(No Model.) 3 Sheets—Sheet 1.

J. McDONOUGH & W. B. COX.

LADDER.

No. 354,333. Patented Dec. 14, 1886.

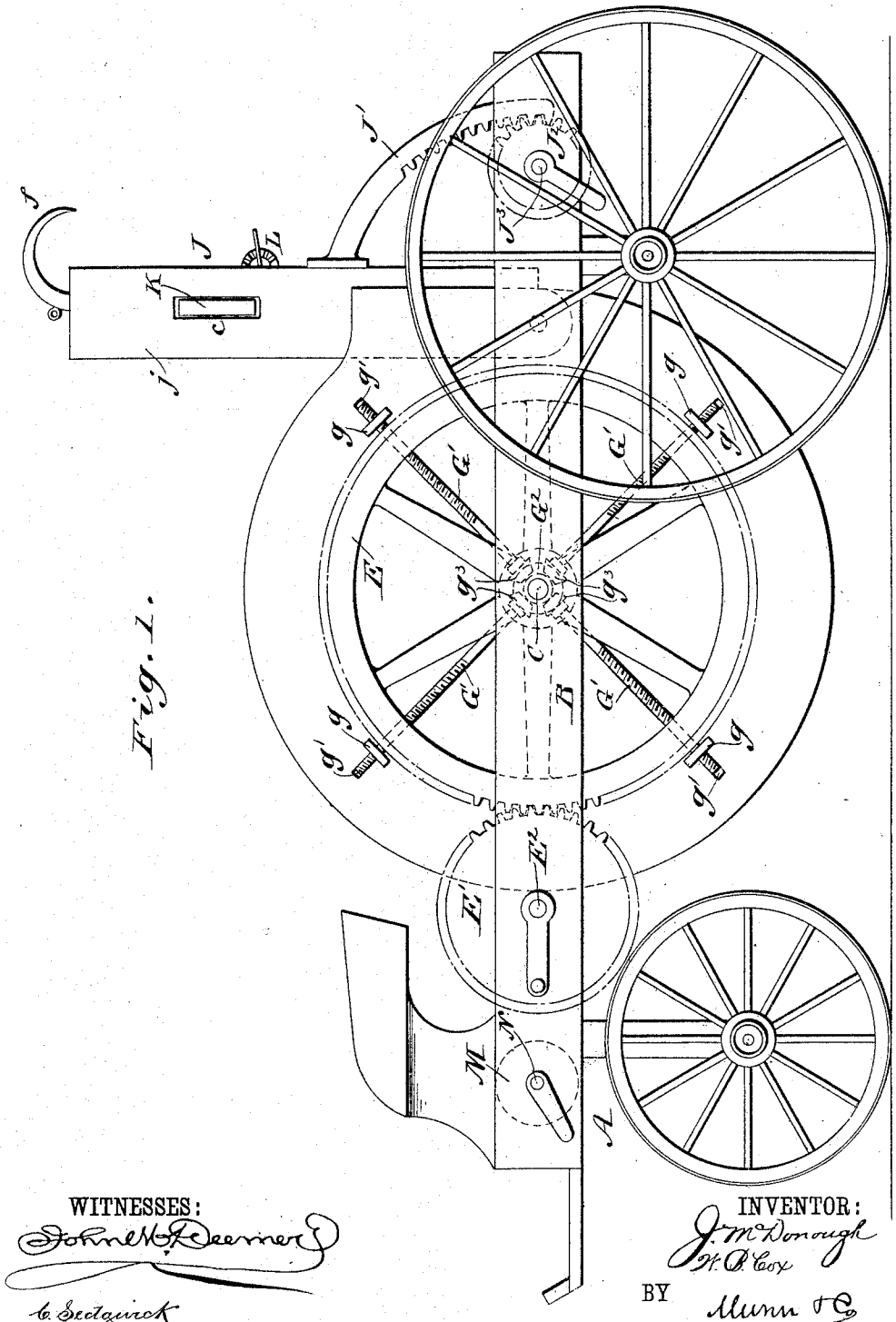


Fig. 1.

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(No Model.) 3 Sheets—Sheet 2

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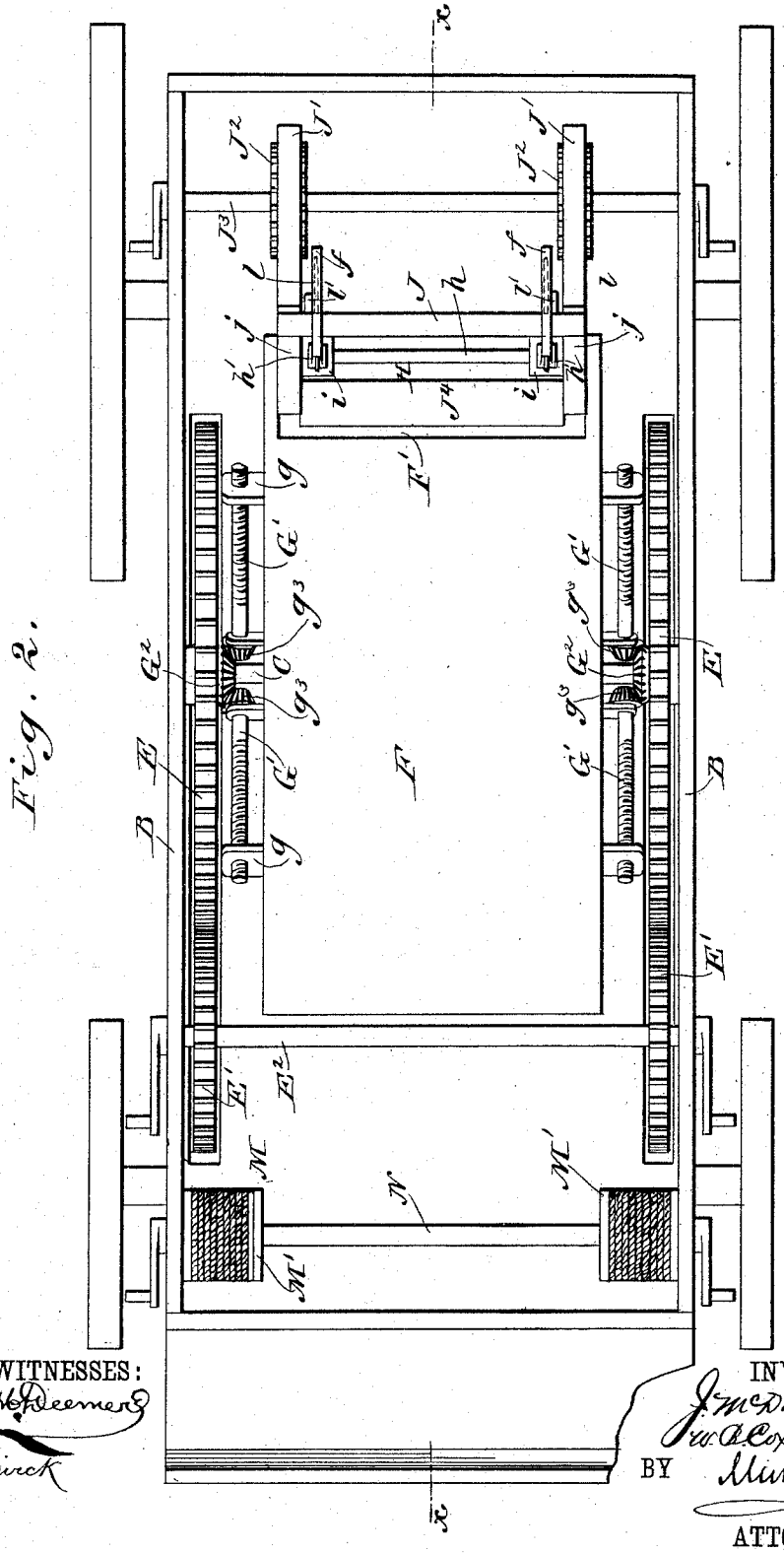


Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 4.

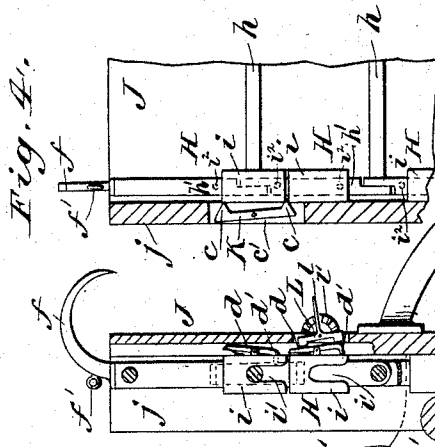


Fig. 3

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UNITED STATES PATENT OFFICE.

JOHN McDONOUGH AND WALTER B. COX, OF NEW YORK, N. Y.

LADDER.

SPECIFICATION forming part of Letters Patent No. 354,333, dated December 14, 1886.

Application filed June 8, 1886. Serial No. 204,469. (No model.)

To all whom it may concern:

Be it known that we, JOHN MCDONOUGH and WALTER B. COX, of the city, county, and State of New York, have invented a new and Improved Ladder, of which the following is a full, clear, and exact description.

The object of our invention is to provide a practical flexible fire-ladder adapted to be wound upon a drum and elevated therefrom by turning the drum. The drum is attached to a suitable carriage, and is inclosed by a suitable casing in which followers are placed to prevent the ladder from displacement or sagging while being wound upon the drum, and while the latter is being turned for elevating the ladder.

The ladder is composed of sections hinged together, and each section is provided with a joint-clasp or sleeve for locking the sections in line with each other. These sleeves are operated automatically both in elevating and lowering the ladder to engagement with and release the joints, and an automatically-operated locking device is attached to each sleeve for locking it in place over the joints of the sections.

The invention consists of the ladder and the parts thereof, constructed as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the carriage, the ladder-casing, the gearing for revolving the drum on which the ladder is wound, and gearing for changing the angle of the sluice through which the ladder passes. Fig. 2 is a plan view of the same. Fig. 3 is a sectional elevation of the same on the line x x of Fig. 2. Fig. 4 is a detail sectional view showing the means for automatically shifting the sliding sleeves.

The carriage A is an ordinary four-wheeled carriage provided with the heavy side pieces, B B. Journaled in the side pieces, B B, is the shaft C, on which is secured a drum, D, Fig. 3. The shaft C is provided at each end with a large gear-wheel, E, with which mesh smaller gear-wheels E′, secured on a crank-shaft, E^2, so that by turning the said shaft the drum D and its shaft C may be turned in either direction for winding the ladder upon the drum or for elevating the ladder. Surrounding the drum C is the cylindrical casing F, which incloses the ladder when wound upon the drum D. Within the casing F are placed followers G, each provided at its ends with a block or projection, g, which reaches through a slot, g', made in the side of the casing F. The projections g have screw-threaded orifices formed in them, through which pass worm-shafts G′, (see Figs 1 and 2,) which are adapted to be revolved by the large bevel gear-wheels G^2, secured upon the shaft C, and the bevel-pinions g^3, secured upon the inner ends of the said worm-shafts, so that when the drum D is revolved for winding up the ladder the followers G will at the same time be moved outward away from the drum by the action of the worm-shafts G′. When the drum D is reversed, the said followers will be drawn inward toward the drum by the action of the worm-shafts G′, thus hugging the coils of the ladder together upon the drum and preventing the displacement of the sections of the ladder.

The ladder is composed of sections H, hinged together by the cross-pieces h, which constitute the rungs of the ladder. Each section H is composed of two corresponding side pieces, h', about two feet in length, and on each side piece is placed a sleeve, i, formed with a recess, i', at one side (see Fig. 3) and adapted to slide over the joint between the sections for locking the sections in line with each other.

The lower end of the ladder is connected to the lugs b, attached to or formed on the drum D, and the outer end of the ladder is passed through the opening F′ of the casing F and through the sluice J, pivoted in front of the said opening F′, the sluice serving as a guide to the ladder when it is elevated by turning the drum D in the direction of the arrow in Fig. 3. The said sluice J is provided with curved racks J′, which mesh with the gear-wheels J^2 on the crank-shaft J^3, so that by turning said crank-shaft the sluice may be set at any desired angle, as circumstances may require. A roller, J^4, is fitted in the sluice J between the side pieces, j j, thereof, behind which the ladder passes, so that the roller confines the ladder within the sluice and avoids

unnecessary friction. In each side *j j* of the sluice J is formed a suitable opening or slot, *c'*, in which is placed the escapement device K, for shifting the sleeves *i* upon the side pieces *h'* of the sections, both in elevating and in lowering or winding up the ladder. Each escapement device is formed at its ends with wedge-shaped or tapering points *c*, and is pivoted at its center in the slot *c'*. The distance between the two points *c* is slightly less than the length of the sleeve *i*, as shown in Fig. 4, so that while the lower point, for example, is engaged by the upper end of one of the sleeves *i* the upper point will impinge against the side of the sleeve next above, and this will hold the lower point in position to lock the sleeve engaged with it and hold it stationary while the section of the ladder on which the sleeve is placed is shoved through the sleeve. When the sleeve thus held stationary occupies a position over the joint next below it, the sleeve next above will have passed the upper point of the escapement device, whereupon the lower sleeve, acting against the beveled lower surface of the lower point *c*, will tip the escapement device on its pivot and pass the said lower point. On reaching the upper point *c* the sleeve in question will strike the beveled surface of said upper point *c* and will again shift the escapement device and bring the lower point again into position to lock the sleeve next below, so that each section of the ladder will be moved through the sleeves thereon, causing the sleeves to be shifted over the joint to lock the sections in line with each other. In this manner all the sleeves *i* will be automatically shifted from a central position in each side bar *h'* to a position over the joints by the act of extending or elevating the ladder. Upon winding up the ladder the escapement devices K will have a reverse action—that is, they will act to automatically slide the sleeves *i* from a position over the joints to a central position in the sections side pieces, *h'*, thus leaving the ladder in a flexible condition, so it can be wound upon the drum D.

For locking the sleeves *i* in their respective positions at the center of the sections, and also over the joints, we provide each sleeve with a spring-latch, *d*, centrally pivoted and provided with a point, *d'*, adapted to pass through an orifice in the sleeve and to enter shallow recesses *i' i²*, (see Fig. 4,) formed in the edges of the side piece, *h'*. At the time of extending the ladder these spring-latches *d* are operated automatically for unlocking the sleeves *i*, and for this purpose we pivot, in a suitable slot formed at the back of the sluice J, a centrally-pivoted plate, L, which is provided with an outwardly-extending lever, *l*, arranged to engage with a circular rack, *l'*, so that by tilting the plate L and locking it by means of the lever *l* and rack *l'* the upper end of the said plate will reach inward beyond the inner surface of the back of the sluice J, whereby it will act to depress the upper ends of the spring-latches *d* as they pass the upper end of the said plate.

The plate L is placed exactly in line with the escapement devices K, so that the plate L will act to release each sleeve *i* at the same time the escapement device K engages with the upper end of each sleeve. When the sleeves reach a position properly over the joints, the points of the locking-levers drop into recesses *i²*, and thus lock the sleeves in that position. Upon lowering or winding up the ladder the plate L will be reversed—that is, it will be turned on its pivot and locked by the lever *l* and rack *l'*, so that its lower end will stand somewhat inward from the inner surface of the sluice J, whereby the lower end of said plate will act to depress the spring-latches *d*, and thus again unlock the sleeves *i* at the same time the escapement devices act to move them from a position over the joints to the center of the side pieces, *h'*, where the points of the locking-levers *d* will again drop into depressions *i²*, and thus lock the sleeves at the centers of the side bars *h'*.

The upper section of the ladder is provided with hooks *f*, by which the ladder, when elevated, may be attached to a cornice or window, or other part of the building. These hooks are provided with rings *f'*, to which may be connected guy-ropes M for steadying the ladder while being elevated and lowered, and these guy-ropes are wound upon drums M', attached to a crank-shaft, N, journaled near the front of the carriage in the main side pieces, B, as shown clearly in Figs. 1 and 2.

The action is as follows: To elevate the ladder, it is only necessary to revolve the drum D in the direction of the arrow in Fig. 3 by turning the crank-shaft E². The revolution of the shaft C will revolve the worm-shafts G' and move the followers G toward the center of the drum, which will prevent the separation of the sections of the ladder. This, as the drum is revolved, will cause the sections to force each other outward through the sluice J. As each section passes the escapement devices K and plates L the sleeves *i* will be unlocked by the plate L and shifted by the escapement devices over the joints between the sections, as above described, and thus lock the sections rigidly in line with each other. In thus elevating the ladder its direction will be controlled by changing the slant of the sluice J by turning the crank-shaft J³. For lowering and winding up the ladder, the crank-shaft B² will be turned to reverse the revolution of the drum D, whereupon the followers G will be forced outward by the action of the worms G', thus furnishing room for the ladder as it is wound upon the drum. In passing the escapement devices K and plates L the sleeves *i* are each automatically unlocked and moved upon the side bars of the section, as above described, from occupying a position over the joints to a position at the center of each section, thus rendering the ladder again perfectly flexible, so it may be wound upon the drum, as shown in Fig. 3.

Having thus described our invention, what

we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the drum and the flexible ladder, of the followers G and means, substantially as described, for moving the followers to and from the drum, substantially as and for the purposes set forth.

2. The combination, with the drum, means for revolving it, and the flexible ladder, of the guide-sluice J, curved rack-bars J′, shaft J^3, and pinions J^2, secured upon the shaft and meshing with the teeth of the curved rack-bars, substantially as and for the purposes described.

3. The ladder composed of hinged sections provided with the sliding sleeves *i*, in combination with the escapement devices K, fitted in the sides of the sluice J, for automatically shifting the sleeves as the ladder is elevated and lowered, substantially as described.

4. The ladder composed of hinged sections, each provided with sliding sleeves, in combination with spring-locking devices *d*, attached to the sleeves, substantially as described.

5. The ladder composed of hinged sections, each provided with sliding sleeves, in combination with spring-locking devices, and the levers L, fitted in the sluice J, for automatically depressing the locking devices, substantially as described.

6. The drum D, placed in the casing F, formed with the radial slots *g*′, in combination with the flexible ladder, the followers G, means for revolving the drum, the beveled gear-wheels G^2 g^3, and the worms G′, all arranged substantially as and for the purposes set forth.

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WALTER B. COX.

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C. SEDGWICK.