

W. F. BROWN.
SAFETY ATTACHMENT FOR GOVERNORS.

No. 498,002.

Patented May 23, 1893.

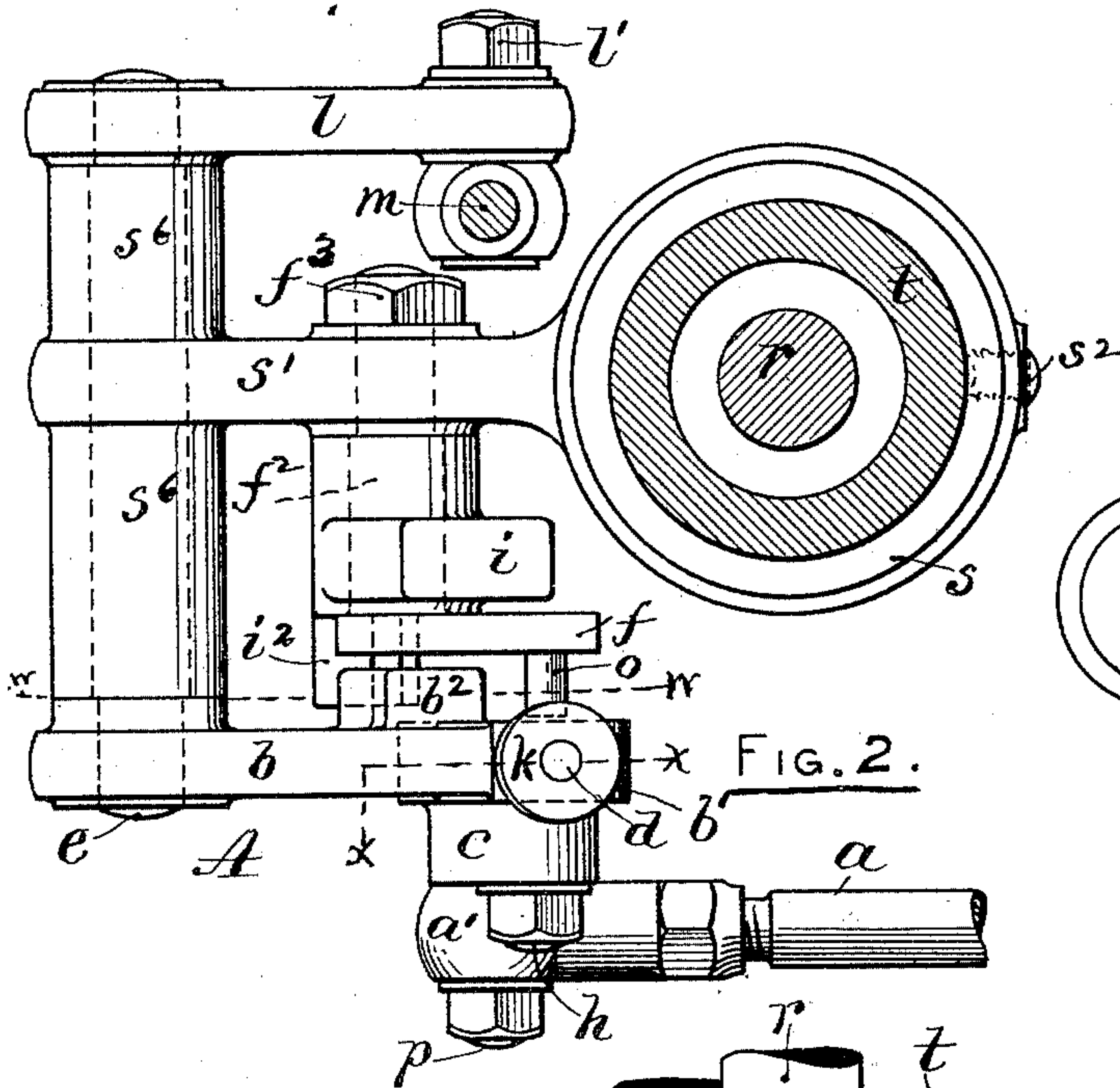


FIG. 1.

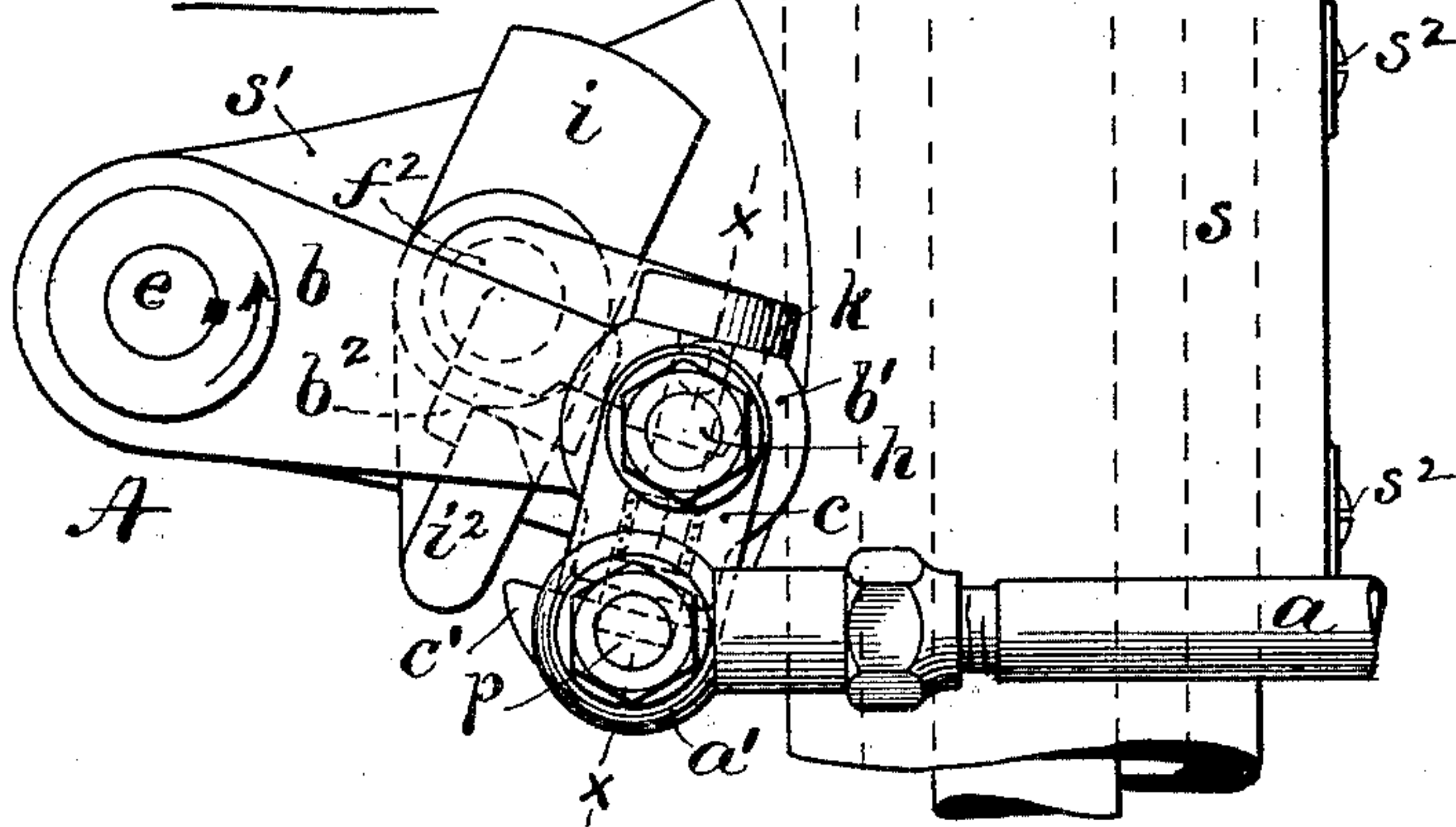


FIG. 2.

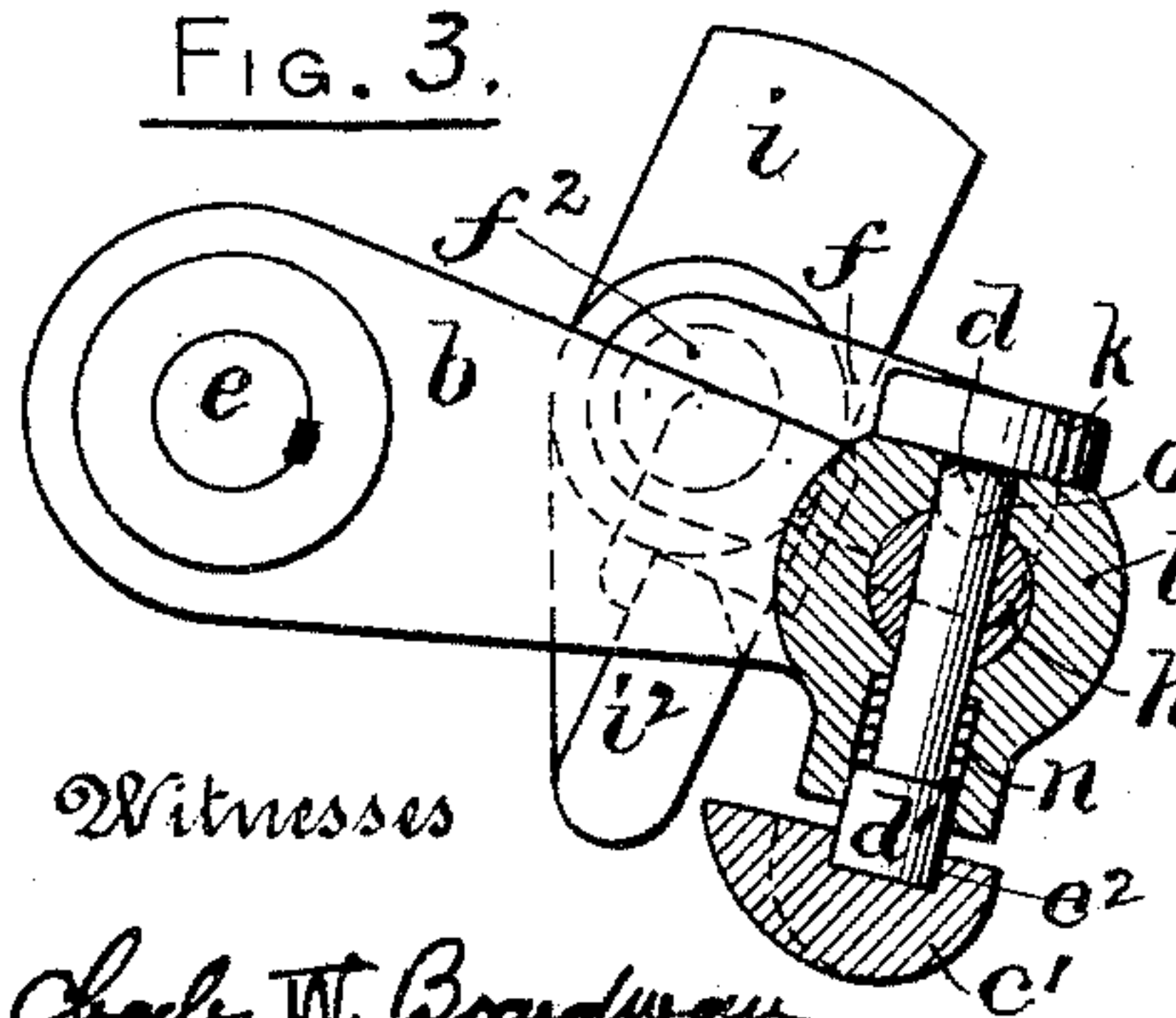


FIG. 3.

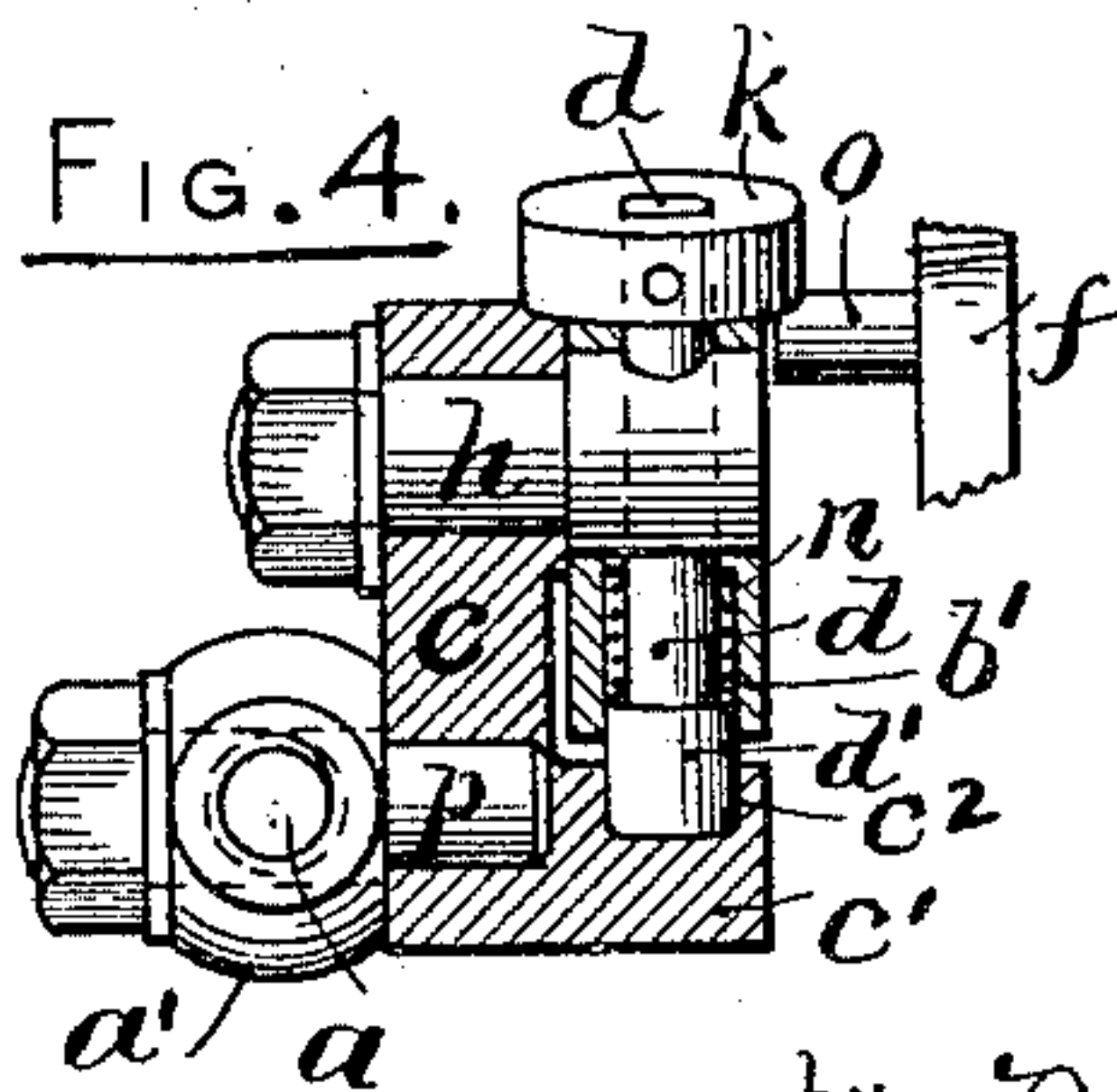


FIG. 4.

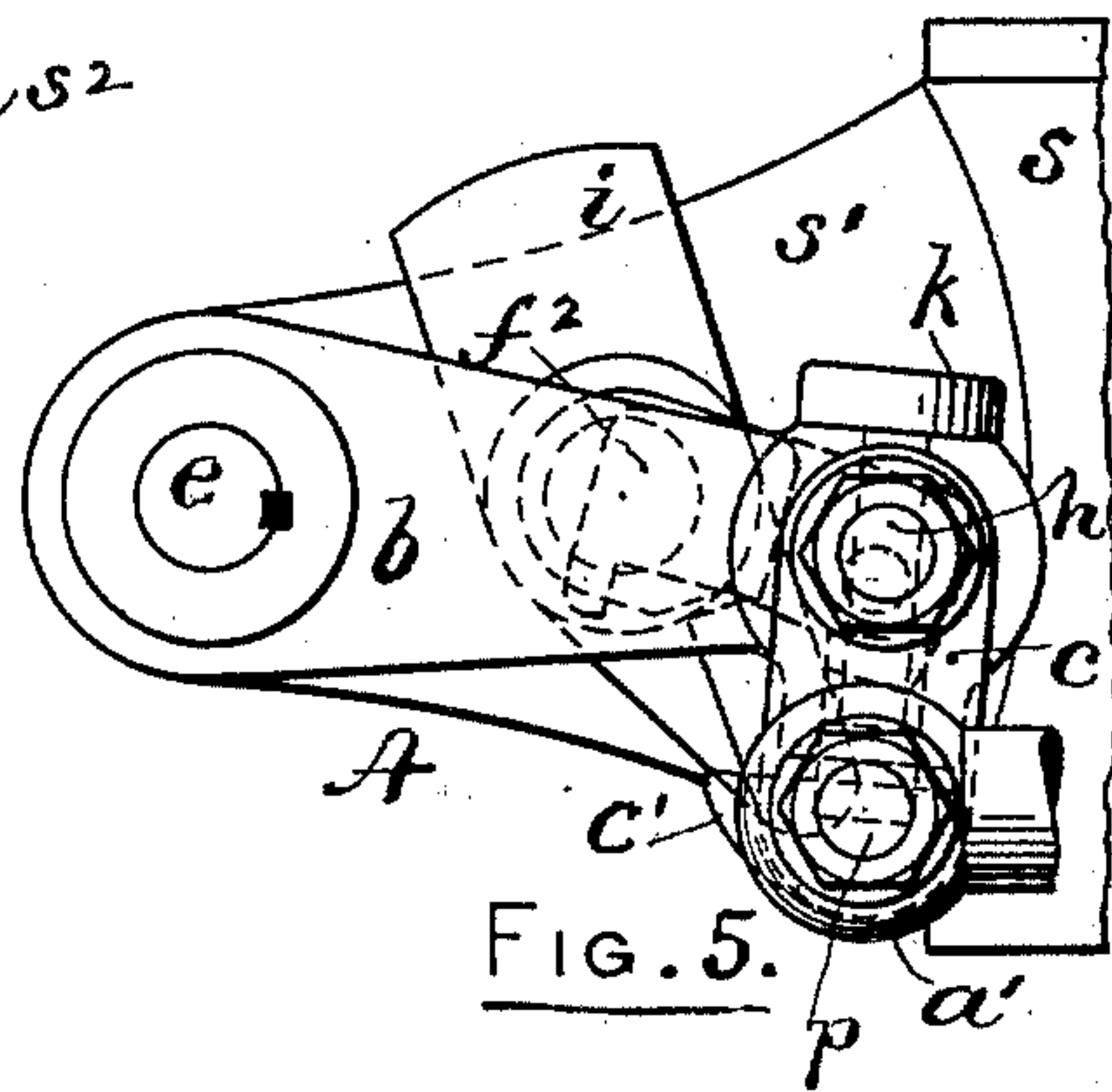


FIG. 5.

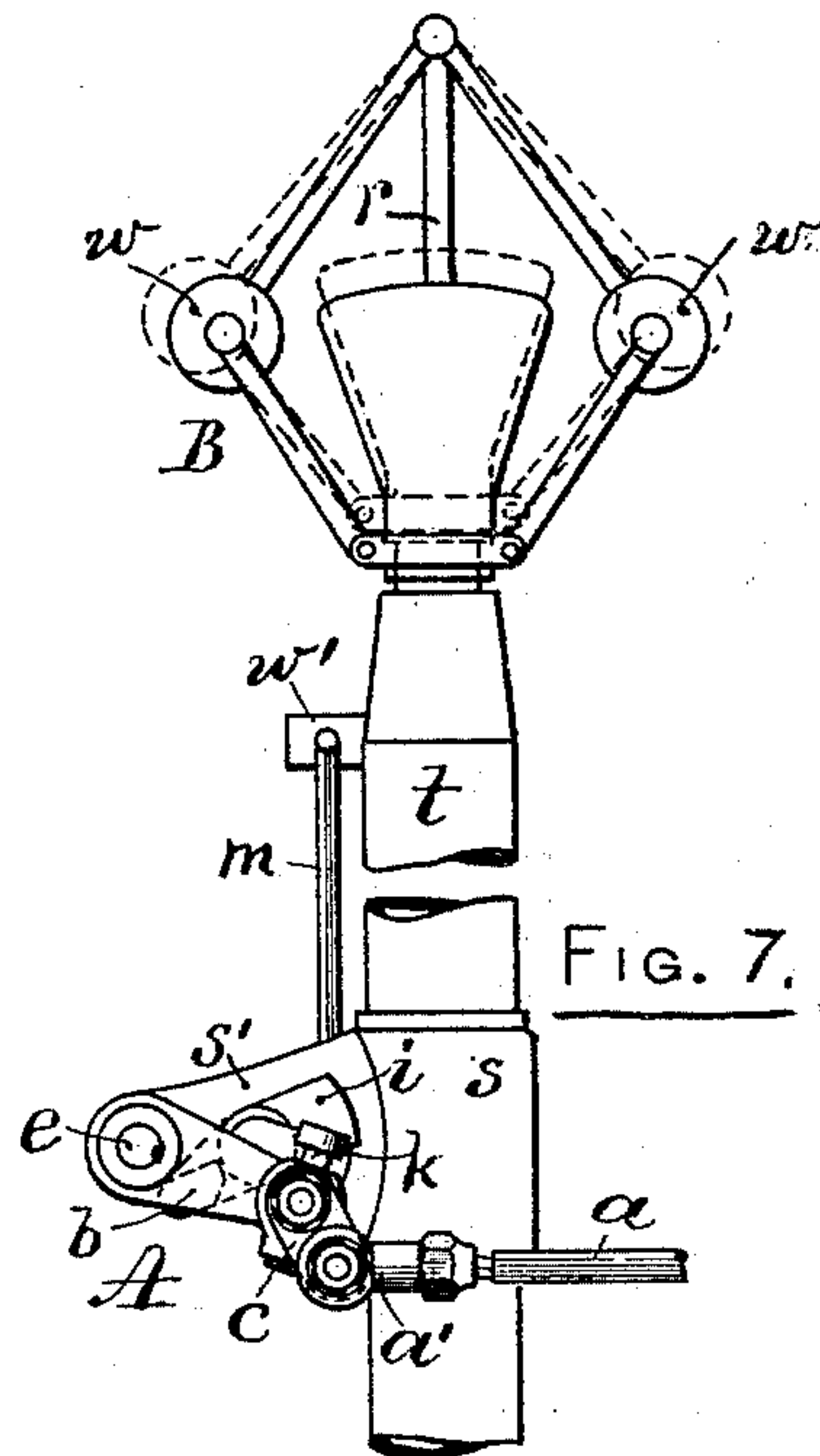


FIG. 7.

Witnesses

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(No Model.)

2 Sheets—Sheet 2.

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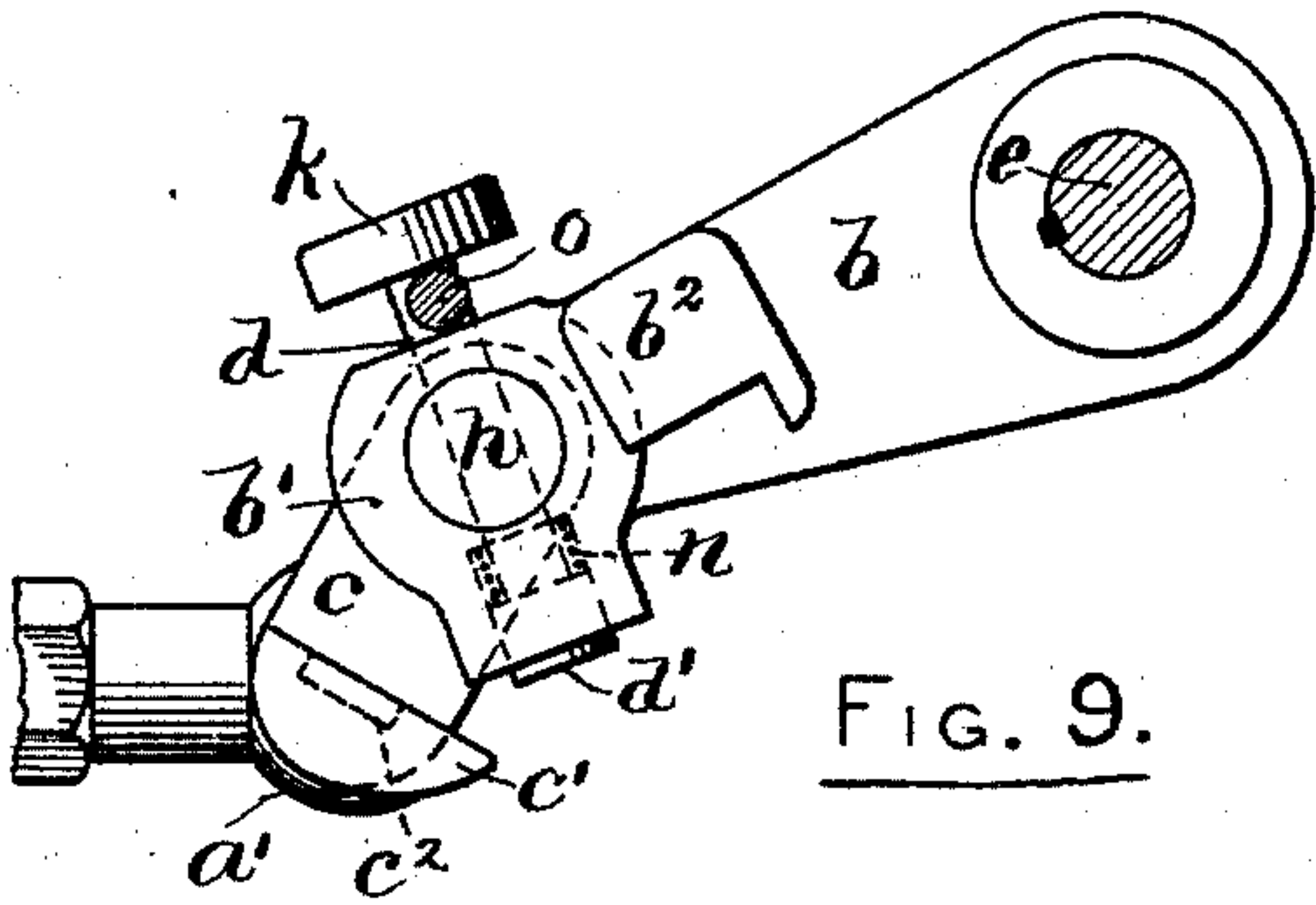


FIG. 9.

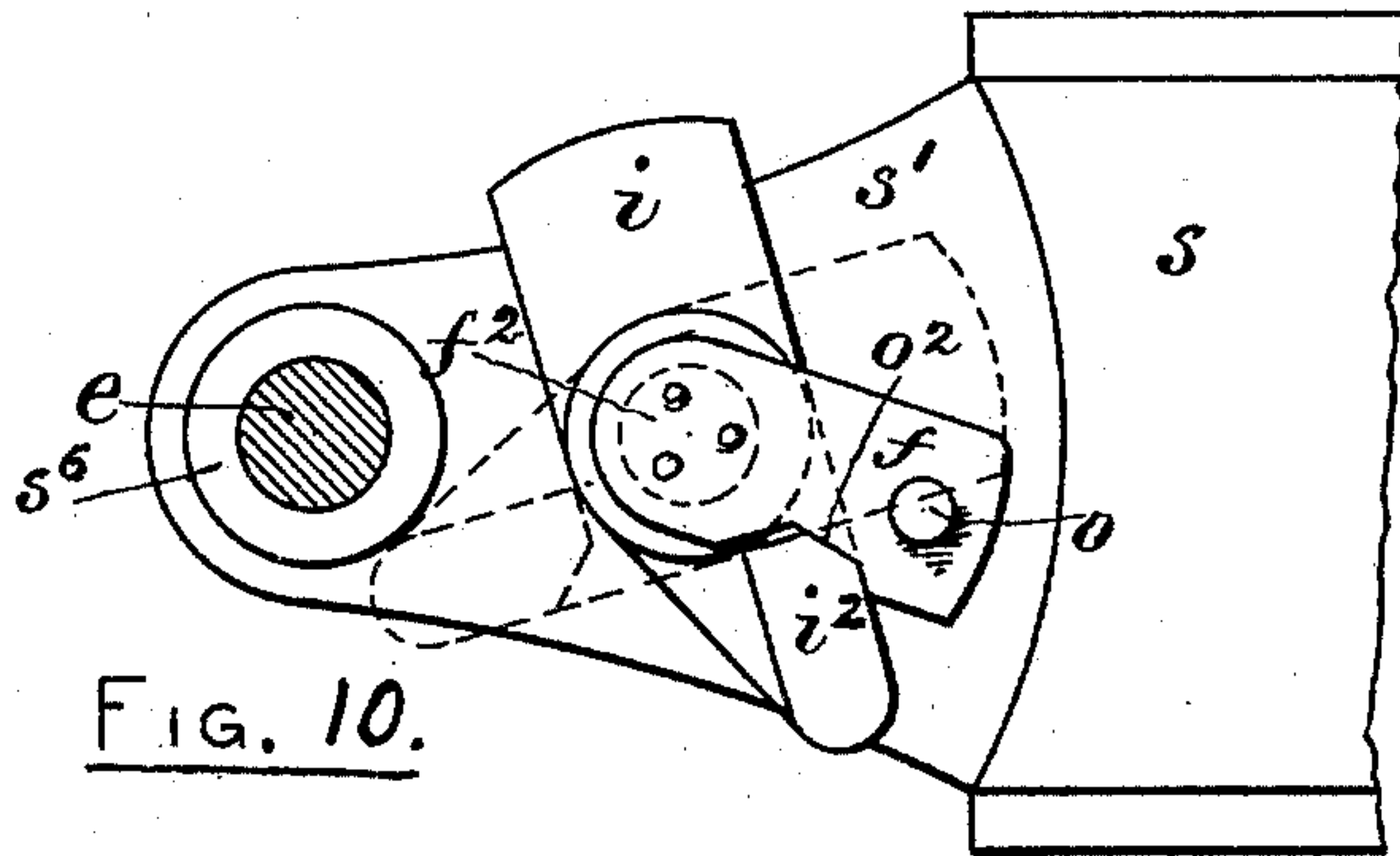


FIG. 10.

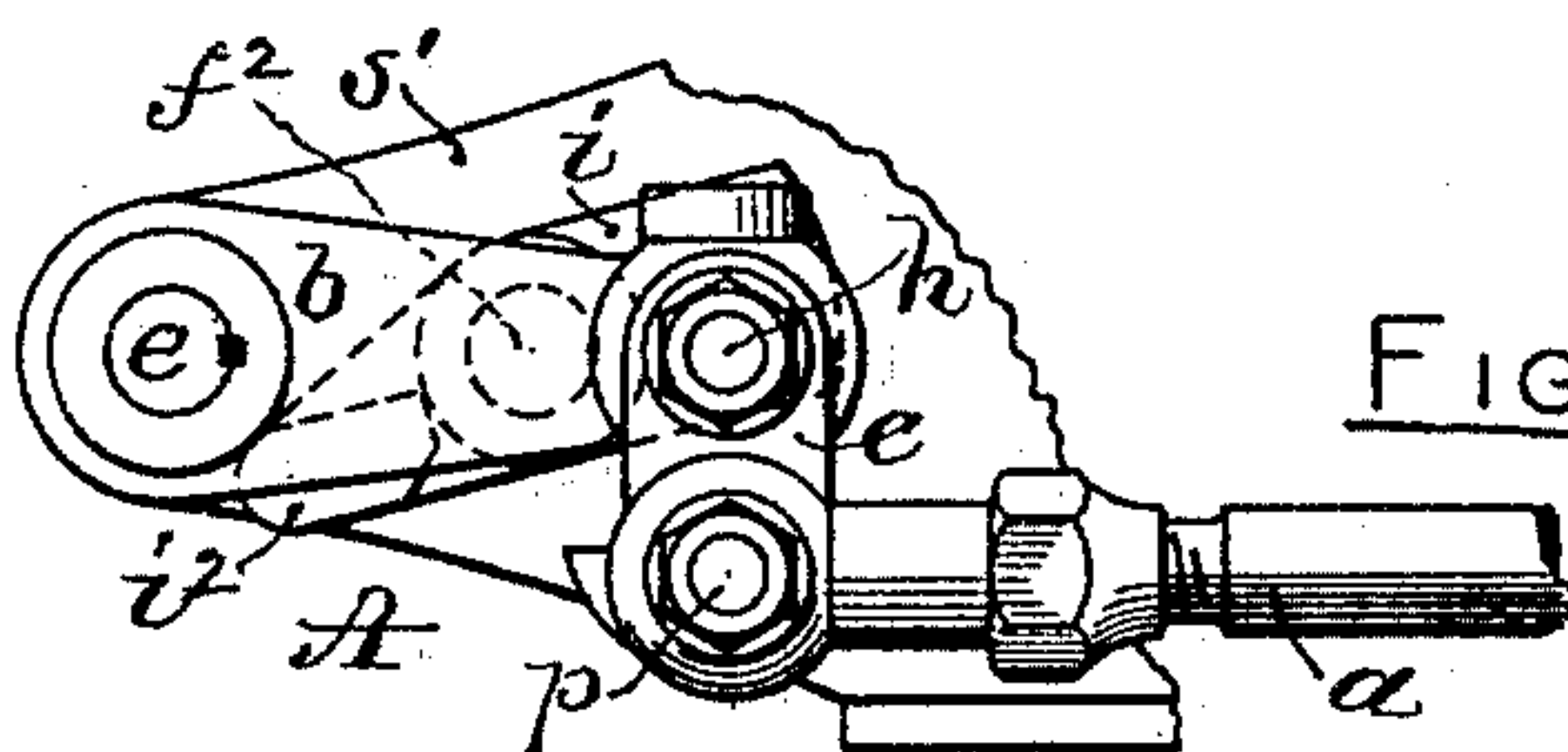


FIG. 11.

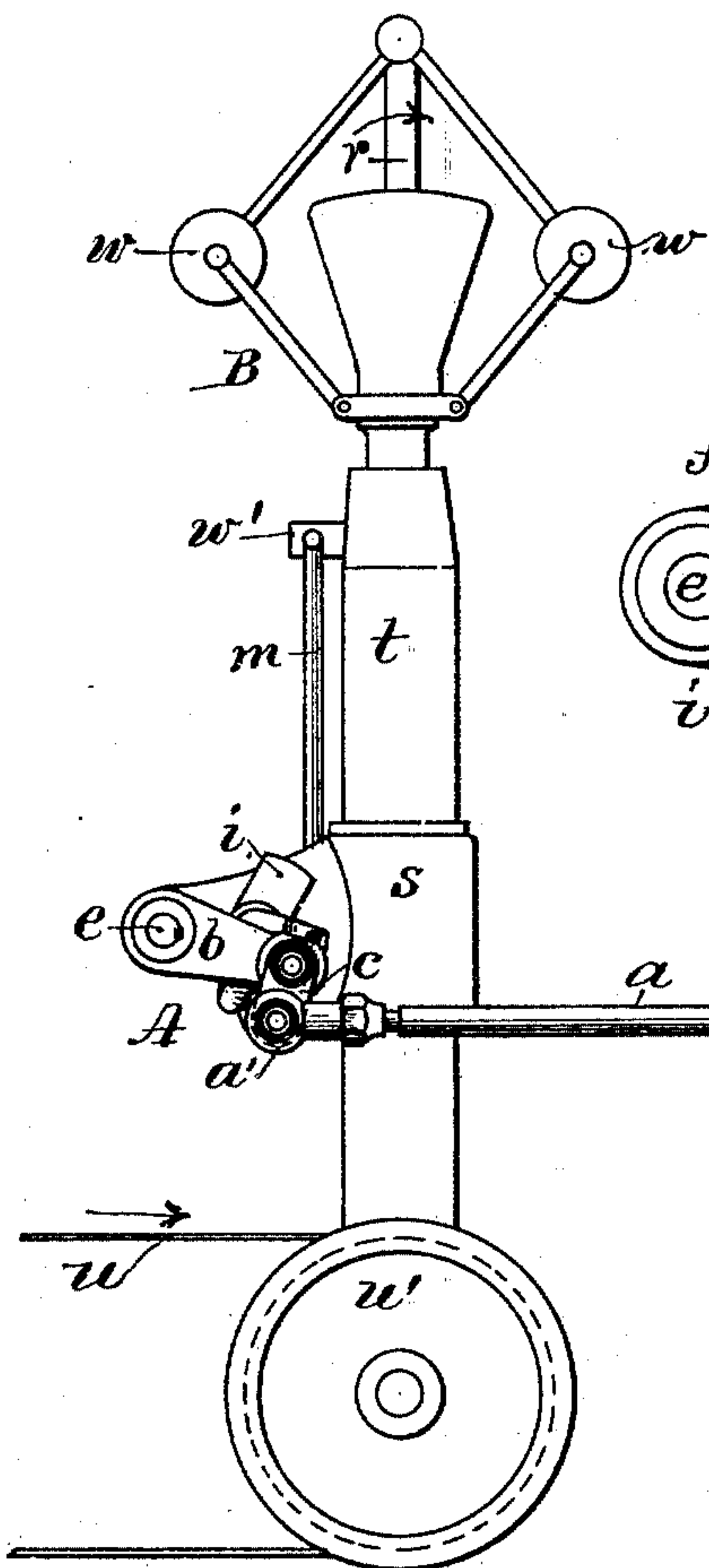


FIG. 6.

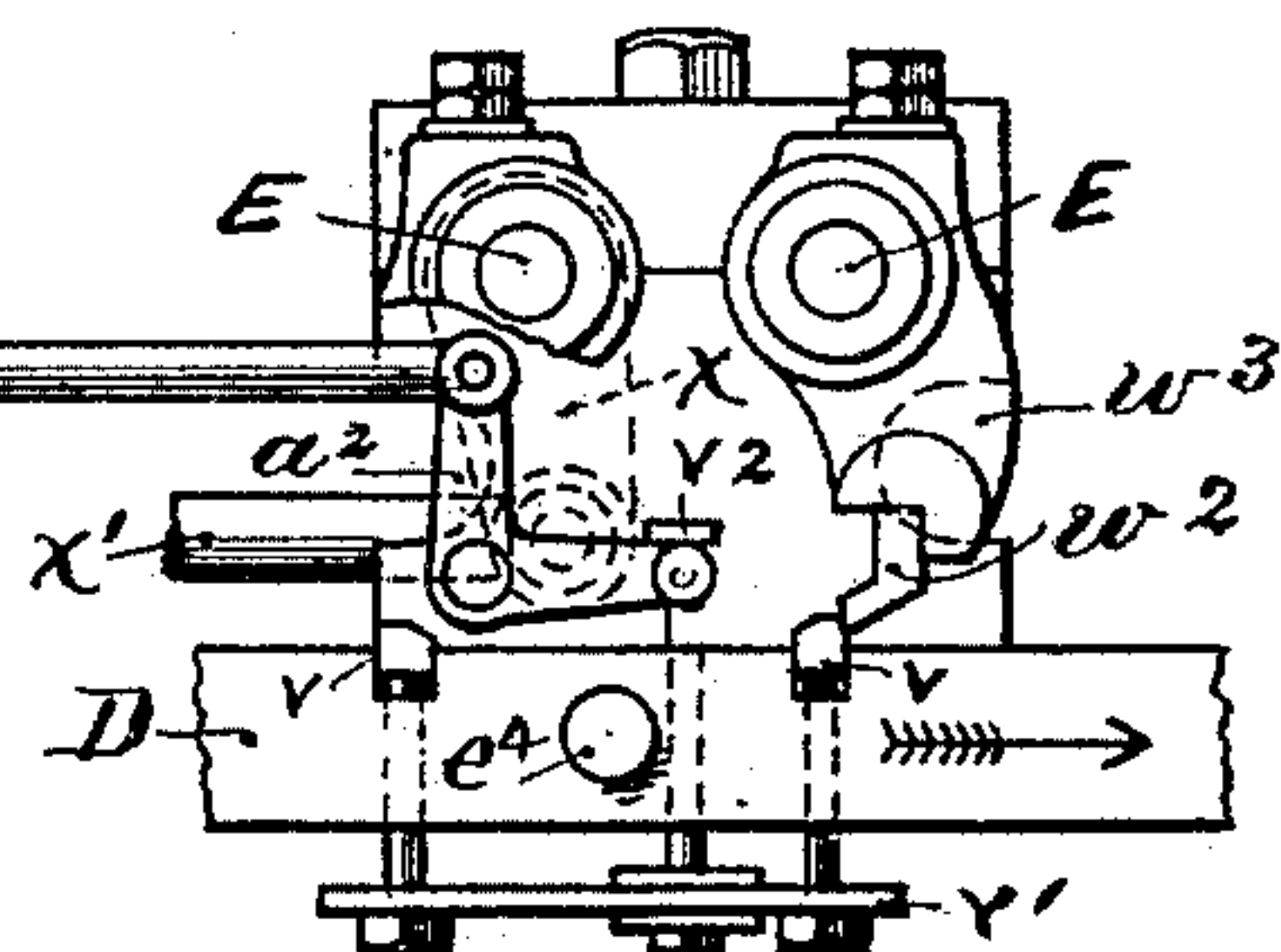
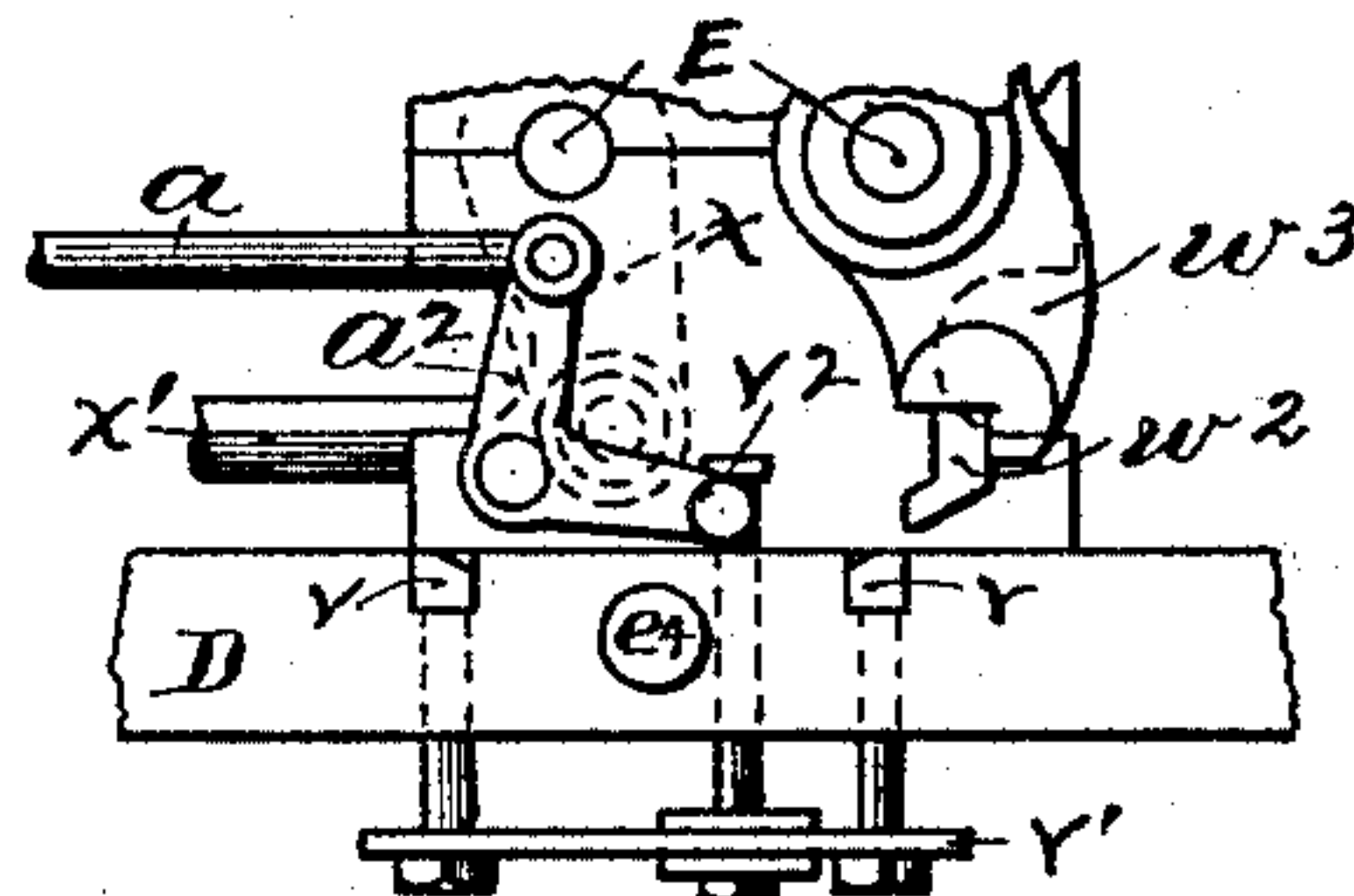


FIG. 8.



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UNITED STATES PATENT OFFICE.

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SAFETY ATTACHMENT FOR GOVERNORS.

SPECIFICATION forming part of Letters Patent No. 498,002, dated May 23, 1893.

Application filed February 13, 1893. Serial No. 462,083. (No model.)

To all whom it may concern:

Be it known that I, WALTER F. BROWN, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Safety Attachments for Steam-Engine Governors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention has relation to devices for automatically rendering inoperative the cut-off valve gear of steam engines, in case of accident to the governor; that is to say in certain types of automatic cut off engines, provided with detachable valve-gear as usually constructed, in which the closing of the steam-valves is effected by weights or dash-pots, the governor-controlled tripping or releasing mechanism is not adapted to automatically prevent the steam-valves from admitting steam into the cylinder in case the governor becomes disabled from any cause. The effect of such disability being to admit an increased amount of steam to the cylinder, thereby instantly increasing the speed of the engine, which if continued for a brief time is liable to result disastrously, not only to the engine itself but to the surrounding machinery and building as well.

The object I have in view is to provide the governor-controlled mechanism of steam engines having detachable valve-gear, with automatically operating means whereby non-action of the valve-opening device is insured in case of accident to the governor, or to the mechanism which actuates it.

My improvement is more particularly adapted to be used in engines provided with a positively driven sliding-bar carrying governor-actuated vertically movable tappets arranged to engage toes which in turn are adapted to open the steam-valves to admit steam through the pores into the cylinder. Among engines of this class, having liberating valve-gear, may be mentioned the well-known "Greene engine."

In carrying out my invention the tappet-

actuating rod is jointed to a governor-controlled lever through the medium of a connection adapted to be automatically disconnected from said rod, or rendered inoperative, whenever the movement of said lever exceeds the normal limit.

In the accompanying two sheets of drawings, Figure 1 is a front side elevation of my improvement in its normal position, the engine being at a state of rest, showing a portion of the governor stand or column. Fig. 2 is a plan view of the same. Fig. 3 is a side elevation, in partial section, showing the relation of the parts corresponding with Fig. 1; the front connections being omitted; the sectional or shaded portion being taken on line xx of Fig. 2. Fig. 4 is a transverse sectional view, taken substantially on line xx of Fig. 1. Fig. 5 is a front view, showing the normal relation of the parts when the engine is in operation. Fig. 6 is a side elevation, in reduced scale, showing a governor provided with my improvement and the manner of connecting the same with valve-actuating mechanism of the automatically detachable type. Fig. 7 is a similar view of the governor, showing the relation of the parts of the device as it would appear in the event of the governor-belt breaking. Fig. 8 shows the corresponding portion of the valve-gear. Fig. 9 is a side elevation viewed from the rear, or on line ww of Fig. 2, the relation of the parts, however, corresponding with the position shown in Fig. 7, wherein the tappet controlling connection is, for the time being, rendered inoperative. Fig. 10 is a front elevation, also taken on said line ww of Fig. 2, but showing the latch thrown backwardly to its limit, and Fig. 11 is a side elevation, in reduced scale, showing the relation of the parts when the engine is running normally.

The valve-gear indicated on Sheet 2 of the drawings is substantially the same as usually provided with the "Greene engine," before referred to. Its construction and arrangement being such that the steam cut-off point is automatically gaged or fixed by means of the governor-actuated bell-crank lever a^2 , which through the medium of the rod v^2 and guided bottom plate v' operates to simultaneously move the tappets v in a vertical direction; the latter at the same time being

mounted in a guided sliding-bar D arranged to reciprocate to and fro by means of an eccentric in the usual manner. The upper ends of the tappets are arranged to engage each a yielding toe w^2 mounted in an arm w^3 secured to a rock-shaft E; the latter carrying at its opposite end a valve-arm x (shown dotted) to which is jointed a rod x' adapted to be attached to the steam-valve mounted in the steam chest, all as common. I would add that any fluctuation in the governor causes the tappets to project more or less above the bar D thereby engaging the toes w^2 to a corresponding extent; the degree of such contact of the surfaces combined with the reciprocating movement of the bar itself operating to vary the area of the steam opening or point at which the steam-valves are tripped to cut off the steam flowing from the steam chest into the cylinder. The steam-valves after being thus released or tripped automatically close the steam ports by means of a weight or dash-pot, as common to engines of this class. I would further state that the weight or resistance of the tappets rod v^2 and corresponding arm of the lever a^2 exceeds that of the horizontal connection a . Therefore whenever the latter is rendered inoperative or disconnected from the governor the tappets automatically drop to their limit, flush with the top of the bar, thus preventing them from "hooking-on" or engaging the toes w^2 until the safety device, about to be described, is returned to its normal position, thereby adapting the connection a to again move in unison with the governor.

My improvement, or safety attachment as it may be termed, is indicated on the drawings by A; the same being supported by an extension s' of the sleeve s adjustably secured by screws s^2 to the governor stand or column t ; said extension having lateral hubs s^6 in which a small rock-shaft e is adapted to oscillate by means of a lever l secured thereto; the latter having a vertical link or connection m jointed to its free end (see Figs. 2, 7, &c.) which in turn is jointed to and receives motion from the governor in any well known manner. To the front end of the said rock-shaft e is secured a lever b having its outer portion enlarged to form a head b' into the center of which a pin h is fixed; the latter extending toward the front to form a journal for the short tie or connection c , soon to be described. The head b' and corresponding portion of the pin are bored out vertically to freely receive the locking-pin d , the latter projecting through the upper and lower faces thereof. As drawn the lower portion d' of the pin is enlarged and extends beyond the lever-head for the purpose of interlocking with said connection c . The head b' is counter-bored to receive a spring n , the latter being also in engagement with the enlargement d' of the locking-pin. A head or collar k is secured to the upper end of the pin, the same projecting beyond the rear face of the lever-

head and arranged to engage a stop-pin o , as clearly shown in Fig. 4. This collar also serves to limit the downward movement of the locking-pin. To the rear side of the lever b is fixed a lug b^2 , arranged to form a catch when combined with the latch i .

The extension s' of the sleeve s has a stationary stud f^2 fixed therein parallel with rock-shaft e ; to the front end of the stud is rigidly secured a short arm f carrying at its outer end a stop-pin o . Upon the stud, and at the rear of said arm f , the latch i is loosely mounted. This latch is provided on its under side with a hook portion i^2 extending beyond the front face of the arm f ; the same being beveled and arranged to engage a notch o^2 of said arm (see Fig. 10) and also adapted to engage with the lug or catch b^2 of the lever b . The upper portion of the latch is so constructed that upon moving it beyond the vertical center it will automatically oscillate to its limit;—the notch o^2 arresting it in one position, the hub s^6 performing a like office at the other extreme, see Fig. 10.

The governor-actuated horizontal connection a , before referred to, is provided at one (rear) end with a head a' jointed to the short connection c by means of a pin p rigidly secured into the lower end of the latter; the corresponding end c' of said connection c being enlarged and extending rearwardly, and further having a substantially flat upper face provided with a recess c^2 arranged to form a seat for the end of the locking-pin, see Figs. 3 and 4.

Figure 1, as before stated, shows the relation of parts when the engine is at a state of rest but it also indicates the position of the parts just before the engine has attained its normal speed, as in starting; the arrow indicating the direction in which the lever b is moving under such conditions.

In Fig. 5 the relation of the parts is as they would appear while the engine is in operation, or just after the engineer had thrown back the latch preparatory to stopping the engine, so that the lever b in descending will be arrested by the toe or hook i^2 of the latch, the latter then sustaining the weight of the moving parts of the governor. In thus arresting the lever it acts to vibrate the latch ahead past its center of gravity; the parts when at a state of rest appearing substantially as represented in Fig. 1.

In a well designed engine of the class hereinbefore referred to provided with detachable valve-gear controlled automatically by a governor, as B, driven say by a belt u any substantial variation in the load imposed upon the engine will, as usual, produce a corresponding change in the path described by the revolving governor-balls w ; such change operating through the connection m , &c., to move the tappets a corresponding extent, thus gaging the point at which the steam-valves cut-off live steam from the cylinder.

From the foregoing description of my im-

provement it will be apparent that the position and relation of the fixed stop-pin o to the collar k of the locking-pin d is such that the latter is automatically withdrawn from the connection c whenever the governor accidentally ceases action, or stops, thereby instantly permitting the tappets to automatically drop to their limit and preventing non-action of the steam-valves.

I am aware that some kinds of modern cut-off engines are provided with various forms of safety devices adapted to automatically trip or release the valve-gear in case of accident to the governor mechanism; but such former devices involve the use of a removable pin or lever, or other analogous part, which must be manipulated by the engineer both in starting and stopping the engine, otherwise the device will not become operative in the event of accident to the governor mechanism. In one patented form of mechanism for regulating steam engines the device includes a shifting-link jointed to the governor-vibrating arm and the connecting-rod which actuates certain parts of the valve-gear, and a stop. In the said device it is necessary, in order to insure its successful working, that the stop be turned both in stopping and starting the engine; the shifting-link referred to being so constructed and arranged that when in operation the major part of the governor's vertical movement is required to bring the device into action; said link, moreover, being simply jointed to the vibrating arm.

In an engine provided with my improved safety-device it is only necessary, in case the engine is to be stopped by closing the throttle-valve, that the engineer first swing the latch i rearwardly from the position shown in Fig. 11 to that represented by full lines in Fig. 10, so that as the lever b gradually descends in unison with the decreasing speed of the governor the catch b^2 will automatically engage the hook i^2 and force the latch ahead past the center; the relation of the parts upon thus stopping the engine is clearly shown in Fig. 1. In restarting the engine the device (when left as just described) requires no attention whatever from the engineer; and as the lever b rises, due to the increasing speed of the engine, the catch is automatically withdrawn from the hook, thus permitting the latch to drop by gravity to its limit, as shown in Fig. 11. Now, in case the governor becomes suddenly and accidentally inoperative from any cause when the engine is running normally the lever b in falling will cause the collar k to engage the stationary stop-pin o , thus arresting the downward movement of the locking-pin; the further and final downward movement of the lever operates to automatically withdraw the pin d from the connection c ; at the instant of unlocking or disconnecting said parts the weight of the lever a^2 , &c., causes the head of the tappets to drop into the sliding-bar and prevents further action of the steam-valves. Figs. 7, 8 and 9

show the corresponding relation of the device, &c.

In order to restart the engine from the position last described the lever b is first forced upwardly until the latch can be swung into engagement with the notch b^2 , thereby lifting the pin from the stop o , followed by pushing the connection a rearwardly until the locking-pin springs into the hole c^2 of the connection c thus locking these parts together, as shown in Figs. 1 and 6. Now upon opening the throttle-valve the rising governor-actuated lever b withdraws the catch from the latch; the device when the engine has attained a normal speed being as shown in Fig. 11. Obviously the position of the lever b will vary within the normal working limits of its oscillation up and down (corresponding with any change in the load upon the engine) without tripping the locking-pin d to prevent non-action of the valve-gear. But when the point say of maximum cut-off has been reached a comparatively small additional angular movement of the lever (equal to one-fourth of an inch at the head b' of the lever) will through the medium of the coacting parts be sufficient to disconnect the tappet-operating rod a from the governor, and thus automatically stop the engine.

In certain cases it may be found desirable to stop the engine quickly and without closing the throttle-valve; in such event the engineer throws the latch over to its limit, as indicated by full lines in Fig. 10, and at the same time lifts the locking-pin d by hand from the connection c ; the tappets then automatically falling to their limit instantly, as hereinbefore described. When the governor stops moving it will be found to have carried the lever b downwardly until arrested by the latch, the latter then supporting the weight of the balls, &c. Upon restarting the engine the engineer simply pushes the rod a rearwardly, thereby forcing the end c' of the connection past the yielding locking-pin until the latter springs into the seat c^2 , thus completing the operation.

Any desired change in the position of the stop-pin o , relatively to the locking-pin, may be effected by an axial movement of the stud f^2 , first unscrewing the clamping nut f^3 for such purpose.

It will be seen that the latch i performs two important offices; it serves (a) when thrown backwardly to the position shown in Fig. 5, preparatory to stopping the engine, to arrest and sustain the weight of the governor-balls, &c., while the engine is stopped, the action of the lever b in falling being to automatically swing the latch forward past the center of gravity, as shown in Fig. 1, thus enabling the engineer to restart the engine with greater facility; and (b) the latch automatically assumes the safety or normal position, shown in Fig. 11, upon restarting the engine so that in case of accident to the governor the latch then will permit the lever, &c., to drop be-

low the normal limit, thereby allowing the locking-pin to be automatically withdrawn from the connection *c*, and thus producing non-action of tappets, &c., see Figs. 7 and 8.

5 It may be unnecessary to state that I do not limit or restrict the construction of my improved safety device to the exact form represented in the drawings.

I claim as my invention and desire to secure by United States Letters Patent—

1. In a steam engine provided with automatically detachable valve-gear, the combination of an actuating-rod connected with the valve-gear, a governor, a lever adapted to be actuated by and in unison with the governor, a yielding locking-pin mounted in said lever, a connection or tie jointed both to said lever and actuating-rod and arranged to be locked to the lever through the medium of said pin, and a fixed stop adapted to automatically withdraw the locking-pin from said connection whenever the lever passes a predetermined limit, substantially as hereinbefore described.

2. In a steam engine provided with mechanism for automatically cutting off the steam at varying points in the stroke, the combination of the governor, a governor-actuated rod, as *a*, attached to the valve-gear, a safety device connecting both said governor and rod arranged to automatically disconnect the rod therefrom, and a latch adapted to arrest the movement of the governor and support the weight of its balls, &c., substantially as hereinbefore described.

3. The combination of the governor and an arm, as *b*, actuated by and in unison with the governor provided with a catch and a yielding locking-pin, with a rod, as *a*, connected with the valve-gear, a connection, as *c*, jointed to said arm and rod arranged to interlock with the locking-pin, a fixed stop, as *o*, adapted to withdraw the locking-pin from the connec-

tion *c*, and a latch arranged to engage with said catch, substantially as described.

4. In a steam engine provided with a governor and automatically detachable valve-gear arranged to be released through the medium of the governor, the combination of a safety device interposed between and connecting said governor and valve-gear adapted to automatically disconnect said parts in case the governor becomes accidentally inoperative and a counter-weighted latch mounted and adapted for operation, substantially as hereinbefore described.

5. In a steam engine, the combination of the governor mechanism, the tappets adapted to operate the steam-valves, an automatically detachable safety-device or stop-motion connected with the governor, connecting means jointed to the safety device and controlling the vertical movement of the tappets, and a supporting-latch adapted to automatically change its position when relieved from the weight of the governor, substantially as hereinbefore described and for the purpose set forth.

6. In a steam engine provided with detachable valve-gear having tappets controlled by a governor and an automatically detachable safety device, a latch adapted to coact with the safety device arranged to automatically swing into position to support the governor while the engine is being stopped, and during the period of rest, and also adapted to automatically change its position upon restarting the engine, thereby permitting the safety device to come into action in case of accident to the governor, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

WALTER F. BROWN.

Witnesses:

GEO. H. REMINGTON,
IDA M. WARREN.