

(No Model.)

G. B. STOWELL.
SURVEYOR'S LEVELING ROD.

No. 495,438.

Patented Apr. 11, 1893.

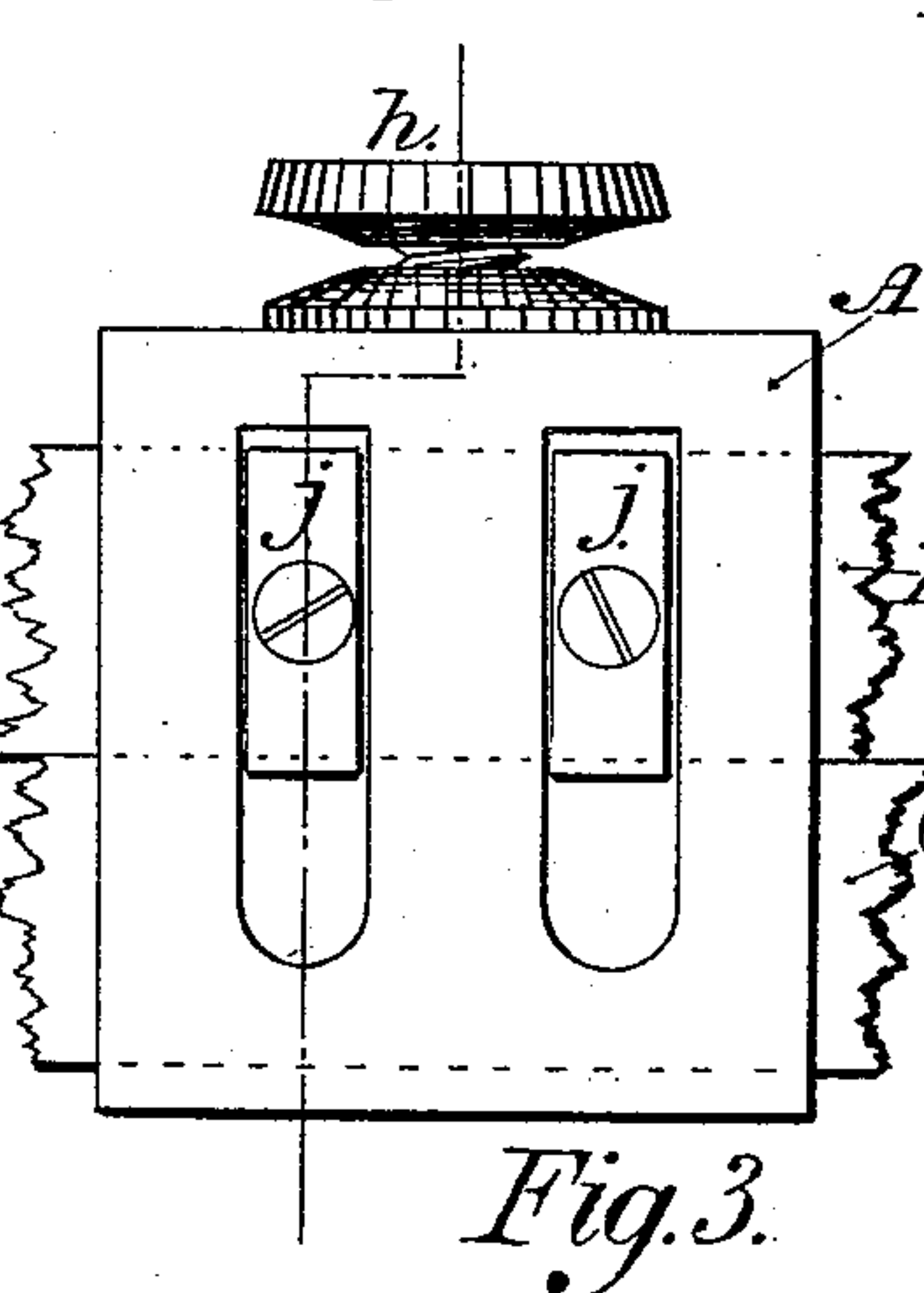
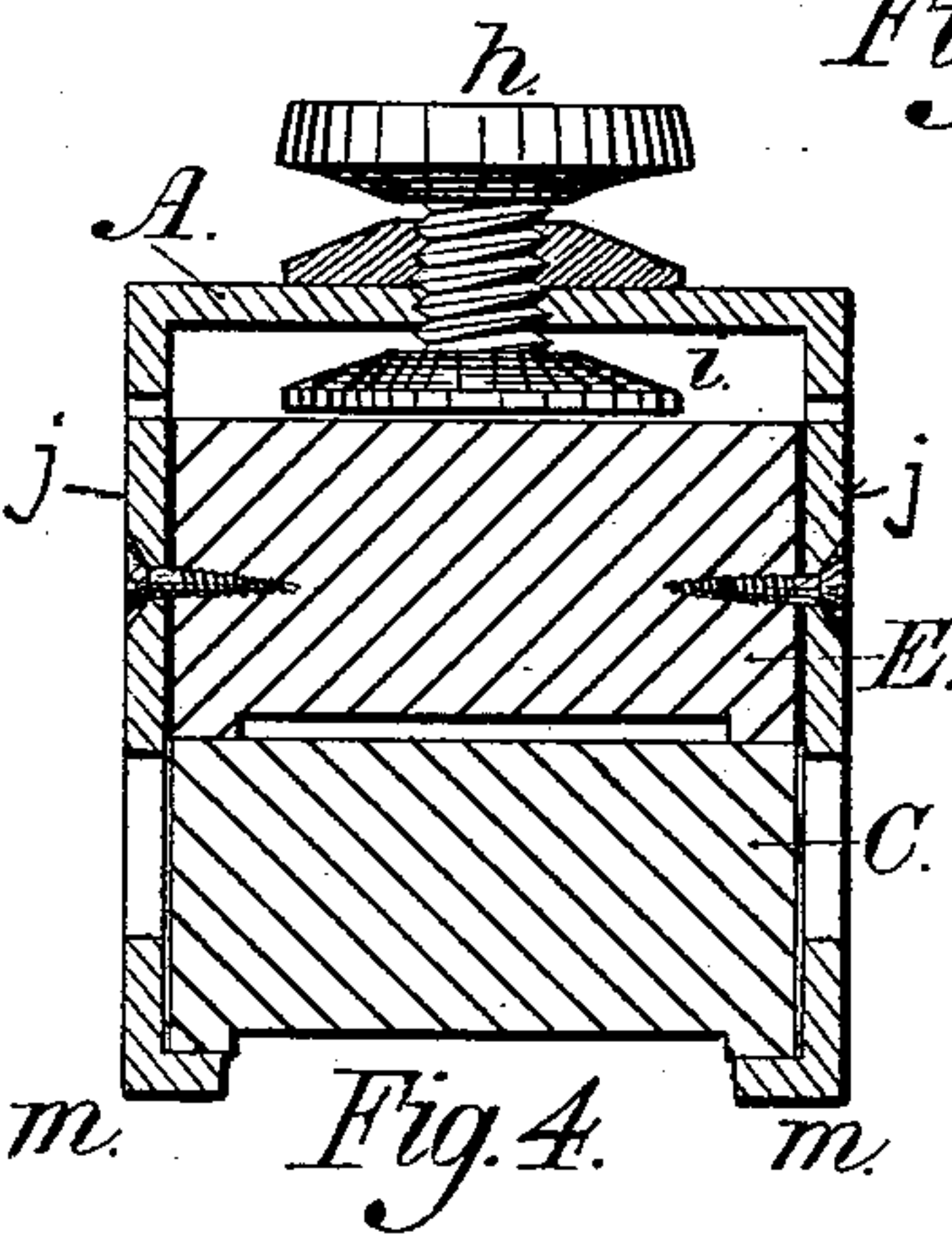
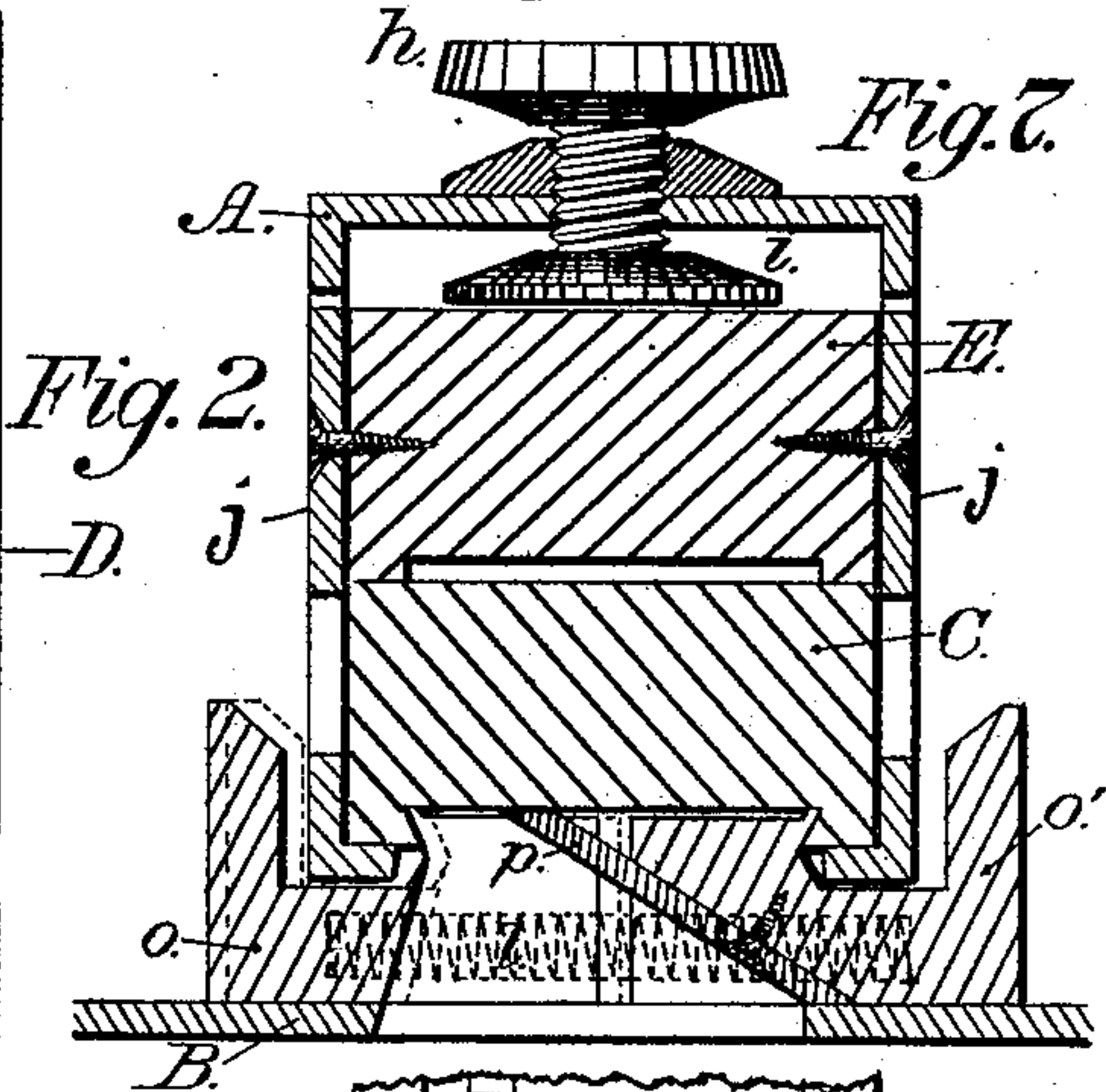
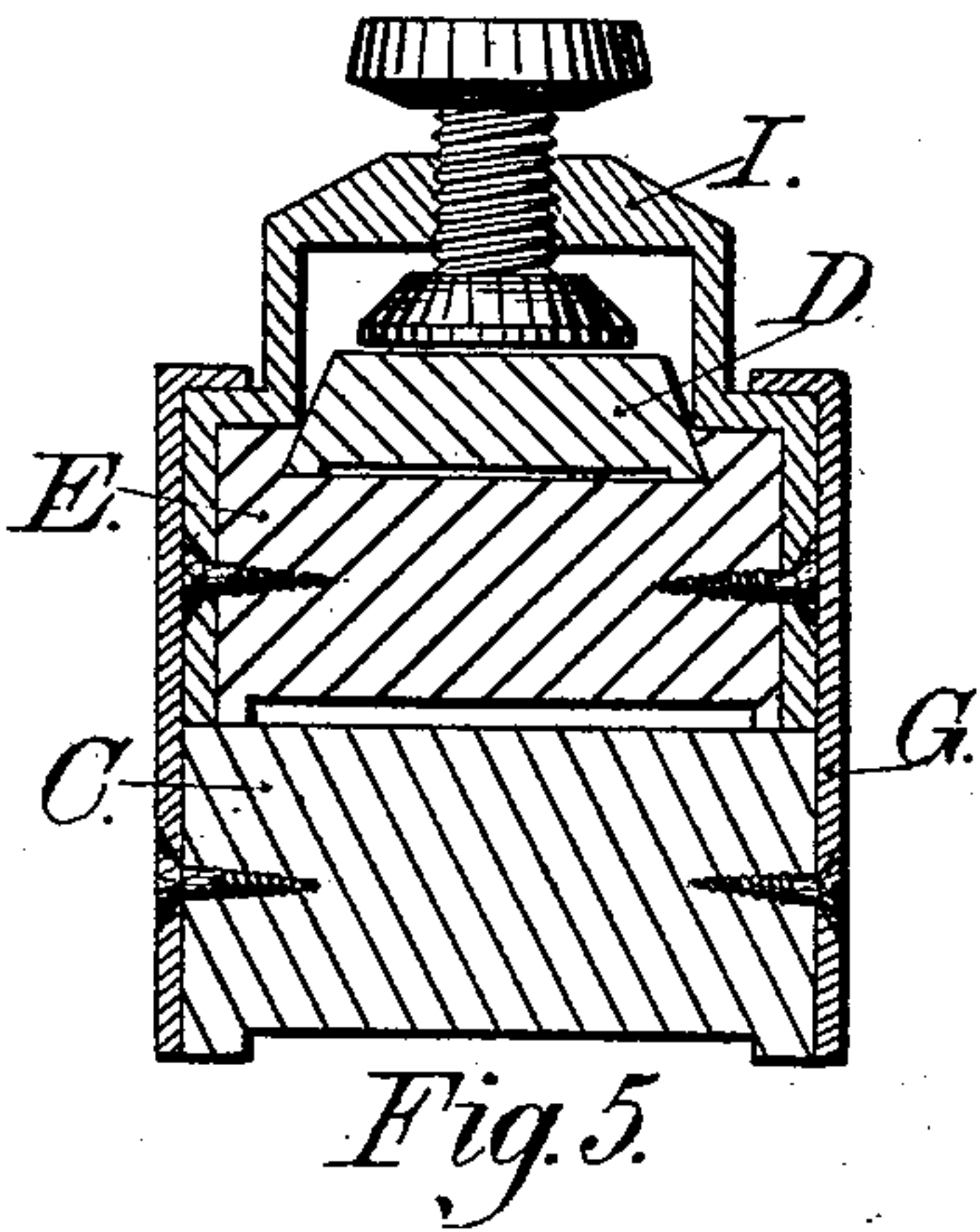


Fig. 1.

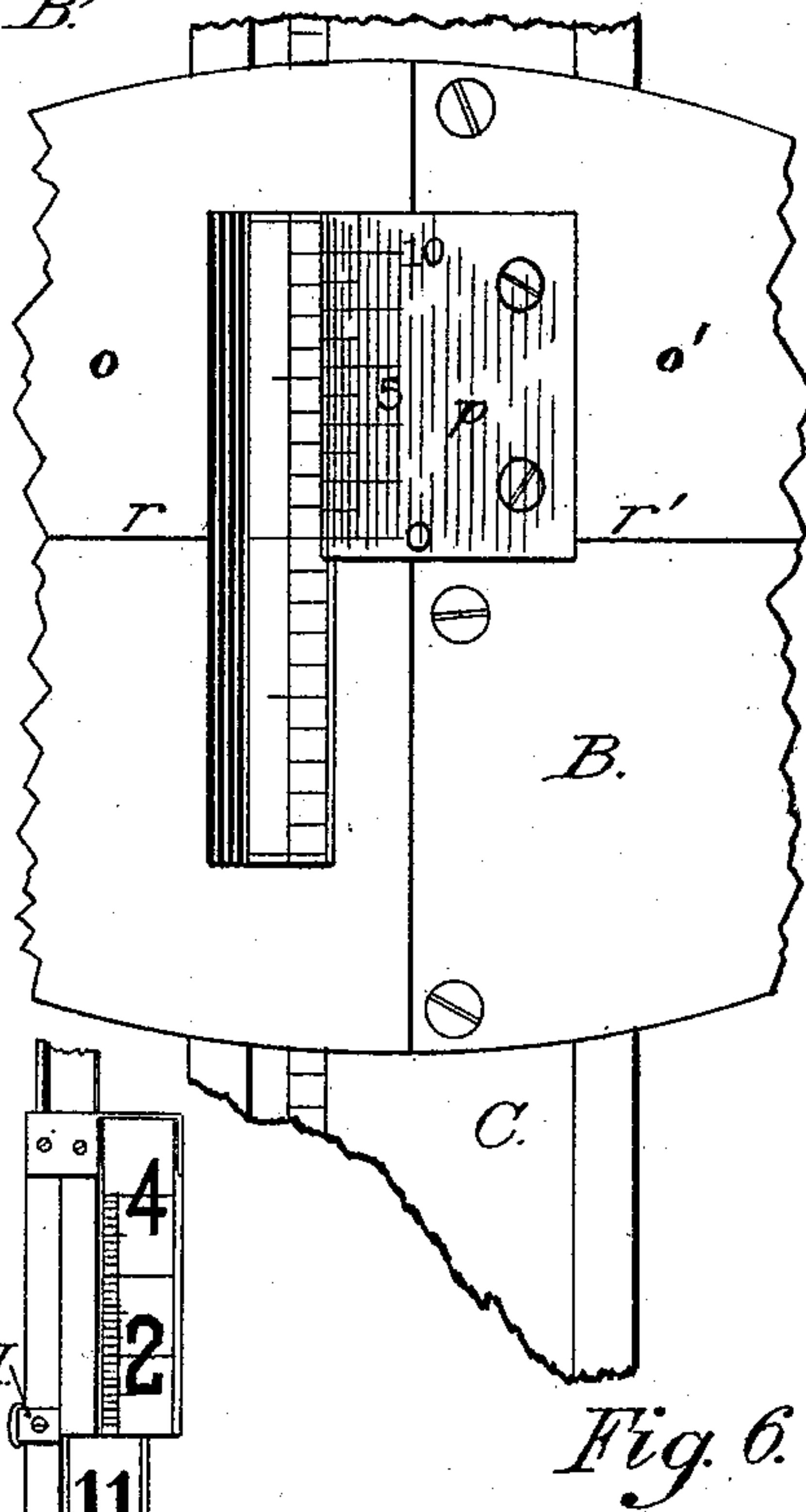
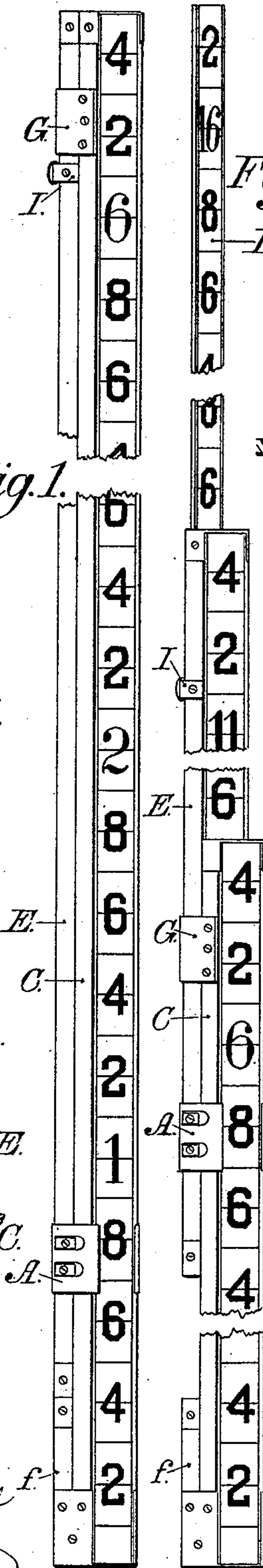
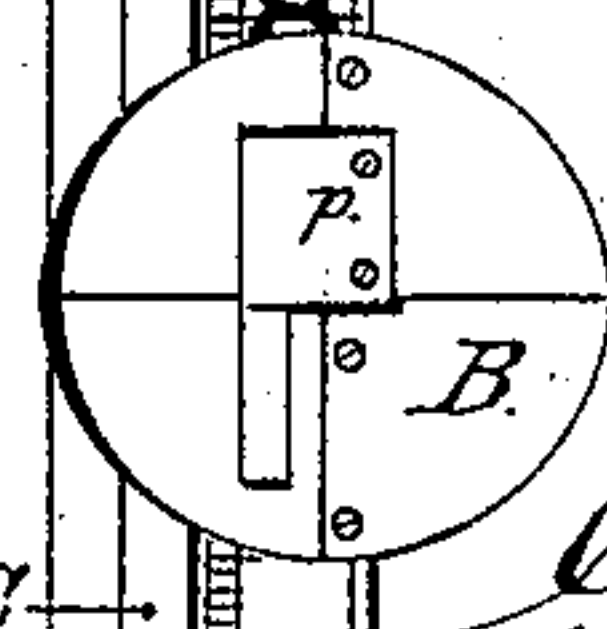


Fig. 8.



Witnesses.

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SURVEYOR'S LEVELING-ROD.

SPECIFICATION forming part of Letters Patent No. 495,438, dated April 11, 1893.

Application filed June 24, 1892. Serial No. 437,846. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. STOWELL, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented a new and useful Leveling-Rod, of which the following is a specification.

My invention consists of an improved self reading and a combined self reading and target leveling rod.

The object of my improvement is a self reading or a combined self reading and target leveling rod which, though designed to slide out several feet longer, is still more concise, lighter and stiffer than any of the devices in present use. These results are obtained by the mechanism illustrated in the accompanying drawings.

Similar letters refer to similar parts in the different views.

Figure 1 is a perspective elevation of the closed rod, the face of which is inclined at an angle of about forty-five degrees from the line of vision so as to show both the main members of the rod. As indicated by the graduations several feet are cut away in the drawings. Fig. 2 is a similar elevation of the rod fully drawn out, unessential parts as before being cut away. Fig. 3 is a side elevation of the setting clamp A. Fig. 4 is a cross section of the rod (closed or extended) through the setting clamp A. Fig. 5 is a cross section of the closed rod near the top through the clamp I. Fig. 6 is a front elevation of the target B. on a section of the rod. Fig. 7 is a cross section of the rod through the setting clamp A. with the sliding target B. at that point. Fig. 8 is a perspective elevation of the combined target and self reading rod partially extended and the target B in sliding position.

The feature of first importance in a leveling rod is length. The longer the rod the better, provided it is not longer than can be conveniently handled or provided, rather, that in gaining the extra length, the advantage thereof is not off set by an addition of extra details of construction which make the rod too heavy and bungling to be practical.

My rod—as I design to build it—closes as shown in Fig. 1. to six and five tenths feet and slides out as shown in Fig. 2 to sixteen

and three tenths feet. This uncommon length is acquired by an extra or second extension D. shown in elevation and cross section by Figs. 2 and 5 respectively of which further mention will follow. C, the main member of the rod, is made (Fig. 2) six and five tenths feet long. The face is hollowed out, leaving raised edges—as shown in the cross section—which receive the pressure and wear of the setting clamp A. and protect the graduations on the face of the rod.

E, is the first extension of the rod and extends when drawn out five feet above the top end of C. In the closed rod, E rests on a short block *f* of uniform section with itself fastened on the back side of the lower end of C. as shown in Figs. 1 and 2. Slide E like member C is also constructed with raised edges or shoulders which prevent its graduations from being defaced by rubbing against C. The movements of slide E are guided and controlled by the clamps A. and G. It will be readily seen from the construction in Fig. 4. that tightening the set screw, *h*, induces a compression between members C and slide E in virtue of which the motion of the latter may be arrested at any point.

Slide D, Figs. 2 and 5, is a new feature of my rod to which special attention is directed.

Previous attempts to increase the length of leveling rods by telescoping slides and other kindred devices have failed because in every case so far as I am aware they have hampered the rod with extra detail and weight offsetting all advantage of extra length and barring its general use.

The device for a second slide illustrated by D, Figs. 2 and 5, must commend itself at once for in opposition to the above objections it adds to the rod a practical working length of four feet and eight tenths without noticeably increasing either its weight or size of section.

The construction and manner of working the extension D in a specially cut groove in the back of extension E. is fully illustrated by Figs. 2 and 5. The extension D. is held in place both in the closed and extended rod by the small setting clamp I. This clamp is fastened to and let into the sides of the slide E in such manner Fig. 5 that when traveling

with the latter extension it will not be interfered with by guiding clamp G. Clamp G is made of two separate pieces of sheet brass fastened on opposite sides of member C. near the top. The two lips of the clamp bend over the back edges of E—an easy fit—leaving the latter free to slide. G is only a guide clamp for the extension E. and its operation is fully apparent from Figs. 1, 2 and 5.

The setting clamp A in most leveling rods is fastened to one or other members of the rod by screws in such manner that the repeated setting and loosening the clamp being reverse strains upon the screws which soon work them loose in the wood and the clamp becomes rickety. The latter evil is neatly avoided in the clamp A shown—natural size—in elevation and cross section by Figs. 3 and 5. The elevation Fig. 3 shows a couple lugs *j.j.* which are screwed to the member E and fitting loosely in the oblong slots in the sides of the clamp A bear no part of the strains exerted by the latter but merely cause it to travel with the member E. The clamp having therefore a free lateral movement as regards both members of the rod, all the strains exerted by the setting screw *h*, are distributed between the presser disk *i* and the clamp lips *m.m.* Thus far my description has pertained to a self reading rod only, that is, a rod on which the figures and graduations are sufficiently distinct for the leveler in looking through his telescope “to himself” read the elevation on the rod indicated by the cross hair in his instrument. This style of rod is distinguished from a target rod—so called—in that the latter is provided with a sliding index or target which the “rodman” moves up or down according to signals from the leveler until a special line or mark on the target is covered by the crosshair in the leveling instrument. The target is then clamped in its last position and its indicated elevation taken—usually by the rodman.

Target rods are usually provided with a vernier, a device by which the elevations indicated by the target are taken to (theoretically) thousandths of a foot. Such accuracy is however unnecessarily fine for the great majority of field work and, since it is attained at a great waste of time over that required for obtaining results sufficiently accurate with a self reading rod, there is a marked tendency among the truly practical engineers to a more and more general use of the latter. Since, however, there are occasions when a target is desirable I have, to adapt my rod to all emergencies, devised for it a target making the rod, if desired a combined self reading and target rod.

The slight additions to the rod as already described necessary to effect the combination are illustrated by Figs. 6, 7 and 8. The only difference between the rod cross sections as shown by Figs. 4 and 7 is that the raised shoulders on which lips *m m* slide are in Fig. 7 deeper and cut beveling inside for reasons

to appear later whereas in Fig. 6 the same shoulders are shallower and have straight edges.

The target consists of two blocks shown in cross section by *o* and *o'* Fig. 7. These blocks are about four inches long. At right angles to their length and about one half inch from either end two brass tubes indicated by dotted lines Fig. 7 are fitted in the blocks. These tubes are permanently fastened in the block *o'* which in turn is screwed to the back of the face B; but in block *o* the tubes are an easy fit so as to allow the block to slide on them. A coil spring placed in each tube holds the blocks apart. When it is desired to attach the target to the rod the blocks *o* and *o'* are pressed together and inserted between the beveled shoulders on the front of the rod Fig. 7. On relaxing the pressure of the fingers the blocks separate until they meet the raised beveled shoulders and the target is held in position on the face of the rod. To slide the target up or down the rodman simply compresses the blocks until friction is enough reduced to allow the target to be raised or lowered. When any desired position is reached the pressure is released and the target remains fixed. The coil springs acting as they do in the blocks, take the place of the usual extra clamp for setting the target.

In the target rod the face members C in addition to the regular feet and tenths of feet graduations has the tenths graduations subdivided into hundredths as shown on left side face of rod in Figs. 6 and 8. A vernier plate, *p.* appropriately graduated, is fastened to block *o'* Figs. 6 and 7, in such a manner that its lower or graduated edge just clears the one hundredths scale on C. and enables rod reading to be taken (theoretically) to thousandths of a foot. The manner of taking vernier reading not being new and being essentially the same in all instruments is not described here.

It will be observed Figs. 6 and 7 that the face of the target B. and blocks *o* and *o'* are cut away in the center in such manner that the vernier and one hundredths graduations on the rod can be readily seen through the opening in the target. The target is in correct position for taking readings when the horizontal hair in the leveling instrument covers the line *r r'* on the target. The target slides on face of rod up to six and three tenths feet. With respect to higher readings it will be seen Fig. 8 that in the combination rod a piece four tenths long is sawed off from member C and fastened to top end of member E in such manner that when the rod is closed the dissevered end occupies the same position in relation to member C as it did before it was separated from the latter. When it is desired to take higher readings than six and three tenths feet the target is slid up to that elevation (equals middle of above block) and set. As the target is now attached to member E. it is elevated to higher readings by

raising the latter slide which can be secured in any position by clamp A. A second set of one hundredths graduations and vernier is provided on the sides of members E and C in such manner that continuous target readings can be taken up to eleven and three tenths feet.

I am aware that prior to my invention extension leveling rods have been made. I therefore do not claim such broadly; but—

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

1. In a combined self reading or target leveling rod, the extension D, sliding in a specially cut groove in the back of slide E, in combination with slide C, clamps A, G, and I and blocks *f*, substantially as set forth.

2. In a combined self reading or target leveling rod, the clamp A composed of set screw *h*, and friction disk *i*; lugs *j. j.* and lips *m. m.* all fastened to and acting upon members E and C in combination with clamps G in the manner and for the purpose described.

3. In a combined self reading and target leveling rod, the target B, comprising blocks *o* and *o'*, vernier plate *p*, tubes and spiral springs *l. l.* in combination with members E and C and clamp A, all as described and for the purpose set forth.

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Witnesses:

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