

D. ROBERTS.
MECHANISM FOR TRANSMITTING RECIPROCATING MOTION.
APPLICATION FILED AUG. 26, 1909.

975,283.

Patented Nov. 8, 1910.

3 SHEETS—SHEET 1.

Fig.1.

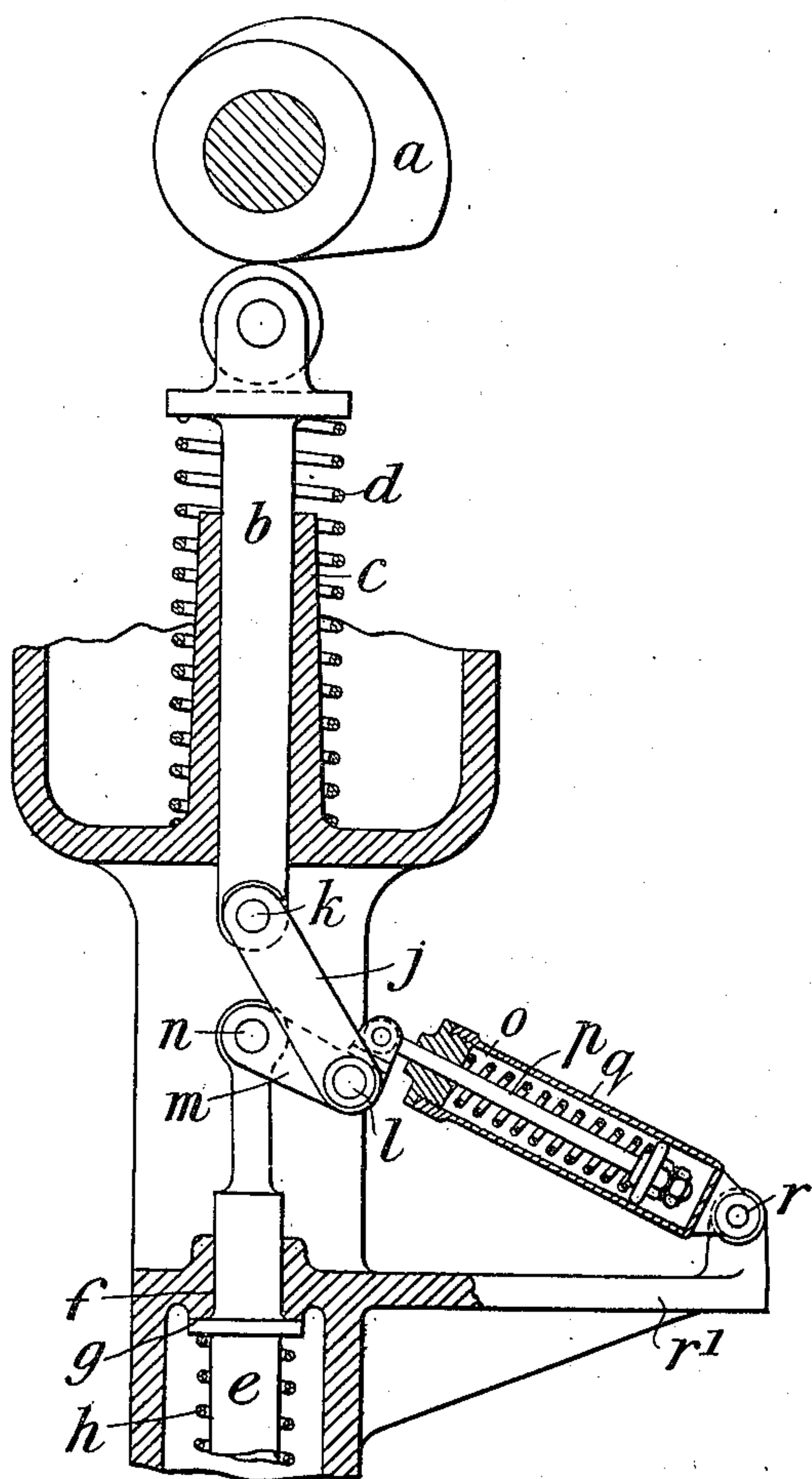
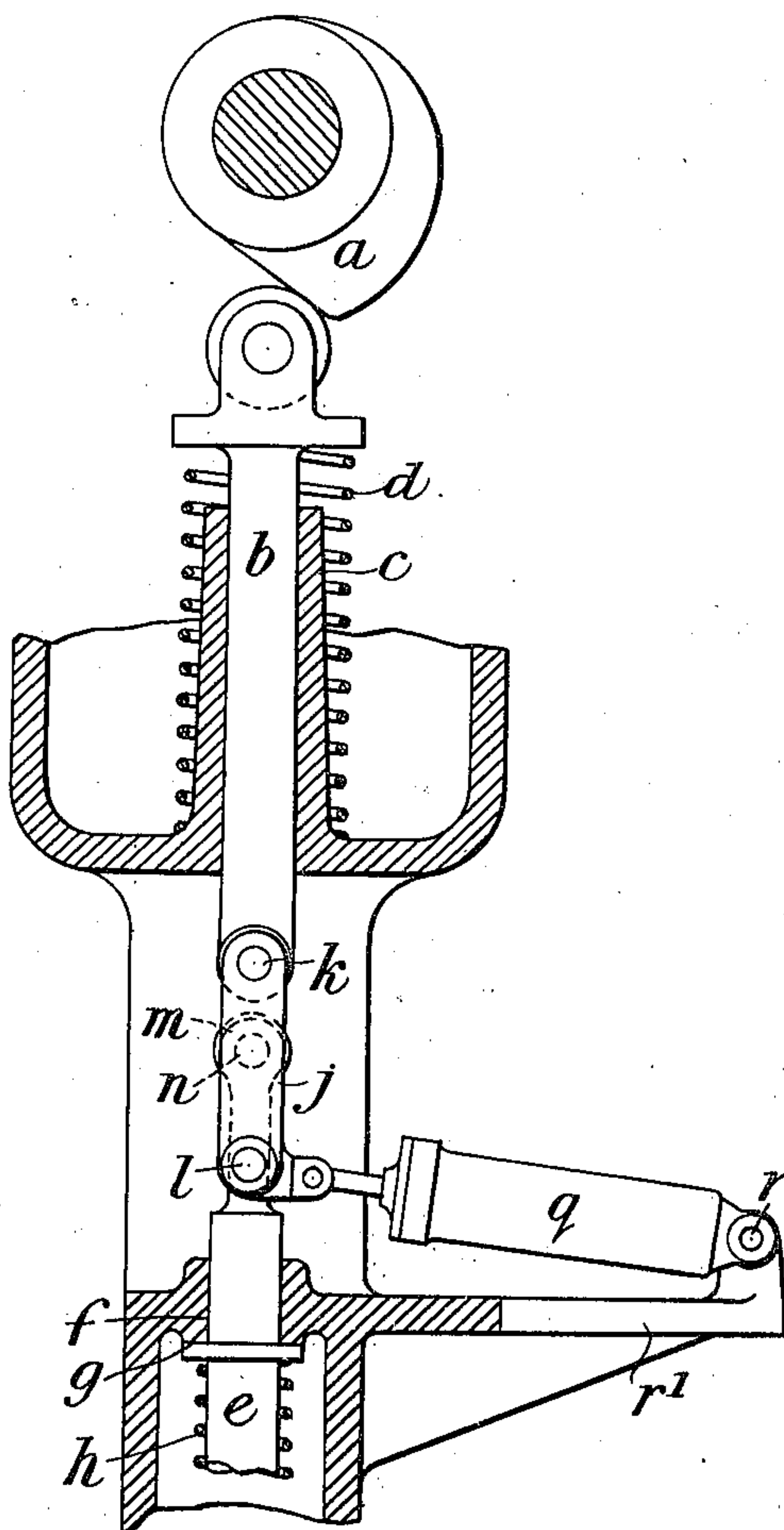


Fig.2.



Witnesses.

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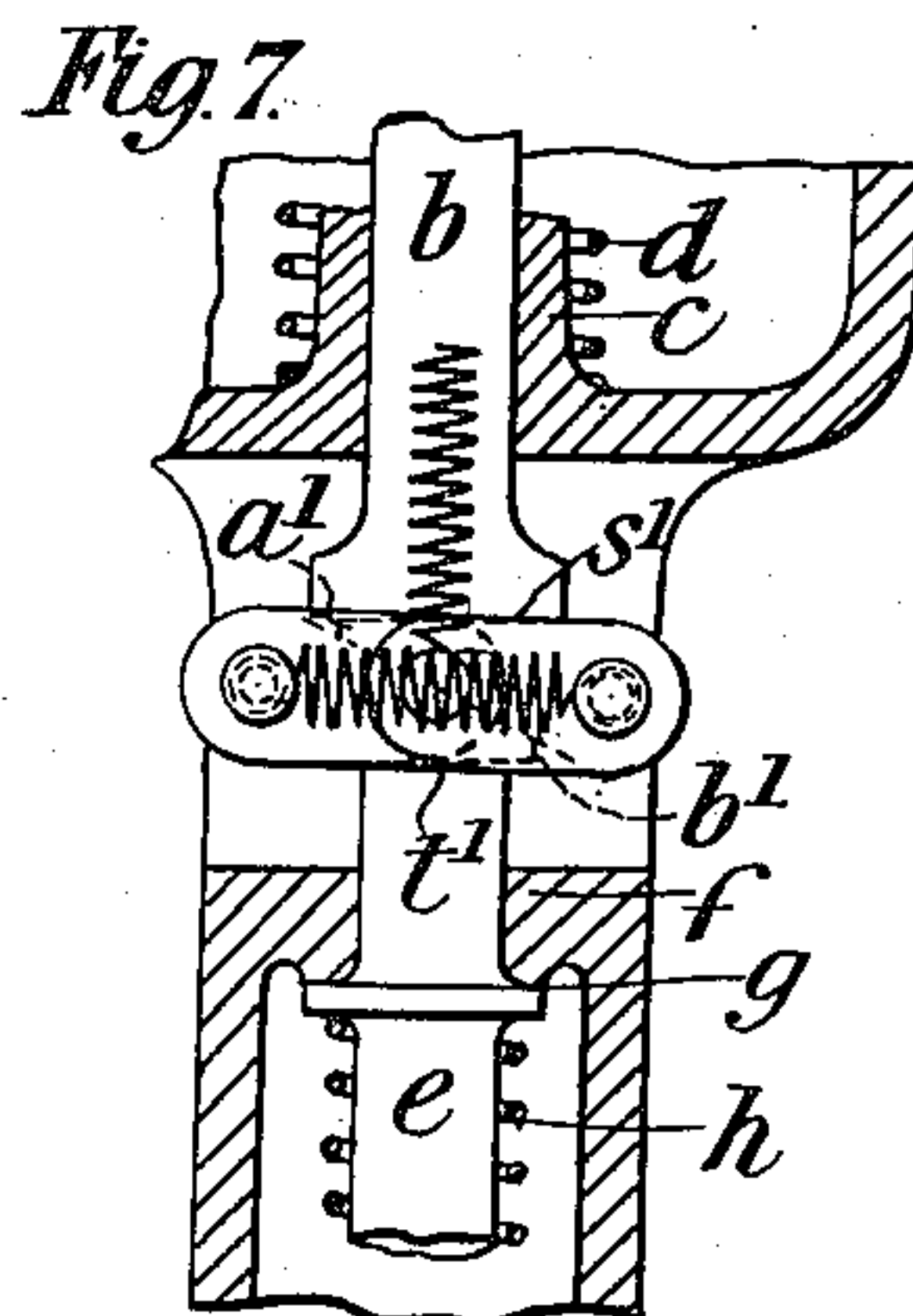
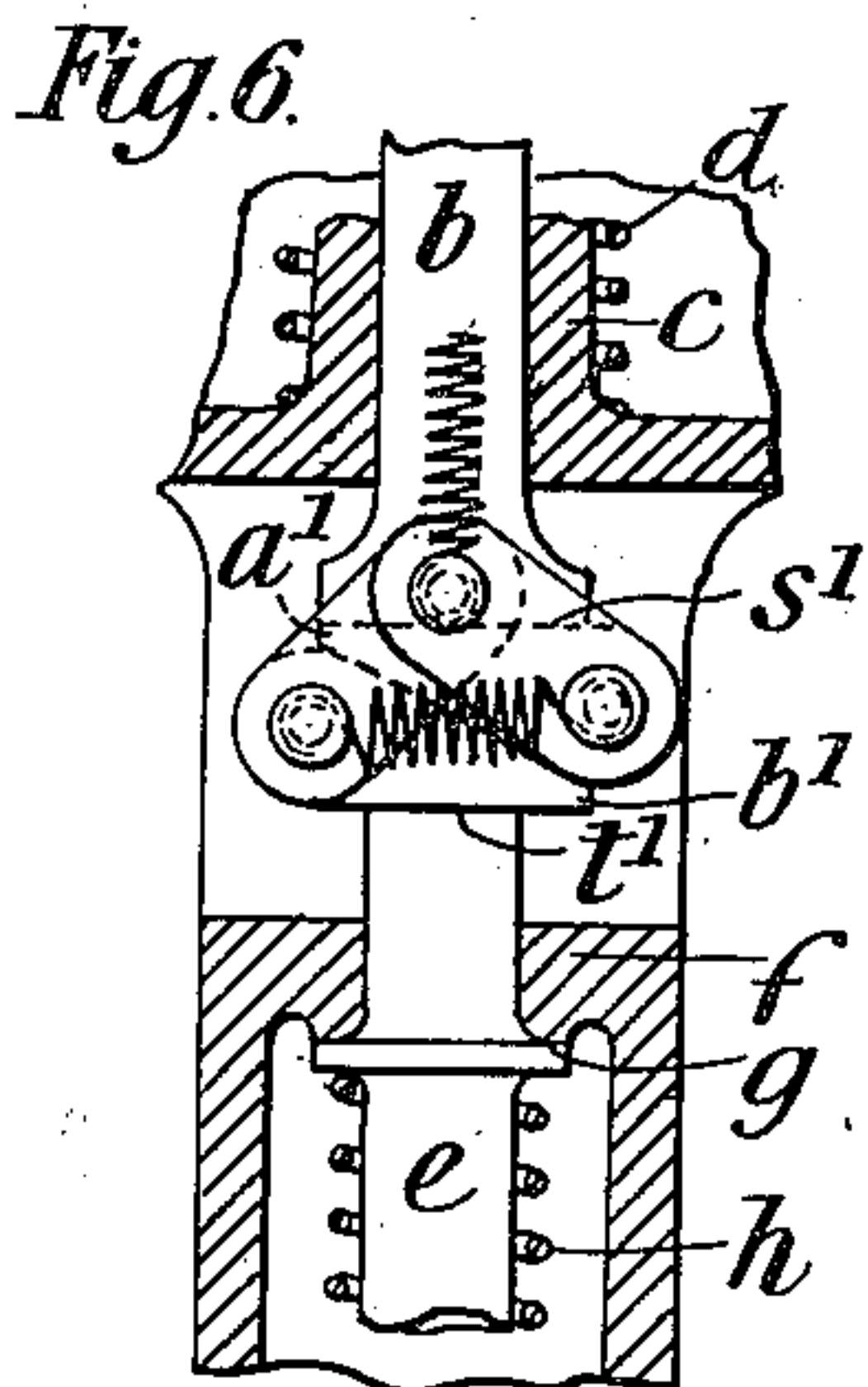
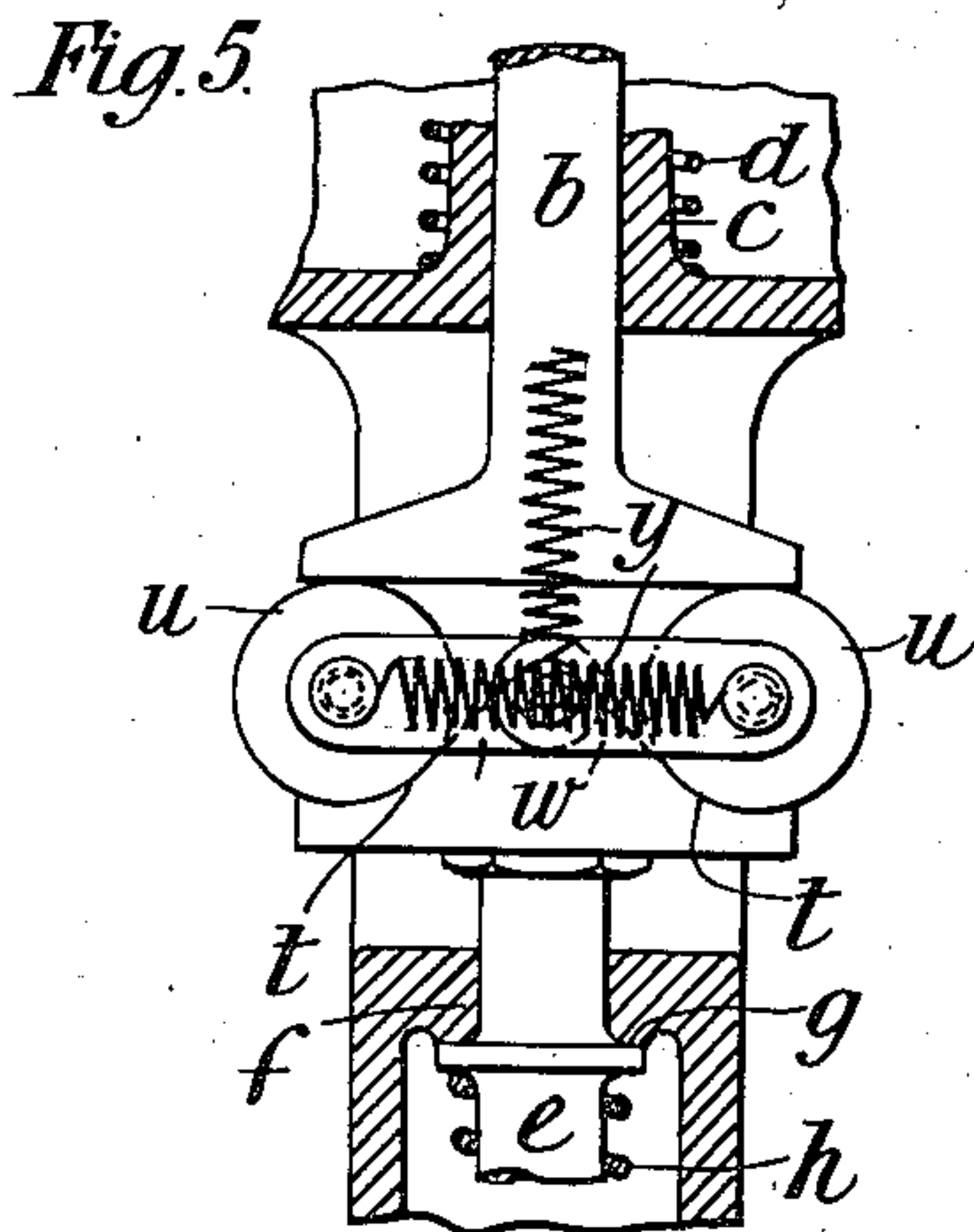
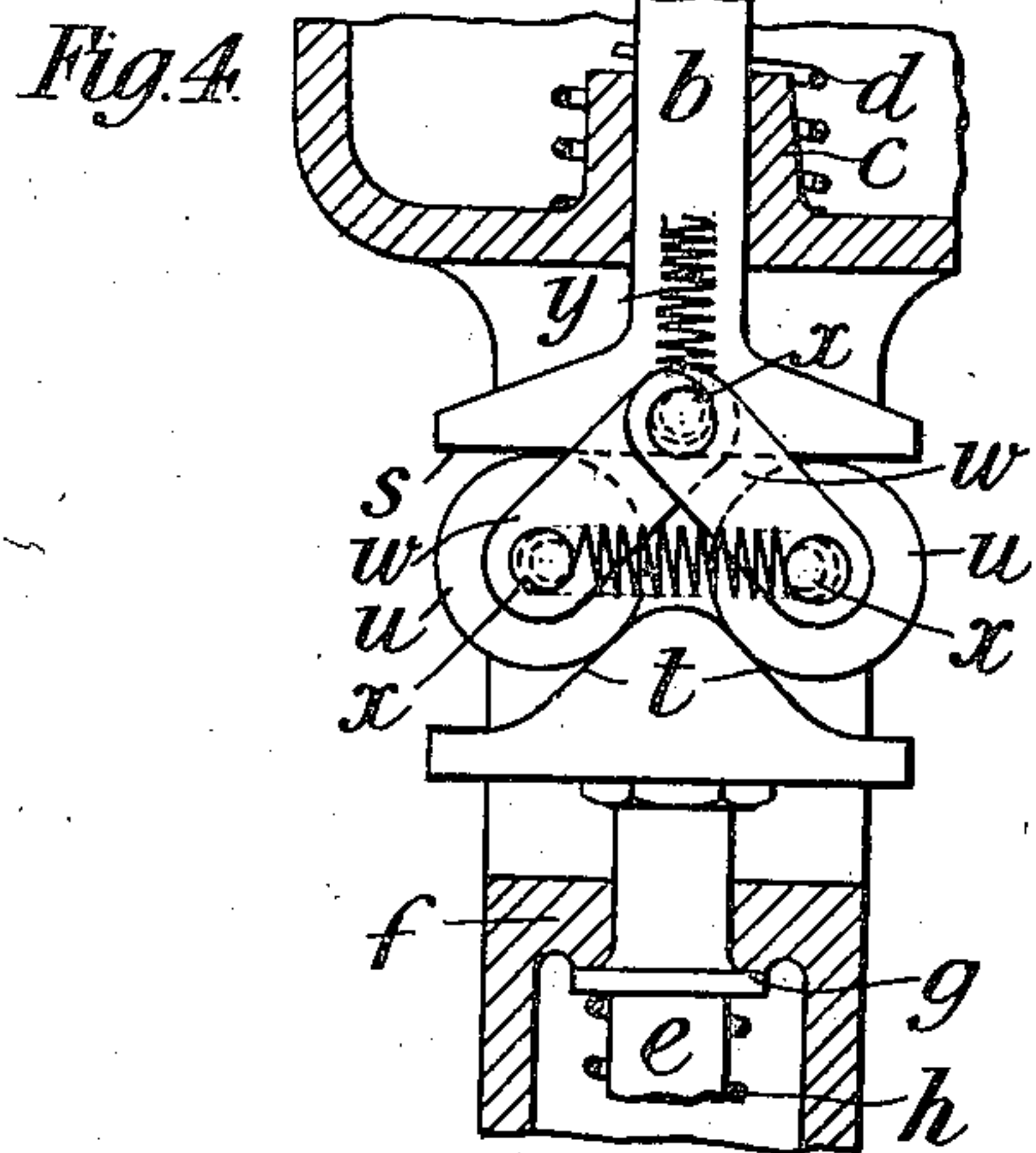
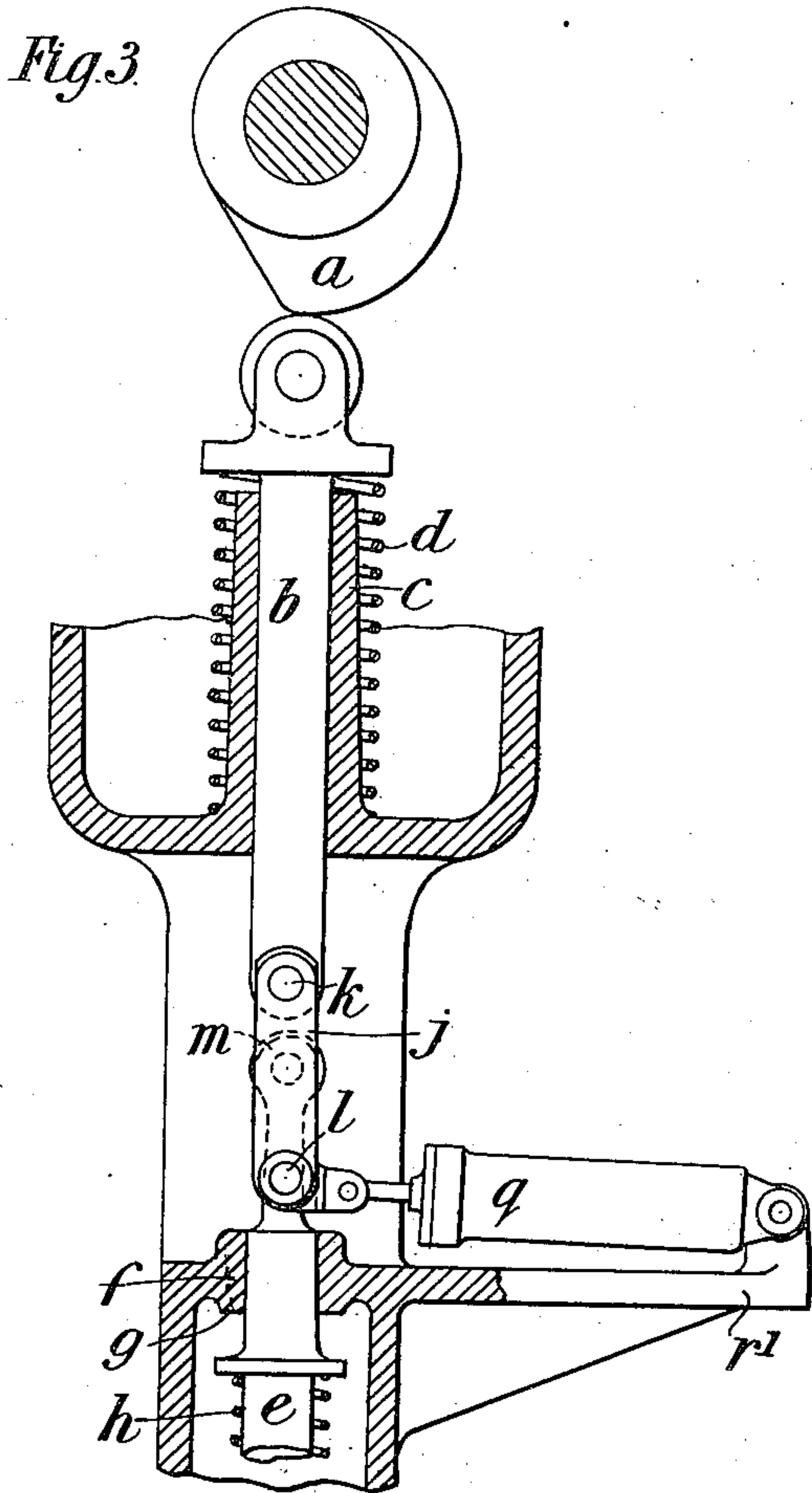
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3 SHEETS—SHEET 2.



Witnesses.

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Fig. 8.

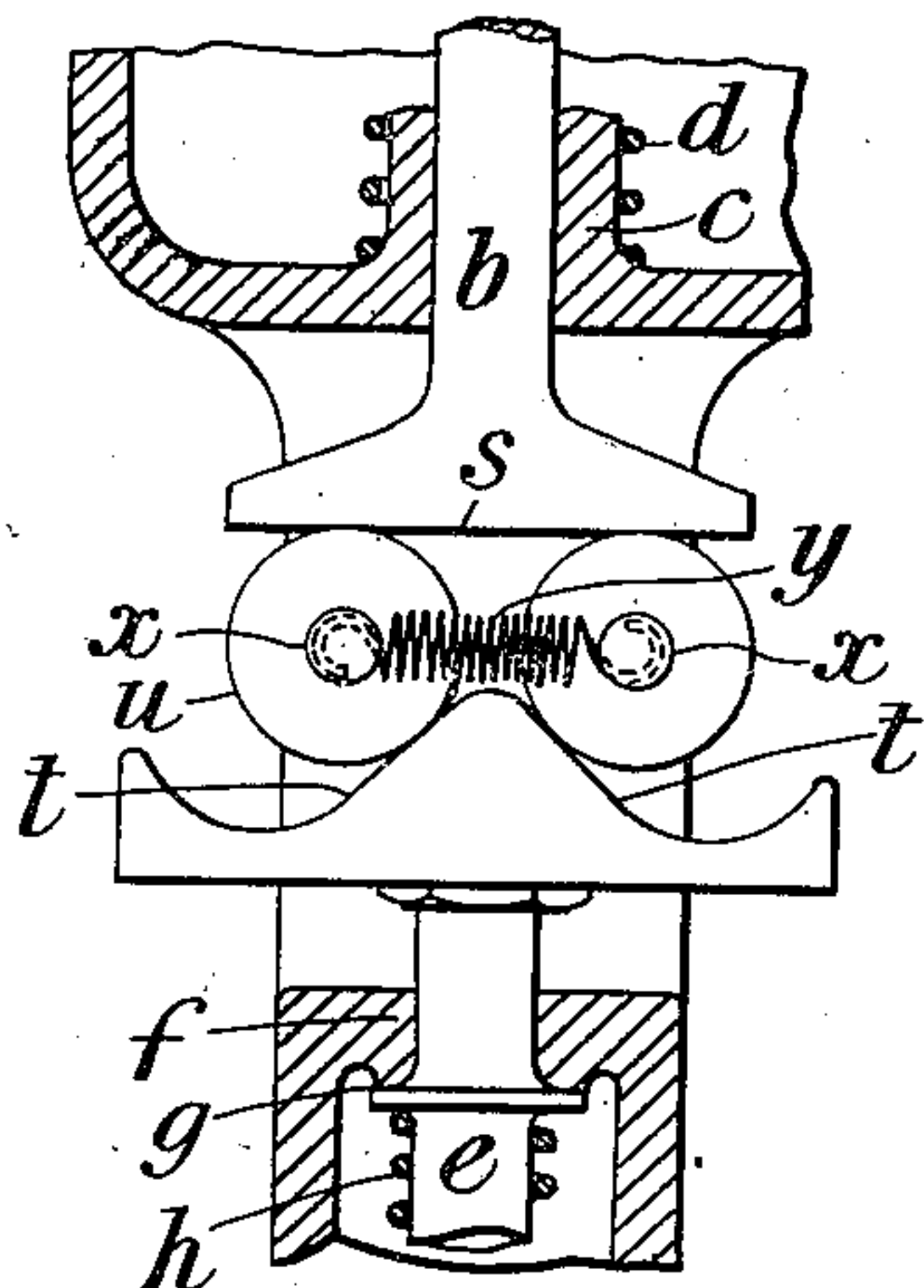


Fig. 9.

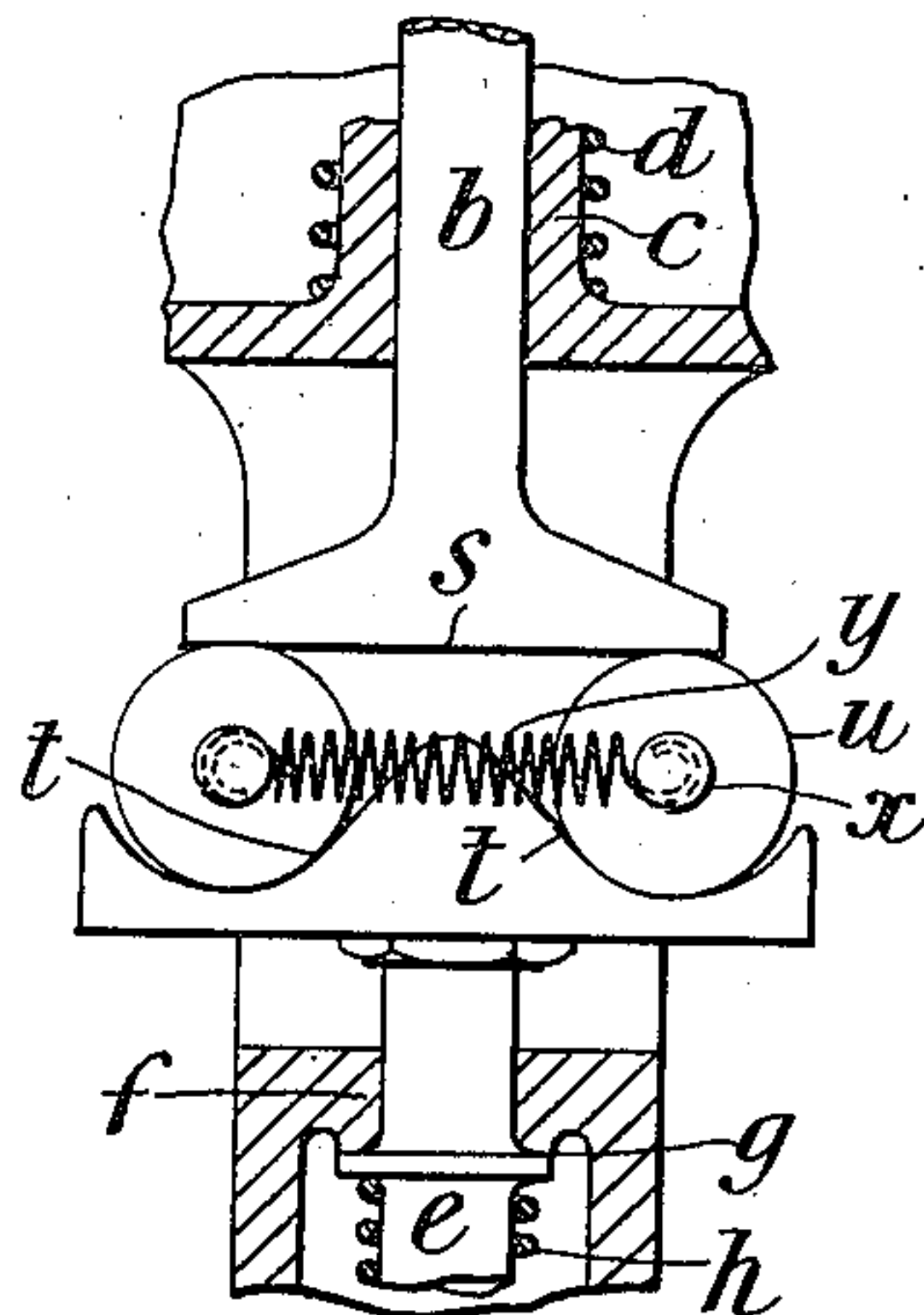


Fig. 10.

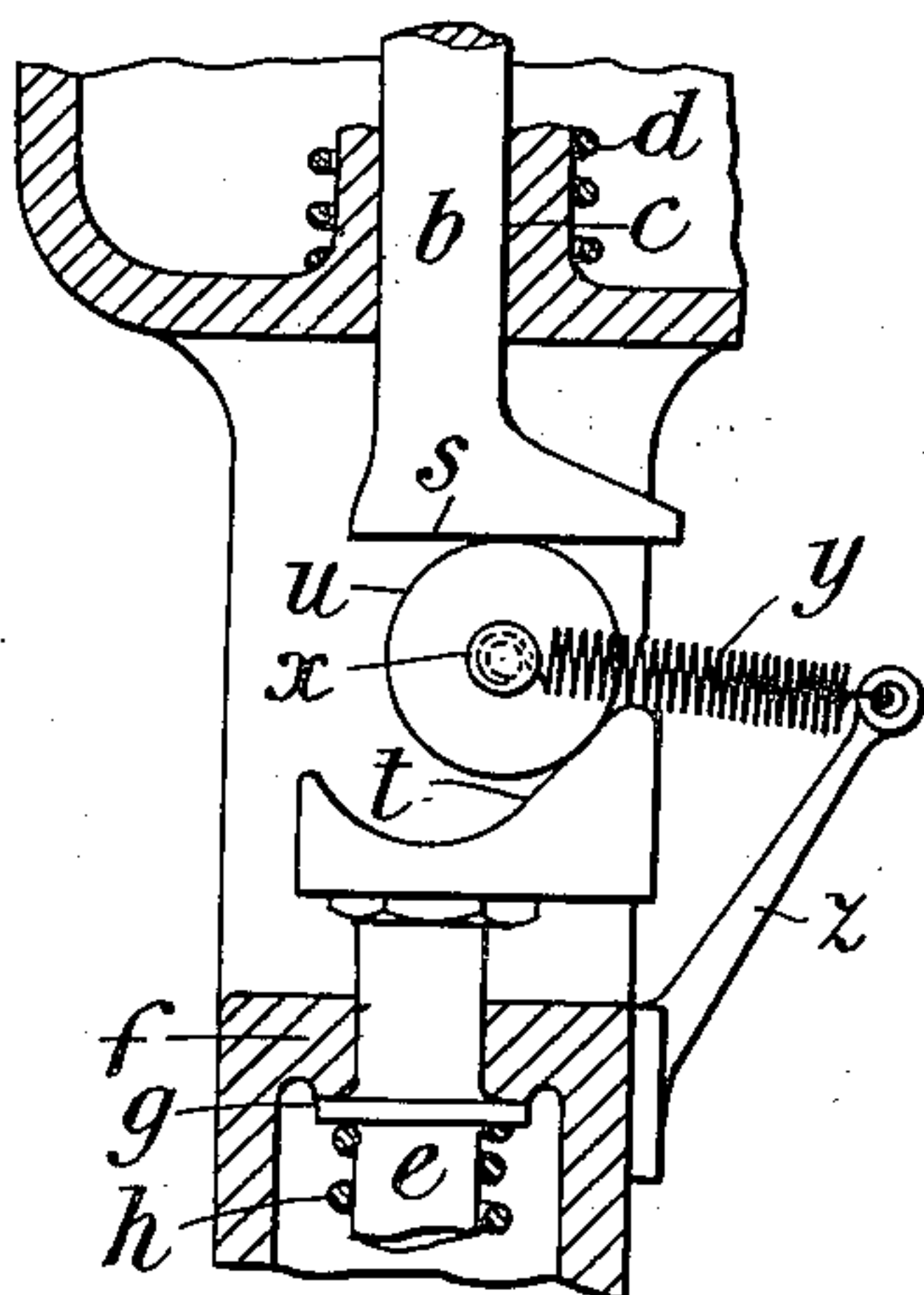
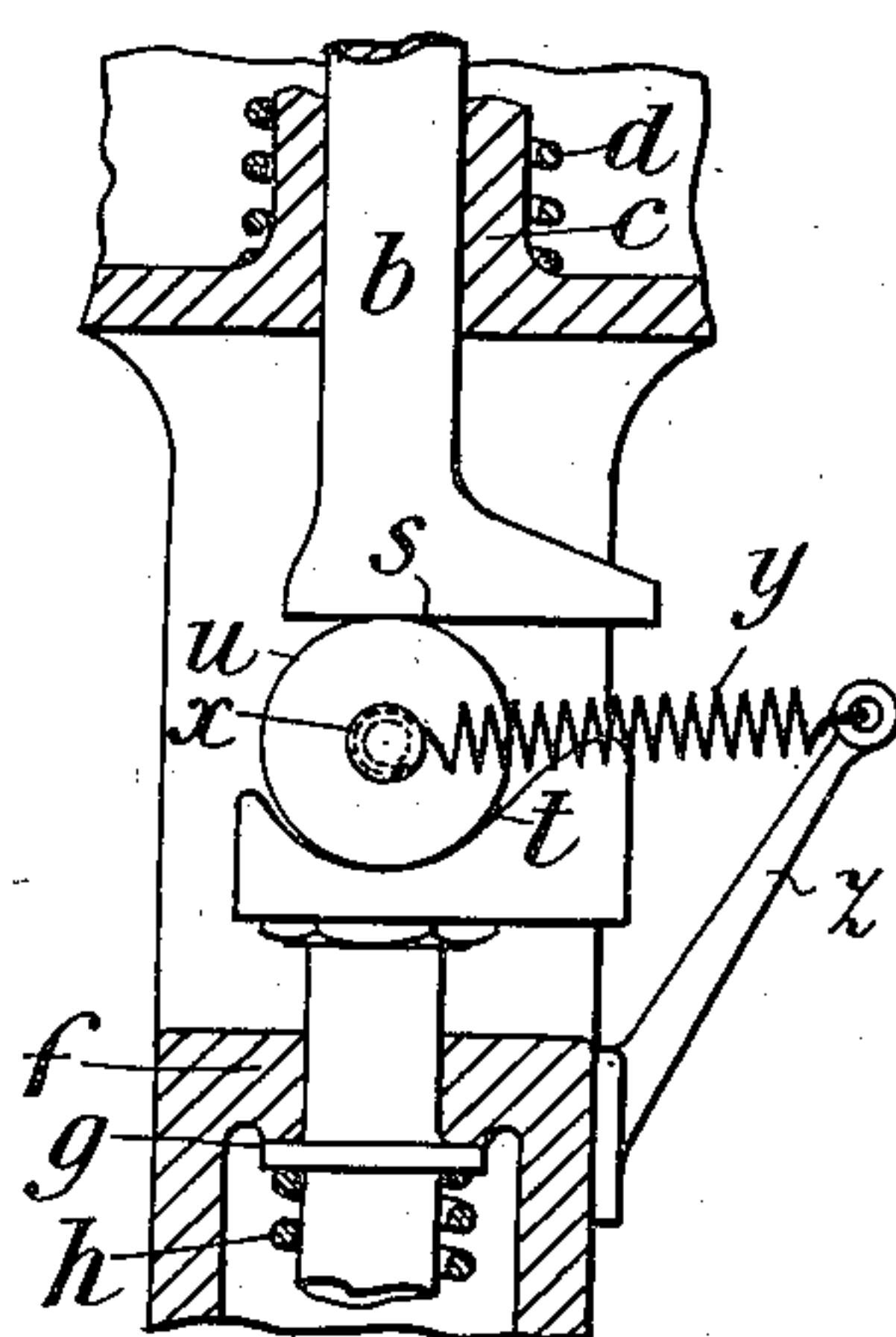


Fig. 11.



Witnesses.
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UNITED STATES PATENT OFFICE.

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MECHANISM FOR TRANSMITTING RECIPROCATING MOTION.

975,283.

Specification of Letters Patent.

Patented Nov. 8, 1910.

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To all whom it may concern:

Be it known that I, DAVID ROBERTS, a subject of the King of Great Britain, and residing at Spittlegate Ironworks, Grant-
ham, Lincolnshire, England, have invented
new and useful Improvements in Mechanism
for Transmitting Reciprocating Motion, of
which the following is a specification.

My invention relates to mechanism for
transmitting reciprocating motion such as
is employed in certain valves and in pumps
of the plunger type and more particularly
pumps in which the forcing stroke is required
to be initiated suddenly and effected with
great rapidity as, for example, is the case
with pumps employed for the injection of
hydrocarbon fuel into the vaporizers or com-
bustion chambers of internal combustion
engines.

In the case of pumps of the type above re-
ferred to control has usually been effected
by a cam or eccentric actuating a striker,
either directly or through the medium of a
lever or levers, slack or lost motion being
provided between it or them and the pump
plunger so that only that portion of the face
of the cam, or only that part of the travel of
the eccentric which gives the quickest motion
is made use of to operate the pump on the
forming stroke, and the length of stroke or
quantity of liquid pumped being governed
mechanically by opening a by-pass valve at
any suitable point in the forcing stroke. It
is found in practice that this mode of oper-
ation when applied to quick running pumps
working against resistance, gives rise to
shock and is noisy owing to the slack or lost
motion between the striker or plunger be-
ing taken up suddenly.

Now, my invention has for its object to
obviate this defect and to this end it consists
in taking up the said slack or lost motion by
mechanical means suitably interposed be-
tween the striker and pump plunger. The
mechanical means employed may assume dif-
ferent forms, and in the accompanying
drawing I have illustrated several different
modifications.

In the said drawing:—Figure 1 is a sec-
tional elevation of one form of mechanism
for carrying out my invention and shown
applied to a pump plunger. Figs. 2 and 3
are views similar to Fig. 1 showing the parts
in different positions. Figs. 4 and 5 are
similar views of a modified form of mecha-
nism, and Figs. 6 and 7, 8 and 9 and 10 and

11 are similar views of still further modi-
fications.

In the form of the invention illustrated
in Figs. 1, 2, and 3 the slack or lost motion
is taken up by links. *a* represents the oper-
ating cam, *b* is the pump plunger striker, *c*
its guide, *d* the spring which holds it up to
the cam *a*, *e* is the pump plunger, and *f* the
pump plunger guide. *g* is the stop against
which the plunger *e* comes to rest at the end
of its suction stroke, and *h* is the spring by
which the plunger *e* is operated on its suc-
tion stroke. *j* is a link connected at one end
to the striker *b* by the pin *k*, and at the other
end by the pin *l* to the link *m*, which link
is connected to the pump plunger *e* by the
pin *n*. In Fig. 1 the pump plunger *e* is
shown at the end of the suction stroke and
the striker *b* in its highest position, the cam
a being on the point of commencing to move
the striker *b* downward, Fig. 2 shows the
cam *a* and striker *b* just commencing the
forcing stroke of the plunger *e* through the
medium of the links *j* and *m* which have
been brought into alinement during the time
of the descent of the striker from the posi-
tion shown in Fig. 1 to that shown in Fig.
2. Fig. 3 shows the striker *b* and plunger *e*
at the end of the forcing stroke. On the re-
turn or suction stroke, which is effected by
the springs *d* and *h* when the plunger comes
to rest on the stop *g*, the links *k* and *m* re-
assume the position shown in Fig. 1 under
the action of the spring *o*. This spring is
coiled around the rod *p* which is pivoted at
one end to the link *m* and is housed with
the spring in the box *q* hinged at *r* to a
fixed bracket *r*¹. The arrangement or posi-
tion of parts may be reversed by chang-
ing the position of the plunger and striker,
that is to say by connecting the link *j* to
the pump plunger *e* and the link *m* to the
striker *b*.

Figs. 4 and 5 show an alternative method
of taking up the slack or lost motion. In this
construction the end of the pump striker *b*
is formed with a flat surface *s*, and the pump
plunger *e* with a double inclined surface *t*.
Between the surfaces *s* and *t* are interposed
two rollers *u*, *u* which are connected together
by toggle links *w* and pins *x* under the action
of springs *y*. The operation of this form of
my invention is as follows:—As the striker *b*
descends from the position shown in Fig. 4
the rollers *u* run down the inclined faces
t until they reach the position shown in

Fig. 5, when they are restrained from further outward movement by the toggle links w . On the upward or suction stroke the toggle links reassume their original position when the plunger comes to rest on the stop g under the action of the springs y .

Figs. 6 and 7 illustrate a construction similar to that shown in Figs. 4 and 5. In this case the striker b and the plunger e are formed with flat surfaces s^1 and t^1 respectively between which are located two wedges a^1 and b^1 which are superposed and slide on each other, the outward movement being restrained by toggle links and springs as in the construction shown in Figs. 4 and 5.

Figs. 8 and 9 illustrate an arrangement similar to that shown in Figs. 4 and 5 but in which the toggle links w are dispensed with, while the arrangement shown in Figs. 10 and 11 is similar to that shown in Figs. 8 and 9 except that one roller u and one inclined face t are dispensed with, the roller u employed being connected by the spring y to a fixed bracket z .

All the above arrangements are shown operated by a cam a but it will be obvious that in lieu of the cam I may make use of an eccentric, and rod; also that I may in some cases use a radius rod in place of the plunger guide in which case the roller operated by the cam, and the link j may be attached to the free end of the radius rod by one and the same pin.

Although I have above particularly described and illustrated my invention as applied to pumps it is to be clearly understood that it is also applicable to valve and other devices in which the same form of reciprocating motion is required.

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

1. The combination with a striker, and means for reciprocating it, of a part separated from the striker and positively actuated thereby at each reciprocation thereof, the separation of said parts providing lost motion between the said parts at each reciprocation of the striker, and devices interposed between said parts for taking up the lost motion, comprising parts movable transversely of the line of movement of the striker, and a yielding device connected therewith to resist said transverse movement, whereby at each reciprocation of the striker the actuated part will be positively actuated by the striker through a shorter range of movement after the lost motion is taken up.

2. The combination with a reciprocating striker, of a reciprocating plunger in line therewith and separated therefrom and having a shorter range of movement than the striker, the separation of said parts pro-

viding a predetermined amount of lost motion between said parts at each reciprocation of the striker, devices interposed between the striker and plunger for taking up the lost motion, adapted to be moved laterally at each operation of the striker, and a spring connected with said devices to resist the lateral movement thereof, whereby the plunger will be positively actuated by the striker, through a shorter range of movement than that of the striker, after the lost motion is taken up, at each reciprocation of the striker.

3. The combination with a reciprocating striker, of a reciprocating plunger in line therewith separated therefrom and having a shorter range of movement than the striker, the separation of the parts providing a predetermined amount of lost motion between them at each reciprocation of the striker, connections for positively transmitting motion from the striker to the plunger at each reciprocation of the striker, having laterally movable portions to take up said lost motion, and a spring connected with said connections to resist said lateral movement thereof.

4. The combination with a reciprocating plunger, of a reciprocating striker in line therewith, means for giving said striker a longer reciprocation than the plunger at each operation of the same, a link pivotally connected to the plunger, a second link pivotally connected to the striker and to the first mentioned link, said second link being longer than the distance between the points of connection of said links with the striker and plunger, and a spring operatively connected with said links adjacent to their point of pivoting to each other, and exerting a pressure thereon in a direction away from said striker and plunger.

5. The combination with a reciprocating striker, of a reciprocating plunger in line therewith separated therefrom and having a shorter range of movement than the striker, the separation of said parts providing a predetermined amount of lost motion between them at each reciprocation of the striker, movable mechanical devices interposed between the striker and plunger, constructed to take up said lost motion, and to be operated at each reciprocation of the striker and a cushioning spring operatively connected with said movable devices to absorb the shock when the lost motion is taken up, whereby the plunger will be positively operated at each reciprocation of the striker, through a shorter range of movement than that of the striker.

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Witnesses:

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