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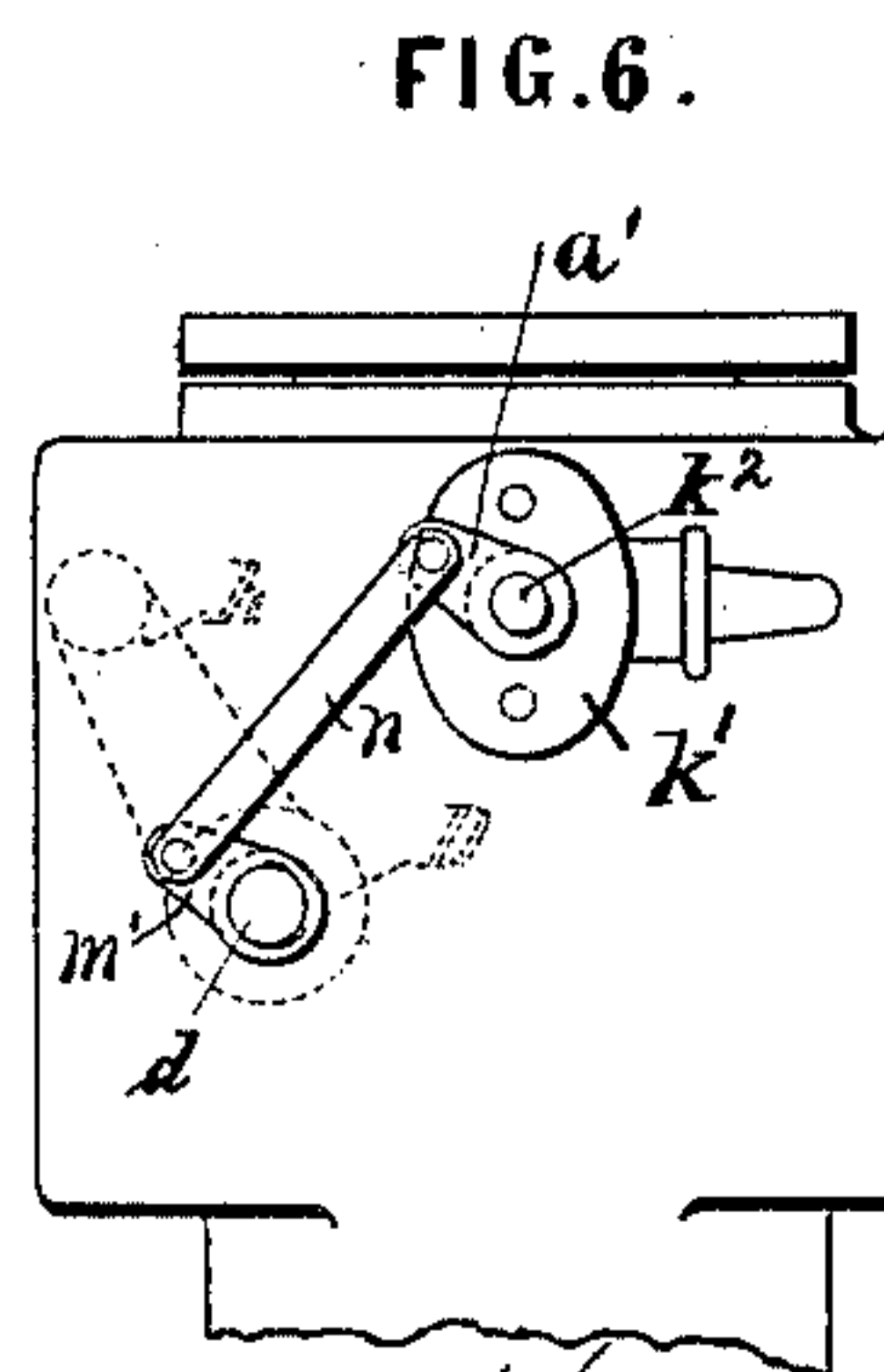
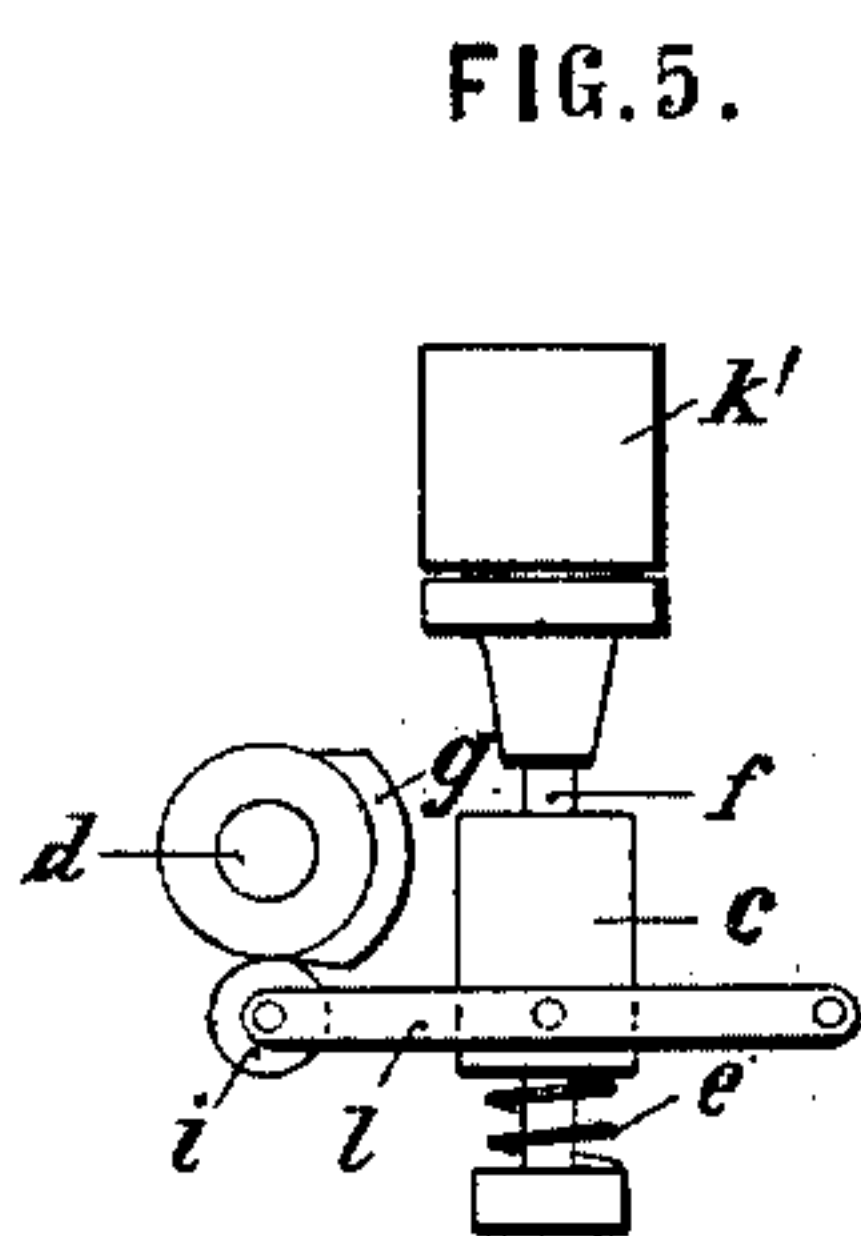
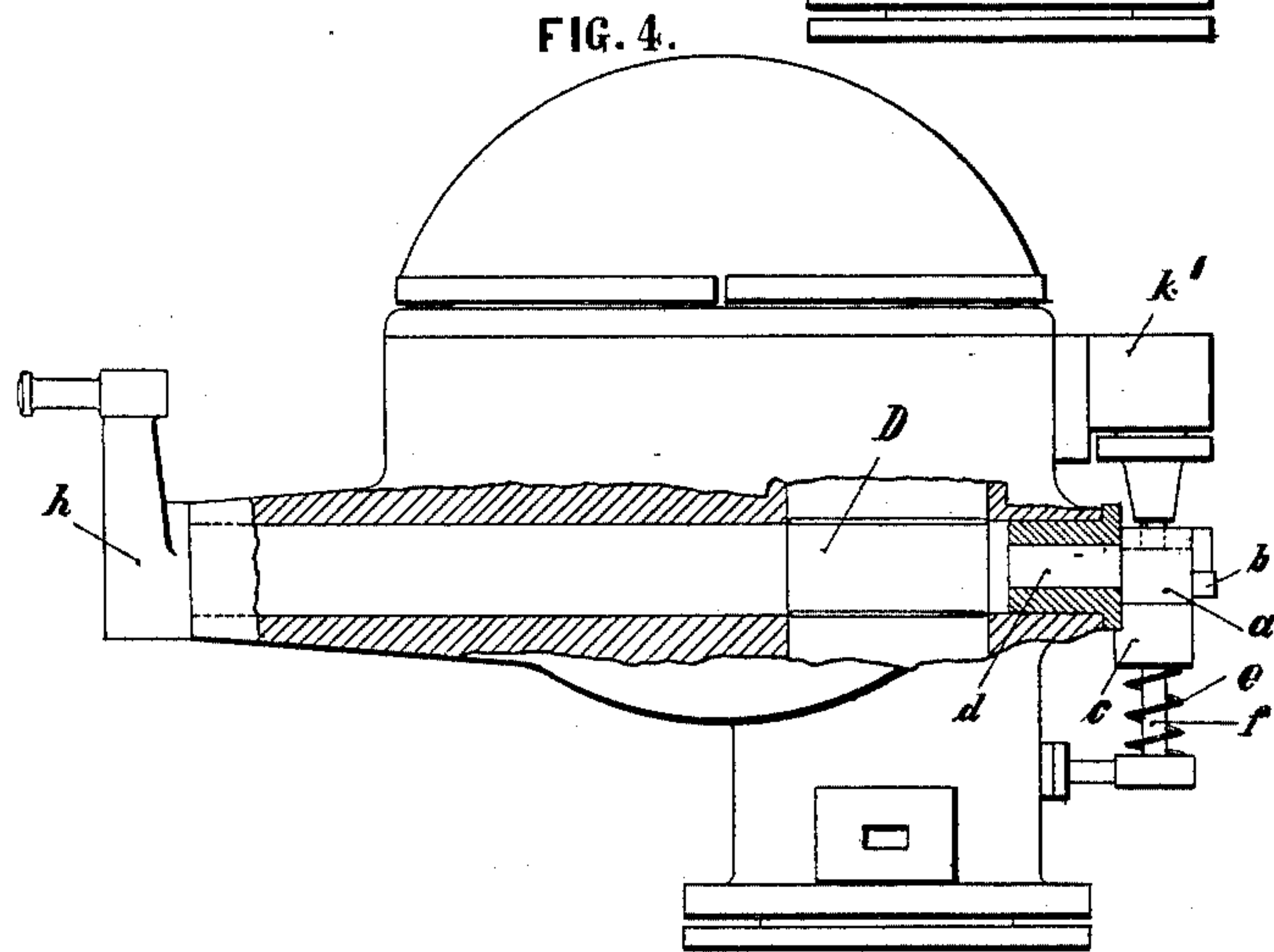
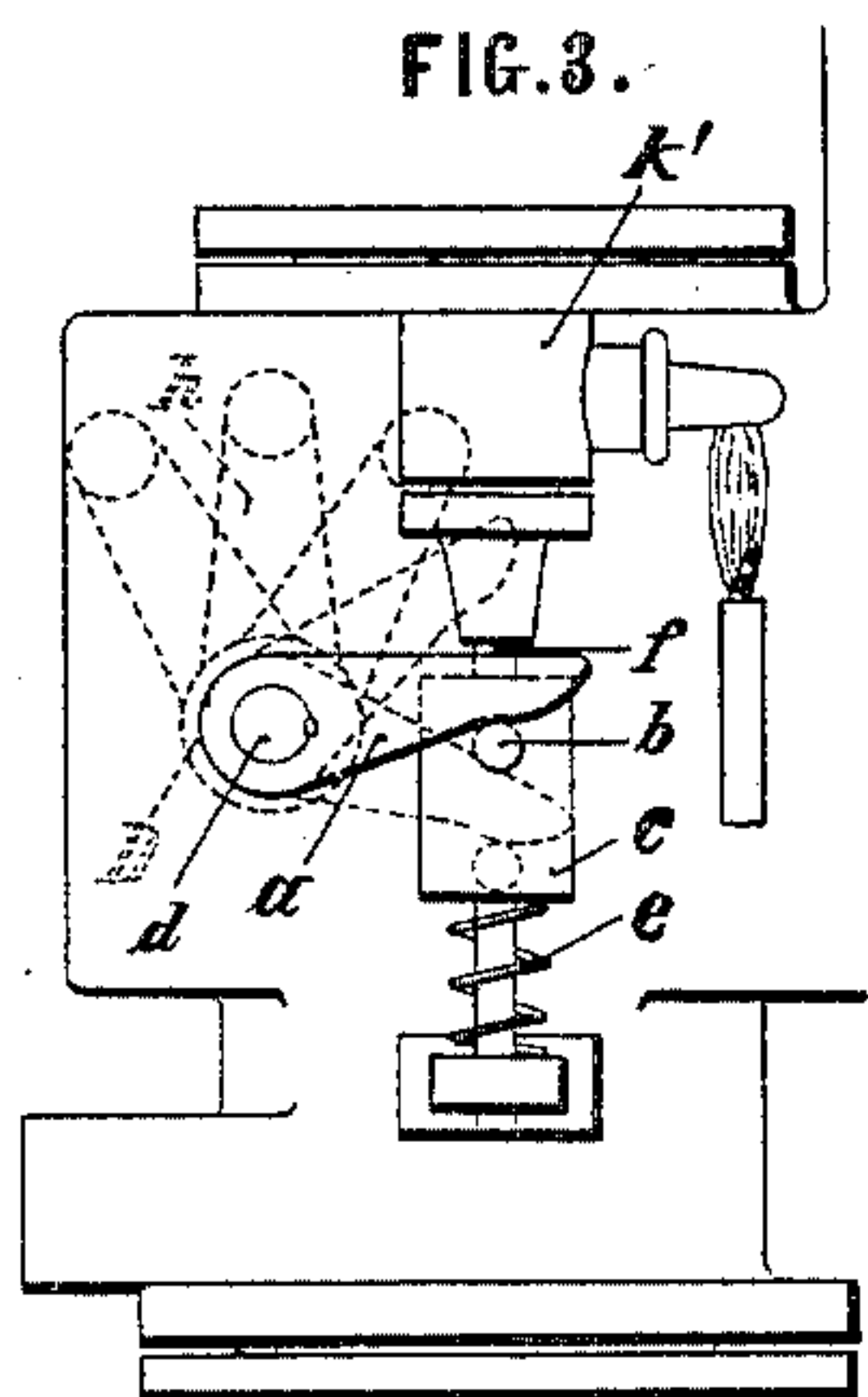
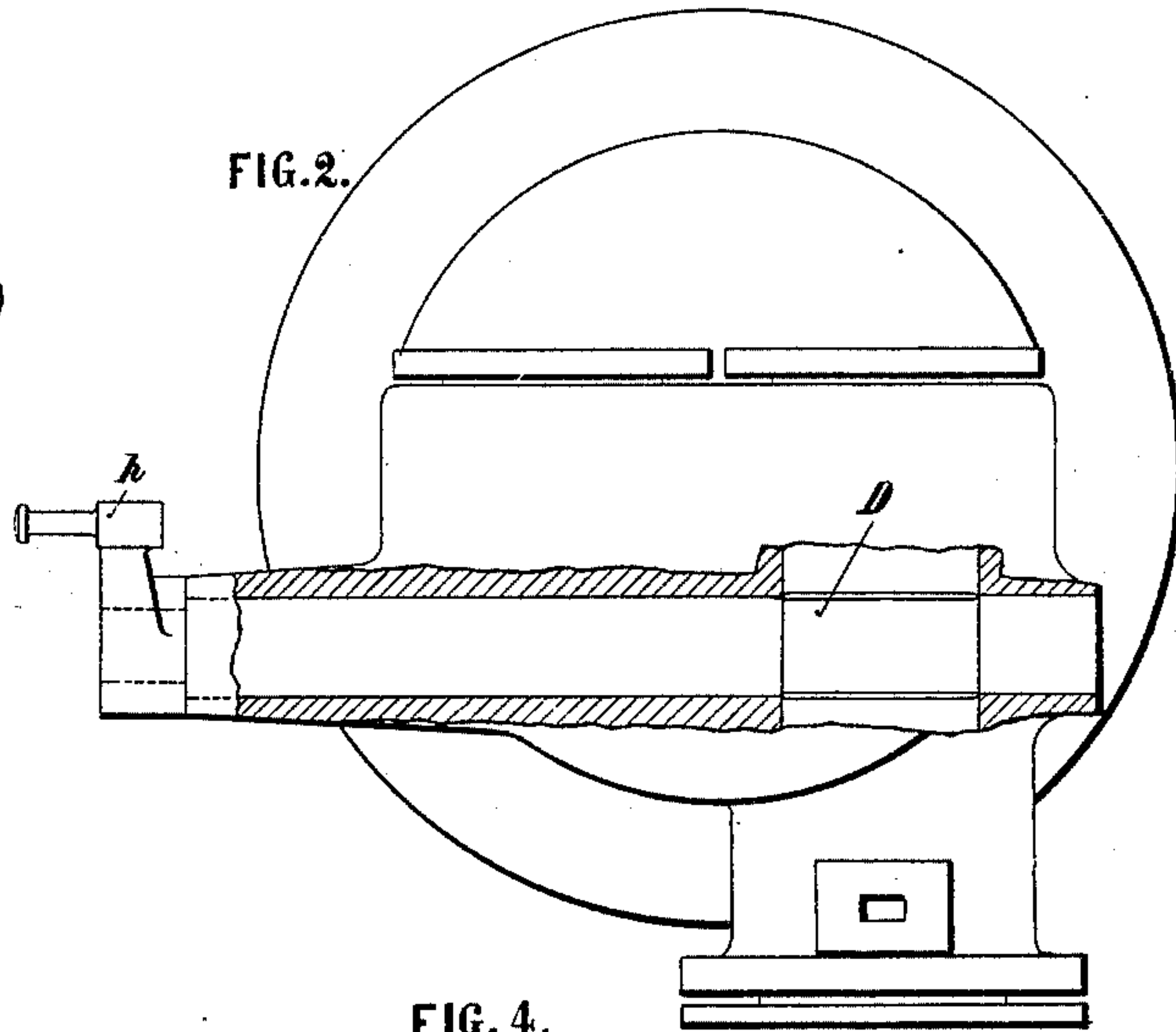
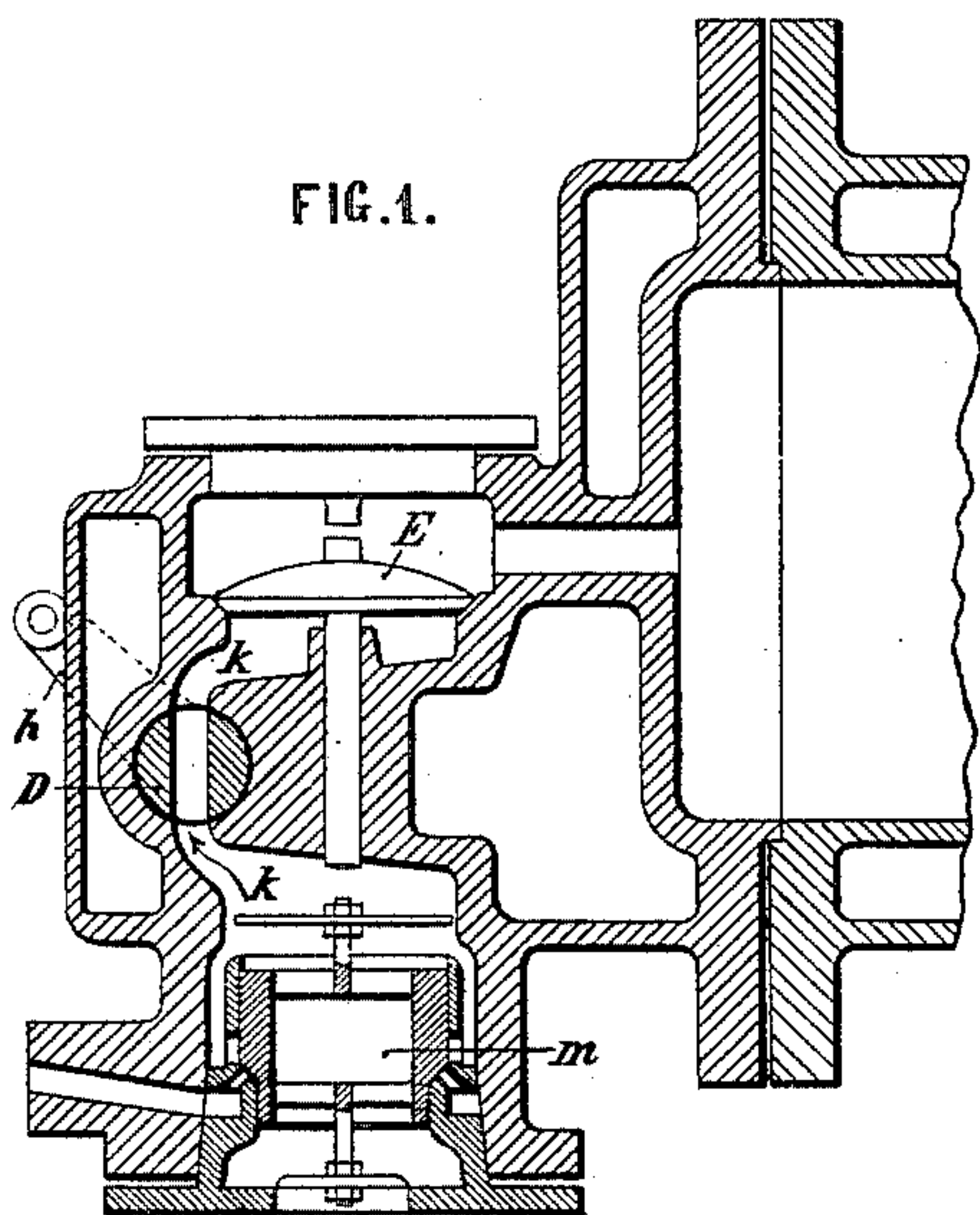
2 Sheets—Sheet 1.

H. EBBS.

DISTRIBUTING AND IGNITING DEVICE FOR GAS ENGINES.

No. 595,050.

Patented Dec. 7, 1897.



Witnesses.
Walter C. Allen.
Fred R. Proctor

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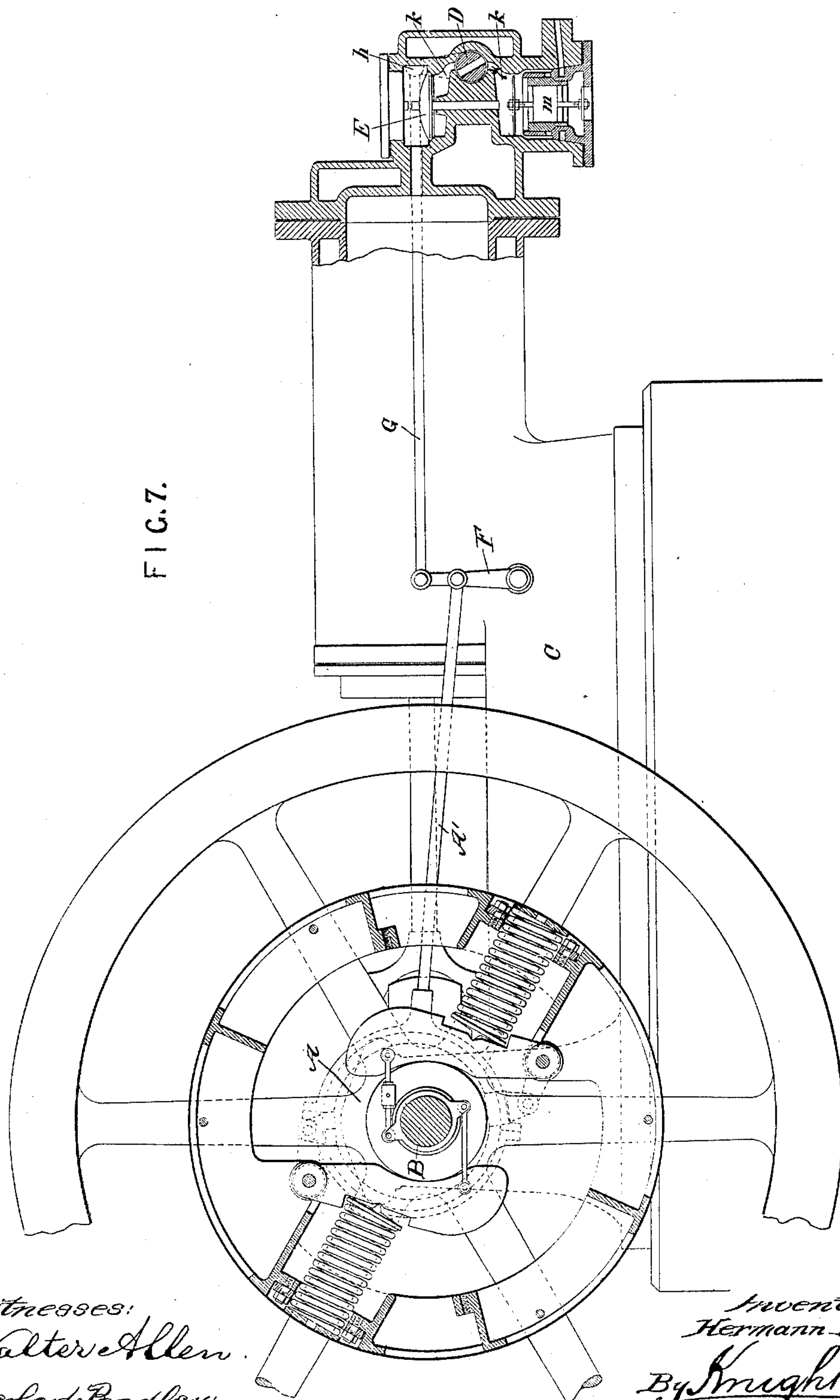
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DISTRIBUTING AND IGNITING DEVICE FOR GAS ENGINES.

No. 595,050.

Patented Dec. 7, 1897.



Witnesses:
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UNITED STATES PATENT OFFICE.

HERMANN EBBS, OF MAGDEBURG, GERMANY, ASSIGNOR TO THE FRIED.
KRUPP GRUSONWERK, OF SAME PLACE.

DISTRIBUTING AND IGNITING DEVICE FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 595,050, dated December 7, 1897.

Application filed November 6, 1895. Serial No. 568,126. (No model.) Patented in Germany October 12, 1892, No. 72,852, and in England January 12, 1894, No. 752.

To all whom it may concern:

Be it known that I, HERMANN EBBS, engineer, a subject of the King of Prussia, and a resident of Magdeburg, Prussia, Germany, have invented new and useful Improvements Relating to Distributing and Igniting Devices of Gas, Petroleum, and Like Engines, (for which Letters Patent have been granted in Germany, No. 72,852, dated October 12, 1892, and in Great Britain, No. 752, dated January 12, 1894,) of which the following is a specification.

The present invention relates to the distributing and igniting devices of gas, petroleum, and like engines, and has for its object to provide simple means for causing the ignition to vary with the cut-off—that is to say, to take place sooner or later, according as the cut-off is early or late—for the purpose of insuring a very economical consumption of the explosive charge and a uniform speed of the engine. The proportion of the residues of combustion of one charge to a new charge is greater when the cut-off is early than when the cut-off is late, and the ignitibility of the charge is thereby diminished. Consequently the ignition should take place proportionately earlier when the cut-off is early, in order that the combustion or the utilization of the charge may be complete. This object is secured according to the present invention by providing for the operation of the distributing or admission valve or cock by an eccentric or equivalent device which has a variable lead under the control of the governor, and by arranging the said valve or cock to operate the igniting-valve in accordance with the requirements—that is to say, sooner or later in proportion to the varying angular advance of the eccentric.

In the accompanying drawings, Figure 1 is a vertical section through the distributing-cock and admission-ports and part of the cylinder of an engine provided with the present improvements. Fig. 2 is a rear elevation, partly in section, of the same. Fig. 3 is a side elevation showing the parts which control the ignition-valve. Fig. 4 is a rear elevation, partly in section, of the parts shown in Fig. 3. Figs. 5 and 6 show slight modifications of

the mechanism for controlling the igniting-valve. Fig. 7 is a side elevation of an engine, showing a vertical section through the distributing-cock and admission-ports and part of the cylinder and showing the cock connected by an eccentric having a variable lead with a governor.

Like letters of reference denote corresponding parts throughout the drawings.

According to one mode of carrying this invention into practice a tap or cock D, in the form of a turning slide, Figs. 1, 2, 4, and 7, is provided in the passage *k* above the mixing-valve *m* for the explosive mixture, but is separated from the cylinder by a non-return or clap valve E, adapted to open toward the cylinder. The said cock D is operated through a crank *h* on its spindle by an eccentric A on the fly-wheel shaft B of the engine or motor C in such a manner that it is opened and closed once in every revolution of the latter.

As a means for connecting the crank *h* with the eccentric A, I provide a lever F, to which the rod A' of the eccentric is fulcrumed, and couple the free end of the lever to the crank by a draw-rod G.

When the motor is working at its full capacity and therefore taking in its maximum charge, the commencement of the opening of the cock occurs simultaneously with the commencement of the suction and of the working strokes, and the complete closing of the cock is simultaneous with the completion of these two strokes. As the pressure of the exploding charge keeps the non-return valve E closed during the working stroke the part of the distributing-cock D being open during this period has no effect upon the working of the engine, neither has the earlier opening of the cock any effect on the working, if with less work done by the engine and the consequent increase in the speed the governor so increases the lead of the distributing-eccentric as to effect the earlier closing of the said cock. Such earlier closing operates to cut off the supply of explosive mixture before the termination of the suction-stroke. Consequently the engine ceases to work with a complete charge and works with a charge which is smaller in proportion as the lead is greater.

During that part of the opening of the cock D which takes place at the end of the compression-stroke and of the discharging-stroke the non-return valve E is closed, so that, notwithstanding the early opening of the distributing-cock, the suction of fresh explosive mixture can only take place after the commencement of the suction-stroke. With a complete charge the ignition should take place at the end of the compression-stroke, and must, therefore, be started shortly before the end of such stroke. If, however, the engine is working with an incomplete charge, the ignition must be effected a little earlier, because then the mixture contained in the cylinder ignites with somewhat greater difficulty and burns more slowly. Its combustion would, therefore, be incomplete if the moment of ignition remained unchanged. Now as the ignition must approximately coincide with the moment at which the distributing-cock opens near the end of the compression-stroke it is possible to obtain a correct and simple control of the ignition-valve by suitably connecting it with the distributing-cock D or by so arranging it that it shall be controlled by the movements of the said cock.

A simple mode of operating the igniting-valve is as follows—that is to say, upon the spindle *d* of the distributing-cock D is fixed an arm *a*, Figs. 3 and 4. At the moment when the said cock begins to open this arm *a* strikes a pin *b*, fixed on a spring-controlled piece *c*, connected with the rod *f* of the ignition-valve *k'* and depresses said piece *c* and rod, and thus opens the valve *k'*. The closing of the valve *k'* is effected by the spring *e* when the arm *a* is raised. When the engine is working with a light load, the distributing-cock D cuts off before the termination of the suction-stroke in consequence of the lead being increased by the governor, and it begins to open before the termination of the compression-stroke. The ignition-valve *k'*, being controlled by the distributing-cock, also opens before the termination of the compression-stroke, and therefore the ignitable mixture has access to the ignition-chamber and the ignition is caused earlier than when the charge is complete. It is immaterial that the ignition-valve is opened shortly before the termination of the discharging-stroke, because the cylinder then contains only gas already burned, and it is of no consequence that the ignition-valve is open during part of the suction-stroke, because, although a portion of the products of combustion in the ignition-chamber may be drawn into the cylinder, a premature ignition cannot take place.

In lieu of the arm *a* for operating the ignition-valve a cam *g*, fixed on the spindle of the distributing-cock, may be used, as in Fig. 5. Said cam acts through a roller *i*, mounted on a lever *l*, connected with the spring-controlled piece *c*, which operates the rod of the igniting-valve.

Sometimes, according to this invention, in lieu of an ignition-valve use is made of an ignition-cock *k*², Fig. 6, which is actuated synchronously with the distributing-cock D by a crank *a'*, fixed on its spindle and connected by a link *n* with a similar parallel crank *m'* upon the journal *d* of the distributing-cock.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A gas or petroleum engine comprising a mixing-valve, a clap-valve located over the mixing-valve and adapted to open toward the cylinder, a passage for the explosive mixture, connecting the mixing-valve with the clap-valve, a cock or turning slide interposed in the passage between the mixing-valve and the clap-valve, for regulating the quantity of the collected gas mixture as also the gas and the air which are drawn in, and means for opening and closing the cock or turning slide, at each revolution of the fly-wheel; substantially as described.

2. A gas or petroleum engine comprising a mixing-valve, a clap-valve, a passage connecting the mixing-valve with the clap-valve, a governor, an igniting-valve, a cock or turning slide located in the passage between the mixing-valve and the clap-valve, devices for connecting the cock or turning slide with the governor, and devices for connecting the cock or turning slide with the ignition-valve; substantially as described.

3. A gas or petroleum engine comprising a mixing-valve, a clap-valve, a passage connecting the mixing-valve with the clap-valve, a governor, an eccentric having a rod and connected with the governor, an ignition-valve, a cock or turning slide having a crank and located in the passage between the mixing-valve and the clap-valve, a lever with which the eccentric-rod is connected, a draw-rod connecting the crank with the lever and devices for connecting the cock or turning slide with the ignition-valve; substantially as described.

4. A gas or petroleum engine comprising a mixing-valve, a clap-valve, a passage connecting the mixing-valve with the clap-valve, a governor, an ignition-valve, a cock or turning slide located in the passage between the mixing-valve and the clap-valve, devices for connecting the cock or turning slide with the governor, and devices for connecting the cock or turning slide with the ignition-valve, consisting of an arm fixed to the cock or turning slide, a spring-controlled piece, having a pin with which the arm engages, and a rod for operating the ignition-valve; substantially as described.

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Witnesses:

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