

No. 893,563.

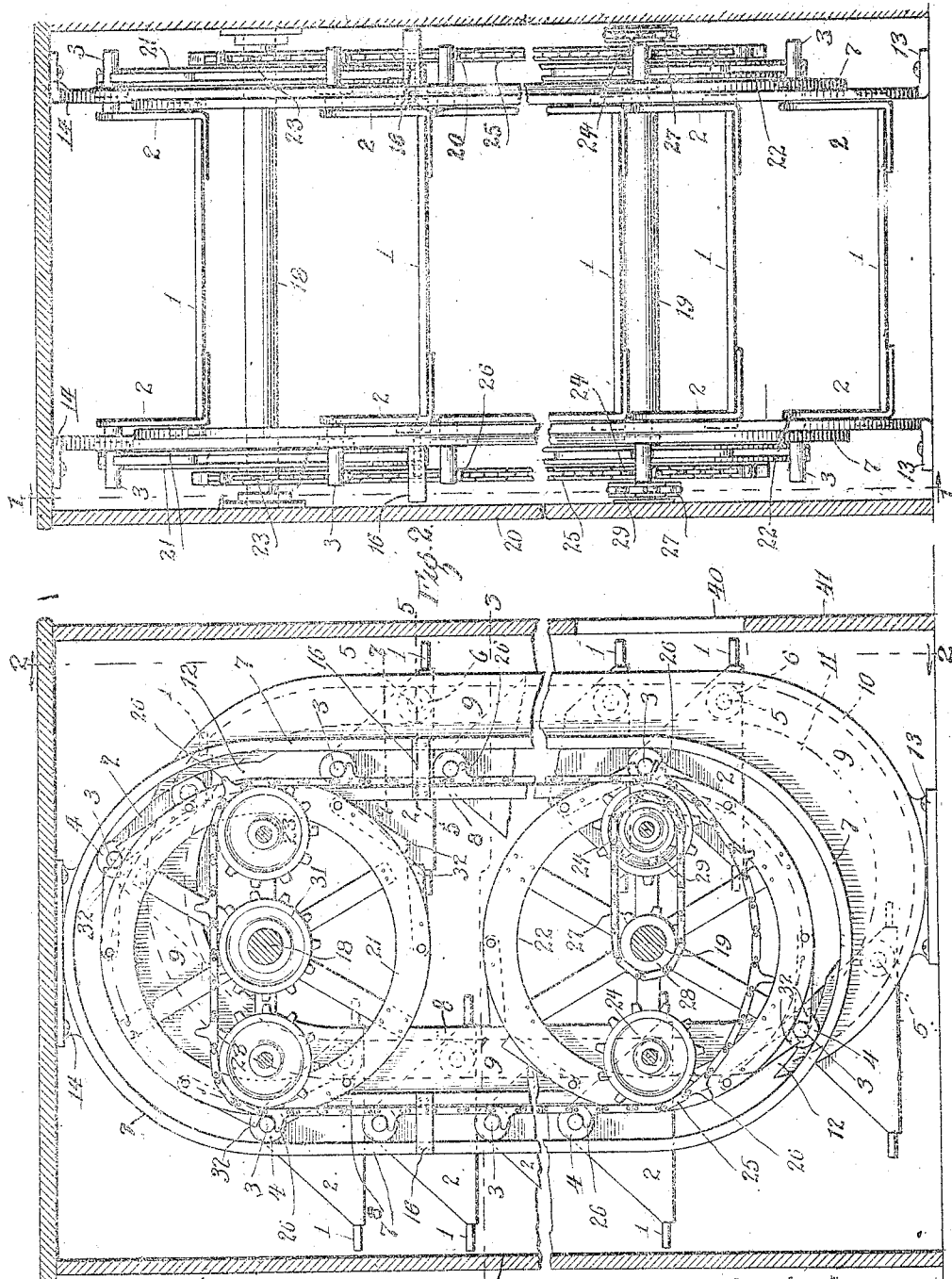
PATENTED JULY 14 1908.

G. R. BASLER.

STORAGE APPARATUS.

APPLICATION FILED DEC. 21, 1907.

2 SHEETS-SHEET 1.



Witnesses:
T. H. Alford.
A. M. Brown

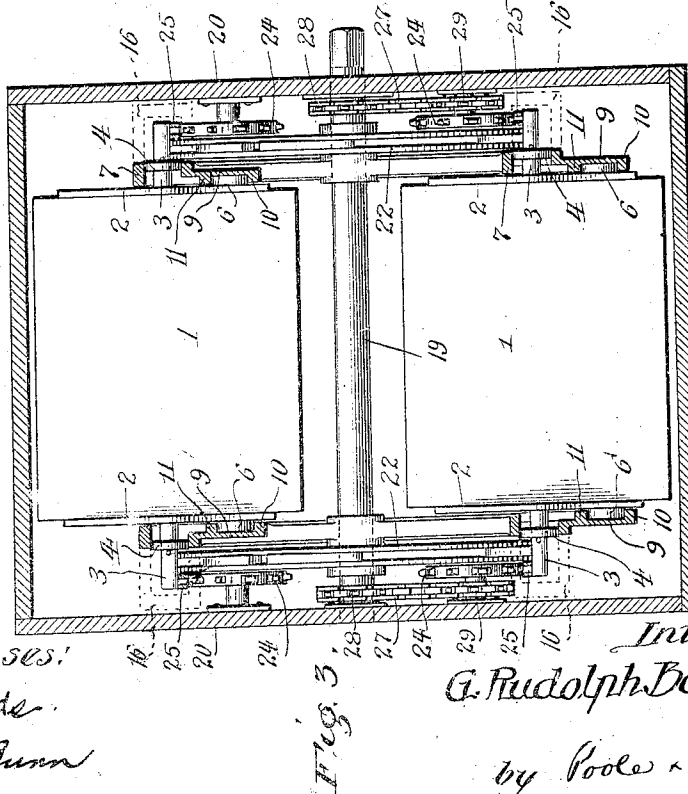
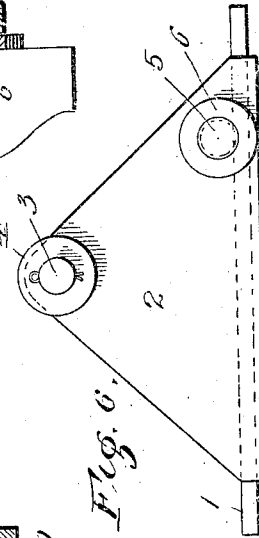
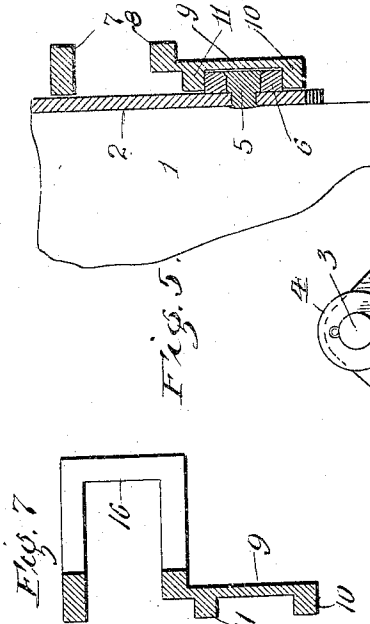
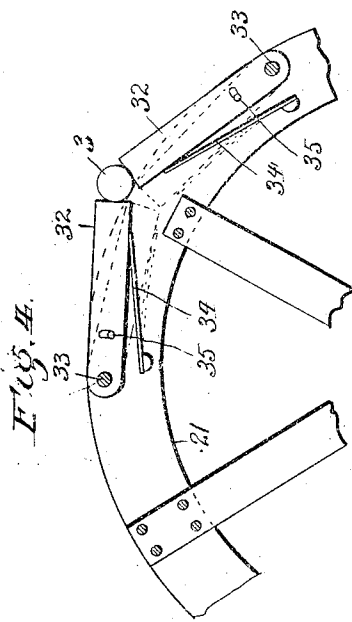
Inventor:
G. Rudolph Basler.
by Poole & Brown
Attys.

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2 SHEETS—SHEET 2.



Witnesses:
T. H. Alfede.
A. M. Bunn

Inventor:
G. Rudolph Basler.

by Poole & Brown
Attys.

UNITED STATES PATENT OFFICE.

GEORGE RUDOLPH BASLER, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS,
OF ONE-HALF TO JENNIE Y. SEELEY, OF CHICAGO, ILLINOIS.

STORAGE APPARATUS.

No. 893,563.

Specification of Letters Patent.

Patented July 14, 1908.

Application filed December 21, 1907. Serial No. 407,550.

To all whom it may concern:

Be it known that I, GEORGE RUDOLPH BASLER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Storage Apparatus, as set forth in my application for United States Letters Patent, Serial No. 407,550, filed in the United States Patent Office December 21, 1907; and I do hereby declare that the specification of said application is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of the said specification.

This invention relates to means for storing articles such as papers, documents or letters in an office, or articles of merchandise in a mercantile establishment, in such manner as to economize floor space while at the same time making the articles readily accessible.

More especially the invention relates to apparatus for the purpose stated embracing a plurality of shelves, receptacles or the like, which are connected with a common supporting means, such as chains or belts and which are arranged in two columns or tiers and have vertical movement in the space allotted to them, in such manner that by the movement of said chains or belts they will be moved together, so that either one of said shelves or receptacles may be brought to a point where the articles may be placed upon or within the same and removed therefrom.

The object of my invention is to provide a construction by which a series of shelves, receptacles or the like are connected with each other and move together as described, and arranged so closely together vertically as to avoid waste or unoccupied space in the apparatus as a whole, while at the same time the shelves or receptacles may be shifted or transferred from the upwardly to the downwardly moving tier of said shelves or receptacles, and vice versa, without the shelves or receptacles interfering with each other at the points of transfer.

My invention embraces, as its main or principal feature, a storage apparatus embracing a plurality of connected shelves, receptacles or the like, arranged in two tiers, together with means for shifting or transferring said shelves, receptacles or the like, from

one tier to the other, or vice versa, adapted to effect vertical separation of the shelves or receptacles at the time of transfer so as to permit the shifting of the said shelves, receptacles or the like from one tier or the other without interference of the same with each other during the shifting movement. The invention also embraces other features of construction in devices of the kind referred to and will be hereinafter pointed out and set forth in the appended claims.

My invention may be better understood by reference to the accompanying drawings, in which,—

Figure 1 is a view in vertical section, taken upon line 1—1 of Fig. 2, of an apparatus embodying my invention. Fig. 2 is a face view of the parts constituting my apparatus, with the housing or inclosure of the apparatus in section, taken upon line 2—2 of Fig. 1. Fig. 3 is a plan section, taken upon line 3—3 of Fig. 1. Fig. 4 is a detail view showing a part of the rim of the upper transfer wheel. Fig. 5 is a detail section taken upon line 5—5 of Fig. 1. Fig. 6 is a detail side elevation of one of the end members of one of the shelves shown in the drawings. Fig. 7 is a detail section taken on the line 7—7 of Fig. 1.

As shown in the drawings, 1, 1 indicate a series of shelves, adapted to receive the articles to be stored, which are arranged in two parallel tiers. Each of said shelves, as illustrated, is provided with two upright end plates 2, 2 which rise from the end margins of the shelves and are preferably made of triangular form. Each of said end plates is provided at its upper margin centrally thereof with an outwardly projecting bearing stud 3 provided with a bearing roller 4. Each end plate 2 is also provided at its lower edge at one side of its center with a guide pin provided with an antifriction roller 6.

7, 7 are guide-bars located at the ends of the shelves and consisting of upright parallel parts and semi-circular upper and lower portions connecting the upright parts with each other.

8, 8 indicate guide-bars located inside of and parallel with the vertical portions of the guide-bars 7, 7. The guide-bars 7, 7 and 8, 8 are spaced at such distance apart as to form between them guide-slots to receive the rollers 4, 4 on the ends of the shelves. The supporting studs 3, 3 on said shelves extend

through the guide-slots between the guide-bars 7 and 8 and project outside of the planes of said guide-bars.

9, 9 indicate vertically arranged guide-plates arranged parallel with the guide-bars 7, 7 and 8, 8 and adjacent to outer faces of the end plates 2, 2 of the shelves. Said guide-plates 9, 9 are provided each with two parallel inwardly projecting flanges 10 and 11 which form between them guide-grooves adapted to receive the guide-rollers 6, 6 on the ends of the shelves. The guide-grooves formed in said guide-plates 9, 9 are parallel with the guide-bars 7 but are offset therefrom so as to bring said guide-grooves in position for engagement with the rollers 6, 6 when the rollers 4, 4 are engaged with the bars 7, 7. This will be understood by reference to Fig. 1, in which the plates 9, 9, in which said guide-grooves are formed, are offset to the right of and downwardly from the guide-bars 7, 7. According to the details of construction illustrated, and as shown in Figs. 1 and 5, each guide-plate 9 consists of two parts or sections separated from each other by two curved slots 12, 12 which are curved concentrically with the semi-circular end portions of the associated guide-bar 7, and through which pass the supporting studs 3, 3 on the shelves, as the rollers 4, 4 move along the inner faces of said guide-bars 7, 7. As illustrated and shown in the figures last above referred to, moreover, the part of each guide-plate 9 at the right hand side of the guide-bar 7 is formed by a casting on which said guide-bar is also formed, while the left-hand part or section of said guide-plate 9 is made integral with the upright guide-bar 8 at the left-hand side of said Fig. 1.

The guide-plates 9, 9, with their guide-grooves adapted for engagement by the rollers 6, 6 on the shelves, as described, are employed for the purpose of maintaining the shelves always in an upright position, the engagement of the guide-rollers 4, 4 with the outer guide-bar 7 when the guide-rollers 6, 6, are engaged with the guide-grooves in the guide-plates 9, 9 serving to prevent any tipping or tilting of the shelves from the horizontal position thereof.

According to the details illustrated, the casting which constitutes each guide-plate 9, and the adjacent part of the guide-bar 7 is secured by means of an integral base-piece 13 to the floor of the room in which the device is located, and, by an integral horizontal plate 14 at the top of the bar 7, to the top wall 15 of a casing which surrounds the apparatus. The upright parts of the guide-bar 7 are shown as rigidly connected with the guide-bars 8 by U-shaped pieces 16, 16, one of which is shown in the detail sectional view, Fig. 7.

Now referring to the means for giving

movement to the several shelves 1, 1, 18 and 19 indicate upper and lower horizontally arranged shafts disposed concentrically with respect to the semi-circular upper and lower ends of the guide-bars 7, 7 and which, as shown, are mounted in bearings attached to the side walls 20, 20 of the casing which surrounds the apparatus. On the ends of the upper shafts 18, exterior to the guide-bars 7, 7, are mounted two wheels 21, 21, and on the ends of the lower shafts 19, 19 are mounted two like wheels 22, 22. Said wheels 21, 22 serve to effect the transfer of the shelves from one to the other of the vertical tiers of shelves, as the latter are moved or shifted, as hereinafter set forth. Mounted to turn on horizontal axes, in the same horizontal plane and parallel with the shaft 18, exterior to the upper wheels 21, 21 are two sprocket wheels 23, 23 of which two are located in each side of the apparatus, one at the front and the other at the rear of said shaft 18. Similarly, at the lower part of the apparatus, sprocket-wheels 24, 24 are located outside of each of the wheels 22, 22 and arranged to turn on horizontal axes at opposite sides of the shaft 19. As illustrated, the wheels 23, 23 and 24, 24 are mounted on bearing studs attached to and projecting inwardly from the side walls 20, 20 of the casing of the apparatus. Trained around the side sprocket-wheels 23, 23, 24, 24 are two carrying belts 25, 25 having the form of sprocket-chains. Said belts are located in vertical planes, one at each side of the apparatus. Said sprocket-wheels 23, 23, 24, 24 are so arranged as to support the upright portions of the belts, which extend between them, adjacent to and inside of the paths of the supporting studs 3, 3 of the shelves when said studs are in the upright guide-slots formed by the straight and parallel parts of the guide-bars 7, 7 and 8, 8. Said belts 25, 25 are, moreover, provided on certain links thereof, with equally spaced, outwardly extending arms 26, 26, adapted for engagement with said supporting studs 3, 3. Said arms 26, 26 on the belts are arranged at such distance apart as to support the shelves 1, 1 as closely adjacent to each other vertically as is possible in view of the articles to be stored or placed on said shelves. In other words, the said arms 26, 26 serve to sustain the shelves at a minimum distance apart vertically as is required for the reception of the articles to be placed thereon, so that there may be no waste space between the shelves. As, for instance, if the shelves are intended to receive document file boxes, the shelves may be located at such distance apart that the boxes will closely fit between them, so that practically the entire spaces between the shelves will be utilized as storage spaces.

The several shelves at both the front and rear of the apparatus are supported or sus-

5 tained by the resting of their supporting studs 3, 3 on the arms 26, 26 and vertical movement of the shelves is effected by turning of the sprocket-wheels 23, 23, 24, 24 in a direction to carry the upright parts of the belts upward or downward. As illustrated, one of the sprocket-wheels 24 is for this purpose positively driven from the lower shaft 19, the driving means illustrated consisting of a sprocket-chain 27 (Fig. 1) which passes over a sprocket-wheel 28 on the shaft 19 and a sprocket-wheel 29 which are rigidly attached to said sprocket-wheel 24, at the outer faces thereof; said sprocket-chain 27 being located outside of the plane of the sprocket-wheel 24 between the latter and the side wall 20 of the casing, as clearly seen in Fig. 3. As illustrated in the drawings, the said lower shaft 19 constitutes the driving shaft for the apparatus; the same being extended at one end through the side wall 20 of the casing and squared at its outer end to receive a crank by which rotary motion may be given thereto.

25 The upper shaft 18 is driven or rotated in the same direction as the lower shaft 19, and any suitable form of driving connection between said shafts may be employed for so turning it. In the construction illustrated the sprocket-chain 25 is utilized for this purpose, the same engaging a sprocket-wheel 31, secured on said shaft 18 between the upper sprocket wheels 23, and in position for engagement with the horizontal part of the said sprocket-chain which extends between said sprocket-wheels 23, 23.

As hereinbefore stated, the several shelves 1, 1 rest upon or are sustained by the arms 26, 26 on both upright parts of the belts 25, 25 and are moved upwardly or downwardly with said upright parts of said belts. The wheels 21 and 22, which may be properly termed transfer-wheels, operate by engagement with the studs 3, 3 to remove the shelves from engagement with two of the supporting arms on the belts and to carry them in a semi-circular path of movement into position for engagement with other supporting arms on said belts, when said shelves reach the top or bottom of the apparatus. The devices shown for effecting engagement of said transfer wheels with the supporting studs 3, 3 on the shelves, are constructed as follows: On the rims of said wheels are mounted a series of pairs of spring-actuated detents 32, 32. These detents are alike on all four of the transfer-wheels and are similarly lettered in the drawings. Said detents 32, 32 are pivoted to the side faces of the wheels near their margins by means of pivot studs 33, 33, with the moving or swinging ends of the detents adjacent to each other. Said detents have at their said swinging ends, transverse faces or shoulders, separated from each other by a space or notch sufficient in width

to permit the introduction of the supporting studs 3 between them, as clearly seen in Fig. 4. Said free or swinging ends of said detents 32, 32, extend outwardly beyond the margin of the transfer-wheel such distance that, when the supporting stud 3 is resting against said margin, it will be confined between the end faces of said detents. The detents are pressed yieldingly outward by means of leaf-springs 34, 34, and the outward movement thereof is limited by means of stop-pins 35, 35 projecting from the face of the wheel and engaging slots in the detents. The arrangement of said detents 32 in pairs, both of which are movable, is employed in order to enable the transfer-wheel to engage the supporting studs on the shelves when said transfer-wheels are turned in either direction. Said transfer wheels 21 and 22 are turned or rotated at such rate of speed with respect to the rate of movement given to the belts 25, as to insure that one of the pairs of detents 32, 32 will engage the supporting studs 3, when said supporting studs reach points horizontally opposite the center of the transfer-wheel and are also opposite the centers of the sprocket-wheels 23, 23 or 24, 24. It follows that, as soon as the studs belonging to either shelf, reach the points referred to, detents on both wheels will be brought into position to engage said studs. In effecting such engagement of the detents with the studs, that one of each pair of detents which is in advance in the turning of the transfer-wheel, will yield inwardly when it reaches and makes contact with the stud, and will spring outward as soon as its free end passes the stud, so as to confine the stud between the ends of the two detents; the other detent of the pair, or the one whose end surface is directed forwardly in the turning of the wheel, forming in effect a stationary stop shoulder for contact with the stud. In other words, one or the other detent of each pair acts as a swinging stop and the other as a stationary stop for engagement with the stud on the shelf, according to the direction in which the wheel may at any time be turned.

The pairs of detents 32, 32 on the transfer wheels are arranged at such distance apart circumferentially of the wheels and the wheels are driven at such speed in relation to the rate of the movement of the belts, that each shelf as soon as brought under the influence of the transfer wheels, has a more rapid rate of movement than is imparted to it by the belts. The shelves will therefore be separated vertically from each other at the time of transfer by the action of the transfer-wheels, to an extent sufficient to prevent interference of the vertically moving shelves, or those which hang on the belts with the shelves which are engaged with and are being laterally moved by the transfer-wheels. The pairs of detents 32, 32 on the

transfer-wheels, in order to effect such vertical separation of the shelves are located at a distance apart greater than the distance between the supporting arms 26, 26 on the belts. In the construction illustrated, each transfer-wheel is provided with three pairs of detents 32, 32 and the speed of rotation of the transfer-wheels is such that said wheels will make one-third of a revolution during the movement of the belts through a distance equal to the spaces between the supporting arms 26, 26. It will be observed that the operation of the lower pair of transfer-wheels 22, 22, is the same as that of the upper pair 21, 21. That is to say, in the case of the upper pair of transfer wheels the shelves, as they reach the upper ends of the upwardly moving parts of the belts 25, 25, will be lifted from one pair of the supporting arms 26, 26, carried over to the downwardly moving part of the belts, and deposited on another pair of the supporting arms at the upper ends of said downwardly moving parts of the belts, while, in the case of the lower transfer wheel 22, each shelf, on reaching the lower ends of the downwardly moving parts of said belts, will be disengaged from one pair of supporting arms, transferred to the lower transfer-wheels, and will be carried by the latter to the lower ends of the upwardly moving parts of said belts where they will be engaged by another pair of said supporting arms, and carried upwardly away from said transfer wheels. In case of the lower transfer-wheels 22, 22 the rate of movement of the detents thereon will be so adjusted with respect to the position of the arms 26, 26 on the belts that the supporting studs 3, 3 on the shelves will reach the lower ends of the upwardly moving parts of the said belts at points just in advance of or above one pair of said arms; this result being produced in the construction shown by making the parts of the belts between the lower sprocket-wheels 24, 24 somewhat longer than the corresponding horizontal parts of the belts between the upper sprocket-wheels 23, 23, so that the lower parts of the sprocket-chain will hang loosely between the said lower sprocket-wheels, as clearly seen in Fig. 1.

It will be understood that the shelves 1, 1, illustrated may be employed to support boxes or receptacles for containing pairs, documents or articles of merchandise, or the shelves themselves may constitute the bottoms of like receptacles. Manifestly, either one of the shelves in the entire series may be brought by the movement of all of the shelves, to a position opposite an opening, such as indicated by 40, in the front wall 41 of the casing or housing which surrounds the apparatus. When the apparatus is located in an office or commercial establishment and it is desired to utilize the entire space between the floor and ceiling of the apartment and to

thereby afford a maximum storage space with a minimum floor space occupied by the apparatus, the latter will extend from the floor to the ceiling.

In prior storage devices having shelves or receptacles carried by belts trained over pulleys, at the top and bottom of the apparatus, the shelves have been placed at a distance apart from each other vertically much greater than the heights of the effective storage spaces afforded between the shelves, this arrangement having been necessary for the reason that the points at which the shelves are connected with the belts in such a structure must be arranged at such distance from each other along the belts that, when the belts pass over the said upper supporting wheels or pulleys, the shelves will not interfere with each other. In other words, in such prior constructions, the distances between the shelves have been greatly in excess of the distance above the shelves in which articles might be stored, with consequent loss of space; it having been necessary that the points of attachment of the shelves to the belts should be so widely separated that any shelf which is being shifted laterally shall have substantially completed its lateral movement before the next succeeding shelf begins its lateral movement. In the construction herein described, the shelves supported on the upright portions of the belts may each carry articles filling the space between the same and the shelf above it, and when the lateral movement or transfer of any shelf takes place, the latter is lifted or separated vertically from the shelf below it, so that no interference of one shelf with another in the lateral movement of the shelves takes place.

It follows from the above that my invention embraces as its essential or material feature, a series of shelves or receptacles, carrying belts on which the same are hung and by which they are given vertical movement, together with means for effecting lateral movement of the shelves, so arranged as to increase the distance between the shelves during such lateral movement, and inasmuch as this feature of construction may be embodied in forms of apparatus differing from that illustrated, so far as the broader aspects of the invention are concerned, I do not desire to be limited to the particular features shown. My invention also includes the details of construction illustrated so far as the same are pointed out in the appended claims as parts of the same.

I claim as my invention:—

1. A storage apparatus comprising a plurality of shelves arranged in two tiers and adapted for vertical movement, and means for effecting lateral movement of said shelves from one tier to the other, at the upper and lower ends thereof, adapted to in-

crease the vertical distance between the shelves during such lateral movement of the same.

2. A storage apparatus comprising a plurality of shelves arranged in two tiers and adapted for vertical movement, endless belts supporting said shelves during their vertical movement, and means acting to shift the shelves from one to the other of said tiers at the upper and lower ends thereof operating to increase the vertical distance between the shelves during such shifting movement of the same.

3. A storage apparatus comprising a plurality of shelves arranged in two tiers and adapted for vertical movement, endless belts supporting said shelves during their vertical movement, and means acting to shift the said shelves in curved paths from one tier to the other at the upper and lower ends thereof, operating to give more rapid movement to the shelves during such shifting movement than during their vertical movement.

4. A storage apparatus comprising a plurality of movable shelves provided with supporting studs, two belts provided with arms adapted for engagement with said supporting studs, wheels supporting said belts, transfer wheels provided with means for engagement with said supporting studs, and a guide adapted for engagement with said studs.

5. A storage apparatus comprising a plurality of movable shelves provided with supporting studs and with guide studs offset laterally from the supporting studs, two belts provided with arms adapted for engagement with said supporting studs, two transfer wheels provided with means for engagement with said supporting studs, and parallel guides for said supporting studs and guide studs.

6. A storage apparatus comprising a plurality of movable shelves provided with supporting studs, two belts provided with arms for engagement with said studs, transfer wheels provided with spring-actuated detents for engagement with said studs, and a guide for said studs adapted to retain the same in engagement with the arms on the belts and with the detents on the transfer wheels.

7. A storage apparatus comprising a plu-

rality of movable shelves provided with supporting studs, two belts provided with arms for engagement with said studs, transfer wheels provided with spring-pressed detents for engagement with said studs, said detents being arranged in pairs with their swinging ends adjacent to each other, and guides for the said studs adapted to retain the same in engagement with the arms on the belts and with the details on the transfer wheels.

8. A storage apparatus comprising a plurality of shelves provided with supporting studs, two belts provided with arms for engagement with said studs, four wheels for supporting each belt, two located at the top and two at the bottom of the apparatus, and transfer wheels located at the top and bottom of the apparatus and provided with means for engagement with said studs.

9. A storage apparatus comprising a plurality of shelves provided with supporting studs, two belts provided with arms for engagement with said studs, four wheels for supporting each belt, two located at the top and two at the bottom of the apparatus, four transfer wheels, and a plurality of pairs of spring-pressed detents on each of said transfer wheels arranged with the swinging ends of the detents of each pair adjacent to each other.

10. A storage apparatus comprising a plurality of shelves provided with supporting studs, two belts provided with arms for engagement with said studs, supporting wheels for said belts, transfer wheels, a plurality of pairs of spring-pressed detents on said wheels, the detents of each pair having their swinging ends adjacent to each other and adapted to project outside of the periphery of the wheel on which said detents are mounted, and a semi-circular guide associated with each transfer wheel and acting to hold the studs in engagement with the detents in the movement of the studs with said detents.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 16th day of December A. D. 1907.

G. RUDOLPH BASLER.

Witnesses:

C. CLARENCE POOLE,
G. R. WILKINS.