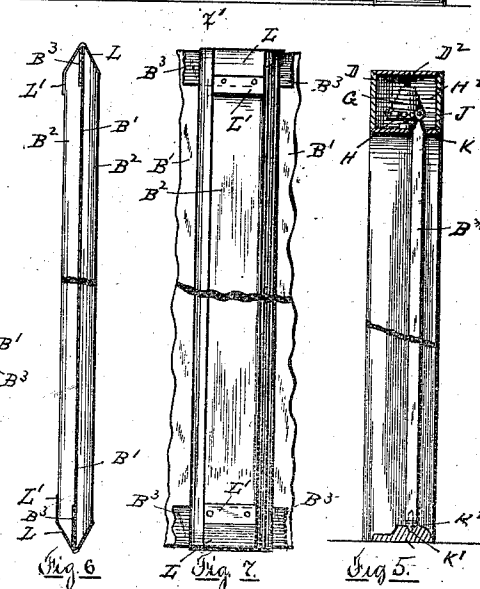
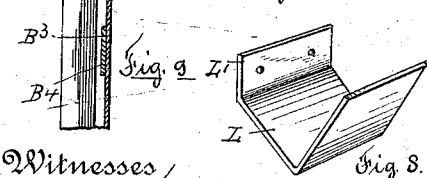
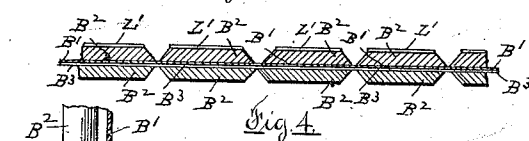
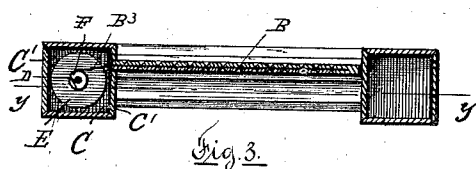
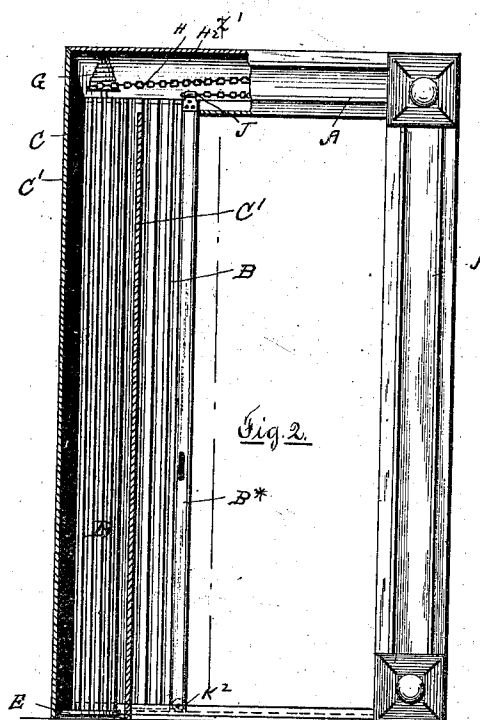
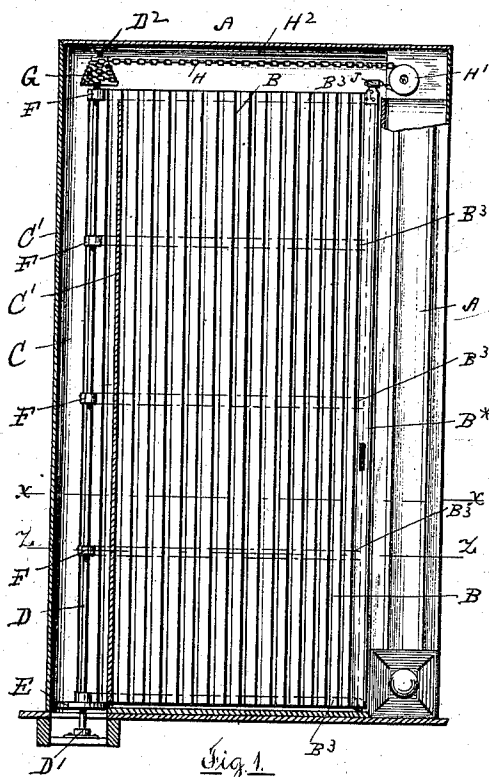


(No Model.)

H. N. H. LUGRIN.
FLEXIBLE DOOR.

No. 541,768.

Patented June 25, 1895.



Witnesses,
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Inventor
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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.

FLEXIBLE DOOR.

SPECIFICATION forming part of Letters Patent No. 541,768, dated June 25, 1895.

Application filed April 14, 1890. Serial No. 347,894. (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 specification, and which represent a flexible door with the connected operative mechanism forming the subject of my invention.

Figure 1 represents a front elevation of the flexible door, the casing upon one side being shown in sectional view in order to disclose the operative mechanism connected with the door. Fig. 2 represents a similar view, but showing the door as partly open. Fig. 3 is a horizontal sectional view on line X X, Fig. 1. Fig. 4 is a transverse sectional view of a portion of the flexible door, shown on line Z Z, Fig. 1, the parts being enlarged. Fig. 5 is a vertical sectional view on line Z' Z', Fig. 2. Fig. 6 is an edge view of the bars and flexible fabric of which the door is composed, the latter being shown in sectional view. Fig. 7 is a side view of the same, and Fig. 8 is a perspective view of the metallic shoe placed upon the ends of the wooden bars in the flexible door. Fig. 9 represents an edge view of one of the parallel bars, showing the metallic band inserted therein and the flexible covering in sectional view.

Similar letters refer to similar parts in the different figures.

My invention relates to a flexible door and it consists in certain improvements in the door itself, and also in the construction and arrangement of the operative mechanism, by which the door is opened and closed, as hereinafter described and specifically set forth in the claims.

Referring to the drawings A, A, denotes the casing of the door which is broken away upon the left side of Figs. 1 and 2 in order to disclose the roll or shaft upon which the flexible door is rolled.

B denotes the flexible door which can be constructed in any of the known methods of making the flexible curtains employed in roll-

top desks, rolling shutters and for similar uses, but which in the accompanying drawings is represented as composed of a sheet of canvas B', or other suitable flexible material, upon one or both sides of which are glued, or otherwise attached the parallel strips or bars b², preferably of wood, and covering the surface of the canvas, and at the free edge of the door is a bar B*, which is wider and thicker than the bars B², forming a stile, which serves as a support for a truck-roll and for the attachment of the operative mechanism, by which the door is wound upon the roll or shaft as hereinafter described. Transversely to said bars, in the present instance at right angles thereto, are bands of steel B³ placed between the canvas and the bars B² upon one side.

The parallel bars B² are grooved as represented at B⁴, Fig. 9, the grooves being as deep as the thickness of the bands and of equal width, so the edges of the bands bearing against the side walls of the grooves aid in preserving the position of the bars and maintaining their uniform angle with the bands, B³. The use of metallic bands incorporated as a component part in the construction of the flexible door serves to prevent the parallel bars B² from being separated by any sharp cutting instrument and an entrance thereby effected through the doorway when the door is closed. The metallic bands are attached to the shaft or roll upon which the flexible curtain or door is to be wound and at their opposite ends to the stile or bar B*, thereby connecting the stile B* with the winding roll, or shaft, upon which the door is wound and causing the metallic bands B³ to receive the tensile strain incident to the winding up of the door, as hereinafter described. These bands B³ can be attached to each of the parallel wooden bars in any known manner, but for ordinary purposes I deem it sufficient to inclose the bands between the parallel bars and the canvas and retain them in position by the adhesion of the bars B².

C denotes a vertical pocket at one side of the door way, and included within the door casing C', C'.

D is a shaft supported upon a step bearing D' and journaled in a bearing D² at its upper end, and carrying at its lower end the disk E and arranged along the shaft are the collars F, F, attached to the shaft, and upon which the flexible door B is wound, and to which the metallic bands B³ are attached. The collars F, increase the diameter upon which the first coil of the flexible door is wound although the flexible curtain forming the body of the door can be wound directly upon the shaft D, if preferred and as the door is coiled upon the winding roll, or shaft, D, its weight is supported upon the disk E, upon which the lower edge of the door rests, as it is wound. At the upper end of the shaft D is attached a helical winding drum G, around which the chain H is wound as the door is unwound from the shaft D.

H denotes a chain or cord, one end of which is wound around the helical drum and the opposite end is attached to a lug J attached to and projecting upward from the flexible door B. The helical drum G is preferably grooved to receive the chain H and the successive coils of chain as it is wound around the drum are made to correspond in diameter with the successive coils of the flexible door as it is wound upon the shaft D, the chain H winding upon the drum as the door is being unwound from the shaft and vice-versa. The chain is thus kept taut in every position of the door the action of closing the door causing the shaft D to rotate and wind the chain upon the helical drum G, as fast as the door is being unwound from the shaft D, and when the door is opened the stile B* is pushed toward the pocket C drawing the chain H off the helical drum and causing the shaft D to be rotated in the opposite direction, and to wind up the door.

A small pulley H' is placed in the pocket H² above the door to change the direction of the motion of the chain H.

A groove K in the upper casing receives the upper end of the door and communicates with the upper pocket H², and the lower end of the door is held from lateral displacement by means of a shallow groove K' in the threshold, in which the lower end of the door enters.

A roll K² journaled in the lower end of the stile B* and running in the groove K' supports the weight of the door at its free edge and sustains the lower edge of the door out of contact with the threshold. The ends of the parallel wooden bars B² are preferably chamfered or made V shaped and upon the ends are attached the strips, or shoes L, preferably of metal, one end of which as at L', Fig. 8, extends upward upon the parallel side of the strip, projecting laterally therefrom the thickness of the strip L and serving to hold the surfaces of the bars from contact and consequent abrasion as the successive coils of the door are being wound upon the shaft D, allowing the surface of the wooden bars to be finished and the finished surfaces to be pre-

served from defacement in the operation of winding the door upon the shaft D.

I do not confine myself to the specific form or material of the parallel bars B²; neither do I confine myself to the form of the metallic bands B³ as wire or wire cable can obviously be employed in place of the flat steel bands for the purpose of receiving the tensile strain in closing the door. I consider a flat steel band preferable as it affords an edge, which bearing against the sides of the grooves B⁴, affords a support transversely to the parallel bars B², and prevents the sagging of the door in the center, which is unsupported.

I do not confine myself to the particular form or material of the strip or shoe represented in Fig. 8, the essential feature of my invention relating thereto, consisting in forming upon the face or surface of the bars B² of a projecting surface, which will come into contact as the door is wound and thereby hold the surfaces of the bars B² apart.

Although it is desirable that the flexible door B be moved across the opening in the direction of its shortest diameter, or in the direction of its width instead of its length, as it requires the shorter length of chain to be wound upon the helical drum, yet it will be obvious that the essential features of my invention, except, that relating to the use of the disk E by which the weight of the door is supported, are equally applicable to the use of a horizontal, instead of a vertical shaft upon which the flexible door is wound. In such an arrangement the shaft upon which the door is wound would be placed in the upper pocket H² and the chain H in a side or vertical pocket, the edges of the door moving in grooves in the side casings of the door. The lateral or horizontal movement of the door is however preferable, as the weight of the door is supported by the roll K² and the vertical shaft D and disk E. The bands B³ are of thin steel, which offers a minimum of resistance to the operation of winding the door upon the shaft D and also secures an elasticity to the door, which imparts a resilient tendency to assume a plane surface as it is being unwound.

The canvas or other flexible material to which the bars B² are attached is attached at one edge to the collars F, F, and at its opposite edge to the stile B*, so that the stile is operatively connected with the roll, or shaft, D, independently of the metallic bands B³, and I do not therefore confine myself to the use of such metallic bands as, connecting the stile B* and roll, or shaft, D, but by the employment of a metallic connection between the stile B* and the roll, or shaft, upon which the body of the door is wound, the tensile strain in closing the door is removed from the material of which the body is composed permitting a light and elastic textile material to be used with the covering of the bars B², the stile B*, roll or shaft D, and the metallic connections between the stile and shaft, with the connecting chain or

cord H and drum G, forming a complete and operative mechanism, independently of the body of the door.

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

1. In a flexible door or shutter, the combination of a series of parallel bars provided with shallow transverse grooves to receive metallic bands, a series of metallic bands inserted in said grooves, and a flexible material attached to said bars and covering said metallic bands, substantially as described.

2. In a flexible door, or shutter, the combination of a series of parallel bars united at their edges by a hinge joint and provided with transverse grooves to receive metallic bands and continuous metallic bands inserted in said grooves, flush with the surface of said parallel bars and having their edges bearing against the edges of said grooves, said metallic bands being capable of bending in a horizontal plane, but rigid in a vertical plane, whereby said parallel bars are maintained at a uniform angle with said metallic bands, substantially as described.

3. The combination with a roll, or shaft, a flexible door or shutter attached at one edge to said roll or shaft and composed of a flexible body and a series of parallel bars or strips attached to said flexible body, and a series of plates projecting from the surface of said bars or strips, whereby they are held apart as the door or shutter is wound upon the roll or shaft, and their surfaces kept from abrasion, substantially as described.

4. The combination with a roll, or shaft of a flexible door, or shutter, attached at one edge to said roll, or shaft and comprising a series of parallel bars, or strips, hinged together at their edges and a series of plates projecting from the surface of said bars, or strips, whereby they are held apart as the door, or shutter, is wound upon the roll, or shaft, and their surfaces kept from abrasion, substantially as described.

Dated the 9th day of April, 1890.

HORATIO N. H. LUGRIN.

Witnesses:

FREDERICK E. POLLARD,
RUFUS B. FOWLER.