(No Model.) 2 Sheets—Sheet 1.

J. P. MAGNEY.

SASH BALANCE.

No. 476,287. Patented June 7, 1892.

Fig. 2.

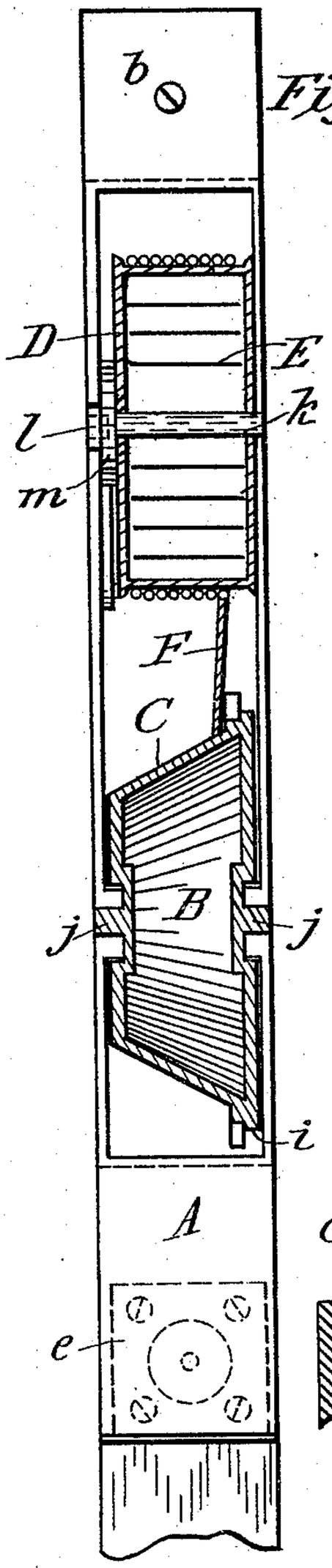


Fig. 1.

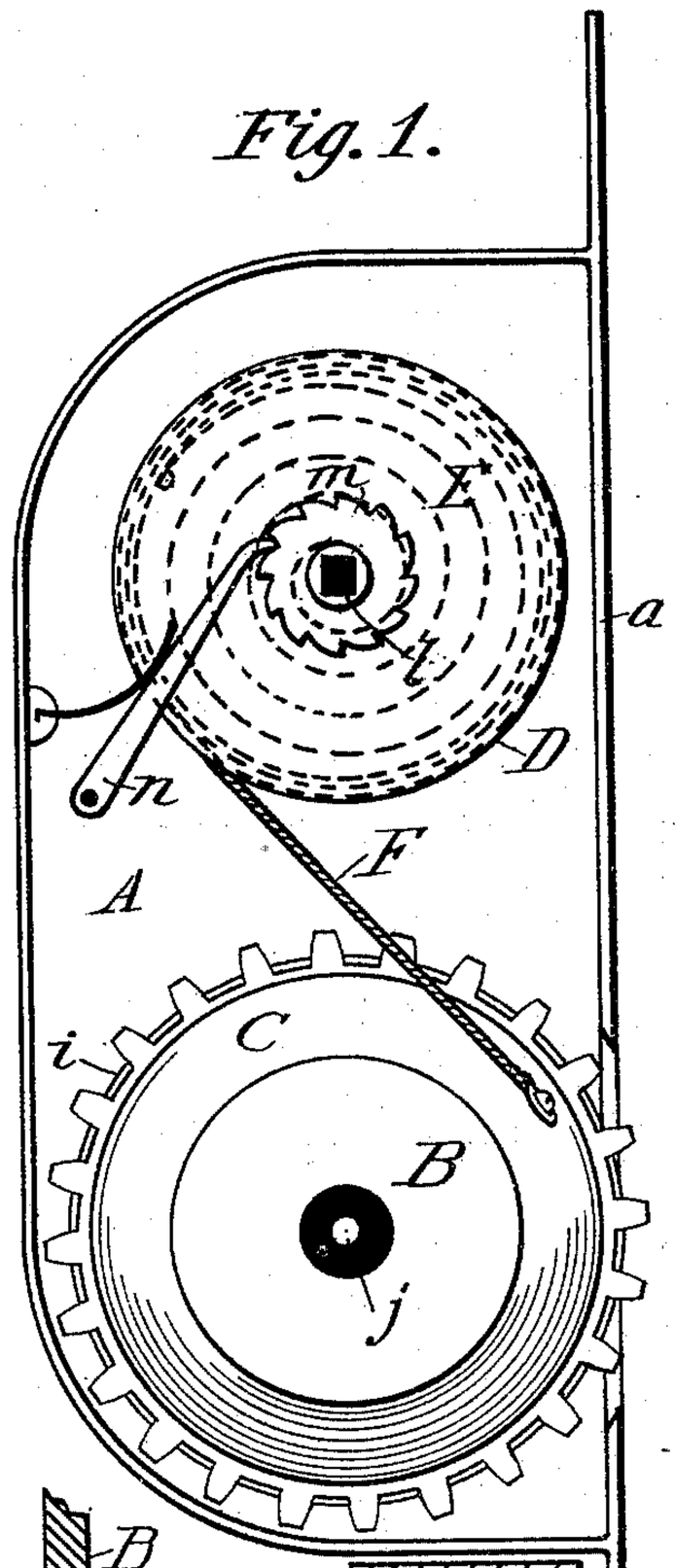


Fig. 5.

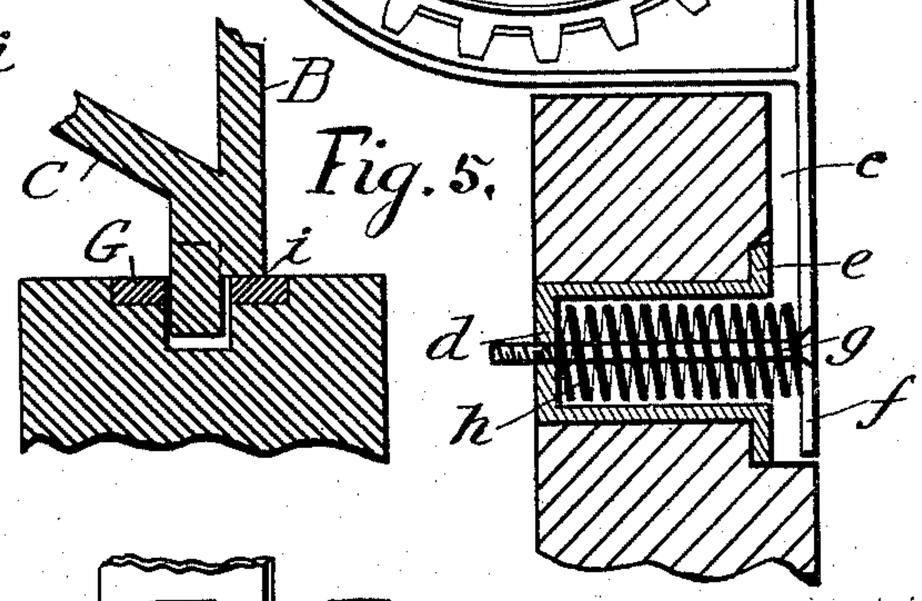
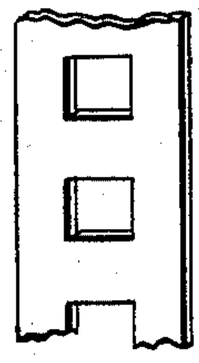


Fig. 6.



WITNESSES.

J. H. Albright.

M. P. Bryan.

INVENTOR

Joseph P. Magney

by Shea & Seely

Atty's.

(No Model.) 2 Sheets—Sheet 2.

J. P. MAGNEY.

SASH BALANCE.

No. 476,287. Patented June 7, 1892.

Fig. 3.

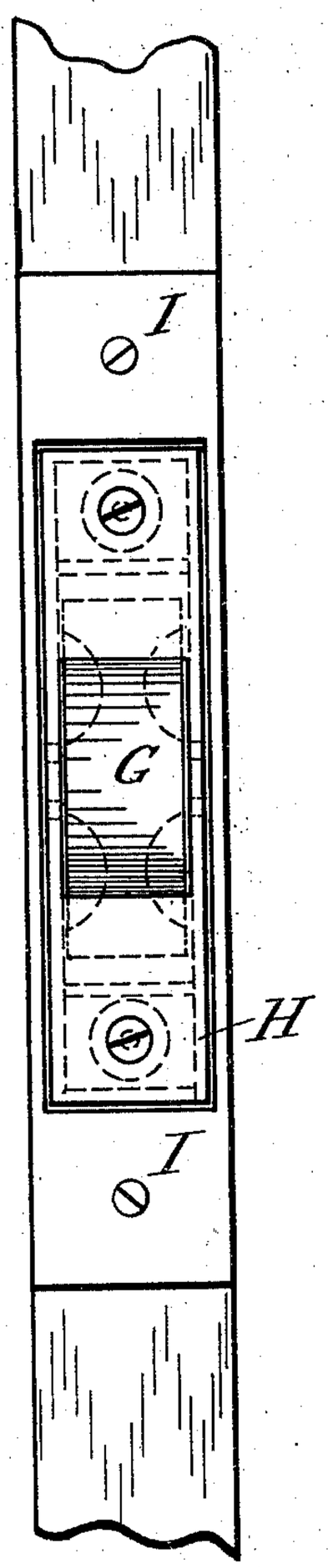
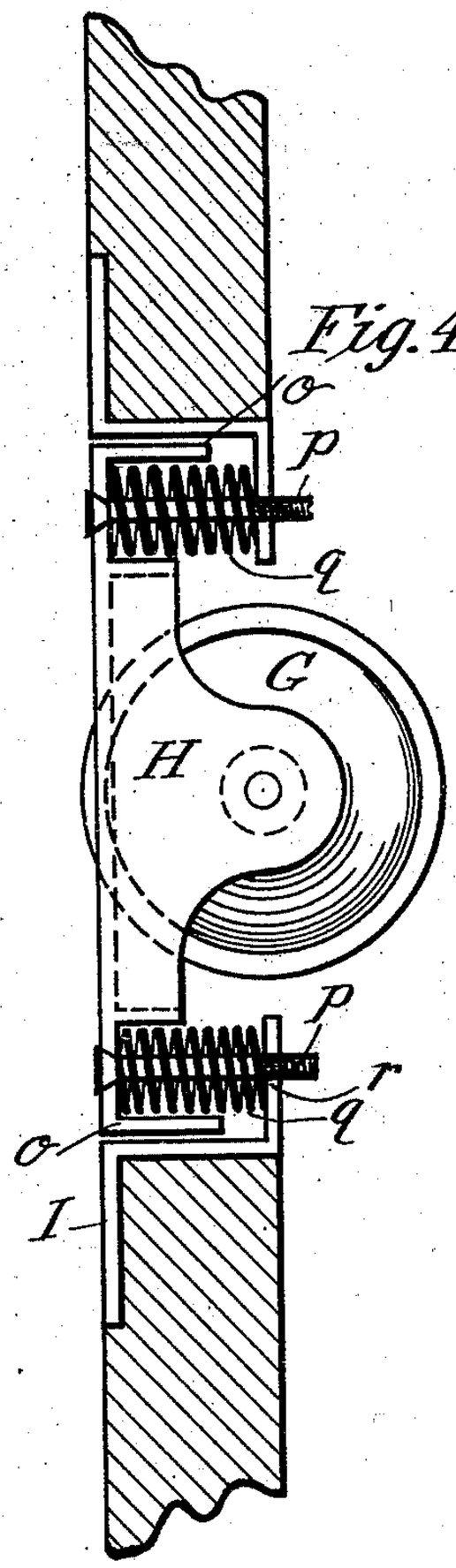


Fig. 4.



Witnesses,
J. W. Albright.
W. R. Bryan.

Inventor
Joseph P. Magney
by Spear & Seely
Attys

UNITED STATES PATENT OFFICE.

JOSEPH P. MAGNEY, OF SAN FRANCISCO, CALIFORNIA.

SASH-BALANCE.

SPECIFICATION forming part of Letters Patent No. 476,287, dated June 7, 1892.

Application filed May 4, 1891. Serial No. 391,504. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH P. MAGNEY, a citizen of the United States, and a resident of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Sash-Balances; and I do hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to improvements in sash-balances of the kind in which the force of a spring wound up by the descent of a sash is caused to act upon a rack-and-pinion movement between the sash and its casing, and thus to assist the upward movement of the window.

The principal object of the present invention is to equalize the tension or force exerted by the spring throughout the movement of the sash. These spring sash-balances are intended as substitutes for the ordinary cord-and-weight balances in general use. They are equally as positive in their action and require much less space in the window-casing; but there is one objection to their use, and that is that the spring exerts greater force as the sash commences to raise than it does when the raising has been completed, and it follows from this that in lowering the sash to wind up the spring there is a constantly-increasing resistance as the sash descends. I have devised an apparatus which completely obviates this difficulty and which equalizes the force exerted by the spring throughout the movement of the sash.

Another object of my invention is to provide special means for insuring the correct engagement of the gearing which connects the sash and casing, and thus securing the smooth and easy running of the rack-and-pinion movement.

Another object is to provide special devices for adjusting the boxes or cases which carry the gearing upon either or both sides, so that the said gearing is placed in proper position relatively to either a tight or loose sash.

For a full comprehension of my invention and of the details of construction, which form part of it, reference must be made to the accompanying drawings, in which—

Figure 1 is a side elevation; Fig. 2, a front elevation, partly in section; Fig. 3, a side elevation, and Fig. 4 a section of an anti-friction bearing for the opposite side of sash. Fig. 5 is a broken section of the cone-wheel B, to illustrate its engagement with a rack on the sash. Fig. 6 is a broken perspective of the rack.

The sash-balancing device herein illustrated is adapted to be applied to both sashes of a window and in very heavy windows to both sides of each sash. I have, however, shown in the drawings only one of such devices and have also illustrated in two figures an anti-friction bearing for the other side of the same sash, the sash being supposed to be light enough to be raised by a single spring.

In the drawings, A represents a box or case set in a window frame or casing and having a flanged face-plate *a*, which lies flush with the bottom of the sash-run and is secured there by a screw *b* in the top flange. The bottom of the case A is, however, allowed a slight movement. The sash-run is slightly recessed, as shown at *c*, and is provided with a thimble *d*, secured by a flange *e* and screws. The bottom flange *f* of the case is connected to a pin *g*, which enters the thimble and is there inclosed by a spring *h*, which tends to press the case constantly outward in the direction of the edge of the sash. In the lower part of the casing is journaled a wheel B, having spur-teeth near one edge adjacent to a shoulder *i*, the latter, Fig. 1, projecting beyond the base-line of the teeth, so as to bear upon the rack. The teeth engage constantly with a rack G in the sash, such rack being preferably a strip of metal having holes punched in it at proper intervals, such, in fact, as is shown in my application for Letters Patent, Serial No. 377,262, filed January 9, 1891.

The wheel B is preferably provided with rigid axles *j*, having bearings on the sides of the case A, although a fixed transverse pin, upon which the wheel turns, may be substituted.

The lower part of the case A is adjusted to the sash by a screw *g*. The head of this screw is countersunk in the face-plate *a*, and by turning it in the proper direction the case A may be accurately adjusted, so as to cause the spur-teeth to engage with the rack in the edge of the sash. The spring *h* is only to keep the plate *a* pressed up to the head of

the screw, the latter being the regulating means. In other words, the spring is not intended to cause a positive pressure of the wheel against the sash, but simply to keep the frame in the position to which it has been adjusted by the screw. This construction of the case A is to be used at one side of heavy windows having balancing devices upon both sides. In light windows having a balancing device upon one side only the lower part of the case A is rigidly secured, and upon the opposite side of the window is an adjustable roller, hereinafter described.

The shoulder *i*, as before stated, projects beyond the base-line of the teeth, or about to the pitch-line, and its purpose is to cause the teeth to engage with the rack at the proper pitch and to prevent them from projecting too far into the recess behind the rack, and thus to bind. It thus forms a self-acting gage for the gearing and insures its smooth and easy running—a point of great importance in rack-and-pinion sash-balances.

It will be understood that in using a toothed rack instead of a perforated strip the shoulder *i* could be formed on the rack adjacent to the teeth, so as to meet a similar bearing-surface on the pinion at the pitch-circle of the engaging teeth.

The wheel B is preferably made hollow, in order to secure lightness as well as to economize material, and it is formed with a tapering or frusto-conical periphery C, which may be grooved or not, as desired.

Mounted in the case A just above the wheel B is the drum or barrel D, which incloses the helical balancing-spring E, one end of such spring being secured to the rotary pin *k* and the other to the barrel, Fig. 1. The tendency of the spring when wound is to revolve the barrel, and the initial winding is accomplished by providing the pin *k* with a squared hole *l* and with a ratchet-wheel *m* and spring-pawl *n*. A passage is made in the window-casing to admit an ordinary square key, by means of which the spring may be put under the required initial tension from the outside, the pawl preventing it from running down.

In sash-balances of this class having a spring and barrel mounted in the window-casing it has been usual to combine the barrel and pinion by forming the spur-teeth upon the barrel and causing it to engage directly with the rack. This, however, resulted in the unusual spring-tension previously alluded to, and I now describe the means I have devised for producing an equalization of tension in the spring throughout the movement of the sash. Secured to the periphery of the drum D is a cable F, preferably of common wire cord, which extends down and is secured to the wheel B at a point on the periphery at or near its largest diameter. It will be understood that the cable is just long enough to be completely wound upon either the drum or the wheel, according as the sash is at the top or bottom of its movement. When the sash is raised to full height, the spring is unwound and the cable coiled upon the barrel or drum. As the window is lowered the movement of the pinion is transmitted by the cable to the drum and the spring commences to wind, while the cable coils upon the wheel B toward the apex of the cone. As the resistance of the spring becomes stronger a gradually-increased leverage is exerted through the cable, owing to the decreasing diameter of the wheel B, the dimensions being such that the increase and decrease are proportionate until the sash reaches the bottom and the spring is fully wound.

In raising the window the action of the spring is transmitted to the pinion in the opposite direction, and as the spring loses tension through unwinding the cable gradually exerts a greater leverage, as its coils unwind toward the base of the cone, thus compensating for the loss in tension.

I have shown in Figs. 3 and 4 an anti-friction roller unprovided with balancing devices and adapted to be used on the casing opposite the sash-balance in sashes where a single spring upon one side is sufficient to counterbalance the weight of the sash. A pulley or roller G is journaled in sliding frame H, the latter being guided in its movement by a case I, secured to the window-frame. Guide-flanges *o* are formed on the frame H, which bear at top and bottom on the case I, and screws *p p*, surrounded by springs *q q*, are threaded into the case I, as shown at *r*. These screws operate in the same manner to adjust the frame H as the screw previously described in connection with the case A. They are countersunk in the face-plate of the frame, and by their means the frame may be accurately adjusted, so as to cause the roller G to come into contact with the edge of the sash. The springs *q*, like the spring *h* before described, only serve to keep the frame H pressed up to the heads of the screws, the latter being the only regulating means. In other words, the spring is not intended to cause a positive pressure of the roller against the sash, but simply to keep the frame in the position to which it has been adjusted by the screws. Whether a sash be tight or loose, therefore, the devices on both sides may be caused to operate with perfect accuracy. The binding of the sash upon one side, caused by the lifting action of a spring upon the other, is entirely prevented by this device.

Any desired form of sash-lock may be used in connection with the sash-balancing device first described; but I prefer to use that described and shown in the above-named application for Letters Patent filed by me January 9, 1890. This consists of a straight bar of metal having a short feather upon one side, which enters the window-casing from the side and may be caused to slide back and forth therein. The feather may thus be caused to

engage with the teeth of the pinion, locking it and preventing its movement, or may be withdrawn or pushed in far enough to clear the teeth, permitting the pinion to rotate in the manner before described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a spring sash-balance, the combination, with a drum inclosing the spring, of a cone-shaped pinion gearing with a rack and a cable connecting the drum and pinion, substantially as and for the purposes set forth.

2. In a sash-balance, the combination, with a box or case set in the window-frame adjacent to a sash-run, of a drum or barrel journaled in said case and inclosing a spring, a wheel below such drum also journaled in the casing, having spur-teeth upon one edge and a frusto-conical periphery and projecting from the case or box to engage with a rack upon the sash, means for adjusting the case, and a cable connected to both drum and pinion, substantially as described and shown.

3. In a spring sash-balance operating through a rack-and-pinion movement, the combination of a rack, a pinion engaging therewith, and a rigid bearing-shoulder to one side of the line of the teeth and projecting beyond the base-line thereof, acting as a positive gage for causing the engagement of the rack and pinion at the proper pitch-circle, substantially as described.

4. In combination, the window casing and sash, a box or frame loosely mounted in said casing, the screw extending through the box into the casing and having a stop at its outer end, and means between the casing and the box, bearing against each, to cause the box to follow the adjusting-screw outward when adjusted.

5. In combination with a window casing and sash, a box or frame loosely mounted in the casing adjacent to the edge of the sash, screws adjustable in the window-casing and connected loosely to said box or frame, and a spring on each screw for pressing the box outward against the heads of the screws, substantially as and for the purposes set forth.

6. In combination, the rack and pinion, the tension means, and the positive rigid bearing-surface between the rack and the pinion to limit the depth of the engaging parts, said positive bearing projecting beyond the base-line of the teeth, substantially as described.

In testimony whereof I have hereunto affixed my signature, in the presence of witnesses, this 17th day of April, A. D. 1891.

JOSEPH P. MAGNEY.

Witnesses:
L. W. SEELY,
GEO. T. KNOX.