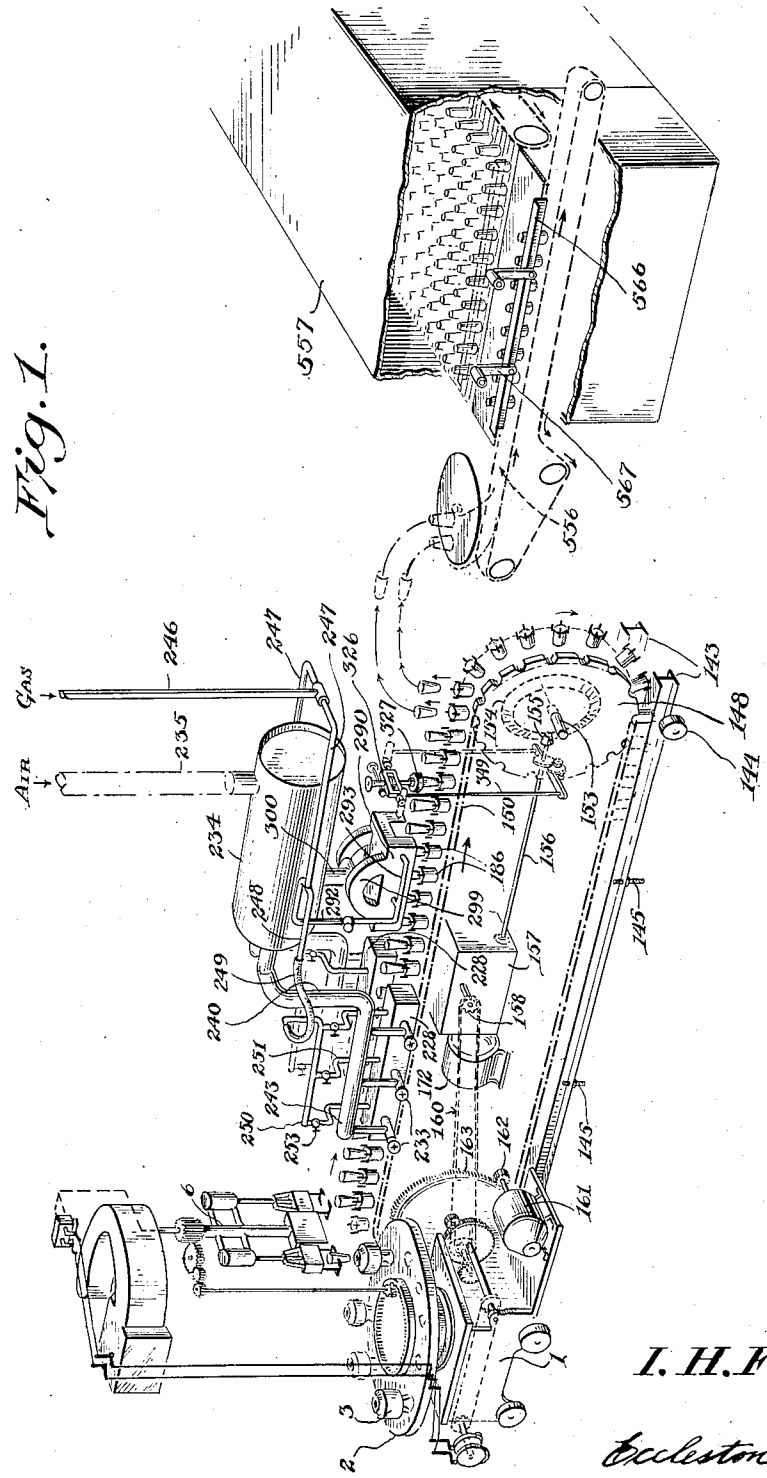
Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 1

Fig. 1.



Inventor

I. H. Freese

Eccleston & Eccleston

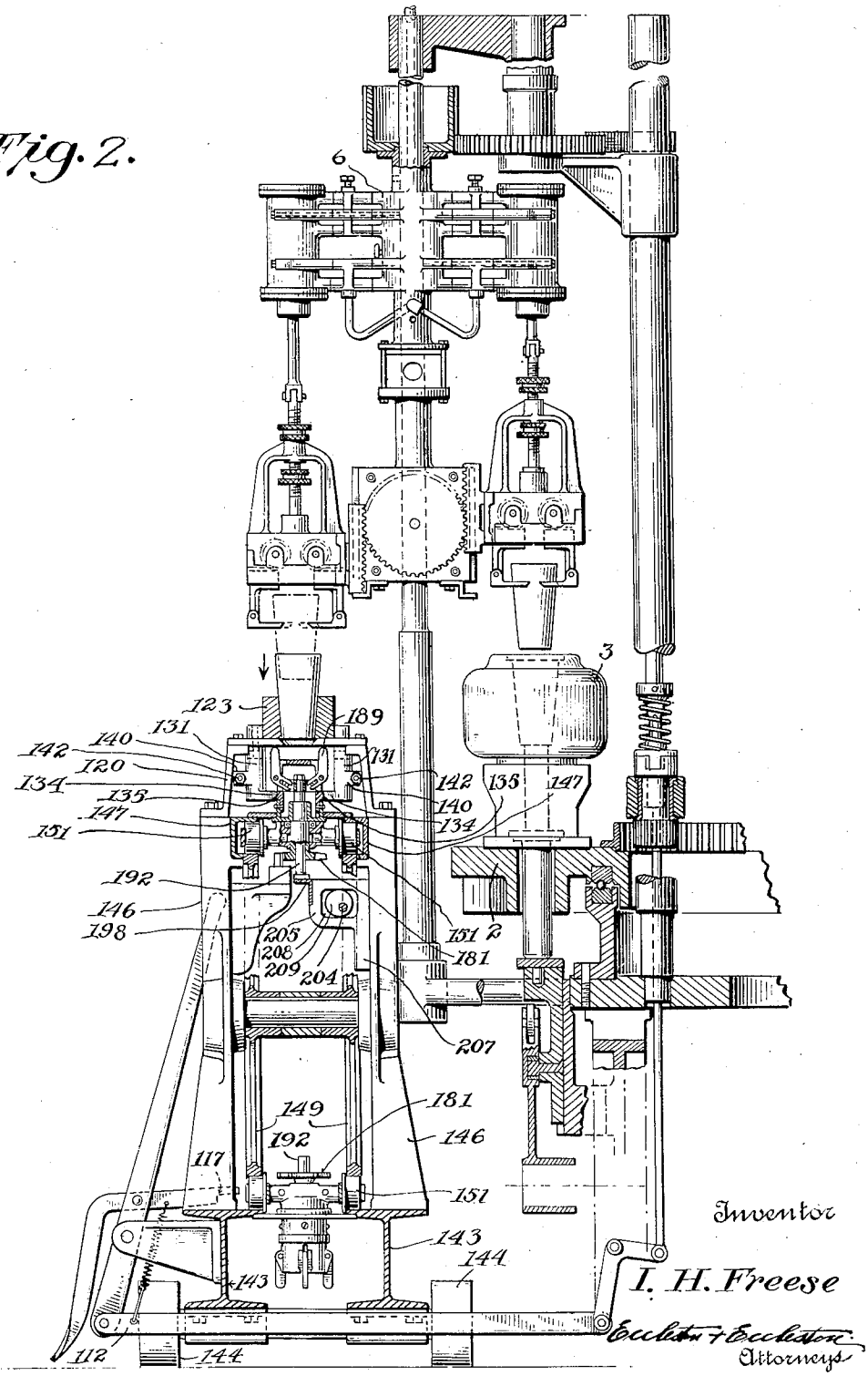
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 2

Fig. 2.



Inventor

I. H. Freese

Eccleston & Eccleston

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 3

Fig. 3.

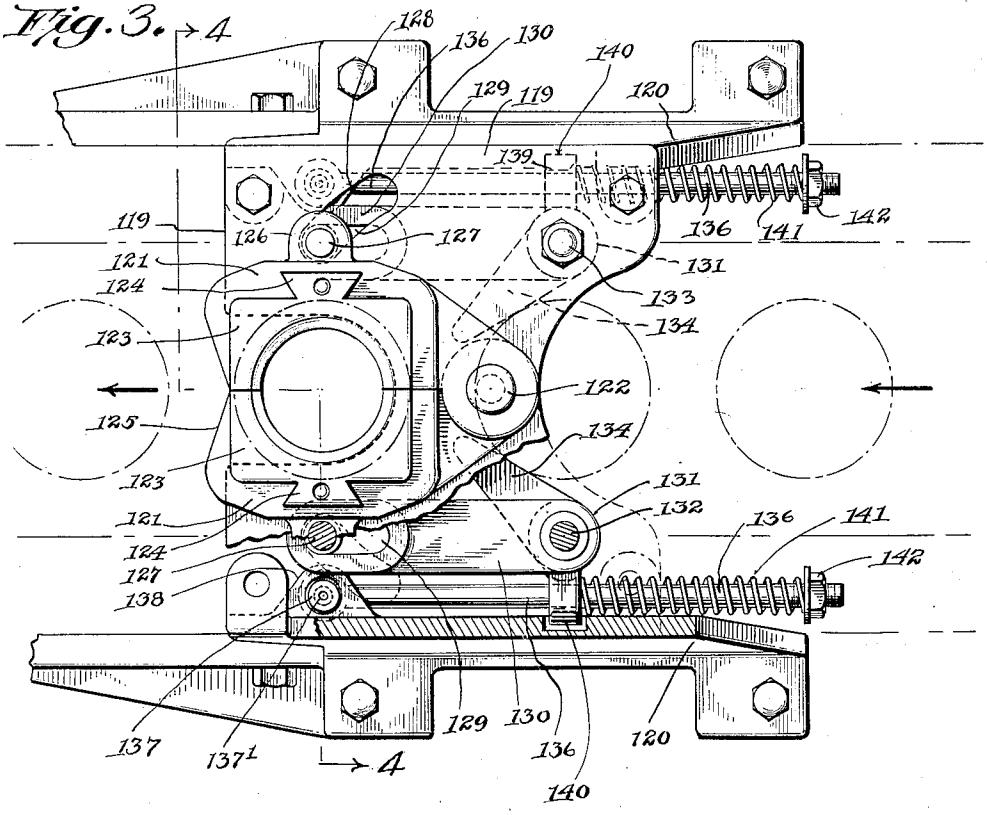


Fig. 4.

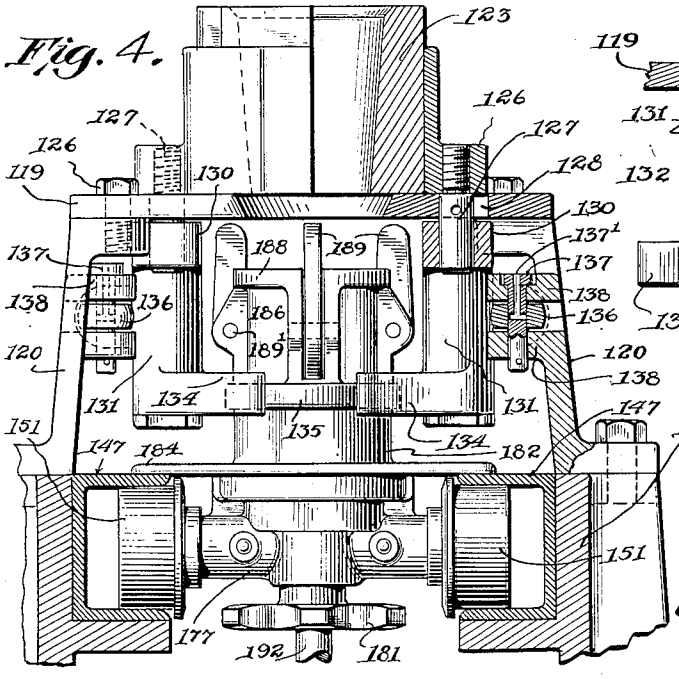
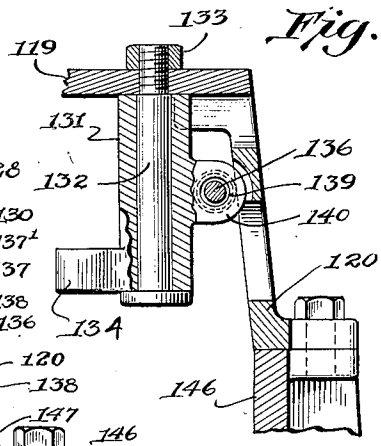


Fig. 5.



Inventor

I. H. Freese

Eccleston & Eccleston

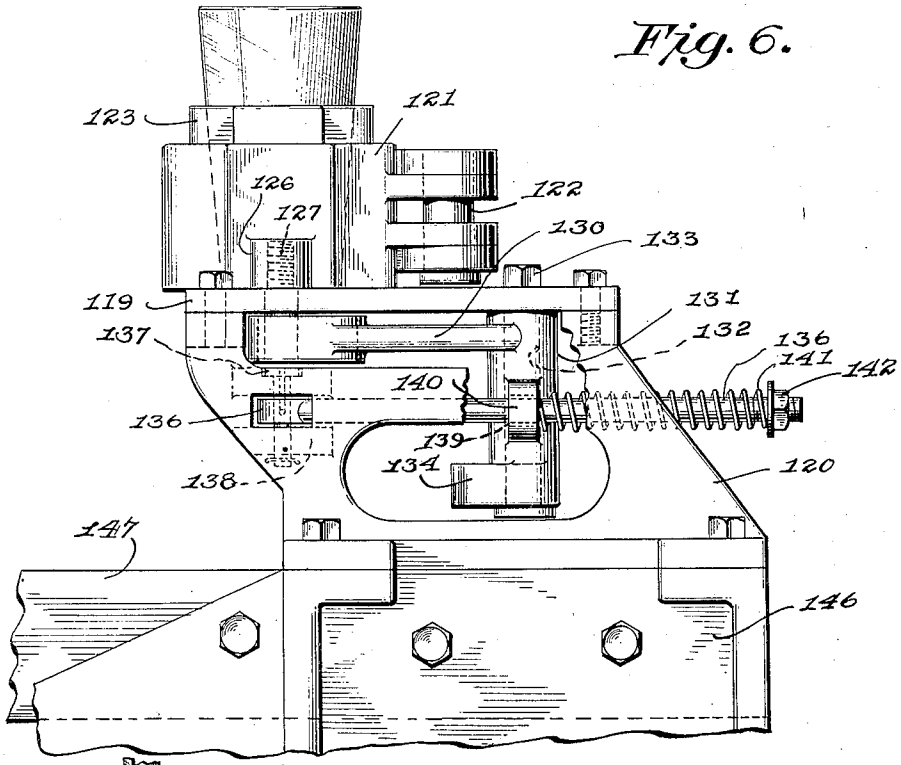
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 4

Fig. 6.



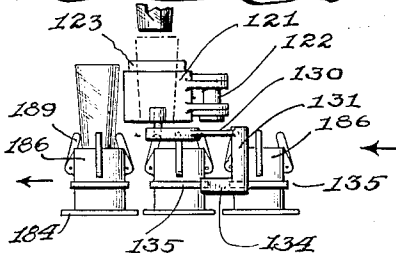


Fig. 7.

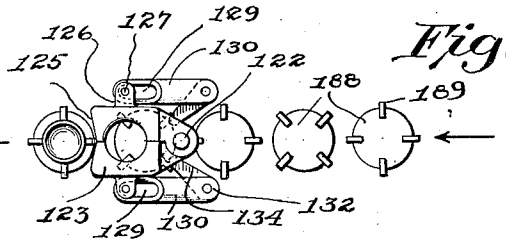


Fig. 8.

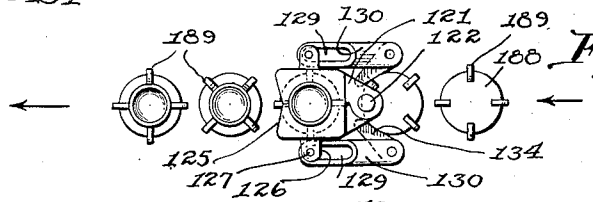


Fig. 9.

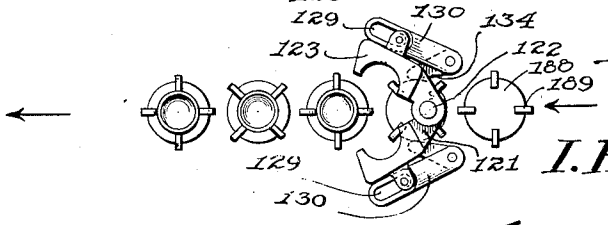


Fig. 10.

Inventor

I. H. Freese

Eccleston & Eccleston

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 5

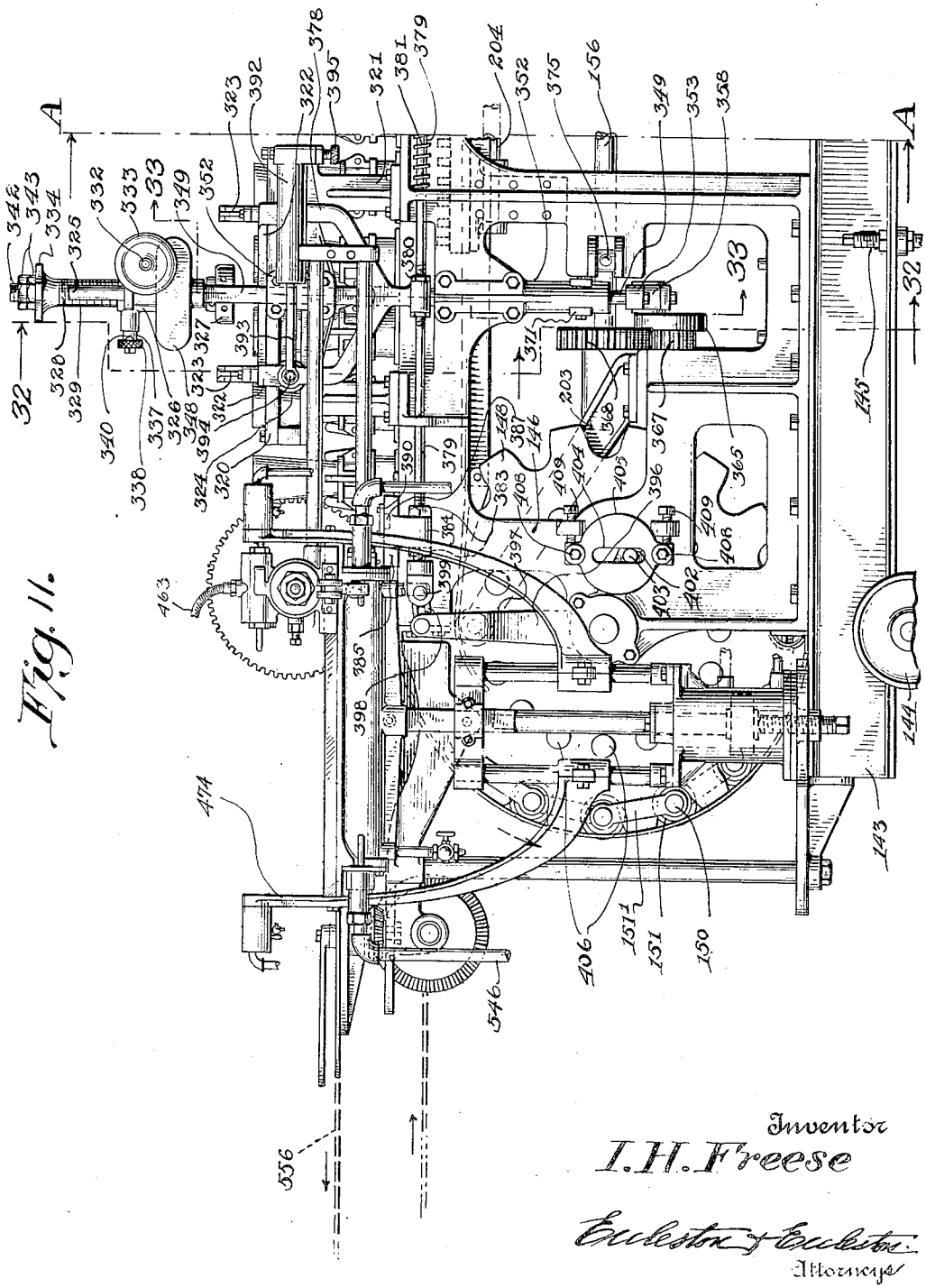


Fig. 11.

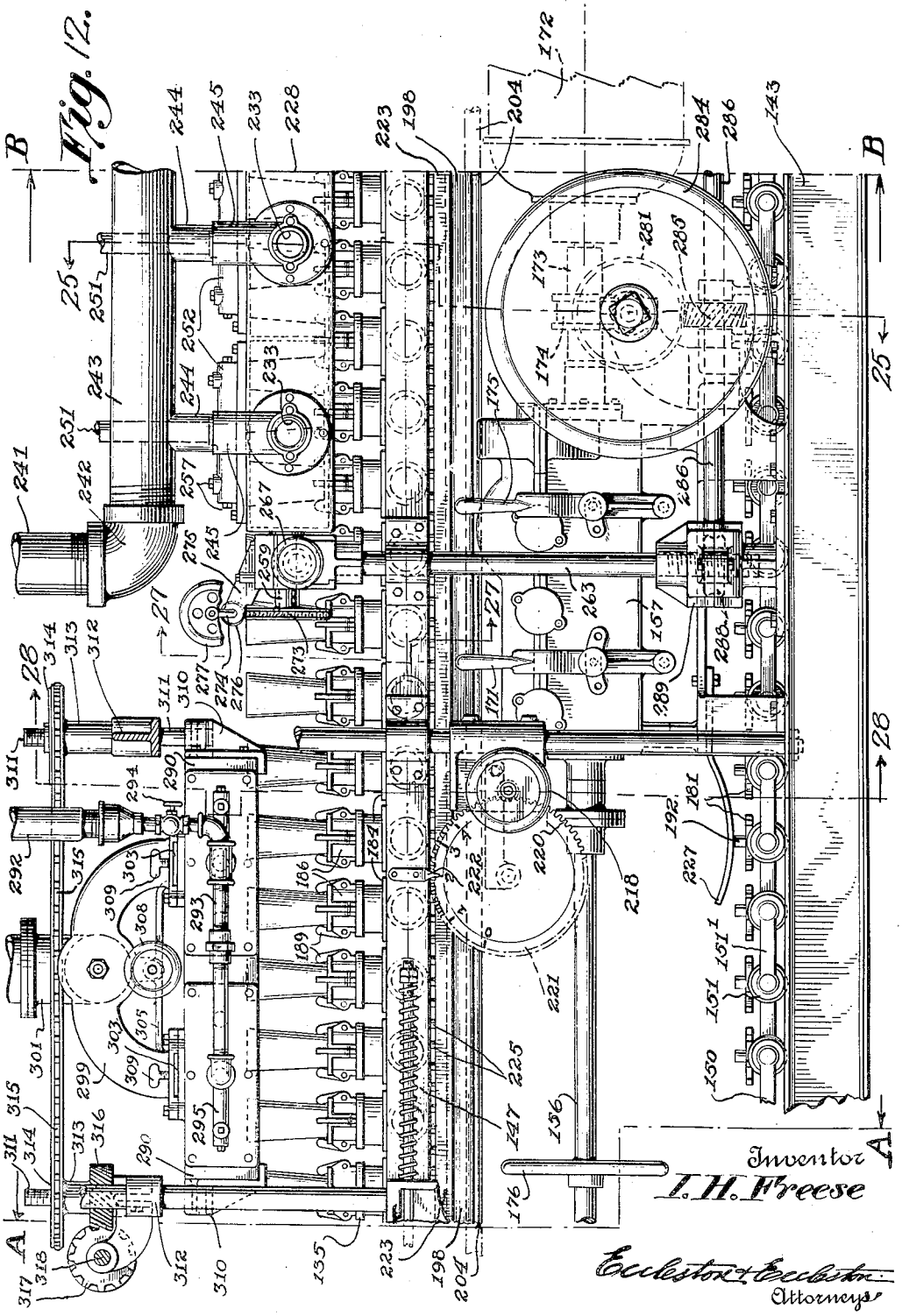
Inventor
I. H. Freese
Brickston & Brickston
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 6

Fig. 12.



Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 7

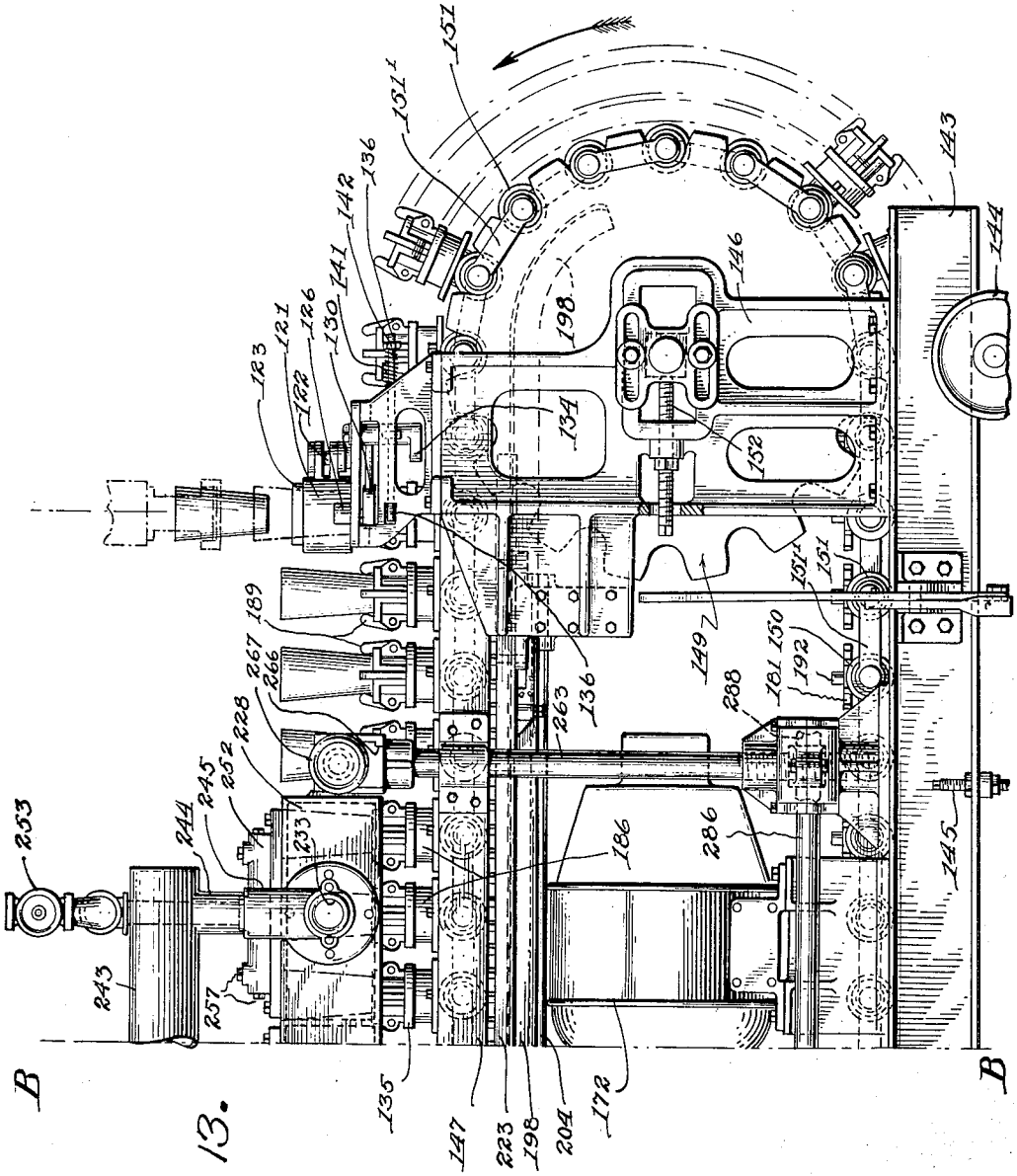


Fig. 13.

Inventor
I. H. Freese

Eaglestone & Eaglestone
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 8

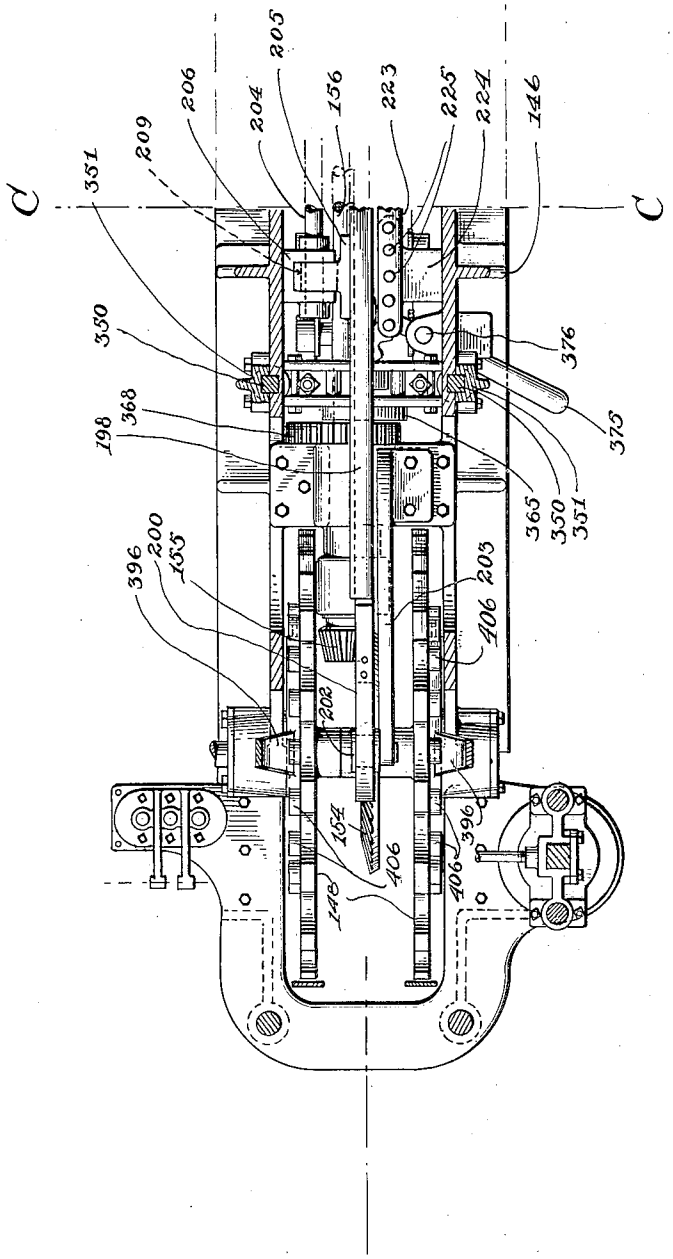


Fig. 14.

Inventor
I. H. Freese

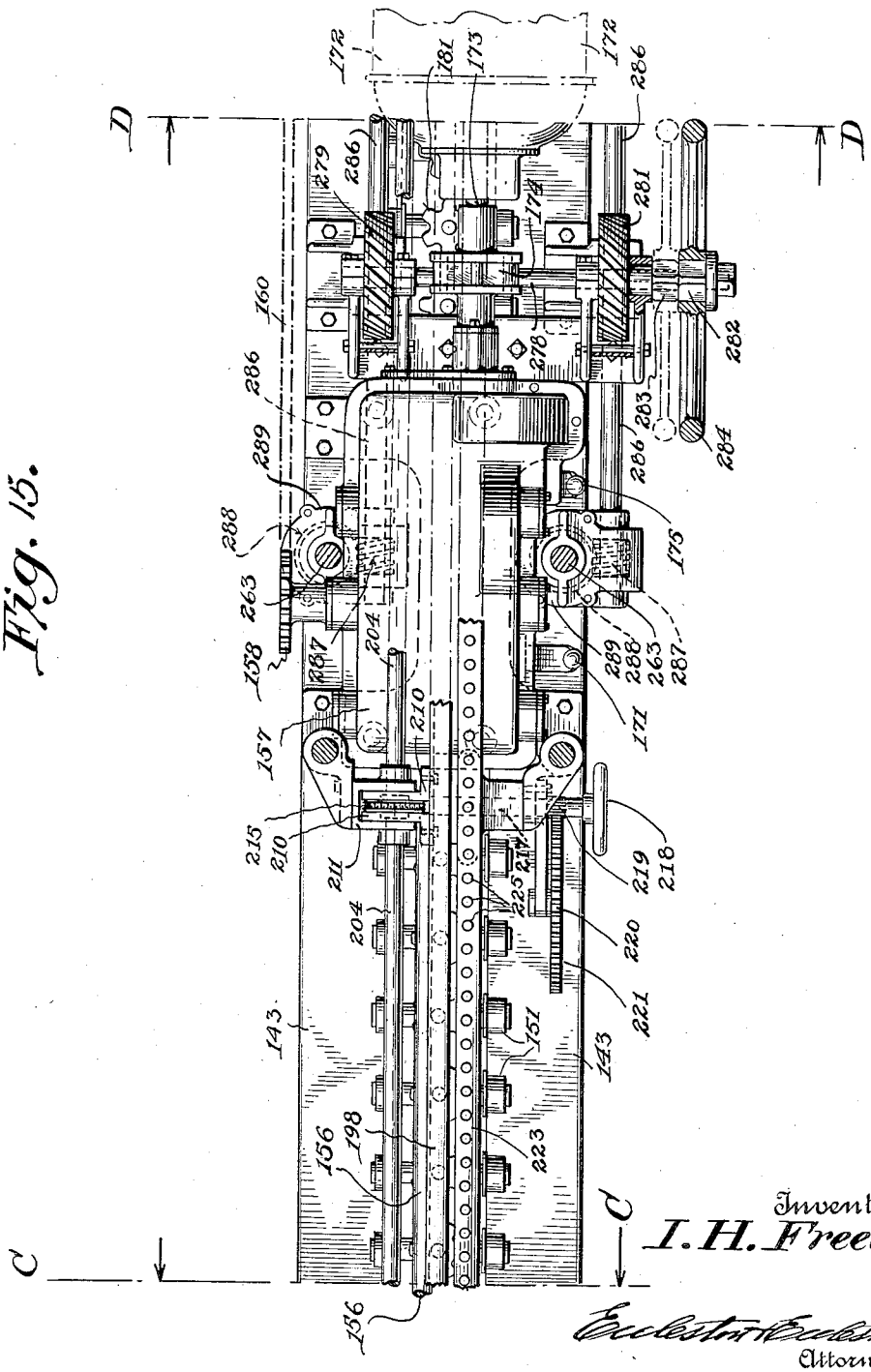
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 9

Fig. 15.



Inventor
I. H. Freese

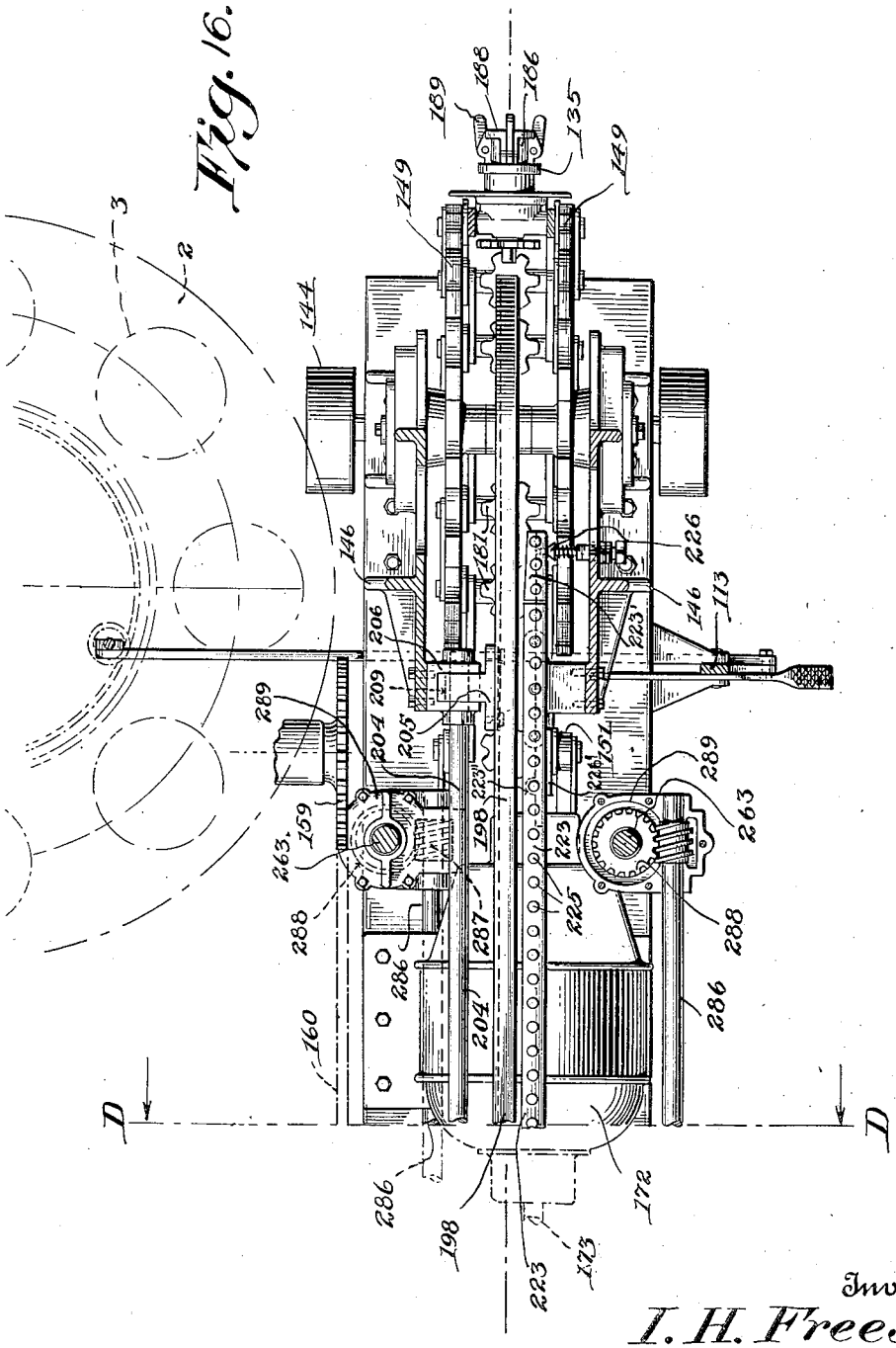
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 10

Fig. 16.



Inventor
I. H. Freese

Eachester & Eachester
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 11

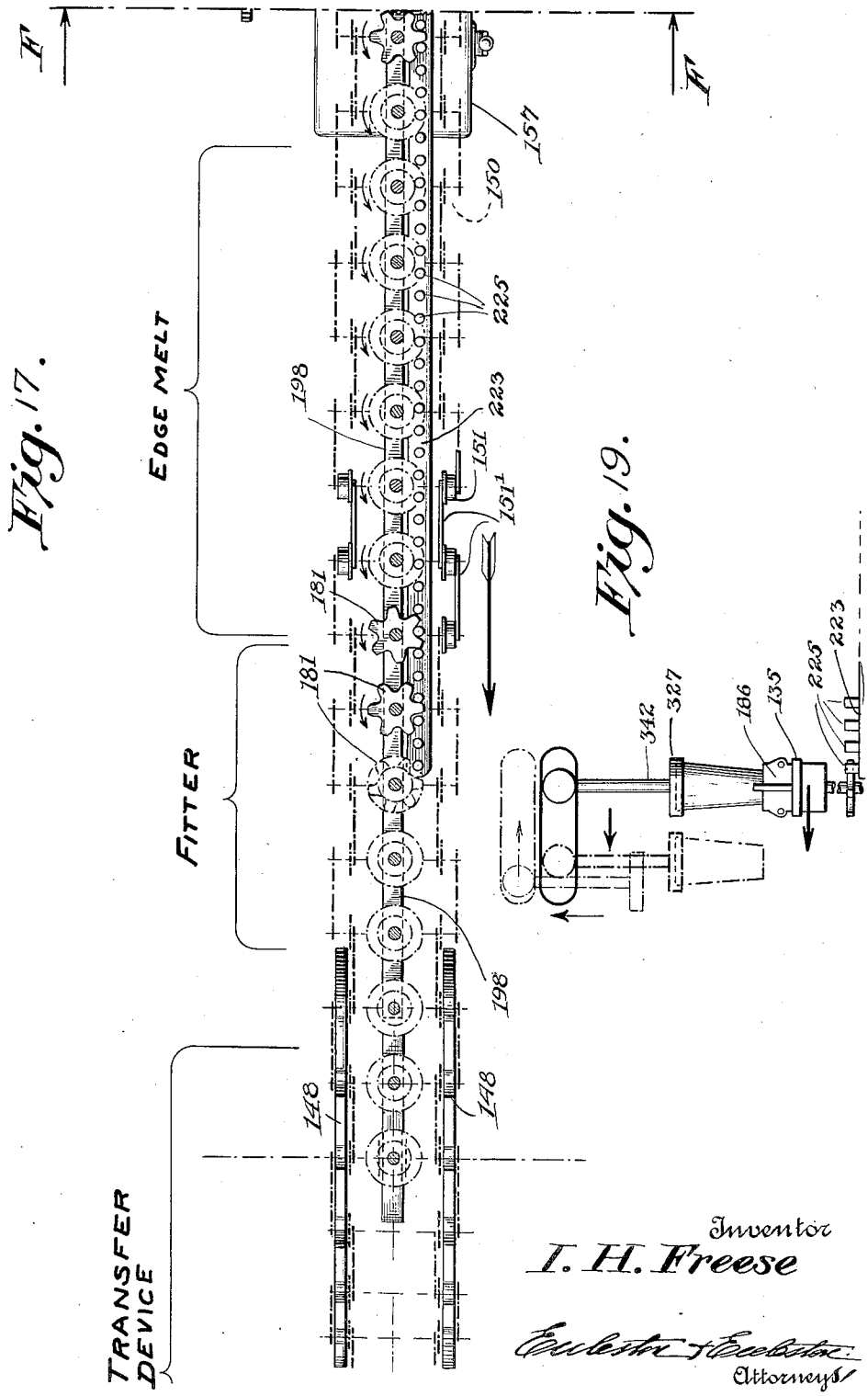


Fig. 17.

Fig. 19.

Inventor
I. H. Freese

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 12

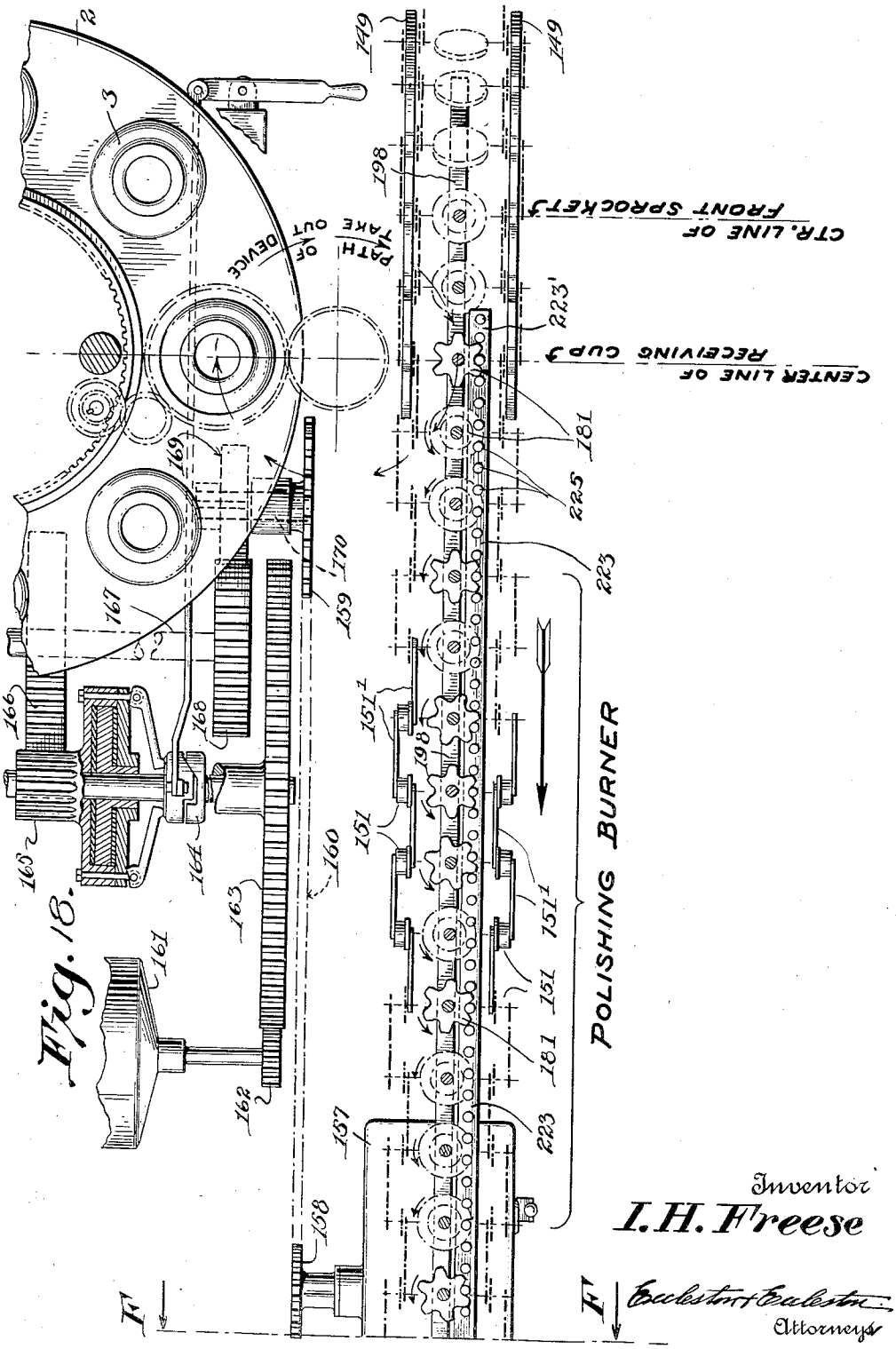


Fig. 18.

Inventor
I. H. Freese

Eckelston & Eckelston
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 13

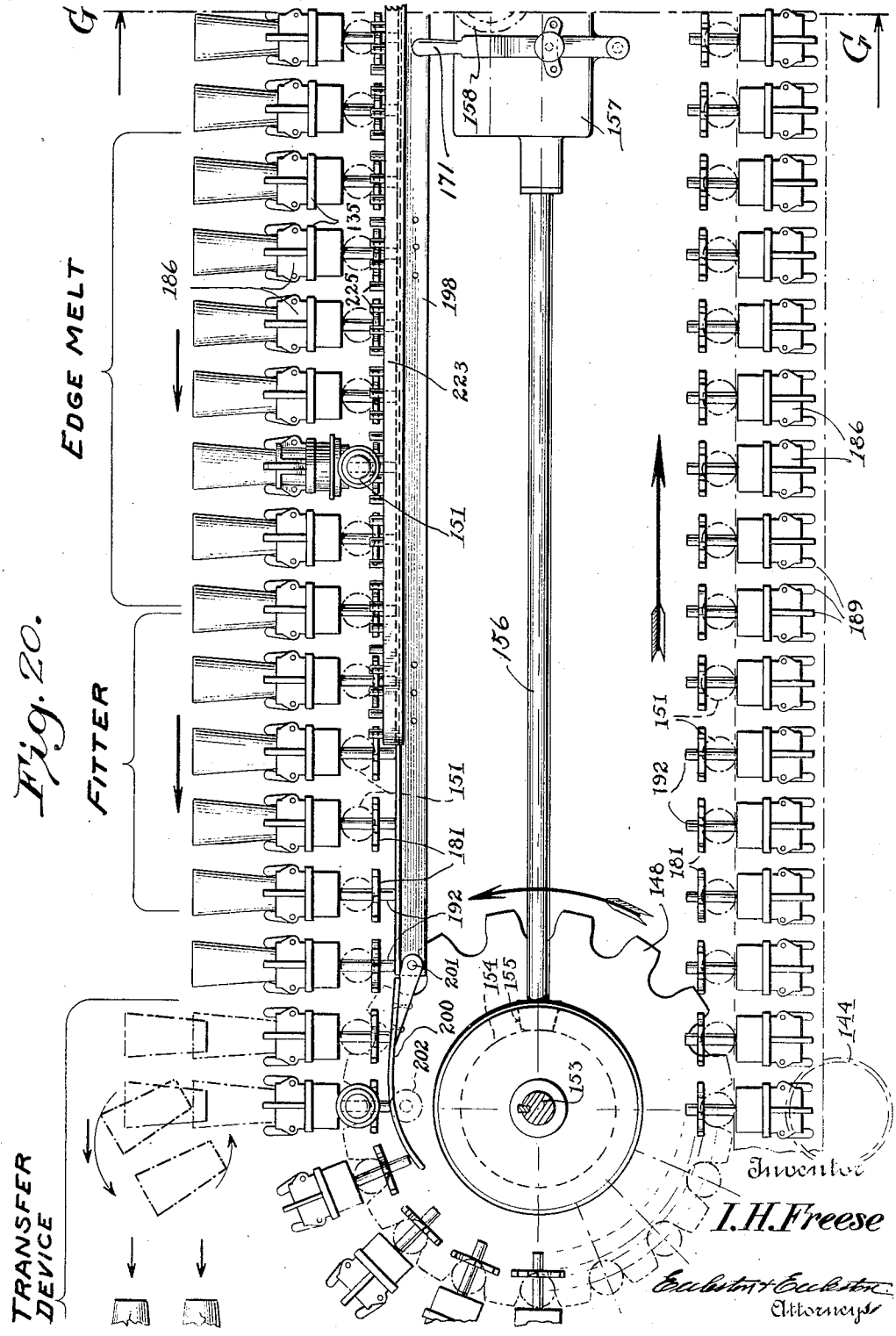


Fig. 20.

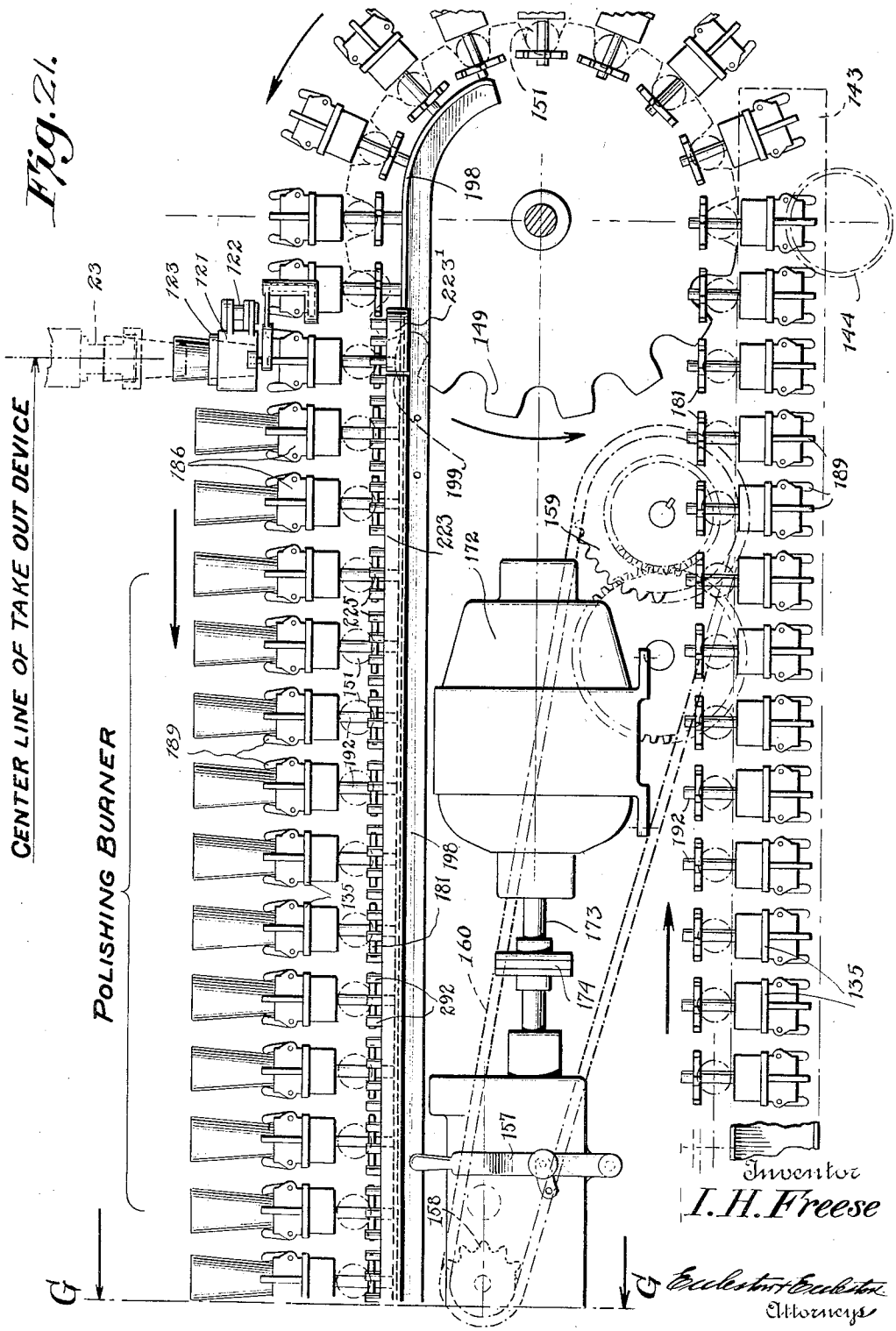
Inventor
I. H. Freese
Eachston & Eachston
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 14

Fig. 21.



Inventor
I. H. Freese

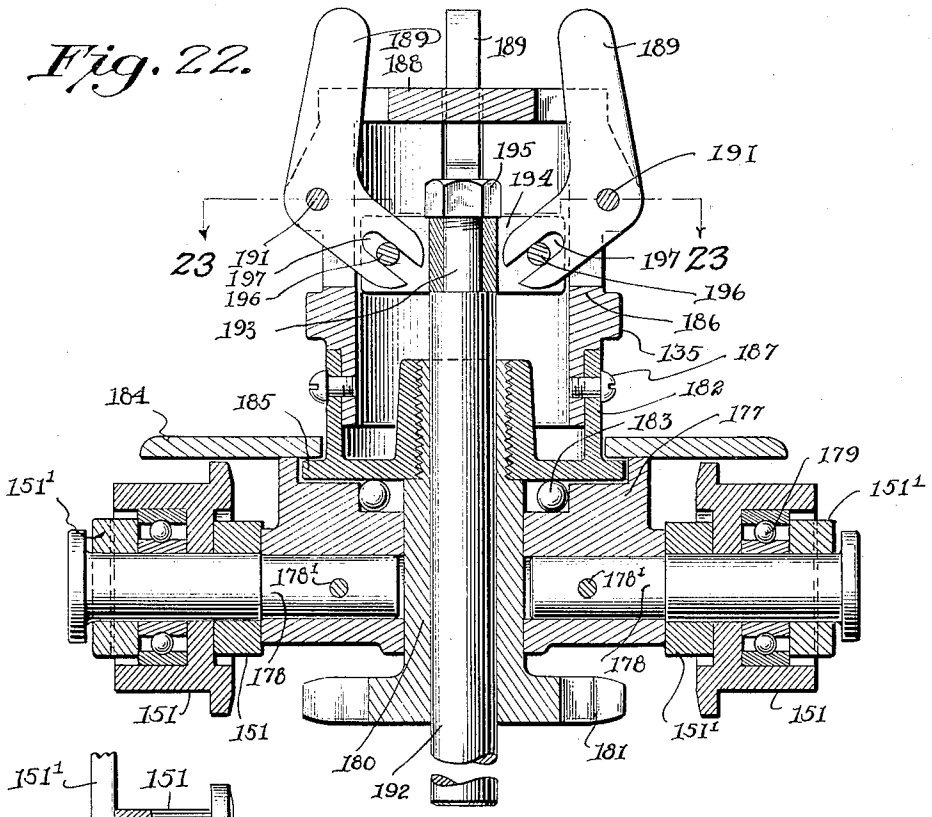
Bachelder & Bachelder
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 15

Fig. 22.



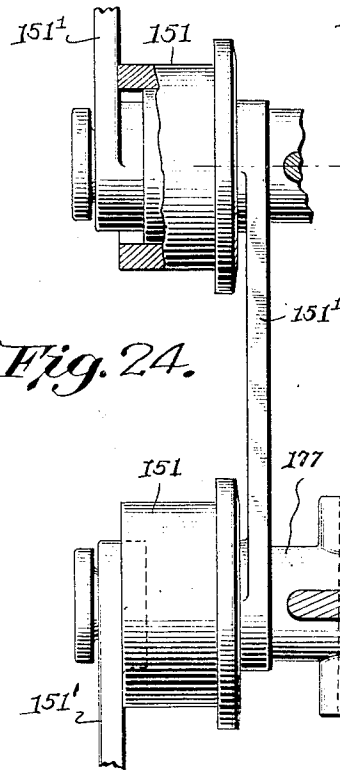
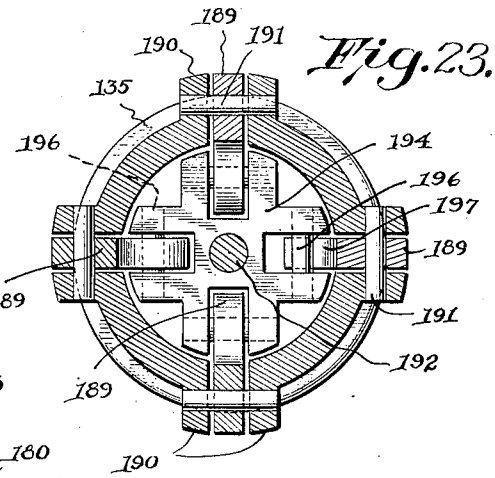


Fig. 24.

Fig. 23.



Inventor

I. H. Freese

Beckstrom & Beckstrom.

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 16

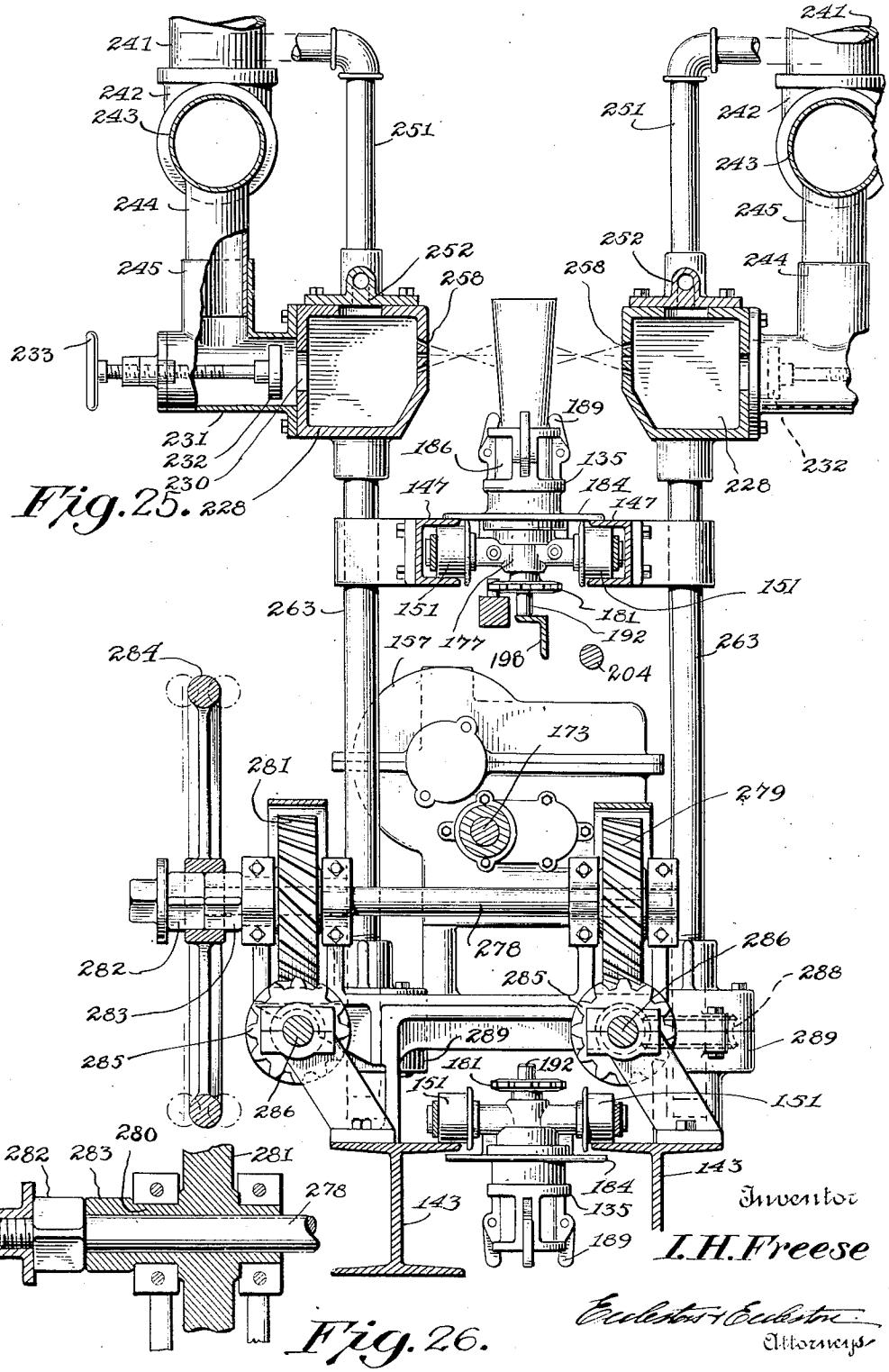


Fig. 25.

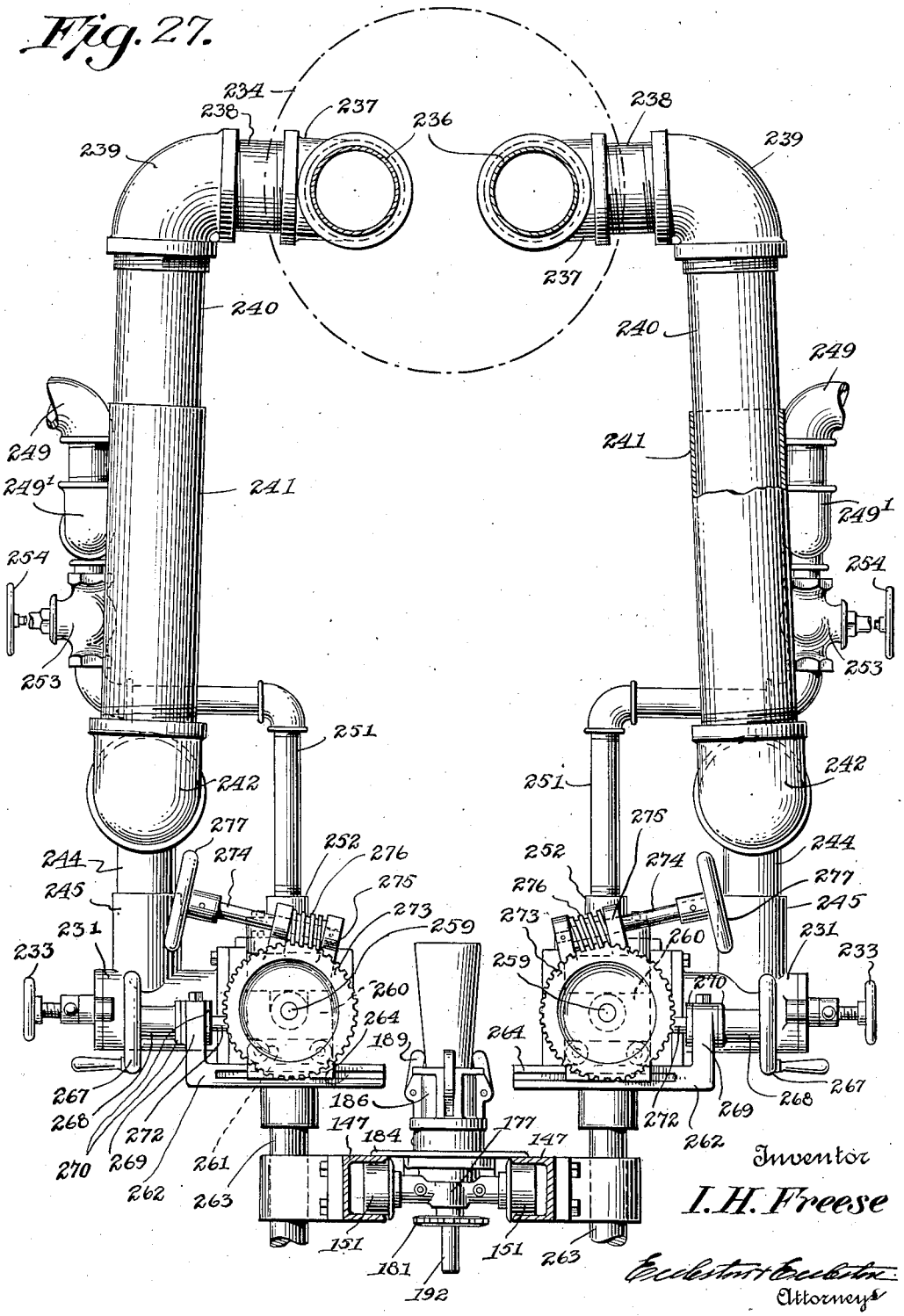
Fig. 26.

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 17

Fig. 27.



Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 18

Fig. 28.

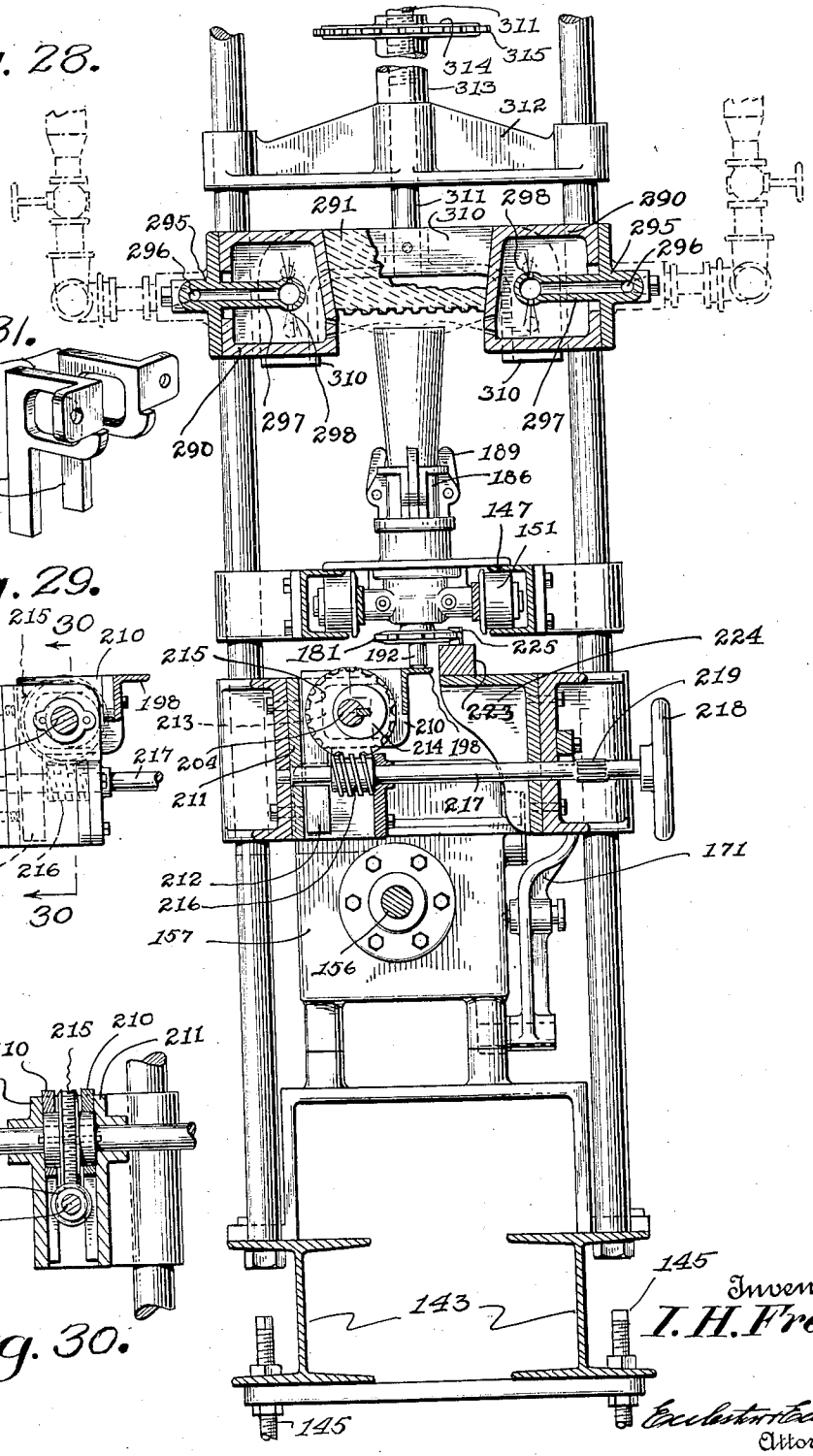


Fig. 31.

Fig. 29.

Fig. 30.

Inventor
I. H. Freese

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 19

Fig. 32.

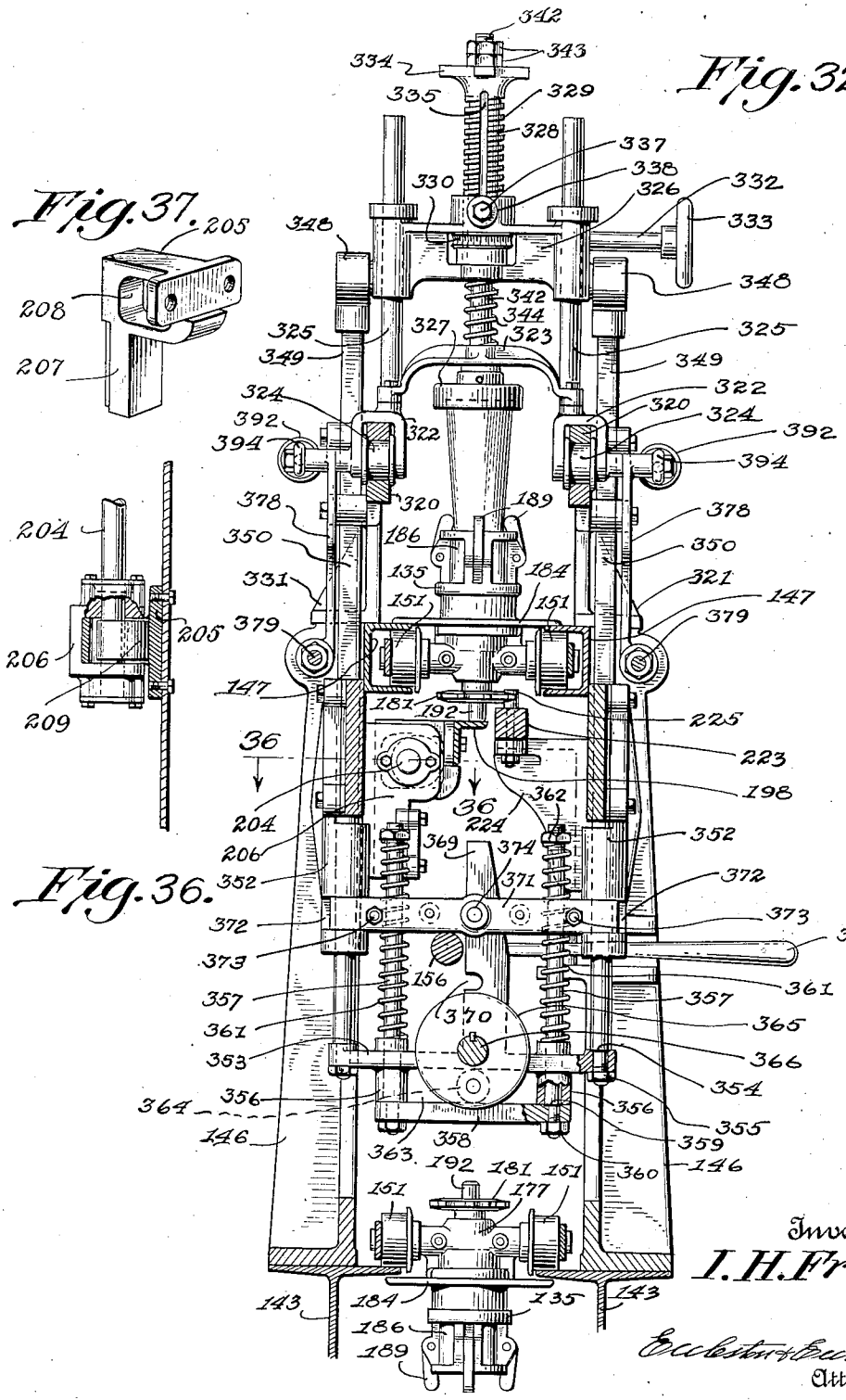


Fig. 37.

Fig. 36.

Inventor
I. H. Freese

Bachelder & Bachelder
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 20

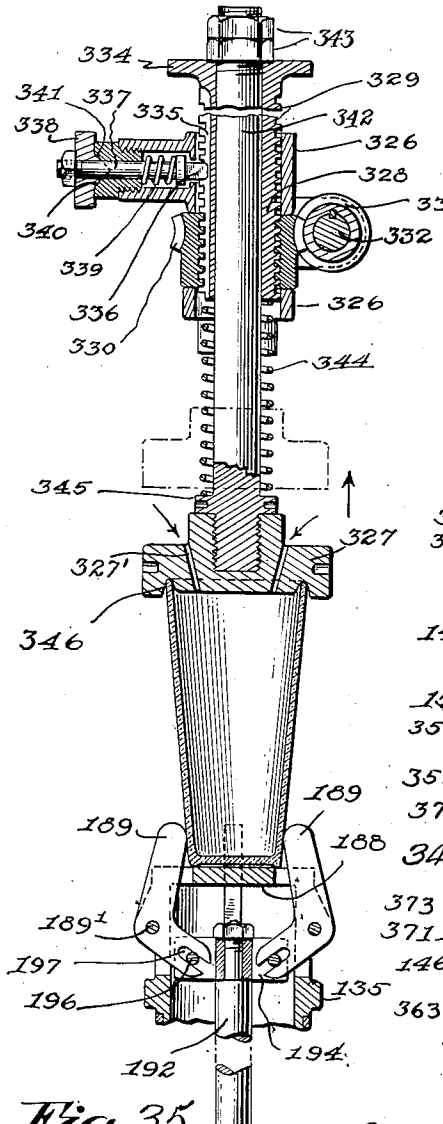


Fig. 35

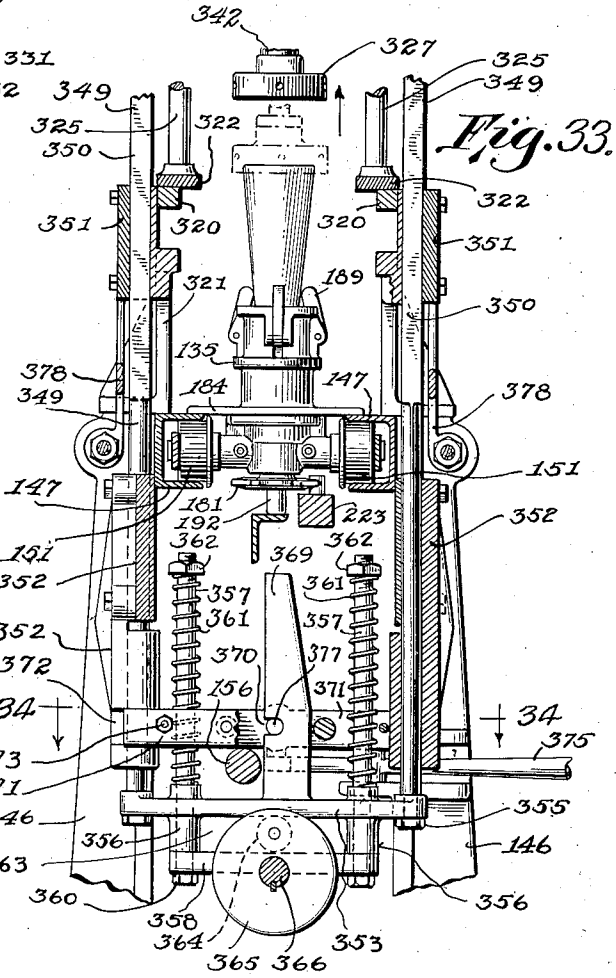


Fig. 33.

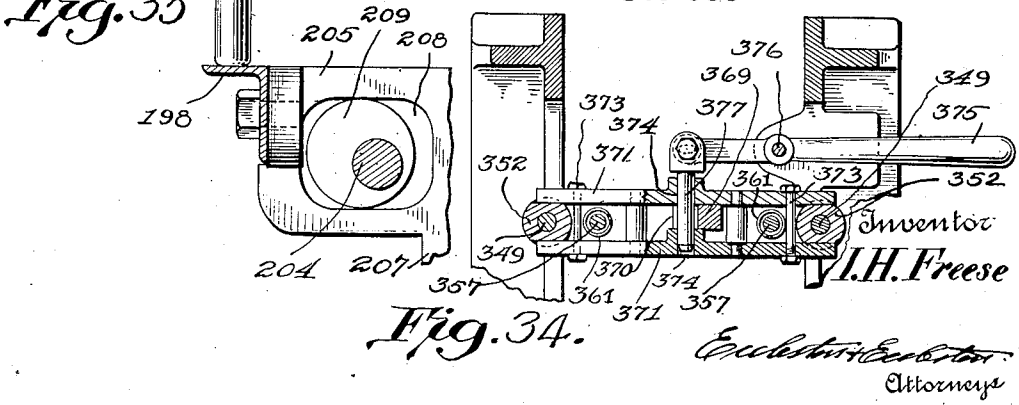


Fig. 34.

Inventor
I. H. Freese

Eccleston & Eccleston
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 21

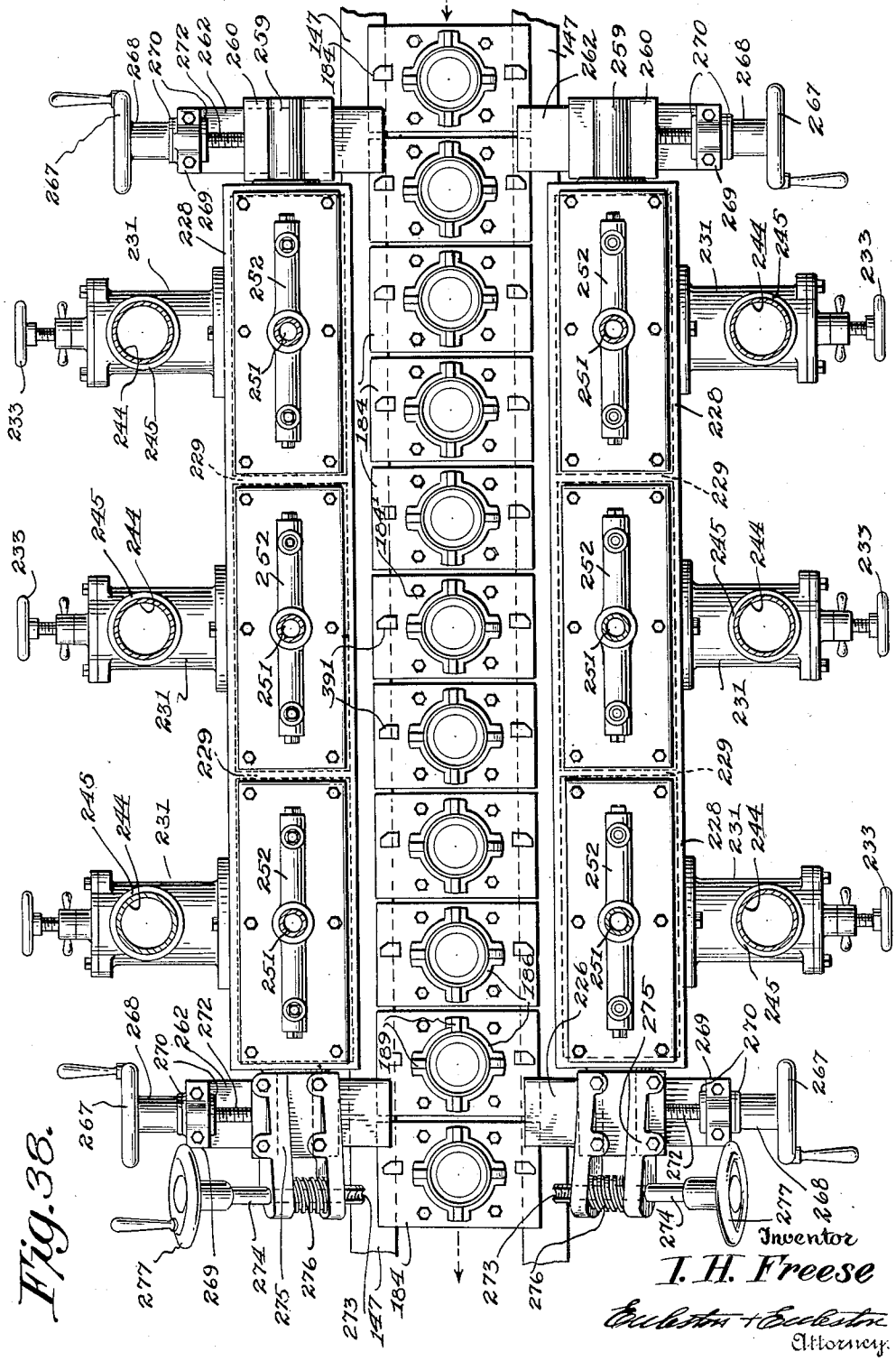


Fig. 38.

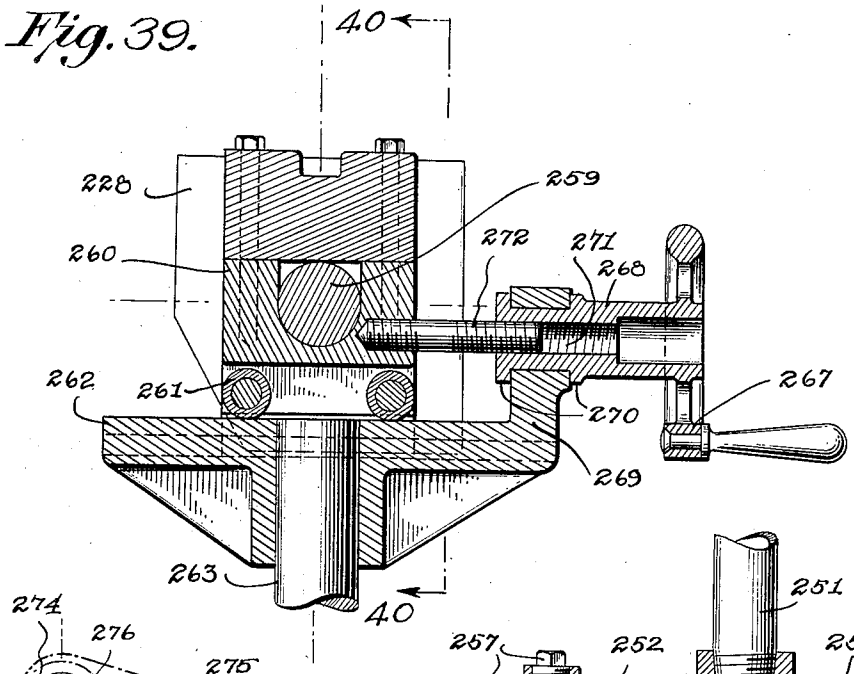
Inventor
I. H. Freese
Eccleston & Eccleston
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 22

Fig. 39.



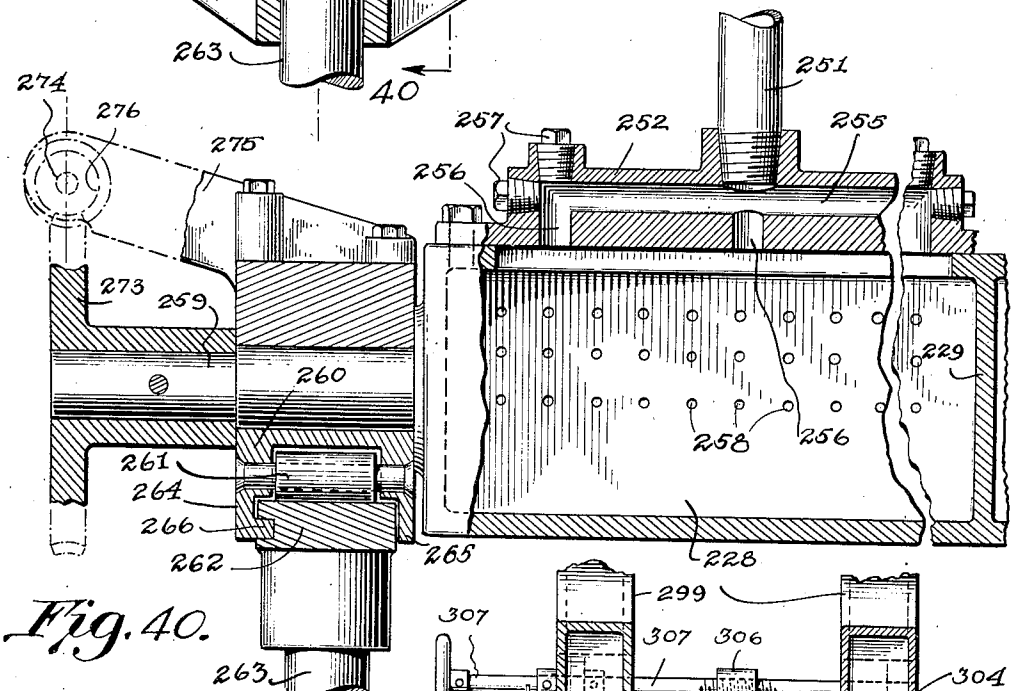


Fig. 40.

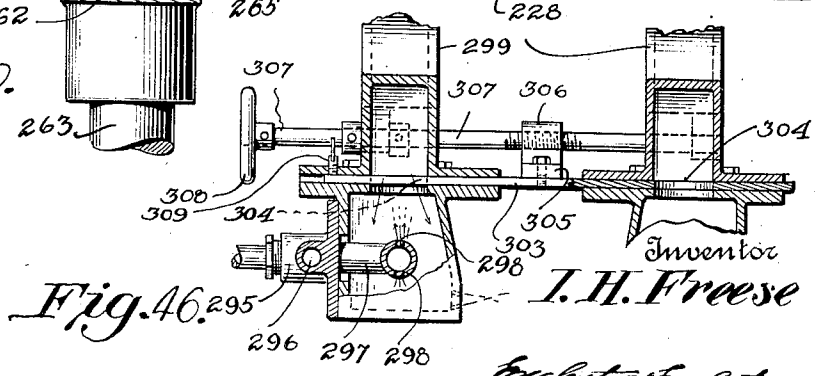


Fig. 46.

Inventor
I. H. Freese

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 23

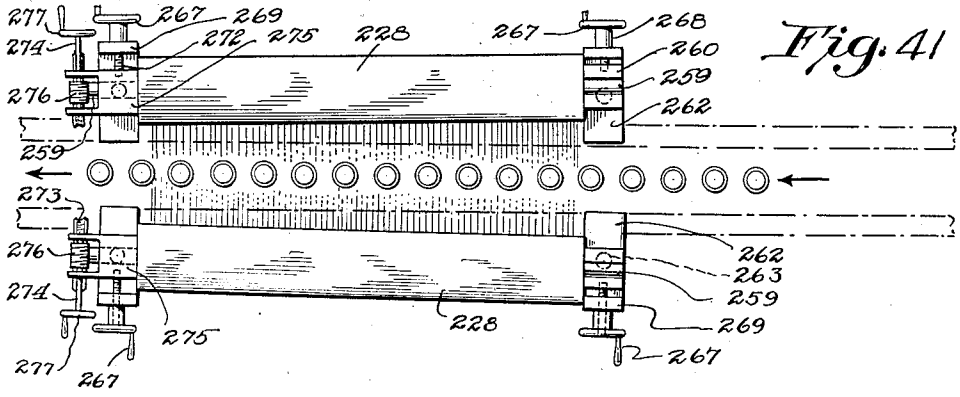


Fig. 41

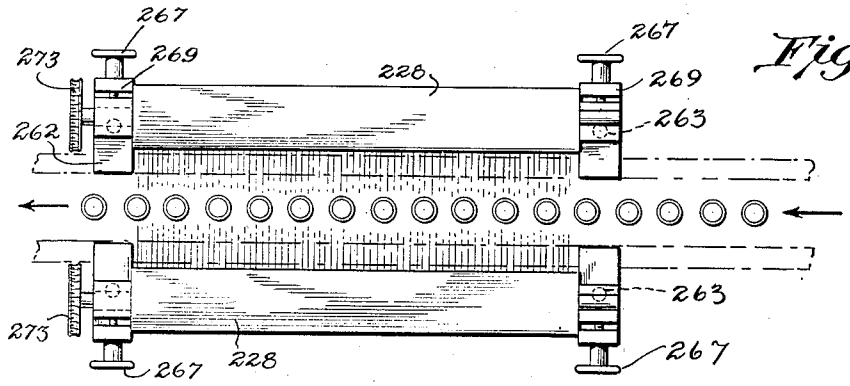


Fig. 42

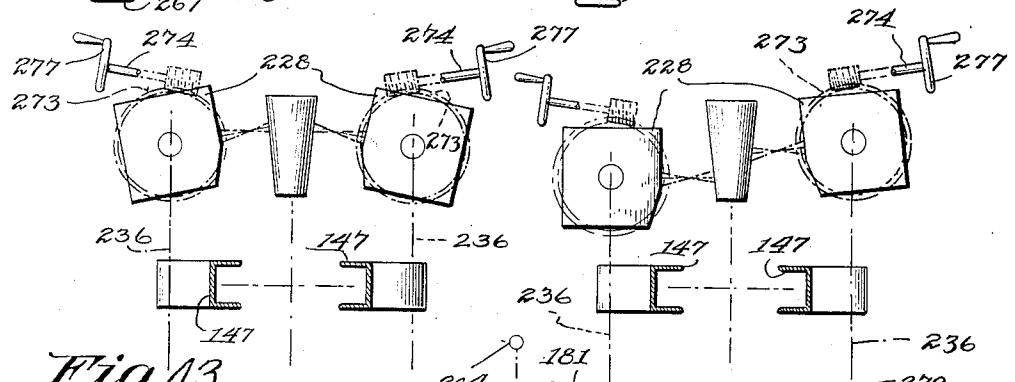


Fig. 43.

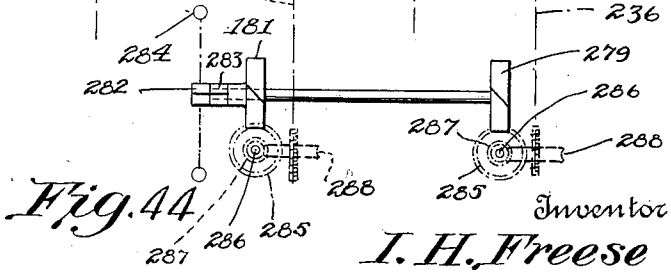


Fig. 44

Inventor

I. H. Freese

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 24

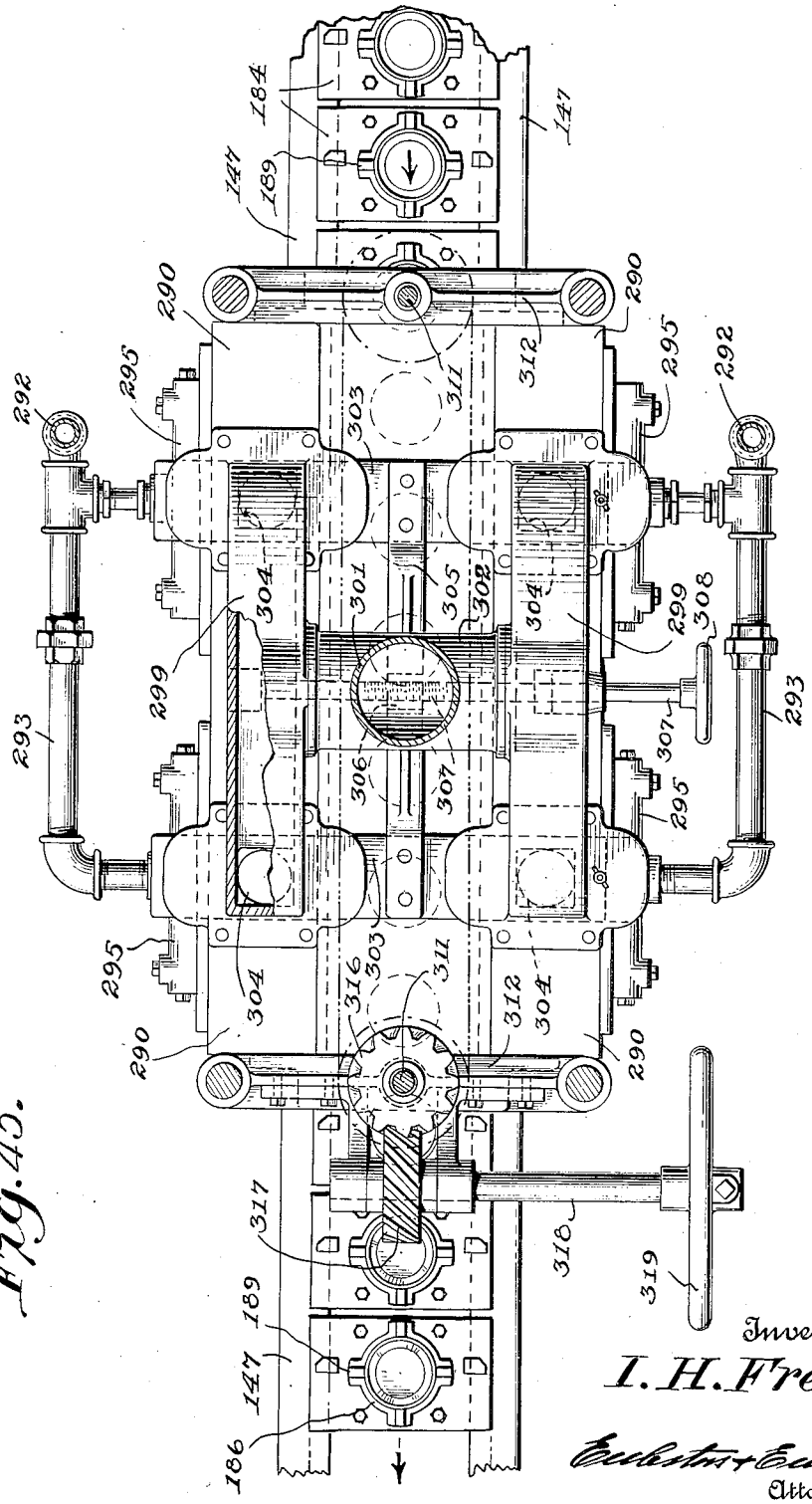


Fig. 45.

Inventor
I. H. Freese

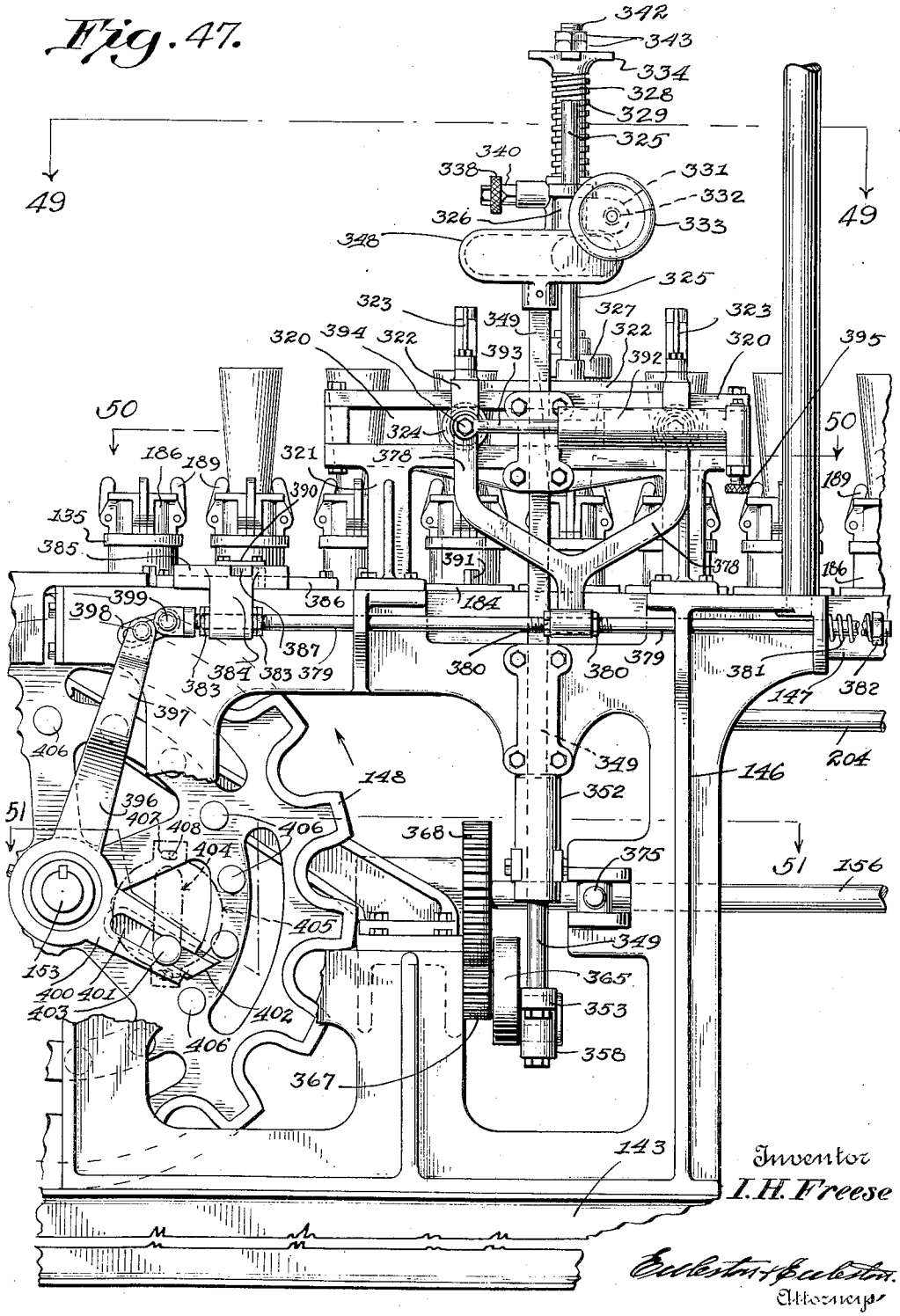
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 25

Fig. 47.



Inventor
I. H. Freese

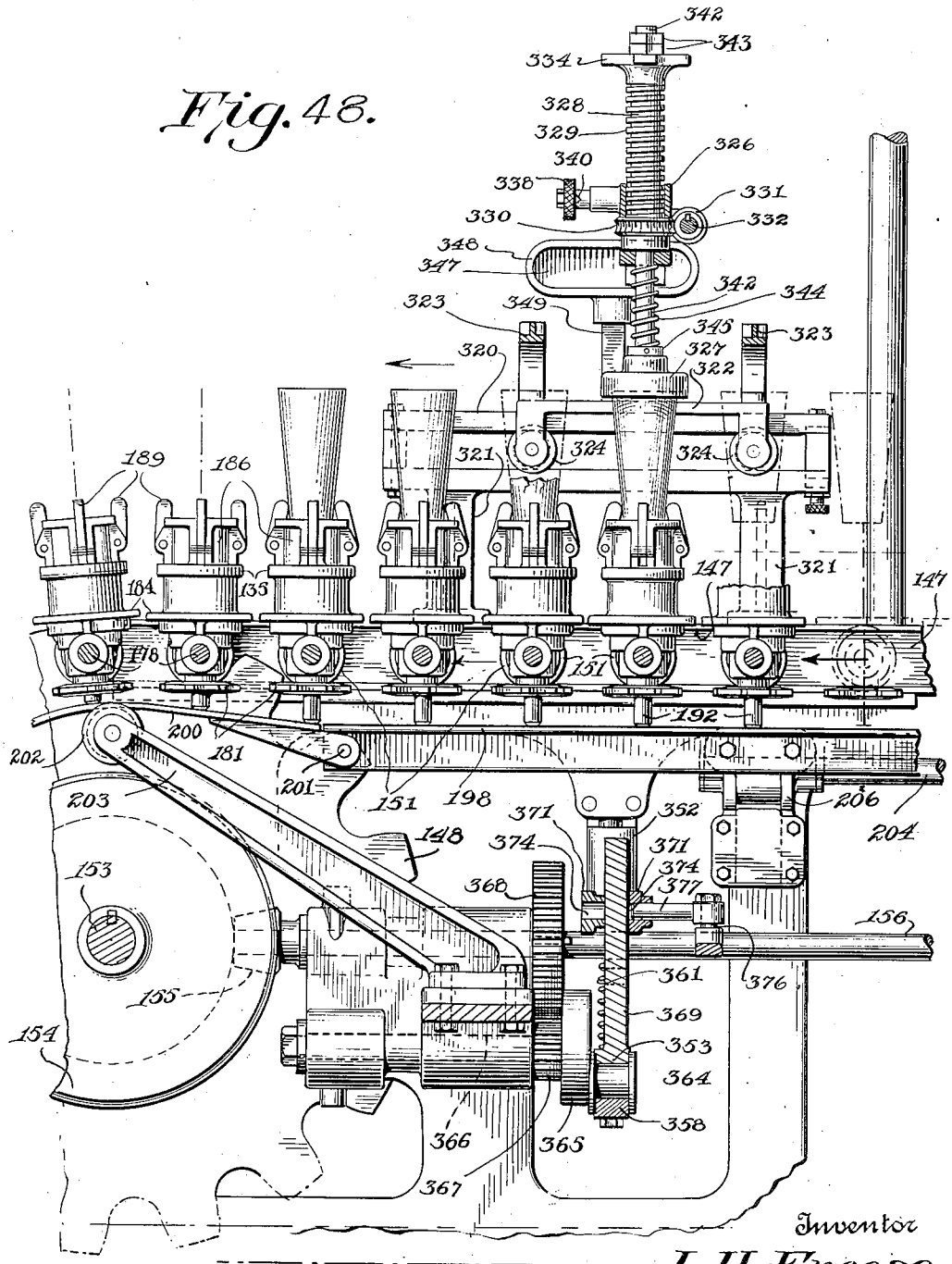
Eckelton & Eckelton.
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 26

Fig. 48.



Inventor

I. H. Freese

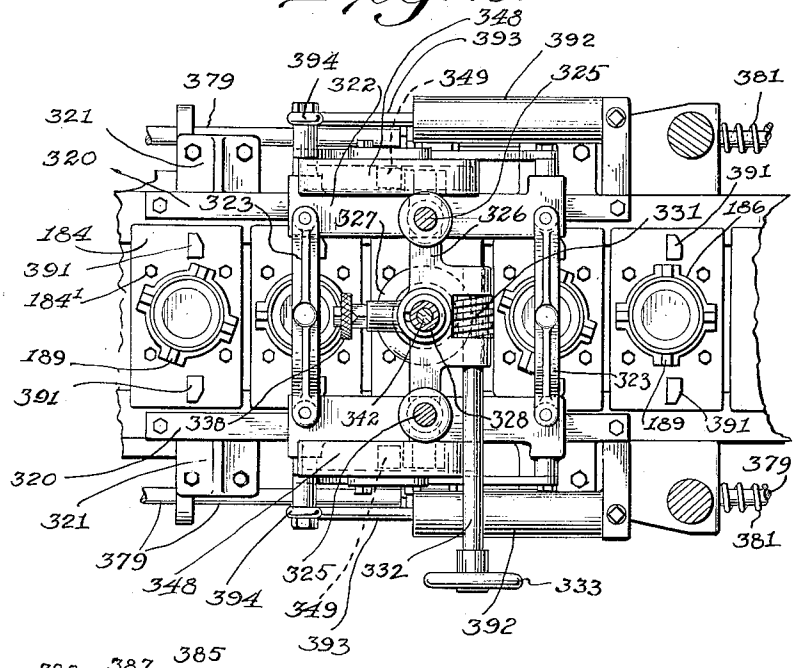
Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 27

Fig. 49.



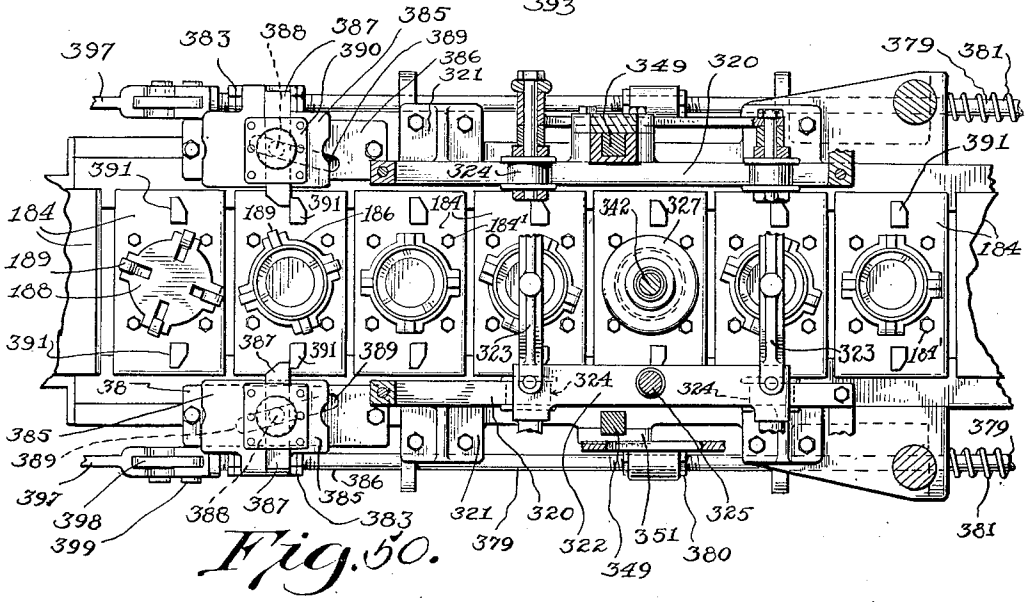


Fig. 50.

Inventor

I. H. Freese

Eaglestone + Eaglestone

Attorneys

Oct. 17, 1933. I. H. FREESE 1,930,746

FIRE FINISHER

Filed Nov. 29, 1927 28 Sheets-Sheet 28

Fig. 52.

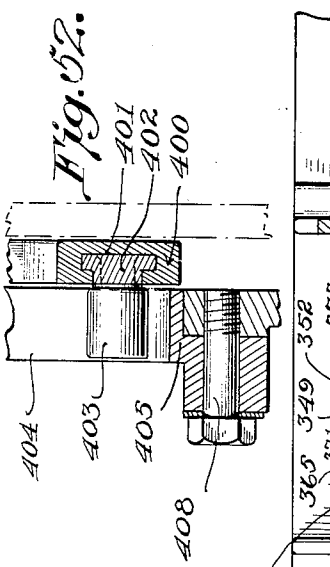


Fig. 51.

Inventor
I. H. Freese

Attorneys

Patented Oct. 17, 1933 1,930,746

UNITED STATES PATENT OFFICE

1,930,746

FIRE-FINISHER

Ira H. Freese, Clarksburg, W. Va., assignor to Hazel-Atlas Glass Co., Wheeling, W. Va., a corporation of West Virginia

Application November 29, 1927
Serial No. 236,524

34 Claims. (Cl. 49—58)

The invention relates to a machine for fire finishing glassware during its transit from the forming machine to an annealing leer, and includes means for mechanically performing every operation necessary from the time the glassware is delivered to the fire-finisher conveyor until it is ready to be placed in the leer.

The invention includes many novel features, but it is unnecessary to list them here as they will be made clear, to those skilled in the art, in the detailed description which is to follow.

In the following detailed description, reference will be had to the accompanying drawings, in which:

Figure 1 is a diagrammatic perspective view of the complete apparatus from the forming of the ware to the delivery of the ware to the leer. Several independent inventions, here shown diagrammatically, are the subject-matter of separate applications, as will appear hereinafter.

Figure 2 is a vertical transverse sectional view of the fire-finisher at the receiving station. A take-out device is shown in elevation, but it is not described herein as it is the subject-matter of a separate application, Ser. No. 448,073, filed April 28, 1930.

Figure 3 is a plan view of the receiver mechanism, parts being broken away to more clearly show the construction.

Figure 4 is a transverse sectional view of the receiver mechanism, taken on line 4—4 of Figure 3.

Figure 5 is a detail view of one of the elements for opening the receiver.

Figure 6 is a side elevational view of the receiver mechanism, showing the receiver closed and holding an unfinished tumbler.

Figure 7 is a diagrammatic elevational view of the receiver mechanism, with the receiver closed, and one of the cups just coming into alignment therewith.

Figure 8 is a diagrammatic plan view of the receiver mechanism in the position shown in Figure 7.

Figure 9 is a diagrammatic plan view of the receiver mechanism, with the receiver closed and having received a tumbler, and a cup in alignment with the receiver.

Figure 10 is a diagrammatic plan view of the receiver mechanism; the receiver having opened to deposit the article on the cup, and the cup having traveled almost free of the receiver, so that the receiver is almost ready to close again.

Figures 11, 12 and 13, when taken together, constitute a side elevational view of the complete machine; the same being divided along lines A—A and B—B; Figure 11 being the delivery end of the machine, and mostly illustrating the fitter and the transfer mechanism; Figure 12 being the mid-section of the machine, and mostly illustrating the polishing burners, the edge-melt burners, and the various adjustments for such burners; and Figure 13 being the receiving end of the machine, and mostly illustrating the receiver, the polishing burner, and the frame construction.

Figures 14, 15 and 16, when taken together constitute a horizontal sectional view of the complete machine; the section being taken just below the upper run of the endless conveyor, and the views being divided along lines C—C and D—D; Figure 14 being the delivery end of the machine, and mostly illustrating the fitter; Figure 15 being the mid-section of the machine and mostly illustrating adjustments for the polishing burners and adjustments for the cup-controlling rail; and Figure 16 being the receiving end of the machine and mostly illustrating burner and rail adjustments.

Figures 17 and 18, when taken together, constitute a diagrammatic plan view showing the general assembly of the various units forming the complete mechanism; with the exception of the transfer mechanism for delivering the ware to the leer; the views being divided along the line F—F; and Figure 18 also showing in plan the driving mechanism for the forming machine, and the driving connection between the forming machine and the fire-finisher. Some of these units constitute the subject-matter of separate applications, as will be indicated hereinafter.

Figure 19 is a detail diagrammatic view illustrating the movements of the fitter.

Figures 20 and 21, when taken together, constitute a vertical sectional view of the endless carrier, the relative position of the various units associated therewith being indicated diagrammatically; the views being divided along the line G—G.

Figure 22 is a vertical sectional view of one of the cup units.

Figure 23 is a horizontal sectional view of one of the cup units, taken on line 23—23 of Figure 22.

Figure 24 is a detail plan view of one of the rollers and connecting links of the endless chain; parts of the roller construction being broken away, and part of the cup supporting frame being shown in horizontal section.

Figure 25 is a vertical transverse sectional view

taken on line 25—25 of Figure 12, and looking in the direction of the arrows.

Figure 26 is a detail view illustrating the means for simultaneously or independently adjusting the polishing burners vertically.

Figure 27 is a vertical transverse sectional view taken on line 27—27 of Figure 12, and looking in the direction of the arrows.

Figure 28 is a vertical transverse sectional view taken on line 28—28 of Figure 12 and looking in the direction of the arrows.

Figure 29 is a detail elevational view of the central supporting and adjusting means for the cup-controlling rail; parts being shown in section.

Figure 30 is a detail vertical sectional view taken on line 30—30 of Figure 29.

Figure 31 is a detail perspective view of the central supporting brackets for the cup-controlling rail.

Figure 32 is a vertical transverse sectional view taken on line 32—32 of Figure 11, looking in the direction of the arrows; and showing the fitter in operative position.

Figure 33 is a vertical transverse sectional view taken on line 33—33 of Figure 11, looking in the direction of the arrows; and showing the fitter locked in inoperative position.

Figure 34 is a horizontal sectional view taken on line 34—34 of Figure 33.

Figure 35 is a detail vertical sectional view of the means for adjustably supporting the fitter ring; the cup holding the article while it is being fitted, and the rail for controlling the operation of the cups.

Figure 36 is a detail horizontal sectional view of an end supporting and adjusting means for the cup-controlling rail, taken on line 36—36 of Figure 32, and parts being shown in detail.

Figure 37 is a detail perspective of one of the end brackets for supporting the cup-controlling rail in vertically adjusted position.

Figure 38 is a plan view of the polishing burner and associated parts.

Figure 39 is a vertical transverse sectional view taken through the mechanism for horizontally adjusting the polishing burners.

Figure 40 is a vertical longitudinal sectional view taken on line 40—40 of Figure 39.

Figures 41 and 42 are diagrammatic plan views illustrating adjusted positions of the polishing burners.

Figures 43 and 44 are diagrammatic end views illustrating further adjusted positions of the polishing burners.

Figure 45 is a plan view of the edge-melt burners, parts being broken away and parts being shown in section.

Figure 46 is a detail view illustrating the edge-melt burners, the air manifolds therefor, and the valves for the air manifolds.

Figure 47 is a side elevational view of the fitter and its associated parts.

Figure 48 is a vertical longitudinal sectional view taken through the fitter and its associated parts.

Figure 49 is a horizontal sectional view taken on line 49—49 of Figure 47.

Figure 50 is a horizontal sectional view taken on line 50—50 of Figure 47.

Figure 51 is a horizontal sectional view taken on line 51—51 of Figure 47; and

Figure 52 is a detail sectional view taken on line 52—52 of Figure 51.

The general arrangement of the complete mechanism for automatically performing all the operations necessary from the forming of the glassware in the molds until the completed articles have been annealed and are ready to be packed, is illustrated diagrammatically in Figure 1. The forming machine is referred to by the numeral 1, and in the present instance it consists of a simple pressing machine having the ordinary rotary table 2 carrying the desired number of molds 3. Obviously any type of forming machine may be employed.

After the glassware has been formed it is delivered from the forming machine to the endless conveyor of the fire-finisher, by an automatic take-out mechanism referred to generally by numeral 6. This take-out mechanism is not described or claimed herein, as it constitutes the subject-matter of a divisional application Ser. No. 448,073, filed April 28, 1930.

The glassware is subjected to various operations as it is carried along by the conveyor of the fire-finisher, as will be described hereinafter; and when it reaches the end of the conveyor it is automatically transferred, as illustrated diagrammatically by arrows on Figure 1, to a leer cross-conveyor 556. This automatic transfer mechanism is not described or claimed herein, as it constitutes the subject-matter of a divisional application Ser. No. 448,074, filed April 28, 1930.

The glassware is carried across the front of a leer 557 by the cross-conveyor 556, and is then fed into the leer by an automatic leer loader, which is illustrated diagrammatically in Figure 1 and referred to generally by the numeral 566. This leer loader is not described or claimed herein, as it is the subject-matter of my Patent No. 1,883,362, granted October 18, 1932.

It will be understood, of course, that the present invention is in no manner limited to use with any particular forming machine, any particular take-out mechanism for removing the ware from the forming machine and depositing it on the conveyor of the fire-finisher, any particular mechanism for transferring the ware from the fire-finisher, or any particular mechanism for feeding the ware in a leer.

The construction first to be described is the mechanism, which may be employed if desired, for receiving the ware delivered from the forming machine.

Arranged beneath the delivery point of the take-out mechanism, is a guiding and delivery mechanism which momentarily receives the tumbler or other transferred article from the take-out mechanism, and then releases it and deposits it in one of the cups which carries the article through the fire-finisher. This guiding mechanism is mounted on the main frame of the fire-finisher, and in the following description reference is to be had particularly to Figures 3 to 10 and 13.

Numeral 119 refers to a plate which is spaced above and attached to the main frame of the fire-finisher by means of brackets 120. Of course the plate is spaced above the main frame of the fire-finisher to permit the cups to pass beneath it, as clearly shown in Figure 4. Two arms 121 rest on this plate 119; the arms being pivotally connected by a pin 122, and are intermittently opened and closed by mechanism to be described hereinafter. Each arm carries a half of a liner 123 which is preferably made of soft metal. When these half-liners are brought together by the closing of the arms, they form a receiver, to receive the article delivered by the take-out

mechanism. The half-liners are removable in order that different liners may be employed to handle the different ware carried through the machine; and of course, the different liners will be shaped to suit the particular ware they are adapted to handle. In this particular instance I have illustrated round tapered tumblers as the ware being handled, and consequently the liner is shown as round and tapered. The liners may be removably attached to the arms 121 by any desired means; the preferred means as illustrated herein, consisting of a dovetail 124. The dovetail is preferably tapered to provide a rest for the liner. For a reason to appear hereinafter, the arms 121 are preferably dished at their forward ends, as indicated by numeral 125.

A lug 126 extends laterally from each arm 121, and a pin 127 projects downwardly from each lug and extends through an arcuate slot 128 in the plate 119. The lower ends of each of the pins 127 is received in an elongated slot 129 provided in the forward ends of levers 130. Each of the levers 130 has its rear end secured to, or integral with, a sleeve 131, which is pivotally mounted on a pin 132; the pins being attached to the plate 119 by nuts 133. A finger 134 is attached to or integral with the lower end of each sleeve 131, and these fingers extend inwardly to a position where they are in the path of the cups, when the receiver is closed, as clearly indicated in Figures 3, 8, and 9. The cups are preferably provided with a flange 135 to engage the fingers 134, and will be hereinafter described in detail.

For the purpose of closing the receiver I provide rods 136 which have their forward ends pivotally mounted on pins 137 carried by lugs 138 projecting inwardly from the brackets 120; the pins being preferably provided with oil holes 137'. These rods extend rearwardly and pass through suitable openings 139 provided in lugs 140 projecting from sleeves 131. The rods extend on rearwardly beyond the lugs 140, and mounted on the rods, beyond the lugs, are coil springs 141; the pressure on the springs being regulated by nuts 142 threaded on the rear ends of the rods 136. Thus when the levers 130 are swung outwardly to open the receiver, the lugs 140 will compress the springs 141 on the rods 136; the rods turning slightly about the pins 137 as pivots. When the flange 135 of a cup passes beyond the ends of fingers 134, thereby releasing them, the springs 141 will force the lugs forwardly, thereby rotating the sleeves 131 and the levers 130 carried thereby; and by means of the pin and slot connections between the levers 130 and arms 121, the receiver will be moved to closed position.

A complete cycle of operation of the receiver mechanism will now be described, reference being had to Figures 3, 4, 5 and 6. Attention is also called particularly to Figures 7, 8, 9 and 10, which illustrate in diagrammatic fashion various steps in the transfer of an article from the receiver to the cups. In Figures 7 and 8 the first cup has received its tumbler, and moved it free of the receiver, and the receiver has closed to receive the next tumbler; but the tumbler has not yet been fed to the receiver, and the second cup is not yet in alignment with the receiver. In Figure 9, the first two cups have received their tumblers, a tumbler has been fed to the receiver, the third cup is in alignment with the receiver, and the receiver will be opened by the succeeeding cup, which is shown in position engaging the fingers 134. In Figure 10, the receiver has been opened, the third tumbler has been deposited in a cup, and the cup has been moved almost far enough to permit the receiver to close, which will occur when the next succeeding cup passes free of the fingers 134.

The continuous movement of an endless chain brings each cup successively beneath the receiver, and the whole mechanism is so timed that just as each cup is almost in alignment with the receiver, the grippers will be separated to deposit a tumbler or other article in the receiver. At this point the flange 135 of the next succeeding cup have come into engagement with the fingers 134; and the continued movement of the endless carrier will cause these fingers to swing outwardly, and open the receiver, whereby the article will be gently deposited in the preceding cup, while the cup is continuously moving, and while it is exactly in alignment with the receiver. Of course, the manner in which the receiver is opened is apparent from the previous description of the construction. The outward movement of the fingers 134 causes the sleeves 131 to rotate, thereby swinging the levers 130 outwardly. These levers have pin and slot connections with the arms 121, and consequently the outward movement of the levers 130 will cause the arms 121 to swing open to open the receiver; this swinging movement of the arms being allowed by the arcuate slots 128 in the plate 119.

The receiver has thus been opened and the article has been deposited in one of the cups. The receiver is maintained open by reason of the continued engagement of the fingers 134 with the flange 135 of the next succeeding cup; and the continued travel of the endless carrier moves the cups with the article forwardly. Of course, the plate 119 is suitably cut away to permit the articles to pass from the receiver to the cups, and to be moved forwardly away from the receiver. Just as the continued movement of the carrier has moved the cup with the article far enough to be free of the receiver, the receiver is quickly closed. In the rapid operation of this mechanism it is essential that the receiver close at the instant the cup and article are clear; and to expedite the closing of the receiver, I have dished the forward ends of the arms 121, as indicated by numeral 125. The manner of closing the receiver will be understood from the foregoing description of the operation. As the cup with the article is being carried forward the fingers 134 will ride on the flange 135 of the next succeeding cup, and just as the article passes clear of the open receiver, the next cup will pass clear of the fingers 134; thereby permitting the springs 141 to swing the levers 130 upwardly and forcing the halves of the receiver to closed position. This inward movement of the levers 130 also moves the fingers 134 inward into the path of the next cup, and this next cup comes into engagement with these fingers to force them apart just as the preceding cup is in alignment with the receiver, which has just received another article from the take-out mechanism, and thus the cycle is repeated.

It will be understood, of course, that the invention is by no means limited to the specific construction and operation of the receiver; in fact, under some conditions it may be possible to deposit the ware in the cups directly from the take-out mechanism; but I have found that this device constitutes a highly efficient and most desirable means for receiving ware from the take-out mechanism and depositing it gently and accurately in the continuously moving cups. It

is needless to add that all of the parts operate in the desired order and in the desired timed relation.

As stated above the receiver is not an essential part of the invention; and accordingly it is not claimed herein; claims to the receiver being made in a divisional application Ser. No. 600,539, filed March 22, 1932.

Having described the means for operating the receiver to deposit the ware in the continuously moving cups; I shall now describe the frame for supporting the endless carrier, the construction of the endless carrier, the means for driving the endless carrier from the forming machine, or by a motor independent of the forming machine, or by hand, and the gear shift mechanism by which the endless carrier may be driven at different speeds with relation to the take-out mechanism.

In the following description reference is to be had particularly to Figures 1, 12, 13, 16, 18, 20 and 21. The construction of the main frame of the fire-finisher and associated devices, is very simple. Two properly spaced I-beams 143 extend the full length of the machine, and are mounted on suitable rollers 144 to facilitate the positioning of the machine with reference to the particular forming machine and leer with which it is to be used; and threaded rods 145 are provided to engage the floor so as to level the machine, support the weight thereof, and also to lock the mechanism in its desired location.

Suitable brackets 146 are mounted on each I-beam adjacent the ends thereof, and these brackets provide journal bearings for the wheels supporting the endless chain conveyer and various other devices to be described hereinafter. Extending substantially the full length of the machine are two properly spaced channel bars 147, which are supported by or attached to the upper ends of the brackets 146. In addition to forming part of the main frame, these channel bars also act as guides for certain moving parts, as will appear hereinafter. Suitably journaled in one set of brackets 146 is a pair of large spaced sprocket wheels 148; and journaled in the other set of brackets 146 is another pair of spaced sprocket wheels 149, of the same size as sprocket wheels 148. These sprocket wheels carry the two endless sprocket chains 150, and in the preferred form illustrated herein the sprocket wheels 148 are the drivers and 149 are the idlers. The sprocket chains are formed of alternate rollers and links; the rollers being indicated by numeral 151 and the links by numeral 151'. Each set of rollers carries one of the ware-carrying cups, and the particular construction of the mounting will be described in connection with the description of the cups; the present description relating only to the endless carrier, the operating means therefor, etc. For the purpose of keeping the proper tension on the endless conveyor, I have provided the usual belt tightener 152.

As stated hereinbefore the driving sprockets are those indicated by numeral 148, which are keyed to the shaft 153. Also keyed to this shaft 153 is a bevel gear 154 which is in mesh with a relatively small bevel gear 155 carried by the shaft 156 which extends rearwardly to the gear shift box 157; which is provided with the usual gearing for providing different driving speeds. Associated with the gear shift box 157 is a small sprocket wheel 158 which is operatively connected with a large sprocket wheel 159 by means of the sprocket chain 160. Referring particularly to Figure 18, it will be noted that the usual motor for operating the forming machine is indicated by numeral 161, which through gears 162 and 163, clutch 164, and gears 165 and 166, continuously rotates the shaft 167, which in accordance with the common practice, rotates the Geneva mechanism for giving the step-by-step rotary movement to the mold table. This shaft 167 in the present instance, carries a gear 168 meshing with a gear 169 which is keyed to the stub shaft 170, carrying the sprocket wheel 159. Thus by the means described, the usual motor for driving the mold table, also drives the endless chains, through gears 168 and 169, sprocket chain 160, gear shift 157, shaft 156, and bevel gears 155 and 154. Of course, the invention is in no manner limited to the specific driving mechanism described herein.

I have not deemed it necessary to illustrate the gear shift mechanism, as it may be of any preferred form; but by reference to Figure 12, it will be seen that I have provided in connection with the gear shift box 157 a gear shift lever 171, which is shown in its vertical or neutral position. By moving this lever to the left (Figure 12) the shaft 156 will be so connected with its driving mechanism that the speed of the endless conveyor will be such that the transfer mechanism will deposit an article in each of the cups. But when ware of very large diameter is being handled, it is apparent that it would be desirable to place an article only in every other cup. To meet this situation, and to suit various other conditions, it is only necessary to move the lever 171 to the right (Figure 12) of its neutral position. When the gears have thus been shifted, the endless conveyer will travel at such a speed that an article will be placed only in every alternate cup. Of course, the ratio of operation between the endless conveyer and the transfer mechanism or forming machine may be varied to any desired extent by an appropriate gear shift.

Under certain conditions, as for instance, when the forming machine is shut down, with the fire finisher full of ware, it is desirable to operate the endless conveyer independently of the forming machine. I have provided means by which this may be accomplished either by motor or by hand. For the purpose of operating the endless carrier by motor, when the forming machine is shut down, I mount on the main frame a motor 172, which operates a shaft 173 leading to the gear shift box 157; the shaft being preferably provided with a flexible coupling 174 to avoid shock to the driving parts when the motor 172 is started. Referring particularly to Figure 12, it will be noted that I have provided a lever 175, which is shown in its neutral position; in which position the shaft 173 is not connected with the main driving shaft 156. By moving this lever to the left (Figure 12) the shaft 173 and the main driving shaft 156 will be operatively connected, and the endless carrier will be driven by the motor 172, thereby carrying the articles in the cups through the fire-finisher and subjecting the articles to the various operations to be described hereinafter. It will be understood that this independent motor 172 may also be employed whenever it is desired to operate the mechanism independently of the forming machine or machines, as, for instance, when ware is being transferred to the cups by hand. Of course, the lever 171 must be moved to neutral position before the lever 175 is thrown into operative position.

As stated hereinbefore, it is also desirable at times to operate the mechanism by hand. For

instance, this may be desirable when the forming machine is shut down, leaving some of the ware on the endless carrier. For this hand operation I have mounted on the main driving shaft 156 a hand wheel 176, and by the rotation of this hand wheel, the endless carrier will move the ware along and cause the various operations to be performed thereon, thus clearing the machine of all ware that had been supplied to it before the press or other forming machine was stopped. Of course, the levers 171 and 175 will be moved to neutral position prior to operating the mechanism by hand through hand wheel 176.

I shall now describe the specific construction of the cups which carry the articles to be treated; and this will be followed by a description of the means for operating the jaws or fingers on the cups, the means for adjusting the extent of closing of the jaws or fingers, and the means for rotating the cups while they are being carried forward on the endless carrier.

In the following description of the cups, reference is to be had to Figures 22, 23 and 24. Numeral 177 indicates a frame member for supporting a cup, and this member extends transversely between the endless chains 150. Seated in, pinned to, and extending from, each end of the frame member 177 is a stub shaft 178, and freely mounted on these stub shafts are the links 151' and the rollers 151; a ball race 179 being preferably provided for the rollers. The pin for securing the stub shaft to the frame member is indicated by numeral 178'. A sleeve 180 extends vertically through and is rotatably mounted in a central opening in the frame member. The lower end of the sleeve is provided with a toothed wheel 181, by which the cups are rotated, and the upper end of the sleeve extends beyond the frame member and has threaded thereon the cup support 182. A ball race 183 is preferably provided between the top of the frame member and the bottom of the cup support; and a plate 184 is attached by screws 184' (Figs. 38 and 50) to the top of the cup frame and projects inwardly to extend over a flange 185 of the cup support, and extends outwardly to a sufficient extent to ride on the channel bars 147. Numeral 186 indicates the cup proper, which is seated on and has a part projecting within, the cup support 182, and is removably attached thereto by screws 187. The cup 186 is provided with a top 188, on which the ware is seated, and the top and sides are slotted to receive the cup fingers 189, which have the shape of a bell-crank. Lugs 190 are provided on the side of the cup adjacent the slots, and in these lugs are mounted pivot pins 191; the cup fingers 189 being pivotally mounted on these pins as clearly illustrated in Figures 34 and 35. The number of fingers for each cup may vary, but in the preferred form, as illustrated herein, I employ four fingers. Each cup is also preferably provided with the previously described flange 135 which controls the operation of the receiver. A spindle 192 extends through and is mounted for loose sliding movement in the sleeve 180; the lower end of the spindle being adapted to rest on a rail throughout the upper run of the conveyer, as will appear hereinafter. The upper end of the spindle is reduced in diameter, as indicated by numeral 193, and mounted on this reduced portion is a spider frame 194, which is secured in place by the nut 195 on the end of the spindle. This spider frame 194 carries pins 196 which are always engaged in the open ended slots 197 provided in the lower ends of the cup fingers 189.

It is apparent that when the cups are in their upright position, that is, on the upper run of the endless conveyer, the spindles 192 will tend to move downward by gravity and thus move the fingers 189 inwardly; the downward movement of the spindles being limited by a rail to be described hereinafter. And, of course, the fingers will also be opened by the rail, to release the ware. It will also be understood that when the cups are on their return trip, that is, on the lower run of the conveyer, the cups are in inverted position, and the spindles 192 will simply fall by gravity, thereby moving the fingers to open position. During the fire-finishing operation it is necessary that the cups be rotated, and this is accomplished by suitable means engaging the toothed wheel 181. I shall now describe the particular construction disclosed herein for controlling the closing of the cup fingers, for regulating the extent of closing of the fingers, for opening the fingers, and for rotating the cups while they are being carried forward by the endless carrier.

In the following description reference is to be had to Figs. 14 to 18, 20, 21, 28 to 32, 36, 37 and 48. Numeral 198 indicates a rail which extends substantially the full length of the machine, and which is arranged beneath the upper run of the conveyer and centrally thereof, so that it is in the path of the cup spindles, which ride thereon. As will be noted by reference to Figure 21, the rail is downturned at the receiving end of the machine, so that as the cups approach the upper run of the conveyer the spindles will ride on the rail 198. Just as each cup reaches the point where it is to receive an article, it is desirable that the fingers 189 be open, and that they be closed immediately after the article has been deposited on the cup. For this purpose the rail is provided with a slight rise or bulge directly beneath the receiver, as indicated by numeral 199. Thus as the cups continue to travel they will be successively opened momentarily to receive an article, and will then be closed to grip the article as the continued travel of the cups permits the spindles to ride down the bulge 199 onto the rail 198; the extent to which the fingers close being controlled by the vertical position of the rail. The spindles will continue to travel on the rail substantially the full length of the machine, and thus the articles will be held firmly while the various operations are being performed. When the cups approach the delivery end of the machine the fingers must be opened to release the articles to permit their transfer to the leer or elsewhere. For this purpose I have provided a short section 200 which has one end pivotally connected to the rail 198 by a pin 201, and which has its free end resting on a roller 202 carried by a bracket 203. As clearly shown in Figures 20 and 48, this pivotally mounted section is inclined upwardly, so that the fingers of the cups will be opened as the spindles ride along this section. The height of the free end of the pivoted section is substantially fixed, as it rests on the roller 202, and therefore it is apparent that the fingers will always be opened to substantially the same extent at this point, irrespective of the vertical adjustment of the rail 198.

By the vertical adjustment of the rail 198 I have provided means for simultaneously adjusting all of the cups to ware of different sizes. Needless to say, this is of great importance. In previ-

ously known fire-finishers it has been necessary to substitute different cups when ware of a different size is to be handled, or each cup had to be individually adjusted to suit the ware. All of this is avoided in the present machine, and all of the cups automatically close to the desired extent when the cups reach the upper run of the conveyer, thereby bringing the spindles into engagement with the rail 198. And when larger or smaller ware is to be handled, it is only necessary to raise or lower the rail, thereby adjusting the extent to which the fingers will close. For the purpose of adjusting the rail I provide a cam shaft 204 which extends beneath the upper run of the conveyer for substantially the full length thereof. The angle rail 198 is attached adjacent its ends to brackets 205, which are mounted for vertical movement in frames 206; the details of construction of the brackets being shown in Figures 36 and 37. Each of these brackets is provided with a depending shank 207 which rests against the frame and restricts any movement of the bracket to a vertical direction. Each of the brackets is also provided with a suitable opening 208, which receives the cam 209 fixed to the cam shaft 204. Thus by the rotation of the cam shaft in the proper direction the brackets will be raised or lowered as desired, thereby raising or lowering the rail 198 which controls the extent of the closing of the cups. At a point about midway of the length thereof the rail is attached to a pair of slightly spaced brackets 210, which are mounted for vertical movement in a frame 211; the details of construction of the bracket members being shown in Figures 28, 29, 30 and 31. The bracket members are provided with a depending shank 212 which rests against the frame and restricts any movement of the bracket to a vertical direction. Each of the bracket members is provided with a suitable opening 213, and these openings receive the cams 214, which are slightly spaced apart and keyed to the cam shaft 204. Also keyed to the cam shaft, between the cams 214, is a worm wheel 215, which meshes with a worm 216 carried by a short shaft 217 which extends transversely of the machine and is provided at its front end with an operating hand wheel 218. Thus by the rotation of the hand wheel the worm wheel 215 will be turned, thereby turning the shaft 204, the end cams 209 and the central cams 214, to raise or lower the brackets and the rail carried thereby. Formed integral with or keyed to the shaft 217 is a small gear 219 which meshes with the teeth 220 formed on the periphery of a large disc 221. This disc constitutes a dial bearing suitable indicia to indicate ware of different breadth. A pointer 222 is mounted on the channel iron 147, to cooperate with the dial 221. Suppose that ware of 2" in diameter has been handled, and the ware of the next job is 2½" in diameter. To simultaneously adjust all of the cups to this new size of ware, it is only necessary to turn the hand wheel 218 to such an extent that the dial 221 will indicate that the cups are set for ware of 2½" diameter, and the rail will have been raised sufficiently to insure the fingers of each cup closing just enough to grip ware of 2½" in diameter. While I have used the term diameter, it will be understood that the cups are in no manner limited to the handling of round ware, but are adapted to ware of any shape.

It is necessary, of course, that the ware be rotated while it is being carried through the polishing burner and the edge melt burner. For this purpose each cup is provided with a toothed wheel 181, described hereinbefore. A bar 223 extends longitudinally of the machine, alongside the previously described rail 198 but in a slightly higher plane than the rail, in order to be in position to cooperate with the toothed wheels 181. The bar 223 is mounted on suitable brackets 224. A series of upstanding spaced pins 225 extends the full length of the bar 223, and as the cups are carried along the upper run of the conveyer the toothed wheels 181 will engage the spaced pins 225, whereby the cups and the ware carried thereby will be rotated. I preferably provide a short pivotally mounted extension 223' of the bar 223, as best illustrated in Fig. 16. The pivot for the extension 223' is indicated by reference character 223'', and numeral 226 indicates a spring-pressed plunger which normally maintains the extension in alignment with the bar 223. A plate or lug 226' which is caried by the pivot arm of the extension 223' is adapted to abut against the bar 223 and thus serve as a stop to prevent the spring-pressed plunger from swinging the extension outwardly beyond alignment with the bar 223. If at the point where the cups start to rotate, the teeth of the wheels 181 do not properly mesh with the pins 225 on the extension 223', thereby tending to jam the parts, the extension will swing backwardly about its pivot, against the pressure of the spring-pressed plunger 226, thereby avoiding possibility of breakage. It will be understood, of course, that as soon as the teeth properly mesh, the extension will be returned to its normal position by the spring-pressed plunger.

I have already described the operation of the machine up to the point where the articles are deposited on the cups, and I shall now briefly describe the operation of the cups. The endless conveyer is continuously moving, and in the lower run of the conveyer the rollers 151 of the cups travel on the top of the I-beams 143; the fingers of the cups being open by reason of the spindles 192 dropping by gravity. In the event that any of the spindles should stick, thus preventing the opening of the fingers, I have provided a fixed cam 227 mounted just above the lower run of the conveyer. Any spindles that have not dropped by gravity will engage this cam and be forced down. As the cups approach the upper run of the conveyer the spindles will fall by gravity in the opposite direction and will ride on rail 198; the cups being thus closed, to an extent determined by the vertical position of the rail. During the travel of the cups on the upper run of the conveyer the rollers 151 will ride in the channels 147, and the plates 184 will rest on and slide along the top of the channels. As each cup passes successively beneath the receiver, the fingers 189 will be opened momentarily by reason of the bulge or rise 199 up which the spindles must ride in their travel along the rail 198. The spindles will immediately ride down the opposite side of the bulge 199, thereby closing the fingers to grip the ware; and during the remainder of the travel of the cups on the upper run of the conveyer, the spindles will ride on the rail. To adjust the cups to ware of different sizes it is only necessary to rotate the hand wheel 218 which, by the means hereinbefore described, will raise or lower the rail to the desired extent; the dial 221 indicating when the rail has been properly positioned to adjust the cups to the particular size of ware to be handled. Of course, all of the cups will be open on the lower run of the conveyer, but as the cups successively reach the upper run they will be automatically ad-

justed to the desired size. Thus, by simply rotating the hand wheel 218 I am able to simultaneously cause all of the cups to conform to the particular size of ware to be handled; thereby avoiding the loss of time and expense in substituting different cups for different sized ware, or individually adjusting each cup to different sized ware.

After the cups have traveled the full length of the machine, and the ware is completed and ready to be transfered to the leer or elsewhere, the spindles successively ride up the incline of the pivotally mounted section 200, whereby the cups are opened to permit the ware to be transferred. The free end portion of section 200 always remains at practically the same height, irrespective of the vertical adjustments of the rail 198, as the free end portions rests on the roller 202 which is mounted in the fixed bracket 203. While the cups are continuously traveling along the upper run of the conveyer, they are also being continuously rotated by means of the toothed wheels 181 which are in engagement with the upstanding pins 225 carried by the bar 223.

While the ware is being carried along by the conveyer it first passes through the polishing burner, then the edge melting burner, and then the fitter. These three devices will now be described in the order named.

In the following description of the polishing burner reference is to be had particularly to Figures 12, 15, 25, 27 and 38 to 44. The polishing burners are indicated by numeral 228, and they are of sufficient length to produce the desired effect in fire polishing the ware. There are two of the burners 228, identical in construction, and oppositely disposed, the ware being carried along between them by the endless conveyer and being continuously rotated as hereinbefore described. In view of the fact that different temperatures may be desired throughout the length of the polishing burners, it is desirable to divide the burners into separate compartments. In the present construction I have divided each burner 228 into three separate compartments by the partitions 229. It will be understood, of course, that the air and gas may be supplied to the burners in any desired manner, that mixers and blowers may or may not be employed, and that the burners may be of any desired structure; and that I am merely describing here the specific construction illustrated. Each of the compartments is provided with an opening 230 in its outer wall, to permit the admission of compressed air to the burner. A short pipe section 231 is attached to the side of each compartment and communicates with the opening 230. A valve 232 is mounted in each pipe section 231 and is adapted to cooperate with the opening 230 to regulate the admission of compressed air; the valves being adjusted by the hand wheels 233. In the form illustrated herein a compressed air tank 234 is mounted above the machine on suitable posts carried by the main frame, and compresed air is supplied to this tank from the source of supply by means of pipe 235. Leading from one end of the air tank are two short pipe sections 236, and threaded on the end of each pipe section is an elbow 237. These elbows extend laterally outward, and threaded in each elbow is a short horizontally extending pipe section 238, and threaded on the outer end of each of these pipe sections is an elbow 239. These elbows turn downwardly and threaded in each of them is a downwardly extending pipe 240. The lower ends of these pipes telescope into the upwardly extending pipes 241; thereby providing a slip joint between the pipe sections. The upwardly extending pipes 241 have their lower ends threaded into elbows 242, and each of these elbows has threaded therein a horizontally extending pipe 243, which extends the full length of the burners. Leading downwardly from each of these pipes 243 are three short pipe sections 244. The lower ends of these pipe sections telescope in the short pipe sections 245 extending upwardly from each of the pipes 231 which lead into the compartments of the burner 228. Thus the compressed air is supplied from the tank 234 to the three compartments of each burner, the volume of air to the compartments being individually controlled by the hand wheels 233 which operate valves 232. I have described this piping, including the threaded pipe sections, the elbows, and the slip joints, in considerable detail, for the burners are capable of adjustment in practically all directions, and the necessary flexibility of the piping is obtained by means of these various elbows, slip joints, etc. The gas is fed into each compartment through the top thereof. The gas is carried from a suitable source by means of a pipe 246 which branches off into two pipes 247, and each of these pipes 247 is again divided into two branches; the branches 248 supplying the gas to the polishing burners while the other branches supply air to the edge melting burners, as will be described hereinafter. Connected to each of the branches 248 is a flexible hose 249, which leads through suitable elbows 249', etc., to a horizontally extending pipe 250. Leading away from each of the horizontally extending pipes 250, are three downwardly extending pipes 251, each of which communicates, at its lower end, with a gas manifold 252, provided on the top of each burner compartment. It is also to be noted that each of these pipes 251 is provided with a valve 253, operated by hand wheel 254, by means of which valves the volume of gas to each compartment is regulated. The construction of the gas manifold is shown in Figure 40, and it consists merely of a horizontally extending passage 255, from which lead a suitable number of ports 256. The manifold is also provided with the usual cleaning holes which are normally closed by plugs 257. Thus the gas, in suitable volume is introduced through a number of ports into the top of each of the burner compartments, and air in suitable volume is introduced through the side of each compartment; a good mixture of the air and gas being assured. Of course, the inner face of each burner is provided with suitable apertures 258 for the flame jets, and by reference to Figure 25, it will be noted that I preferably provide a cross-flame, and for this reason the upper apertures are inclined downwardly, the lower apertures are inclined upwardly, and the central apertures extend horizontally. The flames will play on all sides of the articles as they are continuously moved between the burners, in the continuously rotating cups; and since the fire-polishing of glass is so well known, it is entirely unnecessary to give any description of it here.

I have described the construction of the fire-polishing burners, and the particular means for feeding and regulating the air and gas to the separate compartments of the burners; it being understood that any desired means may be used for supplying, mixing and regulating the air and gases; and I shall now describe the various adjustments of the burners, by which they may be made to suit ware of different height, breadth

and shape, and by which the effect of the burners may be very sensitively controlled.

The ends of the burners 228 are provided with stub shafts 259 which rest in saddles 260. As shown in Figures 39 and 40 these saddles are preferably provided with rollers 261 which ride on plates 262 fixed to the vertical rods 263. To maintain the saddle in position on the plate, I provide the saddle with flanges 264 and 265, which extend downward along the sides of the plate and thus prevent lateral movement between the saddle and plate; and the flange 264 is inturned, as indicated by numeral 266, to ride in a horizontally extending groove in the side of the plate, thereby preventing vertical movement between the saddle and plate. Thus the saddle is free to move only longitudinally of the plate, and by this movement of the saddles either or both ends of the burners may be swung inwardly or outwardly as desired. For the purpose of moving the saddles back and forth, each plate 262 is provided with a hand wheel 267 which has its integral shaft 268 rotatably mounted in an upwardly extending portion 269 of the plate 262; the shaft 268 being held against longitudinal movement by the flanges 270. The shaft 268 is hollow and is interiorly threaded as indicated by numeral 271, to receive the threaded rod 272; the opposite end of which rod is fixed to the saddle 260. Thus by the rotation of the hand wheel 267, the saddle may be moved inwardly or outwardly, the rollers 261 of the saddle riding freely on the plate 262. As a saddle moves inwardly or outwardly that end of the particular burner will move inwardly or outwardly, by reason of the stub shaft 259 resting in the saddle. This adjusting means is illustrated in detail in Figure 39; and there is, of course, one of these adjusting devices for each end of each burner, as clearly shown in the drawings. Both of the hand wheels on one of the burners may be turned in the same direction and to the same extent to move the burner bodily inward or outward; or the hand wheels may be turned to move the front end of the burner inwardly and the rear end outwardly, or vice versa; and the other burner may be independently controlled in the same manner. It will thus be seen that by these simple adjustments I am able to secure practically any desired lateral position of the burners with respect to the ware, and I am thus able to control to a great extent the effect of the burners on the ware. In Figure 42, I have illustrated diagrammatically the burners arranged parallel to each other and parallel to the path of movement of the articles; and in Figure 41, I have illustrated the burners arranged to converge slightly in the direction in which the ware is moving; but it will be understood from the foregoing description that this adjusting means permits the burners to be arranged in a wide variety of positions, thereby greatly increasing the flexibility, and consequently the efficiency, of the burners. It may be mentioned that when one end of one of the burners is moved inwardly or outwardly, the other end merely turns with rod 263 as a pivot; the plate 262 being fixed to the rod 263, and the rod being rotatably mounted.

It is also desirable to tilt the burners, on their axes, to vary the point at which the flames strike the ware, as well as to vary the angle at which the flames strike the ware. For this purpose one of the stub shafts 259 of each of the burners, has pinned thereto a worm wheel 273, and a shaft 274 is rotatably mounted in a bracket 275 carried by the saddle 260. This shaft carries a worm 276 which meshes with the worm wheel 273, and the outer end of the shaft has fixed thereto an operating hand wheel 277. By the rotation of the hand wheels both burners may be tilted upwardly to the desired extent or downwardly to the desired extent, or one of the burners may be tilted upwardly and the other downwardly and vice versa. By this construction the burners are rendered very flexible, and the operator is able to play the flames on the ware at exactly the correct angle or angles to obtain the best results. In Figure 43, I have illustrated diagrammatically both burners tilted upwardly; and in Figure 44, I have illustrated one burner projecting its flame horizontally and the other burner tilted downwardly. These figures are merely to give an illustration of the flexibility of the burners, and it will be apparent that they may be adjusted in various other positions. It will also be noted that in this Figure 44, one of the burners is in a higher plane than the other; and I shall now describe the means by which it is possible to raise or lower both burners simultaneously, or raise or lower either burner independently of the other, by the operation of a single hand wheel.

In the following description of the means for vertically adjusting the polishing burners, reference is to be had particularly to Figures 12, 13, 15, 16, 25 and 26. Numeral 278 indicates a shaft which extends transversely of the machine below the burners. Keyed to the rear end of this shaft is a gear 279, and the opposite end of the shaft passes through the hub 280 of another gear wheel 281; the end of the shaft 278 being squared, as indicated by numeral 282, and the end of the hub 280 being also squared, as indicated by numeral 283. These two squared ends are in abutting relation, and mounted thereon is a hand wheel 284. Of course, the hub of the hand wheel is interiorly squared to cooperate with the squared ends 282 and 283, and the hub is of just about the width of one of the squared ends, so that if the hub of the hand wheel is moved onto either squared end it will be free of the other squared end, and if it be moved into position to straddle both squared ends it will be in position to rotate both of the gears connected therewith. In Figure 25, the hand wheel 284 is shown in full line in position straddling the squared heads 282 and 283, so that gears 279 and 281 will be rotated simultaneously; and in dotted lines the hand wheel is shown in the other two possible positions, that is, mounted solely on the squared head 282, or mounted solely on the squared head 283. It is thus seen that the hand wheel 284 may be moved to position to simultaneously rotate the gears 279 and 281, or it may be moved to position to independently rotate either of these gears. Each of these gears meshes with a gear 285 keyed on a shaft 286 about midway of the length thereof. These two shafts 286 are arranged on opposite sides of the machine and extend substantially the full length of the burners. Both ends of both of these shafts carry worms 287 which mesh with worm wheels 288 which are threaded on the rods 263; the worm wheels being held against vertical movement by the frames 289 in which they are mounted.

From the foregoing description it will be apparent that if the hand wheel 284 is moved to a position straddling the two squared heads 282 and 283, and is then rotated, the gears 279 and 281 will cause both shafts 286 to rotate by reason of the gears 285 meshing with gears 279 and 281; and as the shafts 286 rotate, the worms 287 at each end of both shafts will rotate the worm

wheels 288, and by the threaded engagement between these worm wheels and the rods 263, these rods will be raised or lowered to the desired extent, depending on the direction of rotation of the hand wheel 284, and thus the burners 228 which are carried by the rods 263, will be simultaneously raised or lowered. If it is desired to raise or lower one of the burners independently of the other, it is only necessary to move the hand wheel onto the appropriate squared head, and then rotate it in the desired direction and to the desired extent to move the particular burner to the desired position. Thus the burners may be raised or lowered to suit ware of different height, or to vary the point at which the flame strikes the ware.

By means of the various adjustments described above, either burner may be moved inwardly or outwardly bodily; or either end of either burner may be moved inwardly or outwardly about the other end as a pivot; or either burner may be tilted upwardly or downwardly independently of the other burner; or both burners may be simultaneously raised or lowered; or either burner may be raised or lowered independently of the other burner. The advantageous results of a burner of this unusual flexibility will be apparent to those skilled in the art of fire polishing glassware.

I shall now describe the construction of the edge-melting burner, and in the following description reference is to be had particularly to Figures 1, 12, 28, 45 and 46.

Numeral 290 indicates the edge-melt burners which are spaced to form a path for the passage of the ware, and which have the upper portions of their inner faces converging downwardly to form a support for the fire bricks 291 which span the distance between the burners and throw the heat downwardly against the articles passing therebeneath.

As previously described, the gas line 246 branches into two lines 247, and from each of these branch lines there branches another line 292 which leads downwardly and then runs horizontally along the side of the burners, as indicated by numeral 293. The downwardly extending gas pipe 292 is provided with a slip joint (not shown), and also with a valve 294 for controlling the volume of the gas supplied to the burners. From the horizontal pipe section 293 there are branches leading to the gas manifolds 295. Each manifold is provided with a longitudinal passage 296 communicating with a plurality of pipes 297 which project into the burners 290 for a considerable distance, and have their ends provided with suitable apertures 298 to permit the escape of the gases in the desired directions. The air manifolds are indicated by numeral 299, and it will be noted by an inspection of Figures 1 and 12, that these manifolds are centrally arched, and have downturned ends which communicate with the top of the burners 290. For the purpose of supplying air to the air manifolds, a pipe 300 leads downwardly, between the two air manifolds, from the compressed air tank 234, and has a slip joint connection (not shown) with a short upwardly extending pipe section 301, which connects with a T 302. The oppositely extending ends of the T 302 lead directly into the central arched portion of the air manifolds 299. The compressed air admitted to the top of the air manifolds flows through the two downturned sections of the manifolds and enters the burners. There are thus four ports for the admission of compressed air, two for each manifold, and I shall describe the slide valve construction by which the admission of air through all of these ports may be regulated simultaneously. There are two slide valves 303, which extend across the burners and rest on the top thereof. Each of these slide valves is provided with two ports 304 which are adapted to align with the ends of the air manifolds to permit the air to flow therefrom into the burners. These two slide valves are rigidly connected together by a bar 305, and on this bar, about midway of the length thereof, is a lug 306 which is provided with a threaded hole to receive a threaded rod 307. This rod is suitably journaled, and is provided at its front end with an operating hand wheel 308. By the rotation of this hand wheel the threaded section of the rod 307 will cause the lug 306 to move backward or forward, thereby moving both slide valves 303 backward or forward and causing the openings 304 to align with the ends of the air manifolds to a greater or lesser extent. The slide valves may be secured in their adjusted positions by means of set screws 309.

It is desirable to vertically adjust the edge-melt burners to suit ware of different height, or to vary the point at which the flame strikes the ware. In the following description of the means for vertically adjusting the edge-melt burners, reference is to be had to Figures 12, 28 and 45. The ends of the burners rest in frames 310, and pinned to each of these frames, centrally thereof, is a vertically extending rod 311. Each of these rods extends upwardly through and beyond a bracket member 312 which is suitably supported from the main frame of the machine, and the upper ends of these rods 311 are threaded. Sleeves 313 are in threaded engagement with the rods, and the lower ends of these sleeves rest on the upper faces of the bracket members 312, so that the burners are suspended from the sleeves, by the rods 311. Thus if the sleeves are rotated, the rods will be raised or lowered, thereby raising or lowering the edge-melt burners. For the purpose of rotating the sleeves, a sprocket wheel 314 is fixed to the upper end of each sleeve, and an endless sprocket chain 315 passes over these sprocket wheels. Fixed to the lower end of one of the sleeves is a worm wheel 316, and meshing therewith is a worm 317, which is keyed to the shaft 318, on the front end of which is the operating hand wheel 319. By the rotation of this hand wheel the worm wheel 317 will rotate the worm wheel 316, thereby rotating its sleeve 313, and the rotation of this sleeve is transmitted to the other sleeve by means of sprocket chain 315. The two sleeves are thus simultaneously rotated, and by reason of their threaded engagement with the rods 311 these rods will be raised or lowered, thereby raising or lowering the burners carried thereby.

I have described the construction of the fire polishing burners and the edge-melt burners, and have also described the construction and manner of operation of the various adjustments therefore, whereby the flexibility of the burners is greatly increased, with a consequent improvement in the efficiency thereof. It is entirely unnecessary to describe the operation of edge-melting, as such is well known in the glass industry.

In the manufacture of tumblers it is necessary that a large percentage of them be fitted. This is particularly true of those tumblers or similar articles which are adapted to receive caps; which necessitates an exact diameter of the mouth of the tumblers or the like. Of course, the fitting

is done while the ware is still heated, and the fitter is therefore mounted on the main frame of the machine just beyond the edge-melt burners; so that the ware will be fitted just as it comes from the burners, and while it continues its movement along with the endless carrier. In the event that ware is being handled which it is not necessary to fit, or if such tumblers are being handled that need not be fitted, the fitter is merely thrown out of operation.

In the following description of the fitter, reference is to be had particularly to Figures 11, 14, 17, 19, 32, 33, 34, 35 and 47 to 51, and while the description refers particularly to a fitter, yet it will be understood that the invention is readily adaptable to use as a shaper, such as for shaping flared tumblers or other articles, or shaping barrel tumblers, etc., and the invention contemplates such uses of the mechanism now to be described; and therefore the term "fitter" is used in a generic sense hereinafter. Numeral 320 indicates an elevated trackway on opposite sides of the path of the ware, and supported above the main frame by brackets 321 which are bolted or otherwise removably secured to the main frame. A carriage is indicated generally by numeral 322, and it will be noted that opposite sides of the carriage are connected by arched braces 323, and that each side of the carriage is provided with two rollers 324, which ride in the trackway 320. Extending upwardly from the top of the carriage are two rods 325 on which is slidably mounted the crosshead 326 which carries the fitter head or ring 327. This head is provided with vent holes 327′ so as to prevent the formation of a partial vacuum in the ware being fitted, which might otherwise cause the ware to be lifted with the head. Before describing the means for vertically reciprocating the crosshead 326 to move the fitter head into and out of engagement with the ware, I shall first describe the means for adjusting the vertical position of the fitter head in the crosshead; reference being had particularly to Figures 32 and 35. A vertically extending sleeve 328 is mounted centrally of the crosshead 326, and this sleeve is exteriorly threaded as indicated by numeral 329. Threaded onto the sleeve is a worm gear 330 which is mounted in the crosshead 326 against vertical movement relative thereto. Meshing with the worm gear is a worm 331 carried by the shaft 332 which is suitably journaled in an extension of the crosshead, and which may be rotated by the hand wheel 333. The upper end of the sleeve 328 is provided with laterally extending fingers 334 constituting means for rotating the sleeve by hand, and the sleeve is provided with a vertically extending keyway 335 adapted to be normally engaged by means for preventing rotation of the sleeve. This keyway is normally engaged by a finger 336 carried by a rod 337 fixed to a cap 338; the finger being normally pressed inward into engagement with the keyway 335 by means of coil spring 339. To remove the finger from the keyway it is only necessary to pull the cap outwardly against the pressure of spring 339, and if it is to be maintained in this operative position, the cap may be turned through 90° to throw the rib 340 out of alignment with its corresponding groove 341, whereby the finger will be maintained in position clear of the keyway 335. The fitter ring or head is threaded or otherwise secured to the lower end of a vertical rod 342, and this rod passes upwardly through the sleeve 328 and has nuts 343 threaded on its upper end. Thus the fitter head is suspended from the sleeve, and is supported merely by the nuts resting on the upper end of the sleeve. A coil spring 344 is mounted on the rod 342, and is maintained under compression between the lower end of the sleeve 328 and a flange 345 provided on the lower end of the rod 342. In the specific construction illustrated herein the fitter head is provided with a tapered groove 346 which is adapted to fit over the upper edge of a tumbler, but of course, this head may have any desired shape, and different fitters will be employed for operating on different ware.

To give a fine adjustment to the fitter head it is only necessary to rotate the hand wheel 333, which will cause a slight rotation of the worm gear 330, thereby slightly raising or lowering the sleeve 328 and the fitter head carried thereby; the sleeve being held against rotation by the finger 336. When a rough adjustment is to be made, as when ware of different height is to be treated, the finger 336 is withdrawn, and the sleeve 328 is rotated by hand by grasping the laterally extending fingers 334 on the upper end of the sleeve, whereby the sleeve and fitter head may be rapidly raised or lowered. After the approximate adjustment has been made, the finger 336 will be allowed to spring back into the keyway 335, and then the vertical position of the fitter may be finely adjusted by means of the micrometer adjustment described above.

As the fitter ring is vertically reciprocated during the continued movement of the conveyer carrying the ware, it is necessary that the carriage travel back and forth, but before describing the means for horizontally reciprocating the carriage, I will first describe the means for vertically reciprocating the fitter ring while the carriage is being reciprocated, and the means for locking the fitter ring in inoperative position.

The crosshead 326 which carries the fitter ring, has a roller at each end which fits in the closed horizontal track 347 provided in head members 348 fixed to the upper ends of the vertically reciprocable rods 349. Thus as the rods 349 are vertically reciprocated, the crosshead 326 and the fitter ring carried thereby will also be reciprocated, but at the same time the crosshead and fitter ring may move back and forth by reason of the engagement of the crosshead ends in the closed tracks 347; this combined vertical and horizontal movement being illustrated diagrammatically in Figure 19. The upper portions of the rods 349 are squared, as indicated by numeral 350, and are slidably fitted in guides 351 attached to the outer sides of the frames for the track 320. The lower portions of the rods 349 are round and are slidably fitted in guides 352 attached to the main frame supporting the endless carrier. These rods 349 project downwardly below the guides 352, and the lower ends of the rods are connected by a cross-bar 353. The cross-bar is preferably held in place at the lower ends of the rods, by reducing the diameter of the lower ends to form shoulders 354, and mounting a nut 355 on the ends of the rods, as clearly indicated in Figure 32. Attached to or integral with the cross-bar 353 are two vertical slide bearings 356, and slidably mounted in these bearings are vertically extending rods 357. A cross-bar 358 is attached to the lower ends of the rods 357, preferably by reducing the diameter of the rods to form shoulders 359, and mounting nuts 360 on the ends of the rods, as indicated in Figure 32. Coil springs 361 are mounted on the rods 357; the springs being compressed between the upper ends of the

bearings 356, and the nuts 362 threaded on the upper ends of the rods. Thus the cross-bar 358 is normally forced upwardly, by the springs 361, toward the cross-bar 353; but the two bars are vertically spaced by the downwardly projecting portions of the slide bearings 356, this normally spaced relationship being indicated by numeral 363. A crank pin 364 is received in the space between the cross-bars 353 and 358; the crank pin being carried by a disc 365 keyed to a shaft 366. Also keyed to this shaft is a gear 367 meshing with a larger gear 368 keyed to the main driving shaft 156 of the endless carrier. The gearing is so designed, of course, that the fitter head will be moved downwardly in the correct timed relation to engage each article on the endless conveyer. The continuous rotation of the main driving shaft 156 will continuously rotate the crank or disc 365, and the crank pin 364 engaging the cross-bar 358 will move downwardly this cross-bar and the rods 357 carried thereby. As these rods move downwardly the springs 361 exerting pressure against the upper cross-bar 353, will cause this cross-bar to also move downwardly, thereby lowering the rods 349 and the head members 348 fixed thereto. As previously described, these head members 348 are provided with the closed tracks 347, in which are mounted the end rollers of the crosshead 326 which carries the fitter ring 327. Thus the fitter ring will be moved downwardly, while the closed tracks 347 permit the fitter ring carriage to move back and forth. The springs 361 prevent any breakage of parts in the event of jamming etc., for it is apparent that if anything prevents the normal downward movement of the rods 349, these rods and the parts associated therewith may remain stationary, while the crank pin 364 will simply overcome the upward pressure of the springs 361, and move the lower cross-bar 358 downwardly against the pressure of those springs. As long as the abnormal condition exists the cross-bar 358 will simply be moved down and up, by the crank pin 364 and springs 361, respectively, without any effect whatever on the fitter. It is thus apparent that the above-described connection with the crank pin constitutes a safety-device; but it also has another function, namely, to assist in rendering the fitter inoperative, when its use is no longer necessary. This feature will now be described, reference being had particularly to Figures 32, 33, 34 and 48.

Projecting upwardly from the cross-bar 353, and arranged centrally thereof, is a rigid arm 369, which is provided adjacent its upper end with a notch 370. This arm projects upwardly between two bars 371 which are properly spaced by being fitted in cut-out portions 372 of the outer walls of guides 352; these bars being secured together by means of bolts 373. Thus the bars 371 are in fixed position, and the notched arm 369 reciprocates vertically between them. Two aligned holes 374 are provided in the bars 371, and as the arm 369 reciprocates, the notch 370 therein will also align with these holes. A hand lever 375 is pivotally mounted on the main frame, as indicated by numeral 376, and the inner end of this lever extends inwardly as far as the holes 374, and pivotally mounted on the inner end of the lever is a clutch finger 377. When the fitter is to operate, the lever 375 is moved to position to withdraw the clutch pin 377 from one of the holes 374 and from the notch 370 in the rigid upwardly projecting arm 369, as indicated in Figure 48. When the parts are in this position the fitter will operate in the manner hereinbefore described. When it is desired to throw the fitter out of operation, it is only necessary to move the lever 375 in the opposite direction, when the notch 370 aligns with the holes 374, thereby moving the clutch pin 377 through the notch 370 and into the opposite hole 374; and thus locking the fitter in its elevated position, shown in Figures 33 and 34. When thus locked in inoperative position, the continued rotation of the crank pin 364 will move the lower cross-bar 358 downward, and the springs 361 will move it upwardly, exactly in the same manner as described hereinbefore in connection with possible jamming of parts, and without having any effect on the fitter.

I have thus far described the preferred manner in which the fitter head is mounted, the means for adjusting the fitter head, the carriage for supporting the fitter head, and the means for vertically reciprocating the fitter head while the carriage reciprocates horizontally; and I shall now describe the present means for reciprocating the carriage in a horizontal path.

Depending from the outer sides of the carriage 322 are arms 378, and the arms on each side, converge downwardly into a single arm; each of these single arms being suitably bored at its lower end to receive a horizontally extending rod 379. A portion of the rods 379 are threaded adjacent the arms 378, and are adjustably secured to these arms by means of nuts 380. These rods 379 extend forwardly and rearwardly from the arms 378, and the rear ends of the rods pass through suitable openings in the main frame, and have springs 381 mounted on the ends thereof, compressed between the main frame and nuts 382 threaded on the rear ends of the rods. Thus the rods are normally moved to the right (Figs. 47 and 48) to move the carriage carrying the fitter in the direction opposite to the direction of movement of the endless conveyer. The opposite, or front ends, of the rods 379 are adjustably connected by nuts 383 to arms 384 depending from slide blocks 385, guided for reciprocable movement on the guide plates 386 fixed to the main frame of the machine, on opposite sides of and adjacent to the endless conveyer carrying the ware to be fitted or otherwise shaped. Slidably mounted in open bottom channels extending transversely of the blocks 385, are fingers 387, and each of these fingers has a depending pin 388 which fits in a diagonal slot 389 in the guide plate 386; cover plates 390 being attached to the sliding blocks 385 above the fingers 387, to maintain the fingers in their channels. By this construction, as clearly illustrated in Figures 47 and 50, the two fingers 387 will be moved inwardly when the carriage is moved rearwardly, and will be moved outwardly as the carriage is moved forwardly. I have previously described the plates 184 which are associated with each of the ware-carrying cups and which ride on the upper faces of the channel irons 147 when the cups are in their operative positions on the upper run of the conveyer. These plates 184 are preferably made of steel, and attached thereto or integral therewith are upstanding lugs 391, adjacent the ends of the plates. As illustrated in Figure 50, the lugs 391 on one of the plates 184 will engage the inwardly projecting fingers 387, causing these fingers to travel with the conveyer, and just about the time this occurs the fitter head is moved downwardly into engagement with the tumbler or other article on one of the cups.

As the fingers are moved along with the conveyer, they will move the slide blocks 385 in which they are mounted, and as the depending arms 384 of the slide blocks are connected to the fitter carriage by means of the rods 379 and carriage arms 378, the fitter carriage will also move along with the endless conveyer carrying the ware. But while the fingers 387 are being carried forward by the conveyer they are also being moved outwardly by reason of the pins 388 engaging the diagonal slots 389. Thus after the fingers 387 have traveled along with the conveyer a short distance they will have been moved outwardly a sufficient distance to free them from engagement with the lugs 391; but it will be understood that before this happens, the fitter head will have been moved upwardly out of engagement with the article it has fitted, by the means described hereinbefore. As soon as the fingers 387 are released from the lugs 391, the springs 381 on the rods 379, will move these rods rearwardly, thereby moving the carriage rearwardly, with the fitter elevated. And at this point in the operation the lugs 391 of the next plate 184 will engage the fingers 387, and move the carriage forwardly, while the fitter head comes down to engage the next article on the conveyer, and the cycle of operation is repeated. For providing a cushioning effect on the return stroke of the carriage, I preferably employ dash-pots 392 which are shown as mounted on the fixed track frame 320. The piston rods 393 of these dash-pots are connected to one of the depending arms 378 of the fitter carriage 322 as indicated by numeral 394. On the return stroke of the carriage the piston will compress the air in the dash-pots 392, thereby giving a cushioning effect in the well known manner; the escape of the air, and consequently the extent of the cushioning effect, being controlled by valves 395.

The above described mechanism for reciprocating the fitter carriage operates satisfactorily, but it is apparent that as the continuously moving conveyer engages the carrier while it is at a standstill, it necessarily follows that the conveyer and carriage are subjected to slight shocks. To eliminate, or reduce the force of shocks and render the operation smoother, I provide means by which the carriage is started to move, thus overcoming its inertia, before the lugs 391 engage the fingers 387 to move the carriage with the conveyer. I will now describe this means for overcoming the inertia of the carriage, but it will be understood that the present invention contemplates the use of this filter mechanism either with or without the means for first starting the movement of the carriage before it is engaged by the endless carrier.

In the following description reference is to be had particularly to Figures 11, 47, 49, 50, 51 and 52. Loosely mounted on the shaft 153 which carries the driving sprockets for the endless carrier, are two bell-crank levers 396. One arm, 397, of each of these bell-cranks, is connected to a link 398, which links are pivotally connected to the ends of the rods 379, as indicated by numeral 399. The other arm, 400, of the bell crank lever, is provided with a slideway 401, and slidably mounted therein is a finger 402. This finger is provided with a short laterally projecting pin 403, which is received in a substantially vertical slot 404 in a disc 405 mounted in the frame of the machine. The outer face of each of the endless carrier driving sprockets 148 carries a circular series of rollers 406, arranged to intercept the slidable finger 402 of the bell crank lever. When the rollers 406 strike the fingers 402, they will slowly rock the bell crank levers, and the arms 397 thereof will be moved to the left (Figure 47), and through their connections with the rods 379, will cause these rods and the fitter carriage to move in the same direction as the endless carrier. The machine is so timed, that just after this movement of the carriage has started, the lugs 391 of the endless carrier will engage the fingers 387 and thereby cause the carriage to travel with the conveyer in the manner described hereinbefore. It is thus apparent that the inertia will have been overcome, and the carriage will have started moving, before the endless carrier actually comes into driving engagement with the carriage, and thus practically all shock to the machine, with possible damage to the ware from jarring, is eliminated, and a very smooth operation follows. While the bell crank levers are being rocked about their pivots, the pins 403 are traveling upward in the slots 404, and consequently the fingers 402 are being gradually moved to the left (Fig. 47) out of engagement with the rollers 406. As soon as the fingers are free of the lugs, the bell crank levers are ready to be moved back into position to be engaged by the next roller 406; and it will be understood that the bell crank levers are moved back into that position when the fitter carriage is moved backwardly by the springs 381, after it has been released from the fingers 387 by the withdrawal of those fingers, as previously described. In order that the time of withdrawal of the fingers 402 from the rollers 406 may be varied, the disc 405 which is provided with the slot 404 is made adjustable about its center. Thus it will be seen by reference to Figure 47 that elongated slots 407 are provided in the disc 405 to receive the securing bolts 408; and by reference to Figure 11 it will be seen that screws 409 are provided for adjusting the disc about its center. It is apparent that by adjusting the discs 405 and thus changing the angular position of the slots 404, the fingers 402 may be caused to be withdrawn from the rollers 406, earlier or later.

The operation of all the elements of the fitter unit have been described along with the description of the construction thereof, and consequently only a brief general description of the fitter operation is necessary.

The continuous travel of the endless conveyer brings the ware from the fire-finishing and polishing operation, up to the fitter. Just before the lugs on one of the plates 184 engage the fingers 387, the fitter carriage is given a preliminary movement by the rocking of the bell crank levers 396, as described above. The fitter carriage having been started, the lugs on one of the plates 184 engage the fingers 387, and the carriage now travels along with the endless conveyer. Of course an article is in one of the cups beneath the fitter, and is traveling along with the fitter. Just as this combined travel starts, the fitter head is moved downwardly by means of the continuously rotating crank pin 364, thereby bringing the fitter head or ring into engagement with the edge of the tumbler or the like, and causing the mouth of the tumbler or the like to assume an exact and predetermined size and shape. The continued rotation of the crank pin moves the fitter ring upwardly out of engagement with the article, and at the proper time the carriage is released from its engagement with the endless carrier, (having been previously released from its

engagement with the lugs on the driving sprockets) and the carriage is now moved back to its original position by means of the coil springs 381; this movement of the carriage being cushioned by the dash-pots 392. This cycle of operation is repeated for each article. The fitter may be vertically adjusted, both by micrometer adjustments and by rough adjustments, a safety device is provided to prevent breakage of parts in the event of jamming during the vertical reciprocation of the fitter head, and a clutch is provided to render the fitter head inoperative whenever its use is no longer necessary, all of which features have been described in detail hereinbefore. While I have shown a particular form of fitter head, it is to be understood that the invention contemplates the use of any desired fitter or shaper. For example, a shaper may be employed for flaring tumblers or the like, or for shaping barrel tumblers, and if desired rollers may be provided on the head for engaging the ware. In other words, I contemplate employing any known form of fitter of shaper head. Also as illustrated herein, the cups containing the ware are not rotated during the fitting operation. Under some conditions it may be desirable to rotate the cups during the shaping operation; and to accomplish this it is only necessary to continue the pins 225 further, so that they will be engaged by the toothed wheels 181, during the fitting or shaping operation.

The articles having been fitted, the cups are opened by means of the rail section 200, as previously described, and the articles are now ready to be transferred. The transfer mechanism, which is preferably used with the fire-finisher is not described or claimed herein, as it is the subject-matter of a divisional application, Ser. No. 448,074, as hereinbefore noted.

I have described in detail the construction of the complete fire-finisher mechanism, from the delivery of the ware to it until the ware is ready to be transferred to a leer; and with each unit of the machine I have given a complete description of a cycle of operation. Therefore it is believed to be entirely unnecessary to give any further description of the operation

The machine is, of course, subject to wide modification and variation both in construction and operation, without departing from the spirit of the invention; and all such modifications and changes I aim to include in the scope of the appended claims.

What I claim is:

1. A fire-finisher including a burner, a conveyer, article receiving cups carried by said conveyer and capable of being opened and closed, a member associated with each cup and movable downward to close the cups, a rail beneath a portion of the conveyer and over which said members travel while the cups are in operative position, said rail cooperating with said members to determine the extent of closing of said cups, and means for vertically adjusting said rail.

2. A fire-finisher including a burner, a plurality of continuously moving cups capable of being opened and closed, means carried by each cup for opening and closing the same, a member with which said means cooperate to determine the extent of closing of said cups in their operative position, and a cam for vertically adjusting said member.

3. A fire-finisher including a burner, a plurality of cups capable of being opened and closed, means for moving the cups, a member associated with each cup and movable downward to close the cups, a rail over which said members travel, said rail determining the extent of closing of said cups in their operative position, a bracket supporting said rail, and means for vertically adjusting said bracket.

4. A fire-finisher including a burner, a plurality of cups capable of being opened and closed, a member carried by each cup for opening and closing the same, means for moving the cups, a rail with which said members cooperate to determine the extent of closing of the cups in their operative position, brackets supporting said rail, a shaft, cams carried by said shaft and operatively associated with said brackets to move them in a vertical path, and means for rotating said shaft.

5. A fire-finisher including a burner, a plurality of cups capable of being opened and closed, a member carried by each cup for opening and closing the same, means for moving the cups, a rail with which said members cooperate to determine the extent of closing of the cups in their operative position, brackets supporting said rail, a shaft, cams carried by said shaft and operatively associated with said brackets to move them in a vertical path, a hand wheel operatively connected with the shaft for rotating the same, and a dial operatively connected with the hand wheel for indicating the size of ware to which the cups are adjusted.

6. A fire-finisher including a burner, a continuously moving conveyer, article receiving cups carried by the conveyer and capable of being opened and closed, a horizontally extending rail, means carried by the cups and cooperating with the rail to determine the extent of closing of said cups, means for vertically adjusting said rail, and a member for opening the cups, said member opening said cups to substantially the same extent irrespective of the vertical position of said rail.

7. A fire-finisher including a burner, a continuously moving conveyer, article receiving cups carried by said conveyer and capable of being opened and closed, a horizontally extending rail, means carried by the cups and cooperating with the rail to determine the extent of closing of the cups, an upward bulge in said rail for momentarily opening the cups at the receiving position, and an upwardly inclined member pivotally connected to the rail for opening the cups at their delivery position.

8. A fire-finisher including a burner, an endless conveyer having an upper run and a lower run, cups mounted on the endless conveyer, a toothed wheel associated with each cup, a bar adjacent the upper run of the conveyer and extending longitudinally thereof, upwardly projecting pins mounted on said bar and adapted to be engaged by said toothed wheels, a number of pins at the forward end of the bar being resiliently mounted, to prevent jamming.

9. A fire-finisher including a continuously moving endless conveyer having an upper and a lower run, means for supporting and rotating ware thereon, burners arranged on opposite sides of the upper run of the conveyer and extending longitudinally thereof, the burner flames being directed toward the sides of the ware on the conveyer, said burners being pivotally mounted, and means for moving the burners laterally about one end as a pivot.

10. A fire-finisher including a continuously moving endless conveyer having an upper and a

lower run, means for supporting and rotating ware thereon, burners arranged on opposite sides of the upper run of the conveyer and extending longitudinally thereof, the burner flames being directed toward the sides of the ware on the conveyer, said burners being pivotally mounted, and means for independently moving either of the burners about either of its ends as a pivot.

11. A fire-finisher including a continuously moving endless conveyer having an upper run and a lower run, means for supporting and rotating ware thereon, burners arranged on opposite sides of the upper run of the conveyer and extending longitudinally thereof, the burner flames being directed toward the sides of the ware on the conveyer, said burners being pivotally mounted, means for bodily adjusting either burner laterally, and for laterally adjusting either end of either burner about the other end as a pivot.

12. A fire-finisher including a continuously moving conveyer, means for supporting and rotating ware thereon, burners arranged on opposite sides of said conveyer and extending longitudinally thereof, the burner flames being directed toward the sides of the ware on the conveyer, said burners being pivotally mounted, means for bodily adjusting either burner laterally, and for laterally adjusting either end of either burner about the other end as a pivot, means for rotatably adjusting the burners about their longitudinal axes, and means for vertically adjusting the burners.

13. A fire-finisher including a continuously moving conveyer, burners oppositely arranged along said conveyer, supports on which said oppositely disposed burners are mounted, two gears, each of said gears operatively connected with said supports for raising or lowering them, a hand wheel, and means for connecting the hand wheel with the two gears simultaneously or with either gear independently of the other gear.

14. A fire-finisher including a continuously moving conveyer, an edge-melt burner associated with said conveyer, means for vertically adjusting said edge-melt burner, said means including brackets supporting said burner, vertically extending rods fixed to said brackets, gears threaded on said rods, said gears being operatively connected, and a hand wheel for rotating one of said gears.

15. A fire-finisher including a continuously moving conveyer, a carriage associated with said conveyer, a cross-head vertically reciprocable on said carriage, a sleeve mounted in the cross-head, a worm wheel threaded on said sleeve, means normally preventing the rotation of said sleeve, a hand wheel for operating said worm wheel, a rod passing through said sleeve and suspended from the top thereof, and a fitter head mounted on the lower end of said rod.

16. A fire-finisher including a continuously moving endless conveyer, article receiving cups mounted on the conveyer, a fitter head cooperating with articles in said cups, a vertically movable member carrying said fitter head, horizontal tracks in which said member is reciprocable and means for vertically reciprocating said tracks.

17. A fire-finisher including a continuously moving endless conveyer for carrying glass articles, horizontal tracks, means for vertically reciprocating said tracks, and a fitter carried by said tracks and cooperating with the glass articles carried by the conveyer.

18. A fire-finisher including a continuously moving conveyer, a fitter cooperating with ware on said conveyer, vertical rods for vertically reciprocating said fitter, a cross-bar mounted on the lower ends of said rods, vertical rods slidably mounted in said cross-bar, springs normally forcing the second-mentioned rods upwards, a cross-bar carried by the lower ends of the second-mentioned rods, and a crank-pin between the first and second-mentioned cross-bars.

19. A fire-finisher including a continuously moving conveyer, a fitter cooperating with ware on said conveyer, means for vertically reciprocating said fitter, said means including two resiliently connected members, a crank-pin for reciprocating said members, and means whereby one of said members may be reciprocated independently of the other of said members.

20. A fire-finisher including a continuously moving endless conveyer, a carriage associated therewith, a fitter mounted on said carriage, fingers connected with said carriage, means on said conveyer to engage said fingers to move the carriage with the conveyer, and means for disengaging said fingers from the conveyer.

21. A fire-finisher including a continuously moving conveyer, a carriage associated therewith, a fitter mounted on said carriage, a finger connected with said carriage, means on the conveyer to engage said finger to move the carriage with the conveyer, and means for gradually withdrawing said finger from engagement with the conveyer.

22. A fire-finisher including a continuously moving conveyer, a carriage associated therewith, a finger connected with said carriage, means on said conveyer to engage the finger to cause the carriage to move with the conveyer, a pin on said finger, and a plate having a diagonal slot in which said pin is mounted.

23. A fire-finisher including a continuously moving conveyer having an upper run and a lower run, article-carrying cups on said conveyer, a plate associated with each of said cups, lugs on said plates, a fitter associated with the upper run of the conveyer, fingers connected with the fitter, said fingers engaged by said lugs, and means for disengaging said lugs and fingers.

24. A fire-finisher including a continuously moving conveyer, a sprocket wheel for driving said conveyer, a carriage associated with the conveyer, a fitter mounted on the carriage, and means for intermittently connecting the carriage with the sprocket wheel to cause the carriage and fitter to travel with the conveyer.

25. A fire-finisher including a continuously moving conveyer, a sprocket wheel for driving the conveyer, a carriage associated with the conveyer, a fitter mounted on the carriage, a lever connected with the carriage, lugs on said sprocket wheel, and means carried by the lever and moved into and out of engagement with said lugs.

26. A fire-finisher including a continuously moving conveyer, a sprocket wheel for driving the conveyer, a carriage associated with the conveyer, a fitter mounted on the carriage, a bell crank lever, means connecting one arm of the bell crank lever with the carriage, a finger movably mounted on the other arm of the bell crank lever, lugs on the sprocket wheel, and means for moving said finger into and out of engagement with said lugs.

27. A fire-finisher including a continuously moving endless conveyer having an upper run and a lower run, a fitter associated with the upper run of the conveyer, a movable finger adapt-

ed to complete a driving connection for moving the fitter with the conveyer, and means to withdraw said finger from the driving connection at predetermined times.

28. A fire-finisher including a continuously moving conveyer, a fitter associated with the conveyer, mechanism for intermittently connecting the fitter with the conveyer, and mechanism for giving the fitter a preliminary movement in the direction of travel of the conveyer before it is connected with the conveyer.

29. A fire-finisher including a continuously moving conveyer, a fitter associated therewith, two means for intermittently moving the fitter with the conveyer, one of said means being rendered operative before the other.

30. A fire-finisher including a continuously moving conveyer, an intermittently stationary fitter associated therewith, a carriage carrying said fitter, said carriage being movable in the line of travel of the conveyer, mechanism for overcoming the inertia of the carriage, and mechanism operative immediately thereafter to connect the carriage with the continuously moving conveyer.

31. A fire-finisher including a continuously moving conveyer having an upper run and a lower run, a sprocket wheel for driving the conveyer, a fitter associated with the upper run of the conveyer, a lever connected with the fitter, means on the sprocket wheel for intermittently engaging the lever, fingers connected with the fitter, and means on the conveyer for intermittently engaging the fingers.

32. A fire-finisher including a burner, an endless conveyer having an upper run and a lower run, article receiving cups carried by the endless conveyer, said cups being in upright position while on the upper run of the conveyer and in inverted position while on the lower run of the conveyer, a member associated with each cup for opening and closing the same, said members being movable by gravity, said members maintaining the cups open while on the lower run of the conveyer, and maintaining the cups closed while on the upper run of the conveyer, and mechanism for simultaneously adjusting the extent of closing of all of said cups while on the upper run of the conveyer.

33. A fire-finisher including a burner, an endless conveyer having an upper run and a lower run, article receiving cups carried by the endless conveyer, said cups being in upright position while on the upper run of the conveyer and in inverted position while on the lower run of the conveyer, a member associated with each cup for opening and closing the same, said members being movable by gravity, said members maintaining the cups open while on the lower run of the conveyer, and maintaining the cups closed while on the upper run of the conveyer, a rail arranged between the upper and lower runs of the conveyer and upon which said members ride while the cups are on the upper run of the conveyer, said rail determining the extent of closing of the cups, and mechanism for readily adjusting the vertical position of the rail to simultaneously adjust the extent of closing of all of said cups.

34. A fire-finisher including a burner, a plurality of cups for holding ware to be treated, means including a hand wheel for simultaneously adjusting the cups to ware of different size, a dial for indicating the adjustments necessary for ware of various sizes, and an operative connection between the hand wheel and the dial.

IRA H. FREESE.