

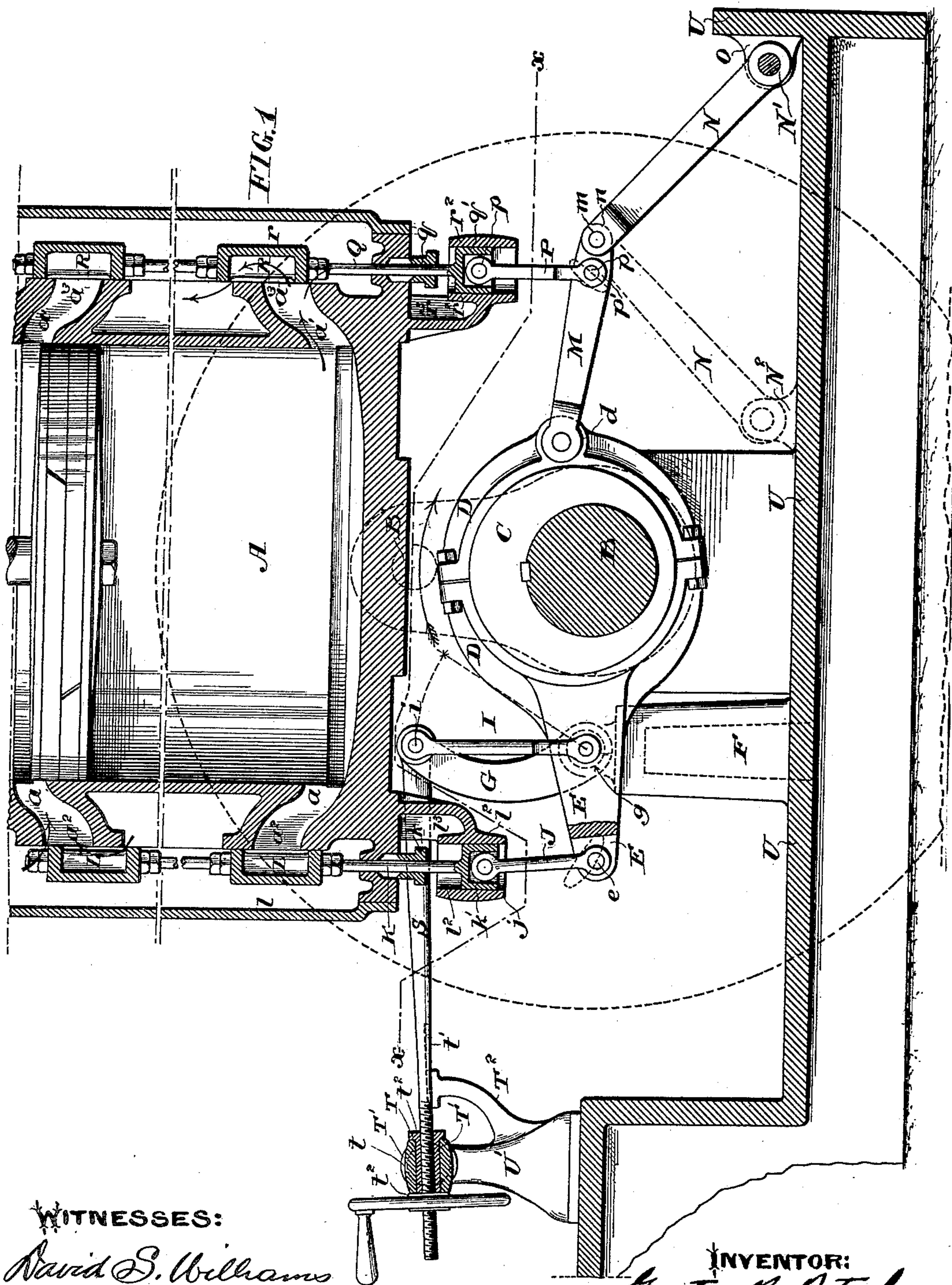
(No Model.)

3 Sheets—Sheet 1.

G. B. PETSCHÉ.
VALVE GEAR.

No. 442,136.

Patented Dec. 9, 1890.



WITNESSES:
David S. Williams
H. W. Harz Pouch

INVENTOR:
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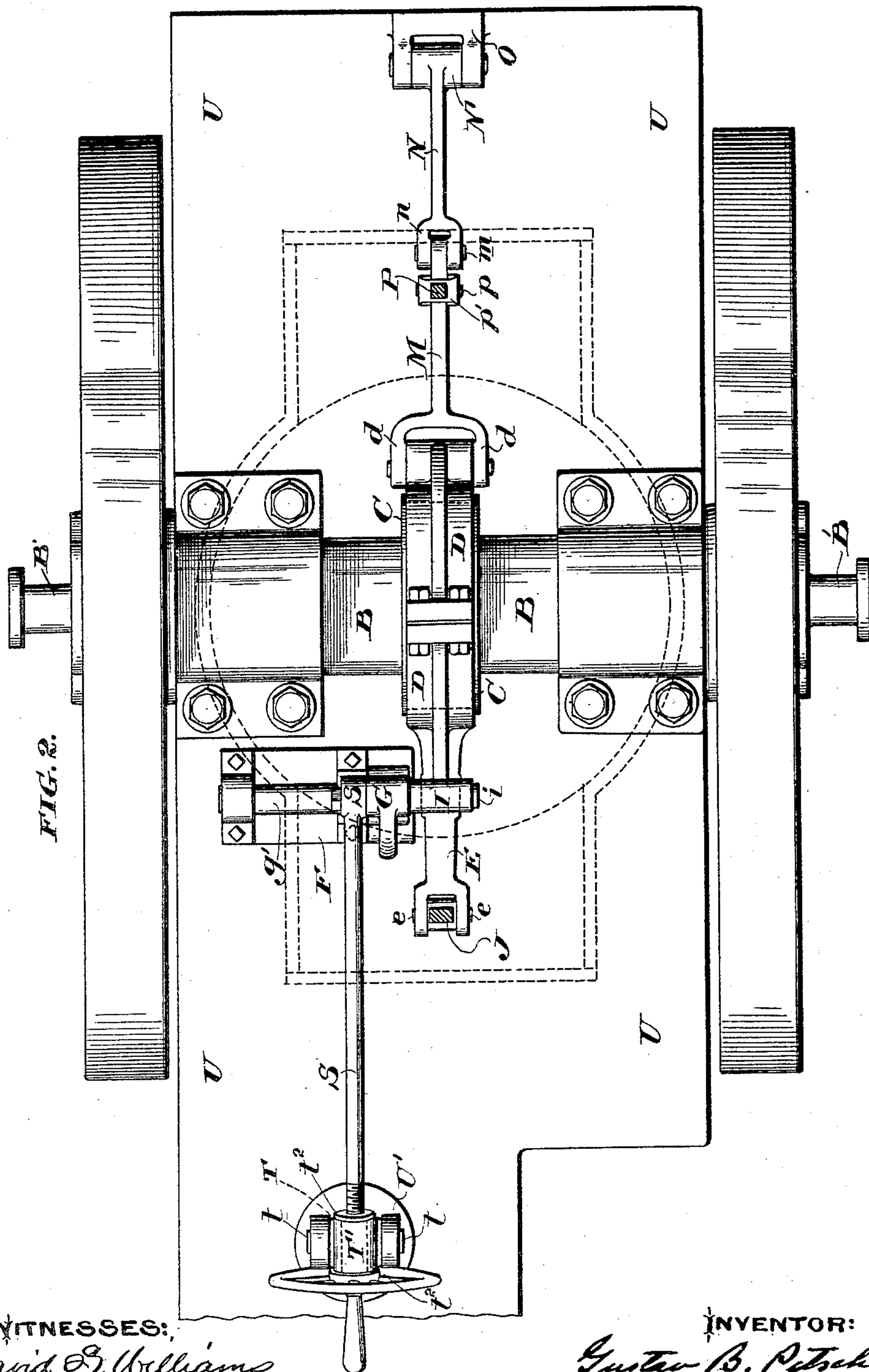
(No Model.)

3 Sheets—Sheet 2.

G. B. PETSCHÉ.
VALVE GEAR.

No. 442,136.

Patented Dec. 9, 1890.



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(No Model.)

3 Sheets—Sheet 3.

G. B. PETSCHÉ.
VALVE GEAR.

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FIG. 3.

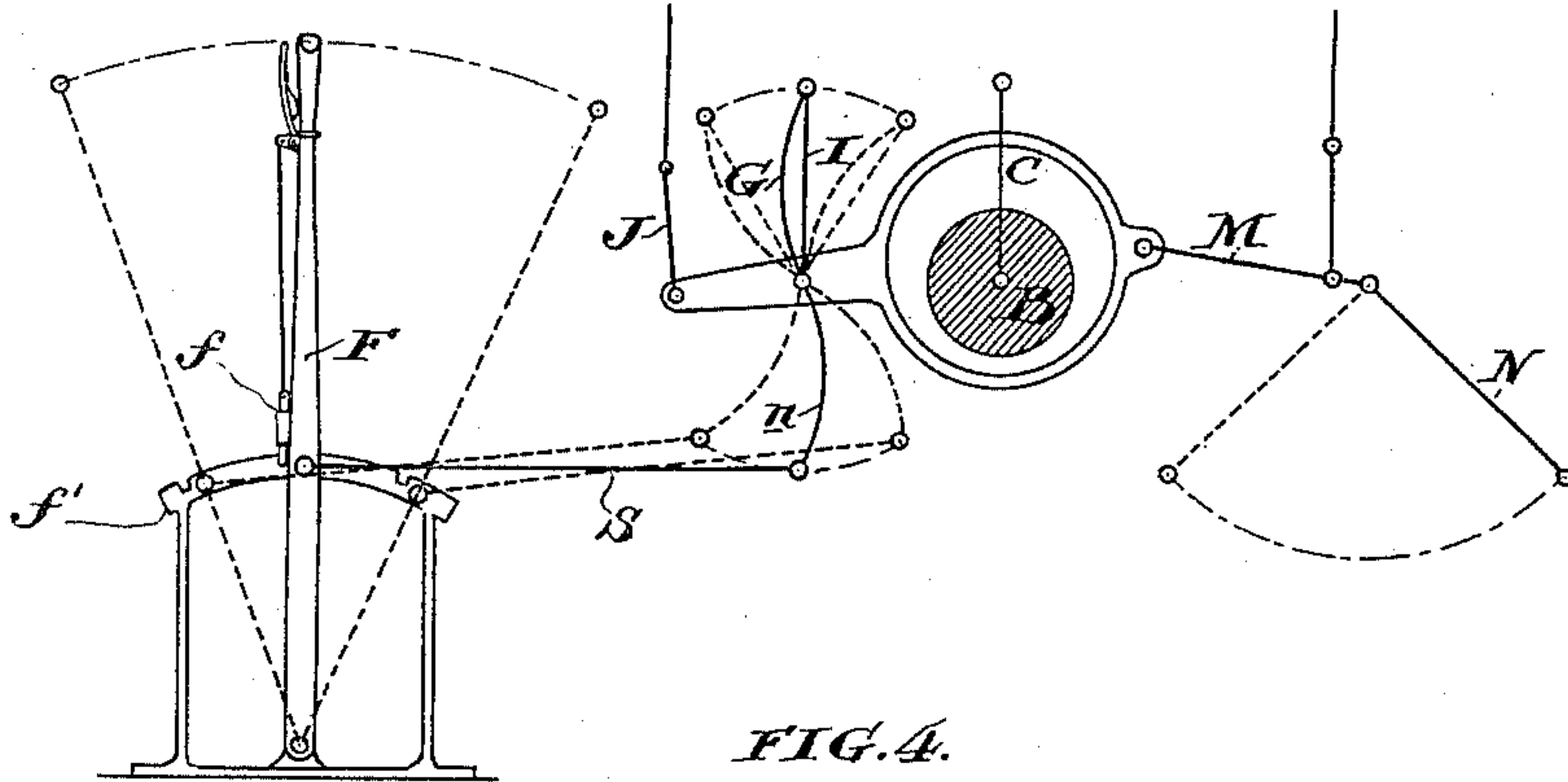


FIG. 4.

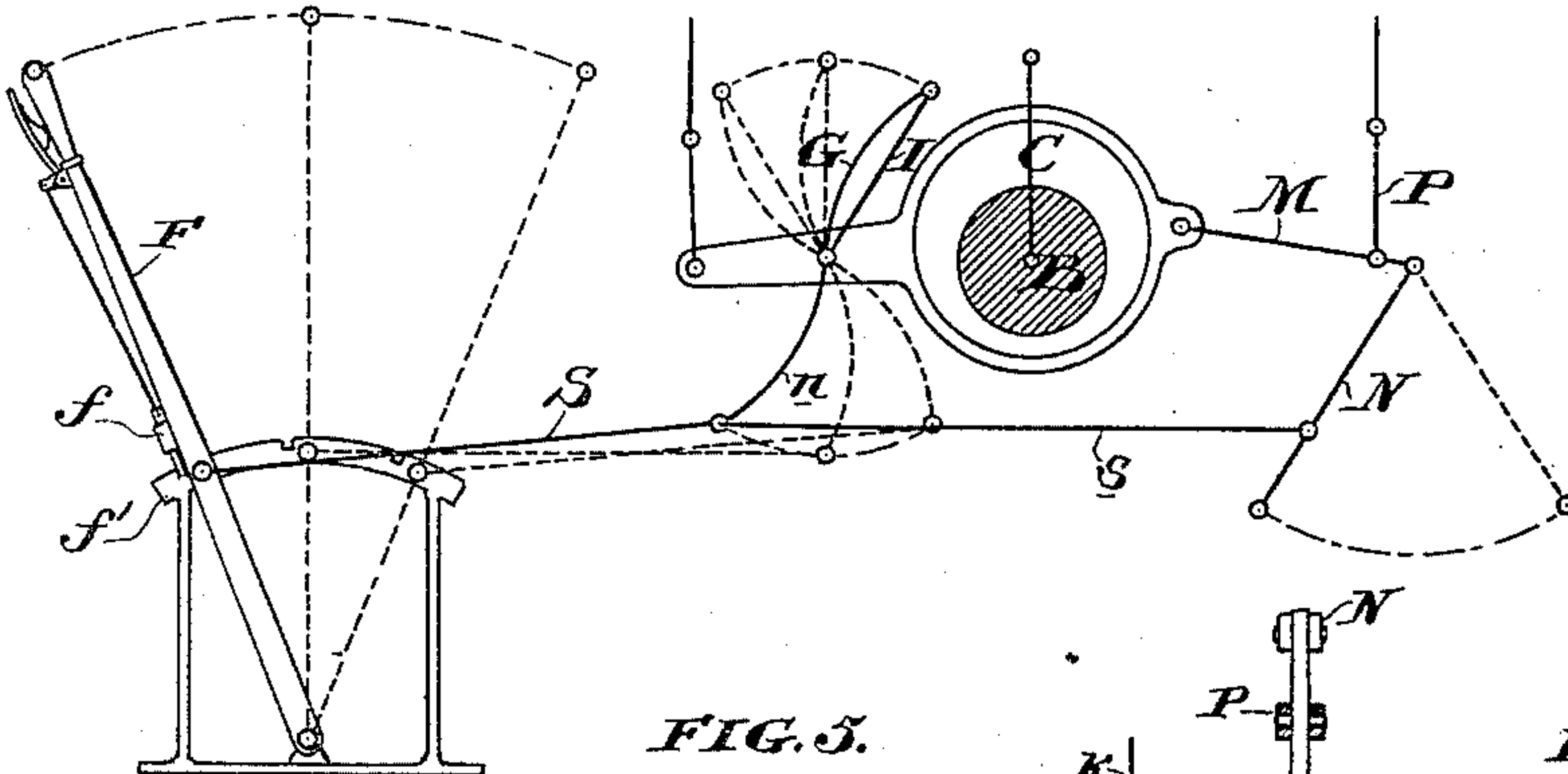


FIG. 5.

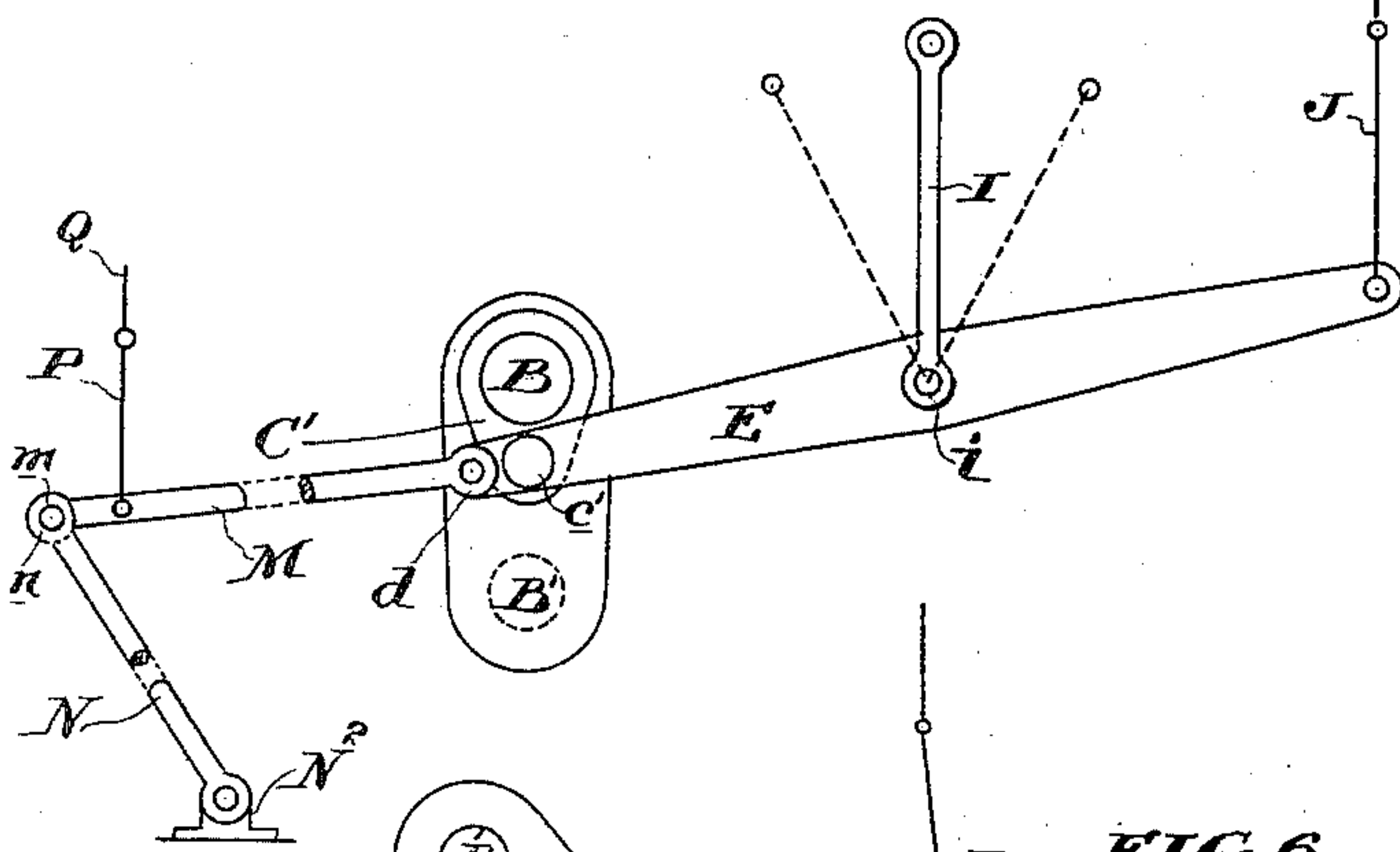


FIG. 5A.

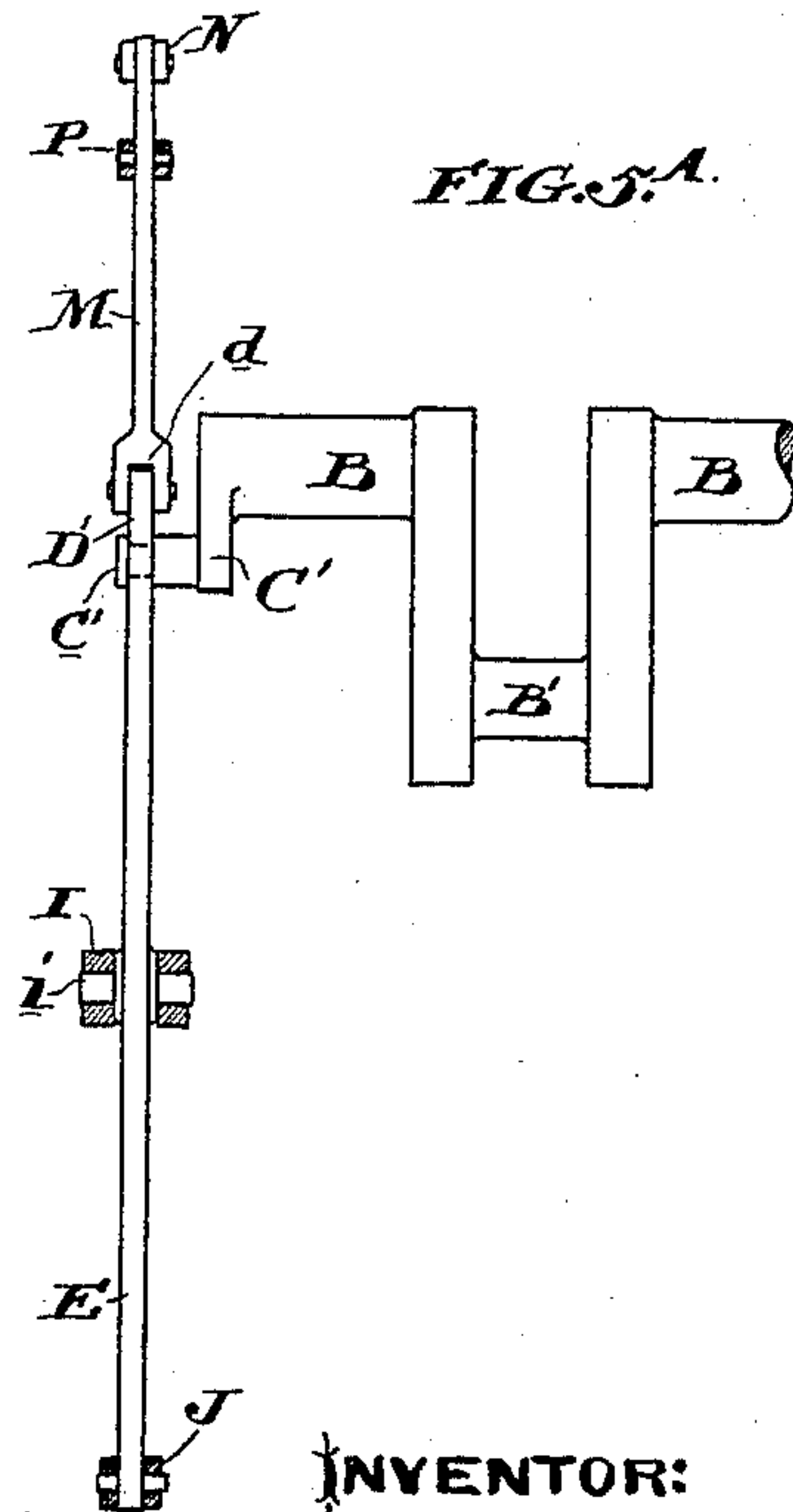
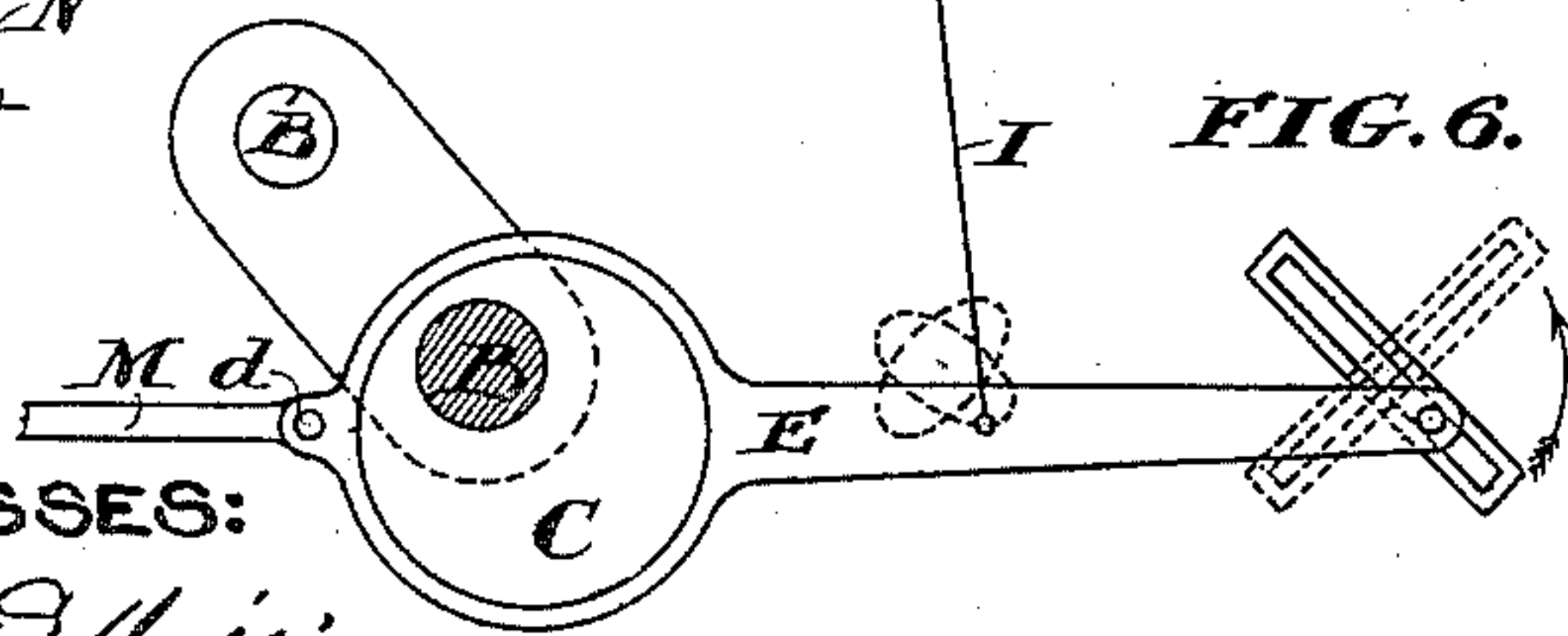


FIG. 6.



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UNITED STATES PATENT OFFICE.

GUSTAV BERNHARD PETSCHÉ, OF PHILADELPHIA, PENNSYLVANIA, AS-
SIGNOR TO THE SOUTHWARK FOUNDRY AND MACHINE COMPANY,
OF SAME PLACE.

VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 442,136, dated December 9, 1890.

Application filed April 8, 1890. Serial No. 347,104. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV BERNHARD PETSCHÉ, a subject of the Emperor of Germany, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Valve-Gears, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My present invention relates to that class of engines in which there are both steam and exhaust valves worked by valve-gearing, and its chief object is to provide novel and improved means to operatively connect both the steam and exhaust valve or valves of an engine of that class to a single eccentric. This not only in a positive way, but also, if desired, so that a single cut-off-controlling mechanism may concurrently operate on both sort of valves; further objects being, should it be desired, to apply my said improved and simplified single eccentric-gearing to an engine as a reversing mechanism as well, and thus to adapt the engine to which it is applied to run in either direction instead of one direction, only like a blowing-engine, to which latter class, however, my gearing, by reason of its compactness, is of especial adaptability and primarily aimed.

The novel features of my invention are fully set forth in the claims concluding this specification, and reference now being had to the drawings accompanying the same, in which similar letters of reference indicate corresponding parts throughout the several figures, they will be found to illustrate my invention as follows:

Figure 1 is a vertical elevation, partially in median section, of a sufficient portion of a non-reversible blowing-engine embodying my present improvement to disclose its association and combination therewith. Fig. 2 is a plan view of the gear proper as disclosed upon the removal of the parts above the off-set broken line xx in Fig. 1. Fig. 3 is a diagram showing how the gearing shown in Fig. 1 may be further combined and operated to effect reversals. Fig. 4 is also a diagram showing a further modification, wherein a

single controlling-lever, through the medium of a throw-rod and operating-levers, may be used to effect the changes incident to reversal in both steam and exhaust valves simultaneously at a single positive operation. Figs. 5 and 5^A are respectively an elevation endwise of the engine-shaft and a plan of a modified form, given fragmentarily, the scale being considerably less than in Figs. 1 and 2; and Fig. 6 is a further modification shown diagrammatically.

In general, in the figures, A represents the cylinder of the engine; aa , the steam-passages connecting either end of the cylinder's bore with the steam-valve ports $a^2 a^2$; $a' a'$, the exhaust-valve passages situated diametrically opposite the former and connecting the cylinder's bore with the exhaust-valve ports $a^3 a^3$.

L L and R R respectively represent the steam and exhaust valves, located within the steam and exhaust chests $l r$; but as they are obviously of the short D-valve duplex sort, each pair arranged tandemwise upon a common continuous connecting-valve stem K Q and thereto secured by shoulders and jam-nuts, they are so familiar and well understood as to need no further explanation here, save only to note, first, that their said stems K Q respectively pass out from the lower ends of the chests, within which they work through packing-glands at k and q , respectively, and have their heads equipped with cross-heads $k' q'$, slidingly fitted to vertically-disposed rectilinear guideways $l^2 l^2 r^2 r^2$, fashioned in preferably integral brackets $l^3 r^3$, depending from the lower face of the chests $l r$, respectively, and also, second, that these valve-stem cross-heads are each chambered and fitted with transverse wrist-pins $j p$, respectively, to effect their connections by the pivotally-attached links J P to the eccentric-gearing next to be set forth.

The crank of the engine is indicated by a broken-line outline, the circle B' denoting its wrist-pin's location in time with the other parts of the device at the terminus of the "up-stroke," as they are primarily shown in Fig. 1. The direction of its travel and also of the eccentric-sheave C, which, like said crank, in

ordinary way attached to or formed integral with the engine-shaft B, is represented by the curved arrow adjoining the circle B', a suitable "lead" being established between them, as is well understood. I further provide the said eccentric-sheave with not only an ordinarily parting eccentric-strap D D, but also contrive and equip the latter with a projecting arm E, extending therefrom toward and at its mid-throw from C to the vicinity of a line lying in the prolongation of the axis of the steam-valve stem K. This arm I provide with a suitable engagement, as the forked end E' and transverse pin *e*, and thereby pivotally attach it to the link J, as aforesaid. The position of the pin *e* or its equivalent is, I find in practice, best if located just within the line of valve-stem K, so that the link J may, when in "timing" and position, as shown in Fig. 1, rake slightly outward or away from the shaft B. Intermediate to this point and the neighboring portion of the eccentric-strap I preferably locate, as upon the projection F of the main frame U, a horizontally-disposed gudgeon-pin *g*. To this pin I attach, by a suitable eye *g'*, a swinging support G, the upper end of which in this instance is shown somewhat above the upper limit of the vertical range of the pin *j*, and there is at *i'*, in turn pivotally connected to a radius-vector link I, which is so suspended therefrom and at or near its lower extremity pivoted to the mid portion of the arm E. (See pivot-pin *i*.) To another point in the eccentric-strap, and preferably diametrically opposite to the arm E, I pivotally attach, as by the eye *d*, a lever M, the opposite end of which lever I further pivotally connect, as by the transverse pin *m* and fork *n n*, to a swinging link N, attached by a gudgeon-block N' to some suitable fixed portion of the general engine-frame. This point of attachment I preferably locate outside or beyond the line of the exhaust-valve stem's play, as shown in Fig. 1, although it may be situate within or to the shaft side of said line, as indicated by a dotted gudgeon at N², such change being in point of fact incidental to the direction in which (if a direct linkage, as P, between M and Q be employed, as I prefer it should) the engine runs in—that is to say, if the engine is designed generally as shown in Fig. 1, and the running direction should be the opposite to that indicated by the arrow near B', the attachment of N should be to the gudgeon-block, located as indicated at N². Of course the support G must to that end be given a throw great enough to shift the radius-vector link not only beyond the cut-off limits which it is primarily calculated in Fig. 1 to swing in, (indicated by a broken line are *x' x'*), but also, as shown in diagram, Fig. 3, to the opposite vertical side of its pivoted base; but as such reversing effect is the ordinary and well-understood result of such shift of the radius-vector-link support in the Marshall or Bemme type of radial gears to which that portion of the mechanism shown in Fig. 1 be-

longs, it is fortunately unnecessary to further discuss it here, and therefore merely pointing out that I prefer such type as the mechanism controlling the locus of the path described by the actuating-point of the arm E, I here pass to a short description of the operation of the knee-jointed members M N.

It is of course apparent that as the eye *d* has a reciprocatory movement transverse to the general mass of the gear developed in it by the joint action of the eccentric-sheave and the radius-vector or other controlling-linkage of the arm E whenever the engine-shaft B be rotated, and that such motion being transmitted to the link M causes, by its jointing with and general angularity to the link N, a rise and fall at the center of union between said links. Now this movement I transmit to the exhaust-valve by the medium of its wristed and guided stem and the familiar transmission device of a link P, which I attach, preferably, to such point in M, as by a forked end *p' p'* and transverse wrist-pin *p*, the path in this instance being indicated by a broken-line outline, (see Fig. 1,) one point of which corresponds to the center of the pin *p*. Just as at the opposite end of the arm E the path described by the center of pin *e* is similarly indicated by a broken-line quasi-elliptical figure. The general direction of the said elliptical figures major axes, it is to be noted in the example, Fig. 1, lie not only divergent to each other, but also both outwardly inclined to the perpendicular, and as the paths of said transmitting-points are reversed in opposite directions (pin *p* going up as pin *e* descends) they manifestly impart reciprocal motion to P and J, and also in approximately inverse timing, the generator of their movements being the common intermediate positively connected eccentric; but it is here further pointed out that instead of by an eccentric sheave and strap, as C D, the circular motion of the shaft may be imparted to the other portions of the above-described gear by a crank and wrist pin. Such modification is illustrated in Figs. 5 and 5^A, where a subsidiary crank C', fitted with wrist-pin *c'* and by an ordinary journal attached to the inner or motion-receiving end of the arm E, is substituted, said arm having in place of the intermediate annular strap D an extension D', terminating, as before, in an eye *d*, to which the knee-joint exhaust-valve linkage is pivotally attached, for, save for the convenience of location which the eccentric affords by reason of the non-crossing of the shaft upon which it is mounted by its rod or arm E, there is no special reason why the valve-motion generator should have that particular form, and since such equivalency between cranks and eccentrics in the class of mechanism under discussion has been long and frequently recognized, it is hereinafter taken as a matter of course, and the term "eccentric" used generically; and with that statement I conclude the description of the pre-

ferred simple sort of my improved valve-gear by pointing out that the position of the radius-vector's movable support is in ordinary manner, whether for purposes of cut-off or of reversal of the steam-valve gear, operatively connected to a throw-rod, controlled also in usual way—as, for example, by the throw-rod S, attached to an extension of G's upper or swinging pivot-pin by a suitable eye, and thence passing with a screwed end to and into engagement with hand-wheel provided with nut T, journaled in a self-aligning but endwise-collared bearing T', (see collars t^2 t^2 and trunnions t t , the nearer one not being shown in Fig. 1,) to the suitably forked and journaled head of a relatively fixed abutment-stanchion U', rotary movement of said screwed throw-rod being prevented by such familiar means as a fixed spline finger T², entered into a registering longitudinal slot t' , fashioned in the lower body of said throw-rod. The support G is also susceptible of automatic regulation by connection with a governor, and, as that is a well-understood modification of a cut-off-valve-gear throw-rod, it need not be further described here, save only to say that the exhaust-valve connections herein described are not under such connection any more difficult and are substantially unaffected by it. However, should it be desired to reverse the engine, the engine being otherwise of a proper sort for such a maneuver, it is only necessary, as above described, to make, in addition to the ordinary rearrangement or shift of the steam-valve gear, a shift of the point of the knee-joint member's frame attachment to such point as shall cause, say, a rise instead of a fall, its motor (the eccentric) still maintaining a constant direction of motion. This is illustrated by broken-line shift position of N in Fig. 1; but, instead of merely relying upon a mere unshackling, shift, and reshackling from the gudgeon-block N' to N², it is also within the purview of my present invention to effect such change by a self-contained mechanism, as a throw-rod, which may be either a substantial counterpart of the screw-actuated steam-valve gear-rod S with nut and abutment and a radius-vector link like I; or else, if desired, a throw-rod s, connected to throw-rod S, and a reversing-lever F, which lever, provided with spring-latch and notched quadrant ff' as a locking device, may be used either directly or as shown in Figs. 3 and 4, or by the intervention of a rock-arm n , and thus to control both G and N's adjustments concurrently from a single lever.

In diagram 6, instead of the radius-vector type of controlling-linkage for the arm E, there is shown a modification, consisting of

the Hackworth or cruciform disposable rectilinear guide type, giving a more correct ellipse as the path described by a corresponding pivot-center point of the actuating-arm E, (which arm, remaining substantially as before, whether reciprocated by the medium of an eccentric or its equivalent, although more conveniently disposable, crank, is therefore here again advisedly designated by its original letter of reference E,) for such ellipse-producing type of locus-controlling mechanism is also within the purview of my present invention, and the hereinbefore-described knee-jointed linkage operative to lever the exhaust valve or valves of the engine has been contrived by me with special reference to its being so combined with it, as indicated in the diagram under description; and while the Marshall type of steam-valve gear, eccentric, and diametrically-opposite valve-chests have been more particularly described, they have been so treated rather as the most apt forms for illustrating than as thereby intended to limit and define my present invention.

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

1. In a valve-gear, the combination, with the engine-shaft, of an eccentric or its equivalent rotary reciprocating mechanism, an arm E, operatively connected therewith and receiving reciprocatory motion therefrom, an adjustable support and link or equivalent mechanism operatively connected to and controlling the locus of the arm E's path, a pair of knee-jointed links pivotally attached at one extremity to the eccentric-strap or its equivalent and at the other to some fixed point, and steam and exhaust valves operatively connected to said arm and knee-jointed links, respectively, substantially as and for the purpose specified.

2. In a valve-gear, the combination of the engine-shaft with a single eccentric or its equivalent, an arm E, operatively connected therewith, mechanism to control the locus of said arm's reciprocations, a pair of knee-jointed levers connected at one extremity to said eccentric-strap or its equivalent and at the other to a controlling throw-rod, said rod thus connected, and mechanism for actuating said rod, whereby the knee-jointed links may be thrown and maintained in positions proper for reversal, substantially as and for the purposes hereinbefore described.

GUSTAV BERNHARD PETSCHÉ.

Witnesses:

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JOSHUA MATLACK, Jr.