

No. 671,583.

Patented Apr. 9, 1901.

J. W. CARMACK.
RACK AND PINION.

(Application filed Oct. 17, 1899.)

(No Model.)

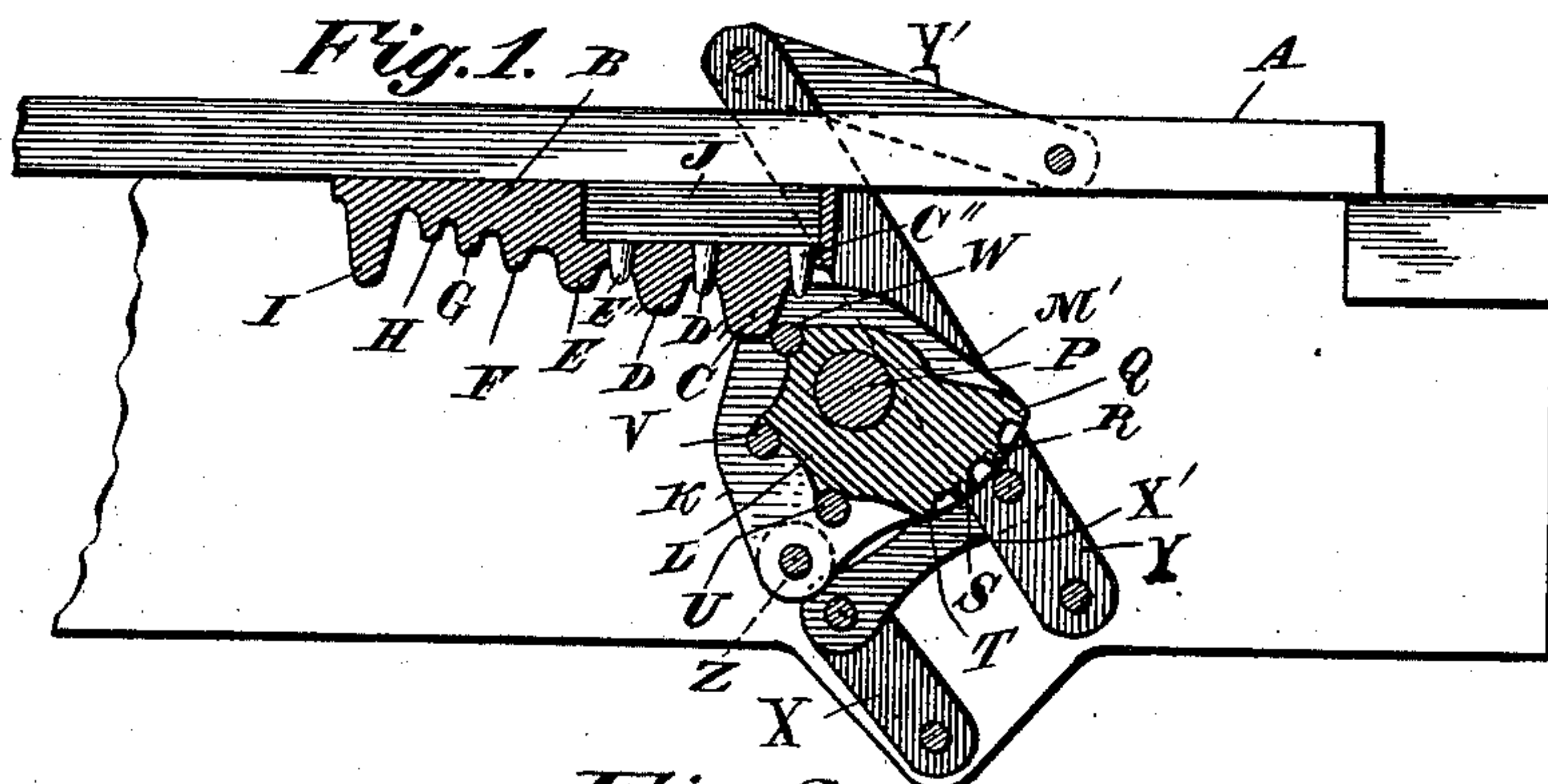


Fig. 2.

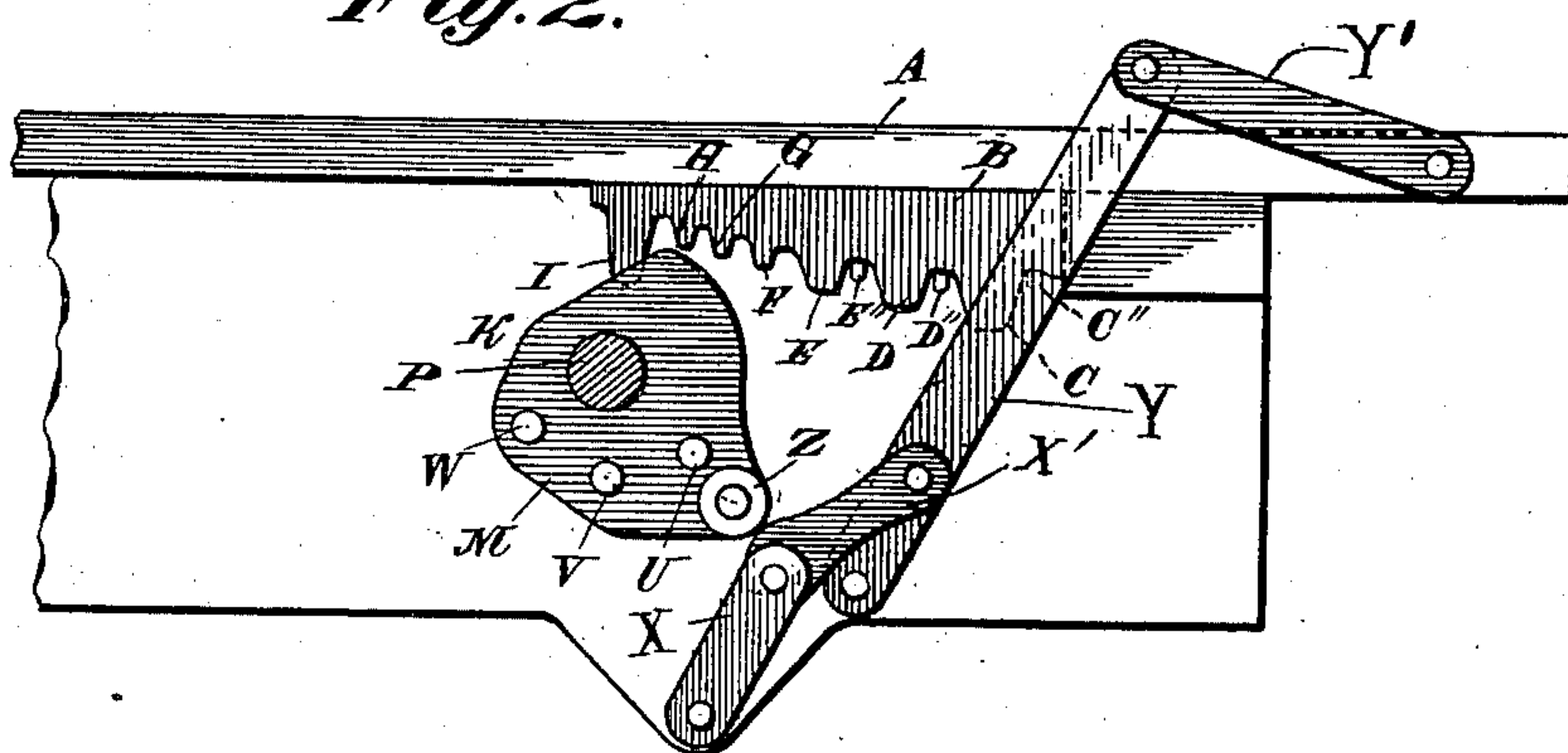


Fig. 4.

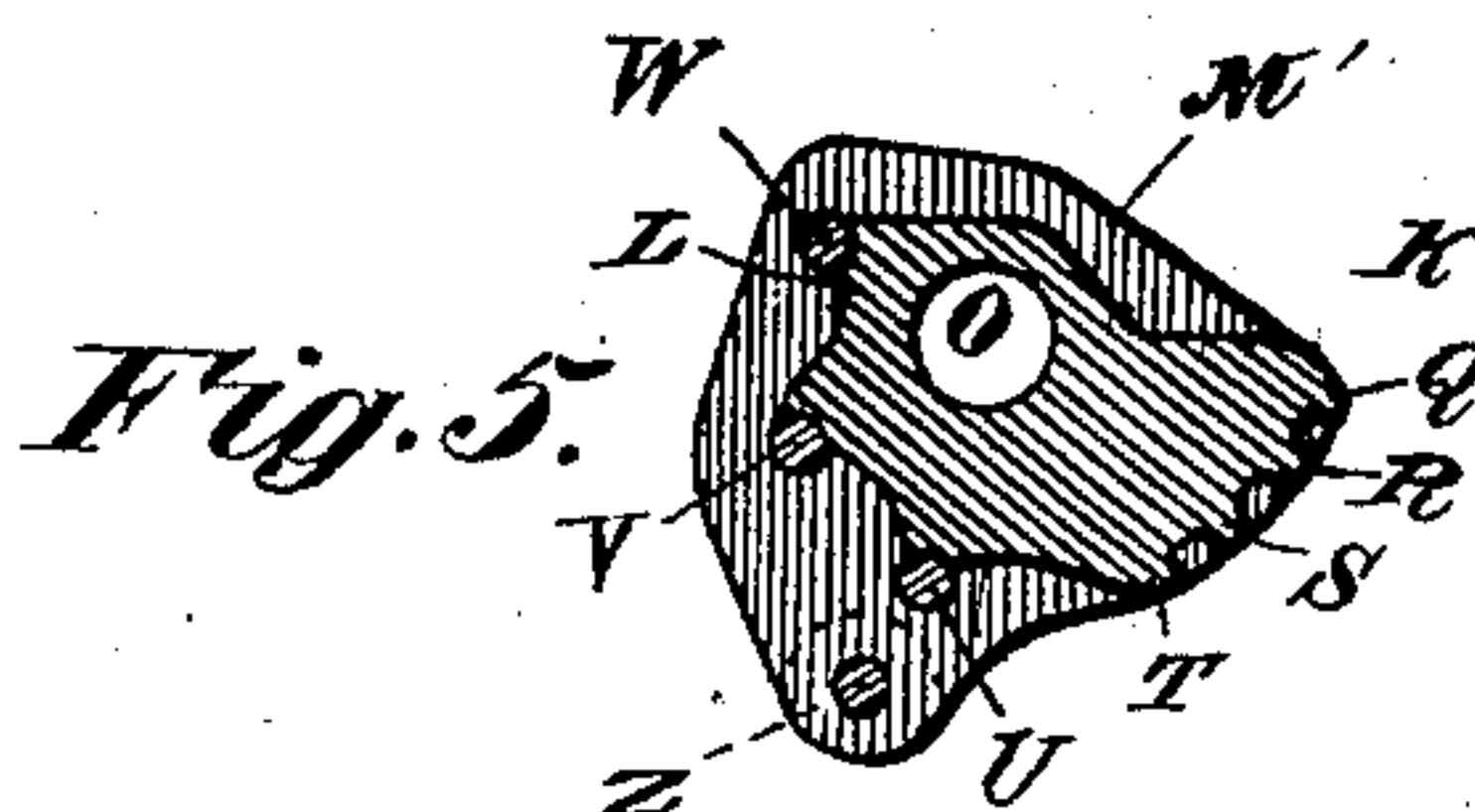
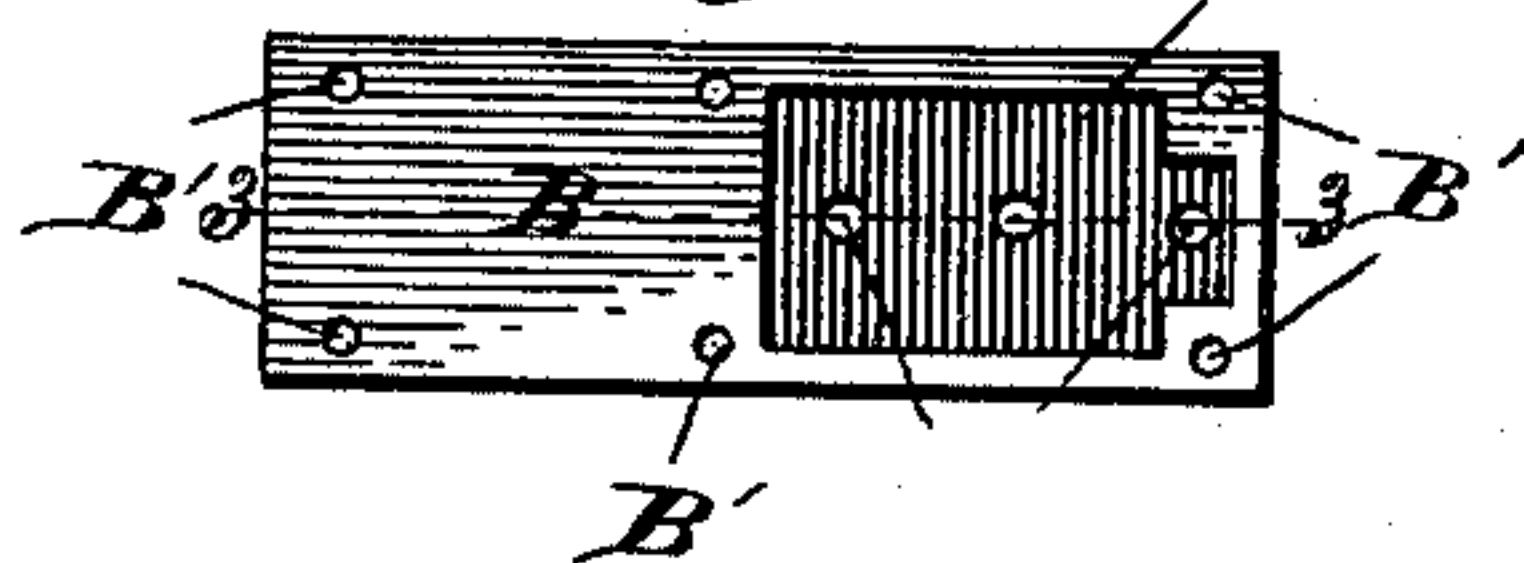


Fig. 6.

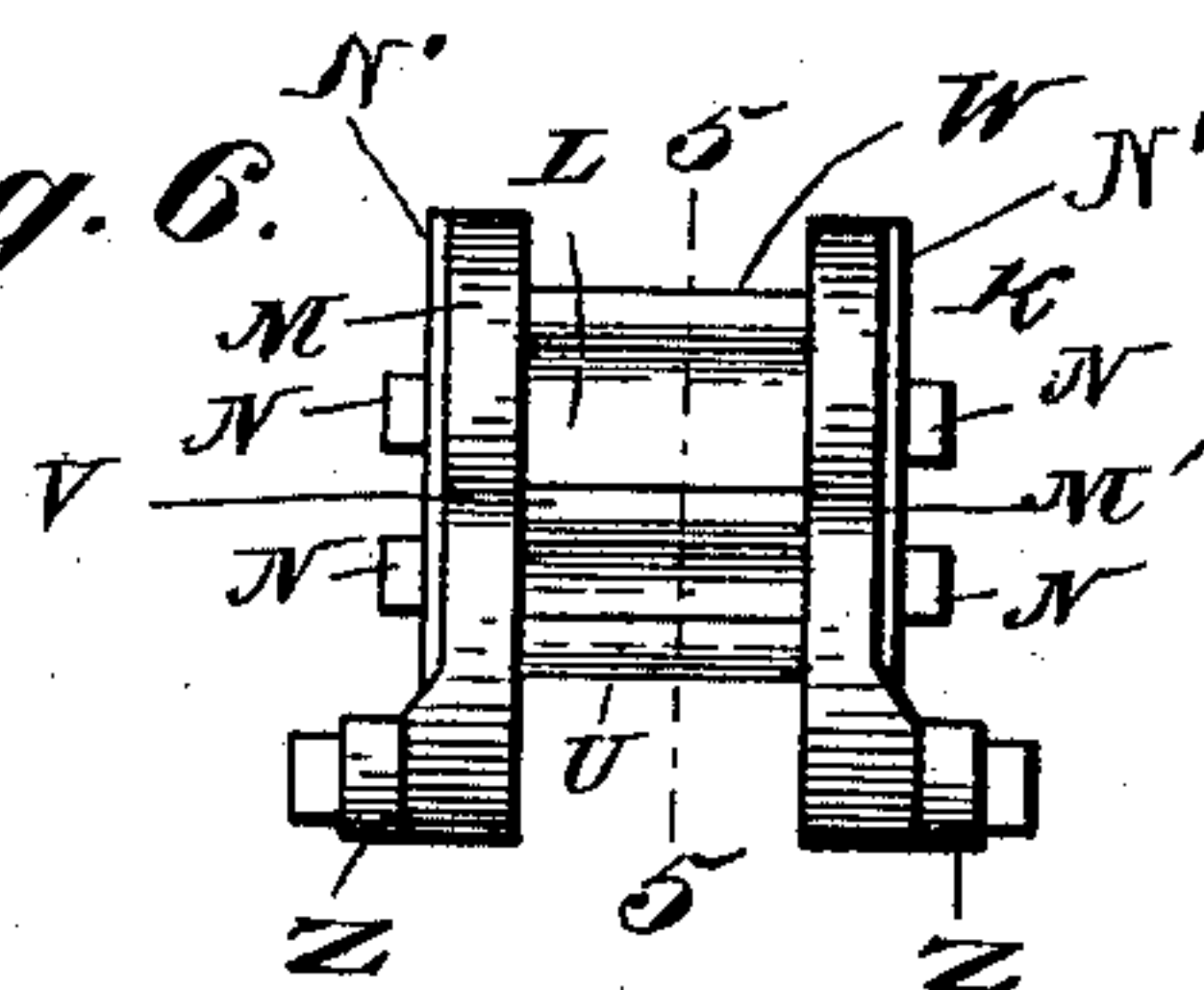
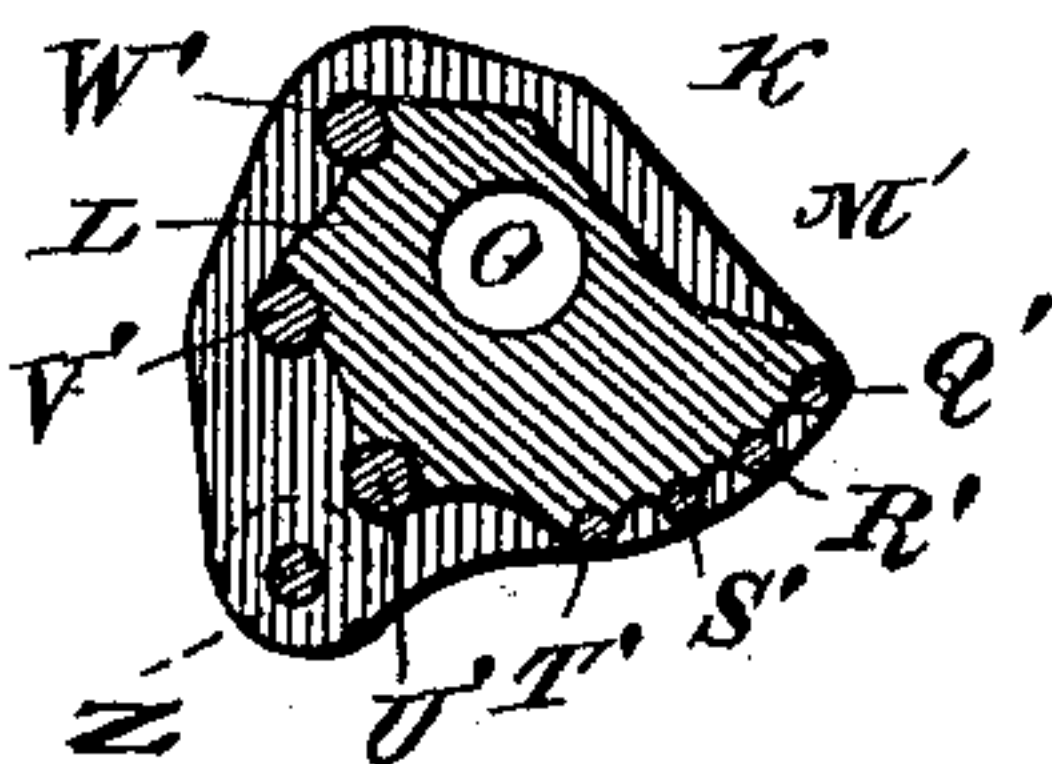


Fig. 7.



Witnesses

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RACK AND PINION.

SPECIFICATION forming part of Letters Patent No. 671,583, dated April 9, 1901.

Application filed October 17, 1899. Serial No. 733,904. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. CARMACK, a citizen of the United States, residing at Dyersburg, in the county of Dyer and State of Tennessee, have invented a new and useful Rack and Pinion, of which the following is a specification.

My invention relates to racks and pinions, and more especially to a certain improved form of rack and pinion intended to convert regular rotary motion into reciprocatory motion in which both the speed and power vary, the object of the invention being to produce an improved rack and pinion of the latter class especially adapted for use in baling-presses, although applicable in other situations.

With this object in view my invention consists in the improved construction, arrangement, and combination of parts hereinafter fully described and afterward specifically pointed out in the claims.

In order to enable others skilled in the art to which my invention most nearly appertains to make and use the same, I will now proceed to describe its construction and operation, reference being had to the accompanying drawings, forming part hereof, in which—

Figure 1 is a sectional view of a rack and pinion constructed in accordance with my invention applied to a plunger in the positions the parts assume at the end of the forward stroke of the plunger. Fig. 2 is a similar view, the parts being in the positions they assume at the end of the return stroke. Fig. 3 is a detail sectional view of the rack on the dotted line 3 3 of Fig. 4, the valves being omitted. Fig. 4 is a top plan view of the rack. Fig. 5 is a detail sectional view of the pinion on the dotted line 5 5 of Fig. 6. Fig. 6 is a view of the pinion in elevation. Fig. 7 is a detail sectional view of a modified form of pinion.

Like letters of reference mark the same parts in all of the figures of the drawings.

Referring to the drawings by letters, A indicates the plunger of the press or other machine in which a reciprocatory movement is required varying in speed and power.

B indicates my improved rack, secured to the under side of the plunger A by means of screws passed through holes B' into the plun-

ger. The rack is provided with teeth C, D, E, F, G, H, and I, depending from its under face, the teeth, except tooth I, gradually decreasing in length and in distance from the top line of the rack, and the teeth C, D, and E are larger and stronger than teeth F, G, and H. The tooth I is much longer than the adjacent tooth H. Channels C', D', and E' lead from a chamber J in the body of the rack into the throats of teeth C, D, and E, and in the throats, at the ends of the chambers, are located upward-opening valves C'', D'', and E''.

K indicates the pinion, composed of a body L and sides M M', the body being secured between the sides by means of bolts N, projecting through outside plates N', and the sides projecting beyond the body, so as to inclose the rack and prevent accidental lateral displacement. The sides and body are provided with an opening O to fit the shaft P, to which the pinion is secured, which shaft will be rotated from right to left by any suitable power. The pinion is provided with teeth Q, R, S, T, U, V, and W, corresponding in location with the teeth of the rack, said pinion-teeth gradually decreasing in distance from the shaft from tooth Q to the tooth W. The teeth may be made either solid or in the form of rollers, a pinion being shown in Figs. 1, 2, and 5 in which Q, R, S, and T are solid teeth, and U, V, and W rollers, while in Fig. 7 all the teeth Q' R' S' T' U' V' W' are in the form of rollers, journaled in sides M M' and held against endwise displacement by the outside plates N'.

X indicates a bar pivoted to the frame of the machine; X', a link pivotally connected to its outer end; Y, a bar pivoted to the frame and connected to bar X by link X', and Y' a link connecting bar Y with the plunger A. The bars X Y and X' and Y' are only incidentally shown to illustrate a means whereby the return stroke of the plunger is effected and form no part of the present invention, being illustrated and described in a pending application by me for Letters Patent for a baling-press and claimed therein.

On the outside of sides M M' of the pinion K are rollers Z, which contact with bar X' to effect the return stroke.

In the operation of my invention, supposing the plunger to be at the end of its return stroke, the tooth I will be in position to be en-

gaged by tooth Q, which will insure engagement of the rack and pinion. The tooth Q will now engage in the throat between teeth I and H, and the gradually-decreasing teeth
 5 R, S, T, U, V, and W of the pinion will consequently engage the gradually-increasing teeth H, G, F, E, D, and C of the rack and force the plunger forward with decreasing speed and increasing power. As soon as
 10 teeth C and W have passed out of engagement and during the time that part of the pinion between teeth W and Q is moving past the highest point in the revolution of the pinion (said portion of the pinion being nearer the
 15 shaft than the teeth) the rack and pinion will be disengaged, and the rollers Z will press the return-bars X and Y backward very quickly, carrying the plunger with them and bringing the tooth I of the rack again into
 20 position to be engaged by the tooth Q to begin the next forward stroke. The teeth U, V, and W, engaging in the throats of teeth C, D, and E, will press the valves C'', D'', and E'' upward, opening them and permitting a
 25 small quantity of oil to pass from chamber J through channels C', D', and E' to lubricate the teeth, thus preventing undue friction and wear.

From the foregoing it will be obvious that I
 30 have provided an improved rack and pinion which by reason of the peculiar construction thereof will occupy the greater part of the revolution of the pinion in forcing a plunger forward with decreasing speed and increasing
 35 power, a movement much to be desired in such machinery as baling-presses, will be out of engagement with each other for the balance of the revolution to permit a quick-return mechanism to act, will always be in po-
 40 sition to insure engagement of the teeth at the beginning of the forward stroke of the rack, and will always keep the teeth lubricated.

While I have specifically described the construction of the various parts, it will be readily
 45 understood that minor changes might be made in such constructions without departing from the spirit and scope of my invention.

Having thus fully described my invention,
 50 what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The cam-pinion herein described comprising a body provided with projecting end flanges, a series of friction-rollers journaled
 55 in said end flanges at gradually-increasing distances from the center and a series of teeth at gradually-increasing distances from the center, substantially as described.

2. The cam-pinion herein described comprising a body with projecting end flanges, a

series of friction-rollers journaled in said end flanges at progressively-increasing distances from the center, and a series of teeth gradually increasing in distance from the center, the tooth farthest from the center having its
 65 forward side extended inwardly in a radial line to a point at substantially the same distance from the center as the nearest roller, substantially as described.

3. The cam-pinion herein described comprising a body provided with end flanges, a series of teeth at gradually-increasing distances from the center, the tooth farthest from the center having its forward side extended
 75 inwardly in a radial line to a point nearer the center than the bottom of its throat, and rollers journaled in the end flanges in advance of the series of teeth leaving a blank space between the rollers and the teeth, substantially as described. 80

4. The pinion herein described, comprising end flanges and a body between the flanges, a series of rollers journaled in the flanges at gradually-increasing distances from the center and end plates secured outside the flanges
 85 to prevent endwise displacement of the rollers, substantially as described.

5. The plunger-rack herein described, comprising a long end tooth, and a series of teeth of progressively-increasing length, the shortest
 90 tooth being next to the long tooth, substantially as described.

6. The rack provided with teeth on its bottom face, and an oil-reservoir in its upper face, and having oil-ducts leading from the reservoir
 95 into the throats of the teeth, substantially as described.

7. The rack provided with teeth on its bottom face, and an oil-reservoir in its upper face, having oil-ducts leading from the reservoir
 100 to the throats of the teeth, and valves in said ducts, substantially as described.

8. The rack provided with teeth in its bottom face, and an oil-reservoir in its upper face, having oil-ducts leading from the reservoir
 105 to the throats of the teeth, and upward-opening valves in said ducts, substantially as described.

9. The combination with the rack having oil-ducts discharging into the throats of the
 110 teeth, of valves in said ducts projecting into the throats, and held normally closed, and a pinion having teeth adapted to engage in the throats and open the valves, substantially as described.

JOHN W. CARMACK.

Witnesses:

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