

1,369,393.

3 SHEETS—SHEET 1.



Phil J. Hawen
Del.



廿四

INVENTOR:
Edward W. Burgess.

BY

Crowin, Wheeler & Woodard
ATTORNEYS.

1,369,393.

Patented Feb. 22, 1921.

3 SHEETS--SHEET 2.

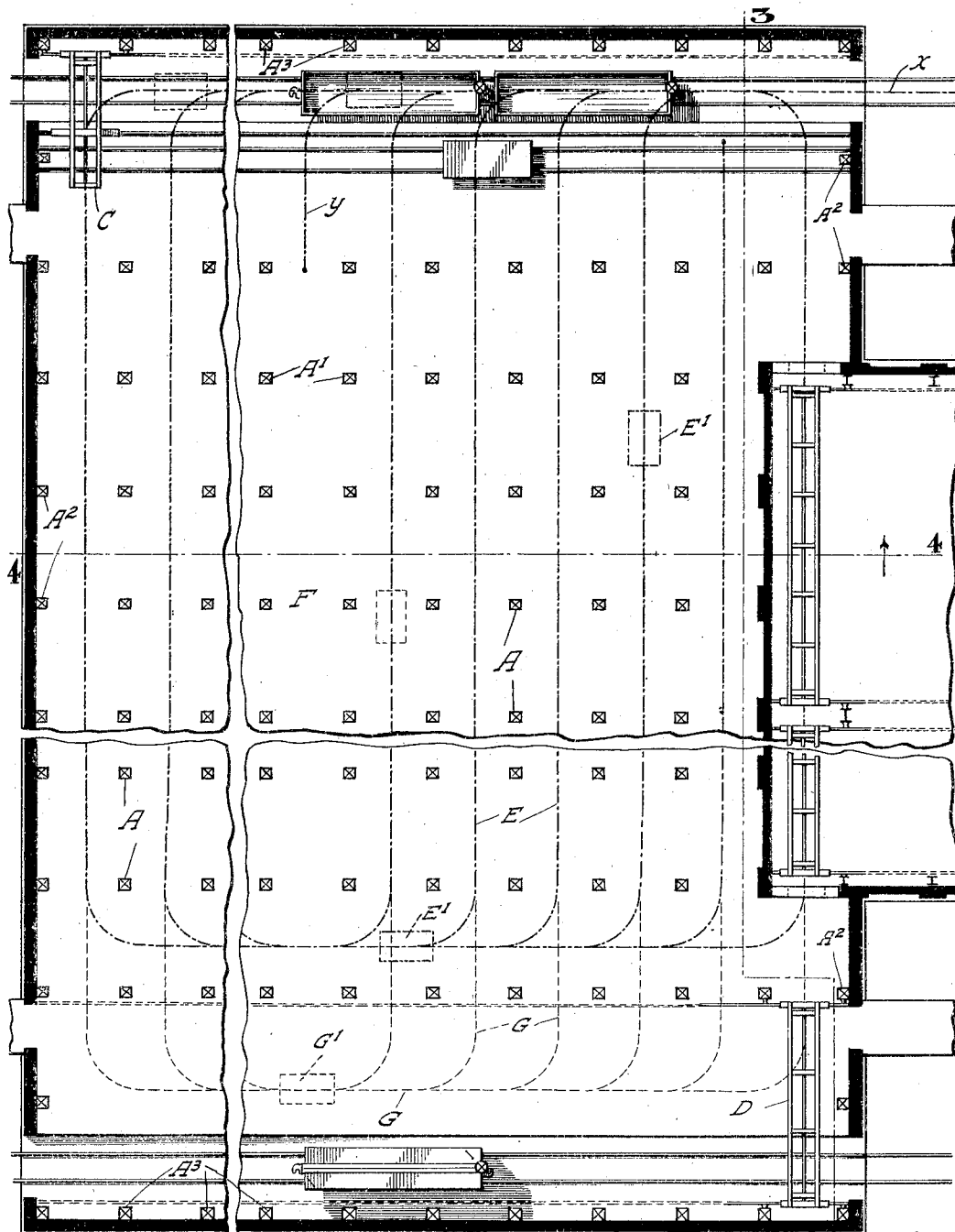


FIG. 2.

INVENTOR:
Edward W. Burgess.

WITNESS:

Phil J. Hawry
Del.

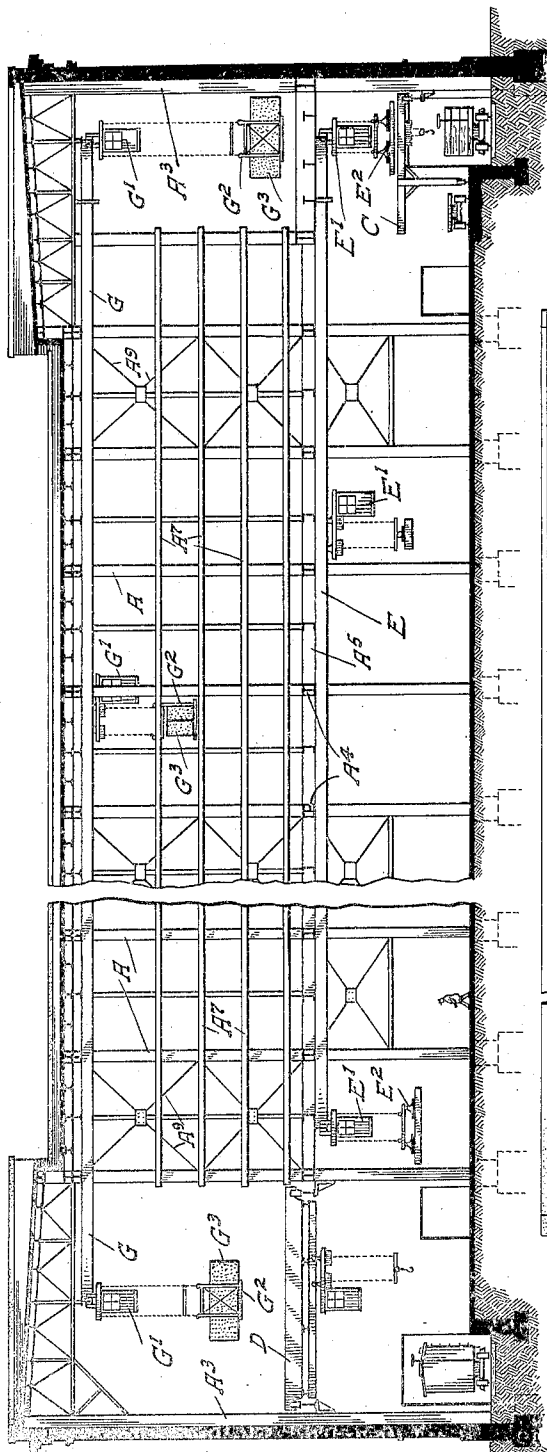
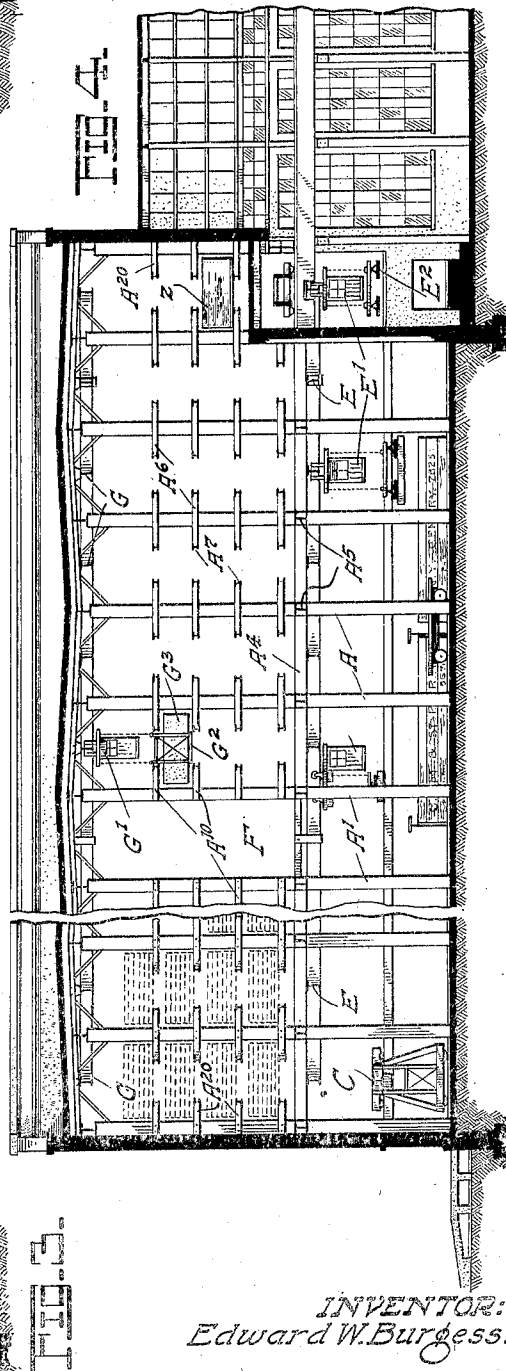
BY

BY
Erwin, Wheeler & Woolard,
ATTORNEYS.

1,369,393.

E. W. BURGESS.
STORAGE BUILDING AND HOIST.
APPLICATION FILED FEB. 7, 1920.

Patented Feb. 22, 1921.
3 SHEETS—SHEET 3.



WITNESS:

Phil J. Hawley
Del.

GRADE

INVENTOR:
Edward W. Burgess.
BY
Erwin, Wheeler & Woodard
ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD W. BURGESS, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO A. O. SMITH CORPORATION, OF MILWAUKEE, WISCONSIN, A CORPORATION OF NEW YORK.

STORAGE-BUILDING AND HOIST.

1,369,393.

Specification of Letters Patent.

Patented Feb. 22, 1921.

Original application filed February 11, 1919, Serial No. 276,329. Divided and this application filed February 7, 1920. Serial No. 356,943.

To all whom it may concern:

Be it known that I, EDWARD WESLEY BURGESS, a citizen of the United States, residing in the city of Milwaukee, county of Milwaukee, and State of Wisconsin, have invented a new and useful Improvement in Storage-Buildings and Hoists, and do declare that the following is a full, clear, and exact description thereof, such as will enable persons skilled in the art to which the invention pertains to make and use the same, reference being had to the drawings hereto attached for disclosure as to certain details of the construction.

This application, covering the combination of a storage building and the hoist used therein, is a division of my former application filed Feb. 11, 1919, Serial No. 276,329, in which the storage building structure is claimed *per se*, and patented June 22, 1920, No. 1,344,617.

My present invention relates to a storage building and a hoist used therein, which, while especially designed for a specific purpose, are capable of use for many general storage purposes.

The storage building hereinafter disclosed has been designed for construction as an adjunct to a plant conducting very large operations in connection with the manufacture of automobile frames, and in which the daily production of the plant has reached such proportions that the problems attending the expeditious handling and storing of such daily output have assumed a very serious aspect, and have rendered imperative the demand for a new type of construction of storage buildings, to overcome the inadequacies and consequent inconveniences of the storage buildings now used for like purposes.

In storing large quantities of articles, such as automobile frames, which although very bulky are yet light in weight in comparison to their bulk, the demands for storage space increase very rapidly. Such articles as automobile frames cannot be stacked in piles containing more than a limited number of frames, for the reason that the weight of the several frames in the pile is liable to distort the frames at the bottom thereof. In addition, the number of such frames which may be so stacked or piled, is limited

to such number as will constitute a stack or pile which may be handled conveniently as a unit, it being the practice for reasons of economy as well as expedition, to so handle such stacks or piles as units in storing automobile frames. Hence, if ground floor storage only be used, the cost of a storage building of ample dimensions will require an outlay much out of proportion to the results secured, to say nothing of the needless waste of time required to transport the frames over the long reaches of such a building. The practice of storing in a smaller building having several floors, is expensive and inefficient, and open to the objection that too much time is required to transfer the stacks or piles of frames to the floor trucks and distribute them over the several floors of the building, and to withdraw them from storage.

I have invented a storage building and so constructed it that the objections to the former methods of storing are completely eliminated, and I do this at a minimum structural cost for the building. My improved storage building will cover only the usual or a comparatively small area of ground, but in external appearance will resemble a building having a height of several stories. However, the building will be clear from the ground floor to the roof, except for the skeleton frame work used in my system of storage, and I have thus released for storage purposes practically the whole of the cubical area of that part of the interior of the building set apart for the storage of frames and other automobile parts.

The building is of good factory construction, with a trussed roof. Rising from the floor and extending to the roof at suitable places in the interior of the building, are several parallel rows of columns which at certain levels are provided with brackets for supporting a series of longitudinal stringers, such brackets and stringers extending a limited distance into the aisles formed by the said parallel rows of columns. A wide space between the stringers supported by one row of columns and the stringers of the next row is preserved, and into and through this space the carrier or cradle for conveying the material to be stored may be moved,

both vertically and horizontally. A mono-rail hoist system, supported at the top of the columns, is arranged centrally over each aisle, and on the track of this system travels
 5 an electric hoist, to which is attached the cradle for the material to be stored. The material to be stored, in the present instance consisting of a stack or pile of automobile frames, all of the frames constituting such
 10 stack or pile being of uniform construction, will be carried by the cradle into the selected storage level or section to position for storage, and deposited crosswise of the aisle, upon the stringers supported by the vertical
 15 columns forming the aisle, and which columns form the side walls of the storage aisles.

In the manufacturing plant in connection with which the storage building herein described is being erected as an adjunct, the organization is such that automobile frames are produced by mechanical devices operating upon a schedule providing for the completion of a given number of frames per
 20 minute. Upon completion, the frames are stacked or piled at a point within the reach of the mono-rail system carrier cradle, which latter immediately transports the stack or pile of frames to the selected place
 25 of storage, and returns for another load.

The provision of superposed storage levels or sections, created by the stringers extending slightly into the storage aisles, necessitates the use of a carrier cradle of
 35 peculiar construction. The cradle which I have devised for this purpose is in the form of a skeleton, and is open at one side and at both ends. These structural features enable me to move the cradle laterally to receive the stack of frames, and to transfer
 40 the stack to its place of storage by passing the cradle into the storage level and depositing the load by resting the projecting ends of the stack of frames on the stringers.

The storage building is provided with a receiving station and with a shipping station, to each of which a railway will be run, so that unloading raw materials as well as loading the finished work for shipment may
 50 be performed within the enclosure of the storage building.

I propose to reserve the floor of the building for the storage of raw materials, such as the steel sheets or plates used in the manufacture of automobile frames, and at a suitable distance overhead have arranged a low-level mono-rail hoist system for handling such raw material. The clear space above
 55 that reserved for the storage of raw materials, and its cooperating mono-rail hoist system, is divided by the brackets and stringers, before referred to, into a plurality of sub-spaces suitably proportioned to the height of the stacks or piles of automobile

frames which can be conveniently stored 65 therein.

In the drawings accompanying this specification,

Figure 1 is an exterior view of a storage building in which my invention has been 70 embodied.

Fig. 2 is a broken sectional plan view, showing generally the outlines of the storage building, together with the arrangement of the columns supporting the storage 75 means, and the course of the mono-rail hoist systems employed in the building.

Fig. 3 is a sectional view in elevation, on the line 3—3, Fig. 2, looking in the direction of the arrows, Fig. 2. 80

Fig. 4 is a sectional view in elevation, likewise broken out, on the line 4—4, Fig. 2.

Fig. 5 is an enlarged view, showing in perspective, the manner in which the columns, brackets and stringers forming the 85 storage structure are assembled, such parts being formed of I-beams and channel bars.

Fig. 6 is a diagrammatic rear view of the hoist and cradle, and showing the arrangement of the cables whereby the cradle is 90 stabilized while being passed into the storage level.

Fig. 7 is a view of the cradle, looking from the side of Fig. 6.

Referring to the drawings, in which Figs. 95 2, 3 and 4 are sectional views of a storage building, of suitable construction, a series of parallel rows of vertical columns A , A' , rise from the floor to the roof. Set in each of the walls of the building is a row of 100 other vertical columns, A^2 , A^3 , the latter being alined with the rows of columns in the open interior of the building. These columns together with the walls of the building, rest upon suitable footings, as is 105 customary in building constructions, and the roof structure is supported at the top of the said walls and columns.

At the right hand end of the building, as viewed in Fig. 3, a portion of the floor is 110 left clear and set apart for use as a receiving station, and a similar space at the left hand end of the building is left clear and set apart for use as a shipping station. A railway is run to each of these stations, 115 so that railway cars bearing raw materials may be discharged within the building at the receiving station, and likewise, cars may be loaded for shipment at the shipping station. Or, the shipping station may be used 120 as a receiving station for raw materials, or vice versa.

A gauntree crane C , is located over the railway at the receiving station, and a transfer bridge D is likewise located at the shipping 125 station. The uses of these mechanisms are well known, and their construction will not be further described.

At intervals, the vertical columns are tied by longitudinal beams A^5 , and cross beams A^4 , at a level some distance above the floor, and the space between the said beams and the floor, and between the railway stations, is reserved for the storage of raw materials, such as the steel sheets or plates, from which the automobile frames are made.

Suspended from the cross beams A^4 , over the steel storage space, is the track E, of a low-level mono-rail system, the course of which is shown in Fig. 2, and which extends centrally of the longitudinal aisles formed by the rows of vertical columns. This track E is continued over the receiving station, and at the end of its longitudinal runs, merges into a line parallel with and directly over the railway at such station. Suitable switches are provided at all junctions, for directing the traveling electric hoist E' , upon which ever track may be desired. As indicated at x in the upper right of Fig. 2, the track may be extended beyond the building and the hoist may be used to carry materials into the building.

The gauntree crane C is employed, among other purposes, for unloading the sheet metal plates from the railway car. These plates are deposited on the station platform, where they will be evened up. The hoist E' , of the low-level mono-rail system, is equipped with a series of electro-magnets E^2 , which when energized and lowered into contact, are adapted to pick up the stacks of sheet metal plates previously unloaded from the car by the gauntree crane, and evened up. The hoist will then carry such plates into the selected aisle for storage at a designated place, upon reaching which the magnets will be deenergized, and the stack of metal plates allowed to rest in the evened-up condition. When not in use, the gauntree crane will be moved along its track until it rests at one side of the building, and out of position to interfere with the movements of the hoist E' .

The transfer bridge D, like the gauntree crane, will be run to the side of the building when not in use, or when it is desired to clear the shipping station for the movement of the mono-rail hoist, hereinafter described as operating at the shipping station.

It has been found desirable to leave an open bay F, through the longitudinal center of the building, between the rows of column A' , A' , for various purposes.

At suitably spaced points above the level of beams A^4 and A^5 , the vertical columns A, are provided with double brackets A^6 , which are attached at their mid-lengths to the columns A. These brackets may be formed of sections of I-beams or of channel bars. At their free ends, the brackets A^6 , support stringers A^7 , formed of channel or I-beams which extend longitudinally of the building,

through the aisles formed by the vertical columns. The columns A' , which border on the bay F, and the columns A^2 , set in the side walls of the building, are provided with single brackets A^{10} and A^{20} , respectively, which extend into the adjacent aisles. The single brackets thus supported, carry stringers A^7 complementary to the stringers across the respective aisles. The columns A and A' , are braced by diagonal tie rods A^3 . The longitudinal stringers divide the aisles formed by the vertical columns into open-end storage levels or sections.

A track G, of a high-level mono-rail system hoist is supported at the top of the vertical columns A, A' , A^2 and A^3 , and over this track moves an electric hoist G' . The course of the track is indicated diagrammatically in Fig. 2, from which, as well as from Fig. 4, it will be seen that the track is arranged centrally over the aisles formed for the storage of stacks or piles of automobile frames. A spur γ , of the track extends into the bay F, as indicated in Fig. 1. As in the case of the low-level track E, the track G, will be provided with switches at all junctions, so that the hoist may be directed into any desired storage aisle.

One use to which I propose to put the bay F, is to install therein an apparatus for painting the automobile frames. Upon completion of the painting operation, the frames will be automatically delivered at a suitable level under the spur γ , of the track G, and in position to be taken by the hoist G' , to the desired place for storage.

The hoist G' , is provided with a skeleton cradle G^2 , which is open at one side and at both ends, as indicated in Fig. 7, for the reception of a stack of automobile frames G^3 . The stack of automobile frames to be stored will be suitably supported on blocks, so as to allow a clearance sufficient for passing the lower fingers of the cradle under such stack, and thus the stack is received in the cradle by lateral movement of the hoist, under the direction of the operator.

The hoist will now move the cradle with its load to the desired storage level, and then into the aisle, and to the place in the level selected for storage, where the hoist will deposit the load upon the stringers A^7 , the stack of automobile frames thus bridging the distance between the stringers in the aisle at that particular level. The outer ends of the lower frame in the stack, projecting beyond the sides of the cradle, rest upon the stringers, and thus the stack is stored. In passing along the aisle to the place selected for storage, the stack of frames will move clear of the stringers above as well as those below, and also clear of the columns, and upon depositing the load by letting out the cables, the cradle will be free from any contact with the stack,

and can then retire for another load. The beams or bars comprising the stringers A' , are provided with a frame supporting surface a' upon which the ends of the lower frame of the stack of automobile frames will rest, when the stack is deposited in its storage position. The said frame supporting surface a' is reinforced by the vertical web a'' , whereby rigidity of the means upon which the stored articles rest is achieved, and deflection thereof under the weight of the stacks of frames is prevented.

At the left of Fig. 4, I have indicated the progress of the storing operations. The start is made by filling the remotest space in any given level, then storing until the level has been filled, whereupon the next level above will be filled, and so on. After the aisle has been stored, the next aisle will be taken. However, as a matter of convenience in removing the frames from storage for shipment, I have found it advisable to store only frames of a given type and uniform size in one aisle, using different aisles for frames of different types and sizes.

When the frames are to be shipped, a hoist G' , operating over the shipping station, will take the stacks of frames from the storage aisles, and deposit them upon the floor of the station, in position for convenient loading in railway cars. The hoist used in withdrawing the frames from storage may be the hoist used for placing the frames in storage; or, it may be a different hoist but of like construction, both operating over the track G .

Great quantities of light parts may be stored in my building, by using bins of suitable dimensions for holding such small parts. These bins are handled and conveyed by the hoist and its cradle, just as are the stacks or piles of automobile frames. I have indicated one of such bins at z , in storage position at the right of Fig. 4.

From what has hereinbefore been disclosed, it will be obvious that my new and improved storage building has as its great advantage the complete utilization for storage purposes of what is practically the solid cubical area of the space set apart for storage. It will be obvious also, that this result is secured by a system of superposed storage, such as would require a building of similar dimensions to be provided with several floors for the reception of the same amount of material.

The results flowing from the use of my invention are that in a building of given length, width and height, I am enabled to dispense with the several floors, and yet pack the storage space solidly from bottom to top, with but a slight allowance of space for occupation by the skeleton frame work used in my storage system.

The stack of frames will be received by the pendent cradle of the hoist in a state of equilibrium, so that there will be no uneven movements of the load during transportation to storage. This cradle, which is of the peculiar form described, is a necessity in the operation of my invention. It will receive the load by relatively lateral movement through the open front thereof, and will discharge the load when the latter has been placed in storage position, simply by retiring after the cradle had been freed from engagement with such load. The provision of the open ends, from which the frames project, enables me to bring about the disengagement and deposit of the load by resting the free ends of the latter upon the stringers supported by the columns. The rows of columns, which form the side walls of the storage aisles, are set apart such distances as will permit the unobstructed passage of stacks of frames into the open ends of the storage levels, without contact with the columns. In the building embodying the invention, the rows of columns are set eighteen feet on centers, with a clearance of nine feet between the stringers in each aisle, at the storage level. But in erecting a storage building in accordance with my invention, the proportions will be such as to meet the requirements of the particular case.

The low level hoist and the storage space, which latter in the construction hereinbefore described, has been designed for the storage of heavy materials, may be omitted and the whole of the storage area of the building be converted into storage levels of the kind described, without departing from the spirit of my invention. Broadly, my invention resides in a construction in which storage aisles are formed by rows of columns which support stringers extending laterally from the columns into the aisles to divide the aisles into storage levels or sections, irrespective of any auxiliary storage provisions, combined with a hoist system operating to carry the articles to be stored into the storage levels.

Figs. 6 and 7 show the cradle of peculiar form which I use in connection with the hoist. The cradle H is constituted of a rectangular rear frame h , braced diagonally as shown in Fig. 6, with arms h^1 extending horizontally from the top member thereof. Fingers h^2 extend from the bottom of the frame in parallelism with the arms h^1 , and are of a length at least equal to the width of the frames of the stack to be received by the cradle. Viewed in plan, the cradle has four sides, approximately equal in length. A bar h^3 , extending between the free ends of the arms h^1 , and parallel with the top member of the rear frame h , contributes to the rigidity of the structure. The relative

location of the said bar h^3 is indicated by dotted lines in Fig. 7. At each of the four upper corners of the cradle a guiding pulley h^4 is mounted, and about each pulley a cable h^5 , fastened to the hoist at h^6 and extending diagonally to the pulley as indicated in Fig. 6, is passed. From the pulley h^4 , the cable leads to a winding drum on the hoist. This arrangement of the cables is such as to maintain the cradle in a state of equilibrium, and insure its passage with the load into the storage level without lateral vibration or contact with the stringers during such passage. All of the cables are under equal tension and the take-up of the winding drums is synchronous. The various movements of the cradle in taking up a load and depositing the same in the selected place for storage, have already been described.

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

1. A storage building, the interior of which is provided with rows of columns which form storage aisles open from bottom to top, and a plurality of longitudinal stringers supported by the columns, and subdividing the aisle into a series of superposed storage levels, combined with a hoist to carry a stack of automobile frames into the aisle, and deposit the stack on the stringers at the storage level by bridging the aisle.

2. In a storage building, a skeleton frame work composed of columns which form open storage aisles, and a plurality of longitudinal stringers which subdivide the aisles into a series of superposed storage levels, combined with a traveling hoist supported by the columns over the aisles and adapted to carry articles to the desired level and place for storage on such level.

3. In a storage building, the combination of a skeleton frame work composed of rows of vertical columns forming storage aisles open from bottom to top and a plurality of stringers supported by the columns for subdividing the aisles into a series of storage levels, with an overhead railway, the track of which is arranged centrally with respect to the aisles, and a hoist traveling on the railway to carry articles to the desired level and place for storage on such level.

4. A storage building containing a skeleton frame-work composed of a series of vertical columns arranged in rows to form storage aisles open from bottom to top, stringers supported by the said columns at different levels, and a traveling hoist arranged at the top of the frame-work, and adapted to carry stacks of automobile frames to the different storage levels and deposit such stacks on the stringers by bridging the aisle.

5. A storage building containing a skeleton framework composed of rows of columns dividing the space into open storage aisles, a plurality of stringers supported by the col-

umns and dividing the aisles into superposed storage levels, and a traveling hoist adapted to carry a stack of automobile frames to any storage level and deposit the stack thereon by bridging the space between the stringers at each side of the aisle.

6. A storage building having rows of columns therein forming storage aisles, cross beams connecting the columns and dividing the aisles into lower and upper storage spaces, stringers supported by the columns above the cross beams and dividing the upper storage space of the aisles into a series of superposed storage levels, and a traveling hoist system to carry a stack of automobile frames to any storage level and deposit such stack by bridging the open space between the stringers at such level.

7. A storage building having rows of columns therein forming storage aisles, cross beams connecting the columns to divide the aisles into lower and upper storage spaces, a low-level hoist system supported by the said cross beams, longitudinal stringers supported by the columns and dividing the upper storage space into superposed storage levels, and a high-level hoist system to carry a load to any storage level and deposit such load at the selected level by bridging the space between the stringers at each side of the aisle.

8. A storage building having rows of columns which separate the interior into open storage aisles, stringers supported by the columns and dividing the aisles into superposed storage levels, a hoist system provided with a pendent cradle open at the front and at both ends for the lateral reception of a load, the ends of which project beyond the cradle, and to convey such load into the desired storage level and deposit it upon the stringers by bridging the space between the same.

9. In a storage building, a hoist provided with a pendent cradle, which is open at its front side and at both ends, for the lateral reception of a stack of automobile frames of a length exceeding that of the cradle, in combination with a skeleton frame-work composed of rows of columns forming storage aisles, and stringers supported by the columns and dividing the aisle into a series of superposed storage levels, whereby the cradle may enter the storage level and deposit its load by engaging the projecting frames with the stringers.

10. In a storage building, a frame work forming the walls of and dividing the interior of the building into storage aisles, stringers supported by the said dividing walls and sub-dividing the aisles into a series of superposed storage levels, in combination with means to carry a load into a storage level and deposit the same therein by bridging the space between opposite stringers and

free from engagement with the said dividing walls.

11. A storage building the interior of which is divided by parallel walls into storage levels open from bottom to top, longitudinal stringers supported by the said walls in opposed relation and sub-dividing each aisle into a series of storage levels, in combination with a traveling hoist supporting a cradle adapted to enter a storage level and

deposit its load therein by bridging the space between opposed stringers.

In testimony whereof I have signed my name at Milwaukee, this 4th day of February, 1920.

E. W. BURGESS.

Witnesses:

W. F. WOOLARD,

C. THEO. OSTERBERG.