

B. F. CARD.  
Folding Spiral Stairs.

No. 214,022.

Patented April 8, 1879.

Fig. 1.

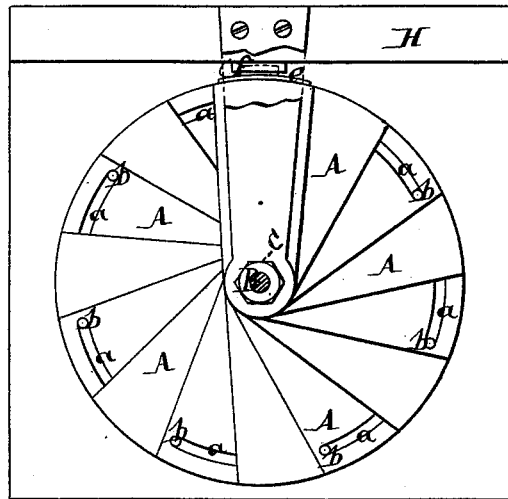


Fig. 4.

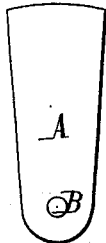


Fig. 5.



Fig. 6.

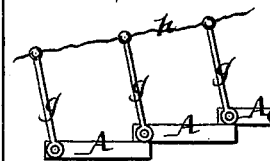


Fig. 7.

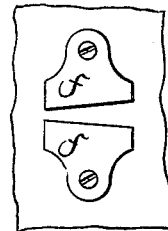


Fig. 8.

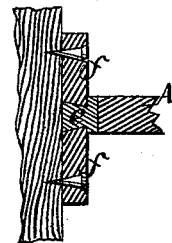


Fig. 2.

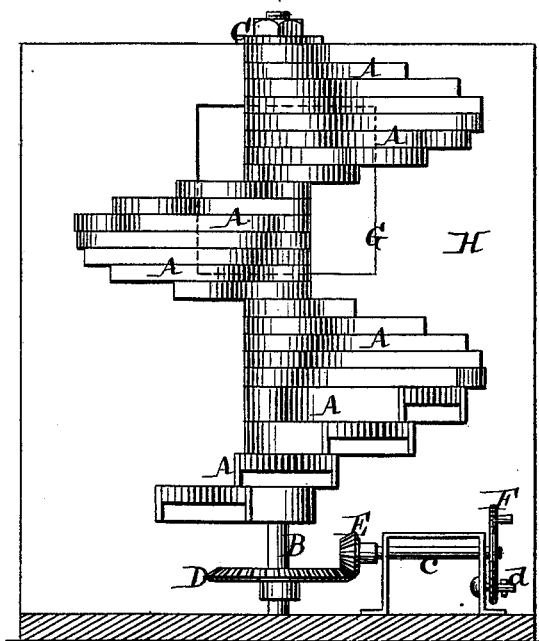
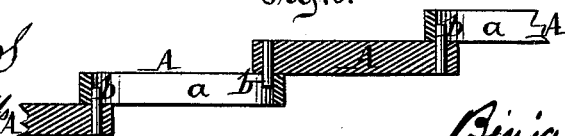


Fig. 3.



Inventor.

Benjamin F. Card

Witnesses.

Levis W. Frost  
Edgar Phillips

# UNITED STATES PATENT OFFICE.

BENJAMIN F. CARD, OF BROOKLYN, NEW YORK.

## IMPROVEMENT IN FOLDING SPIRAL STAIRS.

Specification forming part of Letters Patent No. **214,022**, dated April 8, 1879; application filed September 11, 1878.

*To all whom it may concern:*

Be it known that I, BENJAMIN F. CARD, of the city of Brooklyn, county of Kings, State of New York, have invented a new and useful Improvement in Folding Spiral Stairs for Fire-Escapes, &c., of which the following is a specification:

The object of my invention is to make spiral stairs to be used for fire-escapes, &c., so that the steps shall be movable on a vertical shaft, and be readily folded up and opened when desired either by hand or other power.

The invention consists in an arrangement of steps on a vertical shaft, so as to give them a circular movement, and also in applying intermediate mechanisms connecting the steps with each other, and likewise suitable mechanisms to rotate the vertical shaft and steps connected therewith.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 represents a plan or top view of the stairs when the steps are unfolded. Fig. 2 is a front view thereof. Fig. 3 is a cross-section of a portion of the stairs, showing the connections between the steps. Fig. 4 is a top view of the steps when folded up below the bracket-arm. Fig. 5 is a front view of the steps when folded up. Fig. 6 shows a portion of the stairs and railing. Fig. 7 is a front view of the lock. Fig. 8 is a cross-section thereof, showing one of the steps held by the lock.

In the construction of my improved folding spiral stairs, the steps A are made in triangular shape, or with their sides parallel, having a circular hole in one end. The steps A are placed on the vertical shaft B, one above the other, and contain a hub, whereby sufficient bearing is secured, so that they are held in the plane of their rotation. (See Fig. 2.) The vertical shaft B is suitably journaled at each end in boxes or bearings, and the lower step A is secured to the shaft B by a pin or bolt, while the uppermost step is secured to the building or frame-work that holds the upper end of the shaft B, and is held in position on the shaft B by the nut C. (See Fig. 2.) Each alternate step A has a slot, *a*, running across its outer end on the face of the step, (see Fig. 1,) while the other steps A have on their extreme outer

end two pins or bolts, *b*, one projecting up sufficiently high to make a connection with the step above it, (see Fig. 3,) and the other pin or bolt *b* projecting down sufficient distance to make a connection with steps A below it. At a suitable distance from the uppermost step A, and on one of the steps that are parallel in a perpendicular distance to the uppermost step A, is placed on the outer end of the step a V-shaped dovetailed catch or lock, *e*, or its equivalent. Attached to the wall of the building, to which a bracket for the vertical shaft B is connected, is a corresponding V-shaped and dovetailed recess, *F*, for receiving the V-shaped lock or catch *e*. (See Figs. 7 and 8.)

Placed at the outer ends, and in a suitable position with the surface of the steps A, and secured to the steps A, are placed rods *g*, forming standards for a railing. On the upper ends of these rods *g*, and to each one, is secured a chain or rope, *h*, thus forming a railing when the stairs are open. (See Fig. 6.)

The operation of my device is as follows: The folding spiral stairs are first secured to a building or frame-work by attaching the uppermost step A to such frame-work in any suitable manner, so as to be secure. The lower end of the vertical shaft B is likewise secured to a proper foundation. When it is desired to operate the device, power is applied to the crank or disk F, which transmits motion to the vertical shaft B by means of the gear-wheel E, in connection with the gear-wheel D, secured to the vertical shaft B. This causes the vertical shaft B to revolve, carrying with it the lower step A, which, in turn, operates the step above it by means of the pins *b*, and so on until all the steps are unfolded and in position, forming a complete spiral stairway. The chain or rope *h*, which is secured to the rods or standards *g*, forms a railing to the stairs. The unfolding of the steps gives tension to the rope or chain, so as to make it perfectly firm.

In order to hold the stairs firmly in position and avoid all swaying or unsteadiness, I have a V-shaped dovetailed lock or catch, *e*, secured to the outer end of the steps at proper intervals, with a corresponding V-shaped dovetailed recess, *f*, attached to the building, into

which the V-shaped lock or catch enters, which locks and holds the steps. This lock or catch is placed at a window or door at each story. (See Fig. 2.)

By applying power to the crank *f*, the steps are folded up in a compact space and locked by the bolt *d*, thus preventing any egress or ingress by means of the steps from the windows or doors.

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

1. A continuously opening and folding spiral stair for the inside and outside of buildings, the steps of which are secured at one end to a vertical operating-shaft, whereby the steps are opened or spread out to form the stairs, or folded up, substantially as described.

2. In a folding spiral staircase, the combination of revolving vertical shaft B with movable steps A, constructed and arranged substantially as described, and for the purpose set forth.

3. In a folding spiral staircase, the combination of the revolving vertical shaft B with movable steps A, slots *a*, and pins *b*, constructed and arranged substantially as described, and for the purpose set forth.

4. In a folding spiral staircase, the combination of the revolving vertical shaft B with movable steps A, slots *a*, pins *b*, lock *e*, and recess *f*, constructed and arranged substantially as described, and for the purpose set forth.

5. In a folding spiral staircase, the combination of the revolving vertical shaft B, movable steps A, slots *a*, pins *b*, lock *e*, recess *f*, standards *g*, and railings *h*, constructed and arranged substantially as described, and for the purpose set forth.

6. In a folding spiral staircase, the combination of the revolving vertical shaft B, movable steps A, slots *a*, pins *b*, lock *e*, recess *f*, standards *g*, railing *h*, disk F, gear-wheels D and E, and pin *d*, constructed and arranged substantially as described, and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 7th day of September, 1878.

BENJAMIN F. CARD.

In presence of—

EDGAR J. PHILLIPS,  
WILLIAM P. BURR.