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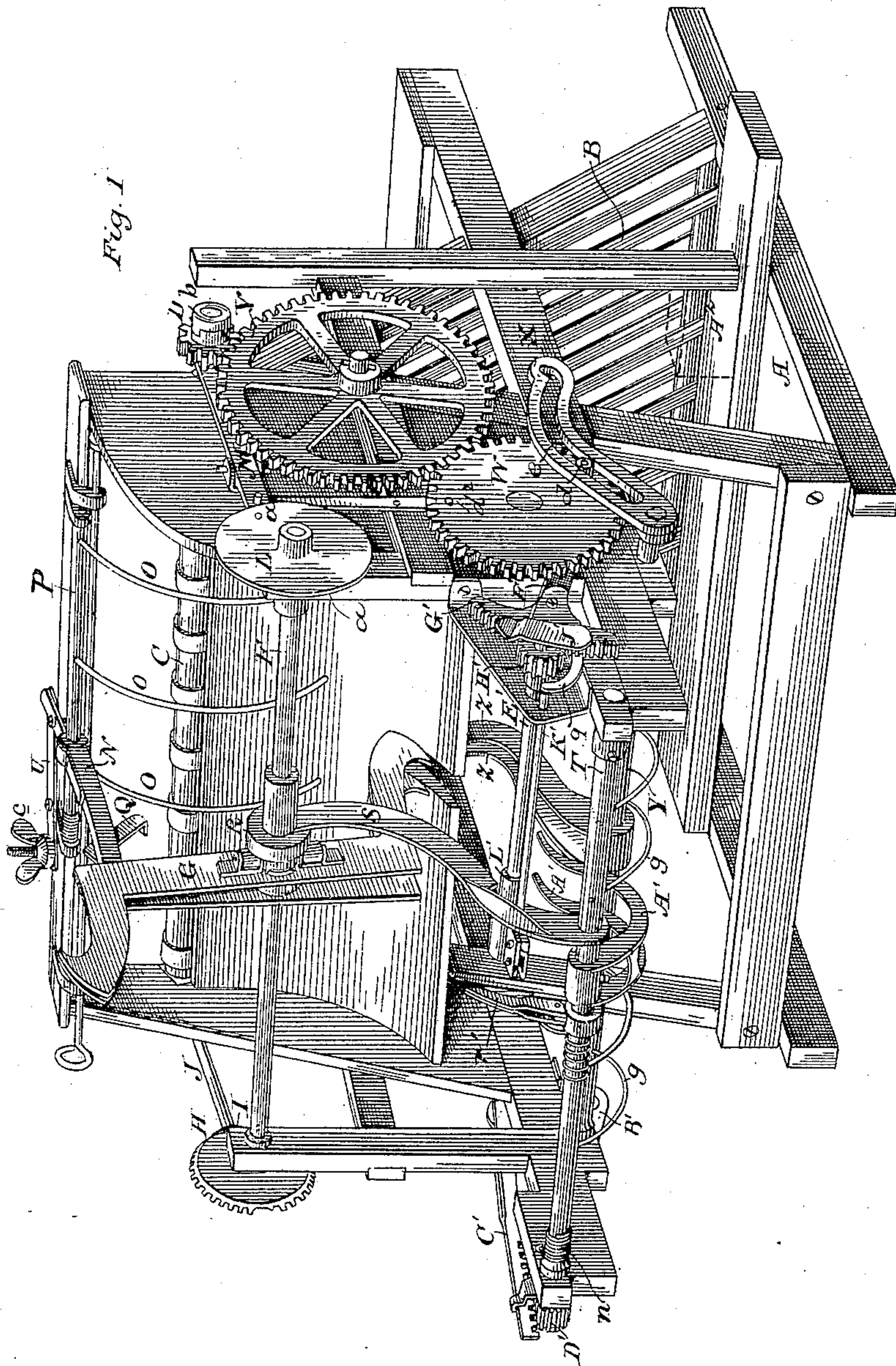
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G. F. GREEN.

AUTOMATIC GRAIN BINDER.

No. 277,709.

Patented May 15, 1883.



Witnesses:

Clarence Poole  
L. H. Marshall.

Inventor:

Geo. F. Green  
By his atty  
R. D. Smith



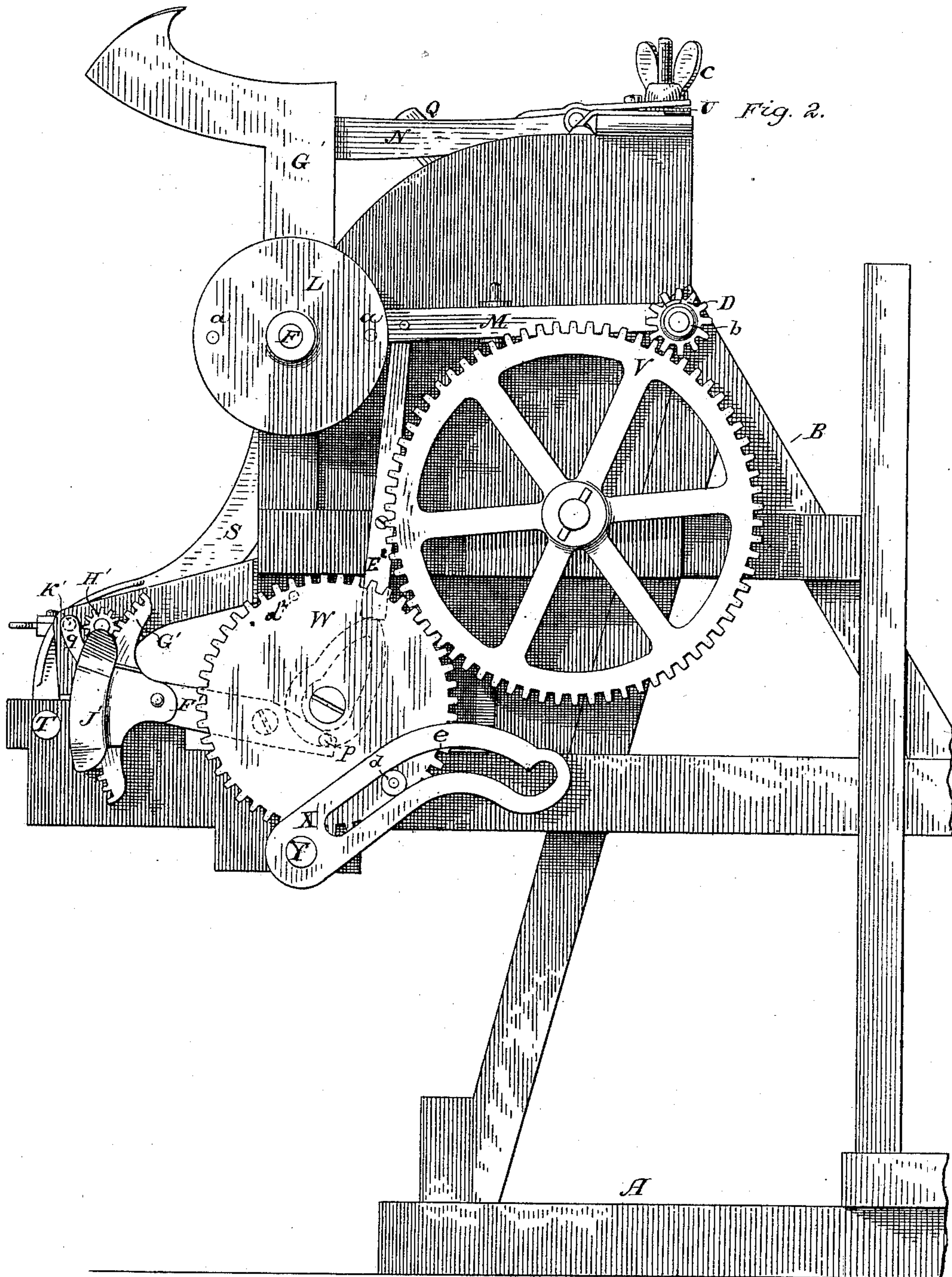
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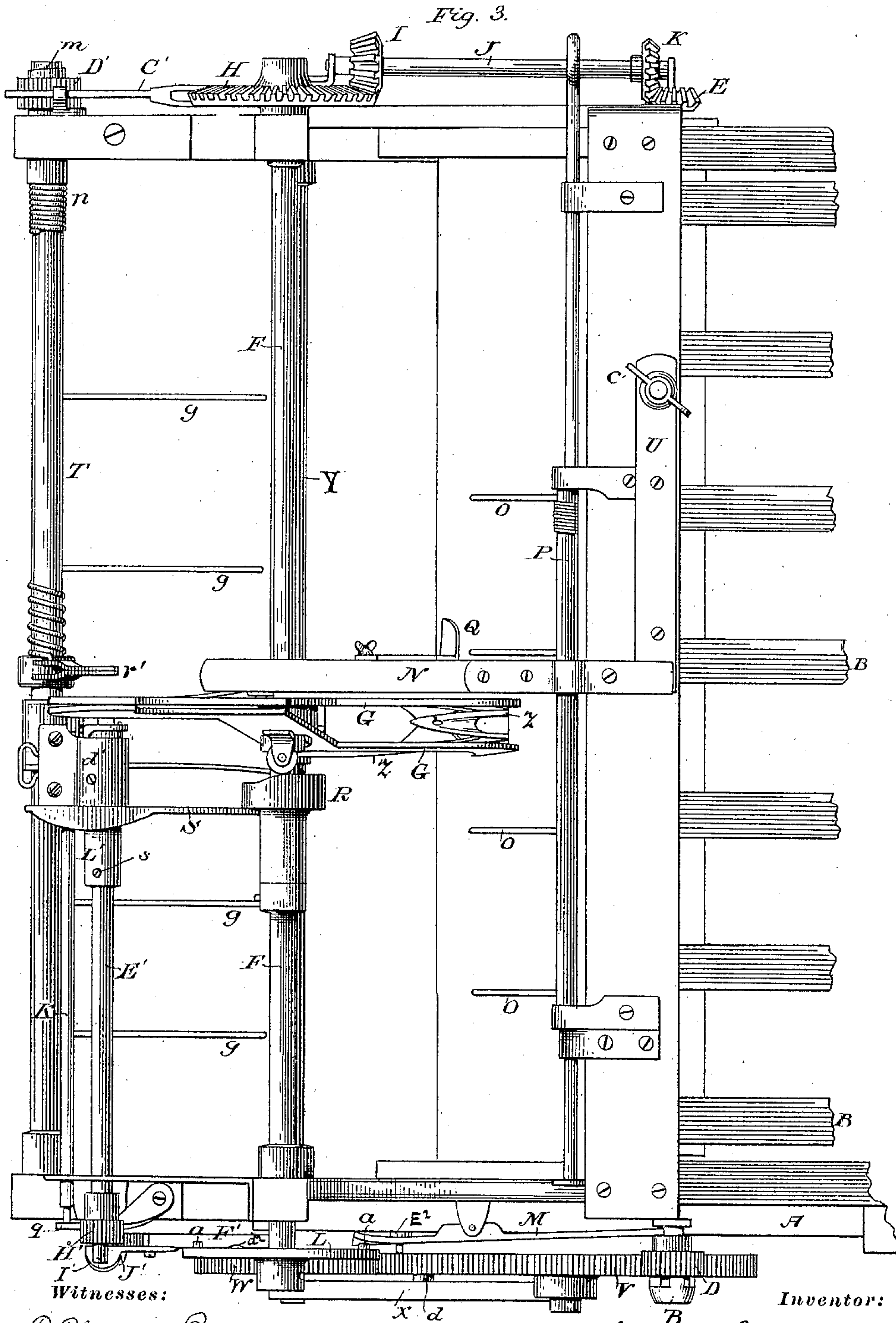
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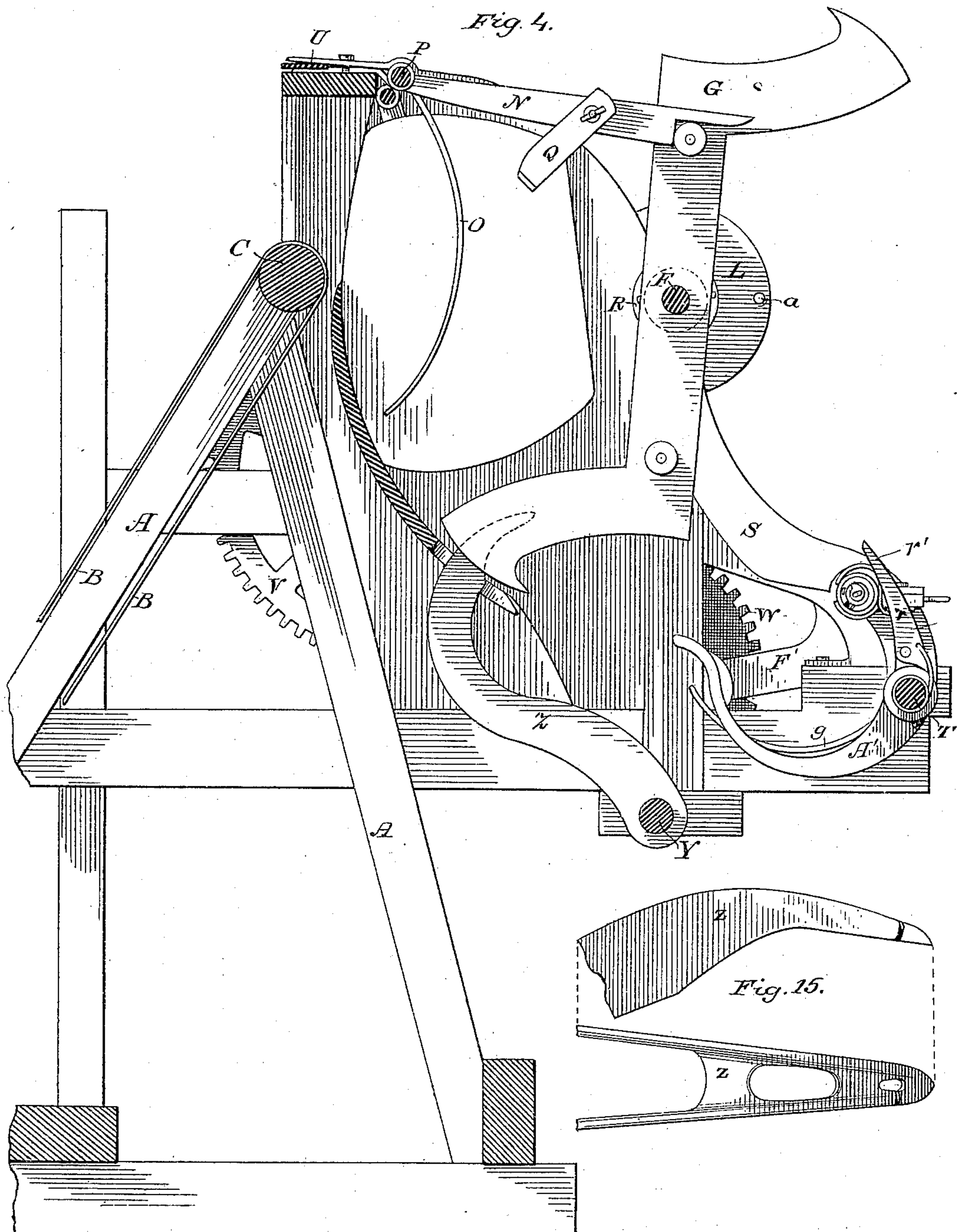
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Witnesses:

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Inventor:

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A. E. Smith

(Model.)

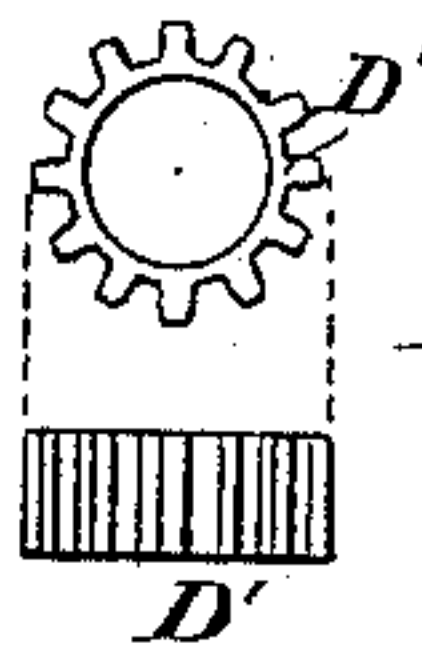
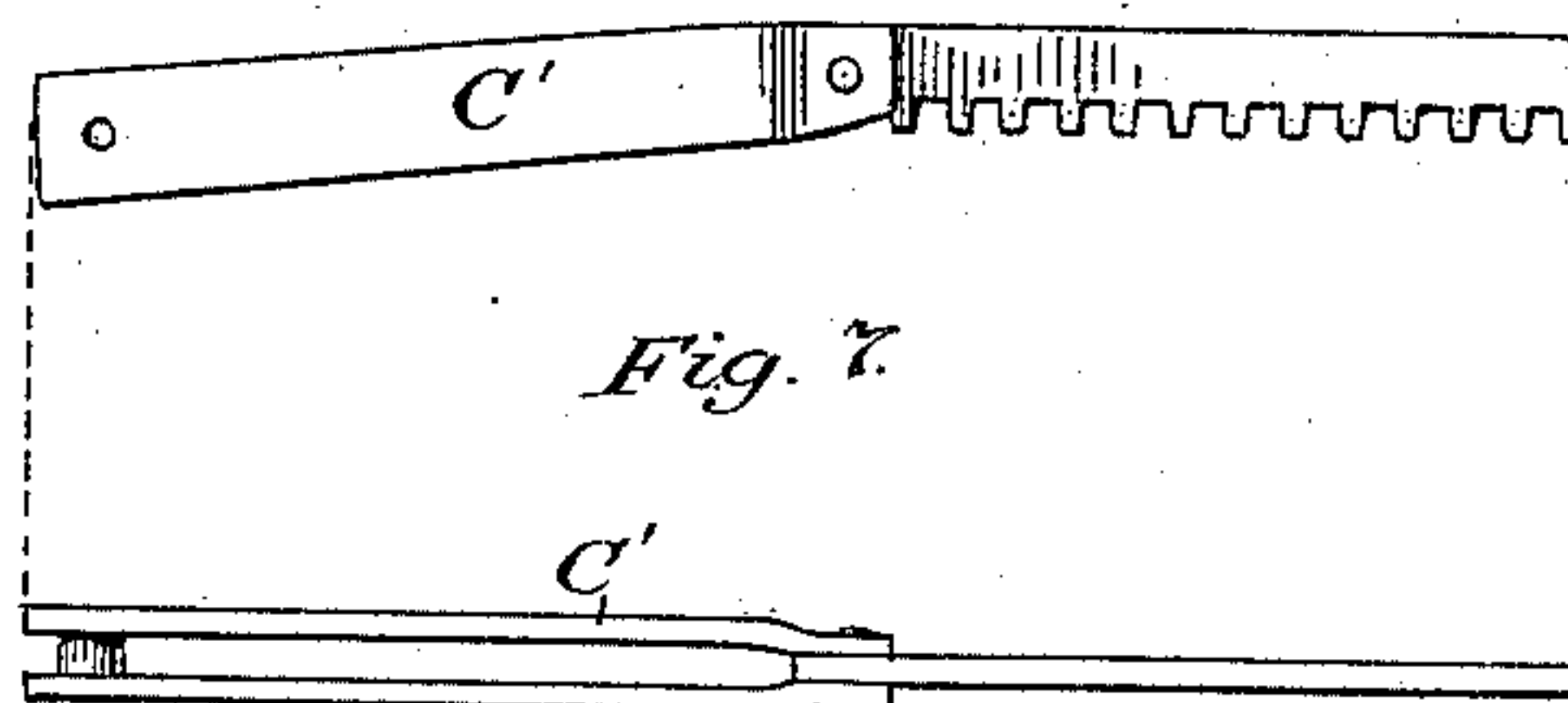
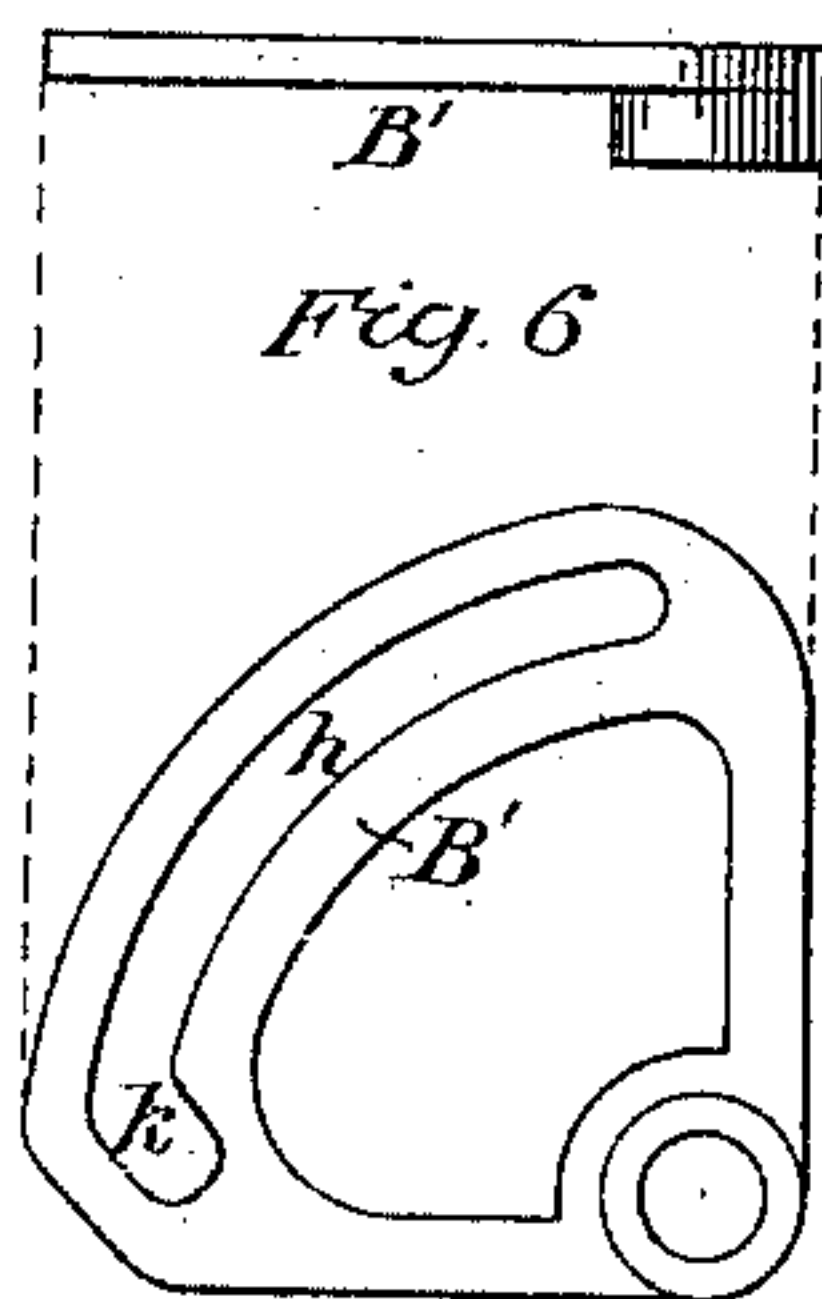
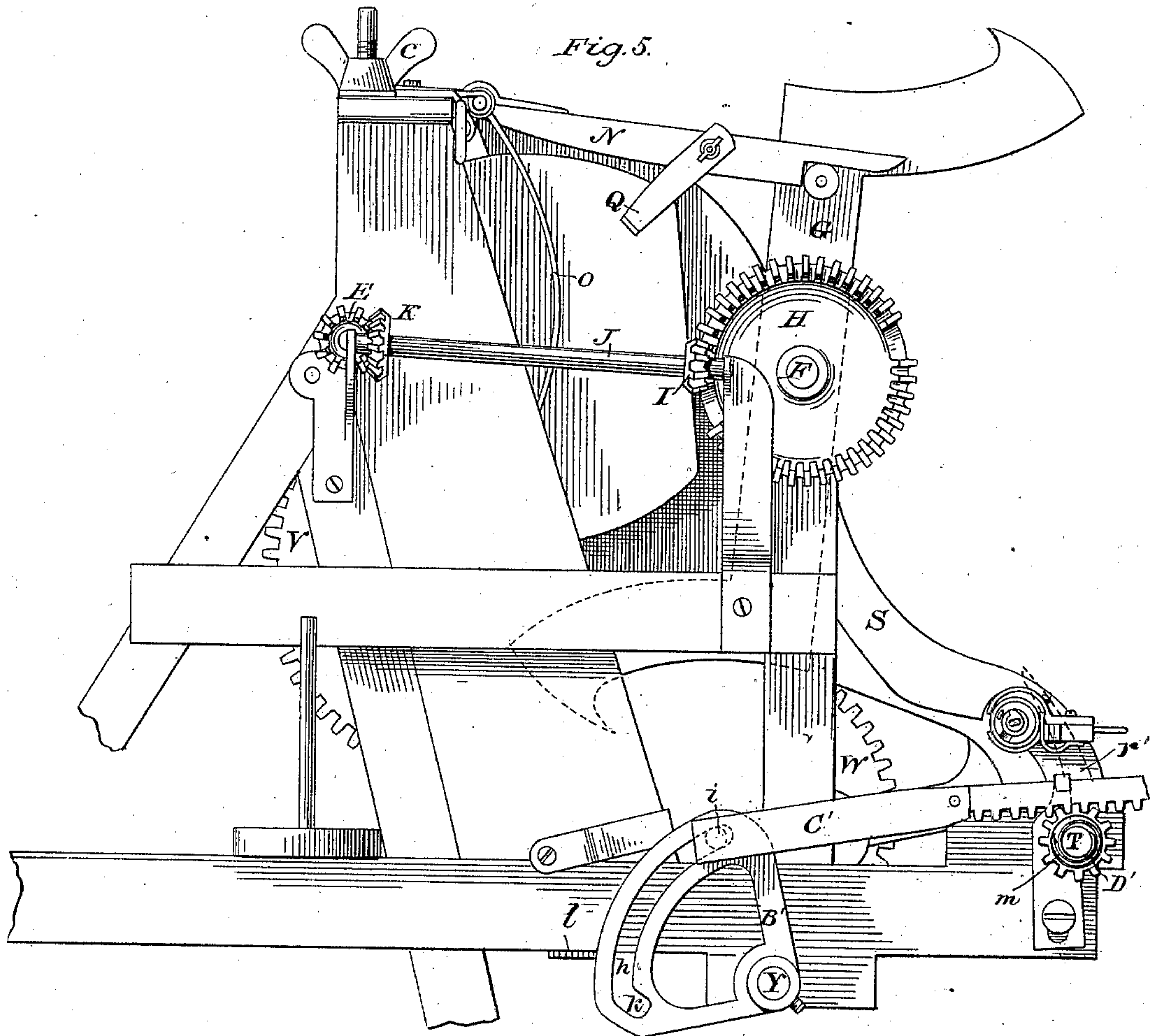
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Fig. 8.

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W. D. Smith



(Model.)

6 Sheets—Sheet 6.

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Fig. 9.

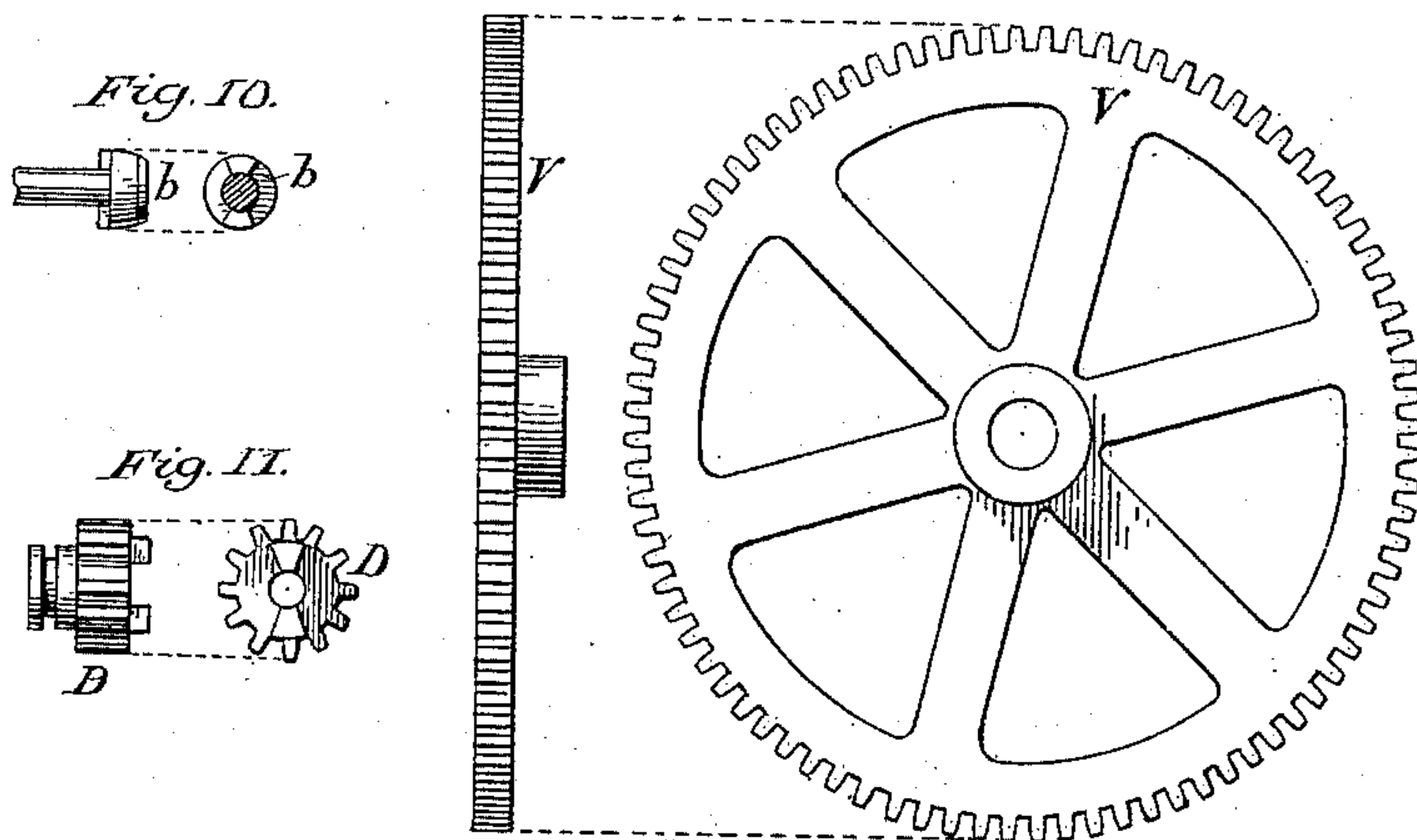


Fig. 12.

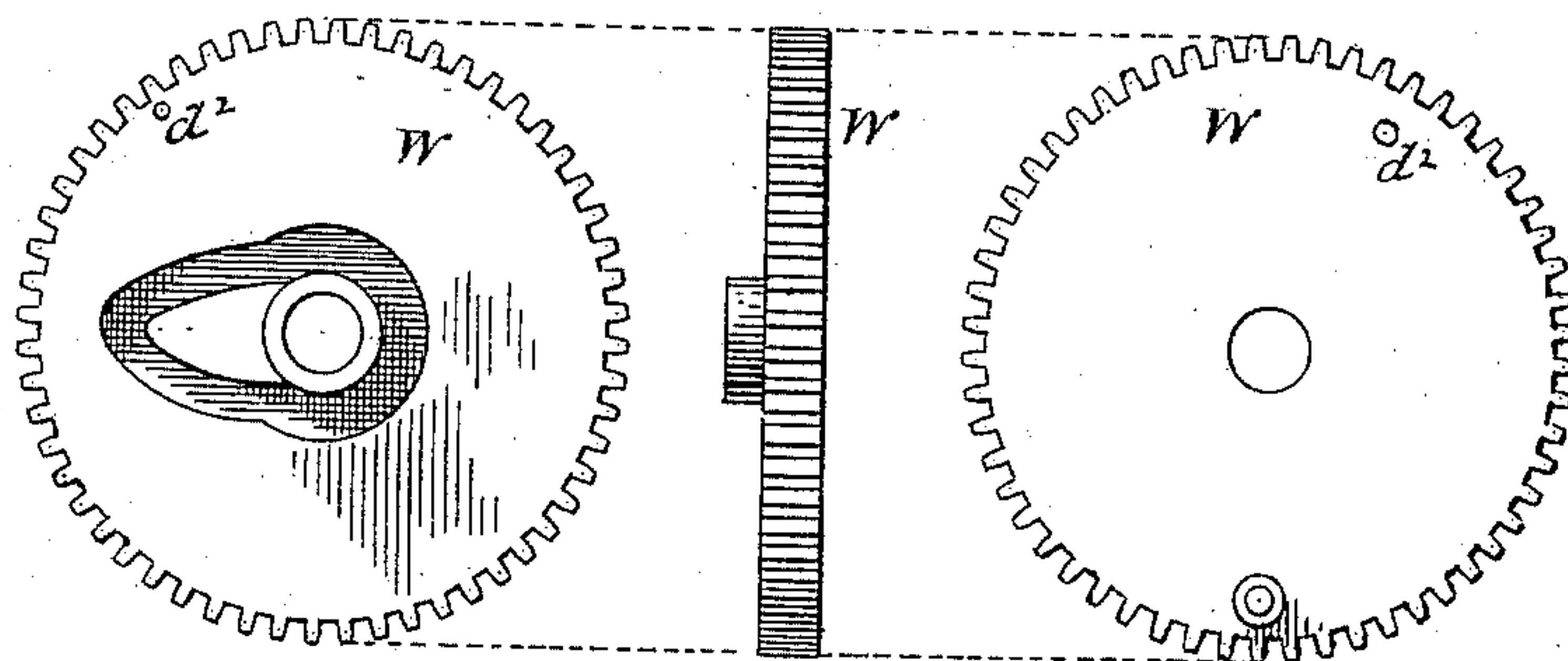
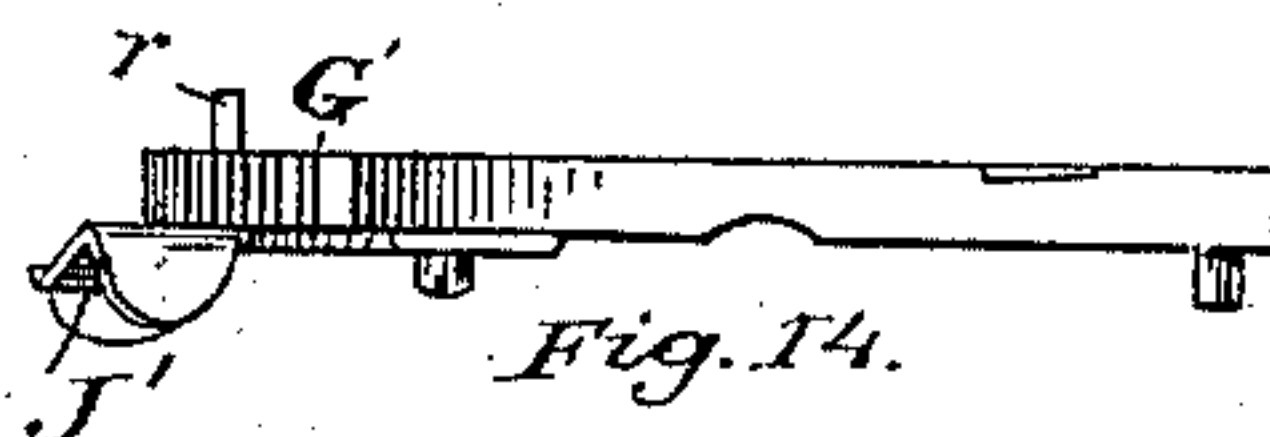
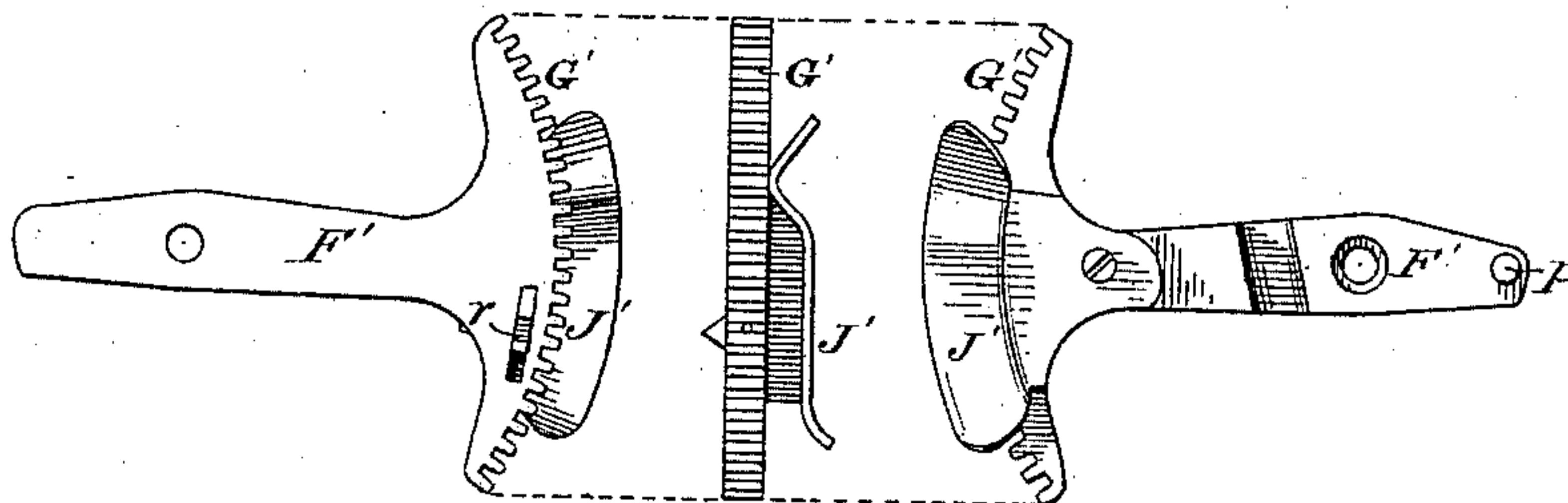


Fig. 13.



Witnesses:

C. Clarence Pool,  
L. H. Marshall.

Inventor:

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By his Attys R. D. Smith



# UNITED STATES PATENT OFFICE.

GEORGE F. GREEN, OF KALAMAZOO, MICHIGAN, ASSIGNOR TO WILLIAM N. WHITELEY, JEROME FASSLER, AND OLIVER S. KELLY, OF SPRINGFIELD, OHIO.

## AUTOMATIC GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 277,709, dated May 15, 1883.

Application filed March 17, 1880. (Model.)

*To all whom it may concern:*

Be it known that I, GEORGE F. GREEN, of Kalamazoo, Kalamazoo county, Michigan, have invented new and useful Improvements in Automatic Grain-Binders; and I do hereby declare that the following is a full and exact description of the same.

This invention belongs to that class of binders where cord is used as a binding material, though the devices are equally applicable to the use of wire or other material for bands. I therefore do not design to limit myself as to the material employed for the bands.

The following are the principal novel features upon which my claims are founded.

First. The binding mechanism is automatically started by the pressure of the accumulating grain, and the tripping device may be controlled at will while the machine is in motion, so as to be tripped by a larger or smaller accumulation of grain.

Second. The divider is in two parts, the ends whereof are together when they pass through the stream of grain and separate laterally immediately thereafter to open a path for the cord-carrier.

Third. The divider is arrested by a locking-arm and is liberated by the elevation of said arm by the accumulation of grain, and said arm is adjustable as to the point of release and as to the pressure required to effect the release.

Fourth. The clutch which causes the engagement of the main wheel of the binder is controlled by the divider, and the disengagement of the same is effected by one of the binder train-wheels as it completes its revolution.

This patent does not refer to the devices whereby the ends of the band are united, because such devices are in great variety, and many of them may be applied to this machine. The special devices for securing the band which I have invented and partially shown in the drawings hereto attached form the subject of my Patent No. 260,093, granted 27th June, 1882.

That others may fully understand my invention, I will describe it in detail, having reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of my machine applied to harvesters. Fig. 2 is a front end elevation of the same. Fig. 3 is a plan of the same. Fig. 4 is a sectional transverse elevation. Fig. 5 is a rear end elevation. Figs. 6, 7, 8, 9, 10, 11, 12, 13, and 14 are details. Fig. 15 represents in plan and side elevation the extremity of the band-carrier, showing the cord-eye and transverse slot.

*The gathering and gaveling devices.*—A is the elevator-frame, to which the binder-frame is attached on the outer side. The elevator-frame is mounted upon the main frame of the harvester in the usual way, and the elevator is propelled by the main wheel by any suitable gearing. B B are the elevator-belts or apron. At each extremity of the upper roller, C, of the elevator there is a pinion, one, D, being loose upon the roller-shaft, and the other, E, being fixed on said shaft. At the top of the binder-frame the shaft F is mounted in suitable bearings at each end of said frame, and the intermittingly-revolving divider G is mounted on said shaft opposite the middle of the receptacle. At one end the shaft F is provided with a bevel-wheel, H, from which one or more cogs are removed at opposite points, so that the meshing pinion I may revolve freely when it arrives at said mutilated point. The pinion I is mounted on a short counter-shaft, J, the opposite end whereof is armed with a similar pinion, K, in mesh with the pinion E. The other end of the shaft F is provided with a wheel, L, provided on its rear or inner side with two cam-studs, a, which engage with the clutch-lever M and push the pinion D into engagement with the clutch b. When in normal position the divider G rests with one end in the receptacle, as an arrester for the grain which is continuously being delivered therein by the elevator. The arrester or divider G is maintained in position by a locking-arm, N, which is hinged to the top of the elevator-frame and engages with said divider until said arm is raised out of engagement therewith, and the pinion I revolves freely in the toothless segment of the wheel H until that time. The grain which is delivered to the receptacle is not supported by the divider-



arm alone, but is confined also beneath the elastic fingers O, which project from the shaft P, also mounted upon the elevator-frame. The shaft P has a spring either coiled about it or otherwise applied to resist the pressure of the grain below the fingers O as the grain is delivered from the elevator. The continued accumulation of grain beneath the fingers O causes them to rise up and finally to engage with the arm N and raise it out of engagement with the arrester or divider. As soon as the divider has been liberated in that way the weight of the grain upon it causes it to rotate far enough to bring the toothed portion of the wheel H into mesh with the revolving pinion I, and the revolution of the divider is thereby continued until said pinion reaches another toothless portion of the wheel H, at which time also the arm N will have again arrested the divider. The revolution of the divider and shaft thus measures and separates the gavel from the stream and delivers it to the binding devices. In the machine as represented the divider has at each movement one-half of one revolution; but, if deemed desirable, it can be provided with a greater or less number of arms, and make its operation complete in a less or greater part of a revolution. The size of the gavel to be separated is determined by the degree of elevation attained by the fingers O before raising the arm N to release the divider. An adjustment as to the desired size of the bundle is secured by an adjustable arm, Q, on the arm N, which may be set high or low to encounter the finger O at one point or another in its upward movement. This completes the first movement in the operation of the binder, the gavel being separated and delivered to the binding devices. There is, however, an action peculiar to the divider G, which may be appropriately described here. The divider G consists of two plates, similar in size and shape. One is fixed upon the shaft F, and the other is mounted thereon with a transverse joint-pin, so that it may have a rocking motion in a plane parallel with the axis of shaft F, and its oscillations in that plane are controlled by a cam, R, which loosely encircles the shaft F, and is kept in position by a bridge, S, which extends between the shafts F and T, and is supported by them. The effect of the cam R is to bring together the points of the separate divider-plates as they pass into and through the stream of grain, and to cause them to separate with a lateral movement immediately afterward, and thereby open a clear path for the passage of the cord-carrier. There is also a tension adjustment for the arm N, consisting of a spring, U, which tends to depress the free end of said arm and force its engagement with the divider G, and the tension of the spring U is increased or diminished by a tension-screw, c. The effect of all this is to regulate the size of the bundle by gaging the rise of the fingers O before releasing the arm N and regulating the resistance of said arm to be overcome. The attendant is thereby enabled, while the ma-

chine is in motion and at will, to vary the size of the bundle, and to vary the time of starting the binding mechanism. At the completion of the first movement of the binder—that is, when the divider has separated the gavel and delivered it to the binding mechanism and is about to come to rest—the cam-stud *a*, which projects from the rear side of wheel L, engages the lever M, and pushes the pinion D into engagement with the shaft C, and sets the binding devices in motion. The second movement of the binding devices is thereby commenced, and consists in compressing the gavel and placing the band around it. The pinion D meshes with and drives the intermediate wheel, V, from which in turn the main wheel W takes its motion with a speed less than that of pinion D. The wheel W bears a wrist or crank pin, *d*, which traverses a slot, *e*, in the arm X, said slot *e* being curved with a radius equal to the radius of the motion of the crank-pin *d*, so that at one part of the path of the latter it simply traverses said slot without changing the position of the arm X, and during the other part of its orbit it causes said arm to vibrate with a variable motion, due to the varying distance of said pin from the axis of said arm. The movement of the arm X communicates a similar movement to the shaft Y, with which said arm is connected, and therefore to the cord-carrying arm Z, which is mounted upon and carried by said shaft Y.

*The band-carrier.*—The cord arm or carrier Z is a curved arm, having an eye inserted near its point to carry the binding-cord. I make said arm Z of two plates, united at their point but separated at their base, where they are mounted upon the shaft Y for the purpose of giving said arm more strength, but mainly to broaden its area of pressure upon the sheaf. The cord will sometimes unavoidably break and the end slip out of the eye of the carrier, so that the machine must be stopped and the carrier threaded again. This is generally a troublesome matter, because the point of the band-carrier cannot be approached in a position convenient for the operation of inserting the end of the cord through the eye in the point of the carrier. To relieve this operation almost entirely of its troublesome character I make a transverse slot in the side of the carrier opposite the eye and extend said slot through into the eye, as shown in Fig. 15. By this means it is not required to insert the end of the cord through the eye; but, by the application of a little force, the cord may be forced sideways through said slot into the eye. It is advisable to make the slot narrower than the cord, so that the latter will not be liable to escape without an application of force directed to that end. When the cord-arm Z advances its point passes between the separated ends of the divider-plates and close to the stationary one without contact with the straw. When it completes its advance it lays the band properly upon the knotting and holding devices at the inner rear ends of the shafts E and K', and re-



mains there nearly at rest until the cord has been properly sized, held, and tied, and the arm then retreats. Opposed to the cord-arm Z there is a compressor, A', mounted upon the shaft T. This compressor is composed of two curved plates, separated a little distance apart, so as to avoid compression of the band, and thereby prevent it from drawing tightly around the bundle. Associated with it, to support the grain as in a receptacle, there are several fingers, g, also secured to the shaft T. Motion is transmitted to the shaft T through the shaft Y, at one end whereof there is a sector, B', having a curved slot, h, in which a pin, i, traverses and gives motion to a rack-bar, C', which in turn actuates the pinion D' and shaft T. The pin i passes to the inner end of the slot h as the segment B' is thrown outward, and engages with that end of said slot before the sector has completed its movement. The rack-bar C' is thereby pushed outward, and the compressor A' is thrown up forcibly to compress the bundle against the cord-arm, and it is held in that position while the cord-arm is at rest—that is, until the knotting of the band has been completed. The shaft Y and sector B' then retrograde; but the pin i is caught in the recess k at the inner end of the slot h, and the rack-bar C' is thereby pulled forcibly and quickly backward until the rack-bar C' encounters a stop, whereby the pin i is pushed out of said recess. Such a stop is conveniently located on the frame, as at l. The object of this movement is to impart to the compressor A' and the fingers g a quick retreat to permit the discharge of the bound bundle. The connection between the shaft T and pinion D' is made elastic, however, by an interposed spring, m, so that shocks are avoided, and a reaction-spring, n, is also placed upon the shaft T, so that as soon as liberated it is rotated to return the compressor A' and fingers g to a normal position to receive the grain, if any shall fall from the divider before its time. This completes the second movement, and it is immediately followed by the third movement—to wit, the knotting of the cord.

*The discharger.*—The action of the shaft T in effecting a positive discharge of the bundle has been already described. The arm r', which is mounted upon said shaft, compels the bundle to move out of the machine when it is restrained by dragging straw or other causes. Said arm is jointed and provided with a retracting-spring, so that on its return movement it may bend inward and yield to pass any accumulation of straw or any other obstructing matter, and regain its proper position when said obstruction has been passed. At the completion of the operation of the binding and discharging the bundle, all of which is included in one revolution of the wheel W, a cam-stud, d<sup>2</sup>, which projects from the back surface of said wheel W, engages with the lower end of the lever E<sup>2</sup>, and thereby the lever M is actuated to move the pinion D out of en-

gagement with the clutch b. The mechanism will then come to rest, and remain so until by the accumulation of a sufficient bundle under the fingers O, it is again tripped and set in motion.

Having described my invention, what I claim as new is—

1. The binding mechanism automatically started by the pressure of the accumulating gavel against a suitable tripping device, combined with means controlled at will while the machine is in action, whereby the mechanism may be set to be started by the accumulation of a larger or smaller gavel.

2. The yielding grain arresting or divider arm, the shipping-lever, and the clutch, combined with means controllable at will, whereby the arrester-arm may be caused to actuate the shipping-lever by the accumulation of a larger or smaller gavel without stopping the machine.

3. The binding mechanism automatically started by the pressure of the accumulating gavel against a suitable tripping device, combined with a yielding arrester-arm, a shipping-lever and clutch, and means controllable at will while the machine is in action, whereby said mechanism may be adjusted to be tripped and set in motion by the accumulation of a larger or a smaller bundle.

4. The yielding fingers O, combined with the hinged arm N, to arrest the revolving separator, provided with adjustable stop, Q, whereby said arm may be adjusted for release with a greater or less elevation of said fingers, as desired.

5. The hinged lock-arm N, provided with the tension-spring U and adjusting-screw c, whereby the resistance of said arm may be regulated at will.

6. An automatic binding mechanism connected by suitable gearing with the elevator-rollers, combined with cam-studs a on the separator-shaft, lever M, and a clutch operated by said lever, whereby the movement of said separator automatically causes said clutch to move into engagement to couple the driving-roller with the connecting-gear of the binder, for the purpose set forth.

7. The elevator-roller C, provided at one end with the pinion D and clutch b, and the pivoted lever M in engagement with said pinion, combined with the lever E<sup>2</sup> and cam d<sup>2</sup> on the wheel W, whereby said clutch is disengaged at each revolution of said wheel.

8. The separator-shaft F, provided at one end with the wheel L, having the studs a, combined with the lever M, pinion D, and clutch b, whereby the elevator-roller is caused to engage with the pinion D and main binder-wheel V, for the purposes set forth.

9. The divider G, composed of two similar plates set upon the shaft F at a distance from each other, combined with mechanism whereby the proximate ends of said plates will be brought together while passing through the



stream of grain and separated laterally immediately thereafter.

10. The separator G, composed of two similar plates, one fixed upon the shaft F, perpendicularly to the axis thereof, and the other mounted upon said shaft at a distance with a transverse joint, combined with a stationary cam, R, whereby the proximate ends of said plates are brought together as they pass through the stream of grain and are separated laterally immediately thereafter.

11. A separator composed, essentially, of two parts capable of lateral separation, combined with mechanism, whereby said parts are brought together while passing into and through the stream of grain, and separated laterally immediately thereafter to open a clear path for the cord-carrier.

12. In an automatic binder, a band-securing mechanism located above the receptacle, so as to be easily guarded against obstruction by straw and dust, combined with a band-carrying arm moving upward from below said receptacle to carry the band to the band-securing mechanism, and a revolving separator whose center of motion is above the receptacle, and which is caused to separate the gavel and pause in the stream of grain while the band-carrier advances from below to compress and place the band around the bundle.

13. A separator composed of two independent plates, one or both whereof are capable of lateral motion, and whose center of motion is above the receptacle, said separator being adjusted to separate the gavel and pause along each side of the path of the band-carrying arm while the band is being carried forward by said arm and secured by the band-securing mechanism, both independent of said separator.

14. The compressor A' and the discharger r', combined with the shaft T and means by which is imparted to said shaft a slow rotation in one direction to operate the compressor, a pause while the band is being secured, and a quick return rotation to operate the discharger, as set forth.

15. The jointed discharger-arm r', mounted upon the shaft T, and the arm A', rigidly secured to said shaft and adjusted thereon so that the bundle is received between said arms as in a receptacle, and supported while being compressed, combined with mechanism whereby said shaft is rotated at the proper time to discharge said bundle positively, as set forth.

16. The vibrating arm B', provided with a slot, h, curved about the axis of motion of said arm, and the offset k or its equivalent at the extremity of slot h, combined with a rack-bar, C', in engagement with said slot, and receiving therefrom an intermittent reciprocation, as set forth.

17. The vibrating arm B', provided with a slot, h, curved about the axis of motion of said arm, an offset, k, at the upper end of said slot, combined with a reciprocating rack-bar, C', provided with a pin, i, and in engagement with said slot, whereby said rack-bar is raised quickly by engagement with said offset k, and pushed out of the same by engagement of the stop l, to permit said bar to drop to its first position again.

GEORGE F. GREEN.

Witnesses:

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ARTHUR JOHNSTON.