

June 27, 1961

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2,990,512

BILLET INSPECTION APPARATUS

Filed Dec. 30, 1958

4 Sheets-Sheet 1

Fig. 1

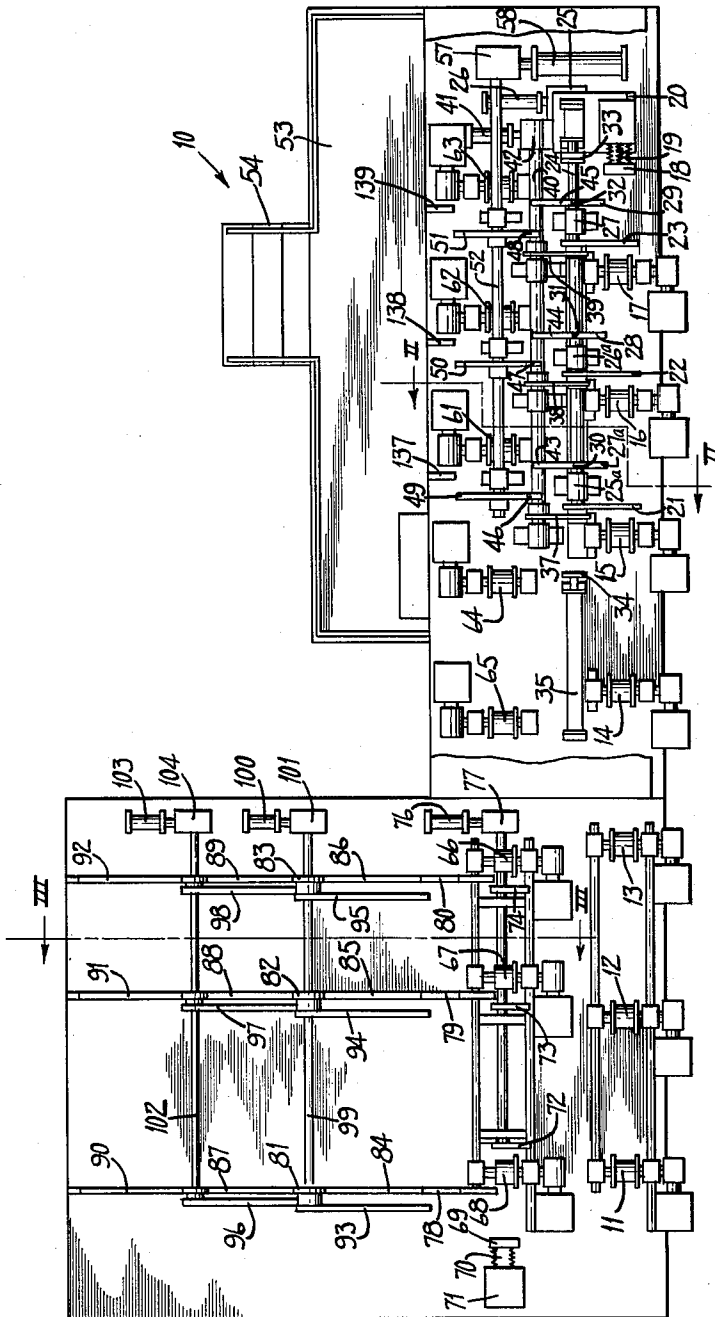
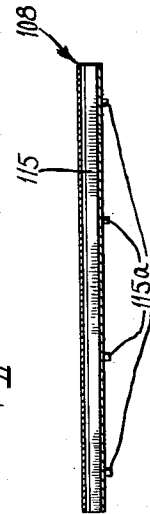


Fig. 5

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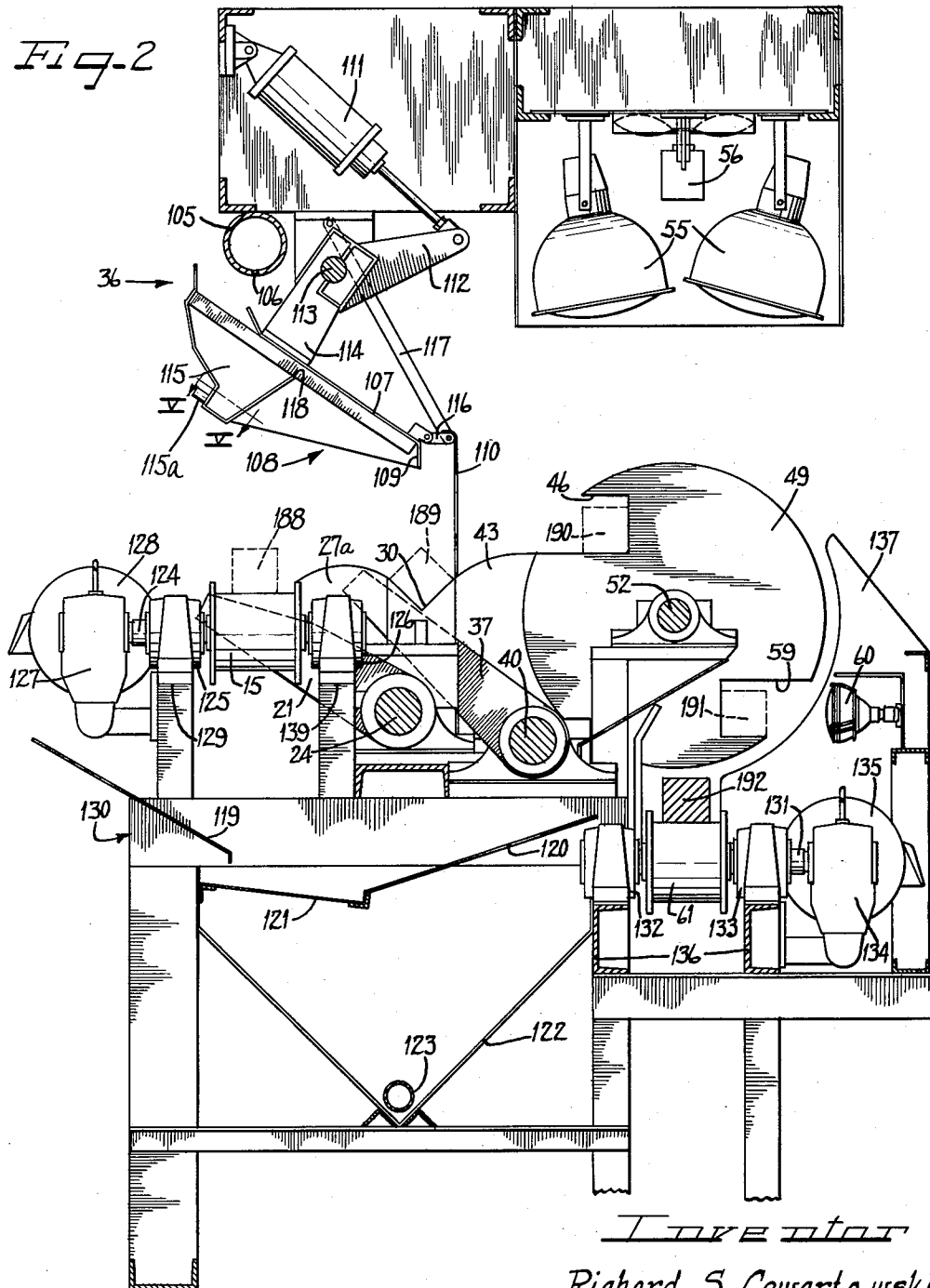
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BILLET INSPECTION APPARATUS

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Fig-2



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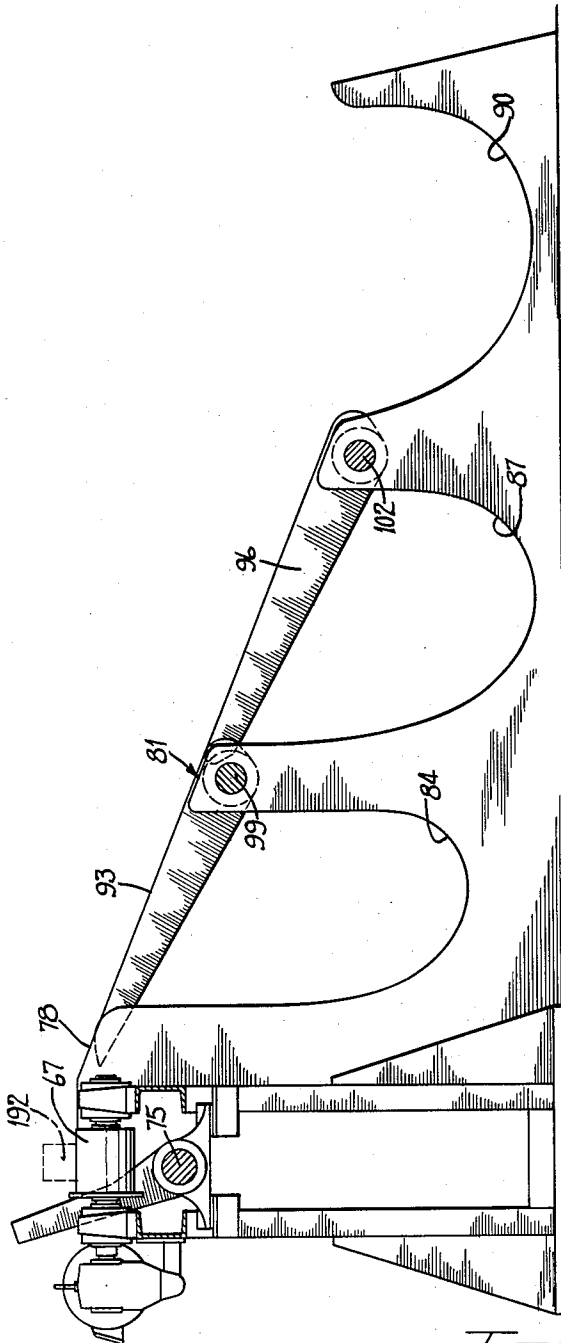
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BILLET INSPECTION APPARATUS

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4 Sheets-Sheet 3

Fig. 3



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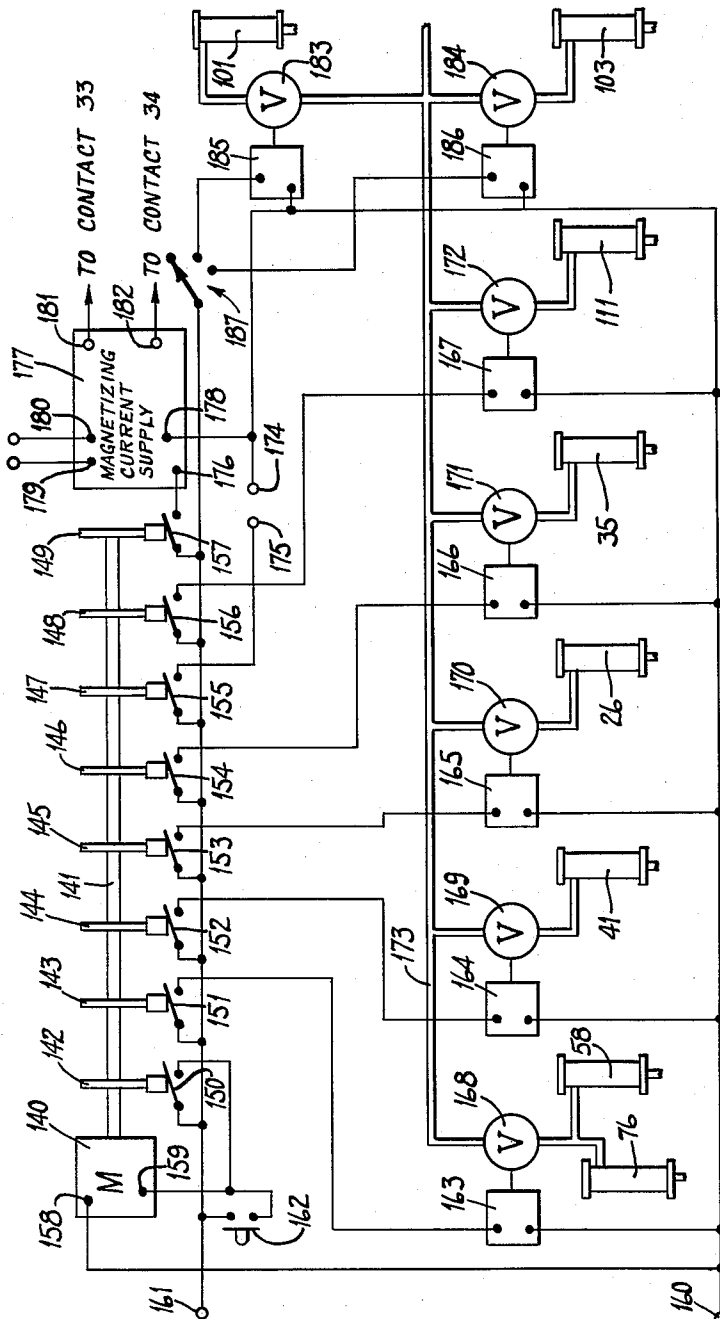
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BILLET INSPECTION APPARATUS

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4 Sheets-Sheet 4

Fig. 4



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## BILLET INSPECTION APPARATUS

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13 Claims. (Cl. 324—38)

This invention relates to handling and inspection apparatus and more particularly to apparatus for handling and inspecting billets by the magnetic particle method.

Heretofore, the handling and inspection of billets, i.e. large elongated objects, has been difficult and time-consuming due to their size and shape. This has been particularly true in the magnetic particle inspection method in which the billet must be placed between contacts to pass current therethrough with magnetic particles being distributed over the surface thereof, after which the billet must be manipulated for complete inspection of the surface thereof.

This invention was evolved with the object of providing a simple, readily constructed, efficient and reliable system for the handling and inspection of billets.

In apparatus constructed according to this invention, means are provided for supporting a billet in a first position relative to an inspector and subsequently rotating the billet through one or more positions relative to the inspector, in a manner to permit the complete inspection of the surface thereof.

According to an important feature of the invention, such means comprises a carrier rotatable about a horizontal axis and arranged to receive a billet in a first position in spaced parallel relation to the axis, the carrier being then rotatable through one or more positions to permit inspection of the entire surface of the billet. The carrier is then further rotatable for discharge of the billet therefrom. Thus the carrier not only serves to support the billet for inspection, but also serves to move the billet from one station to another.

When the carrier is rotated from one position to another, additional billets may be supplied thereto, to thus permit simultaneous inspection of portions of more than one billet, and thus increase the operating speed.

Preferably, the billet is moved through only two inspection positions, spaced 180° apart, one-half the surface being inspected in one position and the other half being inspected in the other position.

Another feature of the invention is in the provision of a magnetizing station at which contact means are engaged with the ends of the billet for flow of magnetizing current therethrough, and means for automatically moving the billet from the magnetizing station to the first inspection position.

A further feature of the invention resides in the provision of a means for automatically moving the billet to the magnetizing position, including conveyor means arranged to move the billet in the direction of its length.

A further feature of the invention is in the provision of conveyor means disposed below the inspection apparatus, to receive a billet directly therefrom.

A still further feature of the invention resides in the construction of means for applying inspection fluid over the surface of the billet.

This invention contemplates other and more specific objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate a preferred embodiment and in which:

FIGURE 1 is a top plan view of a billet handling and inspection apparatus constructed according to the principles of this invention;

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FIGURE 2 is a sectional view taken substantially along line II—II of FIGURE 1;

FIGURE 3 is a sectional view taken substantially along line III—III of FIGURE 1;

FIGURE 4 is a schematic diagram of a system for automatic operation of the apparatus of FIGURE 1; and

FIGURE 5 is a cross-sectional view taken substantially along line V—V of FIGURE 2, illustrating the location of certain drain elements.

Reference numeral 10 generally designates billet handling and inspection apparatus constructed according to the principles of this invention.

The apparatus 10 is particularly designed for the handling of two to four inch square billets having a length of from six to ten feet, but is also useable with round billets, and may also be readily modified for use with billets of different cross-sections and different lengths. The term "billet" is used herein in a generic sense to include elongated objects whether of square or round cross-section or otherwise, and whether solid or in the form of a hollow tube or the like.

In the operation of the apparatus 10, a billet is initially disposed on rollers 11, 12 and 13 which are driven in a direction to move the billet over another driven roller 14 and thence on to driven rollers 15, 16 and 17 until the end of the billet engages a snubber element 18 supported by springs 19 from a support 20. At this time, the billet overlies a series of arms 21, 22 and 23 affixed on a horizontal shaft 24, which is journaled by bearings 25, 26 and 27. The shaft 24 is connected through a mechanism 25a to an air cylinder 26a.

Upon admission of compressed air to the cylinder 26, the shaft 24 is rotated in a clockwise direction, as viewed in FIGURE 2, to engage the underside of the billet and then lift and slide the billet over skid rails 27a, 28 and 29 having generally arcuate upper surfaces, until the billet is positioned in notches 30, 31 and 32.

When the billet is disposed in notches 30—32, the forward end thereof (the right-hand end as viewed in FIGURE 1) is disposed adjacent a contact element 33 carried by the support 20, and the rearward end thereof is disposed adjacent a contact element 34 connected to an air cylinder 35. Upon admission of air to the cylinder 35, the contact 34 is moved forwardly to firmly engage the rearward end of the billet and to move the forward end thereof into firm engagement with the contact 33.

The contacts 33 and 34 are then connected to a current source to cause current flow through the billet. In response to such current flow, a substantially uniform magnetic flux will be developed over the surface of the billet except as distorted by defects within the billet.

During such magnetization of the billet, magnetic particles may be distributed over the surface of the billet, to be attracted to regions of distortion of the magnetic field and thereby indicate the presence of defects. With the billet being of a magnetic material, such as steel, it is also possible to apply the particles after the magnetizing step, since there will be a remanent magnetization of the billet.

The magnetic particles are preferably carried in a suitable fluid which is applied over the billet by means of an applicator system generally designated by reference numeral 36 and described in detail hereinafter.

When the billet is disposed in the notches 30—32, it is disposed over a series of arms 37, 38 and 39 which are secured to a horizontal shaft 40 actuated by an air cylinder 41 through a mechanism 42. When compressed air is introduced to the cylinder 41, the shaft 40 is rotated in a clockwise direction as viewed in FIGURE 2, to move the arms upwardly into engagement with a billet in the notches 30—32 and slide the billet over curved surfaces

of skid rails 43, 44 and 45, to slide into notches 46, 47 and 48 formed in a series of wheels 49, 50 and 51 which are supported on a shaft 52.

When the billet is in notches 46-48, it is in a first inspection station such that an operator may inspect one side thereof. In the case of a square billet, the operator would inspect the upper surface and the right-hand surface as viewed in FIGURE 2.

The operator may walk along an inspection platform 53 having a stairway 54 leading thereto, to inspect the entire length of the billet. A double row of lights 55 are supported above the inspection station, to properly illuminate any concentration of magnetic particles over regions of the billet having defects therein. A row of ventilating fans 56 may be provided to carry off heat from the lights.

After inspection of one side of the billet when disposed in the first inspect station adjacent the skid rails 43-45, the shaft 52 is rotated through 180° in a clockwise direction, as viewed in FIGURE 2, by means of a mechanism 57 actuated by an air cylinder 58. If desired, the mechanism 57 and air cylinder 58 may be replaced with a gear box driven by an electric motor preferably with an electric brake on the motor.

The billet is then in position for inspection of the other side thereof, it being noted that the lower and left-hand surfaces when in the first inspection station adjacent skid rails 43-45, become the upper and right-hand surfaces when moved through 180° to the second inspection station.

Preferably, the wheels 49-51 are provided with billet-receiving notches spaced 180° from the notches 46-48. For example, as shown in FIGURE 2, a notch 59 is formed in the wheel 49 and a position spaced 180° from the notch 46, and similar notches are formed in wheels 50 and 51 in spaced relation to notches 47 and 48. With this arrangement, billets may be fed to the first inspection station while another billet is in the second inspection station, and the billets may be simultaneously inspected.

A row of lights 60 are preferably disposed adjacent the second inspection station, for additional illumination of the billet at that station.

After complete inspection of a billet, the air cylinder 58 is operated to again rotate the shaft 52 through 180° in a clockwise direction. In this movement, a billet is moved from the first inspection station to the second inspection station, and a billet is moved from the second inspection station to drop onto conveyor rollers 61, 62 and 63. A series of notches is then disposed adjacent the skid rails 43-45 in position to receive another billet therefrom.

The conveyor rollers 61-63 are rotated in a direction to move the billet rearwardly, to the left as viewed in FIGURE 1, to pass over driven rollers 64 and 65 and thence onto driven rollers 66, 67 and 68, rearward movement of the billet being noted by the snubber element 69 supported by springs 70 from a support 71.

When the billet is positioned on the rollers 66-68, arms 72, 73 and 74 are disposed to the left of the billet, as viewed in FIGURE 3, the arms 72-74 being supported on a shaft 75 which is actuated by an air cylinder 76 through a mechanism 77.

When compressed air is supplied to the cylinder 76, the shaft 75 is rotated in a clockwise direction as viewed in FIGURE 3, to engage the arms 72-74 with the billet and slide the billet to the right off of the rollers 66-68 onto downwardly inclined surfaces 78, 79 and 80 of plates 81, 82 and 83 in spaced vertical planes transverse to the billet. The plates 81-83 are formed with a first series of aligned notches 84-86, a second series of aligned notches 87-89 and a third series of aligned notches 90-92. Arms or gates 93-95 normally prevent entry of a billet into the notches 84-86, while arms 96-98 normally prevent entry of a billet into the notches 87-89, the arms or gates 93-98 forming continuations of the inclined

surfaces 78-80 on which the billet slides to be deposited into the notches 90-92.

The arms or gates 93-95 are supported on a shaft 99 arranged to be actuated by an air cylinder 100 through a mechanism 101. Arms 96-98 are supported on the shaft 102 which may be actuated by an air cylinder 103 through a mechanism 104.

If it is desired to deposit a billet in the notches 84-86, the air cylinder 100 may be supplied with air to effect elevation of the arms or gates 93-95. Similarly, if it is desired to deposit a billet in the notches 87-89, the arms 93-95 may be left in the normal positions thereof, and the arms or gates 96-98 may be elevated by supplying air to the cylinder 103.

It will be appreciated that this arrangement may be used for segregating billets after inspection, according to the results of the inspection. For example, defect-free billets may be deposited in the notches 90-92, billets having certain types or ranges of defects may be deposited in the notches 87-89, and billets having other types or ranges of defects may be deposited in notches 84-86.

Referring to FIGURE 2, the applicator mechanism for applying the magnetic particle-carrying fluid or bath comprises a fluid or bath feed pipe 105 supported horizontally in parallel relation above a billet supported in notches 30-32, i.e. a billet in the processing and magnetizing station. The fluid or bath flows from the feed pipe 105 out through a series of openings 106 in the lower side thereof and downwardly onto the upper end portion of an inclined surface 107 of an applicator device 108. The fluid or bath flows downwardly on the surface 107 and thence downwardly over a depending flange 109 along the lower edge of the surface 107, to drop onto a billet supported in notches 30-32. A splash shield 110 is connected to the applicator 108 and is positioned to prevent splashing of fluid droplets onto a processed billet carried on the wheels 49-51 or on the run-out conveyor.

After elapse of a certain time interval, a supply valve (not shown) for the pipe 105 is closed to terminate the supply of fluid thereto. In timed relation to the operation of the supply valve, compressed air is supplied to an air cylinder 111 which is connected to an arm 112 affixed to a shaft 113, the applicator 108 being supported from the shaft 113 through arm means including an arm 114. When the air cylinder is actuated, the applicator 108 is moved in a counter-clockwise direction and drainage fluid from the pipe 105 is directed into a compartment 115 formed on the applicator 108. At the same time, the splash shield 110 is so controlled as to prevent splash from reaching processed billets. For this purpose, the splash shield 110 is secured to arms including an arm 116 tiltably connected to the applicator 108. A link 117 is connected between the arm 116 and a fixed axis in spaced relation to the axis of the shaft 113.

When the applicator 108 is moved to the limit of its counter-clockwise movement, fluid may drain from the compartment 115 through drain elements 115a in the form of pipe nipples. Elements 115a are so located as to permit the fluid to fall through open spaces in the structure, directly to a trough formed by plates 119 and 120 to flow through a screen 121 into a tank 122 which also receives excess fluid applied to the billet. A tube or pipe 123 is disposed in the lower end of the tank 122, and a pump (not shown) is provided for supplying fluid from the pipe 123 to the feed pipe 105. The location of drain elements 115a is illustrated in FIGURE 5.

To impart drive to the conveyor rollers 11-17 and 61-68, each roller is preferably individually motorized. For example, the roller 15 is secured to a shaft 124 journaled in bearings 125 and 126, one end of the shaft being coupled through a drive transmission unit 127 to the shaft of an electric motor 128. The bearings 125 and 126, as well as the unit 127 and motor 128 are sup-

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ported from frame members 129 which, in turn, are supported from a main frame generally indicated by reference numeral 130. Similarly, the roller 61 is mounted on a shaft 131 journaled in bearings 132 and 133, one end of the shaft being connected through a drive transmission unit 134 to an electric motor 135. The bearings 132 and 133, and the unit 134 and motor 135, are supported from channel members 136 supported from the main frame. It will be apparent, of course, that the plates forming the skid rails, the bearings for the shafts 24, 40, 52 and 113, as well as the lights 55, feed pipe 105 and the various air cylinders and actuating mechanisms, are also supported from the main frame 130.

It is also desirable, although not absolutely necessary, to provide guard plates 137-139 insuring that any billets that might become displaced from the notches in the wheels 49-51, will be directed toward the conveyor rollers 61-63.

As noted above, the apparatus is adapted to handle round as well as rectangular billets. With round billets, the distance between the upper and lower surfaces of slots 46 and 59 should preferably be only slightly greater than the diameter of the billet and the shaft 52 should be rotated at a speed slow enough to avoid rolling of the billets under the action of centrifugal forces. If desired, automatically operated clamping devices might be employed to prevent rolling of the billets and to allow higher speed operation.

FIGURE 4 diagrammatically illustrates a system for the automatic control of the operation of the apparatus. As shown, an electric motor 140 drives a shaft 141 which carries eight cams 142-149, respectively arranged to actuate switches 150-157.

The motor 140 has terminals 158 and 159. Terminals 160 and 161 are arranged to be connected to a suitable source of electrical power. Motor terminal 158 is connected directly to terminal 160, while terminal 159 is connected to terminal 161 through a push button switch 162, which is connected in parallel with the switch 150. When the push button switch 162 is depressed, the motor 140 is energized and the cam 142 then closes the switch 150 to maintain energization of the motor 140 until the shaft 141 is rotated through 360°, whereupon the switch 150 is opened to deenergize the motor 140 until the push button switch 162 is again depressed.

One terminal of each of the switches 151-157 is connected to the input terminal 161. The other terminals of switches 151, 152, 153, 154 and 156 are respectively connected to electro-mechanical actuators 163-167, the other terminals of which are connected to the input terminal 160. The actuators 163-167 are arranged to control valves 168-172, the valve 168 being connected between a compressed supply line 173 and the cylinders 58 and 76, the valves 169-172 being respectively connected between the supply line 173 and the cylinders 41, 26, 35 and 111.

A supply valve, not shown, for supplying the inspection bath or fluid to the pipe 105, may have an actuator connected to a pair of terminals 174 and 175, the terminal 174 being connected to the input terminal 160, and the terminal 175 being connected to the input terminal 161 through the switch 155.

The switch 157 is connected between the input terminal 161 and a control terminal 176 of a magnetizing current supply 177 having a second control terminal 178 connected to the terminal 160. The magnetizing current supply 177 has a pair of input terminals 179 and 180 for connection to a suitable source of current and a pair of output terminals 181 and 182 respectively connected to the contacts 33 and 34.

The air cylinders 101 and 103 of the segregating gate arrangement are connected through valves 183 and 184 to the compressed air supply line 173, the valves 183 and 184 being respectively actuated by electro-mechanical actuators 185 and 186. One terminal of each of the actu-

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ators 185 and 186 is connected to the input supply terminal 160, and the other terminals thereof are connected to contacts of a selector switch 187 having a movable contact connected to the terminal 161.

### Operation

To describe the operation of the apparatus, it may be assumed that a first billet 188 has been moved by rollers 11-17 to a position over the rollers 15-17 with its end in engagement with the snubber 18; that a second billet 189 is disposed in the notches 30-32; that a third billet 190 is disposed in notches 46-48 of the wheels 49-51; that a fourth billet 191 is in the other series of notches in the wheels 49-51, including the notch 59; and that a fifth billet 192 has been moved by the rollers 61-68 to a position over the rollers 66-68 with its end in engagement with the snubber 69.

With billets in such positions, one side of each of the billets 190 and 191 may be inspected, i.e. the upper and right-hand surfaces of each of the billets 190 and 191 as viewed in FIGURE 2.

After such inspection, the push button switch may be depressed to energize the motor 140 and rotate the shaft 141, the switch 150 being then closed to maintain energization of the motor 140 until the shaft 141 is rotated through one revolution. The switch 151 is first closed to energize the actuator 163 and open the valve 168. Compressed air is then supplied to the cylinders 76 and 58. The cylinder 76 actuates the arms 72-74 to move the billet 192 onto the downwardly inclined surfaces 78-80. The billet 192 may then slide downwardly over the surfaces of the gate 93-98 into the notches 90-92. However, if desired, the selector switch 187 may be rotated to cause actuation of either the cylinder 101 or the cylinder 103, to cause either the gates 93-95 or the gates 96-98 to be elevated, to thus cause the billet 192 to drop either into the notches 84-86 or the notches 87-89.

Actuation of the air cylinder 58 causes the shaft 52 to be rotated through 180°. During the first part of such rotation, the billet 191 drops down onto the conveyor rollers 61-63 to be moved thereby, and by the conveyor rollers 64-68 to the position formerly occupied by the billet 192. When rotation of the shaft 52 through 180° is completed, the notch 59 will be in the position formerly occupied by the notch 46, and notch 46 will be in the position formerly occupied by notch 59, so that the billet 190 will be in the position formerly occupied by billet 191.

The next event in the cycle of operation is the closure of switch 152 to effect opening of the valve 169 and cause actuation of the cylinder 41. Cylinder 41 operates the arms 37-39 to move the billet 189 over the skid rails 43-45 into notches in the wheels 49-51, including the notch 59.

The next event in the cycle of operation is the closure of switch 153 to cause actuation of the cylinder 26 and thus cause rotation of the arms 21-23, to move the billet 188 over the skid rails 27a, 28 and 29 into the notches 30-32. Another billet may then be moved by rollers 11-17 into the position formerly occupied by billet 188.

Next, the switch 154 is closed to cause actuation of the air cylinder 35 and cause engagement of the contacts 33 and 34 with the ends of the billet 188.

Next, the contact 157 is closed to cause operation of the magnetizing current supply 177, to supply magnetizing current to the billet 188.

At the same time, or at a later time if desired, the contact 155 is closed to supply a current to the terminals of 174 and 175 and thus open a valve, not shown, to supply the inspection fluid or bath to the pipe 105, from which it is applied to the billet 188.

In timed relation to the operation of the supply valve, the contact 156 is closed to actuate the air cylinder 111 and cause movement of the bath applicator 108 in the manner as previously described.

This completes the cycle of operation it being understood that each of the switches 151-157 is open at a proper time to allow the next operation as described. For example the arms 37-39 are returned to the position as illustrated prior to movement of the arms 21-23. It is also noted that during actuation of arms 37-39, the applicator 108 is at a position displaced in a counter-clockwise direction from the illustrated position, to elevate splash shield 110 out of the path of billet movement.

It should be noted that the control system illustrated diagrammatically in FIGURE 4 is a program type of system in which each operation is controlled independently of other operations. This has the advantage of simplicity but has the disadvantage that the apparatus can become "jammed" and damaged should there be a failure in functioning of one operation. To overcome this disadvantage, a sequence type of control may be used in which each operation is initiated only upon completion of the preceding operation. For example, indexing movement of the wheels 49-51 may be controlled by a switch responsive to movement of arms 37-39 back to position such as illustrated in FIGURE 2.

It will be understood that other modifications and variations may be effected without departing from the spirit and scope of the novel concepts of this invention.

We claim as our invention:

1. In a billet inspection apparatus, a carrier rotatable about a horizontal axis and arranged to receive a billet in a first position in spaced parallel relation to said axis, and means for rotating said carrier to move the billet to at least one other position to permit inspection of substantially the entire surface thereof and subsequently rotating said carrier to drop said billet therefrom by gravity.

2. In billet inspection apparatus, a carrier rotatable about a horizontal axis and arranged to receive a billet in a first inspection position spaced above a horizontal plane through said axis and to one side of a vertical plane through said axis, and means for rotating said carrier through substantially 180° in a direction to initially move the billet to a position over said axis and then downwardly to a second inspection position below said horizontal plane while maintaining the billet against movement from said second position.

3. In billet inspection apparatus, a carrier rotatable about a horizontal axis and arranged to receive a billet in a first position spaced above a horizontal plane through said axis and to one side of a vertical plane through said axis, means for rotating said carrier through substantially 180° in a direction to initially move the billet to a position over said axis and then downwardly to a position below said horizontal plane, and means for again rotating said carrier through substantially 180° in said direction and causing the billet to drop therefrom at a position below said axis and to receive another billet in said first position.

4. In billet inspection apparatus, means for supporting a billet in a processing position, means for magnetizing and applying magnetic particles to said billet in said processing station, means for moving said billet sidewise to a first inspection position to permit inspection of one side thereof, and means for then rotating the billet to at least one other inspection position to permit inspection of substantially the entire surface thereof and dropping said billet after such other inspection.

5. In billet inspection apparatus, conveyor means for moving a billet to a first position, means for magnetizing and applying magnetic particles to said billet in said first position, means for moving the billet sidewise from said first position to a second position for inspection of one side thereof, means for then rotating the billet to at least one other position to permit inspection of substantially the entire surface thereof and dropping the billet after such other inspection, and means receiv-

ing the dropped billet for then moving the billet to a final position.

6. In billet inspection apparatus, conveyor means for moving a billet to a first position, means for magnetizing and applying magnetic particles to said billet in said first position, means for moving the billet sidewise from said first position to a second position for inspection of one side thereof, means for then rotating the billet to at least one other position to permit inspection of substantially the entire surface thereof, and means for automatically effecting said billet movements in sequence while maintaining the billet in said first and second positions successively for predetermined intervals.

7. In billet inspection apparatus, conveyor means for supporting and moving a billet in the direction of its length to a first position, means for moving the billet sidewise from said first position to a second position, means for processing said billet in said second position, means for moving the billet sidewise from said second position to a third position for inspection of one side thereof, and means for then rotating the billet to at least one other position to permit inspection of substantially the entire surface thereof.

8. In billet inspection apparatus, first and second billet holding means for supporting billet in spaced parallel horizontal positions, means supporting said holding means for rotation about an axis intermediate said positions, to dispose said first holding means in a first position to receive a billet for inspection of one side thereof, said holding means being then rotatable through substantially 180° to dispose said billet in a second position for inspection of the other side thereof and to dispose said second holding means in a position to receive another billet.

9. In billet inspection apparatus, conveyor means for supporting and moving a billet in the direction of its length to a first position, arm means underlying the billet in said first position and rotatable to lift said billet from said first position and then move the billet sidewise to a second position, skid rails for supporting said billet in said sidewise movement, means for magnetizing and applying magnetic particles to said billet in said second position, and means for subsequently rotating said billet to permit inspection of substantially the entire surface thereof.

10. In billet inspection apparatus, conveyor means for supporting and moving a billet in the direction of its length to a first position, first arm means underlying the billet in said first position and rotatable to lift said billet from said first position and then move the billet sidewise to a second position, means for magnetizing and applying magnetic particles to the billet in said second position, second arm means underlying the billet in said second position and rotatable to lift the billet from said second position and move the billet sidewise to an inspection position, and skid rails for supporting said billet in said sidewise movements.

11. In article inspection apparatus, means for supporting an article in a processing position, means for magnetizing the article while in said position, and means for applying processing fluid to the article while in said position, comprising: a fluid supply line in spaced parallel relation above said position having openings for flow of fluid therefrom, an applicator having an inclined surface for receiving fluid from said supply line and directing it onto the billet, means for rotating said applicator in one direction, the upper edge of said inclined surface being disposed beyond the path of flow at the extremity of movement on said one direction, and means on said applicator for receiving drainage flow from said supply line and directing the drainage flow to a region where it does not splash upon processed articles.

12. In billet inspection apparatus, means for supporting a billet in a processing position, means for magnetizing the billet while in said position, and means for apply-

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ing processing fluid to the billet while in said position, comprising: a fluid supply line in spaced parallel relation above said position having openings for flow of fluid there from, an applicator having an inclined surface for receiving fluid from said supply line and directing it onto the billet, means for rotating said applicator in one direction, the upper edge of said inclined surface being disposed beyond the path of flow at the extreme of movement in said one direction, a compartment on said applicator for receiving drainage flow from said supply line, and a splash shield so controlled as to be maintained in the path of splash from the billet being processed to prevent the splash from reaching processed billets.

13. In billet inspection apparatus, means for moving billets seriatim to a processing position and thence sidewise to an inspection position, means for applying processing

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fluid to a billet in said processing position including an applicator having an inclined surface for directing fluid flow onto the billet, a splash shield disposed intermediate said processing and inspection positions to prevent splash from reaching a billet in said inspection position, and means for moving said splash shield upwardly out of the path of movement of a billet from said processing position to said inspection position.

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