Dec. 24, 1929. S. T. HOYT ET AL 1,740,893

TRAY FILLING MACHINE

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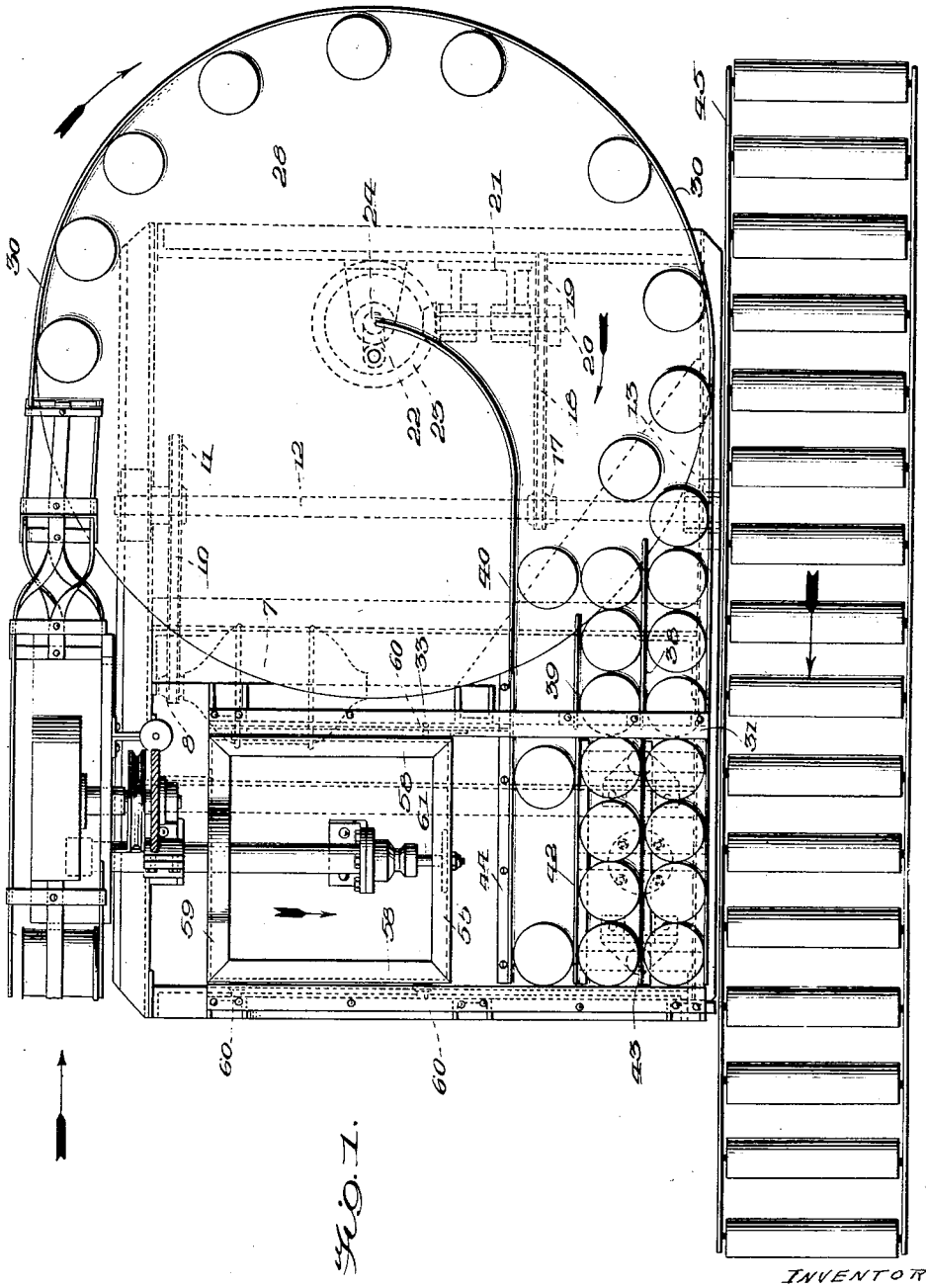


Fig. 1.

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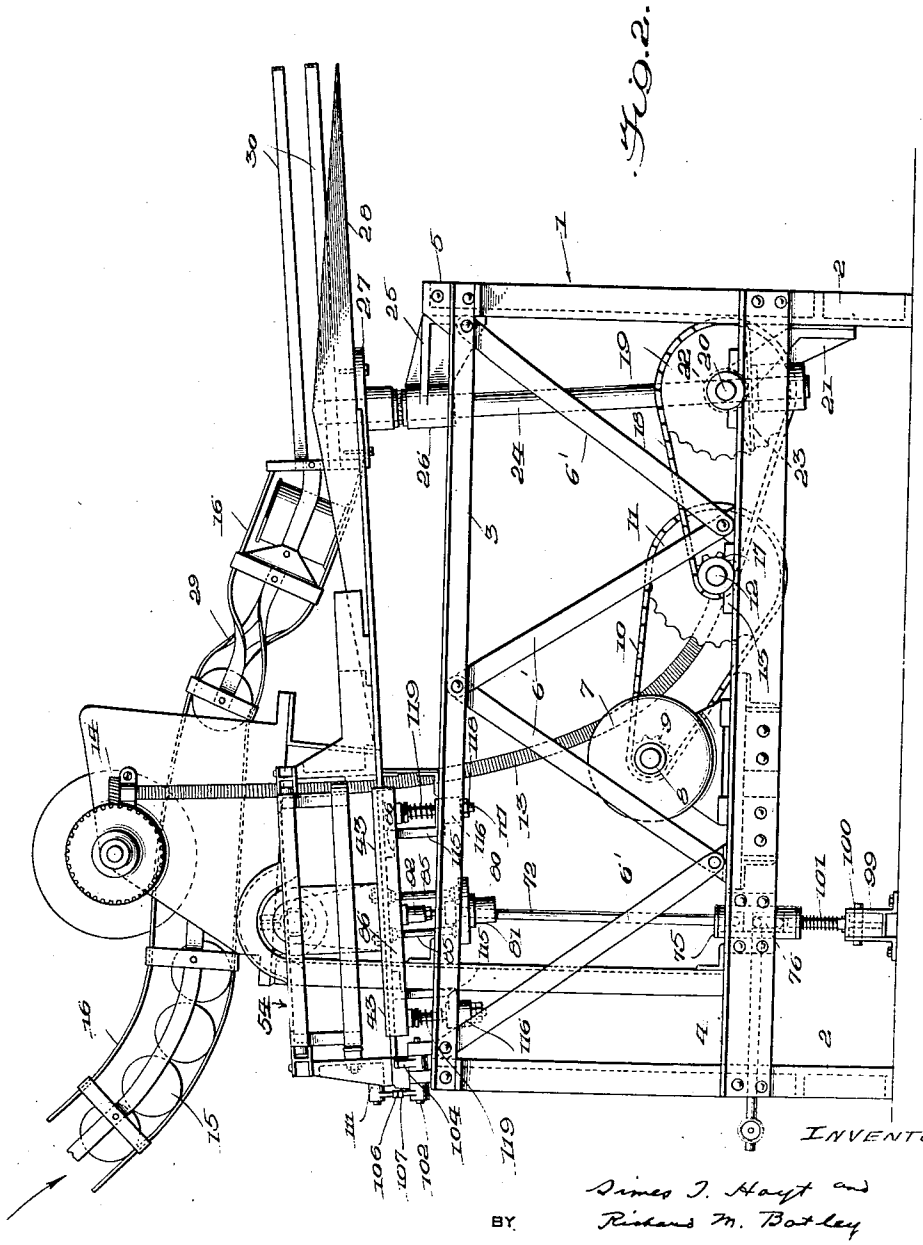
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TRAY FILLING MACHINE

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Fig. 2.



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TRAY FILLING MACHINE

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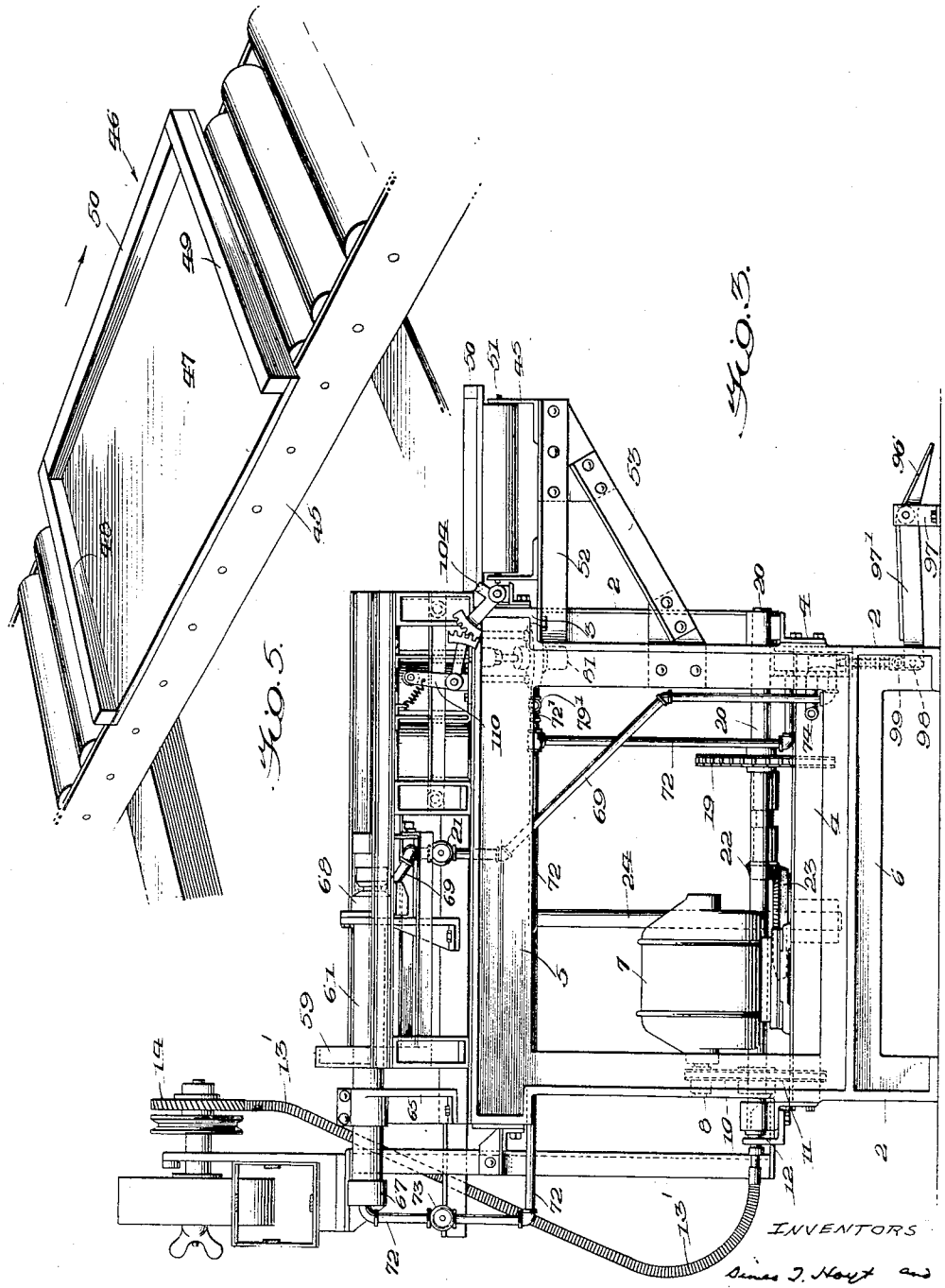


Fig. 5.

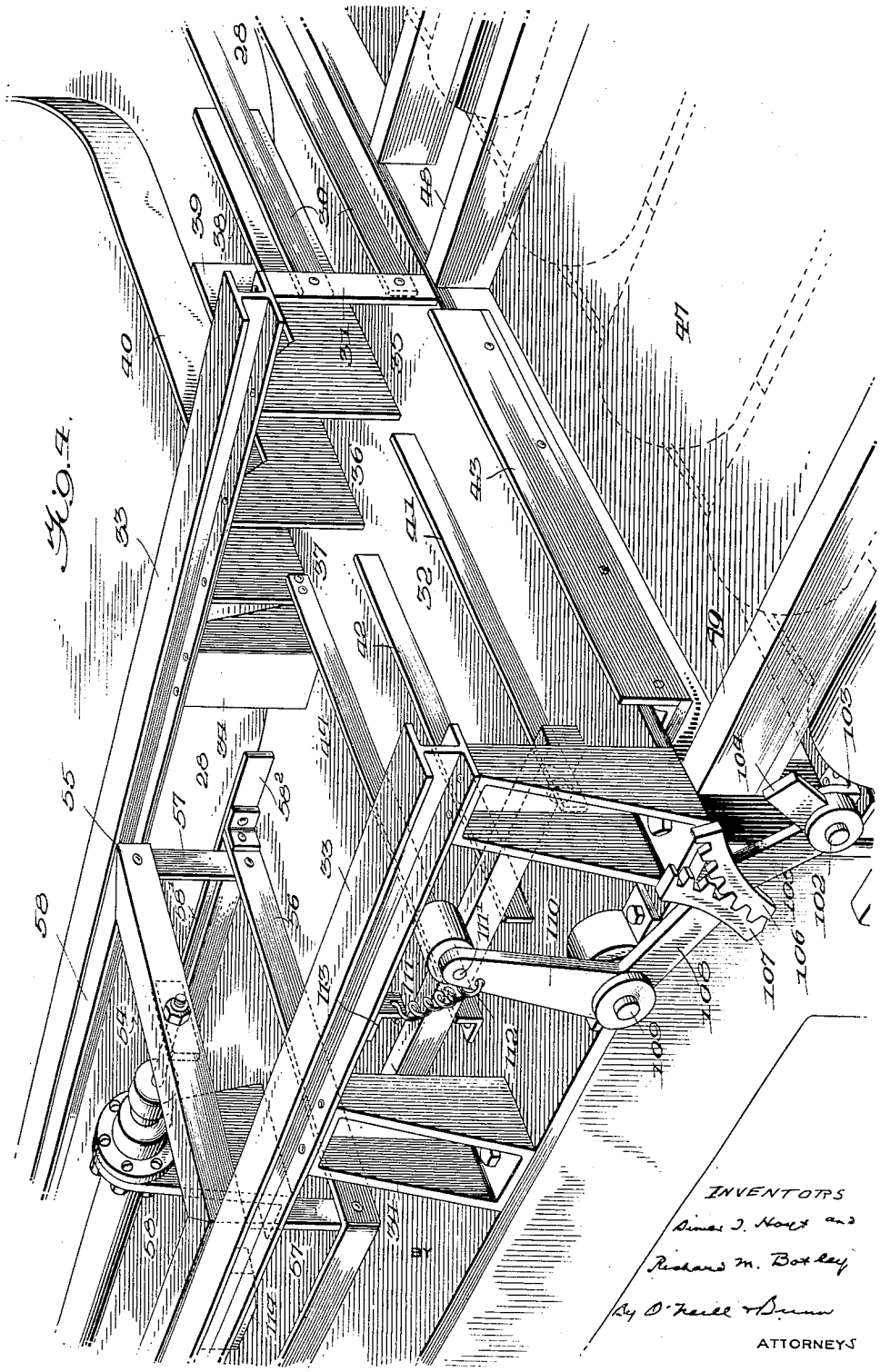
Fig. 3.

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TRAY FILLING MACHINE

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TRAY FILLING MACHINE

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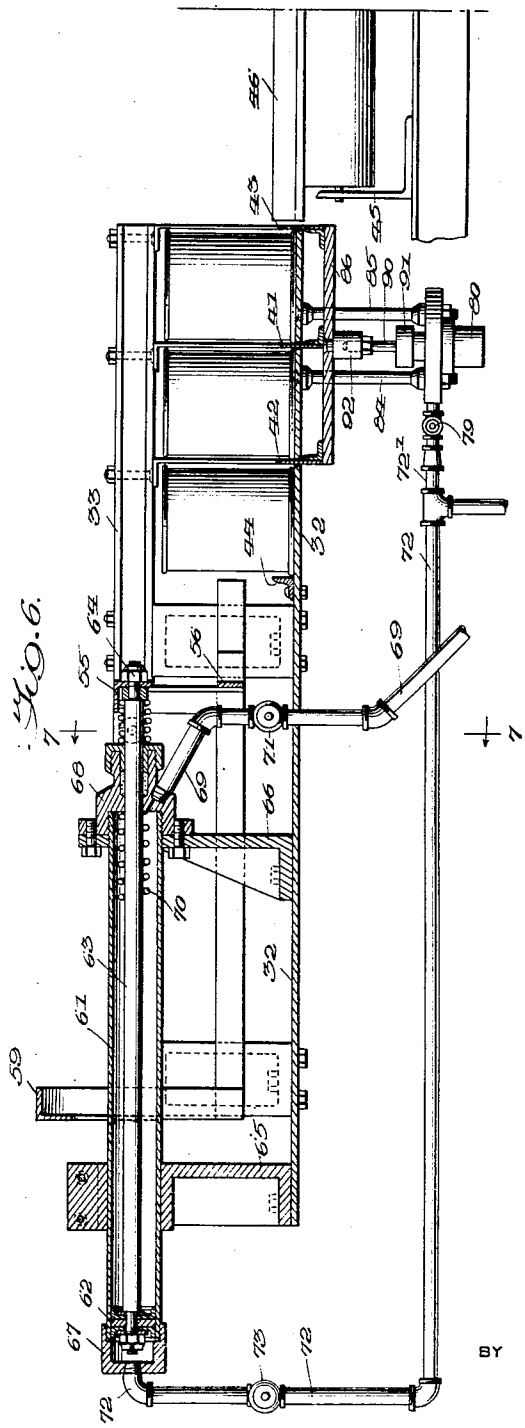


Fig. 6.

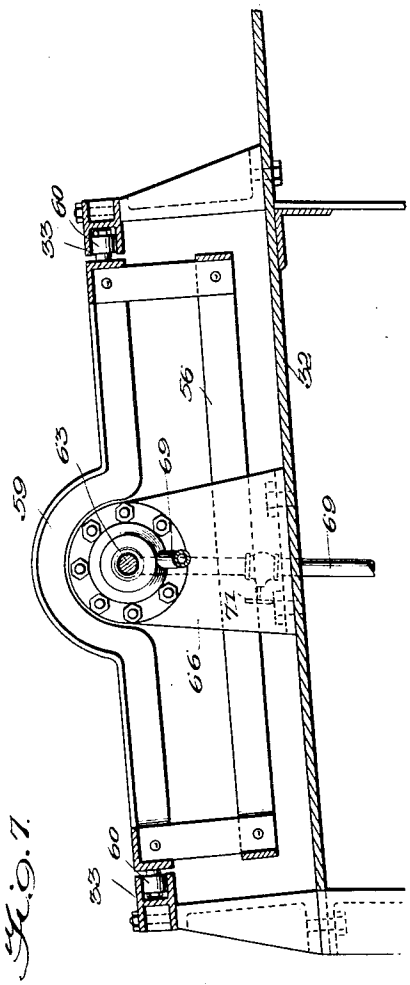


Fig. 7.

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TRAY FILLING MACHINE

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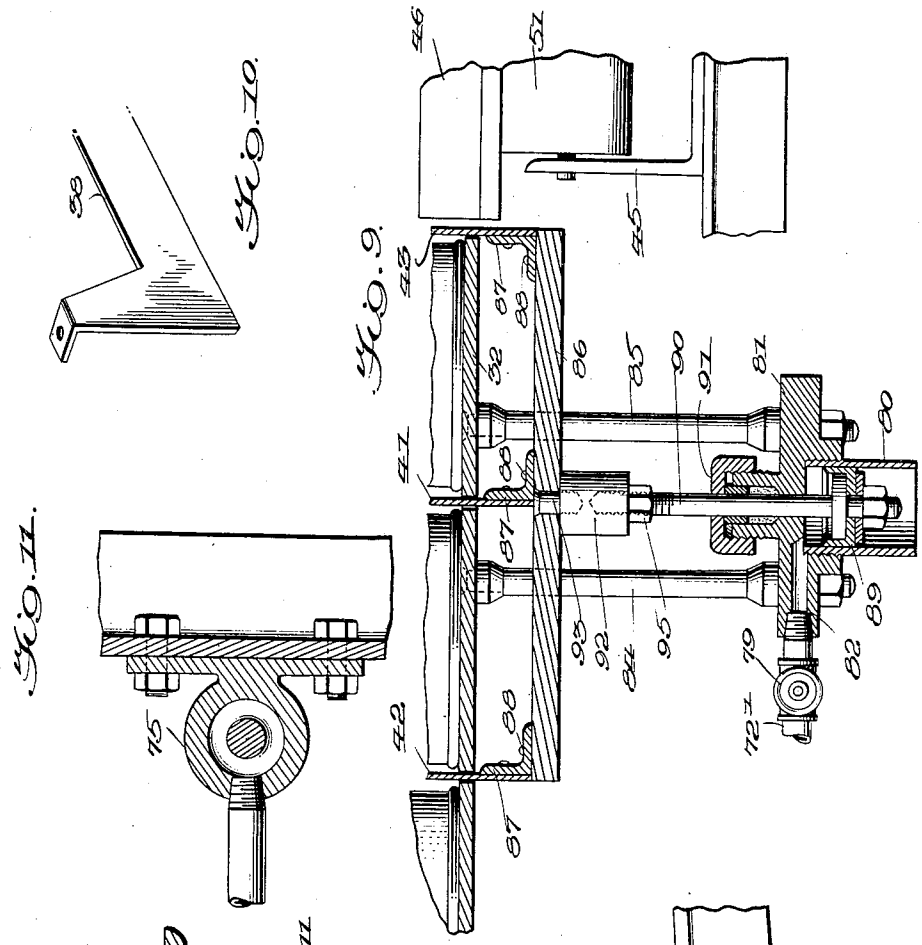
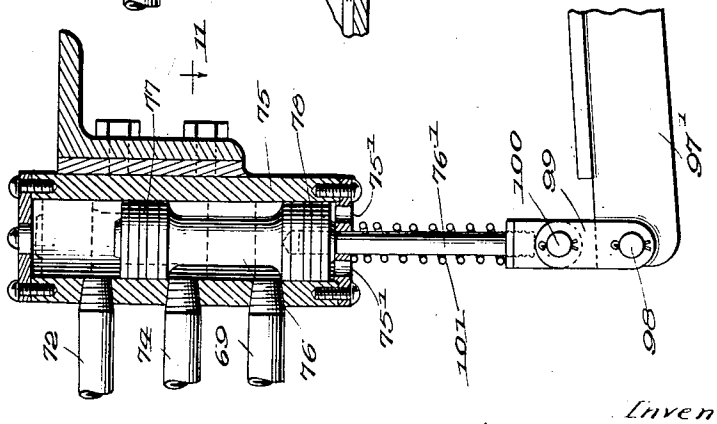


Fig. 10.

Fig. 9.

Fig. 11.

Fig. 8.



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Patented Dec. 24, 1929 1,740,893

UNITED STATES PATENT OFFICE

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TRAY-FILLING MACHINE

Application filed January 14, 1929. Serial No. 332,524.

This invention relates to a machine adapted to receive empty cans from a conveyor, and to thereafter deliver said cans onto portable trays. More specifically the invention includes the step of arranging the cans into groups adapted to fill trays of determined dimensions, and the delivery of said groups to trays mounted on a conveyor traveling adjacent the machine.

A machine of the class referred to is of great utility in any fruit-canning industry, such as a pineapple cannery, in which the empty cans are automatically subjected to several necessary operations before being filled with the fruit. In handling the empty cans certain operations include the step of filling portable trays with said cans, and this work necessitates very high and continued speed by the operator, some of whom are capable of placing 250 to 300 cans per minute upon the trays, over a short period only, the average speed falling far short of such volume. Since the filling of the trays is a necessary link in the chain of operations incident to the canning industry, it is the object of this invention to provide mechanisms which will automatically fill the portable trays at a speed much greater than may be maintained by the most skilled manual operation.

Other objects of the invention will be made apparent in the following specifications, when taken in connection with the drawings forming a part thereof.

In said drawings:—

Fig. 1 is a top plan view of a machine embodying our invention.

Fig. 2 is a front elevation of the machine shown in Fig. 1.

Fig. 3 is an end elevation of the machine.

Fig. 4 is a fragmentary perspective view showing portions of the machine, and the can-receiving hopper.

Fig. 5 is a perspective view showing one of the can-receiving trays mounted upon a conveyor roller.

Fig. 6 is a view, partly in section, showing the means for transferring the cans from the hopper to the trays.

Fig. 7 is a vertical section on the line 7—7 of Fig. 6.

Fig. 8 is a vertical section taken through a valve mechanism forming a part of the structure shown in Fig. 6.

Fig. 9 is a vertical section taken through the lower portion of the tray-receiving hopper, and showing the means for releasing the cans preparatory to delivering them to the tray on the conveyor.

Fig. 10 is a detailed perspective of one end of a rail adapted to guide the cans into position in the hopper, and,

Fig. 11 is a section on the line 11—11 of Fig. 8.

Now referring specifically to the drawings, in which like reference numerals indicate like parts throughout the several views, 1 indicates a frame having the usual supporting uprights 2, upper and lower side rails 3 and 4, and similar end rails 5 and 6, bracing struts 6′ spanning the space between the rails 3 and 4, as best illustrated in Fig. 2 of the drawings.

In the preferred embodiment of the invention as here illustrated, a motor 7 is properly supported on the rails 4, the shaft 8 of the motor being equipped with a pinion gear 9 to receive a drive chain 10 trained over a gear wheel 11, carried by a rotatable shaft 12 mounted in trunnions 13 fixed to the rails 4. As best illustrated in Fig. 3 the end of shaft 12 is operatively connected to a flexible shaft 13′ extending upwardly, the top end of said shaft 13′ being provided with a gear 14 adapted to actuate mechanism forming a part of means for marking the cans 15 as they pass along a chute 16. Since the marking mechanisms form no part of the present invention, no further description thereof is deemed necessary.

The shaft 12 carries a pinion 17 adapted to receive a drive chain 18 trained over a gear wheel 19, mounted on a shaft 20, trunnioned in a bracket 21 carried between the lower portion of the uprights 2, the inner end of said shaft being provided with a beveled pinion 22 in mesh with a beveled gear 23, secured to a shaft 24, the said gear being so mounted that the shaft 24 is about 5° off from the vertical, for a purpose to be hereinafter more specifically explained. The top end of the shaft 24 is supported in position by a bracket

25 secured to the top end rail 5, said bracket carrying a trunnion 26 provided with anti-friction devices facilitating rotation of the shaft, the latter terminating in a flat plate 27, bolted or otherwise secured to a feed disc 28, it being noted that the inclination of the shaft 24 causes the disc 28 to be canted from the true horizontal, the outer edge of the disc being located in a higher plane.

The disc 28 is composed of metal having a smooth and unobstructed top surface permitting the cans to easily slide thereover, the said surface being in the form of a flat circular cone, the pitch or angular inclination of the sides of the cone being about six degrees. The cans 15 are delivered to the rotating disc 28 in a single row from the gravity chute 16, after passing through the marking device, a quarter-turn twist 29 being given to the chute 16, adjacent the disc, whereby to cause the cans to be placed on end upon said disc. Secured at one end to the chute 16, adjacent the disc 28, are guard-rails 30 which are located above and concentric with the periphery of the disc, said rails serving to retain the cans on the disc during the travel of the latter. The rails extend part way around the disc, the other ends of said rails being connected to a bar 31 forming part of the framework of a hopper to be later referred to.

It is to be noted that, as the cans are delivered to the disc 28, rotating in clockwise direction as shown by the arrow, Fig. 1, they are urged forward by the tractive force of the disc, and also by gravity, the rails 30 at all times retaining the cans on the disc surface. It is the purpose of this invention to cause the cans to be delivered from the disc 28, in regular rows, to a hopper structure located adjacent a roller conveyor carrying the trays to be filled.

The hopper structure is defined by a floor 32, having a smooth metallic top surface to permit easy sliding movement of the cans thereon, and upper parallel rails 33, of channel iron, supported above the floor 32 by bracing members 34. The floor 32, in the embodiment here described, carries three extensions 35, 36 and 37, each directed towards the periphery of the disc 28, the outer peripheries of said extensions being on the exact level with or slightly below the level of the disc, and being shaped to conform to a circle concentric with the latter, as most clearly shown in Figs. 1 and 4. Partitions 38, 39, 40, are secured to the rails 33, dividing the extensions 35, 36 and 37 into lanes leading from the disc into the hopper, the partitions 38 and 39 projecting slightly over the surface of the disc, and the partition 40 extending over the disc on a curve substantially concentric with the curve of the guard rails 30, and terminating adjacent the center of said disc.

The floor 32, of the hopper structure here shown, is provided with an elongated slot aligned with the vertical edge of each of the partitions 38 and 39, and plates 41 and 42 are vertically reciprocable through said slots by mechanisms later to be described. A plate 43 is also similarly mounted for vertical reciprocation to open and close the front of the hopper. Secured at one end to the floor 32, and at its other end to the lower portion of the plate 40, is a fixed narrow guide rail 44, adapted to properly align the cans directed into the hopper by the plate 40.

As the cans 15 on the disc 28 are urged along the surface thereof, as heretofore explained, some of them remain in sliding contact with the guard rails 30 and are finally brought to the periphery of the disc 28 and are projected onto the extension 35, between the rails 30 and the partition 38, being finally pushed onto the floor 32 of the hopper, by pressure of oncoming cans at the rear, and held in a row by the plates 41 and 43. The oncoming cans on the disc are crowded to the left (Fig. 1), after the front row in the hopper structure is filled, and are confined between the partitions 40, 38, and the rails 30, and constrained to slide upon one of the extensions 36 or 37, and thence upon the floor 32, to fill the spaces between the reciprocable plates 41 and 42, or the plate 42 and the fixed rail 44. It is understood that, in different machines, the spaces or lanes between the plates 41, 42, 43 and 44 may be longer or shorter, to receive as many cans as desired on each filling operation, dependent upon the size of the cans, it being also obvious that the reservoir is always adapted to hold a sufficient number of cans to exactly fill one tray. In operation, when many cans are upon the disc, some of them will be forced upwardly towards the central axis of the disc, but the extension of the partition 40 will act as a guard and force such can downwardly towards the entrance into the hopper.

In Figs. 1 and 4 is shown a gravity feed conveyor 45 which extends adjacent the exit end of the hopper, and which is adapted to carry the trays 46, which are to be filled with the cans received from the hopper. As clearly illustrated in Figs. 4 and 5, the trays have a smooth floor 47 adapted, when on the conveyor 45, to lie in a plane slightly below the plane of the floor 32 of the hopper, and they are also provided with end walls 48 and 49, and a rear wall 50, the bottom of the tray resting on the loosely mounted rollers 51 of the conveyor 45, the latter being securely held in position by laterally-extending angle-irons 52, secured to the upper portion of each of the uprights 2, and strengthened by braces 53, secured and extending between said uprights and said angle irons.

A pusher member 54 is mounted for reciprocation longitudinally of the hopper, and includes a rectangularly shaped structure

consisting of upper and lower front bars 55 and 56, respectively, and connecting bars 57, 57, one at each side. Rearwardly directed side rails 58, 58 are provided to extend in parallelism to the channel irons 33, the rear ends of said side rails being secured each to each by upper and lower connected bars 59. Each of the side rails 58 is fitted with two laterally-extending anti-friction rollers 60, adapted to ride along the track formed in the channel of the rails 33, in the reciprocations of the pusher 54.

After the cans have been properly assembled in the hopper as described, it is necessary to actuate the pusher 54 to cause the bar 56 to contact the rear row of cans and push them into the tray 46, carried on the rollers 51, it being understood that the bar 56 is mounted for reciprocation in a plane above the plane of the fixed bar 44 on the floor 32. Said means comprises a cylinder 61 in which is reciprocable a piston head 62, mounted on a rod 63 extending through suitable packing and projecting through the end of the cylinder and being rigidly secured to the bar 55, by nut and bolt connections 64, or otherwise. The cylinder 61 is mounted on or extended through supports 65, 66, secured to the floor 32, the rear end of the cylinder being closed by a detachable cap 67, and the front end being also closed by a gland 68 into which extends the reduced end of a pipe 69 adapted to carry fluid under pressure. A coiled spring 70 is secured to and surrounds the rod 63, and has bearing against the inner face of the gland 68, tending at all times to push the head 62 to the position shown in Fig. 6, a valve 71 in said pipe 69, controlling the passage of compressed air therethrough. The cap 67 is also apertured for the admission of compressed air, through a pipe 72, to the rear face of the piston 62, said air being controlled by a valve 73.

The means for controlling the supply of compressed air to cause reciprocation of the piston 62, and thereby move the pusher 54 in forward or rearward direction, are shown in Figs. 3, 6, 8 and 9, it being understood that, before the pusher 54 is moved forwardly against the cans in the hopper, the vertically movable plates 41, 42 and 43 must be drawn downwardly out of the path of travel of said cans. In Fig. 3, the pipe 74 indicates a supply of air under pressure, it being noted that said pipe is extended into a cylinder 75, bolted to the rail 4, in which cylinder is reciprocably mounted a piston 76 having spaced heads 77 and 78, as shown in Fig. 8. The pipes 72 and 69 also lead into said cylinder 75, as does also the pipe 74. In this view the pressure through pipe 74 is communicated to pipe 69, and thence to the piston 62, tending to retain the latter in the position shown in Fig. 6.

In Fig. 9 is shown a branch 72′ of the pipe 72, leading through a valve 79 to a cylinder 80, provided with a head 81 ported at 82 to permit the air from the branch 72′ to enter said cylinder. The cylinder 80 is also secured to the floor 32 of the hopper by means of rods 84, 85 extending through a plate 86, to which plate are secured, by angled brackets 87, and bolts 88, the lower edges of the plates 41, 42 and 43. The cylinder 80 carries a reciprocating piston 89, secured to a piston rod 90, which extends upwardly through a packing gland 91, and carries at its upper end an enlarged head 92 rigidly connected to the plate 86 by means of a screw or bolt 93. The piston rod 90 is screw-threaded at its upper end which extends into the head 92, a nut 95 retaining the head in position.

In Fig. 3 is shown a pedal and lever arm 96, pivotally secured to a standard 97 in front of the machine, and provided with a lever arm 97′ pivotally secured at 98, Fig. 8, to a link 99, provided with a cross bar 100 adapted to receive the lower end of the piston rod 76′, a spring 101 being coiled around said rod and adapted at all times to depress the inner end of the lever 97′ to retain the valve 76 in the position shown in Fig. 8, the compressed air entering the cylinder 75 from the supply pipe 74 and being exerted through pipe 69 to hold the piston 62 in the position as shown in Fig. 6, the valve 76 remaining stationary. With valves 71, 73 and 79′ opened however, pressure upon the pedal 96 will operate to move the valve 76 from the full line position shown in Fig. 8 to the dotted line position, and the air entering through the pipe 74 will pass out of said valve through pipe 72 (see Figs. 3, 6 and 8). A portion of said pressure will be exerted through the branch 72′ of the pipe 72, upon the top of the piston 89, projecting it downwardly within the cylinder, and also pulling downwardly the plates 41, 42, 43, carried by the plate 86, clearing the floor 32 to permit the pusher to eject the cans in the hopper. At the same time however similar pressure is exerted through the main branch of the pipe 72 upon the back face of the piston 62, and, since upward reciprocation of the piston 76 has cut off communication with the pipe 69, the pressure from the pipe 72 will move piston 62 forwardly in the cylinder 61, and cause the pusher 54 to contact the cans in the hopper and push them onto the tray 46. It is to be understood that when the piston 62 is at the rear of the cylinder 61, the pusher is positioned at such a distance behind the rear rows of cans as to permit a complete withdrawal of the blades 41, 42 and 43 through the floor 32, before the pusher 54 contacts said cans. The pusher is actuated quickly, it being noted that, as soon as the head 78 of the piston 76, rises above the end of the pipe 69, the pressure in said pipe is exhausted to the atmosphere through the vents 75′, 75′.

In order to accurately position the trays on the roller conveyor, so that the ends of the trays may properly register with the sides of the hopper walls, we provide a structure best illustrated in Figs. 3 and 4. In said views, a bell-crank lever is pivotally mounted at 102, to a bracket 103, secured to the frame of the hopper structure, one end of the lever constituting a detent or stop 104 adapted to swing into the path of travel of the tray 46, and retain the latter in proper position. The other end 105 of the bell-crank carries a gear segment 106 on its outer face, adapted to mesh with a similar segment 107, carried on an arm 108 of a bell-crank lever pivoted at 109 to the frame of the hopper structure. The upper member 110 of the bell-crank is integral with the arm 108 and carries roller 111, rotating freely on pin 111′ Fig. 4. Carried by pusher 54 is a trip 114 provided with a beveled lower face such that, as the pusher 54 nears the forward limit of its movement, the trip 114 contacts roller 111 and pushes it forwardly resulting in downward movement of segments 106 and 107 and a semi-rotary movement of stop 104 away from the tray to release the latter. Upon rearward reciprocation of the pusher 54, the roller 111 is cleared by trip 114 and the stop 104 is restored by the spring 112 to position for contact by the next tray 46.

As best shown in Fig. 4, the pusher 54 is provided with lower longitudinal side rails 58′, and the rail 58′ nearest the disc 28, is provided with an extension forming a separator bar 58^2, preventing the entrance of cans onto the floor of the hopper at the front of the plate 44.

With the cams 15 being placed upon the disc 28 in upright position, and the hopper empty, it is obvious that the cans will ride on the outer edge of the disc to a point where they are located opposite the forward portion of the plate 38. Due to a combination of centrifugal force, and gravity incident to the conical surface of the disc, the cans leave the disc at this point and are urged by the pressure of the following cans into the first row of the hopper structure, being guided thereinto by the rails 30 and the partition 38. As soon as this first row of the hopper is filled, the oncoming cans at the rear will be deflected, by the cans between the rails 30 and the partition 38, towards the lane formed between the partitions 38 and 39, and will enter and fill the second row of the hopper, between the plates 42 and 41, the third row of the hopper, between partitions 42 and 44, being similarly filled as will be understood. Fig. 1 of the drawings shows a relatively small number of cans on the disc 28, and indicates the conditions incident to the initiation of the continuous operation of the machine, during which the disc is practically filled with the cans, the rear cans pressing upon those at the exit edge of the disc and urging them into the lanes leading into the rows in the hopper, the forward movement into said rows being practically continuous.

When the hopper has been filled with the cans and a tray 46 properly restrained by the stop 104, in its position on the conveyor 45, the operator depresses the pedal 96 and holds it down during the complete forward stroke of the pusher 54 which ejects the three rows of cans from the hopper and shoves them upon the tray. During this movement of the pusher 54, the separator plate 58^2, carried thereby, is projected successively between the last can to enter each of the rows on the hopper, and the first can in the lanes leading to each of said rows, thereby holding back the cans in said lanes, during the forward movement of the pusher 54. When the pedal 96 is depressed, as heretofore explained, compressed air enters the cylinder 80 and drives the piston 89 downwardly, causing plates 41, 42 and 43 to clear the floor 32 of the hopper, and another supply of compressed air simultaneously enters the cylinder 61 and causes the piston 62 to forwardly move the pusher 54, attention being again called to the fact that the instrumentalities are so arranged and proportioned that the plates 41, 42 and 43 have been drawn entirely below the floor 32, prior to the instant of contact of the pusher 54 against the cans in the rear row of the hopper.

The pressure on the pedal 96 must be released immediately upon the completion of the forward stroke of the pusher 54, in order to insure the rapid operation of the machine. When the pressure on the pedal 96 is released, the valve 76 is returned to normal position by the spring 101, in which position the pressure in pipe 72 is released to atmosphere, and pressure is admitted to pipe 69, restoring the piston 62, and the pusher 54 connected thereto, to normal position.

It will be noted, by reference to Fig. 2, that the hopper structure is inclined to accord with the inclination of the disc 28, necessitating that the valve structure 80 be somewhat canted to move the plates 41, 42 and 43 at a right angle to the floor 32 of the hopper.

The plate 86, to which is connected the lower edges of the separators 41, 42 and 43, is mounted on angled brackets 115, as best shown in Fig. 2. The brackets 115 are provided with collars 116 at the lower ends, and rods 117 are secured to the plate 86 and extend through said collars, a nut 118 retaining the rods in position. A coiled spring 119 surrounds each of the rods 117, having contact with a boss on the lower surface of the plate 86, and resting on a horizontally extending flange of the bracket 115. In view of the structure described, it is obvious that,

after the separators 41, 42 and 43 have been pulled downwardly, by downward movement of the piston 89 in the cylinder 80, when the pressure is released in the pipe 72, by the movement of the valve 76 to the full line position shown in Fig. 8, the springs 119 will operate to restore the separators to normal position.

By properly adjusting the hand valves herein referred to, with respect to the pressure in the pipe 74, the operation of the machine may be varied at will, the entire machine being controlled by one operator at the pedal 96, it being possible to place between 300 and 500 cans per minute in the trays on the conveyor.

Modifications of the structure herein disclosed may be suggested to those skilled in the art, but our invention covers all embodiments falling fairly within the scope of the appended claims.

We claim:—

1. Apparatus for filling a tray with cans, comprising a hopper, an inclined rotatable table adapted to receive cans from a source of supply and to deliver them to said hopper, guide members adapted for contact by the cans, under the influence of gravity and the tractive force of the rotating table, and to direct the cans into the hopper in a specified orderly relation, and means adapted to automatically eject the cans from the hopper and onto said tray.

2. Apparatus for filling a tray with cans arranged in a plurality of rows, comprising a hopper, a table rotatably mounted adjacent said hopper and adapted to receive cans from a source of supply, partitions dividing the hopper into a plurality of rows, guide members adapted for contact by said cans on the table and to direct said cans into the rows defined by said partitions, means for automatically moving said partitions from operative position between said rows, and means adapted to thereafter automatically eject said rows of cans from the hopper and onto said tray.

3. Apparatus for filling a tray with cans comprising a hopper having a floor, a plurality of plates reciprocable vertically through said floor and defining rows adapted to receive cans arranged in alignment, a pusher member mounted for reciprocation longitudinally of said hopper, means for automatically feeding cans into said rows, means for automatically moving said plates vertically to clear the floor of said hopper, and means for automatically reciprocating said pusher to eject the rows of cans from the hopper and onto said tray.

4. Apparatus for filling a tray with cans comprising a hopper having a floor, a plurality of plates reciprocable vertically through said floor and defining rows adapted to receive cans arranged in alignment, a pusher member mounted for reciprocation longitudinally of said hopper, means for automatically feeding cans into said rows, means for automatically moving said plates vertically to clear the floor of said hopper, and means for automatically reciprocating said pusher to eject the rows of cans from the hopper and onto said tray, said pusher actuating means being also operable to move the pusher in a reverse direction.

5. Apparatus for filling a tray with cans comprising a hopper having plates extensible through the floor thereof and defining a plurality of rows, means for automatically feeding cans onto said floor to fill said rows, means for moving said plates to clear said floor, and a pusher adapted for reciprocation longitudinally of the hopper to eject said cans onto said tray.

6. Apparatus for filling a tray with cans comprising a hopper having plates extensible through the floor thereof and defining a plurality of rows, means for automatically feeding cans onto said floor to fill said rows, means for moving said plates to clear said floor, a pusher adapted for reciprocation longitudinally of the hopper to eject said cans onto said tray, and means carried by the pusher, adapted to prevent access of cans to the hopper during the ejecting movement of the pusher.

7. Apparatus for filling a tray with cans comprising a hopper having vertically movable plates extensible through the floor thereof and defining a plurality of rows, a rotating table adapted to receive cans from a source of supply, guides on the table and adjacent the hopper, adapted, under rotation of the table, to direct the cans into said rows, means for moving said plates to clear the floor of the hopper, and means for thereafter ejecting the cans from the latter and onto said tray.

8. Apparatus of the class described comprising a hopper and means for feeding cans thereinto, in combination with a conveyor extending adjacent an open end of the hopper, a detent mounted adjacent the hopper and adapted to contact a tray mounted on the conveyor and hold the tray in proper position adjacent the open end of the hopper, a pusher reciprocable in the hopper and adapted to eject the cans therefrom and onto said tray, and means carried by said pusher for automatically moving said detent to release said tray.

9. Apparatus of the class described comprising a hopper and means for feeding cans thereinto, in combination with a conveyor extending adjacent an open end of the hopper, a detent mounted adjacent the hopper and adapted to contact a tray mounted on the conveyor and hold the tray in proper position adjacent the open end of the hopper, a pusher reciprocable in the hopper and adapted to eject the cans therefrom and onto said

tray, means carried by said pusher for automatically moving said detent to release said tray, and means for restoring said detent to operative position after each forward reciprocation of the pusher.

10. Apparatus of the class described comprising a hopper provided with a plurality of vertically-reciprocable plates movable to define rows on the floor of the hopper, or to clear the floor, in combination with means for feeding cans onto the floor of said hopper between said plates, and fluid-pressure controlled devices adapted for operation to move said plates to clear the floor of the hopper and to thereafter push the cans out of the latter.

11. Apparatus of the class described comprising a hopper provided with a plurality of vertically-reciprocable plates movable to define rows on the floor of the hopper, or to clear the floor, in combination with means for feeding cans into the hopper between said plates, a pusher mounted for reciprocation in said hopper, fluid-pressure actuated devices adapted to move said plates to clear the floor of the hopper, fluid-pressure actuated devices adapted to thereafter reciprocate said pusher to eject the cans from the hopper, and a single control adapted for movement to simultaneously initiate the operation of both sets of fluid-pressure devices, in the order indicated.

12. Apparatus of the class described comprising a hopper provided with a plurality of vertically-reciprocable plates movable to define rows on the floor of the hopper, or to clear the floor, in combination with means for feeding cans into the hopper between said plates, a pusher mounted for reciprocation in said hopper, fluid-pressure actuated devices adapted to move said plates to clear the floor of the hopper, fluid-pressure actuated devices adapted to thereafter reciprocate said pusher to eject the cans from the hopper, a single control adapted for movement to simultaneously initiate the operation of both sets of fluid-pressure devices, in the order indicated, and means for automatically restoring said control to normal position, whereby to cause a reverse movement of said pusher and said plates.

In testimony whereof we affix our signatures.

SIMES T. HOYT.
RICHARD M. BOTLEY.