May 17, 1949. H. RICHTER 2,470,265

SETTING APPARATUS FOR TEXTILE FABRICS

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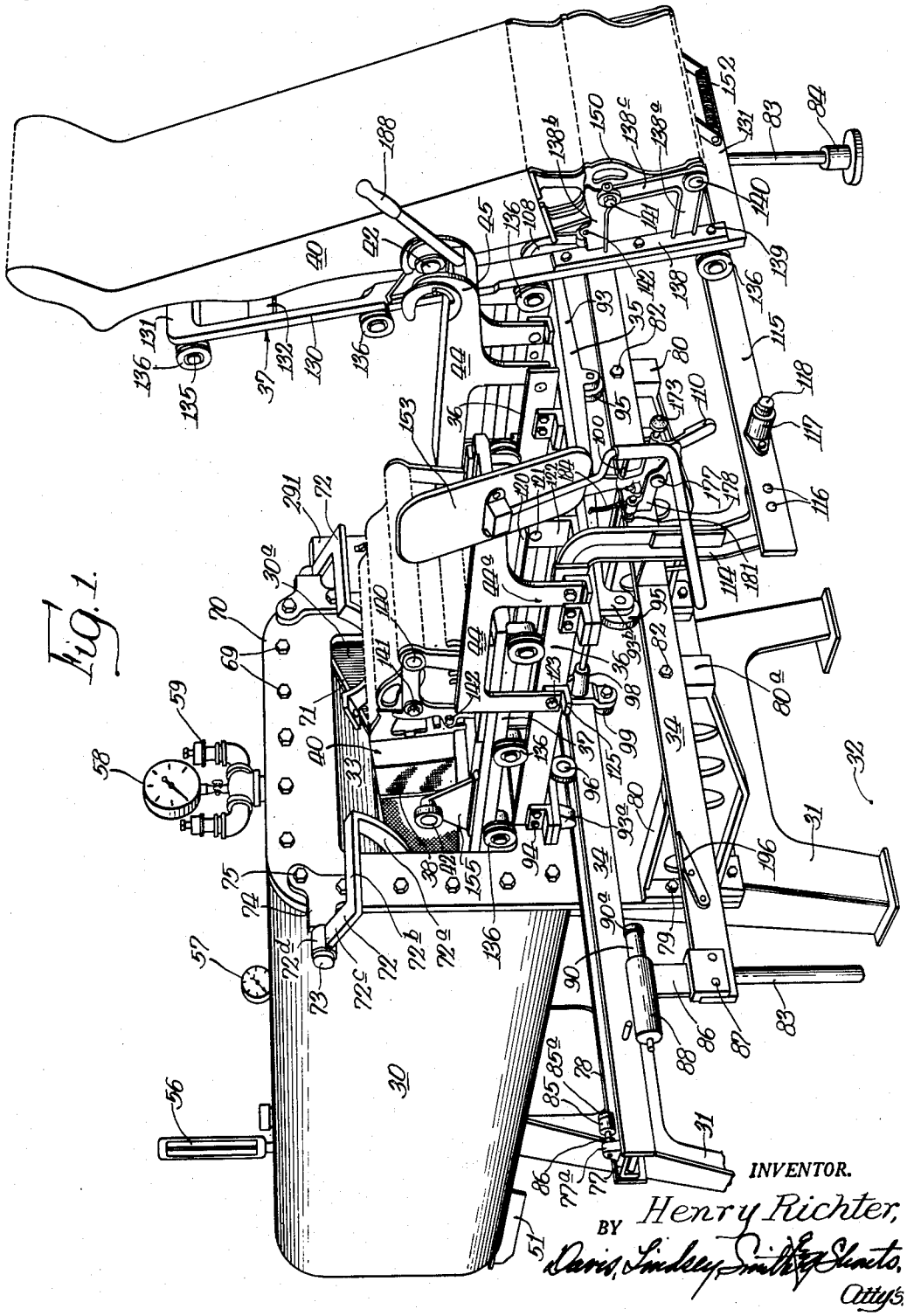


Fig. 1.

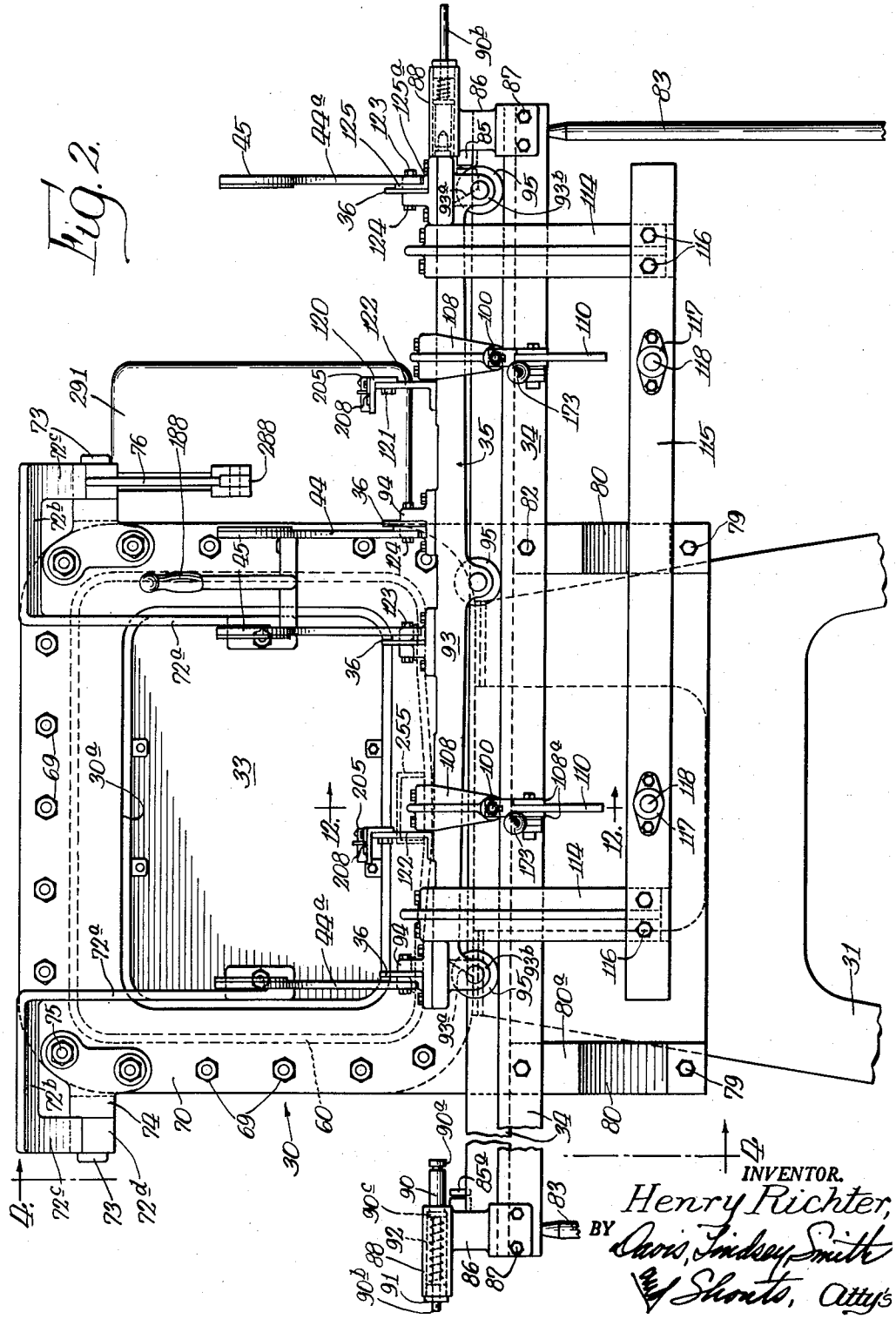
INVENTOR.
Henry Richter,
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Davis, Lindsey, Smith & Shortz
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May 17, 1949. H. RICHTER 2,470,265

SETTING APPARATUS FOR TEXTILE FABRICS

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Fig. 2.



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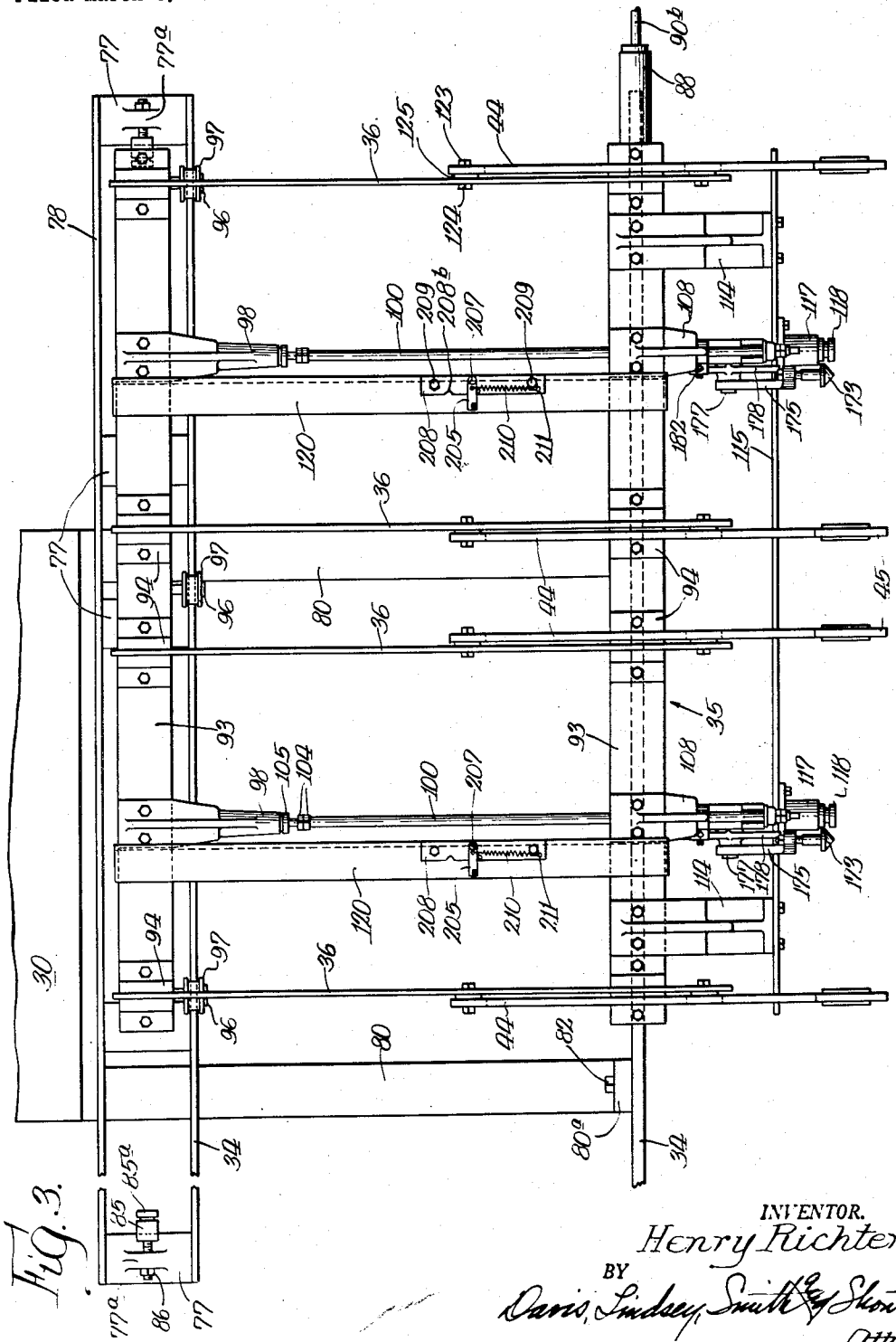


Fig. 3.

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SETTING APPARATUS FOR TEXTILE FABRICS

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Fig. 5.

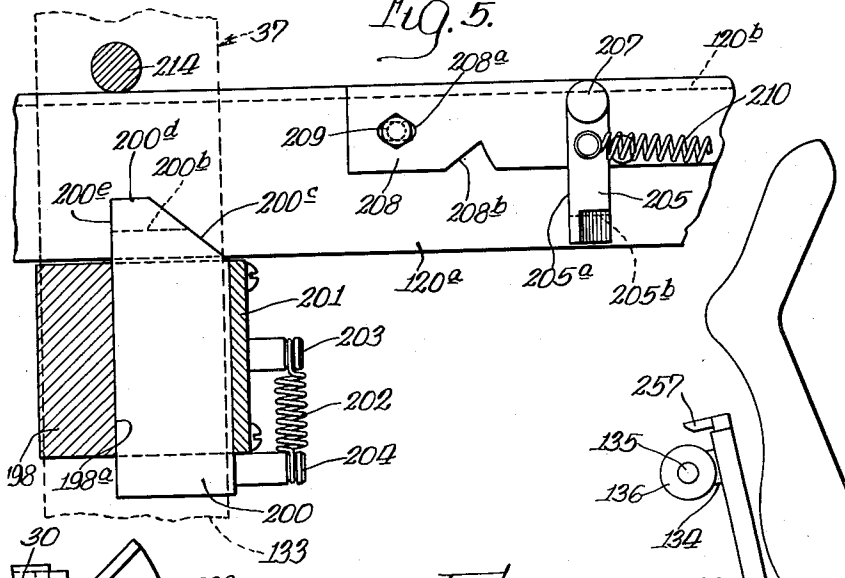
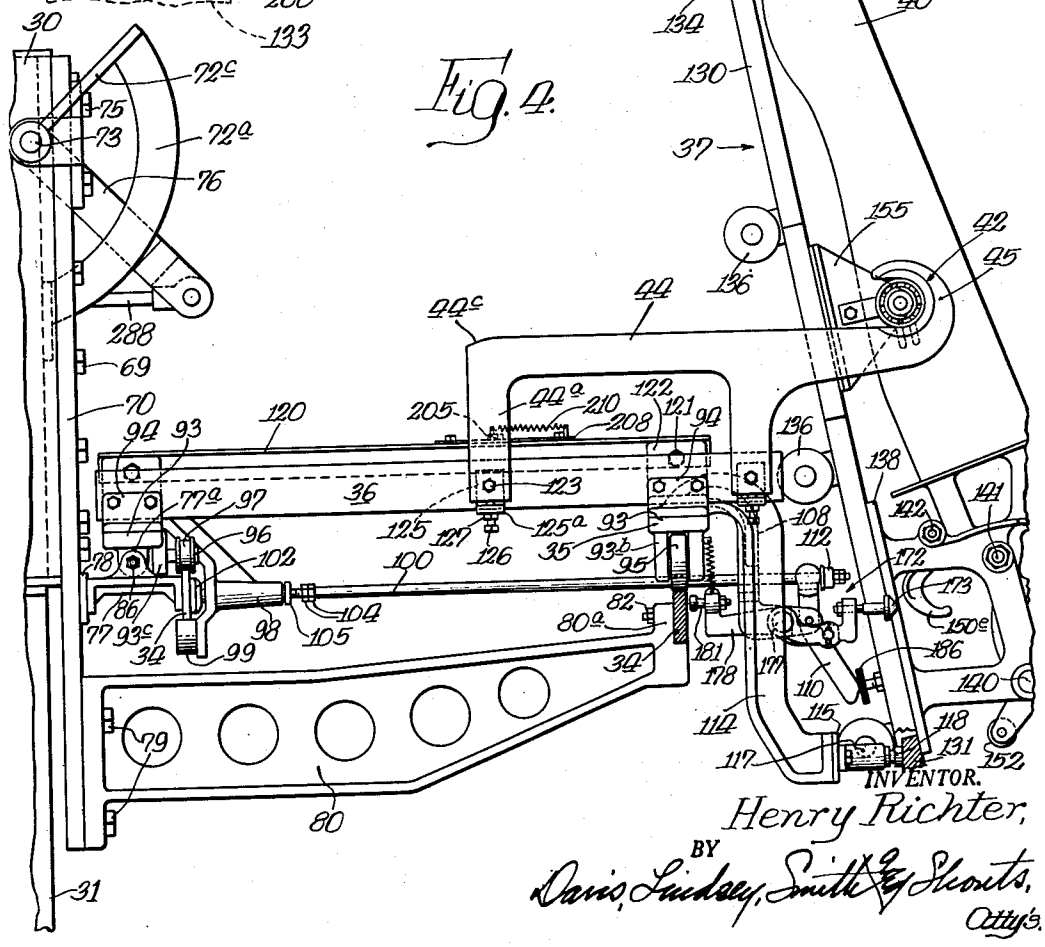


Fig. 4.



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Fig. 6.

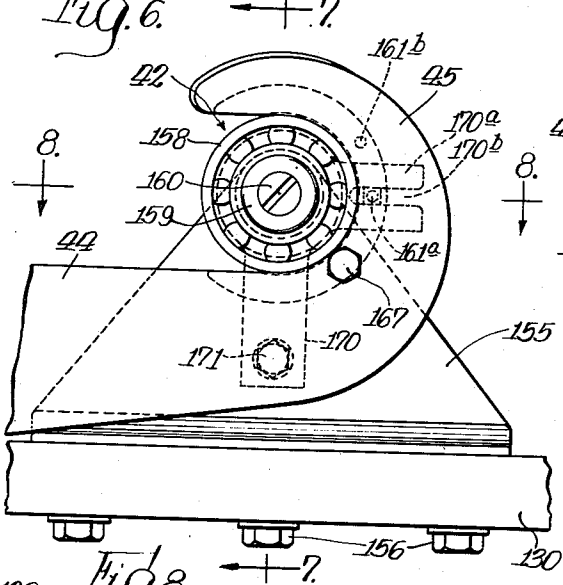


Fig. 7.

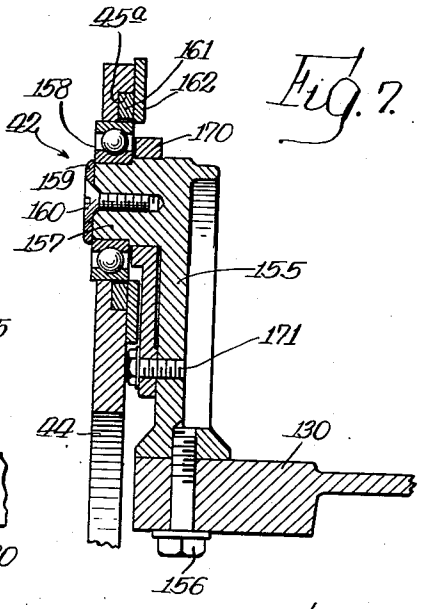


Fig. 8.

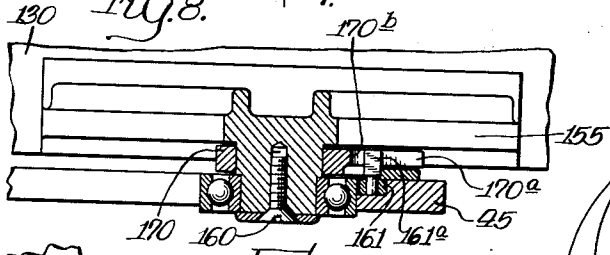


Fig. 9.

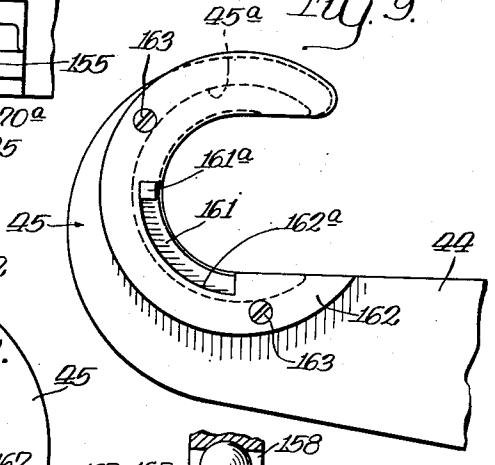


Fig. 10.

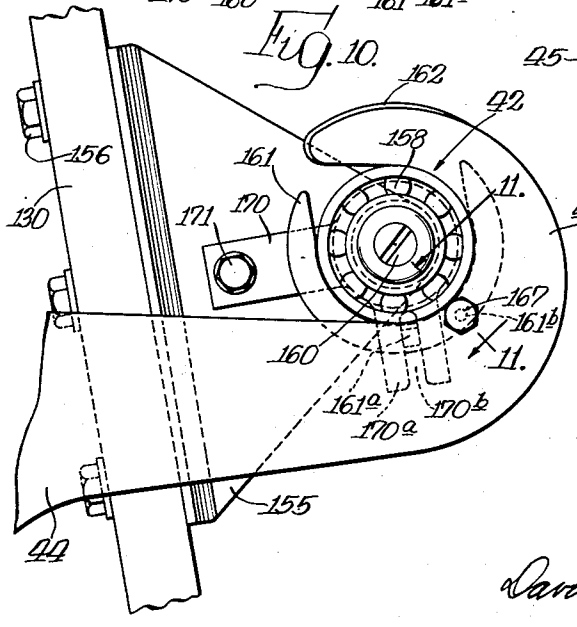
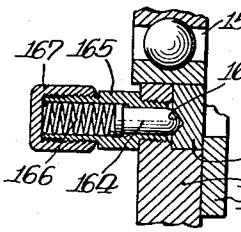


Fig. 11.



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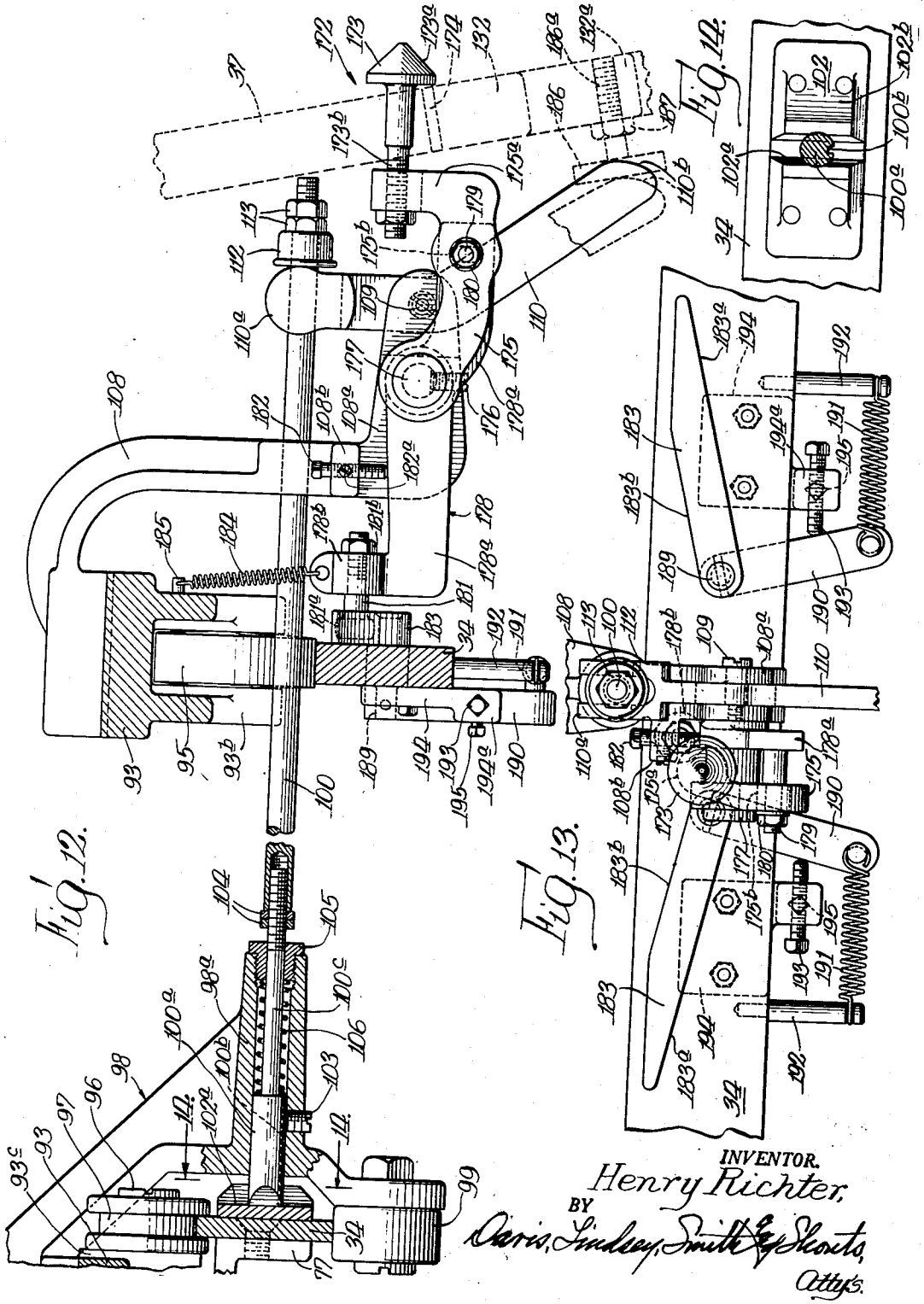


Fig. 12.

Fig. 12.

Fig. 13.

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May 17, 1949. H. RICHTER 2,470,265

SETTING APPARATUS FOR TEXTILE FABRICS

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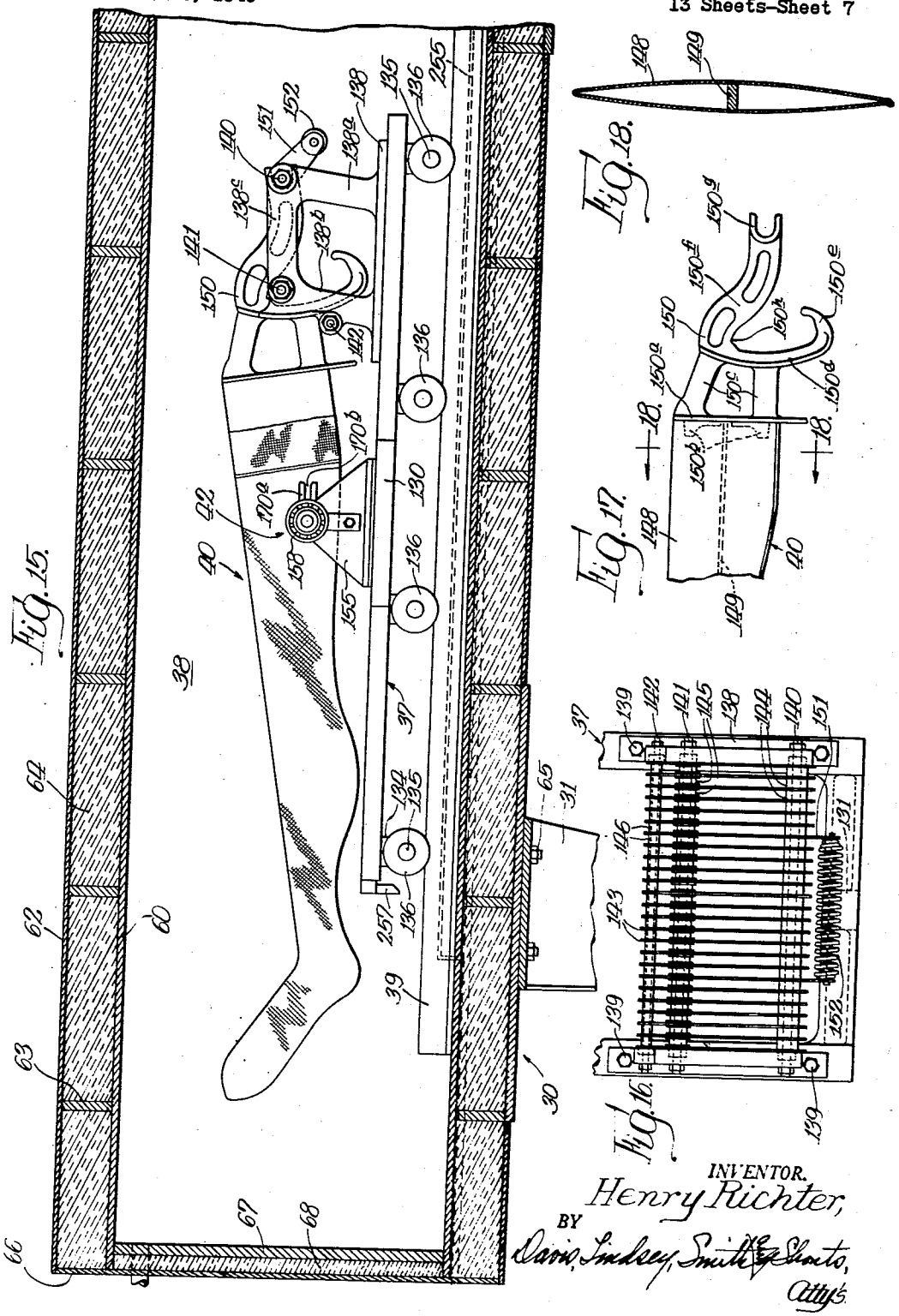


Fig. 15.

Fig. 18.

Fig. 17.

Fig. 16.

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May 17, 1949. H. RICHTER 2,470,265

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Fig. 19.

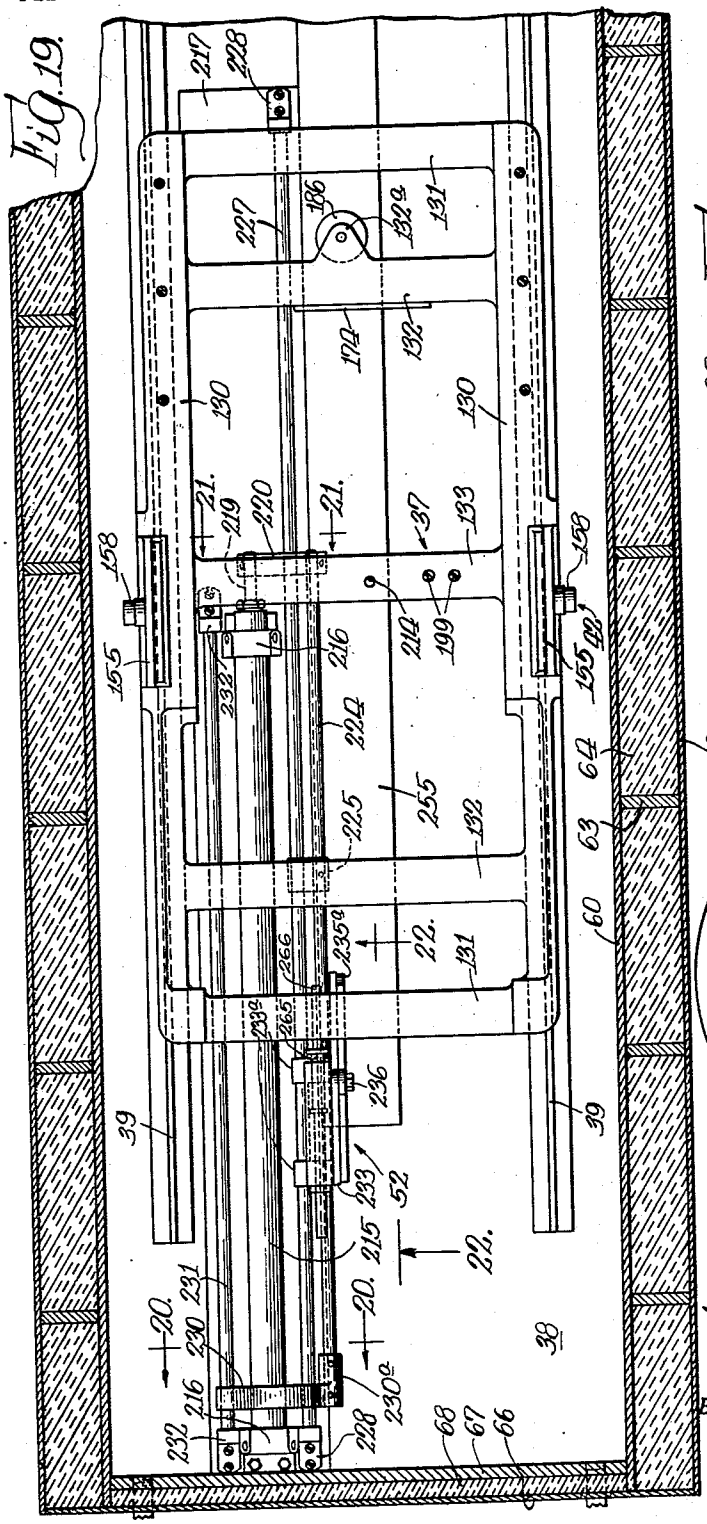


Fig. 21.

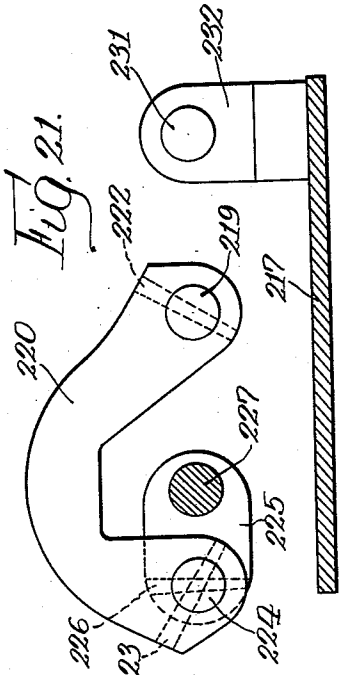
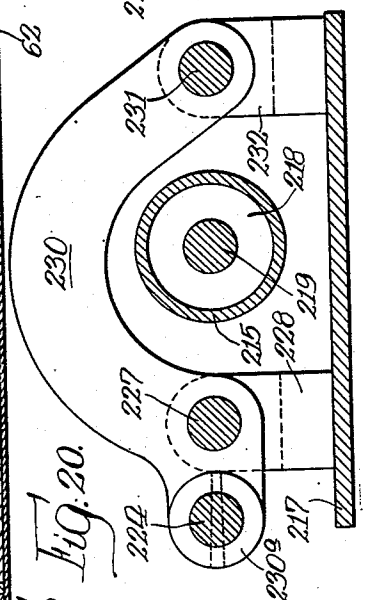


Fig. 20.

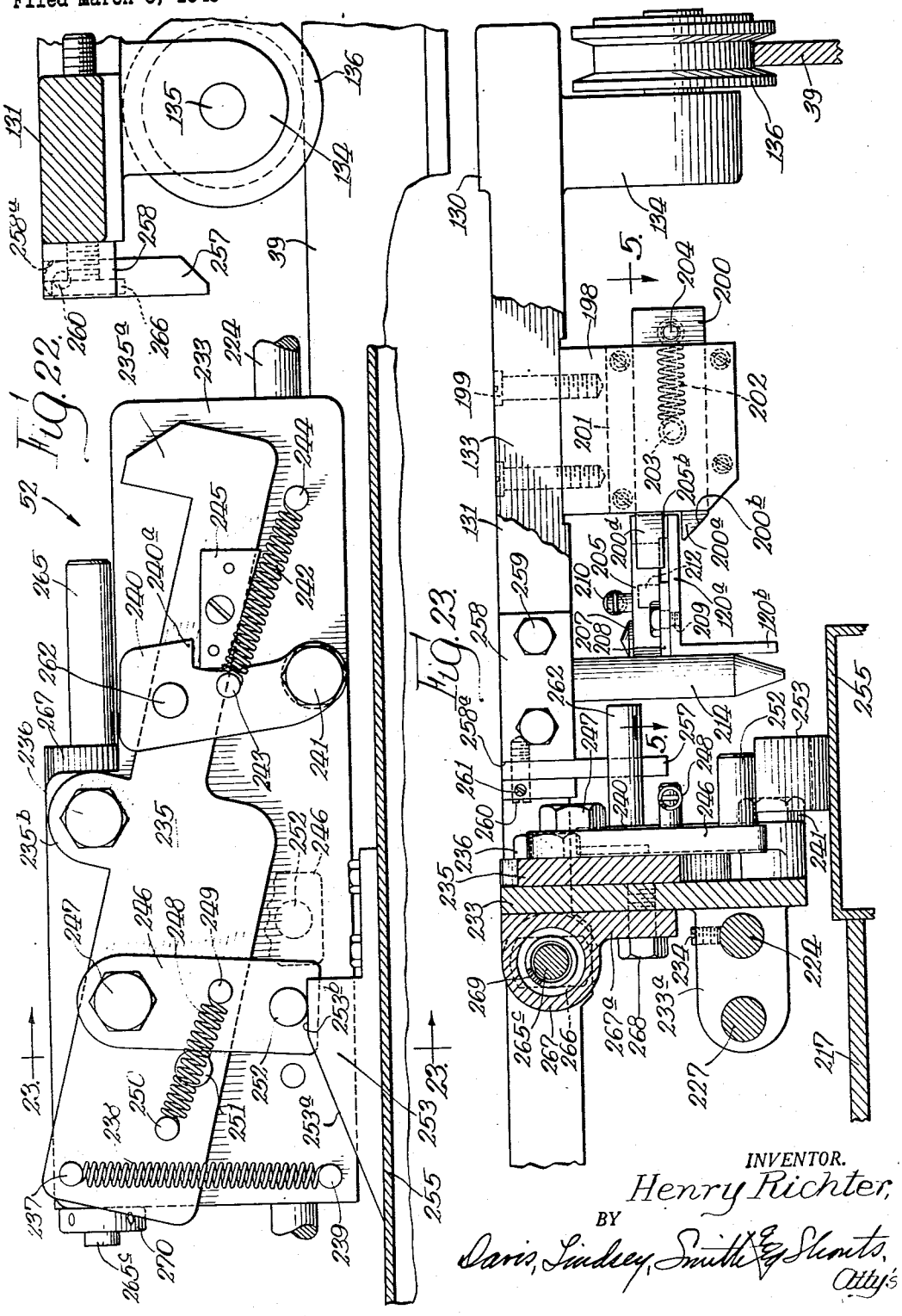


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May 17, 1949. H. RICHTER 2,470,265

SETTING APPARATUS FOR TEXTILE FABRICS

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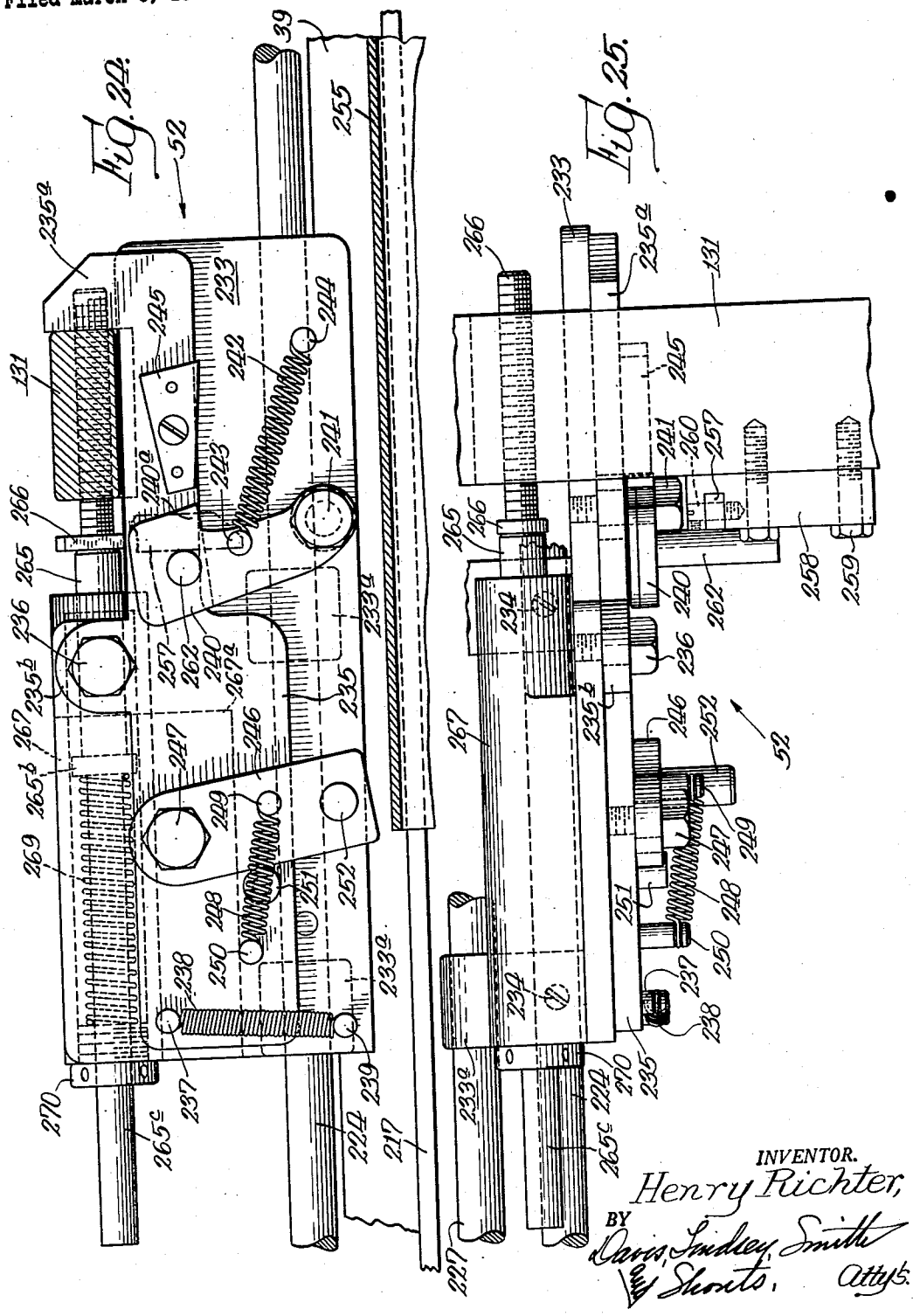


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SETTING APPARATUS FOR TEXTILE FABRICS

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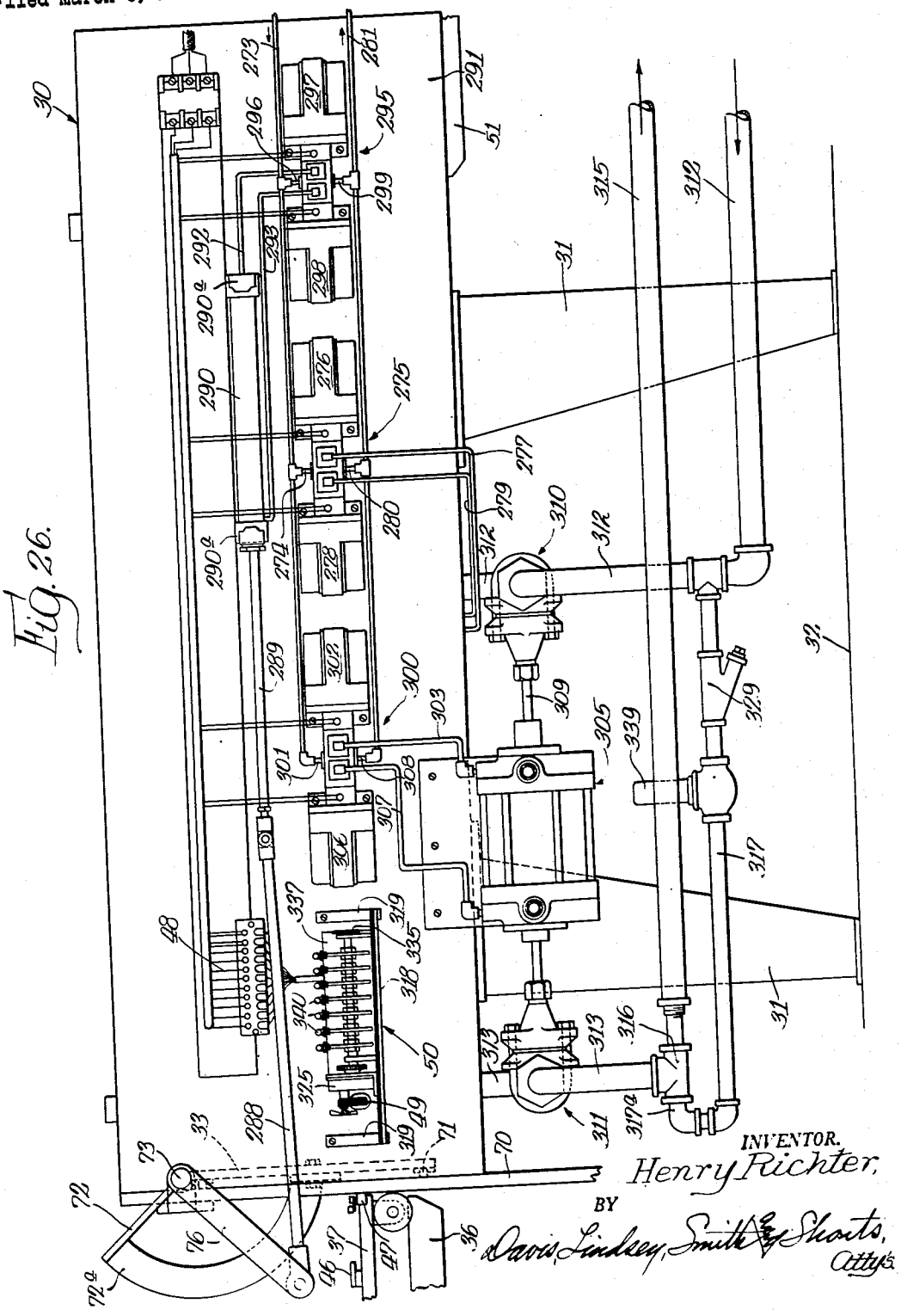


Fig. 26.

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SETTING APPARATUS FOR TEXTILE FABRICS

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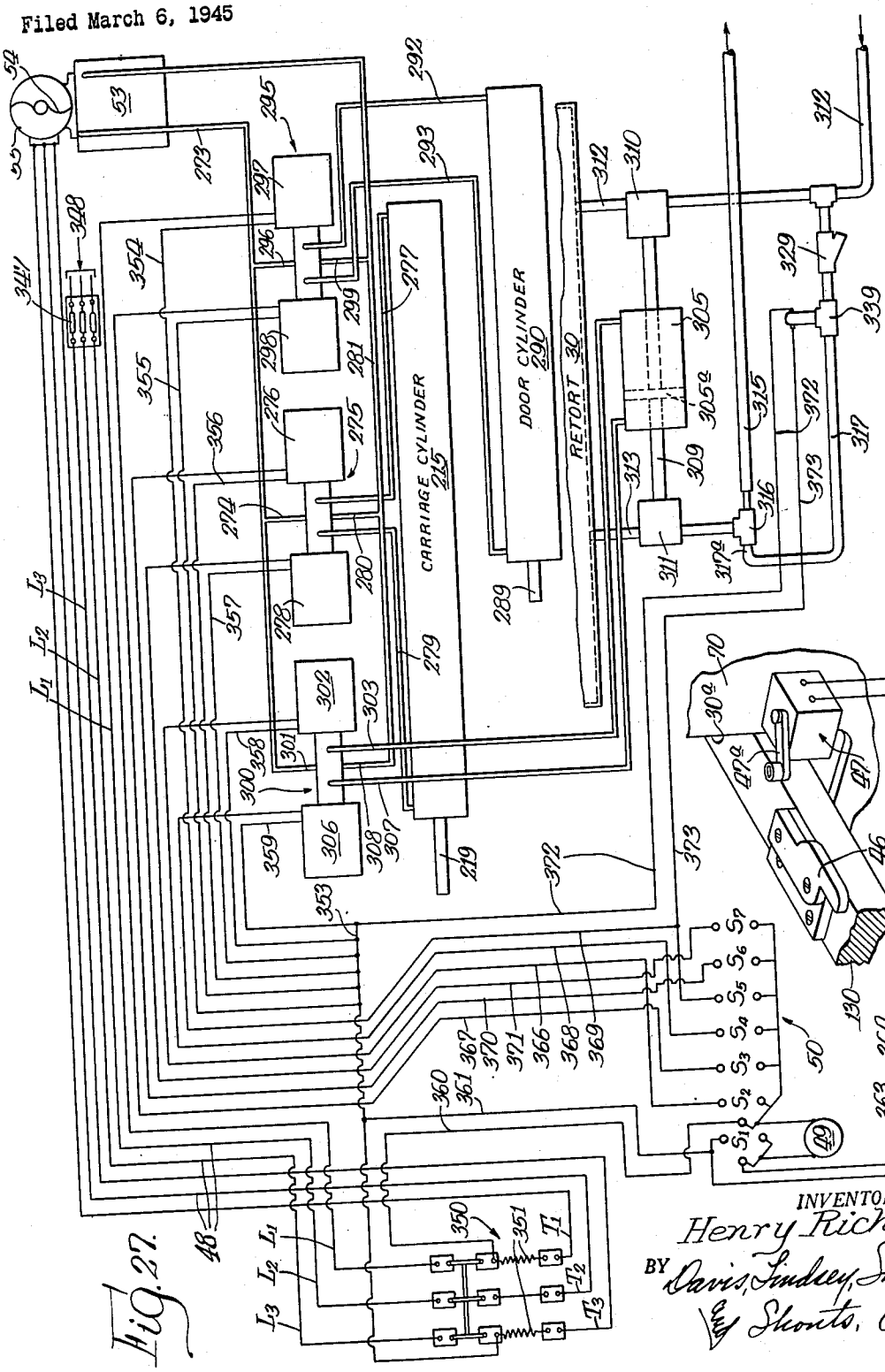


Fig. 27.

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SETTING APPARATUS FOR TEXTILE FABRICS

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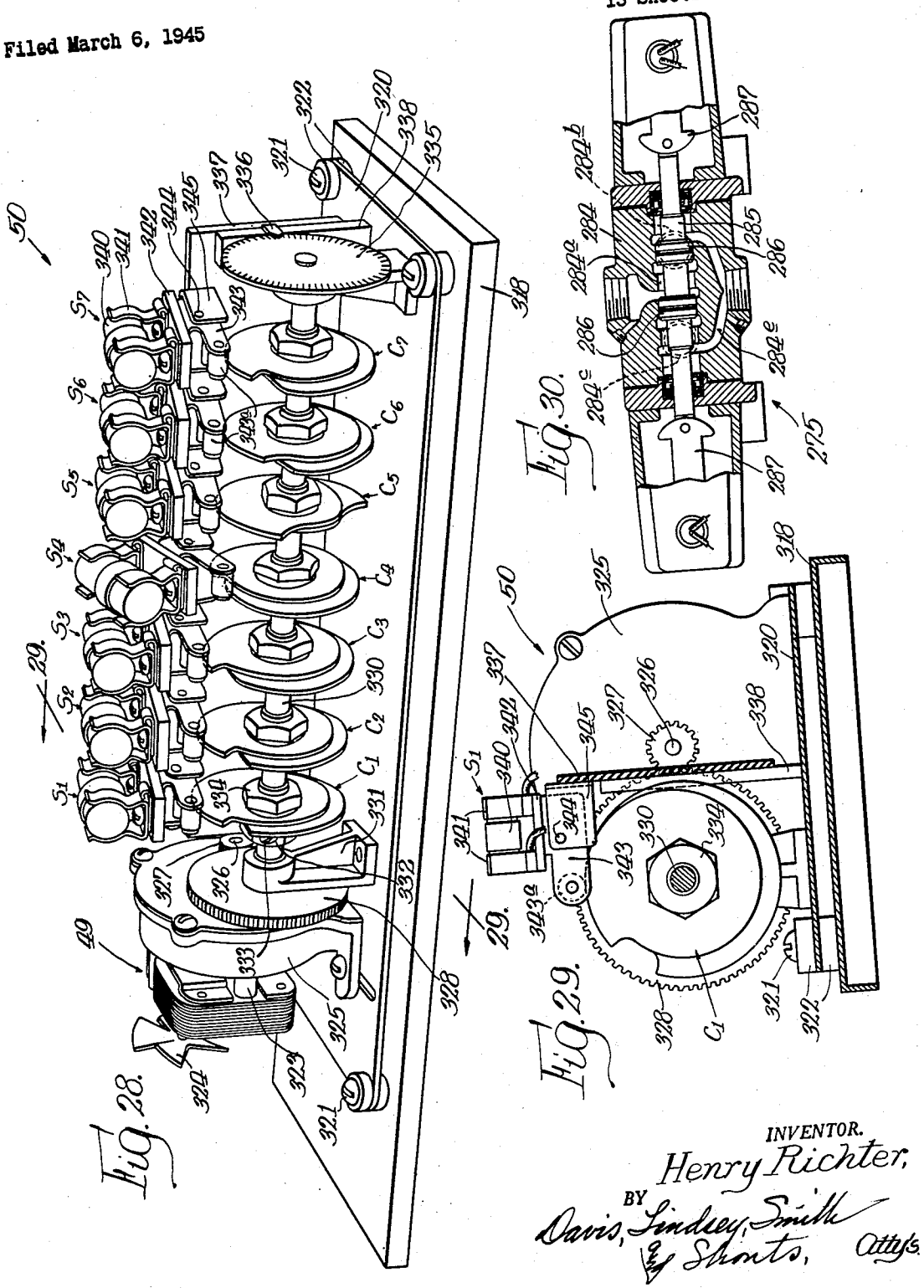


Fig. 28.

Fig. 30.

Fig. 29.

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Patented May 17, 1949 2,470,265

UNITED STATES PATENT OFFICE

2,470,265

SETTING APPARATUS FOR TEXTILE FABRICS

Henry Richter, Kankakee, Ill., assignor to Paramount Textile Machinery Co., Kankakee, Ill., a corporation of Illinois

Application March 6, 1945, Serial No. 581,210

52 Claims. (Cl. 223—76)

1

This invention relates to improvements in setting apparatus for textile fabrics and its purpose is to provide improved means for setting and shaping stockings and other fabrics formed by knitting linear condensation polyamide fibres such as those known to the trade as "nylon."

After shaped textile articles, such as hosiery, have been made from nylon yarn, it is important to subject them to a setting operation on forms of the desired shapes in the presence of saturated steam in order to reduce the resiliency of the knitted loops and remove the natural wrinkles of the loose fabric, thereby causing the articles to retain the shapes of the forms during subsequent use, washing and the like. The hosiery or other knitted articles may be either dyed or of natural color when subjected to the presetting treatment and this treatment is carried on at a high temperature, preferably of from 240° Fahrenheit to 260° Fahrenheit, for a limited period, and at a pressure above that of the atmosphere, thus necessitating the use of a closed chamber in which the articles are contained during the operation.

Setting apparatus of this type has heretofore been provided in the use of which the hosiery or other articles have been placed upon forms mounted in a group on a truck or carriage which has been moved bodily into the chamber into which the steam is introduced after it has been closed. After the desired period of treatment, the carriage has been withdrawn, the articles removed from the forms, another group of untreated articles then placed on the forms, and the setting process then repeated. Apparatus of this type is described and claimed in United States Letters Patent No. 2,309,659, dated February 2, 1943.

One object of the present invention is to provide an improved setting process and apparatus according to which a plurality of groups of forms are moved in succession into the treating chamber, thus permitting the heat treatment of articles on one group of forms during the time that articles are being changed on other forms outside of the chamber. Another important object of the invention is to provide a setting process and apparatus in which the operations of moving the forms into the chamber, closing the chamber, introducing steam into the chamber, shutting off the steam, exhausting the steam from the chamber, opening the chamber, removing the forms from the chamber, and determining the sequence and time durations of these operations, are effected and controlled automatically by power actu-

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ated means. Another object of the invention is to provide improved setting apparatus for textile fabrics comprising a steam receiving retort having an opening, a main carriage movable transversely to said opening, and a plurality of improved form carriages mounted on said main carriage on parallel tracks for movement alternately or successively into said retort through said opening, each form carriage having mounted thereon a plurality of forms for supporting the textile articles to be treated, whereby the articles may be changed on the forms of one form carriage while another form carriage and its article carrying forms is in the retort. Still another object of the invention is to provide apparatus for treating textile fabrics comprising a retort having an opening normally closed by a door mounted to swing inwardly, in combination with means for opening the door and moving into said retort forms carrying textile articles, means for closing the door, and means for then introducing into said retort high pressure steam which acts to maintain the door in closed position during the treatment of the textile articles. A further object is to provide improved means for mounting a door located within the chamber on hinges having bearings outside the chamber, so that the bearings of the hinges are not subjected to the action of the steam. Another object is to provide improved power actuated means for moving form supporting carriages into the retort and withdrawing them therefrom. A further object of the invention is to provide an improved form carriage movable on tracks into a retort and having mounted in parallel relationship for pivotal movement thereon a plurality of forms adapted to carry articles to be treated, the form carriage being tiltable upwardly when withdrawn from the retort for the purpose of locating the forms in positions to permit the articles thereon to be conveniently changed. Another object is to provide a new and improved actuating and controlling system, operated electrically, for controlling and effecting the movement of form carriages into and out of a retort, opening and closing the retort, admitting steam to and exhausting it from the retort, and determining the time relation of these operations. Other objects relate to various features of construction and arrangement, and to details of the improved method of setting textile fabrics, which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which one embodiment of the invention is illustrated. In the drawings.

Figure 1 shows a perspective view of the improved apparatus of the present invention with the door of the retort in open position and one form carriage entering the retort, while another form carriage mounted on the same main carriage as the first mentioned form carriage is shown tilted to an upright position to permit the changing of articles on the hosiery forms which are mounted on this form carriage;

Fig. 2 shows a front elevation of the retort and the track which supports the main carriage, with the door of the retort in its closed position and with the form carriages, normally mounted on the main carriage, removed;

Fig. 3 shows a top plan view of the main carriage and its supporting track;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2, showing an end elevation of the main carriage and a side elevation of one of the form carriages tilted upwardly to permit the changing of articles on the forms carried thereby;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 23, showing one of the latches for holding a tilting form carriage in its horizontal position as it moves into the retort and, also, a device for releasing that latch as the form carriage approaches its outer position;

Fig. 6 shows an enlarged side elevation of one of the bearings carried by the main carriage for supporting a form carriage while the form carriage is being tilted upwardly to the position shown in Fig. 4;

Fig. 7 shows a vertical sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 shows a horizontal section taken on the line 8—8 of Fig. 6;

Fig. 9 shows an enlarged side elevation of one of the hook bearing members, with the retaining member thereof in its normal retracted position, so that the bearing member is adapted to receive one of the roller bearing spindles carried by a form carriage at the conclusion of the withdrawal of the form carriage from the retort;

Fig. 10 shows an enlarged side elevation of one of the hook bearing members, similar to the view shown in Fig. 4, with the form carriage tilted upwardly and with the retaining member of the bearing occupying a position where it retains the roller bearing unit of the form carriage in engagement with the hook bearing member;

Fig. 11 shows a detailed sectional view taken on the line 11—11 of Fig. 10;

Fig. 12 shows a longitudinal sectional view taken on the line 12—12 of Fig. 2, illustrating the mounting of the main carriage upon its track and one of the latch mechanisms by which the main carriage is secured in a position to locate one of the form carriages and its tracks in proper alignment with the opening of the retort, so that this form carriage may be moved from the main carriage onto the supporting tracks within the retort;

Fig. 13 shows an enlarged front elevation of a portion of the main track and one of the means for controlling the latching devices by which the form carriages are located in alignment with the retort, looking toward the left as viewed in Fig. 12;

Fig. 14 shows a detailed sectional view taken on the line 14—14 of Fig. 12;

Fig. 15 shows a longitudinal vertical axial section through the retort, illustrating in side elevation one of the form trucks and its forms mounted on the tracks within the retort;

Fig. 16 shows a top plan view of the rear portion only of one of the form carriages;

Fig. 17 shows a partial side elevation of one of the forms shown in Figs. 1, 4 and 15;

Fig. 18 shows a sectional view taken on the line 18—18 of Fig. 17;

Fig. 19 shows a horizontal axial section through the retort illustrated in Figs. 1 and 2, illustrating a top plan view of one of the form carriages and the actuating mechanism therefor within the retort, the article carrying forms being removed;

Fig. 20 shows a detailed sectional view taken on the line 20—20 of Fig. 19;

Fig. 21 shows a detailed sectional view taken on the line 21—21 of Fig. 19;

Fig. 22 shows a vertical sectional view taken on the line 22—22 of Fig. 19, illustrating a portion of the carriage moving mechanism within the retort after the form carriage has been released and is moving out of the retort;

Fig. 23 is a sectional view taken on the line 23—23 of Fig. 22, illustrating parts of the mechanism by which the form carriages are moved into and out of the retort;

Fig. 24 is a vertical sectional view similar to that of Fig. 22, illustrating the relative positions of the parts when the carriage has been engaged by the actuating mechanism and has been moved into the retort to the full extent of that movement;

Fig. 25 shows a top plan view of the mechanism illustrated in Fig. 24;

Fig. 26 shows a side elevation of the right-hand side of the setting apparatus as it is illustrated in Figs. 1 and 2 with the auxiliary housing removed to show the controlling mechanism by which the operations of opening the door of the retort, moving a form carriage into the retort, turning on the steam, shutting off the steam, opening the door, and moving the form carriage from the retort, are controlled;

Fig. 27 is a somewhat diagrammtic view showing the circuit connections of the electrical and hydraulic systems for effecting and controlling various operations of the apparatus, including the movements of the form carriages into and out of the retort, the opening and closing of the door of the retort, the admission of steam to the retort and the exhaust of steam therefrom;

Fig. 28 is a perspective view of the motor driven circuit controller which is embodied in the system shown in Figs. 26 and 27;

Fig. 29 is a sectional view taken on the line 29—29 of Fig. 28; and

Fig. 30 shows a vertical section through one of the solenoid operated valves illustrated in Figs. 26 and 27.

In order that the apparatus disclosed in the drawings may be more clearly understood, reference will be made to the principal features of the apparatus and their general mode of operation before proceeding to a detailed description of the construction. As illustrated, the apparatus comprises a horizontal retort 30, carried by legs 31 adapted to rest upon a floor or other support 32, and provided at one end with a rectangular opening 30a which is normally closed by a hinged door 33. In front of the retort and extending transversely to the longitudinal axis thereof are a pair of parallel main tracks 34 upon which a main carriage 35 is mounted to travel. The main carriage has mounted thereon two pairs of form carriage track members 36 which extend parallel to each other and to the longitudinal axis of the retort. These track members 36 support

two form carriages 37 and their upper edges are located substantially flush with but slightly above the lower edge of the door opening 30a so that, when a pair of track members 36 are properly positioned with respect to that opening by the movement of the main carriage 35, the form carriage mounted on that pair of track members may be moved therefrom into the chamber 38 of the retort where it is then supported on the retort tracks 39.

Each form carriage 37 has mounted thereon a group of setting forms 40 which, in this instance, are shown as being of the proper shape for the setting of ladies' nylon hosiery. These forms are so mounted that they normally extend parallel to the body of the carriage by which they are carried although they are capable of limited pivotal movement away from the carriage for the purpose of permitting the ready removal and replacement of articles of hosiery or the like located thereon. When a form carriage 37 has been withdrawn from the retort 30, a pair of roller bearing trunnions 42 mounted on opposite sides thereof are adapted to travel on auxiliary horizontal track members 44 which are mounted on the main carriage 35, one of the auxiliary track members 44 being mounted adjacent to but at a substantially higher level than each of the track members 36. When a form carriage 37 reaches the limit of its outward movement on the track members 36, the trunnions 42 mounted on that carriage engage normally open hook-shaped bearing members 45 which are located at the outer ends of the auxiliary track members 44 and the form carriage then tilts upwardly to the position shown at the right of Fig. 1, so that the forms are then readily accessible to the operator who may tilt the forms forwardly on their supports for the purpose of removing previously treated hosiery therefrom and then placing upon the forms other hosiery to be treated.

While a form carriage 37 is being moved into and out of the retort 30, the main carriage 35 is latched in a position which positions the track members 36 for that form carriage in alignment with the retort tracks 39 and, when that form carriage is moved outwardly and tilted upwardly and forwardly, as above described, the main carriage 35 is automatically released so that it may be shifted laterally on its tracks to locate the other form carriage 37 opposite the retort opening 30a with its track members 36 aligning with the retort tracks 39, whereupon the main carriage is automatically secured in the new position. The form carriage 37 last positioned opposite the opening 30a is then moved into the retort 38 while the form carriage 37 last removed from the retort and then occupying the upwardly tilted position shown in Fig. 1, has the treated hosiery on its forms removed by the operator and replaced by other untreated hosiery. In this way, the form carriages 37 are moved alternately into the retort and the forms 40 of each form carriage are worked upon by the operator while the forms carried by the other form carriage are in the retort. When a form carriage carrying untreated hosiery is tilted downwardly from its upwardly inclined position, it is automatically locked in its horizontal position and remains so secured while it is moved into the retort. When that form carriage is again removed from the retort, it is automatically released as it approaches its outer position on its track members 36 so that it can again be tilted upwardly.

Except for the lateral shifting of the main carriage, the downward tilting of the form carriages, the changing of the articles on the forms, and an initial push given to each form carriage to start it toward the retort, all of the operations of the apparatus are effected automatically and in proper timed relation by power means. When a set of untreated articles have been applied to the forms mounted on a form carriage 37 and that form carriage has been lowered to the horizontal position and has been positioned opposite the retort opening 30a by the lateral shifting of the main carriage 35, that form carriage is pushed toward the retort by the operator with the result that as the rear portion of the form carriage starts to enter the retort a projecting cam 46 mounted on that carriage engages a starting switch 47 and actuates the electric circuit 48, shown in Figs. 26 and 27, thereby starting the electric motor 49 which drives the controller 50, illustrated in Figs. 27, 28 and 29, by which the several branches of the circuit are closed and opened in proper sequence to effect the desired operations of the apparatus in correct timed relation. The controller motor 49 operates continuously during each cycle and until the form carriage is ejected from the retort. The movement of the form carriage 37 into the retort is effected by actuating mechanism 52 which is operated at the proper time by the controller 50 through the agency of hydraulic pressure supplied from a tank 53 by a pump 54 and an electric motor 55, shown in Fig. 27, which may be conveniently mounted on a shelf 51 at the rear end of the retort 30. The hydraulic connections are shown in Figs. 26 and 27.

When a form carriage 37 has fully entered the retort, the actuating mechanism 52 is stopped and the controller 50 then operates other hydraulic mechanism which closes the door 33. When the door 33 has been closed, the continuously rotating controller 50 operates through the electric circuit 48 to actuate certain hydraulically operated valve mechanism which admits high pressure high temperature steam to the interior of the retort. The temperature of the steam within the retort is indicated by a thermometer 56 and may preferably be within the range of from 240° F. to 260° F. The pressure of the steam in the supply pipes is indicated by a gauge 57 and the steam pressure within the retort is shown by a gauge 58. Relief valves 59 are mounted adjacent the gauge 58 to relieve the pressure in the retort if it rises above a predetermined maximum. The pressure of the oil or other fluid in the hydraulic circuit may be shown by a gauge at the rear of the retort.

After the hosiery or other articles on the forms in the retort have been subjected to the action of the steam for a suitable interval, preferably about three minutes if nylon hosiery is being treated, the controller 50 operates to shut off the steam and connect the interior to an exhaust conduit through which the steam is exhausted. At the end of a brief exhaust period, the controller closes a branch of the circuit 48 which causes the aforesaid mechanism to operate by hydraulic pressure to open the door 33 which then remains open until another form carriage is moved into the retort during the next cycle of operations. As soon as the door 33 is opened, the controller 50 causes the operation of the carriage moving mechanism 52 to move the carriage outwardly through the door opening. When this moving mechanism reaches the limit of its travel, which

positions it adjacent the door in readiness for engagement with the next incoming form carriage, the movement of the outgoing form carriage is continued by the action of spring pressure stored up in stop mechanism at the end of its inward movement, so that the forward movement of the form carriage is continued with sufficent energy to its forward position where the trunnions 42 engage the hook bearings and its momentum causes it to tilt to the position shown in Fig. 1 without any action on the part of the operator. As the form carriage passes through the opening 30a toward its forward position, the controller 50 operates to open the circuit of the motor 49 and this motor and the controller 50 then remain at rest until the next cycle of operations is started.

Having set forth the general mode of operation of the apparatus of the present invention, the form of the invention disclosed in the drawings will now be described in greater detail. As shown particularly in Figs. 1, 15 and 19, the retort 30 comprises an inner metal shell 60 of rectangular vertical cross section which is surrounded by an outer metal shell 62 of the same cross section, the two shells being spaced apart by the spacing members 63, thus forming a plurality of annular chambers which are occupied by heat insulating material 64. At the bottom of the retort, the lower wall of the outer shell 62 is formed in sections, certain of which are made up of metal plates of greater thickness to which the legs 31 are secured by the bolts 65. At the rear end of the retort, the ends of the inner and outer shells 60 and 62, respectively, are closed by an outer end wall 66 and the rear end of the inner shell 60 is closed in a plane located inwardly from the plate 66 by another plate 67, leaving an intervening space which is occupied by heat insulating material 68. At the front end of the retort, the edges of the inner and outer shells 60 and 62, respectively, are welded to the end member 63. The end plate 70, having formed therein the rectangular door opening 30a, is secured by studs 69 to this end member 63. The end plate 70 extends inwardly beyond the inner surface of the inner shell 60, thus forming an annular flange around the door opening against which the door 33 is adapted to seat when it is closed.

The door 33 is located entirely on the inside of the retort and when it is closed, its outer margin seats against the inner surface of the end plate 70, being preferably provided around this margin with a strip 71 of resilient compressible material, such as rubber, which contacts directly with the plate 70, so that a fluid tight seal is formed and, when steam is introduced into the chamber 38 of the retort, the steam pressure tends to increase the tightness of the seal between the door and the plate 70. In order to permit this arrangement of the door 33 which prevents it from being blown out by the high steam pressures which exist within the chamber 38 during the operation of the apparatus, the door is carried by hinged brackets 72 which are located entirely on the outside of the door and the retort. Each hinged bracket comprises an arcuate portion 72a which is formed integrally with a transversely extending bar 72b having its outer end united with an arm 72c carried by a hub portion 72d which is pivotally mounted on a bearing member 73 carried by a bracket 74 attached to the end plate 70 by studs 75. The bars 72b of the hinged members are of such length that the arcuate portions 72a which are riveted or otherwise secured to the door 33, are permitted to swing inwardly through the door opening 30a during the process of opening the door. In this way, the door is mounted upon hinges which are located entirely outside of the retort so that they are not subject to deterioration by the action of the high temperature steam within the retort. One of the bearing members 72d, at the right of the apparatus as illustrated in Fig. 1, has secured thereto or formed integrally therewith a crank arm 76, shown particularly in Fig. 26, which is adapted to be actuated by the hydraulically operated mechanism hereinafter described for the purpose of opening and closing the door 33. The tracks 34, upon which the main carriage 35 is mounted, extend parallel to each other at the front of the retort and transversely to the longitudinal axis of the retort. Both tracks 34 are in the form of flat bars located in vertical planes and the rear track 34 is secured by intervening brackets 77 to a parallel rail 78 which is bolted or otherwise secured to the end plate 70 of the retort and which extends transversely therefrom to a considerable distance, as shown particularly in Figs. 1, 2 and 3. The rear track 34 is thus spaced from the end plate 70 which extends downwardly below the body of the retort 30 and which has secured to the depending portion thereof, by means of bolts 79, a pair of forwardly extending heavy brackets 80 which are proivded at their forward ends with upturned flanges 80a to which the forward track 34 is secured by bolts 82. In addition, the ends of the forward track 34 are supported by vertically extending rods or struts 83 which extend downwardly and threadedly engage flanged socket members 84 which rest upon the floor 32. By adjusting the rods 83 in the socket members 84, variations in the elevation of the floor may be compensated for so that the forward track 34 is rigidly supported at both ends.

Each end spacing bracket 77 through which the rear track 34 is connected to the supporting rail 78 is provided with an upwardly extending lug 77a threadedly engaged by the stem of a stop member 85 which carries on its end face a layer of cushioning material 85a. The stem of each stop member may be held in adjusted position in its lug 77a by means of a lock nut 86. The stop members 85 at opposite ends of the rear track 34 are directed toward each other and they are adapted to engage the rear portions of the frame of the main carriage 35 at the ends of the movement of this carriage in opposite directions. The forward track 34 is also provided at its ends with stop members which are carried by brackets 86 secured to the ends of the track by bolts or rivets 87. These brackets carry at their upper ends cylinders 88 in each of which there is slidably mounted a stop member 90 constructed in the form of the elongated piston and provided at its forward end with a cushioning plate or washer 90a. Each stop member 90 has a stem 90b which slides in the plug 91 which closes the rear end of the associated cylinder 88 and a coil spring 92 is mounted on each stem 90b between the plug 91 and the stop member 90 which is attached to the stem so that the spring normally tends to move the stop member 90 out of the cylinder and to a position where the annular shoulder 90c formed thereon engages the end wall of the cylinder as shown in Fig. 2. The two stop members mounted at opposite ends of the forward track member 34 face each other and are adapted to engage parts of the forward portion of the main carriage 35 as this carriage approaches the limits

of its travel on the track members 34, thus cushioning the movement of the main carriage and bringing it gradually to rest at the point where the rear portion thereof engages the stop members 85 which are adjusted to be in the proper location for this purpose.

As shown particularly in Figs. 1, 2, 3 and 4, the main carriage comprises a pair of longitudinal frame members 93 which are connected by the track members 36 through angle-shaped brackets 94 each having one flange bolted to a frame member 93 and another flange bolted to one of the track members 36. The rear frame member 93 carries adjacent its ends depending lugs 93a which are adapted to be engaged by the previously described stop members 85 when the main carriage 35 is at the ends of its path of travel. The forward stop members 90 are adapted to be engaged by the ends of the forward frame member 93 and by the horizontal flanges of two of the brackets 94 which are secured thereon.

The forward truck frame member 93 is provided with a plurality of pairs of depending ears 93b between which are rotatably mounted the cylindrical wheels or rollers 95 which are adapted to travel upon the upper surface of the forward track 34, as shown particularly in Fig. 4. The rear frame member 93 of the truck 35 has depending therefrom a plurality of integrally formed ears 93c which carry forwardly projecting trunnions 96 on which are rotatably mounted grooved rollers 97 adapted to travel upon the rear track 34. The carriage 35 is thus mounted for movement longitudinally of the tracks 34 and is held by the grooved rollers 97 against displacement thereon longitudinally of the axis of the retort.

The rear frame member 93 of the truck 35 also has secured thereon a pair of downwardly and forwardly extending brackets 98 which have rotatably mounted upon the lower parts thereof cylindrical rollers 99 which are arranged to travel beneath the rear track 34 when the carriage 35 is moved longitudinally of the tracks 34, thus holding the rear part of the carriage 35 against displacement upwardly away from the rear track member 34.

The brackets 98 carried by the rear part of the carriage 35 also serve as guides and supports for the rear portions of locking bars 100, shown particularly in Figs. 1, 3, 4 and 12, which are adapted to position the main carriage 35 so that a form carriage 37 may be moved therefrom into the retort. Each locking bar has a substantially cylindrical inner end portion 100a which is tapered on its opposite sides at its inner end so that it serves as a wedge or detent adapted to fit between locking plates 102 which are secured to the adjacent track 34 and spaced apart, as shown particularly in Figs. 12 and 14. The locking plates 102 have opposed inclined faces 102a which are adapted to be engaged by the inclined faces of the extremity 100a of the locking bar and this part 100a is slidably mounted in the tubular bearing portion 98a of one of the brackets 98 so that it may be reciprocated into and out of engagement with the locking plates 102. Each of the parts 100a is provided with a longitudinal groove or keyway 100b engaged by a set screw 103 so that it is thereby held against rotation during its reciprocatory movements. Each detent 100a has a stem 100c which is threaded at its outer end for engagement with an internally threaded recess formed in the body portion of the adjacent bar 100, being held in adjusted relation with respect to the body portion 100 by means of lock nuts 104. A threaded plug 105 closes the bore in the tubular portion 98a of the bracket and a coil spring 106 mounted between the plug 105 and the detent portion 100a serves normally to move the latter part into engagement with the locking plates 102. The locking plates have their outer end surfaces 102b tapered forwardly from the surface of the adjacent track so that a detent 100a coming from either direction will ride over these surfaces and into the space between the plates.

When a form carriage 37 has been withdrawn from the retort 30 and is tilted upwardly as heretofore described, it is necessary to release the main carriage from the tracks 34 so that it may be moved longitudinally to permit the other form carriage 37 to be passed into the retort and, for this purpose, each of the locking bars 100 is arranged to be operated by means located at the forward side of the carriage 35 and supported by depending brackets 108 having the form shown particularly in Figs. 2 and 12. These brackets are secured to the upper sides of the forward longitudinal truck frame members 93 and each bracket is provided at its lower end with a pair of forwardly projecting ears 108a between which there is pivotally mounted, on a pivot pin 109, a releasing lever 110 adapted to be actuated by a carriage 37 when this carriage is tilted upwardly to the position shown in Figs. 1 and 4. Each lever 110 is provided at its upper end with a socket portion 110a having an aperture therethrough which is loosely engaged by the locking bar 100 and this socket portion 110a is engaged on its outer side by a collar 112 mounted on the locking bar 100 and held in position by lock nuts 113 which engage the threaded end of the bar 100. The lower portion of each releasing lever 110 is inclined downwardly and forwardly and terminates in a rounded surface 110b adapted to be engaged by a part carried by a form carriage, as hereinafter described, for automatically releasing the detent 100a from the locking plates 102 when a form carriage 37 is tilted upwardly as illustrated by dotted lines in Fig. 12.

The main carriage 35 also comprises a pair of downwardly and forwardly extending brackets 114 which are secured to the opposite end portions of the forward longitudinal frame member 93 of the main carriage and which are provided at their lower ends with forwardly located vertical faces to which a flat bar 115 is attached by rivets 116 or the like. The bar 115 lies in a vertical plane and serves as a stop for limiting the downward swinging movement of the forward end of one of the form carriages 37 when the form carriage is tilted upwardly to the positions shown in Figs. 1 and 4. The bar 115 has mounted thereon two cylindrical blocks 117, each of which has resiliently mounted therein a stop member 118 arranged to engage a cross frame member of one of the form carriages 37, thus bringing the form carriage resiliently to rest as it approaches the limit of its movement toward the positions shown in Figs. 1 and 4. One of the blocks 117 is located substantially in the same vertical plane with each of the releasing levers 110.

In addition to being connected by the track members 36, the front and rear frame members 93 of the main carriage 35 are connected by a pair of angle bars 120 which are secured at their ends by studs 121 to brackets 122 fixed on the front and rear frame members 93 as shown particularly in Figs. 1, 2, 3 and 4. The angle bars

120 extend parallel to the track members 36 but are located at a somewhat higher level and are for the purpose of holding down the form carriages 37 during the movement of these form carriages into the retort, as hereinafter more fully described.

The auxiliary track members 44, heretofore mentioned, are formed with depending supporting legs 44a each of which is secured to a track member 36 by a bolt 123, a nut 124 and an intervening block 125 having a horizontal flange 125a which projects beneath the adjacent track member 36. The hole in each leg 44a engaged by a bolt 123 is elongated vertically and a set screw 126 threadedly engages each flange 125a and bears against the lower end of the adjacent leg 44a so that by adjusting the set screws 126 the upper edges of the auxiliary track members may be leveled or given a slight inclination as desired. The set screws 126 are secured in adjusted position by lock nuts 127.

The form carriages 37 are constructed as shown particularly in Figs. 1, 4, 15 and 19. Each form carriage comprises a pair of side frame members 130, a pair of end frame members 131, a central transverse frame member 133 and two intermediate transverse frame members 132, all of which are preferably cast as one integral construction, being formed preferably of aluminum or the like which is light in weight and capable of withstanding the high steam temperatures in the retort without corrosion or rusting. As illustrated in Figs. 1, 4 and 15, each side frame member has formed integrally therewith four depending bearing lugs 134, each having secured therein a trunnion 135 upon which is rotatably mounted through intervening roller bearings a grooved roller 136 adapted to straddle and travel upon one of the track members 36 and upon one of the retort tracks 39. In this way each form carriage 37 is always supported by an adequate number of rollers 136 as it passes from a pair of track members 36 to the retort tracks 39 or in the opposite direction.

Each form carriage 37 is adapted to support a plurality of forms 40 which are arranged parallel to each other as illustrated in Figs. 1, 4 and 15. For this purpose, each form carriage carries two supporting brackets or hangers 138 which are secured to the forward portions of the side frame members 130 by studs 139. Each hanger 138 extends outwardly in a plane at right angles to the upper surface of the carriage 37 and comprises a forward leg 138a, a rear leg 138b and a connecting member 138c. The two hangers 138 at opposite sides of the same carriage 37 are connected by a tie rod 140 which has its ends secured in the hangers 138 at the junctures of the forward legs 138a with the connecting members 138c. The two hangers 138 are also connected adjacent their rear upper ends by tie rods 141 and the rear legs 138b are provided with rearwardly projecting bosses which are connected by tie rods 142. A series of sheet metal dividers 143, having the form shown particularly in Fig. 16, are apertured for engagement by the tie rods 140, 141 and 142 and are mounted thereon in spaced relation, being spaced apart by a series of spacing sleeves 144 mounted on the tie rod 140, a series of grooved collars 145 mounted on the tie rod 141, and a series of spacing sleeves 146 mounted on the tie rod 142. A unitary supporting structure is thus provided on the forward end of each form carriage 37 for supporting the forms 40 on which the hosiery or other articles to be treated are mounted.

The forms 40 have the construction illustrated particularly in Figs. 1, 17 and 18. Each form comprises a tubular part 148, formed of aluminum, stainless steel, or the like, which, in this instance, is of the proper configuration to give the desired shape to ladies' nylon hosiery. The body portion 148 is substantially flat in transverse cross section, as shown in Fig. 18, and the opposite walls are spaced apart by intervening members 149. The body portion 148 of each form is mounted upon a rocker arm 150 having a flange 150a against which the end of the body portion is seated and having projections 150b which are embedded in and secured to the base of the body portion. The flange 150a is connected by two legs 150c with a curved flange 150d which terminates at the bottom in a reversely bent hook portion 150e. The curved flange 150d is united at its upper end with a forwardly and downwardly curved arm 150f which terminates in a U-shaped bearing portion 150g. When the form is placed on a form carriage 37, the rocker arm 150 is inserted between two of the sheet metal dividers 143 with the flange 150d extending between the spacers on the tie rods 141 and 142 and with the U-shaped bearing portion 150g engaging one of the spacing sleeves 144 and the tie rod 140. With this arrangement, the form 40 is supported on the hangers 138 with the curved surface 150h at the junction of the flange 150d with the arm 150f resting on the spacing collars 145 and with the U-shaped bearing portions 150g fitting over the sleeves 144. The curved flange 150d which is then concentric with the axis of the tie rod 140 lies in proximity to the spacing sleeves 146 on the tie rod 142 so that, when the forms are in the positions shown in Fig. 15, they are retained against rearward movement by the spacing sleeves 146. To facilitate the movement of the carriage 37 on its tracks, the tie rod 140 also carries a pair of arms 151 which have mounted between them a handle 152.

When the forms 40 are supported on the hangers 138 in the manner described above, they extend rearwardly beyond the rear end of the carriage but out of contact therewith, being carried entirely by the brackets 138. When a carriage 37 is withdrawn from the retort and tilted upwardly to the position shown in Figs. 1 and 4, the various forms 40 are capable of being tilted in a forward direction about the spacing sleeves 144 and the tie rod 140 until the hooked portions 150e of the rocker arms engage the spacing collars 145 on the tie rod 141. In this way, each form 40 may be moved forwardly out of alignment with the others to permit the operator to remove a treated stocking therefrom and to replace it with one which has not been treated. In this operation, the operator preferably stands at the right of the forward end of the apparatus as illustrated in Fig. 1 and in order that she may observe the condition of the hosiery being applied to the side of the form 40 directed away from her, a mirror 153 is mounted in a slightly inclined position on the main carriage 35 adjacent the left end of that carriage with the face of the mirror directed toward the left-hand sides of the forms 40 as they appear in Fig. 1. The practice in manipulating the forms 40 when removing and replacing hosiery may vary depending upon the character of the articles being treated. Nylon hosiery which has been dyed is capable of being readily removed from the forms after treatment

and, when treating such articles, the operator ordinarily tilts three of the forms forwardly at the same time and removes the hosiery from all three forms in one operation, after which two of the forms are pushed back to their normal positions and an untreated stocking is placed upon the form which is still in its forward position. The other two forms are then brought forward in succession and untreated stockings are placed thereon. When treating stockings which are undyed, it is ordinarily necessary to tilt the forms forwardly one at a time and to remove the treated article and replace it with an untreated form before the next form of the series, due to the fact that undyed articles contain sizing material which tends to cause them to stick to the forms so that they are less readily removed.

As heretofore mentioned, the form carriages 37 are supported in their upwardly inclined positions by the hooked bearing members 45 which are mounted at the forward ends of the auxiliary track members 44, being then supported by the ball bearing trunnions 42 which are carried at the sides of the form carriages. This construction is illustrated in Figs. 1, 5, 6, 7, 8, 9, 10, 11 and 15, where each form carriage is shown as having a bracket 155 secured to each of its side frame members 130 by means of studs 156. These bearing brackets are located at or near the middle points of the side frame members 130 and each one carries at its upper end the ball bearing trunnion 42 which consists of a cylindrical bearing member 157 formed integrally with the bracket 155 and having mounted thereon a ball bearing roller 158 having an outer diameter such that it substantially fits the inner arcuate surface of its hook-shaped bearing member 45 when moved into engagement therewith as shown in Fig. 6. The ball bearing roller 158 is retained on the bearing member 157 by a washer 159 held in place by a screw 160. When a carriage 37 is moved in a forward direction on the tracks 36, the two ball bearing rollers 158 at opposite sides thereof engage and ride up on the downwardly curved surfaces 44c which are formed at the rear ends of the upper edges of the auxiliary track members 44, thus elevating the forward rollers 136 slightly out of contact with the track members 36. The rollers 158 then travel forward on the auxiliary track members 44 until they seat in the hook-shaped bearing members 45, whereupon the form carriage 37 and the forms mounted thereon are tilted upwardly, preferably due to their own momentum, to the inclined position shown in Figs. 1 and 4. In this position of the form carriage, the forward rollers 136 of the carriage rest against the outer face of the supporting bar 115 which is suspended from the main carriage 35 as heretofore described, so that the form carriage then occupies a stable position while the operator is working upon the forms.

In order to hold the form carriage 37 against accidental rearward movement after it has been moved to the inclined position shown in Figs. 1 and 4, each hook-shaped bearing member 45 is provided with an arcuate retaining member 161 which is mounted for angular movement in an arcuate recess 45a formed in the inner side face of the hook-shaped bearing member 45, being retained therein by a curved plate 162 which is attached to the side of the bearing 45 by means of screws 163. The inner edge of the retaining member 161 conforms to the curvature of the curved bearing surface of the hooked bearing 45 and it is provided with a laterally projecting lug 161a which extends through an arcuate notch 162a formed in the plate 162 and extending through an angle of 90 degrees about the axis of the bearing 45, as shown in Fig. 9. This retaining member 161 is normally retained in the position shown in Fig. 9 by means of a spring-pressed plunger 164 which engages a circular recess 161b formed in the inner face of the retaining member, as shown in Fig. 11. The plunger 164 is mounted in a barrel 165 which threadedly engages a recess in the side of the bearing member 45, as shown in Fig. 11. A coil spring 166, mounted in the barrel, coacts at its outer end with a cap member 167 which threadedly engages the end of the barrel and this spring normally forces the rounded end of the plunger 164 into engagement with the recess 161b.

When a form carriage 37 is moved forwardly and assumes the inclined position shown in Figs. 1 and 4, each retaining member 161 is automatically moved, during the tilting of the carriage, from its normal position, shown in Fig. 9, to a position such as that shown in Fig. 10 where the opening of the hook-shaped bearing member 45 is substantially entirely closed by the retaining member 161. This movement of the retaining member is effected by actuating members 170, one of which is mounted on the outer side face of each bracket 155, being secured thereto by a stud 171. Each actuating member 170 is provided with a circular aperture which is fitted by the enlarged inner end of the adjacent bearing member 157 and this enlarged portion of the actuating member carries two projecting spaced arms 170a which form a slot 170b adapted to receive one of the lugs 161a carried by the adjacent retaining member 161. The actuating member 170 is held in fixed position with respect to the carriage 37 upon which it is mounted and the spaced arms 170a thereof extend parallel to the upper edge of the adjacent auxiliary track member 44 as the form carriage moves forwardly thereon. As the ball bearing rollers 158 enter the hook-shaped bearing members 45 at the end of the forward movement of the carriage 37, the arms 170a embrace the lug 161a which then travels into the slot 170b until it finally occupies the position shown by dotted lines in Fig. 6. Then, as the form carriage 37 is tilted upwardly and forwardly, the actuating arms 170a turn the retaining member 161 in its guideway so that it extends partially around the adjacent ball bearing roller 158, on the rear side thereof, as shown in Fig. 10, thus securely holding the form carriage 37 at the forward ends of the auxiliary track members 44 during the time that the operator is working upon the forms 40. After the hosiery has been changed on the forms, the operator grasps the handle 152 and tilts the forward end of the form carriage upwardly, whereupon the motion of the retaining members 161 is reversed until, as the form carriage assumes a horizontal position, they are again restored to the positions shown in Fig. 9 so that the form carriage may then be pushed rearwardly by the operator with the rear rollers 136 of the carriage resting upon the track members 36 and with the rollers 158 resting upon the auxiliary track members 44. As that motion continues, the rollers 158 eventually pass out of engagement with the auxiliary track members 44 so that the forward rollers 136 again rest upon the track members 36 as the form carriage continues its movement into the retort.

In addition to providing the foregoing means for holding the ball bearing trunnions 42 of each

form carriage in fixed relationship to the hooked bearing members 45 when the form carriage is tilted upwardly, as shown in Figs. 1 and 4, means are also provided for automatically latching the forward or lower end of the form carriage so that it is held in position with its lower end frame member 131 engaging one of the resiliently mounted bumpers 118 and with its forward rollers 136 coacting with the stop bar 115, as shown in Figs. 1 and 4. This means is particularly illustrated in Figs. 4, 12 and 13 and it comprises a form carriage latch 172 which is duplicated for each form carriage, being supported by the main carriage 35 so that it moves longitudinally of the tracks 34 with the form carriage to which it belongs. Each form carriage latch comprises a latch pin 173 having a tapered head 173a adapted to interlock with a hard metal plate 174 secured to the lower or forward cross frame member 132 of the associated form carriage. The latch pin has a stem 173b which threadedly engages the upstanding arm 175a of a latch lever 175 secured by a set screw 176 on the end of a shaft or pin 177 mounted for rotary movement in the flanges 108a of one of the brackets 108 previously referred to. On the shaft or pin 177, there is also mounted a second latch lever 178 which has one arm 178a extending forwardly and provided with an aperture which is engaged by a bolt 179. This bolt also engages an elongated slot 175b formed in the first-mentioned latch lever and the outer threaded end of the bolt is engaged by a nut 180 by which the two levers may be clamped together in different relative angular positions as permitted by the adjustment of the bolt 179 in the slot 175b, this adjustment being desirable in order to locate the head 173a of the latch pin in the precise position desired for engagement with the plate 174 on the form carriage. The lever 178 also has a rearwardly extending arm 178a provided with an upturned extremity 178b. This upturned portion is enlarged to form a boss having an aperture therethrough which is engaged by the threaded stem of a trip member 181. This trip member is secured in place by a nut 181b engaging the forward end thereof and it is provided at its rear end with an enlarged head 181a adapted to be engaged by cam bars 183 which are mounted on the forward side of the forward track 34. The arm 178a of the latch lever 178 is normally held in its uppermost position by a coil spring 184 which is connected with the upwardly extending part 178b thereof and which is attached at its other end to a pin 185 carried by one of the roller supporting lugs 93b which are formed on the forward longitudinal frame member 93 of the main carriage 35. Thus, when a form carriage 37 is tilted to the position shown in Figs. 1 and 4, the forward end thereof swings downwardly and the tapered head 173a of the underlying form carriage latch 172 rides over the plate 174 as the spring 184 is extended and then interlocks with the plate 174, as shown in Fig. 12. As the head 173a of the latch pin snaps over the head of the hard metal plate 174, the spring 184 returns the latch levers 175 and 178 to their normal positions. The normal position of the lever 178 and the normal elevation of the head of the pin 181 may be varied by a stop screw 182 which threadedly engages a lug 108b formed on the adjacent bracket 108 and which is held in adjusted position by a set screw 182a. At the same time that the lower part of the form carriage is locked by the latch mechanism 172 associated therewith, the previously described lever 110 is moved from the position shown by full lines in Fig. 12 to the position shown by dotted lines in that figure, thus operating the associated locking bar 100 and moving the detent 100a out of engagement with the locking plates 102 so that the main carriage 35 is then released and may be moved longitudinally of the tracks 34 so that the form carriage 37 which has just been tilted upwardly may then be worked on by the operator while the other carriage, previously supplied with untreated hosiery or other articles, is moved into the retort, it being understood that the track members 36 of the other form carriage will be latched in proper relationship to the door opening 30a of the retort by the other locking bar 100 as soon as this other carriage reaches that position, the detent 100a of the other locking bar riding up over the inclined faces 102b of one of the locking plates and into engagement with the notch between those plates. The actuation of the locking bars 100 is effected by the engagement with the lower rounded end surface 110b of the associated lever 110 of a circular releasing plate 186 having a stem 186a which threadedly engages a boss 132a projecting from the forward side of the forward frame member 132. The stem 186a is held in adjusted position by a lock nut 187 and by releasing this nut the plate 186 may be adjusted to cause the desired amplitude of movement of the connected locking bar 100 against the compression of the spring 106 associated therewith.

After a new supply of untreated hosiery has been applied to the forms 40 of a form carriage 37 while the carriage is in the tilted position shown in Figs. 1 and 4, that carriage is in readiness for movement into the retort and, assuming that the other form carriage has been withdrawn from the retort and tilted upwardly, the form carriage to which the untreated articles have just been applied is moved to a position opposite the retort. This may be effected manually by the operator who grasps a handle 188 mounted between the two innermost hook bearing members 45, as shown in Fig. 1. As the form carriage carrying the untreated hosiery or the like approaches a position opposite the retort 30, the latch mechanism 172 associated with that form carriage is automatically released due to the engagement of the head 181a of its trip pin 181 with the inclined under surface 183a of one of the cam bars 183 which are shown particularly in Fig. 13, thus releasing the latch pin 173 from its engagement with the latch plate 174 of that form carriage so that the carriage may swing downwardly to a substantially horizontal position. As soon as this form carriage starts its return pivotal movement to the substantially horizontal position, the latch lever 110 is released by the plate 186 mounted on that form carriage so that the locking bar 100 associated with that form carriage moves inwardly under the influence of its spring 106 in readiness to ride over the inclined face 102b of one of the locking plates 102 and latch the main carriage in a position to hold the form carriage in alignment with the opening 30a of the retort as soon as that position is reached.

There are two cam bars 183 located on opposite sides of the middle point of the forward track member 34. Each cam bar is mounted on a pin 189 which is journaled in a bearing formed in the forward track 34 and which has a lever 190 secured on its rear end. A coil spring 191, connecting the lower end of the lever 190 with a pin 192 extending downwardly from the under side

of the adjacent track 34, serves to maintain the lever 190 normally in contact with a stop screw 193 which threadedly engages a lug 194a carried by a bracket 194 attached to the read side of this track 34. The stop screw 193 may be secured in adjusted position by a set screw 195 and may be regulated to locate the connected cam bar 183 in the proper angular position to operate the latch member 172 of one of the form carriages to the desired extent as that form carriage approaches a position opposite the retort. As soon as the latch mechanism 172 is operated by a cam bar 183 to release a form carriage, that form carriage is manually pushed to return it to its horizontal position and as it reaches the horizontal position, the trunnions 42 thereof are automatically released by the retaining members 161 so that the operator may then give the form carriage a push which will cause it to enter the retort to a sufficient extent to cause the tripping plate 46 to actuate the starting switch 47 as heretofore mentioned and as hereinafter more fully described.

The two cam bars 183 mounted on the forward side of the forward track 34 are directed oppositely and are spaced apart so that after one of the latch mechanisms 172 has been released by the movement of the main carriage to a position wherein one of the form carriages may be moved into the retort, the latch levers 175 and 178 associated with that form carriage are returned to their normal positions by the action of the connected spring 184, thus causing the tripping pin 181 to move upwardly and occupy a position between the two cam bars 183 as shown in Fig. 13. After the form carriage which has thus been located has been moved into the retort and then subsequently withdrawn, following a suitable period of treatment, the form carriage is again tilted upwardly to the inclined position shown in Figs. 1 and 4, thus again actuating the associated locking bar 100 through the connected lever 110 to permit the main carriage to be moved endwise on its tracks 34. As this endwise movement of the main carriage 35 begins, the rounded head 181a of the tripping pin 181 associated with that form carriage rides over the top surface 183b of one of the cam bars 183, thereby extending the connected spring 191 so that the cam bar is moved downwardly about its pivot without disturbing the interlocking relationship between the head 173a of the locking pin of the associated latch member 172 with the plate 174 of the form carriage so that the form carriage continues to be held in its inclined position as it is moved from the position opposite the retort to a position adjacent the ends of the tracks 34, which position is determined by the engagement of the ends of the main carriage 35 with the stop members or bumpers 85 and 90 previously described which are located at that end of the track structure.

In addition to the cam bars 183 for releasing the latch mechanisms 172 by which the form carriages are held in their tilted positions, the forward track member 34 is provided at each end thereof, as shown in Fig. 1, with an inclined cam bar 196 which is secured in fixed position. These auxiliary cam bars do not ordinarily have any function in the operation of the apparatus and are used only to release the latch mechanisms 172 with the main carriage 35 at one or the other of its extreme positions in case it is desired to tilt one of the form carriages downwardly from the positions shown at the right of Fig. 1 for the purpose of moving it entirely from its position on the main carriage for purposes of repair, replacement, or the like.

For the purpose of locking it in its horizontal position as it is being moved into the retort, each form carriage is provided with a block 198 secured to the under side of the middle transverse frame member 133 thereof by screws 199 and having a guideway 198a in which is slidably mounted a locking bolt 200 adapted to project under the horizontal flange 120a of one of the angle bars 120 which are mounted on the main carriage 35 parallel to the track members 36, as previously described. The bolt 200 is held in its guideway by a detachable plate 201, as shown in Figs. 5 and 23, and a coil spring 202 is connected between a pin 203 mounted on this plate and another pin 204 secured to the bolt so that it normally moves the bolt to its locking position, this movement being limited by the engagement of the pin 204 with the end of the plate 201. The lower part of the projecting end of the bolt is formed as a tooth 200a having an inclined under face 200b which engages the edge of the top flange 120a of the angle bar 120 when the form carriage is lowered to its horizontal position, thus wedging the bolt to its retracted position. As soon as the form carriage is fully lowered, the spring 202 returns the bolt to the position wherein the tooth underlies the angle bar 120 as shown in Fig. 23, thus holding the form carriage against accidental upward tilting while the form carriage is being moved from the main carriage into the retort.

The bolt 200 remains in its locking position while it is in the retort and when the form carriage is withdrawn from the retort onto the main carriage 35, its tooth 200a again travels beneath the flange 120a of one of the angle bars 120 to prevent upward tilting of the form carriage during the major portion of the forward or outward movement of the form carriage. As the end of this forward movement of the form carriage is approached, the bolt 200 is automatically retracted to release the carriage from the angle bar 120 through the action of a finger 205 which is mounted on the upper side of the top flange 120a of the angle bar and which has a vertical face 205a arranged to coact with a laterally inclined wedging surface 200c formed on another tooth 200d of the bolt 200. The finger 205 is pivoted at 207 on a plate 208 which is adjustably clamped to the upper side of the flange 120a of the angle bar by studs 209 engaging elongated slots 208a formed therein. A coil spring 210 is attached to an intermediate part of the finger 205 and to a pin 211 fixed in the plate 208 and acts normally to hold the finger against a stop pin 212 fixed in the plate 208 so that the finger then extends at right angles to the longitudinal axis of the angle bar 120 and in a position to release the bolt 200 from its locking engagement with the bar 120 just as the upward tilting movement of the form carriage in the hooked bearing members 45 begins. By adjusting the plate 208 on the bar 120, this retraction of the locking bolt 200 may be caused to take place at the required point in the outward movement of the carriage.

When the form carriage is subsequently lowered from its tilted position, the bolt 200 engages and automatically interlocks with the angle bar 120 just before the bolt reaches the finger 205 and the edge 200e of the upper tooth 200d of the bolt then engages the free end of the finger 205 to swing it toward the left, as viewed in Fig. 5, against the tension of the spring 210, thus per-

mitting the bolt 208 to pass by as the form carriage travels toward the retort. The finger 205 has a depending projection 205b on its free end which rides over the top flange 120a of the angle bar and the plate 208 is notched as shown at 208b to receive this lug 205b so that the free end of the finger may move entirely out of the path of travel of the projecting tooth 206d of the locking bolt.

In order that a block 198 and its locking bolt 200 may be properly positioned with respect to the adjacent angle bar 120 when the form carriage to which it is attached is lowered, a tapered centering pin 214 is secured to the transverse frame member 133 of each form carriage to project downwardly therefrom so that as the form carriage approaches the limit of its downward swing this pin will pass downwardly in contact with the side of the vertical flange 120b of the adjacent angle bar 120, as shown in Fig. 23, thereby locating the form carriage properly in a lateral direction as it reaches its horizontal position.

After a form carriage has been latched in its horizontal position on the main carriage 35, as described above, the operator gives it an initial push toward the retort which causes the member 46 to close the starting switch 47 and thereby set in operation the motor 49 for driving the controller 50, thus initiating a series of automatic operations, the first of which is the movement of the form carriage into the retort by the action of the retracting mechanism 52, heretofore referred to, which will now be described. This mechanism which is illustrated particularly in Figs. 19 to 25, inclusive, comprises a cylinder 215, shown in Fig. 19, which is provided at its opposite ends with cylinder heads 216 which are secured to a flat metal plate 217 fixed on the bottom inner wall of the retort and extending throughout a major portion of the length of the retort. Oil or other fluid under pressure may be admitted to either end of the cylinder 215, as mentioned above, and as hereinafter more fully described, for the purpose of actuating a piston 218, shown in Fig. 20, which is connected to a piston rod 219 slidably mounted in the head 216 at the forward end of the cylinder and having its forward end secured to a cross head 220 having the form illustrated particularly in Fig. 21. The cross head is secured on the piston rod 219 by a pin 222 and the opposite extremity of this arch-shaped member is secured by a pin 223 to an actuating rod 224 through the movement of which the form carriage is moved. A guide member 225 is secured to an intermediate part of the rod 224 by a pin 226 and this guide member slidably engages a guide rod 227 which extends substantially throughout the length of the plate 217 with its ends secured to and spaced upwardly from that plate by brackets 228.

The rear end of the actuating rod 224 is fixed in a boss 230a formed on another cross head or guide member 230 which is apertured for sliding engagement with the guide rod 227 and which is of arch shape so that it extends over the cylinder 215, as shown in Fig. 20, with its opposite end apertured for sliding engagement with another guide rod 231 which extends parallel to the guide rod 227 with its ends fixed in brackets 232 which are secured to the plate 217 and which space the guide rod 231 upwardly therefrom, this guide rod being substantially of the same length as the cylinder 215. With this arrangement, the actuating rod 224 is rigidly mounted and guided for longitudinal movement in response to the actuation of the piston 218 in the cylinder 215.

The actuating rod 224 is secured at an intermediate point to a plate or bracket 233 which is provided on one side with a pair of horizontally extending ears or bosses 233a which are provided with circular apertures having a sliding engagement with the guide rod 227 and which are also provided with apertures which are fitted by the actuating rod 224. These ears or bosses are secured to the actuating rod 224 by set screws 234 which permit the plate or bracket 233 to be adjusted longitudinally of the actuating rod and, upon movement of the actuating rod, the bracket 233 is moved longitudinally of the guide rod 227, thus carrying with it the means for actuating a form carriage, including a retractor latch 235 having the form shown particularly in Figs. 22 and 24. This latch 235 is provided at its forward end with an upwardly extending hook portion 235a adapted to extend upwardly over the rear transverse frame member 131 of the form carriage, and it is provided at an intermediate point with an upwardly extending ear 235b by which it is pivotally mounted upon an intermediate part of the supporting plate or bracket 233, through the agency of a stud 236. The retractor latch 235 is provided at its rear end with a pin 237 having connected thereto a coil spring 238 which is attached at its lower end to another pin 239 fixed on the lower rear portion of the plate 233 and this spring acts normally to move the latch 235 to a position wherein the hook portion 235a thereof projects upwardly in front of the cross head 131 of the form carriage.

At the time when a form carriage is moved in response to a manual push into the forward part of the retort 30, the retractor latch 235 occupies the inclined position shown in Fig. 22 with the hook portion 235a thereof depressed against the tension of the spring 238, the retractor latch being then held in this position by means of a latch hook 240 which is pivoted on a stud 241 secured on the lower part of the plate or bracket 233. A coil spring 242 is attached at one end to a pin 243 fixed on the latch hook 240 and at its other end to a pin 244 secured on the plate 233 so that the latch hook is moved normally toward a position where its hook portion 240a overlies a block 245 which is secured on the side face of the retractor latch, as shown particularly in Figs. 22 and 24.

The retractor latch 235 is moved to the inclined position shown in Fig. 22 during the forward movement of the bracket or plate 233 in response to the admission of compressed fluid to the rear end of the cylinder 215, by the action of a trip member 246 which is pivotally suspended from a stud 247 engaging the latch 235 rearwardly of its pivot 236. A coil spring 248 is connected to a pin 249 fixed in the side of the trip member 246 and the other end of the spring is attached to a pin 250 secured to the side of the rear portion of the retractor latch 235 so that it tends normally to maintain the trip lever 246 against a stop pin 251 which projects laterally from the latch 235. The lower part of the trip member 246 has a cylindrical pin 252 secured therein and extending laterally therefrom in the path of a stationary cam block 253 which is secured to the upper side of an inverted channel-shaped member 255 fixed on the bottom wall of the retort and extending longitudinally thereof at one side of the plate 217. Assuming that the bracket 233 carrying the retractor latch 235 is moving forward from its rearward position, the pin 252 on the trip member 246 rides up on the

inclined surface 253a of the stationary cam block 253 until it reaches a position where it rests on the horizontal surface 253b of the cam block, as shown in Fig. 22. This action raises the rear end of the latch 235 and causes a corresponding depression of the hook portion 235a at the forward end thereof and at the same time the hook portion 240a of the latch hook 240 snaps over the block 245 in response to the action of the spring 242 so that, as the forward motion of the bracket 233 is continued, and the trip member 246 moves normally beyond the surface 253b of the cam block, as shown by dotted lines in Fig. 22, the forward portion of the latch 235 is permitted to raise slightly under the influence of the spring 238 with the result that the hook portion 240a of the latch hook coacts directly with the upper surface of the block 245 and thus holds the latch in its inclined position until it is released to engage the form carriage.

The release of the retractor latch 235, when the bracket or plate 233 is at the forward end of its patch of travel, is effected by a trip finger 257 which is pivotally suspended from a block 258 secured to the rear cross frame member 131 of the form carriage by studs 259. The trip finger is mounted in a slot 258a formed in the block 258 and is pivoted on a threaded pin 260 which is held in place by a set screw 261. As the form carriage moves into the retort in response to the push of the operator, the depending finger 257, being then held against counterclockwise movement from the position shown in Fig. 22 by its engagement with the inner wall of the slot 258a, engages a pin 262 which is fixed in the side of the latch hook 240 and arranged to project laterally therefrom into the path of the trip finger 257 as shown in Fig. 23. The latch hook 240 is thereby carried out of engagement with the block 245 so that the retractor latch 235 is permitted to swing upwardly with the hook portion 235a thereof in front of the cross bar 131 of the carriage, as shown in Fig. 24. This condition continues during the rearward movement of the bracket 233 which then takes place in response to the admission of compressed fluid to the forward end of the cylinder 215 and, when the stationary cam block 253 is reached, the trip member 246 pivots on the stud 247 and rides over the cam block 253 until that cam block has been passed, when it is restored to its normal condition in engagement with the pin 251 by the action of the spring 248.

In order to cushion the form carriage and to bring it resiliently to rest when it engages the retractor mechanism, the plate or bracket 233 is provided with a resiliently mounted plunger or bumper 265 which is arranged to engage the head of a stop screw 266 which is adjustably mounted in a threaded aperture formed in the rear cross frame member of each form carriage. The plunger 265 is slidably mounted in the forward end of the cylinder 267 having downwardly extending flanges 267a which are secured to the plate 233 by studs 268, as particularly shown in Fig. 23. The plunger 265 is provided with an enlarged annular shoulder 265b which reciprocates within the bore of the cylinder, and a coil spring 269 is mounted between this shoulder and the block 270 which threadedly engages the rear end of the cylinder 267 and which is apertured for sliding engagement by the stem 265c of the plunger around which the spring 269 is mounted. As a form carriage 37 approaches the position where it is about to be engaged by the retractor latch 235, the stop screw 266, which will have been adjusted to function at the proper time, will engage the end of the plunger 265 and move it rearwardly against the compression of the spring 269 during the final stages of the movement of the form carriage preceding its engagement by the latch 235, as shown in Fig. 24. The spring 269 then remains compressed during the treatment of the articles mounted on the forms 40 positioned on the form carriage and when the carriage is subsequently moved forwardly within the retort by the forward movement of the plate 233, the spring compressed plunger 265 operates, when the hook portion 235a of the latch is depressed by the action of the cam block 253, to impart an outward push to the form carriage which is sufficient to carry it outwardly onto the tracks 36 of the main carriage 35 with sufficient momentum to cause the form carriage to tilt upwardly to the positions shown in Figs. 1 and 4 when it reaches the end of its forward movement.

The hydraulic system, heretofore referred to, for operating the door 33, moving the form carriages 37 and controlling the flow of steam to the retort 30 and its exhaust therefrom, is shown particularly in Figs. 26 and 27. The oil or other fluid is supplied under pressure from the tank 53 by the pump 54 and the electric motor 55 and its flow to the various devices which effect the operations just referred to is controlled by a series of solenoid operated valves which are actuated by the electric circuit 48 under the control of the motor driven controller 50. The oil for operating the piston in the form carriage cylinder 215 is supplied from the pump 54 through a pipe 273 and a branch pipe 274 to a solenoid operated valve 275 of the piston type having at one end a solenoid 276 which, when energized, causes the oil to flow from the valve through a pipe 277 to the rear end of the cylinder 215, thereby moving the carriage moving mechanism toward the mouth of the retort. The valve 275 has at its other end a solenoid 278 which operates when actuated by the electric circuit 48 to cause the oil to flow from the valve through a pipe 279 to the outer end of the cylinder 215, thereby retracting the carriage operating mechanism and drawing into the retort the form carriage attached thereto. During actuation of the valve in either direction, oil admitted thereto during the next preceding operation is exhausted through a branch pipe 280 to an exhaust pipe 281, through which it is conveyed back to the tank 53.

The construction of the solenoid operated valve 275 is illustrated particularly in Fig. 30 and the description thereof will suffice for all such valves which are embodied in the system, since they are all substantially alike. The valve 275 comprises a central valve block 284 provided with a longitudinal bore in which there is slidably mounted a plunger or piston rod 285 of circular cross section having formed thereon two enlarged cylindrical pistons or valve members 286 which are located at the ends of a central chamber 284a adapted to communicate with the outlet ports 284b and 284c to which the outlet pipes 277 and 279, respectively, are connected. The chamber 284a is supplied with oil under pressure through an inlet port which communicates with the branch pipe 274. The piston rod or plunger 285 is connected at its ends to the magnetizable cores 287 of the solenoids 276 and 278 and when one of these solenoids is energized, with the circuit of the other solenoid open, the magnetizable core 287 is moved endwise into its solenoid, thereby shift-

ing the adjacent piston valve 286 to establish a communication between the central chamber 284a and one of the outlet ports 284b or 284c. At the same time that the valve plunger is thus shifted to open an outlet from the chamber 284a, the other valve member 286 is moved to close the communication between the central chamber 284a and the other outlet port. When the valve member is moved in either direction, the excess oil in the discharge passages which is entrapped by a valve member 286, flows outwardly through one of the passages 284e to the branch pipe 280 connected with the exhaust pipe 281 so that it then flows back to the tank 53.

The crank arm 76 which operates the door 33 is pivotally connected through a connecting rod 288, shown in Fig. 26, with a piston rod 289 which is slidably mounted in one of the heads 290a of a cylinder 290 located on the outside of the retort within an auxiliary housing 291, shown particularly in Figs. 2 and 26, which also contains the motor 49, controller 50, the various solenoid operated valves and other parts of the controlling and actuating mechanism. A pipe 292 leading to the rear end of the cylinder 290 is adapted to admit oil or other fluid under pressure to actuate the piston connected to the piston rod 289 to close the door 33. Another pipe 293 connected to the forward end of the cylinder 290 is adapted to actuate the piston therein for retracting the piston rod 289 and opening the door 33.

The oil or other fluid under pressure for actuating the piston of the door operating cylinder 290 is supplied to the pipes 292 and 293 by a solenoid operated valve 295 which controls the flow of oil through a branch pipe 296 from the previously mentioned supply pipe 273 leading from the pump 54. The solenoid operated valve 295 comprises a solenoid 297 which, when energized, causes the flow of oil through the valve from the branch pipe 296 to the pipe 292 leading to the rear end of the cylinder 290, and another solenoid 298 connected to the other end of the valve 295, when energized by the closing of its circuit, causes the flow of oil through the valve chamber from the branch pipe 296 to the pipe 293 leading to the forward end of the cylinder 290. A pipe 299 leading from the solenoid operated valve 295 is adapted to exhaust oil therefrom to the previously mentioned exhaust pipe 281. Thus, when the pump 54 is operating, the door 33 may be closed and opened by energizing the solenoids 297 and 298, respectively.

The flow of steam to and from the retort 30 is controlled by a solenoid operated valve 300 to which oil or other fluid under pressure is supplied from the pipe 273 through a branch pipe 301. This valve comprises a solenoid 302 which, when energized by the electric circuit 48, causes oil to flow through the valve into an outlet pipe 303 leading to the cylinder of a steam valve 305 which is adapted to control the steam flow as hereinafter described. The valve 300 also comprises another solenoid 306 which operates when energized to admit oil or other fluid under pressure through the valve to the pipe 307 which leads to the end of the steam valve cylinder 305 opposite that to which the pipe 303 is connected. The valve 300 has a branch pipe 308 for exhausting oil to the exhaust pipe 281 which leads back to the oil tank 53.

The steam valve 305 comprises a cylinder having mounted therein a piston 305a fixed on a piston rod 309 which is adapted to effect the opening and closing of two gate valves 310 and 311

which are connected in steam pipes 312 and 314, respectively, opening into the retort 30 through the bottom wall thereof beneath the previously described inverted channel-shaped member 255, heretofore referred to, which is mounted on the bottom wall of the retort and which is open at its ends so that steam introduced beneath it is distributed to the opposite ends of the retort. The pipe 312 leads from a source of steam supply and is adapted to supply hot steam under pressure to the interior of the retort 30, when the valve 310 is opened in response to the admission of steam into the right-hand side of the steam valve 305, as viewed in Figs. 26 and 27, through the energization of the solenoid 302 by the electric circuit 48. The pipe 313 is connected at its lower end to an exhaust pipe 315 through which the steam within the retort is exhausted during the period after the valve 310 is closed and immediately preceding the opening of the door 33, the solenoid 306 being actuated by the electric circuit 48 at the proper time to bring this about. A T-connection 316 through which the pipe 313 is connected with the pipe 315 has connected thereto a pipe 317 which is also connected to communicate with the pipe 312. The pipe 317 has connected therein a strainer 329 adapted to remove any sediment in the live steam passing therethrough from the pipe 312 and it also has connected therein a solenoid operated valve 339 which is connected in the electric circuit 48, as hereinafter described, so that it is automatically opened at the same time that the exhaust valve 311 is opened, thus causing high pressure live steam to be discharged from the reduced end 317a of the pipe 317 through the T-connection 316 into the exhaust pipe 315, thereby creating a partial vacuum at the lower end of the pipe 313 which serves to draw the exhaust steam out of the retort during the time that the valves 311 and 339 are open.

Before describing the connections and operation of the electric circuit 48, reference will be made to the construction of the controller 50 which comprises a base plate 318 mounted on supporting brackets 319 which are secured to the outer wall of the retort within the auxiliary housing 291, as shown particularly in Fig. 26. The parts of the controller 50 and its driving motor 49 are mounted directly on a plate 320 which is secured in place by screws 321 engaging the base plate and by insulating washers 322 which space the plate 320 from the base plate and from the screws. The motor 49 has its shaft 323 connected to an auxiliary shaft upon which is mounted a small fan 324 provided for the purpose of indicating to the operator whether or not the motor is running. The motor shaft 323 is connected through a gear reducing unit 325 with a driving shaft 326 having mounted thereon a driving pinion 327. The pinion 327 meshes with a large gear 328 fixed upon the controller shaft 330 which is journaled in bearing brackets 331 extending upwardly from the supporting plate 320. The shaft 330 has secured thereon a plurality of spaced cams C1, C2, C3, C4, C5, C6 and C7, each comprising a plurality of plates of insulating material which are capable of relative angular adjustment for the purpose of changing the external configurations of the cams. In this instance, each cam comprises two insulating plates which are clamped against a nut 332 secured on the shaft 330 by a screw 333. The clamping of the plates against the screw 333 is effected by a nut 334 which engages a threaded portion of the shaft 330 at one side of each cam. At the end of the

controller shaft 330 opposite the driving gear 328, a calibrated disk 335 is secured to the shaft and graduated in degrees adjacent its outer periphery for registration with a stationary pointer 336. By the use of the disk 335 and the pointer 336, the disks of each cam may be adjusted with respect to each other and each cam may be adjusted angularly with respect to every other cam so that the circuit operations controlled by the cams take place in the proper sequence and timed relation.

Above and somewhat to the rear of the series of cams mounted on the shaft 330, there are mounted a series of mercury tube switches S1, S2, S3, S4, S5, S6 and S7 which are connected in the various branches of the electric circuit 48. These mercury tube switches are mounted upon an insulating plate 337 carried by supporting posts 338, one of which also carries a stationary pointer 336. Each mercury tube switch comprises the usual mercury tube 340 detachably secured by spring clips 341 upon a small insulating plate 342 carried by a bracket 343 which is pivotally mounted, by means of a pin 344, upon a U-shaped supporting bracket 345 having its back wall secured to the upper part of the insulating plate 337. Each switch bracket 343 carries at its forward end a roller 343a adapted to travel upon the surface of one of the cams carried by the shaft 330. When a roller 343a is in contact with that portion of a cam surface which is concentric with the axis of the controller shaft 330, the associated mercury tube is maintained in its horizontal position, wherein the contacts contained therein are connected by the body of liquid mercury contained in the tube, but when the roller 343a drops into a depressed portion of the cam surface, the mercury tube assumes an inclined position by gravity and the body of mercury thereby flows to one end of the tube and disconnects the contacts, in the usual manner. In one of the switches, S1, the mercury tube is reversed in its supporting clips 341, so that its contacts are open when it is tilted downwardly and closed when it is up.

The electric circuit 48 for operating the motors 49 and 55 and the solenoid operated valves 275, 295 and 300 is shown diagrammatically in Fig. 27 and comprises three line conductors L1, L2 and L3 which are connected through the fuse block 347 with a 110-volt three-phase alternating current supply source as shown at 348. The line conductors lead through a three pole safety switch 350 having protective resistances 351 connected in two of the lines and from this switch three motor supply conductors T1, T2 and T3 lead to the terminals of the three-phase alternating current motor 55 which drives the oil pump 54.

The solenoid operated valves and the motor 49 are operated by one phase only of the three-phase alternating current supply circuit, each solenoid having one of its terminals connected to the conductor T3 and having its other terminal arranged to be connected to the conductor T1 through one of the mercury tube switches of the controller 50, while the motor 49 is connected to these conductors T1 and T3 through the carriage operated starting switch 47 and also through a branch circuit controlled by the switch S1.

As shown in Fig. 27, a branch conductor 353 is connected to one of the motor supply conductors T3, in advance of the resistance 351 connected in that line, and this conductor is connected to a plurality of other conductors which extend to the windings of the various solenoid operated valves, including a conductor 354 extending to the solenoid 297, a conductor 355 extending to the solenoid 298, a conductor 356 extending to the solenoid 276, a conductor 357 extending to the solenoid 278, a conductor 358 extending to the solenoid 302, and a conductor 359 extending to the solenoid 306. In this way, a permanent connection is established from one line conductor T3 to one terminal of each solenoid.

The connections to the other terminals of these solenoids are made from the line conductor T1 through a conductor 360, connected in advance of the resistance 351 in the line T1, and extending to the controller 50 where it is connected to one terminal of each of the mercury switches S2, S3, S4, S5, S6 and S7 which control the circuits of the solenoids and also to one terminal of the starting motor 49. As shown in Fig. 27, the other terminal of the motor 49 is connected to the conductor T3 by a conductor 361 leading from the previously mentioned conductor 353 and the terminals of the switch S1, which controls the starting motor 49, are connected in parallel with the starting switch 47 through conductors 363 and 364, so that when the resiliently mounted starting arm 47a of the starting motor is engaged by the starting cam 46 on the side frame member 130 of the form carriage 37, the switch 47 is temporarily closed, while the arm 47a is engaged by the cam 46, thus shunting the mercury switch S1 and starting the motor 49 in operation. The initial rotation of the motor turns the cam C1 sufficiently to close the mercury switch S1, thus establishing the circuit of the starting motor 49 through the mercury switch so that it remains closed when the starting arm 47a passes out of engagement with the starting cam 46 and returns to its initial position. The mercury switch S1 then remains closed throughout the cycle of operations until it is again opened by the movement of its roller into a depressed portion of the cam C1.

The terminals of the various switches S2, S3, S4, S5, S6 and S7 which are opposite to the switch terminals connected to the conductor 360 are connected by additional conductors to those terminals of the solenoids which are opposite those connected to the conductor T3. These additional conductors include a conductor 366 leading from the switch S2 to the solenoid 278, a conductor 367 leading from the switch S3 to the solenoid 297, a conductor 368 leading from the switch S4 to the solenoid 302, a conductor 369 leading from the switch S5 to the solenoid 306, a conductor 370 leading from the switch S6 to the solenoid 298, and a conductor 371 leading from the switch S7 to the solenoid 276.

In addition to the connections which have just been described for operating the solenoid operated valves 276, 278, 297, 298, 302 and 306, connections are also made for operating the solenoid operated valve 339. These connections include a conductor 372 leading from the conductor 353 to one terminal of the solenoid operated valve 339 and a conductor 373 leading from the conductor 369 to the other terminal of the solenoid operated valve 339. The solenoid of the valve 339 is thus connected in parallel with the solenoid 306 which effects the opening of the exhaust valve 311 so that when the mercury switch S5 is closed to effect the opening of the valve 311, it also closes the circuit of the solenoid operated valve 339, causing it to operate to

permit live steam to flow through the pipe 317 for creating a suction to exhaust steam from the retort during the period that the valve 311 is open.

In the operation of the apparatus, after placing untreated hosiery on the forms 40 on the carriage 37 with the carriage in its upwardly tilted position as shown in Figs. 1 and 4, the main carriage 35 is shifted laterally to position the form carriage carrying the untreated hosiery opposite the opening 30a of the retort in which position the main carriage is automatically latched by the engagement with the locking plates 102 of the detent 100a of one of the locking bars 100 as soon as the locking bar is released by the initial motion of the form carriage 37 in returning it to its horizontal position. This return tilting of the carriage 37 may be effected as soon as the carriage is in line with the retort because the latching mechanism 172 associated with that form carriage will by that time have been operated by one of the inclined cam bars 183 engaging the pin 181 of that latching mechanism. As the carriage 37 is returned to its horizontal position, it is automatically latched to one of the angle bars 120 through the operation of its locking bolt 200. The operator then gives the form carriage 37 a push toward the retort, causing it to travel rearwardly on its track members 36, whereupon the cam plate 46 carried thereby engages the lever 47a of the starting switch 47 and causes this switch to be temporarily closed during the time required for the cam 46 to pass by the switch. The closing of the switch 47 establishes a circuit in parallel with the circuit of the switch S1 of the controller 50, thus starting the motor 49 which then continues to rotate, carrying with it the shaft 330 of the controller and thereby effecting the rotation of all of the cams mounted thereon. When the motor is thus started, the switch S1 is closed by the initial rotation of the controller and is then maintained in its closed position throughout the major portion of the rotation of the shaft 330 which is operated at a comparatively slow speed due to the gearing connections between it and the motor 49, thereby continuing the operation of the motor throughout one cycle. Promptly after the controller 50 has been started in operation, the depending finger 257 carried at the rear end of the form carriage engages the pin 262 on the latch hook 240 and releases the latch 235 which then engages the rear transverse frame member 131 of the form carriage, as shown in Fig. 24. The controller then operates the cam C2 to close the mercury switch S2 with the result that the circuit of the solenoid 278 is closed and the valve 275 is operated to admit oil under pressure to the forward end of the cylinder 215 thereby retracting the carriage operating mechanism and pulling the carriage 37 into the retort, during which movement the member 246 rides over the stationary cam 250, as heretofore explained. At the end of the inward movement of the carriage, the switch S2 is operated to open its circuit and the cam C3 then operates to close its switch S3 and thereby complete the circuit of the solenoid 297, with the result that the valve 295 is operated to admit oil under pressure through the pipe 292 to the rear end of the door operating cylinder 290, thus causing a movement of the piston rod 289 forward the left as viewed in Figs. 26 and 27 to effect the closing of the door 33.

The parts are then in readiness for the admission of steam to the retort 30 which is effected by the action of the cam C4 which actuates the switch S4 to close the circuit of the solenoid 302 and thereby cause oil to flow under pressure through the valve 300 to the steam valve 305, thus opening the valve 310 and admitting live steam through the pipe 312 to the retort 30. At the end of the interval of time during which the treatment of the stockings or other articles is to take place, for example, three minutes, the switch S4 is opened by the cam C4 and the cam C5 then closes the switch S5 to close the circuit of the solenoid 306, thereby admitting oil under pressure through the valve 300 to the other end of the cylinder 305 and causing the valve 310 to be closed at the same time that the exhaust valve 311 is opened. Simultaneously with these operations, the parallel circuit of the solenoid operated valve 339 is closed so that a partial vacuum is created in the exhaust pipe 315 to cause the exhaust of the steam from the chamber of the retort.

At the end of an interval of time during which the steam is exhausted from the retort, the cam C6 operates to close the switch S6 and thereby energize the solenoid 298 which causes oil under pressure to be admitted through the valve 295 to the forward end of the cylinder 290, thereby opening the door 33. As soon as the door has been opened, the carriage 37 is moved outwardly from the retort in response to the operation of the cam C7 which closes the switch S7 and thereby energizes the solenoid 276 which causes oil to be admitted through the valve 275 to the rear end of the carriage cylinder 215, thus moving the actuating mechanism within the cylinder to discharge the carriage from the cylinder, whereupon it rolls outwardly on the tracks 36, the motor 49 is stopped by the cam C1, and the parts remain stationary, with the carriage actuating mechanism in its forward position and the door 33 open, until the next cycle of operations is started.

As the carriage 37 moves outwardly on the tracks 36, it automatically tilts to its inclined position under the influence of the spring pressed plunger 265 and, as it assumes its inclined position, it is automatically latched in that position by the latch mechanism 172 associated therewith and the plate 186 carried thereby at the same time operates the lever 110 to move the associated locking bar 100 out of engagement with the locking plates 102 so that the main carriage 35 may then be shifted on its tracks 34 to permit the other form carriage, carrying untreated hosiery or other articles on its form carriage 40, to be brought into alignment with the opening 30a of the retort. In this way, the form carriages 37 are moved laterally into and out of the retort and the operator is enabled to work upon the forms of one form carriage while the articles on the forms of the other carriage are being treated within the retort.

By adjusting the various cams on the shaft 330 of the controller and by effecting relative angular adjustments of the insulating plates which are embodied in each cam it is possible to obtain any desired time durations of the different operations which take place during a single cycle of the apparatus. By reference to the dial 335 on the end of the shaft 330 and the relation of its graduations to the pointer or indicator 336, the point at which each cam is brought into operation may be conveniently arranged. Although various time periods for each operation may be employed, depending upon the character of the articles being treated, it has been found that the

steam treatment of ladies' nylon hosiery may be carried on satisfactorily if the cams of the controller are so adjusted to close the switch S1 at the zero graduation on the dial 336, to close the switch S2 at approximately 9° on the dial, to close the switch S3 at approximately 20° on the dial, to close the switch S4 at approximately 26° on the dial, to close the switch S5 at from 265° to 332° on the dial, to close the switch S6 at 332° on the dial, and to close the switch S7 at 346° on the dial.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments which come within the scope of the appended claims.

I claim:

1. The combination in setting apparatus of the class described, of a retort having an opening, a main carriage movable outside of said retort transversely to said opening, a form carriage mounted on said main carriage, and power means automatically engageable with said form carriage while said form carriage is in motion in response to a manual impulse for further moving said form carriage from said main carriage into said retort.

2. The combination in setting apparatus of the class described, of a retort having an opening, a main carriage movable outside of said retort transversely to said opening, a form carriage mounted on said main carriage, means for securing said main carriage in position with said form carriage in alignment with said opening, and power actuated means automatically engageable with said form carriage for then moving said form carriage into said retort after it has been manually started in that direction.

3. The combination in setting apparatus of the class described, of a retort, a carriage mounted for movement into said retort, power actuated means engageable with said carriage after the movement of said carriage has been manually initiated for continuing the movement of said cariage into said retort, and resilient means for stopping said form carriage within said retort.

4. The combination in setting apparatus of the class described, of a retort having an opening, a main carriage movable outside of said retort transversely to said opening, a pair of form carriages mounted on said main carriage for movement transversely to the path of movement of said main carriage, means for securing said main carriage in position with either form carriage aligning with said opening, and power means automatically engageable with either form carriage for effecting movement of a form carriage from said main carriage into said opening.

5. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, power means for moving said carriage into and out of said retort, and means actuated by the momentum of said carriage as it is moved from said retort for causing said carriage to tilt to an inclined position.

6. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, power means for moving said carriage through said opening into said retort and for moving said carriage in the opposite direction, resilient means for bringing said carriage to rest within said retort, and means for permitting a tilting movement of said carriage to an inclined position when it is removed from said retort, said resilient means being operative to impart sufficient momentum to said carriage to effect said tilting movement.

7. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, power means for moving said carriage into and out of said retort, means actuated by the momentum of said carriage as it is moved from said retort for causing said carriage to tilt to an inclined position, and means operative automatically as said form carriage reaches said inclined position for latching said form carriage in said position.

8. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage mounted for movement with respect to said door into said retort, and power actuated means for opening said door and then effecting said movement while said door is stationary.

9. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage, power actuated means for opening and closing said door, separate power actuated means for moving said carriage into and out of said retort, and means including an electric circuit for controlling the said movements of said door and said carriage.

10. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable independently of said door into and out of said retort, means for conveying steam into said retort, power actuated means for moving said carriage into said retort, and power actuated means for then closing said door and admitting steam to said retort through said conveying means.

11. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable with respect to said door into and out of said retort, and power actuated means for moving said carriage into said retort, then closing said door, then introducing steam into said retort, then opening said door, and then withdrawing said carriage from said retort.

12. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable with respect to said door into and out of said retort, and power actuated means for moving said carriage into said retort, then closing said door, then introducing steam into said retort, then shutting off the steam and exhausting said steam from said retort, and then opening said door.

13. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable with respect to said door into and out of said retort, and power actuated means for moving said carriage into said retort, then closing said door, then introducing steam into said retort, then shutting off the steam and exhausting said steam from said retort, then opening said door and then withdrawing said carriage from said retort.

14. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable with respect to said door into said retort, power actuated means for performing the successive steps of moving said carriage into said retort, then closing said door and then introducing steam into said retort, and automatic means

for controlling the sequence and time durations of said steps.

15. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable with respect to said door into said retort, power actuated means for performing the successive steps of moving said carriage into said retort, then closing said door, then introducing steam into said retort, shutting off said steam and exhausting the steam from said retort, then opening said door and finally withdrawing said carriage from said retort, and automatic means for controlling the sequence and time durations of said steps.

16. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for performing the steps of moving said carriage into said retort, then closing said door and then introducing steam into said retort, and means including an electric circuit and a motor driven controller connected therein for controlling the sequence and time durations of said steps.

17. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for performing the steps of moving said carriage into said retort, then closing said door, then introducing steam into said retort, shutting off said steam and exhausting the steam from said retort, then opening said door and finally withdrawing said carriage from said retort, and means including an electric circuit and a motor driven controller connected therein for controlling the sequence and time durations of said steps.

18. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for performing the steps of moving said carriage into said retort, then closing said door and then introducing steam into said retort, means including an electric circuit and a motor driven controller connected therein for controlling the sequence and time durations of said steps, and means operated by an initial movement manually imparted to said carriage for closing the circuit of said motor.

19. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for performing the steps of moving said carriage into said retort, then closing said door, then introducing steam into said retort, shutting off said steam and exhausting the steam from said retort, then opening said door and finally withdrawing said carriage from said retort, means including an electric circuit and a motor driven controller connected therein for controlling the sequence and time durations of said steps, and means operated by an initial manual movement of said carriage toward said retort for closing the circuit of said motor.

20. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for opening said door and moving said carriage into said retort, and means including an electric circuit and a motor driven controller connected therein for controlling said last named means, and means actuated by an initial movement manually imparted to said carriage for closing the circuit of said motor.

21. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for opening said door and moving said carriage into said retort, and means including an electric circuit and a motor driven controller connected therein for controlling said last named means, means actuated by an initial movement manually imparted to said carriage for temporarily closing the circuit of said motor to thereby operate said controller, and means embodied in said controller for thereby maintaining the circuit of said motor during one cycle of said steps.

22. The combination in setting apparatus of the class described, of a retort having an opening, a door for closing said opening, a form carriage movable into said retort, power actuated means for opening said door and moving said carriage into said retort, means including an electric circuit and a motor driven controller connected therein for controlling said last named means, means actuated by an initial movement manually imparted to said carriage for temporarily closing the circuit of said motor to thereby operate said controller, and means embodied in said controller for thereby maintaining the circuit of said motor during one cycle of said steps, said controller being arranged to operate said last named means to arrest the operation of said motor at the end of said cycle.

23. The combination in setting apparatus of the class described, of a retort, a form carriage movable into said retort, a door for closing said retort, means for conveying steam to and from said retort, fluid pressure operated means for operating said door, moving said carriage and controlling the flow of steam in said conveying means, and means for controlling the operation of said fluid pressure operated means.

24. The combination in setting apparatus of the class described, of a retort, a form carriage movable into said retort, a door for closing said retort, means for conveying steam to and from said retort, fluid pressure operated means for operating said door, moving said carriage and controlling the flow of steam in said conveying means, means including an electric circuit for controlling the operation of said fluid pressure operated means, said last named means including a motor driven controller, and means actuated in response to a manual movement of said carriage for controlling the circuit of said motor.

25. The combination in setting apparatus of the class described, of a retort, a form carriage movable into said retort, a door for closing said retort, means for conveying steam to and from said retort, fluid pressure operated means for operating said door, moving said carriage and controlling the flow of steam in said conveying means, solenoid operated valves for controlling said fluid pressure operated means, an electric circuit having said valves connected therein, and means for controlling said circuit to cause the said operations effected by said fluid pressure operated means to take place in predetermined sequence and timed relation.

26. The combination in setting apparatus of the class described, of a retort, a form carriage movable into said retort, a door for closing said retort, means for conveying steam to and from

said retort, fluid pressure operated means for operating said door, moving said carriage and controlling the flow of steam in said conveying means, solenoid operated valves for controlling said fluid pressure operated means, an electric circuit having a plurality of branch circuits connected to said solenoid operated valves, and a motor driven rotary controller comprising a plurality of switches connected in said branch circuits for operating said solenoid operated valves in predetermined sequence and timed relation.

27. The combination in setting apparatus of the class described, of a retort, a form carriage movable into said retort, a door for closing said retort, means for conveying steam to and from said retort, fluid pressure operated means for operating said door, moving said carriage and controlling the flow of steam in said conveying means, solenoid operated valves for controlling said fluid pressure operated means, an electric circuit having a plurality of branch circuits connected to said solenoid operated valves, a motor driven rotary controller comprising a plurality of switches connected in said branch circuits for operating said solenoid operated valves in predetermined sequence and timed relation, and means actuated by a movement of said carriage for starting the operation of said motor, said controller having means for thereafter continuing the operation of said motor through a predetermined cycle of operations of said solenoid operated valves.

28. The combination in setting apparatus of the class described, of a retort having an opening, a door located within said retort and overlapping the margins of said opening, and means located entirely outside of said retort for mounting said door for inward movement away from said opening.

29. The combination in setting apparatus of the class described, of a retort having an opening, a door located within said retort and overlapping the margins of said opening, and hinges secured to the outside of said retort and to the outside of said door for permitting an inward swinging movement of said door.

30. The combination in setting apparatus of the class described, of a retort having an opening, a door located within said retort and overlapping the margins of said opening, means located entirely outside of said retort for mounting said door for inward movement away from said opening, and means for admitting high pressure steam to the interior of said retort.

31. The combination in setting apparatus of the class described, of a horizontal retort provided at one end with an end plate having a door opening therein, a door within said retort overlapping said end plate when closed, and hinge members pivoted on the outer side walls of said retort and having inwardly offset portions secured to said door to permit the inward swinging thereof.

32. The combination in setting apparatus of the class described, of a horizontal retort provided at one end with an end plate having a door opening therein, a door within said retort overlapping said end plate when closed, hinge members pivoted on the outer side walls of said retort and having inwardly offset portions secured to said door to permit the inward swinging thereof, and resilient means around the outer margin of said door on its outer face for contacting with said end plate around said opening.

33. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said carriage outside of and within said retort, actuating mechanism mounted within said retort and having a part movable toward and from said opening, and means for attaching said part of said mechanism to said carriage.

34. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said carriage outside of and within said retort, actuating mechanism mounted within said retort and having a part movable toward and from said opening, and means for automatically connecting said carriage to said part of said mechanism by moving said carriage partially into said opening.

35. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, and means for automatically causing said latch member to seize said carriage when said carriage is moved into proximity with said latch member.

36. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means for automatically causing said latch member to seize said carriage when said carriage is moved into proximity with said latch member, and means for then operating said mechanism to move said carriage into said retort.

37. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means for automatically causing said latch member to seize said carriage when said carriage is moved into proximity with said latch member, means for then operating said mechanism to move said carriage into said retort and subsequently reversing the direction of movement of said carriage, and means actuated as said carriage passes outwardly through said opening for operating said latch member to release said carriage.

38. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means for automatically causing said latch member to seize said carriage when said carriage is moved into proximity with said latch member, means for then operating said mechanism to move said carriage into said retort and subsequently reversing the direction of movement of said carriage means actuated as said carriage passes outwardly through said opening for operating said latch member to release said carriage, and means additional to said mechanism for moving said carriage from said retort when it has been released by said latch member.

39. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said re-

tort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means for automatically causing said latch member to seize said carriage when said carriage is moved into proximity with said latch member, means for then operating said mechanism to move said carriage into said retort and subsequently reversing the direction of movement of said carriage, means actuated as said carriage passes outwardly through said opening for operating said latch member to release said carriage, and resilient means adapted to cushion the movement of said carriage as said carriage approaches said latch member and to project said carriage from said retort when said carriage is released by said latch member.

40. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means normally tending to move said latch member to a position to interlock with a part of said carriage, means including a latch hook for holding said latch member in a retracted position, means for operating said mechansim to move said latch member in its retracted position toward said opening, and means for tripping said latch hook and thereby permitting said latch member to interlock with a part of said carriage when said carriage is moved to position said part adjacent said latch members.

41. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means normally tending to move said latch member to a position to interlock with a part of said carriage, means including a latch hook for holding said latch member in a retracted position, means for operating said mechanism to move said latch member in its retracted position toward said opening, a pin extending laterally from said latch hook, and a finger carried by said carriage and adapted to engage said pin to trip said latch hook to release said latch member and permit it to interlock with a part of said carriage when said carriage is moved to cause said finger to engage said pin.

42. The combination in setting apparatus of the class described, of a retort having an opening, a form carriage, means for supporting said form carriage for movement into and out of said retort, actuating mechanism including a latch member movable parallel to the path of movement of said carriage, means normally tending to move said latch member to a position to interlock with a part of said carriage, means including a latch hook for holding said latch member in a retracted position, means for operating said mechanism to move said latch member in its retracted position toward said opening, means for tripping said latch hook and thereby permitting said latch member to interlock with a part of said carriage when said carriage is moved to position said part adjacent said latch member, means for then operating said mechanism to move said latch member and said carriage into said retort, and means operative when said latch hook is again moved toward said opening for releasing said latch member from said carriage and causing it to be held by said latch hook.

43. The combination in setting apparatus of the class described, of a horizontal retort having an opening at one end, a form carriage, tracks in said retort for supporting said carriage, track members opposite said opening for supporting said carriage outside of said retort, a cylinder mounted adjacent said tracks and having a piston therein, a piston rod connected to said piston and extending parallel to said tracks, means for admitting fluid under pressure to opposite ends of said cylinder, an actuating member connected to said piston rod and movable therewith longitudinally of said retort, and means carried by said actuating member for detachably engaging said carriage.

44. The combination in setting apparatus of the class described, of a horizontal retort having an opening at one end, a form carriage, tracks in said retort for supporting said carriage, track members opposite said opening for supporting said carriage outside of said retort, a cylinder mounted adjacent said tracks and having a piston therein, a piston rod connected to said piston and extending parallel to said tracks, means for admitting fluid under pressure to opposite ends of said cylinder, an actuating member connected to said piston rod and movable therewith longitudinally of said retort, a latch member movable with said actuating member and adapted to interlock detachably with said carriage, and a resiliently mounted member adapted to cushion the movement of said carriage as it is moved toward said latch member and to move said carriage on said track members away from said retort when said latch member is detached from said carriage.

45. The combination in setting apparatus of the class described, of parallel track members, a form carriage mounted to travel on said track members, trunnions carried by said carriage, hook bearing members adapted to be engaged by said trunnions after a predetermined travel of said carriage on said track members to permit tilting of said carriage about the axis of said trunnions, and means for engaging said trunnions and retaining them in engagement with said hook bearing members when said carriage is tilted.

46. The combination in setting apparatus of the class described, of parallel track members, a form carriage mounted to travel on said track members, trunnions carried by said carriage, hook bearing members adapted to be engaged by said trunnions after a predetermined travel of said carriage on said track members to permit tilting of said carriage about the axis of said trunnions, and retaining members movable about the axis of said trunnions when said carriage is tilted for holding said trunnions in engagement with said hook bearing members while said carriage is tilted.

47. The combination in setting apparatus of the class described, of parallel track members, a form carriage mounted to travel on said track members, trunnions carried by said carriage, hook bearing members adapted to be engaged by said trunnions after a predetermined travel of said carriage on said track members to permit tilting of said carriage about the axis of said trunnions, retaining members movable about the axis of said trunnions when said carriage is tilted for holding said trunnions in engagement with said hook bearing members while said carriage is tilted, and means movable with said trunnions for engaging said actuating members and turning them about

the axis of the trunnions during the tilting of the carriage.

48. The combination in setting apparatus of the class described, of parallel track members, a form carriage mounted to travel on said track members, trunnions carried by said carriage, hook bearing members adapted to be engaged by said trunnions after a predetermined travel of said carriage on said track members to permit tilting of said carriage about the axis of said trunnions, said bearing members having arcuate recesses along their inner margins, arcuate retaining members mounted in said recesses and having lugs projecting laterally therefrom, and means movable with said trunnions and engageable with said lugs for turning said retaining members around said trunnions as said carriage is tilted.

49. The combination in setting apparatus of the class described, of parallel track members, a form carriage mounted to travel on said track members, trunnions carried by said carriage, hook bearing members adapted to be engaged by said trunnions after a predetermined travel of said carriage on said track members to permit tilting of said carriage about the axis of said trunnions, said bearing members having arcuate recesses along their inner margins, arcuate retaining members mounted in said recesses and having lugs projecting laterally therefrom, and spaced fingers movable with each of said trunnions and adapted to receive one of said lugs to turn the connected retaining member about the axis of the bearing member when the carriage is tilted.

50. The combination in setting apparatus of the class described, of parallel track members, a form carriage mounted to travel on said track members, trunnions carried by said carriage, auxiliary track members mounted parallel to but

at a higher elevation than said track members, said auxiliary track members terminating at their outer ends in upturned hook bearing members, said trunnions being adapted to travel on said auxiliary track members after a predetermined travel of said carriage on said track members and then to engage said hook bearing members to support the carriage as it is tilted about the axis of said trunnions, and means movable about said trunnion for retaining said trunnions in engagement with said hook bearing members while said carriage is tilted.

51. The combination in setting apparatus of the class described, of a retort, means for introducing steam into said retort, a conduit for exhausting steam from said retort, and means for introducing live steam into said exhaust conduit to create a partial vacuum at the intake of said conduit.

52. The combination in setting apparatus of the class described, of a retort, means for introducing steam into said retort, a conduit for exhausting steam from said retort, a valve in said conduit, and means for opening said valve and introducing a jet of live steam into said conduit to create a partial vacuum at the intake of said conduit.

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The following references are of record in the file of this patent:

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Number	Name	Date
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