(No Model.)

A. S. SPAULDING.

FLEXIBLE DOOR.

No. 558,577. Patented Apr. 21, 1896.

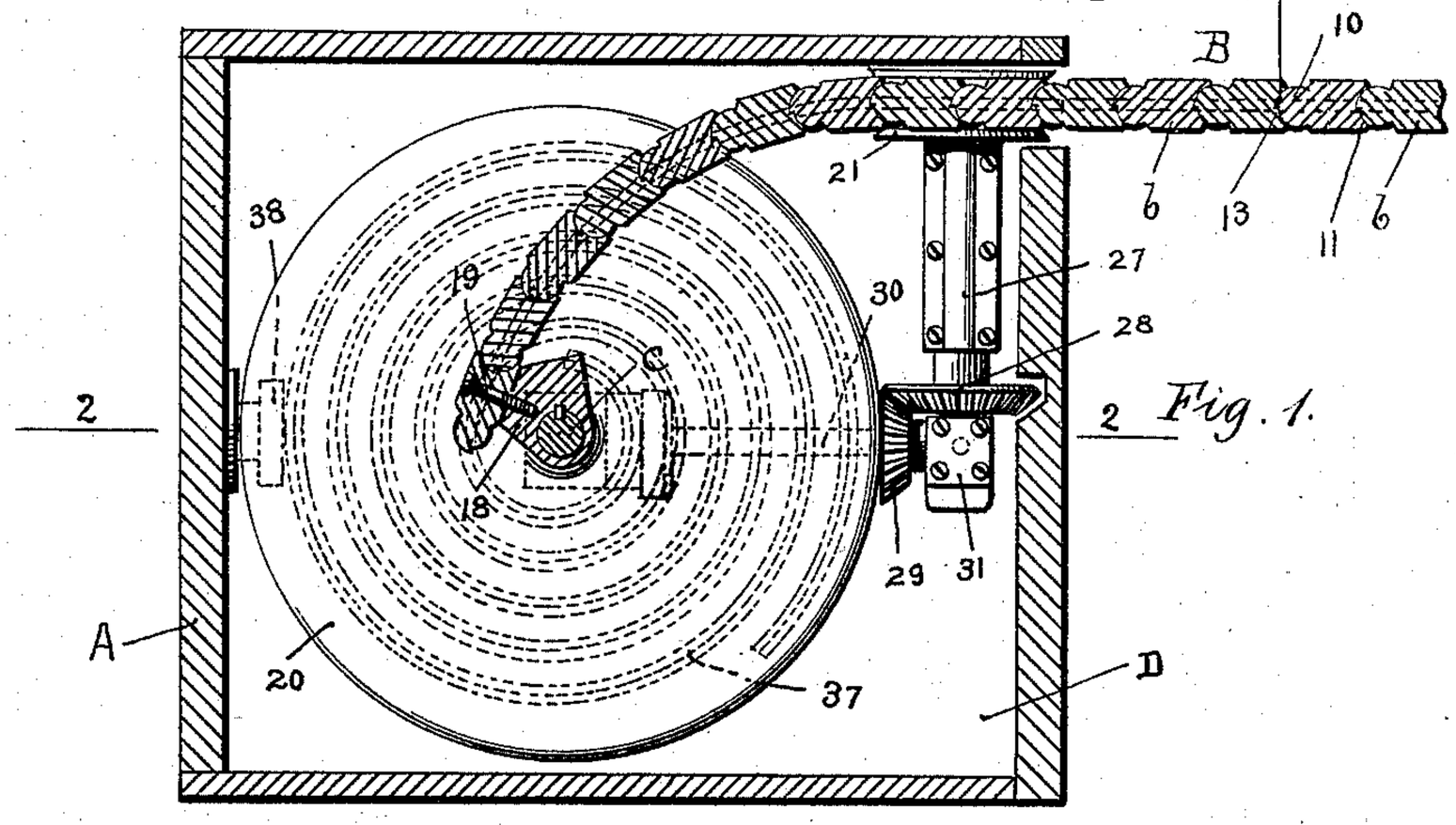

Fig. 1.

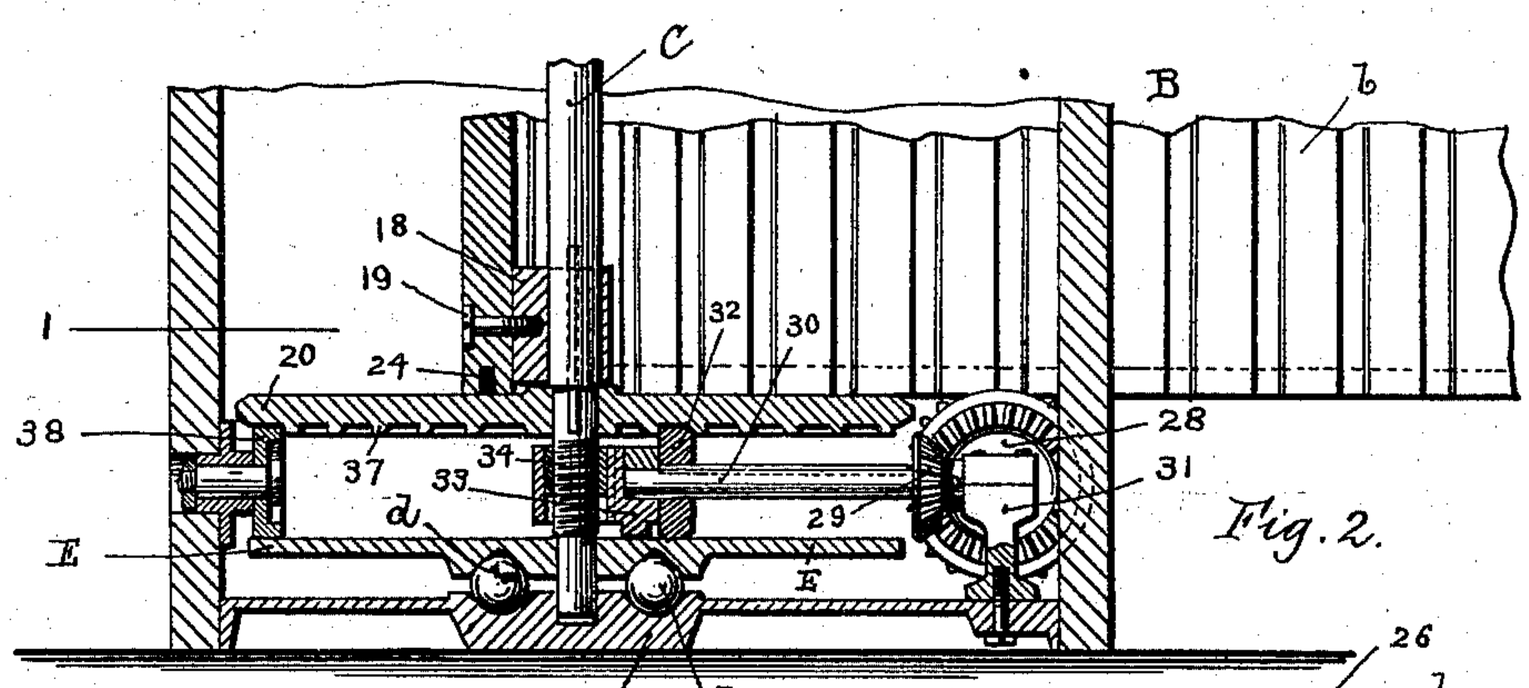

Fig. 2.

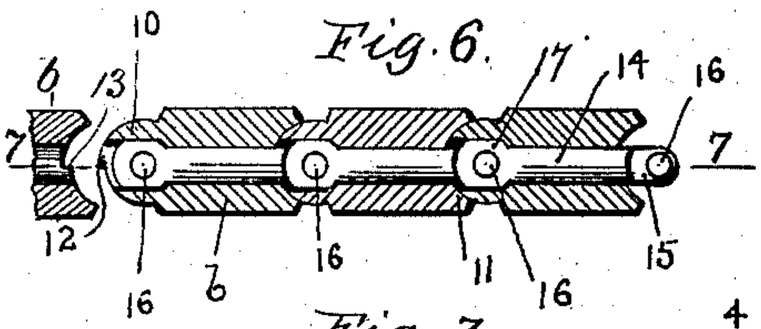

Fig. 6.

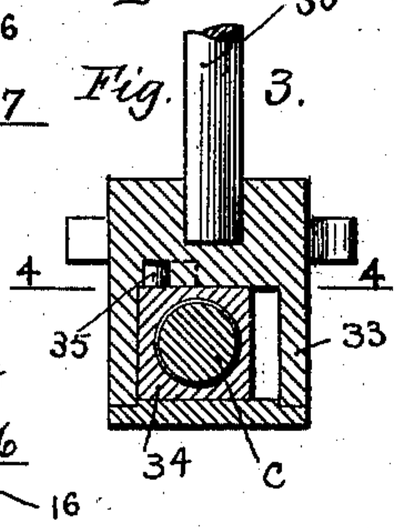

Fig. 3.

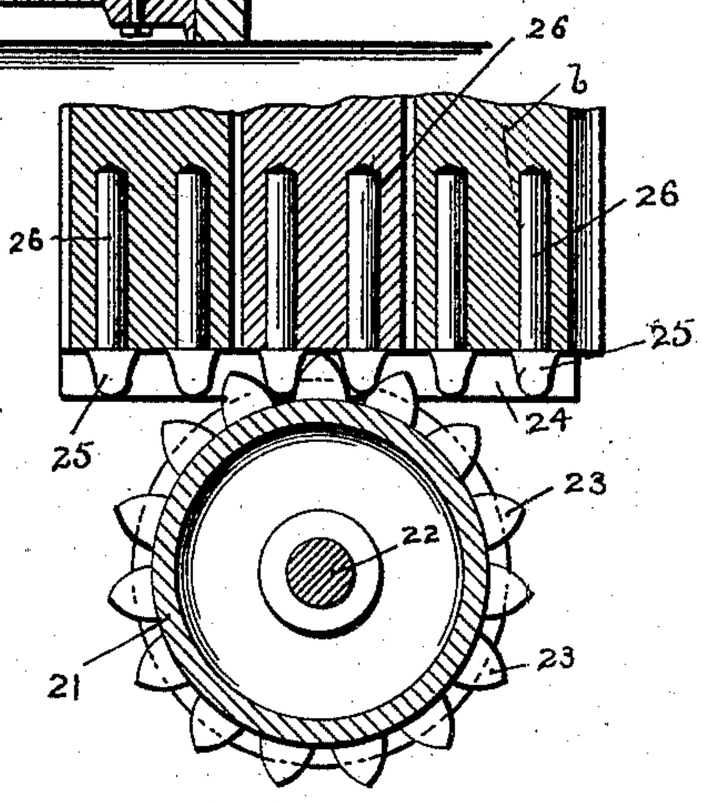

Fig. 5.

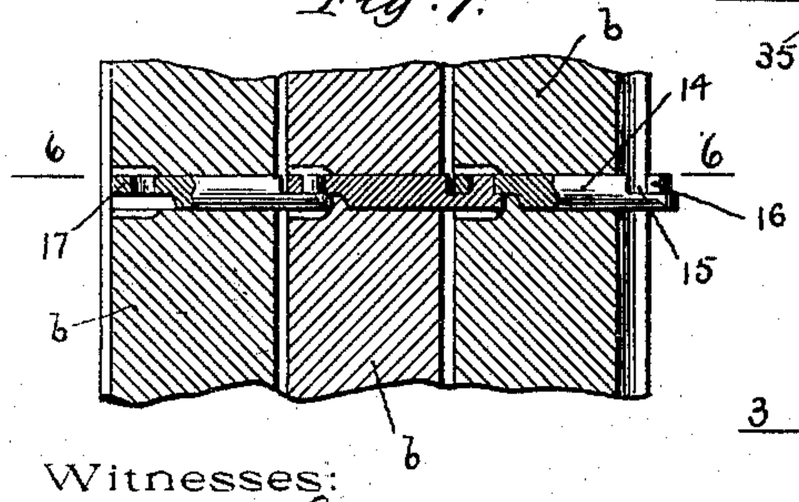

Fig. 7.

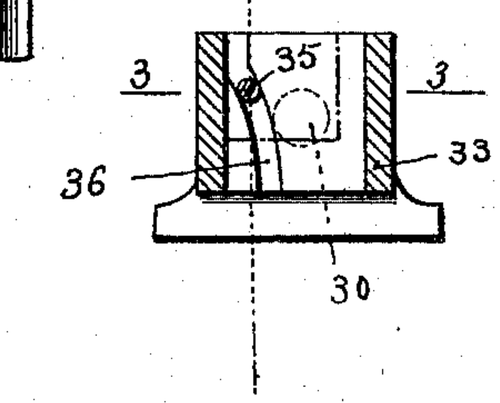

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

ALGENON S. SPAULDING, OF WORCESTER, MASSACHUSETTS.

FLEXIBLE DOOR.

SPECIFICATION forming part of Letters Patent No. 558,577, dated April 21, 1896.

Application filed June 24, 1895. Serial No. 553,795. (No model.)

To all whom it may concern:

Be it known that I, ALGENON S. SPAULDING, a citizen of the United States, residing at 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.

My invention relates to that class of flexible doors which are so mounted that they can be coiled or rolled up around a vertical shaft; and the objects of my invention are to improve the construction of the parallel strips or leaves, to provide improved means for hinging the strips or leaves together, and to provide a strong, simple, and easy-running mechanism, controlled by the lateral movement of the door, for turning the vertical shaft at varying speeds.

To these ends my invention consists of the parts and combinations of parts, as hereinafter described, and more particularly pointed out in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a transverse sectional view of a flexible door and its operating mechanism constructed according to my invention, taken on the line 1 1 of Fig. 2. Fig. 2 is a vertical sectional view taken on the line 2 2 of Fig. 1. Fig. 3 is an enlarged transverse sectional view taken on the line 3 3 of Fig. 4. Fig. 4 is a vertical sectional view taken on the line 4 4 of Fig. 3, and Figs. 5, 6, and 7 are enlarged detail views to be hereinafter referred to.

A flexible door constructed according to my invention comprises a number of parallel strips or leaves, preferably made of wood, having convex beads and corresponding sockets.

Referring to the drawings and in detail, B designates the flexible door, which is made up of a series of parallel strips or leaves *b*. The leaves *b* are each provided on one edge with a convex bead 10 and upon its opposite edge with a corresponding socket 11.

I prefer to mold the beads and sockets so that they will be provided with engaging abutments, which will form a tight joint extending substantially through the central part of the door when said door is straightened out or unrolled.

As shown most clearly in Figs. 1 and 6, it will be seen that the convex beads 10 are each provided with an extending abutment 12, and the sockets 11 are shaped to form corresponding abutments 13. In practice I have found that this is a desirable form of construction, as it will be seen that the convex beads and their sockets form engaging surfaces at each side of the joint formed by the abutments 12 and 13, and these engaging surfaces will prevent any dust or dirt from accumulating in position to interfere with the formation of a tight joint when the door is extended.

The means which I preferably employ for connecting the parallel strips or leaves consist of a series of hinge-bolts, which are formed with engaging ends and are so constructed that they may be inserted from one side of each of the parallel strips or leaves.

Referring to Figs. 6 and 7, 14 designates a a hinge-bolt, which is milled or cut away near one end to form a projecting pintle 16. At its opposite end the hinge-bolt is provided with an offset flattened portion 17, having a socket for receiving the pintle of the succeeding bolt.

The strips or leaves *b* are each bored out transversely to receive the shanks of the hinge-bolts, and are counterbored to form sockets for receiving the flattened portions 17, thus bringing the pintle 16 into position substantially concentric with the convex beads.

A flexible door as thus constructed may be mounted or operated in any desired manner.

As shown in the drawings, A designates a casing inclosing a pocket, in which the door may be coiled or wound up. A metallic base-plate D is secured in place at the bottom of the casing A, and is provided with a runway for receiving the balls *d*, which form a bearing for a freely-mounted disk E. The vertical shaft C is provided with anchor-pieces 18, which are splined in position so that they turn with said shaft, but are capable of an independent longitudinal movement thereon. The flexible door B is secured near its end to the anchor-pieces 18 by means of screws 19, as shown. Near its lower end a disk 20 is secured rigidly upon the vertical shaft C, and this disk 20 is adapted to receive and support the weight of the door B. The disk 20 rests upon and is supported by one or more rollers 38 and a driven roller 32, which are interposed between the disk 20 and the freely-

mounted disk E. By means of this construction it will be seen that the entire weight of the door and its appurtenances will rest upon and be supported by the bearing-balls *d*, so that very little friction will be opposed to the movement of the door.

To provide for the accurate winding or coiling of the door about the vertical shaft C, I preferably provide means controlled by the lateral movement of the door for turning said shaft at various speeds. An actuating-roller 21 is journaled near one side of the casing A in position to engage with the door B and be turned thereby. The actuating-roller 21 may consist of an ordinary flanged pulley, and may be turned by friction; but in practice I preferably provide the door with means for positively turning the same.

As shown, the parallel strips or leaves *b* are provided with grooves 24 on their lower edges, and pieces, as 25, having shanks 26, are driven into the strips *b* to form rack-teeth for engaging with gear-teeth 23, extending from the periphery of the actuating-wheel 21. The shaft 22 of the actuating-wheel 21 is journaled in a bearing 27, and is provided at its opposite end with a bevel-gear 28, which meshes with and drives a bevel-gear 29, fastened upon a driving-shaft 30. The driving-shaft 30 is journaled at one end in a bearing-piece 31, pivotally mounted upon the base-plate D, and at its opposite end in a movable bearing piece or block 33. The driving wheel or disk 32 is mounted on the shaft 30, and is splined in position so that it will turn therewith, but may be shifted longitudinally thereon.

As shown in the drawings, the driving-roller 32 is arranged to turn the disk 20 by means of friction; but, if preferred, it is obvious that the driving-roller 32 may be provided with teeth arranged to mesh with and engage teeth on the disk 20, thus providing a more positive driving mechanism for the vertical shaft.

A spiral guideway or groove, as 37, is formed on the under surface of the disk 20, and by means of this construction it will be seen that as the door winds around the vertical shaft C the driving wheel or roller 32 will turn and move away from the center, thus providing an automatic driving mechanism for the vertical shaft, which will turn the same at the right speed to cause the door to wind accurately and evenly thereon.

If desired, other means may be employed for moving the driving-wheel 32 toward and away from the center, and I have illustrated a construction in which the inner end of the shaft 30 is shifted or moved so that the driving-wheel 32 will normally tend to move away from the center while the door is being rolled up and toward the center while the door is being unrolled. While this mechanism is not essential to the operation of a flexible door constructed according to my invention, I prefer to employ the same, as the parts may be so proportioned that the driving-roller may be always located in a line which is substantially tangential to the spiral groove or guideway, thus decreasing the friction between these parts.

As shown in the drawings, the vertical shaft 30 is threaded near its lower end and engages a nut 34, which fits into a socket in the movable block or bearing-piece 33. The nut 34 is provided on one side with a projecting pin 35, which engages with a cam-slot 36 in the block or bearing-piece 33. By means of this construction it will be seen that the rotation of the shaft C will cause a vertical movement of the nut 34 and will shift the block or bearing-piece 33 to move the driving-roller 32 to the desired angle or position. In some cases where this construction is employed the spiral groove or guideway can be omitted, as the driving-roller 32 will have a normal tendency to shift upon the shaft 30, but in practice I preferably retain the spiral groove or guide in order to more positively secure the accurate position of the driving-roller.

I am aware that many changes may be made in the construction of my flexible door by those who are skilled in the art, and that certain parts may be used in different combinations and in different locations without departing from the scope of my invention as expressed in the claims. I do not wish, therefore, to be limited to the construction which I have shown and described; but

What I do claim, and desire to secure by Letters Patent of the United States, is—

1. A flexible door comprising a series of parallel strips or leaves, having convex beads and corresponding sockets, said beads and sockets being provided with engaging abutments for forming a tight joint near the center of the door, substantially as described.

2. A flexible door comprising a series of parallel strips or leaves having convex beads and corresponding sockets, said beads and said sockets being provided with engaging abutments for forming a tight joint near the center of the door, and with engaging surfaces at each side of said joint, substantially as described.

3. In a flexible door, the combination of a series of parallel strips or leaves having convex beads and corresponding sockets, said beads and sockets being provided with engaging abutments for forming a tight joint near the center of the door, and a series of engaging hinge-bolts arranged near the center of said door, each of said hinge-bolts having a socket at one end, and a pintle near the opposite end, the end of the bolt carrying the pintle being formed so that it may be inserted from one side of a strip or leaf, and will project from the opposite side of said strip in position to engage the succeeding hinge-bolt, substantially as described.

4. In a flexible door, the combination of a series of strips or leaves having convex beads and corresponding sockets, and a series of en-

gaging hinge-bolts arranged in a straight line substantially in the center of the door, each of said hinge-bolts having a pintle near one end, and a socket near the opposite end, the end of the bolt carrying the pintle being of substantially the same size as the shank of the bolt, whereby it may be inserted from one side of a strip or leaf, and will project from the opposite side thereof, in position to engage the succeeding hinge-bolt, substantially as described.

5. The combination of a vertical shaft, a flexible door mounted to wind or coil around said shaft, a disk fastened to the shaft, a driving roller or wheel engaging said disk, and gearing contrclled by the lateral movement of the door, for turning said driving roller or wheel, substantially as described.

6. The combination of a vertical shaft, a flexible door mounted to coil around said shaft, a disk fastened to the shaft, a driving roller or wheel engaging said disk, gearing controlled by the lateral movement of the door for turning the driving-roller, and means for shifting said driving-roller whereby the vertical shaft may be turned at variable speeds, substantially as described.

7. The combination of a vertical shaft, a disk fastened to said shaft, a flexible door mounted to coil around said shaft and to rest upon said disk, a driving roller or wheel engaging said disk, gearing controlled by the lateral movement of the door for turning said driving-roller, and a spiral guideway or groove for shifting said driving-roller, whereby the vertical shaft may be turned at variable speeds, substantially as described.

8. The combination of a vertical shaft, a disk mounted on ball-bearings, a disk fast upon the vertical shaft, rollers interposed between said disks, a flexible door mounted to coil around said vertical shaft, and gearing controlled by the lateral movement of the door for turning said shaft, substantially as described.

9. The combination of a vertical shaft, a disk carried by said shaft, a flexible door mounted to coil around said shaft, a driving-shaft, a driving roller or wheel mounted on said driving-shaft and engaging said disk, means controlled by the lateral movement of the door, for actuating said driving-shaft, and means for swinging the inner end of said driving-shaft to vary the relative position of the driving-roller, and the disk, substantially as described.

10. The combination of a vertical shaft, a disk carried by said shaft, a flexible door mounted to coil around the vertical shaft, a driving-shaft and roller for turning said disk, gearing for actuating said driving-shaft, a nut threaded onto said vertical shaft, and a pin-and-cam groove for swinging the inner end of said driving-shaft, substantially as described.

11. The combination of a vertical shaft, an actuating-wheel having gear-teeth, a flexible door resting on said actuating-wheel, and arranged to coil around said vertical shaft, said flexible door being slotted on its lower edge, and having gear-teeth meshing with the gear-teeth of the actuating-wheel, and means driven from said actuating-wheel for turning the vertical shaft at variable speeds, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALGENON S. SPAULDING.

Witnesses:
PHILIP W. SOUTHGATE,
LOUIS W. SOUTHGATE.