

(No Model.)

2 Sheets—Sheet 1.

H. N. H. LUGRIN.
DOOR.

No. 460,208.

Patented Sept. 29, 1891.

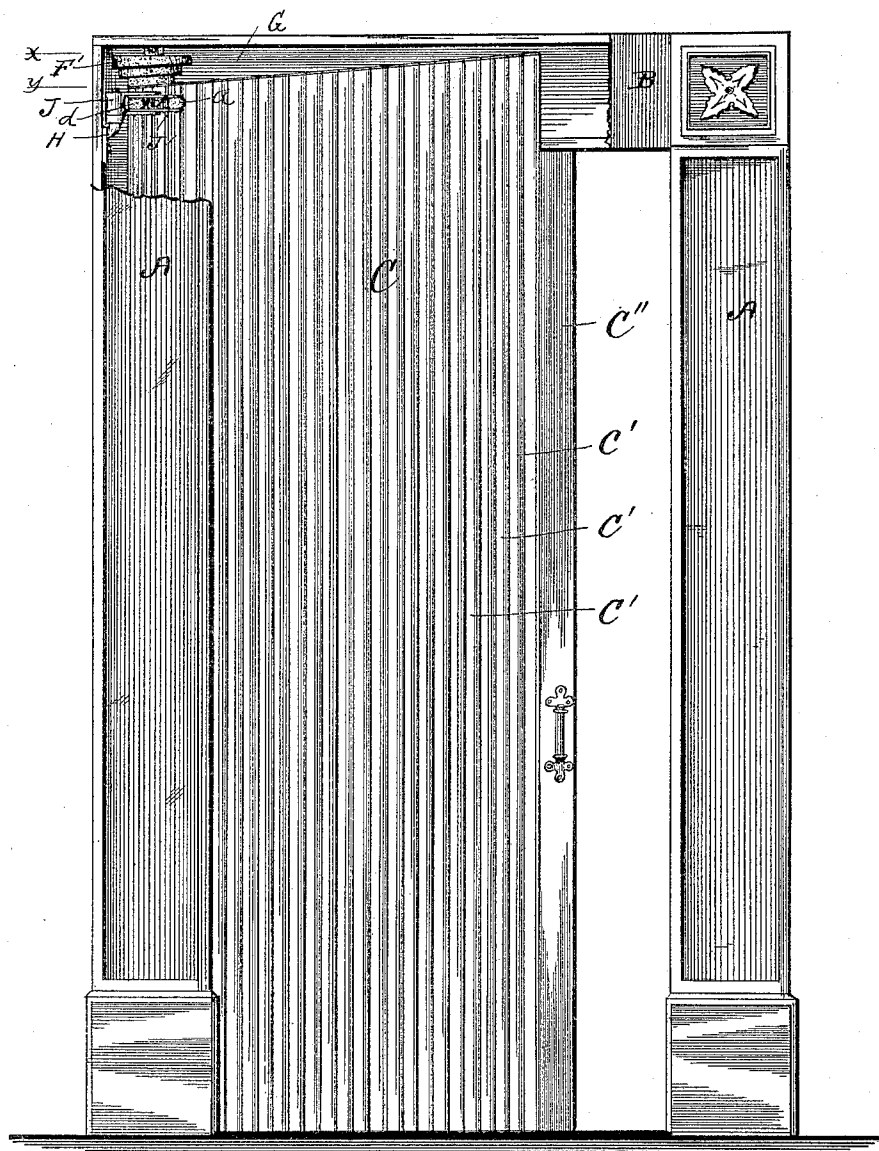


Fig. 1.

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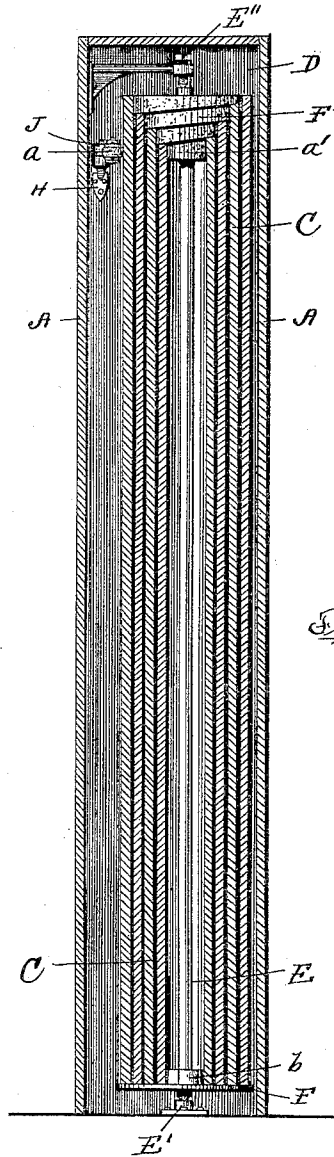
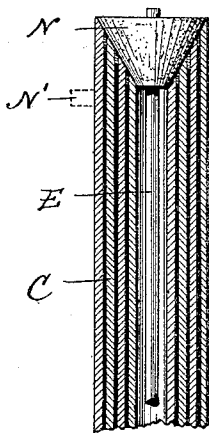
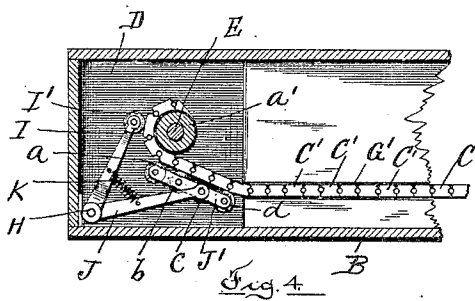
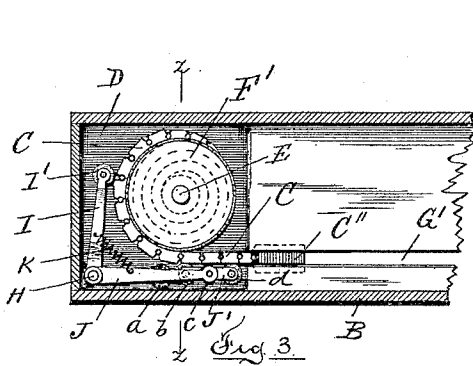
By his Attorney

Rufus B. Fowler

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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.

DOOR.

SPECIFICATION forming part of Letters Patent No. 460,208, dated September 29, 1891.

Application filed November 26, 1890. Serial No. 372,709. (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, forming a part of the same, and in which—

Figure 1 represents a flexible door embodying my invention, a portion of the casing being shown in sectional view in order to disclose the operative portions which embody my invention. Fig. 2 represents a sectional view of the door after it is wound, the section being taken on line Z Z, Fig. 3, and showing the winding-shaft in full. Fig. 3 represents the top view of the winding-shaft, the casing having been removed on line X X, Fig. 1, the door being shown as rolled up. Fig. 4 represents a similar view, as shown in Fig. 3, except that the section is taken on line Y Y, Fig. 1, and the door is shown as unwound from the winding-shaft; and Fig. 5 represents the upper part of a winding-shaft with the door as wound thereon and represented in sectional view, the figure showing a modification in the construction of the winding-drum upon the winding-shaft.

Similar letters refer to similar parts in the several figures.

My invention relates to that class of doors in which a flexible door or shutter of any known form of construction is wound upon a shaft or drum as the shutter is moved in the operation of opening the door and unwound therefrom in the operation of closing; and it has for its object to provide means whereby the shaft is rotated as the door is opened.

In the accompanying drawings, A A denote the door-casings upon either side of the opening, and B the top casing.

C denotes the flexible door or shutter, which may consist of a strip of canvas with wooden slats or parallel bars attached thereto, or, as represented in the drawings, of a series of parallel bars hinged together in any known manner, and at the free edge of the door C

is a heavier bar or stile C'', by which the door is moved in the act of opening or closing and to which the lock or latch can be attached.

Within a pocket D at one side of the door opening, and inclosed within the usual casings of the door, is a shaft E, supported upon a step-bearing E' at the lower end and journaled at the top, or, as represented, turning upon the point of a screw E''. Attached to the lower end is a disk F, above which the door is wound, with the lower ends of the parallel bars forming the shutter C resting upon the disk, by which the weight of the door is supported when wound. At the upper end of the shaft I attach a helical drum, with its smallest end a' corresponding in diameter with the collar b, attached to the shaft E, and together with said collar a' forming a drum upon which the first coil of the shutter C is wound. The parallel bars C', of which the door or shutter is formed, are gradually increased in length toward the stile C'', so that as the door is wound upon the helical drum F' the upper ends of the parallel bars C' will be wound around the drum and rest against the steps of the drum F', causing the upper end of the door to be wound upon a curved surface, which is concentric with the axis of the shaft E, the helical drum increasing in size as the door is wound fast enough so that each successive coil of the door or shutter will clear the next coil immediately beneath it. The face of the helical drum forming the successive steps of the drum is covered with rubber or similar material, by which the friction is increased between the ends of the parallel bars C' and the helical drum F'', and I usually cover the ends of the bars C' in contact with the drum with a similar material. The upper ends of the bars C' enter the pocket G above the door-opening, passing through a slot G' in the upper door-jamb. This slot serves to guide the door in a right line as it is opened and closed.

Within the side pocket in which the shaft E is journaled I fasten a bracket H, upon which is journaled the swinging arms I and J, the arm I carrying at its free end a friction-roll I', and the arm J carrying at its free end the bar J', pivoted midway its length to

the end of the arm J and provided with fixed studs upon which the friction-rolls *a*, *b*, *c*, and *d* turn.

Between the arms I and J, I place the spiral spring K, attached to the arms, with its tension exerted to draw the arms closer together and causing the friction-roll I' to press against the door or shutter as it is wound upon the drum F' and holding the rolls *a*, *b*, *c*, and *d* against the door as it approaches the drum F', the roll *d* being so placed that a straight line joining the center of the roll *d* and the center of the drum F' will pass through the point upon the circumference of the drum F', to which the door is tangential as it approaches the drum. As the door is opened, pressure is applied to the stile C'', pushing the door along the groove or slot in the upper jamb toward the pocket D. Between the pocket D and the shaft F the door rests against the series of rolls *a b c d*, which serve to guide the door toward the shaft F, the roll *d* exerting a pressure upon the door to press it firmly against the face of the drum F', causing the frictional contact of the door upon the surface of the face of the drum F' to rotate the drum and shaft F, thereby rolling up the door as fast as it is delivered to it by the movement of the door along the slot G'. The door itself should be so constructed that the edges of the adjacent parallel bars C' will abut against each other when the door is extended so that the pressure applied to the free edge of the door will be received by all the parallel bars, and the pressure of the roll *d* should be sufficient to produce the requisite friction of the door upon the circumference of the helical drum to cause the shaft E to be rotated as the door moves between the helical drum and the roll *d*.

The helical drum F' is covered with rubber, leather, or other material, which will increase the friction between the face of the drum and the upper ends of the parallel bars C', and, if found necessary, the ends of the bars C' in contact with the drum may be covered with a similar material. The increase in the size of the helical drum F' from its smallest to its greatest diameter is determined by the thickness of the parallel bars C', the increase being sufficient to cause the ends of the bars to be wound upon the surface of the drum F' and cause each coil to clear the coil immediately beneath it. When the door is wound upon a cylindrical shaft or drum, the first coil only is wound upon a cylindrical surface. After one coil of the door is wound the second coil is wound upon it, so that all the succeeding coils after the first are wound upon a polygonal surface, each of the bar C' forming one of the sides of the polygon. Consequently the coil is liable to become eccentric to the axis of the shaft E, and the amount of the door or shutter wound up at different periods of the angular movement of the shaft will be irregular or uneven.

In practice it is usually found more convenient

to make the door, as represented, with the bars C' slightly increasing in length from the shaft E to the stile C'', making the upper end of the door at an oblique angle with the bars, while the lower end is at right angles with the bars C'; but in cases where the lower end of the door can conveniently enter a pocket at the bottom similar to the pocket G the lower end, like the upper end, can be oblique and the helical drum F', with mechanism, as already described, by which the door is held against the drum, can be duplicated at the bottom of the shaft E.

In some cases it may not be necessary to employ both of the swinging arms I and J, and one can then be omitted; or in lieu of a single spring K, attached to both of the arms I and J, separate springs can be used having one end attached to an arm and the other end attached to the casing of the pocket D.

In Fig. 5 I have shown a modification of the helical drum F' in the form of a cone N, the upper ends of the door being chamfered to correspond with the angle formed by the face of the conical drum N. The drum N as well as the chamfered ends of the door can be covered with rubber, leather, or other similar material, and the broken lines N' denote the position of a pressure-roll by which the bars of the door are pressed closely against the surface of the conical drum, the conical drum being substituted in place of the helical drum F' and the construction and operation of the door being in other respects the same.

As the door is wound upon the drum F', as represented in Fig. 3, the arms I and J are spread apart against the tension of the spring K, and the bar J' turns upon the stud by which it is attached to the lever J, assuming a position corresponding with the position of that portion of the door between the slot G' and the shaft E. When the conical drum N is employed in place of the helical drum F', its size should increase from its smaller to its larger end, so that each successive coil of the door as it is wound upon the drum N shall be held clear from the coil immediately beneath it.

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

1. The combination, with a flexible door or shutter, of a shaft around which said door is wound and a drum attached to said shaft upon which the edge of the door is wound, said drum having an increasing diameter from one end to the other, whereby each of the successive coils of the door as it is wound is held from contact with the coil immediately beneath it, substantially as described.

2. The combination of a shaft around which a flexible door is wound, a flexible door having an edge forming an oblique angle with the axis of said shaft, and a drum attached to said shaft upon which said oblique edge of the door is wound, said drum increasing in diameter from its inner to its outer end, substantially as described.

3. The combination, with a flexible door or shutter, of a shaft around which said door is wound, a drum attached to said shaft and upon which said door is wound, and a pressure-roll bearing against said door to hold it in frictional contact with said drum, whereby the movement of said door between said drum and said roll will cause the drum to be rotated and the door to be wound thereon, substantially as described.

4. The combination, with a flexible door, of a shaft around which said door is wound, a drum attached to said shaft and provided with a covering of rubber or frictional material, whereby its friction is increased, and a pressure-roll applied to hold said door in frictional contact with said drum, as and for the purpose specified.

5. The combination, with a flexible door, of a shaft around which said door is wound, a drum attached to said shaft and upon which said door is wound, a swinging arm hinged at one end to the frame-work of the door, a bar pivoted to the free end of said swinging arm,

a series of rolls carried on said bar, and a spring applied to said swinging arm to hold said rolls against said door, substantially as described.

6. The combination, with a flexible door, of a shaft, a drum attached to said shaft, a pair of hinged arms carrying friction-rolls at their free ends and bearing against said door as it is wound upon said drum, and a spring with its ends attached to said hinged arms to hold said rolls in contact with said door, substantially as described.

7. The combination, with a flexible door, of a shaft around which said door is wound, and a helical drum attached to said shaft and upon which said door is wound, substantially as described.

Dated at Worcester, in the county of Worcester and State of Massachusetts, this 17th day of November, 1890.

HORATIO N. H. LUGRIN.

Witnesses:

FREDERICK E. POLLARD,
RUFUS B. FOWLER.