No. 702,335. Patented June 10, 1902.

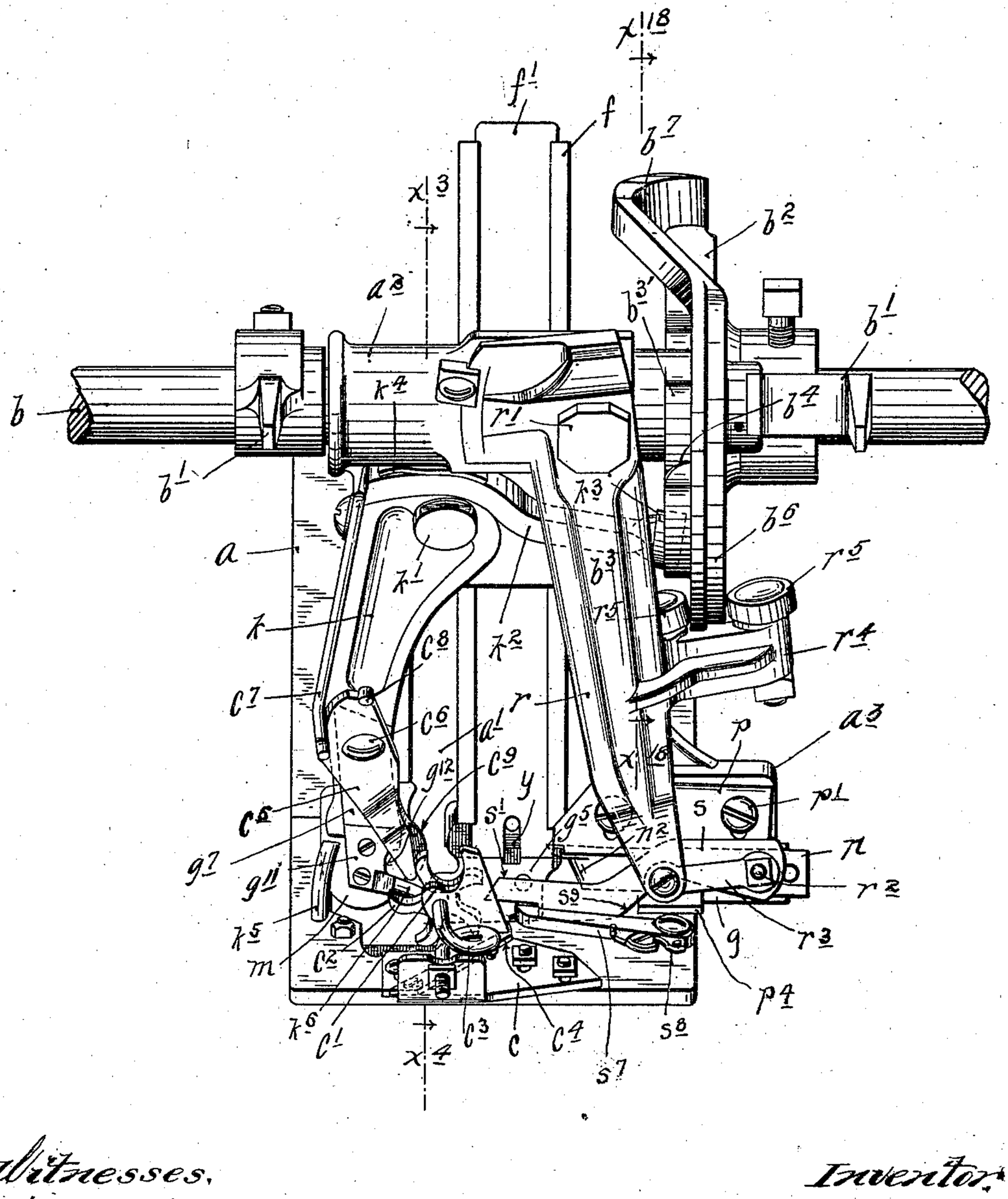
J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 1.

Fig. 1.



Witnesses.
Harry Kilgore.
Anne D. Read.

Inventor.
Joseph L. Ware.
By his Attorneys.
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 2.

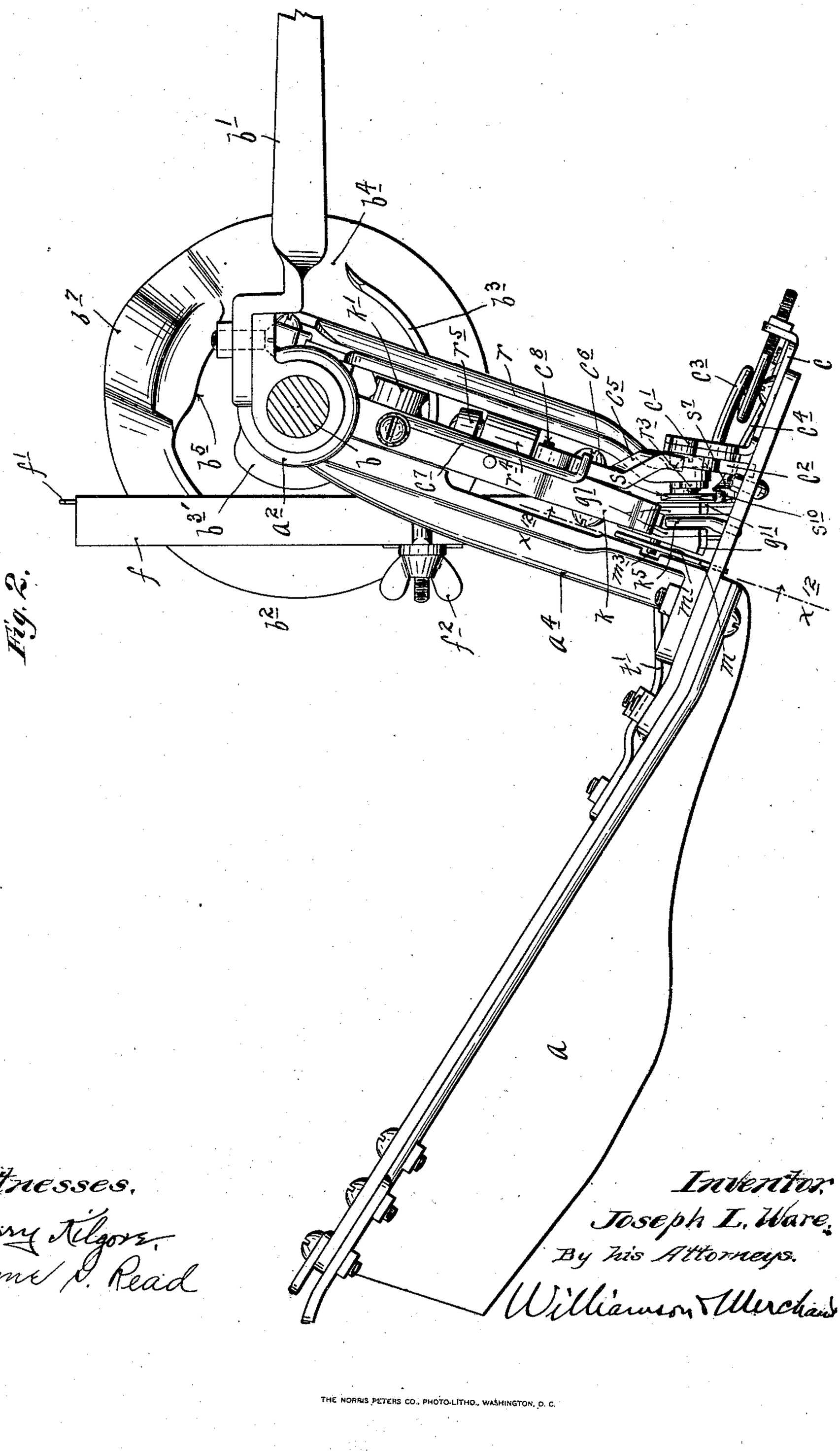


Fig. 2.

Witnesses.
Harry Kilgore.
Anne D. Read

Inventor.
Joseph L. Ware.
By his Attorneys.
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 3.

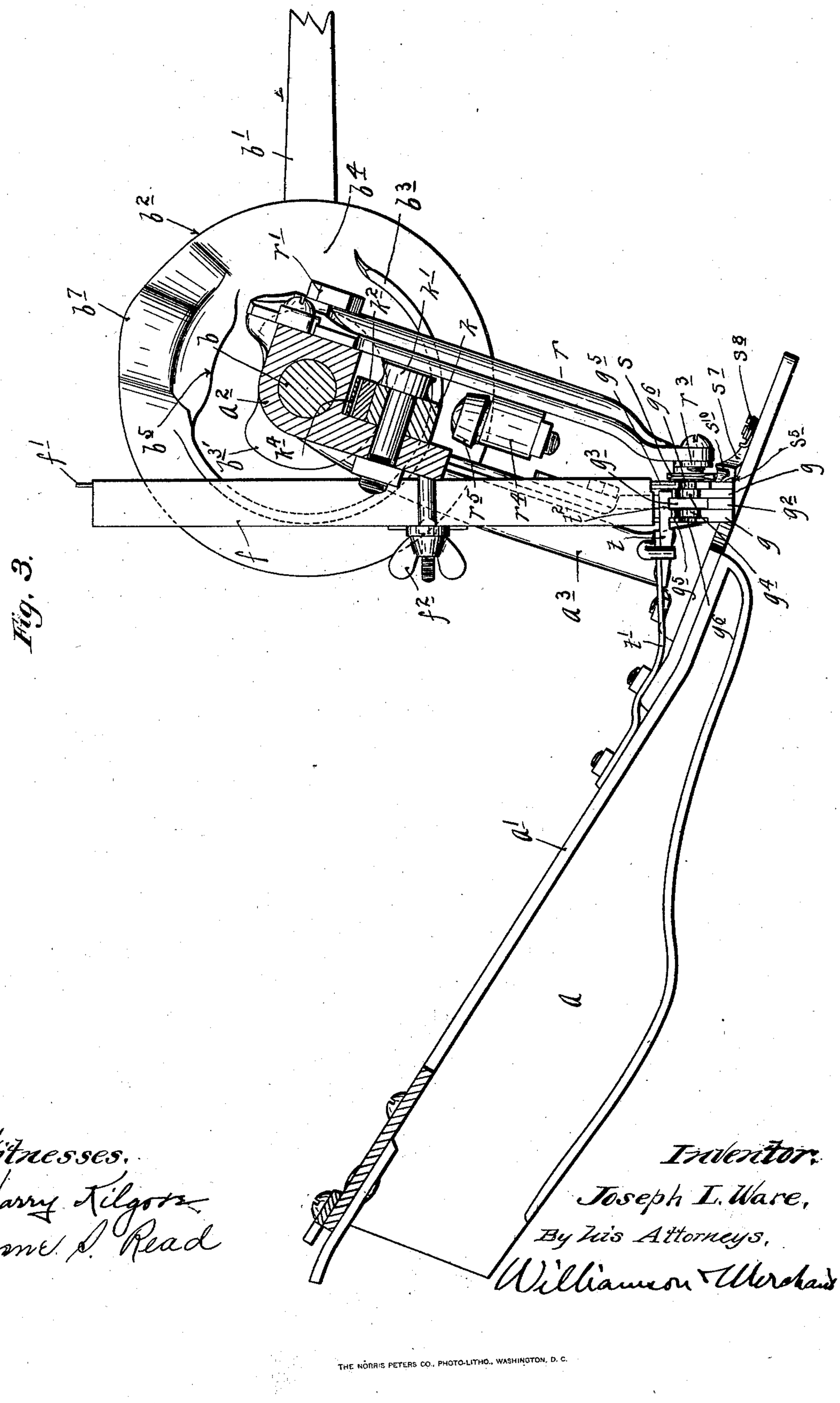


Fig. 3.

Witnesses.
Harry Kilgore
Anne L. Read

Inventor.
Joseph L. Ware,
By his Attorneys,
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 4.

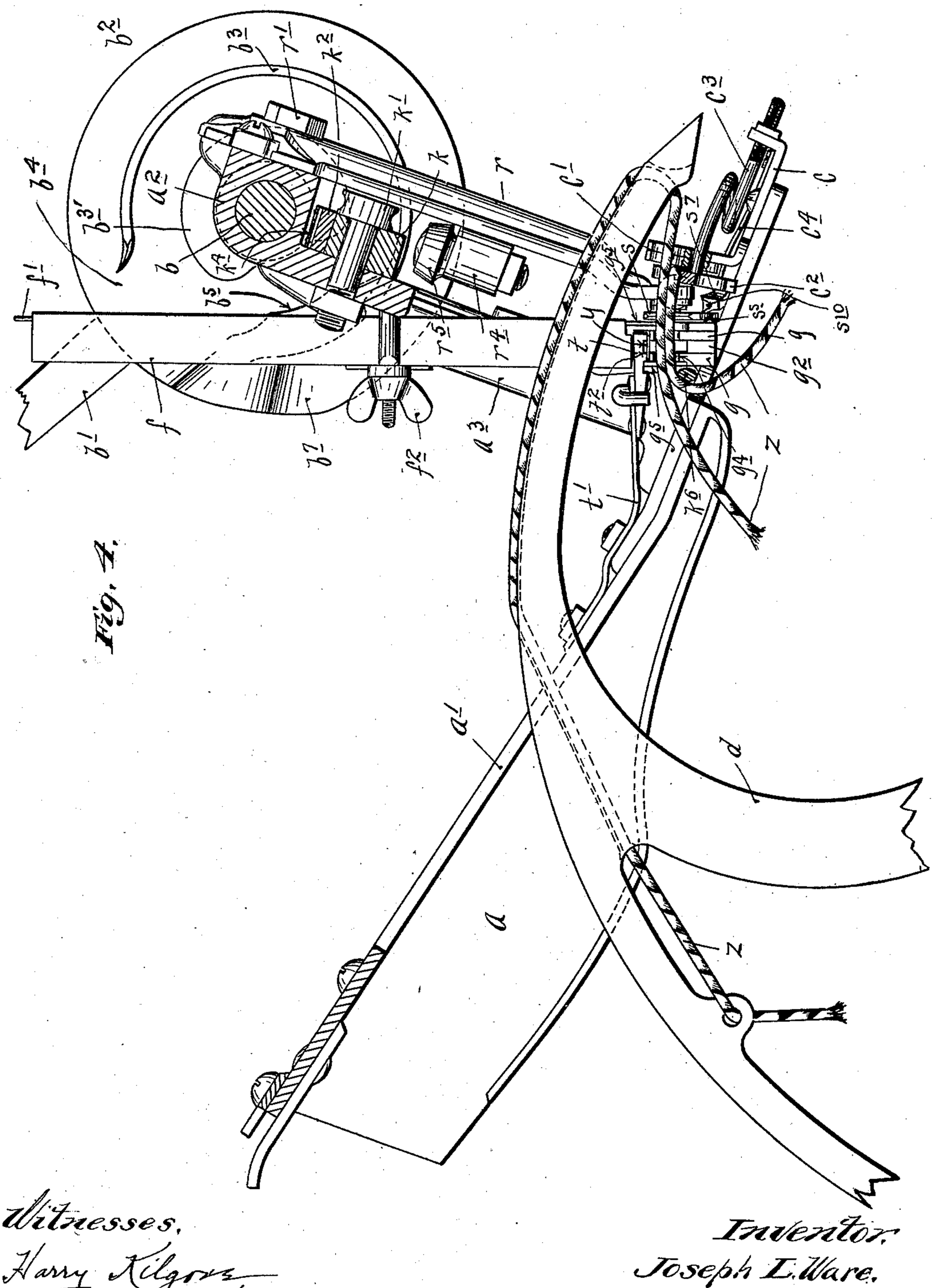


Fig. 4.

Witnesses,
Harry Kilgore.
Anne I. Read

Inventor.
Joseph L. Ware.
By his Attorneys,
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

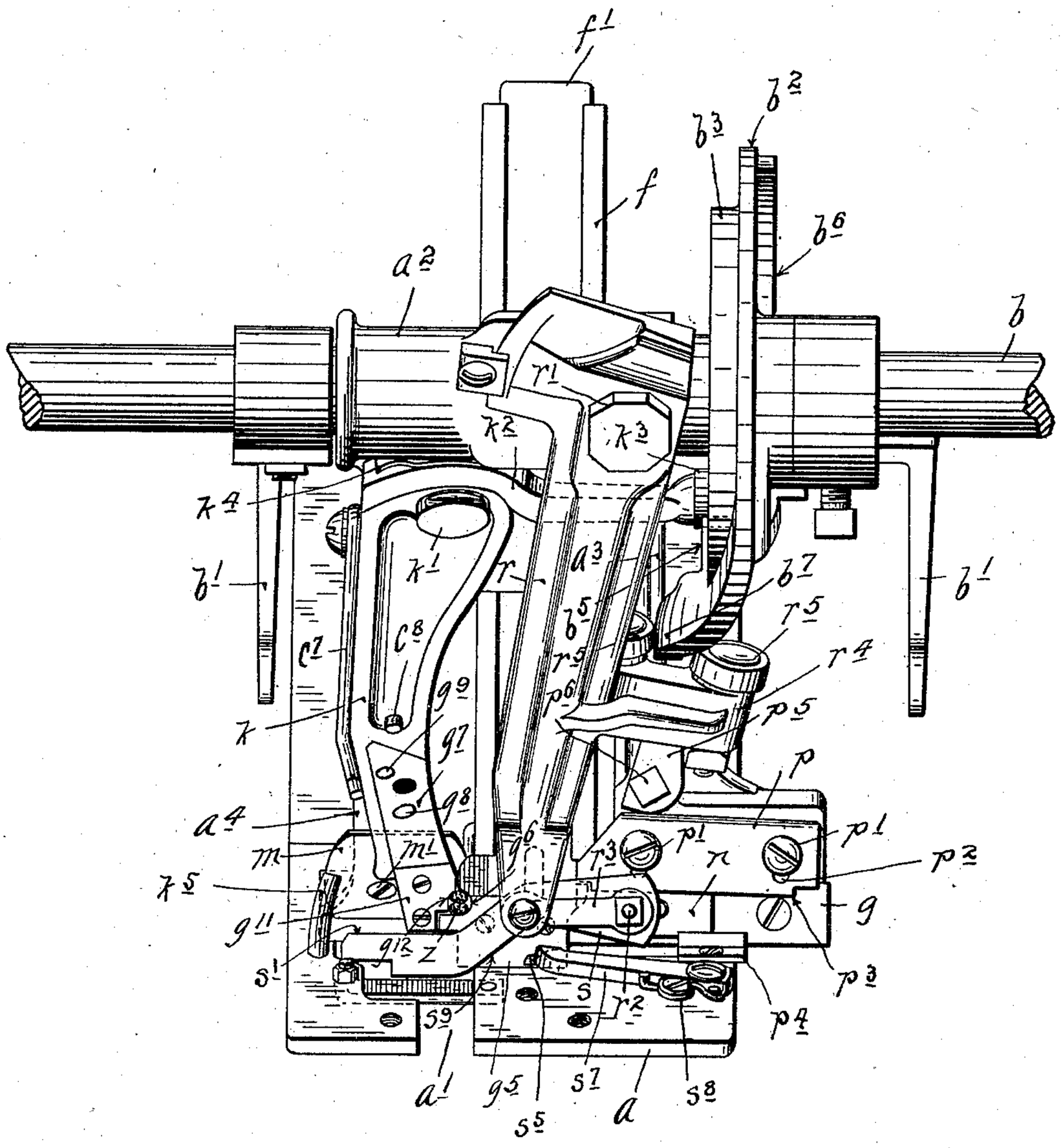
J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 5.

Fig. 5.



Witnesses.
Harry Kilgore.
Anne L. Read

Inventor,
Joseph L. Ware,
By his Attorneys,
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 6.

Fig. 6.

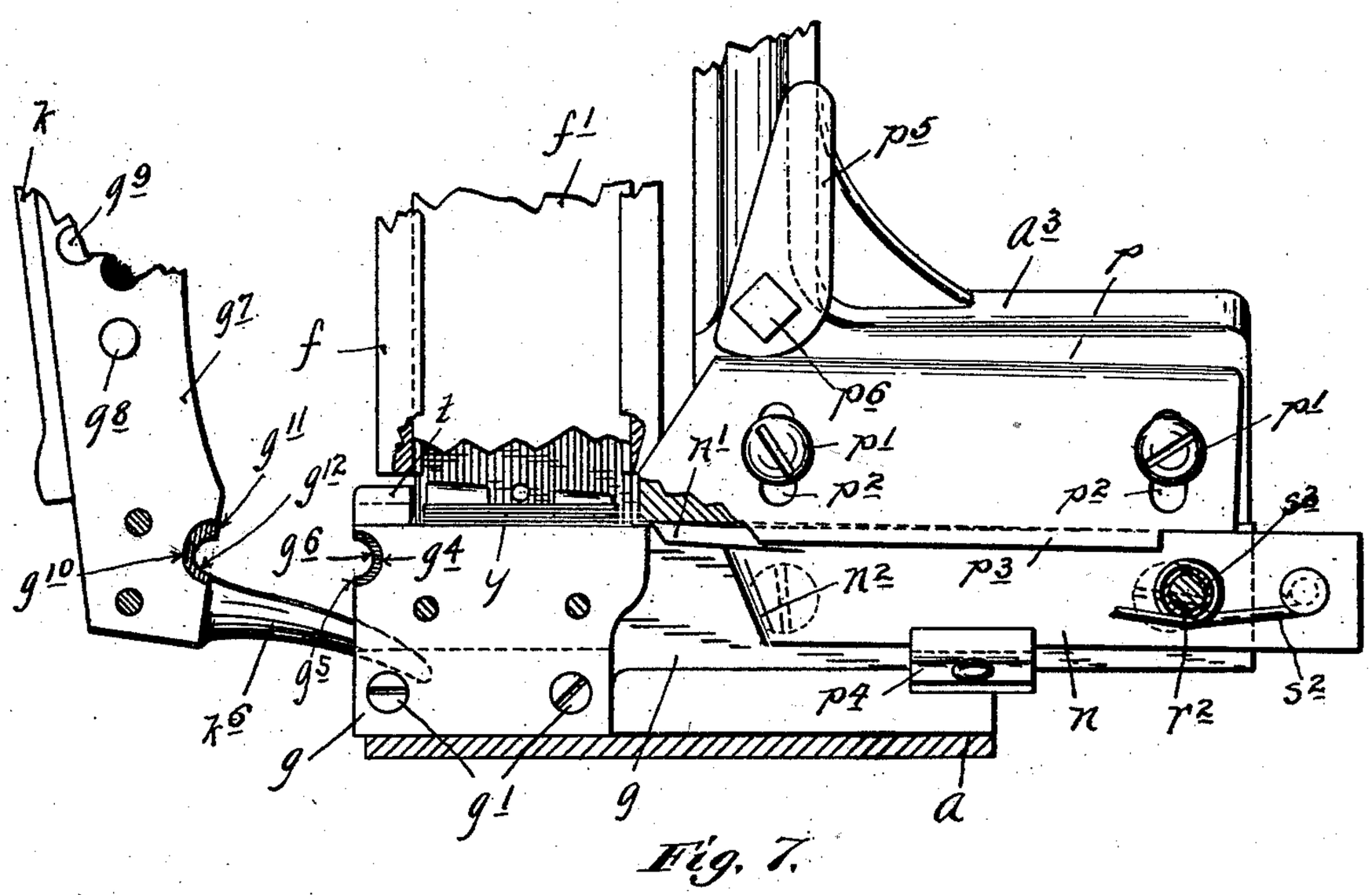
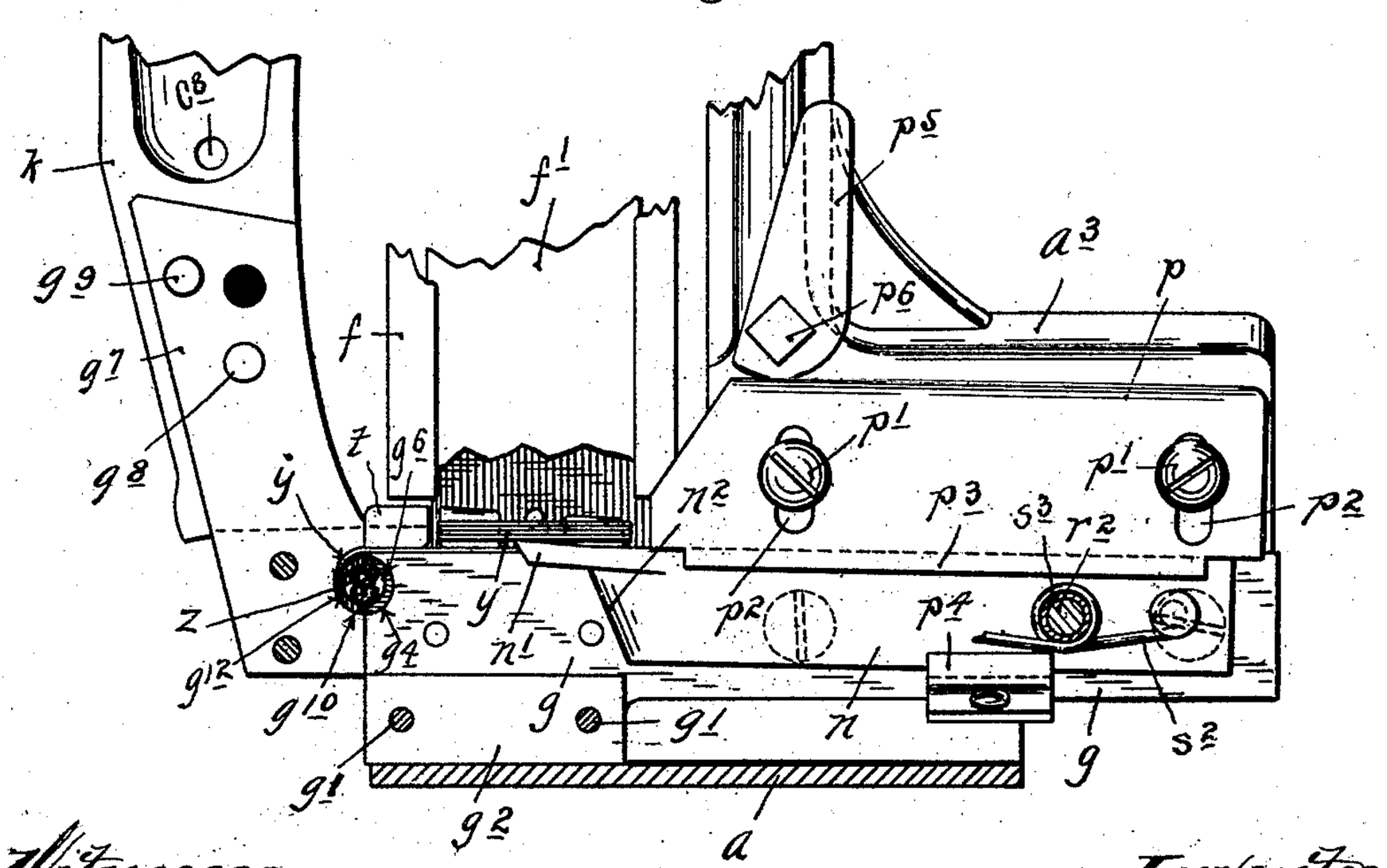


Fig. 7.



Witnesses,
Harry Kilgore
Anne S. Read.

Inventor,
Joseph L. Ware,
By his Attorneys,
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 7.

Fig. 8.

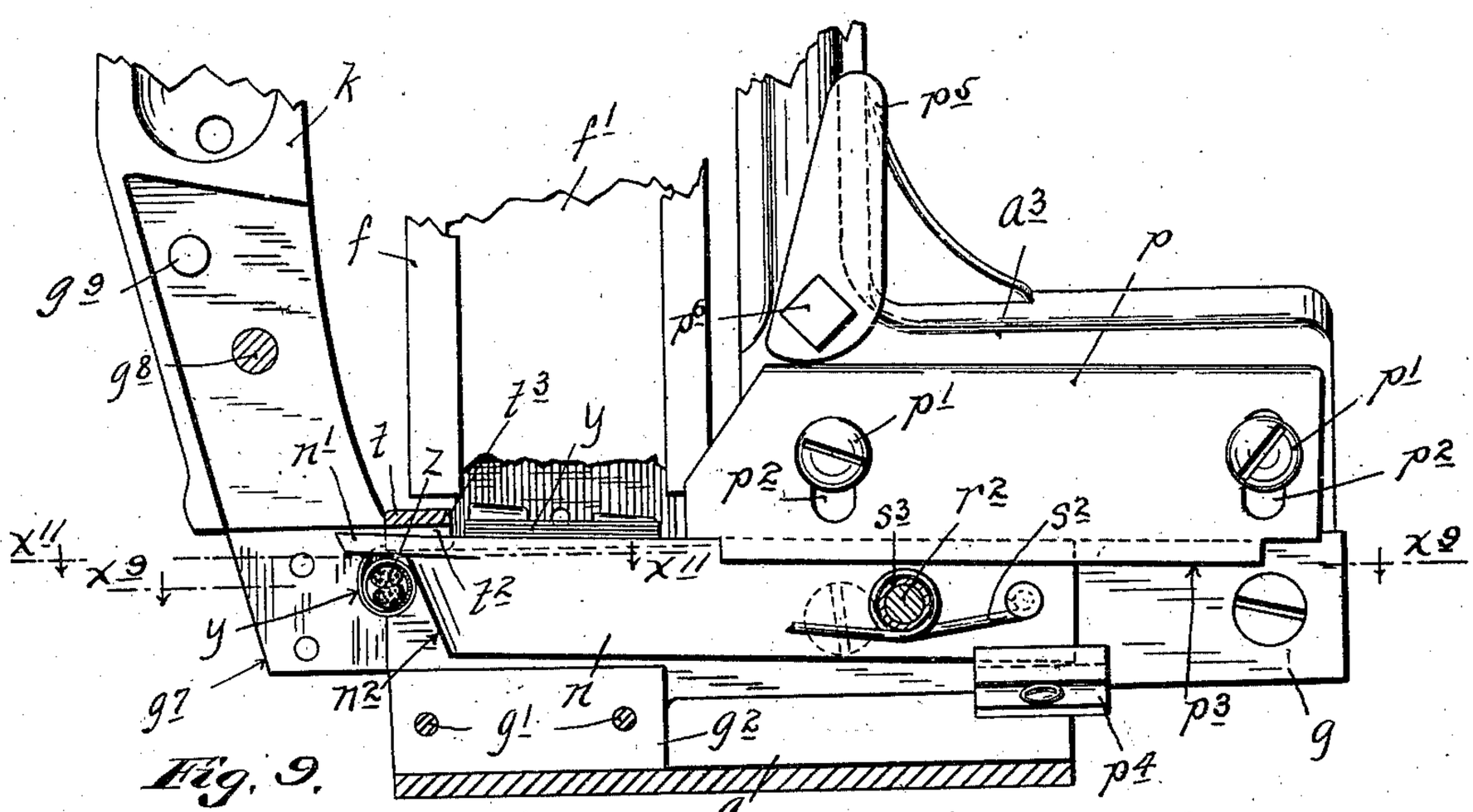
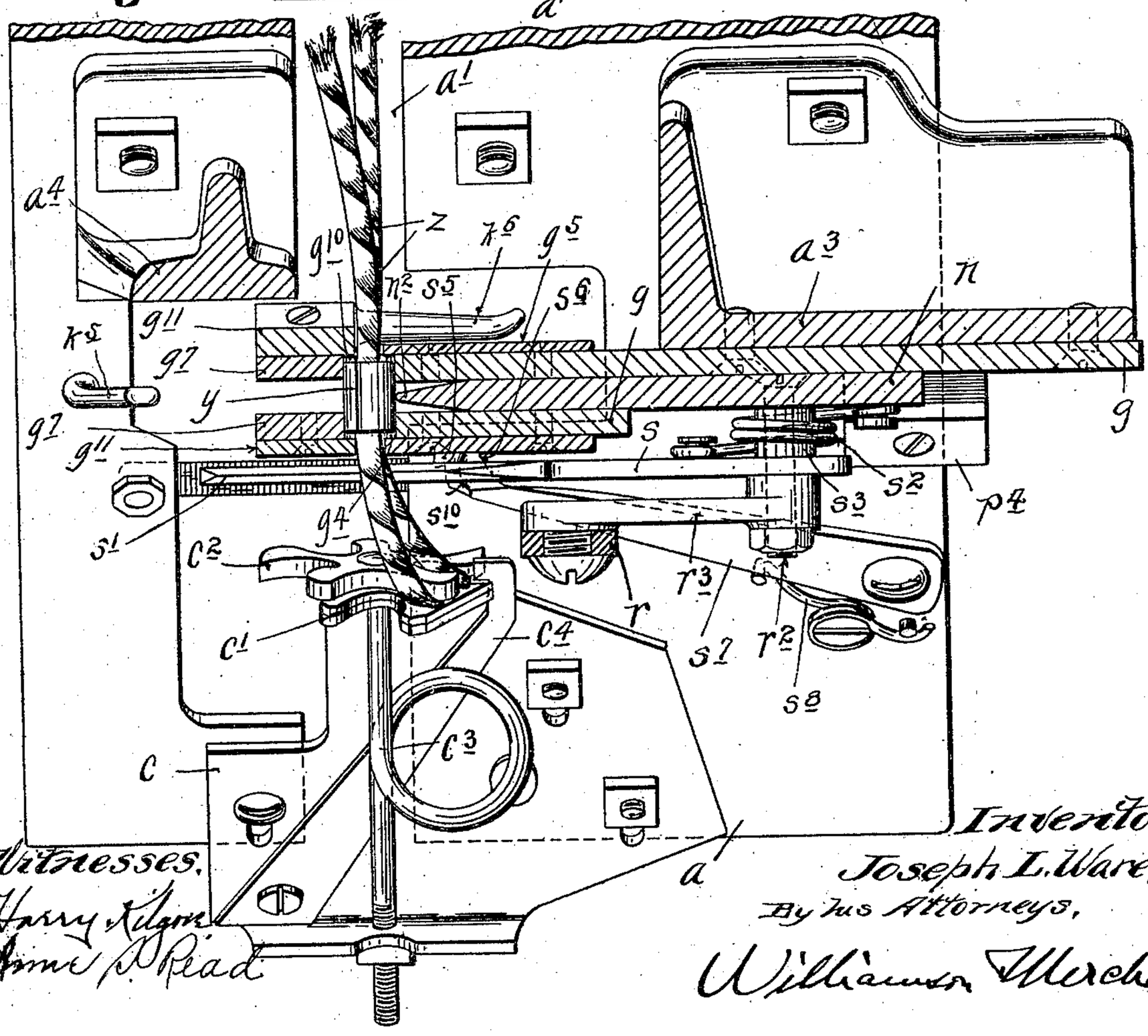


Fig. 9.



Witnesses,
Harry Kilgore
Anne S. Read

Inventor,
Joseph L. Ware,
By his Attorneys,
Williamson Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 8.

Fig. 10.

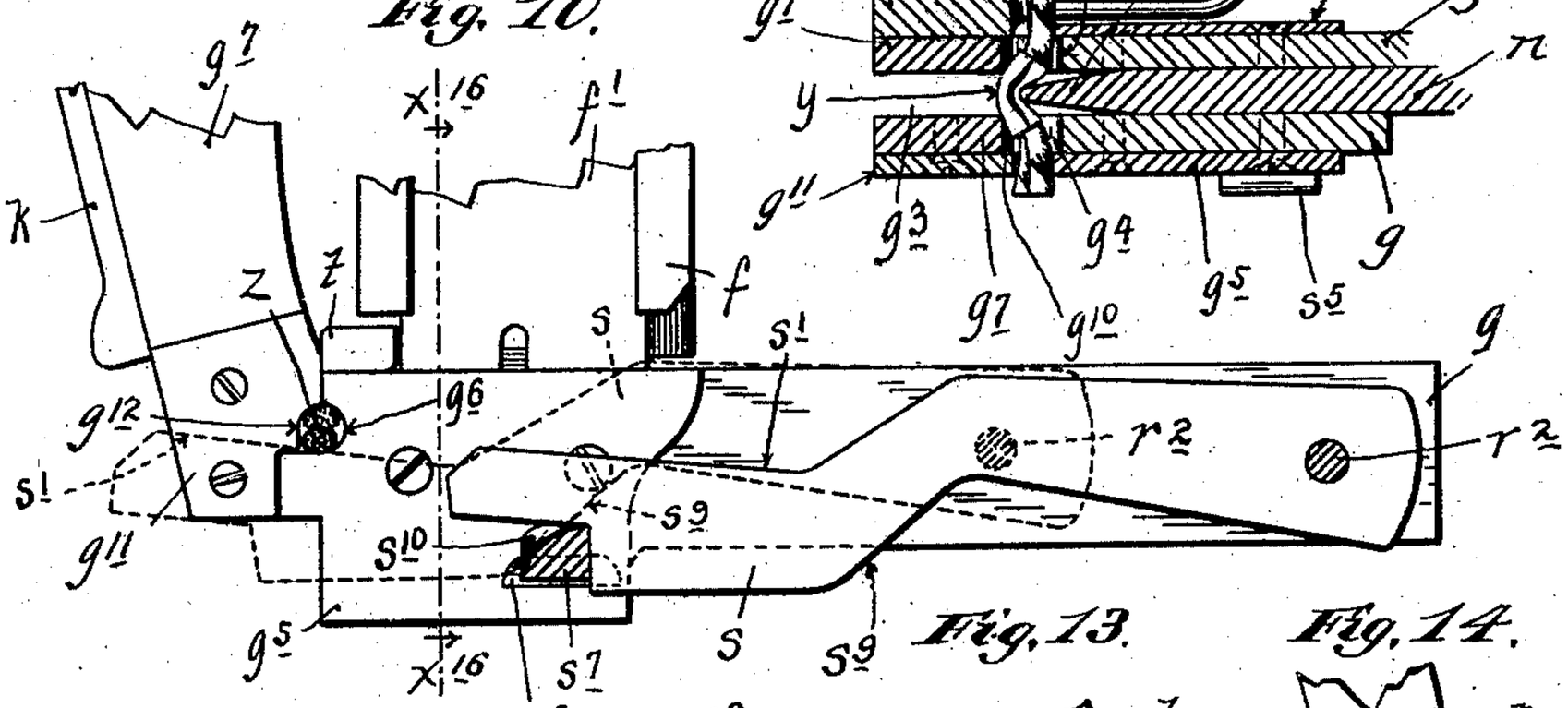


Fig. 11.

Fig. 12.

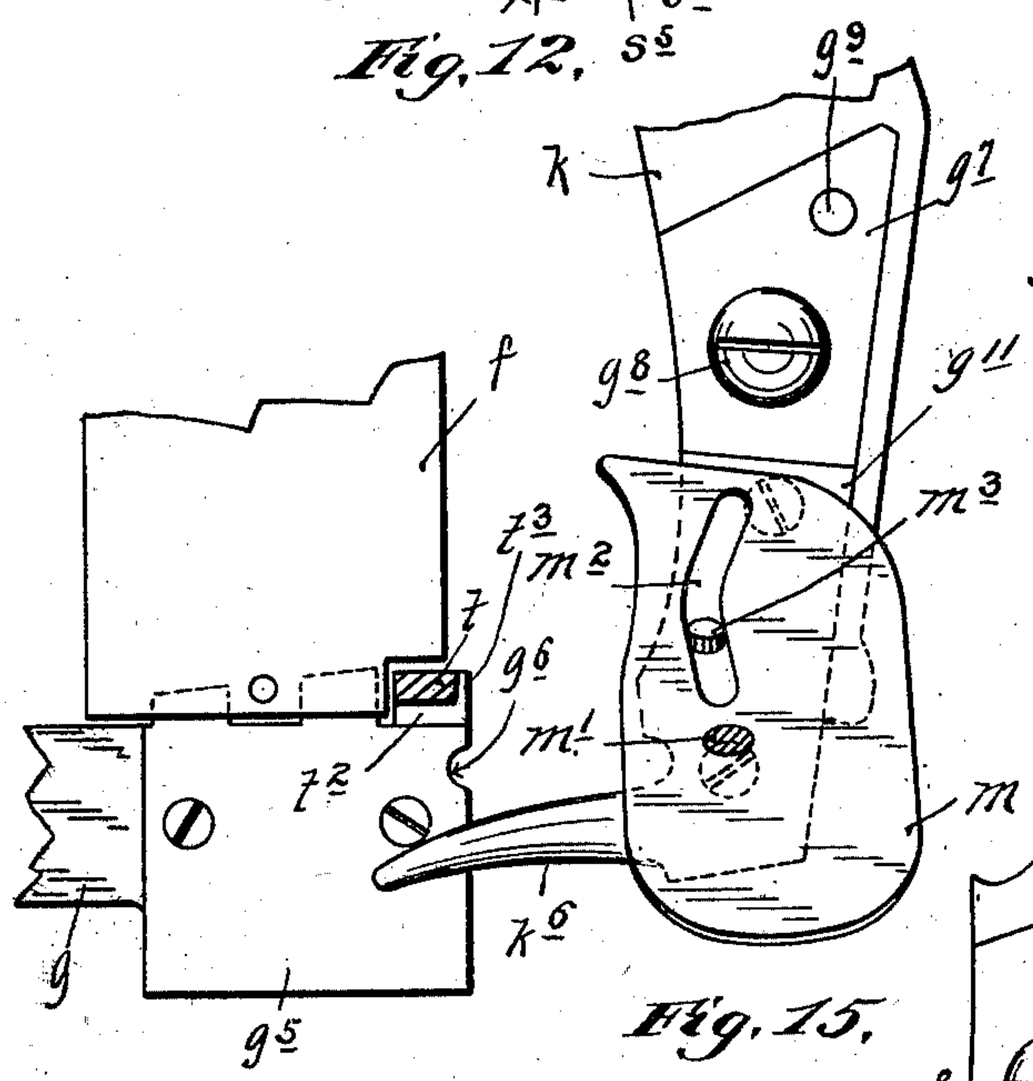


Fig. 13.

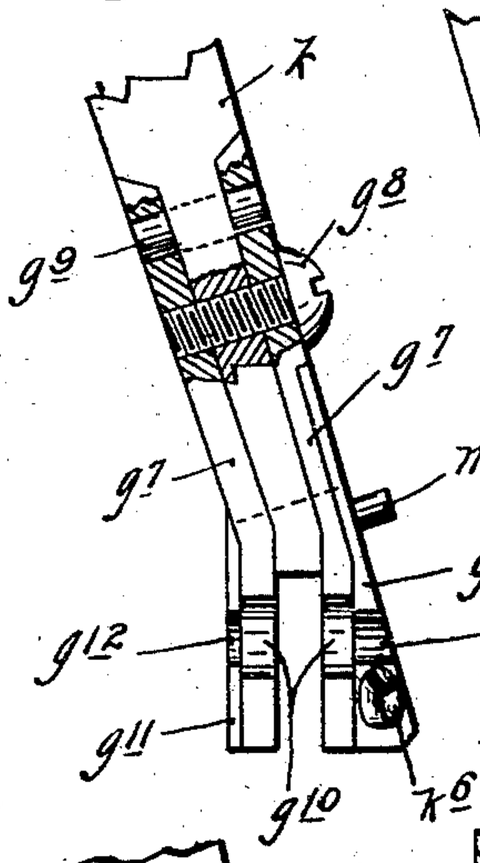


Fig. 14.

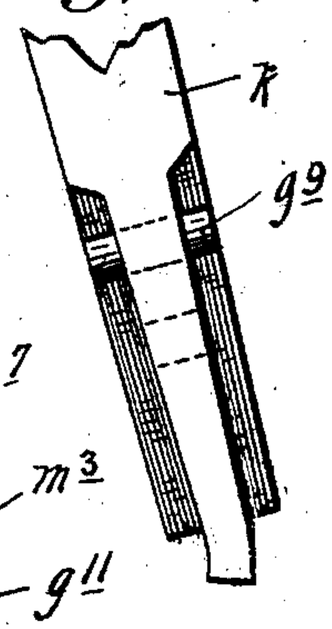


Fig. 15.

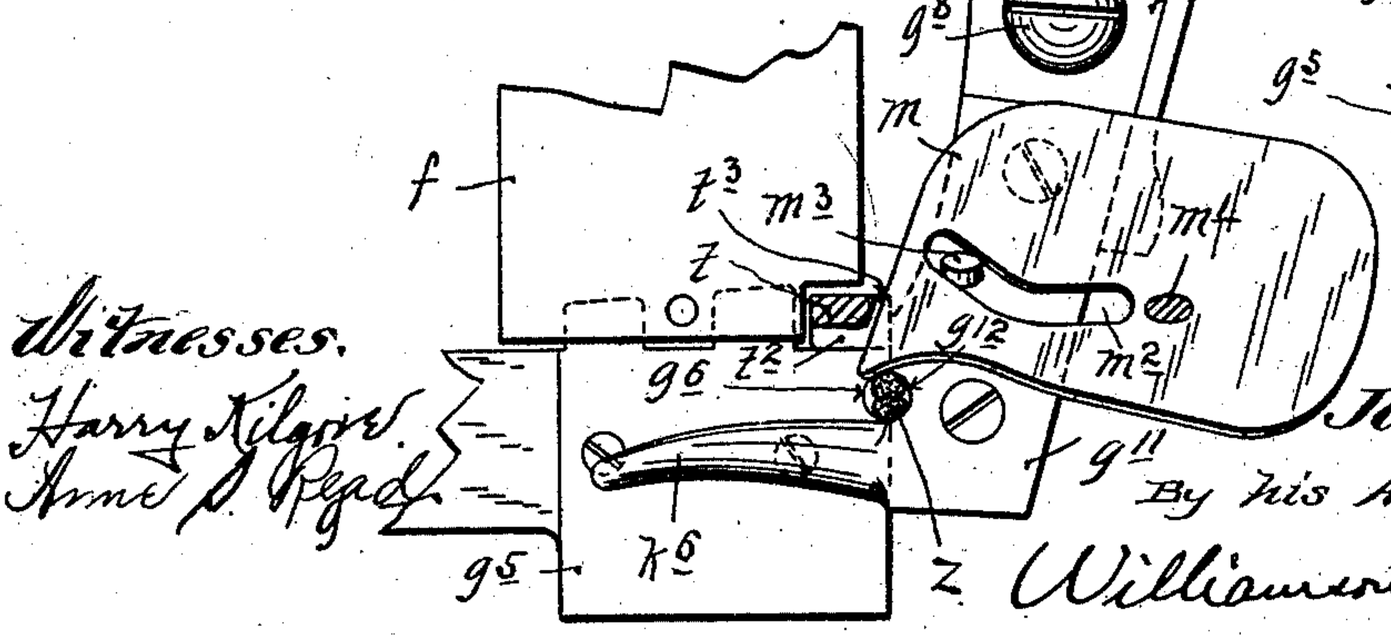
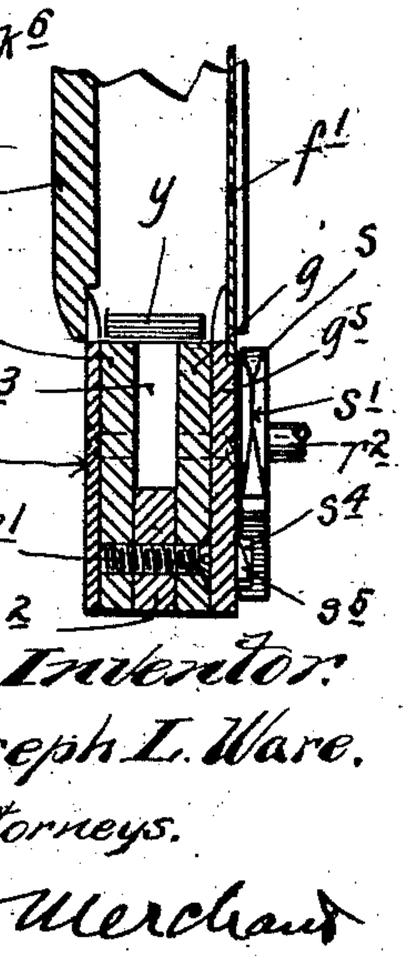


Fig. 16.



Witnesses.
Harry Kilgore.
Anne D. Read.

Inventor.
Joseph L. Ware.
By his Attorneys.
Williamson & Merchant

No. 702,335. Patented June 10, 1902.

J. L. WARE.

GRAIN BINDER.

(Application filed Sept. 7, 1900. Renewed May 2, 1902.)

(No Model.) 9 Sheets—Sheet 9.

Fig. 17.

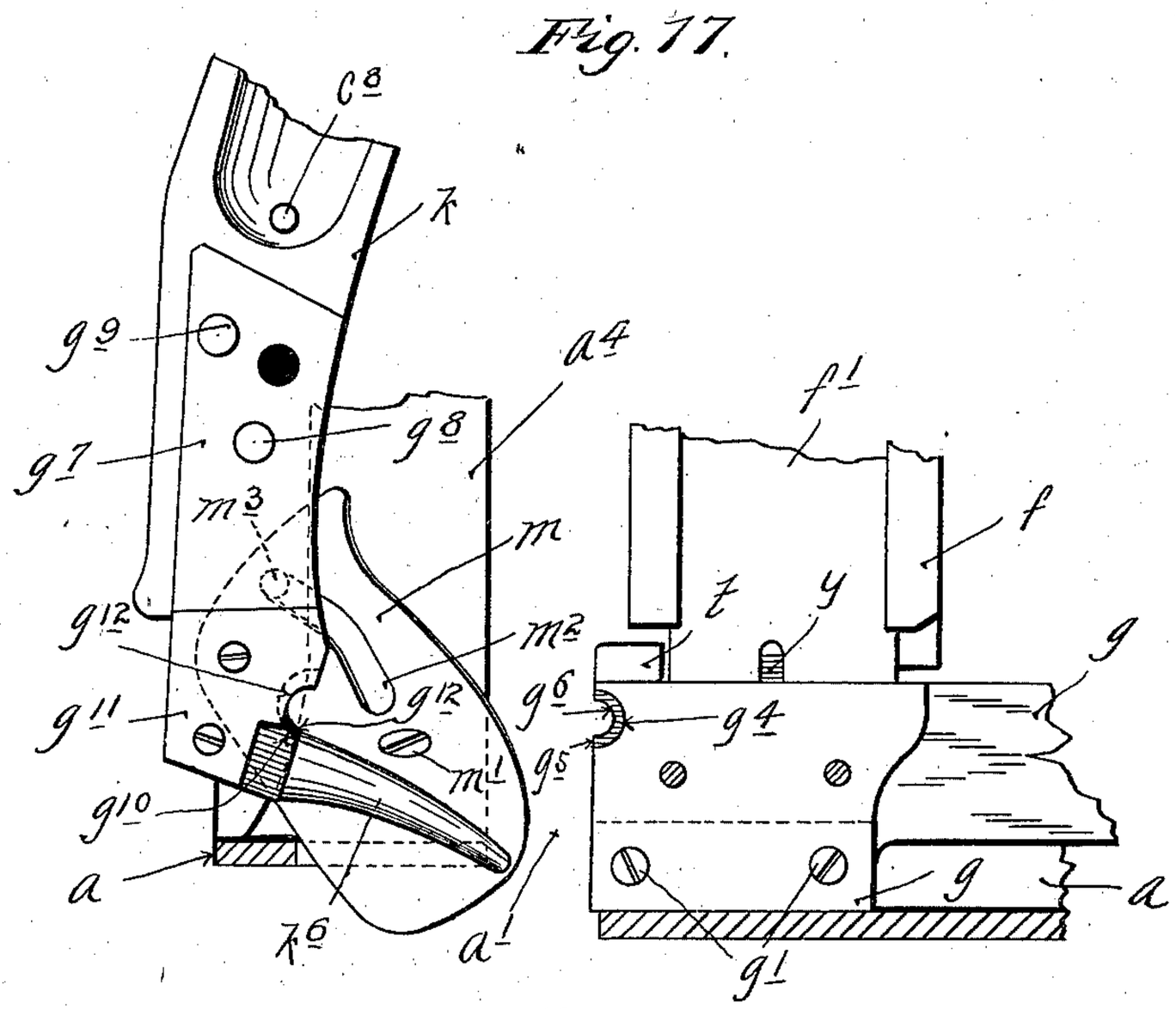
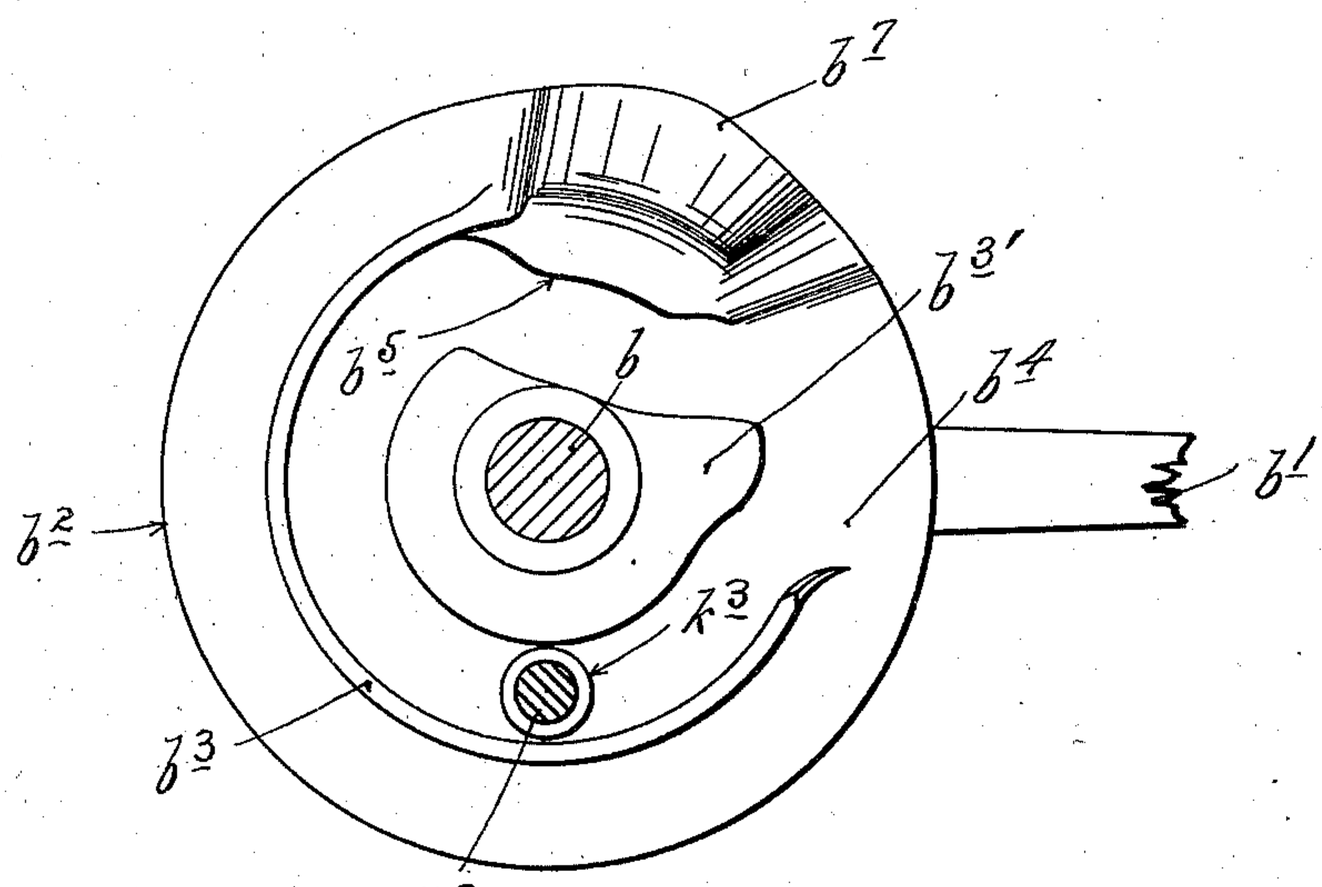


Fig 18.



Witnesses.
Harry Kilgore.
Anne D. Read.

Inventor.
Joseph L. Ware.
By his Attorneys.
Williamson & Merchant

UNITED STATES PATENT OFFICE.

JOSEPH L. WARE, OF ST. PAUL, MINNESOTA.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 702,335, dated June 10, 1902.

Application filed September 7, 1900. Renewed May 2, 1902. Serial No. 105,694. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. WARE, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Grain-Binders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to the class of grain-binders wherein metal clips are employed to fasten the ends of the applied bundle-binding bands, and has for its object the provision of simple and efficient mechanism for forming and applying the metal clips to the said bands.

To the ends above indicated my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

So far as I am aware prior to my invention, the result of which is the machine herein shown, described, and claimed, no practical commercial machine had been devised for forming and applying metal clips to the ends of the bands or bundle-binding cords.

The trade has long demanded a machine which will make possible the use of very cheap grades of twine or cord for binding grain. Experience has shown that very cheap twines or cords of the strength required to bind grain cannot be knotted or tied by automatic devices.

There is at the present time manufactured in this country in large quantities for various commercial uses a so-called "grass twine." This grass twine when properly secured as a binding-band around a bundle of grain is extremely efficient for that purpose and has the important advantage that it is a very cheap twine. Prior attempts to use this grass twine to bind grain have failed, for the reason that the twine cannot be knotted or tied and for the further reason, already stated, that no efficient mechanism has hitherto been provided for applying the metal clips thereto. Hence it is obvious that the provision of an efficient machine for forming and applying the clips, thereby making possible the use of very cheap grades of twine, and particularly of the so-called "grass twine," will not only reduce the cost of binding grain, but will create a new and extremely large field of demand for a home product.

I have produced a machine which will accomplish in a most satisfactory manner the above-noted and desirable results.

The said machine is illustrated in accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a front elevation of the binder with the parts in normal positions. Fig. 2 is a side elevation of the binder with the parts in the normal positions. Fig. 3 is a vertical section on the line $x^3\,x^4$ of Fig. 1. Fig. 4 is a vertical section also taken on the line $x^3\,x^4$ of Fig. 1, but showing the needle thrown upward into a position to deliver the twine to the cord-holder and to the forming-throat. Fig. 5 is a front elevation of the binder with the die-section closed and other parts in corresponding positions. Fig. 6 is a detail, partly in transverse vertical section and partly in front elevation, some parts being broken away, illustrating the normal positions of the die-sections and of the clip-driver or forming-plunger. Fig. 7 is a view corresponding to Fig. 6, but showing die-sections as closed. Fig. 8 is a view corresponding to Fig. 7, but showing the clip-driver moved farther toward the clip-forming throat. Fig. 9 is a horizontal section on the line $x^9\,x^9$ of Fig. 8, some parts being shown in full. Fig. 10 is also a view corresponding closely to Fig. 7, but showing the knife and parts for actuating the same, certain other parts being removed. Fig. 11 is a detail and horizontal section on line $x^{11}\,x^{11}$ of Fig. 8, but showing the driving-plunger forced to its extreme position to kink and complete the clip. Fig. 12 is a detail, partly in rear elevation and partly vertical section on the line $x^{12}\,x^{12}$ of Fig. 2. Fig. 13 is a detail in right side elevation, some parts being broken away, showing the movable die-section. Fig. 14 is a view corresponding to Fig. 13, but with the spring-jaws of the die-section removed. Fig. 15 is a view corresponding to Fig. 12, but showing the die-section as closed. Fig. 16 is a vertical section on line $x^{16}\,x^{16}$ of Fig. 10. Fig. 17 is a view corresponding to Fig. 6, but showing the movable die-section as thrown to its extreme

open position, in which position the clip and secured band are discharged; and Fig. 18 is a section on the line x^{18} x^{18} of Fig. 1.

The frame of the binder is made up of an ordinary breastplate a, having a needle-passage a', and a bearing-head a^2, having depending brackets or legs a^3 a^4, the lower extremities of which legs are secured on said breastplate. The binder-driving shaft b is journaled in the head a^2 and is provided with a pair of bundle-discharging arms b' and with a cam-wheel b^2, which cam-wheel will be further described later on. Secured on the forward portion of the breastplate a is a bracket c, having a notched inner end flange c', with which an ordinary cord-holder c^2 coöperates in the ordinary manner to hold the cord or twine, (indicated by the character z.) This cord-holder c^2 in the construction illustrated is journaled on the inner end of an adjustable spring-rod c^3, supported by the bracket c, as best shown in Figs. 4 and 9. A retaining-pawl in the form of a leaf-spring c^4 prevents backward rotations of the cord-holder c^2 and determines its proper normal positions. There is nothing very important in this specific construction, as various other cord-holding devices will serve the purpose of my invention.

The needle d, which is of the ordinary or any suitable construction, operates to deliver the twine to the cord-holder and to place the twine around the bundle in the same manner as in an ordinary twine binder employing a knotter.

In my present machine the metallic clip-blanks (indicated at y) are cut to the proper length before they are supplied to the machine, and hence a magazine is employed to contain a stack of the same. This magazine (indicated at f) is advisably in the form of a vertically-disposed spout, one side of which is made in the form of a slide f' to afford ready access to the blanks. The magazine is shown as held in position by nutted bolts f^2.

From the magazine f the blank clips y are forced into the clip-forming throat of a divided die, the sections of which are separable, so as to readily release the clip after it is formed, and secured on the band or band-forming section of the twine. One section of this divided die is in the present machine fixed to the breastplate a, while the other is movable with respect thereto. The fixed die-section is advisably made up of a pair of heavy metal plates g, rigidly connected by screws or bolts g', but spaced apart by a spacing-block g^2 (see Figs. 7, 9, 11, and 16) to form a seat g^3 for the driver or driving-plunger, presently to be noted. The inner member of the die-plates g (see Fig. 9) is longer than the outer member and is shown as rigidly secured by screws to the base of the bracket-leg a^3. The upper edges of the die-plates g directly underlie the lower open end of the magazine f and serve as a support or banking-surface upon which the clip-blanks y normally rest, as shown in Fig. 6. At their left-hand ends, as viewed in Figs. 6, 9, and 11, the fixed die-plates g are formed with semicylindrical notches g^4, which constitute a portion of the so-called "clip-forming" throat, the other half-section of which throat will be hereinafter found to be located in the movable die-section. To the outer sides of the die-plates g are secured supplemental plate-sections g^5, each having a semicircular notch g^6, which extends concentric with the throat-forming notches g^4, but on the line of a materially smaller circle, for an important purpose to be hereinafter stated.

The movable die-section is carried at the free lower end of an oscillating lever k, pivoted to the bearing-head a^2 at k'. This movable die-section is made up of a pair of jaws or die-plates g^7, of spring metal, and they are secured to the said arm k, as shown, by a screw g^8 in such manner that they are free to spring laterally or separate slightly, but are held against other movements on said arm k by said screw g^8 and a pin g^9. At their lower and right-hand edges, as viewed in Figs. 6, 7, and 11, the die-plates or jaws g^7 are formed with approximately semicylindrical notches g^{10}, which when the die-sections are pressed together, as shown in Fig. 7, register with the notches g^4 of the fixed die-plates g, except that the upper edges of said notches g^{10} extend far enough from the upper edges of the notches g^4 to afford a narrow mouth opening tangentially into the clip-forming throat formed by the said notches g^4 and g^{10}, thereby permitting the entrance of the clip-blank, as shown in Fig. 7. To the outer face of each die-plate g^7 is secured a supplemental plate or cheek-piece g^{11}. Each plate or cheek-piece g^{11} is provided with a semicircular notch g^{12} of less diameter than notches g^{10} and adapted when the die-sections are closed to register and coöperate with notches g^6 of the supplemental plate-sections g^5 to form guide-eyes for the twine or band z, as best shown in Fig. 7.

The lever k is provided with an arm extension k^2, which for an important purpose, to be hereinafter noted, is preferably of strong spring metal. At its extended end the arm k^2 is provided with a roller k^3, which works in a channel formed between profile-cams b^3 and $b^{3'}$ of the cam-wheel b^2. The cam-flange b^3 is cut away at b^4 and is provided with an inwardly-projecting cam-section b^5, which cam parts act as hereinafter described. A spring k^4 on the arm k^2 tends to force the free end of said arm upward. k^5 is a stripper finger or stud which projects from the breast a and works between the jaws g^7 of the movable die and serves to clear the same of straw under the extreme opening movement of said die, as shown in Fig. 17.

An actuating-pawl c^5 for the cord-holder c^2 is pivoted at c^6 to the lever k and is held by a spring c^7 in its normal position against the stop c^8 on said lever k. The free end of this pawl c^5 normally engages one tooth of the

cord-holder c, as shown in Fig. 1, and is provided with a side flange c^9, which serves to guide the twine or band over the engaged tooth and into the proper notch of the cord-holder.

At its lower end the lever k carries a twine-locating finger k^6, (shown as formed integral with one of the cheek-pieces g^{11},) which at its base joins tangentially with one of the notches g^{10} of the movable die-sections. Normally this finger k^6 stands as best shown in Figs. 6 and 12. To press the twine downward and insure its alinement with the notches g^6 and g^{10} as the sections of the die close, a so-called "tucker" is provided. As shown, this tucker is in the form of a thin flat plate m, pivoted to the bracket-leg a^4 at m' and provided with a cam-groove m^2, which coöperates with a cam-pin m^3, carried by the lever k. Normally the tucker m stands as best shown in Fig. 12; but the initial closing movement of the movable die-section and arm k forces the tucker into the position shown in Fig. 15. Thus it will be seen that under the closing movement of the movable die-section the locating-finger k^6 and the tucker m cooperate to positively guide the twine to the perforations formed by the closed notches g^6 and g^{12} and that these notches then serve to hold the overlapped ends of the band projecting axially through but clear of the walls of the clip-forming throat formed by the closed notches g^4 and g^{10}, thus leaving an open annular space within the throat and around the twine, as best shown in Figs. 7 and 11. This, as is evident, permits the clip to be turned completely around the ends of the twine or band.

Mounted to reciprocate within the seat g^3, previously noted as located between the fixed die-plates g, is the clip driver and kinker, which, as shown, is formed from the flat bar n and is provided at its forward end with a clip-driving nose n' and with a crushing or kinking edge n^2. The top of the driving-nose n' extends on a straight line with the upper edge of the bar n, and the end of the same is beveled or cut backward and downward on an incline, while the kinking edge n^2 is comparatively sharp and extends in a vertical plane. The driver n is mounted to work against one face of the inner die-plate g, and its upper edge is pressed against and guided by a guide-plate p, which guide-plate is adjustably secured to the base of the bracket-leg a^3, as shown, by set-screws p', that work through slots p^2 in said plate p and into said leg a^3. The guide-plate p is preferably formed with a depending flange p^3, which overlaps the upper edge of the driver n, as best shown in Fig. 8. A keeper-bracket p^4, shown as secured on the breastplate a, also assists in holding and guiding the driver n.

The guide-plate p is set with its lower guiding-surface extending at an angle to the upper surface of the fixed die-plates g, upon which die-plates, it will be remembered, rests the lower member of the stack of clip-blanks y in the magazine f. Hence when the driver n is moved toward the left with respect to Figs. 8 and 9 the end of the driving-nose n' will be gradually and continuously raised. When the guide-plate p is properly set, the inclined end of the nose n' on first making contact with the end of the clip-blank will engage the same for less than its complete thickness, but as it forces the blank toward the left will increase its hold on the same and slightly raise the stack of blanks in the magazine, as shown in Fig. 7. This shifting engagement of the beveled or inclined driving end of the driving-nose n' produces but little wear on the sharp upper edge thereof and produces a wear which maintains the proper form of the driving-surface. Were it not for this sliding action or shifting wear between the nose and the clip, the sharp driving edge would soon be worn off from the said driving-nose, and it would thus be rendered inoperative.

As an auxiliary locking device and as a means of effecting adjustments of the guide-plate p an eccentric-stop p^5 is advisably employed. As shown, this stop p^5 is pivoted to the leg a^3 at p^6 and engages the inner upper surface of said plate, as shown in Figs. 6, 7, and 8. The friction between the eccentric p^5 and the plate p will be such that the eccentric will not be forced from its set position by the crowding action of the plate b, which, as stated, is also quite securely held or set by the tightened set-screws p'.

As a means for reciprocating the driver n an oscillating arm r is pivoted to the bearing-head a^2 at r' and is connected to a projecting stud r^2 from the driving-plunger n by means of a link r^3. The arm r is, as shown, provided with a projection r^4, on which a laterally-spaced pair of antifriction-rollers r^5 is mounted. These rollers r^5 embrace and are subject to a peripheral cam b^6 of the cam-wheel b^2. This cam b^6 has a laterally-bulged section b^7, which when it engages between the rollers r^5 forces the driving-plunger n toward the left with respect to Figs. 6 and 7 or toward the closed throat of the die. Also connected to and operated by the oscillating arm r is a knife s, the butt-end of which is directly pivoted on the stud r^2 of the driving-plunger n. The free upper edge of this knife s is sharpened, as indicated at s'. A spring s^2, which, as shown, is wound around a sleeve s^3 on the stud r^2, is connected at one end to the right-hand end of the driving-plunger n and at its other end to the knife s. This spring acting over the stud r^2 as a fulcrum keeps the upper surface of the driving-plunger n pressed against the guide-plate p and, yielding, holds the knife s downward.

The knife is provided on its inner surface (see Fig. 16) with a longitudinal groove s^4, which when the knife is forced forward engages the lug s^5 on the outer supplemental die-plate g^5. The spring s^2 also tends to throw the knife s forward and away from the

lug s^5. When, however, the knife is moved forward or toward the left, it engages the cam-surface s^6 of a spring-pressed lever s^7, which, as shown, is pivoted on breastplate a and is subject to a spring s^8. Under this engagement the knife forces the lever s^7 out of its path against the action of said spring s^8, but the said knife is in turn by this engagement forced laterally, so that its groove s^4 engages the cam-lug s^5. The knife is thereby positively prevented from rising and cutting the cord while it is being moved toward the left and while the clip is being formed to unite the ends of the band.

After the clip has been completely formed by the movement of the driving-plunger n toward the left and the knife is again moved toward the right an inclined cam-surface s^9 on the knife engages an inclined cam-surface s^{10}, formed on the upper surface of the free end of the arm s^7, and the knife is thereby caused first to assume the dotted-line position indicated in Fig. 10 and then to move further upward and cut the completed band loose from that end of the twine which is held by the cord-holder.

As the blank clips are forced from the magazine into the clip-forming throat, formed by the closed die-notches g^4 and g^{10}, they are pressed under a yielding presser-foot t, which, as shown, is formed on the free end of a strong spring t', secured to the breastplate, as best shown in Fig. 4. As best shown in Figs. 6, 7, and 10, the presser-foot t normally engages the upper edges of the fixed die-plates g just over the notches g^4 and g^6, the lower right-hand edge of the same being slightly rounded to permit the clips to be forced thereunder. This presser-foot t assists in guiding the clip into the closed throat of the die and also prevents buckling of the clip-blank while it is being turned or curled within the said throat and around the twine.

By reference to Figs. 12 and 15 it will be seen that the presser-foot t has grooves t^2 and t^3, which respectively permit the free passage of the nose n' of the driver n and of the twine-engaging end of the tucker m.

In the normal positions of the parts (indicated in Figs. 1, 2, 3, 6, and 12) one end of the twine is held by the cord-holder and the needle is of course in a lowered position, so as to permit of the formation of the bundle. Approximately the first one-third rotation of the shaft b and cam-wheel b^2 takes place while the other parts of the binder, except the needle, remain in their normal positions. During this one-third rotation of the shaft b the needle is raised into the position indicated in Fig. 4, in which position it places the uncut end of the band in the open notch of the cord-holder and lays the twine over the finger k^6 in line with the open throat-forming notches g^4 and g^{10} of the separated die-sections. Under the movement of the shaft b and cam-wheel b^2 from the position indicated in Fig. 4 into a position about one hundred and eighty degrees from their normal positions the sections of the die are moved together to close the clip-forming throat g^4 g^{10}, and the clip-driver n is forced forward to start the clip into the throat, as shown in Fig. 7. A slightly-continued movement of the shaft b and cam-wheel b^2 carries the clip-driver into the position indicated in Figs. 8 and 9, in which position of said driver the clip y is completely turned around the ends of the band. A little further movement of the said shaft and cam-wheel throws the clip-driver n into its extreme position. (Indicated in Fig. 11.) Under this final movement of the driver the kinking edge n^2 thereof engages the intermediate portion of the curled but incompletely-formed clip, and thereby kinks the clip and presses it firmly onto the ends of the band, as shown in said Fig. 11. In the position of the parts indicated in Figs. 5 and 11 the shaft b and cam-wheel b^2 have made approximately two-thirds of a complete rotation. While the clip-forming movements of the clip-driver are taking place, the movable die-section is firmly held against the fixed die-section by the action of the cam-flange b^3 of the cam-wheel b^2 on the roller k^3 of the bell-crank k^2. As shown in Fig. 5, the bulged cam portion b^7 of the cam-flange b^6 on the wheel b^2, acting on one of the rollers r^5, has moved the oscillating lever r, the clip-driver n, and knife s out to their extreme positions toward the left. As the shaft b and cam-wheel b^2 are moved from the positions indicated in said Fig. 5 on around to the limit of the first rotation or to normal position, two important actions take place—to wit, first, the knife s, under the action of the cam s^6 of the lever s^7, raises and cuts off the ends of the formed band, and, second, as soon as the band has been cut the opening b^4 in the cam-flange b^3 is brought into line with the roller k^3, and at the same time the said roller is engaged by an outwardly-bulged portion of the cam-hub $b^{3'}$ and is thereby forced downward, with the result that the die-carrying lever k is moved into the extreme open position. (Indicated in Fig. 17.) When the parts are in the positions indicated in Fig. 17, the cord-locating finger k^6 is drawn completely out of the path of the secured band, and thereby affords a clear and open discharge-passage for the free discharge of the band, which in the operation of the machine is of course applied around the bound bundle. The laterally-yielding jaws of the movable die-section yield slightly under the final driving movement of the clip-driver, which produces the kink in the coiled clip. This yielding action prevents the band from being cut by too severe pressure in the kinking action and at the same time will permit of such additional yielding action as is necessary when straw or foreign material becomes caught within the clip-forming throat of the die or between the clip and the said yielding jaws. The strong spring-arm k^2 of the lever

k also yields slightly to prevent breaking of the parts in case straw or foreign material becomes caught between the abutting faces of the closing die-sections. To some extent the spring-jaws of the movable die-section and the spring-arms of the oscillating die-carrying lever *k* perform the same function, but neither, however, answers the full purpose of the other.

The die constructed in separable sections and arranged to be separated to afford clearance for the discharge of the formed clip I consider, broadly, new in this art. In fact I consider my present invention generally as a pioneer in the field to which it appertains, and hence it will of course be understood that the machine above described is capable of many modifications within the scope of my invention.

The machine above described has been built and tried, and in the field has performed its work in a most satisfactory manner.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a grain-binder employing a clip-fastener, a die composed of separable sections and means for separating the same, in combination with a driving device for forcing the clip-forming material into said die when the sections are closed.

2. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections, of automatic means for locating the ends of the band between said die-sections, means for forming the clip within said die and around the ends of the band, and automatic mechanism for separating the die-sections to afford clearance for the discharge of the formed clip.

3. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections arranged to form a clip-forming throat with tangential entrance-passage for the clip-forming material, with automatic means for locating the ends of the band within the throat of said die, a driving device for forcing the clip-forming material through said entrance-passage into the throat and around the ends of said band, and automatic mechanism for separating the die-sections to afford clearance for the discharge of the formed clip.

4. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections arranged to form a clip-forming throat with tangential entrance-passage for the clip material, of automatic devices for locating the ends of the band within the throat of said die, a driving device operating to force the clip-forming material into the throat of said die and around the ends of said band and by a continued movement to kink and press the same onto said band, and automatic mechanism for separating the die-sections.

5. In a grain-binder employing a clip-fastener, the combination with a banking-surface against which the clip-forming material is pressed, of a die composed of separable sections arranged to form a clip-forming throat and receiving from said banking-surface, a driver mounted to move at an angle to said banking-surface whereby the nose of said driver is given an increasing projection from said banking-surface in the driving action thereby insuring the engagement of the blank and giving an increasing hold while forming the clip, and means for separating the die-sections, substantially as described.

6. In a grain-binder employing a clip-fastener, the combination with a banking-surface against which the clip-forming material is pressed, of a die composed of separable sections arranged to form a clip-forming throat and receiving from said banking-surface, a driver mounted to move at an angle to said banking-surface for the purpose set forth, said driver having a projecting beveled driving-nose and an extended kinking edge, and means for separating the die-sections, substantially as described.

7. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections arranged to form a clip-forming throat with a tangential entrance thereto, of a clip-driver mounted to move transversely of and into the clip-forming throat of said die, the said driver having a projecting beveled driving-nose and an extended kinking edge for action on the clip, and means for separating the die-sections, substantially as described.

8. In a grain-binder employing a clip-fastener, the combination with a banking-surface against which the clip-blanks are delivered flatwise, of a die having a clip-forming throat, receiving from said banking-surface, a blank-driver, and an adjustable guide-plate for said blank-driver, having a guiding-surface extending at an angle to said banking-surface, whereby said plate may be adjusted to take up the wear and preserve the proper position of said guide-surface, substantially as described.

9. In a grain-binder employing a clip-fastener, the combination with a magazine for the clip-blanks, of a banking-surface against which the blanks are delivered flatwise from said magazine, a die having a clip-forming throat receiving from said banking-surface, a blank-driver, and an adjustable guide-plate for said blank-driver, having its guiding-surface extending at an angle to said banking-surface, whereby said guide-plate may be adjusted to take up the wear and preserve the proper position of the guiding-surface, substantially as described.

10. In a grain-binder employing a clip-fastener, the combination with a divided separable die having a clip-forming throat with an entrance for the clip-forming material, of connections for moving one of the die-sections with respect to the other, involving a yielding part, and a driver movable transversely

of and into the clip-forming throat of said die, in the clip-forming action, said parts operating substantially as described.

11. The combination with a divided separable die having a clip-forming throat with an entrance-passage, one of the die-sections having laterally-spaced spring jaws or plates, for the purpose set forth, and a driver mounted to move transversely of and into the clip-forming throat of said die, substantially as described.

12. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections arranged to form a clip-forming throat with an entrance-passage, of connections for moving one of said die-sections with respect to the other, comprising an oscillating lever with a spring-arm or yielding part, and automatic mechanism for imparting positive and predetermined movement to the motion-receiving end of said lever whereby breaking or straining of the parts in the die-closing action is prevented.

13. In a grain-binder employing a clip-fastener, the combination with a die having a clip-forming throat, of a banking-surface against which the clip-blanks are delivered flatwise, a blank-driver, an adjustable guide-plate having a guiding-surface against which said driver is mounted to move, and a cam or eccentric operating as a stop to said guide-plate, substantially as described.

14. In a grain-binder employing a clip-fastener, the combination with a die formed in separable sections and provided with a clip-forming throat, of means for moving one of the die-sections with respect to the other, comprising a reciprocating part carrying a cord-locating finger extending from the throat-section of the movable die member, and a driver for forcing the material from which the clips are to be formed, into the throat of said die, substantially as described.

15. In a grain-binder employing a clip-fastener, the combination with a divided die having a clip-forming throat, of means for moving one of the die-sections with respect to the other, comprising a reciprocating part carrying a cord-locating finger extending from the throat-section of the movable die member, a pivoted tucker coöperating with said finger and actuated by or with the movable die member, and a driver for forcing the material from which the clips are to be formed, into the throat of said die, substantially as described.

16. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections, each of said sections having coöperating approximately semicylindrical notches forming a clip-forming throat, of cheek-pieces having cord-holding notches and arranged to hold the cord or band clear of the walls of said throat when said die-sections are in closed relation, and means for locating the ends of the cord within the notches of said cheek-pieces.

17. In a grain-binder employing a clip-fastener, the combination with a die composed of separable sections, said die-sections having coöperating approximately semicylindrical notches forming a clip-forming throat, of cheek-pieces having cord-holding notches extending approximately concentric with said throat-forming notches when said die-sections are in closed relation, and arranged to hold the cord or band clear of the walls of said throat, one of said cheek-pieces having a projected cord-locating finger extended tangentially to the cord-holding notch thereof.

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

JOSEPH L. WARE.

Witnesses:
ANNE S. READ,
F. D. MERCHANT.