

Feb. 23, 1932.

D. E. GRAY

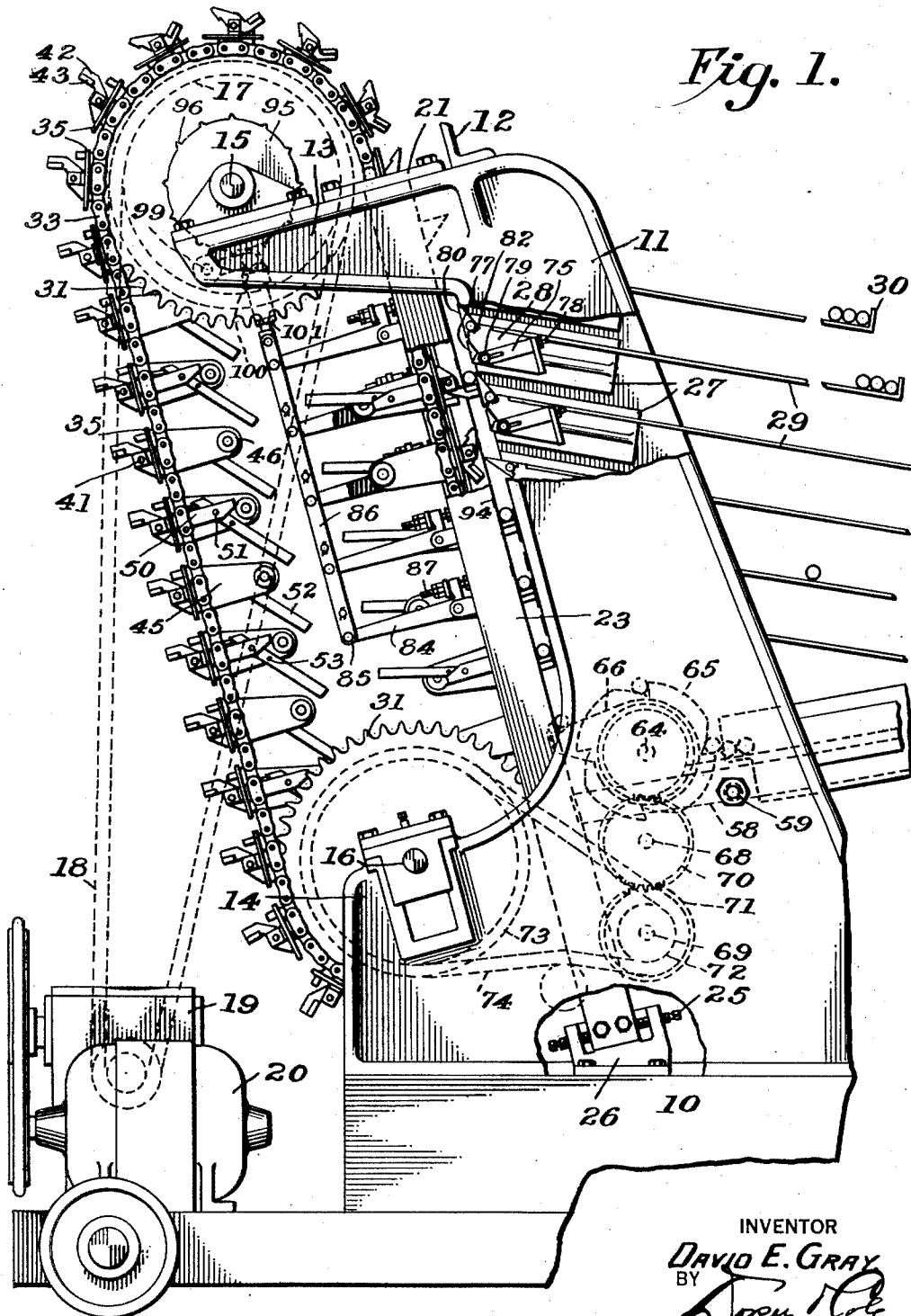
1,846,327

GAUGING AND SORTING MACHINE

Filed Nov. 15, 1927

5 Sheets-Sheet 1

Fig. 1.



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1,846,327

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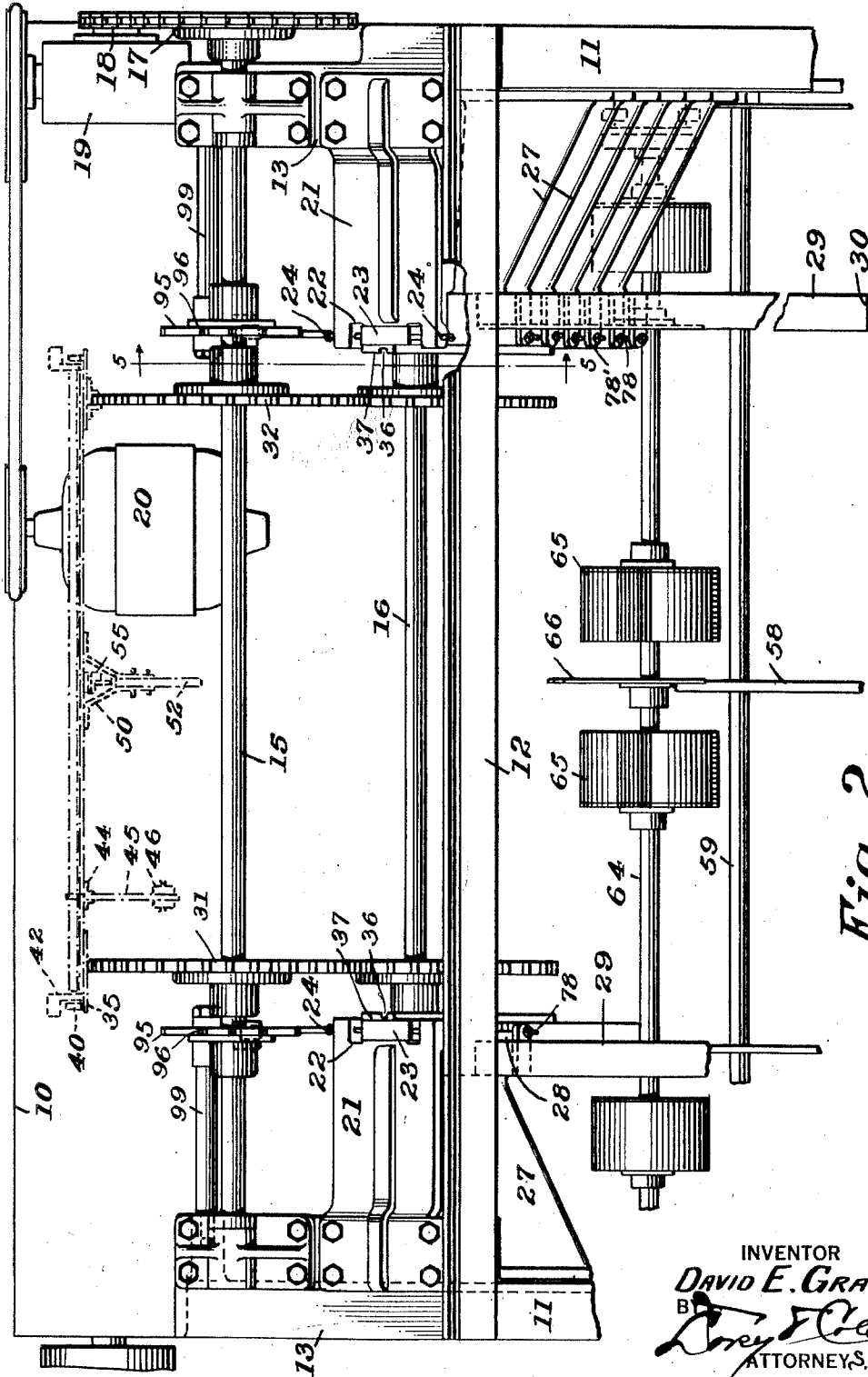


Fig. 2.

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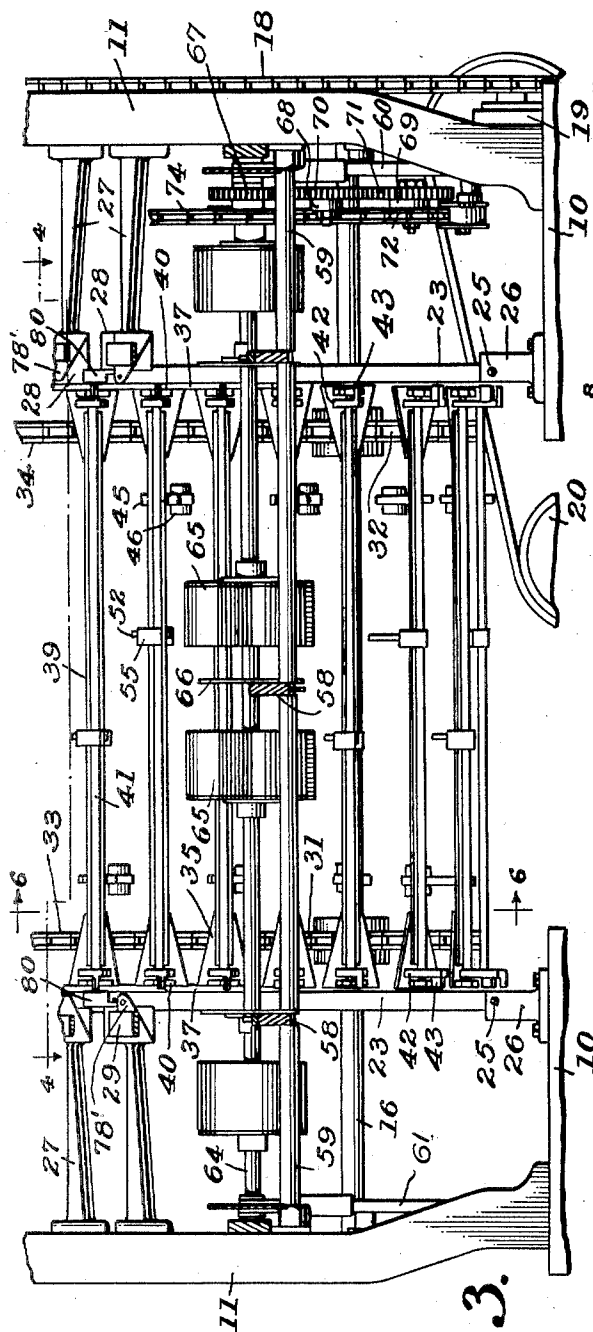


Fig. 3.

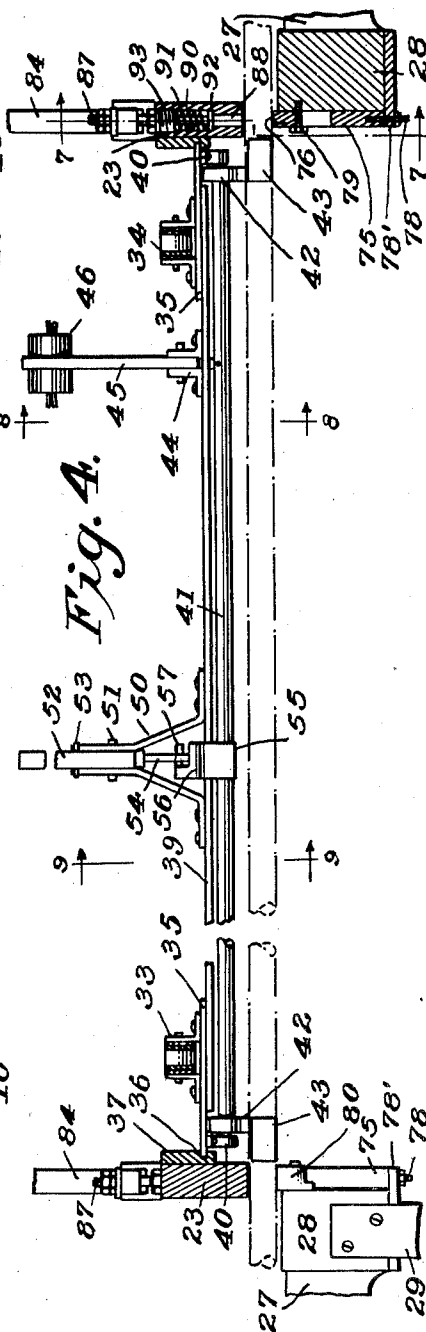


Fig. 4.

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Fig. 8.

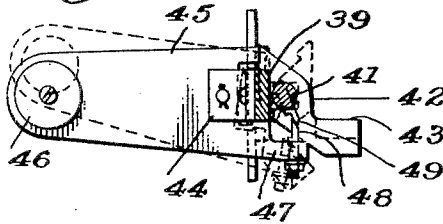


Fig. 9.

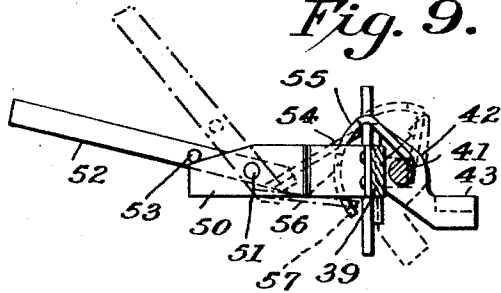


Fig. 7.

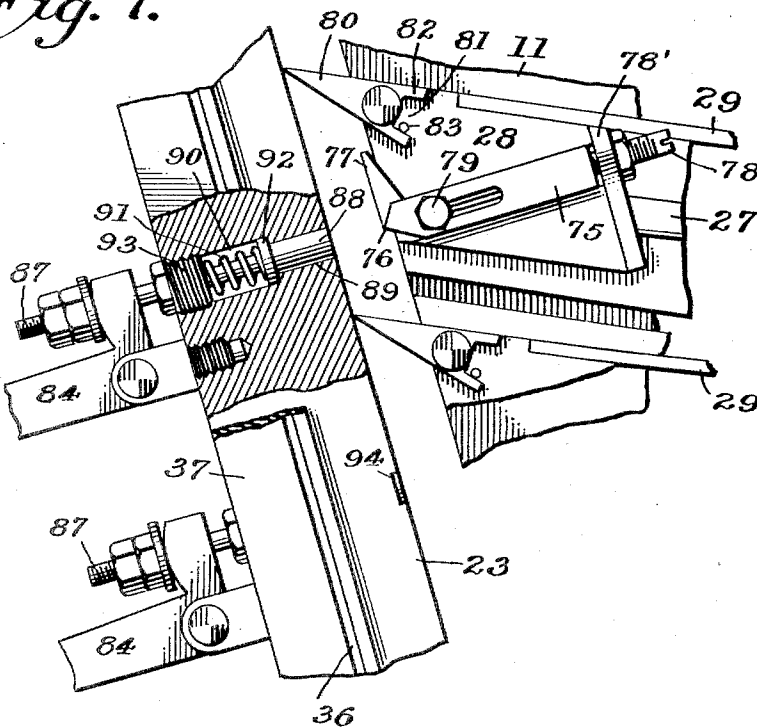


Fig. 11.

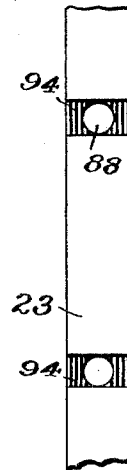
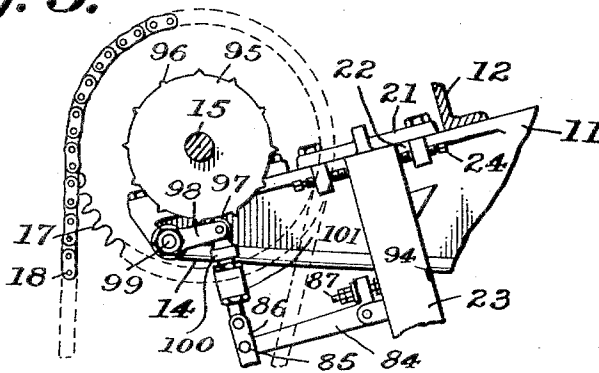


Fig. 5.



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Fig. 10.

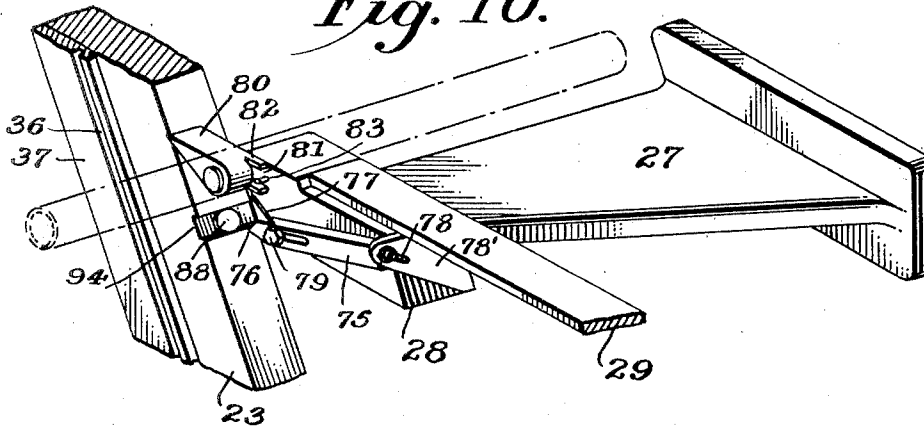
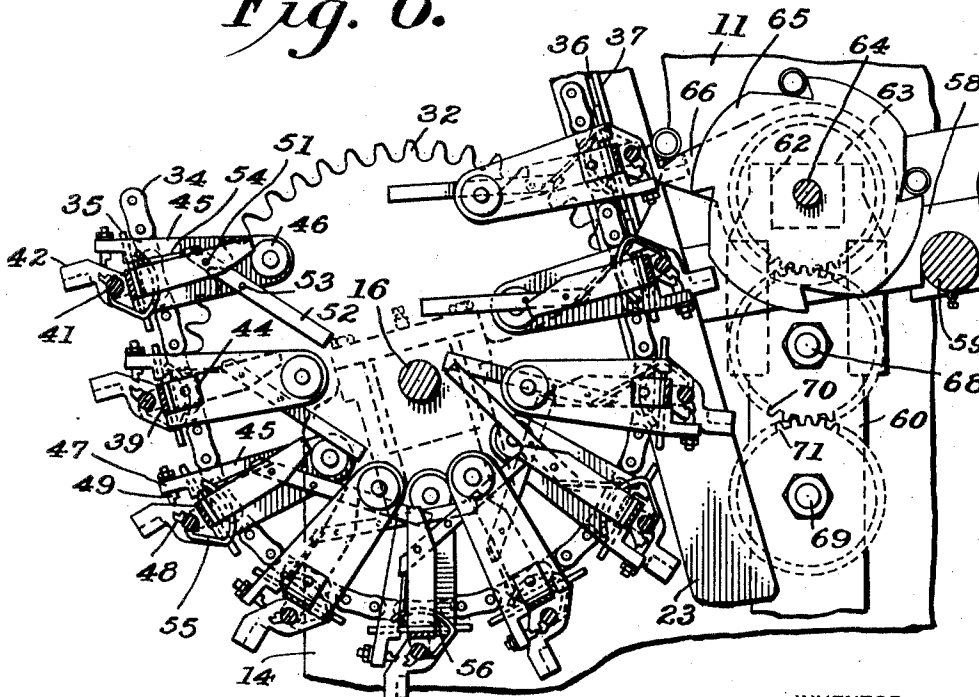


Fig. 6.



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UNITED STATES PATENT OFFICE

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GAUGING AND SORTING MACHINE

Application filed November 15, 1927. Serial No. 233,473.

This invention relates to gauging and sorting machines, and more particularly to machines for gauging and sorting cylindrical articles, such as glass tubing and cane.

5 It is essential for many purposes that articles be gauged and sorted according to their size, but considerable difficulty has heretofore been experienced in doing this automatically. When, for instance, there is a diametrical
10 variation in an article, at the points at which co-acting gauge and sorting mechanisms operate, opposing forces are brought to bear thereupon, causing a jamming of the article, or other hindrance to effective operation,
15 often with destructive effect upon the comparatively delicate gauging and sorting mechanisms. This factor assumes great importance as regards glass tubing and cane, since these articles are subject to diametrical
20 variations due to the "drawing" operations by which they are produced.

When gauging articles of glass or other fragile material breakage is also involved, hence in handling such articles positively
25 acting operating members, such as fixed gauges, grippers and ejectors, which move into and out of contact with the tubing with a jar or pressure, are especially objectionable, because they are apt to induce fracture and
30 inaccurate gauging.

In one aspect the invention embodies a travelling carrier by which articles are conveyed in succession along continuous gauge bars to gauge members which cooperate with
35 yieldable portions of the gauge bars to form gauges. When the articles encounter a gauge which obstructs their free movement they are arrested and held between the gauge members and yieldable portions of the gauge bars, and
40 are automatically unloaded from the carrier. The articles which pass one set of gauges are successively presented to other sets of gauges until they reach gauges which arrest them. Release of the arrested articles is effected by
45 retracting the yieldable portion of each gauge bar prior to the presentation of the next article to that set of gauges, whereupon the arrested article falls upon check fingers and is directed thereby into a receptacle provided
50 for articles of its size.

The primary object of the present invention is to rapidly and accurately sort cylindrical articles, such as tubes and rods.

Another object of the present invention is to automatically sort fragile articles by diameter without breakage.

A feature of prime importance in this invention is the smooth, rapid transfer of articles along one of the gauge elements, and the absence of mechanism which is likely
60 to induce violent shocks, rebound, or other hindrance to accurate gauging.

Another important feature is the rugged construction of the gauge mechanism, and the elimination of delicate parts without the
65 sacrifice of accuracy.

The above and other objects may be attained by the use of my invention, one embodiment of which is described and claimed in the following specification and illustrated
70 in the accompanying drawings, in which,

Fig. 1 is a side elevation of a gauging and sorting machine constructed in accordance with this invention, certain portions being
75 broken away to more clearly illustrate details of construction;

Fig. 2 is a top plan view of the machine with the carrier chains and associated mechanism removed;

Fig. 3 is a fragmentary front elevation of
80 the lower portions of the machine;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3;

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 2;
85

Fig. 6 is a transverse sectional view taken on the line 6—6 of Fig. 3 showing the operation of the resetting mechanism on a greatly enlarged scale.

Fig. 7 is an enlarged transverse vertical
90 section taken on the line 7—7 of Fig. 4, showing one of the gauging mechanisms;

Fig. 8 is an enlarged detail section taken on the line 8—8 of Fig. 4, showing the counterbalancing mechanism for maintaining the
95 tube carriers in proper position;

Fig. 9 is an enlarged detail sectional view of the resetting mechanism for the article carriers taken on the line 9—9 of Fig. 4;

Fig. 10 is a fragmentary perspective view 100

of one of the brackets supporting one of the gauge fingers; and

Fig. 11 is an enlarged fragmentary view of the front face of one of the gauge bars.

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Frame

Referring to the drawings in detail, a bed 10 is provided at opposite ends with standards 11, the upper ends of which are rigidly connected by a transversely extending bar 12.

Extending rearwardly from the upper and lower ends of the standards 11 are arms 13 and 14 respectively, carrying bearings in which opposite ends of a pair of shafts 15 and 16 are journaled. A drive sprocket 17 is secured near one end of the shaft 15, for cooperation with a drive chain 18, which in turn is connected by means of a suitable gearing 19 with a prime mover, such as an electric motor 20 fixed to the bed 10.

Secured to the upper ends of the standards 11 are inwardly extending brackets 21, which are bifurcated as at 22 to receive the upper ends of the gauge bars 23, which are held therein by means of adjustable clamping screws 24. The lower ends of these gauge bars are secured by clamping screws 25 to the bifurcated brackets 26 which are secured to the bed 10. As illustrated, these gauge bars 30 are inclined to the vertical so that articles traversing them will lie in close contact therewith and their angular position as well as their location relative to shafts 15 and 16 may be altered by adjusting the clamping screws 35 24 and 25.

Extending inwardly from the standards 11, intermediate their upper and lower ends, are brackets 27, at the inner ends of which are heads 28, which lie directly in front of, and in spaced parallel relation to the gauge bars 23 to form upwardly and rearwardly inclined passages for the travel of the articles to be sorted. Secured to the upper faces of the heads 28 are forwardly and downwardly extending plates 29, provided with stops 30, which together form racks in which the sorted articles are collected according to diameter.

Carriage mechanism

Secured near opposite ends of the shafts 15 and 16 are sprocket wheels 31 and 32, respectively, provided with sprocket chains 33 and 34, so that upon transmitting rotary movement to the shaft 15 by the motor 20, 55 both shafts and their associated mechanism will move in unison.

Certain links of each chain are provided with guide plates 35, the lateral edges of which ride in grooves 36 (Fig. 4), formed in tracker plates 37, carried by the inner faces 60 of the gauge bars 23. The guide plates 35, which are secured to opposite chains, are rigidly connected by tie bars 39 which move in spaced parallel relation to the axes of 65 shafts 15 and 16. Brackets 40 are secured

to the guide plates 35, and rotatably mounted therein are shafts 41, adjacent opposite ends of which are mounted carriers 42, having seats 43 to support the articles to be sorted. It will thus be seen that my movement of the chains 31 and 32, the articles to be sorted are carried upwardly between the front faces of the gauge bars 23 and the rear faces of the heads 28.

Secured near an end of each tie bar 39 is a bracket 44 to which is pivoted a rearwardly extending trip lever 45, provided at its rear end with a counter weight 46 (Fig. 8). To prevent interference between the brackets, as they are inverted in passing around the sprockets 31, the brackets on adjacent tie bars are mounted near opposite ends thereof. The forward ends of the trip levers are bifurcated and partially embrace the tie bars as shown, thus restricting their rocking movement. Lugs 47 project forwardly from the lower edges of the trip levers and carry adjustable pins 48, which project upwardly for engagement with cooperating pins 49 carried by the shaft 41. When the carriers 42 are in normal position, the pins 49 rest on the upper ends of the pins 48 in such a manner that when excess pressure is brought upon the seats 43 of the carriers 42, the shaft 41 will rock and the lugs 47 will move downwardly, against the influence of the counter weight 46, and trip lever 45, thereby causing the pins 49 to pass behind the pins 48 and permit the seats and their associated mechanism to fall to unloading position. Thus the carriers will 100 unload their contents, and will remain in unloading position until reset.

The return of the seats 43 to article carrying position is effected partially by gravity and partially by the resetting mechanism to be more fully described hereinafter. The gravity operation is as follows: When the crest of the upward movement of the carriers 42 is reached and they start to descend, their positions are reversed, and the force of gravity will cause the counterweights to fall. Thus pins 48 are retracted so as to clear the pins 49 and to permit the shafts 41 to rotate, and to return the carriers 42 and seats 43, to article carrying position.

To assure the restoration of the carriers to article carrying position, I provide a resetting mechanism such as that illustrated in detail in Fig. 9. This includes a pair of brackets 50 which are secured to and project rearwardly from each tie bar 39. Pivoted at 51 between the brackets 50 is a lever 52 whose movement in one direction is limited by a stop pin 53. This lever projects rearwardly to such an extent that it will fall by gravity about its pivot, and projecting from the forward end of the lever 52 in an upwardly inclined position is a relatively light finger 54. A plate 55, fixed to the shaft 41 in longitudinal alignment with the lever, projects 115

upwardly and rearwardly and terminates in a downwardly curved portion 56. This is recessed laterally to accommodate the finger 54 which, when the lever upon inversion falls into the dotted line position shown in Fig. 9, engages the end wall 57 of the recess and causes the shaft 41 to rotate in its bearings and move the carriers 42 and seats 43 into article engaging position. This movement of the lever 52 takes place upon inversion of the carriers 42 when they reach the crest of their upward movement and start their descent.

In order to permit the pins 48 to resume article carrier supporting position, before the release of the resetting mechanism, the levers 52 of the latter, when inverted, assume a markedly oblique position with relation to the radii of the sprocket wheels 31 and 32 (Figs. 1 and 6). This throws their centers of gravity out of radial alignment with the shaft 16 so that the fingers 54 cannot disengage the end walls 57 until they have travelled well past the vertical (Fig. 6). In the meantime the trip levers 45 will have fallen, thus bringing the pins 48 into position to engage the pins 49 and support the carriers.

Article feeding mechanism

The articles may be fed to the carriage mechanism by any suitable feeder, but that found most satisfactory is described and claimed in my copending application Serial Number 233,474 filed of even date herewith. Briefly, it consists of a magazine (Fig. 1) comprised of upwardly and forwardly inclined rails 58 which are connected to the machine by a suitable transversely extending rod 59 supported by standards 11. Secured to the inner sides of the standards 11 near their lower ends are plates 60 and 61 (Fig. 3), the upper ends of which are bifurcated as at 62 to receive bearing blocks 63 in which the feed roll supporting shaft 64 is journaled.

Secured in spaced relation on said shaft 64 are notched feed rolls 65 which select the articles and deliver one at a time onto the guide members 66 which incline downwardly and inwardly toward the machine. These guide members extend inwardly beyond the front faces of the gauge bars 23 so that the articles delivered thereon will move by gravity into contact with the said gauge bars, where they remain until picked up by the seats 43 of the carriers 42.

Extending inwardly from the plate 60 are studs 68 and 69 upon which pinions 70 and 71 are rotatably mounted. The hub of the pinion 71 terminates at its outer end in a sprocket 72 aligned with a sprocket wheel 73 secured to the shaft 16. A chain 74 cooperates with sprocket 72 and sprocket wheel 73 so that when the shaft 16 rotates the feeder mechanism will be driven. A pinion 67 is secured

to the shaft 64 for meshing engagement with the pinion 70.

Selecting mechanism

Adjustably secured to the inner face of each head 28 is a gauge finger 75 provided at its rearmost end with a gauge point 76 and a guard 77. The opposite end of the gauge finger is engaged by an adjusting screw 78 threaded through an ear 78' carried by the head 28. After adjustment the finger may be locked in the desired position by a clamping screw 79.

Pivotally secured to the inner face of each head 28 adjacent its upper rear corner is a check finger 80 which is bifurcated as at 81 to form a pair of legs 82 for engagement with a stop pin 83.

Pivotally mounted on the rear face of each gauge bar 23 are bell crank levers 84, the longer arms of which extend rearwardly and are pivoted at 85 to push rods 86. The shorter arms of the levers are disposed upwardly and are apertured to receive the reduced threaded stems 87 of push pins 88. The latter operate through spaced parallel apertures 89 in the gauge bars 23 in a manner to be more fully described hereinafter. Extending into the gauge bars 23 from the rear faces thereof, and in axial alignment with the apertures 89, are recesses 90 for the reception of compression coiled springs 91, the inner ends of which bear against heads 92 formed on the push pins 88 while their outer ends bear against threaded bushings 93. As indicated in Figs. 6 and 7 the forward ends of pins 88 are yieldingly projected into the plane of the front faces of the gauge bars 23 beyond the bottom faces of transverse grooves 94 to provide smooth uninterrupted gauge surfaces.

Simultaneous retraction of the pins 88 is effected by cam wheels 95 which are secured near opposite ends of the shaft 15 and are provided with teeth 96. The latter engage rollers 97, for actuating the push rods 86 to intermittently retract the push pins 88 as the shaft 15 is rotated. The rollers 97 are mounted in the bifurcated ends of levers 98, which are supported on pivot studs 99 that project inwardly from rear ends of the arms 13, these levers being connected to the upper ends of the push rods 86 by yokes 100 and turn buckles 101.

Operation

The tubes or cane to be gauged, are placed in the magazine formed by the rails 58. Moving gently down the inclined rails they engage the feed rolls 65 and are successively selected by the notches in said rolls, and delivered onto the guide members 66, upon which they travel rearwardly until they contact with the gauge bars 23. In this position they lie directly in the path of travel of the

seats 43 of the carriers 42 and are thereby carried along the gauge bars toward the gauges.

The articles pass between the heads 28 and the gauge bars 23, and lift the check fingers 80 which fall back to normal passage closing position immediately after being lifted. Upon encountering a space between one of the gauge points 75 and its push pin 88 which is too small to allow the article to pass freely, its further progress is arrested. Such arrest may be effected by the mere contact of the article with the gauge element, or may constitute an actual wedging of the article between one of the gauge points 75 and its respective push pins 88. This creates pressure on the seats 43 which support this article, and rotates the corresponding carriers 42 together with their respective shaft 41. This causes pin 49 to exert pressure on the pin 48 and move it away from the pin 49 against the influence of the counterweight 46, thus allowing shaft 41 to rotate until the seats 43 drop within the outline of the guide bars 23 and unload the articles.

To release an article which may have become wedged, the push pins are automatically retracted by engagement of one of the teeth 96 on the cam wheel 95 with the roller 97, which intermittently depresses the roller 97, immediately after the seats 43 pass the gauge points 76 and before the next succeeding seats move far enough to bring articles resting thereon into engagement with the check fingers 80. Depression of the rollers 97 lowers the push rods 86 thus rocking the bell crank levers 84 to move their shorter arms away from the guide bars 23 and retract the push pins 88 against the influence of their respective springs 91. Such retraction is only momentary, but releases the arrested article and permits it to fall upon the check fingers 80 which direct it onto its proper rack formed by the plates 29.

The machine will function even when articles are not of uniform diameter throughout their length. Glass tubing for instance will frequently taper from one end to another, and in such event the larger end will be arrested by one of a pair of aligned gauges whereas the smaller end will pass through. When this happens considerable difficulty is likely to be experienced unless the smaller end of the article quickly finds its way back below the gauge point. By the retraction of the push pin immediately after the arrest of the article, not only its larger end is actually released but its smaller end is enabled to quickly descend onto the proper check fingers so that complete release of the article from the gauge is effected before the next successive article is presented.

Articles which are not arrested by one set of gauges continue along the gauge bars on their respective carriers and are presented to additional sets of gauges which progressively

decrease in size. Articles of such small diameter as to pass all of the gauges without being arrested will eventually be discharged from their respective carriers into a suitable receptacle by contact with cams 103, which are secured near the upper ends of the gauge bars.

Adjustment of the machine, to gauge articles of widely varying diameters may be made by advancing or retracting the gauge fingers 75. A still greater range of variation is possible by altering the position of the bars 23 by adjustment of the clamping screws 24 and 25. Gauging is accomplished within very close limits, yet with great rapidity and a minimum of breakage. Numerous variations and alterations of structure are possible without destroying the functions described and illustrated, and changes in the combination and arrangement of parts may be resorted to within the scope of the appended claims without departing from the spirit of the invention.

By the term "unload" as used herein I mean the release of articles by the article advancing means, but to avoid confusion with the release of the articles which have been arrested by the gauges I prefer to call the first mentioned operation "unloading" and the other operation "releasing".

I claim:

1. A sorting machine which includes a gauge bar along which articles are advanced against the force of gravity, a gauge finger cooperating with the gauge bar in arresting articles of or above a predetermined size and means for advancing articles along the gauge bar against the force of gravity toward the gauge finger.

2. A sorting machine according to claim 1 in which arrested articles are retained between the gauge bar and gauge fingers against the force of gravity.

3. A sorting machine according to claim 1 in which means carried by the gauge bar release arrested articles and means associated with the gauge bar direct released articles into suitable receptacles.

4. A sorting machine which includes a gauge bar along which articles are advanced against the force of gravity, a gauge finger cooperating with the gauge bar in arresting articles of or above a predetermined size and means for advancing articles along the gauge bar against the force of gravity toward the gauge finger and means carried by the gauge bar to release arrested articles and means associated with the gauge bar to direct released articles into suitable receptacles, the releasing means being synchronized with article advancing means to permit an arrested article to be discharged before the next successive article is presented for gauging.

5. A sorting machine which includes a plurality of gauges for simultaneously gauging

an article, and a unitary means for advancing an article into the gauges and for unloading said article if resistance is offered to its passage through any one of the gauges.

5 6. A sorting machine which includes gauges arranged in spaced relation, and means for presenting an article for contact with said gauges simultaneously, said means automatically unloading said article should
10 any part thereof fail to pass a gauge.

7. A sorting machine which includes spaced gauges of uniform size for simultaneously gauging an article and an article carrier for advancing an article into said
15 gauges and unloading it should any part thereof fail to pass through any of said gauges.

8. A sorting machine which includes article advancing means, a gauge, means for
20 moving said article advancing means to advance an article supported thereon into the gauge, and means normally maintaining said article advancing means in article carrying position, said last named means being adapted
25 to permit the unloading of an article from the advancing means when the article resists passage through said gauge.

9. A sorting machine which includes article advancing means, a gauge, means for
30 moving said article advancing means to advance an article thereon into said gauge, and means normally supporting said advancing means in article carrying position against the force of gravity, said last named means being
35 displaceable by the resistance of an article to passage through the gauge and permitting withdrawal of the advancing means from carrying position.

10. A sorting machine which includes article supporting means, a gauge, means for
40 moving said article supporting means into said gauge, yieldable means for maintaining said article supporting means in article carrying position, and a receptacle associated
45 with said gauge for receiving articles which fail to pass therethrough, said yieldable means being operable by the resistance of an article to passage through said gauge, and thus permitting delivery of an article into
50 said receptacle.

11. A sorting machine which includes a series of gauges progressively decreasing in size, a receiving compartment associated with each gauge for receiving articles of equal or
55 greater size than the gauge, an article carrier for advancing articles to successive gauges until one is reached whose size is equal to or smaller than that of the article, whereupon the resistance of the gauge to the passage of
60 the article therethrough causes the article carrier to continue its travel without the article, and means for delivering the article to the corresponding receiving compartment.

12. A sorting machine which includes a
65 continuous gauge member adapted to be trav-

ersed by articles to be gauged, and means cooperating therewith to define a gauge for arresting articles of predetermined size.

13. A sorting machine which includes a
70 continuous gauge member adapted to be traversed by articles to be gauged, means cooperating therewith to define a gauge for arresting articles of predetermined size, and means for advancing articles toward the gauge by moving them in continuous contact
75 with the gauge member.

14. A sorting machine which includes a member presenting a normally continuous surface, a series of spaced members in opposed relation to said surface and defining
80 therewith a series of gauges for arresting articles of predetermined sizes, a movable article carrier for advancing the articles into said gauges, and means for moving said article carrier; said article carrier being so
85 positioned with respect to said normally continuous surface that an article will be in substantially continuous contact therewith during its travel.

15. A sorting machine which includes
90 gauge members each having recesses in one face, yieldable members aligned with the recesses and normally lying in a plane with the faces of the gauge members, gauge elements in spaced relation to the gauge members, the
95 critical points of said gauge elements arranged in opposed relation to the yieldable members and defining therewith a series of gauges, means for advancing articles along the gauge members into the gauges and for
100 causing articles exceeding predetermined sizes to be held in the gauges, and means for retracting the yieldable members to release articles from the gauges.

16. A sorting machine which includes article
105 advancing means, means for arresting articles carried thereby, the article advancing means being displaceable to unload an article when the latter is arrested and leave it suspended in the arresting means, and means
110 for restoring the advancing means to article carrying position.

17. A sorting machine which includes article
115 advancing means, means for arresting articles carried thereby, yieldable means normally holding the advancing means in article carrying position but being displaceable upon the arrest of an article to permit movement of the advancing means from article carrying position, and means for restoring the
120 advancing means to article carrying position.

18. A sorting machine which includes article
125 advancing means, means for arresting articles carried thereby, yieldable means normally holding the article advancing means in article carrying position but being displaceable upon the arrest of an article to permit movement of the advancing means from article carrying position, and means for restoring
130 the advancing means to article carrying position.

tion, the latter being withdrawn from contact with the advancing means after the yieldable means returns to holding position.

- 5 19. A sorting machine which includes a gauge for arresting articles of predetermined size, means for advancing articles into the gauge, and means for releasing an arrested
10 article by permitting it to move out of the gauge in a direction opposite its advancing movement.

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