F. M. GREEN.

LANDING CHASSIS.

APPLICATION FILED SEPT. 28, 1918.

1,298,038.

Patented Mar. 25, 1919.

3 SHEETS—SHEET 1.

FIG. 3.

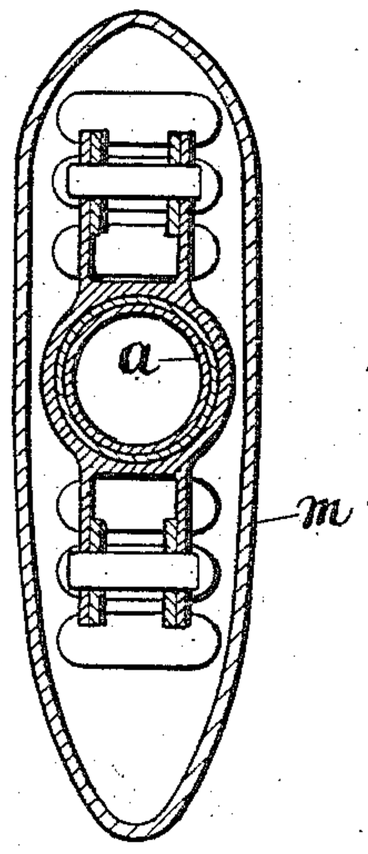


FIG. 4.

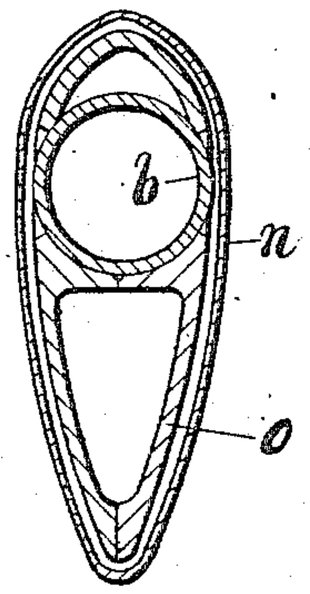


FIG. 1.

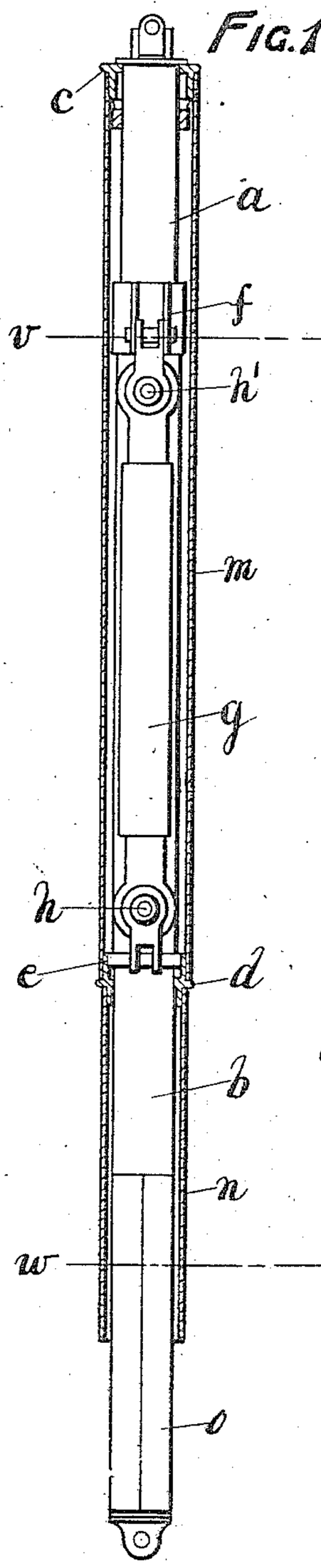
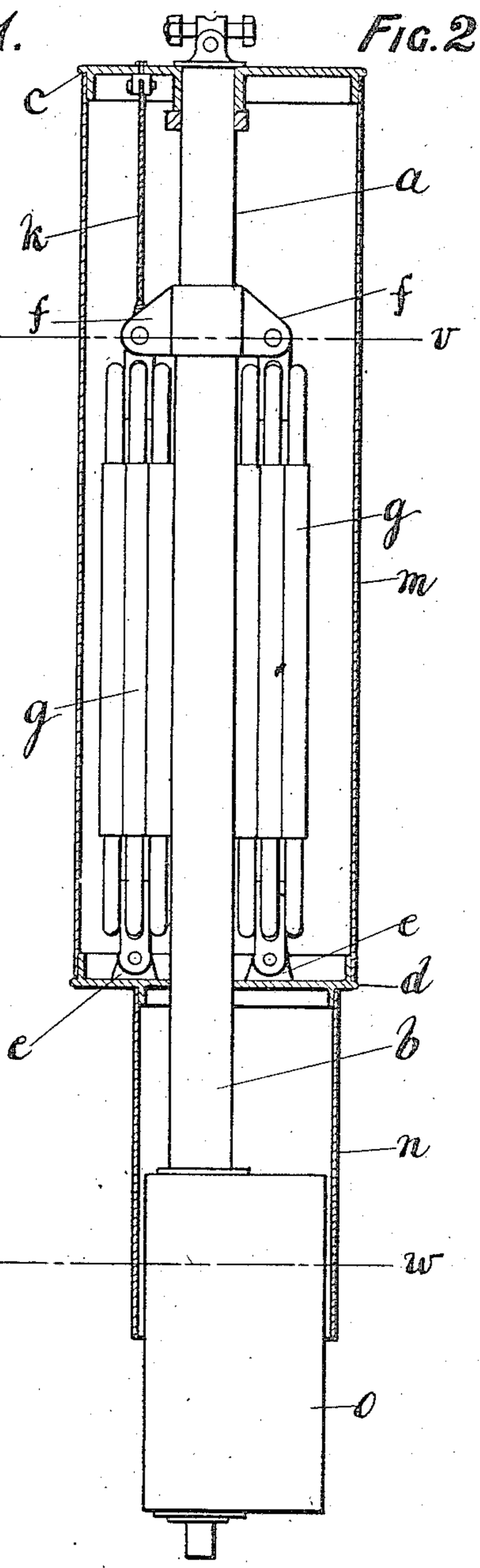


FIG. 2.



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3 SHEETS—SHEET 2.

FIG. 5.

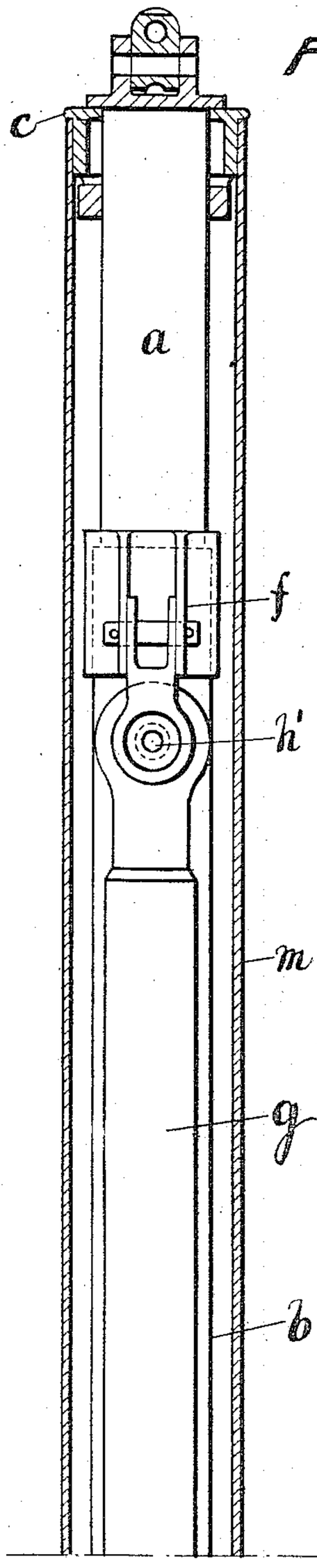
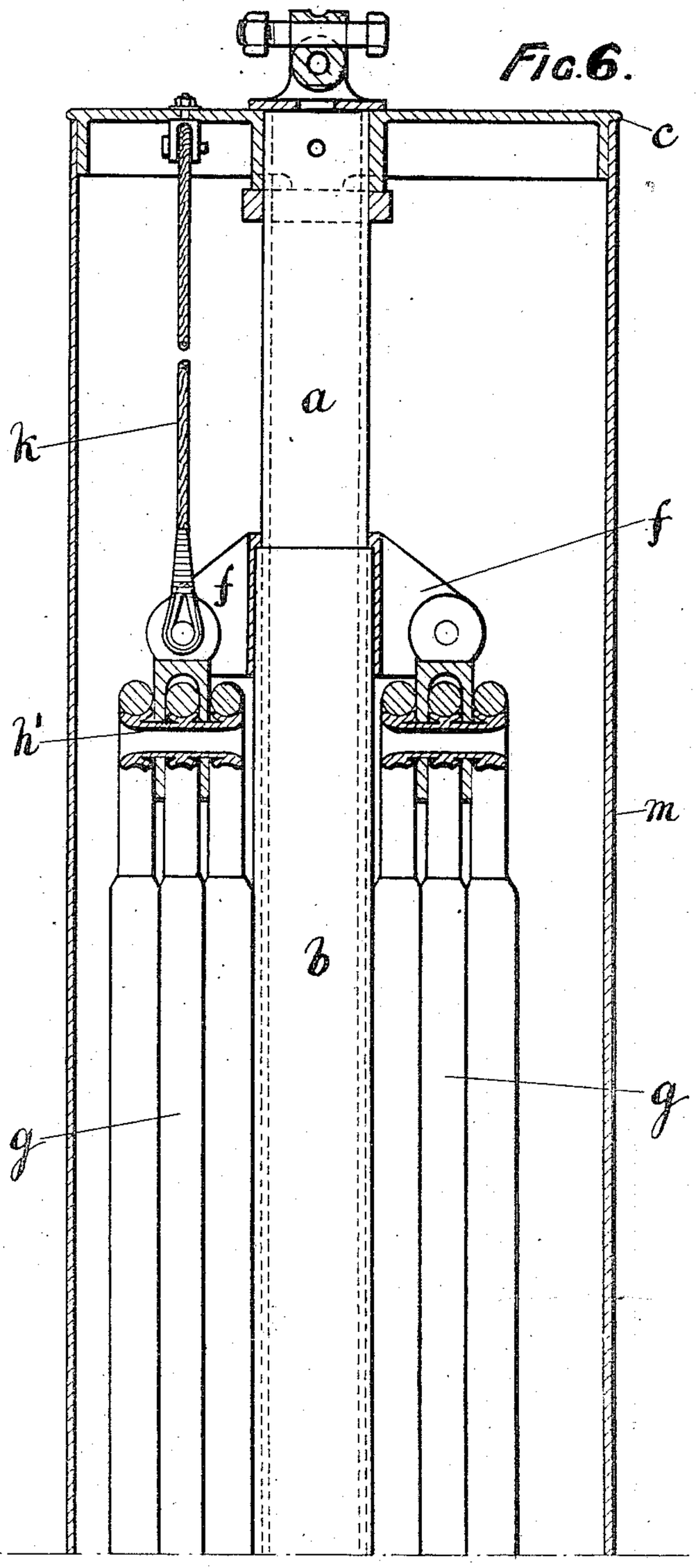


FIG. 6.



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3 SHEETS—SHEET 3.

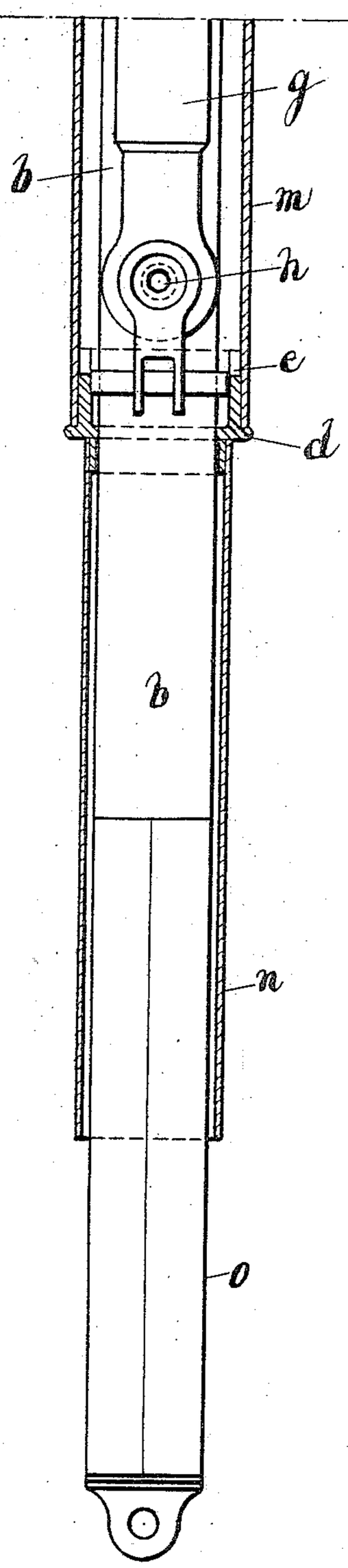

Fig. 5a

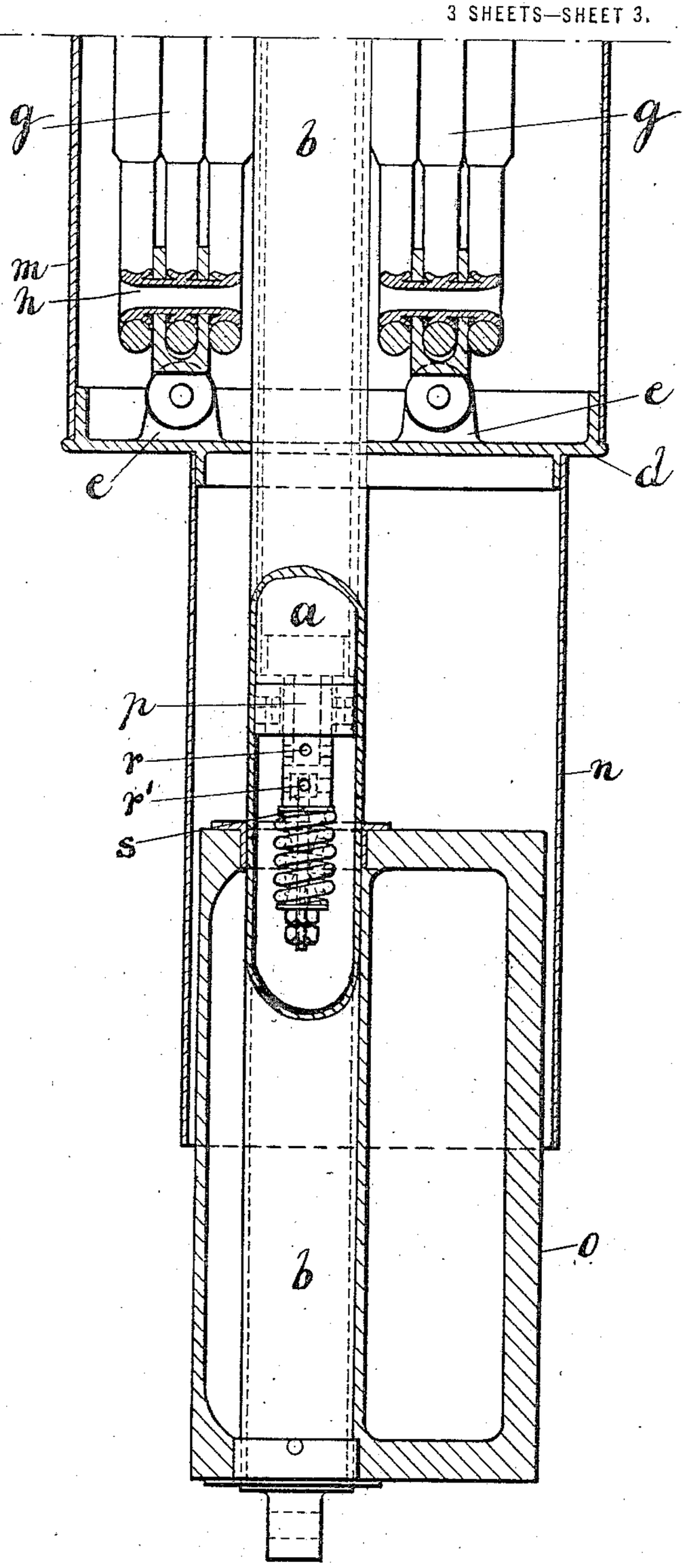

Fig. 6a

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UNITED STATES PATENT OFFICE.

FREDERICK MICHAEL GREEN, OF PARKSIDE, COVENTRY, ENGLAND, ASSIGNOR TO SIDDELEY-DEASY MOTOR CAR COMPANY LIMITED, OF PARKSIDE, COVENTRY, ENGLAND.

LANDING-CHASSIS.

1,298,038. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed September 28, 1918. Serial No. 256,112.

To all whom it may concern:

Be it known that I, FREDERICK MICHAEL GREEN, a subject of the King of Great Britain and Ireland, residing at Parkside, Coventry, in the county of Warwick, England, have invented new and useful Improvements in Landing-Chassis, of which the following is a specification.

This invention relates to landing chassis of aeroplanes and the like, of the type in which the shock absorbing members are controlled partly by hydraulic means and partly by springs, and it consists of an improved shock-absorbing strut for connecting the axle carrying the landing wheels with the fuselage, which has for its object obtaining a maximum shock absorbing effect with a minimum amount of relative movement between the parts of the strut.

A further object of the invention is to reduce the windage on this type of strut and to simplify its construction.

We attain these ends by the construction shown in the accompanying drawing in which:—

Figures 1 and 2 are views in front and side elevation respectively—partly in section—of a strut constructed according to the present invention.

Fig. 3 is a view in transverse section on lines *v v* Figs. 1 and 2.

Fig. 4 is a view in transverse section on lines *w w* Figs. 1 and 2, and

Figs. 5 and 6 are views in side and front elevation—partly in section on an enlarged scale—showing more clearly the details of construction of the upper portion of the strut.

Figs. 5ª and 6ª are views similar to Figs. 5 and 6 showing the lower portion of the strut.

Throughout the views similar parts are marked with like letters of reference.

Two tubular elements *a* and *b* are arranged to telescope with respect to one another the element *a* being adapted to be attached to the fuselage of the machine and the element *b* being adapted to be attached to the frame or axle carrying the landing wheels.

On the end of the inner tubular element *a* is a piston *p* adapted to slide in the outer tubular element *b*. In said piston is a series of permanent leakage holes *r* and one or more auxiliary leakage holes r^1 the latter being controlled by a spring-loaded valve *s*. On the upper end of the tubular element *a* is fixed a plate *c* which carries the attachment by which the strut is attached to the fuselage of the machine. This plate is attached to the tubular element *a* so that its plane lies at right angles to the axis of said element. Coupled with this plate by means of a cover or "fairing" *m*—which is so shaped as to give this part of the strut an elliptical or streamline shape in cross section—is another plate *d* which is free to slide in relation to the tubular elements *a* and *b*. On the plate *d* is mounted a second cover or "fairing" *n* which also has an elliptical or stream-line shape in cross section. This cover or "fairing" is adapted to coöperate with a similarly shaped housing *o* mounted on the lower end of the tubular member *b*—which carries the attachment by which the strut is attached to the frame or axle carrying the landing wheels—so as to preserve the elliptical or stream-line shape of the strut in cross section throughout its entire length. On the sliding plate *d* are mounted two brackets *e* and *e'* between which and two brackets *f* and *f* mounted on the upper end of the outer tubular element *b* are arranged the controlling springs *g* which consist of lengths of rubber cord which are attached to the pins *h* and h^1 carried by the two groups of brackets *e* and *f*.

Extending between the plate *c* and the brackets *f* and *f* are one or more inextensible flexible couplings *k* for the purpose of limiting the relative movement of the two elements *a* and *b* when the landing chassis is inoperative, the lengths of said couplings being such as will keep the springs *g* under a certain amount of tension.

When the aeroplane is flying the weight of the axle and wheels of the landing chassis is sufficient to make the tubular element *b* of the strut drop with respect to the element *a* within the limits of the couplings *k* so as to extend the strut to its fully extended position. The oil in the tubular elements then

flows through the permanent leakage holes r and fills the space in the tubular element b below the piston p. When the aeroplane alights the oil in the tubular element b has to pass the piston p into the tubular element a. If the landing shock is less than the predetermined amount the oil will flow through the permanent leakage holes r but if the shock exceeds the predetermined amount the spring-loaded valve s will open and give the oil an additional path or paths through the auxiliary leakage hole or holes r^x to the interior of the tubular element a thus operating as a safety valve which prevents the oil from exceeding a predetermined pressure.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a shock absorbing strut for the landing chassis of aeroplanes and the like, the combination with two tubular members arranged to telescope with respect to one another and in which the relative movement of said members is controlled by hydraulic means, of springs operating in tension between said tubular members to limit the relative movement of one in respect to the other in the direction to reduce the length of the strut, of a check device to limit the re-action of said members, and of covers or "fairings" adapted to give the strut an elliptical or stream-line shape in cross section.

2. A shock absorbing strut for the landing chassis of aeroplanes comprising two tubular members arranged to telescope one within the other, an hydraulic cushion operating between said members, a plate fixed on the upper end of the inner tubular member, a plate adapted to slide freely over the outer tubular member, a tubular cover or "fairing" fixed to and connecting said plates, a second tubular cover or "fairing" carried by the plate adapted to slide over the outer tubular member, a housing mounted on the lower end of the outer tubular member said housing being adapted to cooperate with the second cover or "fairing" to preserve the elliptical shape of the strut in cross section, a bracket mounted on the upper end of the outer tubular member, a series of springs operating in tension between said bracket and the plate carried by the upper end of the inner tubular member, and check couplings operating between said plate and said bracket.

3. A shock absorbing strut for the landing chassis of aeroplanes comprising two tubular members arranged to telescope one within the other, a hydraulic cushion operating between said members, an elliptically shaped plate fixed on the upper end of the inner tubular member, a plate adapted to slide freely over the outer tubular member, a tubular cover or "fairing" of stream like form fixed to and connecting said plates and cover or "fairing" constituting a tubular box, a second tubular cover or "fairing" of stream-line form carried by the plate adapted to slide over the outer tubular member, a housing of stream-line form mounted on the lower end of the outer tubular member said housing being adapted to slide telescopically in relation to and within said second cover or "fairing", a bracket mounted on the upper end of the outer tubular member, springs operating in tension between said bracket and the plate carried by the upper end of the inner tubular member, and check couplings operating between said bracket and said plate.

4. A shock absorbing strut for the landing chassis of aeroplanes comprising two tubular members arranged to telescope one within the other, an elliptically shaped plate fixed on the upper end of the inner tubular member, an elliptically shaped plate adapted to slide freely over the outer tubular member, a tubular cover or "fairing" of elliptical shape in cross section fixed to and connecting said plates, a second tubular cover or "fairing" of elliptical shape in cross section carried by the plate adapted to slide over the outer tubular member, a housing of elliptical shape in cross section mounted on the lower end of the outer tubular member said housing being adapted to slide telescopically in relation to and within the said second cover or "fairing", brackets mounted on the upper end of the outer tubular member, springs operating in tension between said brackets and the plate carried by the upper end of the inner tubular member in a manner to control the relative movement between the two tubular elements in the direction to shorten the length of the strut, hydraulic means for same end, and check couplings operating between said bracket and said plate for controlling the amount of movement between the two tubular members of the strut in the direction to increase its length.

5. In a shock absorbing strut for the landing chassis of aeroplanes the combination of two tubular members a and b arranged to telescope one within the other, an elliptically shaped plate c fixed on the upper end of the inner tubular member a, an elliptically shaped plate d adapted to slide freely over the outer tubular member b, a tubular cover or "fairing" m of elliptical shape in cross section fixed to and connecting said plates c and d, a housing of elliptical shape in cross section mounted on the lower end of the tubular member b, a second tubular cover or "fairing" n of elliptical shape in cross section carried by the plate d and adapted to slide freely over the housing o, a bracket f mounted on the upper end of the outer tubular member b, springs g oper-

ating between said bracket *f* and the plate *e* carried by the inner tubular member *a*, check couplings *k* operating between the plate *d* and the bracket *f*, a piston *p* formed on or carried by the lower end of the inner tubular member *a* permanent leakage holes *r* through said piston, auxiliary leakage holes r^1 through said piston and of a spring-loaded valve *s* controlling said auxiliary leakage holes.

In testimony I have signed my name to this specification.

FREDERICK MICHAEL GREEN.