May 1, 1928. 1,667,737

A. S. NICHOLS

CONVEYER AND DOOR AND METHOD OF OPERATING SAME

Filed Feb. 21, 1924 5 Sheets-Sheet 1

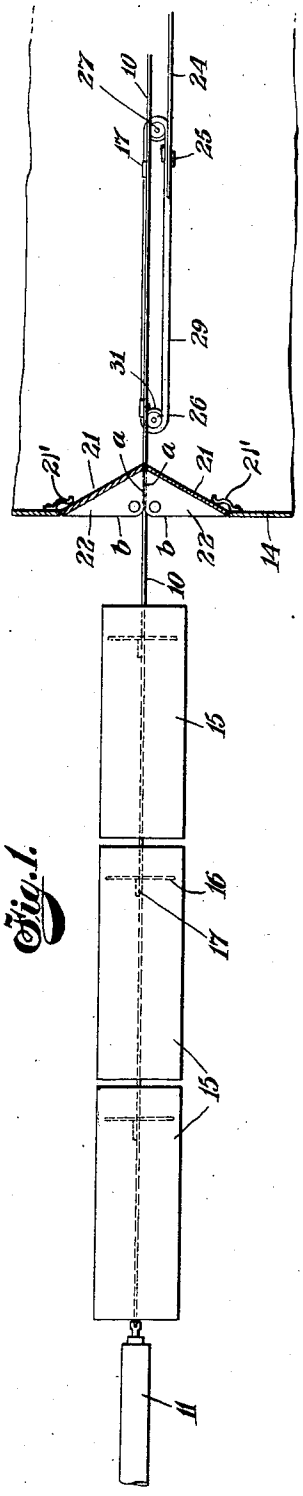


Fig. 1.

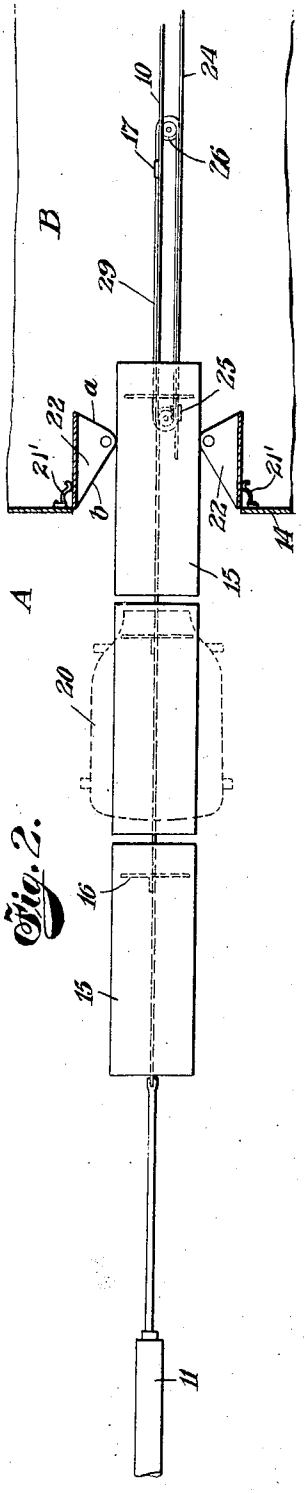


Fig. 2.

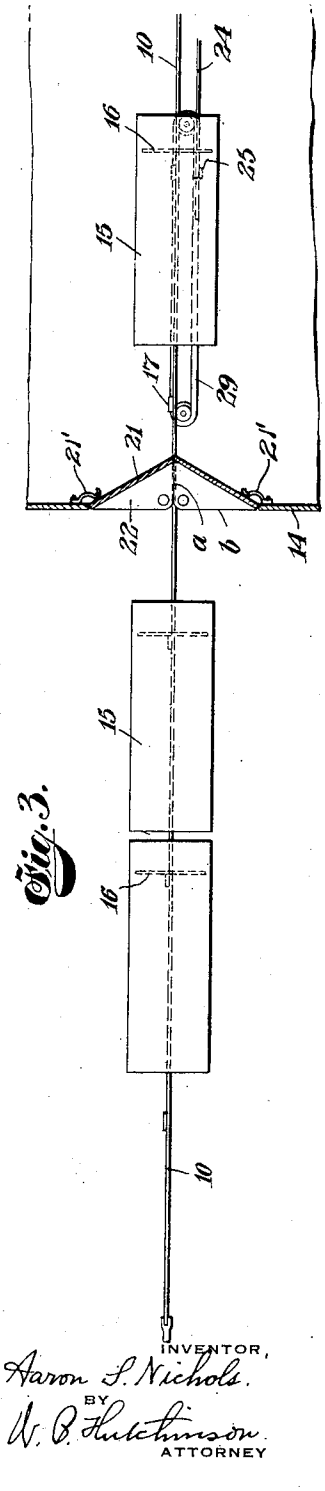


Fig. 3.

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May 1, 1928. 1,667,737

A. S. NICHOLS

CONVEYER AND DOOR AND METHOD OF OPERATING SAME

Filed Feb. 21, 1924 5 Sheets-Sheet 2

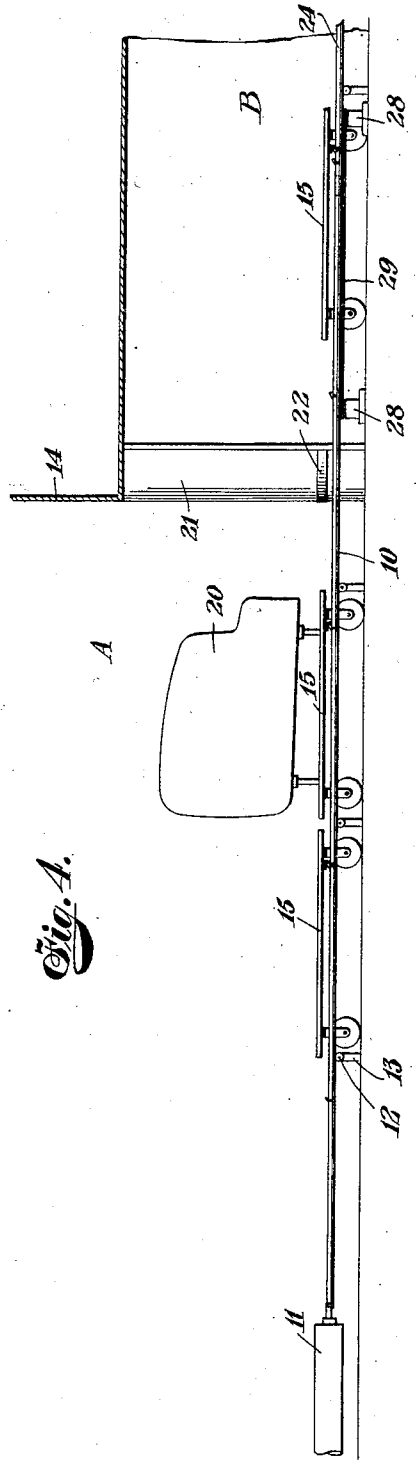


Fig. 4.

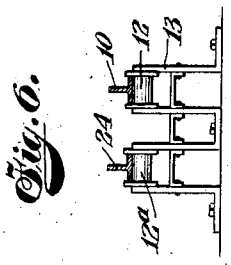


Fig. 6.

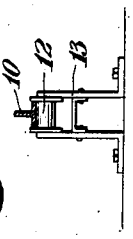


Fig. 7.

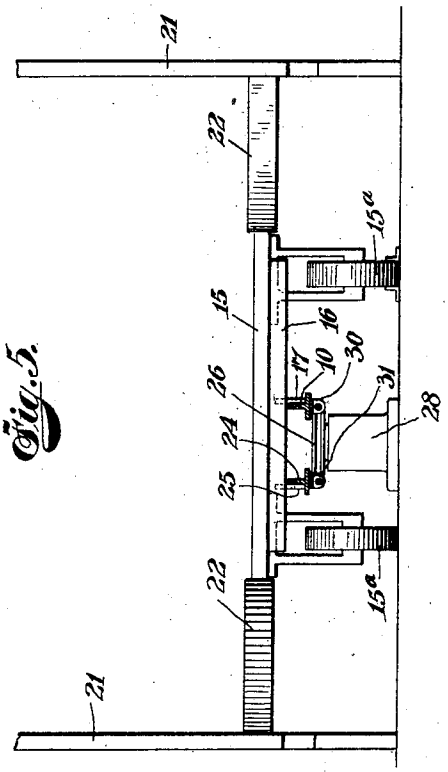


Fig. 5.

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CONVEYER AND DOOR AND METHOD OF OPERATING SAME

Filed Feb. 21, 1924 5 Sheets-Sheet 3

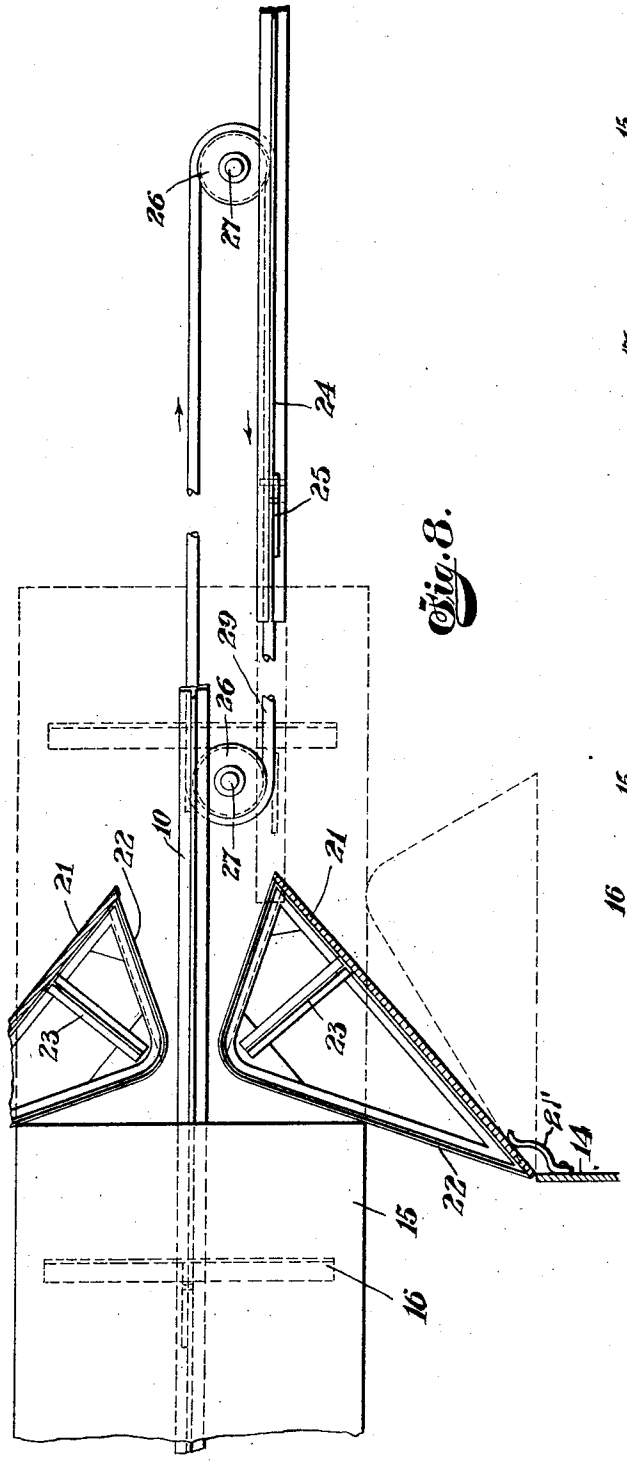


Fig. 8.

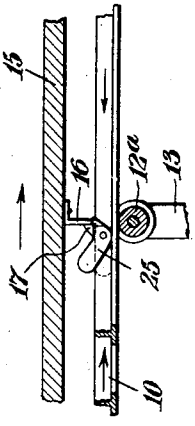


Fig. 10.

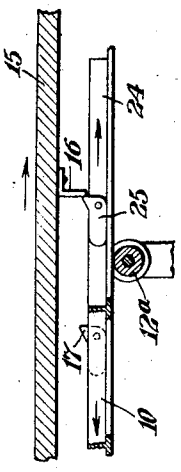


Fig. 12.

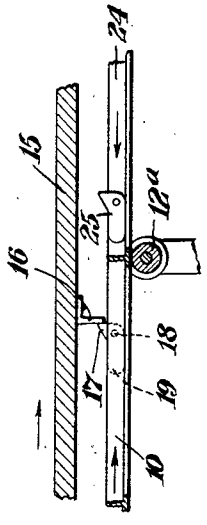


Fig. 9.

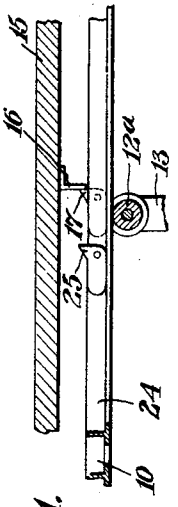


Fig. 11.

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May 1, 1928. 1,667,737

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CONVEYER AND DOOR AND METHOD OF OPERATING SAME

Filed Feb. 21, 1924 5 Sheets-Sheet 4

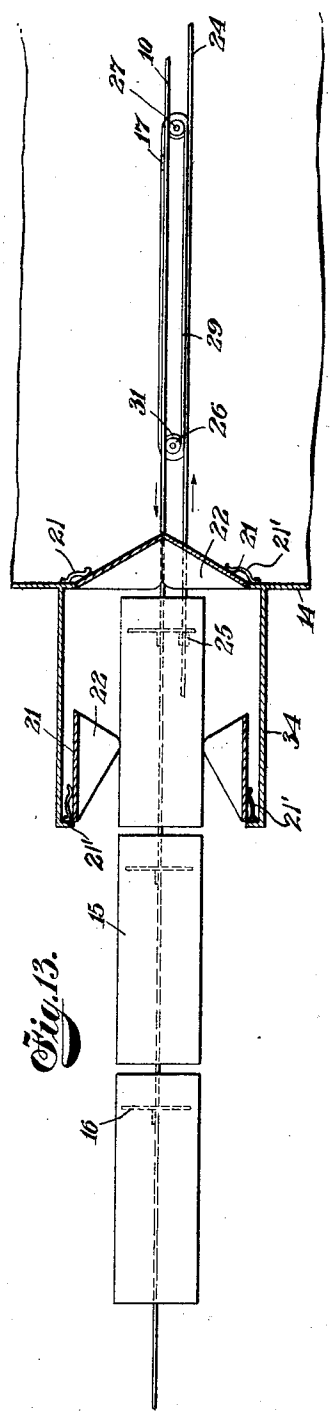


Fig. 13.

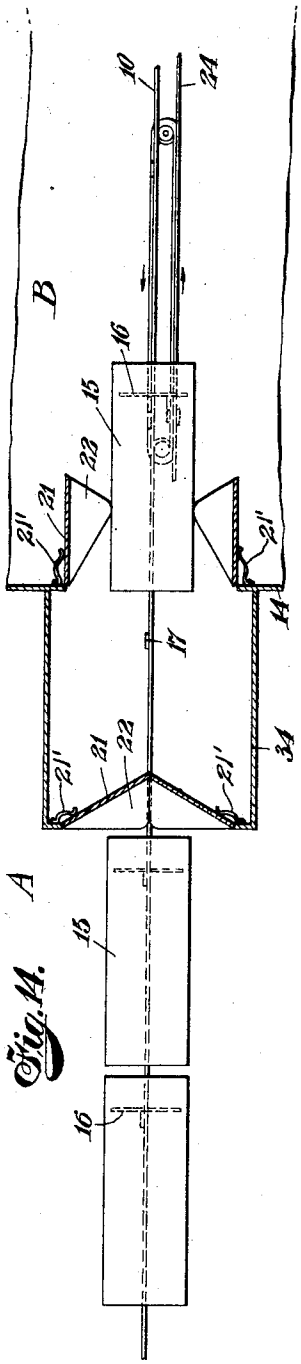


Fig. 14.

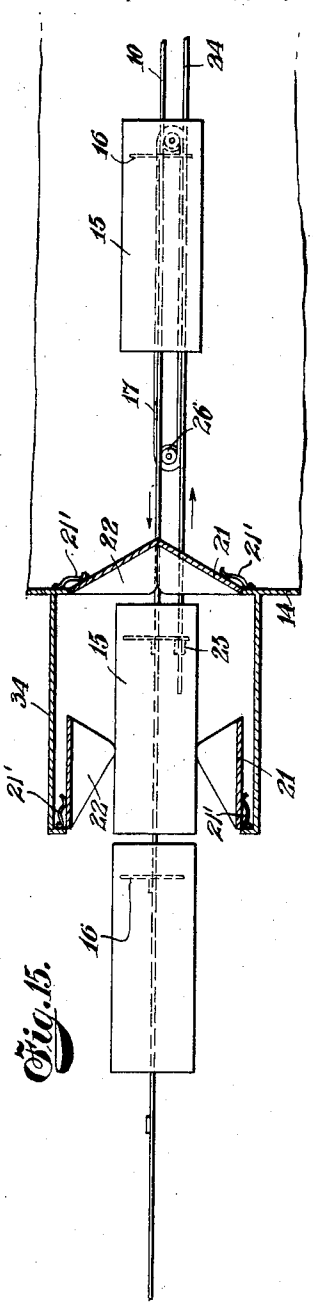


Fig. 15.

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May 1, 1928. 1,667,737

A. S. NICHOLS

CONVEYER AND DOOR AND METHOD OF OPERATING SAME

Filed Feb. 21, 1924 5 Sheets-Sheet 5

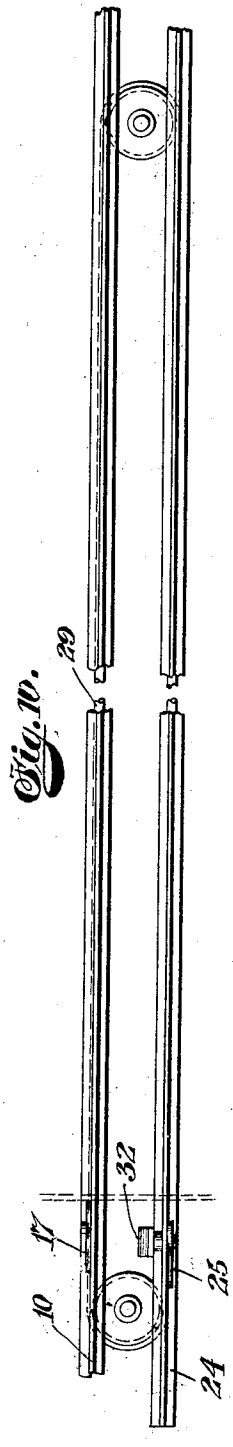


Fig. 16.

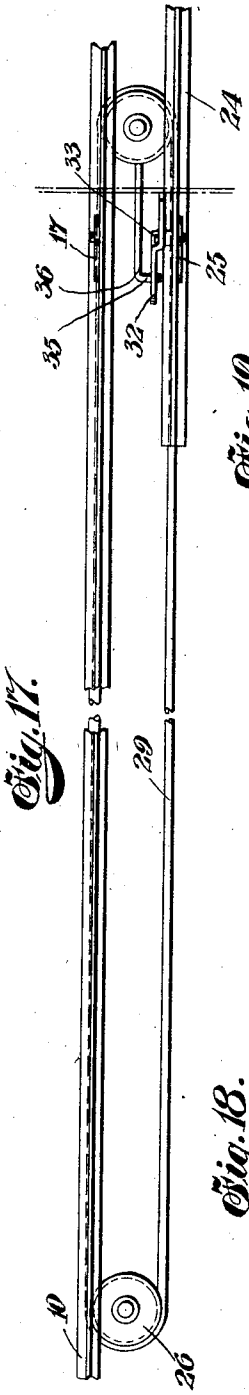


Fig. 17.

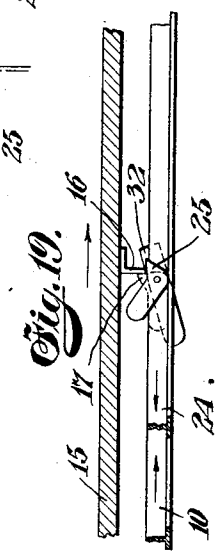


Fig. 19.

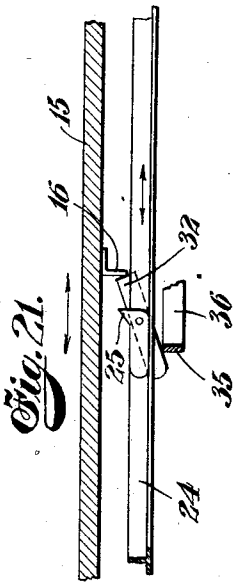


Fig. 21.

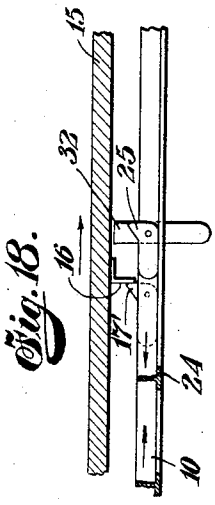


Fig. 18.

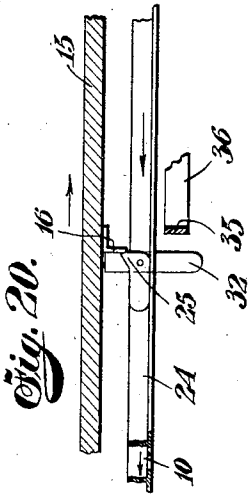


Fig. 20.

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Patented May 1, 1928.

1,667,737

UNITED STATES PATENT OFFICE.

AARON S. NICHOLS, OF NEW YORK, N. Y.

CONVEYER AND DOOR AND METHOD OF OPERATING SAME.

Application filed February 21, 1924. Serial No. 694,308.

My invention relates to a method of and apparatus for operating conveyers and doors, where the conveyers are arranged to move from one room or compartment to another. It often happens, and particularly in manufacturing operations, that a certain part of work will be done on an article of manufacture while it is moving through a room, and that other operations will be done in another room to which the article is conveyed, and sometimes the atmospheric conditions such as temperature, humidity, or other conditions, will be quite different in the two rooms, and it is advisable to maintain normal conditions as far as possible. For instance in the embodiment of my invention which I have chosen to illustrate, conveyers are used to move automobile bodies from one room where certain work is done on them, as for example painting or varnishing, or both, and the bodies are conveyed as fast as the work is done into an adjoining room, which may be a dry room. Obviously the temperature and conditions in the dry room will be quite different from what said conditions are in the work room. My invention is intended to meet conditions of this kind, and provide means for conveying the articles under manufacture from one room to the other by moving the individual elements or parts of the conveyer which carries them through a door or doors in such a way as to separate the elements passing through the door from the general body of the conveyer, to the end that the doors or door may be quickly opened and shut after the conveying element has passed through, thus preventing the air from one room from permeating to too great an extent into the next room. In other words I provide for moving the doors to allow the conveyer parts to pass through, and in which the conveyer elements will automatically separate themselves from the remaining part of the conveyer and permit the quick and easy closing of the doors. Obviously this idea may be carried out in many ways with many forms of conveyers and with a great variety of doors, and my invention relates more particularly to the general arrangement for permitting the above results to be obtained, all of which will appear more clearly from the description which follows.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar reference characters indicate corresponding parts in all the views.

Figure 1 is a diagrammatic plan of a form of conveyer adapted for use in the workroom and dry room of a plant handling automobile bodies and the like, showing the door between adjacent rooms closed.

Figure 2 is a view similar to Figure 1 with the doors as they appear while an element of the conveyer is passing through them.

Figure 3 is a view similar to Figures 1 and 2 but showing the independent movement of one of the elements of the conveyer as it passes through a door and as it has become separated from the other elements of the conveyer to permit the closing of the doors.

Figure 4 is a diagrammatic elevation of the apparatus referred to in the foregoing figures.

Figure 5 is a cross sectional view showing one of the conveyer elements in end elevation and in contact with the door opening means.

Figure 6 is a detail sectional view showing how the operating rails or plungers are arranged.

Figure 7 is a detail sectional view showing the support for the main rail or plunger.

Figure 8 is a broken enlarged plan view showing more in detail the door operating means.

Figure 9 is a sectional elevation showing the relation of the main and auxiliary rails for moving the conveyer elements and with the main rail connecting with the adjacent element or truck.

Figure 10 is a view similar to Figure 9 showing another position of the parts with the dog of the auxiliary rail about to engage an element of a truck.

Figure 11 shows the position of the parts after the dog of the auxiliary rail or plunger has moved back to engage a truck.

Figure 12 shows an advance movement from that shown in Figure 11, with the dog of the auxiliary rail engaging a truck element.

Figure 13 is a modification of the invention showing a vestibule to facilitate the carying out of the invention, said vestibule being arranged in the partition wall and with a door at each end.

Figure 14 is a view similar to Figure 13

with the first set of doors closed and the second set opened.

Figure 15 shows a further movement of the parts and with the first element of the conveyer spaced apart from the others.

Figure 16 is a broken plan of the rail and cable mechanism for moving the conveyer parts.

Figure 17 is a similar view with the parts in a different position and showing the means for giving an additional movement to the individual conveyor elements, and

Figures 18 to 21 are details showing progressively the means for giving an additional impulse or movement to the individual conveyer elements.

From the description which follows it will be understood that my invention can be applied to any conveyer having spaced elements moving through a door opening, and with the object of opening and closing the doors as each conveyer element or each separate part of the conveyer passes through. By way of example I have illustrated the invention as applied to a plant in which automobile bodies or the like are each carried on a separte platform or truck, so that work may be done upon it, and the conveyer carries the bodies through the doors of the partition wall after this work has been done, and into the connecting dry room or other room. The form of conveyer in detail is not material.

As shown, parallel reciprocating rails or plungers 10 are used, which are operated by mechanism shown at 11, and the rails can be supported in any convenient way, as for instance upon the roller 12 mounted in a suitable support 13. Each plunger runs through the doorway of the partition wall 14, and in the example shown, each plunger carries spaced elements 15 which in the present instance are platforms, each adapted to contain a car body 20. The plunger 10 at each stroke moves a distance of the length of the platform of truck 15. These are slightly spaced for reasons of economy, and in passing through the doors of the partition 14 they must of necessity become more widely separated to insure proper operation of the doors. As a means of connecting the main rail or plunger 10 with the platforms or trucks 15, the latter has each a catch in the form of a transverse angle iron 16 on the under side which is engaged by a dog 17 pivoted on the rail as shown in Figure 9, this dog being pivoted as shown at 18, and having a weighted tail 19 lying on the web of the rail. Thus the dog will engage the catch 16 so as to advance the platform 15, and on the return movement of the rail or plunger, the dog will slip beneath the catch as in Figure 10.

Where the conveyer comprising the rail 10 and platforms 15 passes through the wall 14, doors 21 are provided and these may be of many forms without affecting the invention, although I prefer to use self closing doors, and a door is preferably made up of two elements 21 hinged on opposite sides of the door opening. Each door or member 21 in order that it may be opened automatically, has preferably a triangular abutment 22 having two walls "*a*" which meet as in Figure 1 when the door members 21 meet edge to edge, and surfaces "*b*" which are parallel with the partition 14 when the door members are closed. Any one of several means may be provided for rendering the door self-closing but as illustration of the idea, springs 21' are shown in the figures. The abutments 22 can be in the form of rails, and may have an internal brace 23 if desired. This arrangement is such that the abutments 22 come opposite the edges of the platform 15, and when the doors are closed as in Figure 1, they are substantially parallel with the partition 14. Thus when the platform 15 is advanced, its front end will strike flatwise against the surfaces "*b*" of the abutments 22, thereby pushing open the doors, and the abutments will ride along the side edges of the platform 15 as it passes through. After the platform has passed through, the doors quickly close behind it.

To enable the doors to operate quickly and to close quickly, means is provided to separate the element or platform 15 passing through a door from those immediately following, and this independent movement permits the doors to close quickly, thus preventing any great interchange of air between the adjacent rooms. As a convenient means of doing this, I have shown an auxiliary rail or plunger 24 which is arranged adjacent to the door way and can be supported on rollers 12^a (see Figure 6). This auxiliary rail is made to slide in opposite directions from the rail 10 so that when the rail 10 moves forward, the auxiliary rail will move backward, and vice-versa, and the auxiliary rail is provided with dogs 25 like the dogs 17 already referred to, and spaced so as to at the proper time engage the catches 16 as presently described. As a means of connecting the main and auxiliary rails, spaced pulleys 26 are shown (see Figure 8) turning on vertical studs 27, and supported on pedestals 28 or the like. The pulleys 26 carry cables 29 which connect by a bracket 30 or the like (see Figure 5) with the main rail. The cable 29 also connects by a bracket 31 with the auxiliary rail, 24, and so the rails 10 and 24 move at the same time but in opposite directions.

In Figure 1 I have shown a line of platforms approaching the closed doors 21, and as the front platform or truck strikes the abutments 22, it opens the doors. A dog 17 of a main rail 10 engages the catches 16 as

in Figure 9 to effect the foregoing movement. Meanwhile the pulleys 26 will have been turned by reason of the connection already described, so as to carry the dog 25 of the auxiliary rail 24 behind the catch 16 of the front car, the dog tipping up as shown in Figure 10 to permit this, and the dog passing well behind the catch as in Figure 11 to insure perfect contact. Then as the main rail 10 moves back to engage another platform 15, the auxiliary rail 24 will move forward, its dog 25 engaging the catch 16 as in Figure 12, and carrying the platform 15 quickly forward through the doors and spacing it from them as in Figure 3, thereby permitting the doors to shut quickly behind the said advanced platform 15. Thus it will be seen that the conveyer elements, which in the case illustrated are the platforms 15, are separated as they pass the doors, thereby permitting the quick closing of the latter, and thus the doors are opened but a short space of time, the operation of the conveyer is not interfered with, and the passage of air from one room to the other is limited.

In Figures 13 to 15 I have shown a slight modification of the invention which can be used, and which still further prevents the escape of air. As here illustrated, vestibules or sleeves 34 are arranged in connection with the parts 14, these vestibules being each of the length of one of the elements or platforms 15. The platforms are operated as already described, and the vestibules have doors like those described, only they are arranged at both ends. Thus as in Figure 13, the platform will open the first pair of doors and enter the vestibule, while the second pair of doors are closed. Then as the front platform is given its independent movement as already described, the first pair of doors will close, thereby preventing the escape of air from one room to the other, and the second pair will open as in Figure 14; then as another platform enters the vestibule as in Figure 15, the first platform will be independently advanced through the second pair of doors and spaced apart as in Figure 15.

In Figures 16 to 21 I have shown a means which can be used for giving an additional impulse to each truck or element 15 as it leaves the door, so as to make sure that its catch 16 will be engaged by the proper dog 17 on the rail 10 so as to advance it regularly out of the way of the following elements. Many devices might be used for this purpose, but a simple means is illustrated in which a lever 32 is pivoted to the auxiliary rail 24 as shown at 33, and its upper end extends into the path of the catches 16 as shown in Figure 18, and its lower end extends into the path of a fixed abutment, as for instance the bent end 35 of an arm 36 which can be supported on the post or pedestal 28. It will be noticed that an advancing element or platform 15 will pass over the lever 32 as shown in Figure 19, and the latter will drop behind the catch 16 as in Figure 20. Then as the auxiliary rail nears the limit of its forward stroke, the lower end of the lever 32 striking the abutment 35, will tilt on its pivot, and the upper end acting against the catch 16 of the adjacent platform 15, will give to the latter an added push or impulse so as to carry it forward to a point where it will be sure to be engaged by the proper dog of the main rail 10.

From the foregoing description it will be clearly seen that in the instance illustrated the materials which are car bodies, can be operated on in the room A, then passed to the dry room B without permitting any great interchange of air between the two rooms. The conveyer illustrated is one of ordinary form, but the general system of operating the doors from the conveyer and separating the conveyer elements to permit the quick action of the doors, is believed to be new. Obviously there is no necessity of showing a great variety of conveyers and doors and operating means, as any mechanic can readily see that the principle herein described can be applied to many types of conveyers and doors, and the essential thing is to have the conveyer arranged so that it will open the door in front of each of its carrying elements, and close it behind said element as it passes through. It will be further observed that to carry this principle into effect in the most practical and economic way, it is desirable to have the carrying element movable independent of the other elements of the conveyer, to provide for the separation necessary to the successful operation of the doors, and further, that it is better to have the movement of the element as it passes the door accelerated, to the end that the separation of the parts of the conveyer may be quickly effected and the doors quickly operated.

In the method and apparatus described, a saving in heat is effected. The prevailing practice is to withdraw the heated air from a drying room by means of an exhaust fan and ducts with such force or power that the excess hot air that is provided for the drying room may be drawn out of the tunnel-like room before it reaches the open ends of the oven or tunnel, which in the present case is represented by "B." This practice never takes out all of this heated air, in fact the loss of heat suggested this invention, as with its use the saving in steam or heat will repay the cost of installing the closed ends to a tunnel drying oven in a short time, regardless of cost of ducts, fans and constant motive power.

The cost of attaching this device to open end ovens or tunnels is comparatively small,

and requires no additional power other than is provided to operate the conveyer, and the important thing is to separate the cars or carrying elements at a point opposite the doors to permit the doors to automatically close. Thus no space is wasted, as the oven, or tunnels or dry rooms represented by "B" can be filled practically full.

I claim:—

1. An apparatus of the kind described comprising a reciprocating element, spaced carrying elements actuated thereby, a doorway having self closing doors, means for opening the doors by the passage of a carrying element between them, and means for accelerating the movement of the carrying element passing through the doors thereby permitting the quick closing of the doors behind it.

2. An apparatus of the kind described comprising a reciprocating plunger, carrying elements carried by the plunger, a doorway through which the carrying elements pass, doors for the doorway, and means actuated by the back stroke of the plunger for advancing the forward carrying element through and away from the doors.

3. An apparatus of the kind described comprising a conveyer having a reciprocating plunger, carrying elements advanced by the forward movement of the plunger, a doorway through which the carrying elements pass, means for opening and closing the doors of the doorway as a carrying element passes through the doorway, and means actuated by the back stroke of the plunger for independently moving a carrying element while the latter passes through and away from the doorway.

4. An apparatus of the kind described comprising a conveyer having a reciprocating rail, carrying elements carried by the rail, a doorway having self closing doors through which the carrying elements pass, an auxiliary rail connected with the main rail so as to move at the same time but in an opposite direction, and a connection between the auxiliary rail and the forward carrying element whereby the back stroke of the plunger causes the auxiliary rail to move the carrying element through the doorway.

5. An apparatus of the kind described comprising a conveyer having a reciprocating main rail, carrying elements connected with said main rail so as to be moved forward by the forward movement of said rail, a doorway having self closing doors through which the carrying elements pass, an auxiliary rail movable parallel with the main rail, and an operative connection between the auxiliary rail and the forward carrying element whereby the auxiliary rail moves said element on the back stroke of the main rail.

6. An apparatus of the kind described comprising spaced carrying elements, a reciprocating element for advancing the carrying elements step by step, an auxiliary element adjacent the reciprocating element for further advancing said carrying elements, and means connecting said reciprocating element and said auxiliary element for operating the latter whereby the back stroke of the reciprocating element causes the auxiliary element to move forwardly to advance the carrying elements.

7. An apparatus of the kind described comprising spaced carrying elements, a reciprocating element for advancing the carrying elements step by step, an auxiliary element adjacent the reciprocating element for a portion of the length of the latter, and means operated by said reciprocating element for moving said auxiliary element in unison and parallel therewith but in opposite directions thereto whereby to further advance the carrying elements upon the back stroke of the reciprocating element.

8. An apparatus of the kind described comprising spaced carrying elements, a door through which said elements pass, a main rail adapted to impart movement to said carrying elements, an auxiliary rail arranged to give an independent movement to each of said elements as they pass through the door, and means for giving an additional push to each of said elements as they approach the limit of the independent movement.

9. An apparatus of the kind described comprising spaced carrying elements, a door through which the elements pass, a main rail arranged to impart movement to said elements, an auxiliary rail arranged to impart independent movement to the carrying elements passing through the door, a tilting lever carried by the auxiliary rail and in the path of a corresponding catch on a carrying element, and an abutment in the path of the lever whereby the movement of the auxiliary rail causes the lever to advance the aforesaid element.

10. An apparatus of the kind described comprising a plurality of spaced elements, reciprocating means for moving said elements, and means for increasing the speed of movement of the foremost element when it reaches a certain point in the path of movement of said elements.

11. An apparatus of the kind described comprising a plurality of spaced elements, a reciprocating member for moving said elements step by step, and another reciprocating member having means for engaging the foremost element for increasing the speed of movement of the foremost element when it reaches a certain point in the path of movement of said elements.

12. An apparatus of the class described comprising a plurality of spaced elements,

a reciprocating member for moving said elements step by step, and another reciprocating member having means for engaging the foremost element for increasing the speed of movement of the foremost element when it reaches a certain point in the path of movement of said elements, the reciprocations of said members being out of phase.

13. An apparatus of the class described comprising a plurality of spaced elements, a reciprocating member for moving said elements step by step, doors in the path of movement of said elements, and another reciprocating member having means for engaging the foremost element for increasing the speed of movement of the foremost element when it reaches said doors.

14. An apparatus of the class described comprising a plurality of spaced elements, a reciprocating member for moving said elements step by step, doors in the path of movement of said elements, and another reciprocating member having means for engaging the foremost element for increasing the speed of movement of the foremost element when it reaches said doors, the reciprocations of said members being out of phase.

15. An apparatus of the class described comprising an element, reciprocating means for moving said element step by step, and a second reciprocating means having means for engaging the element for increasing the speed of said element during a portion of its travel, the reciprocations of second means being 180 degrees out of phase with the reciprocations of the first.

In testimony whereof, I have signed my name to this specification this 5th day of February, 1924.

AARON S. NICHOLS.