

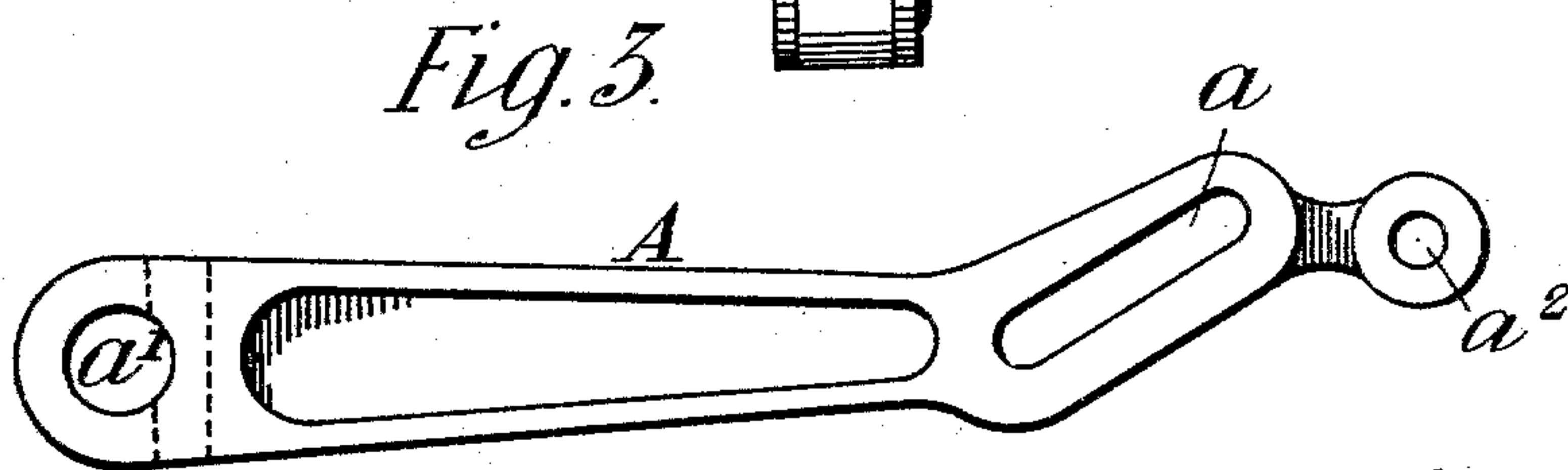
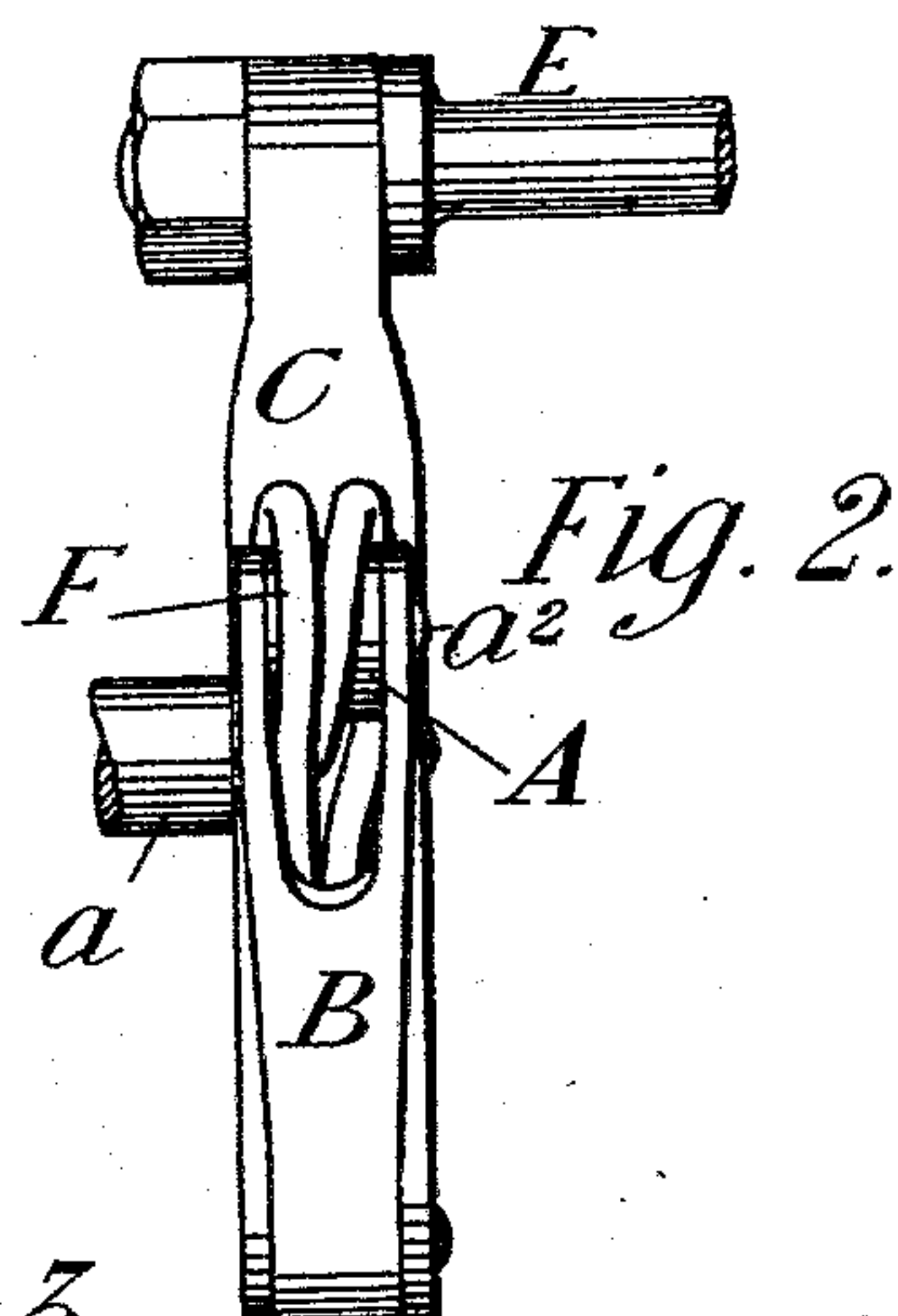
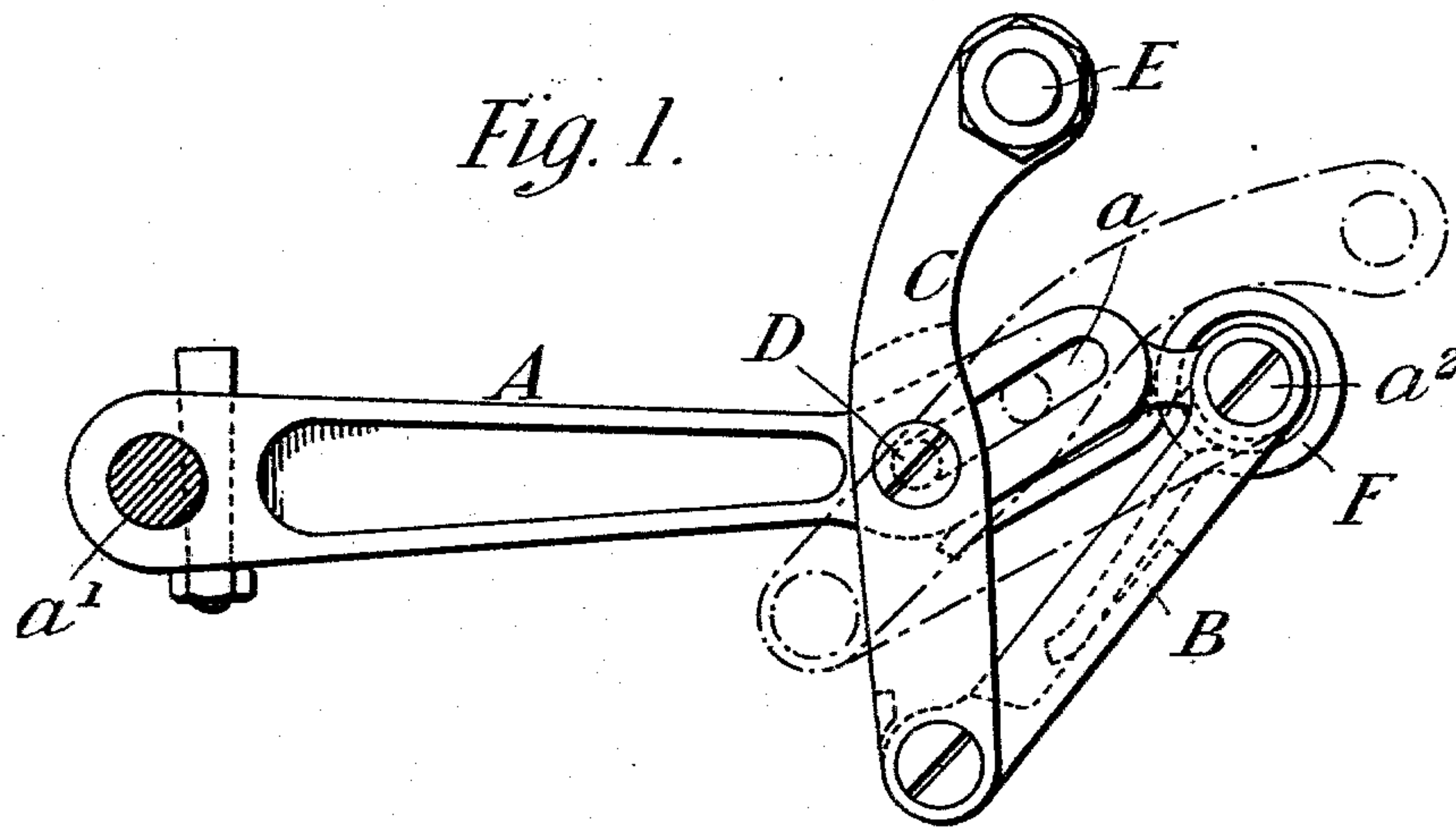
(No Model.)

2 Sheets—Sheet 1.

T. S. JAMES.
CRANK.

No. 589,728.

Patented Sept. 7, 1897.



Witnesses.
Nancy S. James
Thos. A. Green

Inventor.
Thomas Spencer James,
By *James L. Norris,*
Atty.

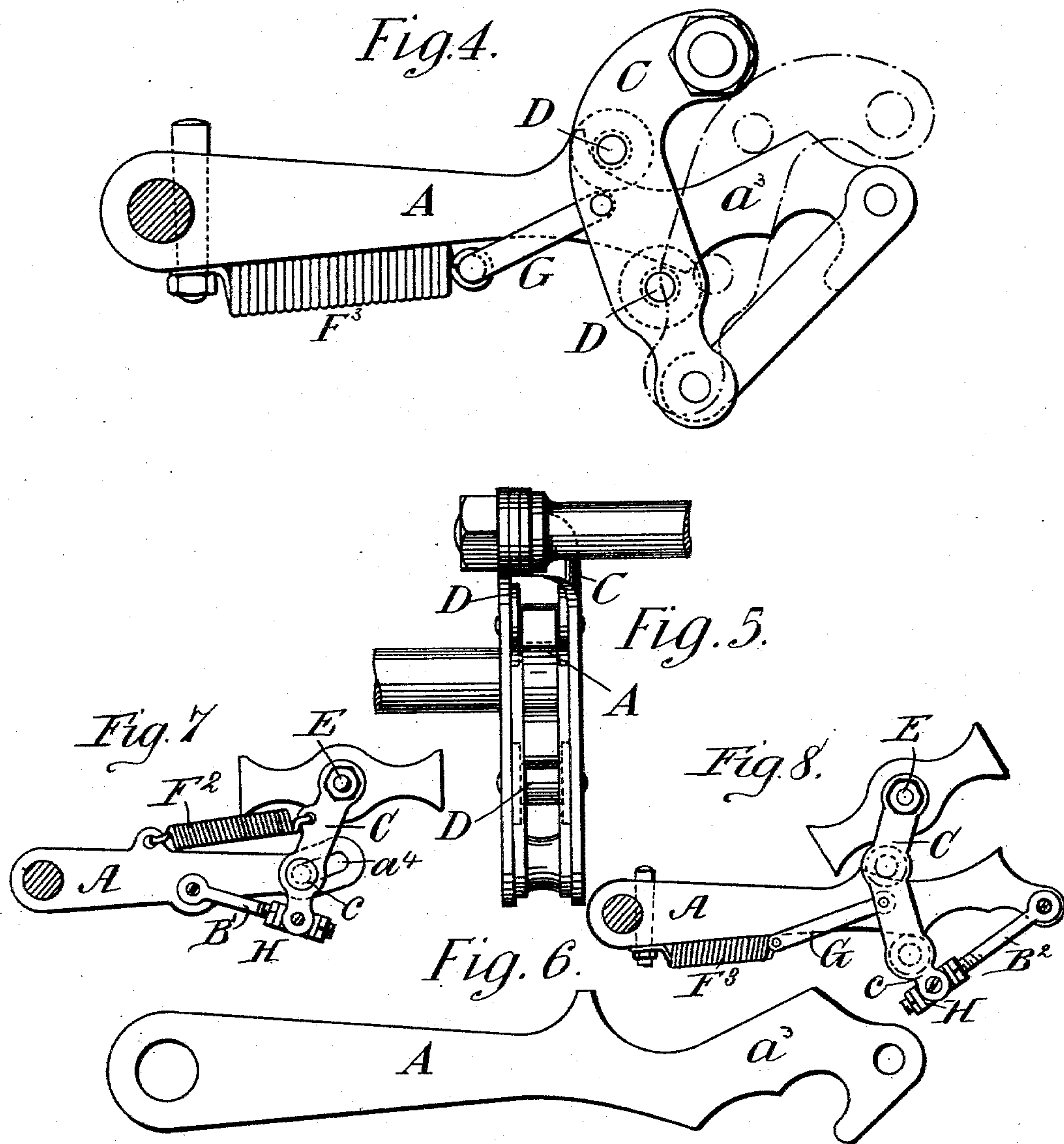
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2 Sheets—Sheet 2.

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CRANK.

No. 589,728.

Patented Sept. 7, 1897.



Witnesses.
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UNITED STATES PATENT OFFICE.

THOMAS S. JAMES, OF LONDON, ENGLAND.

CRANK.

SPECIFICATION forming part of Letters Patent No. 589,728, dated September 7, 1897.

Application filed November 14, 1896. Serial No. 612,152. (No model.)

To all whom it may concern:

Be it known that I, THOMAS SPENCER JAMES, engineer, a citizen of England, residing at 172 Camden Grove, Peckham, London, in the county of Surrey, England, have invented a certain new and useful Improved Construction of Cranks, of which the following is a specification.

My invention relates to that description of cranks wherein a separate lever-arm carrying the crank pin or pedal is so connected to the crank-arm as to be capable of assuming variable angular positions thereto, and thus to cause the crank-pin to assume positions at correspondingly variable distances from the crank-shaft. In all constructions of this kind heretofore proposed the said lever-arm has been pivoted directly to the crank-arm and has been acted upon by a spring connected at one end thereto and at the other end to the crank-arm, so that on applying pressure on the crank-pin the lever-arm is turned outward on its pivot to an extent controlled by the spring. With such constructions the disadvantages exist, first, that when applied to pedal-cranks for cycles the crank motion is an uncertain and unpleasant one, inasmuch as the crank-pedal does not offer any rigid resistance to the foot, and, secondly, as soon as the pressure of the foot is momentarily decreased (it may be unintentionally) the spring will at once draw back the lever-arm and shorten the crank radius again at a time when it may be desired to keep this at its maximum length.

The present invention has for its object to obviate these disadvantages; and it consists in a peculiar construction of the crank-arm and its connection to the pedal-lever, whereby the use of a spring may either be entirely avoided or it may be made quite slight, so that it will only draw the pedal-lever back to its inward position when the pressure of the foot is more or less entirely taken off the pedal. This action is obtained, in the first place, by not pivoting the pedal-lever directly to the crank-arm, as has always been done heretofore, but to a link, which in its turn is pivoted to the crank-arm, and, secondly, in forming on the crank-arm a surface lying at an angle to the radial line of the crank-arm, on which surface the pedal-lever bears by means of a pin

or roller. When the pedal is being acted upon by a moderate force, the pedal-arm will be situated in the inward position, with its roller at the lower or inner end of the crank-incline. On applying an increased force the resistance offered by the crank-arm and driving-wheel to an acceleration of their motion will cause the roller of the pedal-lever to ride up the incline, and consequently the lever and pedal will be thrown forward, thus extending the radius of the crank. On the crank performing the backward half of the revolution the pedal-lever will of itself fall back into the inward position again, aided, if necessary, by a spring.

The accompanying drawings show variously-modified arrangements of the crank constructed according to the above-described invention.

Figure 1 shows a side view, and Fig. 2 an end view, of one construction. Fig. 3 shows a view of the crank-arm separate from the lever-arm. Fig. 4 is a side elevation of a modification. Fig. 5 is an end view thereof, and Fig. 6 is a view of the crank-arm detached. Fig. 7 is a side elevation of a still further modification, and Fig. 8 is a similar view of another modification.

A is the crank-arm, fixed at a' to the crank-shaft and having its front end formed with an upward-inclined slot a , while at a^2 it has pivoted to it a link B, to the other end of which is pivoted the looped or slotted lever-arm C, through the opening of which the crank-arm A passes and which has a pin D, (which may, if necessary, carry a roller,) working in the slot of A. The upper end of the lever-arm C carries the crank-pin E.

A looped spring F is made to act upon the crank-arm and link B, so as to tend to retain the pedal-lever in the backward position shown in full lines at Fig. 1. When the crank-pin is only subject to a moderate pressure for overcoming a moderate resistance, the lever C will remain in that position in which the crank-pin E will be at a minimum radius from the crank-shaft at a . When, on the other hand, the crank-pin is subject to an increased pressure, this will cause the lever E to move forward and upward in the slot a , the link B turning on its pivot in following this motion until when the crank-pin

is subject to the maximum strain the parts will assume the extreme position shown in dotted lines at Fig. 1, in which position it will be seen that the radius or length of the leverage at which the crank-pin works is considerably longer than that at which it works when only overcoming a minimum resistance. During the backward or ineffective part of the revolution the pedal-lever C will of itself fall back to the inward position, aided by the spring F, so that the crank-pin will be at the minimum distance from the crank-shaft, and consequently the motion of the rider's feet will be correspondingly reduced.

Fig. 4 shows a side elevation of a modification of the above construction. Fig. 5 shows an end view, and Fig. 6 shows a view of the crank-arm detached. This arrangement only differs from the foregoing one in that instead of making the end of the lever-arm A with a slot in which works a pin on the lever C the latter is provided with two rollers D D, working, respectively, on the upper and under surfaces of the upward-inclined part a^3 of the crank-arm; also, instead of acting upon the lever by a looped spring at the first arrangement it is acted upon by a helical spring F^3 , connected to it by a link G. The under side of the crank-arm is by preference formed with a series of hollow curves, as shown, which will have a ratchet-like action in tending to hold the lever C in different forward positions corresponding to different degrees of pressure put upon the crank-pin. The action is otherwise precisely the same as at Figs. 1 to 3, the dotted lines showing the position of the lever and links when the maximum force is applied.

In Fig. 7 the lever C is engaged with a pin c in the oblique slot a^4 of the crank-arm and has its forked lower end pivoted to a ring H, confined between caoutchouc washers and collars on a rod or link B', pivoted to the crank-arm A. The spring F^2 is arranged on the upper side of the crank-arm A.

In Fig. 8 the upward inclined or curved end

of the crank-arm A passes through a slot in the lever C, which bears upon the crank with rollers, as at Fig. 4, the lower end of the lever being formed with an eye c , held between caoutchouc washers and collars on a rod or link B', pivoted to the crank-arm. The spring F^3 is connected to the lever C by a link G.

The under side of the crank-arm is formed with ratchet-like hollows, as in the arrangement at Fig. 4.

Having thus described the nature of this invention and the best means I know for carrying the same into practical effect, I claim—

1. A variable-throw crank consisting of a crank-arm fixed on the crank-shaft and having an inclined surface lying at an angle to the radial line of the crank-arm, a separate lever carrying the crank-pin, connected to the crank-arm by a pivoted link, and a roller or equivalent device on said lever bearing upon the said inclined surface of the crank-arm and made to travel thereon when pressure is applied to the crank-pin, substantially as and for the purpose set forth.

2. A variable-throw crank consisting of a crank-arm fixed on the crank-shaft, a separate lever carrying the crank-pin connected to the crank-arm by pivoted link, said lever having a slot or loop through which the end of the crank-arm passes pins or rollers on said lever bearing on inclined surface upon the crank-arm, and a spring tending to keep the said lever in a retracted or inward position in which the crank-pin is nearer the crank-shaft than when the lever is forced outward against the action of the spring, substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 4th day of November, A. D. 1896.

THOMAS S. JAMES.

Witnesses:

OLIVER IMRAY,

JNO. P. M. MILLARD.