

April 8, 1930.

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1,753,980

MEANS FOR UTILIZING THE WASTE SPACE IN HOT HOUSES

Filed May 17, 1928

4 Sheets-Sheet 2

Fig. 1.

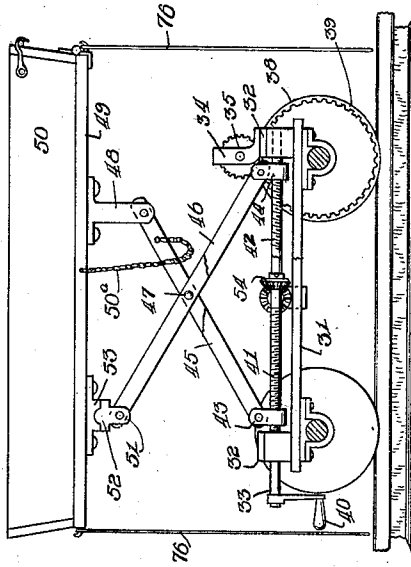


Fig. 5.

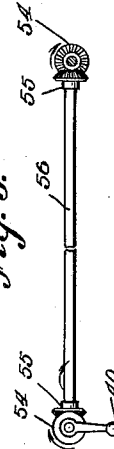


Fig. 3.

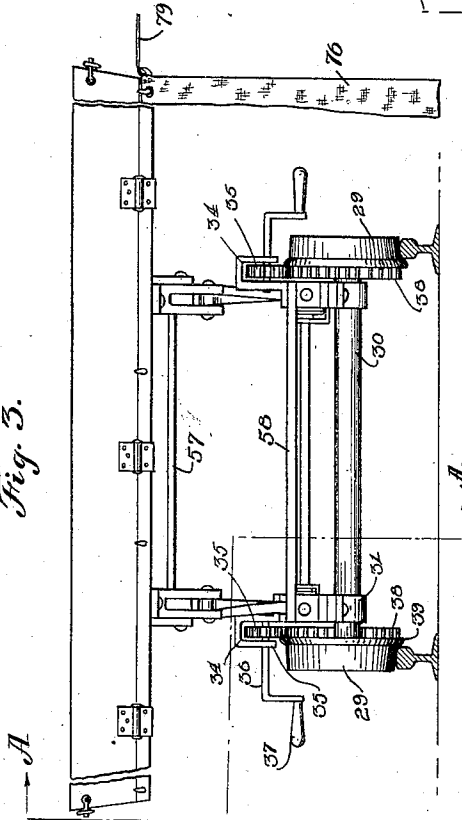
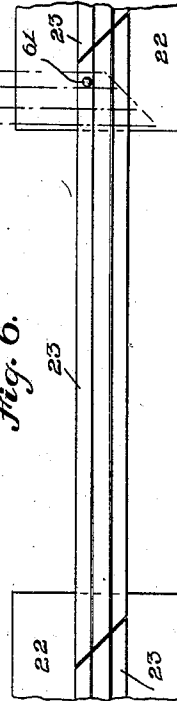


Fig. 6.



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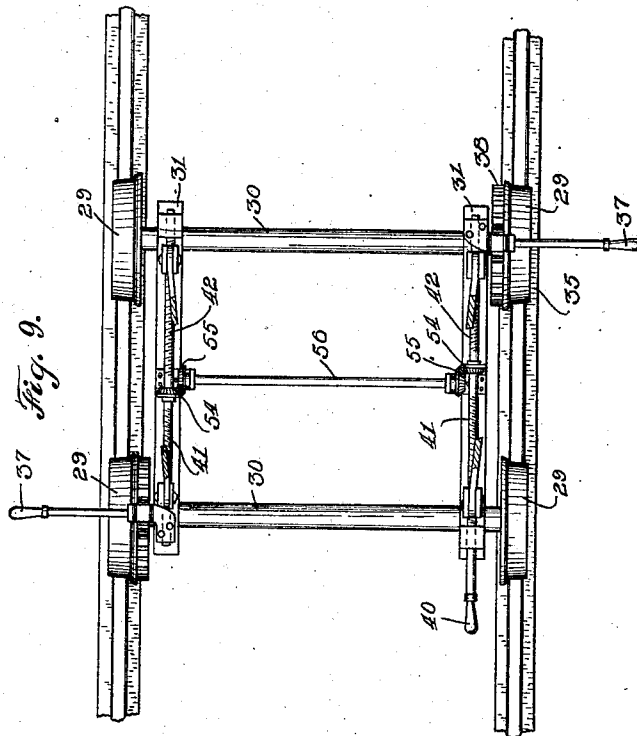
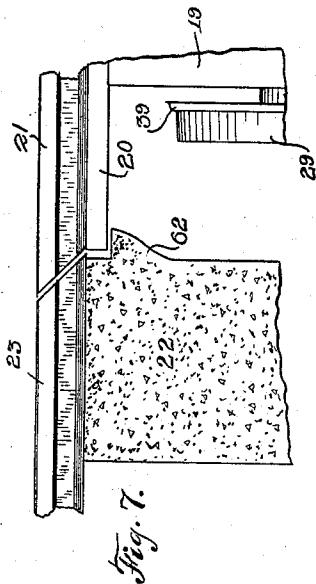
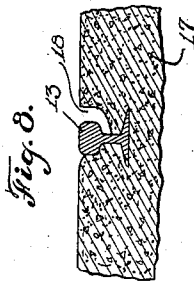
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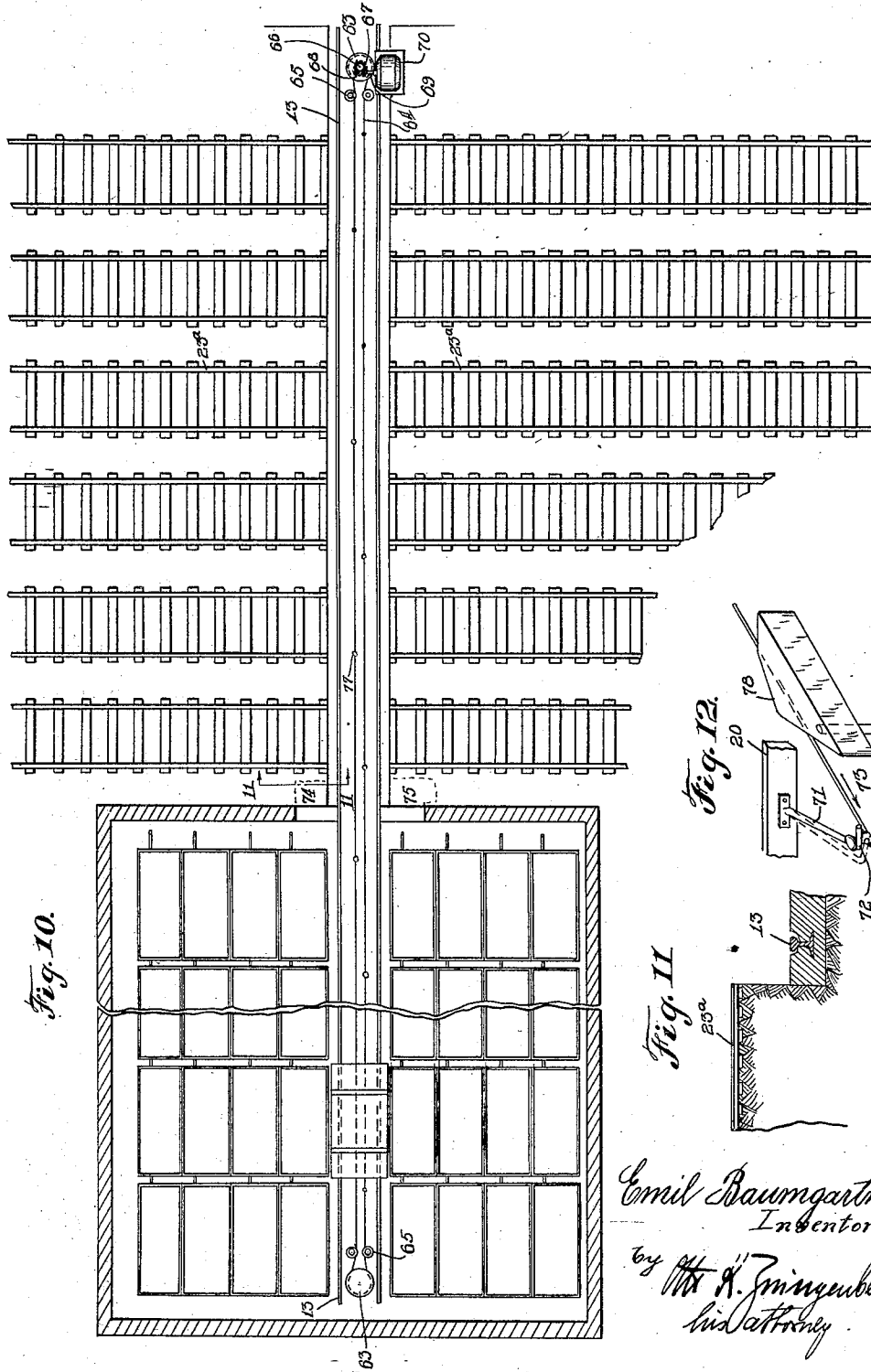


Fig. 10.

Fig. 12.

Fig. 11.

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MEANS FOR UTILIZING THE WASTE SPACE IN HOTHOUSES

Application filed May 17, 1928. Serial No. 278,379.

This invention relates to hot houses and it particularly relates to hot houses in which the waste space of the aisles between the benches is utilized for setting up plants.

5 The problem of utilizing the space of a hot house, which is wasted by the aisles required at present to work along the benches, is of long standing; various suggestions have been made to solve this problem, but up to
10 now the hot houses are still operated in the old, time-honored way which calls for an aisle between two adjoining benches.

I have found a solution for this problem which permits to use practically the entire
15 floor space of a hot house for useful work. For the purpose of said improvement, the invention consists of the arrangement of certain parts and combination of the same, which will be more fully described in the
20 following specification and illustrated by the accompanying drawings in which,

Figure 1 is a plan view of the ground floor of the hot house, showing the spaced relation of the benches and some of the means allow-
25 ing to arrange them in the manner illustrated by said figure.

Figure 2 is a vertical transverse sectional view along the line 2—2 seen towards the door as indicated by the arrows attached to
30 the line 2—2.

Figure 3 is a longitudinal side elevation of one of the benches, carrying the plants, as standing on the tracks during the various operations; the figure also illustrates the
35 mechanical means for lifting and lowering the benches.

Figure 4 is a vertical sectional view of the bench along the line A—A of Figure 3; the figure also illustrates the mechanical means
40 for lifting and lowering the benches.

Figure 5 is a detail view of part of the mechanical means for lifting and lowering the benches illustrated in Figures 3 and 4.

Figure 6 is a diagrammatic view of means, for instance in the form of a rail, for bridg-
45 ing the gaps between two rails linearly arranged as a part of the means carrying the benches illustrated by Figures 3 and 4.

Figure 7 is a diagrammatic and fragmen-
50 tary view of an end of a rail on an adjoin-

ing block and of a platform, said rail connecting with the rails linearly arranged on the block and the movable platform illustrated by Figure 2.

Figure 8 is a diagrammatic and fragmen- 55 tary view of a rail embedded in the concrete pavement of the ground floor, showing a groove in aforesaid concrete along the rail to receive the flange of the wheels of the platform illustrated in Figure 2.

Figure 9 is a top view of the wheel base of the benches showing the means to impart motion to the wheels and showing the relation of said motion imparting means in connection with the other arrangement and 60 members of the bench system.

Figure 10 shows a rail system outside the house. Figure 11 shows the spaced relation between the side tracks and the middle track. Figure 12 illustrates the manner of moving 70 the platform.

Like numerals denote like parts all through the various figures.

In the drawing 11 denotes the walls of a hot house having an entrance 12, adapted to be closed by a door (not shown). Inside of the hot house the ground floor is divided by a track system, consisting of the parallel rails 13, into two sides of which side 14 is slightly wider than side 15. Benches 16, preferably 80 all of the same dimensions, are arranged in parallel stacks, parallel to each other and to the rails 13; it will be noticed from an inspection of Figures 2 and 8 that the rails 13 are arranged in the pavement 17 of the ground floor so that the upper side of the rail 13 is flush with the ground floor. A groove 18 is provided all along the rails 13 on the inside of the same.

A four wheel car 19, with a platform 20 90 thereon, is provided on the said rails 13; a pair of rails 21 is provided on top of said platform 20 at a suitable distance from and parallel to each other so as to be disposed perpendicularly to the longitudinal axis of 95 the said platform 20 and to the rails 13; the platform 20, with the rails 21 thereon, is, therefore, somewhat elevated above the ground floor. It will be noticed that at both sides 14 and 15 of the hot house blocks 22 100

are arranged at suitable distances from each other; on top of these blocks 22 rails 23 are arranged in linear extension of the rails 21 on the platform 20.

5 Benches 24 are arranged each on a four wheel car 25 on two parallel rails 23, which have the same distance from each other as two opposite wheels of the car 25; the distance of the rails 21 on the platform 20 is necessarily the same as the distance of two such rails 23.

The benches 24 are arranged on the sides of the floor in stacks of four, or any other number, according to the width of the hot house. 15 It will be noticed from Figure 2 that a free space 26 is arranged between each two blocks 22 for the reasons specified further below. This space 26 is to contain all the pipings needed in the operation of the hot house and they are preferably arranged longitudinally through the hot house, parallel to the rails 13. 20 These pipes are used, among other purposes, for heating the hot house; the upper pipe 27 conducts the heat either in the form of steam, or hot water and the lower pipes 28 serve as return pipes, for instance to conduct the condensed water of the steam, etc. Also water pipes may be arranged in this space 26. The space 26, furthermore, is used as an aisle for 30 watering, weeding or for any other step in the cultivation of the plants in the various stages of their development.

In Figure 2, it is shown that four benches 24, are arranged in each stack back to back; 35 the bases 25 along the middle of the hot house about the platform 20. The benches 24 cannot always stay together back to back as shown in Figure 2; occasionally they must be moved so that one can step between individual 40 benches to get at the plants. It is quite natural that the length of the benches and the plants there give the benches a total weight which is too great for manual operation and means are therefore provided to impart motion to the wheels of the base 25 on which said 45 benches are arranged.

Wheels 29 are arranged at the ends of two parallel axles 30, which are operatively engaged by two heavy plates 31, arranged above 50 said axles 30. Near the ends of each of said plates 31 a heavy iron block 32 is rigidly arranged upon said plates 31 and a rod 33 is rotarily arranged in said metal blocks 32. On either side of the benches one of the metal 55 blocks 32 has superimposed thereon a U-shaped frame 34, in which a small spur gear 35 is operatively arranged on a shaft 36, which extends outside and terminates in a handle 37 (see Figure 3). This spur gear 35 60 is of relatively small diameter and meshes with a spur gear 38 of slightly smaller diameter than the flange 39 of the wheel 29. Each spur gear 38 is rigidly secured upon one of the axles 30 and is closely adjoining the 65 flange 39 of the adjoining wheel 29. On

turning the handle 37 in either direction the whole bench moves accordingly back or forth, as the case may be.

From Figure 9 it is obvious that the motion 70 imparting means on each bench are disposed closely to the wheels at diagonally opposite points. The rod 33 terminates in a handle 40 and is provided with two screw threads 41 and 42 running from the middle of the distance between the blocks 32 in opposite directions. 75 Sleeves 43 and 44, screw threaded inside, operatively engage aforesaid screw threads 41 and 42, respectively; they are furthermore at their upper ends hingedly connected with the heavy iron bars 45 and 46, 80 respectively, which in turn are hingedly connected with each other at 47. A T-shaped arm 48 is hingedly connected at the upper end of the bar 45 and is rigidly secured by any suitable means, such as rivets, or the like, to 85 the bottom 49 of the box 50.

A fork shaped piece 51 is hingedly connected at the upper end of the iron bar 46 and terminates in a perpendicularly disposed rounded male projection 52, engaging a female part of a pillow 53, depending from the bottom 49 of the box 50. A chain 50^a is secured with its ends to the bottom 49 and to the upper end of the iron bar 45. 90

In the middle of the rod 33 a miter gear 95 54 is secured which meshes with a miter gear 55 on the rod 56; another miter gear 55 is provided at the other end of rod 56 and meshes with miter gear 54 secured to a like rod 33 similarly arranged on the other side of the 100 wheel base.

From the construction of this arrangement it will be obvious that upon turning the handle 40 in one or the other direction the sleeves 43 and 44, will, depending on the threads 41 105 and 42, either approach or separate from each other, and by the inter-connection of the various parts, particularly the heavy bars 45 and 46, the box 50 will either lower or rise according to the direction in which the handle 110 40 is turned. Owing to the arrangement of a rod 33 at both sides of the wheel base and the co-operation of these two rods 33 with the rod 56 by means of the miter gears 54 and 55 respectively, the box 50 can be raised or 115 lowered evenly by turning only the handle 40. In order to steady the whole frame work, or structure, just described, braces 57 and 58 are provided to give it the proper stabilization for the purposes intended. 120

It has already been mentioned that the benches eventually have to be separated from their back to back position. It may for instance be necessary for the operation of the hot house that the benches in the linear alignment A¹, B¹, C¹, D¹, . . . I¹ must be moved 125 towards the middle of the hot house in order to allow an inspection at the space between the benches A¹ and A². To accomplish this particular purpose I use the motion impart- 130

ing means at diagonally opposite points of the axles 30 as to the box A¹ and all the boxes on the same side of the hot house. The location of the motion imparting means is indicated at opposite ends by the little squares 59 and 60. If I want to move the benches A¹, B¹ . . . I¹ towards the middle of the hot house, I turn the handle 37 located at the square 59 in such direction that the bench A¹ will move to the platform 20, which was brought in front of the stack of the benches A¹. As soon as this is accomplished I can walk between the benches A¹ and A² and can accomplish any work which may be necessary. If I then want to move bench B¹, I turn the handle 37 of bench B¹ located at square 59 so as to bring that bench B¹ on another platform 20 brought up in front of the stack of benches B¹ and so on all through down to bench I¹. It is self-evident that owing to the movement of the benches A¹ towards the middle of the hot house I can move the bench A² in a similar manner towards the bench A¹ and so on until each individual bench on the same side of the house has been attended to. With the benches on the left side 15 of the hot house I proceed in exactly the same manner except that on this side I now operate the motion imparting means, indicated by squares 60.

In connection with the outside track system, which will be described further below, it is still possible when all the benches have been tended to, to ultimately arrange benches on the rails 13 whereby practically the whole space of the hot house can be taken advantage of for useful purposes. To do this it will be of advantage to move the benches 24 in the stack on the side 14 of the hot house over to the outer end of the rails 23 so that the first bench almost touches the wall 11 of the hot house.

Another feature of my invention is the temporary bridging of the gap between two adjoining blocks 22 by means of the rails 23. During the work of for instance the two benches A¹ and A², after having turned the box A¹ to the middle of the hot house, it is obvious from an inspection of Figure 2 that the space 26 between the benches A¹ and A² must be used as an aisle. The rails 23 bridging over the gap between the blocks 22, adjoining the benches A¹ and A², must then be removed or turned aside to do the work conveniently. This can be done by the arrangement of the rails as illustrated by Figure 6. From said figure it will be noticed that the rails 23 terminate shortly in front of the edges of the blocks 22 and that the ends of the rails 23 are secured to the blocks 22; they are advantageously cut at both ends in oblique directions parallel to each other so that the rail can be turned around 90° to be out of the way.

The same arrangement can be used in

bridging over the gap between the opposite blocks 22 in the middle of the hot house. The five benches 24 can then be arranged that either one bench or two halves of adjoining benches completely fill the space of the middle aisle so as to have together nine benches arranged back to back over the full width of the hot house. If this system of arranging the benches is maintained all over the house down to the bench stack 1, practically the whole space of the ground floor of the hot house is utilized except for an isle at both front sides and at least one aisle along one longitudinal side of the house.

I may further say that the rails 21 of the platform 20 and on the adjoining blocks 22 are cut in an oblique direction and that the rails 23 of the platform 22 correspondingly flare outwardly (Figure 7); the ends of the rails 23 therefore closely abut the rails 21 on the platform 20 and receive these outwardly flaring ends of said rails in case a heavy bench 24 is moved on the platform 20 and tends to tilt the same. A projection 62 of block 22 adjoining the platform also prevents the platform from tilting.

It is obvious from the foregoing that my new method of arranging the benches, which carry the plants, allows a great variation in grouping said benches together. This variation is of course first of all governed by the dimensions of the hot house and then by the personal element of preferring to do a certain work in a certain way instead of another; this is often instrumental in determining the operation of the hot house, but all these variations can be performed without changing the fundamental principle of my method.

The cultivation of the plants also makes it imperative at certain seasons of the year to bring the plants out into the open air. This will be accomplished in the manner described below. Moreover, in the old fashioned style of operating hot houses the soil in the benches 24 is necessarily put into boxes 50 after the same have been permanently installed within the hot house. The supply of the boxes with soil in this old fashioned manner by carting it in wheel-barrows is slow and unnecessary hard work. I can overcome this by filling the soil into the boxes 50, or renewing it outside of the hot house.

It will be noticed from Figures 10 and 11 that the rails 13 are extending out into the yard and that parallel rails 23^a are arranged sidewardly and perpendicularly disposed to the rails 13 at the same distance from each other and according to the same principle except that they are laid directly on the ground fastened to wooden ties in the manner of a railroad track. It will be further noticed from Figures 10 and 11 that the rails 13 are disposed below the surface of the soil in such depth that the rails 21 on the platform 20

will connect with these rails 23^a outside in the yard. It will be further noticed that a horizontally disposed disk 63 is arranged on a rotarily arranged shaft (not shown) between the inside ends of the rails 13 and at the outside ends another such disk is mounted on a vertically disposed rotary shaft 66.

Over the peripheral face of these disks 63 an endless belt 64 is arranged which is pressed inwardly by vertically disposed rollers 65 so that the parallel lengths of the belt 64 are running close to each other. On the belt 64 double hooks 77 are secured projecting perpendicularly upwardly. The disk 63 outside the hot house, horizontally arranged on the vertically disposed rotary shaft 66, is near its top provided with a spur gear 67 of relatively large diameter, this worm wheel 67 being in mesh with a worm 68 secured to the rotary shaft 69 of the electric motor 70.

An arm 71, of elastic material, is secured at the middle of the front side to the platform 20 and is provided at its free end with a hook 72 engaging the front side of the double hook 77. Inasmuch as the belt 64 moves below the wheel axles of the platform 20 and is only slightly above the concrete pavement 17, it is obvious that the hook 72 when engaging the hook 77, on the belt moving in the direction of the arrow 73, pulls the platform 20, with the bench 24 arranged thereon, out of the house. It will be further noticed from the Figure 10, in connection with the diagrammatic Figure 12, that the horizontally disposed hook 72 is pushed off the double hook 77 by means of a curve 78 where the belt 64 engages the same tangentially, the hook 72 being then pushed off hook 77 and lifted by the elastic arm 71. The bench 25 stops then either at the place 74, where the old exhausted soil of the box 50 can be dumped by tilting the same around the end of the heavy iron bar 45 (see Figure 4), whereafter fresh soil is filled into the box from the place 75 opposite the place 74; if the plants are to be aired, the platform is stopped in front of any one of the rail tracks 23^a in the yard for moving the benches thereon in the same manner as in the house inside.

My new method of operating a hot house also allows an efficient heating of the same. In Figure 4 it is shown that curtains 76 of densely woven material, impregnated with some chemical to withstand the action of the humidity of the air of the hot house and to be less permeable to the air, depend from the edges of the bottom 49 of the box 50 down to the pavement 17 of the hot house. Cuffs 79 of similar material are provided at the front and rear edges of the bottom 49 (see Figure 3, the cuff being shown on one side only) which bridge over the gap between two linearly arranged boxes 50 and also the gap between the stacks where posts 80 are located to support the roof of the hot house.

It is evident that heat emanating from the hot pipes 27 cannot freely travel into the space of the hot house, but is forced to stay below the bottom 49 of the boxes 50 so as to be conveyed to the soil in addition to the heat absorbed by the soil from the sunlight.

I wish to state that the description given above illustrates only the general principle of my new method of operating a hot house in connection with the means described, or their equivalent; that I do not want to be restricted only to the means described here, because it is obvious that various elements of my invention can be changed without sacrificing the advantages of or departing from the spirit of the invention.

It is obvious that the way of moving the platform with the bench thereon outside of, or inside into the house can be operated in various mechanical ways, but this does not distract from the fact that my new system allows to freely move the plants with a minimum of personal labor and of time, and to practically use the whole floor space of the hot house, while it also provides the possibility of access to each individual bench and allows to regulate also the height of the bench for the greater comfort of the worker and in view of the requirements of the plants.

What I claim is:

1. In a hot house the combination of a flooring, a rail track, embedded in said flooring, extending longitudinally in approximately the middle of the hot house, a system of side tracks, arranged parallel to each other, disposed perpendicularly and spacedly elevated relative to aforesaid longitudinal rail track, a platform, movably arranged on aforesaid longitudinal rail track, provided with rails connecting the elevated tracks on the sides of the longitudinal rail track, and a plurality of wheel actuated movable benches spacedly arranged back to back on said elevated tracks.

2. In a hot house the combination of a flooring, a rail track, embedded in said flooring, extending longitudinally in approximately the middle of the hot house, a system of side tracks, arranged parallel to each other, disposed perpendicularly and spacedly elevated relative to aforesaid longitudinal rail track, provided with rails connecting the elevated tracks on the sides of the longitudinal track, a plurality of wheel actuated movable benches spacedly arranged back to back on said elevated tracks so as to cover substantially the whole flooring, and an outer similar system of side tracks connecting with the aforesaid longitudinal rail track.

3. In a hot house the combination of a flooring, a rail track, embedded in said flooring, extending longitudinally in approximately the middle of the hot house, a plurality of blocks, arranged at suitable distances from each other in linear arrangement both

parallel to each other and perpendicular to aforesaid longitudinal tracks, a rail secured to the top of each alternate pair of said blocks disposed in alignment perpendicular to the said longitudinal rail track, means connect-
 5 ing the rails on the adjoining blocks so as to form one elevated side rail, a platform, movably arranged on aforesaid longitudinal rail track, provided with a pair of parallel rails
 10 registering with two corresponding rails of aforesaid elevated side rails, and a plurality of wheel actuated movable benches, adapted to engage the rails on said platforms as well as two side rails registering with them, ar-
 15 ranged back to back so as to cover substantially the whole flooring.

4. In a hot house the combination of a flooring, a rail track embedded in said floor-
 20 ing, extending longitudinally in approxi- mately the middle of the hot house, a system of elevated side tracks parallel to each other and disposed perpendicularly to aforesaid longitudinal rail track, a platform, movably
 25 arranged on aforesaid longitudinal rail track, provided with rails so as to connect with the elevated tracks on the sides of the longitudinal rail tracks, and a plurality of wheel actuated and vertically adjustable
 30 movable benches arranged back to back on said elevated tracks so as to cover substan- tially the whole flooring.

5. In a hot house the combination of a flooring, a rail track, embedded in said floor-
 35 ing, extending longitudinally in approxi- mately the middle of the hot house, a system of elevated side tracks parallel to each other and disposed perpendicularly to aforesaid longitudinal rail track, heat conducting
 40 means, a platform, movably arranged on aforesaid longitudinal rail track, provided with rails so as to connect with the elevated side track on the sides of the longitudinal rail track, and a plurality of wheel actuated
 45 movable benches, arranged back to back on said elevated tracks so as to cover substantially the whole flooring, and having cuffs at the front sides and a curtain at the length sides of each bench.

6. In a hot house as described by claim 1,
 50 the combination comprising a longitudinally extending rail track and elevated side tracks serving as a support for the benches, the distance between the tracks being arranged with
 55 respect to the benches so as to leave no open space between the same.

7. In a hot house as described by claim 3, the combination comprising removable means
 60 connecting the rails arranged on alternate pairs of blocks in linear extension to the rails on said blocks.

8. In a hot house as described by claim 1, the combination comprising a platform mov-
 65 ably arranged on the longitudinal rail track, rails spacedly related to each other on said

platform so as to connect with the elevated side tracks.

9. In a hot house as described by claim 1, the combination comprising a plurality of wheel actuated movable benches adapted to
 70 be arranged back to back and side to side to each other so as to cover substantially the whole flooring.

10. In a hot house as described by claim 4, a plurality of wheel actuated and vertically
 75 adjustable movable benches adapted to be arranged back to back and side to side so as to cover substantially the whole flooring.

11. In a hot house as described by claim 5, a plurality of laterally movable benches
 80 adapted to be arranged back to back and side to side to each other and each provided with cuffs at its front sides and curtains at its length sides.

In witness whereof I have hereunto set my
 85 hand.

EMIL BAUMGARTNER.

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