

H. & L. MOTE.
EXTENSION LADDER.

APPLICATION FILED SEPT. 14, 1908.

Patented June 22, 1909.

3 SHEETS—SHEET 1.

925,822.

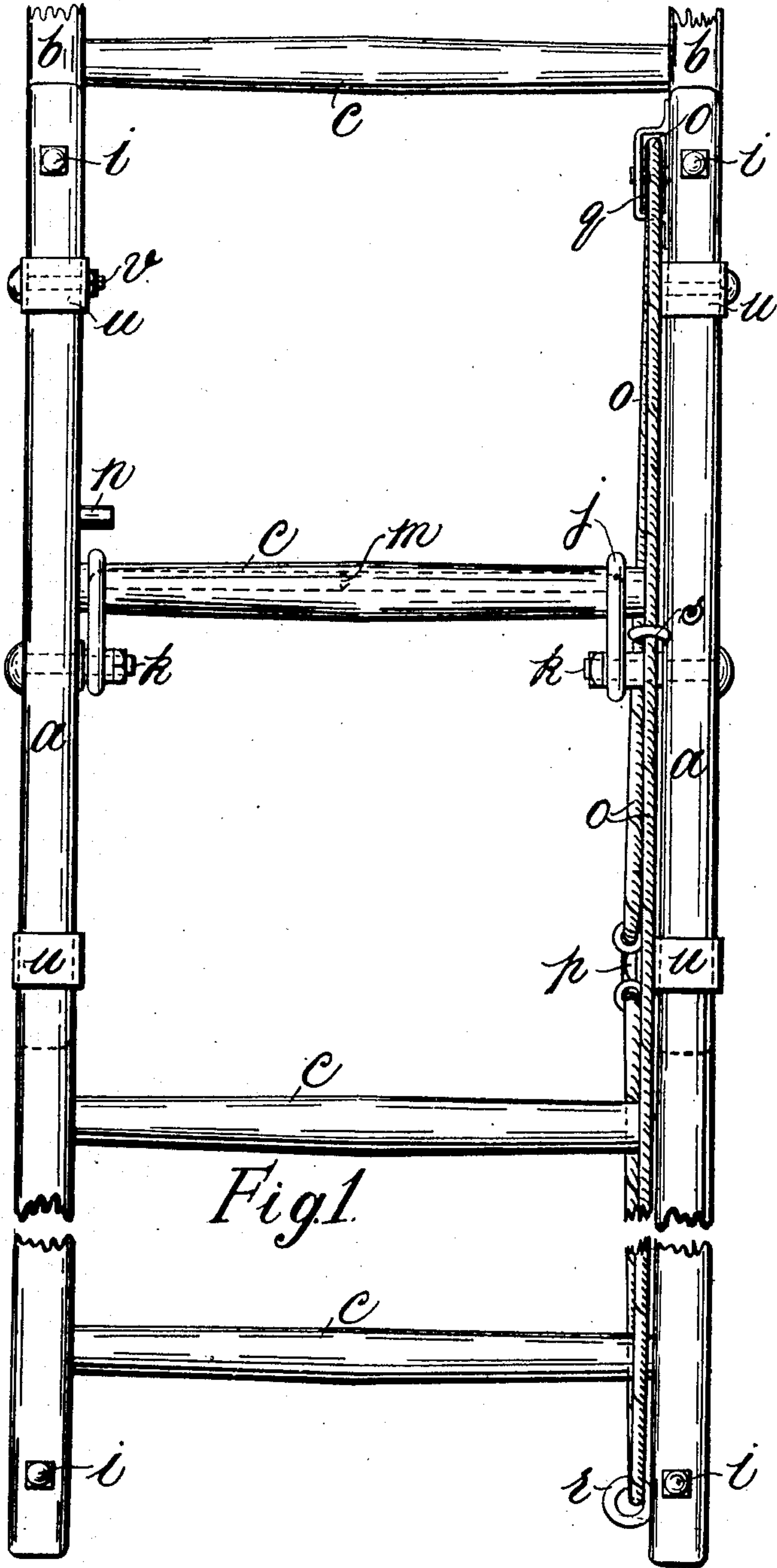


Fig. 1.

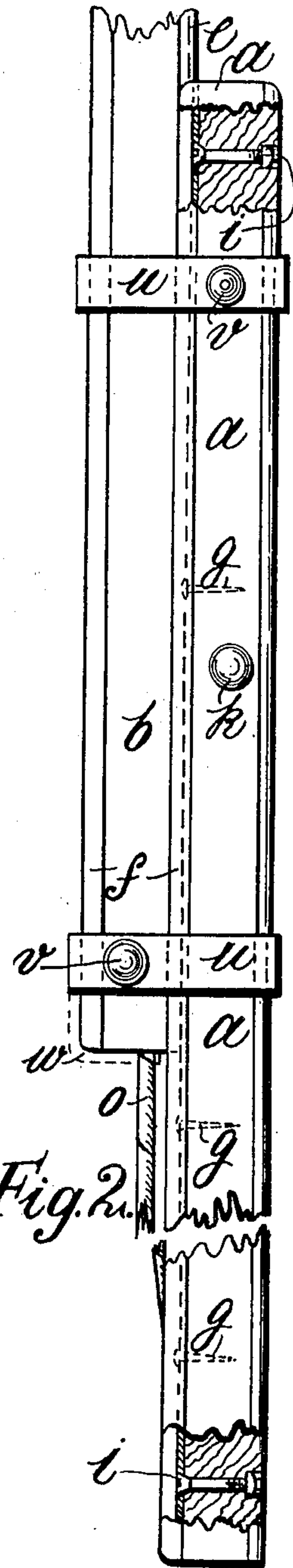


Fig. 2.

Witnesses.

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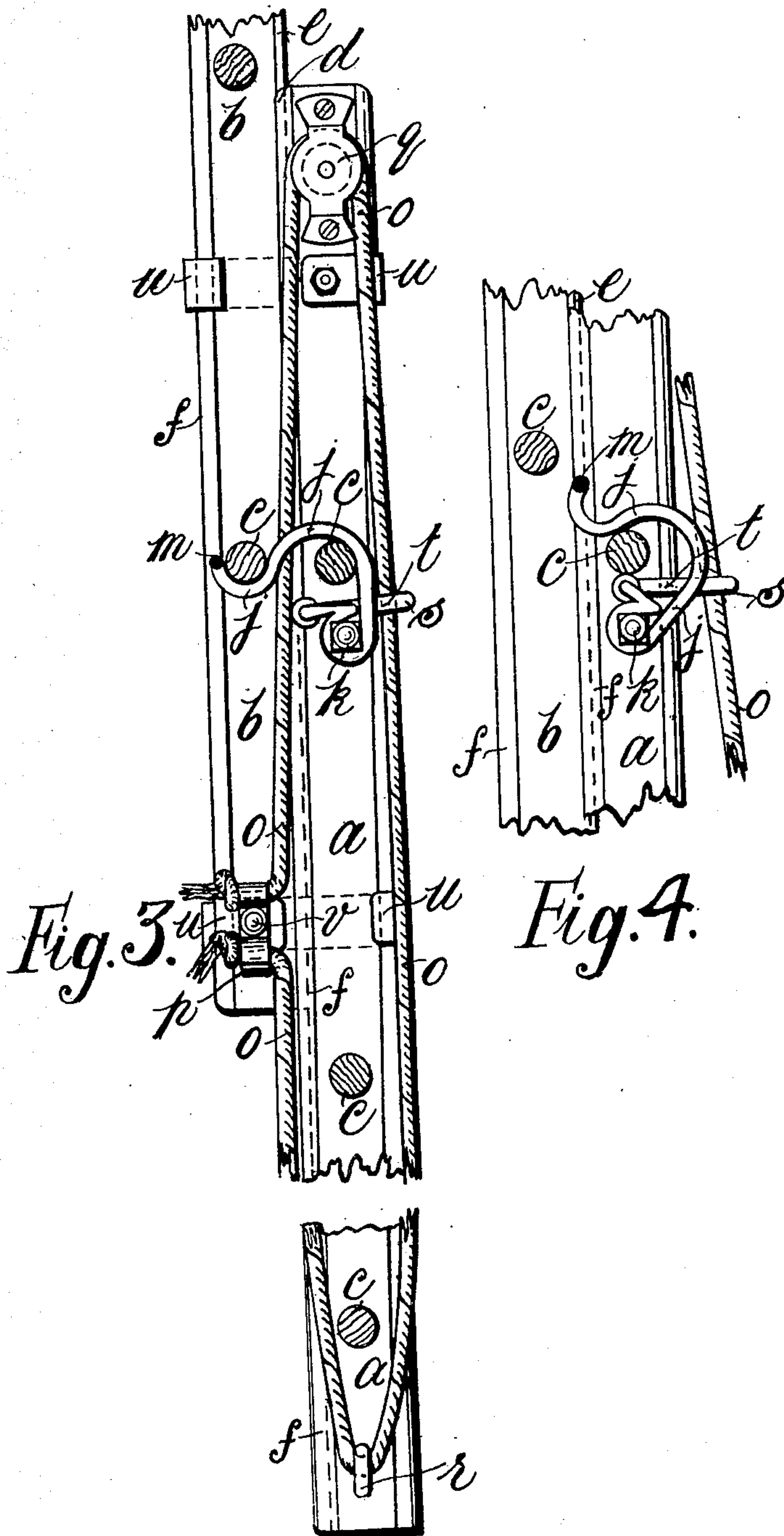
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3 SHEETS—SHEET 3.

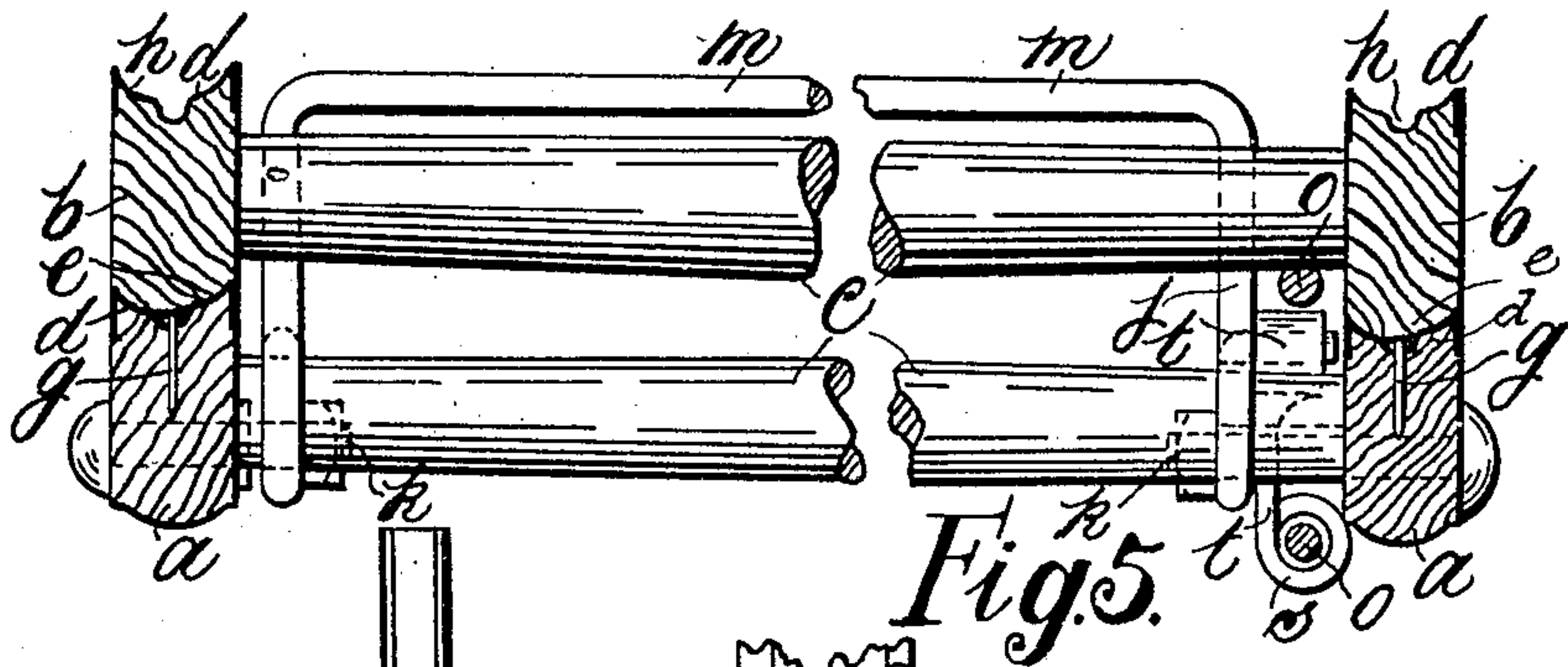


Fig. 7.

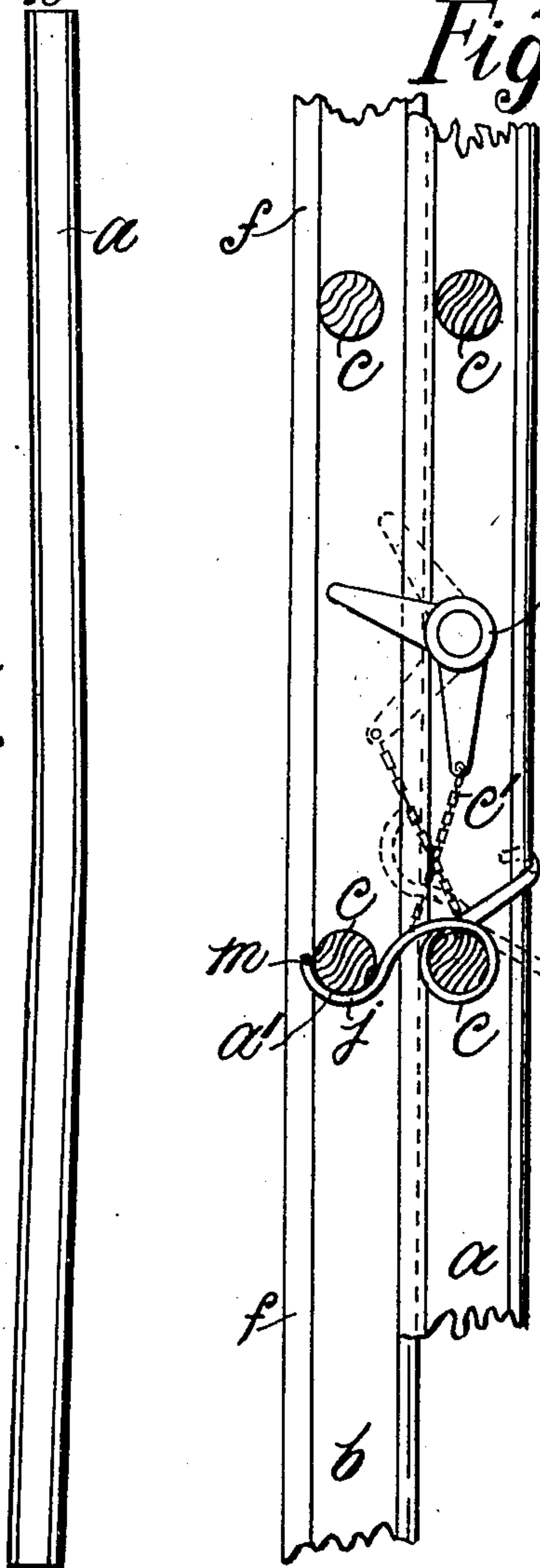
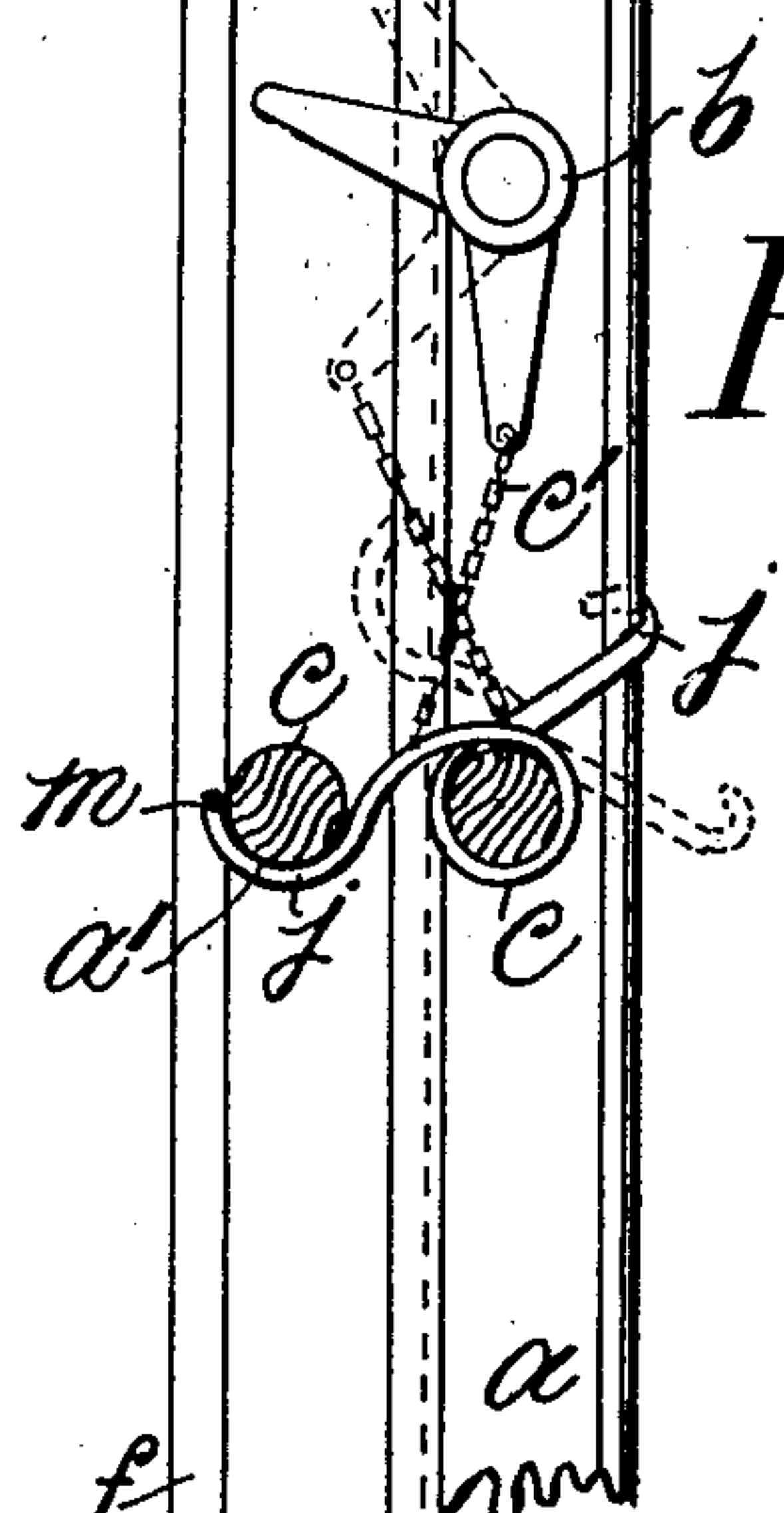


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

HORACE MOTE AND LOUIS MOTE, OF EDMONTON, LONDON, ENGLAND.

EXTENSION-LADDER.

No. 925,822.

Specification of Letters Patent.

Patented June 22, 1909.

Application filed September 14, 1908. Serial No. 452,994.

To all whom it may concern:

Be it known that we, HORACE MOTE and LOUIS MOTE, subjects of the King of Great Britain and Ireland, and residents of Edmonton, in the county of London, England, engineers and manufacturers, have invented certain new and useful Improvements in Connection with Extension-Ladders, of which the following is a specification.

Our invention relates to improvements in extension ladders, the object being to provide an improved construction of such which will resist considerable transverse strains due to weight placed on the ladder while it is leaned against a wall or other object, a further object being to provide for the extension part of the ladder to slide on the back of the longitudinal members of the bottom ladder instead of on the rungs of the front ladder as is usually the case, the improved means enabling the extension to be easily raised and lowered as required, a still further object being to provide improved means for operating and retaining the extendible portion of the ladder in position.

Our invention will be fully described with reference to the accompanying drawings, in which,

Figure 1 shows a front elevation of so much of an extension ladder as is necessary to illustrate our invention, Fig. 2 side elevation of same, Fig. 3 sectional side elevation through the rungs of the ladder with the parts in retaining position, Fig. 4 partial sectional side elevation showing the retaining parts in a position to enable the extension portion of the ladder to be raised or lowered, Fig. 5 sectional plan of the ladder, Fig. 6 side elevation of a modified arrangement and Fig. 7 diagrammatic view which will be hereinafter specially referred to.

In carrying out our invention, which will be described with reference to a ladder composed of two parts, though it is equally applicable to ladders composed of more parts.

a represents the longitudinal members of the bottom ladder and *b* similar members of the extension ladder. We arrange for the ladder to bear against and slide on the longitudinal members *a* of the front ladder instead of sliding along or against the rungs *c* of the bottom ladder as is usually the case. For this purpose the joining or sliding faces of the longitudinal members of each ladder are preferably grooved and formed with a

bead respectively, *d* being the groove and *e* the bead. The transverse section of each substantially corresponds being usually somewhat semi-circular or curved though we would have it understood that any suitable section of groove and bead may be employed. The outer or bottom ladder is grooved at its under side and the extension ladder provided with the bead. The outside faces of the longitudinal members may be beaded or rounded or be formed flat, if desired, but the back faces of the longitudinal members are always grooved as already stated and shod with a longitudinal strip of sheet metal *f* substantially corresponding in cross section to the groove. Each strip is flanged at both edges so that together with the semi-circular cross-section of the metal a plate of considerable transverse strength is obtained which is well calculated to resist transverse strains on the ladder due to the weight of a person or persons climbing the ladder. In order to obtain the greatest advantage of these metal strips to resist bending of the ladder we, during construction, bend each section of the ladder longitudinally to a curve such as is indicated in Fig. 7 before applying the metal strips. The bending is such as to leave the longitudinal members concave on that side at which the metal strips are applied.

The ladder is held in the bent position and the metal strips secured to the longitudinal members at intervals by nails *g*, screws or the like, the heads of which are adapted to sit below the contact surfaces of the two ladders. For this purpose each metal strip may be provided with a longitudinal groove *h* standing below the main groove *d*, or counter-sunk depressions may be employed for the same purpose. The ends of the metal strips are, however, secured in a more substantial manner, that is to say, by bolts *i* passed through them and the longitudinal members.

During the fixing of the strips the latter conform to the curvature of the members *a* or *b* so that when the ladder is unbound it tends to assume a straight line but the longitudinal strips of metal resist this tendency and hence the ladder never becomes perfectly straight only under a considerable load acting transversely from the convex side which is always outward when the ladder is placed against a wall. It will therefore be seen that the application of weight to the

outside of the ladder always tends to put a tensile strain on the metal strips consequently they, together with the wooden members to which they are attached, are capable of supporting very heavy loads. Not only so but the cross-section of the members *a* or *b* may be considerably less than is usual with other ladders and hence be much lighter in weight.

Our improved means for operating the extension ladder consists in pivoting to the upper ends of the vertical members *a* of the bottom ladder two fork shaped arms *j* which normally extend transversely so that the forks may engage with a rung *c* of the extension ladder as indicated clearly in Fig. 3 but instead of connecting these forks by a tubular axis we prefer to use short bolts *k* passed through the members *a* as the pivotal means and connect the outer ends of the forks together by a bar *m* so that they may move in unison. We also find that by this arrangement we may dispense with the frictional arrangement in connection with the operating pulley. A stop *n* is employed to prevent the forked arms being pulled too far over toward the front.

In order to operate the ladder we use an endless cord *o* secured at one point to a bracket *p* fixed to the bottom end of one of the members *b* of the extension ladder the cord passing upward from this bracket behind the rungs of the first ladder and over a pulley *q* secured to one of the members *a* of the front ladder the cord thence passing downward in front of the rungs of the front ladder through a guide ring *r* and thence to the bracket before mentioned. In passing the cord downward it is led through a loop *s* formed in an arm *t* loosely pivoted to and carried by one of the forks *j*, the arms *t* enabling the forked arms *j* to be also operated when the ladder is being extended. To carry out the extension the front portion of the cord is pulled downward in a direction about parallel with the ladder each rung of the extension portion lifting up the arms *j* as it passes but as soon as a rung has passed the arms fall by their own weight to normal position and a rung of the extension portion can be let down and rest in the arms *j* as indicated in Fig. 3. Fig. 4 shows the position the arms *j* assume when a rung is passing them. In order to lower the extension portion of the ladder the front portion of the cord is pulled downward as before and also outward so as, through the arm *t*, to pull the arms *j* against the stop *n* when the rungs of the extension portion can pass downward freely.

In order to hold the two portions of the ladder together transversely while permitting of the free movement of the extension ladder for adjusting the vertical height we employ transverse metal loops or braces *u*

to pass around the vertical members *a* and *b* of the ladders. The bottom braces are firmly secured to the lower end of the extension ladder by bolts *v* or the like but pass freely around the longitudinal members of the front ladder so that the back members may readily slide thereon. The top braces are formed in a similar manner but are fixed to the upper ends of the front ladder by bolts, as before, and pass freely around the longitudinal members of the extension ladder. The bottom braces may be further provided with extensions from the back as at *w* passing downward and under the foot of the extension ladder so as to serve as a protection to it when let down to the ground, if required. The braces also tend to strengthen the ladder in a transverse direction.

In Fig. 6 the means for retaining the slidable portion of the ladder in position longitudinally consist of arms *j* forming part of the cross bar *m* which instead of being specially pivoted to the sides *a* are pivotally curled around one of the rungs *c*, the rear portion *a'* of the arms being twisted to normally rest against the longitudinal members of the second ladder. The arm *t* is dispensed with and the operating cord has no connection with arms *j*, but is merely passed around pulley *q* and guide ring *r*. Above the arms *j* and usually about midway between two rungs of the bottom ladder we pivot to the side members *a* one, or a pair, of bell crank levers *b'*, the lower arm of which is connected to one of the arms *j* by a chain or cord *c'*. In this arrangement when the second ladder is raised by cord *o*, its rungs lift up to the broken line position and successively pass the arms *j*, the latter through the chain *c'* pulling the outer arms of the bell crank levers inward out of the way. On releasing the cord the rung of the second ladder can rest in the arms *j* as before these latter having, by their own weight, returned to the horizontal position. To lower the ladder it is first raised the distance of two rungs, past the outer arms of the bell cranks, and then lowered, the rungs successively pushing the bell cranks downward and raising the arms *j* to admit of free descent.

By grooving and beading the sliding surfaces of the two parts of the ladder lateral movement of one ladder upon the other is prevented, but such a movement given to one is transmitted to the other. By the arrangement described the ladders are also kept in perfect alinement longitudinally besides which great depth in a transverse direction is obtained by the longitudinal members of each section of the ladder being arranged edgewise against each other instead of one being against the rungs of the other, as in ladders hitherto constructed. A still further advantage of the construction referred to is that the same width of ladder is employed

for each section. The metal strips may be applied to ordinary single or non-slidable ladders for the purpose referred to.

What we claim as our invention and desire to secure by Letters Patent is:—

1. In an extension ladder, the combination, with a lower ladder-section having curved side-bars provided with grooves in their concave faces, of sheet-metal facings secured in the said grooves, an upper ladder-section having curved side-bars provided with beads on their convex faces which slide in the faced grooves of the said lower ladder-section, and means for operatively connecting the said ladder-sections together.

2. In an extension ladder, the combination, with a lower ladder-section having curved side-bars provided with grooves in

their concave faces, of sheet-metal facings secured in the said grooves and provided with flanges at their edges which overlap the said side-bars, an upper ladder-section having curved side-bars provided with beads on their convex faces which slide in the faced grooves of the said lower ladder-section, and means for operatively connecting the said ladder-sections together.

In testimony whereof we have hereunto set our hands in the presence of two witnesses.

HORACE MOTE.
LOUIS MOTE.

Witnesses:

TH. RAND,
R. F. WILLIAMS.