April 5, 1960 E. L. HEIM 2,931,480

COIN SEPARATORS

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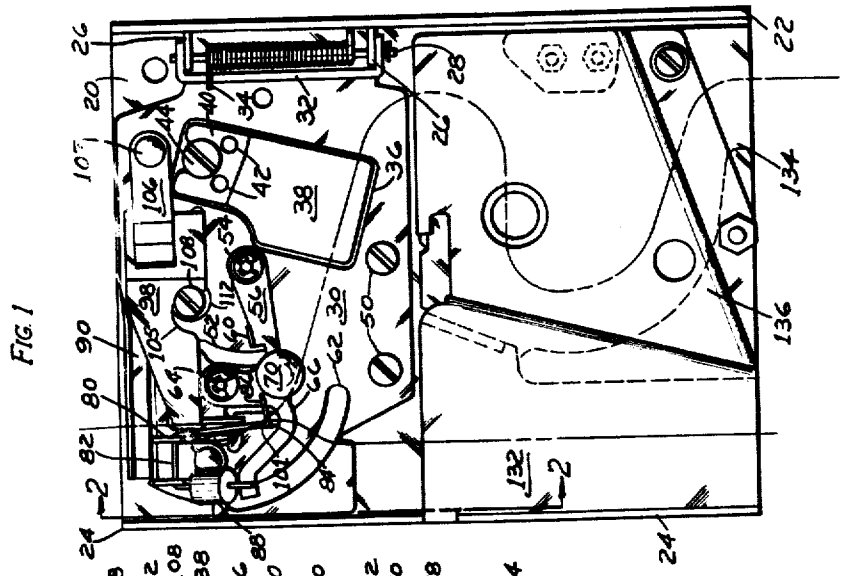


FIG. 1

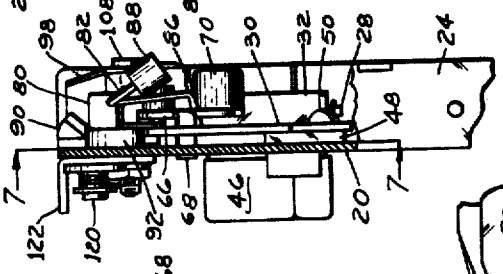


FIG. 2

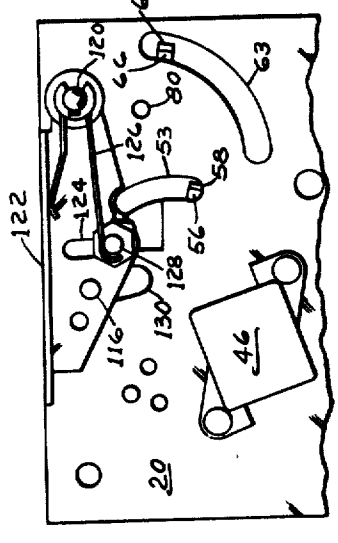


FIG. 3

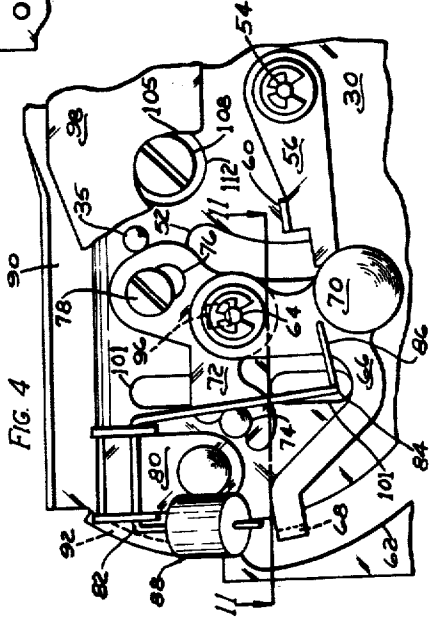


FIG. 4

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FIG. 5.

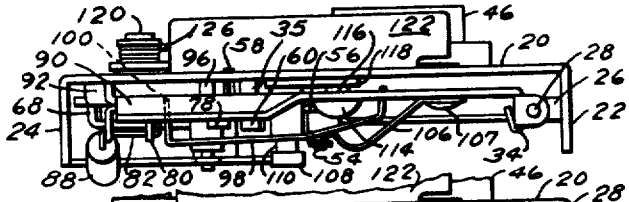
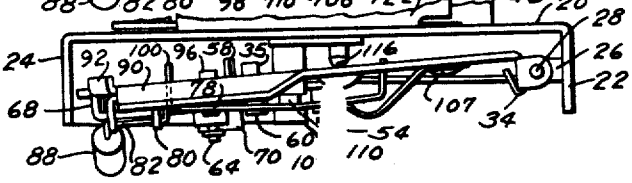


FIG. 6.



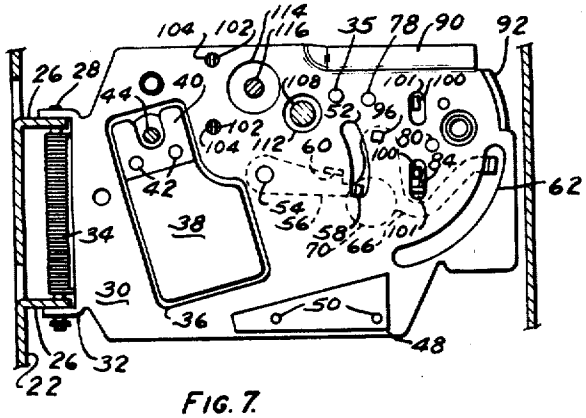


FIG. 7.

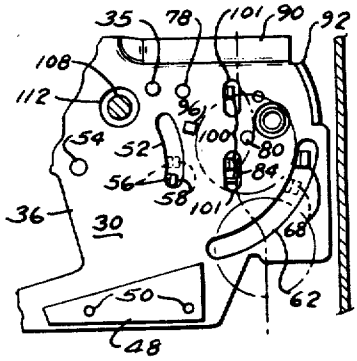


FIG. 8.

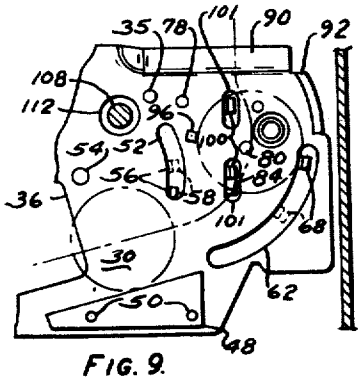


FIG. 9.

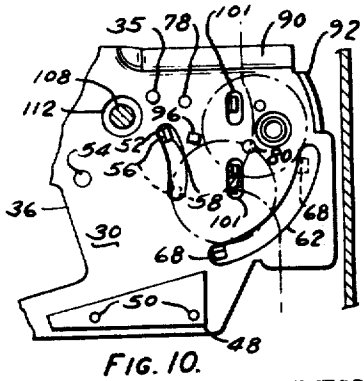


FIG. 10.

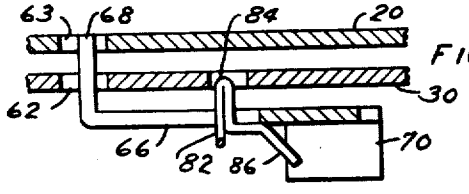


FIG. 11.

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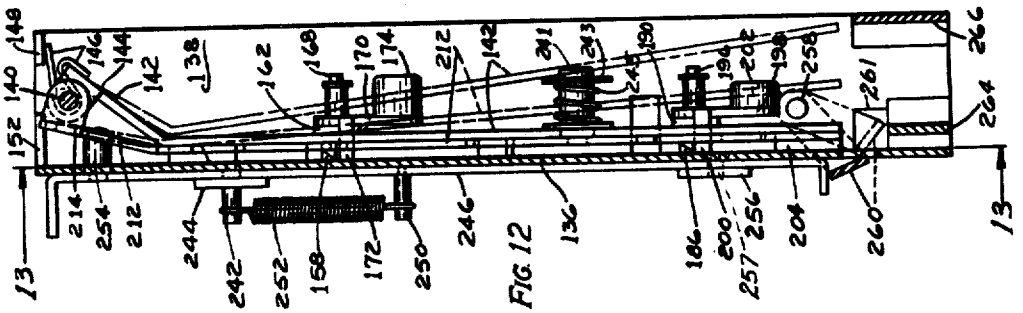


FIG. 12

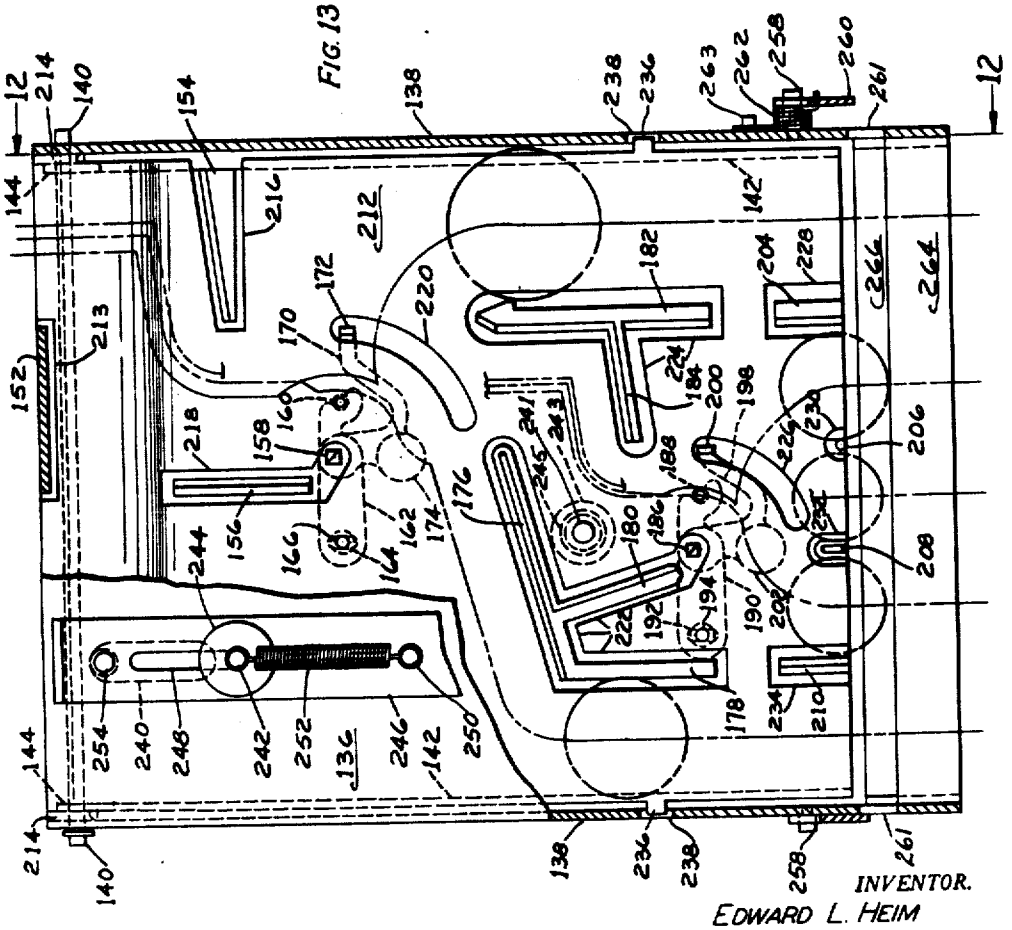


FIG. 13

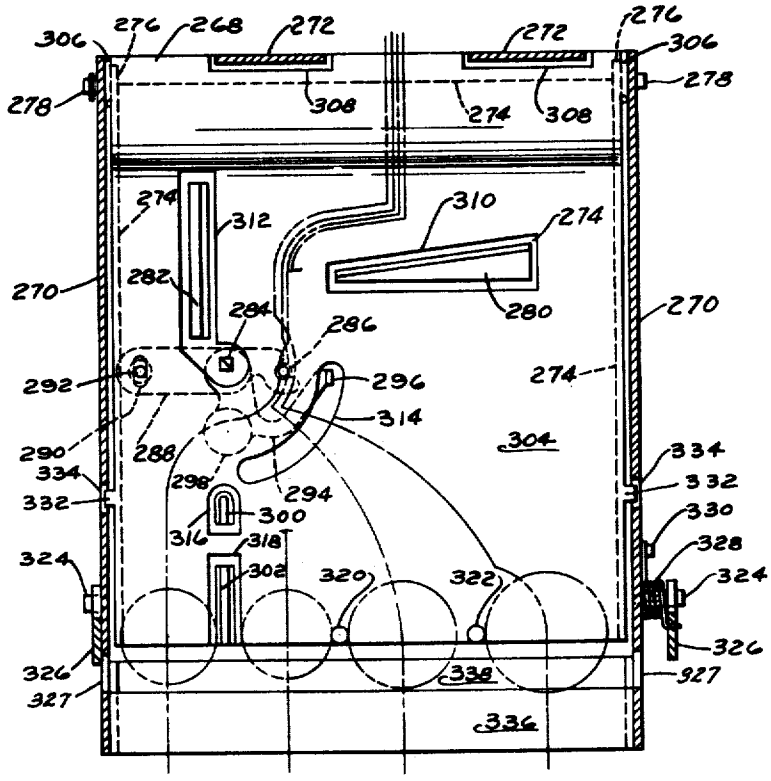
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COIN SEPARATORS

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FIG. 14



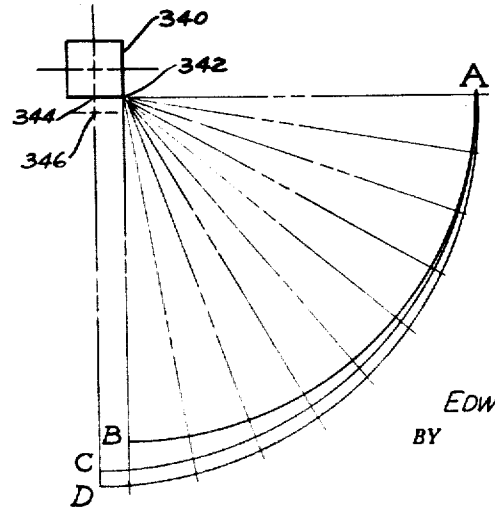


FIG. 15

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2,931,480

COIN SEPARATORS

Edward L. Heim, Normandy, Mo., assignor, by mesne assignments, to National Rejectors, Inc., a corporation of Missouri

Application May 20, 1954, Serial No. 431,051

10 Claims. (Cl. 194—102)

This invention relates to improvements in coin separators. More particularly, this invention relates to improvements in the coin-sizing gauges for coin separators.

It is, therefore, an object of the present invention to provide an improved coin-sizing gauge for coin separators.

Coin separators are intended to separate authentic from spurious coins; the separators being intended to accept the authentic coins and to reject the spurious coins. Coin separators customarily have coin-sizing gauges which can measure the coins introduced into the coin separators and which can accept coins of a predetermined diameter but which can reject coins that exceed that diameter. The value of any coin separator is largely based upon its ability to segregate the spurious coins from the authentic coins; and the coin-sizing gauges of coin-separators largely determine the ability of those coin-separators to segregate the spurious from the authentic coins. While a number of coin-sizing gauges have been proposed and while a number of such gauges are now being used, it would be desirable to provide a coin-sizing gauge which is more accurate than present coin-sizing gauges. The present invention provides such a highly accurate coin-sizing gauge for coin separators; that coin-sizing gauge readily separating spurious coins that are only a very small amount larger than the authentic coins which can be accepted by that coin-sizing gauge. It is, therefore, an object of the present invention to provide a highly accurate coin-sizing gauge for coin separators.

The coin-sizing gauge provided by the present invention has relatively movable coin-receiving surfaces. The spacing between the coin-receiving surfaces of that coin-sizing gauge will change as the coin-sizing gauge is actuated by coins introduced into the coin separator. The initial spacing of the coin-receiving surfaces of the coin-sizing gauge is small enough to enable that gauge to receive and support all authentic coins and a number of coins which are larger than the authentic coins. That spacing will increase, as the coin-sizing gauge is actuated, until that spacing is large enough to accept authentic coins; but that spacing will not increase to the point where over-sized coins can be accepted, instead, those over-sized coins will be rejected by the gauge. In this way, the authentic coins can be directed to an accepted coin chute while the over-sized coins can be held against movement toward that chute. It is, therefore, an object of the present invention to provide a coin-sizing gauge with relatively movable coin-receiving surfaces which are initially spaced apart a predetermined distance and which move relative to each other whenever a coin actuates that gauge.

The final distance between the coin-receiving surfaces of the coin-sizing gauge, provided by the present invention, can be adjusted and then fixed. This is desirable because it enables the size of the accepted coins to be predetermined with great accuracy. In addition, it makes it possible for one size of coin-sizing gauge to be adjusted to accommodate but to distinguish between coins of closely similar diameter. In addition, the adjustment of

the position of one coin-receiving surface relative to the other enables the coin-sizing gauge to compensate for any wear of the coin-receiving surfaces. It is, therefore, an object of the present invention to provide a coin-sizing gauge wherein the position of one of the coin-receiving surfaces thereof can be adjusted relative to the position of the other coin-receiving surface thereof.

A rejected coin chute is provided adjacent the coin-sizing gauge of the present invention. One of the coin-receiving surfaces of the coin-receiving gauge of the present invention moves past that rejected coin chute when it is actuated by a coin. If the coin has the proper diameter and weight, that one coin-receiving surface will support that coin and carry it past the rejected coin chute. However, if that coin has a diameter appreciably smaller than the authentic coin, that one coin-receiving surface can permit the spurious coin to fall into the rejected coin chute. It is, therefore, an object of the present invention to provide a rejected coin chute adjacent a coin-sizing gauge and to have one of the coin-receiving surfaces of that gauge carry authentic coins past that rejected coin chute.

One of the coin-receiving surfaces of the coin sizing gauge provided by the present invention is stationary. The other coin-receiving surface of that gauge is rotatable about a pivot which is spaced from the stationary coin-receiving surface. Accordingly, the distance between the movable coin-receiving surface and the stationary coin-receiving surface will change as the movable coin-receiving surface is acted upon by a coin. The spacing between the pivot for the movable coin-receiving surface and the stationary coin-receiving surface can be adjusted at will. Such an adjustment will determine the size of the coins that will be accepted and rejected by the coin-sizing gauge. It is, therefore, an object of the present invention to provide a coin-sizing gauge which has a stationary coin-receiving surface and which has an adjustable pivot for the movable coin-receiving surface of that gauge.

The coin separator provided by the present invention has a feeler wire that can enter the coin passageway and can intercept any washers that attempt to pass through that passageway. This feeler wire is disposed adjacent the coin-sizing gauge provided by the present invention, and that coin-sizing gauge will direct the coins past the portion of the passageway in which the feeler operates. If a washer is passing through the passageway, the feeler wire will intercept that washer; and thereafter the coin-sizing gauge will move the feeler wire out of the passageway and permit the washer to fall to the rejected coin chute. This is an improvement over prior coin separators wherein washers that were intercepted by the feeler wire had to be scavenged out of the passageway. With the coin-sizing gauge and the feeler wire provided by the present invention, the washers are automatically freed and permitted to drop to the rejected coin chute.

The coin-sizing gauge of the present invention can also be used to separate as many as four coins of different denomination. One of those coins can pass between the coin-receiving surfaces of that gauge without actuating that gauge, another of those coins can activate the coin-sizing gauge and be transported to a coin-receiving chute, another of those coins can roll off the outer face of the movable coin-receiving surface of that gauge after that gauge has rotated a short distance, and the last of those coins can roll off that outer face of that surface of the gauge after the gauge has rotated still further. It is therefore an object of the present invention to provide a coin-sizing gauge that can separate four coins of different denominations.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing and accompanying description, several preferred embodiments of the present invention are shown and described but it is to be understood that the drawing and accompanying description are for the purpose of illustration only and do not limit the invention and that the invention will be defined by the appended claims.

In the drawing, Fig. 1 is a front elevational view of one form of coin separator that is made in accordance with the principles and teachings of the present invention,

Fig. 2 is a partially broken away, partially sectioned end view of the coin separator of Fig. 1,

Fig. 3 is a rear elevational view of the upper part of the coin separator of Figs. 1 and 2,

Fig. 4 is an enlarged front elevational view of a portion of the gate of the coin separator of Figs. 1–3,

Fig. 5 is a plan view of the coin separator of Figs. 1–4,

Fig. 6 is a plan view of the coin separator of Figs 1–5, and it shows that coin separator as it is being scavenged,

Fig. 7 is a sectional view of the coin separator of Figs. 1–6, and it is taken along the plane indicated by the line 7—7 in Fig. 2,

Fig. 8 is a view of part of the gate of Fig. 7, and it shows a slightly advanced position of the movable coin-receiving surface in dotted lines,

Fig. 9 is another view of the said part of the gate of Fig. 7, and it shows, by dotted lines, the movable coin-receiving surface in a further advanced position,

Fig. 10 is another view of the said part of the gate of Fig. 7, and it shows, by solid lines, the movable coin-receiving surface in fully advanced position,

Fig. 11 is an enlarged sectional view in plan through the coin separator adjacent the movable coin-receiving surface of the coin-sizing gauge,

Fig. 12 is a sectional view of another form of coin separator provided by the present invention, and it is taken along the plane indicated by the line 12—12 in Fig. 13,

Fig. 13 is a sectional view of the coin separator of Fig. 12, and it is taken along the plane indicated by the line 13—13 in Fig. 12,

Fig. 14 is a sectional view of still another form of coin separator provided by the present invention, and

Fig. 15 is a schematic diagram explaining the separating movement of the coin-receiving surfaces of the coin-sizing gauge of the present invention.

Referring to the drawing in detail, the numeral 20 generally denotes the frame of a coin separator that is made in accordance with the principles and teachings of the present invention. That frame has a vertically extending flange 22 at the right-hand edge thereof and has a vertically extending flange 24 at the left-hand edge thereof. Two ears 26 are provided on the flange 22 and those ears extend toward the flange 24. Openings are provided in the inner ends of the ears 26 and a pivot pin 28 extends through those openings. A gate 30 has a C-shaped bracket 32 at the right-hand edge thereof, and openings are provided in the top and bottom of that bracket. The pivot pin 28 extends through the openings in the top and bottom of that bracket and thereby holds the gate for rotation relative to the ears 26. A helically wound spring 34 is telescoped over the pivot pin 28, and one end of that spring bears against the C-shaped bracket 32 of the gate 30 while the other end of that spring bears against the flange 22 of the frame 20. This spring biases the gate 30 for rotation toward the center wall of the frame 20. However, a pin 35 is carried on the rear face of the gate 30, and that pin will engage the center wall of the frame 20 and limit the rotation of the gate 30 toward that center wall. The length of the pin 35 is selected so that pin can hold the gate 30 away from the center wall of the frame 20 a distance just slightly greater than the thickness of an authentic coin. Where this is done, the gate 30 will co-act with the center wall of the frame 20 and with the pin 35 to test the thickness of coins introduced into the coin separator. Authentic coins will pass between the center wall of the frame 20 and the gate 30, but thicker coins will be held against movement into the passageway provided by the coin separator.

A generally rectangular opening 36 is provided in the gate 30. This opening is somewhat larger than, and is intended to accommodate a magnet keeper 38. This keeper is a plate of magnetic material, which has an off-set portion 40 at the upper end thereof, and that off-set portion has two centering pins 42. The centering pins 42 will extend into corresponding openings in the center wall of the frame 20 and will hold the magnet keeper 38 precisely aligned with the openings 36 in the gate 30. A screw 44 will extend through the off-set portion 40 of the magnet keeper 38 and will seat in the center wall of frame 20. The space between the center wall of frame 20 and the off-set portion of the magnet keeper 38 will be large enough to permit a coin to pass between the magnet keeper 38 and that center wall. A magnet 46 is secured to the rear of the center wall of the frame 20 and that magnet will be in register with the magnet keeper 38. The magnet keeper 38 will provide a path of low magnetic reluctance between the poles of the magnet 46.

The numeral 48 denotes a runway which is secured to the rear face of the gate 30 by screws 50. This runway inclines downwardly toward a point that is below the magnet 46 and is below the magnet keeper 38. The lower end of the runway 48 underlies the opening 36 in the gate 30 and underlies the magnet keeper 38. Thus, coins which roll along the runway 48 will be supported until they have entered the space between the magnet keeper 38 and the magnet 46. Consequently, the magnetic lines of force from the magnet 46 will be able to act upon coins while they are still supported on the runway 48, and those magnetic lines of force will continue to act on those coins for a short time after those coins roll off of the lower end of the runway 48.

The numeral 52 generally denotes an arcuate slot in the gate 30. A corresponding arcuate slot 53 is provided in the center wall of the frame 20, and the slots 52 and 53 will be in register with each other whenever the gate 30 is in parallel relation with the center wall of the frame 20. A pivot 54 is mounted on the gate 30, and that pivot is adjacent the center of configuration of the arcuate slot 52. The pivot 54 rotatably supports a lever 56, which has a coin-blocking projection 58 thereon. The coin-blocking projection 58 is spaced away from the pivot 54 and is in register with the slot 52 in the gate 30 and with the slot 53 in the center wall of the frame 20. The coin-blocking projection 58 of the lever 56 actually extends into the slots 52 and 53. Thus, the coin-blocking projection 58 spans the passageway defined by the gate 30 and the center wall of the frame 20. An ear 60 is provided on the lever 56 adjacent the free end of that lever. The ear 60 is directed transversely of the lever 56, as is the coin-blocking projection 58; but the ear 60 is directed away from the passageway while the coin-blocking projection extends into that passageway. The coin-blocking projection 58 will normally be at the bottom of the slot 52 and will rest upon and be held by the portion of the gate 30 which defines the bottom of the slot 52.

A slot 62 is formed in the gate 30 and that slot has an arcuate configuration. A slot 63 of similar configuration is provided in the center wall of the frame 20. The slots 62 and 63 will be in register with each other whenever the gate 30 is in parallel relation with the center wall of the frame 20.

A pivot bracket 72 has a notch in one end thereof, and that notch engages a pin 74 carried on the gate 30. A slot 76 is provided in the other end of the bracket 72, and a set screw 78 extends through the slot 76 and seats in an opening in the gate 30. The set screw 78 will normally be tightened against the bracket 72 and will thus hold that bracket immovable relative to the gate 30.

However, when it is desired to adjust the position of the pivot bracket 72, the set screw 78 can be loosened and the bracket 72 can be rotated about the pin 74.

A pivot 64 is mounted on the pivot bracket 72, and that pivot can be moved up or down by rotating the pivot bracket 72 about the pin 74. It will be noted that the pin 74 and the pivot 64 are on the opposite ends of a generally horizontal line; and hence rotation of the pivot bracket 72 about the pin 74 will provide substantially vertical adjustment of the position of pivot 64. The pivot bracket 72 holds the pivot 64 close to the geometric center of the arc defined by the slot 62.

A generally V-shaped lever 66 has one end thereof secured to the pivot 64. The other end of the lever 66 has a coin-receiving surface 68 thereon, and that coin-receiving surface extends into the slots 62 and 63 of the gate 30 and of the center wall of the frame 20, respectively. The coin-receiving surface 68 thus spans the passageway defined by the gate 30 and the center wall of the frame 20. A weight 70 is secured to the lever 66, and that weight biases the lever 66 for rotation about the pivot 64 to the position shown in Fig. 1. In that position, the weight 70 is disposed below the level of the pivot 64 and is substantially in vertical alignment with that pivot. As the lever 66 rotates about the pivot 64, the weight 70 will be raised upwardly, and it will also be moved horizontally away from the pivot 64. The horizontal movement of the weight 70 away from the pivot 64 will increase the effective moment arm of that weight and will thus increase the restoring force which that weight applies to the lever 66. Consequently, when the coin-receiving surface 68 of the lever 66 is adjacent the bottom of the slot 62, the effective moment arm of the weight 70 is a maximum; and while the weight 70 always tends to bias the lever 66 to the position of Fig. 1, the bias becomes increasingly great as the lever is rotated in a counter clockwise direction, as that lever is viewed in Fig. 1.

The weight 70 is in register with the ear 60 on the lever 56. When the lever 66 rotates in a counter clockwise direction, as that lever is viewed in Fig. 1, the weight 70 will approach the ear 60. If the rotation of lever 66 is sufficient, the weight 70 will strike and raise the ear 60, thereby raising the lever 56. The raising of that lever moves the coin-blocking projection 58 thereon out of blocking position. When the lever 66 returns to the position shown in Fig. 1, the weight 70 will permit the lever 56 to return to the position shown in Fig. 1.

The numeral 80 denotes a pivot bracket that is secured to the gate 30 adjacent the free edge of that gate. A feeler wire 82 is pivotally supported by the bracket 80. That feeler wire has a reentrant coin-intercepting portion 84, and it has inclined portion 86 which is contiguous to the coin-intercepting portion 84. A weight 88 is secured to the feeler wire 82, and that weight biases the coin-intercepting portion 84 of that wire for movement into the passageway defined by the gate 30 and the center wall of the frame 20.

Two vertically-directed openings 101 are formed in the gate 30 and those openings are in vertical alignment with each other. The lower of the openings 101 is in register with the coin-intercepting portion 84 of the feeler wire 82; and the weight 88 will normally hold the coin-intercepting portion 84 of the wire 82 in the lower opening 101. That coin-intercepting portion can be moved out of the passageway between the gate 30 and the center wall of the frame 20, and out of the lower opening 101, by the engagement of the lever 66 with the inclined portion 86 of the feeler wire 82. This inclined portion 86 will act as an inclined plane and ease the coin-intercepting portion 84 of the feeler wire 82 out of the passageway. However, when the lever 66 rotates in a counter clockwise direction, as that lever is viewed in Fig. 1, that lever will move out of engagement with the inclined portion 86 of the feeler wire 82 and will thus permit the weight 88 to force the coin-intercepting portion 84 of that wire into the passageway. When the coin-intercepting portion 84 is in the passageway, it will feel the surface of the coins that are in the passageway and are being guided by the coin-receiving surface 68 of the lever 66.

An inclined surface 90 is provided on the upper edge of the gate 30, and that surface inclines outwardly and upwardly from the center wall of the frame 20. This inclined surface tends to coact with the center wall of the frame 20 to define a coin-receiving entrance for the passageway between the gate 30 and the center wall of the frame 20. A guiding flange 92 is formed on the free edge of the gate 30 below the level of the inclined portion 90. This flange will guide coins which moves downwardly past the inclined portion 90. The flange 92 is arcuate in configuration, and it is spaced from the pin 35 a distance slightly greater than the diameter of authentic coins. As a result, the pin 35 will coact with the guiding flange 92 to permit coins that have a diameter closely approximating the diameter of an authentic coin to enter the passageway between the gate 30 and the center wall of the frame 20; but that pin will coact with that flange to keep grossly over-size coins from entering that passageway. For example, if the coin separator of the present invention were to be used to measure and accept United States nickels, the spacing between the pin 35 and the flange 92 should be slightly greater than the average diameter of United States nickels. While United States nickels are intended to be of a fixed diameter, variations in manufacture and subsequent wear can vary the diameters of individual nickels.

The numeral 96 denotes a small stationary element that is secured to the rear face of the gate 30 and which extends toward the center wall of the frame 20. This stationary element is rectangular in cross section and it will thus have sharp corners. The stationary element 96 is adjacent the pivot 64, as indicated particularly in Fig. 4. The sides of the stationary element 96 are set at an angle to the top and bottom and sides of the frame 20; and the left-hand face of that stationary element, as viewed in Fig. 4, is generally perpendicular to a line between the pivot 64 and the coin-receiving surface 68 of the lever 66 whenever that coin-receiving surface is in its normal position. The left-hand face of the stationary element 96, as that element is viewed in Fig. 4, will serve as a coin-receiving surface.

It will be noted that the pivot 64 is disposed below the level of the coin-receiving surface of the stationary element 96, and that it is spaced to one side of that coin-receiving surface. As a result, the coin-receiving surface on the stationary element 96 is intermediate the pivot 64 and the coin-receiving surface 68 on the lever 66 whenever that lever is in its normal position, as shown in Figs. 1, 3, 4, and 7. Because the pivot 64 and the coin-receiving surface on the stationary element 96 are not coincident, the coin-receiving surface 68 on the lever 66 will not rotate with the coin-receiving surface on the element 96 as its center of rotation; instead it will rotate about the pivot 64. The distance between the pivot 64 and the coin-receiving surface 68 on the lever 66 will, of course, be fixed and will remain unchanged as the coin-receiving surface 68 rotates. However, the distance between the coin-receiving surface 68 on the lever 66 and the coin-receiving surface on the stationary element 96 will change as the coin-receiving surface 68 rotates about the pivot 64. As the lever 66 rotates in a counter-clockwise direction, as that lever is viewed in Fig. 4, the distance between the two coin-receiving surfaces will become progressively greater; and the distance between those surfaces will be greatest when the coin-receiving surface 68 is adjacent the lower end of the slot 62.

A stripper plate 98 is carried by the gate 30. This

plate has fingers 100 that are disposed adjacent openings 101 in the gate 30, and it has pivots 102 that are disposed in openings 104 in the gate 30. The stripper plate 98 will have the pivots 102 thereof held in the openings 104 by a leaf spring 106 which is suitably secured to the gate 30, as by a rivet 107. Whenever desired, the spring 106 can be bent sufficiently to displace the pivots 102, of the stripper plate 98, from the openings 104; but under normal operating conditions, the springs 106 will hold the pivots 102 continuously in the openings 104. The fingers 100 of the plate 98 will normally be in register with the openings 101 but will not normally be disposed in those openings. The openings 101 will be wide enough that the lower of those openings can receive the coin-intercepting portion 84 of feeler wire 82 while also receiving the lower finger 100, whereby the feeler wire 82 can move freely relative to the gate 30 and the stripper plate 98.

The point of engagement between the leaf spring 106 and the stripper plate 98 is disposed to the left of the pivots 100, as that stripper plate is viewed in Fig. 1. Accordingly, that spring applies a force to the stripper plate 98 which tends to urge the fingers 100 toward the gate 30. The fingers 100 will not ordinarily move into the openings 101 in the gate 30 because a notch 105 in the plate 98 fits a reduced neck portion 110 on a pin 108 that is secured to the center wall of the frame 20; and the portion of the plate 98 which defines the notch 105 will engage the inner shoulder adjacent the reduced diameter portion 110 and thus limit the inward movement of the left-hand end of the stripper plate 98. The outer shoulder adjacent the reduced diameter portion of the pin 108 will limit outward movement of the left-hand end of the stripper plate 98; and thus the stripper plate will be confined to a limited path of movement. When the gate 30 is rotated away from the center wall of the frame 20, as indicated particularly in Fig. 5, the spring 106 will resist any corresponding movement of the stripper plate 98; and the openings 101 in gate 30 will telescope over the fingers 100 of that stripper plate. If the outward movement of the gate 30 is further continued, the pivot bracket 72 or some other element carried on the gate 30 will engage the rear face of the stripper plate 98 and urge that stripper plate to move with the gate 30. This movement of gate 30 can be tolerated for the length of the reduced diameter portion 110 of the pin 108; but thereafter the portion of the plate 98 that defines the notch 105 will engage the outer shoulder adjacent the portion 110 on pin 108 and halt further outward movement of the stripper plate 98 and of the gate 30. At such time, the fingers 100 will extend through the openings 101 in the gate 30 and will strip off any coin which tends to move outwardly with that gate during the scavenging operation.

An opening 112 is provided in the gate 30 to accommodate the pin 108 which is secured to the center wall of the frame 20. This opening is large enough to permit movement of the gate 30 about the pivot pin 28 without any binding on the pin 108.

Under normal operating conditions, the fingers 100 of the stripper plate 98 will be disposed outwardly of the passage defined by the gate 30 and the center wall of the frame 20, but during scavenging operations the gate 30 will be moved away from the center wall of the frame 20 and the openings 101 in that gate will telescope over the fingers 100 of the stripper plate 98. Those fingers will thus force any coin which may be adhering to the gate 30, or that is carried by that gate 30, to drop away from that gate.

A generally spherical recess 114 is formed in the rear surface of the gate 30, and that recess is in register with a cam 116. The cam 116 is secured to a pressure plate 122 that rotates about a pivot 120 which is supported on the center wall of the frame 20. A spring 126 bears against a bolt 128, which serves as a stop for the spring 126; and that spring extends around pivot 120 and bears against the horizoneal flange at the top of the pressure plate 122. The spring 126 tends to rotate the pressure plate 122 to the position shown in Fig. 3, but it can be overcome by a downward force on the horizontal flange at the top of the pressure plate 122. An arcuate slot 130 is proved in the center wall of the frame 20 to accommodate the cam 116. Thus, a downward force on the horizontal flange at the top of the pressure plate 122 will result in a counter clockwise rotation of the pressure plate 122, as that pressure plate is viewed in Fig. 3; and such rotation will move the cam 116 downwardly in the slot 130. A wiper blade 118 is provided for the coin-separator, and that wiper blade is pivoted about the pin 108. The wiper blade can be rotated about the pin 108 into the passageway defined by the gate 30 and the center wall of the frame 20. Normally, however, the wiper blade is held above that passageway and is only moved through that passageway when the pressure plate 122 is forced to move downwardly. A lost motion connection, not shown, is provided between the cam 116 and the wiper blade 118 so the cam can start to move before the wiper blade begins to move.

The cam 116 is in register with the recess 114 on the gate 30, and when it is disposed in that recess the gate 30 can be held closely parallel to the center wall of the frame 20. However, when the cam 116 is moved downwardly, as when the pressure plate 122 is depressed, the cam 116 acts against the wall of the recess 114 and drives the gate 30 outwardly and away from the center wall of the frame 20. Thereafter, the wiper blade moves into the passageway between the gate 30 and the center wall of the frame 20 and wipes away any coins which are held between the magnet keeper 38 and the magnet 46. The wiper blade is normally held against the off-set of the magnet keeper 38 by the spring 126 and the cam 116, and thus is normally out of the path of coins rolling past the magnet 46.

A rejected coin chute 132 is disposed below the gate 30, and it is in register with a coin-intercepting area that is defined by the coin-receiving surfaces on the lever 66 and on the stationary element 96. This rejected coin chute is below the path of movement of the coin-receiving surface 68 on the lever 66, and it can receive coins that are not carried past it by the coin-receiving surface 68. The numeral 134 denotes an accepted coin chute, and that chute is indicated by dotted lines in Fig. 1. This accepted coin chute is beyond the lower end of the runway 48 and is beyond the magnet 46.

The lever 66 is formed so the distance between the pivot 64 and the coin-receiving surface 68 of that lever is greater than the diameter of authentic coins to be accepted by the coin separator of the present invention. The pivot-supporting bracket 72 is then made so the pivot 64 is displaced below and on the far side of the coin-receiving surface of the stationary element 96, whereby the coin-receiving surface on the stationary element 96 is between the pivot 64 and the coin-receiving surface 68 on the lever 66.

The set screw 78 is loosened so the pivot-supporting bracket 72 can be rotated about the pin 74; and thereafter a perfectly sized coin of the desired denomination is placed in engagement with the coin-receiving surface on the stationary element 96. That coin is then slowly forced downwardly to cause the lever 66 to rotate about the pivot 64. After the lever 66 has rotated approximately fifty-one or fifty-two of the approximately sixty-four degrees of its path of travel, the spacing between the coin-receiving surface 68 and the left-hand face of the stationary element 96, as that element is viewed in Fig. 4, should just equal the diameter of that perfectly sized coin. However, if that spacing does not closely approximate the diameter of that coin, the pivot 72 should be rotated about the pin 74 to make that spacing

equal the diameter of that coin. Once the desired spacing has been attained, the set screw **78** can be tightened to lock the pivot-carrying bracket **72** against further rotation about the pin **74**. A gauging disc, which has been machined to have the desired diameter, can be used in lieu of a perfectly sized coin to check the setting of the pivot bracket **72**. Such a gauging disc is desirable since minted coins vary due to manufacturing tolerances and wear. For example the diameter of the United States nickels can vary from eight hundred and thirty thousandths of an inch to eight hundred and thirty-five thousandths of an inch. By using a gauging disc which has a diameter that is about half way between the two ranges of coin size anticipated, it is possible to attain very precise setting of the pivot-supporting bracket **72**.

Where a gauging disc with a diameter of eight hundred and thirty-three thousandths of an inch is set so the coin-receiving surfaces **68** will release that disc at an angle of approximately fifty-one degrees, that coin-receiving surface will release nickels which have a diameter of eight hundred and thirty thousandths of an inch at about forty degrees and will release nickels with a diameter of eight hundred and thirty-five thousandths of an inch at about fifty-eight degrees. Any coins, slugs or washers that have diameters which are less than eight hundred and thirty thousandths of an inch will be released by the coin-receiving surface **68** before that surface has traveled over forty degrees. These figures are based on an over all length of travel of the lever **66** of approximately sixty-four degrees; and, therefore if a different angular length of travel was used, these figures would have to be changed proportionately.

In one preferred embodiment of the present invention, each side of the element **96** was ninety-three thousandths of an inch long, the distance between the axis of pivot **64** and the inner edge of the coin-receiving surface **68** was eight hundred and forty-nine thousandths of an inch, the sides of the element **96** were shifted about fifteen degrees from the directions defined by the sides of frame **20**, and the pivot **64** was set inwardly of and below the level of the coin-receiving surface on element **96** so the initial distance between the coin-receiving surface **68** and the coin-receiving surface on element **96** was eight hundred and twenty thousandths of an inch and so the final distance between the coin-receiving surface **68** and the coin-releasing surface on element **96** was eight hundred and forty-two thousandths of an inch. That embodiment of the present invention accepted coins in the diameter range of eight hundred and twenty-five thousandths to eight hundred and forty thousandths of an inch, and rejected all other coins; thereby accepting substantially all United States nickels and rejecting substantially all other coins, slugs or washers. To enable prior coin-sizing gauges to accept substantially all United States nickels, those gauges had to be set to accept coins in the diameter range of eight hundred and ten thousandths to eight hundred and fifty-five thousandths of an inch; and when so set, those gauges permitted an objectionable number of spurious coins, slugs and washers to be accepted.

Once the spacing of the pivot **64** relative to the coin-receiving surface of the stationary element **96** has been established and fixed, the coin separator is ready to receive coins. If unduly large coins are introduced into the opening defined by the center wall of the frame **20** and the inclined portion **90** of the gate **30**, those coins will strike the upper edge of the guiding flange **92** and will strike the over-size pin **35**; and those coins will be held by the flange **92** and the pin **35**. Coins which are small enough to pass between the flange **92** and the pin **35** will fall toward the coin-receiving surface **68** on the lever **66** and toward the coin-receiving surface on the stationary element **96**. If a coin is too small to be held by these coin-receiving surfaces, that coin will fall directly downwardly to the rejected coin chute **132**. Thereafter, it will be led to a discharge point where the customer can retrieve same. If a coin is large enough to be held by the coin-receiving surfaces on lever **66** and element **96**, and if that coin is of the proper weight, it will force the coin-receiving surface **68** to move downwardly about the pivot **64**. As that coin-receiving surface moves downwardly, the distance between that surface and the coin-receiving surface on the stationary element **96** will increase. If the coin is within the diameter range established for authentic coins, the increase in the spacing between the coin-receiving surfaces will not be great enough to release that coin until after that coin has been moved to a position where it can fall onto the runway **48**. Thus, the increase in the spacing between the coin-receiving surfaces will not release a coin with a diameter in the predetermined range of diameters until after the coin-receiving surface **68** has traversed over half of its path, and thereby carried the coin past the rejected coin chute **132**. If a coin is large enough to move the coin-receiving surface **68** but is smaller than the prescribed range of diameters, the coin-receiving surface **68** will move downwardly a short distance only, as indicated in Fig. 8, and will then release that coin. Thereupon that coin will fall downward into the rejected coin chute **132**; and the path of one such coin is indicated by the dashed line in Fig. 8. Where a coin has the proper diameter, it will be carried to a point where it can fall onto the runway **48** and roll past the magnet **46**, as indicated particularly in Fig. 9. Where a coin is larger than the prescribed range of diameters; it will either fall off of the back edge of the coin-receiving surface **68** as that surface approaches the bottom of the slot **62**, or it will continue to be held by the coin-receiving surfaces. Thus, in the preferred embodiment of the present invention described above, a coin that had a diameter of eight hundred and forty-one thousandths of an inch would not be released by the coin-receiving surfaces since those surfaces were set to define a distance no greater than eight hundred and forty thousandths of an inch. When the movable coin-receiving surface **68** has moved to the lower end of the slot **62** but has not been able to release a coin carried thereby, that coin-receiving surface will respond to the bias of weight **70** and start back toward its normal position. The weight **70** will be able to start the lever **66** and the surface **68** thereon back to their initial positions even though the weight of the coin opposes that movement, because the effective length of the moment arm of the weight **70** is a maximum when the surface **68** is adjacent the lower end of slot **62**, and because the initial downward momentum of the coin has been dissipated. As the lever **66** and the surface **68** start to return to their initial positions, under the influence of weight **70**, they will tend to decrease the distance between the coin-receiving surface **68** and the coin-releasing surface of element **96**; but since the oversize coin is still being carried by the coin-receiving surface **68**, that coin will halt further movement of lever **66**, and lever **66** will jam that coin against accidental dislodgment. That coin can, however, be freed for movement to the rejected coin chute **132**, as by pressing downward on the pressure plate **122** in the scavenging operation. The downward pressure plate **122** will move the gate **30** away from the center wall of the frame **20** and will enable the fingers **100** of stripper plate **98** to push the coin out of engagement with lever **66** and element **96**, whereupon that coin will fall to the rejected coin chute **132**.

Where a coin is less than eight hundred and twenty-five thousandths of an inch in diameter, that coin may cause the lever **66** to rotate, but the distance between the coin-receiving surface **66** and the coin-receiving surface on the stationary element **96** will quickly increase to the value of the diameter of that coin. When this happens, the lever **66** will be so far from the runway **48** that the coin will not be able to reach that runway; instead it will fall downwardly into the riejected coin chute **132**. Coins which have diameters that are larger than eight hundred

and forty thousandths of an inch will either be held between the coin-receiving surface **68** and the coin-releasing surface on the element **96** or will roll backwardly off of the rear edge of the coin-receiving surface **68** and fall into the rejected coin chute **132**. Consequently, only those coins which are in the range of eight hundred and twenty-five thousandths to eight hundred and forty thousandths of an inch will be directed into the accepted coin chute.

To reach the accepted coin chute **134**, the coin must roll along the runway **48** and past the magnet **46**. Magnetic lines of force will be generated in the coin by the magnet **46**, and those lines of force will create eddy currents in that coin. The greater the electrical conductivity of the coin, the greater the strength of the eddy currents. These eddy currents, in turn, will create a magnetic field which will coact with the magnet **46** to retard the rate of rolling of the coins. If the coin has the desired electrical conductivity, it will follow the path indicated by a dashed line in Fig. 1 and will reach the accepted coin chute **134**. If the electrical conductivity of the coin is not of the proper value, the coin will either be retarded too much or too little and will fall into the rejected coin passageway **136**. This passageway connects with the rejected coin chute **132**. If the coin is of magnetic material, it will be stopped and held by the magnetic field from the magnet **46**. If a coin is held by the magnet **46**, it is a simple matter to scavenge that coin out of the coin passageway, as by pressing downwardly on the pressure plate **122**.

The lever **56** has a coin-intercepting surface **58** thereon, which is adjacent the upper end of the runway **48**. This surface will prevent coins from being deflected into the accepted coin passageway when those coins are supposed to fall to the rejected coin chute **132**. For example, if an undersize coin were to fall through the coin-intercepting area defined by the coin-receiving surfaces, that coin might tend to reach the runway **48** and roll past the magnet **46**. This is particularly likely if the coin first strikes the coin-receiving surface **68** and then bounds toward the runway **48**. Any such coin would be blocked against movement along the runway **48** by the coin-intercepting surface **58**.

The coin intercepting surface **58** does not interfere with the rolling of coins of the proper size along the runway **48**, because the lever **66** will engage the ear **60** on the lever **56** when the lever **66** rotates in a counter clockwise direction, as that lever is viewed in Fig. 1. The ear **60** is in register with the weight **70** and will be lifted upwardly by that weight when the coin-receiving surface **68** approaches the coin-releasing position. The rounded surface of the weight **70** provides a very easy and frictionless engagement between the ear **60** and the weight **70**. Thus, whenever a coin is about to be released by the lever **66**, as that lever approaches the lower end of the slot **62**, the coin-blocking projection **58** will be out of the passageway for the coin. Once the coins have passed by the position of the coin-blocking projection **58**, that projection will return to coin-blocking position under the gravitational forces acting on the lever **56**. The lever **56** will be permitted to move downwardly when the lever **66** is moved back to normal position by weight **70**. While in that position, the coin-intercepting projection **58** can reject the undersize coins introduced into the coin separator, and thus prevent acceptance of such coins.

If a washer, that has a diameter within the range of diameters for which the coin separator of the present invention is set, is introduced into that coin separator, the coin-receiving surface **68** will guide that washer past the lower opening **101**. As the lever **66** rotates during this movement, the inclined portion **86** of the feeler wire **82** will be freed from its engagement with the lever **66**, and thereupon the weight **88** will tend to force the coin-intercepting surface **84** of that feeler into the passageway. The positioning of the lever **66** and the inclined portion **86** of the feeler **82** is such that the coin-intercepting surface **84** of the feeler **82** will engage the washer at a series of points along an arcuate line which is spaced inwardly from the periphery of that washer. As a result, the coin-intercepting reentrant portion **84** of the feeler **82** will enter the opening in the washer and will stop further movement of that washer toward the runway **48**. The weight **70** will have had a certain amount of momentum created within it, and that momentum, together with the momentum of the rest of the lever **66**, will cause that lever to move even further in the counter clockwise direction, as that lever and weight are viewed in Fig. 1; but shortly thereafter the gravitational forces on the weight **70** will stop counter clockwise rotation of the lever **66** and will cause that lever to rotate in a clockwise direction. As the lever **66** starts to move in a clockwise direction, the edge of that lever will engage the inclined portion **86** of the feeler wire **82**, and will again move the coin-intercepting portion **84** out of the passageway between the gate **30** and the center wall of the frame **20**. As the coin-intercepting portion of the feeler wire is moved out of that passageway, the washer will tend to fall directly downwardly toward the rejected coin chute. If the washer is of the same diameter as an authentic coin, that washer will be able to pass through the area defined by the coin-receiving surface **68** and the coin-releasing surface on the element **96** and fall to the rejected coin-chute **132**. That washer will not fall toward the runway **48** because its momentum toward that runway was eliminated by the interception of that washer by the feeler wire **82**. The dominant force on the washer, when it is released by the feeler wire **82**, will be the gravitational force; and the washer will respond to that force to drop into the rejected coin-chute **132**. If the washer is larger than an authentic coin, it will be held by the coin-receiving surfaces and can then be released for movement to the rejected coin chute **132** by a scavenging operation. Most washers that persons use in trying to operate vending machines are closely similar in diameter to authentic coins; and all such washers will be initially held by the feeler **82** and will then be automatically permitted to drop to the rejected coin-chute **132** as the lever **66** tends to return to its initial position. This is very advantageous because it avoids the need of a great number of scavenging operations.

The coin-sizing gauge provided by the present invention can be used on various United States coins and various coins of foreign countries. To enable the coin-sizing gauge to accept and reject coins of different denominations, it is only necessary to dimension the lever **66** so the distance between the pivot **64** and the coin receiving surface **68** is slightly greater than the predetermined range of the diameters. Once the lever **66** has been properly dimensioned it is a simple matter to fit it to a gate that can accommodate it.

The stripper plate **98** will ordinarily remain in assembled relation with the gate **30**. However, when it is desired to separate that plate from that gate, it is only necessary to distort the spring **106** slightly and lift the pivots **102** out of the openings **104** and to slide the plate **98** upwardly until the portions that are in register with the shoulders on the pin **108** are out of register with those shoulders. Thereafter, the stripper plate can be moved completely out of register with any part of the gate **30**, and that gate can then be rotated freely about the pivot pin **28**.

The coin-sizing gauge provided by the present invention can be set so it has a range of accepted diameters which is much closer to the range of diameters of authentic coins than the range of any prior coin-sizing gauge could be. This is very advantageous because it enables the coin-sizing gauge of the present invention to accept substantially all authentic coins and yet reject substantially all spurious coins. Where a number of

such coin-sizing gauges are provided for the coins of various denominations to be introduced into the coin separator, the maximum acceptance of authentic coins can be coupled with the maximum rejection of spurious coins.

In Figs. 12 and 13, the numeral **136** denotes a frame which has vertically directed flanges **138** at each side thereof. These flanges support a rod **140** that serves as a pivot. A gate **142** is provided with ears **144**, and those ears have openings which telescope over the pivot **140**. Hence, the gate **142** can rotate about the pivot **140** relative to the center wall of the frame **136**. A spring **146** is wound around the pivot **140** and one end of that spring bears against the gate **142**. The other end of that spring bears against a lug **148** on one of the flanges **138** of the frame **136**. The spring **146** biases the gate **142** for rotation toward the center wall of the frame **136**.

A plate **152** is secured to the center wall of the frame **136**, and that plate coacts with the right hand flange **138**, as the flanges are shown in Fig. 13, and with the center wall of the frame **136** and with the gate **142** to define a coin entrance. A runway **154** is mounted on the gate **142** below and in direct registry with the coin entrance. This runway has a chamfer on the upper surface thereof to minimize bouncing of coins striking that runway. A vertically-directed stop **156** is mounted on the gate **142** at a point beyond the left hand end of the runway **154**, as that runway is viewed in Fig. 13. This stop has a chamfered edge thereon to minimize bouncing of coins that strike it, and that stop will prevent over travel of coins leaving the runway **154**. A pin **158** is mounted on the gate **142** below and to the right of the stop **156**, as that pin is viewed in Fig. 13. The upper surface of the pin **158** is chamfered to minimize the bouncing of coins striking that pin.

A pivot pin **160** is mounted on the gate **142**, and that pin extends rearwardly from the gate. The pin **158** and the pivot pin **160** are disposed on opposite faces of the gate **142**. A pivot bracket **162** is disposed at the rear face of the gate **142**, and that bracket has a notch which engages and can rotate relative to the pivot pin **160**. A slot **164** is provided in the opposite end of the pivot bracket **162**, and a screw **166** extends through the slot **164** and seats in the gate **142**. The screw **166** can be tightened to hold the pivot bracket **162** against rotation about the pivot pin **160**, but it can be loosened to permit such rotation. The pivot bracket **162** provides the same adjustability that the pivot bracket **72** of Figs. 1–4 provides.

A pivot **168** is mounted on the pivot bracket **162** and can move with that pivot bracket. The pivot **168** rotatably supports a generally V-shaped lever **170**. That lever has a coin-receiving surface **172** extending transversely thereof, and that surface is at one end of the lever **170**. A weight **174** is secured to the lever **170** adjacent the bottom of the V defined by that lever. The other end of the lever **170** is rotatably mounted on the pivot **168**. The lever **170** is very similar to the lever **66** of Figs. 1–10.

A runway **176** is mounted on the gate **142** below and to the left of the lever **170**, as that lever is viewed in Fig. 13. The runway **176** has a downwardly directed guide portion **178** at one end thereof and has a downwardly directed stop portion **180** intermediate the ends thereof. A divider **182** is secured to the gate **142** at a point to the right of the runway **176**, as that runway is viewed in Fig. 13. The divider **182** has a runway portion **184** thereon, and that runway portion extends to the left of the divider portion **182**. The runway **176** and its guide portion and its stop portion are chamfered to minimize bouncing of coins. Similarly, the divider **182** and the runway portion thereof are chamfered to minimize the bouncing of coins. A pin **186** is mounted on the gate **142** between the stop portion **180** of the runway **176** and the runway portion **184** of the divider **182**. This pin is similar to the pin **158** and it has its upper face chamfered.

A pivot pin **188** is mounted on the gate **142** and that pin extends rearwardly from that gate. The pivot pin **188** is similar to the pivot pin **160**. A pivot bracket **190**, similar to the pivot bracket **162**, is mounted so it can rotate about the pivot pin **188**. A slot **192** in the end of the pivot bracket **190** can receive a screw **194**. This screw, like the screw **166**, can be used to permit or halt rotation of the pivot bracket. A pivot **196** is mounted on the pivot bracket **190**, and that pivot is comparable to the pivot **168**. A generally V-shaped lever **198**, comparable to the lever **170**, is mounted on the pivot **196**. That lever has a transverse coin-receiving surface **200** and it has a weight **202**.

A chamfered guide **204** is provided on the front surface of the gate **142**, a divider pin **206** is also provided on the front of the gate **142** as is a divider **208**. The divider **208** is chamfered. A guide **210**, that is chamfered, is provided on the front face of the gate **142**. The guides **204** and **210** are spaced on opposite sides of the dividers **206** and **208**, and the guides and dividers **204** and **210** and **206** and **208** are located adjacent the lower edge of the gate **142**.

A stripper plate **212** is provided with ears **214**, and those ears telescope over the pivot **140**. Hence, the stripper plate **212** can rotate relative to the center wall of the frame **136** and relative to the gate **142**. The upper end of the stripper plate **212** is cut away, as at **213**, to avoid striking the plate **152**.

The stripper plate **212** has a slot to accommodate the runway **154**, it has a slot **218** to accommodate the stop **156** and the pin **158**, it has an arcuate slot **220** to accommodate the coin-receiving surface **172** on the lever **170**, it has a slot **222** to accommodate the runway **176** and the pin **186**, it has a slot **224** to accommodate the divider **182** and it has a slot **226** to accommodate the coin-receiving surface **200** on the lever **198**. In addition, the stripper plate **212** has notches **228**, **230**, **232** and **234** to accommodate the guide **204**, the pin **206**, the divider **208** and the guide **210** respectively. The various slots and notches in the stripper plate **212** will normally telescope over the runways, stops, dividers and pins and will enable the stripper plate to bear against the front face of the gate **142**. However, those notches and slots will also permit movement of the gate **142** away from the stripper plate **212**.

A vertically-directed slot **240** is provided in the stripper plate **212** adjacent the upper end of that stripper plate. A pin **242** is mounted on the center wall of the frame **136** in register with but below the opening **240** in the stripper plate **212**. A washer **244** is carried by the pin **242** and it extends radially outwardly from that pin. An elongated plate **246** with transversely bent upper and lower ends, has a slot **248** therein. That slot telescopes over the pin **242** and permits movement of the plate **246** relative to that pin. A pin **250** is mounted on and is movable with the plate **246**. A helical spring **252** engages the pins **242** and **250** and biases the plate **246** for movement upwardly. However, that spring can yield to permit downward movement of the plate **246**. The upper end of the slot **248** in the plate **246** will limit the downward movement of that plate. A cam **254** is carried by the plate **246**, and it extends through an opening in the center wall of the frame **136** and through the opening **240** in the stripper plate **212**. That cam can bear against the inclined upper portion of the gate **142**. When the plate **246** is moved downwardly, as by pressing downwardly on the upper bent end of that plate, the cam **253** will move downwardly and engage the gate **142**. Such engagement will force the gate **142** to rotate about the pivot **140**. This movement of the gate **142** will tend to cause the stripper plate **212** to move away from the center wall of the frame **136** because a spring **245** encircles a pin carried by the stripper plate **212** and also bears against a washer **243** on that pin. This spring tends to drive the gate **142** against the stripper plate, and thus the stripper plate tends to move with the gate. However, the stripper plate **212** has ears **236** at the opposite edges

thereof, and those ears extend into slots 238 in the flanges 138. The slots 238 permit limited movement of the ears 236, and thus of the stripper plate 212, but they will eventually halt movement of the stripper plate 212. Thereafter, continued downward movement of the cam 254 will force the gate 142 to move away from the stripper plate 212. The spring 245 will yield to permit that movement. The final moved positions of the stripper plate 212 and of the gate 142 are shown by dashed lines in Fig. 12. The gate 142 and the stripper plate 212 will move together until the stripper plate reaches the moved position indicated by dashed lines in Fig. 12, and thereafter the gate 142 will continue to move to its moved position as indicated by dashed lines in that figure. A holding plate 256 is secured to the center wall of the frame 136 by a pin 257. That pin extends through a slot, not shown, in the plate 246; and that slot permits the plate 246 to reciprocate relative to the pin 257. The holding plate 256 maintains the plate 246 in intimate engagement with the center wall of the frame 136 but does not bind that plate against movement relative to that center wall.

A rod 258 extends through and is supported by the flanges 138 on the frame 136. This rod serves as a pivot for an elongated deflector bar 260. This bar has arms which extend up to and telescope over the ends of the pivot 258. A spring 262 encircles the pivot 258 and biases the deflector bar for movement to the position shown by solid lines in Fig. 12. However, that spring can yield to permit movement of the deflector bar 260 to the position shown by dotted lines in Fig. 12. In moving to the position indicated by dotted lines in Fig. 12, the bar 260 enters slots 261 that are formed in the flanges 138 to receive that bar. The plate 246 can be moved downwardly to force the deflector bar 260 from the solid line position of Fig. 12 to the dotted line position of that figure. Release of downward pressure on the plate 246 will enable the spring 252 to pull the plate 246 upwardly and permit the deflector bar 260 to return to the position shown by solid lines in Fig. 12. An ear 263 is provided on the right hand flange of the frame 136, so that frame is viewed in Fig. 13, and that ear receives one end of the spring 262. The other end of that spring bears against the right hand end of the deflector bar 260.

Two transversely extending plates 264 and 266 are spaced from and rearwardly of the center wall of the frame 136. These plates are secured to and are supported by the flanges 138 of the frame. The plate 264 coacts with the center wall of the frame to define an accepted coin area while the plates 264 and 266 coact together to define a rejected coin area. The deflector plate 260 normally permits coins to move downwardly to the accepted coin area defined by the plate 264 and the center wall of the frame 136, but it can be moved to the dotted position of Fig. 12 to deflect coins to the rejected area between the plates 264 and 266.

The levers 170 and 198 of Figs. 12 and 13 operate in substantially the same manner that the lever 66 of Figs. 1–11 operates. The pivots 168 and 196 for those levers are spaced to the left of the right hand faces of the pins 158 and 186. Hence, as those levers rotate, the distance between the coin-receiving surfaces 172 and 200 and the pins 158 and 186 respectively increases. Hence, those levers can serve as coin sizing gauges.

The coin separator of Figs. 12 and 13 can receive five coins as for example, the United States penny, nickel, dime, quarter, and half dollar. Each of these coins will be introduced into the coin entrance and will fall downwardly and strike the runway 154. Thereafter the coins will roll down by gravity until they reach and fall off the left hand end of that runway. In the event any of those coins tend to go too far, they will strike and be restrained by the stop 156. The coins will fall downwardly toward the lever 170, and the quarter and half dollar will be initially held by the coin receiving surface 172 and the pin 158. The penny, nickel and dime will fall between the coin-receiving surface 172 and the pin 158 and will not rotate the lever 170. A quarter will cause the lever 170 to rotate in a clockwise direction and the coin-receiving surface 172 will guide that quarter until it is released for movement to the runway 176. That quarter will roll along the runway 176 until it reaches the end of that runway and will then fall downwardly and be guided by the guide portion 178 and by the guide 210. The half dollar will be unable to pass between the coin-receiving surface 172 and the pin 158, even when the lever 170 has rotated to the end of its path of rotation. Hence that half dollar cannot reach the runway 176. Instead, that half dollar will roll backwardly off of the coin-receiving surface 172 after the lever 170 has rotated through just a part of its path of rotation. As the half dollar rolls off the back of the coin-receiving surface 172, it will fall to the right of the divider 182. This divider will guide the half dollar downwardly as will the guide 204.

The penny, nickel and dime which fell between the coin-receiving surface 172 and the pin 158 will strike the runway portion 184 of the divider 182. Those coins will then roll along that runway until they reach and fall off of the left hand end of that runway portion. In the event any of those coins tend to go too far, they will strike and be restrained by the stop 180. If a penny rolls along the runway 184, that penny will fall downwardly and be initially held by the coin-receiving surface 200 and the pin 186. That coin will cause the lever 198 to rotate and will be carried beyond the divider 208. At the time the lever 198 releases the penny, it will be able to continue to the space defined by the guide 210 and the divider 208.

If a nickel strikes the runway 184, it will roll along that runway and fall toward the lever 198. That nickel will be initially held by the coin-receiving surface 200 and by the pin 186, and it will force the lever 198 to rotate in a clockwise direction. However, the nickel will be too large to move between the coin-receiving surface 200 and the pin 186, even when the lever 198 is rotated to the full extent of its path of rotation. Hence, the nickel will not be able to reach the space defined by the space 210 and the divider 208. Instead, the nickel will roll off of the back side or outer edge of the coin-receiving surface 200 and will fall into the area defined by the divider pin 206 and the guide 204.

When a dime strikes the runway portion 184 of the divider 182, that dime will roll along the runway portion 184 until it reaches and falls off the end of that runway portion. That dime will be able to fall directly between the coin-receiving surface 200 and the pin 186. In doing so, that coin will fall into the area defined by the divider pin 206 and by the divider 208.

Hence, the coin separator of Figs. 12 and 13, is able to separate five coins with just two coin-sizing gauges.

In the event a coin is held between the center wall of the frame 136 and the stripper plate 212, that coin can be scavenged to the rejected coin area by pushing downwardly on the bent upper end of the plate 246. Such downward pushing will first rotate the deflector bar 260 from the position shown in solid lines in Fig. 12 to the position shown in dotted lines. When the deflector bar 260 is in the position shown by dotted lines in Fig. 12, it underlies the coin passages between the stripper plate 212 and the center wall of the frame 136 and will force all coins to move to the rejected coin area defined by the plates 264 and 266. Shortly thereafter, the cam 254 will strike the inclined upper portion of the gate 142 and force that gate to rotate in a counterclockwise direction about the pivot 140. The spring 245 will cause the stripper plate 212 to move with the gate 142 and will thus enlarge the passageway between that stripper plate and the center wall of the frame 136. After the ears 236 on the stripper plate 212 have reached the end of the slots 238 in the flanges 138, the stripper plate 212

will be held against further movement away from the center wall of the frame 136. However, the gate 142 will continue to move away from the center wall of the frame 136 and will thus withdraw the runways, the stops and the guides and the pins from the complementary openings in the stripper plate 212. When this happens, there will be no support for coins between the stripper plate 212 and the center wall of the frame 136, and those coins will slide downwardly, strike the deflector bar 260, and then fall into the rejected coin area between the plates 264 and 266. At the conclusion of the scavenging operation, the plate 246 can be released and the spring 252 will return it to its normal position. Furthermore, the spring 146 will restore the gate 142 and the stripper plate 212 to their normal positions.

In Fig. 14 the numeral 268 denotes a frame which has vertically directed flanges 270 at each edge thereof. That frame has two plates 272 adjacent the upper end thereof and those plates are horizontal.

A gate 274 is provided with ears 276, and those ears telescope over a pivot 278 which extends between and is supported by the flanges 270 of the frame. This pivot permits the gate 274 to rotate relative to the frame. A runway 280 is provided on the gate 274 and a stop 282 is provided on the gate in spaced relation to the runway 280. A pin 284 is mounted on the gate 274 intermediate the stop 282 and the runway 280.

A pivot 286 similar to the pivot pins 160 and 188 of Figs. 12 and 13 is formed on the rear face of the gate 274. A pivot bracket 288, similar to the pivot brackets 162 and 190 of Figs. 12 and 13 is provided with a notch that receives the pivot pin 286. The pivot bracket 288 has a slot 290 and a screw 292 extends through the slot 290 and can be tightened to prevent rotation of the bracket 288 about the pivot 286. A lever 294, comparable to the lever 66 of Figs. 1–11 is secured to the bracket 288 by a pivot, not shown. The lever 294 has a coin-receiving surface 296 and a weight 298.

A divider 300 is mounted on the gate 274 below the pin 284, and a guide 302 is mounted on the gate 274 below and in register with the divider 300. Two dividers 320 and 322 are also formed on the gate 274. The runway 280, the stop 282, the pin 284, the divider 300 and the guide 302 are chamfered. This chamfering minimizes bouncing of the coins after they strike these portions of the coin separator.

The numeral 304 denotes a stripper plate that is provided with ears 306. These ears have openings that telescope over the pivot 278 and permit rotation of the stripper plate 304 relative to the center wall of the frame 268 and relative to the gate 274. The stripper plate 304 has two cut away portions 308 which are complementary to the plates 272. Those cut away portions permit movement of the stripper plate 304 without striking the plates 272.

The stripper plate 304 has a slot 310 to accommodate the runway 280, has a slot 312 to accommodate the stop 282 and the pin 284, has an arcuate slot 314 to accommodate the coin-receiving surface 296, has a slot 316 to accommodate the divider 300, and has a slot 318 to accommodate the guide 302. Notches are not required for the divider pins 320 and 322; those pins being only as long as the distance between the stripper plate and the center wall of the frame 268.

A pivot 324 extends between and is supported by the flanges 270 of the frame 268. That pivot supports a deflector bar 326 which is comparable to the deflector bar 260 of Figs. 12 and 13. Slots 327, similar to the slots 261 in the flanges 138, are formed in the flanges 270. The slots 327 will accommodate the deflector bar 326 when that bar is moved downwardly to deflecting position. A spring 328 encircles the pivot 324 and has one end thereof bearing against an ear 330 on the flange 270 at the right hand side of the frame 268 and has the other end thereof bearing against the right hand end of the deflector bar 326. This spring biases the deflector bar out of the coin passageway between the stripper plate 304 and the center wall of the frame 268. However, it can yield, as does the spring 262 in Figs. 12 and 13, to permit the deflector bar to enter the coin passageway and direct coins to the rejected coin area.

Ears 332 are formed on the stripper plate 304, and those ears extend into slots 334 in the flanges 270 of the frame 268. The ears are permitted to move in the slots 334, but they restrict movement of the stripper plate 304 in the same manner that the ears 236 restrict the movement of the stripper plate 212 in Figs. 12 and 13.

Plates 336 and 338, which are similar to the plates 264 and 266 of Figs. 12 and 13 extend between and are secured to the flanges 270 of the frame 268. The plate 336 coacts with the center wall of the frame 268 to define an accepted coin area while the plates 336 and 338 coact to define a rejected coin area.

The plates 272 coact with the stripper plate 304 and with the center wall of the frame 268 to define a coin entrance. That entrance can receive four coins, such as the United States penny, the United States dime, the United States nickel and the United States quarter. Each of the coins falling from the entrance will strike the runway 280 and be directed to the left hand end of that runway. On reaching the left hand end of that runway the coins will fall downwardly toward the lever 294. The dime will fall between the coin-receiving surface 296 and the pin 284 without any appreciable movement of the lever 294. In doing so, that coin will fall between the divider pin 320 and the guide 302. A penny will strike and be initially held by the pin 284 and the coin-receiving surface 296. The lever 294 will rotate under the weight of the penny and will conduct that penny to a point where it can fall to the left of the divider 300. That penny will then fall to the left of that divider and be guided downwardly by the guide 302. A nickel will be initially held by the coin-receiving surface 296 and by the pin 284, but it cannot pass between those surfaces. Instead, that coin will fall off of the back, or outer, edge of the coin-receiving surface 296 after the lever 294 has rotated through the greater part of its path of rotation. As the nickel falls off of the back edge of the coin-receiving surface 296 it will fall to the right of the divider pin 320 and will find its way between that divider pin and the divider pin 322. The quarter will be initially held by the coin-receiving surface 296 and the pin 284, but it too cannot pass between those surfaces. Instead, that coin will fall off of the back edge of the coin-receiving surface 296 after the lever 294 has rotated just a small part of its path of movement. That coin will fall onto the divider pin 322 and will roll to the right of that pin where it will fall downwardly into the accepted coin area. In this way, the one coin sizing gauge can separate four coins of different denominations.

In the event any of the coins happens to stick between the stripper plate 304 and the center wall of the frame 268, the deflector bar 326 can be moved, in the manner in which the deflector bar 260 is moved in Figs. 12 and 13, and this will be followed by movement of the gate 274 and the stripper plate 304 away from the center wall of the frame 268. The movement of the stripper plate 304 will be limited by the ears 332 and the slots 334, but the gate 274 will continue to move after the stripper plate 304 has been stopped. In this way, all support for the coins will be removed and those coins will move downwardly, strike the deflector bar 326, and be directed to the rejected coin area between the plates 336 and 338.

In Fig. 15 the numeral 340 generally denotes a pin that is comparable to the pins 96, 158, 186 and 284. That pin can be set with its left and right faces vertical, although in some cases it may be desirable to incline the left and right faces of that pin, as is done in Figs. 1–10. The numeral 342 indicates a possible center of rotation

and the letters A and B define the arc which would be drawn if the point **342** was used as a center. The numeral **344** denotes a possible center of rotation, and the letters A and C define the arc which would be drawn with the point **344** as a center. It will be noted that the distance from the point **342** to the point B is the same distance as the distance from the point **342** to the point A. However, the distance from the point **344** to the point C is greater than the distance from the point **342** to the point A. Consequently, where the pivots **64, 168** and **196** are placed in registry with the point **344**, and where the coin-intercepting surfaces **68, 172** and **200** are placed in registry with the point A, rotation of the levers **66, 170** and **198** provides an increase in the spacing between the pin **340** and the coin-intercepting surfaces. That increase in spacing is the vertical distance between points B and C.

The point **346** can be used as the center for the pivots **64, 168** and **196**. Where this is done, the increase attained through the rotation of the levers is even greater; that increase in distance being the vertical distance between the points B and D.

Whereas several preferred embodiments of the present invention have been shown and described in the drawing and accompanying description, it should be apparent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof:

What I claim is:

1. A coin separator that can segregate spurious coins from authentic coins and that can also segregate authentic coins of different diameters from each other and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a substantially flat coin-receiving surface thereon and that has a second substantially flat surface thereon, said coin-receiving surface and said second surface abutting each other to define an abrupt coin-gauging edge on said stationary element, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-gauging edge on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being straight, said second coin-receiving surface normally being parallel to said second substantially flat surface on said stationary element, said second coin-receiving surface always having the upper edge thereof disposed below the level of said substantially flat coin-receiving surface on said stationary element, said second coin-receiving surface being disposed within said passageway, said second coin-receiving surface having a length less than the distance between said pivot and said second coin-receiving surface, the coin-receiving areas on said second coin-receiving surface being substantially equi-distant from said pivot, said coin-gauging edge on said stationary element and said second coin-receiving surface normally defining a coin-intercepting area in said passageway, a rejected coin chute disposed below and in register with said coin intercepting area, and an accepted coin chute that is disposed below the level of said coin-intercepting area and is below the level of said coin-receiving surface on said stationary element and is adjacent the lower end of said arcuate path of said second coin-receiving surface, said second coin-receiving surface normally being spaced from said coin-gauging edge on said stationary element a predetermined distance, the spacing between said second coin-receiving surface and said coin-gauging edge on said stationary element increasing, at a substantially constant rate of increase as said second coin-receiving surface moves through said arcuate path, because of the spacing between said pivot and said coin-gauging edge on said stationary element, said coin-gauging edge on said stationary element and said second coin-receiving surface coacting to permit undersize coins to pass therebetween and fall to said rejected coin chute prior to and during the major part of the movement of said second coin-receiving surface through said arcuate path, to intercept and hold coins of the proper size until said second coin-receiving surface has moved through the major part of said arcuate path and those coins are adjacent said accepted coin chute, to intercept and hold grossly oversize coins until those coins tilt away from said coin-gauging edge on said stationary element and fall to said rejected coin chute, and to intercept and hold slightly oversize coins.

2. A coin separator that can segregate spurious coins from authentic coins and that can also segregate authentic coins of different diameters from each other and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a substantially flat coin-receiving surface thereon and that has a second substantially flat surface thereon, said coin-receiving surface and said second surface abutting each other to define an abrupt coin-gauging edge on said stationary element, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-gauging edge on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, said second coin-receiving surface having the upper edge thereof disposed below the level of said substantially flat coin-receiving surface on said stationary element, said second coin-receiving surface having a length less than the distance between said pivot and said second coin-receiving surface, the coin-receiving areas on said second coin-receiving surface being substantially equi-distant from said pivot, said coin-gauging edge on said stationary element and said second coin-receiving surface normally defining a coin-intercepting area in said passageway, a rejected coin chute disposed below and in register with said coin-intercepting area, and an accepted coin chute that is disposed below the level of said coin-intercepting area and is below the level of said coin-receiving surface on said stationary element and is adjacent the lower end of said arcuate path of said second coin-receiving surface, said second coin-receiving surface normally being spaced from said coin-gauging edge on said stationary element a predetermined distance, the spacing between said second coin-receiving surface and said coin-gauging edge on said stationary element changing, at a substantially constant rate of change as said second coin-receiving surface moves through said arcuate path, because of the spacing between said pivot and said coin-gauging edge on said stationary element.

3. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon and that has a second surface thereon, said coin-receiving surface and said second surface abutting each other to define an abrupt coin-gauging edge on said stationary element, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-gauging edge on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, said second coin-receiving surface and said pivot being oppositely disposed of said coin-gauging edge on said stationary element whenever said second coin-receiving surface is in its normal position, said coin-gauging edge on said stationary element and said secondary coin-receiving surface normally defining a coin-intercepting area in said passageway, a rejected coin chute disposed below and in register with said coin-intercepting area, and an accepted coin chute that

is disposed below the level of said coin-intercepting area and is below the level of said coin-receiving surface on said stationary element and is adjacent the lower end of said arcuate path of said second coin-receiving surface, said second coin-receiving surface being movable through said arcuate path to increase the spacing between said coin-gauging edge on said stationary element and said second coin-receiving surface at a substantially constant rate of increase.

4. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a substantially flat coin-receiving surface thereon and that has a second substantially flat surface thereon, said coin-receiving surface and said second surface abutting each other to define a sharp coin-gauging edge on said stationary element, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced from said coin-gauging edge on said stationary element, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-gauging edge on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute.

5. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-receiving surface on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, said second coin-receiving surface having a length less than the distance between said pivot and said second coin-receiving surface, the coin-receiving areas on said second coin-receiving surface being substantially equi-distant from said pivot, said coin-receiving surface on said stationary element and said second coin-receiving surface normally defining a coin-intercepting area in said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-receiving surface on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute, said second coin-receiving surface responding to the rotation thereof about said pivot, from said coin-intercepting area, to substantially continuously increase the distance between itself and said coin-receiving surface on said stationary element until said coins move out of engagement with said second coin-receiving surface and move toward said second coin chute.

6. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-receiving surface on said stationary element in the plane of said passageway, a movable element which is mounted on said pivot and which has a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, said coin-receiving surface on said stationary element and said second coin-receiving surface normally defining a coin-intercepting area in said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-receiving surface on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute, said second coin-receiving surface responding to the rotation thereof about said pivot, from said coin-intercepting area, to increase the distance between itself and said coin-receiving surface on said stationary element, a second pivot that is adjacent said second coin chute, a stop that is mounted on said second pivot for rotation relative to said second coin chute and that has a coin-intercepting portion which is movable into and out of coin-intercepting position in said second coin chute, said stop normally holding said coin-intercepting portion in coin-intercepting position in said second coin chute but being engageable by said movable element to move said coin-intercepting portion out of coin-intercepting position in said second coin chute whenever said movable element intercepts coins of said predetermined diameter and guides said coins past the first said coin chute to said second coin chute.

7. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-receiving surface on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-receiving surface on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute, said second coin-receiving surface responding to the rotation thereof about said pivot, from said coin-intercepting area, to increase the distance between itself and said coin-receiving surface on said stationary element, said pivot and said coin-receiving surface on said stationary element being adjustable relative to each other to adjust the initial spacing between the first said and said second coin-receiving surfaces.

8. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-receiving surface on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-receiving surface on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute, said second coin-receiving surface responding to the rotation thereof about said pivot, from said coin-intercepting area, to increase the distance between itself and said coin-receiving surface on said stationary element said pivot being movable through a generally vertical path to adjust the position of said pivot relative to said fixed coin-receiving surface and

thereby adjust the initial spacing between the first said and said second coin-receiving surfaces.

9. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-receiving surface on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-receiving surface on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute, said second coin-receiving surface responding to the rotation thereof about said pivot, from said coin-intercepting area, to increase the distance between itself and said coin-receiving surface on said stationary element, the first said and said second coin-receiving surfaces normally defining a line that is transverse of said passageway, said pivot being movable in a direction generally normal to said line to shift the lower end of said arcuate path without appreciably changing the upper end of said arcuate path.

10. A coin separator that can segregate coins in accordance with their diameters and that comprises a frame, a passageway for coins, a stationary element that is disposed within said passageway and that has a coin-receiving surface thereon, a pivot that is adjacent said passageway and that is adjacent said stationary element but that is spaced laterally from said coin-receiving surface on said stationary element in the plane of said passageway, a second coin-receiving surface that is movable in an arcuate path about said pivot with said pivot as the center of rotation, said second coin-receiving surface being disposed within said passageway, a first coin chute adjacent said arcuate path, and a second coin chute adjacent the lower end of said arcuate path, said coin-receiving surface on said stationary element and said second coin-receiving surface coacting to intercept coins of a predetermined diameter and to guide said coins past the first said coin chute to said second coin chute, said second coin-receiving surface responding to the rotation thereof about said pivot, from said coin-intercepting area, to increase the distance between itself and said coin-receiving surface on said stationary element, and a feeler that is biased for movement into said passageway to feel coins but is movable out of said passageway by the rotation of said second coin-receiving surface about said pivot, said second coin-receiving surface responding to the weight of coins in said passageway to move in one direction to permit said feeler to move into said passageway to feel said coins and responding to the interception of said coins by said feeler to move back in the opposite direction to move said feeler out of said passageway and free the said coins held thereby.

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