

Nov. 26, 1935.

A. A. HOLBECK

2,022,000

APPARATUS FOR BREAKING MATERIAL

Original Filed Jan. 28, 1933 3 Sheets-Sheet 1

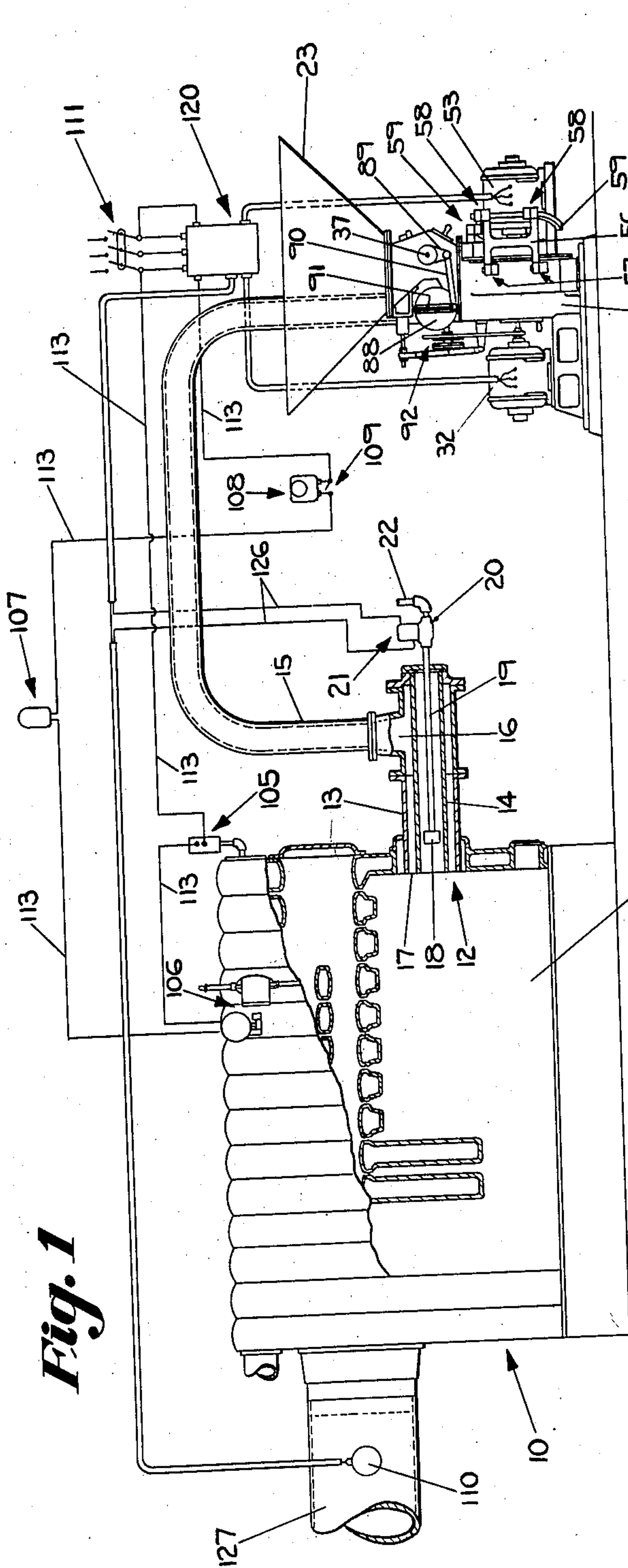


Fig. 1

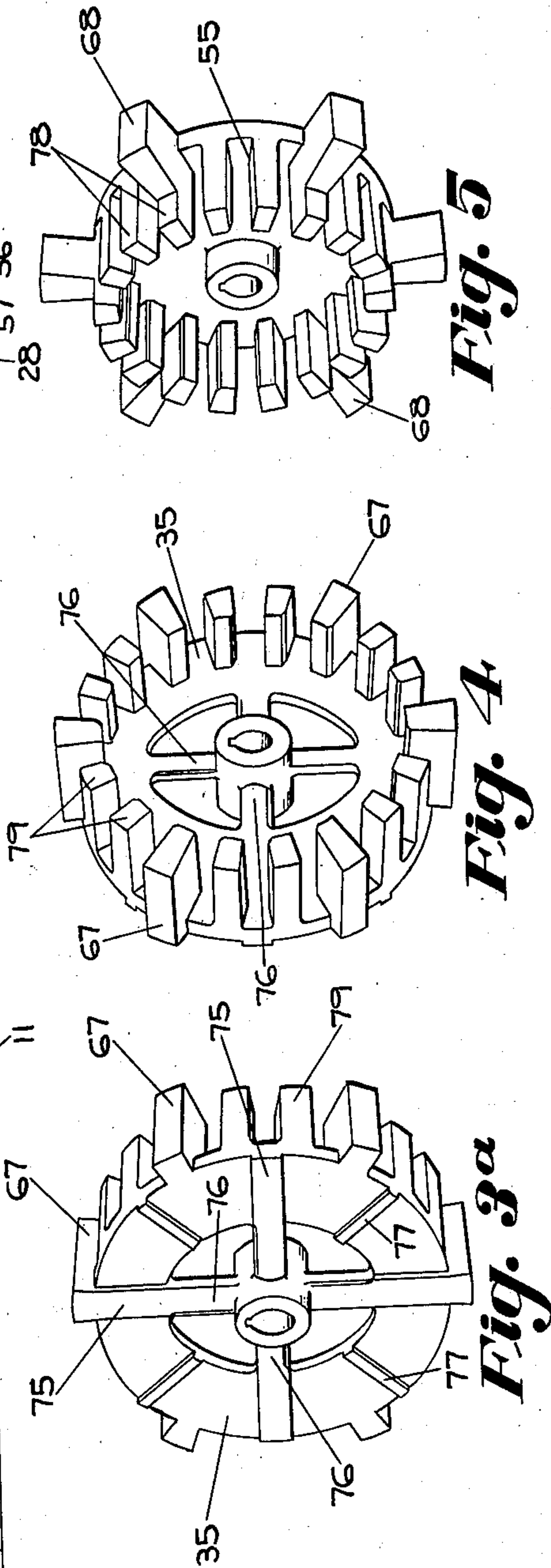


Fig. 5

Fig. 4

Fig. 3a

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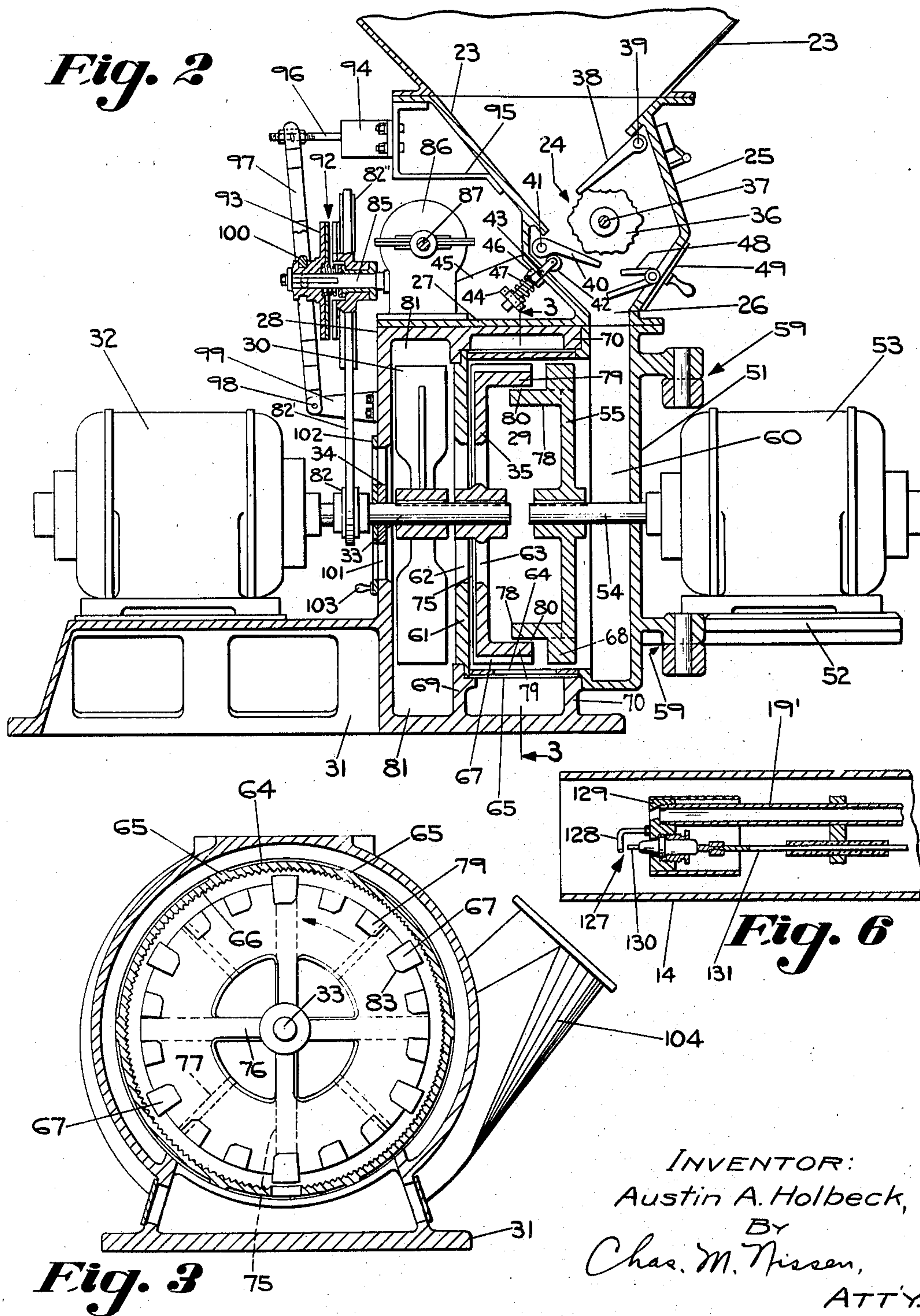
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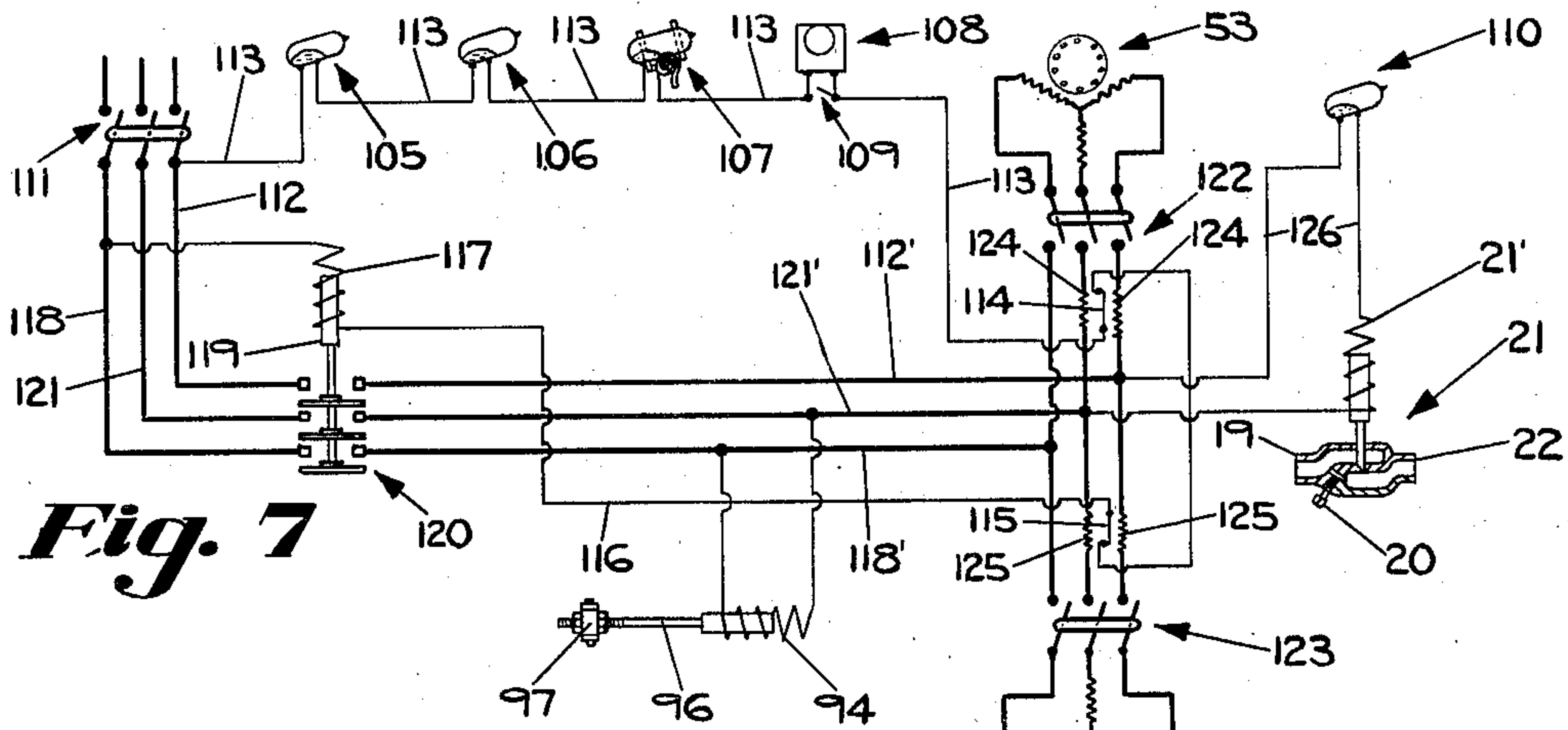


Fig. 7

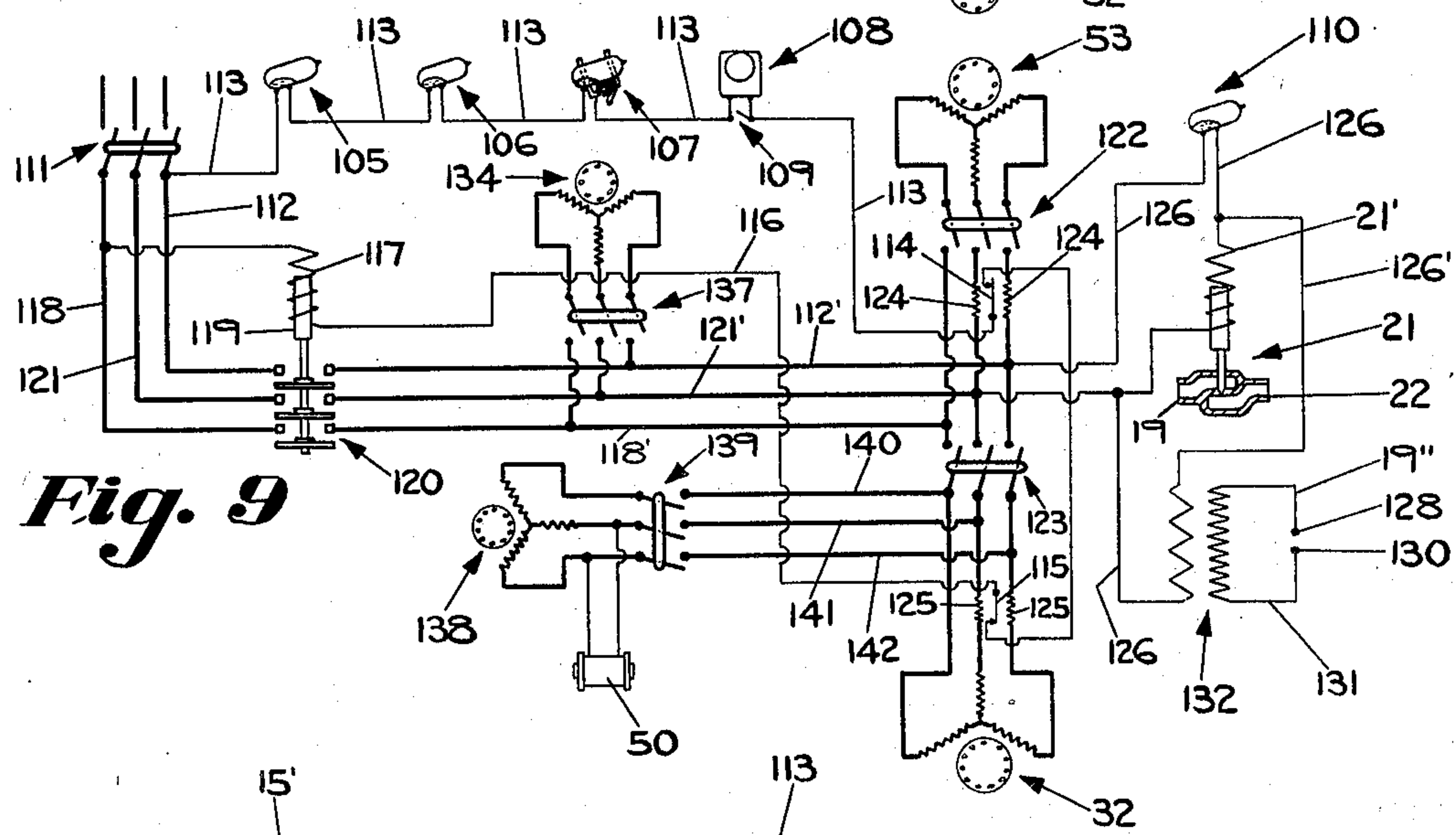


Fig. 9

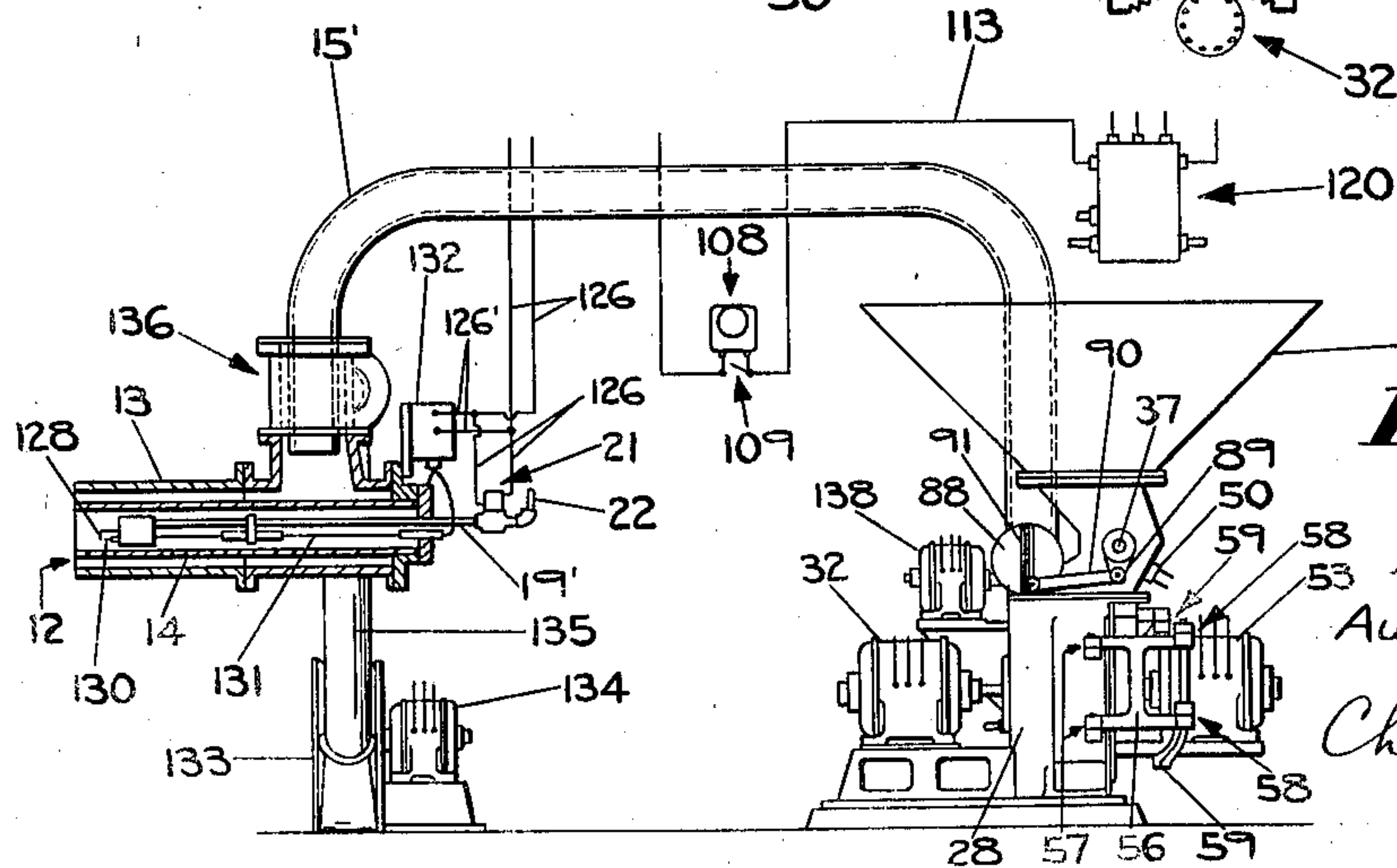


Fig. 8

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UNITED STATES PATENT OFFICE

2,022,000

APPARATUS FOR BREAKING MATERIAL

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Original application January 28, 1933, Serial No. 654,012. Divided and this application May 17, 1933, Serial No. 671,533

5 Claims. (Cl. 83—11)

The present invention relates to automatic heating systems thermostatically controlled, and one of the objects of the invention is the provision of improved and efficient apparatus for including in such systems a pulverizer for the combustible material to be used and operating such pulverizer in accordance with requirements.

Another object of the invention is the provision of improved rotor elements in a pulverizer which is particularly adapted to be used in an automatic heating system but which is capable of general application.

A further object of the invention is the provision of a motor-operated pulverizer and feeding means therefor combined with controlling mechanism in an automatic heating system, to effect stopping of the feeding means independently of the stopping of the pulverizer.

Another object of the invention is the provision of thermostatically controlled and automatically operated pulverizing mechanism, combined with means for feeding a mixture of air and pulverized material to a furnace burner for burning in the furnace chamber.

A further object of the invention is the provision of improved mechanism for feeding a mixture of pulverized fuel and air to a furnace burner and providing auxiliary air feeding mechanism to such burner to enable the same to burn pulverized fuel continuously without extinguishment directly in the chamber of a furnace.

Another object of the invention is the provision in an automatic thermostatically controlled heating system of a pulverizer and means for feeding the pulverized material to a burner and automatically supplying an expansion gas flame for a limited period to effect the starting of the burner.

A further object of the invention is the provision of a thermostatically controlled automatic heating system embodying a pulverizer operated only as the pulverized material is needed in order to avoid the storage of pulverized fuel with its attendant danger of spontaneous combustion in storage.

Another object of the invention is the provision in a thermostatically controlled automatic heating system embodying a motor operated pulverizer, of safety features operable under predetermined abnormal conditions to stop or prevent the operation of the system including the pulverizer.

A further object of the invention is the provision of feeding directly to a pulverizer the material to be pulverized and eliminating tramp iron

to prevent the same from injuring the pulverizing elements.

Another object of the invention is the provision in an automatic thermostatically controlled heating system of a direct firing unit comprising feeding, pulverizing, mixing burner and initial ignition mechanism, to enable a self-sustaining fuel flame to be maintained continuously directly in the furnace chamber of the heating system.

The present application is a division of application Ser. No. 654,012, filed January 28, 1933.

In the accompanying drawings, Fig. 1 is an elevation of a thermostatically controlled automatic heating system embodying the present invention;

Fig. 2 is an enlarged sectional elevation of the feeding mechanism and the pulverizing apparatus shown in elevation in the right-hand portion of Fig. 1;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Figs. 3a and 4 are perspective views of opposite faces of the fan side of the rotor element of the pulverizer shown in section in Fig. 2;

Fig. 5 is a perspective view of the inner face of the feed side rotor element of the pulverizer;

Fig. 6 is an enlarged sectional elevation of an electric ignition device adapted to be attached to the furnace burner shown in Fig. 1;

Fig. 7 is a wiring diagram of the electric circuits and the connections for the heating system shown in Fig. 1;

Fig. 8 illustrates a modified heating system embodying a separate motor for operating the mechanism for feeding the material to the pulverizer, and including the addition of an auxiliary air supplying mechanism for the burner; and

Fig. 9 is a wiring diagram of the circuits and connections for the heating system shown in Fig. 8.

In the accompanying drawings, 10 designates a furnace having a furnace chamber 11, to which the present improved direct firing unit is adapted to be connected. The burner 12 of said unit comprises concentric, spaced-apart tubes both open at their inner ends into the furnace chamber 11 and both closed at their outer ends as shown in Fig. 1. A feed pipe 15 communicates at 16 with the cylindrical space between the tubes 13 and 14, and when the mixture of air and fuel is projected into the said cylindrical space, it passes into the furnace chamber 11 through the annular burner opening at 17.

A gas igniting burner 18 is connected to the end of the gas pipe 19 extending along the center

of the inner tube 14. Such burner may comprise a constantly burning pilot and an expansion burner, the pilot being regulated by the hand operated valve 20 and the expansion burner being controlled by the electromagnetic valve 21. When the latter is opened, the gas flowing from the supply pipe 22 through the expansion burner produces a gas flame of sufficient size and heat adjacent the pulverized fuel burner opening 17 to ignite the fuel when the heating system is to be started in operation. Although illuminating gas is preferable for this purpose, it should be understood that any other suitable inflammable fluid may be used, if desired.

The pulverizing apparatus, the feeding mechanism therefor, and the mixing and feeding fan are shown in sectional elevation in Fig. 2. The pulverizer includes certain improvements on that disclosed in the prior Patent No. 1,855,171, granted April 19, 1932, on an improvement in unit pulverizers; and while this pulverizer is described in connection with an automatic heating system as applied to the pulverization of coal, it will be understood that the pulverizer may be used equally as well for the pulverization of materials other than coal, which materials may be of a highly diversified character. In other words, the pulverizing apparatus represented by the present improved construction is of a very wide and general utility, and by no means restricted to the specific use or adaptation thereof, in connection with a heating system as will be described herein, merely for the purpose of illustrative convenience.

As shown in Fig. 2, a hopper 23 is provided to receive the material to be pulverized, which material in the illustrative embodiment of the apparatus is coal which is adapted to be burned at the annular burner opening 17, this coal being delivered to the said burner opening in a finely powdered condition, the comminution thereof being accomplished in the mill structure now about to be described in detail. It will be understood, however, as has been previously pointed out, that any material of a sufficient degree of softness may be comminuted in the pulverizing apparatus.

In this pulverizing apparatus, as illustrated in Fig. 2, a rotary feeder 24 is mounted in the throat 25 above the feeder discharge outlet 26. The throat 25 is attached to a plate 27 mounted on the top of a casing 28 in which the pulverizer 29 and the fan 30 are enclosed. The casing 28 is supported on the bed plate or base 31 which also supports the motor 32 for driving the fan shaft 33. The inner end of the shaft 33 carries the fan side rotor element 35 of the pulverizer 29.

The feeder 24 comprises a rotary element 36 mounted on the shaft 37. A plate 38 pivoted at 39 rests loosely on top of the rotary element 36. The plate 40 is yieldingly supported by the roller 42 pivoted to the inner upper end of the slide rod 43.

The rod 43 slides through a wall of the throat 25 and also through a strap 44 secured to the bracket plate 45. A nut 46, screw-threaded onto the rod 43, acts as an adjustable abutment to limit the inward movement of the roller 42. A spring 47 between the nut 46 and the stationary strap 44 is compressed when the material fed below the feed roll 36 depresses the plate 40.

A permanent magnet 48 fastened to a removable cover 49 is placed in the path of the descending material to remove tramp iron. Such permanent magnet and the feeding apparatus adjacent

the same, as shown in Fig. 2, may be the same in construction and operation as that disclosed in the aforesaid Holbeck Patent No. 1,855,171, granted April 19, 1932. If desired, an electromagnet 50, as shown in Figs. 8 and 9, may be substituted for the permanent magnet 48 and arranged to be energized whenever the feeding mechanism 24 is operated.

A hollow circular closure 51 for the feed side of the casing 28 is provided with a platform 52 on which is mounted the motor 53. The shaft 54 of the latter extends inwardly and carries at its inner end the feed side rotor element 55, which is shown in section in Fig. 2 and in perspective in Fig. 5. When the motor 53 is operated, the rotor 55 is rotated relatively to the casing 28 and the closure 51 in a direction opposite to the direction of rotation of the fan side rotor element 35 which is driven by the motor 32. The fan side rotor element 35 is shown in perspective in Figs. 3a and 4.

The feed side rotor element 55 together with the closure 51 and the motor 53 may be moved axially of the shaft 54 away from the casing 28 and then swung laterally on vertical hinges so that both rotors will be freely accessible for inspection, repair or replacement. The bracket 56 shown in Fig. 1 is pivoted by means of the vertical hinges 57, 57 to the outer front side of the casing 28. To the vertical hinges 58, 58 on the outer edge of the bracket 56 are pivoted rearwardly extending links, the inner ends of which are pivoted by means of the vertical hinges 59, 59 to the outer face of the closure 51, as shown in Fig. 2. The bracket 56 and the links serve to support the motor 53, the closure 51 and the rotor 55 for bodily movement as a unit, first axially of the shaft 54 and then arcuately. The reverse movement enables the closure 51 to be brought back into inter-fitting relation with the casing 28, as shown in Fig. 2. This supporting structure is disclosed in the prior Holbeck patent No. 1,855,171, granted April 19, 1932.

By referring to Fig. 2, it will be seen that the closure 51 when in the position shown, provides a feed chamber 60 for the material dropped from the feed mechanism 24.

A partition 61 located in the casing 28 is provided with an opening 62 which registers with the opening 63 through the central portion of the fan side rotor element 35. A removable cylindrical liner 64 is provided with circumferentially spaced projections 65 which extend transversely parallel to the axis of the shafts 33 and 54. The inner cylindrical wall of the liner 64 is provided with a multiplicity of transverse grooves to form a serrated inner cylindrical grinding wall 66 closely adjacent to which the radial grinding lugs 67 and 68 on the rotors, travel along circumferential paths. Circular shoulders or supporting surfaces are provided on the annular flanges 69 and 70 for engagement by the radial projections 65 to center the liner 64 or hold the same concentric with the axis of the shafts 33 and 54. The circumferentially distributed points of support at 65, 65 lessens the frictional contact to facilitate removal of the liner when desired, but nevertheless the frictional mounting of the liner is sufficient to hold the same in adjusted position against the partition 61 at its rear edge and against the inner edge of the closure 51 at its front edge.

When the coal to be pulverized falls to the bottom of the chamber 60, it will accumulate to a certain extent therein. If there is any tramp

iron or other uncrushable material, the larger pieces of the material will remain in the bottom of the chamber 60 and may be removed when the closure 51 is opened.

5 Inasmuch as the disk 55 is closed, the material to be pulverized must find its way peripherally of the disk 55 between the grinding lugs 68 into the pulverizing zone. During such passage, the material is ground by impact against the leading
10 sides of the lugs 68 and against the serrated cylindrical wall 66.

The fan 30 driven by the motor 32 is adapted to produce a current of air from the feed side of the disk 55 into the hollow chamber between the
15 rotor elements 35 and 55. Whatever material passes through the peripheral space surrounding the rotor 35 will be further crushed by impact against the radial spaced lugs 67, 67, and by being thrown by the latter against the serrated cylindrical wall 66.

20 While the suction of the air through the opening 62 tends to draw the crushed material through the peripheral space between the lugs 67 and the serrated wall 66 and radially to the left of the rotor 35 as viewed in Fig. 2, this tendency
25 is counteracted by the radial fins 75, 75 which are formed in radial continuation of the spider arms 76, 76, and by the auxiliary radial fins 77, 77 intermediate the fins 75, 75 as shown in Fig. 3. The faces of the fins 75 and 77 adjacent to the
30 inner wall of the partition 61 are approximately in the same vertical plane which is closely adjacent to such inner wall. Consequently, an effective seal will be produced to prevent the passage of coarse material between the back of the
35 rotor 35 and the adjacent wall of the partition 61.

The rotor 55 is provided with parallel spaced-apart pulverizing lugs 68, 68, which may be integral with the grinding lugs 78, 78, but the spacing between the latter is shorter than the spacing
40 between the grinding lugs 68, 68. The rotor 35 is provided with similarly spaced pulverizing lugs 79, 79, which overlap the lugs 78, 78 so as to leave only a small cylindrical space 80 between the
45 path of travel of the adjacent faces. It is preferred to arrange the parallel lugs 78 and 79 so that the path of travel of the feed side rotor pulverizing lugs 78 shall be of smaller diameter than the path of travel of the fan side rotor pulverizing
50 lugs 79. This arrangement enables the grinding lugs 68 to be placed adjacent to the serrated wall 66 while providing sufficient space between the lugs 68 for entrance of the material into the pulverizing zone, and, moreover, the
55 entrance to the ring space between the paths of travel of the adjacent faces of the pulverizing lugs 78 and 79 will be nearer the lug 68 to lessen the tendency of the material to pass back to the rotor 35 and the adjacent wall of the partition 61.

60 It should be understood that the rotors are driven at high speed in opposite directions and that the lugs 78 and 79 of the rotors cooperate with each other and with the serrated wall 66 to pulverize the material. During this pulverizing
65 action, the particles of material are acted upon by centrifugal force which tends to throw or hold them outwardly in opposition to the inward air current produced by the fan 30 and, as the result of these forces and instrumentalities acting on
70 the particles, only the finely pulverized material is carried by the air current through the opening 62 into the fan chamber 81.

In order to drive the feeding mechanism 24
75 from the shaft 33, a pulley 82 on the latter is

connected by a belt 82' to a pulley 82' which is mounted loosely on the shaft 85 of the speed reducer 86. The shaft 87 of the latter is connected to a disk 88 shown in Fig. 1. On the shaft 37 of the feed roll 36 is mounted an arm 89 which is
5 pivotally connected to a link 90. The latter is adjustably connected to a diametrical slot 91 on the disk 88.

A clutch 92 which is adapted to be spring released is associated with the pulley 82', the outer
10 clutch element 93 being splined on the shaft 85. An electromagnet 94 mounted on the bracket 95 secured to the hopper 23 may be employed to pull the rod 96 to the right as viewed in Fig. 2, thereby swinging the lever 97 on its pivot 98 to apply the
15 clutch 92 and thus connect the shaft 33 to the speed reducer 86. The lower end of the lever 97 is pivotally supported on the bracket 99 secured to the fan housing 28. A shipper 100 connects the lever 97 to the clutch element 93. Although
20 the shaft 33 rotates at a high speed, the speed reducer 86 will effect relatively very slow operation of the feeding mechanism 24.

On account of the high speed rotation of the shaft 33 and the parts connected thereto including the armature of the motor 32, there will be
25 considerable momentum tending to continue rotation of the shaft 33 after the current to the motor 32 has been cut off. It is desirable to stop the feeding mechanism in the automatic heating
30 system illustrated in Fig. 1 as soon as the current to the motor 32 is cut off and therefore the electromagnet 94 is arranged to be de-energized so that the clutch 92 will be released and the feed mechanism 24 stopped as soon as the motor current is interrupted.

In order to assure the mixture of an ample amount of air with the pulverized coal entering the fan chamber 81, it is preferred to provide an
40 air intake opening at 101 regulated by a shutter 102 operable by the handle 103. The mixture of air and the pulverized coal is forced by the blower fan 30 through the discharge pipe 104 into the pipe 15 for passage to and through the burner
45 12. If desired, the connection of the pipe 15 may be eccentrically of the cylinder 13 so as to effect a spiral flow of the mixture through the annular cylindrical passageway in the burner to maintain thorough mixture and a uniform distribution of the pulverized coal as it enters into the furnace
50 chamber 11.

The wiring diagram of the circuits and the connections for the system of control is shown in Fig. 7. A hot water temperature switch or steam or
55 vapor pressure shown is illustrated diagrammatically at 105, a low water switch at 106, a room thermostat switch at 107, a time or clock switch at 108, a manual switch at 109, and a stack switch at 110. These switches may be of well-known construction and those designated 105, 106, 107
60 and 110 are automatically tiltable mercury tube switches of well-known construction.

When the main line switch 111 is closed and the manual switch 109 is closed, the switches 105, 106 and 110 are normally closed. The room thermostat switch is open when the heating system is out of operation. When the thermostat switch 107 closes to start the heating system, a circuit is completed from the supply main 112
65 through the conductor 113, switches 105, 106, 107, 109, safety switches 114, 115, conductor 116, and solenoid 117 to another supply main 118. The energization of the solenoid 117 effects lifting of the armature 119 to close the motor switch 120.

By means of the separate manual switches 122, 75

123, the motors 53 and 32 are connected to the conductors 112', 121' and 118', and the latter are connected to the supply mains when the switch 120 is closed. Suitable starting apparatus not

5 shown may be provided for the motors 32 and 53. Heating resistances 124, 124 and 125, 125 are associated with the safety switches 114 and 115 to open the circuit to the solenoid 117 if excessive currents flow through the motors 32 and 53. Each of the safety switches comprises an element

10 which will be warped sufficiently by a predetermined amount of heat to open its switch. Opening of either switch will effect opening of the switch 120 and the stopping of the motors 32 and 53.

15 Simultaneously with the starting of the motors 32 and 53 by the closure of the switch 120, the electromagnet 94 will be energized to effect application of the clutch 92, as shown in Figs. 2

20 and 7.

Also, as soon as the switch 120 closes, the solenoid 21' will be energized by the current in the conductor 126 and consequently the electromagnetic valve 21 will be opened to produce the expansion gas flame for ignition of the mixture of pulverized coal and air distributed to the burner 12 by the fan blower 30. Such expansion gas flame will continue until the furnace has been thoroughly heated because the stack switch 110 is placed in the flue 127 at a point remote from the burner 12. The arrangement is therefore such that, although the expansion gas flame continues only during the starting period of the heating system, the length of such period is indefinite, since it is dependent upon the desired heating up of the furnace to the point where the burner 12 for the pulverized coal will be self-sustaining. That is to say, the adjustment of the stack switch 110 and its location, shall be such as to continue the expansion gas flame to maintain the burning of the pulverized coal at the burner 12 until sufficient heat is generated in the furnace to render the burner 12 self-sustaining while the pulverized coal is fed into the furnace and the electromagnetic valve has been closed by the stack switch thermostat element tilting the mercury switch 110 to open position.

In the modification shown in Figs. 8 and 9, the pilot valve 20 of Fig. 7 has been omitted and means for electrically igniting the pulverized coal at the burner 12 has been added to the heating system. As shown in Fig. 6, a spark plug 127 is supported by the burner end of the gas pipe 19'. One terminal 128 of the spark plug is grounded to the metal block 129, while the other terminal 130 is insulated and connected to the conductor 131. The transformer 132 is connected in parallel with the electromagnet solenoid 21', as shown in Fig. 9. Simultaneously with the opening of the electromagnetic valve 21, the electric ignition mechanism is operated to ignite the gas flowing from the pipe 19' and the gas flame thus produced will continue until the stack switch opens the mercury switch 110 automatically, whereupon the operation of the ignition mechanism will be discontinued, the gas flame will be extinguished, and the pulverized coal flame will sustain itself in the furnace chamber until the opening of the room thermostatic switch 107 will effect automatic stopping of the motors 32 and 53 and extinguishment of the pulverized fuel flame.

In order to assure sufficient air being supplied to the pulverized coal burner 12 when connected to the largest furnaces, an auxiliary blower 133 operated by a motor 134 may be connected by

the pipe 135 to the mixing chamber 136, which is associated with the pipe 15', as shown in Fig. 8. The motor 134 is connected to the conductor 112', 118', and 121' by the manual switch 137, as shown in Fig. 9. Therefore, whenever the motors 32 and 53 are operated, the motor 134 is also operated. The three motors 32, 53 and 134 are started and stopped simultaneously.

In the system shown in Fig. 8, a separate motor 138 is provided to drive the feeding mechanism 24 through the speed reducing mechanism shown in Fig. 2, thereby eliminating the clutch apparatus shown in the latter view.

As shown in Fig. 9, when the manual switch 139 is closed, the motor 138 will be connected by the conductors 140, 141, 142 to the terminals of the motor 32. The motors 32 and 138 are connected in parallel so that whenever one is operated the other one also will be operated. The use of the separate motor 138, however, enables the feed mechanism 24 to be stopped by the cutting off of current from the motor 138 independently of the motor 32. The stopping of the feed mechanism is therefore independent of the stopping of the parts connected to the fan blower motor 32. The speed reducing mechanism has sufficient friction to stop the motor 138 as soon as the current thereto is interrupted, although, if desired, an electromagnetic brake may be used for the motor 138. It should be particularly understood that when the current to the motors 32 and 53 is cut off, they immediately begin to slow down, the pulverizer and the blower cease to function sufficiently, and therefore the feed of coal into the chamber 60 should be discontinued when the current to the motors 32 and 53 is interrupted.

Only when the feed motor 138 is operated is the electromagnet 50 energized, thus economizing current, because only when the feed mechanism 24 is operated need the tramp iron magnet be operative. If, during operation of the pulverized fuel burner the pressure in the case of a steam boiler reaches a predetermined maximum, or when the heating of the hot water in a hot water boiler reaches a predetermined temperature, the switch 105 will open to automatically stop the operation of the burner 12. When the steam pressure or temperature has dropped sufficiently, the direct firing unit will be automatically restarted. In a similar manner, when the water in the boiler falls below a predetermined minimum, the switch 106 will be opened to prevent further operation of the system until the proper water level has been restored. The time switch 108 operates automatically to start and stop the direct firing unit at predetermined set times.

It will be understood, in connection with the electric ignition apparatus, that it is not to be limited to the use of gas only for ignition, as fuel oil, gasoline, or other inflammable liquids may be used in a similar manner, if desired.

Reverting to the operation of the pulverizer comprising the oppositely rotating elements 35 and 55, it should be noted that the construction is such as to maintain the same entirely open at all times for free and uniform flow of air during pulverization. The coal to be pulverized is fed gradually into the chamber 60 from which it passes peripherally of the disk of the rotor 55 into the ring space 80. The feed side lugs 68 and 78 keep the coal from accumulating at any portion of the wall 66 of the liner 64, so as to permit free passage of the air and coal into the ring space 80 between the lugs 78 and 79. The

outer ends of the lugs 68 are closely adjacent to the serrated wall 66, and therefore the pulverizing action on the material may start before such material reaches the oppositely moving lugs 78, 79.

The radially projecting lugs 67 closely adjacent to the serrated wall 66 act to keep the space surrounding the lugs 78 open for free access to the air through these lugs into the chamber 29 between the rotor elements. Air may pass through the spaces between the lugs 79 as well as between the spaces between the lugs 78 into the chamber 29, but coarse particles are ejected outwardly against the wall 66. When the particles enter the space 30 they are pulverized by impact and attrition effected by the rapidly rotating lugs 78, 79 passing each other in opposite directions.

The radial ribs or fins 75, 77, in addition to strengthening the fan side rotor element 79, also seal the space between the back of such rotor element and the adjacent wall of the partition 61 against the passage of any coarse particles through such space to the opening 62. Such ribs or fins set up a fan action counteracting the tendency of the fan 30 to produce a current of air through such space. The air entering the pulverizing zone is therefore prevented from being by-passed into the fan housing without going through the lugs 78 and 79 of the rotors.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. Pulverizing apparatus comprising the combination with a casing, of two overlapping concentric rotor elements comprising spaced-apart series of pulverizing lugs parallel to the axis of rotation of the said rotor elements, separate motors one connected to each of said rotor elements to rotate the same in opposite directions, means affording an entry opening into the said casing for the material to be pulverized, peripheral spaced-apart preliminary grinding devices on the rotor element adjacent to the said entry opening, a cylindrical grinding wall adjacent to the path of the said preliminary grinding devices, the rotor element adjacent to the entry opening comprising a closing disc compelling the material to pass peripherally of the said last-named rotor element to the said pulverizing lugs, spaced-apart peripheral grinding devices adjacent to the said grinding wall and mounted on the rotor element spaced from the entry opening, the said last-named rotor element having an exit opening in the central portion thereof, and radial ribs on the open rotor element adjacent to a stationary inner wall of the casing to prevent by-passing material from between the rotor elements to the opening in the spaced rotor element.

2. Pulverizing apparatus comprising the combination with a casing having a single pulverizing zone, of pulverizing rotor elements, one comprising a closed disc on the entry side of the casing and the other being open at its central portion at the outlet side of the casing, the said rotor

elements having overlapping lugs in the pulverizing zone and parallel to the axis of rotation of the said rotors, a cylindrical grinding wall, radial lugs on the said rotor elements in operative relation to the said cylindrical grinding wall, a fan to produce a current of air through the said zone from the periphery of the said zone through the opening in the said open rotor element, radial ribs on the back of the said open rotor element in position to move adjacent to an inner wall extending transversely of the said cylindrical wall, and means for driving the said rotor elements in opposite directions.

3. A pulverizing apparatus comprising the combination with a casing defining a pulverizing zone therein, of pulverizing means within the casing, instrumentalities including rotary feed devices for feeding material to the pulverizing means, mechanism including a motor for driving the pulverizing means, means for driving the said rotary feed devices from the mechanism for driving the pulverizing means, and instrumentalities associated with the driving means and including clutch and magnet devices for stopping the actuation of the feed devices simultaneously with a stopping of actuation of the mechanism for driving the pulverizing means and independently of continued movement of the latter mechanism after power shut-off therefrom.

4. A pulverizing apparatus comprising the combination with a casing defining a pulverizing zone therein, of rotary pulverizers within the pulverizing zone, motor operated drives for the pulverizers, feeding mechanism for feeding material to be pulverized into the pulverizing zone, a clutch-controlled driving connection between one of the motor-operated drives and the feeding mechanism for operating the latter, and mechanism for operating the clutch-controlled driving connection and including a solenoid, a pivotally mounted lever connected to the solenoid and to the clutch of the clutch-controlled driving connection, whereby upon energization of the solenoid responsively to application of power to the motor-operated drives, the clutch becomes applied to operate the feeding mechanism, and upon de-energizing the solenoid responsively to interrupting the power to the motor-operated drives, the clutch becomes disengaged to immediately stop the feeding mechanism regardless of continued operation of the motor drives through their own momentum.

5. A pulverizing apparatus comprising the combination with a casing defining a pulverizing zone therein, of pulverizing means within the pulverizing zone, motors for operating the pulverizing means, mechanism for feeding material to be pulverized into the pulverizing zone, and means for driving the feeding mechanism from one of the said motors, the said means comprising a clutch for operatively connecting and disconnecting the drive for the feeding mechanism with the said motor, and electromagnetically controlled mechanism for actuating the clutch responsively to application and interruption of power to the said motor, whereby the feeding mechanism is stopped immediately upon de-energization of the electromagnet, irrespectively of continued operation of the motor through its own momentum.

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