

June 5, 1956

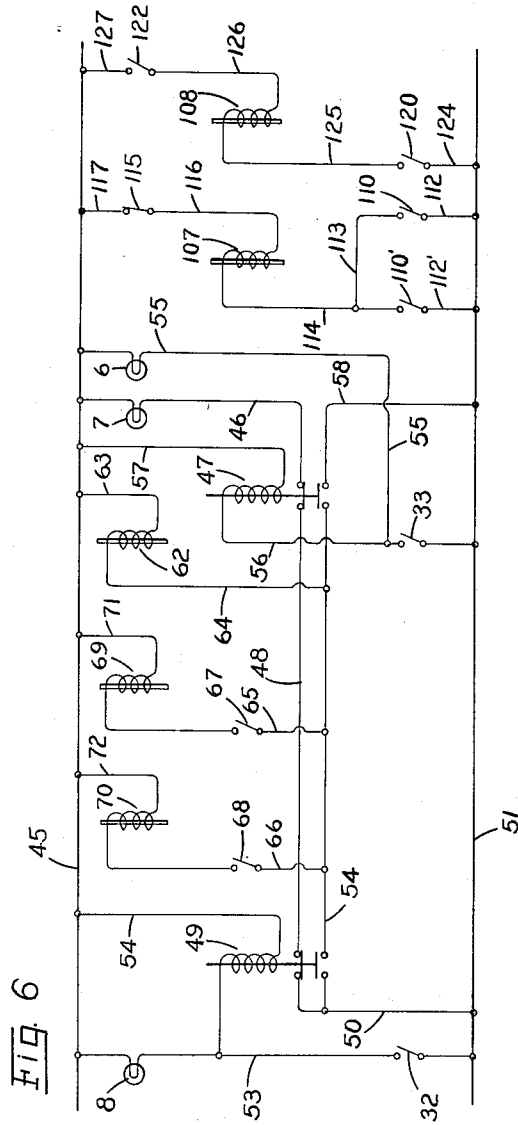
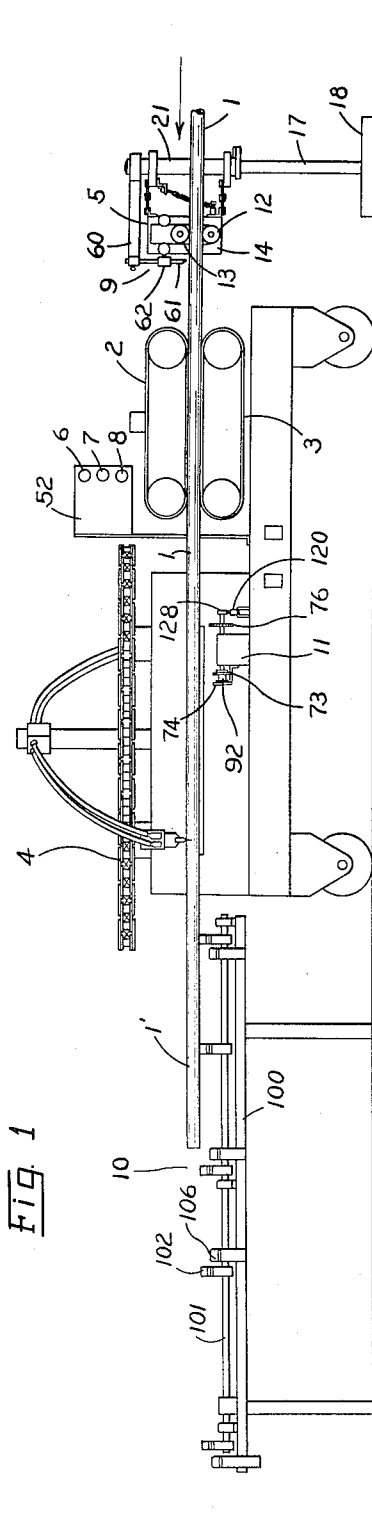
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2,748,937

TUBE AND ROD GAUGING APPARATUS

Filed March 3, 1952

3 Sheets-Sheet 1



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FIG. 2

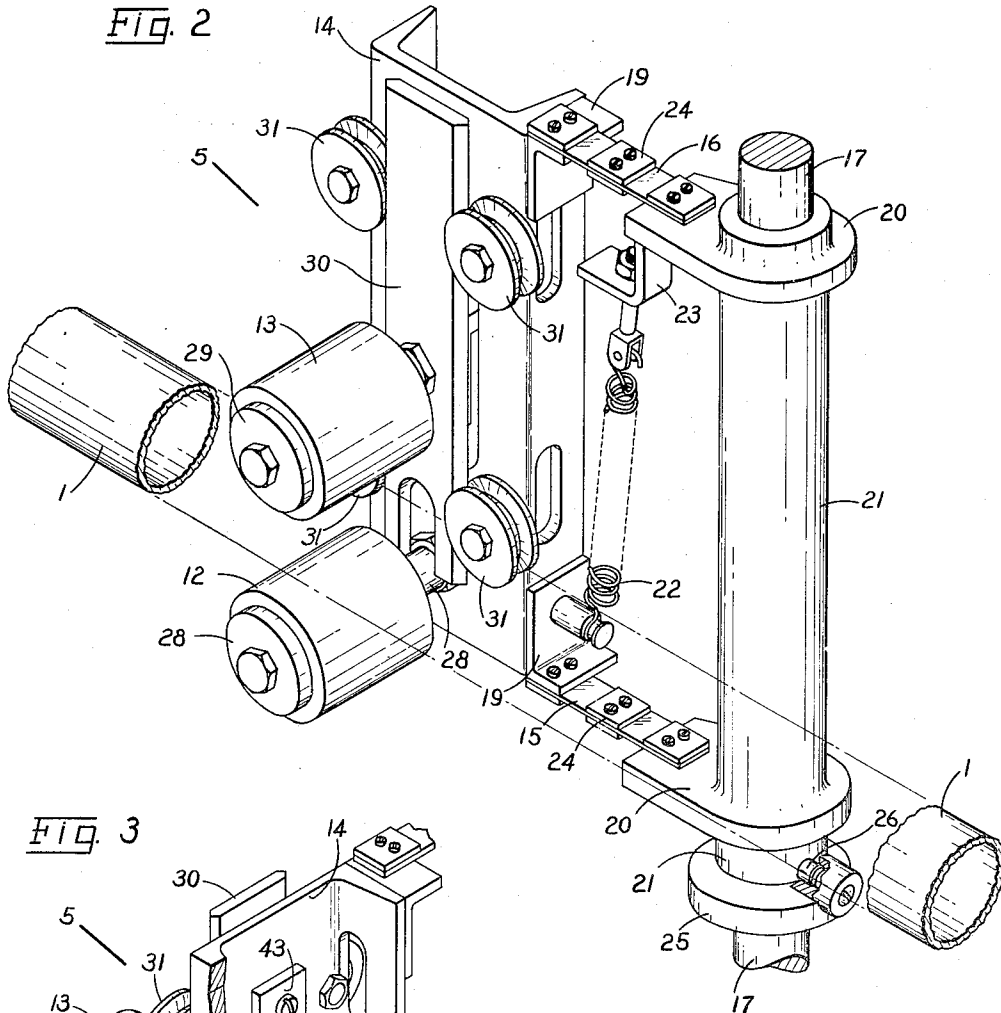
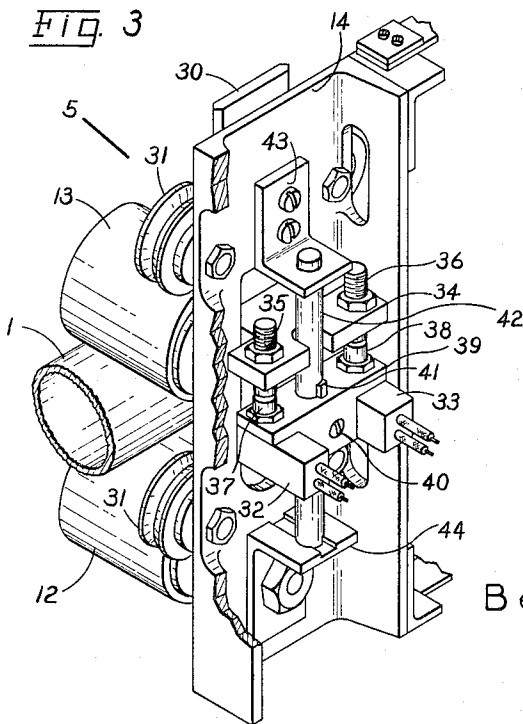


FIG. 3



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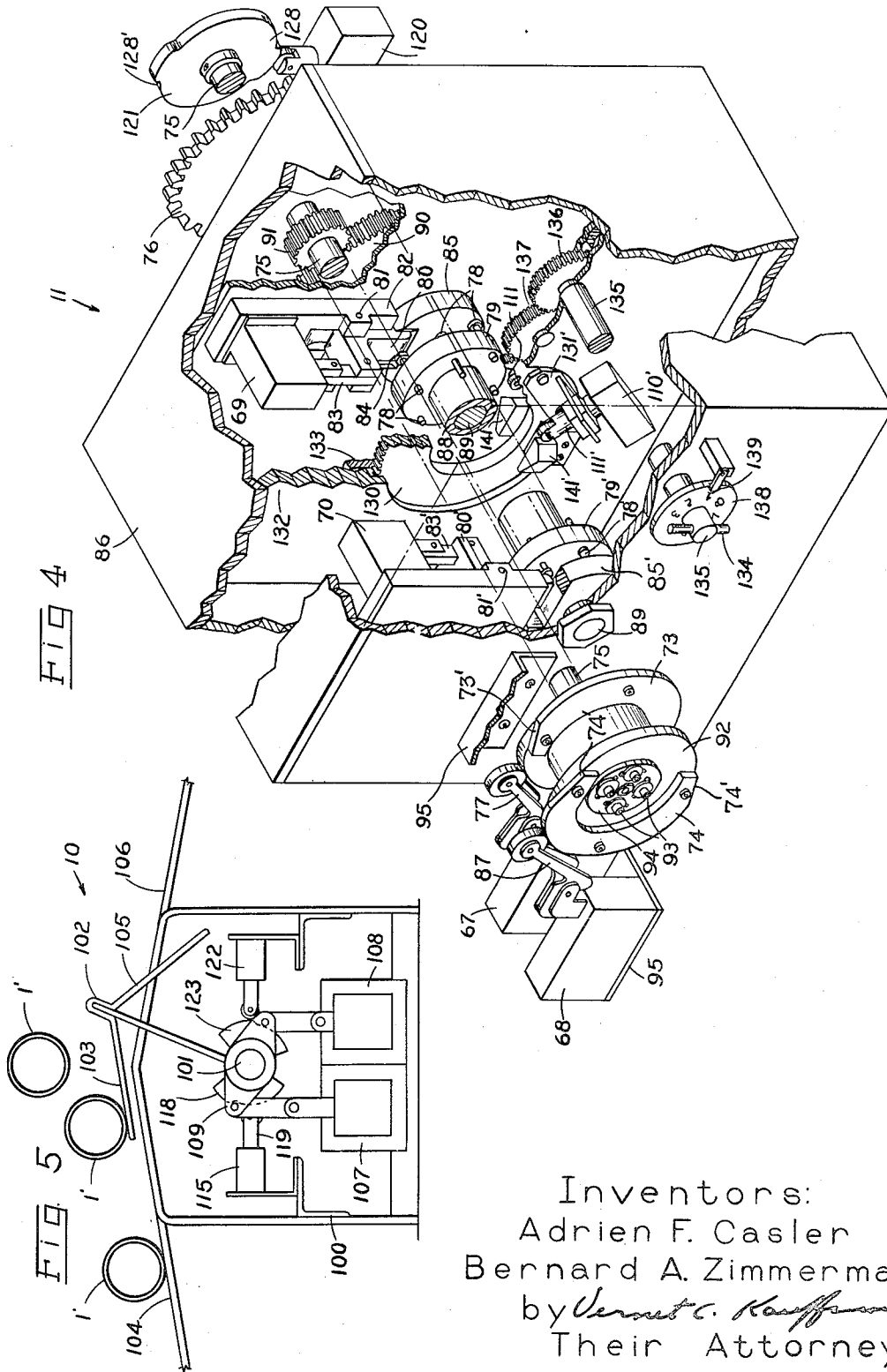
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TUBE AND ROD GAUGING APPARATUS

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Application March 3, 1952, Serial No. 274,622

10 Claims. (Cl. 209—88)

Our invention relates to apparatus for drawing and for gauging vitreous tubing or rod and having in combination therewith apparatus for severing said tubing or rod into lengths and for selecting lengths in accordance with the gauged size of the tubing or rod.

One object of our invention is to provide apparatus for gauging the outside diameter of vitreous tubing or rod while it is being drawn, as for instance by drawing apparatus such as that disclosed in Danner Patent 1,218,598 dated March 6, 1917. In accordance with this object the size of the tubing or rod is determined at the moment of its fabrication with the result that an immediate adjustment of the drawing apparatus can be made to compensate for variations in said tubing or rod and a much narrower size range of tubing or rod can be made without difficulty. The apparatus also facilitates the manufacture of less off-size tubing or rod and the ready adjustment of the proper combination of temperature, drawing speed and other factors contributing to the making of the proper size and the best quality of tubing or rod.

Another object of our invention is to provide gauging apparatus suited to continuous operation during the course of movement of vitreous tubing or rod being drawn from a furnace, the apparatus being adapted to sensitive operation because of, inter alia, its ability to float with changes in the position of the tubing or rod. The apparatus is also constructed in a manner to prevent its being damaged by large inclusions in the tubing or rod and causing it to maintain its accurate alignment and operative function under the relatively dirty and, accordingly, rapid wear producing conditions of its use.

Another object of our invention is to provide in combination with apparatus for drawing tubing and rod and thereafter severing said tubing or rod into lengths, apparatus for gauging said tubing and rod and in the course of the final operations thereof, selecting and segregating lengths of said tubing or rod comprised of off-size portions. Further aspects of this object are to provide means in said apparatus whereby the lengths into which the tubing or rod is severed can be varied at will and whereby said apparatus can operate in the same manner regardless of the length being severed. It is also desirable that the gauging apparatus cause the marking of off-size portions of tubing or rod since such off-size portions can often be cut from tubing or rod of proper size in a salvage operation.

Still other objects and advantages of our invention will appear from the following detailed description of a species thereof and from the accompanying drawing.

In the drawing, Fig. 1 is a schematic side elevation of apparatus comprising our invention and including continuous drawing and severing apparatus for vitreous tubing or rod; Figs. 2 and 3 are perspective views taken from the front and back, respectively, of gauging apparatus; Fig. 4 is a perspective view of the memory device of the apparatus with portions of the housing and associated

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parts broken away and separated to more clearly show their relation; Fig. 5 is an end view of the selecting apparatus of the combination; and Fig. 6 is a wiring diagram of the electrical portions of the apparatus.

The combination of apparatus of our invention illustrated in the drawing is, as shown in Fig. 1, arranged along the path of movement of vitreous tubing 1 being pulled from a tube-forming furnace (not shown) by the tractor chains 2 and 3 of drawing apparatus of the type disclosed in Danner Patent 1,218,598, dated March 6, 1917. Further movement of the tubing 1 advances it to severing apparatus 4 which may be, for instance, of the type shown in Brown et al. Patent 2,120,853 dated June 14, 1934, where said tubing 1 is cut into uniform lengths 1'. The gauging apparatus 5 is located just ahead of the tractor chains 2 and 3 in said course of movement of the vitreous tubing and has the function of determining whether said vitreous tubing 1 is larger or smaller than or within a predetermined acceptable size range, and of lighting the proper one of the signal lights 6, 7, and 8 to indicate the class into which the tubing 1 falls. The gauging apparatus also causes the marking means 9 to make a mark on the tubing 1 if it is either over or under the acceptable size range and of causing the selecting apparatus 10 to segregate such lengths of the tubing 1 as comprise off-size portions. Because of the spaced relation of the gauging and selecting portions 5 and 10 of the apparatus, a memory device 11, driven by a common drive (not shown) for the tractor chains 2 and 3 and severing apparatus 4, is provided to cause the measurements of the gauging apparatus 5 to effect actuating of the selecting apparatus 10 in proper synchronism with the movements of said tubing 1.

Referring to the details of the apparatus, and more particularly to the gauging apparatus 5 (Figs. 2 and 3), the latter is comprised of stationary and movable gauge rolls 12 and 13, respectively, arranged to bear against bottom and top portions, respectively, of the tubing 1 at a point just ahead of the tractor chains 2 and 3 of tubing and rod drawing apparatus. Both gauge rolls 12 and 13 are mounted upon the frame 14 of the gauging apparatus and are kept in alignment with the tubing 1, regardless of any vertical fluctuation in the position thereof, by the flexibility of the metal spring leaves 15 and 16 which mount said gauging apparatus upon a support column 17 on the base plate 18. The spring leaves 15 and 16 extend from angle bars 19, attached to lower and upper corners of the frame 14, to collars 20, attached to a sleeve 21 surrounding the upper end of the support column 17, and are only required to keep the gauging apparatus in proper alignment with the course of movement of the tubing 1 inasmuch as the weight thereof is carried by a helical spring 22 extending between a post on the lower angle bar 19 to coupling 23 on a lip of the upper collar 20 on the sleeve 21. Plates 24 fastened to opposite sides of mid-portions of the leaf springs 15 and 16 serve to stiffen them transversely so that they are not as readily subject to a twisting influence which would alter the true rolling position of the rolls 12 and 13 with relation to the tubing 1. However, means are provided in the free turning sleeve 21 on the upper end of the column 17 for allowing the gauging apparatus to be swung around the support column 17 to a position out of operative relation to the tubing 1 if desired. The vertical position of the apparatus is determined by a collar 25 on the support column 17 and forming a rest for the lower end of the sleeve 21, whereas, the rotative position thereof with respect to said column 17 is determined by the engagement of the rounded end of a spring pressed slug 26 retained by said collar 25 and engaging a depression in the periphery of the sleeve 21.

The vitreous tubing 1 being measured by the apparatus passes freely between the lower gauge roll 12 on a spindle 28 attached directly to the frame 14 and the upper roll 13 on a spindle 29 extending from a plate 30 located within vertical guideways established by four rollers 31 at spaced points along said frame 14. V edges along the vertical sides of the plate 30 fit into correspondingly shaped grooves in the rollers 31 and that combination provides an extremely rigid mounting for the upper roll 13 which is only very slightly affected by the wear between the plate 30 and the rollers 31 and which prevents twisting and deviation from the true vertical gauging movement. The pressure of engagement of the roll 13 against the tubing 1 is produced by the combined weight of the plate 30 and the other parts attached thereto and is sufficient to cause the roll 13 to follow all variations in said tubing 1 and at the same time actuate a control means of said apparatus which for the most part is located upon the back of the frame 14. Variations in the tubing 1 produce a corresponding movement of the plate 30 and result in the actuation of the control switches 32 and 33 in that a corresponding movement of a bracket 34, extending through an opening in the frame 14 from the back of the plate 30, and movements of the heads of the screws 35 and 36, on wings of said bracket 34, press against the control buttons 37 and 38 of said switches 32 and 33.

The gauging or measuring functions of the apparatus are based upon the finding of off-size portions of the tubing 1 which are either smaller or larger than an acceptable size range and is dependent upon the operation of switch 32 when the tubing 1 is found to be smaller than this range and the operation of switch 33 when the tubing 1 is found to be larger than said range. This selective operation of the switches 32 and 33 results from a difference in the elevation of the screws 35 and 36 in the bracket 34 inasmuch as said switches 32 and 33, which are correspondingly mounted upon a cross bar 39, are held at fixed positions during the gauging of any one size of tubing 1. A screw 40 and key 41 fix the position and orientation of the cross bar 39 along a vertical support rod 42 on brackets 43 and 44 at the back of frame 14 and allow the cross bar 39 and the switches 32 and 33 to be readily adjusted to another relation to the bracket 34 and operating screws 35 and 36 should it be desirable to gauge a different nominal size of tubing 1. Under any of these conditions of operation, the cross bar 34 and the operating screws 35 and 36 are at positions to allow the switch 32 to take its normal open position and the switch 33 to be retained at an abnormal open position when the tubing 1 being gauged is within the selected size range. At such times and as shown in the diagram in Fig. 6, the indicator lamp 7 is in operation because of circuit connections directly to one side 45 of the electric current supply and through the lead 46, normally closed contacts of relay 47, lead 48, normally closed contacts of relay 49 and lead 50 to the other side 51 of said electric current supply. No other operations are dependent upon the gauging apparatus under these conditions and the operation of the center lamp 7 of the three lamps 6, 7, and 8 on the panel board 52 over the tractor chains 2 and 3 indicate proper functioning of the entire drawing operation.

The advance of a portion of the tubing 1 smaller than the acceptable size range causes the cross bar 34 and the operating screws 35 and 36 to be lowered so that the operating screw 35 trips the switch 32 to an abnormal closed position causing the indicator lamp 8 to operate and the relay 49 to break the circuit to indicator lamp 7. Under these conditions, a circuit is made from the switch 32, which is connected directly to one side 51 of the current supply, through lead 53 to the lamp 8 which is similarly connected to the opposite side 45 of said supply. A circuit is also established from lead 53 to the relay 49 which is attached to the side 45 of the current supply by lead 54 and the resulting operation of the relay

49 causes the circuit to the lamp 7 to be broken between leads 48 and 50. A further function of the gauging apparatus occurs under these conditions as the relay 49 also completes a circuit from lead 50 to lead 54 and effects thereby a controlling function over means 9 for marking the off-size tubing 1 and a controlling function over a memory device 11 which in turn causes the off-size tubing 1 to be subsequently segregated.

The advance of a portion of the tubing 1 larger than the acceptable size range causes the cross bar 34 and the operating screws 35 and 36 to be raised above their usual position so that the screw 36 allows the switch 33 to return to its normally closed position and thereby causes the indicator lamp 6 to operate and causes the circuit to indicator lamp 7 to be broken. The switch 33 effects operation of the lamp 6 by completing a circuit from the current supply lead 51 to said lamp 6 through the lead 55 and breaks the circuit to the lamp 7 by completing a circuit from the current supply lead 51 to the relay 47 through the lead 56 so that said relay 47 is actuated and interrupts the circuit between leads 46 and 48. The relay 47 is permanently connected to the other current supply lead 45 by the lead 57 and, like relay 49, also completes a circuit adapted to effect control over the tubing marking and tubing selecting apparatus of the present combination. The control circuit completed by the relay 47 at this time comprises the lead 58 which is connected to the current supply lead 51 and the lead 54.

The discovery of oversize or undersize portions of the tubing 1, which has resulted in the operation of one or the other of the indicator lamps 6 and 8, effects operation of other portions of the apparatus by means of the control circuit in part represented by the lead 54. One portion of said apparatus actuated in this manner is the tube marking means 9 which is located relatively near the gauge rolls 12 and 13 and farther along the course of movement of the tubing 1. The tube marking means 9 is mounted upon an arm 60 extending from the support column 17 at a position which enables the sharp edge of the hammer 61 to be brought against the tubing 1 immediately after it has passed from between the gauge rolls 12 and 13 to score or chip lines across the tubing 1 when the solenoid vibrator 62 forces said hammer 61 thereagainst. As shown in Fig. 6, the solenoid vibrator 62 is connected directly to the current supply lead 45 through lead 63 and through lead 64, lead 54 and either lead 50 or 58 (depending upon whether the tubing 1 is undersize or oversize and relay 49 or 47 is actuated) to the current supply lead 51. The lag in the operation of the marking means 9 after the off-size tubing 1 is engaged by the gauge rolls 12 and 13 permits said off-size tubing 1 to travel to the marking means 9 before said means is operated and has the effect of timing the marking of the tubing 1 with the advance thereof.

The control circuit (lead 54) also has the function of causing the off-size tubing 1 to register in the memory device 11 so that it, in turn, can effect operation of the selecting means 10 and the segregation of said off-size tubing 1 when said tubing 1 has advanced farther along its course of movement to operative relation to said selecting means 10. The control circuit is effective only when oversize or undersize tubing 1 causes relay 47 or 49 to connect it to the current supply lead 51 and exercises its control of the memory device 11 in the same way, regardless of the off-size condition, by completing a circuit to the two corresponding secondary control circuits associated with said device 11 which circuits are represented by the leads 65—66, time control switches 67—68, the registering solenoids 69—70 and the leads 71—72. Each secondary control circuit in turn is capable of effecting registration of off-size tubing 1 in a respective portion of the memory device 11 and in the combination provide a means whereby an interrupted cycle of registering is readily set up and more accurate and flexible modes of operation are obtainable. The time control switches 67 and 68, which are mounted opposite respective cams 73

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and 74 (Fig. 4) on the main drive shaft 75 of the memory device 11, assume control over the respective registering means of the memory device 11 alternately inasmuch as said cams 73 and 74 extend around directly opposite portions of said main drive shaft 75 and accordingly provide non-overlapping periods of control.

In the usual manner of operating said apparatus, the active periods of the memory device 11 are synchronized with the separation of the tubing 1 into lengths by the severing means 4 and cover the period when all but the end portion of said lengths pass between the gauge rolls 12 and 13. Such operation is effected because the cams 73 and 74 each have an effective length (high portion) of less than 180° by virtue of the tapered ends 73' and 74', respectively. This manner of operation causes the functions of the memory device to skip the portions of the tubing 1 finally appearing as the ends of each length and prevents these end portions from being controlling as to whether said length comprises an off-size portion and will be segregated. This manner of operation is preferred as the size of the ends of the lengths of tubing 1 is of no consequence as said ends are trimmed from the lengths or are reformed to a different shape in the final product, such as the reduced necks of the tubular envelopes for fluorescent lamps for instance.

The operation of the memory device 11 is timed to the advance of the tubing 1 by the drive provided in a chain (not shown) engaging the sprocket 76 on the main drive shaft 75 of the memory device 11 and the common driving apparatus (not shown) of the tractor chains 12 and 13 and the severing apparatus 4. This means turns the main drive shaft 75 at the rate of one revolution for each two lengths of tubing 1 formed by the severing apparatus 4 and may, for instance, advance one end of the cam 73 into engagement with the roller on the operating arm 77 of the totally enclosed switch 67 very shortly after a portion of said tubing 1 representative of an end of the length passes between the gauge rolls 12 and 13. If the control circuit, in part represented by the lead 54, is active because of an off-size portion of the tubing 1 between the gauge rolls 12 and 13, the secondary control circuit including said switch 67 will be completed thereby and the registering solenoid 69 will displace one of the six registry pins 78 in the memory wheel 79 toward the center of the device 11. The solenoid 69 effects displacement of a pin 78 by means of the bell crank 80 which is pivoted upon a pin 81 carried by bracket 82, also furnishing support for said solenoid 69, and turns said bell crank 80 by means of an interconnecting link 83 so that the lower arm thereof pushes against the head end 84 of said pin 78. This same action will result if an off-size portion is engaged at any time during the entire interval the gauge rolls 12 and 13 are engaging a portion of the same length of the tubing 1 and will displace a single pin 78 in the memory wheel 79 from the position where the head end 84 is against the stationary ring 85 on the housing 86 to a position where said head end 84 bears against the memory wheel 79. When the tubing 1 advances to such an extent that the portion of the tubing 1 which is to form this first-mentioned length passes from between gauge rolls 12 and 13, the cam 73 has turned beyond the roller on the actuating arm 77 for the timing switch 67 and the secondary circuit controlled thereby is rendered inoperative.

The advance of the succeeding portion of the tubing 1 which is representative of the next length to be severed therefrom advances the cam 74 into engagement with the roller on the operating arm 87 of the normally open timing switch 68 so that said switch 68 and the registering circuit controlled thereby is closed. This particular registering circuit effects operation of the solenoid 70 which in turn causes one of the pins 78' in a memory wheel 79' to be displaced toward the center of the memory device 11 by actuation of means corresponding to that associated

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with the other secondary control circuit and indicated with corresponding primed numbers.

Because the secondary control circuits are operated alternately at regularly occurring intervals, the pins 78 and 78' in the memory wheels 79 and 79' are not directly opposite each other but are spaced midway between each other so that the constant rotation of said memory wheels 79 and 79', which are on opposite ends of a sleeve 88 keyed to the shaft 89 and said pins 78 and 78' are aligned with the bell cranks 80 and 80' at respective intervals. The six pins 78 and 78' in each of the memory wheels 79 and 79', require said wheels and the shaft 89 to be turned at one sixth the speed of the drive shaft 75 by the interconnecting gears 90 and 91 in order to provide a continuously repeated cycle of operation. Exact synchronization of the memory device 11 with the advance of the tubing 1 and the formation of lengths therefrom is provided for by having the timing cams 73 and 74 mounted upon a common hub 92 adjustably attached by the bolts 93 to an end flange on a sleeve 94 keyed to the drive shaft 75. The skip interval during which both secondary control circuits are inoperative, on the other hand is determined by the shape of the cams 73 and 74 and the adjusted position of the control arms 77 and 87 for the switches 67 and 68 which are mounted upon a bracket 95 extending from the housing 86 surrounding the memory wheels 79 and 79' and the other parts of said memory device 11.

The result of the registration of off-size tubing 1 in the memory device 11 is not received until the tubing 1 has advanced beyond the tractor chains 2 and 3 (which are preferably the type disclosed in Danner Patent 1,218,598 dated March 6, 1917) and from engagement with severing means 4 (which is preferably the type disclosed in Brown et al. patent 2,120,583 dated June 14, 1938). At that time, said tubing 1 passes over the bed 100 of the selecting means 10 and the wheels 79 and 79' of the memory device 11 have rotated sufficiently to cause the pins 78 and 78', representing that particular portion of said tubing 1, to be at positions to effect operation of said selecting means 10. The tubing 1 as shown in Figs. 1 and 5 advances to a position directly over the center mounted shaft 101 for deflector 102 at the time the severing operation is complete and the length 1' formed therefrom drops by its own weight toward the deflector 102. If the preceding length 1' has been of proper size and the present length 1' is also of proper size (as is the usual conditions of operation), said length 1' will fall onto the left hand (Fig. 5) slope 103 of the deflector 102 and roll down the inclined rails 104 to the storage means (not shown). If, on the other hand, the length 1' of tubing dropping toward the deflector 102 is off-size, said deflector 102 will tilt to the left due to rotation of the shaft 101, and said length 1' will fall onto the right hand slope 105 and roll down the inclined rails 106 to other storage means (not shown).

The position of the deflector 102 is under the control of solenoids 107 and 108 connected to opposite sides of the rocker arm 109 on the deflector support shaft 101 and is not shifted from left to right or in the reverse direction unless the proper pin 78 or 78' in wheels 79 and 79' of the memory device 11 is positioned so as to effect completion of the proper electrical circuits to said solenoids 107 and 108. The presentation of the length 1' of tubing to the selector device 11 is synchronized with the advance of one of the pins 78 or 78' to operative relation to one or another of two duplicate control switches 110 or 110' (only one appearing in Fig. 4) adjacent the path of rotation of the memory wheels 79 and 79'. This presentation of a length 1' of tubing results in a shift in position of the deflector 102 when the pin 78 or 78' representing that length 1' is at a different position than the preceding pin 78 or 78'. If the presently considered length 1' of tubing is off-size, the pin 78 or 78' representing said length 1' will be at a position in the memory wheel 79 or 79' where the shank thereof engages the roller on the

control pin 111 or 111' of the switch 110 or 110' during the rotation of said memory wheel 79 or 79' and forces said control pin 111 or 111' down so that said normally open switch 110 or 110' is closed. As shown in the wiring diagram, Fig. 6, the length 1' of tubing can be represented by either pin 78 or 78' with the same result since switches 110 and 110' are connected to the supply lead 51 by leads 112 and 112', respectively, and through leads 113 and 114 to the deflector operating solenoid 107. The interlock circuit formed by the switch 115 and the leads 116 and 117 and connecting the solenoid 107 to the supply lead 45 prevents the operation of the solenoid 107 when the deflector 102 is already tilted to the left as said switch 115 (Fig. 5) is shifted to an abnormal open position by the presence of the raised portion of a cam 118 on the deflector support shaft 101 behind the control pin 119 of said switch 115. The pins 78 and 78', representing a length 1' of tubing of proper size and, accordingly, not displaced toward the center of the memory device 11, pass to one side of the control pins 111 and 111' and do not therefore operate the switches 110 and 110' which control the tilting of the deflector 102. However, the deflector 102 may, at such times, be at a tilted-to-the-left position because the preceding length 1' of tubing had been off-size and will be tilted back to the right by the operation of the solenoid 108 which is under the control of a circuit comprised of the normally open time switch 120, opposite the cam 121 on the drive shaft 75 of the memory device 11, and the normally closed interlock switch 122 opposite the cam 123 on the support shaft 101. The switches 120 and 122 and the leads 124, 125, 126, and 127 form the circuit connections from the solenoid 108 to the supply leads 45 and 51 and provide for the operation of said solenoid 108 each time a length 1' of tubing advances over the selecting means 10 inasmuch as the cam 121 has opposite reduced portions 128 and 128' for operating the switch 120 at the proper intervals.

Means are also provided in the memory device 11 for adjusting the timing of the right-to-left tilt or discarding operation of the deflector 102 of the selecting means 10 in that a change in the longitudinal size of the lengths 1' of tubing and in the speed of operation of the drawing apparatus require that suitable compensation be provided for in the operation of said selecting means 10. This adjustment is made by advancing or retracting the switches 110 and 110' controlling said operation along the circular path of movement of the pins 78 and 78' and is performed by rotating the ring gear 130, to which said switches 110 and 110' are attached by the brackets 131' (only one bracket showing) within the recess in the partition 132 of the housing 86 of the memory device 11 in which it is held by the ring 133. An external cross bar 134 on a shaft 135 extending to a train of gears 136 and 137 in a pocket in the housing 86 and in part formed by said partition 132 permit the ready rotation of the ring gear 130, whereas a dial 138 on said shaft 135 and the fixed pointer 139 indicate the amount of adjustment that has been made.

All portions of the apparatus are adapted to continuous operation; however, the memory device requires all pins 78 and 78' in the memory wheels 79 and 79' to be correspondingly arranged therein at the time they again pass into position to register off-size tubing 1. The rearrangement of the pins 78 and 78' occurs when the rotation of the memory wheels 79 and 79' carries said pins 78 and 78' to positions where the extending ends of the displaced pins 78 and 78' slide across the sloping faces of the cams 141 and 141', respectively, attached to the ring gear 130 and are forced back thereby to the position where the head end thereof slides along the faces of the stationary rings 85 and 85'.

Although a preferred embodiment of our invention has been disclosed, it will be understood that the invention is not to be limited to the specific construction and arrangement of parts shown, but that they may be widely modi-

fied within the spirit and scope of our invention as defined by the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In combination, apparatus for gauging tubing or rod comprising separable rolls engaging opposite sides of said tubing or rod and control means adapted to be actuated upon separation of the rolls either a greater or lesser amount than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls, selecting apparatus located at a position below and further along the path of movement of the tubing or rod and comprising rails extending to opposite sides and sloping downward from a position below said path, and a movable deflector having downward sloping side portions and mounted for lateral movement to positions over the juncture of said rails whereby lengths of the tubing or rod fall onto one side portion and roll onto the rails at one side thereof at one position and whereby said lengths fall onto the other side portion and roll onto the rails at the other side thereof at another position, and a memory device comprising memory means, means controlled by the said control means of the gauging apparatus for registering in the memory device the presence of an off-size portion of said tubing or rod in engagement with said gauging apparatus, and means actuated by the memory means at a subsequent interval and effecting movement of the deflector means of the selecting apparatus for directing lengths of tubing or rod comprised of off-size portions to the same one side of said rails.

2. In combination with apparatus for severing tubing or rod into lengths during the course of movement thereof, apparatus for gauging the tubing or rod comprising separable rolls engaging opposite sides of said tubing or rod and control means adapted to be actuated upon separation of the rolls either a greater or lesser amount than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls, selecting apparatus located in position to receive lengths cut from said tubing or rod by the severing apparatus and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means having registry members advanced to operative positions in synchronism with the advance of uniform lengths of the tubing or rod through the severing apparatus, means controlled by the said control means of the gauging apparatus for registering in a said registry member at an operative position the presence of off-size portions of a length of said tubing or rod in engagement with the gauging apparatus, means for rendering the last-mentioned means operative during only a selected portion of the period a registry member is located at the operative position and a selected portion of a length of said tubing or rod is in engagement with the gauging apparatus, and means actuated by the memory means at the proper subsequent interval and effecting operation of the selecting apparatus for causing the lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

3. In combination with apparatus for severing tubing or rod into lengths during the course of movement thereof, apparatus for gauging the tubing or rod comprising separable rolls engaging opposite sides of said tubing or rod and control means adapted to be actuated upon separation of the rolls either a greater or a lesser amount than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls, selecting apparatus located in position to receive lengths cut from said tubing or rod by the severing apparatus and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory pins, a pair of memory wheels each mounting the pins at uniformly spaced intervals about the axis of rotation and midway between the pins of the other wheel and each rotatable in synchronism with the

operation of the severing apparatus, displacing means including a member located at one position about each memory wheel and controlled by the said control means of the gauging apparatus for displacing a memory pin at said position to register an off-size portion of the tubing or rod engaged by the gauging apparatus, means operated in synchronism with the severing apparatus for causing the displacing means adjacent each memory wheel to be alternately actuated by the advance of successive lengths of off-size tubing or rod into engagement with the gauging apparatus, and means including a member located adjacent each memory wheel at the position therearound which is reached by each of the pins at the end of the timed interval during which the portion of the tubing represented thereby is advancing to the selecting apparatus for effecting operation thereof to cause the length of tubing or rod comprised of said off-size portion to be directed to one of said paths of movement.

4. In combination, apparatus for gauging tubing or rod comprising a pair of spaced separable rolls, mounting means for holding the rolls against opposite portions of the tubing or rod with one roll mounted for movement relatively to the other roll, control means having respective cooperating portions supported from the movable roll and the mounting means and adapted to be actuated upon either a greater or a lesser separation of the rolls than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls, and flexible support means for holding the mounting means and permitting limited motion thereof transversely of the tubing or rod to cause the rolls to float with variations in the position of the tubing or rod, selecting apparatus located in position to receive lengths cut from said tubing or rod and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means, means controlled by the said control means of the gauging apparatus for registering in the memory means the presence of an off-size portion of said tubing or rod in engagement with said gauging apparatus, and means actuated by the memory means at a subsequent interval and effecting operation of the selecting apparatus for causing lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

5. In combination, apparatus for gauging tubing or rod and comprising a pair of spaced separable rolls having parallel axes of rotation, mounting means for holding the rolls against opposite portions of the tubing or rod with their axes horizontal and with one roll mounted for vertical movement relatively to the other roll, control means having respective cooperating portions supported from the movable roll and the mounting means and adapted to be actuated upon either a greater or a lesser separation of the rolls than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls, and horizontally positioned flat spring leaves for holding the mounting means and permitting limited vertical motion thereof to cause the rolls to float with vertical changes in position of the tubing or rod, selecting apparatus located in position to receive lengths cut from said tubing or rod and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means, means controlled by the said control means of the gauging apparatus for registering in the memory means the presence of an off-size portion of said tubing or rod in engagement with said apparatus, and means actuated by the memory means at a subsequent interval and effecting operation of the selection apparatus for causing lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

6. In combination, apparatus for gauging tubing or rod and comprising a pair of spaced rolls having parallel axes of rotation and adapted to engage opposite portions of

the tubing or rod, a frame for holding one of said rolls, a plate arranged perpendicular to the axis of the other roll for mounting said roll, means on said frame for guiding the plate in a direction of movement permitting said rolls to move closer together or farther apart, control means including cooperating members mounted respectively upon the frame and the plate and adapted to be actuated upon separation of the rolls either a greater or lesser amount than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls for determining deviations in the size thereof, and flexible support means for holding the frame and permitting limited motion thereof laterally of the tubing or rod to cause the rolls to float with variations in the position of the tubing or rod, selecting apparatus located in position to receive lengths cut from said tubing or rod and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means, means controlled by the said control means of the gauging apparatus for registering in the memory means the presence of an off-size portion of said tubing or rod in engagement with said apparatus, and means actuated by the memory means at a subsequent interval and effecting operation of the selecting apparatus for causing lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

7. In combination, apparatus for gauging tubing or rod comprising a pair of spaced rolls having parallel axes of rotation and adapted to engage opposite portions of the tubing or rod, a frame for holding one of said rolls, a plate arranged perpendicular to the axis of the other roll for mounting said roll, means on said frame for guiding the plate in a direction of movement permitting said rolls to move closer together or farther apart, control means including cooperating members mounted respectively upon the frame and the plate and adapted to be actuated upon separation of the rolls either a greater or a lesser amount than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls for determining deviations in the size thereof, and support means for holding the frame at a fixed relation to the path of movement of the tubing or rod, selecting apparatus located in position to receive lengths cut from said tubing or rod and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means, means controlled by the said control means of the gauging apparatus for registering in the memory means the presence of an off-size portion of said tubing or rod in engagement with said apparatus, and means actuated by the memory means at a subsequent interval and effecting operation of the selecting apparatus for causing lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

8. In combination, apparatus for gauging tubing or rod and comprising a pair of spaced rolls having parallel axes of rotation and adapted to engage opposite portions of the tubing or rod, a frame for holding one of said rolls, a plate carrying the other roll and arranged perpendicular to the axis thereof and having opposite parallel sides, spaced guide rollers mounted upon the frame and having grooved peripheries engaging the said parallel sides of the plate for restricting said plate to a direction of movement allowing the rolls to move closer together or farther apart, support means for holding the frame at a fixed relation to the path of movement of the tubing or rod, and control means including cooperating members mounted respectively upon the frame and the plate and adapted to be actuated upon separation of the rolls either a greater or lesser amount than a predetermined acceptable range due to the presence of portions of the tubing or rod between said rolls for determining deviations in the size thereof, selecting apparatus located in position to receive lengths cut from said tubing or rod

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and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means, means controlled by the said control means of the gauging apparatus for registering in the memory means the presence of an off-size portion of said tubing or rod in engagement with said apparatus, and means actuated by the memory means at a subsequent interval and effecting operation of the selecting apparatus for causing lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

9. In combination, apparatus located along the course of movement of tubing or rod for gauging the tubing or rod comprising a pair of spaced rolls having parallel horizontal axes of rotation and adapted to engage opposite sides of the tubing or rod, a frame for holding one of said rolls, a plate arranged perpendicular to the axis of the other roll for mounting said roll and having opposite parallel edges, guide rollers mounted upon the frame and having grooved peripheries engaging spaced portions of the parallel edges of the plate for restricting said plate to a direction of movement allowing the rolls to move closer together or farther apart, a fixed support member, horizontally positioned flat spring leaves joining the frame and the fixed support member for permitting limited vertical motion of the frame to cause the rolls to float with vertical changes in position of the tubing or rod, means connected between the frame and the fixed support means for counter balancing the weight of said frame and portions of the gauging apparatus attached thereto, control means including cooperating members mounted respectively upon the frame and the plate and adapted to be actuated upon separation of the rolls either a greater or lesser amount than a predetermined acceptable range due to the presence of off-size portions of the tubing or rod between said rolls for determining deviations in the size thereof, selecting apparatus located in position to receive lengths cut from the tubing or rod and including means for directing said lengths to either of two paths of movement, and a memory device comprising memory means, means controlled by the said control means for registering in the memory means the presence of an off-size portion of said tubing or rod in engagement with the gauging apparatus, and means actuated by the memory means at a subsequent interval for effecting operation of the select-

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ing apparatus for causing lengths of tubing or rod comprised of off-size portions to be directed to a given one of said paths of movement.

10. The combination with means for severing continuously moving tubing or rod into lengths, means for gauging the tubing or rod comprising separable members engaging opposite sides thereof and control means adapted to be actuated upon separation of said members either a greater or a lesser amount than a predetermined acceptable range by the presence of off-size tubing or rod between said members, and selecting means located to receive lengths cut from said tubing or rod and including means for directing said lengths to either of two paths of movement, of a memory device comprising a wheel driven in synchronism with said severing means and having thereon a plurality of shiftable pins spaced about the axis of rotation of said wheel, displacing means including a solenoid actuated member located at one position adjacent said wheel and controlled by said control means of the gauging means for displacing a pin at said position to register an off-size portion of the tubing or rod engaged by the gauging means, means including adjustable cam members and associated switches controlled thereby and operated in synchronism with the severing apparatus for causing said displacing means to be actuated by successive lengths of off-size tubing or rod, said cam means being shaped and arranged to render actuation of said displacing means effective during the gauging of a predetermined portion only of each length of tubing or rod, and means including a switch member at a position about said wheel in the path of shifted pins and operable thereby to control operation of said selecting means.

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