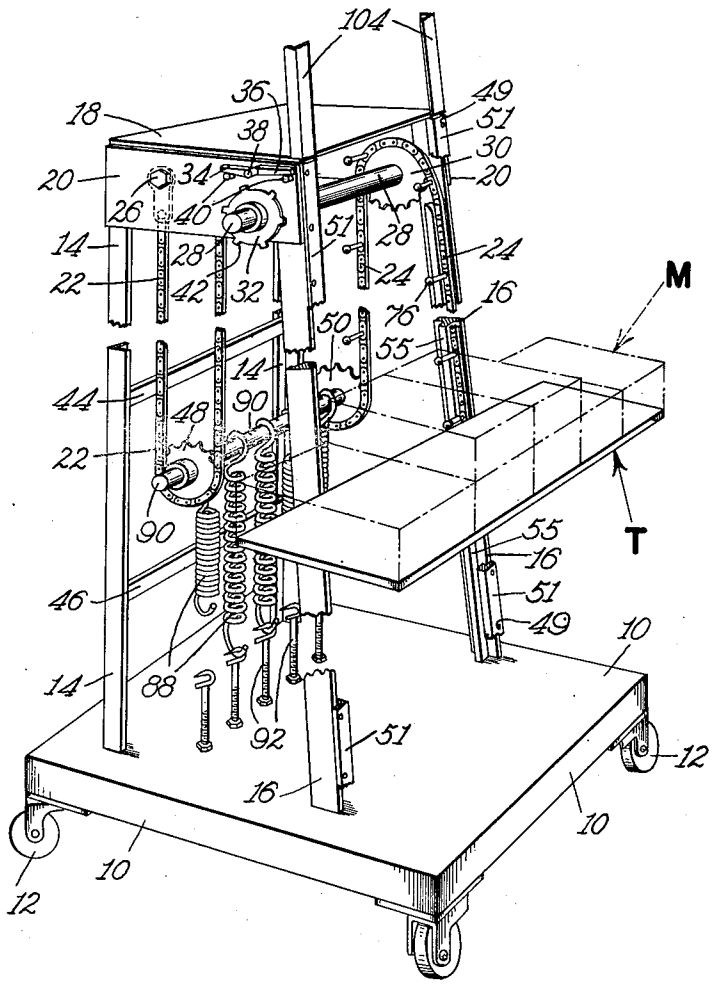
July 29, 1952 E. F. SMITH 2,604,996

SELF-LEVELING CANTILEVER SHELF ASSEMBLY

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FIG. 1



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SELF-LEVELING CANTILEVER SHELF ASSEMBLY

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FIG. 2

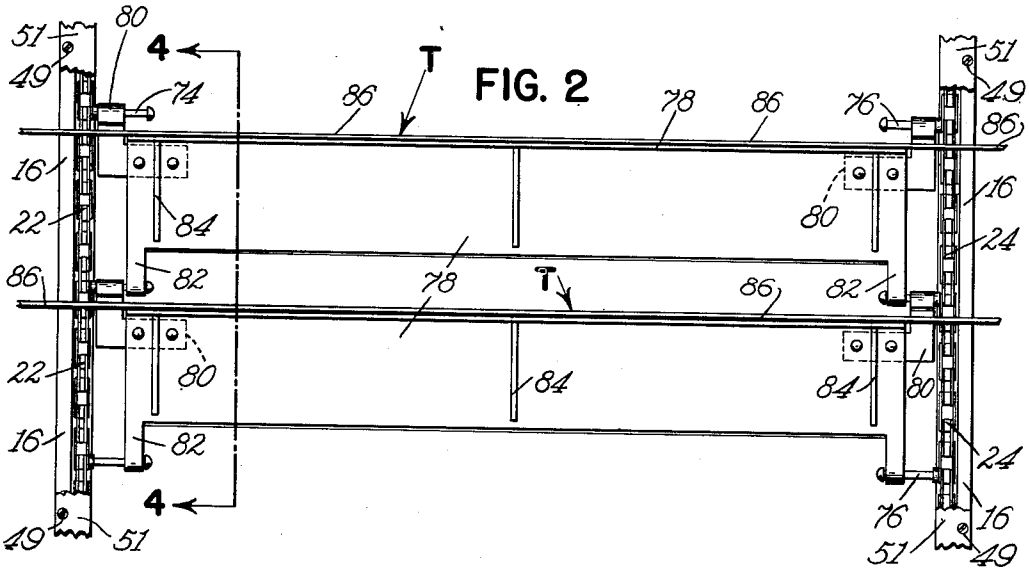


FIG. 3

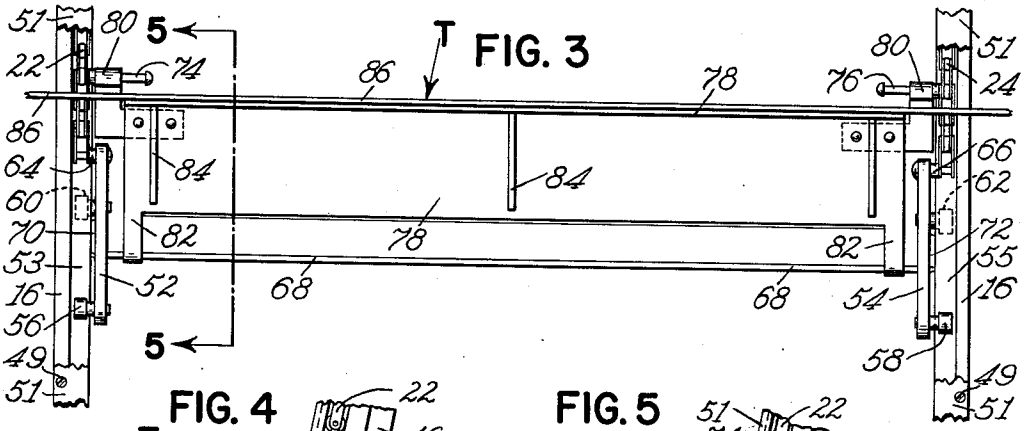


FIG. 4

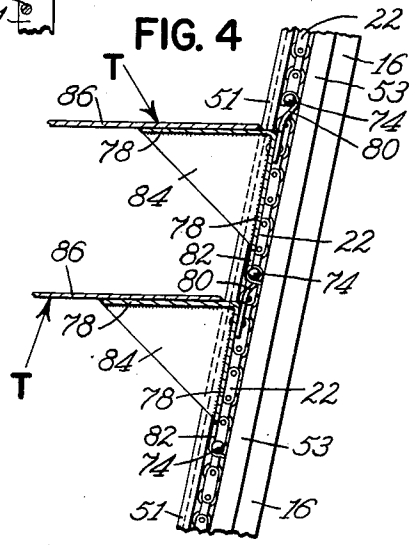
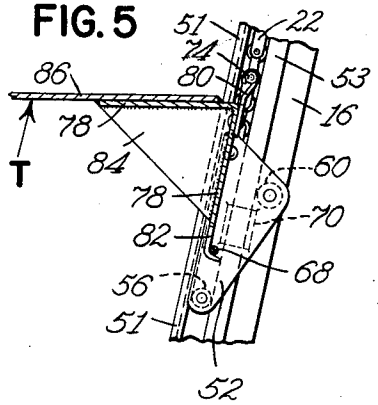


FIG. 5



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SELF-LEVELING CANTILEVER SHELF ASSEMBLY

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FIG. 6

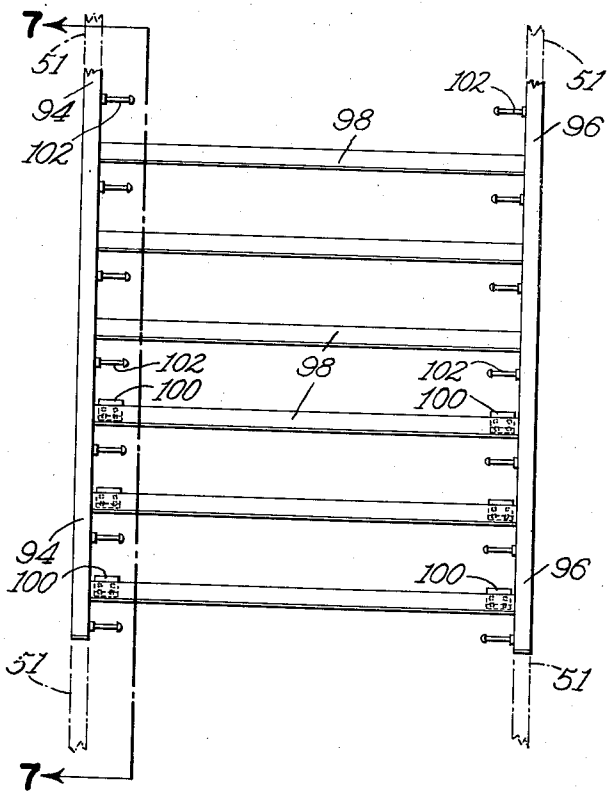
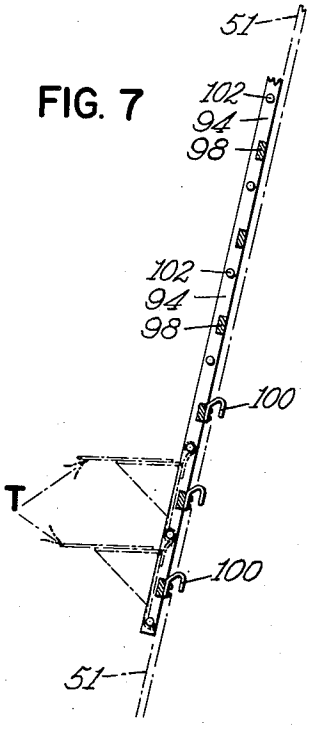


FIG. 7



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Patented July 29, 1952

2,604,996

UNITED STATES PATENT OFFICE

2,604,996

SELF-LEVELING CANTILEVER SHELF ASSEMBLY

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Application July 26, 1947, Serial No. 763,776

8 Claims. (Cl. 211—49)

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This invention relates to storing and dispensing apparatus and more particularly to improvements in the construction thereof.

My invention is particularly adapted for use as an industrial dispenser wherein articles of various sizes and shapes may be conveniently stored and dispensed from a movable storage rack. When an operator has to lift or lower an article to be worked on, it not only requires time but also induces fatigue. When material is maintained at a constant level the efficiency of the operator is increased.

Heretofore storage and dispensing racks had certain disadvantages such as their not being self-leveling or that they were of such shape or design that they could not hold articles of varying sizes, lengths and widths. It is therefore an object of my invention to provide a constant level storing and dispensing device which is open on three sides so that it can store articles of various widths and lengths.

Another object of my invention is to provide an industrial dispenser that can store articles of different sizes and shapes and still have the advantage of maintaining the upper layer of material at a constant predetermined level.

Another object of my invention is to provide a dispenser of the self-leveling type which will have removable shelves to facilitate storing articles of various shapes, widths and lengths.

Another object of my invention is to provide a self-leveling dispenser in which the material supporting shelf or shelves can be rendered immobile at any height and thereby increase the general utility of the rack.

Another object of my invention is to secure shelves or trays to a support so that counteracting forces will be used to relieve stress and strain on the connections supporting the shelves and trays.

A further object of my invention is to provide a dispenser which will be of simple construction and design to thereby decrease the cost of manufacture.

Other objects and features of the invention will appear as the description of the particular physical embodiment selected to illustrate the invention progresses. In the accompanying drawings, which form a part of this specification, like characters of reference have been applied to corresponding parts throughout the several views which make up the drawings.

In the accompanying drawings

Fig. 1 is a perspective view of my storing and dispensing apparatus.

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Fig. 2 is a partial front view showing two removable adjacent trays attached to the dispenser.

Fig. 3 is a partial front view showing the guiding carriages and removable bottom tray of the dispenser.

Fig. 4 is a sectional end view taken on line 4—4 of Fig. 2.

Fig. 5 is a sectional end elevation taken on line 5—5 of Fig. 3.

Fig. 6 is a front elevation of a modified form of my invention showing a multiple tray mounting device.

Fig. 7 is a side elevation taken on line 7—7 of Fig. 6.

I have shown in Fig. 1 an embodiment of my invention wherein a base 10 is supported on four conventional swivel casters 12 to permit the apparatus to be moved about freely. The main superstructure mounted on the base consists of a pair of angle iron uprights 14 making up a framework braced by cross pieces 44 and 46, and two T beams 16 which are fixedly mounted at one side of base 10 as shown in Fig. 1. The upper ends of angle irons 14 and T beams 16 are fixedly secured to top plate 18 and side plates 20 all of which are rigidly connected together to form the supporting superstructure for my storage and dispensing apparatus.

A pair of elongated flexible members such as sprocket chains 22 and 24 are connected to the side plates 20 by suitable anchor bolts 26. A shaft 28 is rotatably mounted in suitable bearings (not shown) supported by the side plates 20 and has a pair of sprockets 30 fixedly mounted thereon at either end adjoining the inside of side plates 20. On the end of shaft 28 is mounted a locking ratchet 32 having teeth 42 with which a pair of pawls 34 or 36 engage when in lowered position. The pawls 34 and 36 are pivotally mounted on a stud 38, connected to the side plate 20. Pawls 34 and 36 are held in raised inactive position by suitable spring detents 40. When the pawl or arm 34 engages with the teeth 42 of the ratchet 32 it will prevent the shaft 28 from rotating in a clockwise direction and when the pawl 36 engages with the teeth 42 of the ratchet 32 it will prevent the ratchet 32 and the shaft 28 from rotating in a counter-clockwise direction. Either or both of the pawls 34 and 36 may be released by pressing in their respective spring actuated detents 40 thus allowing the pawls 34 and 36 to be pushed into engagement with the teeth 42 of ratchet 32.

Sprocket chains 22 and 24, which depend from their respective anchors 26, pass under and

around sprockets 48 and 50 and over and around sprockets 30 and are secured at their lower end to suitable carriages 52 and 54 as shown in Figs. 1 and 3. The sprockets 48 and 50 which are rotatably mounted on suitable bearings carried by shaft 90, are supported by loops formed in sprocket chains 22 and 24 as shown in Fig. 1.

The sprocket chains 22 and 24 which may be of the conventional roller type shown in Fig. 4, are confined to a path of travel on suitable guides such as the channels formed by legs 53 of T beams 16 and the cover plates 51.

Carriages 52 and 54 each have a roller 56 and 58 traveling on the outside and rollers 60 and 62 traveling on the inside of legs 53 and 55 of T beams 16. The upper end of the carriages 52 and 54 have lugs 64 and 66 to which are secured the lower ends of sprocket chains 22 and 24. A keeper 68 is connected at opposite ends to the carriages 52 and 54 (Figs. 3 and 5) and acts to maintain the rollers in proper spaced relationship with respect to each other and to T beams 16. Each carriage 52 and 54 has a raised flat portion 70 and 72 which rides against the outside of legs 53 and 55 and acts to hold the rollers 56 and 60, 58 and 62 from rubbing up against the sides of the T beams 16.

Each sprocket chain 22 and 24 has projecting from its links at regularly spaced intervals studs 74 and 76. To these studs 74 and 76 may be attached one or more removable cantilever trays or material supporting cantilever shelves T as shown in Figs. 1 and 2. Each of the removable trays T consists of an angle plate support 78 (Fig. 4) to which is attached at the upper end hook shaped brackets 80 which are secured to the supporting angle plates 78 by suitable means such as welding or riveting.

Additional bracing is provided for the angle plates 78 by triangular brackets 84 to hold the material supporting shelf 86, consisting of a flat plate, rigid.

Supporting hooks 82 project from the lower side of the angle plate supports 78 and act to lock the tray or shelf T in place after it has been hooked on to the studs 74 and 76.

The hooks 80 and 82 are of such shape and design that if the cantilever material support T was inadvertently struck by an operator it would not become detached. On the other hand if an operator desired to remove the removable material supporting shelf 86 he would have to tilt the platform upwardly about the hooks 80 and then raise the tray to unhook it from studs 74 and 76.

The shelves I have shown in Figs. 1, 2 and 3 have the advantage that they are open on three sides and therefore can carry articles of various lengths and widths. For purposes of carrying smaller parts, each shelf may be modified to provide it with side or end walls.

It should be noted that the lower hooks 82 of one tray engage with the studs 74 and 76 supporting the upper hooks 80 of the tray immediately below (Figs. 2 and 4).

This has the advantage that the forces applied by the hooks 80 and 82 to the studs 74 and 76 are in opposite directions and therefore have a tendency to automatically cancel themselves out, where top and bottom hooks are secured to the same studs as shown in Figs. 2 and 4. This has the advantage of removing stress and strain from the studs 74 and 76.

When it is desired to carry material of bulky size the trays T do not have to be attached one immediately adjacent to the other as shown in Fig. 2 but a certain number of studs 74 and 76 may be skipped each time so as to allow whatever amount of space between supporting shelves T is required for any particular type of material carried. In other instances where the same type of material is to be stored and dispensed, as for example sheet material such as paper, it may be desirable to use only one shelf T. In this case sheet material may be fed directly by machine or by hand onto my apparatus and be removed therefrom in like manner. The self-leveling feature, herein described, will maintain the upper layer of the stacked articles at a constant predetermined level at all times. In this case the shelf would be connected to the lowermost studs 74 and 76 carried by the sprocket chains 22 and 24 and by the spacing rod 68 which is connected to the carriages 52 and 54.

The material M supported on the supporting shelf or trays T is counter-balanced by calibrated tension springs 88 which are connected at one end to the floating shaft 90 and are connected at the lower end to adjustable anchor hooks 92.

The calibrated tension springs 88 are of similar design and construction as those shown in patent to W. J. Gibbs 2,251,874 granted August 5, 1941 and stretch and contract a distance directly correlated with the amount of force applied to or removed from the springs 88. The anchor hooks 92 are adjusted when the trays T are empty so that the empty trays will be at the highest position desired. Adjustments may be made to have the material supporting platform carry articles of different weight by disconnecting the springs 88 one at a time from the adjustable hooks 92 until the desired amount of tension is obtained. Since sprockets 30 are fixedly mounted on shaft 28, they interconnect sprocket chains 22 and 24 for equal movement in the same direction thereby maintaining the trays T horizontal at all times even when material is not equally distributed across the tray T.

In Fig. 6 I have shown a modified form of my invention which enables a plurality of trays T to be raised up and down and does not require adding or removing one tray at a time when loading or unloading the dispensing and storage apparatus.

This modified form of my invention consists of two side members 94 and 96 which are rigidly interconnected by a plurality of cross pieces 98. At the lower end of the cross pieces 98 are three pairs of suitable hooks 100 which are adapted to be mounted on the lowest projecting studs 74 and 76 of sprocket chains 22 and 24. The sprocket chains 22 and 24 may if desired be of the roller type shown in Figs. 4 and 5 to reduce friction. The side members 94 and 96 are provided with opposed projecting studs 102 which are substantially of the same construction as studs 74 and 76 shown in Figs. 1 and 2. They are similarly spaced from each other so as to allow the shelves T shown in Figs. 1 and 2 to be secured thereto in like manner. The method and manner of mounting these shelves T is the same as that previously described with respect to mounting shelves or trays T directly on the studs 74 and 76 shown in Fig. 2.

When the hooks 100 of the side members 94 and 96 are hooked on to the three lower studs 74 and 76 carried by the sprocket chains shown in Fig. 1, the side members 94 and 96 will slide against the plates 51 and are partially supported by the upper guide supports 104 when the side members 94 and 96 are in raised position. The

supports 51 and 104 are lubricated to reduce friction in the same manner as other moving parts. The hooks 100 are so spaced that they fit on the studs 74 and 76 so that there will be no side play and thus assist in confining the lower part of the sprocket chains 22 and 24 at proper spaced relationship with respect to one another.

I have shown in Fig. 7 two shelves or trays T in phantom position to illustrate the manner in which these trays are mounted on the rack. Since only the three bottom studs 74 and 76 of the sprocket chains 22 and 24 are used the upright members may rise upwardly until the upper pair of studs 74 and 76 to which the hooks 100 are attached reaches sprockets 30 which constitutes the limit of its travel. This modified form of the invention has the advantage that trays do not have to be removed as they become empty nor do trays have to be added one at a time when loading my dispensing and storage apparatus.

The operation of my invention may be briefly described as follows:

After the tray T shown in Fig. 1 has been properly positioned by adjusting bolts 92, a layer of material, to be stored, is placed thereon. The calibrated tension springs 88 are then disconnected one at a time until the trays T are depressed by the weight of the material to the extent desired. Thereafter it is only necessary to add or remove trays T and material to and from the storage and dispensing apparatus and the shelves T will be automatically raised and lowered so that the uppermost layer of material or tray T will be maintained at a constant level.

When only one shelf or tray T is used as shown in Fig. 1, articles to be stored are placed one upon the other. One advantage of the cantilever construction I have shown is that material can be fed directly from a machine onto my material rack which will automatically lower the material as additional amounts of material are placed thereon.

In the same manner material can be removed from the rack by a machine since the shelf T will automatically rise as material is removed therefrom. My dispensing apparatus also has the advantage that material to be stored can be of various lengths and widths because the tray T is open on three sides. Material to be stored and dispensed can also be placed on and removed from the shelf T by hand or other suitable means instead of by a machine. Since the springs 88 are calibrated the upper layer of material will always be maintained at a constant level.

For certain types of articles it is desirable to employ a plurality of trays or shelves with the storage and dispensing apparatus such as shown in Figs. 2, 3, and 6. My apparatus is so designed that the trays may be placed immediately adjacent one another or at a distance spaced from one another.

When the trays are placed immediately adjacent one another the bottom fasteners 82 of one tray will be secured to the same studs 74 and 76 as the upper hooks 80 of trays immediately below thereby reducing the amount of stress and strain placed upon the studs 74 and 76.

When the trays T are to be hung directly on the studs 74 and 76 they are hooked onto the studs 74 and 76 from the top one at a time and loaded. Empty trays are similarly removed, one at a time, from the top as the stored articles are removed from the dispenser.

In some cases where it is not desirable to remove one tray at a time, a plurality of trays

may be hung on a support such as that shown in Figs. 6 and 7. In this case, it is not necessary to add or remove trays each time a tray is loaded or emptied. When the trays are emptied they rise upwardly and as they are filled they descend. The calibrated tension springs 88 will maintain whichever loaded tray is uppermost at an approximate constant level.

Since some classes of material are not adaptable for use with self-leveling dispensers I have provided a device which can immobilize the self-leveling mechanism of my invention. By engaging pawls 34 and 36 with the teeth 42 of ratchet 32 the shelves T may be locked at any height desired. When the pawls 34 and 36 and ratchet 32 are used the springs 88 should be preferably first unhooked so that there will be no tension on chains 22 and 24.

The invention above described may be varied in construction within the scope of the claims, for the particular device selected to illustrate the invention is but one of many possible embodiments of the same. The invention, therefore, is not to be restricted to the precise details of the structure shown and described.

What I claim is:

1. Apparatus for storing articles comprising, a movably mounted supporting base, an upright structure connected to said base, guide rails extending up and down on said upright structure, elongated flexible members connected at one end to said upright structure, pulleys mounted at the upper end of said upright structure over which the other ends of said flexible members are trained, carriages movably attached to said rails, a cantilever material support, means connecting said cantilever support to said carriages at one side only, connecting means for securing the ends of said flexible members that are trained over said pulleys to said carriages, and calibrated spring tension means connected at one end to said elongated flexible members and at the other end to the base for applying tension thereto varying with the amount of force exerted thereon by the weight of the articles carried on said article support to maintain the top articles at a substantially constant predetermined level regardless of whether articles are removed from or added to the articles stacked on said support.

2. Apparatus for storing and dispensing material comprising, a movable base, a frame extending upwardly from said base, elongated flexible members having one end thereof constructed and arranged to travel in a direction transverse to said base, extensions formed on said elongated flexible members at predetermined regular intervals, material storing shelves having devices for removably connecting said shelves with pairs of said spaced extensions, guides confining said extensions to a predetermined path of travel to maintain said shelves horizontal, and calibrated tension springs connected to said flexible members for raising and lowering one end of said flexible members a distance directly correlated with the weight of the material added to and removed from said shelves.

3. Apparatus for storing and feeding articles comprising a movable base, a frame extending upwardly from said base, elongated flexible members for supporting articles to be carried by said apparatus, means for confining said members to a predetermined path of travel with respect to said frame, members projecting from said elongated flexible members at regularly spaced intervals, shelves having connections at the top and

the bottom of one side thereof to engage with a pair of spaced members formed on said flexible members, said connections being constructed and arranged so that the top connections of one tray and the bottom connections of the next adjoining tray are connected to the same projecting member on the flexible members to cancel out forces applied thereto in opposite directions by said connections, spring tension mechanism, and means connecting said mechanism to said elongated flexible members for maintaining the articles in the uppermost tray at a constant level.

4. Apparatus for storing and dispensing material comprising a base, uprights extending upwardly from said base, braces connected to said uprights for maintaining said uprights fixed with respect to said base, guiding tracks mounted on said uprights, a carriage mechanism movably attached to said tracks for reciprocatory movement thereon, a material support extending horizontally from and supported by said carriage mechanism, elongated flexible members for lowering and raising said carriage mechanism and the material support connected thereto, a plurality of calibrated tension springs having one end of each spring connected to said base and means interconnecting the other end of said springs to said cantilever material support to maintain the upper layer of material on said material support at a constant predetermined level.

5. Apparatus for storing and dispensing stacked articles comprising, a vertical frame, guide rails mounted on said frame, means movably attached to said guide rails and secured to one side of the supporting member forming a cantilever material support, calibrated counter-balancing springs having one end of each spring attached to said frame, and means interconnecting the other end of said springs to said cantilever material support to raise and lower said material support a distance in direct correlation with the amount of material carried by said support to maintain the upper layer of material at a constant predetermined level.

6. Apparatus for storing and dispensing articles comprising uprights, guide rails mounted on said support, a cantilever material support movably attached at one side only to said guide rails, a plurality of elongated flexible members connected to said cantilever material support, mechanism for interconnecting said flexible members for equal movement in the same direction, calibrated counterbalancing springs, and means interconnecting said springs with said flexible members for raising and lowering said cantilever material support a given distance for each increment and decrement of weight added to and removed from said cantilever material support to maintain the top portion of the material supported on said material support at a constant predetermined level.

7. Apparatus for storing and dispensing articles comprising, an upright framework, guide rails mounted on said framework, a device movably attached to said rails for up and down travel on said rails parallel to one side of said framework, a plurality of material supports spaced vertically above one another and attached at one side only to said device, calibrated springs constructed and arranged to store and release energy at a uniform rate corresponding to the distance moved by said springs, and means connecting said springs at one end to said framework and the other end to said device for raising and lowering said device a distance corresponding to the weight of articles added to and removed from said material supports to maintain the articles in the highest loaded platform at an approximate predetermined level.

8. Apparatus for storing and dispensing articles comprising, an upright framework, guide rails mounted on said framework, a device confined by said guide rails to up and down movement along a predetermined path of travel with respect to said upright framework, mechanism for attaching a plurality of detachable shelves to said device, calibrated springs constructed and arranged to extend and contract a distance corresponding directly with the amount of energy stored in the springs, mechanism maintaining one end of said springs free from movement with respect to said apparatus, and means interconnecting the other end of said springs with said device to lower and raise said device a distance corresponding approximately to the amount of articles placed on and removed from said shelves to maintain the highest shelf having articles at approximately a predetermined level.

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