

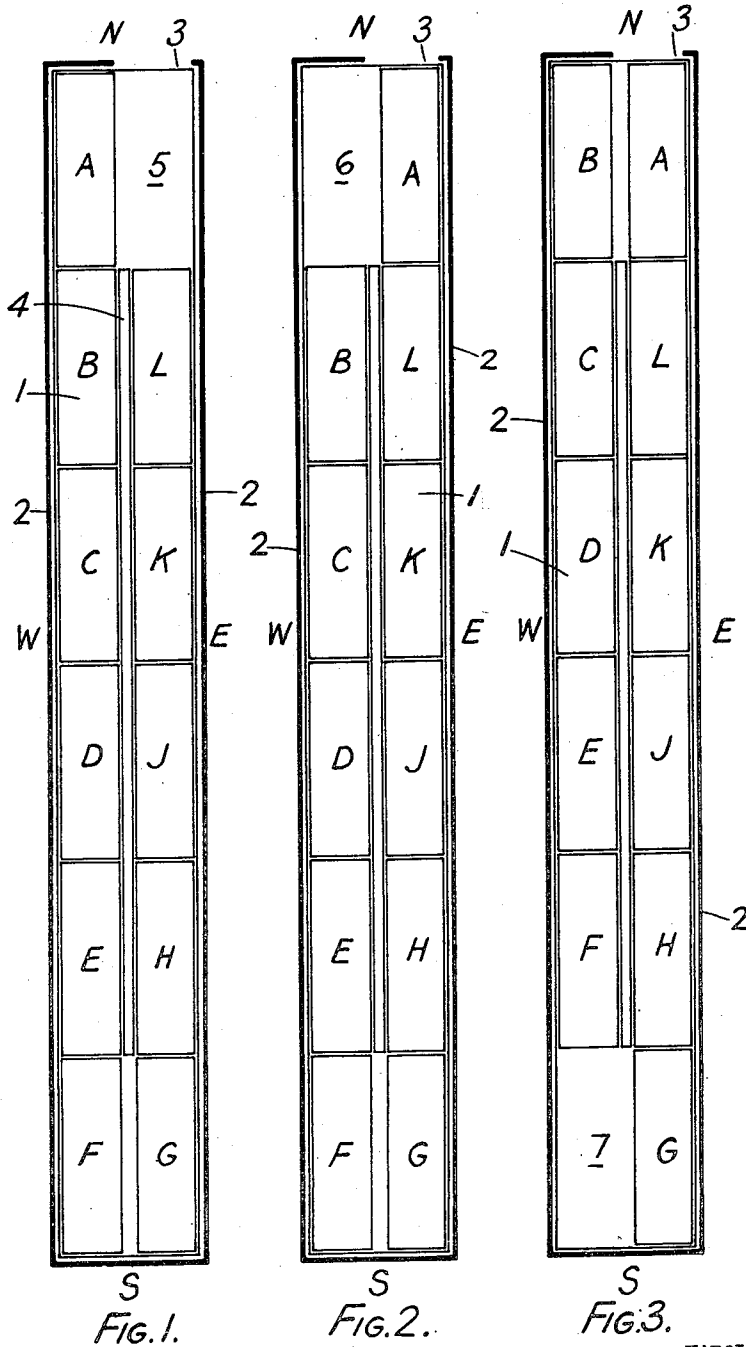
May 21, 1940.

H. AUGER ET AL
GARAGE OR CAR PARK

2,201,939

Filed Sept. 17, 1938

7 Sheets-Sheet 1



INVENTORS
HAROLD AUGER
WARD E. PEARSON
BY *Norman & Bateman*
ATTORNEYS

May 21, 1940.

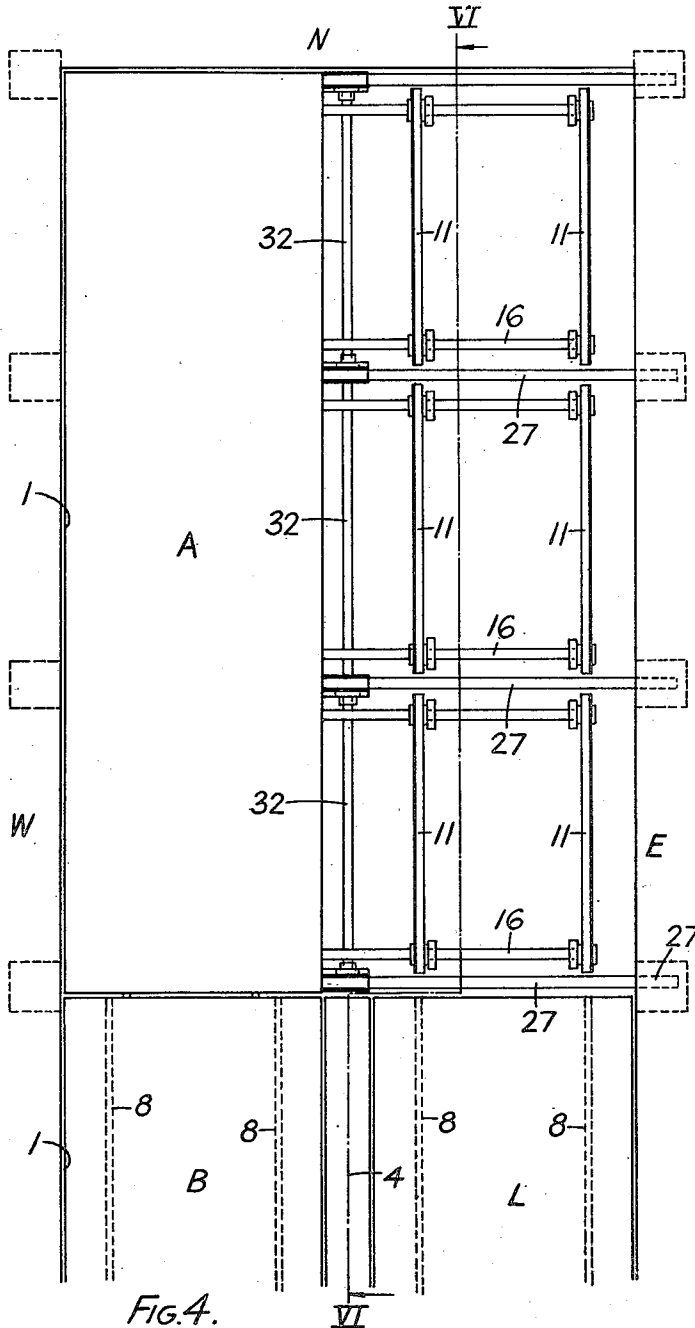
H. AUGER ET AL

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GARAGE OR CAR PARK

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INVENTORS

HAROLD AUGER
WARD E. PEARSON

BY *Norris & Bateman*
ATTORNEYS

May 21, 1940.

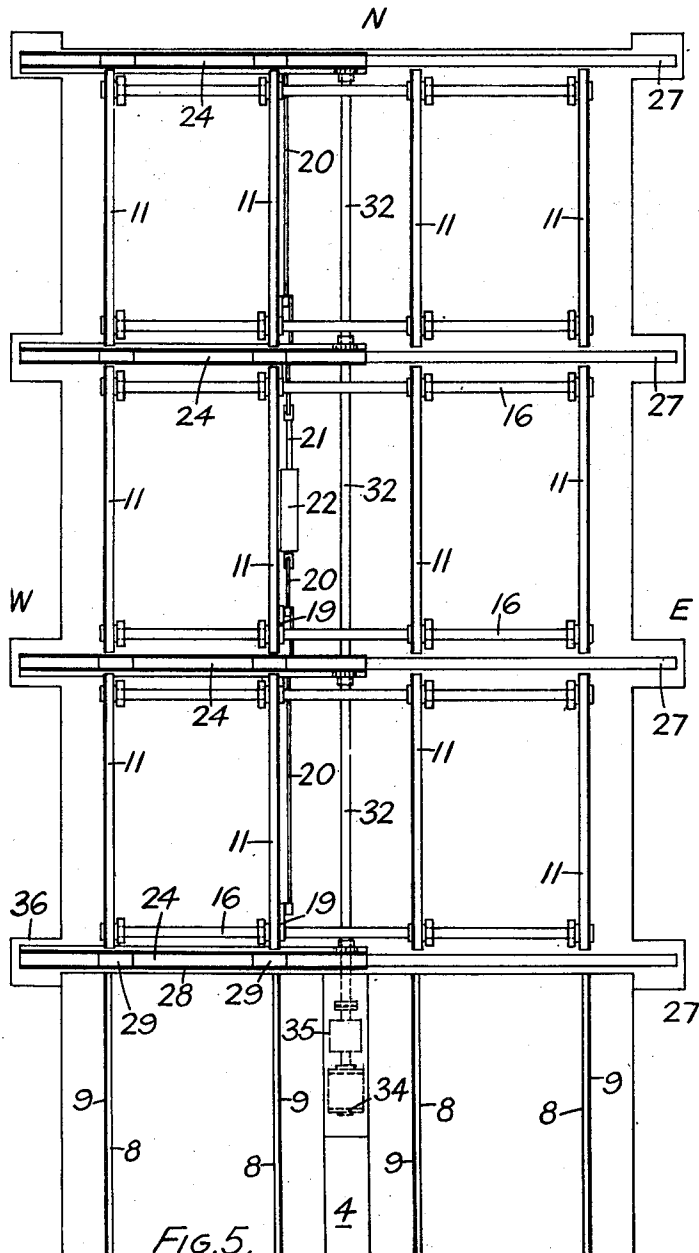
H. AUGER ET AL

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7 Sheets-Sheet 3



INVENTORS

HAROLD AUGER
WARD E. PEARSON

BY *Norris & Bateman*
ATTORNEYS

May 21, 1940.

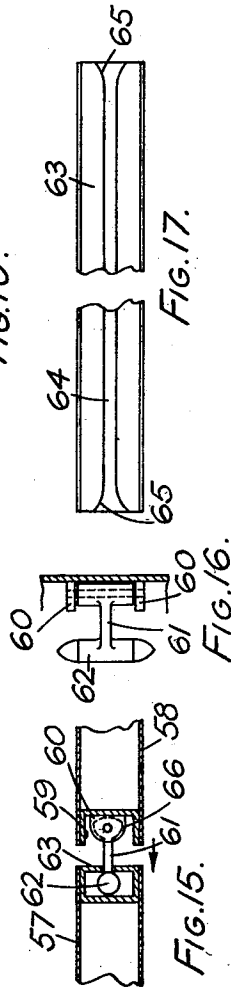
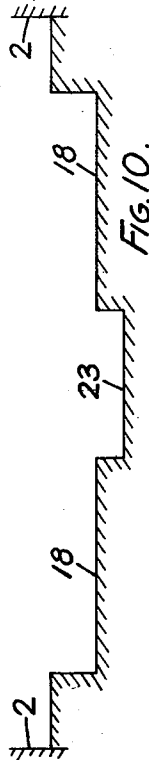
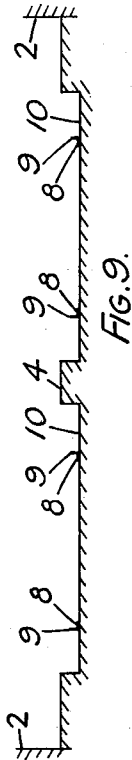
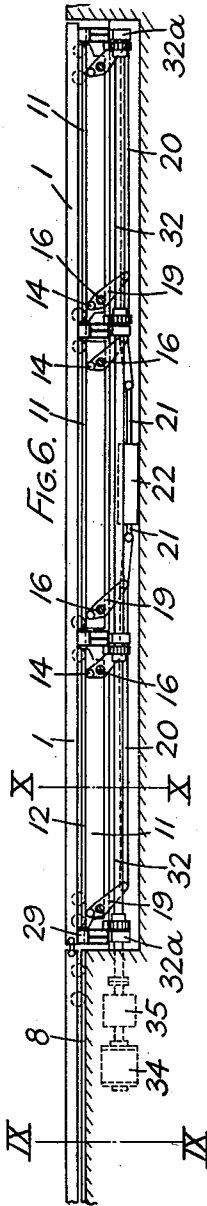
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7 Sheets-Sheet 4



INVENTORS
HAROLD AUGER
WARD E. PEARSON
BY *Norris & Bateman*
ATTORNEYS

May 21, 1940.

H. AUGER ET AL

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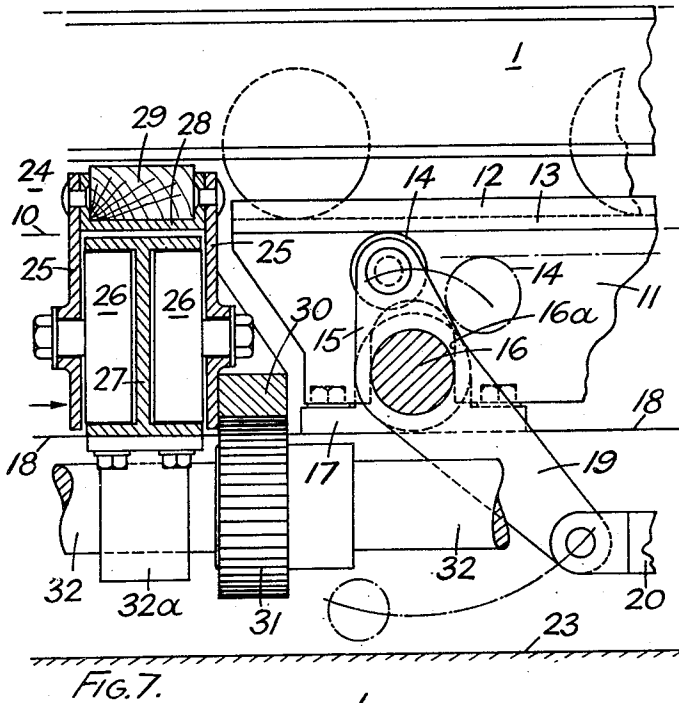


FIG. 7.

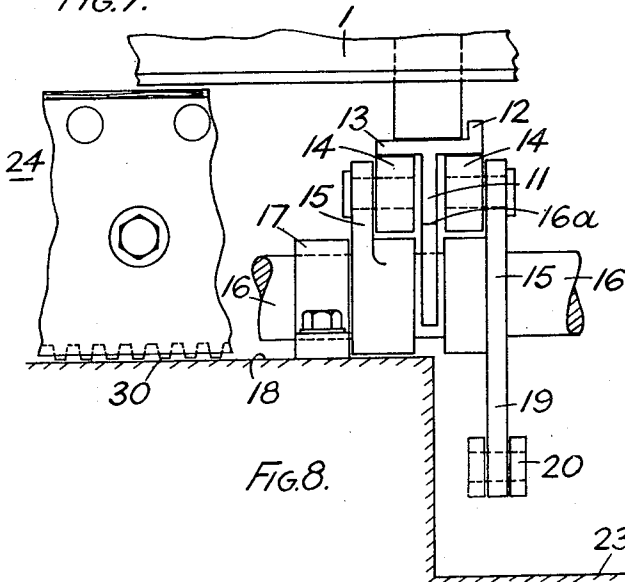


FIG. 8.

INVENTORS

HAROLD AUGER
WARD E. PEARSON

BY *Norris & Bateman*
ATTORNEYS

May 21, 1940.

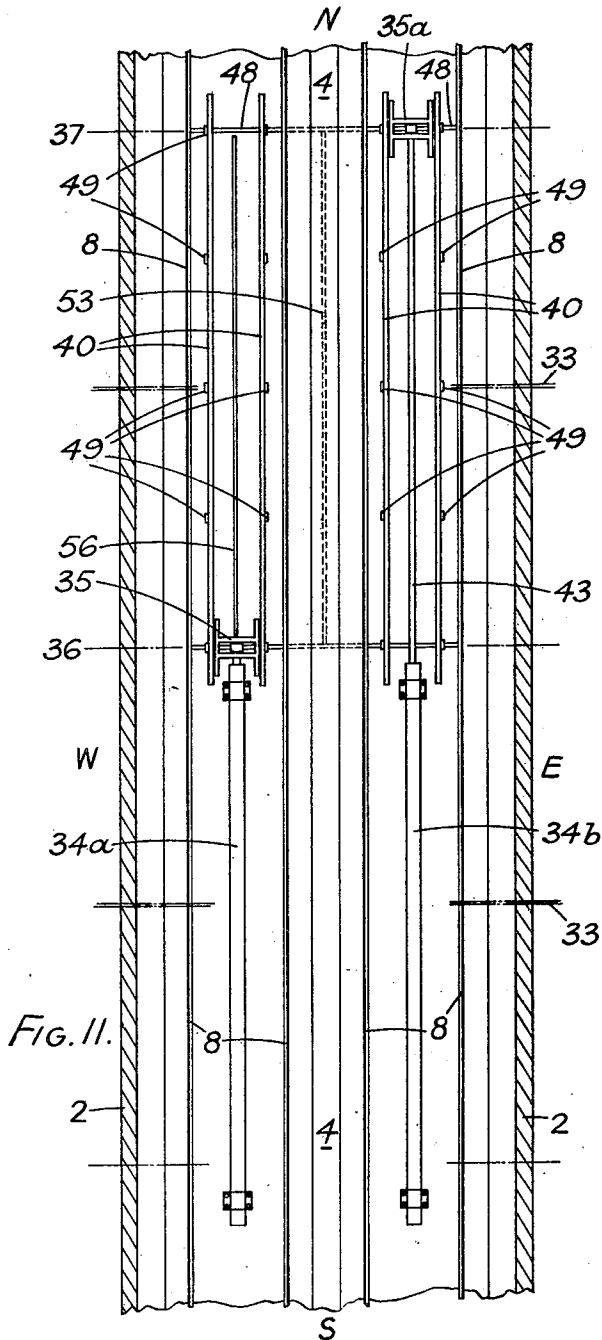
H. AUGER ET AL

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INVENTORS

HAROLD AUGER
WARD E. PEARSON

BY *Norris & Bateman*
ATTORNEYS

May 21, 1940.

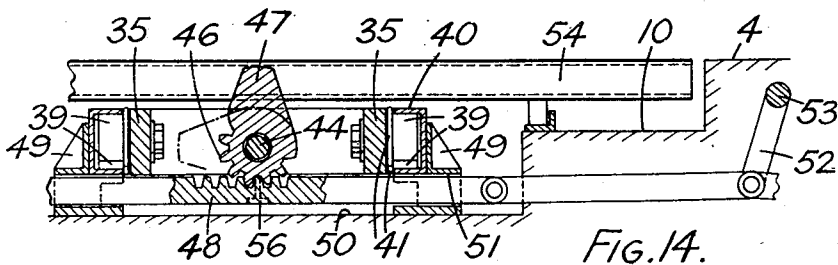
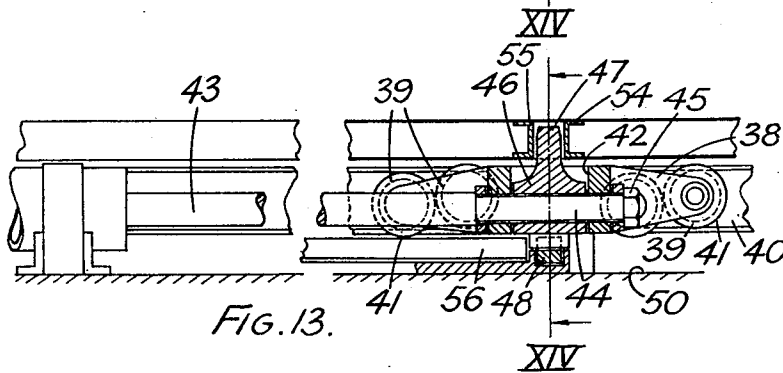
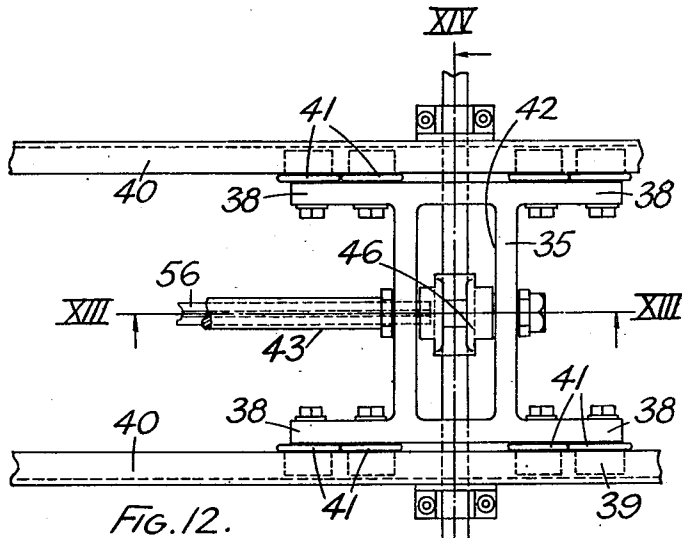
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GARAGE OR CAR PARK

Filed Sept. 17, 1938

7 Sheets-Sheet 7



INVENTORS

HAROLD AUGER
WARD E. PEARSON

BY *Norris & Bateman*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,201,939

GARAGE OR CAR PARK

Harold Auger, Burnham, and Ward Edgerly
Pearson, London, England; Natalie Pearson
Nicholson, executrix or administratrix of Ward
Edgerly Pearson, deceased

Application September 17, 1938, Serial No. 230,488
In Great Britain September 25, 1937

5 Claims. (Cl. 214-16.1)

This invention relates to garages or car parks in which cars are arranged to be moved from place to place in the park by mechanical means which may, however, be hydraulically or electrically actuated. Such a car park is conveniently termed, and will be hereinafter referred to, as a mechanised car park. The object of the present invention is to construct an improved mechanised car park on a single floor or level with one or a number of units, each unit comprising at least two ranks of aligned platform sections, in which the space per unit unoccupied by cars when the park is full is equivalent to the space occupied by a single car or the space occupied by two cars. Nearly the whole space of a unit, and consequently of the part, will thus be occupied by cars, the ratio of the space occupied to that unoccupied being a maximum. Entry to and exit from a unit is at one end or both ends of one or more of the ranks, and the approach or exit roads which are outside the boundary of the park need only be the width of a single car of the largest dimensions intended to be accommodated in the park.

In the accompanying drawings is illustrated an embodiment of the invention showing how it may be carried out in practice.

Fig. 1 is a plan view of a car park comprising a single unit with space for twelve platform sections, each of which is capable of supporting a car and one space being shown vacant.

Fig. 2 is a similar view showing one of the platform sections in a different relative position to the remaining platform sections.

Fig. 3 is a similar view showing certain of the platform sections occupying different positions relative to that shown in either Fig. 1 or Fig. 2.

Fig. 4 is a view similar to the upper part of Fig. 1, drawn to an enlarged scale, and

Fig. 5 is a similar view in which, however, the platform sections have been removed.

Fig. 6 is a section on the line VI—VI, Fig. 4, looking in the direction of the arrows.

Fig. 7 is a portion of Fig. 6 drawn to an enlarged scale so as more clearly to illustrate the details of the mechanism, and

Fig. 8 is an end view of the mechanism shown in Fig. 7 looking in the direction of the arrow in that figure.

Fig. 9 is a sectional view on the line IX—IX, Fig. 6, showing the profile of the permanent floor of a unit, the platform sections and the mechanism being removed, and

Fig. 10 is a similar view on the line X—X, Fig. 6.

Fig. 11 is a portion of a plan view drawn to a scale which is intermediate between that of Fig. 1 and that of Fig. 4.

Fig. 12 is a plan view of detail drawn to a much larger scale.

Fig. 13 is a section taken on the line XIII—XIII, Fig. 12, looking in the direction of the arrows, and

Fig. 14 is a section on the line XIV—XIV, Figs. 12 and 13, looking in the direction of the arrows.

Fig. 15 is a fragmentary longitudinal sectional view showing the end beams of two adjacent platform sections,

Fig. 16 is a fragmentary plan view of the same, parts being removed, and

Fig. 17 is an end view of the left-hand platform section of Fig. 15, looking in the direction of the arrow in that figure.

Referring now to Fig. 1, the unit comprises two parallel ranks of platform sections indicated by the general reference numeral 1, the several sections being distinguished by the letters A, B, C, D, E, F, G, H, J, K, L. For convenience of description the ranks are indicated as being arranged to run in the north and south direction, as shown by the letters N, S, E, W. In the case of the park consisting of a single such unit it will be surrounded by an enclosing wall or boundary indicated by the thick line 2. An entrance or doorway into the park is indicated by a gap in the boundary at 3. The ranks are divided by a central portion of the floor indicated at 4 which is conveniently referred to as the central curb, and it will be observed that said curb extends between the two ranks of platform sections, but only as far as the end of the last two platform sections but one. It will further be observed that a space marked 5 at the end of one of the ranks opposite to the door 3 is vacant, having no platform section therein.

Fig. 2 is a view similar to Fig. 1 except that the platform section A has been moved into the vacant space 5, thus leaving vacant the space 6 which is previously occupied.

Fig. 3 is a view similar to Figs. 1 and 2, but the west rank of platform sections numbered B to F have been moved so that B occupies the vacane space 6 and a vacant space 7 is left at the other end of the rank. If the cycle of operations is continued platform section G will be moved into the space 7, thus leaving a vacant space, which it had previously occupied and permitting the east rank of platform sections A, L, K, J, H to be moved towards the south whereby a vacant space will be left at the north end oppo-

site the entrance 3 exactly as shown in Fig. 1, except that the platform section immediately to the west of the vacant space is B instead of being A. The platform section B can now be moved into the vacant space marked 5 in Fig. 1 so that it occupies a position opposite the entrance exactly as platform section A does in Fig. 2. It will be clear without further description that by a repetition of the series of movements of the platform sections hereinabove described any particular platform section can be brought opposite the entrance 3 and is therefore in position, either to receive or to deliver a car to the outside through said entrance. The cycle of movements as above described is equivalent to a right-hand rotation of the platform sections in the unit. By reversal of the movements, however, of the various sections a left-hand rotation may be obtained, one or other of these rotations being employed according to the position of the platform section which it is desired should be brought opposite the entrance 3, that is to say should occupy the position of the section A in Fig. 2 or Fig. 3. To permit the entrance of a car to the part a platform section not occupied by a car must obviously be brought opposite the opening 3 as indicated in Fig. 2 or Fig. 3.

The platform sections consist of flat topped trucks mounted on wheels, preferably eight wheels being provided on each side of the truck, said wheels running on parallel rails extending from north to south in each rank. The trucks may be constructed of four beams of channel section united to form a frame and strengthened with cross and bracing members, the top of the truck being formed by a plating attached to the various beams and members. The rails 8 (Figs. 4 and 5) which may be of L-section with an upstanding flange 9, forming a guide for the wheels, are secured to the floor of the park which is at a level below that of the top of the curb 4 such that the upper surfaces of the trucks forming the platform sections will be approximately at the level of the surface of the curb. The levels of the curb and the part of the floor with the rails are shown in Fig. 9. It will be convenient to refer to the surface of the curb 4 as being the "ground-level", whereas the level indicated at 10 on which the rails are laid may be indicated as "sub-level 10." The sunk portion at sub-level 10 will be a little wider than the width of a platform section. There may be a curb of suitable width the upper surface of which is at ground level extending round the unit inside the boundary as indicated in Figs. 1 to 3 and Figs. 9 and 10.

The mechanism for moving the various platform sections, which, by reason of the very small scale of Figs. 1, 2 and 3, is omitted from these figures, will now be described.

Referring particularly to Figs. 4 and 5, the rails 8 are shown in full lines in Fig. 5 and in dotted lines in Fig. 4. The scale of the figures is still so small that the upstanding flanges 9 are only shown by thick lines in Fig. 5. As has already been stated, the rails do not extend to the end of the unit but stop short at a distance therefrom equal to the length of a platform section. They are continued in the end spaces by rails 11, each of which is, however, formed in three sections arranged end to end with gaps between the ends of the sections.

Referring now in addition to Figs. 6, 7 and 8, the rails 11, as will be seen from Fig. 8, are of mainly T-shaped cross-section with an upstand-

ing flange 12. The supporting wheels of the platform section 1 run on the horizontal part 13 of the T-section which may be referred to as the table 13, and the under surfaces of the table on each side of the downwardly extending web of the rail are supported by rollers 14 carried in the ends of crank arms or cams 15 which are themselves secured to cross shafts 16 supported in bearings 17 which are secured to the floor. The floor level at the place where the bearings are located is lower than sub-level 10, which is marked 10 in Fig. 9 and is indicated at 18 in Fig. 10, this being conveniently referred to as sub-level 18. The ground level is shown on each side of the sub-level 18 in Fig. 10. As hereinbefore mentioned the rails 11 are formed in three sections spaced apart end to end, and, as seen from Fig. 7, their downwardly depending webs are provided with slots 16a through which the cross shafts 16 pass. The cross shafts carrying the cranks 15 on which the rails 11 are supported can be rotated in their bearings 17 by means of arms 19 which, as indicated in Fig. 8, may conveniently be extensions of the cranks 15. Each shaft is provided with one such arm as indicated in Fig. 5 and the lower ends of said arms are connected by links and connecting rods 20 to the ends of the piston rods 21 of a hydraulic cylinder 22 secured to the bottom of a trough in the floor, which is at a lower level than sub-level 18 and is indicated at 23 in Figs. 7, 8 and 10. As shown in Fig. 6 there are six cross shafts so that the rail sections 11 are supported by a roller 14 near each end.

In the position of the connecting rods 20 and arms 19 shown in Figs. 6 and 7 of the drawings the position of the rollers 14 is just over the top, i. e., to the left, of the vertical centre line through the axis of the cross shaft 16, and the rails 11 are therefore in nearly their uppermost position. If the piston is moved in the hydraulic cylinder by admission of fluid pressure therein to cause the connecting rods 20 to move to the left in Figs. 6 and 7 the cross shafts 16 will be rotated so that the rollers will move in a clockwise direction over their dead centre to the position marked in broken lines and the table of the rail 11, also shown in broken lines, will therefore be lowered so as to lower the platform section, the wheels of which rest on the rails. The slots 16a are sufficiently deep to allow the rails to drop. Admission of fluid under pressure to the hydraulic cylinder 22 so as to move the piston in the other direction will cause the rods to move to the right in Fig. 6 to occupy the position shown in that figure and the cranks and rollers 14 will again be raised so as to raise the rails 11 to their former level. It will be understood that all the shafts 16 will be operated simultaneously by a single hydraulic cylinder so that the rails 11 at the ends of both the east and west ranks will be raised and lowered at the same time.

At the ends of the rails 11 in the gaps between said rails and the rails 8, and between the sections of said rails themselves, are provided transverse carriage members or cross bearers 24. These are, as shown in Fig. 5, somewhat longer than the width of the platform sections. They are formed, as clearly seen from Fig. 7, of a pair of parallel longitudinal plates 25 spaced apart and carrying rollers 26 which run between the top and bottom flanges of an I-beam 27 which is secured on sub-level 18. The plates 25 are connected by a beam of channel section 28 in which a piece of wood or other suitable mate-

rial 29 is inserted and the channel beam and insert are provided with gaps spaced apart a distance equal to the gauge of the rails 8 and 11 so as to permit the wheels of a platform section to pass from the fixed rails 8 on to the movable rails 11 or vice versa. One of each of a pair of plates 25 also has secured to it a rack 30 with which a pinion 31 carried on a longitudinal shaft 32 is adapted to engage. The longitudinal shaft 32 is carried in bearings 32a which are advantageously secured to the bottoms of the I-beams 27. Rotation of the shaft 32 is accomplished by means of a motor such as an electric motor indicated at 34 with, if necessary, a reducing gear 35. It is clear that by rotation of the motor the cross bearers 24 will be caused to traverse from side to side from one rank to the other of the unit. As the rack and cross bearers are wider than the platform sections, pockets 36 are formed at the sides of the ranks extending the sub-level 18 so as to accommodate the ends of the I-beams and cross bearers.

The operation of the apparatus above described to cause a platform section to move from the end of one rank into a vacant space in the next adjacent rank is as follows. Assuming that the platform section A is opposite a vacant space in the next rank as shown in Fig. 1 and Fig. 4. The platform section will be supported with its wheels on the rails 11 which are in their upper position as shown in Figs. 6, 7 and 8. If now fluid under pressure be admitted to the hydraulic cylinder 22 to cause the piston rods 21 and connecting rods 20 to move to the left in Fig. 6 the rails 11 will be lowered away from the wheels of the platform sections and the platform sections will therefore drop slightly so as to rest on the blocks 29 of the cross bearers 24 with their wheels above the flanges of the rails 11. The motor 34 can now be permitted to operate to rotate the shaft 32 and pinions 31 in the appropriate direction by means of the rack 30 so as to move the cross bearers 24 to the right in Fig. 5 and thereby move the entire platform section from the position which it occupied in the west rank to the vacant space in the east rank, that is to say the position shown in Fig. 2. The motor 34 will now be stopped, the pressure fluid supply to the hydraulic cylinder 22 will be changed so that the piston rods 21 and connecting rods 20 will be moved to the right so as to reoccupy the position shown in Figs. 6, 7, and 8. This results in raising the rails 11, and with them the platform section, to their former level to support the platform section above and clear of the cross bearers 24.

Referring now to Fig. 11, the side boundaries of the unit are indicated at 2 and the curb at 4 and the rails at 8. The scale of this figure, it will be observed, is about intermediate between that of Fig. 1 and that of Fig. 4. The platform sections are removed, but the location of a platform section when at rest is between the lines 33, 33, and the central portion of the figure is at a distance of at least the length of one platform section from the end space in the unit. For example the central portion of the figure might be considered to correspond with the space occupied by the platform section marked C in Fig. 1, while the right-hand portion would represent a part of the space occupied by the section K in Fig. 1. The figure shows the mechanism for moving the platform sections longitudinally on the rails for which purpose a hydraulic cylinder 34a, 34b is provided in each rank having a piston the end of the rod of which terminates in a crosshead 35. This cross-

head, when the piston is at the lower limit of its travel, as shown in the left hand portion of the figure, is located on a line 36 which would be coincident with the centre line of a platform section occupying the central space in Fig. 11 of the drawings. In the right hand portion of Fig. 11 the piston of the hydraulic cylinder 34b is assumed to be at the upper extremity of its travel and the crosshead 35a is located on the centre line 37 of the next platform section to the right of the middle one shown in the figure. As will be seen from the enlarged detail views Figs. 12, 13, 14, the crosshead 35 is provided with projecting wings 38, two on each side, said wings carrying anti-friction wheels 39 the treads of which are adapted to run on the inner surfaces of the flanges of guide rails 40. The anti-friction wheels 39 are provided with flanges 41, and it will be observed that of the four guide wheels at one side of the crosshead two are adapted to run on the under side of the upper flange of the guide rails while the other two are adapted to run on the upper side of the lower flange of the guide rails 40. The crosshead is thus constrained to move in straight line parallel with the axis of the hydraulic cylinder.

As clearly seen in Fig. 12 the central portion of the crosshead is formed of a box-like structure having a rectangular opening 42 through which the piston rod 43, reduced in diameter at this point as shown at 44 in Figs. 13 and 14, is passed, being secured to the crosshead in the usual way by a nut 45. Within the opening 42 and adapted to rotate on the reduced portion 44 of the piston rod is a toothed sector 46 provided with a projection 47. The teeth of the sector 46 are adapted to engage with the teeth of a rack 48 which can be reciprocated in a direction transverse to the axis of the piston rod and thereby rotate the toothed sector 46 on the reduced portion 44 of the piston rod. The length of the path of the rack 48 is such as to cause the sector to rotate through an angle of 90°, as clearly shown in Fig. 14. The guide rails are supported on chairs 49 secured to the bottom of a recessed portion of the floor which is lower than sub-level 10 on which rails 8 are supported, this level being indicated at 50 in Figs. 13 and 14. Two racks 48 are provided in each rank to engage with the toothed sectors on the piston rods when these are located at the respective limits of the travel of the crosshead, that is to say on the lines 36 and 37 in Fig. 11. The chairs for supporting the guide rails on these centre lines will each be provided with an orifice indicated at 51 in Fig. 14 within which orifices the racks are reciprocated by means of links 52 carried on a longitudinal shaft 53. Said longitudinal shaft can be located within the central curb 4 in suitable bearings and rotated by any suitable device. The platform sections, which are not shown in Fig. 11, and of which a portion only is indicated in Figs. 13 and 14, are constructed of a framework strengthened by cross members. The central cross member of each platform section, which is indicated at 54 in Fig. 13, is provided with a transverse slot 55 into which the projection 47 of the toothed sector 46 will enter when said sector is moved by the rack to the position shown in Fig. 13 and in full lines in Fig. 14. Movement of the rack to the right in Fig. 14 will result in rotation of the toothed sector 46 to withdraw the projection 47 from the slot 55 and cause it to assume the position shown in broken lines in Fig. 14.

The movements of the two racks 48, which are connected through the shaft 53, will occur simultaneously, but the arrangements are such

that when one rack is moved to cause the toothed sector with which it is in engagement to move into position to engage with a platform section the movement of the other rack is such as to withdraw the projection of the toothed sector from engagement with the platform section above it.

When the crosshead 35 is in the position shown in the left hand part of Fig. 11 and the rack is moved so as to cause the projection 47 at that point to engage in the slot in the platform section a movement of the piston in the hydraulic cylinder 34 will cause the crosshead to move upwards and will therefore move the platform section immediately above from the central space of Fig. 11 to the next space up, this being the limit of travel of the crosshead, which is, of course, fixed by the length of the hydraulic cylinder 34a. When the crosshead is at the upper end of its travel, as shown at 35a in the right hand part of Fig. 11, and the rack 48 is moved so as to cause the projection 47 of the toothed sector 46 to engage with the platform section located immediately above the crosshead, then admission of fluid under pressure to the hydraulic cylinder 34a will cause the piston to move downwards and the platform section will be moved from its position at the top of Fig. 11 to the central position of that figure.

As the crosshead is moved longitudinally along the rank the toothed sector 46 will be withdrawn from engagement with the rack 48, it is necessary, therefore, to maintain the toothed sector in the same relative position, that is with its projection 47 in engagement with or disengaged from the platform section during such longitudinal movement. For this purpose a guide 56 is provided extending between the two racks 48 at the extremities of the travel of the crosshead. As shown the guide is in the form of a rail of T section suitably supported on the sub-level 50, the upstanding web of which engages in the space between two teeth of the sector. The guide is seen in the left hand part of Fig. 11 because the crosshead is then at the lower extremity of its travel. When, however, the crosshead is at the upper extremity of its travel, as shown at the right of Fig. 11, the piston rod 43 obscures the guide and prevents it being seen in the plan.

By the means above described one platform section may be moved longitudinally in a rank. The other platform sections in the same rank will also be caused to move by being pushed or being pulled simultaneously by the moving platform section. The sections must therefore be connected together by a coupling, a suitable form of which is illustrated in Figs. 15, 16 and 17, which will now be described.

The right-hand platform section in Fig. 15, marked 58 has its end beam of channel section 59, the flanges of which are outwardly directed. Upon the web of said channel section brackets 60 are provided between which are supported coupling members. These comprise respectively a shank 61 and a head 62. As shown in Fig. 16 the head has a main cylindrical body portion terminated by pointed ends, making the whole somewhat of a torpedo shape. The end of the adjacent platform section 57 is also formed of a beam of channel section, but the flanges on their outside edges are provided with upward and downward extensions, 63 separated by a slot 64, clearly shown in Fig. 17, which is of a width approximately equal to the vertical thickness of the coupling shank 61. The slot 64 has flared

ends 65. The coupling is supported by a barrel portion upon a pivot pin between the brackets 60 so as to permit a vertical movement of the head which is, however, limited in amount by providing the barrel portion of the coupling with projections 66 which engage with the web of the channel member 59. Usually two such couplings are provided at one end of each platform section. It will be seen that when two platform sections are coupled together one of them can exert either a pushing or pulling action on the other and cause it to move longitudinally along the rails. When a platform section is being transferred from one rank to another rank as hereinbefore described with reference to Figs. 4 and 5 of the drawings the coupling member on its end or on the adjacent end of the next platform section will move along the slot 64 at the end of the platform section with which it is coupled and after leaving said slot will enter the slot in the end of the platform section in the adjacent rank, the flared ends of the slot 64 and the form of the coupling head as shown at 62 in Figs. 17 and 16 respectively assisting this to occur. When the platform section which is moved has a slotted end beam and not coupling members the same relative movement will occur. In either case the platform section which is moved will be uncoupled from a section in one rank and will be coupled with the next adjacent section in the other rank.

It has already been stated that in the embodiment illustrated the platform sections are composed of trucks supported on eight pairs of wheels. As shown in Fig. 6 these wheels are disposed with two pairs near each end of the truck and two pairs about one-third of the distance from each end. The axes of each of said pairs of wheels are spaced apart such a distance horizontally as will enable the wheels to span the gaps between the ends of the rails 8 and 11 and the gaps between the ends of the rails 11 as clearly indicated in Fig. 6.

In order to effect the movements of the platform sections in the manner hereinbefore described the supply of fluid under pressure to and its exhaust from the hydraulic cylinders 22 at each end of the unit is controlled by suitable valves of any well known kind. The supply of current to the electric motors 34 at each end of the unit must be controlled by suitable switches. The supply of fluid under pressure to and its exhaust from the hydraulic cylinders 34a and 34b, of which there is one in each rank, will also be controlled by suitable valves. The rotation of the shaft 53 to operate the racks 48 in one or other direction may be effected by a suitable hand lever secured on the shaft. The control valves, switches and synchronising shaft may be operated by servo motors instead of manually if desired.

Having described the various devices and apparatus comprised in the mechanised car park a complete cycle of operations will now be explained.

Assuming that the space opposite the opening 3 in the boundary is vacant as indicated at 5 in Fig. 1 of the drawings, in order to admit a car to the park it will be necessary to move an empty platform section into the vacant space. The platform section selected may be either in the east or in the west rank of the unit. Assuming that it is in the west rank the first operation is to move the end platform section of said rank into the vacant space. For this purpose the switch controlling the supply of current to the motor 34 at the north end of the unit will be closed to

cause the motor to rotate a sufficient number of revolutions and in such a direction as to move the cross bearers 21 to a position under the rails 11 of the space from which the platform section is to be moved if said cross bearers are not already in that position. The valves controlling the supply of fluid to the hydraulic cylinder 22 at the north end of the park will then be opened to admit fluid under pressure to the cylinder in such a way as to lower the rails 11 and permit the platform section in the occupied space (for example A in Fig. 1) to rest on the cross bearers 24. The third step is to close the switch controlling the supply of current to the motor 34 so that the motor will be rotated in a direction to move the cross bearers 24 supporting the platform section from the occupied space to the vacant space. The valve controlling the supply of fluid to the hydraulic cylinder 22 will now be operated to admit fluid pressure to said cylinder and cause rotation of shaft 16 to raise the rails 11 to their upper position, thereby lifting the platform section from the cross bearers 24.

In transferring the platform section from one rank to the other the couplings will be disengaged from the section to which said section was previously coupled and will be engaged with the abutting section in the rank to which said section has been moved as hereinbefore described.

In order to effect movement of the platform sections in a rank so that the platform section in a space next to a vacant space at the end of the rank may be caused to occupy said vacant space it will be necessary for the crosshead associated with the hydraulic cylinder appertaining to the rank in which the platform sections are to be moved to occupy its extreme limiting position in the direction opposite to that in which it is desired the movement of platform sections should take place. For example, assuming that there is a vacant space at the upper end of the left hand rank of platform sections in Fig. 11, if the crosshead 35 is not already in the position shown in the drawings but it is at the other end of its travel, it will be necessary to return it to the lower end. This may be effected by first rotating the shaft 53 through its operating lever to cause the rack 48 at the upper end of Fig. 11 to move in such a direction that the projection 47 of the toothed sector will occupy the position shown in broken lines in Fig. 14, that is to say it will not be in engagement with the platform section immediately above it. Fluid under pressure can then be admitted to the hydraulic cylinder 34a to cause the piston and crosshead 35 to move towards the lower end in Fig. 11 until the crosshead occupies the position shown. The shaft 53 will then be rotated to move the rack 48 at the lower end of Fig. 11 in a direction to cause the projection 47 to assume the position shown in full lines in Figs. 13 and 14 and engage with the slot in the platform section immediately above. The hydraulic pressure control valve may now be operated to admit fluid pressure to the cylinder 34a to cause the piston to move in the upward direction and thereby move the crosshead 35, and with it the platform section immediately above to the next space to the right in Fig. 11. In doing so remaining platform sections at the lower end and beyond in Fig. 11 will move with it by reason of the couplings and the platform section immediately in front of it at the upper end of Fig. 11 will be pushed so that the platform section at the extreme upper end will be moved into the vacant space at the end of the rank. It will be

observed that the travel of the crosshead is equal to the length of a platform section and no more.

It will be appreciated that a certain amount of time is required in order to bring a selected car in a unit to a point where it can leave depending on the original location of the car in the unit. If however the number of entrances is increased the time spent in moving the platform sections to the desired point will naturally be reduced.

The hydraulic cylinders 22 for effecting the lowering and raising of the rails 11 and the hydraulic cylinders 34a, 34b for moving the platform sections along the ranks may be controlled by valves operated by suitable control members. Similarly, the motor 34 may be operated by a suitably controlled switch. While in the embodiment of the invention shown in Figs. 1, 2 and 3, there is only one vacant space, it will be obvious that there might be two vacant spaces at opposite corners. In such a case the platform sections could be moved along the two ranks simultaneously but in opposite directions, and this could be effected by mechanically interconnecting the valves operating the hydraulic cylinders 34a, 34b.

Similarly, the switches controlling the motors 34 of the cross bearers at opposite ends of the units could be interlocked so that the cross bearers are moved simultaneously in opposite directions.

The invention is not confined to the specific embodiments herein illustrated and described in detail, but various alterations may be made, and many different devices for moving the platform sections may be designed by skilled engineers which will fall within the scope of the invention and are intended to be included in the appended claims.

We claim:

1. Storage equipment including aligned platform sections for supporting articles to be stored, arranged as a unit in two ranks, which ranks are side-by-side and on the same floor level, power actuated means associated with both ranks for moving all the platform sections in a rank simultaneously along the rank, and apparatus at each end of the ranks for transferring platform sections from an end of a rank to the adjacent end of the other rank, said transferring apparatus each comprising carriage apparatus adapted to support a platform section and movable transversely of the ranks so as to be adapted to transfer platform sections between adjacent ends of the two ranks, means for supporting said end platform sections independently of the carriage, means for effecting relative vertical movement between said supporting means and the associated carriages for loading and unloading said carriages, and power actuated mechanism for effecting said carriage movement, at least one platform section position in the unit being left vacant to permit the platform sections to be circulated around the unit.

2. Storage equipment including aligned platform sections for supporting articles to be stored arranged as a unit in two ranks, which ranks are side-by-side and on the same floor level, power actuated means associated with both ranks for moving all the platform sections in a rank simultaneously along the rank, and apparatus at each end of the ranks for transferring platform sections from an end of a rank to the adjacent end of the other rank, said transferring apparatus each comprising carriage apparatus adapted to support a platform section and movable trans-

versely of the ranks so as to be adapted to transfer platform sections between adjacent ends of the two ranks, means for supporting said end platform sections independently of the carriage, said supporting means being movable vertically whereby a platform section may be loaded on and unloaded from said carriage apparatus, power actuated mechanism for effecting said carriage movement, and means for guiding said carriages during such movement, at least one platform section position in the unit being left vacant to permit of the platform sections being circulated around the unit.

3. Storage equipment comprising a plurality of trucks arranged as a unit in two ranks side-by-side on the same floor level, rails extending along said ranks for supporting said trucks, power actuated means for shifting all the trucks in a rank simultaneously along the rank, and power actuated apparatus at the end of the unit for transferring trucks between adjacent ends of the two ranks, said transferring apparatus each comprising carriage apparatus adapted to support a truck and movable transversely of the ranks so as to be adapted to transfer trucks between adjacent ends of the two ranks, and rail sections in the end truck positions movable vertically so as to provide for loading a truck in an end position in a rank onto the associated carriage apparatus and for unloading a truck from the carriage apparatus into an end rank position, power actuated apparatus for effecting said vertical movement of said rail sections, power actuated apparatus for effecting the transverse carriage movement, and means for guiding said carriage during said movement, at least one truck position in the unit being left vacant to permit circulation of the trucks around the unit.

4. Storage equipment comprising a plurality of platform sections for supporting articles to be stored arranged in two ranks side by side and movable along said ranks, carriage apparatus for transferring platform sections between adjacent ends of the two ranks, means for moving platform sections in the end positions vertically to load and unload the carriage apparatus, couplings between

plings being disconnectable and connectable by relative lateral movement between the platform sections, and means associated with each rank for shifting all the platform sections in a rank through a distance equal to the spacing of the platform sections, said shifting means each comprising a member rotatable about an axis parallel to that of the ranks into a position in which it engages a platform section and into a position in which it is out of engagement with the platform section, means for rotating said members between their operative and inoperative positions at the end positions of their travel, and power actuated means for moving said members longitudinally of the ranks.

5. Storage equipment comprising a plurality of platform sections for supporting articles to be stored, arranged as a unit in two ranks side by side and movable along said ranks, apparatus at both ends of the ranks for transferring platform sections from either end of a rank to the adjacent end of the other rank, said transferring apparatus comprising carriage apparatus movable between positions beneath platform sections located at adjacent ends of the two ranks, supporting means for said end platform sections, power actuated apparatus for moving said supporting means vertically whereby a platform section may be loaded onto and unloaded from said carriage apparatus, means associated with each rank for shifting all the platform sections in a rank through a distance equal to the spacing of the platform sections, said shifting means each comprising a member rotatable about an axis parallel to that of the ranks into positions in which it is respectively in engagement with and out of engagement with said platform section, power actuated means for shifting said members longitudinally of the ranks, and means for rotating said members between their operative and inoperative positions at the end positions of their travel, at least one of the platform section positions in the unit being vacant to permit of circulation of platform sections around the two ranks.

HAROLD AUGER.

WARD EDGERLY PEARSON.