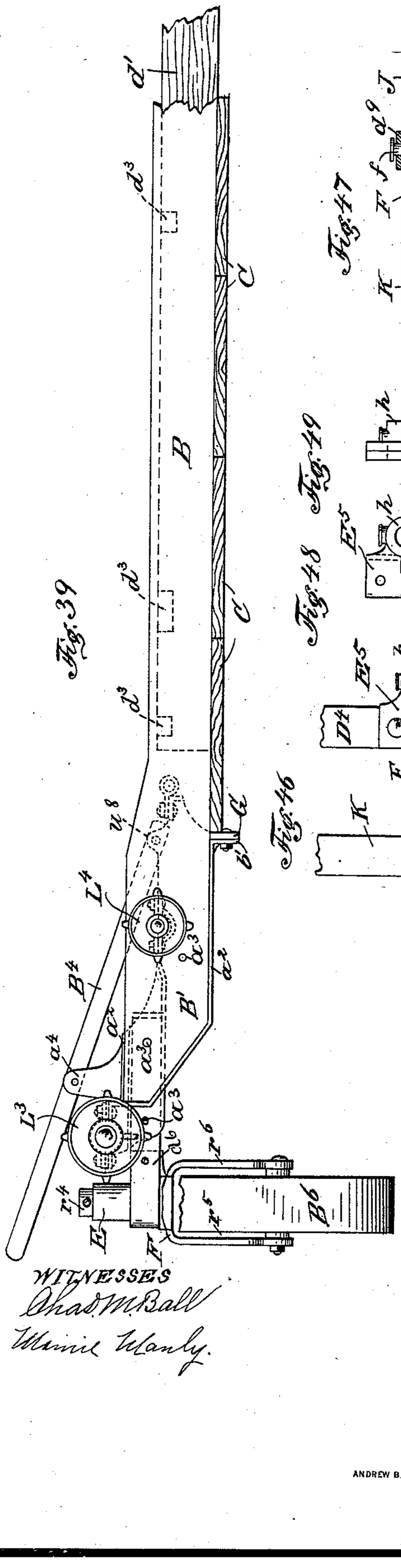


Fig. 47

Fig. 44

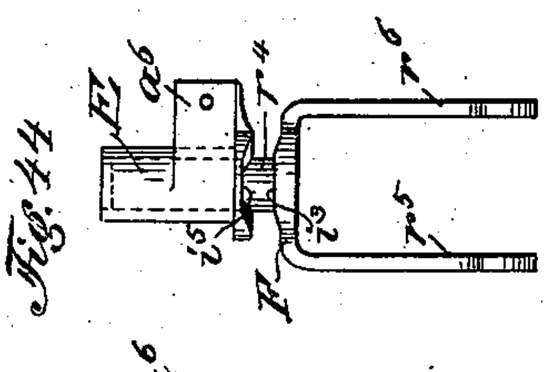


Fig. 43

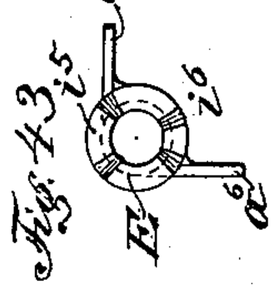


Fig. 42

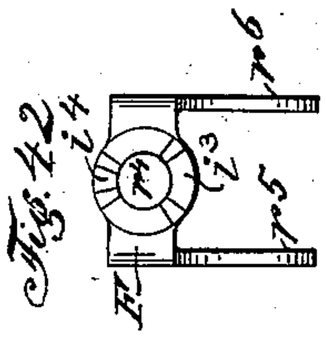


Fig. 48

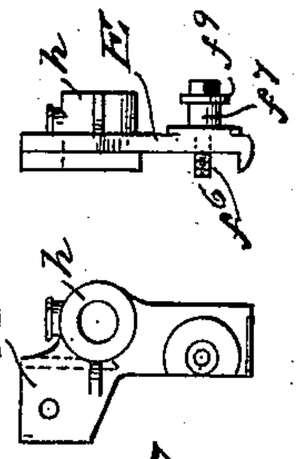


Fig. 49

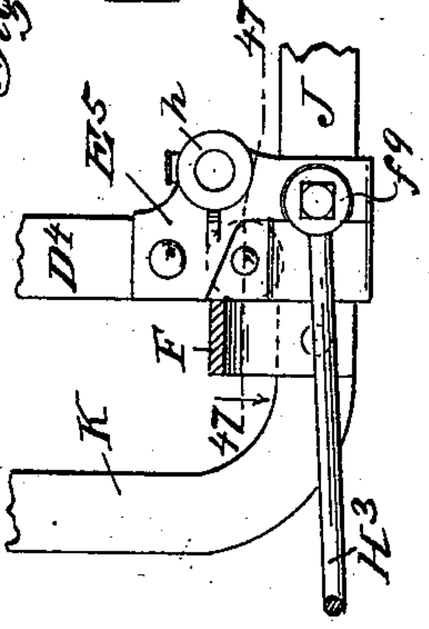


Fig. 46

Fig. 40

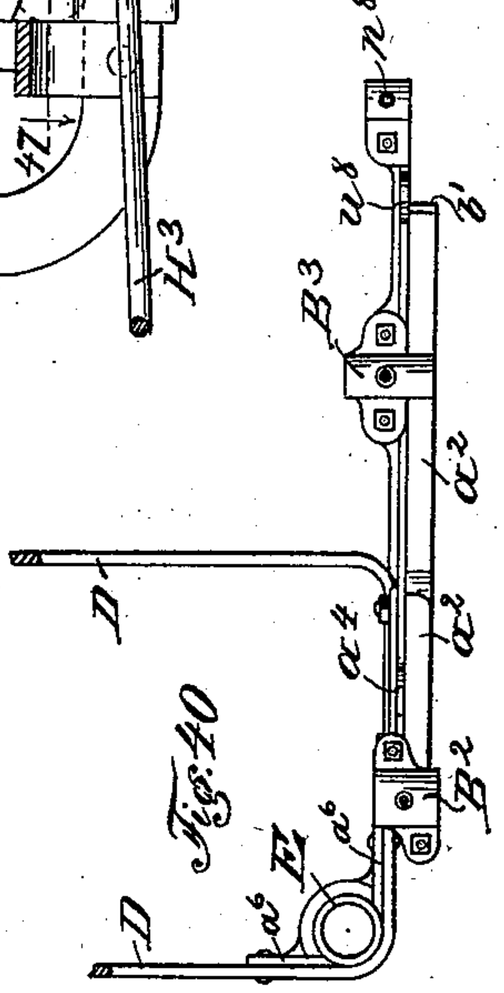
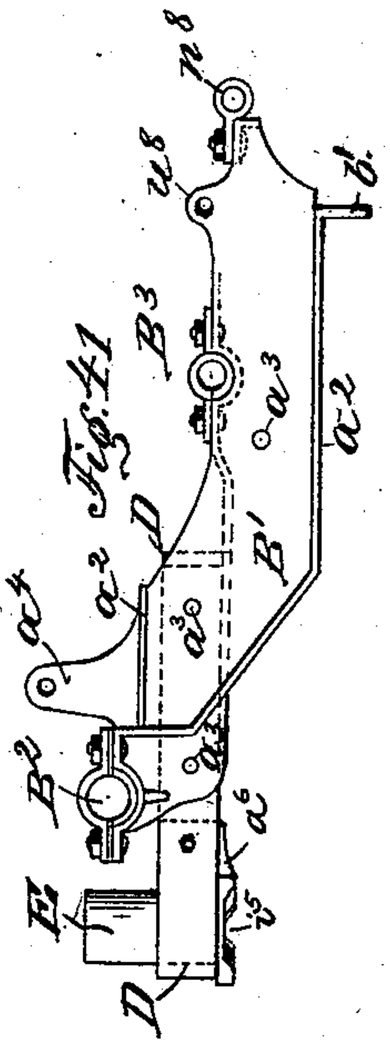


Fig. 41



WITNESSES
Chas. M. Ball
Minnie Manly.

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John S. Davis
By W. K. Miller Attorney

(No Model.) 17 Sheets—Sheet 17.

J. S. DAVIS.

REAPING AND BINDING MACHINE.

No. 557,193. Patented Mar. 31, 1896.

Witnesses
E. A. Duffey
C. A. Duffey

Inventor
John S. Davis

UNITED STATES PATENT OFFICE.

JOHN S. DAVIS, OF ROCKPORT, OHIO,

REAPING AND BINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 557,193, dated March 31, 1896.

Application filed December 17, 1894. Serial No. 532,099. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. DAVIS, a citizen of the United States, residing at Rockport, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Reaping and Binding Machines, of which the following is a specification.

My invention more especially relates to grain-binding harvesters of the class known as "low-down" or "platform" binders, in which the binding-receptacle is substantially level with the grain-platform.

The object of my invention is to improve the construction and increase the efficiency of the machine, which end I attain by certain novel combinations, constructions, and organizations of instrumentalities hereinafter set forth, and specifically designated in the claims at the end of this specification.

My improvements are specially applicable to low-down binders of the type shown in United States Letters Patent No. 417,473, granted to me December 17, 1889.

The accompanying drawings show so much of a grain-binding harvester embodying all of my present improvements as is necessary to illustrate the subject-matter herein claimed. Some of these improvements may, however, be used without the others and in machines differing somewhat in their details of construction from those herein shown.

Figure 1, Sheet 1, is a plan view showing the main or gearing frame, the binder-frame, and part of the platform-frame, with many of the parts omitted and others partly broken away. Fig. 2, Sheet 2, is an elevation of the gearing or stubble side of the machine, partly in section, on the line 2 2 of Fig. 1, showing substantially the same parts as that figure. Fig. 3, Sheet 3, is a plan view of the platform-frame and some of its appurtenances, the main or gearing frame and binder-frame being removed. Fig. 3½, Sheet 3, is a vertical section through the platform-decking parallel with the finger-beam. Fig. 4, Sheet 4, is a plan view of the binder-frame detached from the platform-frame with the binding gearing and mechanism removed. Fig. 5, Sheet 4, is an elevation of the parts shown in Fig. 4 as seen from the gearing side of the machine. Fig. 6, Sheet 4, is a view of the parts shown in Figs. 4 and 5 as seen from the rear, as indicated by the arrow 6. Fig. 7, Sheet 4, is a vertical cross-section on the line 7 7 of Figs. 4 and 5, looking forward. Fig. 8, Sheet 5, is a plan view of the gearing or stubble side of the platform-frame and its appurtenances with the binding mechanism mounted thereon. Fig. 9, Sheet 6, is an elevation of the gearing or stubble side of the parts shown therein—the binder mechanism. Fig. 10, Sheet 7, is a vertical section on the line 10 10 of Figs. 8 and 9, looking forward. Fig. 11, Sheet 8, is an elevation of the binding mechanism as seen from the stubble side, detached, and with the bundle discharger or ejector and other parts removed. Fig. 12, Sheet 9, is a plan view of the platform-frame and some of its appurtenances with the binding mechanism mounted thereon in horizontal section on the line 12 12 of Fig. 9, the retainer and ejector-shaft being removed. Fig. 13, Sheet 10, is a vertical transverse section through the binder-frame on the line 13 13 of Fig. 12, looking forward, with the gearing and other parts removed, but showing the decking and the manner in which the front end of the knotter-box and its bracket are secured to the binder-frame. Fig. 14, Sheet 10, is a vertical transverse section through the platform and binder-frames on the line 14 14 of Fig. 12, looking forward, with all of the parts in advance of the line 13 13 of said figure removed. Fig. 15, Sheet 11, is a rear elevation, partly in section, like Fig. 10, with parts removed. Fig. 16, Sheet 11, is a view like Fig. 15, but with the parts in different positions. Fig. 17, Sheet 10, is a view like Figs. 15 and 16, showing additional parts and different positions of the binding mechanism. Figs. 18 and 19, Sheet 12, are rear face views showing the manner in which the main cam and gear wheel actuates the retainer and discharger or ejector, the latter being shown in dotted lines. Fig. 20, Sheet 13, is a front face view of the main cam and gear wheel and appurtenant mechanism, showing the devices for stopping and starting the binder. Fig. 21, Sheet 13, is a vertical transverse section through the same, on the line 21 21 of Fig. 20, looking inward to-

ward the entrance or platform side of the binder, showing mechanism additional to that illustrated in the preceding figure. Fig. 22, Sheet 13, is a side view of the trip-lever and a portion of its latching devices detached. Fig. 23, Sheet 14, is a front face view of the forward bearing of the binder-gearing shaft as seen in Fig. 20. Fig. 24, Sheet 14, is a view of the opposite side of the same as seen in Fig. 7. Fig. 25, Sheet 14, is a top view of the same. Fig. 26, Sheet 14, is a rear face view of the rear bearing of the binder-shaft as seen in Fig. 6. Fig. 27, Sheet 14, is a front face view of the same. Fig. 28, Sheet 14, is a top view thereof; and Fig. 29, Sheet 14, is an end view of the same. Fig. 30, Sheet 12, is a rear face view of the binder cam and gear actuating the cut-off, compressor, needle-arm, and knotter-pinion, showing the sector-gear about to engage said pinion. Fig. 31, Sheet 12, is a similar view of the same, but showing the pinion as released from the sector-gear, but controlled by the cam. Fig. 32, Sheet 12, is a side view of the knotter-pinion detached. Fig. 33, Sheet 15, is a front face view of the binder cam and gear wheel, showing the opposite side to that shown in Figs. 30 and 31, and also showing the cut-off, compressor, needle-arm, and their connecting mechanism in their normal position—that is, that assumed when the binder-arm is lifted—and illustrating the manner in which the above-mentioned parts are actuated by the cam. Fig. 34, Sheet 15, is a view in elevation, partly in section, of the front portion of the binder mechanism, looking forward, being a view of the opposite side of the mechanism shown in Fig. 33. Fig. 35, Sheet 14, is a side view of the front knotter-box bracket seen in Fig. 13; and Fig. 36, Sheet 14, is a view of its front edge, as shown by the arrow 36, Fig. 35. Fig. 37, Sheet 14, is a side view of the knotter-box rear supporting-bracket seen in Fig. 14. Fig. 38, Sheet 14, is an edge view of the same, looking inward, as shown by the arrow 38, Fig. 37. Fig. 39, Sheet 16, is a view in elevation of the rear portion of the platform-frame and appurtenances, looking forward. Fig. 40, Sheet 16, is a plan view of the rear inner or stubble corner of the platform-frame and connecting-bracket; and Fig. 41, Sheet 16, is a view in elevation of the rear of the same, looking forward. Fig. 42, Sheet 16, is a top view of the caster-wheel yoke detached. Fig. 43, Sheet 16, is a bottom view of the tubular bracket, in which the caster-wheel yoke is journaled. Fig. 44, Sheet 16, is a rear elevation of said yoke and bracket with their shoulders slightly apart to show the construction by which the yoke is yieldingly held in its normal trailing position. Fig. 45, Sheet 14, is a rear elevation, partly in section, of the rear binder-frame standard, showing how the front end of the binder-frame is traversed and guided on the track-rails of the binder-frame. Fig. 46, Sheet 16, is a detached view, partly in elevation and partly in section, on the line 46 46 of Fig. 12, looking toward the divider side of the machine and showing the link connection for adjusting or sliding the binder-frame on the platform-frame; and Fig. 47, Sheet 16, is a view of the same parts, partly in plan and partly in section, on the line 47 47 of Fig. 46, looking downward, as indicated by the arrow in the last-named figure. Figs. 48 and 49, Sheet 16, are respectively face and edge views of a journal-bearing and pivot-bracket cast in one piece and secured upon the binder-frame. The link or pitman which moves the binder-frame backward and forward upon the platform-frame is pivoted to this bracket. Figs. 50, 51, and 52, Sheet 2, show the details of the mechanism mounted upon the main frame by which the binder-frame is adjusted backward and forward upon the platform-frame, Fig. 50 being a side elevation, Fig. 51 a similar view of the rocking-lever socket detached, and Fig. 52 an edge or front view of the same. Fig. 53, Sheet 2, is a plan view of the parts shown in Fig. 50 with the lever-socket removed. Fig. 54, Sheet 2, is a view partly in elevation and partly in section on the line 54 54 of Figs. 50 and 53. Fig. 55, Sheet 1, is a side view of the platform-frame, tilting lever, and its locking devices detached, as seen from the grain side of the machine. Fig. 56, Sheet 17, is an elevation, and Fig. 57, Sheet 17, a top view, of one of the packers detached. Fig. 58, Sheet 17, is a face view, and Fig. 59, Sheet 17, an edge or top view, of one of the eccentric disks of the packer, showing its antifriction-rollers. Fig. 60, Sheet 17, is a face view, and Fig. 61, Sheet 17, an edge view, of the opposite eccentric disk. Fig. 62, Sheet 17, is a view showing both disks and their antifriction-rollers in position on their driving-shaft. Fig. 63, Sheet 17, is a top view of a complete packer in place. Fig. 64, Sheet 17, is a side view of one of the packers and its link connections with the main frame. Fig. 65, Sheet 17, is an elevation of the packer with one of the disks removed. Fig. 66, Sheet 17, is a face view of one of the eccentric rollers detached; and Fig. 67, Sheet 17, a vertical central transverse section on the line 67 67 of Fig. 66.

Figs. 1 and 2 are on a smaller scale than the other figures. Figs. 3, 4, 5, 6, 7, 8, 39, and 45 are on a scale about one-third larger than Figs. 1 and 2 and the remaining figures on a scale about twice as large as that of Figs. 1 and 2.

I will describe in turn the mechanism, its actuating-gearing, and the operation of the machine.

Unless otherwise indicated the parts are of usual approved construction.

Figs. 1 and 2 show a main gearing or drive-wheel frame, consisting of flat metal bars secured together edgewise or vertically. The driving-wheel is inclosed at its sides and in front by a U-shaped frame A^3, the branches $b^3 b^{10}$ of which project back of the wheel. The driving-wheel is fast on and turns with its

axle A^2, journaled in the upper ends of brackets or standards A^4 A^6 A^8 secured upon and projecting above the frame. The main frame may consequently be made to rock upon the axle when desired. The main axle A^2 projects on the divider side of the machine, its projecting end being mounted in the bracket A^8, above mentioned. The branch b^4 of the main frame extends forward from a point near the line of the finger-beam and is bent around and overlaps the front end of the frame A^3, extending beyond it to the stubble side of the machine, and is bent backward, forming another branch b^5. A cross-piece I^4 connects the rear end of the branch b^5 with the branch b^3 in front of the main axle. The rear ends of the branches b^3, b^{10}, and b^4 are all flexibly connected with the platform-frame and in a line parallel with, but slightly in advance of the finger-beam, by pins a^8 a^9, passing through brackets a' and b^8 and a socket or recess r^3 on the stubble side of the reel-post stand H secured to the platform-frame and inner end of the finger-beam. A stud upon the pivot on the rear end of the branch b^4 turns freely in the recess r^3. A cross-brace g connects the stand H with the bracket b^8, in which the branch b^{10} is pivoted. I thus secure a strong, light, and well-braced frame.

The tongue A^5 and its diagonal brace b^9 are hinged to the front of the main frame by a bolt a^7, passing through the tongue, brace, and brackets, thus permitting the tongue to rock freely vertically on the frame.

A clamping-bolt c^2 secures the driver's footboard B^5 and seat-spring c' to the tongue. The driver's seat A^7 is secured upon the upper end of this seat-spring, above the driving-wheel and axle.

The platform-frame is shown as consisting mainly of a long angle-iron finger-beam A extending entirely across the front of the platform, with the guard-fingers secured to the vertical flange of said beam. The finger-beam is connected with a back rail B by a longitudinal bar Z^2 on the divider side of the platform and by a similar longitudinal bar G near the delivery end of the platform. This bar G projects in front of the finger-beam near the grain side of the driving-wheel and serves as a support for one of the pivots of the main frame, as well as a point of attachment for a tilting lever C', hereinafter described. The rear end of the bar G is secured to a clip or lug b' projecting beneath the inner edge of the bracket B'. At their points of intersection the bar G and finger-beam A are firmly secured together by an angular clip b^2. (See Fig. 9.)

The bottom boards C are suitably secured to the finger-beam and back rail.

The flanged bracket B', Figs. 40 and 41, is provided with a lug b' abutting against the longitudinal bar G, to which it is firmly secured. This bracket is likewise provided with flanges a^2, into or between which the back rail B snugly fits. This back rail and bracket are secured at their inner or stubble ends to a frame composed of a metal bar, bent into a U shape, with its open end in front. The rear of this U-shaped frame is firmly clamped to the back rail B and bracket B' by rivets or bolts a^3. The side bars D of this U-shaped frame constitute track-rails on which the binder-carriage slides. These bars are arranged parallel with each other on the stubble side of the machine and project in advance of the finger-beam, to which they are firmly secured by brackets a a', the bracket a' also serving as the pivot of the branch b^3 of the main frame.

An inclined brace B^4, secured at its inner lower end to a lug u^8 on the bracket B' and near its other end to a corresponding lug a^4 on said bracket, projects slightly beyond the stubble side of the machine and serves as a support or point of attachment for the rear end of the stationary portion of the inclined deck or platform $N^\times$. (See Figs. 1, 2, 8, and 39.) By the construction thus described the inner rear corner of the grain-platform is firmly braced.

The divider side of the machine is supported on a grain-wheel Z' carried by an arm Z' pivoted to the finger-beam so as to bring the axis of the grain-wheel near the center of the platform and permit the wheel freely to swing horizontally around its pivot to aid in turning the machine.

A tubular bracket E, provided with suitable flanges, is firmly bolted to the outer rear corner of the platform-frame by bolts a^6. (See Figs. 2, 39, 40, and 41.)

A caster-wheel B^6 is mounted in the arms r^5 r^6 of a yoke F, provided with a journal r^4 turning in the tubular bracket or socket E, above mentioned, to support the rear corner of the stubble side of the platform.

From the foregoing description it will be seen that the machine rests upon three wheels, the driving-wheel in front of the cutting apparatus and the grain-wheel and caster-wheel in rear thereof.

A practical difficulty is encountered in all harvesting-machines when cutting on hillsides, especially those of the rear-cut type like mine—that is, those having the cutters in rear of the driving-wheel and the caster-wheel in rear of the grain-platform—owing to the tendency of the grain end of the platform to drag or fall back and of the caster-wheel consequently to cant or swing around slightly and thus cause the machine to run obliquely downhill. This difficulty I obviate by making the stubble-side caster-wheel B^6 temporarily serve as a rudder to counteract this tendency and keep the machine in the direct line of travel. To do this I form upward projections i^3 i^4, with sloping ends and of unequal length, on the shoulders of the yoke F, and corresponding recesses i^5 i^6 on the bottom of the tubular bracket E, so that when the caster-wheel B^6 is trailing in correct alinement directly in the rear these projections and re-

cesses interlock and prevent the caster-wheel from swinging on the hillside, thus guiding the machine properly. When turning a corner, however, the inclined surfaces of these recesses and projections slide over one another, lift the corner of the frame slightly, and allow the wheel to turn. The projection i^3, it will be observed, is wider than the opposite one, i^4, and the recesses are of corresponding widths, so that, when the machine is swinging, in turning or backing, there can be no engagement of the recesses and projections until the wheel resumes its proper trailing position.

A tilting lever C′ is secured at its rear end to the longitudinal platform-frame bar G by detachable fastenings, such as a clasp c^5 and bolts c^3 c^4, (see Figs. 1, 2, and 9,) thus making in effect the tilting lever and bar G one continuous piece. I prefer to connect them detachably, however, for convenience in shipping. The tilting lever extends forward parallel with and beyond the driving-wheel on its grain side, so as to be within convenient reach of the driver when in his seat. A rack-bar C^2, Figs. 2 and 55, pivoted to rock vertically on the bracket A^6 on the main frame in the line of the driving-axle passes through a guide-clasp c^6 on the tilting lever. The rack-bar is provided with notches c^9. A spring-detent c^7 controlled by a thumb-latch c^8 interlocks with these notches and holds the tilting lever in any desired position. Raising or lowering this lever causes the binder-frame and platform-frame to rock on their supporting-wheels and jointed connections to set the cutting apparatus at any desired height.

The machine is to be provided with a suitable reel mounted upon a post T′, Figs. 2 and 10, secured on the stand H and operating as usual. This reel, however, is not shown in the drawings.

The bottom of the platform is composed, as before remarked, of closely-abutting boards C, or other material which will form a tight bottom and thus prevent the waste of the grain. Above this bottom C is arranged a removable sectional decking, over which the grain travels, which decking is constructed as follows: The outer or divider section of this decking consists of boards C^3 arranged parallel to the finger-beam, with spaces between each board for the passage of the carrier-belts and teeth. These boards C^3 are connected by cross-strips d^4 d^5, which rest in notches d^2 d^3 cut in strips d d' secured, respectively, to the back of the finger-beam and the front of the back rail. These boards and cross-strips fit snugly between the finger-beam and back rail, thus preventing longitudinal or backward-and-forward movement, while lateral movement is prevented by the notches d^2 d^3, above mentioned. The inner ends of these strips extend to about the line of the inner divider or support for the reel-post and abut against the series of corresponding intermediate deck-boards C^4, united by longitudinal stips d^6 d^7, likewise resting between the finger-beam and back rail B. The deck-boards C^4 overlap these strips, and their inner edges abut against those of the boards C^3 and rest upon the strip d^5. A series of inclined deck-pieces e are arranged between the inner ends of the deck-boards C^3 and the binder-carriage. These strips are arranged with spaces between them, their upper ends being wide and their inner ends terminating in narrower necks, which extend under the decking C^4 and are secured to the under side of the cross-strips d^6 and the upper side of the cross-strip d^7, thus giving them the angle shown in Figs. 3½ and 10 and forming openings S for the passage of the carrier-belts f^8, Fig. 10. These carrier-belts traverse rollers S^3 on the divider end of the platform and corresponding rollers L^5 near the longitudinal bar G. The details of construction of the platform are clearly shown in Figs. 3, 3½, 8, 10, and 12. A light, simple, and convenient construction of decking is thus secured.

The rear stubble side of the platform-frame is covered by a fixed deck $N^\times$, Figs. 1, 3, 8 and 9, secured to the transverse inwardly-inclined rear brace B^4, projecting over the binder-frame on the stubble side and extending inward at a slight inclination under the rear inclined deck-boards e. This fixed decking $N^\times$ rests upon the rear portion of a correspondingly-inclined movable deck N^2, about the same width fore and aft as the grain-platform and secured upon and movable with the binder-carriage, being slotted at proper points for the passage of the binding mechanism—such as the cut-off, compressors, packers, needle-arm, &c. The lower or inner edge of the portion of the deck forward of the needle-arm rests on the bearings k^7 k^8 of the cut-off shaft N′, Fig. 12. A strip m^6, Fig. 13, secured on the outer upper edge of this portion of the deck, is bolted at its forward end to a perforated ear or ledge m^7 on the front bracket M^2, while its rear end is bolted to a corresponding ear m^8 on the rear bracket M^4, thus causing the deck to fit close to the knotter-box. The rear portion of this deck is bolted to a spring-bar N^3, riveted at its lower end to the inner binder-frame sill J and other suitable supports. (See Figs. 6, 9, and 12.) The deck N^2 extends below and clear of the upper ends of the inclined pieces e of the deck C^4, (see Fig. 10,) so as to avoid interference therewith when shifting the binder-frame backward and forward. The rear end of the movable deck N^2 slides under the fixed deck $N^\times$ and supports its forward end (see Fig. 9) and in turn slides over and is supported by an arm or rod N^4, projecting horizontally forward from the rear end of the platform-frame. (See Figs. 3, 8, 9, and 12.)

By the construction above described I am enabled to preserve the continuity of the decking, while adjusting the binder longitudinally on the frame.

The binder-frame (shown in skeleton form in Figs. 4, 5, 6, and 7) consists, essentially, of

two bottom bars or sills I J, the rear ends of which are arranged horizontally parallel with each other and with the track-rails D, inside of which they fit and slide. The horizontal portions of these bars are connected by suitable cross-pieces F′ F² F³ F⁴. The front end of the outer frame-bar I is bent up perpendicularly. The inner one is also similarly bent up for a portion of its height and then inclined inward until it abuts against the upper portion of the outer bar I, and the two are securely riveted together and constitute the front standard K. The two members of this standard are further united by an elbow-shaped brace K′, the outer lower end of which brace is riveted to a peculiarly-shaped bracket D′, Figs. 23, 24 and 25, secured to the upturned portion of the outer bar I, while the inner upper end of the brace K′ is secured by a screw-nut *e′* to the outwardly-inclined member of the standard K. The horizontal binder-frame bars I and J are further connected a short distance in rear of the front of the standard by an outer upturned member D³ and an inner member D⁴, the upper portion of which slopes downwardly and is united to the standard D³ in a manner similar to that hereinbefore described. (See Figs. 6, 20, 34, and 45.) This last-named figure shows rollers *d*⁹ journaled upon the outer sides of the standard-bars D³ D⁴ and running upon the track-rails D of the platform-frame. The ends of these standard-bars D³ D⁴ are bent at right angles, so as to form toes *e*², which underlie the track-rails D of the platform-frame and the horizontal bottom bars I J of the binder-frame, thus forming guides which hold the binder-frame in place while traversing the rails D.

A horizontal tie C⁵, Fig. 6, connects the standard-bars D³ D⁴, the inner end being riveted directly to D⁴, while the other end is secured to a bracket D⁵, Figs. 6, 27, 28, and 29, in turn secured to the outer bar D³. The diagonal brace-rod E′ is riveted at its lower end to this tie C⁵ and bracket D⁵, while its upper end is screw-threaded and passes through the inclined portion of the bar D⁴ and is firmly clamped thereto by jam-nuts 1 2. (See Fig. 6.) The rear ends of the binder-frame sills I J are kept to the track-rails by clips E² and *j*³, Fig. 6, from both of which project flanges *e*⁶, which underlie the bottom of their respective track-rails. The binder-sills I J are connected by cross-braces F′ F² F³ F⁴. The brace F² is a simple strip with its edges bent at right angles and riveted to the bars I J, as shown in Fig. 1, while the other braces F′ F³ F⁴ project above the sills, as shown in Fig. 5. The front brace F′ lies between the standards K L and carries the forward bearing H² of the longitudinal gear-shaft K², hereinafter described. (See Figs. 1, 7, and 18.) The brace F³, Figs. 1, 6, and 34, projects inwardly over the sill J, to which it is secured, and carries a bar *k*⁷, for a purpose hereinafter explained.

The front end of a tubular overhanging arm E³ is firmly clamped in a semicircular socket E⁴, provided with correspondingly-shaped caps *e*⁷, by means of bolts passing through said caps, arm, clamps, and the standards K L. This arm lies on the outer or stubble side of said standards and extends horizontally backward over the binding-table, its rear end being firmly supported by an inclined brace M parallel with it and secured at its forward end to the vertical portions of the standards K L by bolts or rivets *g′*, the rear end of this brace being screw-threaded and passing through a perforated ear *g* on a semicircular bracket N, clamped on the rear end of the overhanging arm by bolts *f*³, passing through caps *f*², the arm *e*³, and bracket N. (See Figs. 4 and 5.) Another somewhat similar brace O, secured by bolts *e′ l* to the standards K L near the inner side of the binder-frame, extends diagonally upward and forward through a perforated ear *g*² on the same bracket N, to which it is adjustably secured in a manner similar to that hereinbefore described. This enables me not only securely to brace the overhanging arm, but to adjust its rear end slightly rearwardly and laterally, for the purpose hereinafter described.

The binder-frame, with all the mechanism mounted thereon, much of which will be hereinafter described, is adjusted backward and forward and held in any desired position to accommodate different lengths of grain in the following manner: A hand-lever H′ is fitted in a socket H² rocking vertically parallel with the inner face of the driving-wheel on a pivot on the bracket A⁴ of the main frame. A spring-detent *f*⁵ on this lever, controlled by a thumb-latch *f*⁶, engages at proper times with a ratchet-plate *f*⁴ on the upper edge of the bracket A⁴. (See Figs. 2, 50, 51, and 52.) A connecting-rod H³ is pin-jointed at its front end to the lower end of the lever-socket H² and at its rear end to a bracket E⁵, the upper end of which is secured to the upright D⁴ of the rear standard L and its lower end to the inner sill J of the binder frame or carriage by a screw-bolt *f*⁶ that passes through a stud or thimble *f*⁷ cast on the bracket E⁵. The rear end of the connecting-rod is pivoted on this thimble and held in place by a washer *f*⁹ on the bolt *f*⁶. (See Figs. 46, 47, 48, and 49.) It will thus be seen that the driver from his seat can readily shift the binder-frame backward and forward on the track-rails D and hold it in the desired position by a locking-detent and ratchet *f*⁴ *f*⁵. This link connection, it will be observed, also allows the platform-frame to be raised and lowered without interfering with the binder-frame.

Figs. 8, 10, and 12 show a series of pickers T³ mounted eccentrically on a shaft *w* and connected by swinging arms *k′*, having their upper ends pivoted near the edge of the picker-disks and their lower ends to a down-hanging clip *w′* secured to the longitudinal bar G and the inner bottom board C of the

platform, thus combining the stiffness of both board and bar. The pickers T^3, it will be observed, work in the slots or openings between the narrow portions of the inclined decking *e*, close to the rollers L^5.

A vibrating quadrant-shaped cut-off finger O′, Figs. 10 and 12, is mounted on a shaft N′ rocking in bearings k^7 k^8 in clips secured to the inner sill J of the binder-frame. The mode of actuating this cut-off will be hereinafter explained.

A series of packers *p′* is shown as mounted upon and operated by eccentrics fixed on a shaft K^2, Fig. 12, mounted in bearings near the center of the binder-frame. As the only eccentrics heretofore employed are objectionable on account of their frictional surfaces I have devised antifriction roller-bearing eccentrics, the construction and operation of which are shown in Figs. 56 to 67, inclusive, Sheet 17. Each packer is composed of a ring P carrying the usual hooked finger P′. Eccentric disks P^2 P^3 are secured upon the shaft K^2 by hubs *p p′*. These disks lie parallel to each other and are kept at the proper distance apart by spacing-lugs on the disks P^2, through which rivets p^7 extend, thus fastening the disks securely together. Antifriction-rollers *j* turn on pivots *j′* between the disks. The ring P encircles said rollers *j*, which bear against the inner face of the ring, (see Fig. 65,) thus securing an antifriction or roller bearing eccentric. One of these disks, it will be observed, is larger than the other two. The eccentric disks P^2 P^3 project beyond the periphery of the rollers *j* and overlap the packer-ring P, (see Figs. 58 and 59,) which thus form a groove or guide which prevents lateral displacement of the ring P. A swinging arm j^2 is pivoted at its upper end in a perforated ear j^3 on the periphery of each packer-ring and at its lower end to a bracket j^4 fixed to the outer binder-sill I. (See Fig. 12.) The result of this organization is that the rotary motion of the shaft K^2 causes the point of each packer-tooth to traverse an eccentric crescent-shaped path, with the curved side toward the feed or entrance end of the binder, as indicated by the dotted line *z* in Fig. 17.

A quadrant-shaped compressor-arm Q^2, which moves parallel with and close to the cut-off quadrant O′, is fixed on the rear end of a rock-shaft Q′ mounted in bearings m^3 m^2, Figs. 13 and 14, formed in the knotter-box brackets M^3 M^4, Figs. 35, 36, 37, and 38, which brackets are fixed upon the outer sill I of the binder-frame, and to which the knotter-box M^2, hereinafter described, is secured.

The front end of an oscillating shaft R^5, Fig. 8, is journaled in a bracket R^6 mounted upon the outer or stubble side of the rear standard L of the binder-frame. The rear end of this shaft turns in a bearing j^7, secured to the knotter-box M^2. (See Figs. 8 and 11.) A plate R^8, somewhat of an hour-glass shape, is mounted centrally upon the rear end of the shaft R^5 and vibrates in a plane parallel with that traversed by the cut-off and binder-arm. The inner edge of this plate acts as an additional compressor, retainer, and ejector for the gavel, as hereinafter explained.

The needle or binder-arm W′ is mounted on the rear end of a rock-shaft W, the rear end of which shaft is mounted in suitable bearings formed on the branches P^4 of a bracket fixed upon the rear end of the overhanging arm E^3, while its front end is supported in a bearing W^7 in a bracket E^4 fixed on the binder-frame standard L.

The upper portion of the binding-receptacle is formed of two parallel breast-pieces R′ R^2, arranged on opposite sides of the needle-arm and secured rigidly at their upper ends to the above-mentioned branches P^4 at the rear end of the overhanging arm E^3, whence the breast-pieces are inclined downward and inward toward the grain side of the machine, being united at their lower ends by the cross-piece R^4, Figs. 8 and 10. These breast-pieces are sufficiently rigid to remain in the desired position. A sheet-metal shield T^2 is riveted to parallel supporting-strips *u*, turning on pivots u^8 on the lower ends of the branches P^4 of the bracket N. (See Fig. 8.) The shield, as shown in Fig. 10, extends some distance inward over the grain-platform and is curved upward, so as to form, with the decking *e*, a gradually-contracting throat through which the grain is forced toward the binder, as hereinafter described.

A post or rod E^2, Fig. 10, preferably curved concentrically relatively to the pivots u^8, is mounted upon a base-bracket e^6 secured to the shield T^2 near its inner end and near the cross-brace R^4 of the breast-pieces. The upper end of this post or rod E^2 passes loosely through a perforated ear u^4 projecting from the cross-piece R^4. A pin *x′*, passing through the upper end of the post above the ear u^4, limits the downward movement of the post, and consequently of the shield secured thereto. A coiled spring R, surrounding the post E^2, interposed between the ear u^4 and the base e^6, tends to force the shield downward with an elastic pressure, the upward movement of the shield being limited by the contact of the shield-supporting strips *u* with the cross-piece R^4. An automatic yielding throat is thus secured for the binder-receptacle, so that in the event of a superabundance of grain being forced into the receptacle choking would be prevented and the mechanism saved from undue strain.

The knot-tying device adopted for this machine is substantially similar to that illustrated in United States Letters Patent No. 401,013, granted to me April 9, 1889, and need not, therefore, be described in detail here. It consists essentially of a tying-bill 12, properly located relatively to the needle-arm, and mounted on the rear end of a longitudinal shaft intermittently rotated at proper times by suitable gearing. (See Figs. 9 and 12.) This knotting mechanism is shown as mounted

in a knotter-box M^2, secured to the binder-frame so as to move therewith as it is adjusted backward and forward on the platform-frame. (See Figs. 9, 12, 13, and 14.) The forward end of the knotter-box is provided with a downwardly-extending lug, secured by a bolt i' to a vertical bracket M^3, Figs. 13, 35, and 36, provided with flanges k^3 k^4 at right angles to each other. The flange k^3 is riveted to the outer binder-frame sill I, while the flange k^4 is riveted to the cross-tie F^2 of the binder-frame. (See Fig. 13.)

The upper front end of the knotter-box is secured to the top of the bracket M^3 by a brace-rod i^8 provided with proper adjusting-nuts to retain the bracket in place. The brace-rod i^8 extends diagonally inward and downward and is secured to the tie-piece F^2 by a rivet or bolt K^5. The parts are thus held securely together. The rear end of the knotter-box is in like manner provided with a downwardly-extending lug bolted to the outer face of a peculiarly-shaped vertical flanged bracket M, Figs. 14, 35, and 36, having on its lower end a flange k^5 secured upon the outer binder-frame sill I. An adjustable brace-rod j^5 is secured at its inner end to a perforated ear j^6 on the bracket M^4 just above the sill I, while the outer end is double-riveted to a bearing-clip j^7, secured on the knotter-box by screw-bolts 3 4. Another brace j^3, secured to the top of the bracket M^4, extends inward and downward and is double-riveted and adjustably secured to a clip k riveted on the inner binder-frame sill J, Figs. 14 and 17. The rear end of the knotter-box is firmly bolted to the flange J^4 of the bracket M^4.

By the means above described the knotter-box, while readily adjustable, is firmly secured to and moves with the binder-frame sills I J. The swinging arm j^2 of one of the packers P^2 turns on a pivot-pin k^6 projecting from a lug on the bottom of the bracket M^4. (See Figs. 14 and 17.)

An internal gear-ring H^4 on the driving-wheel A′ drives a pinion H^5 on a cross-shaft I′ journaled in bearings I^2 I^3 on the wheel-frame branches b^3 b^5. The spacing-bolt I^4 prevents lateral displacement of these branches. A sprocket-wheel I^5 on the cross-shaft I′ transmits motion by means of a sprocket-chain J^2 to a sprocket-pulley J′ on a counter-shaft J^4 journaled at its inner end in a bearing h in the bracket E^5 on the binder-frame. (See Figs. 1, 2, 12, and 46.) The outer end of this shaft is journaled in a bearing h' on the hollow casing or gear-block K^5. A miter-pinion j^3 on this counter-shaft meshes with a similar pinion J^5, Fig. 12, on a longitudinal shaft K^2 journaled at its front end in a bearing h^2 on the gear-block K^5, secured to the forward tie F′ of the binder-frame, and near its rear end journaled in a bearing on one of the ties F^4 of the binder-frame. A spur-pinion K^3 on the front end of this shaft K^2 intermittently engages with the binder-gear K^4, as hereinafter explained. The rear end of the shaft K^2 is inserted loosely in a tubular shaft L′, provided with diametrically-opposed longitudinal slots h^3, in which a clutch cross-pin h^4 on the shaft K^2 plays to permit of its longitudinal adjustment relatively to the tubular shaft while being rotated by it. This tubular shaft is journaled in bearings B^2 and h^5 on the fixed portion of the binder-frame, (see Fig. 12,) the rear bearing B^2 being formed in the frame-bracket B′ and the front bearing h^5 being mounted on a tie-piece L^2, secured to the fixed track-rails D of the platform-frame.

A sprocket-wheel L^3 on the rear end of the shaft L′ through a sprocket-chain drives a corresponding wheel L^4 on a longitudinal shaft w, mounted in suitable bearings B^3 M′ on the rear frame-bracket B′ and finger-beam A. The pickers or gathering-fingers T^3 are mounted eccentrically on this shaft w. The cutters are also driven by means of a crank-wheel M′ on its forward end. A small sprocket-wheel w^2 on the rear end of this shaft drives, by means of a chain, a similar wheel w^3 on a shaft S^2, on which the carrying-rollers L^5 are mounted. This shaft S^2 is on the inner or stubble side of the platform. A corresponding series of rollers S^3 are mounted on a shaft on the grain side of the platform. (See Fig. 3.) The front rollers of each series are made of larger diameter than the rear ones to cause the front carrier-belt to run faster than the rear ones to accelerate the movements of the butts of the grain, the advantage of which is well known. The two sets of rollers are traversed by carrier-belts f^8, Fig. 10, as usual.

From the foregoing description it will be seen that in adjusting the binder-frame backward and forward on the platform track-rails D (see Fig. 2) the sprocket-wheels I^5 and J′ must necessarily correspondingly recede from or approach each other, thus requiring a corresponding variation in the length of the driving-chain J^2 to compensate this movement. This variation I produce in the following manner, (see Sheet 2:) A rock-shaft g^2, Fig. 54, Sheet 2, is mounted loosely in bearings g^3 g^4, formed on clips i i', bolted to the wheel-frame branch b^3. An idler h^6 is mounted on a large journal g^6 on the free end of a swinging arm g^5 on one end of this rock-shaft. Another idler h^7 is loosely mounted on this same shaft. A segment-gear h^8, also mounted loosely in bearings coincident with those of the rock-shaft, meshes with a corresponding gear h^9, formed on the lever-socket H^2 and actuated thereby. One end of a spring i^2, coiled around the bearing g^4, presses against a lug i^3 on the segment-gear h^8, while its other end presses in the opposite direction against the end of journal g^6 on the free end of arm g^5, Fig. 54. The sprocket-chain J^2 passes around idler h^6 and over idler h^7, (see Fig. 2,) which thus takes up its slack as the binder-frame is adjusted to its forward limit—that shown in Figs. 1 and 2. The other figures show the rearward adjustment of the binder-frame,

which is effected by moving the shifting-lever H′ forward, which causes the segment-gear h^9 on the lever-socket H^2 to actuate the segment-gear h^8, so as to swing the lower idler h^6 on the free end of the arm g^5 upward, and thus pay out a greater length of chain. The pitch diameter of the segments h^8 and h^9 and the length of the swinging arm g^5 are so proportioned as to properly pay out or take up the chain automatically, in conformity to the varying distance between the sprocket-wheels I^5 and J′, during the adjustment of the binder-frame. The spring i^2 holds the idler h^6 yieldingly against the chain J^2 to compensate for any slight irregularity in the latter. The point of bringing the connecting-link H^3 to the binder-frame being substantially coincident with the joints a^8 a^9 m^5 connecting the wheel and platform frames the latter frame can be rocked on its supports without disturbing the adjustment of the binder-frame.

The cut-off, compressor, needle-arm, and ejector are all automatically operated at suitable periods from the pinion K^3 on the forward end of the continuously-rotating longitudinal driving-shaft K^2 in the following manner: The pinion K^3 meshes with the main cam and gear wheel K^4, one tooth and parts of the two adjacent teeth of the said wheel K^4 being removed opposite said pinion, so that normally the two do not mesh, but are made to engage in the following manner: A tripping-pawl w^5, Figs. 20 and 21, rocks vertically parallel with the face of the binder-gear K^4 on a pivot n^6 thereon. One end of this pawl carries a nose n, corresponding with the missing tooth in the mutilated portion of the binder-gear K^4, while a spiral spring n^3, acting on the other end, tends normally to throw said nose into engagement with two extension-teeth o^8, arranged diametrically opposite each other on the front of the pinion K^3 to form starting-teeth. The trip-lever T rocks on a central pivot y' between ears n' n^2 on a bracket D′ on the front standard K of the binder-frame. A nose u^7 on the lower end of this trip-lever, when the binder is at rest, is forced by a spring r, seated in a recess u^8 of the trip-lever just below its pivot, into engagement with the pawl w^5 above mentioned, the nose hooking under the ledge n^5 on the pawl, thus holding the latter out of engagement with the starting-teeth o^8 on the pinion K^3. (See Figs. 20, 21, and 22.) The manner of throwing this gear into and out of action will be hereinafter described.

The main binder-gear K^4 is mounted upon a longitudinal shaft D^2, journaled in bearings w^3 w^4, formed on the brackets D′ and D^5, respectively mounted on the standards K L of the binder-frame, between which standards the binder-gear K^4 is located. (See Fig. 21.)

The cam J^6 and segment-gear U, Figs. 18 and 19, on the rear face of the gear K^4 actuate the shaft R^5 of the ejector and retainer R^8 through the medium of the pinion H^6 and friction-rollers y y, mounted on the front face of said pinion, but on diametrically-opposite sides of the shaft R^5. (See Figs. 8, 9, and 11.)

A cam and gear wheel R, mounted on the overhanging end of the shaft D^2, just in rear of the rear standard L, actuates the cut-off, compressor, needle-arm, and knotter-pinion, as hereinafter explained. A cam m' upon the front face of this cam and gear wheel R, Figs. 21 and 33, actuates the cut-off O′ in the following manner: The cut-off O′ is mounted on the rear end of a shaft N′, Fig. 12, rocking in bearings k^7 k^8 on clips secured upon the inner binder-frame sill J. A crank O^2, Fig. 34, near the forward end of this shaft is linked by a rod O^3 to the free end of a radius bar or arm O^4, secured on a rock-shaft O^5, the rear end of which rocks in a bearing in a bracket Q, mounted on the cross-tie F^3 of the binder-sills, (see Figs. 21 and 34,) while its forward end rocks in a bearing o^6 in a bracket D^7 on the binder-frame. (See Figs. 4, 5, and 6.) An arm O^7 on the front end of this rock-shaft O^5 (see Figs. 21, 33, and 34) carries a laterally-projecting stud provided with a roller m, traveling in a cam-track m', formed on the front face of a cam-wheel R, which actuates the cut-off at proper intervals, as hereinafter explained.

A wrist-pin m^4 on the rear face of the cam and gear wheel R actuates the compressor Q^2 in the following manner: A crank-arm Q^4 on the front end of the compressor-shaft Q′ is connected by a link Q^5 to this wrist-pin m^4 on the cam and gear wheel R. (See Figs. 15, 16, 17, 33, and 34.) A connecting-link w^9 carries on its upper end a pin x^5, traversing a slot x^6 in a crank w^8, connected with the needle-arm, for a purpose hereinafter described. The needle-arm W′ is keyed upon the rear end of the rock-shaft W, hereinbefore described. The slotted crank-arm w^8 above mentioned is keyed upon the needle-arm and is operated through the connecting-link w^9 by the wrist-pin m^4 on the cam and gear wheel R above mentioned, to insure the harmonious coöperation of the needle-arm and compressor, as hereinafter explained.

The binding mechanism is automatically thrown into action at the proper time and the size of the bundles regulated by means of a float-trip S^2, mounted on a rock-shaft S′, passing through ears x^2, formed on the cross-piece R^4, connecting the breast-pieces R′. An arm S^4, Fig. 10, fixed on this rock-shaft, is provided with a series of holes, into either one of which one end of a link-rod S^5 may be hooked to vary the size of the bundles. The outer end of this link-rod is hooked into one branch of an elbow-lever S^6, Figs. 8 and 9, vibrating about a stud 6, mounted on the breast-piece R′. The other branch, w^9, of this elbow-lever S^6 is connected by a rod S^7 to the trip-lever T above mentioned, (see Figs. 9 and 21,) which throws the binding mechanism into gear at the proper time, as herein explained. A coiled spring S^8, Fig. 8, on the rock-shaft S′

through its link connections creates downward pressure on the float-trip S^2 to hold it against the initial pressure of the incoming grain. When sufficient grain to form a bundle of the desired size is packed into the binding-receptacle, the outer end of the float-trip S^2 rises and through the medium of the link-rod S^5, elbow-lever S^6, and trip-rod S^7 pulls the trip-lever T out of engagement with the starting-pawl w^5, the spring n^3 of which, Fig. 20, throws the nose n of said pawl into engagement with one of the starting-teeth o^8 on the pinion K^3, thus causing this pinion to mesh with the gear K^4 and impart to it one revolution, when said gear is brought to rest in the following manner: As soon as the bundle is ejected the float-trip drops into the empty receptacle, the trip-lever T, aided by the spring r, assumes its normal position, which brings its nose w^7 within the path of the curved portion n^4 of the ledge n^5, which slides upon said nose w^7 and lifts the starting-pawl w^5 out of the path of the starting-teeth o^8, and the ledge n^5 hooks over the nose n^7 of the trip-lever and positively prevents further movement of the gear K^4. To relieve the trip-lever T and its pivotal connection from undue shock which might be caused by the sudden stopping of the gear K^4, I provide a stop n^9, projecting from the bracket D', against which the lower end of the trip-lever bears at a point near its nose w^7. (See Figs. 20 and 21, the nose being shown in the former by dotted lines.) A ledge Q^5 on the front side of the cam and gear wheel K^4 passes close to the inside of the trip-lever and strikes it near its upper end to force it positively into its proper place in the path of the starting-pawl w^5 in case the spring r fails to press it into this position. The ledge Q^5 comes to rest immediately after acting upon or passing beyond the trip-rod S^7, as above explained. (See Figs. 20 and 21.)

As before stated, a cam J^6 on the rear face of the cam and gear wheel K^4 coacts with the sector-gear U thereon, actuating the retainer and ejector shaft R^5 through the medium of the pinion H^6 and its diametrically-opposed rollers $y\ y$. (See Figs. 18 and 19.) An intermittent compressing movement is imparted to the retainer and ejector R^8 by the cam J^6 and rollers $y\ y$ above mentioned, while a backward half-revolution is given to said ejector to discharge the bound bundle by the sector-gear U and pinion H^6. Fig. 18 shows the normal relation of the parts with one of the rollers y pressed against the cam J^6 while the grain is being packed against the upper prong of the retainer R^8. (Shown in dotted lines.) When the binder-gear K^4 starts, it revolves in the direction indicated by the arrow, and the roller y presses against the cam, which gradually forces it outward as the periphery of the cam increases its distance from the center of the gear K^4 until it reaches the position shown in Fig. 19, where it will be seen that the upper prong of the retainer has been pressed inward to its limit against the bundle, at which moment the sector-gear, it will be seen, is about to engage with the pinion H^6 to eject the bundle; but the cam still controls the ejector. The end of the cam 7, although about to escape from the roller y, will not do so until the tooth 8 of the sector-gear U has positively engaged the pinion and has full control thereof. The continued rotation of this gear imparts a backward half-turn to the retainer and ejector R^8, discharging the bundle and again leaving the ejector in its normal position. (Seen in Fig. 18.) The sector-gear U (see Figs. 9, 11, and 21) projects from the rear face of the gear K^4 beyond the path of the rollers $y\ y$, and its central portion is cut away, so as to admit of the free passage of these rollers during the half-revolution of the pinion H^6.

The tying-bill or knotter-hook may be constructed in usual well-known ways, of which that shown in Letters Patent No. 279,082, granted to me June 5, 1883, may be taken as a type.

In the accompanying drawings I have shown a knotter-pinion U^2 as adapted to be intermittently rotated from the cam and gear wheel R by the sector-gear T^4 and cam U^3 (see Figs. 11, 15, 16, 30, 31, 32, and 33) in the following manner: Figs. 11, 15, and 33 show the knotter-pinion at rest, with its extension-teeth Q Q, Fig. 32, resting against the cam U^3, which prevents any rotary movement and controls the pinion until it reaches the point shown in Fig. 30, where it will be seen that the end of the cam q^2 is about to pass off the extension-tooth q, at which point the sector-gear T^4 engages with the pinion and imparts to it about one and one-fourth of a revolution, leaving it in the position shown in Fig. 31, at which moment the knotter-hook or tying-bill 12 is brought into a position where the knot is completed and at the point of being discharged therefrom, at which time the pinion U^2 is disengaged from the sector-gear T^4 and its extension-teeth q come in contact with the ledge Q' on the cam and gear wheel R, whereby the wheel is reversed about one-fourth of a revolution and brought back to its normal position under the control of the cam U^3.

In order that the needle may properly present the cord to the knotter-hook 12, the needle-point obviously must pass below the knotter at a proper distance from it axis, or, in other words, the axis of the needle-shaft must be at a proper distance from that of the knotter-hook, which relation can readily be secured and maintained under the organization herein shown by means of the braces M and O, connected with the rear end of the overhanging binder-arm E^3, which latter can readily be adjusted both vertically and laterally relatively to the knotter by means of said braces.

The following is a description of the opera-

tion of the binding mechanism and its appurtenances. The method of raising and lowering the cutting apparatus without disturbing the various parts has heretofore been explained. The gearing has of course to be provided with suitable clutch mechanism for engaging or disengaging it, and the reel may be operated in any of the suitable and usual well-known ways. The carrier-belts f^8 and pickers T^3, being mounted on the platform-frame, always maintain the same relation thereto. The packers, cut-off, compressor, binding-arm, retainer and ejector, and knotting mechanism, with their appurtenances, are mounted upon the binder-frame and partake of its forward and backward adjustments, always maintaining their proper relation to each other. The binder-frame can readily be adjusted backward and forward relatively to the grain-platform by sliding said binder-frame longitudinally upon the track-rails D of the binder-platform, which operation is readily effected by the driver from his seat upon the wheel-frame shifting the adjusting-lever H′ backward or forward, as required, in the manner hereinbefore explained, and still keep the driving-chain J^2 taut. During these movements the joint F^9 between the link H^3 and binder-frame moves slightly out of line with the joint a^8 between the finger-beam and main frame, (see Fig. 2,) but not enough to cause the raising and lowering of the cutting apparatus or disturb the relation of the various parts. The organization is such that the standards K L of the binder-frame, when in their forward position, are in advance and outside of the rear side of the driving-wheel. Figs. 1, 2, 8, 9, and 12 show the binder-frame in its advanced position. The forward end of the longitudinal sliding shaft K^2, and the various mechanisms actuated thereby, it will be observed, also move backward and forward with the binder-frame. The reel sweeps the cut grain back upon the platform in the usual way, it falling upon the platform-boards C^3 with its heads to the rear. The carrier-belts f^8 sweep the grain inward over the decking C^4 and crowd it upward upon the inclined deck-pieces *e*. As the front carrier-belt runs faster than the others, it tends to carry the butts of the grain faster than the heads, thus overcoming the tendency of the butts to drag, which would cause the grain to lie diagonally upon the platform. The gatherers or pickers T^3, working up through the slots in the deck-pieces *e*, sweep the grain deposited thereon upon the fixed and movable decks $N^\times$ and N^2, thus transferring it from the fixed portion of the platform-frame to the longitudinally-adjustable binder-frame. The pickers operate close to the carrier-belts, so as to prevent them from carrying particles of straw down though the openings S in the decking. The inclined yielding shield T^2, it will be observed, projects over the deck-boards C^4 and inclined deck-pieces *e*, and together with the latter and the inner lower portion of the deck $N^\times$ N^2 forms a gradually-converging throat through which the grain is crowded by the packers into the binding-receptacle. The pickers and packers, it will be observed, (see Fig. 10,) are sufficiently far apart to afford a space or packing-chamber in the narrowest portion of this throat, in which the incoming grain is temporarily arrested, and thereby straightened by the action of the packers and the incoming grain, after which it is compressed by the packers in the wider portion of this chamber or binding-receptacle against the retainer and ejector R^8 and under the float-trip S^2, where it accumulates until the latter is raised sufficiently to cause the pull on the rods S^5 and S^7, Figs. 8 and 10, to actuate the trip-lever T and throw the binder-gear into action, whereupon the cam *m′* on the cam and gear wheel R, Fig. 33, acts directly upon the arm O^7, through its roller *m*, and actuates the cut-off O′ through the medium of the rock-shaft O^5, arm O^4, link O^3, and crank O^2, causing it to rise and cover the point of the compressor Q^2 before the latter rises above the decking, (see Fig. 33,) the compressor being momentarily detained for this purpose by locating its wrist-pin m^4 on the cam and gear wheel R back of or on the grain side of a line drawn from the axis of the compressor-shaft Q′ to the axis D^2 of the cam and gear wheel R, so that said wrist-pin necessarily travels a short distance before it acts upon the crank-arm Q^4, which actuates the compressor-shaft Q′ to raise the compressor. (See Figs. 10, 15, 16, 33, and 34.) The organization is such that the cut-off O′ continues to keep the points of the compressor protected, (see Figs. 15 and 16,) thus securing a wide opening or passage-way through the grain for the passage of the compressor, and, owing to the curved shape of the quadrant *x* of the cut-off, it is free to move upward until its free point comes close to the shield T^2, without the necessity of pausing to hold the passage-way open for the compressor, as is the case in the corresponding mechanism shown in my Patent No. 417,773, of December 17, 1889, but can hasten on in its work of separation, which at this stage of the operation is found to be an indispensable feature, as any delay in working heavy tangled grain results in failure. The cam *m′* on the cam and gear wheel R, moreover, is in this instance so shaped as at once to move the cut-off to the limit of its throw when it once starts. The next movement necessary is for the compresssor to bring the gavel or bundle to be bound within the compass of or inside the path traversed by the needle-arm in its descent, so said needle-arm should not pierce the bundle, but traverse the passage-way opened for it, which object is attained in the following way: The needle-arm W′ is normally yieldingly held in its upward position, or that of rest, by a detent or roller arm u^7, pivoted on an ear x^2, projecting from the cross-

tie R^4, connecting the breast-pieces R'. A coiled spring n^8 normally holds the roller u^6 in a depression in the nose or point of the needle-arm, thus holding the latter until the pin x^5 of the connecting-link w^9 travels the entire length of the slot x^6 of the crank w^8, by which the needle-arm is operated when this position is reached, (see Fig. 16,) at which moment it will be seen the compressor is above and in advance of the point of the needle, which passes down close by the side of the compressor through the open space made by the latter, the needle-arm thus having no other function to perform than that of placing the cord about the bundle and properly presenting it to the knotter-hook 12.

Fig. 15 shows the relation of the cut-off, compressor, and needle-arm before the latter begins to move; Fig. 16, the position of these parts as the needle-arm begins its descent, and Fig. 17 the position of these parts at the end of the forward stroke of the needle-arm. Fig. 17 also shows the packers as working at this moment clear of the grain in the space between the cut-off and compressor, the path of the point of the packers being indicated by the broken line Z Z. The bundle, it will be observed, at this stage is tightly compressed between the rear face of the compressor Q^2 and that of the retainer and ejector R^8. The needle-arm has practically reached its full throw and the knot is being tied, during which operation there is no appreciable movement of the compressor or needle-arm, as the wrist-roller *m*, Fig. 33, which actuates both the needle-arm and compressor, has reached the point of rest provided on the cam *m'* on the cam and gear wheel R. The retainer R^8 at this stage is being pressed against the bundle and is approaching the position illustrated in Fig. 19. After the wrist-pin m^4 and roller *m* (see Figs. 33 and 34) have passed their dead-centers, or their points of rest, the needle-arm is prevented from premature retreat, while the pin x^5 at the upper end of the link w^9 is recrossing the slot x^6 by the roller u^6 being pressed over the top end of the needle-arm. (See Fig. 17.) The knot is tied by the rotation of the knotter-hook 12, as hereinbefore set forth. After this operation is completed the bundle is discharged by the reverse movement of the ejector R^8. The float-trip S^2 will not necessarily be raised entirely to the top of the binding-receptacle before disengaging the trip-lever T from the starting-pawl w^5 and against the bracket D', as in such case the float-trip S^2 would obviously retard or interfere with the discharge of the bundle. This difficulty I overcome by means of a coiled spring u^5 on the rear end of the rod S^7, which spring is pressed against the top of the trip-lever T by the upward movement of the float S^2, which is free to be raised by the bundle while being ejected, the spring u^5 being of sufficient stiffness not to yield until the starting-pawl w^5 is tripped.

Having thus fully described the construction, organization, and operation of my improved harvester-binder, what I claim therein as new and as of my own invention is—

1. A harvester-binder platform-decking consisting of strips resting on the finger-beam and back rail, transversely-slotted boards secured to said strips and covering the platform between the carrying-rollers, and a series of correspondingly-slotted inclined boards, provided with narrow necks extending under the other boards, and overhanging the inner carrying-rollers and pickers.

2. The combination, in a harvester-binder, of a removable sectional deck comprising strips resting on the finger-beam and back rail, transversely-slotted boards secured to said strips, and a series of corresponding slotted inclined boards having narrow neck portions extending under the inner ends of the other boards, substantially as and for the purposes specified.

3. The combination, in a harvester caster-wheel, of a tubular socket or journal-bearing, V-shaped recesses of varying widths on its bottom, a harvester-yoke provided with a journal or spindle, turning in said bearing, and corresponding projections on the yoke for interlocking with the recesses of the journal-bearing, when the caster-wheel is in normal or trailing position, but preventing such interlocking at any other time, substantially as specified.

4. A harvester-binder frame, comprising in its organization parallel horizontal bars or sills, uprights on said sills united at their top portions to form parallel arms or standards, an overhanging binder-arm secured in said standards, and diagonal braces extending from said standards to a point near the outer end of said overhanging arm, substantially as and for the purposes specified.

5. A movable harvester-binder frame, comprising in its organization parallel horizontal bars or sills, adapted to slide on corresponding bars on the platform-frame, cross-ties connecting said sills, uprights on said sills united at their top portions so as to form parallel arms or standards, transverse brackets or braces connecting said standards, an overhanging arm mounted in said standards, diagonal braces extending from said standards to a point near the outer end of said overhanging arm, and means for adjusting said arm, both vertically and laterally, by means of said braces, substantially as and for the purposes specified.

6. A movable harvester-binder frame, comprising in its organization parallel horizontal bars or sills, adapted to slide on corresponding bars on the platform-frame, cross-ties connecting said sills, uprights on said sills united at their top portions, so as to form parallel arms or standards, transverse brackets or braces connecting said standards, journal-bearings for portions of the binding mechanism supported on said frame and brackets, an

overhanging arm mounted in said standards, diagonal braces extending from said standards to a point near the outer end of said overhanging arm, and means for adjusting said arm, both vertically and laterally, by means of said braces, substantially as and for the purposes specified.

7. A harvester driving-chain tension-regulator, consisting of the combination of a rocking lever carrying a sector-gear, a shaft carrying arms with a roller mounted therein, a pinion loosely mounted on said shaft and meshing with the sector-gear, a coiled spring on the shaft, one end of the spring acting on a projection on the pinion and the other end pressing in an opposite direction on the roller-arm, substantially as and for the purposes specified.

8. The combination of a main or gearing frame, a platform-frame, hinges connecting them, a binder-frame adjustable longitudinally on the platform-frame, a sprocket-wheel on the binder-frame, a corresponding wheel on the gearing-frame, a driving-chain connecting these sprocket-wheels, an adjusting-lever on the gearing-frame, its sector-gear, a pinion gearing therewith and carrying a spring-pressed arm upon which a tension-roller is mounted, which roller acts upon the driving-chain to regulate its tension as the binder-frame is adjusted longitudinally, substantially as specified.

9. The combination, substantially as hereinbefore set forth, of a main or gearing frame, a driving-wheel mounted therein, a platform-frame, its supporting-wheels, hinge connections between said gearing and platform frames, in rear of the driving-wheel, track-rails on the inner or stubble side of said platform, projecting in advance of the finger-beam and of the rear of the driving-wheel, a binder-frame movable longitudinally on said track-rails, a hand-lever secured to the platform-frame and crossing the joint between it and the gearing-frame, means on the gearing-frame for locking this hand-lever in position, a rocking lever on the gearing-frame, a link pivoted to the rocking lever and hinged to the binder-frame at a point substantially coincident with the hinge connections between the main and platform frames, a sprocket-chain connecting the gearing on the main and platform frames, and a tension device on the rocking lever which automatically tightens or pays out the driving-chain to compensate the vertical movements of the platform-frame, and the longitudinal adjustments of the binder-frame, substantially as specified.

10. The combination, in a harvester-binder, of carrying-rollers at opposite ends of the grain-platform, gatherers or pickers mounted in bearings on the platform-frame, on the stubble side of the carrying-rollers, carrier-belts traversing said rollers, transversely-slotted decking covering said carrier-belts, rollers and pickers, a binder-frame movable longitudinally on ways or track-rails in said platform-frame, fixed decking secured to the rear of the platform-frame, with its inner end underlying said inclined slotted deck, and a movable decking secured to the binder-frame, with its inner end underlying the slotted deck and its rear end working under and supporting the fixed decking, substantially as specified.

11. The combination, in a harvester-binder, of a movable binder-frame, an overhanging arm thereon, down-hangers or branches on said arm, breast-pieces mounted on said branches, a grain-shield mounted on arms hinged to said branches, a post or rod by which said shield is suspended from the breast-pieces, and a spring intermediate of the breast-pieces and shield, tending to depress the latter upon the grain passing under it, substantially as specified.

12. The combination, in a harvester-binder, of a platform-frame, carrier-belts traversing it, gatherers or pickers on the frame to receive the grain from the belts, a binder-frame longitudinally adjustable on the platform-frame, and a grain-shield flexibly suspended from the binder-frame and overlying the pickers and inner ends of the carrier-belts, for the purposes specified.

13. The combination, in a harvester-binder, of a platform-frame, carrier-belts traversing it, gatherers or pickers on the stubble side of said belts, a binder-frame longitudinally adjustable on the platform-frame, a cut-off mounted on the binder-frame, decking covering these parts, and a grain-shield flexibly suspended from the binder-frame, and overlying the cut-off, pickers and inner ends of the carrying-belts, the space between the shield and decking thus forming a yielding converging throat through which the grain passes to the binding-receptacle, when not intercepted by the cut-off, substantially as specified.

14. The combination, in a harvester-binder, of a cam and gear wheel, a cam on one face thereof, a cut-off actuated thereby through its crank-and-link connections, a wrist-pin on the opposite face of the cam and gear wheel, a driving-link intermediately pivoted thereon, a compressor driven through its crank-and-link connections from one end of said driving-link, a needle-arm, its actuating-crank and slot, and a pin on the opposite end of said driving-link, working in said slot, substantially as specified.

15. The combination, in a harvester-binder, of a retainer and ejector, its shaft, its driving-pinion, and diametrically-arranged friction-rollers on the outer face thereof, a main binder-wheel, a cam thereon acting on the friction-rollers to oscillate the retainer and ejector at proper intervals, to compress the bundle, and a sector-gear to rotate the retainer and ejector, mounted on a ledge projecting from the face of the main wheel, and overriding the friction-rollers, substantially as specified.

16. The combination, in a harvester-binder, of a cam and gear wheel, a cam on one face

thereof, a cut-off actuated thereby through its crank-and-link connections, a wrist-pin on the opposite face of the cam and gear wheel, a driving-link intermediately pivoted thereon, a compressor driven through its crank-and-link connections from one end of said driving-link, a needle-arm, its actuating-crank and slot, a pin on the opposite end of said driving-link, working in said slot, a knotter, its actuating-gear, and a cam and sector gear on the periphery of the main cam and gear wheel actuating said knotter-pinion, substantially as specified.

17. The combination, in a harvester-binder, of a grain-platform, carrier-belts traversing it, gatherers or pickers on the stubble side of said belts, a binder-frame adjustable longitudinally on the platform-frame, a compressor mounted in bearings on the stubble side of the binder-frame, a cut-off mounted in bearings on the grain side of said frame, between the pickers and compressor, packers mounted on a central shaft of the platform-frame between the cut-off and compressor shafts, a retainer and ejector on the stubble side of the grain-receptacle, a knotter, a needle-arm, decking, a yielding shield, and breast-pieces sustaining it; the organization being such that the grain delivered from the carriers is forced by the pickers over the cut-off and compressor to the packers, which convey it to the binding-receptacle, consisting essentially of the movable decking and breast-pieces, substantially as and for the purposes specified.

In testimony whereof I have hereunto set my hand this 11th day of December, A. D. 1894.

JOHN S. DAVIS.

Witnesses:
F. A. CUTTER,
H. P. BAILEY.