

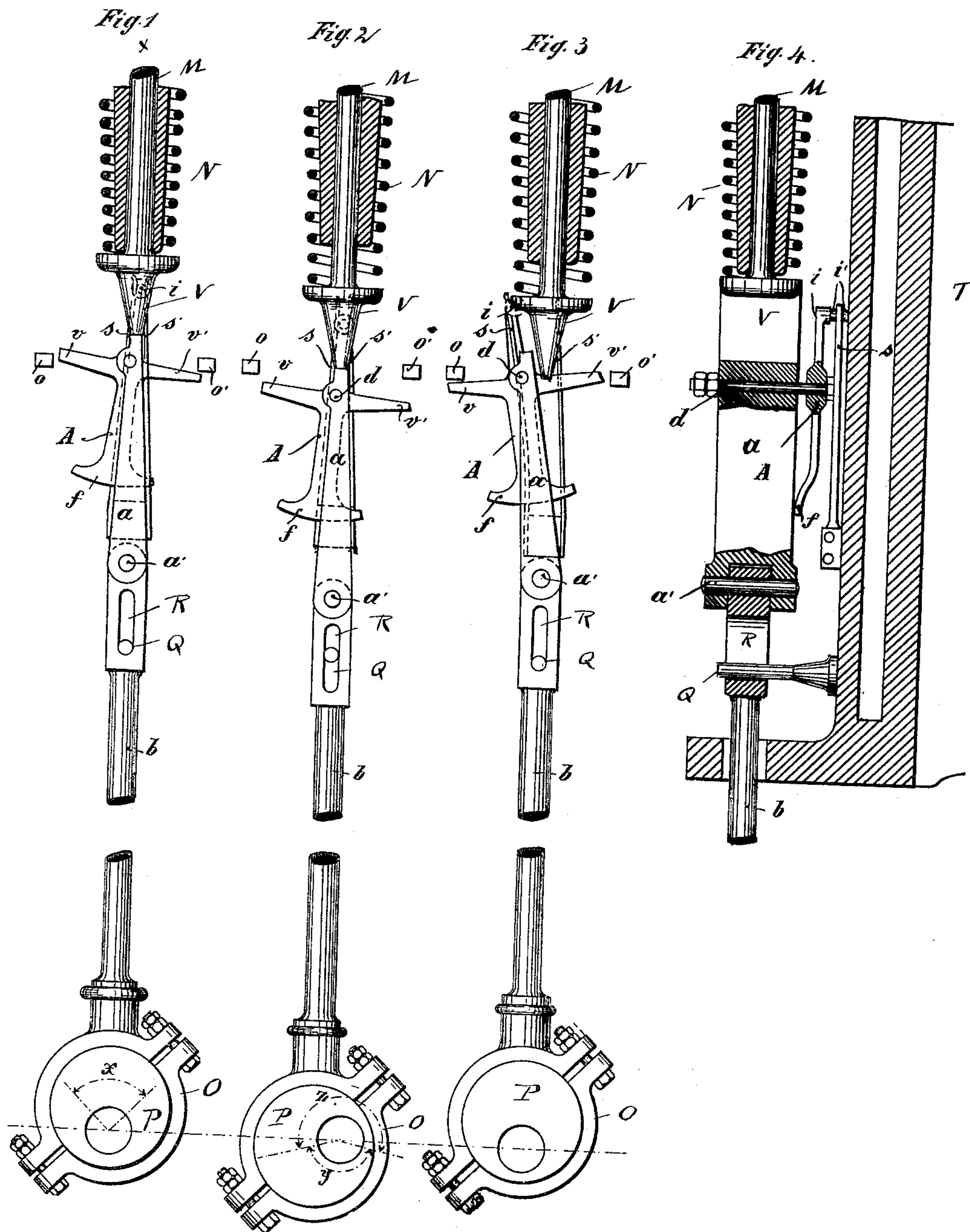
(No Model.)

2 Sheets—Sheet 1.

E. CAPITAINE.
VALVE GEAR FOR GAS ENGINES.

No. 410,729.

Patented Sept. 10, 1889.



Witnesses:
Henry Huber
Carl Kapp

Inventor
Emil Capitaine
by Louis Pagenex
Attorneys

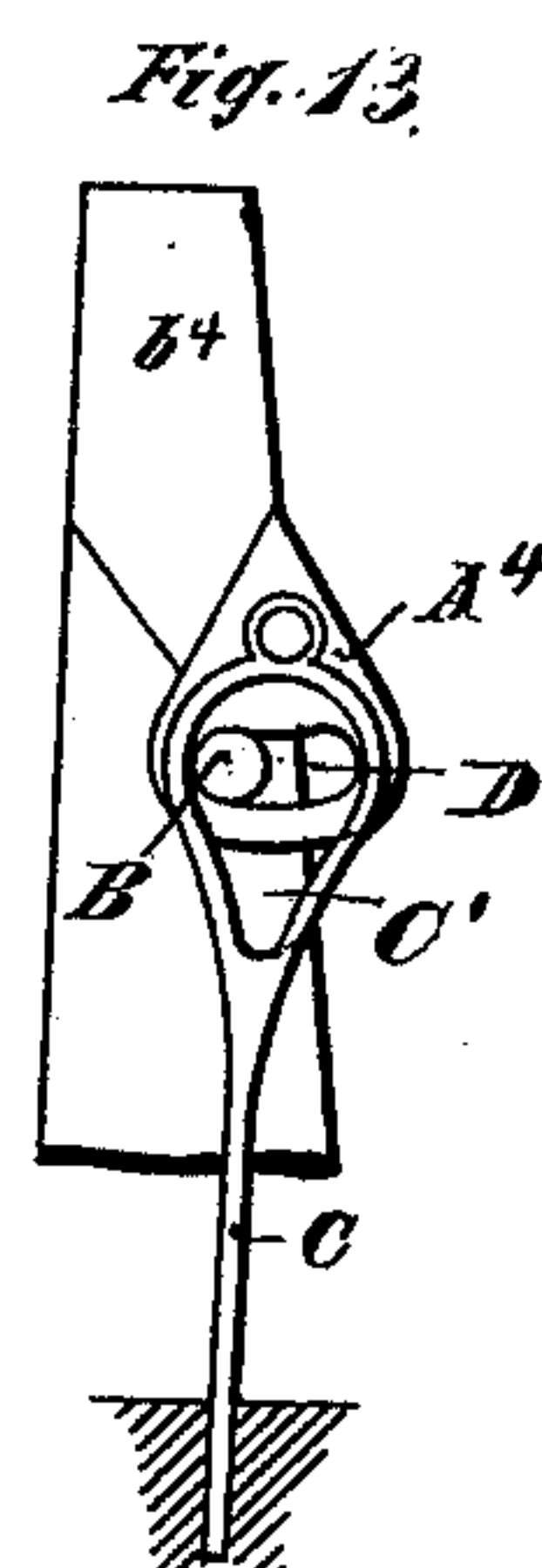
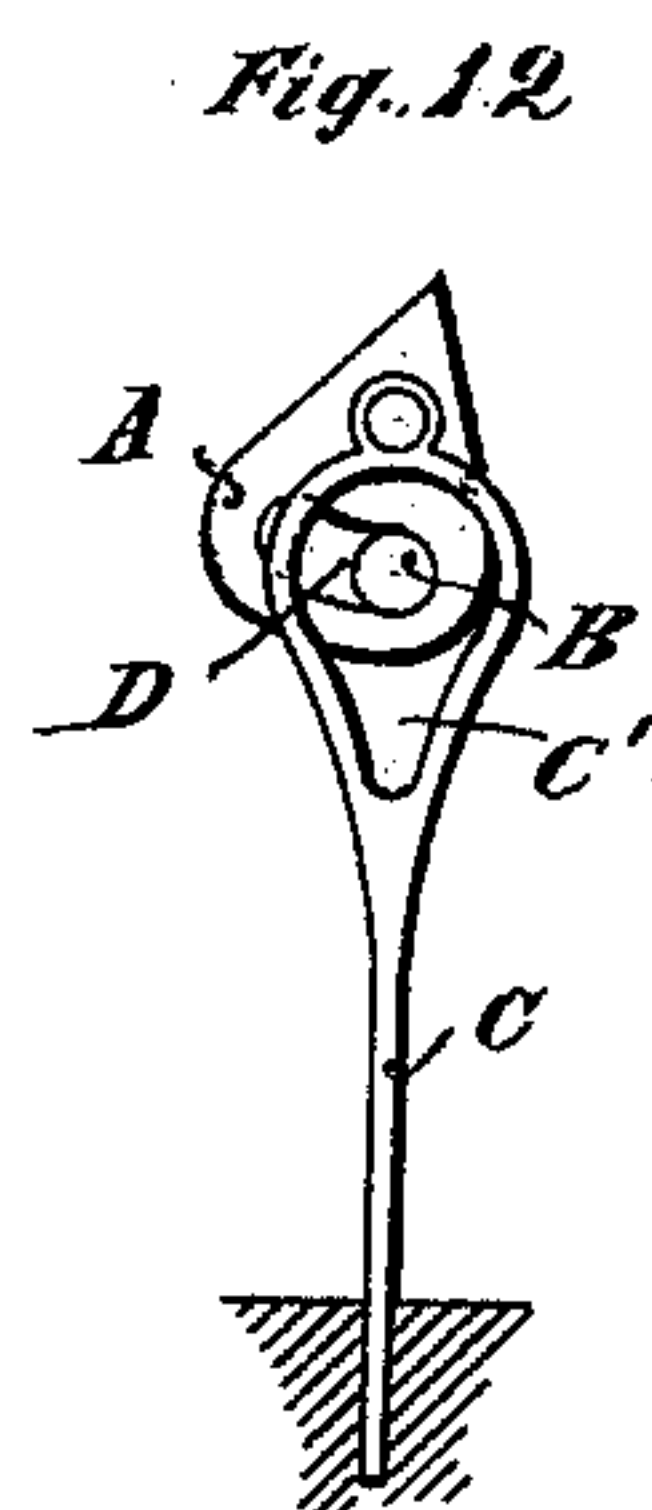
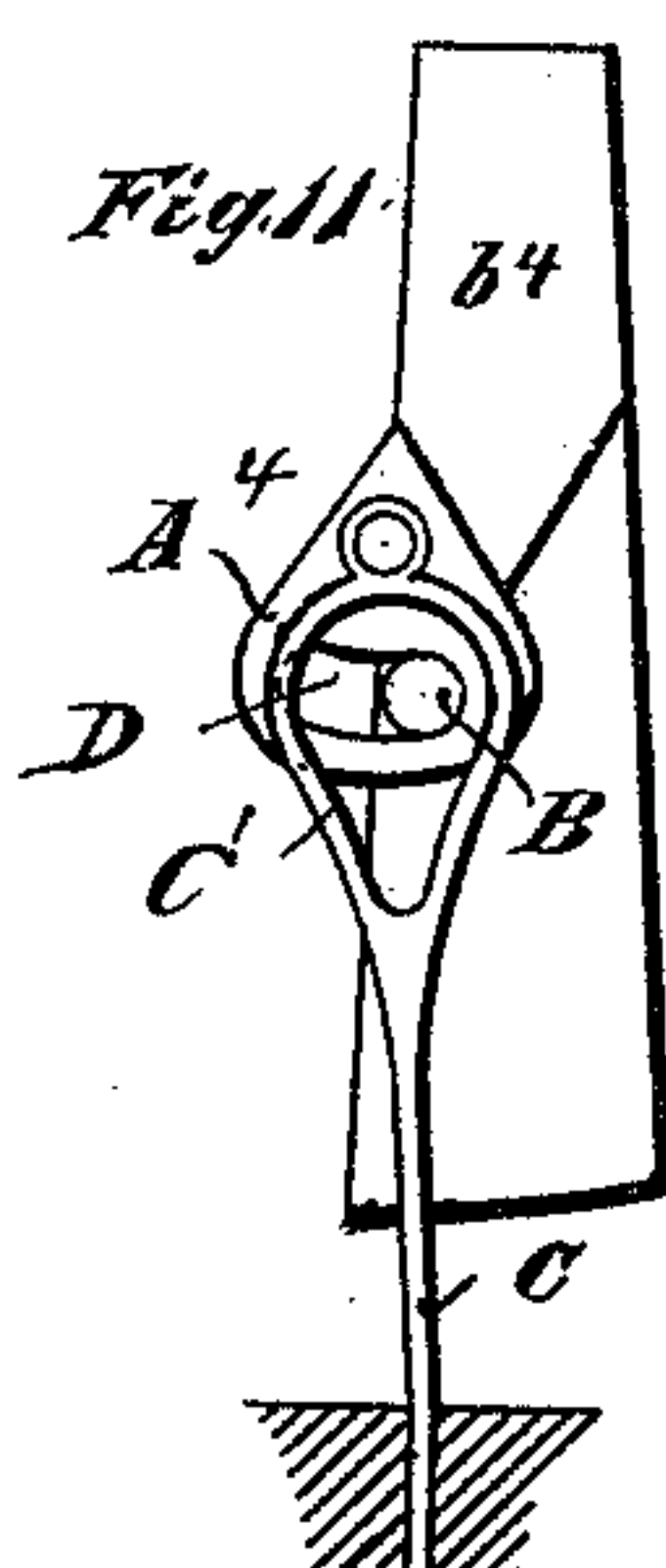
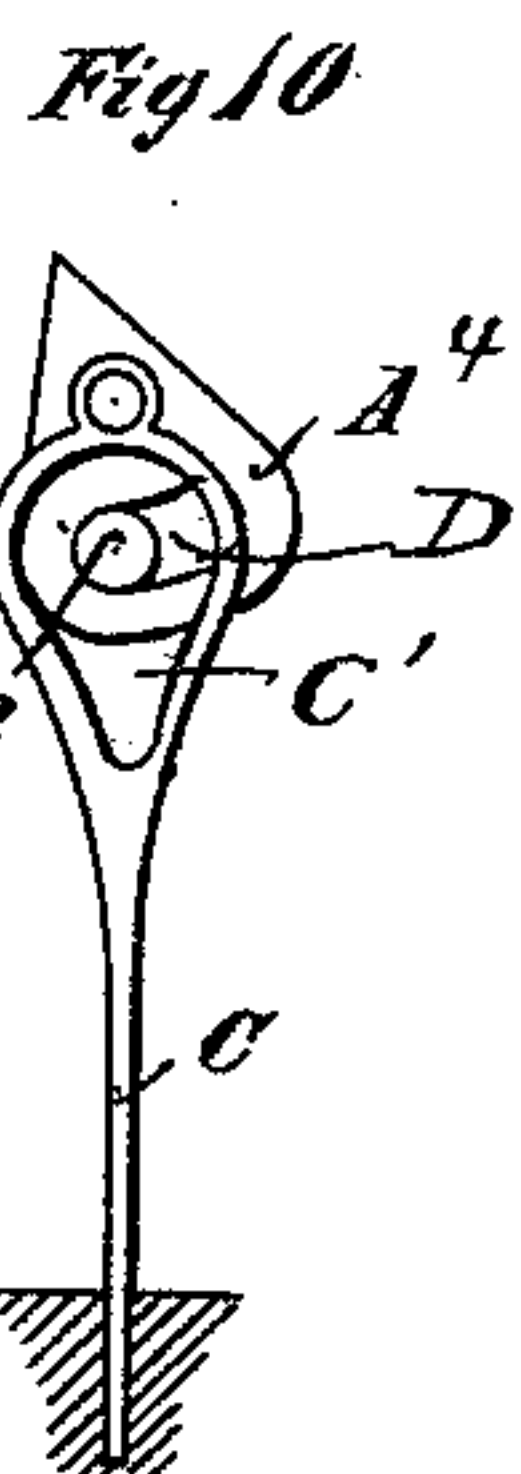
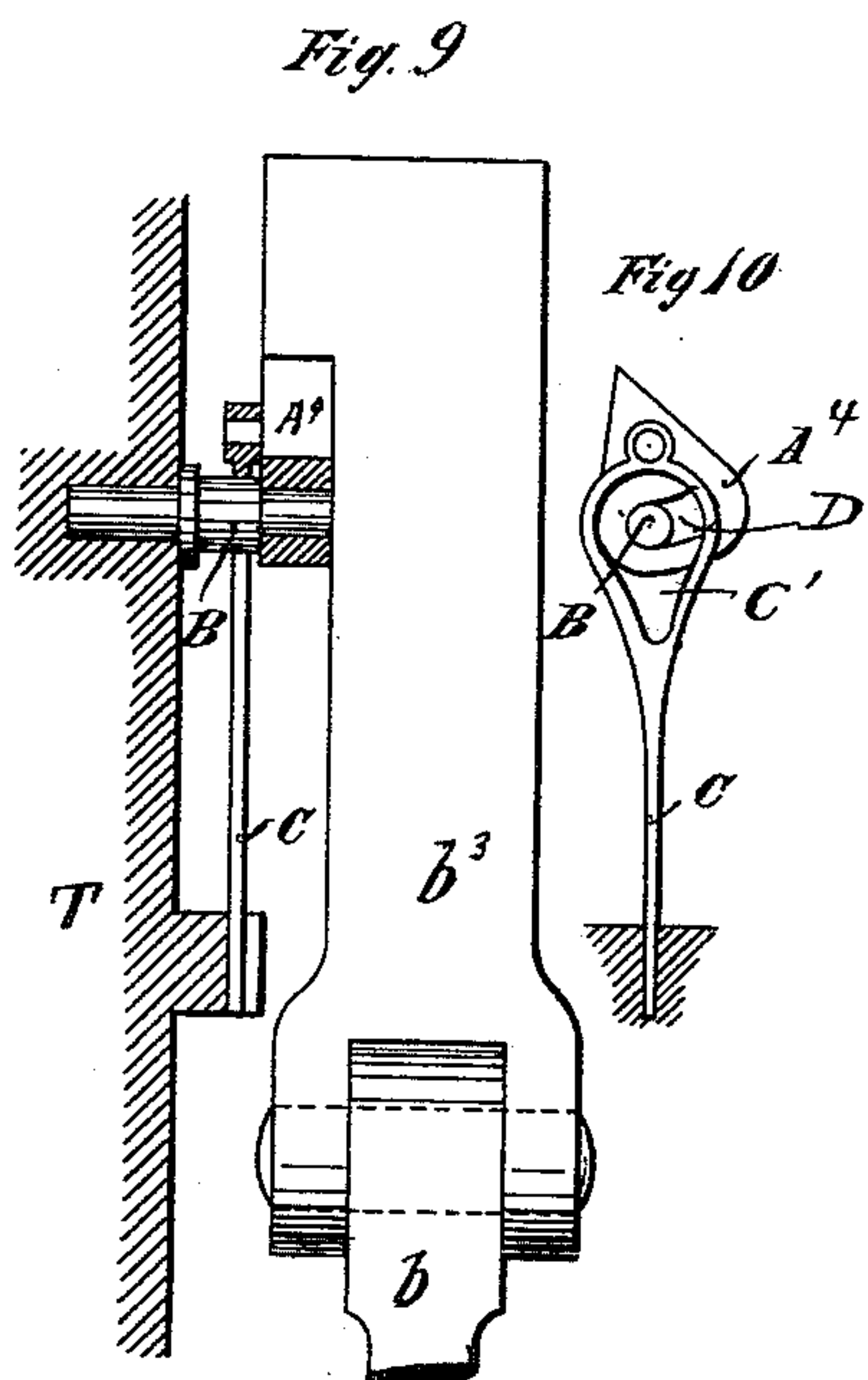
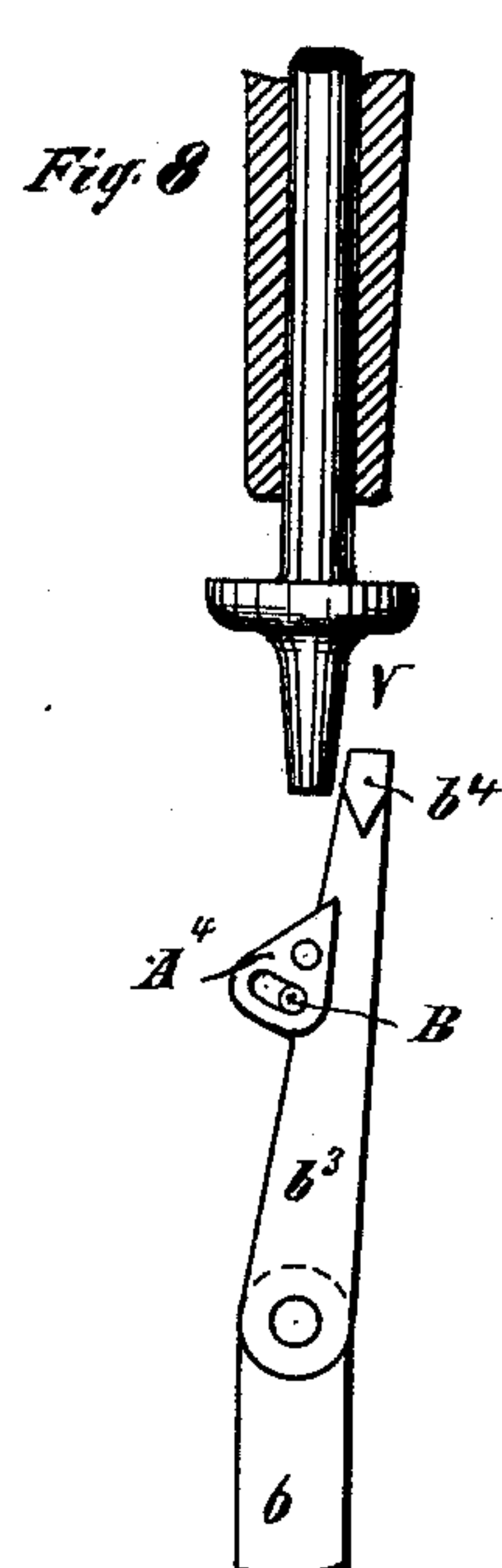
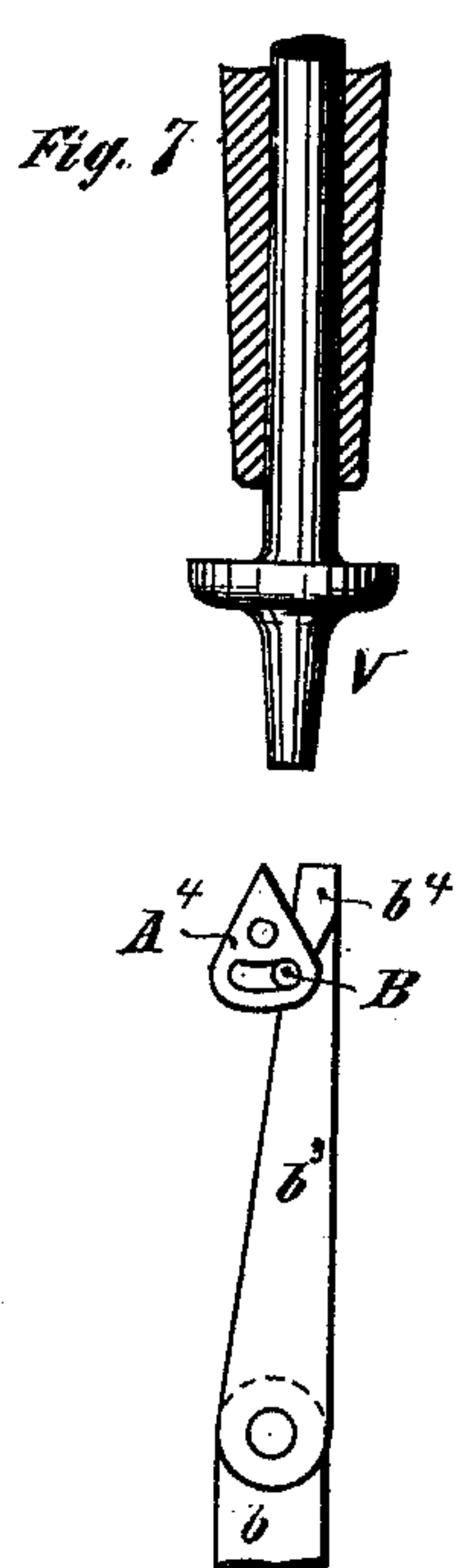
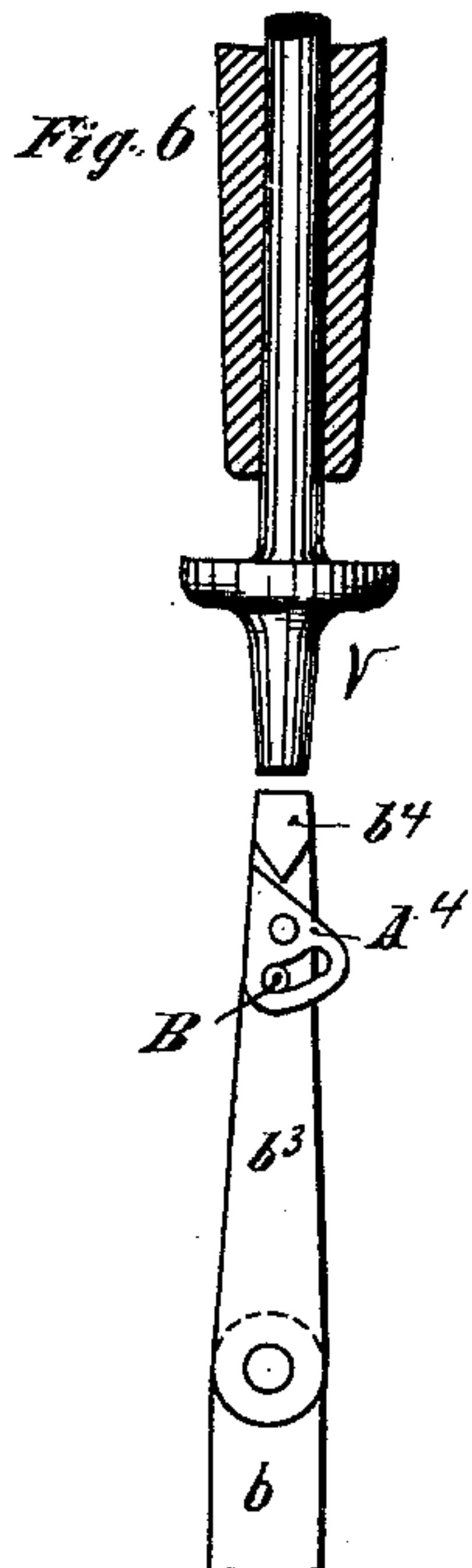
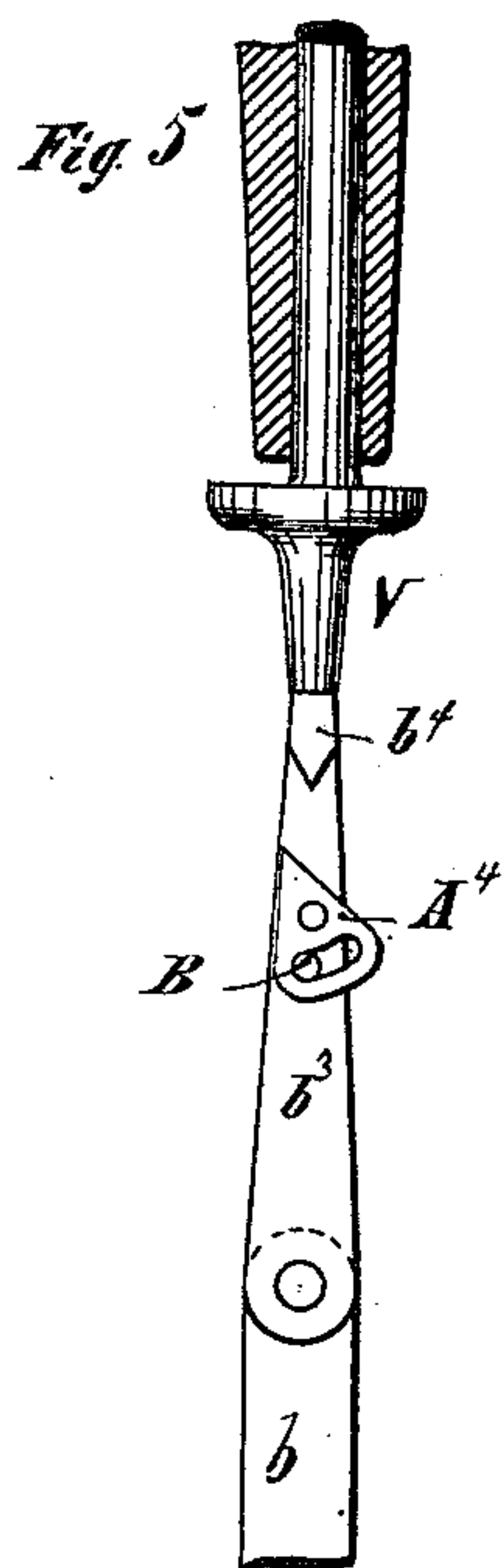
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2 Sheets—Sheet 2.

E. CAPITAINE.
VALVE GEAR FOR GAS ENGINES.

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Henry Huber
Carl Karp

Inventor
Emil Capitaine
by *Georg Rechner*
Attorneys.

UNITED STATES PATENT OFFICE.

EMIL CAPITAINÉ, OF BERLIN, GERMANY.

VALVE-GEAR FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 410,729, dated September 10, 1889.

Application filed November 28, 1888. Serial No. 292,072. (No model.) Patented in Germany February 4, 1888, No. 44,409.

To all whom it may concern:

Be it known that I, EMIL CAPITAINÉ, a subject of the German Emperor, and a resident of Berlin, in the Kingdom of Prussia and German Empire, have invented certain new and useful Improvements in Valve-Gears for Gas-Engines, (for which Letters Patent No. 44,409, dated September 10, 1888, protection beginning February 4, 1888, were issued in Germany,) of which the following is a specification.

This invention relates to a new and improved valve-gear for gas-engines of that class in which an explosion takes place for every two revolutions of the main shaft or every four strokes of the piston.

The object of my invention is to provide a new and improved valve-operating gear which is simple in construction, adjusts itself automatically to operate the valve at the proper time, and dispenses with the use of noisy cog-wheels.

In the accompanying drawings, Figures 1, 2, and 3 are elevations of my improved valve-operating gear for gas-engines, showing parts in different positions, some parts being in section and others broken out. Fig. 4 is a vertical transverse sectional view on line *xx*, Fig. 1. Figs. 5, 6, 7, and 8 are elevations of a modification, showing the parts in different positions, parts being in section. Fig. 9 is an enlarged vertical transverse sectional view of this modified construction. Figs. 10, 11, 12, and 13 are detail elevations showing the different positions of the spring and heart-cam.

Similar letters of reference indicate corresponding parts.

The valve-spindle M is acted upon by a spiral spring N, which presses it downward. The reciprocating rod *b* is connected with a band O, surrounding the eccentric-disk P. The guide-pin Q passes into a longitudinal guide-slot R of the rod *b*.

A laterally-swinging arm *a* is pivoted by a pivot *a'* to the upper end of the rod *b*. Near the upper end of said hinged part *a* a pivot *d* passes through it from front to rear, and on the inner end of said pivot *d* a lever A is mounted to rock, which is provided at its lower end with an enlargement *f*, forming a friction-spring bearing against the rear edge of the hinged part *a*.

The lever A is provided with two laterally-projecting arms *v' v'*, the ends of which can strike against the fixed projections *o* and *o'* on the cylinder T.

The upwardly-projecting arm *i* of the lever A carries the pin *i'*, provided with an anti-friction roller, and is located between two flat springs *s* and *s'*, secured to the cylinder and projecting upward.

The valve-stem M is provided on its lower end with a tapering head V.

When the rod *b* moves upward, the upper end of the hinged part *a*, which is in line with the rod *b*, abuts against the lower end of the head V and presses the same and the valve-stem upward, compressing the spring N. During the upward stroke of the rod *b* the arm *v'* strikes against the projection *o'*, whereby the lower end of the lever A is swung to the left and the upper end, carrying the anti-friction roller, to the right, and the said anti-friction roller, acting on the spring *s'*, presses the upper end of the same to the right. Attention is here called to the fact that the friction of the spring part *f* on the rear edge of the hinged part *a* is so regulated as not to be overcome by the springs *s* and *s'*. When the rod *b* moves downward to its lowest position, the end of the hinge-piece *a* leaves the end of the tapered head V, and the spring *s'*, the upper end of which has been bent to the right by the anti-friction roller on the lever A, now acting on said roller, swings the lever A and the hinged piece *a*, on which the lever A is held in place by the friction-spring *f*, toward the left, so that when the rod *b* rises again the upper end of the hinged part *a* will not abut against the lower end of the tapered head V, but will slide up on the side of said head, as shown in Fig. 3, and thus will not operate the valve. When the rod *b* has completed its upward stroke, the arm *v* strikes against the projection *o*, whereby the lever A is swung in such a manner that its lower end is moved to the right and its upper end to the left, thereby bringing the left-hand spring *s* in tension. When the rod *b* descends, the spring *s*, which has been brought in tension, as described, swings the lever A back into vertical position, so that when the rod *b* again rises the upper end of the hinged piece *a* will abut against the bottom of the head V and lift the valve-

stem, and so on alternately. It thus follows that for one upstroke of the rod *b* the valve will be operated and will not be operated by the following upstroke, and so on.

5 In the construction shown in Figs. 5 to 13 the part *b*³ is hinged to the upper end of the reciprocating rod *b*, which is operated by the eccentric, and said part *b*³ is provided at its upper end on one edge with a head *b*⁴, having
10 its lower end made V-shaped. A spring C is fixed at its lower end on a projection of the cylinder T, and is provided at its upper end with an enlargement C', through which a pivot B, projecting from the cylinder, can pass. On
15 the upper end of the spring C an inverted heart-cam A⁴ is pivoted, which is provided at its lower end with a segmental slot D, into which the pin B projects.

The operation of this construction is as follows: When the hinged part *b*³ is in line with the reciprocating rod *b*, as shown in Fig. 5, and said rod *b* moves upward, the upper end of the hinged part *b*³ will abut against the tapered head V on the lower end of the valve-rod and press said valve-rod upward. As
25 shown, the V-shaped head *b*⁴ is now some distance above the cam A⁴. As the rod *b* descends the left-hand side of the V-shaped bottom edge of the head *b*⁴ strikes the heart-cam
30 A⁴ and swings the same into the position shown in Figs. 7 and 11, whereby the spring C is bent to the left and the hinged part *b*³ is swung to the right, so that when the rod *b* again rises the hinged part *b*³ will be so inclined that it cannot abut against the lower
35 end of the head V, as shown in Fig. 8, and thus the valve will not be operated during this upstroke of the rod *b*. The spring C has straightened in the meantime and assumes the position shown in Fig. 12, whereby the heart-cam
40 A⁴ is drawn from the position shown in Fig. 7 to the position shown in Figs. 8 and 12. As the rod *b* descends the point of the head *b*⁴ engages the point of the heart-cam A⁴, the heart-
45 cam A⁴ and the head *b*⁴ having the position

shown in Fig. 13, the upper end of the spring C being bent to the right and the hinged part *b*³ being in vertical position. If now the rod B moves upward, its upper end can abut against the lower end of the head V on the valve-stem. The spring C straightens and thereby its upper end is moved to the left, and the heart-cam A⁴ is again brought into the position Fig. 10, which corresponds to its position shown in Fig. 5, when the above-described operation can repeat itself, and so on.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In valve-gear for gas-engines, the combination, with a valve-stem and a reciprocating rod, of a hinged piece on the end of the reciprocating rod, which hinged piece is adapted to act on the valve-stem, and a spring-actuated mechanism, substantially as herein described, for inclining the hinged part so that the same will not strike the valve-stem at alternate strokes, substantially as set forth.

2. The combination, with a valve-stem, of a reciprocating rod, a hinged part on the end of said reciprocating rod, a lever pivoted on said hinged part, fixed springs acting on the lever, and fixed stops acting on said lever, substantially as set forth.

3. In a valve-gear, the combination, with a valve-stem, of a reciprocating rod, a hinged part on the end of said reciprocating rod, a lever pivoted on said hinged part and having a spring bearing on the hinged part, said lever also having two opposite arms, fixed springs that can act on said lever, and fixed stops that can act on the arms of said lever, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

EMIL CAPITAINÉ.

Witnesses:

CARL BORNGRAEBER,
BERNH. POERSCHMANN.