June 14, 1949. H. E. FIRESTONE 2,472,943

STAIR ELEVATOR

Filed April 17, 1946 2 Sheets-Sheet 1

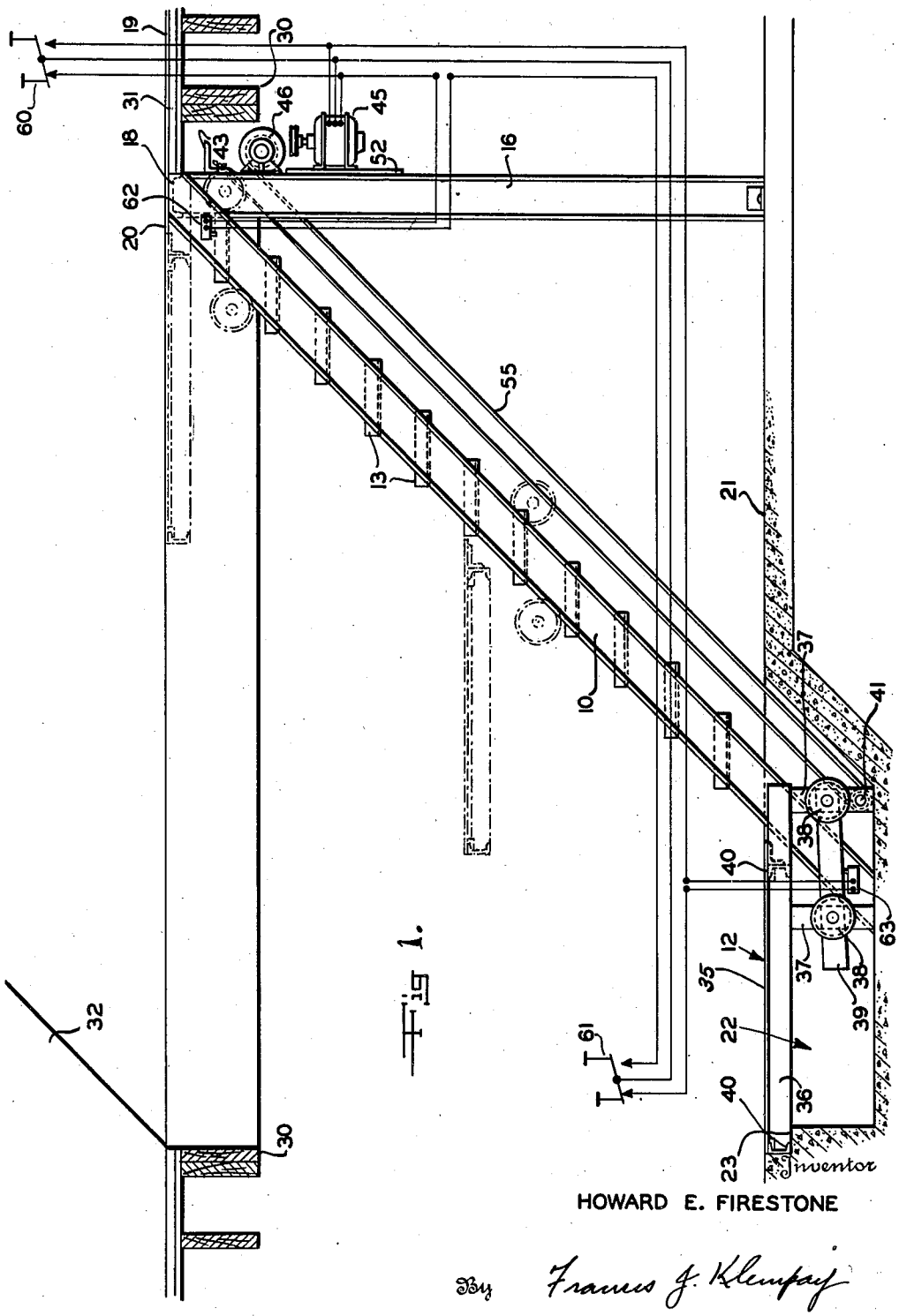



Fig. 1.

Inventor

HOWARD E. FIRESTONE

By Frances J. Klempay

Attorney

June 14, 1949. H. E. FIRESTONE 2,472,943

STAIR ELEVATOR

Filed April 17, 1946 2 Sheets-Sheet 2

Fig. 2.

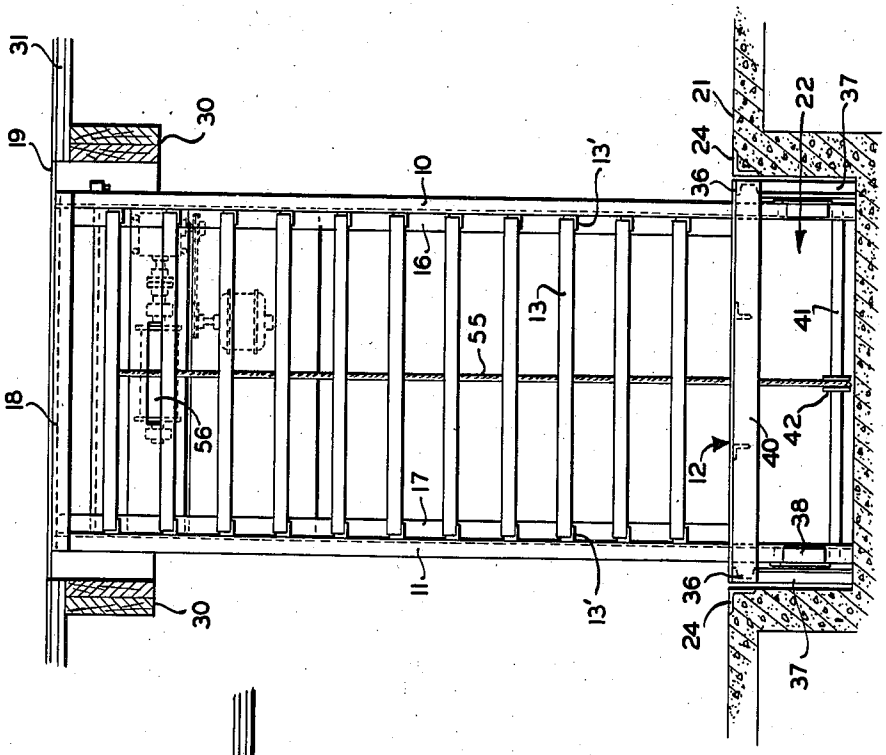
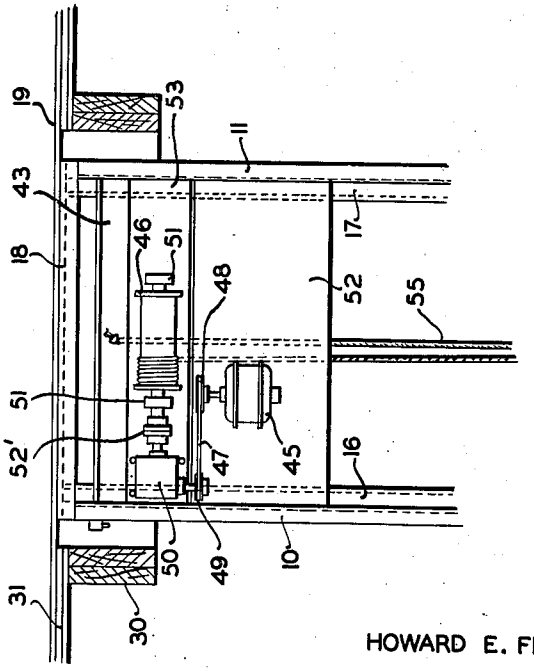



Fig. 3.




Inventor
HOWARD E. FIRESTONE

By Francis J. Klempay
Attorney

Patented June 14, 1949

2,472,943

# UNITED STATES PATENT OFFICE

2,472,943

## STAIR ELEVATOR

Howard E. Firestone, Salem, Ohio

Application April 17, 1946, Serial No. 662,811

1 Claim. (Cl. 187—12)

1

This invention relates to incline elevators and is more particularly concerned with such elevators as applied to smaller buildings which were not originally built to house a vertical shaft for an elevator of the more common type.

It will be understood that many small business houses have great need for elevating and lowering facilities of a modest character yet many are not in a position to install adequate mechanisms, due either to lack of space or to the prohibitive costs of such complicated organizations of rails, cars, cables, etc., as are now generally proposed for the purposes indicated.

It is therefore a prime object of the present invention to provide a simple but practical elevating and lowering mechanism which is extremely economical as regards initial installation cost. Another object of the invention is the provision of an elevator which may be installed in the existing recess or "stair-well" of a conventional building having more than one floor.

Yet another object of the invention is the provision of improved elevating equipment of the general character outlined above which does not render the associated stairs of the building unsuited for use in their normal and intended manner.

These and other objects and advantages of the invention will become apparent upon consideration of the following detailed specifications and accompanying drawing wherein there is disclosed one preferred embodiment of the invention. As many departures may be made from the exact details of the teaching in the drawings and the specifications without departing from the spirit of invention, it should be understood that the present embodiment is illustrative only.

In the drawings:

Figure 1 is a side elevation of an elevator assembly constructed in accordance with the principles of the invention;

Figure 2 is a front elevation of the assembly of Figure 1; and

Figure 3 is a fragmentary rear elevation of the assembly of Figure 1, showing the organization of certain of the operating parts.

Referring to the drawing more in detail, reference numerals 10 and 11 indicate a pair of steel channels which are made to serve the dual purpose of supporting the elevator car 12 and of also supporting a plurality of stair treads 13. The upper ends of the channels 10 and 11 are supported on a pair of upright channels 16 and 17. Channels 10 and 11 are held in spaced relation by a spreader channel 18. This last mentioned

2

channel 18 also serves to support the structure of an upper floor 19 and serves also as the tread and "nosing" of the topmost step indicated as at 20.

I provide the angle clips 13' to support the ends of the stair treads 13. The lower ends of side channels 10 and 11 are extended below the surface 21 of the lower floor into the pit 22, which pit is formed in the lower floor to receive the elevator car 12 when said car is in its lowered position. This pit 22 has formed at its edge farthest removed from the stairs a ledge 23, the purpose of which is to maintain the car 12 in a level position with respect to the surface of the floor 21. The two longer sides of the pit are protected against chafing and chipping by steel angles 24 set flush with the floor 21.

The entire assembly, as described thus far, may be advantageously installed in the existing stair well of an existing building, certain members of which are shown as the joists 30 and flooring boards 31, for example. The sloping ceiling 32 gives clearance overhead for either passengers or freight.

The elevator car proper, indicated generally by numeral 12, consists of the platform surface plate 35, made of steel for example, its supporting channel bars 36 to which are attached wheel bearing angles 37, and flanged wheels 38 secured to angles 37 and freely rotatable thereon. A pair of the wheels 38 are positioned on each side of the stair proper to engage the stair channels 10 and 11 and are held securely in a longitudinal direction by stiffener bars 39. Cross channels 40 are provided to insure against the spreading of wheels 38 in a transverse direction. The downwardly extending length of wheel bearing angles 37 assures the "bottoming" of the car 12 firmly on the floor of pit 22.

Extending transversely of and secured to the lower ends of the two rearmost wheel bearing angles 37 is a shaft 41 which journals a free running sheave 42 whose function will be explained below.

Motive power for the apparatus of the invention may be derived from motor 45 which operates cable drum 46 through a V-belt 47, sheaves 48 and 49, and gear reducer 50. Drum 46 is journaled in a pair of pillow blocks 51 and any misalignment of the parts is compensated for by a flexible coupling 52'. Two mounting boards 52 and 53 are secured to the upright channels 16 and 17 and serve as anchorage panels for the motor and cable drum, respectively. An angle 43 is also attached to the upright channels 16 and 17 in a

location above that of board 53 to secure the free end of a flexible cable 55 which cable is the ultimate connecting means between car 12 and motor 45.

From its anchored position on angle 43 cable 55 is trained about sheave 42 on shaft 41, referred to above, and thence through an aperture 56 in the cable drum support board 53 to drum 46.

An electrical circuit for controlling the operation of the illustrated embodiment of the invention may comprise the manually operated selector switches 60 and 61 by which the operator may initiate the motion of the car 12 either upwardly or downwardly subject to the limiting control of upper limit switch 62 and lower limit switch 63. It should be understood that motion of the car may be arrested at any position, as shown in dotted outline, for example, at the will of the operator. Safety limit switches 62 and 63 are attached to the side channel 10 at the upper and lower limits, respectively, of the car's normal traverse and are positioned to be actuated upon contact of the stiffener bar 39 of the car.

In considering the operation of the invention, it will be noted that when the car is at either of its extreme positions it will be level and will offer a supporting surface continuous with the plane of the upper or lower floor as the case may be, of the housing structure. At this point the cargo may be expeditiously loaded and by the operation of one of the control buttons the car may be started on its trip to the opposite floor. The limit switch at said opposite floor will deenergize the motor at the proper moment and unloading may then proceed. As illustrated by the present embodiment, the car 12 is designed to rest, when not in use, at the lower floor 21 where it serves as a part of the floor surface. The arrangement of the cable 55, as illustrated, produces a power multiplication factor of 2:1 but this ratio can be changed, by the employment of the customary multiplicity of sheaves and rope strands as is well known. The selection of cable arrangement, motor size, gear reducer ratio and other variable factors will perforce be dictated by the particular application for which the invention is intended.

It should now be apparent that I have provided an improved incline elevator which accomplishes the objects initially set out. The apparatus described lends itself to economical manufacture, by such methods as welding, for example, and



utilizing such relatively low cost standard rolled steel shapes as channels, angles and plates. The structure described will in no way interfere with the normal uses of the associated stairs and the usual special elevator shaft structure will not be required in its application.

The above specifically described embodiment of the invention should be considered as illustrative only as obviously many changes may be made therein without departing from the spirit or scope of the invention. Reference should therefore be had to the appended claim in determining the scope of the invention.

What I claim is:

An incline elevator for a stairway having side rails supporting the treads thereof and a pit in the lower floor into which said rails extend, comprising an elevator frame having a horizontally disposed load-bearing deck and a pair of spaced depending supports positioned outwardly of each of said rails, a pair of flanged wheels journaled on two of said supports for engaging the upper edges of said rails, a second pair of flanged wheels journaled on the other two of said supports for engaging the lower edges of said rails, a transverse shaft interconnecting the said other two of said supports and positioned below said rails, a sheave freely rotatable on said shaft, a cable, a drum, means at the upper end of said rails to anchor an end of said cable, said cable extending from said anchoring means over said sheave and thence to said drum, and means to rotate said drum, said supports extending below said wheels and sheave whereby the bottom ends of said supports engage the floor of said pit when said frame and deck are in lowermost position.

HOWARD E. FIRESTONE.


## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,358,062 | Davis | Nov. 9, 1920 |
| 1,956,650 | Milner | May 1, 1934 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 21,969 | Switzerland | Aug. 15, 1900 |