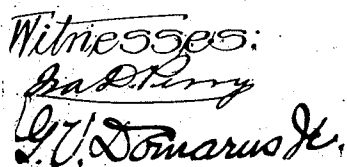


1,048,013.

4 SHEETS—SHEET 1.

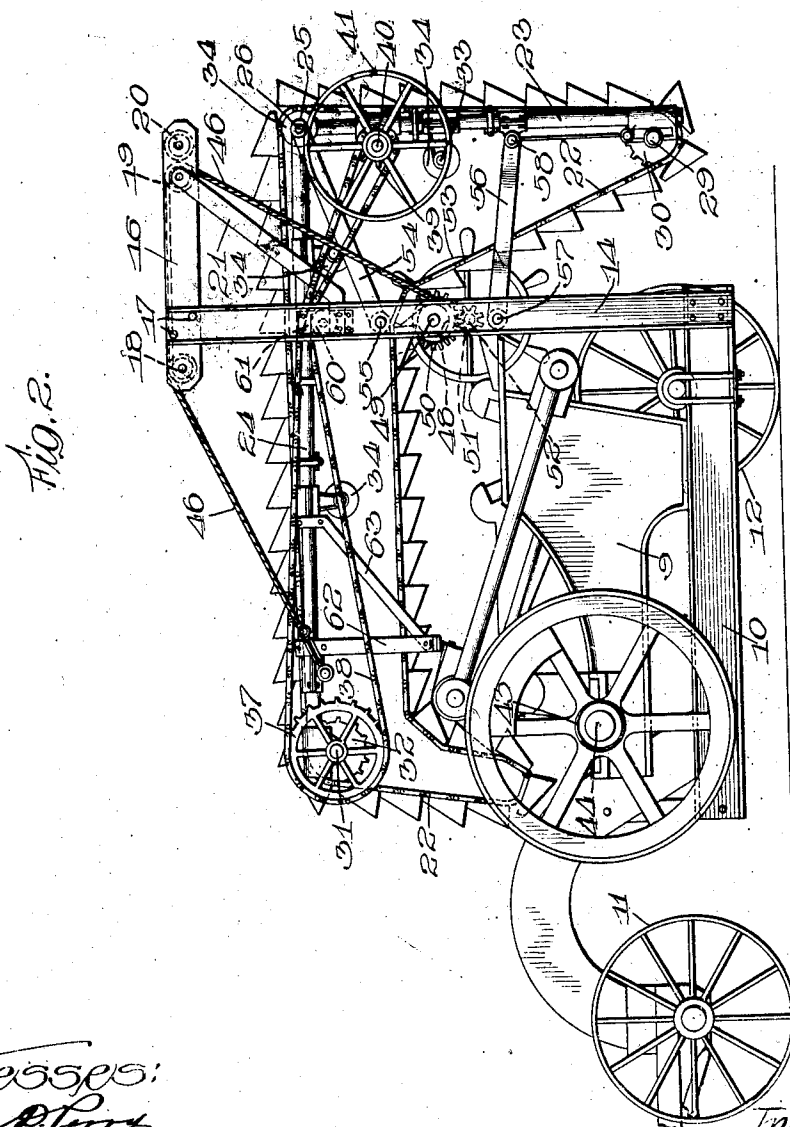


S. F. WELCH.
 FOLDING ELEVATOR.
 APPLICATION FILED MAY 13, 1908.

1,048,013.

Patented Dec. 24, 1912.

4 SHEETS—SHEET 2.



Witnesses:
B. A. Perry
G. J. Donatus Jr.

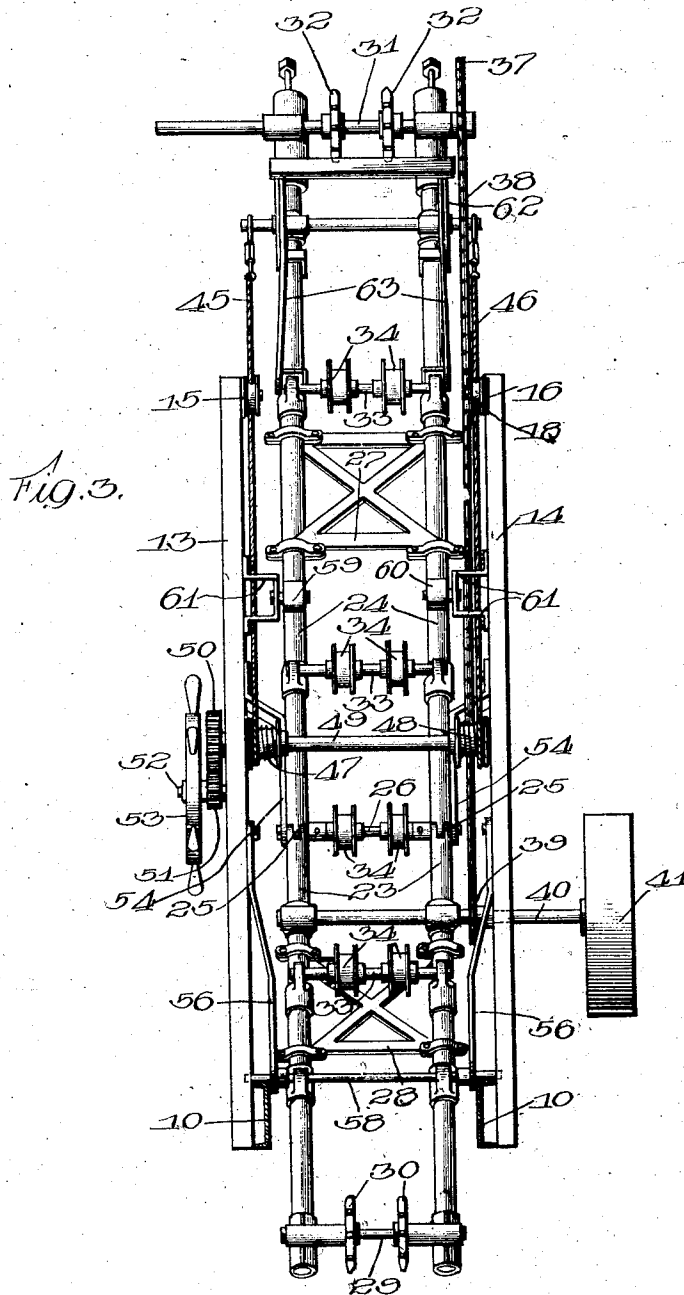
Inventor:
Samuel French Welch,
 by *Bond & Sons, Patent Attorneys.*

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4 SHEETS—SHEET 3.



Witnesses:
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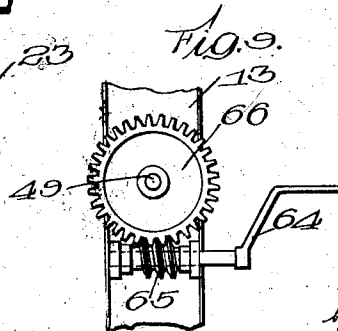
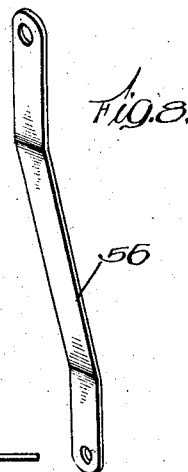
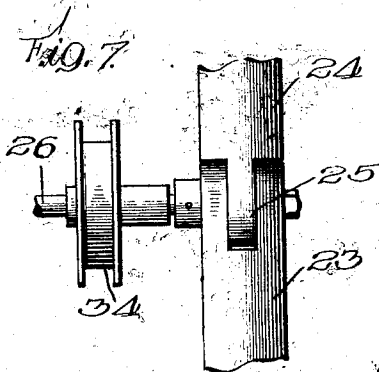
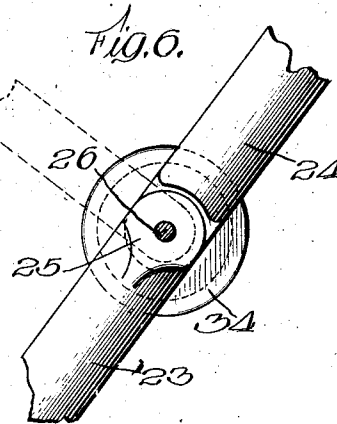
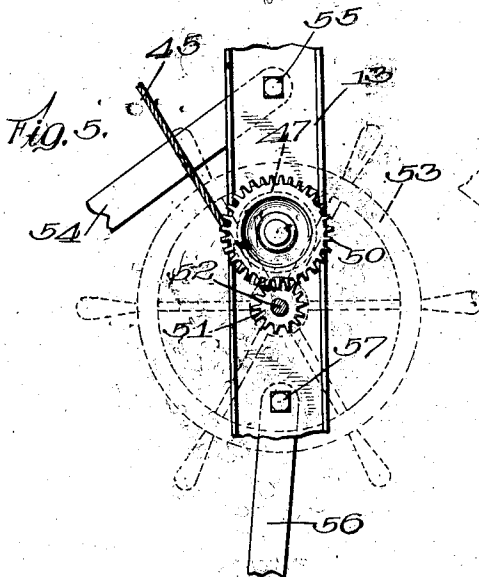
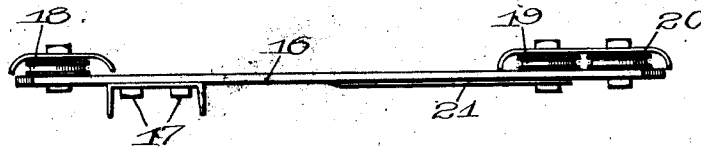
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1,048,013.

Patented Dec. 24, 1912.

4 SHEETS-SHEET 4.

Fig. 4.



Witnesses.
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UNITED STATES PATENT OFFICE.

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FOLDING ELEVATOR.

1,048,013.

Specification of Letters Patent.

Patented Dec. 24, 1912.

Application filed May 13, 1908. Serial No. 432,615.

To all whom it may concern:

Be it known that I, SAMUEL FRANK WELCH, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Folding Elevators, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to machines for handling crushed stone, etc., and it is also applicable to other uses, but has particularly to do with mechanism for elevating or conveying materials, such as crushed stone, etc., in connection with road-making, grading and other analogous work.

The object of my invention is to provide a new and improved construction by which the elevator may readily be folded for transportation purposes or extended for use. I accomplish this object as illustrated in the drawings and as hereinafter described.

What I regard as new is set forth in the claims.

In the drawings, in which my improved elevator is shown in connection with a portable stone crusher,—Figure 1 is a side elevation showing the elevator extended ready for use; Fig. 2 is a side elevation showing the elevator folded; Fig. 3 is a view on line 3—3 of Fig. 1 showing the elevator in elevation; Fig. 4 is an enlarged detail, being a plan view of one of the horizontal arms which carry the guide rollers or fulcrum over which the hoisting cables operate; Fig. 5 is a side elevation showing the arrangement of the windlass by which the hoisting cable is operated; Fig. 6 is a side view showing the construction of the hinged joint of the elevator frame; Fig. 7 is a view at right angles to that shown in Fig. 6; Fig. 8 is a view illustrating one of the straps or links for the elevator frame; and Fig. 9 is a view showing a modification.

Referring to the drawings,—9 indicates a stone-crusher which may be of any suitable construction and is mounted on a carriage comprising a frame 10 provided with wheels 11—12 so that it may readily be transported.

13—14 indicate uprights, which are mounted on the frame 10 and are suitably braced in position. Said uprights carry horizontal arms 15—16, shown in Figs. 2

and 3, which are rigidly secured thereto, preferably by bolts 17, as shown in Fig. 4, from which it will be seen that said arms project a short distance to the left of the uprights and a greater distance to the right thereof. At their shorter ends the arms 16 carry pulleys or sheaves 18, and at their longer ends they are provided with pulleys or sheaves 19—20 set a short distance apart, as best shown in Fig. 4. The several pulleys form fulcrum for the hoisting ropes as will be hereinafter described.

21 indicates braces by which the longer ends of the horizontal arms 15—16 are braced from the uprights 13—14, as best shown in Figs. 1 and 2.

22 indicates an endless conveyer, preferably of the bucket type, which is mounted upon a hinged frame, the construction of which is best shown in Figs. 1, 2 and 3. Said frame is composed of two parallel members, preferably tubes, each composed of a lower member 23 and an upper member 24 which are hinged together, as shown at 25 in Fig. 3. The hinge of said members is also shown in Figs. 6 and 7. As therein shown, a single pivot 26 serves as the hinge for both side members of the elevator frame.

27 indicates an intermediate brace for the upper members 24, and 28 a similar brace for the lower members 23 of the elevator frame.

29 indicates a shaft which connects the lower ends of the members 23 and also carries sprocket-wheels 30 or a pulley around which the endless conveyer 22 passes. In like manner 31 indicates a shaft which connects the upper ends of the parallel members 24 and carries sprocket-wheels 32 which support the upper portion of the endless conveyer.

33 indicates a series of cross-shafts which carry idlers 34 for guiding the endless conveyer. Said shafts also serve as braces for the elevator frame. The pivot 26 also carries idlers 34.

37 indicates a sprocket-wheel mounted on the shaft 31 and driven by a chain 38 from a sprocket-wheel 39 which is mounted on a shaft 40 journaled in suitable bearings carried by the lower members 23 of the elevator frame, as shown in Fig. 3. Said shaft is provided with a pulley 41 which is driven

by a belt 42 from a pulley 43 carried by the main shaft 44 of the stone-crusher, as shown in Fig. 1. Thus the endless conveyer 22 is driven from the mechanism which operates the stone-crusher.

45—46 indicate cables, the upper ends of which are connected to the outer end portions of the side members of the elevator frame, as shown in Figs. 1 and 2, and pass between the pulleys 19—20 and down to drums 47—48 mounted on a shaft 49 which is suitably supported by the uprights 13—14, as shown in Fig. 3. Said shaft is provided with a gear 50 which meshes with a pinion 51 mounted on a stud 52, said gear being provided with a hand-wheel 53 by which it may be rotated. Thus a windlass is provided for drawing in or paying out the cables 45—46 and thereby raising or lowering the outer end portion of the elevator.

The elevator is pivotally connected with the uprights by means of straps 54, one at each side, which at one end are connected with the side members of the elevator frame in line with the pivot 26 and at their other ends are connected with the uprights 13—14 by pivots 55, as shown in Figs. 1 and 2. Said straps, therefore, act as links which afford a swinging or traveling connection between the elevator frame and the uprights 13—14, causing the pivot 26 to swing in the arc of a circle about the pivots 55 as a center. 56 indicates another pair of straps or links, which are pivoted at their upper ends to the uprights 13—14 by pivots 57, which are placed lower than the pivots 55, as shown in Figs. 1 and 2, and at their lower ends the links 56 are connected with the lower members of the elevator frame by pivots 58, as shown in said figures. When the elevator frame is in its extended or operative position, the lower links 56 are almost vertical, as shown in Fig. 1, but when the elevator frame is folded said links extend almost horizontally, as shown in Fig. 2, carrying the lower portion of the elevator frame up bodily and moving it out into a substantially vertical position, as illustrated.

59—60 indicate supports, preferably rollers, which are carried by the uprights 13—14 preferably on brackets 61, in such position that they underlie the upper members of the elevator frame when folded, as shown in Figs. 2 and 3, thus supporting said frame when folded. Said rollers also serve to fulcrum the upper members of the elevator frame when the elevator is being folded or swung back into inoperative position. For example, as the elevator is folded back at the hinged point the members of the upper section strike and rest upon said rollers 59—60 which act as rolling fulera for said members, and as the movement continues the lower section of the elevator frame is automatically raised clear of the ground, the

elevator as a whole being held and guided to proper position by means of the links 54—56. When the elevator is again raised to operative position, this movement is reversed and the parts automatically brought to and securely held in proper position.

62 indicates a bail secured to the side members of the elevator frame and extending at right angles thereto, as shown in Figs. 1 and 2, so that when said elevator frame is folded, as shown in Fig. 2, it will rest upon a portion of the stone-crusher 9 and assist in supporting the elevator frame. 63 indicates braces for said bail.

From the foregoing description it will be seen that when the elevator frame is in its operative position the upper and lower members thereof are in line, the elevator frame being then supported by the cables 45—46 which bear upon the pulleys 20. The lower end of the elevator frame is held in position by the links 54 and 56, the ends of the pivot 58 also engaging the uprights 13—14, as shown in Fig. 3, and serving to prevent the lower end of the elevator frame from swinging in too far. In this position the lower portion of the elevator receives the discharge from the stone-crusher and elevates it for delivery. When the apparatus is to be transported, by operating the windlass the upper end of the elevator is pulled over toward the uprights and then swung over, the cables running on the pulleys 19 until the parts finally assume the position shown in Fig. 2, the cables then running also on the pulleys 18. At the same time the lower members of the elevator frame are automatically raised by the swinging of the upper member of the elevator frame upon the rollers or supports 59—60 as fulera in the manner already described and are carried outward and upward by the links 54—56, as shown in Fig. 2, so that they assume a vertical position. When the parts are fully folded, the upper members of the elevator frame are in a horizontal position resting on the bail 62 which engages a portion of the stone-crusher. It will be apparent that after the elevator frame swings past the center in folding it is necessary to pay out on the cables in order to allow the upper members of the elevator frame to swing downward to their horizontal position, and that they may be restored to their operative position by drawing in the cables until the upper portion of the elevator frame assumes a vertical position and swinging it past the center, when it will again assume the position shown in Fig. 1.

Instead of using the hand-wheel and spur-gear shown in the drawings, any other suitable construction may be employed for actuating the hoisting devices, as, for instance, a worm and crank shown in Fig. 6, in which 64 indicates a crank operating the worm 65

which engages a worm-wheel 66 mounted on the shaft 49 in lieu of the gear 50. The worm gear possesses certain advantages in that it is self-locking or self-retaining in any position, thus doing away with the necessity of manipulating a pawl as is necessary where the spur gear is used and making it impossible for a careless operator to drop the elevator to the injury of the elevator or of himself or others. In other respects also my invention is not restricted to the specific details shown and described, except in so far as they are particularly claimed, but includes generically the subject-matter of the broader claims.

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

1. An elevator comprising a suitable support, an elevator frame comprising upper and lower members hinged together and adapted to extend outward and upward from said support, said members being movable independently of said support, the upper member being adapted to fold over upon said support, and means connecting the lower member with said support and operating to permit said lower member to move bodily upward when the upper member is folded over upon said support.

2. An elevator comprising a suitable support, an elevator frame comprising upper and lower members hinged together and adapted to extend outward and upward from said support, said members being movable independently of said support, the upper member being adapted to fold over upon said support, and means connecting the lower member with said support and operating to permit the lower member to move bodily upward and into a substantially vertical position when the upper member is folded over upon the support.

3. An elevator comprising a suitable support, an elevator frame comprising upper and lower members hinged together and adapted to extend outward and upward from said support; said members being movable independently of said support, the upper member being adapted to fold over upon said support, means connecting the lower member with said support and operating to permit said lower member to move bodily upward when the upper member is folded over upon said support, and a fulcrum carried by said support upon which said upper member turns.

4. A folding elevator comprising a suitable standard, a folding elevator frame comprising members hinged together adapted to extend outward and upward from said standard, the upper member being adapted to fold over upon said standard, said members being movable independently of said standard, swinging links connecting the lower member of said elevator frame with

said standard and movable to permit movement of the lower member upward or downward and toward or from a vertical position, hoisting mechanism, and an endless conveyer mounted on said elevator frame.

5. A folding elevator comprising a suitable standard, a folding elevator frame comprising members hinged together adapted to extend outward and upward from said standard, the upper member being adapted to fold over upon said standard, said members being movable independently of said standard, swinging links connecting the lower member of said elevator frame with said standard and movable to permit movement of the lower member upward or downward and toward or from a vertical position, hoisting mechanism mounted on said standard and connected with the upper member of said elevator frame, and an endless conveyer mounted on said elevator frame.

6. A folding elevator, comprising a suitable standard, a folding elevator frame adapted to extend outward and upward from said standard, swinging links pivotally connected at different heights with the standard and connected at longitudinally separated points with the elevator frame, hoisting mechanism, and an endless conveyer mounted on said elevator frame.

7. A folding elevator comprising a suitable standard, a folding elevator frame adapted to extend outward and upward from said standard, swinging links connected at different points with the lower portion of the elevator frame and with the standard and movable to permit movement of the elevator frame toward or from a vertical position, hoisting mechanism, and an endless conveyer mounted on said elevator frame.

8. A folding elevator comprising a suitable support, a hinged elevator frame adapted to extend outward and upward from said support, swinging links pivotally connected at different points with said support and with the elevator frame and movable to permit movement of the same toward or from a vertical position, and hoisting mechanism mounted on said support and connected with the upper portion of the elevator frame.

9. A folding elevator comprising a suitable support, a hinged elevator frame adapted to extend outward and upward from said support, swinging links pivotally connected at different points with said support and with the lower portion of the elevator frame to permit movement of the same toward or from a vertical position, hoisting mechanism mounted on said support and connected with the upper portion of the elevator frame, and an endless conveyer mounted on the elevator frame.

10. A folding elevator, comprising a standard, a folding elevator frame composed of members hinged together, said elevator

frame being adapted to extend outward and upward from said standard, a link connected with the standard and with the hinge of the elevator frame, and a second link pivoted to the standard and connected with the lower portion of the elevator frame, said links cooperating to carry the elevator frame toward or from a vertical position.

11. A folding elevator, comprising a standard, a folding elevator frame composed of members hinged together, said elevator frame being adapted to extend outward and upward from said standard, a link connected with the standard and with the hinge of the elevator frame, a second link pivoted to the standard and connected with the lower portion of the elevator frame, said links cooperating to carry the elevator frame toward or from a vertical position, and an endless conveyer mounted on said elevator frame.

12. A folding elevator comprising a standard, a folding elevator frame comprising members hinged together, means connecting the lower member with the standard and operating to permit the lower end portion of the lower member of the elevator frame to move relatively to the standard when the upper member is folded, and an endless conveyer mounted on said elevator frame.

13. A folding elevator, comprising a standard, a folding elevator frame composed of members hinged together, said elevator frame being adapted to extend outward and upward from said standard, a link connected with the standard and with the hinge of the elevator frame, a second link pivoted to the standard and connected with the lower portion of the elevator frame, said links cooperating to carry the elevator frame toward or from a vertical position, an endless conveyer mounted on said elevator frame, and hoisting mechanism mounted on said support and connected with the upper member of the elevator frame.

14. A folding elevator comprising a suitable support, a folding elevator frame composed of members hinged together and adapted when in operative position to extend outward and upward from said support, said upper member being adapted to fold over upon said support, swinging means connecting the lower member of said elevator frame to said support, and movable to permit movement of the same toward or from a vertical position, and hoisting mechanism mounted on said support and connected with the upper member of the elevator frame.

15. A folding elevator, comprising a standard, pulleys carried by said standard, a folding elevator frame adapted to extend outward and upward from said standard, and to be swung inward over the standard,

hoisting mechanism comprising a cable extending between said pulleys and connected with the upper portion of said elevator frame, said cable being arranged to bear on one of said pulleys when the elevator frame is in operative position and to bear on the other pulley when the elevator frame is swung over said standard, and means for operating said cable.

16. A folding elevator, comprising a standard, pulleys carried by said standard, a folding elevator frame adapted to extend outward and upward from said standard and to be swung inward over the standard, hoisting mechanism comprising a cable extending between said pulleys and connected with the upper portion of said elevator frame, said cable being arranged to bear on one of said pulleys when the elevator frame is in operative position and to bear on the other pulley when the elevator frame is swung over said standard, means for operating said cable, and means connected with said standard and with the lower portion of the elevator frame and movable to carry the same toward or from a vertical position.

17. A folding elevator comprising a suitable support, a folding elevator frame composed of a plurality of members adapted to align when in operative position, the upper member being adapted to fold over upon said support and having a fulcrum thereon between its ends, and means for supporting said members when in operative position, adapted to permit said elevator frame to move bodily upward or downward.

18. A folding elevator, comprising a suitable support, a folding elevator frame composed of members hinged together, means connecting the lower member of the elevator frame with said support and arranged to permit endwise movement thereof, said upper member being adapted to fold over upon said support, and a fulcrum on which said upper member is adapted to bear between its ends when folded over upon said support.

19. A folding elevator, comprising a suitable standard, a folding elevator frame composed of members hinged together, means connecting the lower member with said standard and arranged to permit endwise movement thereof, said upper member being adapted to fold over upon said standard, and a fulcrum carried by said standard on which said upper member is adapted to bear between its ends when folded over said standard.

20. The combination of a carriage, a suitable support mounted thereon, a folding elevator frame comprising upper and lower members hinged together, said upper member being adapted to fold over upon said support leaving the lower member suspended, and means connecting the elevator

frame with said support but permitting said elevator frame to move independently of said support and operated by movement of the upper member into operative position for automatically moving the lower member into operative position.

21. The combination of a carriage, a suitable support mounted thereon, a folding elevator frame comprising upper and lower members hinged together, said upper member being adapted to fold over upon said support leaving the lower member suspended, and means connecting the lower member with the carriage and operated by the movement of the upper member into or out of operative position to move said lower member into or out of operative position.

22. The combination of a carriage, a suitable support mounted thereon, a folding elevator frame comprising upper and lower members hinged together, said upper member being adapted to fold over upon said support leaving the lower member suspended, and means connecting the lower member with the carriage and operated by the movement of the upper member into or out of operative position to move the lower member vertically and carry the lower end thereof toward or from the carriage.

23. A folding elevator comprising a suitable support, an elevator frame comprising upper and lower members adapted to cooperate when in operative position, the upper member being adapted to fold over upon said support and having a fulcrum thereon between its ends, and means for automatically moving the lower member bodily relative to said support when the upper member is moved into or out of operative position.

24. A folding elevator comprising a suitable support, an elevator frame comprising upper and lower members adapted to cooperate when in operative position, the upper member being adapted to fold over upon said support and having a fulcrum thereon between its ends, means for automatically moving the lower member bodily relative to said support when the upper member is moved into or out of operative position, and hoisting mechanism connected with the upper member and operating to move the same into or out of operative position.

25. An elevator comprising a suitable support, an elevator frame comprising upper and lower members hinged together and adapted to extend outward and upward from said support, the upper member being adapted to fold over upon said support, means connecting the lower member with said support and operating to permit the lower member to move bodily upward and into a substantially vertical position when the upper member is folded over upon the

support, and a fulcrum carried by said support upon which said upper member turns.

26. An elevator comprising a suitable support, an elevator frame comprising upper and lower members hinged together, a fulcrum carried by said support on which said upper member is adapted to turn, and means connecting said lower member with the support and operating to permit the same to move bodily upward when the upper member is folded over upon said support.

27. A folding elevator, comprising a suitable support, an elevator frame, comprising upper and lower members hinged together, adapted to extend outward and upward from said support, swinging links connected with the lower member of said elevator frame at longitudinally separated points and connected with the support at different heights whereby said links operate to move the lower member into and out of operative position, and means for supporting the upper member upon said support when in its folded position.

28. A folding elevator, comprising a suitable support, an elevator frame, comprising upper and lower members hinged together, adapted to extend outward and upward from said support, swinging links connected with the lower member of said elevator frame at longitudinally separated points and connected with the support at different heights whereby said links operate to move the lower member into and out of operative position, means for supporting the upper member upon said support when in its folded position, and hoisting mechanism mounted on the support and connected with the upper member.

29. A folding elevator comprising a suitable support, an elevator frame comprising upper and lower members hinged together, adapted to extend outward and upward from said support, swinging links connected with the lower member of said elevator frame at separated points and connected with the support at separated points, whereby said links operate to permit the lower member to move into and out of operative position, means for supporting the upper member upon said support when in its folded position, and hoisting mechanism mounted on the support and connected with the upper member, said hoisting mechanism being arranged to operate to lift the upper member both when in its folded and when in its operative position.

30. A folding elevator, comprising a suitable standard, a folding elevator frame adapted to extend outward and upward from said standard, said frame comprising upper and lower members hinged together, swinging links pivotally connected at different heights with the standard and connected at longitudinally separated points with the

lower member of the elevator frame, and hoisting mechanism connected with the upper member of the elevator frame.

31. In apparatus of the class specified, an upper section, a lower section, means for supporting the upper section, an elevator belt on said sections, means for folding the upper section downward to a position above the lower section leaving the lower section in a substantially upright position, a wheeled vehicle, and a frame on the vehicle for supporting the upper section in horizontal position, the lower section extending below the ground line of the wheels when the elevator is in use, said vehicle being movable on its wheels when the upper section is horizontal and the lower section is thereby brought above the said ground line.

32. In apparatus of the class specified, an upper section, a lower section, an elevator belt on said sections, a joint between said sections, supporting links secured to said joint, whereby the lower section is supported at its upper end, means for supporting said links, means for holding the lower section in position, means for folding the upper section downward to a position above the lower section, leaving the lower section in a substantially upright position, a wheeled vehicle, and a frame on the vehicle for sup-

porting the upper section in horizontal position, the lower section extending below the ground line of the wheels when the elevator is in use, said vehicle being movable on its wheels when the upper section is horizontal and the lower section is thereby brought above the said ground line.

33. In apparatus of the class specified, an endless chain and multiple bucket elevator operating connections therefor, means for applying said connections in rear of the elevator to lower the same, other means for applying said connections in front of said elevator to raise the same, and mechanism for controlling said connection and having the same mode of operation for both raising and lowering the elevator.

34. In apparatus of the class specified, a folding elevator, a frame, a windlass on the frame, operating connections from the windlass to the elevator, means whereby the same are operated to either raise or lower the elevator by one and the same forward and backward mode of operation of the windlass, and means for supporting said connections.

SAMUEL FRANK WELCH.

Witnesses:

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W. ENDERICH.