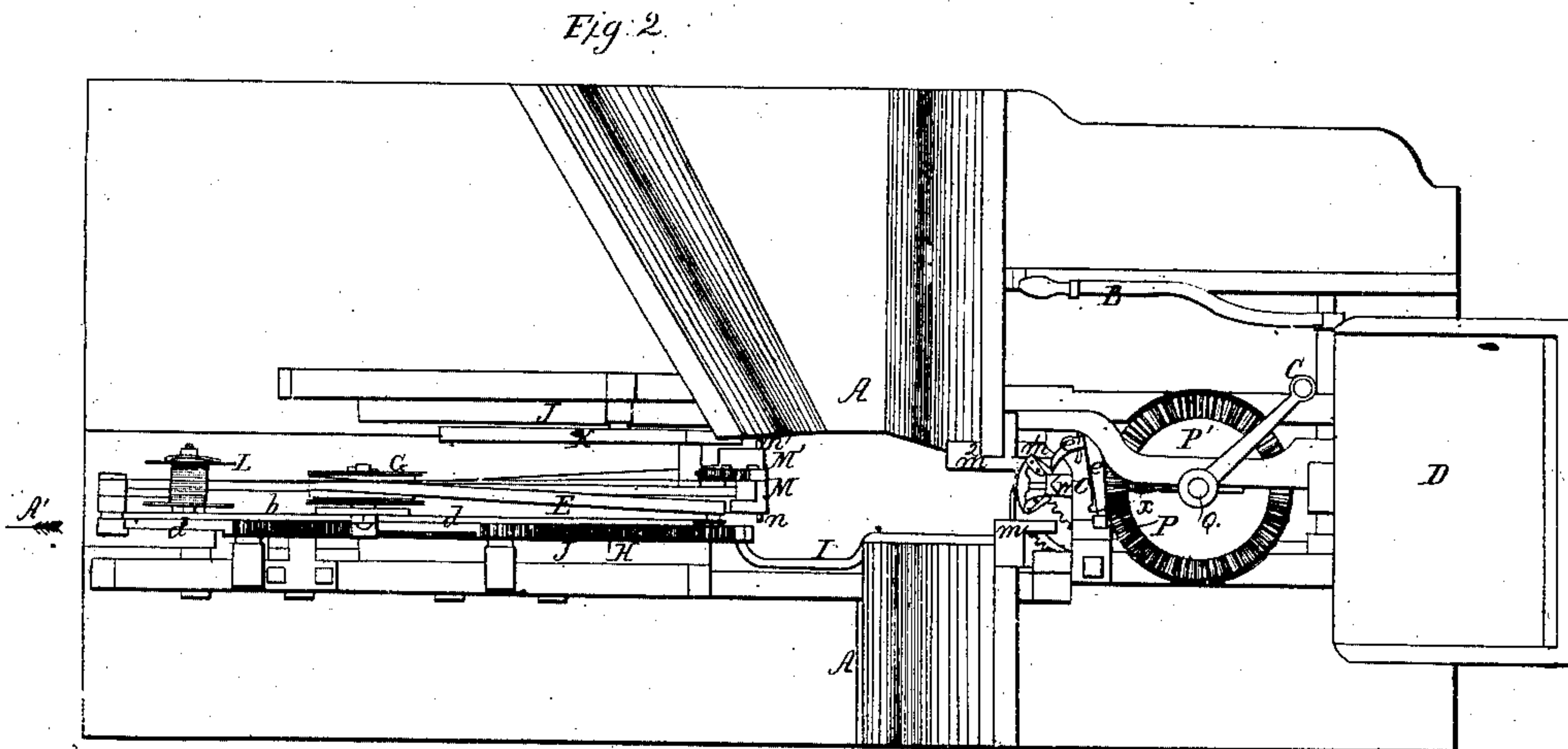
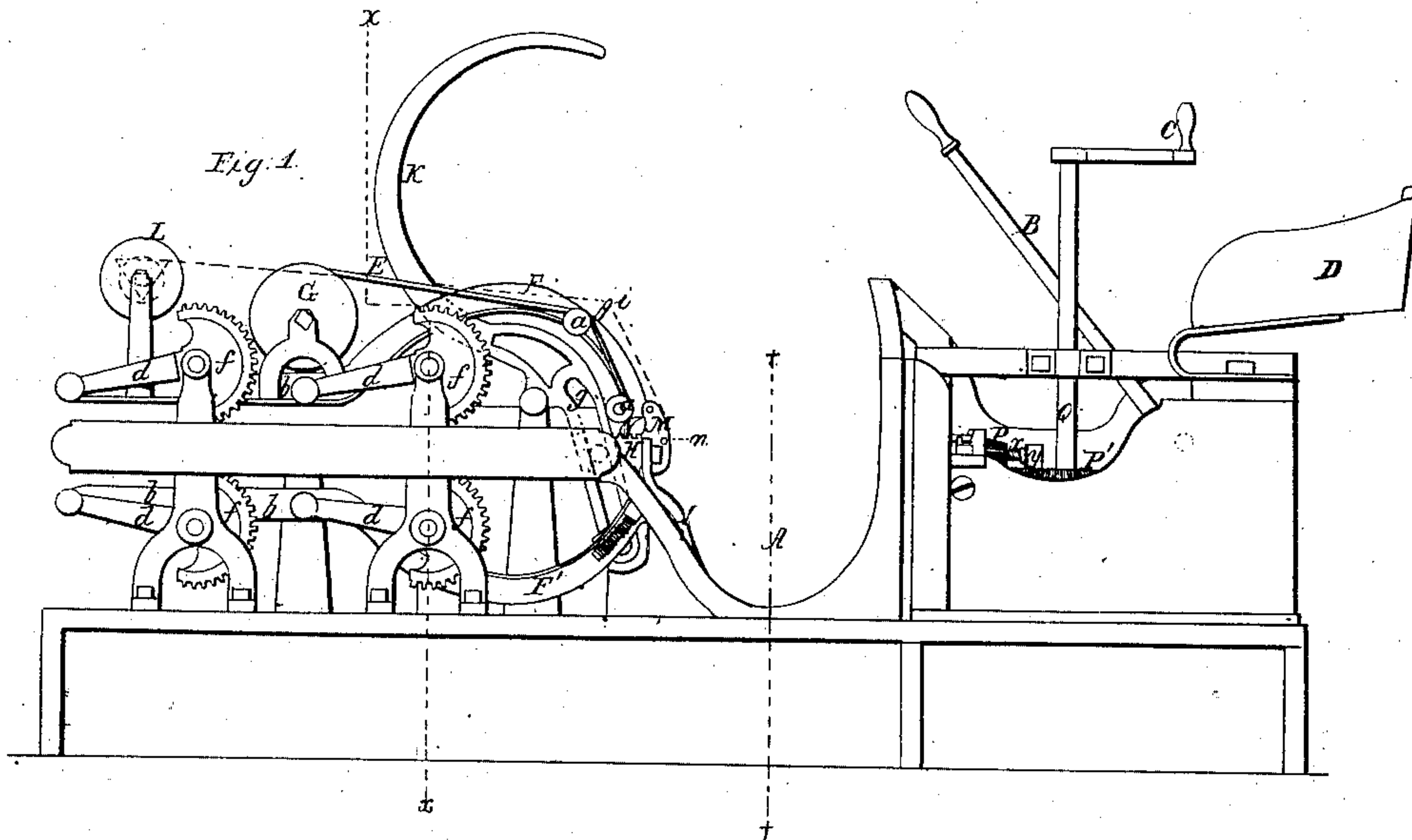


S. T. HOLLY.
MACHINE FOR BINDING GRAIN.

No. 41,377.

Patented Jan. 26, 1864.



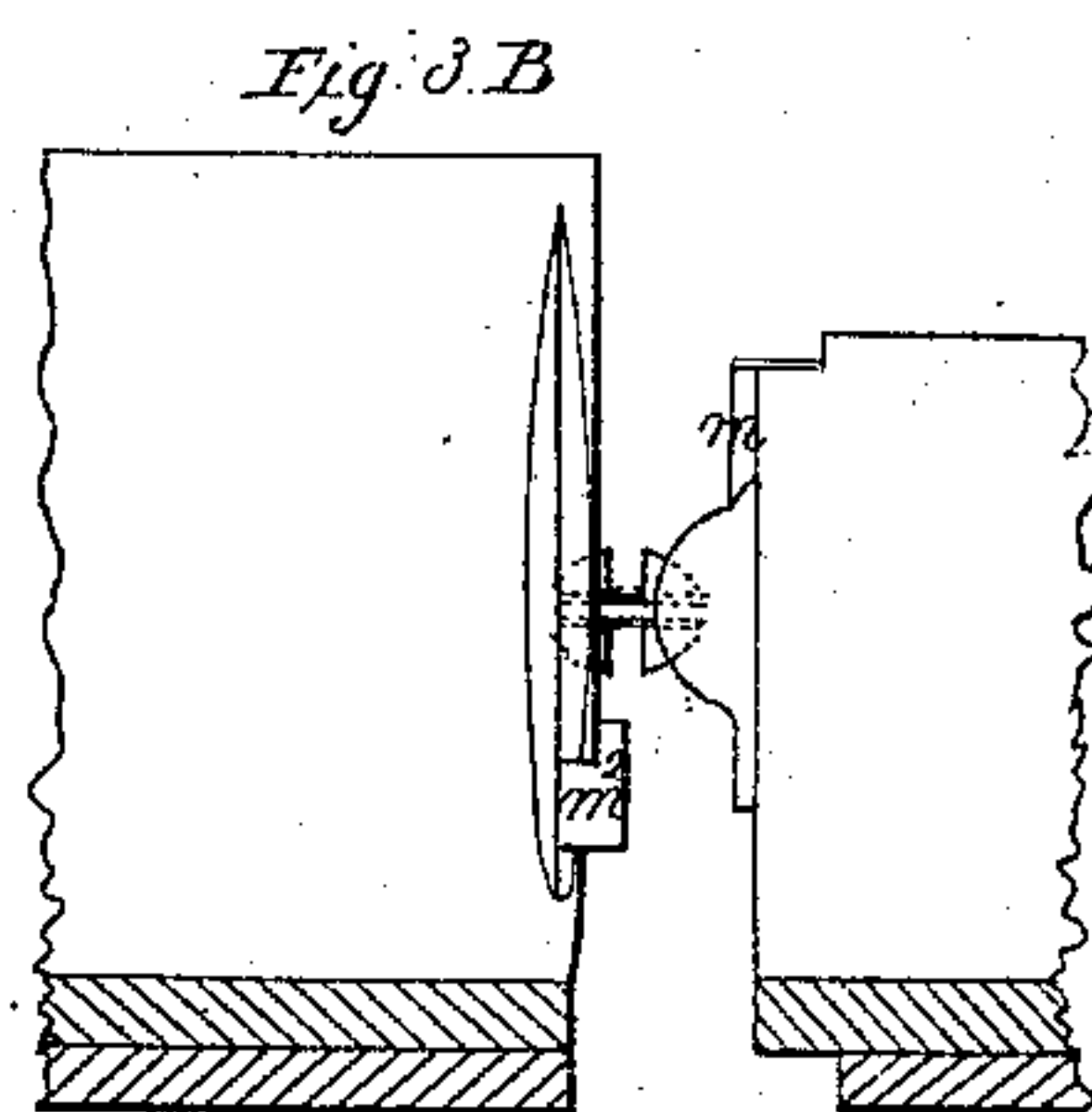
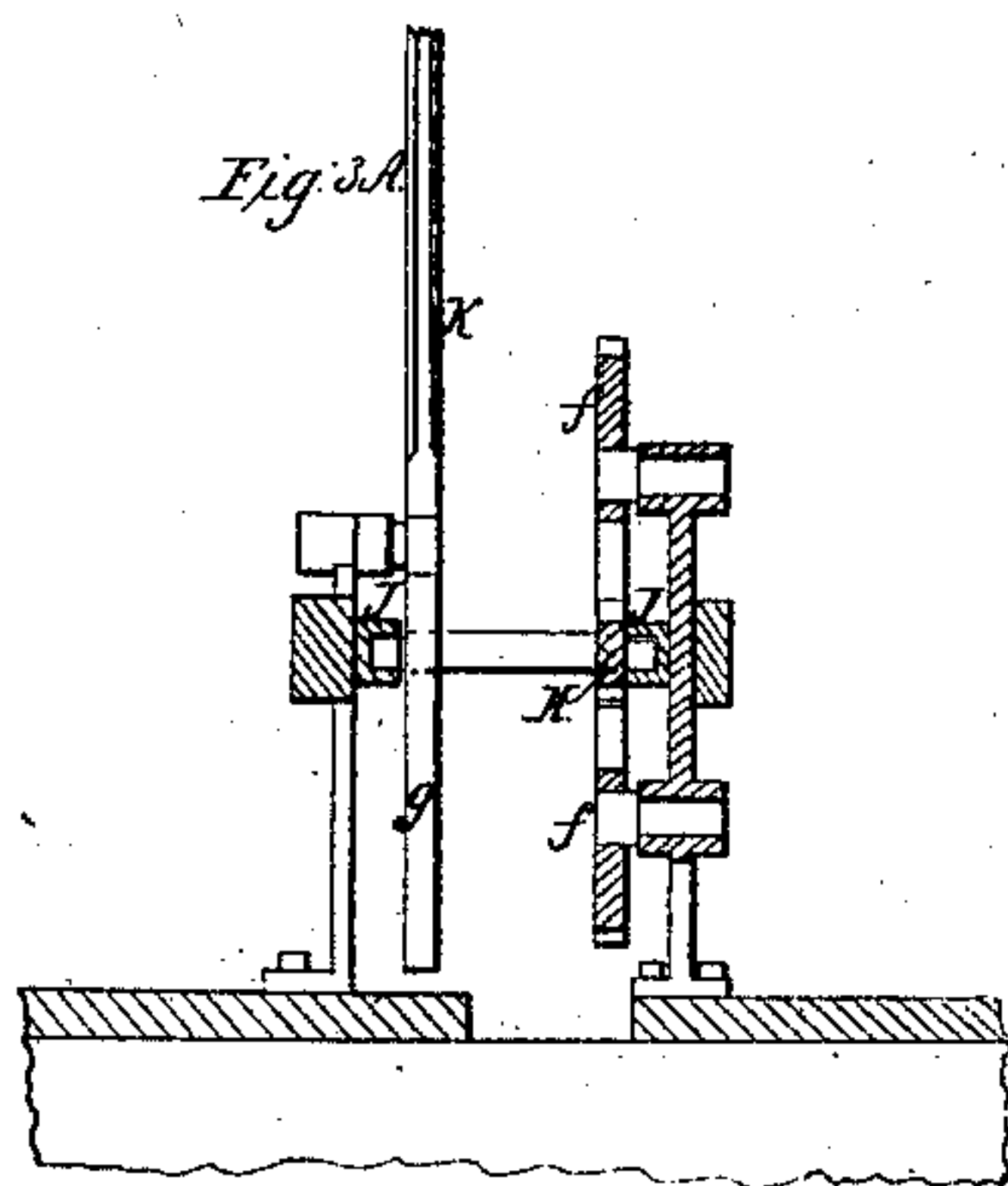
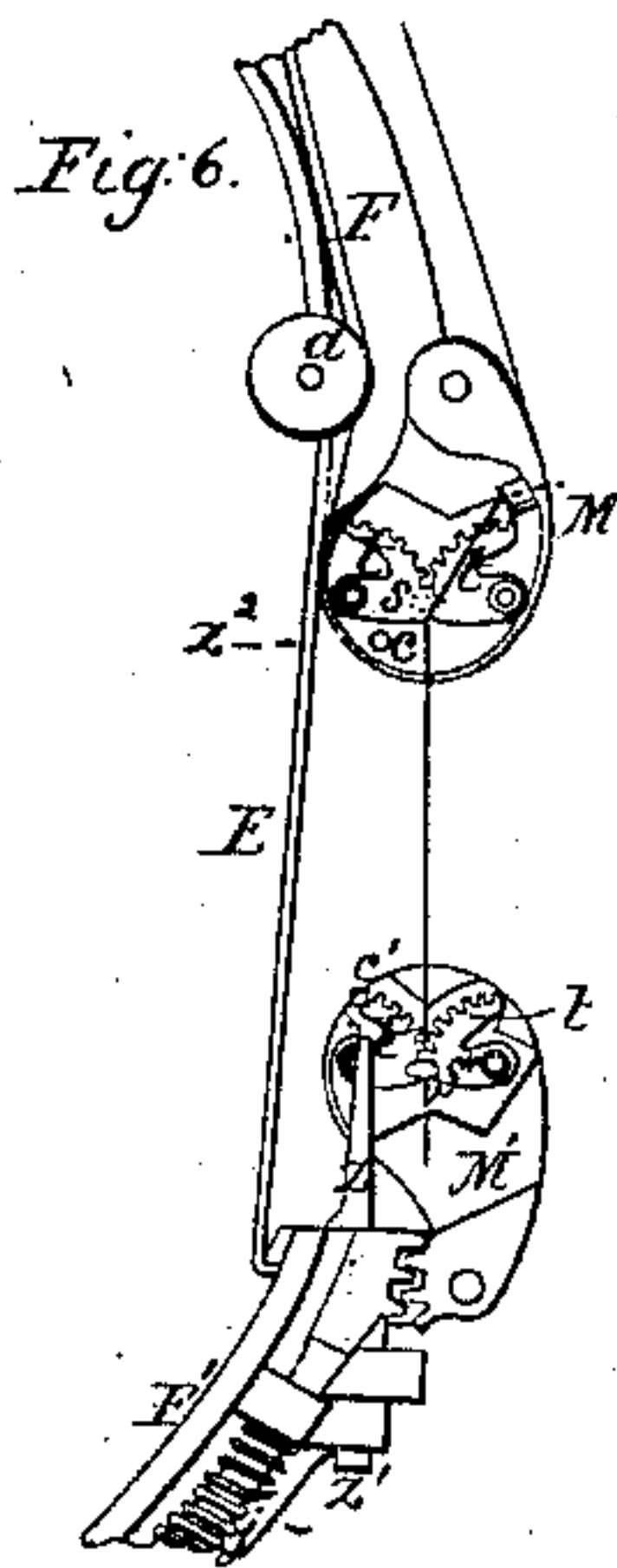
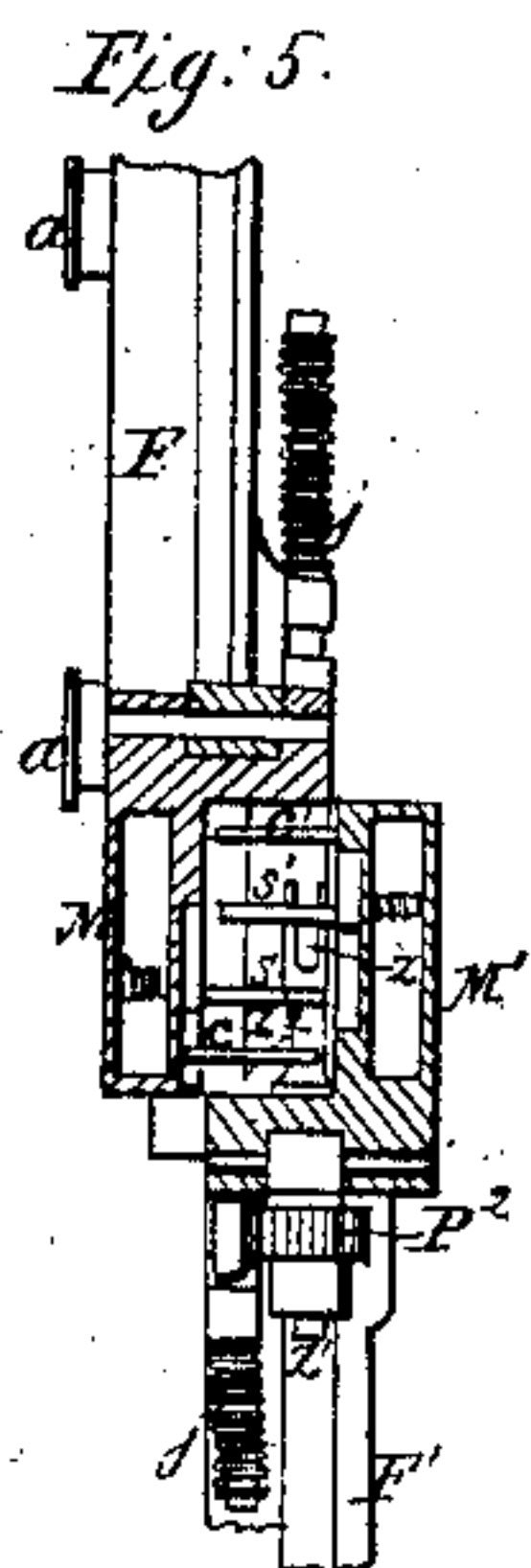
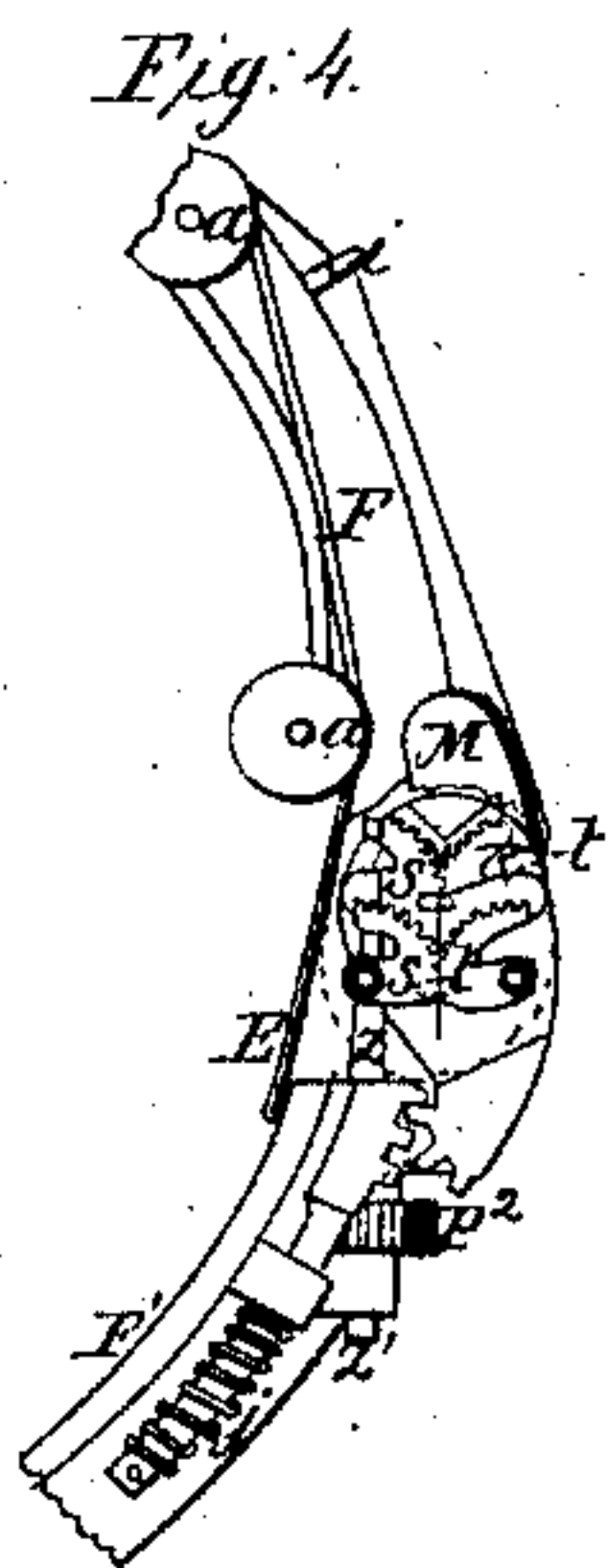
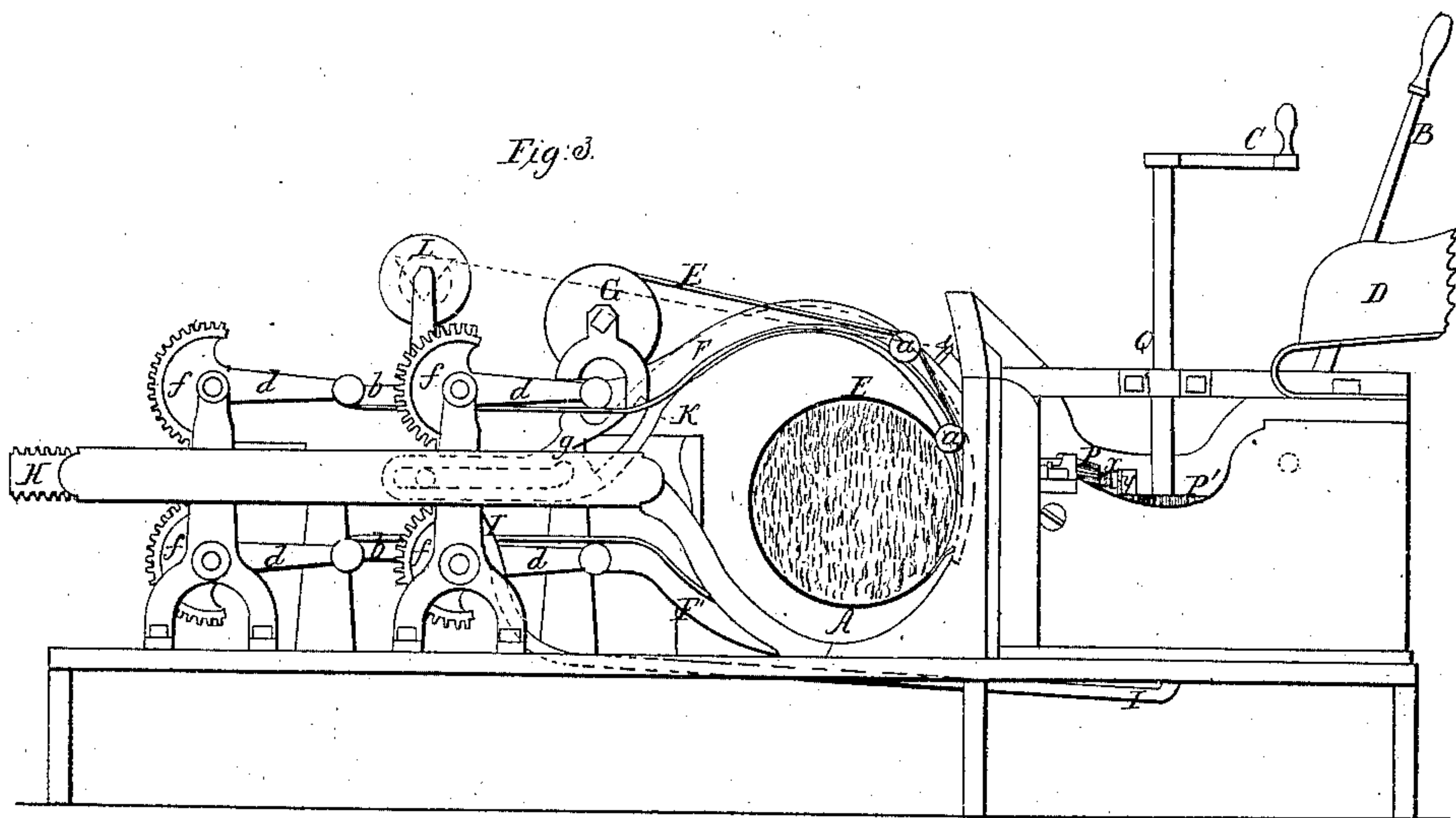
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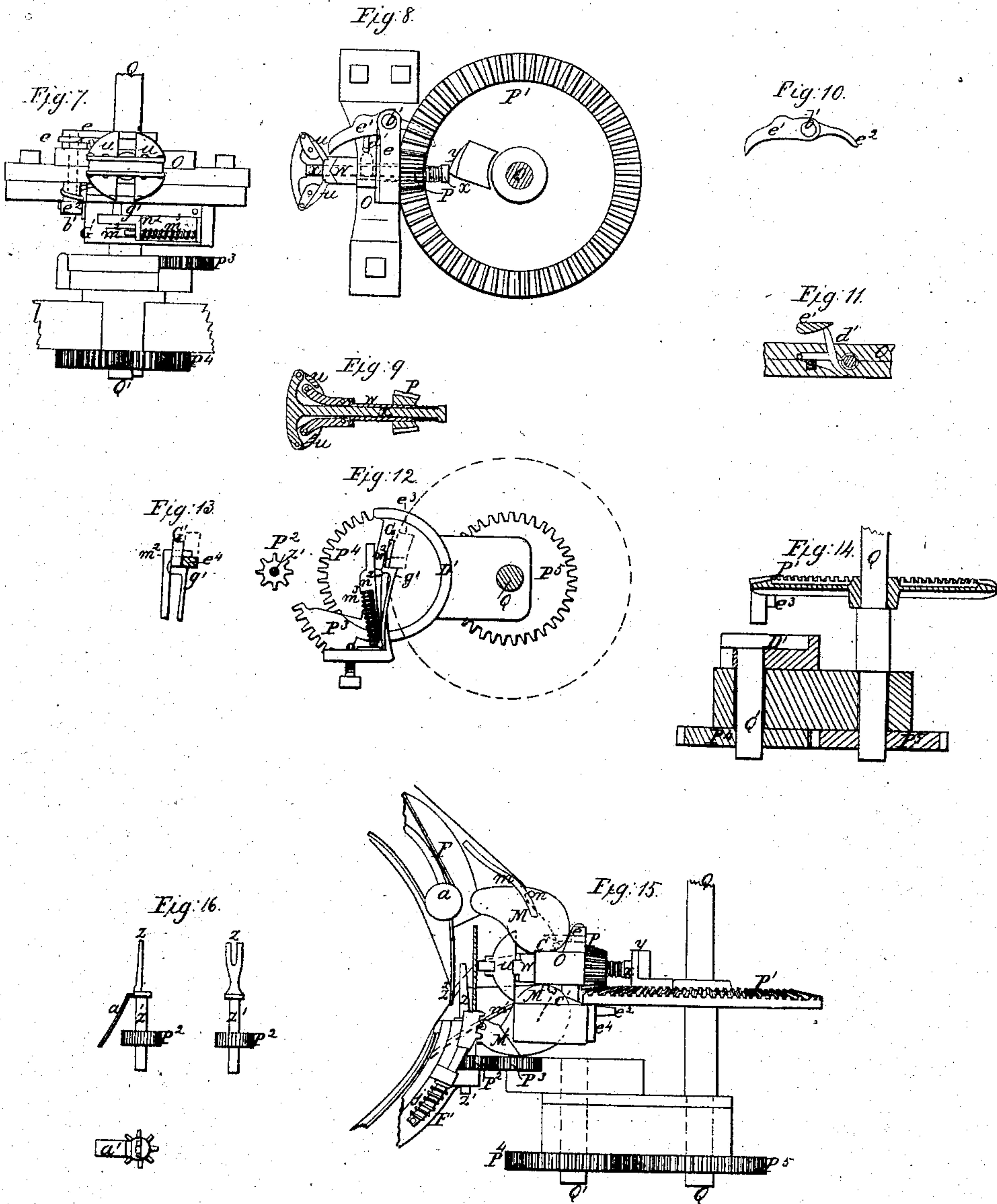
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UNITED STATES PATENT OFFICE.

SOLOMON T. HOLLY, OF ROCKFORD, ILLINOIS.

IMPROVEMENT IN MACHINES FOR BINDING GRAIN.

Specification forming part of Letters Patent No. 41,377, dated January 26, 1864.

To all whom it may concern :

Be it known that I, SOLOMON T. HOLLY, of Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Machines for Binding Grain, some of which are applicable to the binding of other substances; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the accompanying drawings, in which—

Figure 1 represents an elevation of a grain-binding apparatus constructed according to my invention, and suitable to be connected with a reaping-machine. Fig. 2 represents a plan of the same. Fig. 3 represents an elevation of the same, with the parts in the positions they occupy when the sheaf is bound. Fig. 3 A represents a transverse section of the apparatus at the line *xx* of Fig. 1, looking toward the cord-securing mechanism. Fig. 3 B represents a transverse section of the grain-cradle at the line *††* of Fig. 1, looking toward the cord-securing mechanism, (without the latter.) Figs. 4 and 5 represent a side elevation and a vertical section of the hinged hands and their appurtenances upon a larger scale, and Fig. 6 represents a side elevation of them in different positions. Fig. 7 represents a front view of the cord-twister and its appurtenances. Fig. 8 represents a plan of the same; Fig. 9, a horizontal section of the cord-twister detached; Fig. 12, a plan of a part of the cord-securing mechanism below the line *xx* of Fig. 7. Fig. 13 represents a plan of parts of the detent mechanism after the band is secured; Fig. 14, a vertical section of a part of the mechanism following the line *xx* of Fig. 12; Fig. 10, a plan of the movable knife and its appurtenances; Fig. 11, a vertical section of the bearing of the cord-twister; Fig. 15, a side elevation of the cord-securing devices in the positions they occupy immediately previous to securing the band; and Figs. 16 represent views of the revolving fork.

Figs. 4 to 16, inclusive, are drawn upon a larger scale than the other figures.

The object of my invention is to bind grain with cord and secure the ends of the band with facility and dispatch. The system which I employ for this purpose is to compress the grain into a sheaf by means of a strap, to en-

circle it with the binding-cord, and to secure the ends of the band by twisting them together and tucking the twisted ends between the band and the grain, where they are held by friction sufficiently to secure the band from slacking. My machinery for carrying this invention into effect consists of many parts, some of which may be used with advantage in combination with other means of securing the ends of the band.

The first part of my invention consists in the combination of a flexible strap with mechanism for extending it round the bundle or gavel to be bound, and drawing it taut with varying force, so that the grain is compressed by the strap (previous to binding it) with a force varying according to the quantity of the grain in the gavel.

The special object of the second part of my invention is to prevent the compressing-strap, when not acting, from interfering with the movement of the grain to and from its position during binding, and consists in arranging the instrumentality for applying the compressing-strap to the gavel in such manner that the strap is held out of the track of the grain while the latter is being moved to and from the place in which it is bound.

The third part of my invention consists in the combination of a reciprocating arm, fitted with fingers or their equivalent, for carrying the binding-cord, with a reciprocating bar, in such manner that the rectilinear movement of the bar causes the end of the arm to describe a curve around the place where the sheaf is to be bound.

The fourth part of my invention consists in the combination of a pair of reciprocating arms to extend the binding-cord round the sheaf, with fingers or their equivalents to hold said cord, and with the same reciprocating bar, so that the two arms are caused to embrace the opposite sides of the grain to be bound, and to apply the cord to it by the same movement of the bar.

The fifth part of my invention consists in the combination of a reciprocating arm with a hinged hand and fingers or nippers to carry the binding-cord.

The sixth part of my invention consists in the combination of the movable hinged hand and fingers with an inclined plane to turn the

hand partially on its wrist-pin, so as to present the cord properly to the band-securing devices.

The seventh part of my invention consists in the combination of two pairs of fingers for holding the binding-cord in such manner that one pair will pass between the other pair when moving in one direction, and outside the other pair when moving in the opposite direction, whereby the end of the cord carried by the first pair is delivered to and seized by the second pair.

The eighth part of my invention consists in the combination of a gathering-arm (which embraces the grain to be bound) with the same reciprocating bar that operates the arm which carries the binding-cord or the compressing-strap, in such manner that, although these two arms are moved by the same reciprocating bar, the gathering-arm completes its movement before the other arm, and remains practically stationary while the latter completes its movement.

The ninth part of my invention consists in the combination of two reciprocating arms fitted with fingers to carry the binding-cord round the gavel with a cord-twister for twisting the ends of the band together.

The tenth part of my invention consists in the combination of a pair of spring-fingers to hold the binding-cord with a pin or stud located between them and the position of the grain, and across which the cord is strained.

The eleventh part of my invention consists in the combination of a pair of spring fingers holding the binding-cord with a device for opening them, which is operated by the band-securing mechanism, so that the grasp of the fingers upon the binding-cord is relaxed at the proper time in the operation of securing the band.

The special object of the twelfth part of my invention is to prevent the slacking of the binding-material and compressing-strap during the operation of securing the band, and consists in the combination of the instrumentality for applying either the binding-cord or the compressing-strap, or both of these, to the gavel, with mechanism for holding that part of said instrumentality which is in the vicinity of the band-securing devices in its place until the band is properly secured.

The thirteenth part of my invention consists in the combination of the cord-twister with a device for cutting the cord in such manner that the cord constituting the band is severed from the remainder at the proper time in the operation of twisting the ends of the band together.

The fourteenth part of my invention consists in the combination of the cord-twister with a fork to tuck the twisted ends of the band between the band and the grain.

The fifteenth part of my invention consists in the combination of the mechanism for operating the cord-twister with devices for stopping its motion when it is in the proper position for receiving the ends of the band to be twisted together.

All the parts of my invention are embodied in the machinery represented in the accompanying drawings. The grain to be bound is placed in a cradle, A, upon one side of which are situated the devices for compressing the gavel and applying the binding-cord, while upon the opposite side are the devices for securing the ends of the band. The former devices are operated by means of a lever-handle, B, and the latter by means of a revolving crank-handle, C, both of these being within the reach of an attendant seated upon a seat, D, carried by the machine. In order to compress the sheaf, a flexible strap of leather, E, is employed, which is applied to the gavel of grain by means of two reciprocating curved arms F F'. These arms also apply the binding-cord and will hereinafter be called the cord-carrying arms. This strap is coiled upon a spring-drum, G, which tends continually to wind it up, (the drum having a spring within it similar in construction and operation to a clock-spring.) Its end is conducted over friction-rollers *a a* upon one of the cord-carrying arms, and is made fast to the extremity of the other cord-carrying arm F'. The two cord-carrying arms are operated by the same reciprocating bar, as follows: Each arm has a shank, *b*, which is connected by pivots with a pair of oscillating arms, *d d*, projecting from cog-segments *f f*, which turn upon stationary fulcrum-pins secured to the frame of the machine. The teeth of these segments engage with corresponding rack-teeth formed upon the opposite sides of the reciprocating bar H, so that as the bar is moved to and fro, the extremities of the cord-carrying arms are caused to describe curves around the opposite sides of the gavel of grain. In this movement the extremities of the arms, starting from the side of the gavel opposite the band-securing devices, diverge until the oscillating arms *d d* are upright, after which the continued movement of these oscillating arms by the reciprocating bar H causes the extremities of the cord-carrying arms to approach each other. The reciprocating bar is connected with the lower end of the hand-lever B by means of a connecting-rod, I, so that the operator can work the arms without leaving his seat D; and in order to maintain the bar in its proper position while moving, it is supported by friction-wheels which run in guides J J, secured to the frame of the machine.

The compressing-strap is extended and drawn round the gavel by the operation of the cord-carrying arms, and in order that the strap when not operating may not interfere with the movement of the grain to and from the cradle in which it is bound, the arms and their appurtenances which apply the strap to the gavel are so arranged that they hold it when not operating at one side of said cradle, as shown at Fig. 1, out of the track of the grain while being moved. In order that the grain may not interfere with the free movement of the cord-carrying arm, it is first partially compressed

by a vibrating compressing-arm, K. The compressing-arm is pivoted to the frame of the machine, and it has a slotted shank, *g*, which is applied to a friction-wheel carried by the reciprocating bar H, so that the movement of said wheel in the slot of the shank causes the compressing-arm to vibrate down and up. It is desirable that the compressing-arm should do its work before the compressing-strap or the cord is passed round the gavel. Its slotted shank *g* is therefore made in such form, as shown in the drawing, that the movement of the compressing-arm is effected by the first part of the movement of the reciprocating bar, while during the last part of the movement the friction-wheel traverses the length of the slotted shank without imparting motion to the arm, whereby the compressing-arm is held stationary while the cord-carrying arms complete their movement.

The reel L for the binding-cord is mounted upon a spindle on the shank of the upper cord-carrying arm, and is prevented from turning too freely by a cord-tension consisting of a spring-plate, *h*, which is held in contact with one of its heads by a nut screwed upon the spindle or by a pin passed through the spindle. The end of the cord is conducted through a guide, *i*, to the spring-hand M of the cord-carrying arm F.

Each cord-carrying arm is provided at its end with a hand, M M', connected with it by a wrist-pin or hinge, so that the hand may be turned toward the cord-twisting devices. Each of these hands is held in its normal upright position, as shown at Figs. 4, 5, and 6, by means of a spring, *j*, which acts through a rack upon a cogged segment secured to the hand concentric with the wrist-pin. Each hand is fitted with a pair of fingers or forceps, *s s'*, to hold the cord. These project from the hands parallel with the axis of the gavel to be bound. One finger of each pair is grooved longitudinally, as shown at Figs. 4 and 6, and the other is arranged to fit into the groove, so that the two can gripe the cord firmly between them. Each finger is secured to a cog-segment, *t*, which is mounted upon an arbor to which a spring is applied, whose tendency is, by turning the arbor, to force the fingers toward each other, and as the cogged segments of the two fingers engage, the fingers always interlock when permitted to approach each other. The upper sides of each pair of fingers are beveled so as to form a shallow groove when the two fingers are close to each other; their lower sides are correspondingly beveled to form a blunt wedge when the two are close together. The movement of both pairs of fingers by the springs is limited in an upward direction by the contact of the ends of the cogged segments with stops, so that the fingers cannot turn upward beyond the line passing through the axes of their arbors, but they can be pushed downward as far as their cogged segments will permit without disengagement. The extent of

the movement in one direction imparted to the cord-carrying arms by the reciprocating bar H is sufficient to cause the hinged hands to meet and then overlap each other, when they are in the positions represented in Figs. 1 and 2. As they overlap, the fingers *s* of the upper hand M bear upon the fingers *s'* of the lower hand M', and pushing them down, open them and pass through between them; hence if the end of the binding-cord be carried by the fingers of the upper hand, it will be carried between the fingers of the lower hand, and the latter, closing by their springs above the fingers of the upper hand, will grasp the binding-cord. The several parts will then occupy the positions in which they are represented at Figs. 4 and 5. When, however, the movement of the reciprocating bar H is reversed, to cause the two hands to separate, the fingers *s* of the upper hand are borne against the under side of the fingers *s* of the lower hand, are opened in a downward direction by the pressure, and pass outside of them, closing above them upon the binding-cord, so that as the hands separate the several parts will occupy the positions in which they are represented in Fig. 6. In thus separating, as the tendency of the strain upon the cord is to draw the fingers of the lower hand into the line passing through the centers of their arbors, the lower fingers will bite upon the end of cord and hold it securely, while as the fingers of the upper hand open downward, the binding-cord renders through them as the hands separate. The continued movement of the reciprocating bar H in the direction of the arrow A', Fig. 2, carries the spring-hands in curves around the gavel to the side thereof at which the cord-securing devices are operated, and causes them to approach each other. As they approach, a pin, *n*, secured to the upper hand M (see Figs. 2 and 15) bears upon a curved inclined plane, *m*, secured to the frame of the machine. This inclined plane slopes outward from the gavel, so that as the hand is depressed, its pin glides downward and outward upon the inclined plane and the hand is turned outward until its edge bears upon a block, O, which forms the bearing in which the shaft of the cord-twister turns. While the upper hand is thus being turned outward, the lower hand is turned in a similar manner by the contact of its edge with a curved inclined plane, *m*², and of a pin, *n'*, near its edge, with a curved inclined plane, *m*¹, until its edge bears against the under side of the block O. The two hands are then in the positions they occupy when the band is secured, as represented at Fig. 15. The cord-securing devices in this machine are mainly two, viz., the cord-twister by which the ends of the portion of the cord which constitutes the band around the gavel are twisted together, and a revolving fork by which the twisted ends are tucked between the band and the grain, where they are held by friction with sufficient force to secure the band. The cord-twister consists

mainly of a pair of spring-jaws, $u u$, Figs. 7, 8, 9, and 15, secured by links to one end of a hollow shaft, w . This shaft has a beveled pinion, P , at its opposite or outer end, which engages with and is turned by the beveled wheel P' upon the upright shaft Q , which has at its upper end the crank-handle O , by which the cord-twister is turned. The hollow shaft is traversed by a piston, x , connected at its inner end with the spring-jaws, and having a spiral spring coiled under its head. The tendency of this spring is to close the jaws and hold them closed until they are opened by pressure applied to the head of the piston by the action of an inclined cam-block, y , secured to the beveled wheel P' . The revolving fork z is formed upon the upper end of an arbor, z' , which turns in bearings carried by the lower cord-carrying arm F' . This arbor is provided at its lower end with a pinion, P^2 , which, when the cord-carrying arms are in the positions they occupy when the band is to be secured, (see Figs. 12 and 15,) is in a position to be turned by a cog-segment, P^3 , secured to the counter-shaft Q' . This counter-shaft is caused to revolve by means of the upright shaft Q , by connecting the two with cog-wheels $P^4 P^5$. The fork z , when not turning, must face the gavel, as shown at Figs. 4 and 5, so that the cord may extend through its crotch. It is held in this position, when its pinion is separated from the cog-segment P^3 , by the pressure of a spring, a^1 , Figs. 16, against a flattened portion of the collar of the fork-arbor. This spring yields and permits the fork to revolve when force is applied to the pinion by the cog-segment P^3 .

In order that the two ends of the part of the cord constituting the band may be twisted together, they must be extended between the open jaws of the cord-twister so that the latter when closing may grasp them. For this purpose a fixed fork, z^2 , is secured to the end of the upper cord-carrying arm F , and a pin, c , is secured to the upper hand M nearer the gavel than the spring-fingers; hence when the upper hand is turned on its wrist so as to project outward, as shown at Fig. 15, the cord passing from the gavel will be strained across the fork z^2 and the pin c directly between the jaws of the cord-twister $u u$. The revolving fork z , carried by the lower hand, stands in such a position that the cord seized by the lower fingers extends through its crotch, and between it and the fingers there is a pin, c' , upon the lower hand M' , (similar to the pin c on the upper hand,) over which the cord is extended so that it is within the jaws of the cord-twister. This pin c' is made use of to open the lower fingers so that they may release the cord at the proper time, as will be hereinafter described. It is therefore secured to one of the cog-segments of the lower pair of fingers, so that the application of pressure to it causes the lower fingers to open.

In order to cut the part of the cord consti-

tuting the band from the remainder, a pair of knives operating like shears are provided. One blade e of this pair is secured to the block O . The other blade e^1 is secured to the upper end of an upright arbor, b' , which turns in the block O , and has an arm, e^2 , secured to its lower end in a proper position to be struck by a cam-block, e^3 , secured to the under side of the beveled wheel P' . The arbor b' has a spring coiled upon it which turns the blade back as soon as the cam-block passes by the arm e^2 , and holds the blade stationary until the cam-block again acts. The blade e^1 , when moved by the cam-block e^3 , passes between the pin c and fingers of the upper hand, thus bearing the cord extended between them against the stationary blade, cutting it, and leaving the end of the portion extending to the reel fast in the fingers of the upper hand.

In order that the cord-twister may receive the cord between its jaws, it must stand with its jaws held open by the cam-block y , in the position represented at Figs. 7 and 8. Then the first movement of the upright shaft Q carries the cam-block y past the head of the piston x , and permits the jaws of the twister to close and gripe the cord. As the upright shaft turns, the under cam-block e^3 operates upon the knife e^1 and causes the cord to be cut by the time the cord-twister has made a quarter of a revolution. The severing of the cord releases the upper end of the band; the lower end is released at the same time by opening the lower fingers by means of the pin c' . In order to do this, a T-lever, d' , is placed in the block O , with its shank in a horizontal position, with the lower end of its head in a position to bear against the pin c' , and with the upper end of its head in a position to be depressed by the inclined under side of the knife-blade e^1 . This T-lever is borne up by a small spring, but when the knife is moved to cut the cord its inclined under side, passing over the upper end of the head of the T-lever, depresses it and forces its lower end to bear upon the pin c' and open the lower fingers, thus releasing the lower end of the band at about the same time that the upper end is cut loose from the cord leading from the reel. As both ends of the band are thus placed within the control of the cord-twister, its continued revolution (by the turning of the crank-handle O) twists them together in the fork z until the cog-segment P^3 engages with the pinion of the fork. When this takes place, the fork is turned one revolution, which is completed while the cam-block y bears against the head of the piston x and opens the jaws of the cord-twister, so that the twisted ends of the band are withdrawn from the cord-twister and tucked between the band and the grain. As soon as this is effected, the lever B is moved to withdraw the cord-carrying arms $F F'$, the compressing-strap E , and the compressing-arm K , and, as the first movement of the outer extremity of the lower cord-carrying arm is in the direction of the length of the

twisting-fork z , its tines are withdrawn from the sheaf, leaving the twisted ends of the band tucked in between the grain and the band. The withdrawal of the arms and compressing-strap releases the bound sheaf, which is then removed from the cradle.

In order that the lower fingers may be opened by the pressure of the end of the T-lever upon the pin c' , and also that the lower arm which carries the end of the binding material in its fingers and one end of the compressing-strap may not move and relax the tension upon the gavel, the lower cord-carrying arm must be held stationary or locked fast until the binding is completed. This is effected by a segment-flange, D' , (secured to the shaft Q'), which is passed beneath the hand of the arm, and then prevents its withdrawal. When the cord-twister is in the proper position to receive the cord, the space between the ends of the segment-flange is opposite the grain, so that the lower hand can pass by the track of the segment (in revolving) to its proper position against the block O ; as, then, the segment is revolved, it passes beneath the hand and holds it stationary until the space is again brought round to permit its withdrawal.

It is important that the revolution of the upright shaft Q should be stopped just when the cord-twister is open to permit the escape of the twisted cord, so as to be ready to receive the parts of the next band, as shown at Figs. 7, 8, and 15. This is effected by means of a spring-stop, m^2 , which is controlled by the lower hand M' . The stop is hook-formed; its end projects through and is guided by a slot in a stationary curved plate, G' ; its shank has a spring, m^3 , coiled upon it, which permits it to move in the same direction as the beveled wheel is turned as far as the slot in the curved plate G' will permit. It is secured to a spring-holder, n^2 , which is pushed toward the upright shaft Q by the lower hand as it approaches the position it occupies when the cord is to be secured. When the spring-holder is in this position the hook-head of the stop m^2 is within the range of motion of a projection, e^4 , secured to the beveled wheel P^1 , so that the latter strikes the end of the stop m^2 and carries it along with it until further motion is prevented by the contact of the stop with the end of the slot in which it moves, which contact takes place when the cord-twister is in the desired position. As the operator may then withdraw his hand from the crank-handle C , the spring m^3 of the stop would tend to turn the upright shaft backward. To prevent this, a spring-pawl, g' , is provided, and is so placed that its end passes behind the cam-block e^4 and prevents any backward movement of the upright shaft. The beveled wheel P^1 and shaft Q are thus held for the time from turning forward by the stop m^2 , and backward by the spring-pawl g' , but as the former is carried by the spring-plate n^2 , which, as before stated, is pressed toward the upright shaft Q by the

lower hand M' , the withdrawal of the lower hand to release the sheaf permits the spring-plate n^2 to spring from the upright shaft and withdraw the end of the stop m^2 from the projection e^4 , thus leaving the beveled wheel free to be turned forward when next required. As the end of the stop in withdrawing clears the projection e^4 , the spring m^3 on its shank draws its head backward, so that when the lower hand next presses the stop toward the upright shaft, the end of the stop is behind the projection e^4 , and consequently does not prevent the turning of the beveled wheel in a forward direction until it has made a complete revolution.

When the reciprocating bar is moved back to withdraw the cord-carrying arms, the compressing-strap, and the compressing-arm, the end of the cord held in the fingers of the upper hand is carried back, and, as the two hands meet and overlap, is applied, as before described, to the fingers of the lower hand, so that all the parts are again in the proper positions to commence binding a new gavel of grain.

The binding apparatus thus described is arranged to have the gavel of grain placed in the cradle by a fork operated by hand, and to have the sheaf removed by the same means. The binding mechanism may, however, be used in connection with machinery for delivering the grain to it and removing the bound sheaf. As the tension of the compressing-strap is imparted by a coiled spring which is wound up by the extension of the strap around the gavel, and as the force required to wind up such a spring increases, the tighter it is wound, and as a small gavel requires a less extension of the compressing-strap to surround it than a larger one, the compressing-strap, in the combination described, has the advantage of doing the work with a yielding pressure, which adapts itself to the quantity of grain, so that the gavel is always well compressed, whether the quantity of grain be large or small. The coiled spring may, however, be replaced by any other suitable means of imparting a variable tension to the compressing-strap. The arms which apply the compressing-strap to the gavel are arranged in such manner with reference to the position occupied by the grain during binding, and so hold the compressing-strap, that it is held out of the track of the grain, as shown at Fig. 1, while gavel is being placed in position for binding and removed therefrom. This arrangement of the parts of the machine is important, because a compressing-strap cannot be used with advantage if it be permitted to extend across the track of the grain and interfere with its movement. The construction of the instrumentalities for thus holding the compressing-strap and applying it to the grain may be varied without departing from the principle of this part of my invention. The location of the cord-reel on the side of the grain-cradle opposite that at which the band-securing devices operate is advantageous, as

there is then no necessity of extending the cord across the position of the grain before the grain is placed in the cradle. The securing of a cord band by twisting the ends together and catching them between the band and the grain, enables the band to be secured without the necessity of tying a knot, and simplifies the construction of the band-securing devices.

The holding fast or locking of the lower cord-carrying arm (which in this machine is one of the instrumentalities for applying both the binding material and the compressing-strap to the gavel) in the vicinity of the band-securing devices, is a matter of considerable importance, for if the instrumentalities which apply either the binding material or the compressing-strap can change their position during binding, this operation will not be properly effected, and the most effectual mode to prevent such change is to lock the instrumentalities in their position. In the present machine, as the upper cord-carrying arm is connected with the lower through the rack and segments, the locking of the lower one secures the upper one, so that the instrumentalities for applying both the binding material and the compressing-strap are locked fast until the binding is completed. The construction of these instrumentalities, and also of the mechanism for locking them or holding them fast in the vicinity of the band-securing devices, may, of course, be greatly varied without departing from the principle of this part of the invention.

Having thus described an apparatus which embodies all parts of my invention in a practical form, I deem it proper to state that I do not confine my invention to the precise construction which is represented in the said apparatus, as the apparatus may be varied in form according to circumstances or to meet the views of different builders of machines, and in construction, by the substitution of equivalent devices in the combinations invented by me, without departing from my invention, so long as the combinations as entireties retain substantially the same modes of operation.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a flexible compressing-strap with mechanism for extending it round the gavel to be bound and drawing it taut with a variable force, the combination, as a whole, operating substantially as set forth.

2. The arrangement of the instrumentalities for applying the compressing-strap in such manner that the latter is held out of the way of the grain while it is being moved to and from the place where it is bound, substantially as set forth.

3. The combination of a reciprocating arm, fitted with fingers for carrying the binding-cord, with a reciprocating bar for operating it, substantially as set forth.

4. The combination of two reciprocating arms with fingers to operate upon the binding-cord, and with the same reciprocating bar, so

that the two arms are caused to embrace opposite sides of the gavel to be bound and apply the binding-cord by the movement of the same bar, substantially as set forth.

5. The combination of a reciprocating arm with a hinged hand fitted with fingers to carry the binding-cord, substantially as set forth.

6. The combination of a hinged hand, fitted with fingers, with an inclined plane or other instrumentality to turn the hand on its wrist-pin, substantially as set forth.

7. The combination of two pairs of fingers (for holding the binding-cord) and the mechanism for moving them, in such manner that one pair will pass between the other pair when moving in one direction (relatively thereto) and outside the said other pair when moving in the opposite direction, (relatively thereto,) so as to deliver the cord held by the first pair to the second pair, the combination, as a whole, operating substantially as set forth.

8. The combination of a gathering-arm with the same reciprocating bar that operates the arm (or arms) which carries the binding-cord or the compressing-strap in such manner that the said gathering arm completes its movement before the other arm does, substantially as set forth.

9. The combination of two reciprocating arms, fitted with fingers to carry the binding-cord, with a cord-twister for twisting the ends of the band together, substantially as set forth.

10. The combination of fingers carrying the binding-cord with a pin or stud across which the binding-cord is strained, substantially as set forth.

11. The combination of fingers holding the binding-cord with an instrumentality for relaxing their hold on the cord which is operated by the band-securing mechanism, substantially as set forth.

12. The combination of the instrumentalities for applying the binding material or the compressing-strap to the gavel, with a locking mechanism for holding them fast until the binding is completed, the combination, as a whole, operating substantially as set forth.

13. The combination of the cord-twister (having jaws adapted to seize and hold cord) with a knife for cutting the cord, substantially as set forth.

14. The combination of the cord-twister with a fork to operate upon the twisted ends of the band, the combination, as a whole, operating substantially as herein set forth.

15. The combination of the mechanism for operating the cord-twister with stop mechanism for stopping its motion when it is in the proper position for receiving the ends of the band, the combination, as a whole, operating substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

Witnesses: SOLOMON T. HOLLY.

SILAS G. TYLER,

B. ROBERSON.