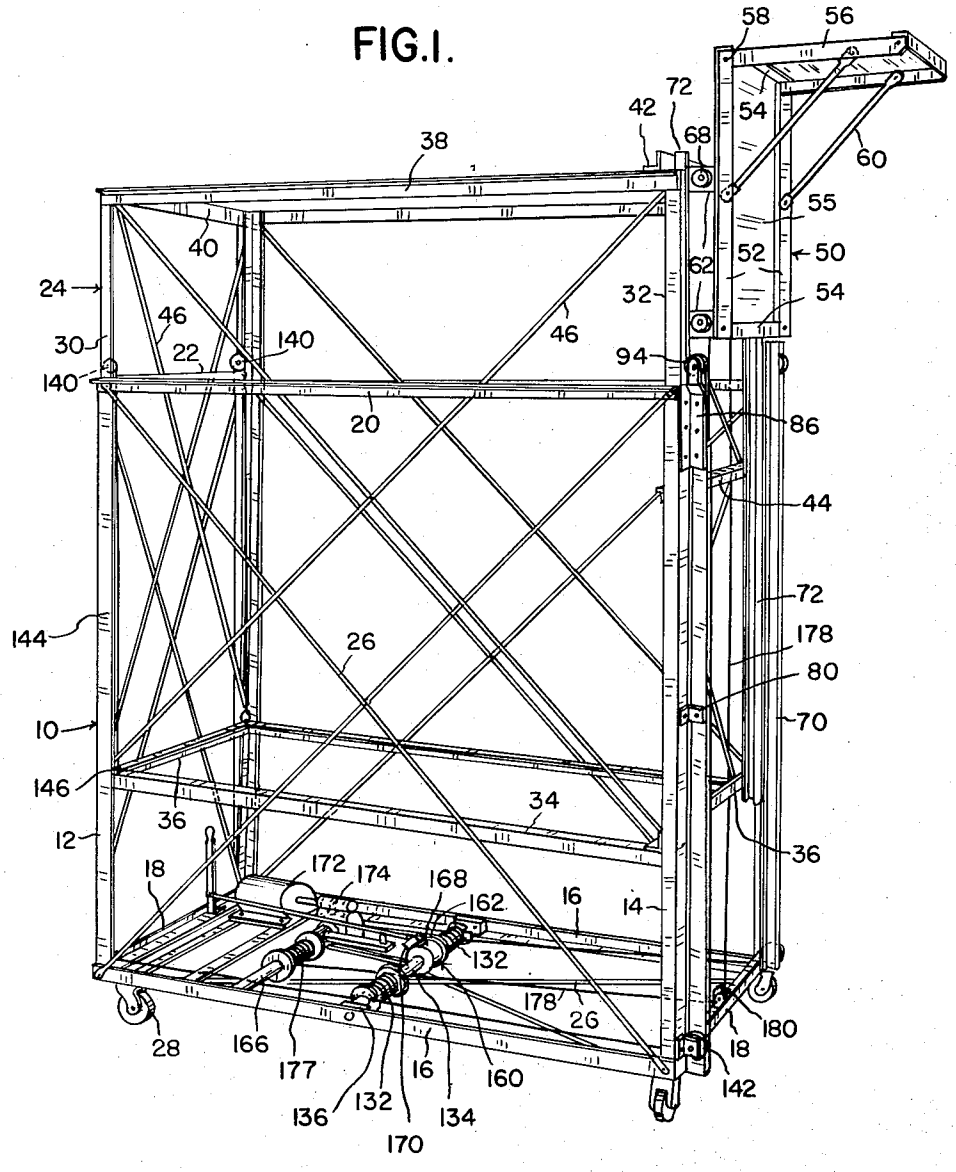
Sept. 11, 1956 C. A. HARLAN ET AL 2,762,659

EXTENSIBLE SCAFFOLD

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FIG.1.



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EXTENSIBLE SCAFFOLD

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FIG.2.

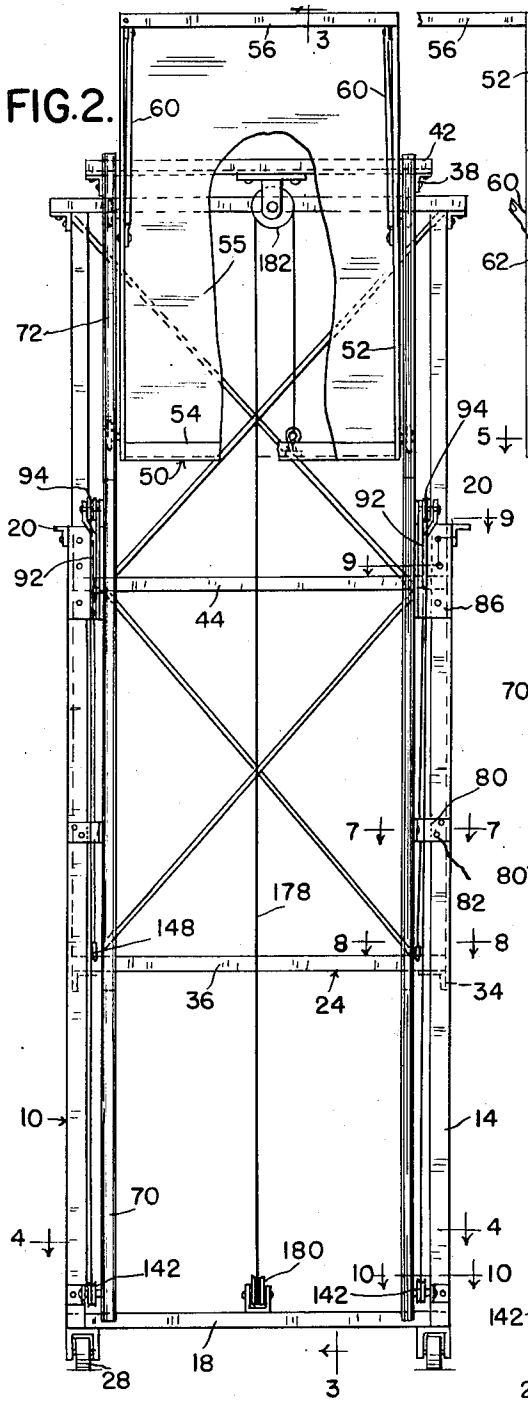


FIG.3.

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FIG.4.

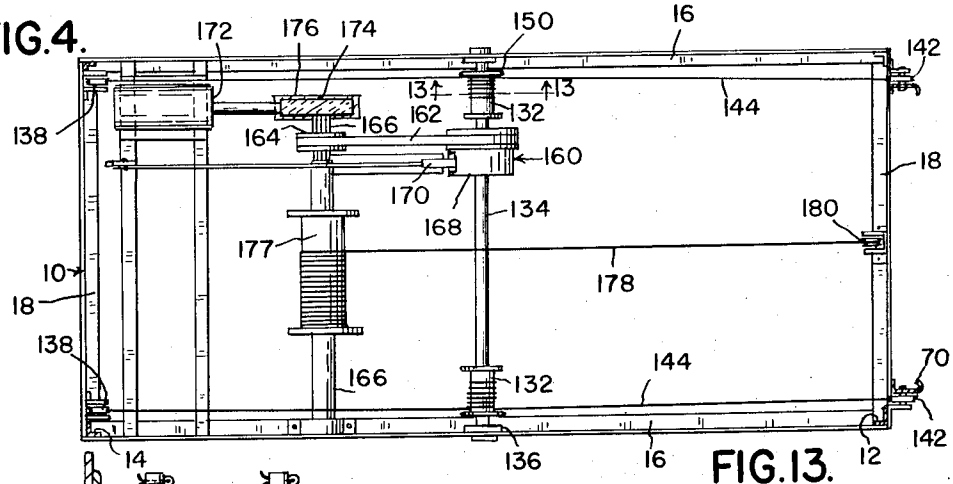


FIG.13.

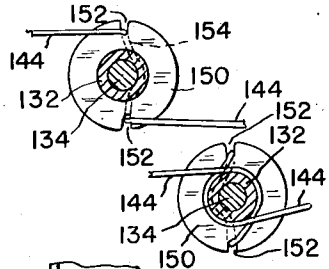


FIG.14.

FIG.5.

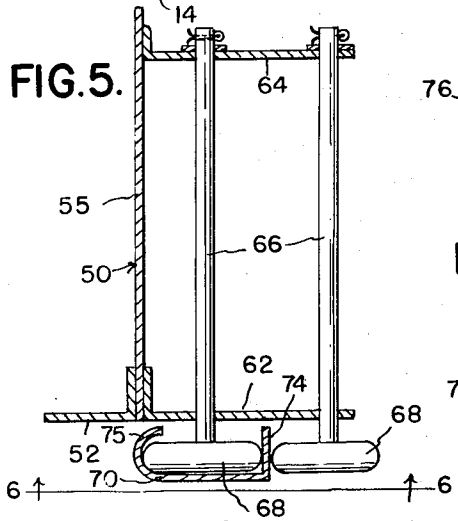


FIG.7.

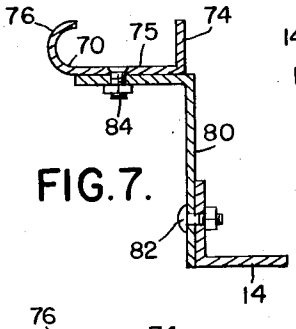
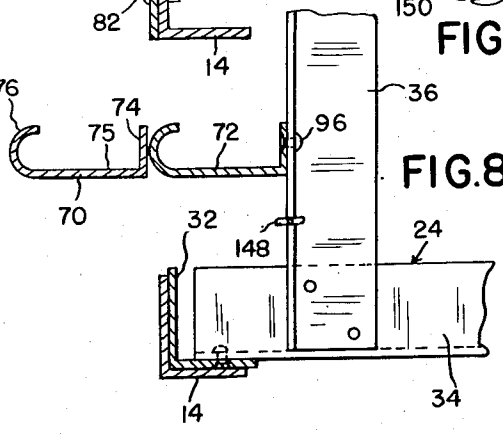


FIG.8.



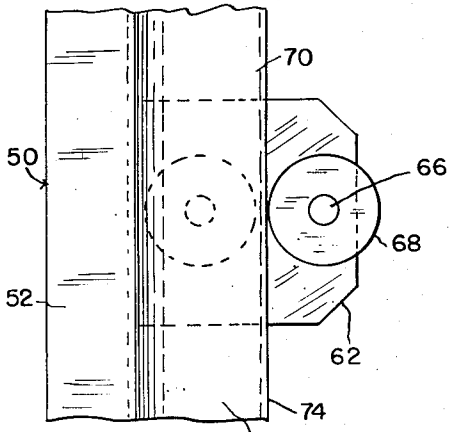


FIG.6.

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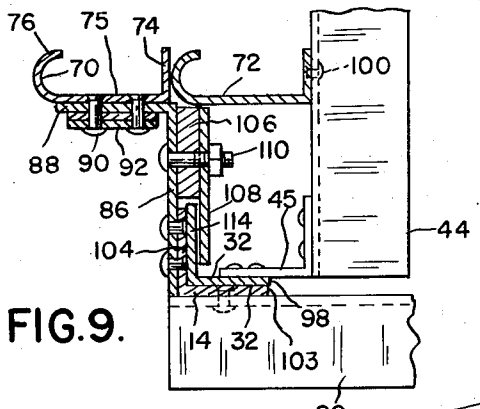


FIG.9.

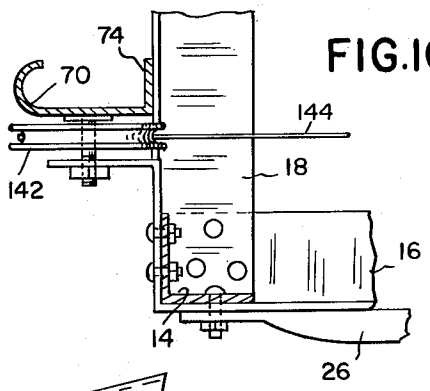


FIG.10.

FIG.11.

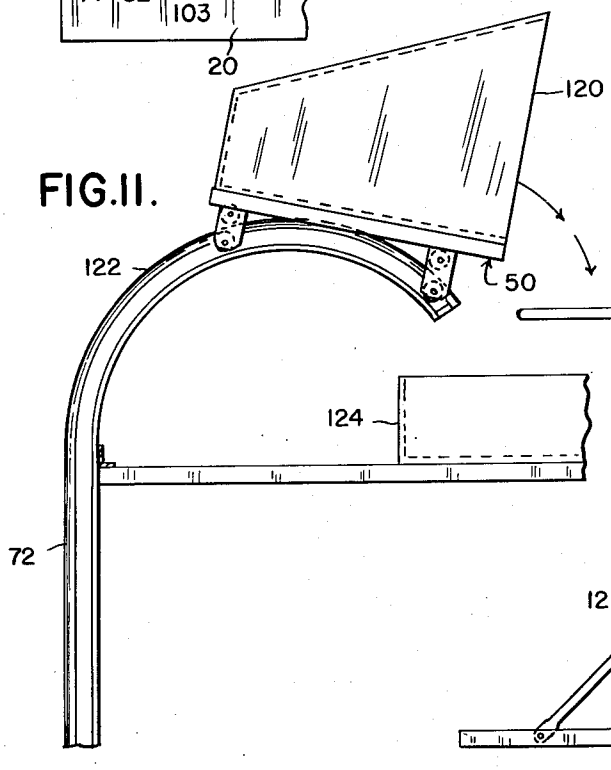
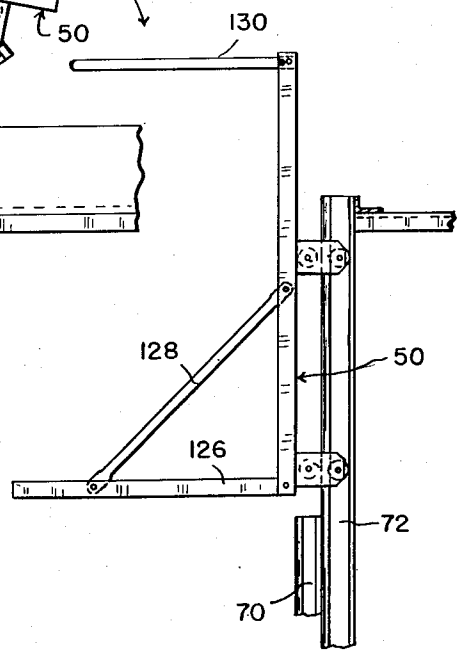


FIG.12.



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United States Patent Office 2,762,659 Patented Sept. 11, 1956

2,762,659

EXTENSIBLE SCAFFOLD

Campbell Allen Harlan, Birmingham, and John M. Harlan, Detroit, Mich.

Application March 16, 1953, Serial No. 342,666

12 Claims. (Cl. 304—29)

The present invention relates to an extensible scaffold, and more particularly, an estensible scaffold including an extensible trackway mounting a vertically movable carriage.

It is an object of the present invention to provide an estensible scaffold capable of being lowered to permit its passage through doors or the like, and capable of being extended to provide a working platform at a substantial elevation.

It is a further object of the present invention to provide an estensible scaffold characterized by its lightness, its ease and mobility, and its collapsibility.

It is a further object of the present invention to provide a readily movable extensible scaffold including power means associated therewith for raising and lowering the scaffold and for raising and lowering a carriage on the scaffold while the scaffold is either extended or collapsed.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a perspective view of the extensible scaffold.

Figure 2 is a front elevation of the scaffold with parts broken away and parts omitted.

Figure 3 is a fragmentary section on the line 3—3, Figure 2.

Figure 4 is a section on the line 4—4, Figure 2.

Figure 5 is an enlarged fragmentary section on the line 5—5, Figure 3.

Figure 6 is an end view of the detail shown in Figure 5, looking in the direction of the arrows 6—6, Figure 5.

Figure 7 is an enlarged fragmentary section on the line 7—7, Figure 2.

Figure 8 is an enlarged fragmentary section on the line 8—8, Figure 2.

Figure 9 is an enlarged fragmentary section on the line 9—9, Figure 2.

Figure 10 is an enlarged fragmentary section on the line 10—10, Figure 2.

Figure 11 is a fragmentary side elevation showing a modification of the scaffold.

Figure 12 is an enlarged fragmentary side elevation illustrating yet another modification of the scaffold.

Figure 13 is an enlarged fragmentary section on the line 13—13, Figure 4.

Figure 14 is a view similar to Figure 13 showing the relationship of parts after partial rotation of the drum.

Referring now to the drawings, the extensible scaffold comprises a lower frame indicated generally at **10** comprising vertically extending rear corner posts in the form of angle irons **12**, and vertically extending front corner posts in the form of angle irons **14**. The lower ends of the angle irons **12** and **14** are interconnected by side frame members **16** and end frame members **18**. The angle irons **12** and **14** are disposed with their flanges extending parallel to the sides and ends of the frame and with the concave portion thereof facing inwardly of the frame. At the tops of the angle irons **12** and **14** there

are provided a pair of side frame members **20** and the rear corner posts **12** are interconnected by a cross frame member **22**. The upper ends of the front posts **14** are not directly interconnected, since this space is required for movement of a vertically movable frame construction indicated generally at **24**. The lower or main frame **10** however, is braced by suitable means such for example as the diagonally extending brace rods some of which are designated at **26**.

In order to provide easy movement of the scaffold from place to place, the main frame **10** is provided with casters **28**.

The vertically movable frame **24** is telescoped within the main frame **10** and comprises rear corner posts **30** and front corner posts **32**. The corner posts **30** and **32** are in the form of angle irons which are nested within the angle irons comprising the corner posts **12** and **14** of the main frame.

Inasmuch as the vertically movable frame **24** moves freely within the main frame **10**, its rear corner posts **24** and front corner posts **32** are interconnected at their bottoms by longitudinally extending angle irons **34** and laterally or transversely extending angle irons **36**. At the same time the upper ends of the corner posts of the movable frame **24** are interconnected by longitudinally extending angle irons **38**. The rear corner posts **30** are interconnected by an angle iron **40**. The forward portions of the longitudinally extending angle irons **38** are interconnected by a transverse angle iron **42**. In addition, a second angle iron **44** interconnects the front corner posts **32** intermediate their ends by means of brackets **45** as well illustrated in Figure 9. As in the case of the main frame **10**, the movable frame **24** is rendered rigid by diagonally extending brace members some of which are designated at **46**.

A carriage, generally indicated at **50**, is provided which is mounted for vertical movement on the scaffold from top to bottom thereof whether or not the scaffold is in vertically extended or collapsed position. The carriage **50** comprises a pair of substantially vertically extending laterally spaced angle irons **52** interconnected at their tops and bottoms by angle irons **54** to produce a rigid structure. The space between the vertical angle irons **52** and the horizontal angle irons **54** is covered by a panel **55**. Pivoted adjacent the upper ends of the angle irons **52** is a platform **56**, the hinge connection being indicated at **58**. In order to maintain the platform **56** in proper position, suitable braces **60** are provided, which as illustrated in Figure 1 rigidly support the platform **56** in horizontal position.

In order to provide for substantial movement of the carriage **50** in any position of adjustment of the scaffold, rearwardly extending brackets **62** and **64** are provided having openings therein forming journals for shafts **66** on which are mounted wheels or rollers **68**. A pair of rollers **68** are mounted adjacent the lower corners of the panel **55** and a second pair of such rollers are mounted adjacent the sides of the panel intermediate the upper and lower edges thereof, as best illustrated in Figure 3.

Carried by the vertical posts **14** at the front of the main frame **10** are a pair of vertically extending roller receiving tracks **70**. Carried adjacent the front posts **32** of the movable frame **24** is a second pair of roller receiving tracks **72**. Each of the tracks, as well illustrated in Figure 8, includes a straight inwardly extending flange **74**, an outer wall **75**, and an arcuately curved forward wall **76**, these being adapted to partly surround the corresponding roller **68** as illustrated in Figure 5, so as to prevent removal of the roller from its track except through an open end thereof.

The stationary tracks **70** are connected to the posts **14**

by a plurality of brackets **80** as illustrated in Figure 7, which are bolted or otherwise secured to the inwardly extending flange of the posts **14** by bolts **82**, and are bolted to the wall **75** of the tracks **70** by bolts **84**. It will be observed that the heads of the bolts **84** are countersunk to avoid interference with movement of the rollers in the tracks. Adjacent the upper end of the main frame **10**, as best illustrated in Figure 9, there are provided brackets **86** which interconnect the posts **14** and the tracks **70**. The bracket **86** provides a web **88** secured to the track **70** by means of rivets **90**, these rivets also serving to secure a pair of bracket members **92** in position, the bracket members **92** being separated at their upper ends as illustrated in Figures 1 and 2 to provide openings forming journals for sheaves **94**. The track members **72** are secured to and vertically movable with the movable frame **24**.

As best illustrated in Figure 8, the movable frame **24** is provided with the angle iron **36** extending transversely across and interconnecting the forward portions of the longitudinally extending angle irons **34**. The vertically movable tracks **72** are connected adjacent their bottoms to the angle irons **36** by suitable means such as the rivets indicated at **96**.

As best seen in Figure 9, the cross piece **44** is riveted or otherwise secured as indicated at **100**, to the mid-portion of the trackway **72**, the ends of the angle iron or cross piece **44** being connected to the longitudinally extending flanges **98** of the front corner posts **32** by the brackets **45**. As best seen in Figure 1, the cross piece or angle iron **42** may also be similarly connected to the upper ends of the tracks **72**.

It will be recalled that the front posts **14** of the main frame **10** are not directly interconnected at their upper portions and this of course is for the purpose of permitting passage therethrough of the means which serve to interconnect the movable frame **24** and the carriage **50**. However, a construction is provided which supports the upper ends of the posts **14** against lateral displacement and this construction is best illustrated in Figure 9. As seen in this figure, the stationary front corner posts **14** of the main frame comprise the rearwardly or longitudinally extending flanges **103**, and inwardly or transversely extending flanges **104**. The bracket **86** which connects the angle iron **14** to the stationary track sections **70** carries a spacer block **106** to which is secured a plate **108**, suitable securing means such as the bolt **110** being provided. It will be observed that the stationary corner post **14**, the bracket **86**, the spacer block **106**, and the plate **108** together provide surfaces which confront portions of the vertically movable corner post **32** in four directions. The corner post **32** comprises the rearwardly or longitudinally extending flange **98** and an inwardly or laterally extending flange **114**. More specifically, the inner surface of the rearwardly extending flange **103** confronts or engages the outer surface of the rearwardly or longitudinally extending flange **98** of the corner post **32**. The rearwardly facing surface of the flange **104** of the corner post **14** engages or confronts the forwardly facing surface of the inwardly extending flange **114** of the corner post **32**. The spacer block **106** engages or confronts the end surface of the flange **114**. The forwardly facing surface of the plate **108** engages or confronts the rearwardly directed surface of the flange **114**. The outer edge of the plate **108** engages or confronts the inner surface of the rearwardly extending flange **98** of the post **32**.

It will be recalled that the corner posts **32** are rigidly interconnected at their tops, bottoms and mid-portions by cross members. From the foregoing it will be apparent that the rigid interconnection between the corner posts **32** of the movable frame **24** thus provides an adequate support for the upper portions of the corner posts **14** of the main frame **10**.

As well illustrated in Figures 8 and 9, the track sections **70** and **72** are directly adjacent to each other and are so spaced that each receives one of the rollers **68** carried by each of the brackets **62**. Thus, when the movable frame **24** is in its lower or collapsed position, each of the rollers **68** is engageable in a pair of adjacent tracks **70** or **72**. However, when the movable frame **24** is elevated to its uppermost position it is possible to elevate the carriage **50** to the position illustrated in Figure 1 and still maintain adequate support therefor. At this time the sets of rollers **68** most closely adjacent to the carriage **50** move out of the open upper ends of the tracks **70** but the outermost of the pairs of rollers remains in the tracks **72**. Thus, at all times at least four rollers are engaged in trackways so as to provide adequate support for the carriage.

As best seen in Figure 11, means may be provided for mounting a hopper **120** on the vertically movable carriage **50**. In this case the upper ends of the upper track **72** include an arcuate portion **122** and as the carriage **50** reaches the upper end of the track **72** it enters upon the arcuately curved portion **122**, thus tipping the hopper to the position illustrated in Figure 11. It will of course be appreciated that the curved portions **122** of the track **72** may be caused to tip either forwardly or rearwardly. In the case where the covered portions of the track tip forwardly, the hopper may be caused to dump into a receptacle located in front of the scaffold. In Figure 11 however, the tracks are illustrated as curved rearwardly and there is shown a receptacle **124** which will be carried at the top of the movable frame **24**, into which the contents of the hopper **120** may be dumped.

Referring now to Figure 12 there is illustrated another variation of the present invention, in which case the carriage **50** is provided with a lower platform **126** held in position by supporting arms **128**. Spaced upwardly from the platform **126** is a railing **130** which will provide a safety feature for a man standing upon the platform **126**. If desired, a section of the railing **130** may be movably associated with the remainder of the railing to permit ready access to the platform, after which the movable section of the railing may be replaced. Conveniently, the movable section of the railing may be hinged at one end to the carriage and have a releasable locking engagement at its free end with the remaining portion of the railing.

Power means are provided for selectively raising and lowering the movable frame **24** relative to the main frame **10**, and for selectively raising and lowering the carriage **50**.

As best illustrated in Figures 1–4, the means for raising and lowering the movable frame **24** comprises a pair of cable winding drums **132** carried on a shaft **134**, mounted in suitable bearings indicated at **136** which are carried by the longitudinally extending main frame members **16**. Sheaves **138** are provided adjacent the lower rear corners of the main frame and sheaves **140** are provided adjacent the upper rear corners of the main frame. In like manner, sheaves **142** are mounted adjacent the lower front corners of the main frame, and sheaves **94** previously referred to are carried by the main frame adjacent the top front corners thereof. A pair of cables **144** are provided each associated with one of the drums **132** and the sheaves **138**, **140**, **142** and **94**. One end of each of the cables **144** is secured to the lower portion of the movable frame **24** as indicated at **146** in Figure 1, and the opposite end of each of the cables is secured to a corresponding point at the forward ends of the movable frame **24** as indicated at **148** (Figure 2 and 3).

Reference is now made to Figure 13 to illustrate a useful modification of the cable winding drums **132**. Each of the drums as illustrated in Figure 13 is provided with a radially extending flange **150** at one end thereof and these flanges **150** are in turn provided with diametrically opposite outwardly opening cable receiving notches **152**. The cable **144** is initially connected over the sheaves

and secured at its ends to the lower corners of the movable frame **24** as previously described, in such a way as to leave a certain amount of slack or looseness in the cable. This permits producing a bight in an intermediate portion of the cable adjacent one of the drums **132** and the cable is introduced through the notches **152** as illustrated in Figure 13 so that the bight of the cable, indicated at **154**, is located outwardly of the drum by the flange **150**, and the leads of the cable **144** extending away from the drum are located to overlie the drum. With the parts in the relationship illustrated in Figure 13, 180° rotation of the drum and flange brings the leads of the cable **144** into engagement with the periphery of the the drum and further rotation winds up both leads of the cable simultaneously. The foregoing construction is highly desirable in that it permits ready separation of the cable from the main frame without disengaging its ends from their securement to the movable frame.

The shaft **134**, as best illustrated in Figure 4, is provided with a combined pulley and brake member **160** and is connected by a pulley belt **162** to a driving pulley **164** mounted on a drive shaft **166**. Suitably associated with the brake drum **168** is a brake diagrammatically indicated at **170** which is adapted to lock the brake and hence the shaft **134** against rotation. An electric motor **172** is mounted on the main frame **10** and includes a worm **174** meshing with a worm wheel **176** keyed or otherwise secured to the shaft **166**. The pulley **164** is axially movable on the shaft **166** between a first position in which it is splined to the shaft and hence rotatable therewith, to a second position in which it is freely rotatable on the shaft. Suitable means for effecting driving engagement between the pulley **164** and the shaft **166** are well known and are not illustrated or described in detail at this point. From the foregoing it will be observed that when the driving pulley **164** is in position to be driven by the shaft **166**, rotation is imparted to the shaft **134** and hence the cable winding drums **132** will be driven in one direction or the other depending upon the direction of rotation of the motor **172**, thus raising or lowering the movable frame **24**.

Rigidly secured at all times to the shaft **166** is a second cable winding drum **177** to which is secured a cable **178** movable around a sheave **180** carried by the cross bar **18** at the lower end of the main frame **10**, and thence upwardly over a sheave **182**, the end of the cable **178** being connected to an intermediate point of the cross bar **54** of the carriage **50**. Thus, when the motor is actuated the carriage **50** may be raised or lowered in accordance with the direction of actuation of the motor.

With the foregoing detailed description in mind, it will be observed that by suitable actuation of the motor the movable frame **24** may be raised and lowered and may be locked in any desired elevated position by engagement of the brake **170**. Moreover, the carriage **50** may be selectively raised or lowered from a lowermost position to an elevated position determined by the amount of elevation of the movable frame **24**.

It will be observed in Figure 1 that the platform **56** of the carriage **50** is located substantially above the top of the movable frame **24**. This is a very desirable feature since it permits locking of the movable frame **24** in a position such that it will clear overhead structure in a building for ready movement thereon, and at the same time permits elevation of material on the platform **56** to a point substantially above the top of the movable frame **24**.

The drawings and the foregoing specification constitute a description of the improved extensible scaffold in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What we claim as our invention is:

1. An extensible scaffold comprising a lower frame having a first pair of vertically extending tracks carried by said lower frame at the front thereof, a movable frame guided for vertical movement on said lower frame, a second pair of vertically extending tracks carried by said movable frame at the front thereof, each track of said second pair being parallel to, laterally spaced from and in proximity to one of said first pair of tracks, a vertically movable carriage at the front of said scaffold and having at each side thereof a vertically spaced pair of guide devices, each of which comprises a pair of elements, corresponding elements of each of said pair of elements being vertically movable in and guided by one of said first pair of tracks and the other element of each pair of elements being vertically movable in and guided by one of said second pair of tracks.

2. An extensible scaffold as defined in claim 1 in which said movable frame is telescoped within said lower frame.

3. An extensible scaffold as defined in claim 1 in which said tracks comprise channel members and said elements comprise rollers.

4. An extensible scaffold as defined in claim 3 in which said channel members are shaped to surround said rollers to an extent sufficient to prevent movement of said rollers laterally out of said channels.

5. An extensible scaffold as defined in claim 1 comprising a motor on said lower frame, and lift means operated by said motor for selectively raising said movable frame and said carriage.

6. An extensible scaffold as defined in claim 5, said lift means comprising drum and cable means for raising and lowering said carriage, a connection between said motor and drum means, a second drum and cable means for raising and lowering said movable frame, and means for selectively connecting and disconnecting said motor and second drum means.

7. An extensible scaffold as defined in claim 4 in which each of said pairs of tracks are disposed with the open side of the channel members in confronting relation, and the tracks of the pair carried by said movable frame are positioned directly in rear of the tracks of the pair carried by said lower frame.

8. An extensible scaffold as defined in claim 1 in which said carriage includes a paltform and a platform support extending downwardly therefrom, the uppermost of said pair of guide devices at each side of said carriage being disposed substantially below said platform to provide for elevation of said platform above the top of said movable frame.

9. An extensible scaffold comprising a rectangular lower frame elongated from front to rear and having a pair of front and a pair of rear corner posts, means interconnecting the tops and bottoms of said rear posts, means interconnecting the top and bottom of each rear post with the top and bottom of the corresponding front corner post, means interconnecting the bottoms of said front posts, the space between said front corner posts upwardly from the bottoms thereof being unobstructed, a movable frame guided for vertical movement within said lower frame and having front and rear corner posts guided for vertical movement by the corresponding corner posts of said lower frame, means interconnecting the tops and bottoms of each corner post of said movable frame to the tops and bottoms of the adjacent corner posts thereof, means carried by the front corner posts of one of said frames slidably engaging the front corner posts of said other frame to prevent separation between the upper portions of the front posts of said lower frame, a first pair of vertically extending tracks on said lower frame, each of which is adjacent to and carried by a front corner post thereof, a second pair of vertically extending tracks on said movable frame, each of which is adjacent to and carried by a front corner post thereof parallel to but spaced laterally from the track carried by the adjacent front corner post of said lower frame, a vertically movable carriage having at each side thereof a pair of vertically spaced guide devices, each guide device comprising a pair of elements, one of which is received by a track

carried by said lower frame and the other of which is received in a track carried by said movable frame.

10. A scaffold as defined in claim 9 in which each pair of tracks comprises channel members disposed with the open sides thereof in confronting relation, and in which said elements comprise rollers received in the channels of said channel members.

11. A scaffold as defined in claim 10 in which the tracks of said first pair of tracks are positioned in front of the tracks of said second pair of tracks.

12. A scaffold as defined in claim 10, the upper ends of said first pair of tracks being open to provide for movement of the rollers out of the upper end thereof upon upward movement of said carriage while said movable frame is in elevated position.

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