

**June 10, 1947.**

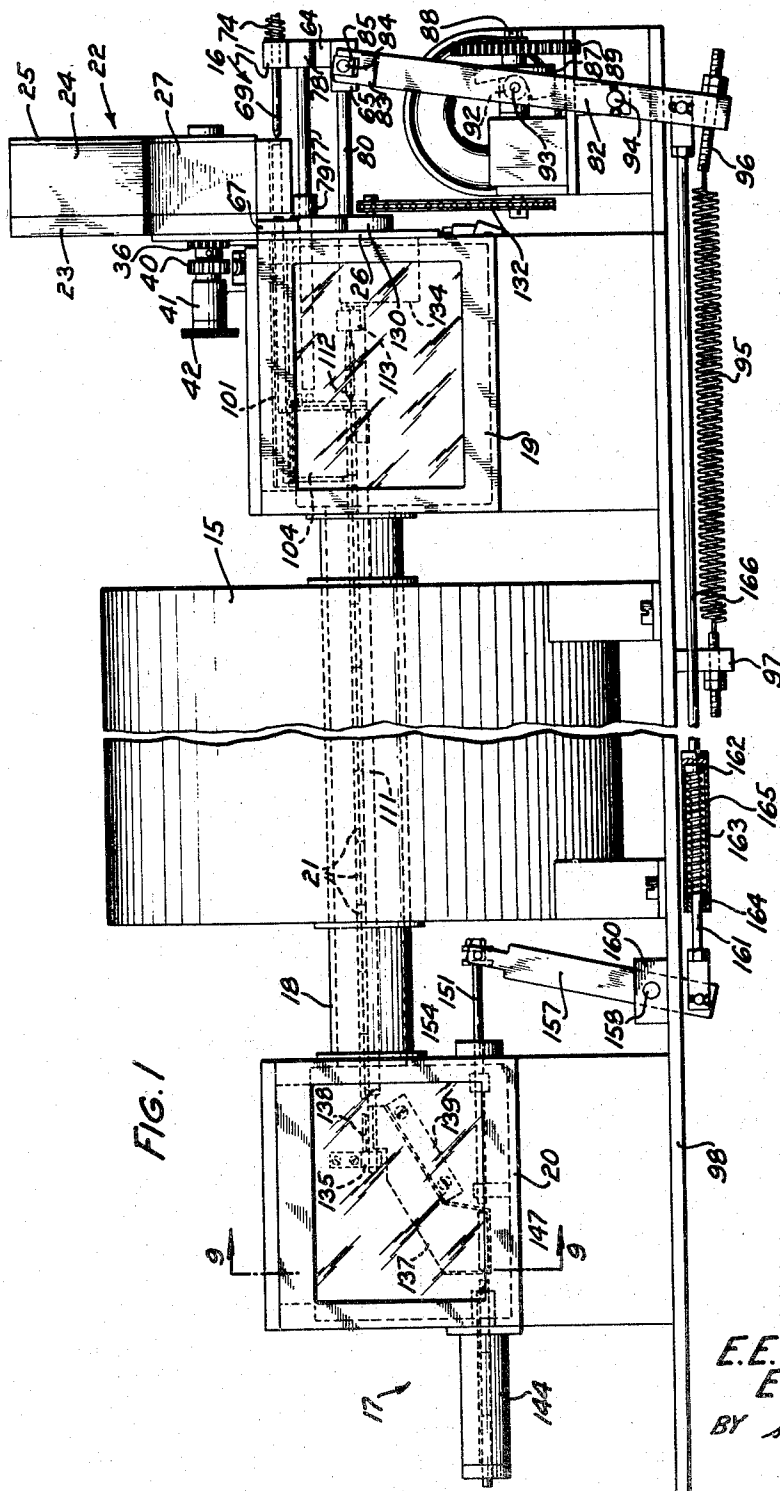
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**2,421,920**

# ARTICLE HANDLING APPARATUS

Filed Nov. 6, 1943

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

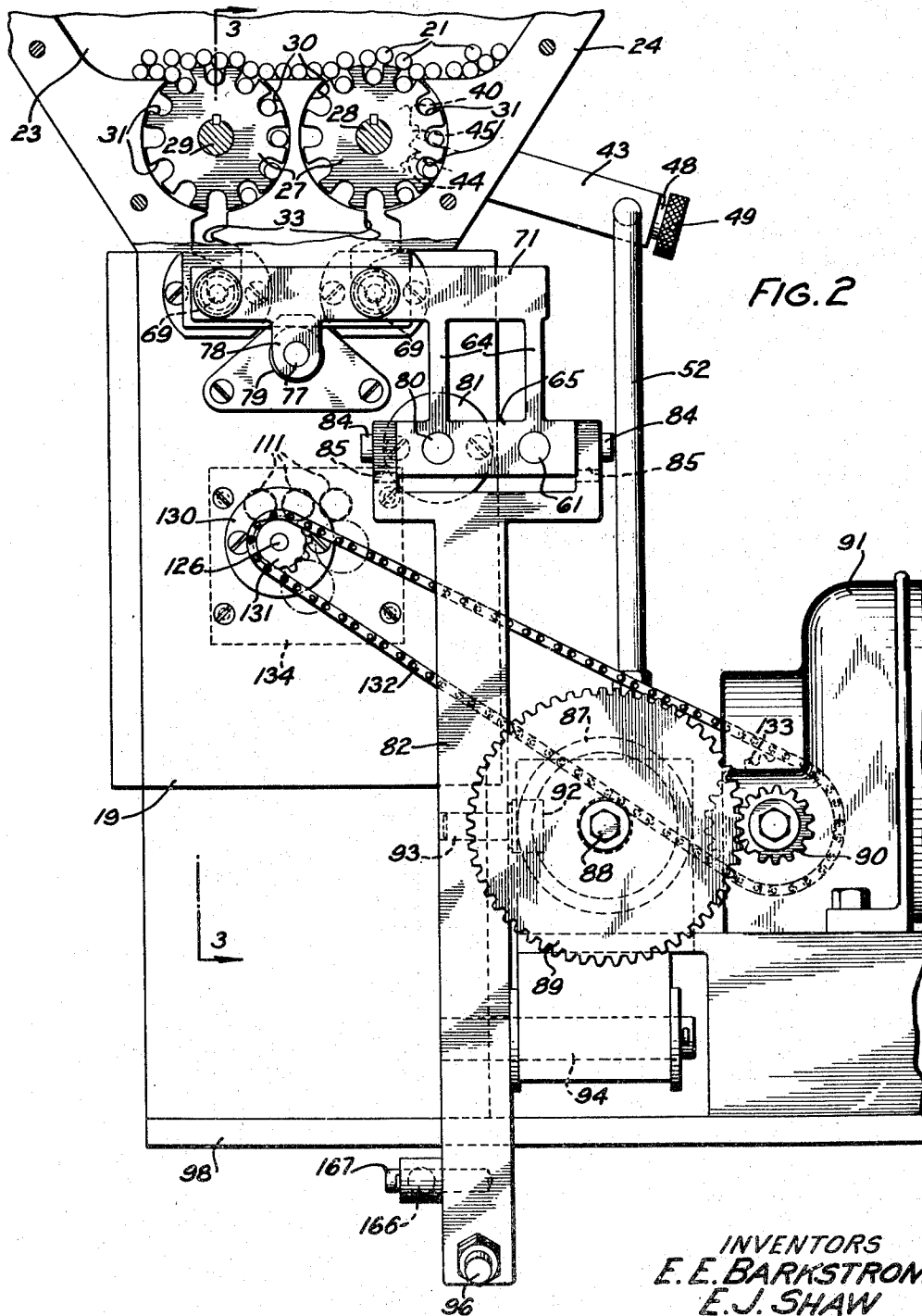


FIG. 2

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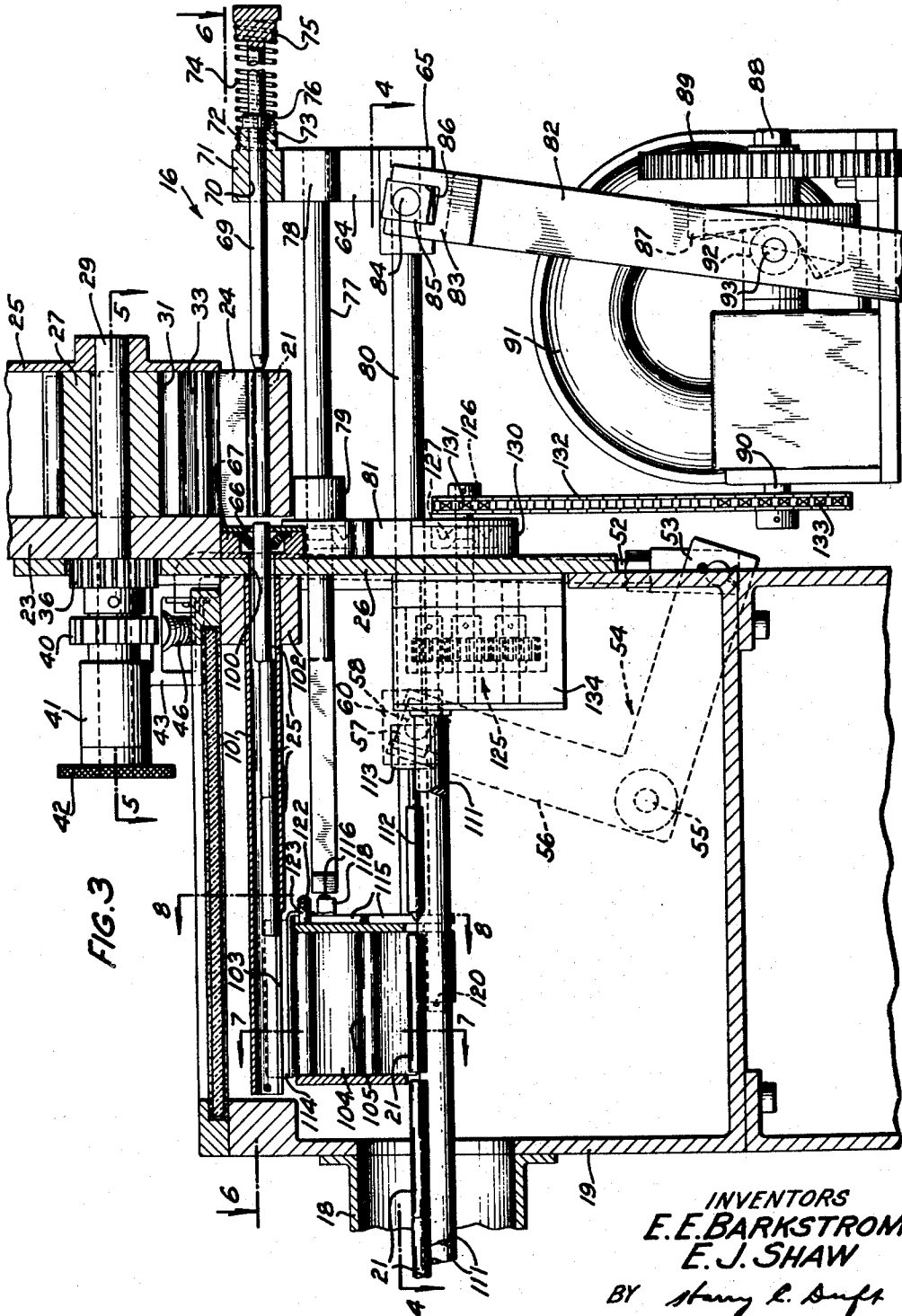
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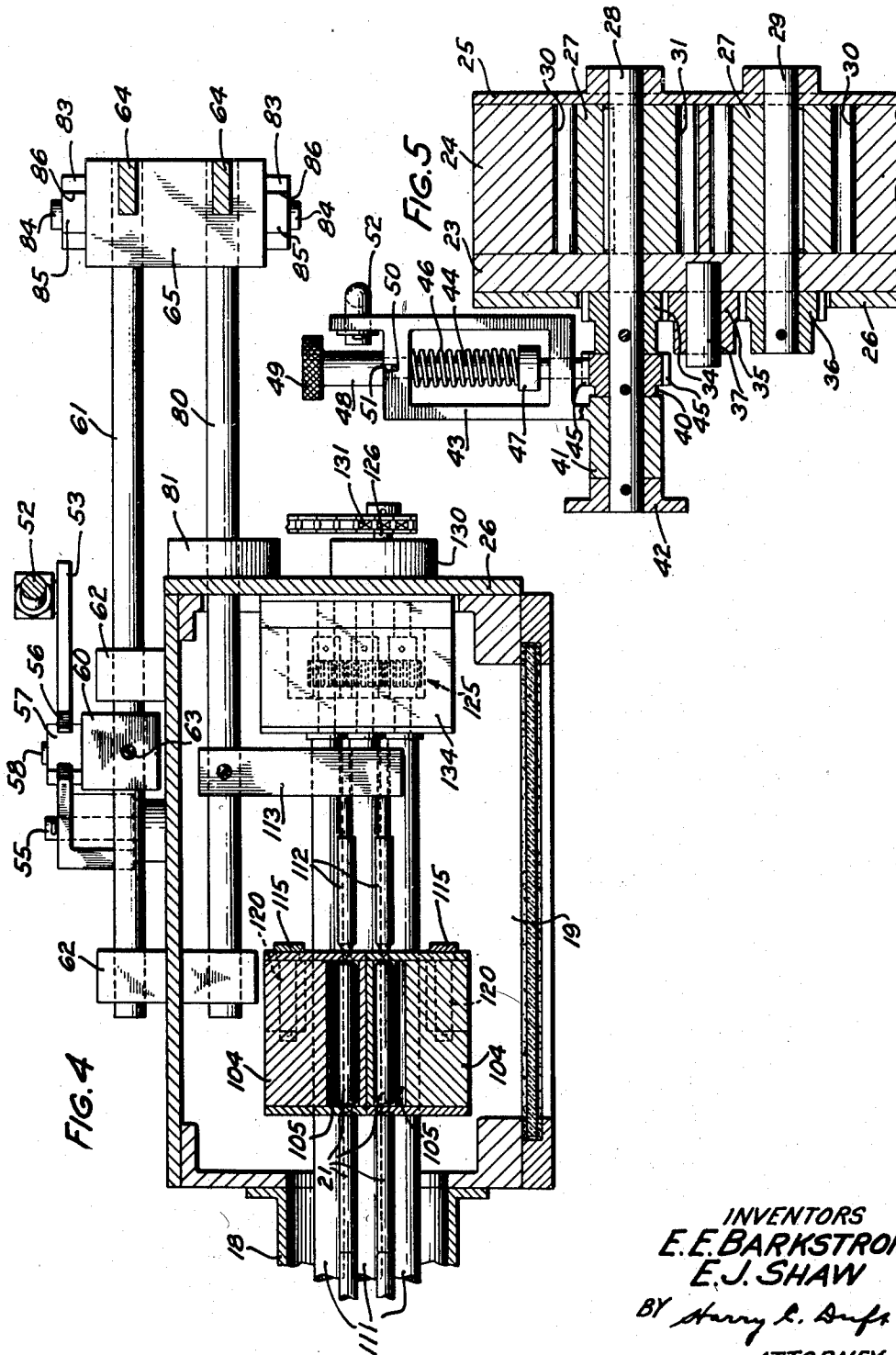
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ARTICLE HANDLING APPARATUS

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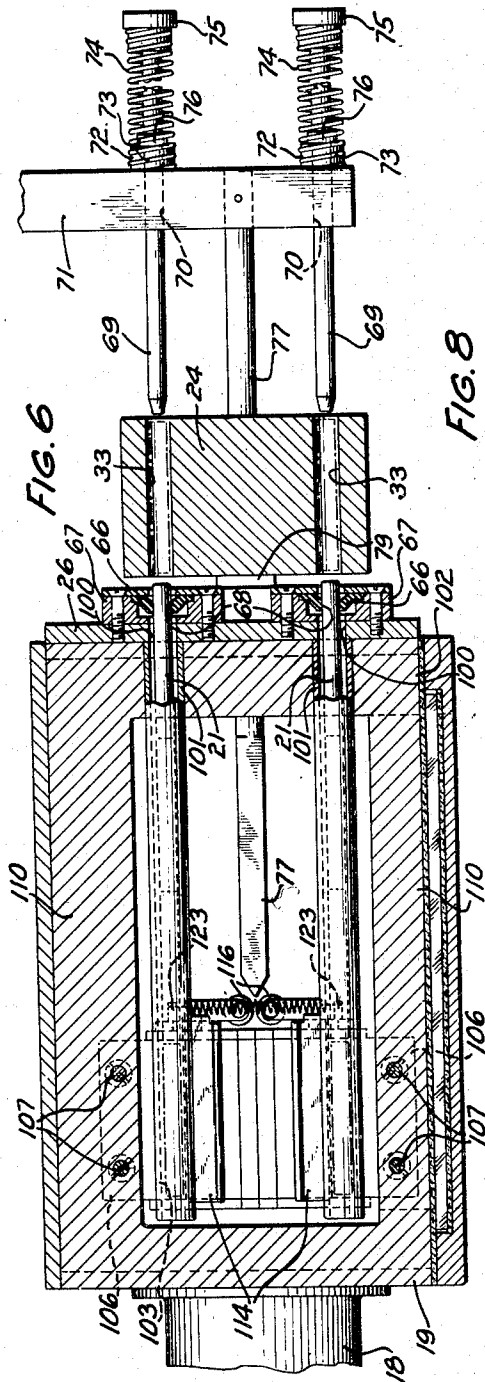


FIG. 6

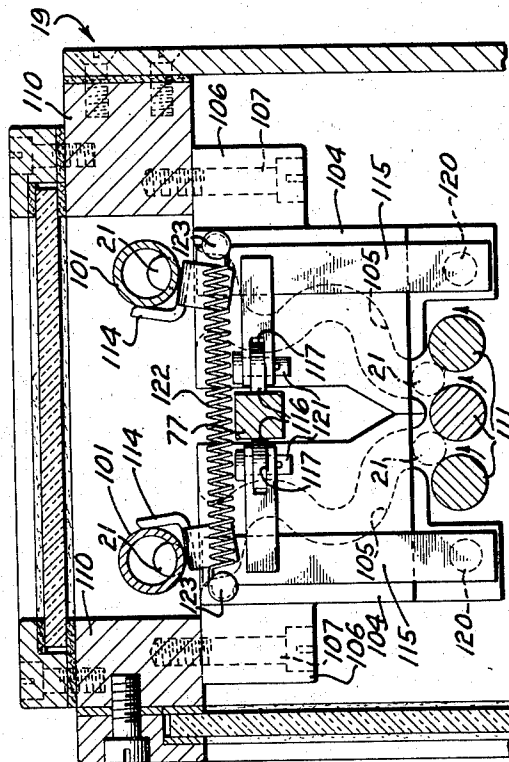
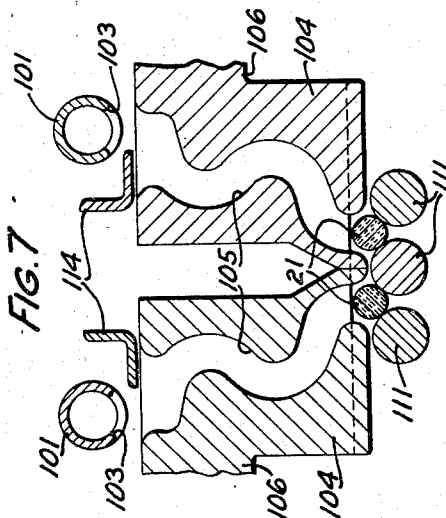


FIG. 7



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# ARTICLE HANDLING APPARATUS

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[illegible]

Fig. 1 is a cross-sectional view of a mechanical assembly. It shows a housing (20) with a central cavity. Inside, there are two vertical rods (136) connected by a horizontal link (137). The rods are guided by bushings (138) and secured with nuts (21). A base plate (140) is at the bottom, and a component (139) is visible on the left. A dimension line '10' is shown on the left side.

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## UNITED STATES PATENT OFFICE

2,421,920

## ARTICLE HANDLING APPARATUS

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Application November 6, 1943, Serial No. 509,162

12 Claims. (Cl. 214-18)

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This invention relates to article handling apparatus, and more particularly to an apparatus for charging articles into and discharging articles from a pyrolytic carbon depositing furnace.

In the manufacture of carbon resistors of the type in which an adherent coating of carbon is deposited on a ceramic body by the pyrolytic decomposition of carbon-containing gases, one practice has been to place the ceramic bodies in a suitable furnace in a batch and then to operate the furnace to deposit the carbon. Where, however, it is desired to produce large quantities of resistors of this type, it is more efficient to operate the furnace continuously and to provide automatic charging and discharging mechanisms therefor.

An object of the present invention is to provide an efficient and effective apparatus for charging articles into and discharging articles from a pyrolytic carbon depositing furnace.

In accordance with one embodiment of this invention, an apparatus may be provided including a charging mechanism whereby rod-shaped ceramic cores are transferred from a magazine and pushed through an air seal from which they are transferred to rotating rollers which extend through the furnace. The cores are pushed along these rollers by a second pusher operating in coordination with the first pusher. At the discharge end, the cores drop from the rollers, the ends of which are positioned in a chamber from which the cores are discharged through a second air seal by a third pusher operating in coordination with the first and second pushers.

Other objects and advantages of the present invention will be apparent from the following detailed description taken in conjunction with the drawings, of which

Fig. 1 is a fragmentary side elevation of an apparatus constructed in accordance with this invention;

Fig. 2 is an enlarged, fragmentary end elevation, partly in section, of the apparatus shown in Fig. 1;

Fig. 3 is a vertical sectional view along the line 3-3 of Fig. 2;

Fig. 4 is a horizontal sectional view along the line 4-4 of Fig. 3;

Fig. 5 is a horizontal sectional view along the line 5-5 of Fig. 3;

Fig. 6 is a horizontal sectional view along the line 6-6 of Fig. 3;

Fig. 7 is an enlarged vertical sectional view along the line 7-7 of Fig. 3;

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Fig. 8 is an enlarged vertical sectional view along the line 8-8 of Fig. 3;

Fig. 9 is an enlarged vertical sectional view along the line 9-9 of Fig. 1; and

Fig. 10 is a vertical sectional view along the line 10-10 of Fig. 9.

Referring now to the drawings, and particularly to Fig. 1, an apparatus is there illustrated for applying a carbon coating to ceramic cores comprising a pyrolytic furnace 15 having a charging mechanism 16 positioned at the right end thereof and a discharging mechanism 17 positioned at the left end. The charging and discharging mechanisms are connected to the furnace by a tube 18 which extends through the central portion of the furnace and is connected at its right end to a chamber 19 associated with the charging mechanism and at its left end to a chamber 20 associated with the discharging mechanism.

In the operation of this apparatus, rod shaped, ceramic resistor cores 21 are stacked in a magazine, or hopper 22, positioned above the charging mechanism 16, as shown in Figs. 1 and 2.

This magazine, which comprises a vertically positioned rear plate 23, a large U-shaped block 24 which is attached to the upper portion of the plate 23 and supports the cores, and a front plate 25, is mounted on the upper portion of a vertically positioned supporting plate 26, attached to the rear of the chamber 19 and forming the rear wall thereof. The cores are transferred two at a time from the magazine by a pair of transfer cylinders 27 mounted on shafts 28 and 29 which are journaled in the front and rear plates 23 and 25, respectively, of the magazine 22, the cylinders being positioned in suitable apertures 30 formed in the base portion of the U-shaped block 24. As may be best seen in Figs. 2, 3 and 5, the outer surfaces of the cylinders 27 are provided with longitudinally extending semi-cylindrical grooves 31 of somewhat greater depth than the diameter of the cores and the cylinders are so positioned in the block 24 that their upper surfaces form a part of the bottom of the interior of the magazine and are substantially in alignment therewith.

Since the interior of the magazine is U-shaped, as described, the cores tend to roll into the exposed notches 31. Thus, as the transfer cylinders 27 rotate, the cores are carried downward and deposited in the upper ends of S-shaped slots 33 formed in the lower portion of the block 24. The lower ends of these slots are closed. By forming these slots in S-shape and restricting their width

to a size but slightly greater than the diameter of the cores, the cores are caused to roll rather than to drop from the grooves in the cylinders to the bottom of the slots. It has been found that by causing the cores to roll downward rather than to drop, the possibility of some cores being deposited at the bottom of the slots on end or in a position which would make the next transfer operation difficult is largely avoided.

Rotation of the cylinders 27 is intermittent and is coordinated with the operation of the charging mechanism which will be described in detail hereinafter. Referring to Fig. 5, it will be noted that the transfer cylinder shaft 28 is substantially longer than the shaft 29 and is provided with a spur gear 34 which drives a pinion gear 35 which, in turn, engages a second spur gear 36 keyed to the left end of the shaft 29. The pinion gear 35 is mounted on a short stud shaft 37 which extends from the rear plate 23 of the magazine 22. A ratchet wheel 40 is keyed to the shaft 28 and is positioned to the left of the spur gear 34, as viewed in Fig. 5. A sleeve 41 is rotatably mounted on the shaft 28 and positioned adjacent the ratchet wheel 40, being retained on the shaft by a knurled knob 42 which is keyed to the left end of the shaft.

The sleeve 41 serves as a support for a housing 43 which is integrally formed therewith and through which extends a plunger 44. This plunger, which is slidably journaled in the housing 43, serves as a pawl and may be moved clockwise, as viewed in Fig. 2, about the shaft 28 to rotate the ratchet wheel 40. One end of the plunger 44 bears against the periphery of the ratchet wheel, being suitably shaped to engage one side of a tooth 45 of the wheel. The plunger is normally held in engagement with the ratchet wheel by a helical spring 46 which is positioned about the plunger. One end of this spring bears against an inner side of the housing 43 and the other end bears against a collar 47 which is fixed to the plunger and positioned within the housing 43. The spring 46 is selected to permit the plunger to ride over the inclined portion of the ratchet tooth during the return, that is the counterclockwise movement of the plunger, the pressure exerted by the spring, however, being insufficient to cause the plunger 44 to counter-rotate the ratchet wheel 40.

The other end of the plunger 44, which extends somewhat beyond the housing 43, is provided with a shoulder 48 at the end of which is attached a knurled knob 49 by which the plunger may be manually disengaged from the ratchet wheel 40. The shoulder 48 bears against the outer end of the housing 43, as may be seen in Fig. 5, and determines the advanced position of the plunger 44. In order to provide a means for retaining the plunger 44 in disengaged position, a pin 50 extends transversely through the plunger 44 at a point adjacent the shoulder 48. The ends of this pin are normally positioned in notches 51 formed in the upper end of the housing as viewed in Fig. 5. However, when the plunger 44 is to be disengaged from the ratchet wheel, as where the shaft 28 is to be rotated manually through the knob 42, the plunger may be withdrawn and rotated a quarter turn. The pin 50 then rests against the end of the housing 43 and the end of the plunger 44 is held out of engagement with the ratchet wheel 40. This feature may also be used to halt the transfer of cores from the magazine 22 where it is de-

sired to permit the remainder of the apparatus to continue operating.

It will be apparent from the foregoing that as the pawl housing 43 is oscillated clockwise, as viewed in Fig. 2, and the ratchet wheel 40 rotated, the shaft 28 will also be rotated, thus rotating the core transfer cylinder 27, mounted thereon. At the same time, the other transfer cylinder will also be rotated, being driven by the gears 34, 35 and 36. Oscillation of the housing 43 is effected through a substantially vertically disposed link arm 52 which is attached at its upper end to the outer end of the housing 43 and connected at its lower end to one arm 53 of a bell crank designated generally as 54. As shown in Figs. 3 and 4, this bell crank is mounted on a stud shaft 55 and is provided with an upwardly extending arm 56, the upper end of which is bifurcated to receive a bearing block 57. This bearing block, the side edges of which are notched to slidably engage the sides of the bifurcated portion of the arm 56, is pivotally mounted on a pin 58 fixed to a side of a block 60 which is mounted on a horizontally reciprocating rod 61. The rod 61 is slidably journaled in and supported by a pair of spaced lugs 62, fixed to a side of the chamber 19, as shown in Fig. 4. The block 60 may be moved along the rod 61 to adjust the position of the bearing block 57 and then may be locked in position by a set screw 63 which is threadedly mounted in the block 60 and engageable with the rod 61. Reciprocation of the rod 61 to the right, as viewed in Fig. 4, causes the bell crank 54 to be rotated in a clockwise direction causing the link arm 52 to be pulled downwardly and this, in turn, moves the housing 43 and associated plunger 44 in a clockwise direction. This advances the ratchet wheel 40 and causes two cores 21 to be positioned in the slots 33 by the magazine transfer cylinders upon each reciprocation of the rod 61.

Referring to Fig. 3 it will be noted that the bottoms of the S-shaped slots 33 formed in the U-shaped block 24 of the core magazine are in line with a pair of resilient disc-shaped members 66 which are mounted in housings 67 attached to the upper portion of the plate 26 of the chamber 19. These members 66 form seals for the chamber 19 and are each provided with a small aperture 68 (Fig. 6) to permit passage of the cores 21 through the seal. The presence of a core in the aperture closes the aperture, thus effectively preventing the escape of gases from the chamber or the admission of air to the chamber. It will be understood that since this apparatus is designed to operate continuously, a core is at all times during the operation of the apparatus in position in the aperture of each diaphragm.

The ceramic cores are pushed through the seals 66 by two horizontally disposed pusher rods 69 which extend through apertures 70 formed in a supporting block 71. The rods 69 are mounted parallel to each other and are spaced apart, as may be seen in Fig. 6, a substantial portion of each rod 69 projecting to the right of the cross block 71, as shown in this figure. Two short, sleeve-shaped members 72 are mounted on the cross block 71 and are positioned so as to be in line with the apertures 70. A helical groove 73 is formed in the outer surface of each member 72 to receive and engage one end of a helical spring 74 which is positioned about the right portion of each rod 69. The other end of each spring is fastened to a similarly peripherally grooved cap 75 fitted over the end of each rod 69. As the

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cross block 71 is moved to the left, as viewed in Fig. 3, by mechanism to be explained hereinafter, the rods 69 are normally carried therewith. However, the springs 74, while selected to urge the pusher rods 69 to the left with sufficient pressure to move cores through the seals 66, will permit the rods to stop during the operation of the pusher mechanism should they encounter undue resistance. In this way, damage to the mechanism is prevented. A collar 76, associated with each pusher rod 69 and positioned within the spring 74, normally bears against the associated sleeve-shaped member 72 and in cooperation with the spring 74 determines the normal relative position of each rod 69 and the cross block 71.

The cross block 71 (Figs. 3 and 4) is supported on a pair of spaced upright members 64 which are mounted on the upper side of a second cross block 65. This assembly is in part supported by a cam bar 77, the rear of which is rigidly mounted in a lug 78 fixed to the underside of the cross block 71. The cam bar 77 is slidably journaled in a bearing 79 mounted on the end plate 26 of the chamber 19. The forward portion of the bar 77 extends into the chamber 19. Support is also provided for the assembly by a rod 80, the rear end of which is rigidly mounted in the cross block 65 while the forward portion extends through a bearing 81 mounted on the end plate 26 of the chamber 19 below the bearing 79. The rear end of the rod 81 is also fixed to the cross block 65 and since this rod is slidably journaled in the supporting lugs 62, as hereinbefore described, this rod 81 also aligns and supports the assembly.

Reciprocation of the block 65 and associated cross block 71 is accomplished by the oscillation of a cam actuated lever arm 82, the upper end of which is provided with a bifurcated portion 83 between the arms of which is positioned the block 65, as shown in Figs. 2 and 3. Trunnion pins 84 are fixed to either end of the cross block 65 and pivotally support a pair of bearing blocks 85 which are similar in purpose and design to the slidable bearing block 57. These blocks 85 slidably engage the two arms forming the bifurcated portion 83 of the lever arm 82, the blocks being positioned in rectangular notches 86 formed in the upper ends of each of these arms. Thus, the lever arm 82 is permitted to move in an arcuate path as the block 65 and associated parts are advanced horizontally.

Oscillation of the lever arm 82 is effected through a cam 87 mounted on a shaft 88 which is rotated by a gear 89 driven by a second gear 90, driven by a motor 91. The cam 87 engages a roller 92 mounted on a stud shaft 93 which is fixed to the lever arm 82 at a point above a shaft 94, which serves as a pivotal support for the lever arm 82. Consequently, as the roller 92 engages the raised portion of the cam 87, the upper portion of the lever arm 82 is moved to the left, carrying with it the cross blocks 65 and 71 and associated parts.

In order to return the charging mechanism after it has been advanced by the cam 87, one end of a helical spring 95 is attached to the lower end of the lever arm 82 at a point beneath the shaft 94 by a threaded post 96 which is fixed thereto. The other end of the spring is attached to a lug 97 mounted on the lower side of a table 98 which serves as a base for the entire apparatus. The spring 95 pulls the lever arm 82 clockwise and retracts the blocks 65 and 71 and associated parts after the roller 92 has passed over the raised portion of the cam 87.

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As a pair of resistor cores are moved forward by the pusher rods 69 and pushed through the apertures 68 in the seals 66, they pass through a second pair of apertures 100, formed in the end plate 26 of the chamber 19, and enter the right ends of a pair of tubes 101 which communicate with these apertures. These tubes are mounted in a supporting block 102 which is fixed to the inner upper side of the plate 26 and forms a part of the supporting structure of the chamber 19. As additional cores are transferred from the magazine and pushed through the seals, on succeeding reciprocations of the pusher mechanism, those cores theretofore transferred are advanced along the tubes 101 and eventually reach the left ends thereof (Figs. 3 and 6). The lower portions of the left ends of these tubes are provided with elongated slots 103 in the lower sides thereof, as shown in Figs. 3 and 7, which are somewhat greater in length than the length of a core and slightly wider than the diameter of a core. These slots 103 are positioned over a pair of blocks 104 which are provided with sinuous slots 105 similar to the slots 33 in the magazine block 24 and serving substantially the same purpose. The outer sides of these blocks 104 (Figs. 6 and 8) are provided with projecting portions 106 through which extend bolts 107 which engage a frame 110 and support the blocks thereon. This frame 110 forms a part of the supporting structure of the chamber 19, as may be seen in Fig. 8. The lower ends of these sinuous slots 105 are open and as cores roll down the slots, they are directed onto three conveyor rollers 111 which extend through the tube 18, a portion of which, as heretofore explained, is positioned within the furnace 15.

These rollers 111 serve as rails and the cores are advanced along these rails in two lines by a second pair of pusher rods 112 which are mounted on a block 113 carried by the forward portion of the rod 80. The rod 80 is reciprocated by the block 65 and thus, at the time that the pusher rods 69 are moving cores through the tubes 101, the pusher rods 112 are moved forward and engage the rear of the cores which have been deposited on the rollers 111 from the slots 105 and move the cores forward a distance substantially equivalent to the length of a core.

In order to prevent interference between the cores being moved forward by the pusher rods 112 and the cores being moved into position over the slots 103 in the tubes 101 by the rods 70, a pair of right angled retaining plates 114 are provided to retain the cores in the tubes 101 until the transfer rods 112 have been retracted sufficiently so that those cores may drop directly to the rollers 111. These retaining plates are mounted on the upper ends of a pair of pivotally mounted arms 115 and are moved under the slots 103 as soon as the transfer mechanism has advanced sufficiently to engage the forward end of the cam bar 77 with a pair of opposed rollers 116. The length of the cam bar 77 is so selected that the retaining plates 114 are moved under the slots 103 to prevent cores from dropping therefrom at the beginning of a cycle of reciprocation of the transfer mechanism and are maintained in that position until just before the end of the cycle. These rollers are positioned in recesses 117 formed in the ends of a pair of lugs 118 which are mounted on the upper ends of the pivotable arms 115 and extend toward each other substantially at right angles to the arms 115. Stud shafts 120 mounted in the blocks 104 support the arms 115, while a pair of pins 121, po-

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sitioned in the ends of the lugs 118 and extending across the recesses 117, provide a rotatable support for the rollers 116. A helical spring 122 is connected to lugs 123 mounted on each of the arms 115 and positioned at the upper ends thereof and urge the arms together so that when the cam bar 77 is retracted, the retaining plates 114 are pulled toward each other and out from under the slots 103 in the tubes 101. This permits the retained cores to drop into the slots 105 and to roll into position on the conveyor roller 111.

The conveyor rollers, 111 are rotated continuously during the operation of the apparatus to permit uniform exposure of the cores to the gases in the furnace. In order to prevent the cores from being forced down between the rollers, the rollers are rotated in the same direction at differing speeds. It has been found that the difference in speed of rotation need not be great and that by rotating, for example, the right hand roller as viewed in Fig. 2, at 16 R. P. M., the middle roller at 18 R. P. M., or roughly 10% faster, and the left roller at approximately 20 R. P. M., also roughly 10% faster than the speed of rotation of the adjacent roller, the tendency of the cores to be forced down between the rollers is avoided. It will be apparent that if the rollers be rotated in a counterclockwise direction, as indicated, and at the speeds stated, the right hand roller will tend to carry the cores downward, but the middle roller, rotating faster, will tend to carry the cores upward, thus overcoming the effect of the right hand roller. Similarly, the middle roller also tends to carry the cores supported between it and the left hand roller downward, but this tendency is overcome by the greater speed of rotation of the left hand roller.

Rotation of the rollers 111 is accomplished through a gear system 125 which is driven from a shaft 126. As may be seen in Fig. 3, the right end of the shaft 126 extends through a seal 127 which is positioned in a housing 130 mounted on the end plate 26 of the chamber 19. A sprocket gear 131 is mounted on the outer end of the shaft 126 and is driven by a chain 132 which is, in turn, driven through a sprocket gear 133, mounted on the shaft 86 and rotated by the motor 91. As may be seen in Fig. 3, the right ends of the rollers 111 are journaled in a housing 134 which contains the gear system 125, while, as shown in Figs. 1 and 10, the left ends of the rollers are journaled in a bearing block 135 which is mounted within the chamber 20 at the left end of the apparatus.

The cores are intermittently advanced in two lines along the rollers 111 by the pusher rods 112 and are moved through the tube 18 which extends through the furnace 15. As they pass through the furnace, a coating of carbon is deposited on the cores as a result of the pyrolytic decomposition of certain carbon-forming gases which are supplied to the furnace by means not shown. Referring to Fig. 10, it will be seen that the left portions of the rollers 111 in the area beyond the end of the tube 18 are substantially reduced in diameter to provide spaces 136 between the adjacent rollers wide enough to permit the cores to drop through. As the cores are positioned over these reduced portions, the cores drop from the rollers 111, and fall into a pair of troughs 137 which are positioned under the spaces 136 at the ends of the rollers, as shown in Fig. 10. Three guide pins 138 are mounted in the bearing block 135 and positioned above the rollers 111 to prevent the cores from jamming as

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they begin to drop. The troughs 137 are supported by a bracket plate 139 mounted on a side wall of the chamber 20. The cores slide down the troughs, which are inclined at a substantial angle, and reach lower portions 140 thereof which are substantially horizontal. Each of these lower portions is provided with apertures 141 to admit a pusher rod 142 by which the coated core is transferred from the lower portion of the trough and advanced through a seal 143 mounted in a cylindrical housing 144. The two housings 144 are positioned at the lower left end of the chamber 20 and supported thereon by retaining plates 145. A large annular groove 146 is formed in each housing 144 and in cooperation with the associated retaining plate forms a chamber through which cooling air may be circulated if required. After the cores are moved through the air seals, they may be discharged into a suitable receptacle, not shown.

The pusher rods 142 are reciprocated at the same time as the pusher rods 69 and 112. As may be seen in Fig. 10, the rods 142 are supported at their left ends by a bearing block 147 which is mounted on the base of the interior of the chamber 20 while the right ends of these pusher rods are rigidly fixed to a cross bar 150. A longitudinally reciprocable shaft 151 is rigidly fixed to the cross bar 150 at a point substantially midway between the pusher rods 142 and extends through an air seal 153 mounted in a housing 154 attached to the rear wall of the chamber 20. The seal 153 serves also as a bearing and supports the shaft 151 which is slidable therein. A pair of flanges 155 are integrally formed near the right end of the shaft 151 and the flanges are spaced slightly apart, as shown in Fig. 10, to engage a pin 156 positioned therebetween. This pin is mounted in the upper end of a lever arm 157 and extends at right angles thereto so as to drivably connect the lever arm to the reciprocable shaft 151. The lever arm 157 is mounted on a pivot pin 158 mounted in a block 160 fixed to the table 98. The lower end of the lever arm 157 is connected to the left end of a connecting rod 161 at the right end of which is formed a flange 162. A helical spring 163 is mounted on this rod and its right end bears against the inner side of the flange 162, while its left end is engaged by an inwardly projecting portion 164 of a sleeve 165. The sleeve 165 is mounted on the left end of a second rod 166 and encloses the spring 163, as shown in Fig. 1. The right end of the rod 166 is connected to the lower end of the lever arm 82 by a pin 167 which extends transversely therethrough, as shown in Fig. 2. Thus, as the lever arm 82 is pivoted by the cam 87, the lever arm 157 will be pivoted at the same time, the spring 163 permitting the lever arm 157 to stop should the pusher rods 142 encounter undue resistance. The operation of the apparatus is coordinated and synchronized so that, as two coated cores are delivered to the troughs 137 upon a single reciprocation of the charging apparatus, the two cores previously so delivered are discharged from the chamber by the pusher rods 142.

While but one embodiment of this invention has been shown and described, it will be understood that this is merely illustrative and that many changes and modifications may be made therein without departing from the spirit or scope of the present invention.

What is claimed is:

1. An article handling apparatus comprising a magazine, a chute associated with said magazine,

means for transferring an article from said magazine to said chute, a charging chamber adjacent said chute, an air seal in said chamber for admitting an article to said chamber while preventing the entry of air, a pusher mechanism for transferring an article from said chute to said chamber through said seal, a charging station in said chamber, a second chute in said chamber for guiding an article so transferred to said charging station, an article treating apparatus adjacent said chamber, means extending from said chamber through said treating apparatus for supporting an article, means for moving an article from said charging station into said treating apparatus along said supporting means, a discharge chamber associated with said treating apparatus, the other end of said supporting means extending therein, an air seal in said discharge chamber to permit an article to be discharged from said chamber while preventing the entry of air, and means for discharging an article from said chamber through said seal.

2. An article handling apparatus comprising a magazine, a chute associated with said magazine, means for transferring an article from said magazine to said chute, a charging chamber adjacent said chute, an air seal in said chamber for admitting an article to said chamber while preventing the entry of air, a pusher mechanism for transferring an article from said chute to said chamber through said seal, a charging station in said chamber, a second chute in said chamber for guiding an article so transferred to said charging station, an article treating apparatus adjacent said chamber, a discharge chamber associated with said treating apparatus, a plurality of rollers extending from said charging chamber through said treating apparatus and to said discharging chamber, means for moving an article from said charging station along said rollers and into said discharge chamber, an air seal in said discharge chamber to permit an article to be discharged from said chamber while preventing the entry of air, and means for discharging an article from said chamber through said seal.

3. An article handling apparatus comprising a magazine, a chute associated with said magazine, means for transferring an article from said magazine to said chute, a charging chamber adjacent said chute, an air seal in said chamber for admitting an article to said chamber while preventing the entry of air, a pusher mechanism for transferring an article from said chute to said chamber through said seal, a charging station in said chamber, a second chute in said chamber for guiding an article so transferred to said charging station, an article treating apparatus adjacent said chamber, a discharge chamber associated with said treating apparatus, a plurality of rollers extending from said charging chamber through said treating apparatus to said discharge chamber, means for moving an article along said rollers, the portions of said rollers in said discharge chamber being reduced to permit an article to drop between said rollers, an air seal in said discharge chamber to permit an article to be discharged from said chamber while preventing the entry of air, and means for discharging an article from said chamber through said seal.

4. An article handling apparatus comprising a magazine, a charging chamber adjacent said magazine, an article support within said chamber, means for transferring an article from said magazine to said chamber, means for advancing an article along the article support in said chamber,

a chute in said chamber for receiving articles from said support, said chute having an irregular passage formed therein to permit an article to move therethrough while preventing end to end rotation of the article, a transfer mechanism positioned at the base of said chute for moving an article laterally from said chute, and means for preventing an article from moving through said chute while an article is being transferred from the base of said chute.

5. An article handling apparatus comprising a magazine, a charging chamber adjacent said magazine, an article support within said chamber, means for transferring an article from said magazine to said chamber, means for advancing an article along the article support in said chamber, a chute in said chamber for receiving an article from said support, said chute having an irregular passage formed therein to permit an article to move therethrough while preventing end to end rotation of the article, a transfer mechanism positioned at the base of said chute for moving an article laterally from said chute, and means for preventing an article from moving through said chute while an article is being transferred from the base of said chute, said means operating in timed relation to the operation of said transfer means.

6. An apparatus for charging a furnace with articles to be treated comprising a pair of rotatable rollers extending through the furnace for supporting and rotating articles supported thereon, means for successively feeding articles to said rollers, means for advancing articles along said rollers, and means for rotating said rollers, said means being connected to drive the roller which tends to lift an article at a greater peripheral speed than the roller which tends to depress the article.

7. An apparatus for charging a furnace with articles to be treated comprising a magazine, a pair of rotatable rollers extending through the furnace for supporting and rotating articles supported thereon, means for successively feeding articles from said magazine to said rollers, means for advancing articles along said rollers, and means for rotating adjacent rollers at successively greater peripheral speeds so as to exert a greater lifting than depressing force on the articles supported thereon.

8. An apparatus for charging a furnace with articles to be treated comprising a magazine, a pair of rotatable rollers extending through the furnace for rotating articles positioned thereon, means for successively feeding articles from said magazine to position above said rollers by pushing one article with another, intermittently operable means for successively dropping the articles onto said rollers, means for causing said articles to be properly positioned on the rollers, said means including a sinuous passage, and means coordinated with said feeding means for advancing the articles along said rollers.

9. An apparatus for charging a furnace with articles to be treated comprising a magazine, a pair of rotatable rollers extending from the furnace for rotating articles positioned thereon, means for successively feeding articles from said magazine to position above said rollers by pushing one article with another in end to end relation, intermittently operable means for successively dropping the articles onto said rollers, means for causing said articles to be properly positioned on the rollers, said means including a sinuous passage, and means coordinated with

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said feeding means for advancing the articles along said rollers.

10. An apparatus for charging a furnace with articles to be treated comprising a magazine, means for successively feeding articles from said magazine, a seal associated with said furnace, means for pushing articles fed from said magazine through said seal at one level, a pair of rotatable rollers disposed at a lower level extending through the furnace for rotating articles supported thereon, means for successively dropping articles pushed through said seals onto said rollers, means for causing said articles to be properly positioned on the rollers, said means including a sinuous passage, and means coordinated with said feeding means for advancing the articles along said rollers.

11. An apparatus for charging a furnace with articles to be treated comprising a magazine, a pair of rotatable rollers extending through the furnace for rotating articles positioned thereon, means for successively feeding articles from said magazine to said furnace at one level by pushing one article with another in end to end relation, means for successively dropping the articles onto said rollers, and means for rotating said rollers, said rotating means being connected to drive the roller which tends to lift an article at a greater peripheral speed than the roller tending to depress the article.

12. An apparatus for charging a furnace with articles to be treated comprising a magazine,

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means for successively feeding articles from said magazine, a seal associated with said furnace, means for pushing articles fed from said magazine through said seal at one level, a pair of rotatable rollers disposed at a lower level extending through the furnace for rotating articles supported thereon, means for successively dropping articles pushed through said seals onto said rollers, and means for rotating said rollers, said means for rotating the rollers being connected to drive the roller which tends to lift the articles at a greater peripheral speed than the roller which tends to depress the articles.

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