

(No Model.)

2 Sheets—Sheet 1.

H. N. H. LUGRIN.  
FLEXIBLE DOOR.

No. 520,065.

Patented May 22, 1894.

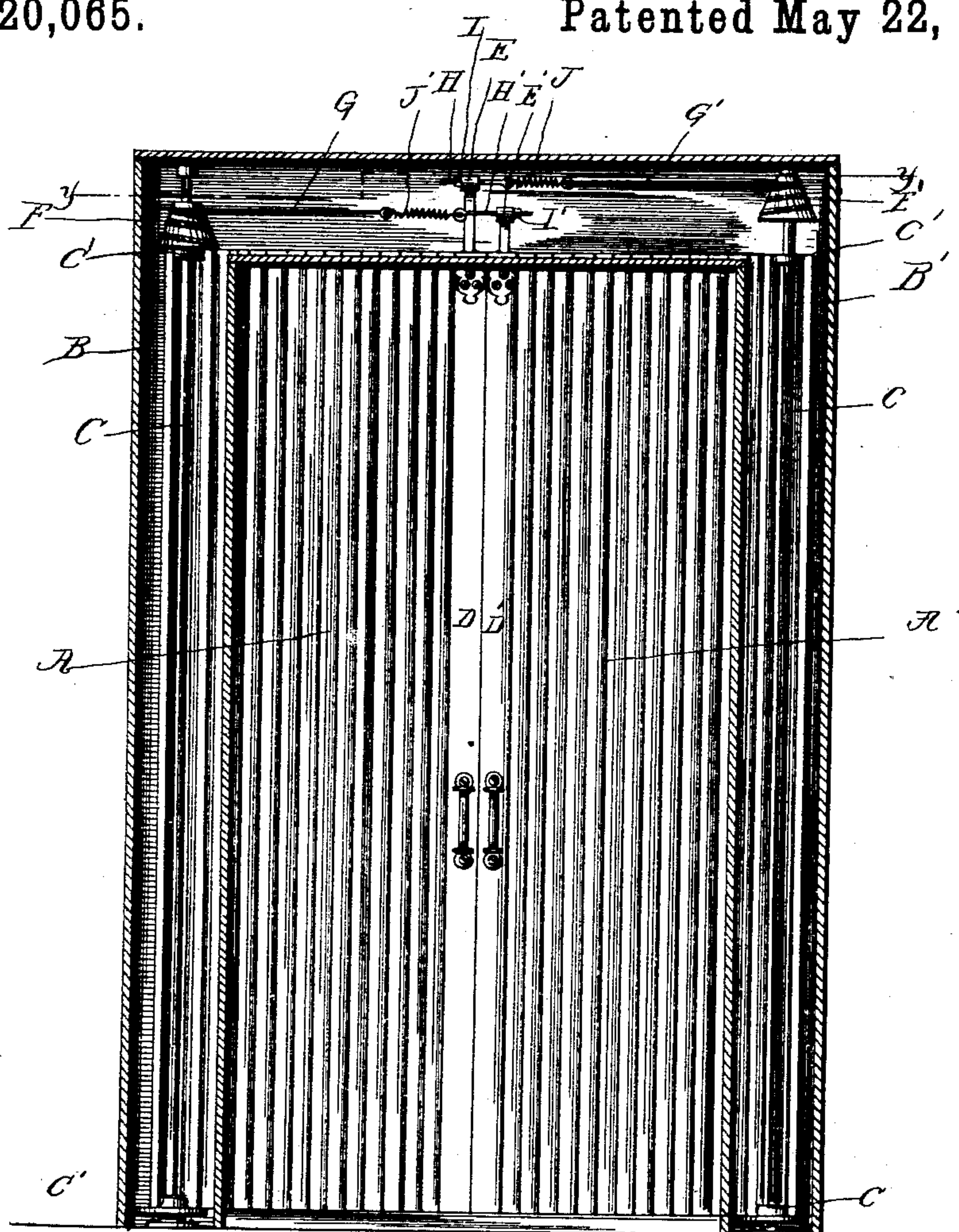


Fig. 1.

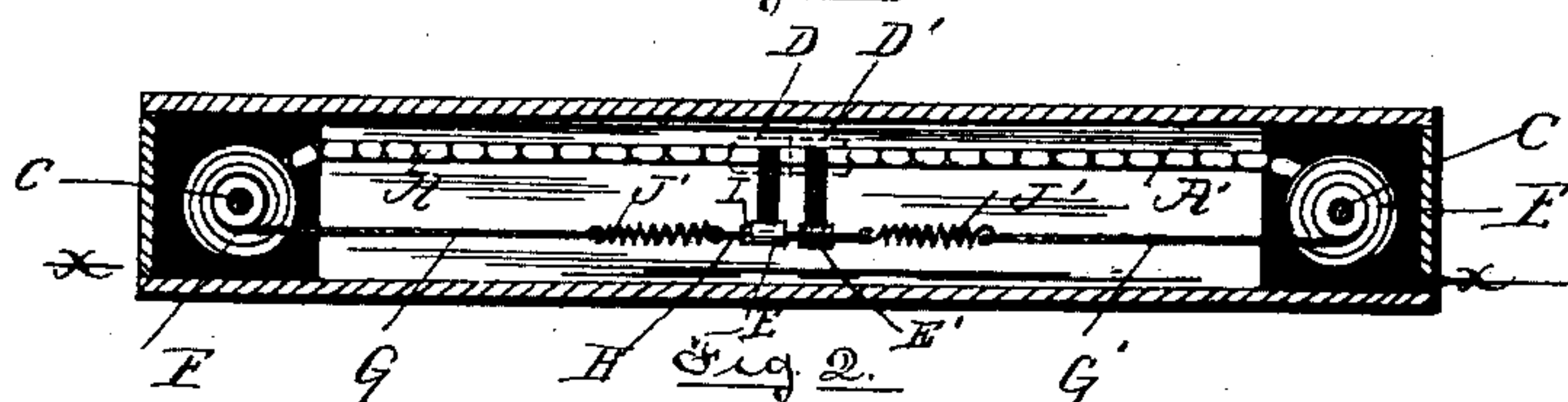


Fig. 2.

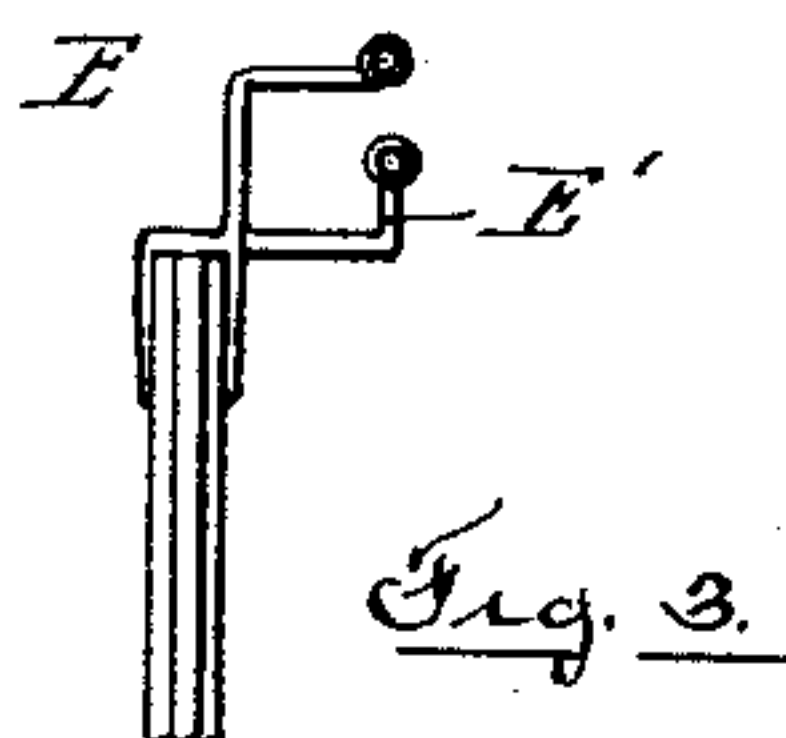


Fig. 3.

Witnesses

Walter S. Bowen

H. W. Fowler

Inventor

Horatio N. H. Lugin

By his Attorney

Rufus P. Fowler

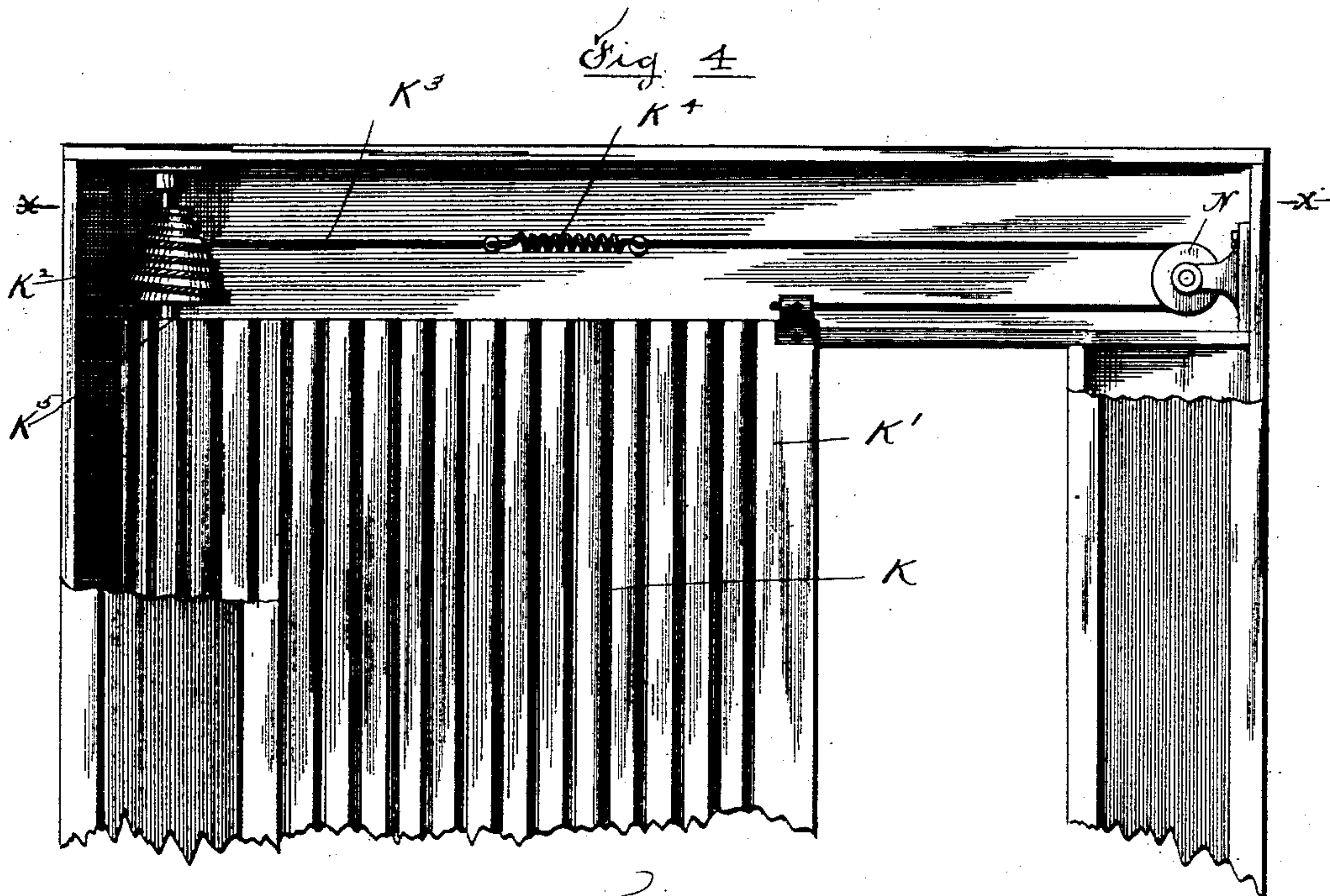
(No Model.)

2 Sheets—Sheet 2.

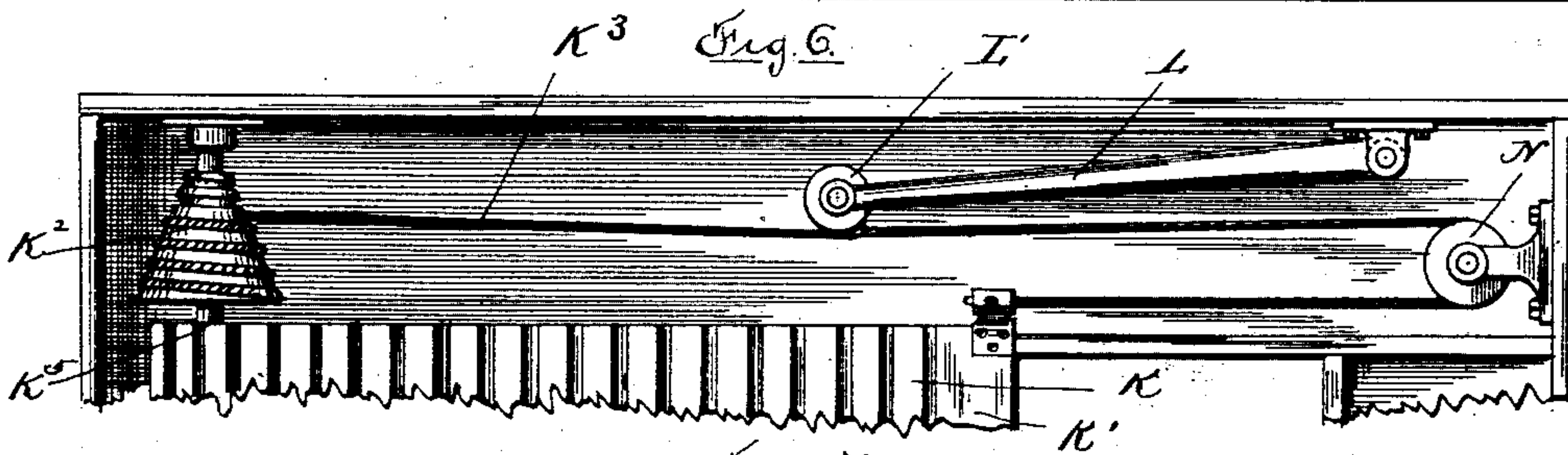
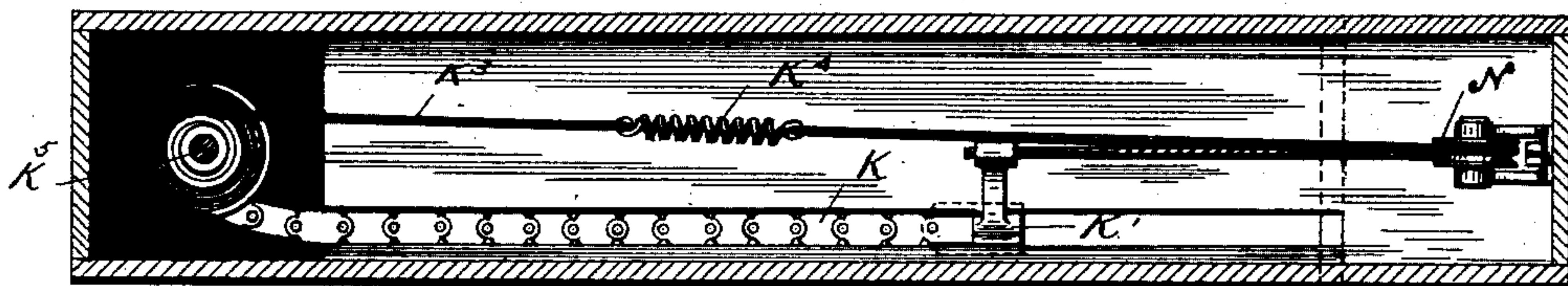
H. N. H. LUGRIN.  
FLEXIBLE DOOR.

No. 520,065.

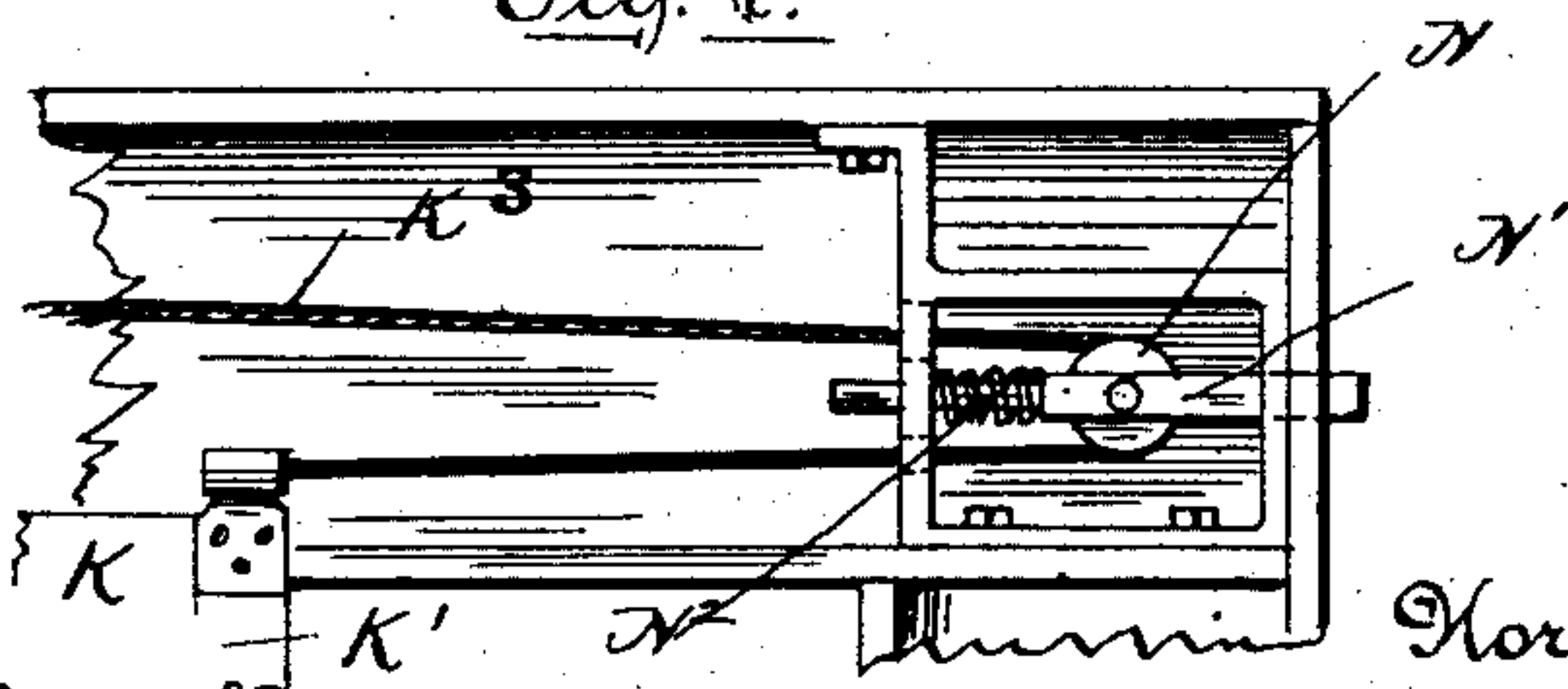
Patented May 22, 1894.



*Fig. 5*



*Fig. 7.*



Witnesses

Walter S. Bowen

H. W. Fowler

Inventor

Horatio N. H. Lugin

By his Attorney

Rufus S. Fowler



# UNITED STATES PATENT OFFICE.

HORATIO N. H. LUGRIN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR, BY  
DIRECT AND MESNE ASSIGNMENTS, TO THE LUGRIN FLEXIBLE DOOR  
COMPANY, OF PORTLAND, MAINE.

## FLEXIBLE DOOR.

SPECIFICATION forming part of Letters Patent No. 520,065, dated May 22, 1894.

Application filed January 30, 1891. Serial No. 379,680. (No model.)

*To all whom it may concern:*

Be it known that I, HORATIO N. H. LUGRIN, a citizen of the United States, and a resident of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Flexible Doors, of which the following is a specification, reference being had to the accompanying drawings, representing a flexible door embodying my invention, and in which—

Figure 1 represents an elevation of a door embodying my invention, with the door casings at the sides and the top of the door removed, on line *x, x*, Fig. 2, in order to disclose the operating mechanism. Fig. 2 is a top view of the operating mechanism, the inclosing casing having been removed on line *y, y*, Fig. 1. Fig. 3 represents the bent arms attached to the upper ends of the door stiles, to which the operating cords are attached. Fig. 4 represents the top portion of a single door, with the "take-up" device attached to the operating cord. Fig. 5 is a top view, represented in sectional view on line *X', X'*, Fig. 4. Fig. 6, shows a modified form of the "take-up" device, and Fig. 7 represents another modification of the "take-up" device.

Similar letters refer to similar parts in the different figures.

Referring to the drawings Fig. 1, represents a double door, or a door formed in two independent sections meeting at the center of the doorway or opening, each of the sections moving from the center outward in the operation of opening the door. The body of the door itself consists of a flexible curtain or shutter preferably made of a series of parallel wooden bars, or strips, hinged together at their edges by means of pintles, transverse bands of metal, or by canvas or other flexible material. In the side pockets *B, B*, are journaled the shafts *C, C*, having collars *C', C'*, to which one edge of the flexible curtains are attached, the rotation of the shafts *C, C*, causing the flexible curtains *A, A'*, to be wound up in a coil around their respective vertical shafts *C*. Each of the sections *A, A'*, are provided at their free edges with a bar or stile *D, D'* to the upper ends of which are attached the bent arms or brackets *E, E'*. To the upper ends of the vertical winding shafts *C, C*, are attached the cone drums *F*,

*F'*, each of which are provided with a spiral groove to receive the operating cords *G, G'*. The cord *G*, is attached at one end to the larger end of the cone *F*, and at its opposite end it is connected to the bracket *E*, attached to the stile *D*, of the curtain *A*. In like manner the cord *G'*, has one end attached to the larger end of the cone *F'*, with its opposite end connected with the bracket *E'*, attached to the stile *D'*, of the curtain *A'*. The connection of the cords *G, G'*, with the brackets *E, E'*, are made by means of eye bolts *H, H'*, held in the brackets *E, E'*, and provided with nuts *I, I'*, by which the cords *G, G'*, may be taken up. Interposed between the cords *G, G'*, and the eye bolts *H, H'*, are the spiral springs *J, J'*, which provide for a variation in the length of the cords *G, G'*, that may be required by any irregularity in winding the curtains *A, A'*, around their respective winding shafts. If the curtain *A*, be moved to the left, Fig. 1, the cord *G'*, will be unwound from the cone *F'*, causing the shaft to which the cone *F'*, is attached to be rotated and the curtain *A'*, to be wound around it, drawing the curtain *A'*, to the right and by the movement of the curtain *A, A'*, the vertical shaft *C*, is caused to rotate by the unwinding of the cord *G*, thereby causing the curtain *A*, to be wound around the shaft *C*, as fast as the stile *D*, is moved toward the left. In the same manner the movement of the stile *D'*, toward the right will cause the shaft *C*, to be rotated by the unwinding of the cord *G*, producing a corresponding movement of the stile *D*, toward the left thereby unwinding the cord *G'*, from the cone *F'*, and causing the curtain *A'*, to be wound around the shaft *C*. The two sections of the door or the curtains *A, A'*, can therefore be opened by a force applied to either one of the sections alone and when the doors are opened both curtains *A, A'*, can be simultaneously closed by drawing either the stile *D*, or *D'*, to the center of the door opening. If the stile *D*, be moved from the side of the door opening to the center in the operation of closing the door, the curtain *A*, will be unwound and the shaft *C*, will be rotated winding up the cord *G*, which will draw the stile *D*, and its connected curtain *A'*, toward the center of the opening.

The above described method of simultane-



ously operating the two halves of a flexible door or two flexible curtains together forming a door is not only adapted for wider openings where double doors are accustomed to be used, but also for the ordinary doorway of two and one half or three feet in width and when so used the curtains forming the two sections of the door will be comparatively quite narrow and the coil formed by winding them around their respective shafts will be correspondingly small and capable of being inclosed within the space of the ordinary door casing. As the door is being wound the first coil is wound upon the collars C', C', but each successive coil of the curtain will be wound upon the preceding coils thereby forming a polygonal drum. This causes the winding of the door to be liable to be irregular, or in other words, causes the door to be wound with varying speed during each single rotation of the winding shafts C, C, and as the cords G, G', are wound and unwound with regularity upon the drums F, F', the variation in the winding of the curtains A, A', renders an adjustment necessary which is provided for by the insertion in the cords G, G', of the take-up device consisting, as illustrated in Figs. 1, 2, 4, and 5, of a spiral spring which is made to form a part of the flexible connection between the curtains and the winding drums. These springs, as attached to the cords G, G', are held in a constant state of tension so that in case the cords are unwound from their conical drums faster than their attached curtains are being wound the springs will act to take up the slack, and in case the cords G, G', are being wound upon their conical drums faster than the curtains are being unwound the springs will expand, thereby increasing the length of the flexible connections between the curtains and the conical drums. The brackets E, E', are attached to the upper ends of the stiles D, D', respectively and are bent or offset in order to allow the cords G, G', to pass each other without interference. The take-up device, consisting of the spiral springs J, J', can be used in connection with a single door or a door in which a single curtain or shutter is used to close the opening said use of a take-up device is illustrated in Fig. 4, in which the door K, is connected by its free edge K', with the conical drum K<sup>2</sup>, by means of a flexible connection K<sup>3</sup>, which comprises the spring K<sup>4</sup>, whose elasticity allows the requisite variation in the length of the flexible connection K<sup>3</sup>, to compensate for the irregularity in winding the curtain K, around the vertical shaft K<sup>5</sup>. Fig. 5, represents the same device shown in top view and Fig. 6, represents the same arrangement of flexible door and winding drum with a flexible connection between them, but showing a modified form of the take-up device which consists of a pivoted lever L, carrying at its free end a roll L'. The roll L', rests upon the cord K<sup>3</sup>, and the lever L, is weighted

to cause the roll L', to bear with sufficient force upon the cord, in order to take up any slack in the cord consequent upon the irregular winding of the curtain K, around the vertical shaft K<sup>5</sup>. When a single curtain or shutter is used the flexible connection K, between the free edge of the door K', and the conical winding drum K<sup>2</sup>, must be carried around a pulley N, to change its direction and this feature of the construction allows the take-up features to be modified as represented in Fig. 7, in which the pulley N, is carried upon a sliding bar N', which is actuated by a spring N<sup>2</sup>, to slide the bar N', carrying its pulley N, against the flexible connection K, and taking up the slack in the cord.

There are many other well known and obvious methods by which the length of the flexible connection between the free edge of the curtain and the conical winding roll may be varied in order to compensate for the irregularity in winding the curtain itself. I do not therefore confine myself to the special methods shown and described.

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

1. In a flexible door the combination of a winding shaft around which the curtain or shutter is wound a curtain or shutter arranged to be wound around said shaft, a helical drum attached to said shaft, a flexible connection connecting said helical drum with the free edges of said curtain or shutter and a take-up mechanism, substantially as described, connected with said flexible connection in order to compensate for the irregularity in winding said door or shutter, substantially as described.

2. The combination of a pair of flexible curtains, or shutters, arranged to be drawn from opposite sides of a door or other opening in order to close the same, vertical shafts around which said curtains are arranged to be wound, drums attached to said shafts, arms or brackets attached to the free edges of said curtains, screw threaded rods provided with adjusting nuts held in said arms and a flexible connection between said screw threaded rods and said winding drums, substantially as described.

3. In a flexible door the combination with a rotating shaft and a door arranged to be wound around said shaft, of a drum attached to said shaft and a flexible connection connecting the free edge of said curtain with said drum, said flexible connection comprising a spiral spring, by which the length of said connection is varied to compensate for the irregularity in winding and unwinding said curtain, substantially as described.

Dated this 15th day of January, 1891.

HORATIO N. H. LUGRIN.

Witnesses:

RUFUS B. FOWLER,  
H. W. FOWLER.