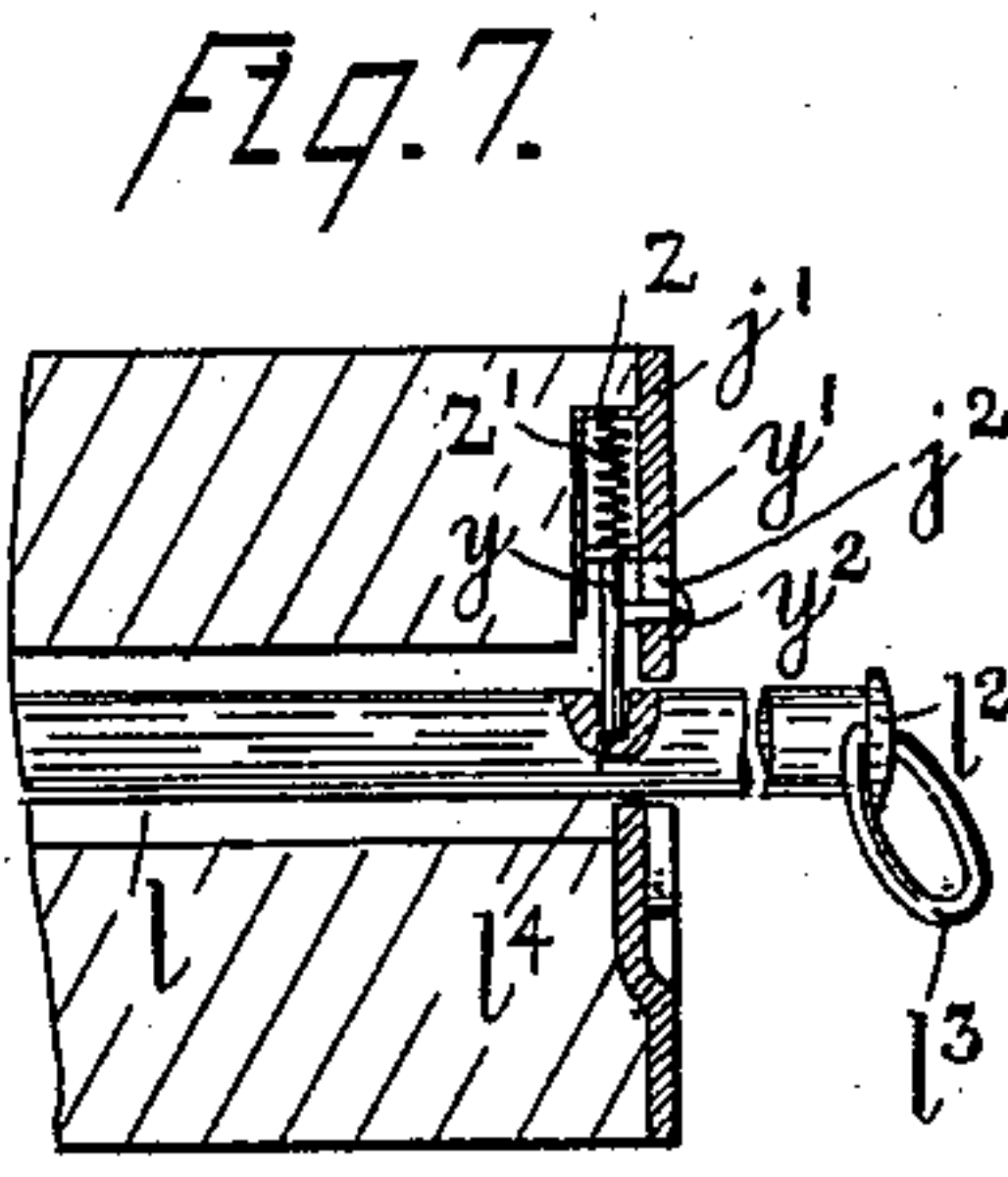
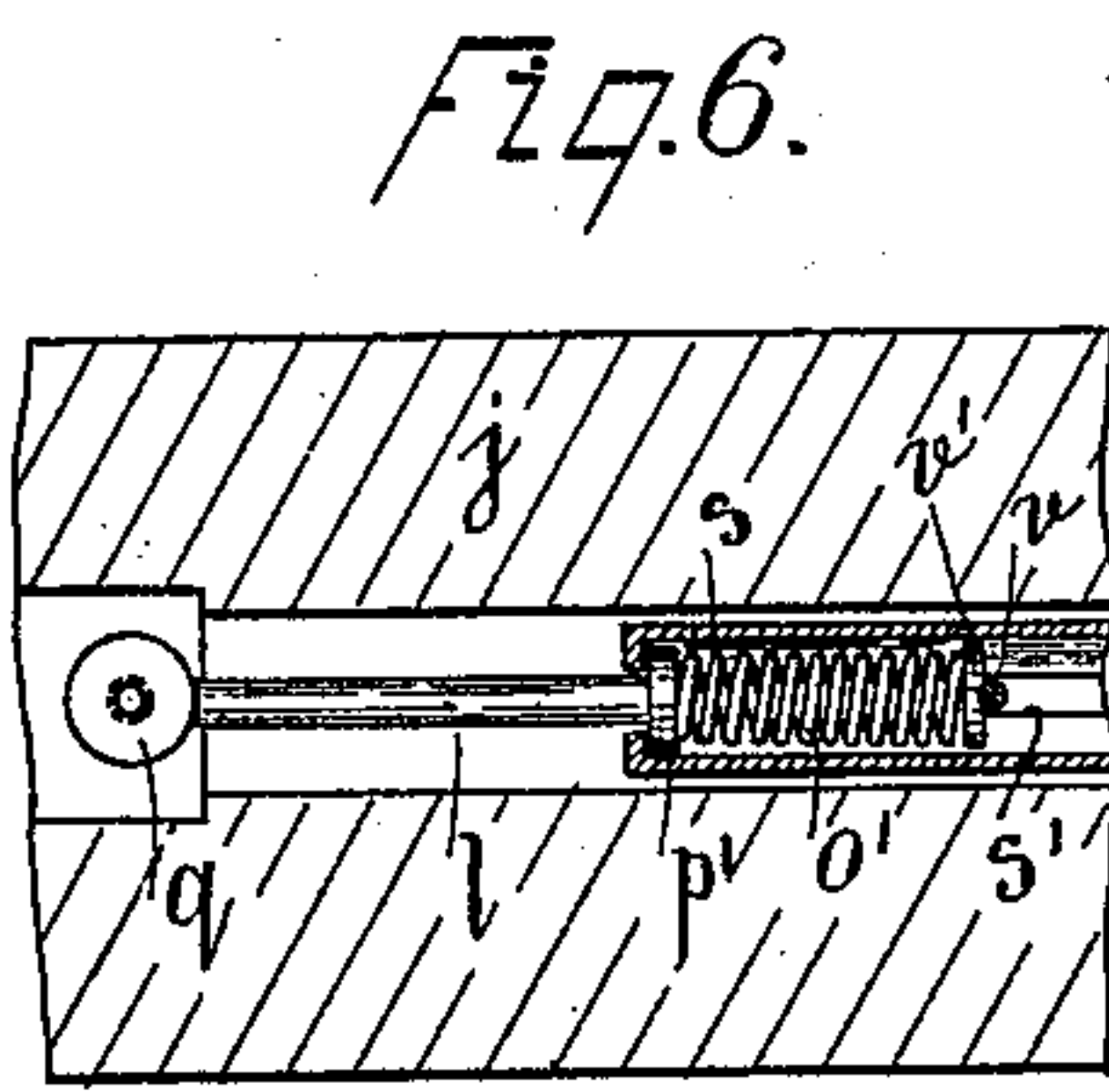
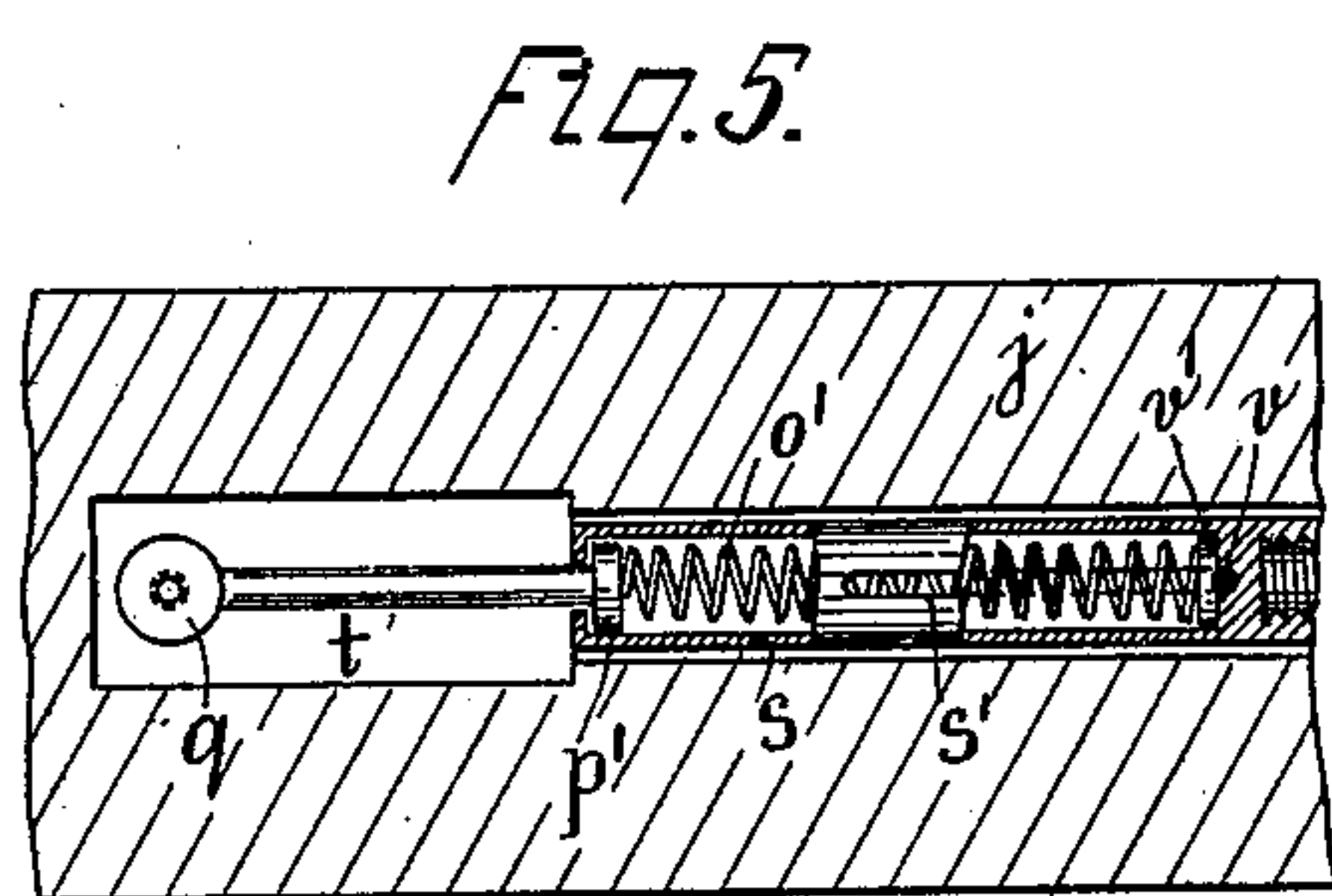
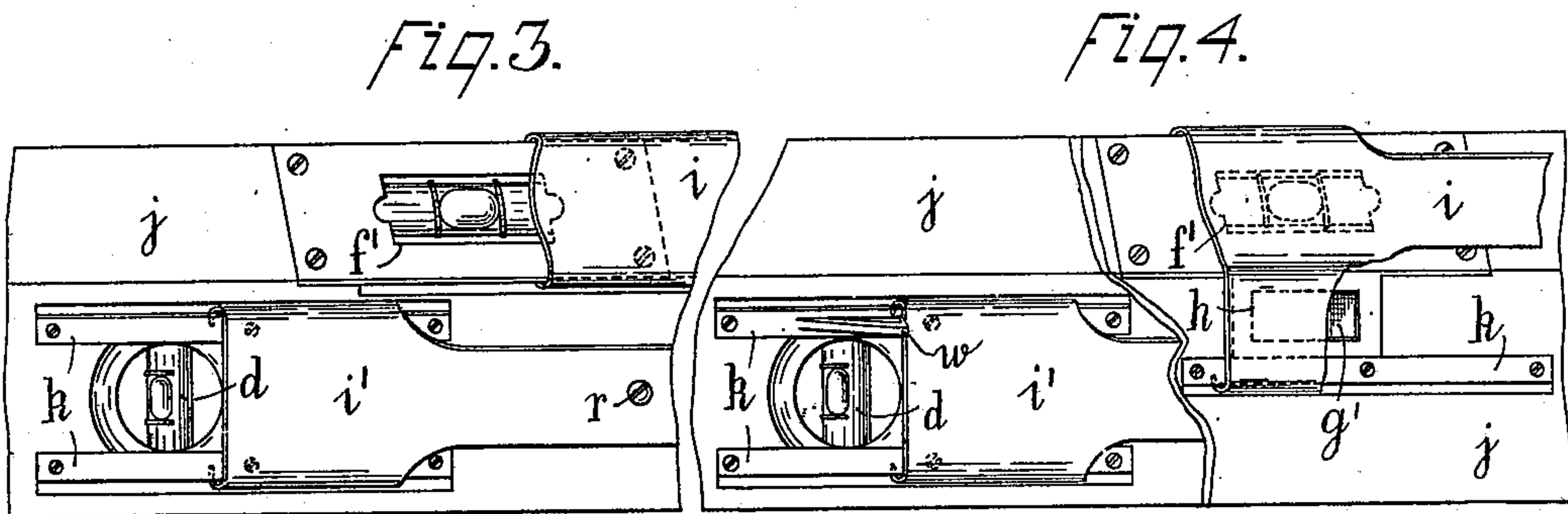
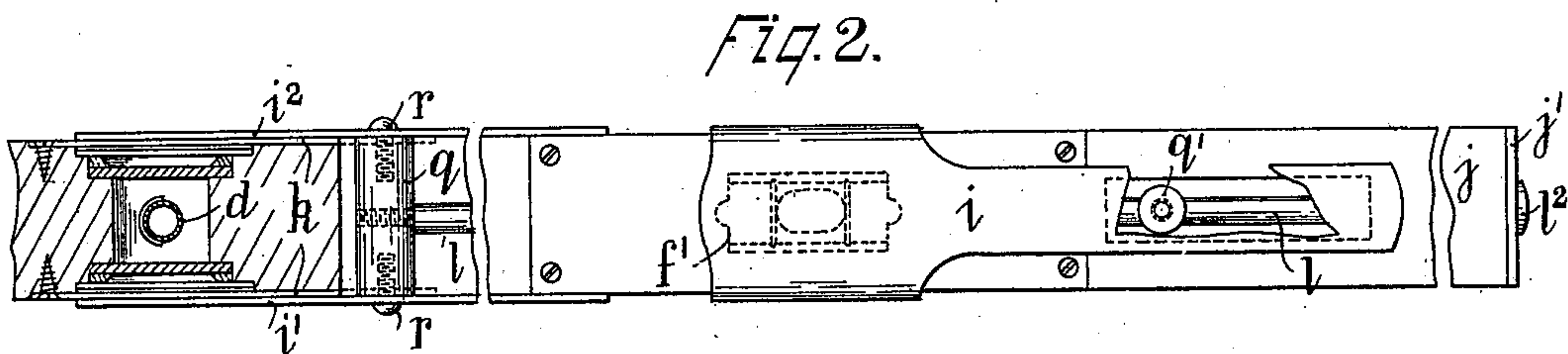
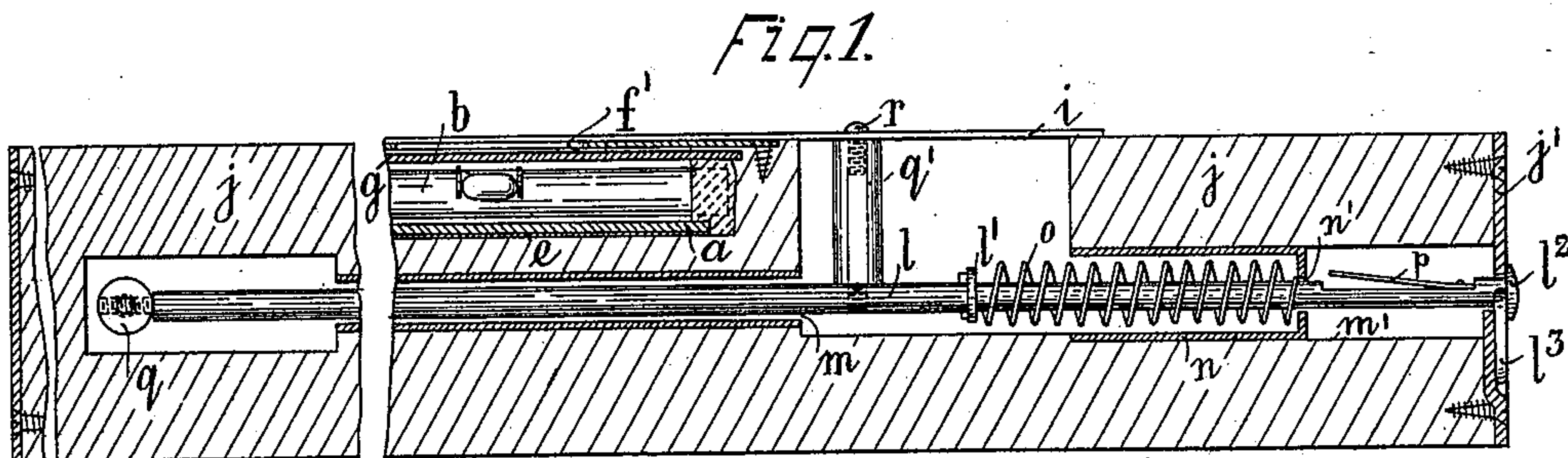


(No Model.)

G. HENNEBERG.
SPIRIT LEVEL.

No. 594,692.

Patented Nov. 30, 1897.



Witnesses
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Harry Galkoun

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UNITED STATES PATENT OFFICE.

GUSTAV HENNEBERG, OF NEW YORK, N. Y., ASSIGNOR TO EDUARD
LEISSNER, OF SAME PLACE.

SPIRIT-LEVEL.

SPECIFICATION forming part of Letters Patent No. 594,692, dated November 30, 1897.

Application filed August 20, 1897. Serial No. 648,925. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV HENNEBERG, a subject of the Emperor of Germany, and a resident of New York, county and State of New York, have invented certain new and useful Improvements in Spirit-Levels, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, wherein—

10 Figure 1 is a longitudinal sectional view of my improved spirit-level. Fig. 2 is a plan, partly sectional, view. Figs. 3 and 4 are perspective views thereof, and Figs. 5, 6, and 7 sectional views showing detail of construction.

15 My invention relates to spirit-levels; and it consists of the hereinafter-described improvements in the construction thereof.

20 Spirit-levels are used in many trades, and it is often necessary to ascertain the position of a beam in a dark part of a building or to set up a piece of machinery in corners wherein the light cannot well penetrate. The mechanic manipulating the level has consequently considerable difficulty to distinguish the position of the bulb, because the faint rays of light will hardly show any difference in refraction. To obviate this difficulty, I cover the bottom of the recess *e*, wherein the tube containing the spirit is set, by a concave mirror (designated by letter *a* in Fig. 1 of the drawings) and cover the sides of the recess with light-colored smoothly (glossy) finished material, preferably of light-green color. 25 The mirror reflects the light and concentrates the rays upon the tube. The refraction of the rays passing through the liquid is different from that of the rays passing through the bulb and the difference being greater the more the rays are concentrated. It is therefore clear that the bulb is thereby made prominently visible and its position in the tube easily discernible for a considerable distance. The material covering the sides of the recess enhances the effect of the mirror and of the reflection of the light by imparting to the rays a slight coloring without diminishing the volume of the reflected light.

30 Instead of embedding the mirror *a* on the bottom of the recess *e* the bottom part of the tube *b* may be covered with amalgam and paint

in a similar manner as the back of a mirror, and in that case the lower part of the tube itself will operate as a mirror for the purpose stated. This manner of construction of my improved level I use, preferably, in the shorter tube *d*, visible in Figs. 3 and 4, which is set in one end of the level and used for determining the vertical position of an object.

35 In ordinary spirit-levels the tube is protected against breaking (but not against dust) by a metallic shield affixed to the block and provided with a slot through which the central part of the tube is visible. In some levels similar metallic shields and slots are provided on the sides of the block to enable the operator to see the position of the bulb from the side.

40 To protect the tube from dust, I set underneath the metallic shield *f* a glass plate *g*, and in the same manner I protect the look-holes *h* on the sides of the level by glass plates *g'*. To protect these plates and the tube underneath against breaking, I employ the sliding shields *i*, *i'*, and *i''*. Shield *i* may be made to cover only the top slot *f'*, as shown in Fig. 3, or for the protection of both of the top slot *f'* and of the side slots *h*, as shown in Fig. 4. The edges of these shields *i*, *i'*, and *i''* are turned in and engage the projecting flanges of the bars *k*, secured to the block and serving as guideways to these shields. These shields can be moved to and from their position, protecting the look holes or slots by hand, each independently of the other, or they may be operated in unison by the mechanism shown in Fig. 1, which is arranged in bore *m*, extending longitudinally through the block *j*, as follows: In the somewhat enlarged under part *m'* of the bore *m* a metallic tube *n* is set, opening on one end and provided with a hole *n'* on its farther end. Hole *n'* is only large enough to permit the rod *l* to pass through. Between this closed end of the tube *n* and collar *l'*, secured to the rod *l*, is set a recoil-spring *o*, acting upon the closed end of the tube *n* and the collar *l'* in such manner as to draw the rod into the block. Head *l''* of the rod *l* abuts against the end plate *j'*, secured to the block, and thereby limits the inward motion of the rod. Ring *l'''*, secured to the end of rod *l*, serves as a handle for pull-

ing the rod outward, and the flat spring *p*, riveted in a recess of the rod *l*, arrests the rod when pulled out and holds it against the action of the spring *o* by stemming itself against the plate *j'*. Head-piece *q* and stud *q'* are secured to the rod *l*, and the shields *i*, *i'*, and *i''* are secured to the ends thereof by screws *r*. Thus when the rod *l* is pulled outward the shields *i*, *i'*, and *i''* are simultaneously shifted from their position covering the look-holes, and when the rod is again released the spring *o* rebounding returns it automatically to its normal position and thereby shifts the shields back, closing the look-holes.

In Figs. 5, 6, and 7 I have shown a somewhat modified construction of the mechanism operating the shields. This construction is devised for the purpose to enable the operator to shift the shields *i'* and *i''* independently of the shield *i*—as, for instance, when using the level for determining the vertical position of some object. In this modified construction a slotted tube *s*, provided with a slot *s'*, is screwed on the end of the rod *l* and the head-piece *q* is screwed to the stem of the plunger *t*. Pin *v* is fixed in the block *j*, and washer *v'* rests against it. Spring *o'*, set in the tube between the washer *v'* and the head *p'* of the plunger *t*, is an equivalent for the spring *o*, described above, and at the same time holds head-piece *q* in position.

When it is required to shift shields *i'* and *i''* independently of the shield *i*, the operator grasps the heads of the screws *r* (which may be somewhat enlarged to present a better hold) and moves these shields toward the right-hand end of the block. By this motion he presses plunger *t* against the action of the spring *o'* until spring-latches *w*, such as the one shown in Fig. 4, are released and springing forward hold the shield in open position. To shift the shields *i'* and *i''* back again, the spring-latches *w* are compressed into their recesses provided in the bars *k*, and the spring *o'* thus relieved will drive the shields *i'* and *i''* back into their normal position covering the look-holes. This same spring *o'* acts also as a substitute for the spring *o*, as shown in Fig. 1. It has been stated that the pin *v* is set firmly in the block *j* and holds washer *v'* against the action of the spring *o'*. Thus when the rod *l* is pulled outward by action upon the ring *l''*, shifting all slides at the same time, the spring *o'* will be compressed between the pin *v* and washer *v'* (remaining stationary) and the end of tube *s* moving with the rod *l*. The relative position of all parts of the moving mechanism in this position is shown in Fig. 6. The spring *o'* is

shown compressed, and when the hold on the rod *l* is released the spring will rebound and thereby pull the rod inwardly into the block *j* and also move the sliding shields *i*, *i'*, and *i''* in their position protecting the look-holes.

In Fig. 7 a modified construction is shown for the arresting of the rod *l* when pulled out of the block *j*. In this construction a recess or notch *l'* is provided in the top of the rod and a sliding bolt *y* is set in a recess in the end of the block *j*. This bolt is provided with a head *y'* sliding in a square recess *z*, and between the end of the recess and the head of the sliding bolt *y* is set a small recoil-spring *z'*, pressing the bolt downward into the notch *l'* when the rod *l* is drawn sufficiently far outward. Secured in the bolt is a button *y''*, whose stem slides in slot *j''* of the plate *j'* and its head projects slightly outward. By pushing this knob upward the bolt *y* is released or moved from the recess *l'* and the rod *l* allowed to slide in following the action of the spring *o* or *o'*, according to which form of construction is used.

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

1. The combination with a spirit-level, comprising a rectangular block, having a recess provided with reflecting covering, a glass tube set in the recess and glass-covered look-holes for observing the tube in the recess, of sliding shields for covering the look-holes, comprising metallic plates having their edges bent, grooved bars secured to the block, the bent edges of the shields engaging in the grooves of the bars and the shields being guided thereby in their motion, and of means for moving the shields.

2. The combination with a spirit-level provided with sliding shields protecting the look-holes, of mechanism for operating the sliding shields, comprising a tube open on one end and provided with a central bore on the other end, a rod sliding through the tube, a collar secured to the rod, a spiral spring slid on the rod between the collar and the head of the tube, studs secured to the rod, screws securing the sliding shields to the studs, and means for securing the rod against the action of the spring when withdrawn from its normal position.

In witness that I claim the improvements described in the foregoing specification I have signed my name in the presence of two subscribing witnesses.

GUSTAV HENNEBERG.

Witnesses:

PETER WINDERLING,
HENRY SCHREITER.