(No Model.) 5 Sheets—Sheet 1.

H. E. PRIDMORE.

GRAIN BINDER.

No. 481,244. Patented Aug. 23, 1892.

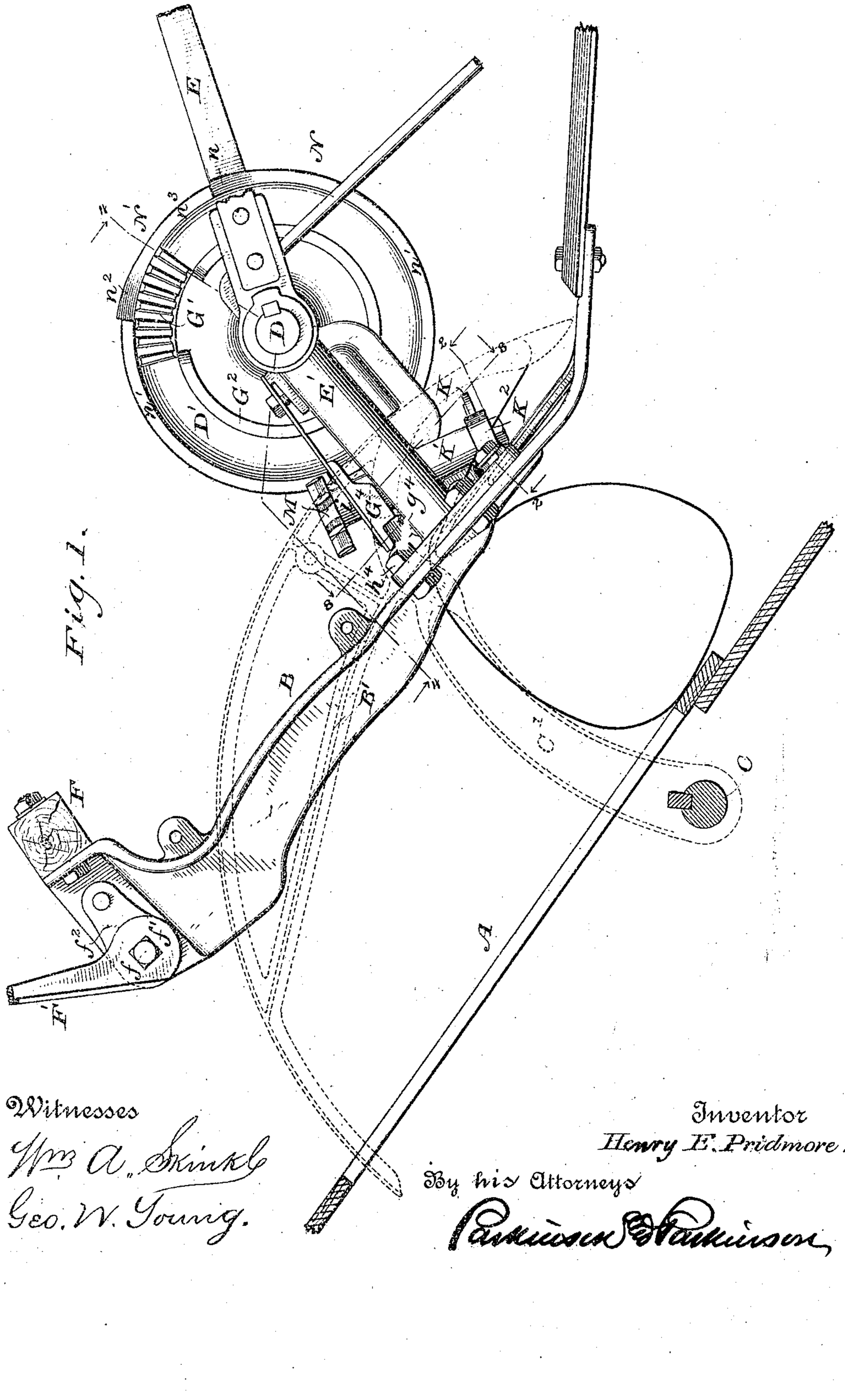

Fig. 1.

Witnesses
Wm A. Skinkle
Geo. W. Young.

Inventor
Henry E. Pridmore.
By his Attorneys
Parkinson & Parkinson

(No Model.) 5 Sheets—Sheet 2.

H. E. PRIDMORE.

GRAIN BINDER.

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Fig. 4.

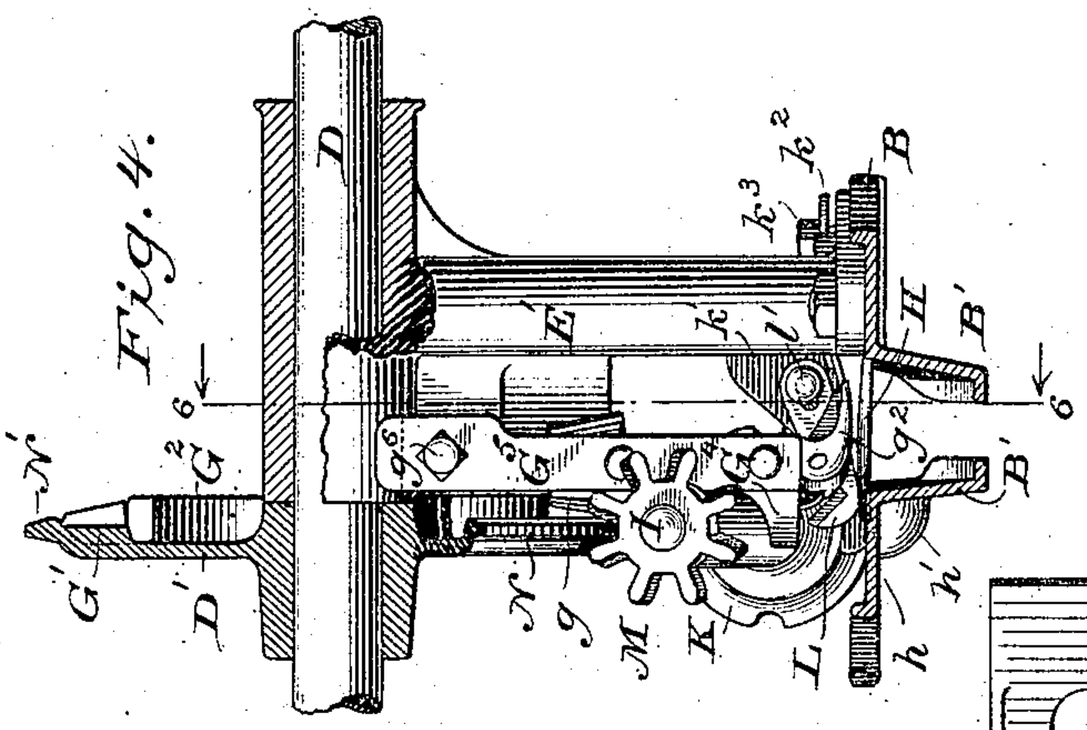


Fig. 14.

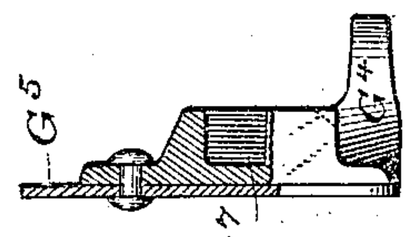


Fig. 15.

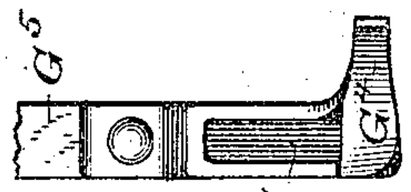


Fig. 3.

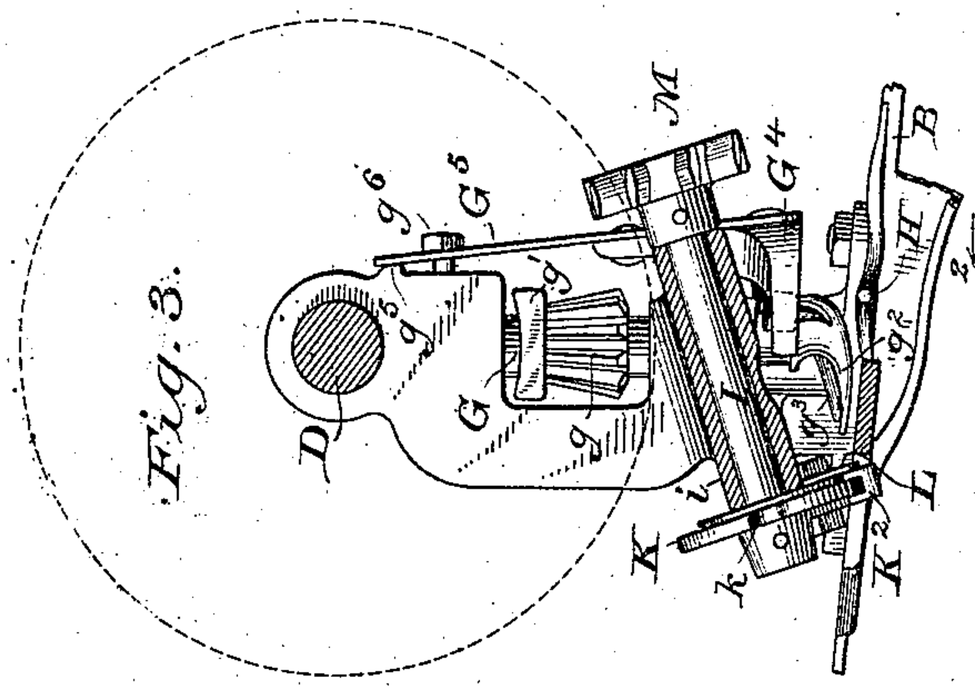


Fig. 2.

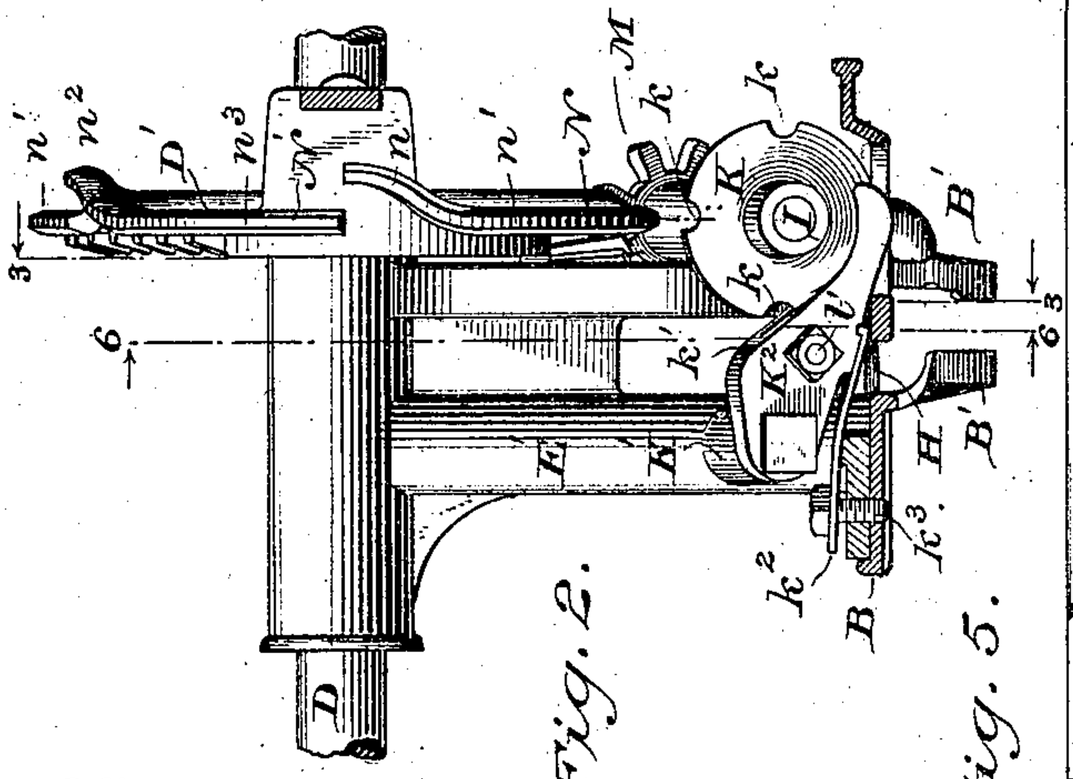
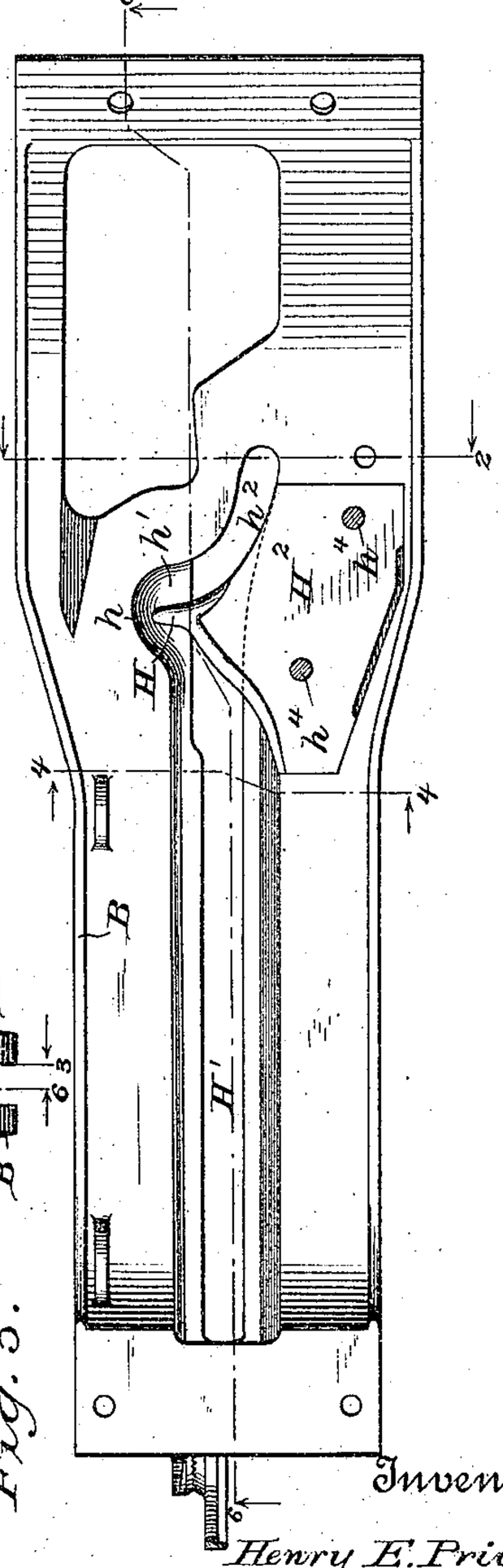


Fig. 5.



Witnesses

Wm A. Skinkle

Geo. W. Young.

Inventor

Henry E. Pridmore.

By his Attorneys

Parkinson & Parkinson

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H. E. PRIDMORE.

GRAIN BINDER.

No. 481,244. Patented Aug. 23, 1892.

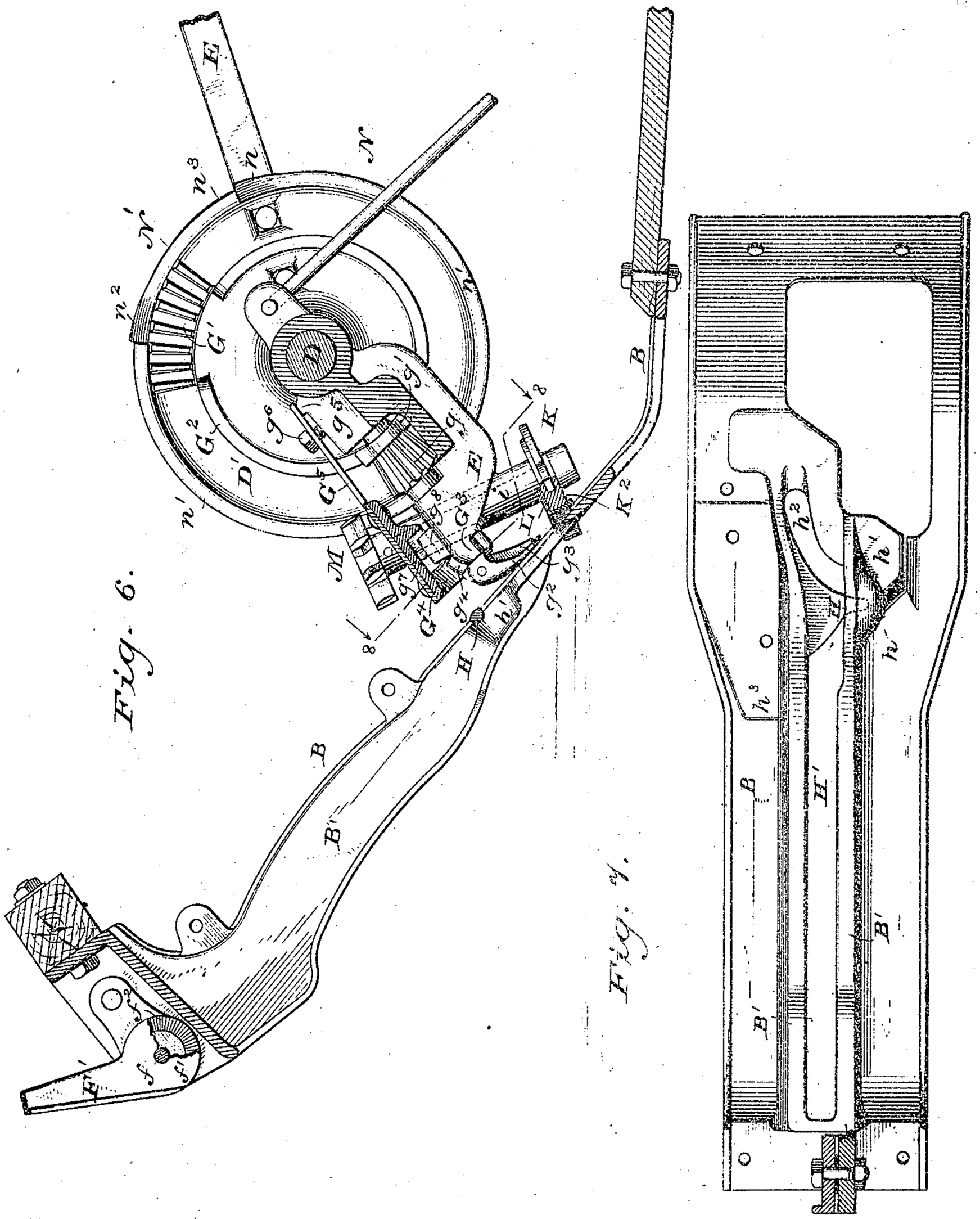

Fig. 6.

Fig. 7.

Witnesses

Wm A. Skinkle.

Geo. W. Young.

Inventor

Henry E. Pridmore.

By his Attorneys

Parkinson & Parkinson

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H. E. PRIDMORE.

GRAIN BINDER.

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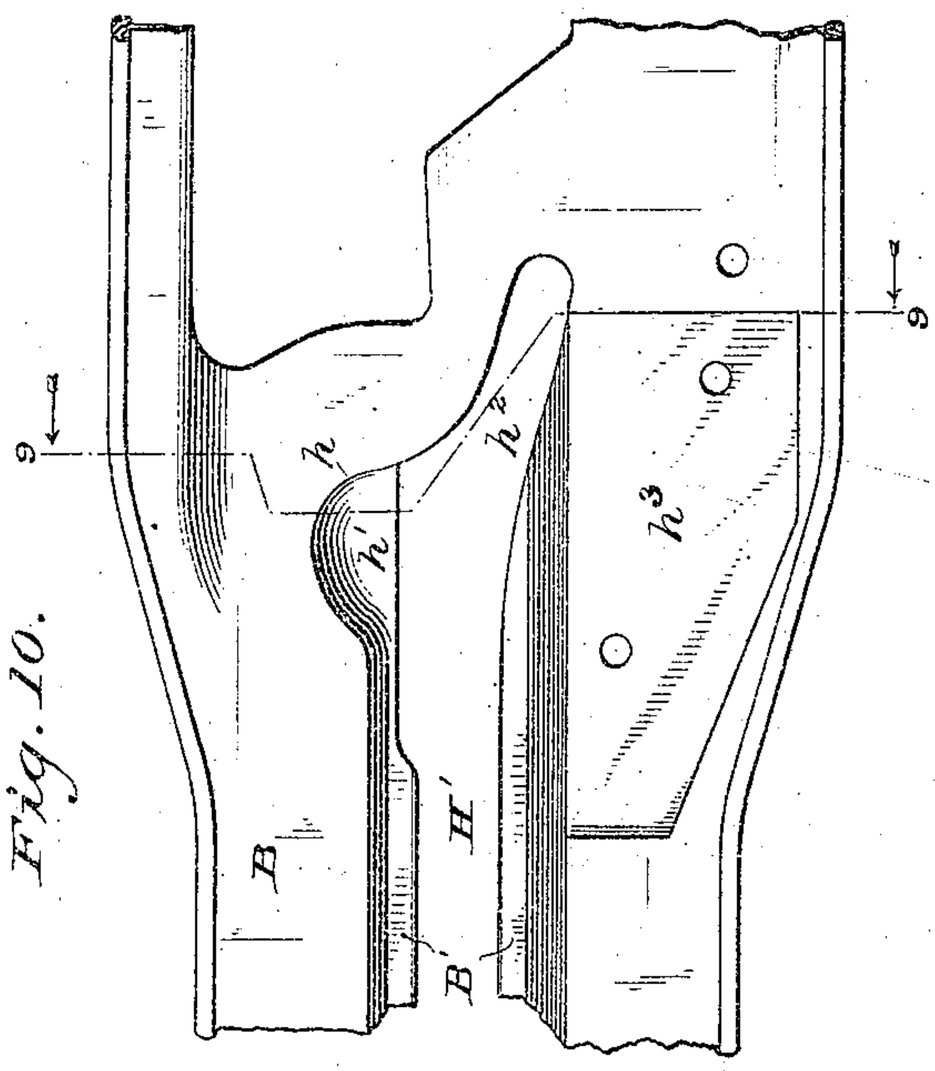

Fig. 10.

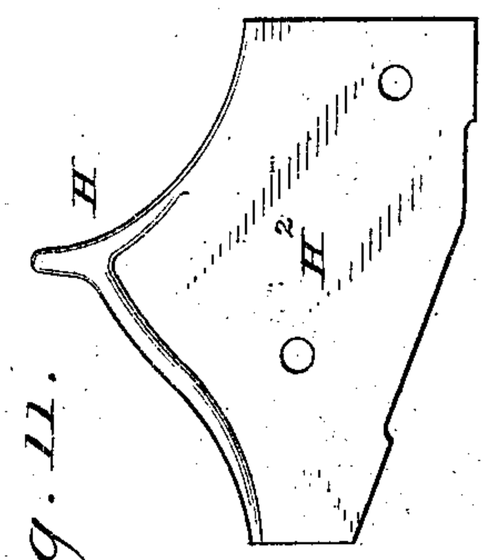

Fig. 11.

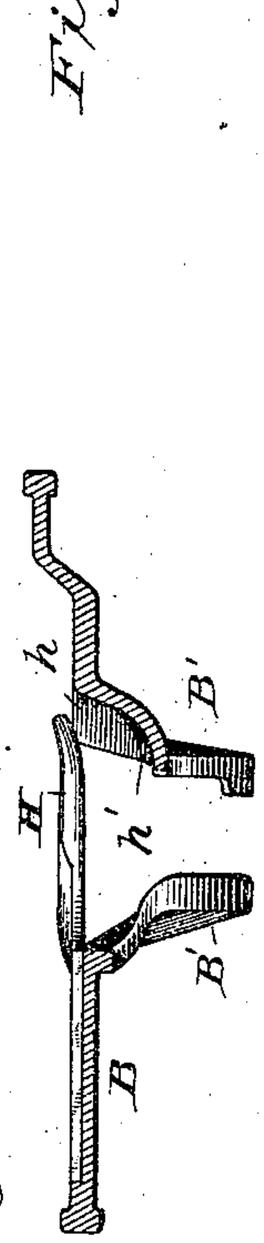

Fig. 9.

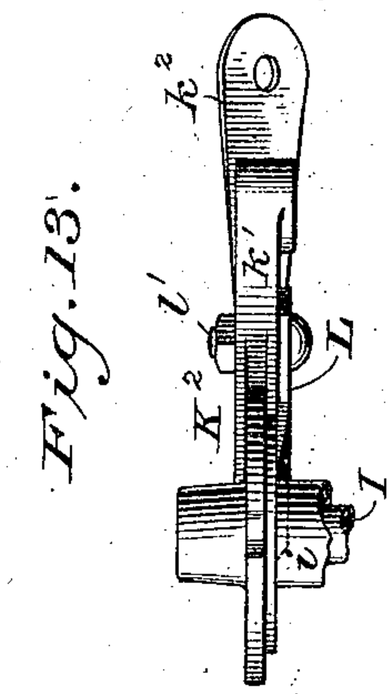

Fig. 13.

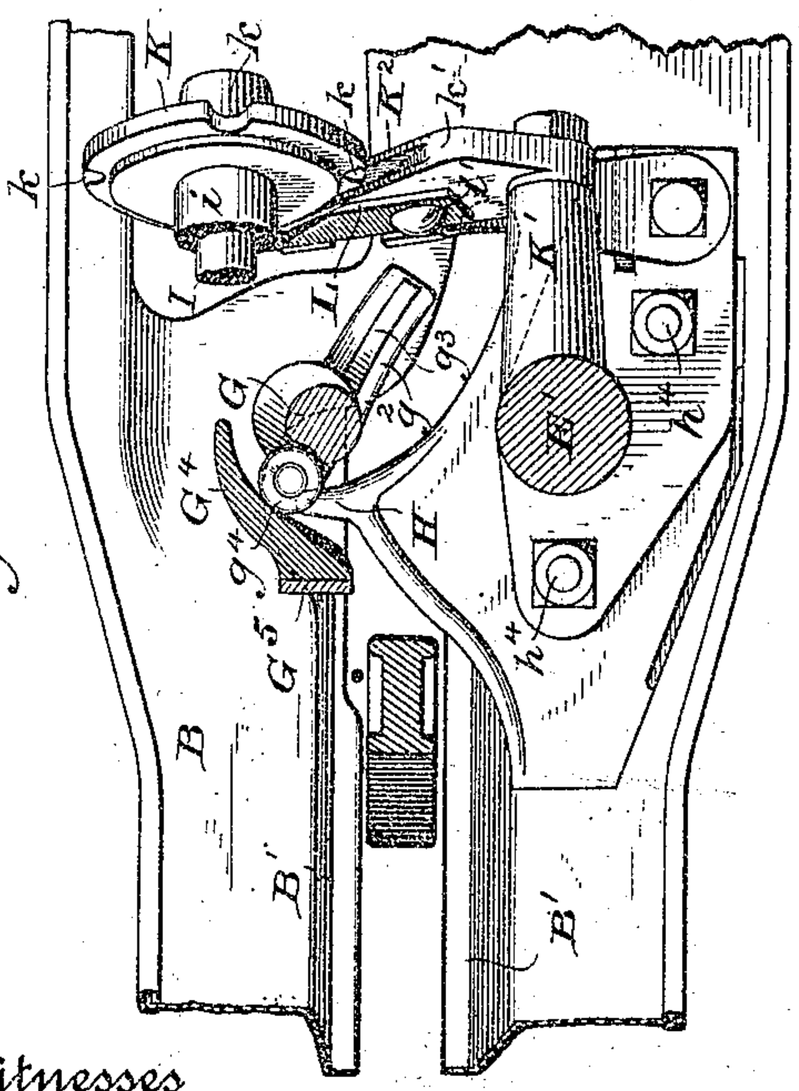

Fig. 8.

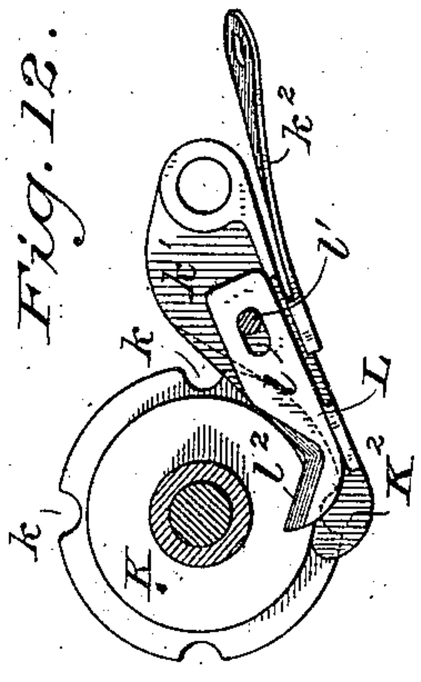

Fig. 12.

Witnesses

Wm A. Skinkle.

Geo. W. Young.

Inventor

Henry E. Pridmore.

By his Attorneys

Parkinson & Parkinson

(No Model.) 5 Sheets—Sheet 5.

H. E. PRIDMORE.

GRAIN BINDER.

No. 481,244. Patented Aug. 23, 1892.

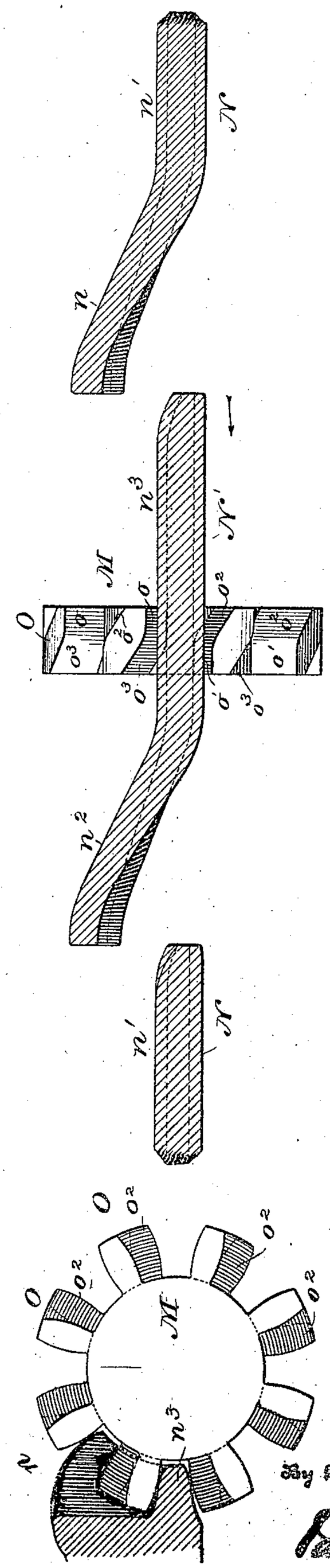

Fig. 26.

Witnesses
Wm. A. Skinkle
Geo. W. Young.

Inventor
Henry E. Pridmore.
By his Attorneys
Bakewell & Cabanis

UNITED STATES PATENT OFFICE.

HENRY E. PRIDMORE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE McCORMICK HARVESTING MACHINE COMPANY.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 481,244, dated August 23, 1892.

Application filed October 17, 1887. Serial No. 252,535. (No model.) Patented in England, April 30, 1887, No. 6,326.

To all whom it may concern:

Be it known that I, HENRY E. PRIDMORE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain-Binders, (for which Letters Patent No. 6,326 of the Kingdom of Great Britain were granted as of the year 1887, April 30, to my assignee, Cyrus H. McCormick, of Chicago, Illinois,) of which the following is a specification.

It is desirable in the employment of the modern tying-bill in grain-binders to have it stop at the end of the knotting movement, with its jaws trending outward in the direction of the extended cord-slot through the breast-plate, that the loop may be stripped therefrom and the ends wrenched from between the jaws by the direct strain of the sheaf as it is ejected by the discharge-arms of the binder. Where this has been done heretofore it has been necessary either to give the knotter two revolutions in order to bring the crossed ends of the strands between its jaws or else to cause the holder to carry these end strands around part way to meet the jaws before they complete their revolution. This has been accomplished either by arranging the ordinary disk-holder in such position and actuating it in such direction that it carries the strands around from the chin of the knotting-jaws toward and past their spindle, bending them around the latter, so that they meet the jaws when the latter have finished about three-quarters of their revolution, or else by mounting the holder in a swinging stock and carrying it away from the cord-slot after it has received the strands to bend them substantially in the same manner as above over the knotter-spindle to anticipate the coming around of the knotting-jaws.

My invention relates in the main, but not entirely, to improvements upon the first of these two constructions. In carrying it out the knotter is mounted in bearings parallel with the face of the tyer-cam and driven and controlled by a gear-segment and delay-flange thereon in the usual way. The heel of its pivoted jaw is acted upon by a fixed cam to open it and closed by a spring-cam, as heretofore. A finger projects from that side of the cord-slot away from the knotter-spindle toward and underneath the crown of the knotter, and serves as a stop for the cord-strands inside of the knotter-jaws, which in their revolution carry the cord along the inner edge of this finger over its end and around into a continuation of the slot on the outer side thereof, the side of the cord-slot beneath the crown of the knotter being pocketed or recessed to receive the end of this finger and underlying it that the strands may be prevented from slipping past until positively carried past by the revolution of the jaws. A holder-spindle is mounted in bearings beneath and practically in the plane of the tyer-cam, so as to trend obliquely inward and upward past the knotter-spindle, and at its upper end said holder-spindle receives a pinion, which engages with a peripheral flange on the tyer-cam, which has lateral jogs or deflections and is cut away at a suitable point or points to intermittently actuate the pinion, as would a worm-wheel. The lower and outer end of the spindle outside of the knotter receives a holder-disk, not differing materially, if at all, from those heretofore used, and of such diameter that the periphery adjacent to the cord-slot projects thereover slightly into the plane in which the cord is laid, while its axis of course is considerably on the other side of the tyer-spindle from said plane, so that the quarter of a revolution or thereabout given it by the tyer-cam in each binding operation, carrying the cord-strands from the plane in which they are laid to a position practically beneath this axis, will wind them or lap them to a marked extent about the spindle. A holder-shoe is pivoted to a stud from the knotter-stock on the opposite side of the cord-slot from the disk and is carried therebeneath and pressed against its lower periphery by a strong spring, which may be adjustable in tension, and its shank is curved and shaped so as to form a deflector to guide the cord into the first notch of the disk. A stationary knife attached to the shoe and turned up at its end severs the cords between the disk and the knotter after they have been tied and as they are carried therepast in the final movement of the disk.

Other features and details of the improve-

ment will appear from the ensuing description.

In the drawings, Figure 1 is an end elevation of a binding attachment involving my invention sectioned through the binding-table and seen from the rear in the present instance, though with a different style of machine it might be seen from the front. Fig. 2 is a section on the correspondingly-numbered line in the preceding figure, seen from the stubble side; Fig. 3, a transverse section, as indicated by like numerals in the preceding figure; Fig. 4, an irregular section on the line similarly numbered in the first figure and seen from the inner or grain side; Fig. 5, a top plan view of the breast-plate detached; Fig. 6, a section through tying-head and breast-plate upon the lines indicated by like numerals in the second, fourth, and fifth figures; Fig. 7, a bottom plan view of the breast-plate broken away at one end to explain the adjustable bridge, which rests upon the outer edge or deflector; Fig. 8, an enlarged detail view of the tying-head and adjacent portion of the breast-plate in section, as indicated by like numerals in the first figure and seen from above; Fig. 9, an irregular transverse section through the breast-plate, enlarged, on the line indicated in the succeeding figure; Fig. 10, a top plan view of that portion of the breast-plate adjacent to the tying-head, enlarged, and with the stop-finger in the cord-plate removed; Fig. 11, an enlarged detail view of said stop-finger; Fig. 12, an enlarged detail view of the holder and cutter detached and seen from the side; Fig. 13, an enlarged detail view of said holder and cutter seen from above in the plane of the holder-disk; Figs. 14 and 15, enlarged detail views of the spring-cam for the pivoted tying-jaw seen, respectively, from the rear of the machine and from the grain-side, and the latter being partly in section; and Fig. 16, a diagrammatic view, partly in projection, to explain the method of operating the holder-pinion by the peripheral flange on the tyer-cam.

A represents the binding-table or decking; B, the overlying breast-plate, having flanges B′ depending from each side of the cord-slot therethrough; C, the needle-shaft, and C′ the binder arm or needle keyed thereon; D, the tyer-shaft journaled, as usual, in an overhanging arm of the post-frame or main bracket and carrying the tyer-cam D′ above the binding-throat; E, the discharge-arm rigidly secured to said shaft mediately or immediately, so as to be brought around in its revolution and sweep the bound sheaf from the binding-throat; E′, a bracket sleeved upon the tyer-shaft and depending therefrom to the breast-plate, to which its feet are bolted, that it may serve as an outside support therefor; and F is a bar or timber overhanging from the front or rear of the binder and serving as the inside support for said breast-plate, all of which, except in certain details hereinafter explained, do not or need not differ materially from corresponding elements of binders heretofore in use.

In all modern binders a hood or deflector composed of a flexible sheet of metal—one or more—is secured above the head of the elevator and depends outwardly over the grain-chute to direct the grain properly toward the binding-table. It has been customary to connect this hood or deflector with the breast-plate by means of a wooden bar or bridge rigidly bolted between the flanges of said breast-plate and extending inward until its end rests upon and, it may be, partly depresses, the outer edge of said hood. Sometimes it is desirable that it should press upon the hood with greater force than at others, or else, owing to the bending of the hood or other causes, the latter falls away from the bridge, leaving a gap between, and in the jolting of the machine tends to whip up against it, resulting in injury to one or the other, or in rapid wear. I therefore make this bridge-car F′ adjustable radially upon the bolt *f*, which secures it to the breast-plate, and in obtaining this capability of adjustment I prefer to form the bar of metal, providing it with a discular hub *f*″, serrated on its inner face and matching against an opposing serrated disk *f*², secured to the flange which receives said pivotal bolt at the inner end of the breast-plate, so that by loosening the bolt the bridge-bar may be turned to bring its end higher or lower to bear against the deflector properly, and then upon tightening the bolt the serration will be caused to engage and hold the bar firmly in the adjusted position.

In bearings in the hanger from the tyer-shaft, which serves, in addition to its function in supporting the breast-plate, as a housing for the spindles of the tying-head, is mounted the knotter-spindle G, having at its upper end the usual bevel-pinion *g* and delay-shoe *g*′, the pinion engaging with a gear-section G′ upon the face of the tyer-cam, of sufficient length to give it a single revolution and the delay-shoe engaging as usual with a delay-flange G², extending around the cam from one end of the segment to the other. The lower end of the spindle has the usual rigid jaw *g*² and pivoted jaw *g*³, the latter being provided at its heel end, outside of the rigid jaw, with an anti-friction roller *g*⁴ to engage with the fixed cam G³ upon the supporting-stock, whereby the pivoted jaw is opened, and with the spring-cam G⁴, whereby it is closed after passing off of the fixed cam. The relation of the tyer-spindle and its delay-shoe to the gear-segment and flange and to the tying-jaws is such that upon each revolution of the tyer-cam these jaws are left in a position trending outwardly and somewhat obliquely in the direction of the cord-slot in the breast-plate, that the knot may be readily stripped from them by the action of the ejector-arms in sweeping the bound sheaf from the receptacle. The spring-cam, the operative face of which is preferably of cast metal, gets its

elasticity from a long plate spring G^5, constituting its shank and depending parallel with the tyer-spindle from a seat g^5 upon the stock, between which and its lower end it receives an adjusting-screw g^6, whereby the pressure of the cam may be adjusted. Lest the transverse leverage of the revolving knotter at the lower end may twist or disarrange the cam, it is slotted, as at g^7, to receive a pin or flange g^8 from the stock, which, while not interfering with its play toward or away from the knotter-spindle, will prevent lateral movement in the direction of its revolution.

Since the knotter stops with its jaws trending outward in the direction of the extended slot in the breast-plate, provision has to be made to obstruct this slot that the strands may not escape past the knotter until its revolution commences. Therefore a finger H is arranged to project from that side of the slot away from the tyer-spindle toward and past the general line of the other side, which is recessed or pocketed, as at h, to receive the end of this finger, while the depending flange beneath is left unbroken or is continued by web h', overlapped by the end of this finger and some distance beneath it. The finger is of such length that its end extends to a point abreast of or slightly beyond the axis of the tying-bill, as shown in Fig. 8, so that the spindle of the tying-bill, the finger, and the underlying web or flange practically close the passage of the cord-slot to the strands extending from the gavel to the holder so long as the knotter is in its position of rest; but when the knotter revolves these strands are positively swept around, and, being bent over the web, are carried from the main slot H′ along and past the end of the tying-bill and into the extended portion h^2 of said cord-slot on the other side of said finger. This extended portion is not or may not be directly in line with the main portion of the slot, but is preferably arranged obliquely thereto at a slight angle, flaring from that side of the tying-spindle past which the binder-arm moves, and the knotter when it comes to rest stops with its jaws trending outward practically parallel with this extended slot that it may cross the path of the cord, and that the strands may be laid upon its chin in the recession and accession of the binder-arm, and also that the knot may be wrenched therefrom by a direct pull when the discharge-arms come around to eject the bound sheaf.

For convenience in casting the breast-plate the stop-finger is made detachable therefrom, being formed integral with a plate H^2, which fits into a seat h^3 in the upper surface of the breast-plate at the appropriate side of the cord-slot and is secured by bolts h^4, which may also serve to secure the foot of the knotter-stock or tyer-frame to said breast-plate.

On the other side of the holder-spindle from the cord-slot through the breast-plate the tyer-frame has an oblique bearing or bearings i beneath the tyer-cam and practically in the same plane therewith or parallel with said plane. This receives the holder-spindle I of sufficient length to bring its outer end some distance outside of the knotter and near to the breast-plate and its inner end close to the periphery of the tyer-cam inside of the knotter. To said outer end is pinned the holder-disk K of the usual form and having herein for the purpose of this description four notches k equidistant from each other.

A boss K′ from the tyer-frame on the farther side of the cord-slot in the breast-plate affords a pivot for a holder-shoe K^2, which passes beneath the disk and embraces slightly more than the space between two of its notches. The shank of this shoe is curved, as at k', so as to receive and deflect the cord into the receptive notch of the disk, and it is pressed against the periphery of the disk by a spring k^2, adjustable in stress by means of an adjusting-screw k^3, acting upon its end. The diameter of the holder-disk is such that its periphery where it first meets the shoe is over the cord-slot in the breast-plate and practically in the plane in which the cord is laid, and as its axis is on the other side of the tyer-spindle from this plane and beneath the tyer-cam it will generally be depressed at the lowest point in its periphery below the surface of the breast-plate, which for this reason is cut away, as shown, to receive the shoe and the disk. Since the holder-disk must turn toward the shoe which first meets it at about its horizontal diameter, and since it has but four notches, it follows that it will make a quarter of a turn in the aggregate for each binding operation, and that, receiving the cord strands at one end of its horizontal diameter, it will carry them down to the lower end of its vertical diameter, which will be directly or almost directly beneath the tyer-cam, and therefore a marked distance to that side of the tyer-spindle and jaws. Hence these strands will be wrapped or bent definitely around the tyer-spindle by this movement of the holder, so that the tyer-jaws will meet them upon completing about three-quarters of a revolution, and being already opened by their fixed cam, which is slightly in precedence of its usual location, they will pass on each side of them and immediately closing will grasp them. The cord strands or ends from the knot are, however, severed slightly before the holder-disk completes its quarter-revolution and just after they are seized by the tying-jaws, this being accomplished by a knife L, secured to the shank of the holder-shoe by means of a longitudinal slot l and clamping-bolt l', so that it may be adjusted to compensate for wear or to properly time it. The end of this knife is turned up toward the axis of the holder-disk, against the inner side of which it comes, and formed with a cutting-edge l^2, which intercepts the cord-strands just in advance of the stoppage of the disk or just before it has completed its quarter-revolution, and against which they are sheared, the new

end or spool strand being retained and belayed to the next or receptive notch by the ensuing recession of the binder-arm.

In order to give the requisite movements to the holder-disk, the inner end of its spindle has a pinion M, which for each quarter-revolution of the disk to be accomplished unbrokenly might have but four teeth, or the same number of teeth as notches in the disk, but herein is provided with eight teeth, or just double the number that there are notches in the disk, so as to have an interval of delay after an eight of a turn. This pinion engages with a rib or flange N upon the periphery of the tyer-cam, having an initial oblique reach n, succeeded for a distance corresponding with the interval between the severing of the cord and the starting of the tyer and holder in the ensuing binding operation by a reach n', so described as to act as a delay-ledge and hold the pinion stationary and the holder-disk consequently immovable, this at a point corresponding relatively to the initial movement of the knotter, being followed by a short ledge N', having at the outset an initial oblique reach n^2, which gives the initial movement to the holder-pinion, turning it the distance of one tooth or one-eighth of a revolution, then has a straight reach n^3, which holds it stationary until the knotter has completed about three-quarters of its revolution and its jaws are passing or about to pass on each side of the cord-strands or end strands, when it delivers the pinion to the oblique initial reach of the first flange, by which the pinion is turned another tooth, completing the quarter-revolution of the holder-disk, carrying the cord-strands finally home between the open knotting-jaws and shearing them against the knife and severing them, when both knotter and holder stop and the discharge-arms strike the bound sheaf and sweep it from the machine, pulling the knot from the holder-jaws in so doing.

Since the holder-pinion is turned by oblique flanges or by a worm motion and intermittently held stationary by straight flanges it is evident that either the interdental spaces must be of a generally oblique trend or else the teeth must be set so far apart as to accommodate both the straight reach and the oblique reach of the actuating-flange, whichever happens for the moment to be passing through. It is impractical to set them thus far apart, because it would lead to wabbling and defective action, and were the flanks and faces of the teeth set oblique to the axis of the pinion from side to side the wear from the oblique reaches of the actuating-flange, which imposes all the labor on the pinion, being distributed through the whole width of the tooth would affect the engagement of the straight or delay flange, causing it to become loose and therefore fail to hold the pinion steady. The straight flange also would have only an edge of each of the two flanking-teeth to bear upon in performing its office and would itself rapidly wear away these edges. I therefore cut the teeth O as regular spur-teeth with their faces parallel with the axis to admit the straight reaches of the actuating-flange. Then from about the center of the teeth, measured from the sides of the wheel, I bevel the faces and flanks to alternate sides at an angle corresponding with the oblique reaches of the actuating-flange. The retreating faces and flanks are beveled toward that side of the pinion which first receives the oblique reaches, and the advancing faces and flanks are beveled toward that side from which said reaches depart. Thus the straight reaches of the actuating-flange are received between two parallel straight faces of successive teeth, one f the faces o extending to half the thickness of the advancing face of its tooth on that side of the wheel from which the flange approaches and the other face o' diagonally opposite extending to one-half the thickness of its tooth on that side from which the flange departs, while the oblique reaches engage with oblique faces of opposing teeth, one oblique face o^2 extending from the straight face of its tooth or from the center of said tooth on the retreating face to that side of the pinion from which the oblique reach approaches and the other oblique face o^3 diagonally opposite upon the retreating face of the other tooth, extending from the straight face of that tooth to the side from which the oblique reach of the flange departs. By this construction the oblique faces of these teeth, which receive practically all the labor and all the wear, may be worn away until they have eaten up all or nearly all of the straight faces without affecting the steadiness of the engagement between the straight reaches of the flange and said pinion, so that if an oblique reach should rest loosely in the interdental spaces of the teeth and fail to turn the pinion the proper distance it will nevertheless be turned to that distance as the succeeding straight reach enters between the teeth and thereafter held stationary until the coming around of another oblique reach.

I claim—

1. The combination, substantially as hereinbefore set forth, with the tying-bill and mechanism which gives it a single revolution and stops it with its jaws trending outward in the direction of the cord-slot, of the finger projecting from one side of the cord-slot beneath and slightly in advance of the tying-bill and the pocket on the other side, into which the end of said finger enters, having a continuous bottom merging into the flange beneath the cord-slot, whereby the cord-strands are bent over said flange in order to pass the end of the finger.

2. The combination, substantially as hereinbefore set forth, with the tying-bill and mechanism which gives it a single complete revolution and stops it with its jaws trending outward in the direction of the extended cord-slot, of a rotary cord-holder on the outer side of said tying-bill, and actuating mechanism

giving the holder-disk a partial turn to carry the cord-strands transverse to the tyer-spindle, then stopping it temporarily while the tying-jaws come around, and then moving it onward again to complete the fraction of a revolution due to each binding operation.

3. The combination, substantially as hereinbefore set forth, with the tying-bill and mechanism which stops it at the end of its knotting revolution with its jaws trending outward in the direction of the extended slot in the breast-plate, of a rotary holder-disk outside of the tying-bill, in a plane transverse to that in which the cord is laid and rising from the breast-plate, a holder-shoe extending from the opposite side of the cord-slot and bent down to pass beneath the under edge of the disk, whereby a mouth is formed to receive and direct the cord, and mechanism for rotating the holder-disk to carry the cord along the shoe and away from the slot toward or past the knotter-spindle, bending or wrapping the strands thereover to meet the tying-jaws as they come around.

4. The combination, substantially as hereinbefore set forth, with the tying-bill, of a flat holder-disk outside thereof and practically vertical to the breast-plate, a shoe coacting with said disk, a holder-spindle directed inward beneath the tyer-cam and past the tyer-spindle, and actuating mechanism on said tyer-cam for rotating the holder-spindle at each tying operation.

5. The combination, substantially as hereinbefore set forth, with the tying-bill and tyer-cam, of the flat holder-disk outside of the tying-bill, its coacting shoe, the holder-spindle directed obliquely inward and upward beneath the tyer-cam and having a pinion at its inner end, and oblique teeth on the tyer-cam, whereby said pinion is rotated.

6. The combination, substantially as hereinbefore set forth, with the tying-bill and tyer-cam, of the holder-disk outside of the tying-bill, its coacting shoe, the holder-spindle directed obliquely inward and upward beneath the tyer-cam and having a pinion at its inner end, oblique teeth on the tyer-cam, whereby said pinion is rotated, and delay-flanges between said oblique teeth.

7. The combination, substantially as hereinbefore set forth, with the tying-bill and tyer-cam, of the inclined holder-spindle directed from the outer side of the tyer-spindle inward past it beneath the tyer-cam, the pinion at the inner end of said spindle, the holder-disk at the outer end thereof, the shoe coacting with said disk, and the delay-ledges and oblique teeth on the periphery of the tyer-cam engaging with the pinion, whereby said holder-spindle is rotated.

8. The combination, substantially as hereinbefore set forth, with the tyer-cam and its peripheral flanges, having oblique reaches succeeded by straight or delay reaches, of the holder-pinion having its teeth formed with straight faces and flanks to about half their thickness and with oblique faces and flanks to the other half, arranged alternately to one side and the other, whereby wear is reduced.

9. The combination, substantially as hereinbefore set forth, with the holder and its spindle, of a wheel D′, having a peripheral flange or flanges with straight and oblique reaches, and a pinion M, having its teeth formed with alternate straight faces *o* and *o′* to about half their thickness, and with oblique faces o^2 o^3 to about the other half of their thickness.

10. The combination, substantially as hereinbefore set forth, with the breast-plate, of the metal bridge-arm F′ at its inner end, the bolt *f*, whereby it is secured to a flange from said breast-plate, and the serrated disks f' f^2, whereby said bridge-arm is held in any desired adjustment upon the axis of its securing-bolt.

HENRY E. PRIDMORE.

Witnesses:
A. S. WELLS,
L. VASSALL.