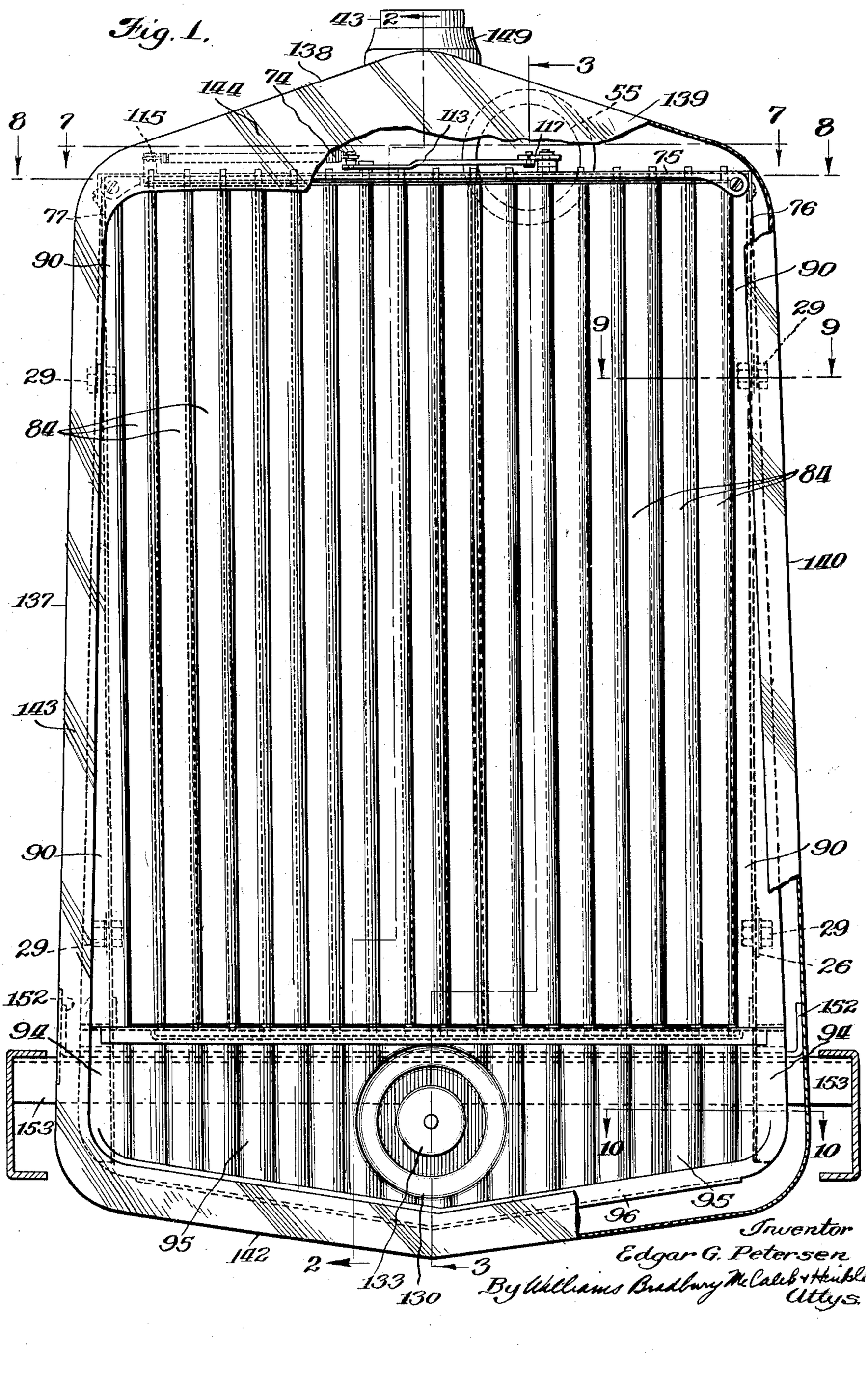
May 9, 1933. E. G. PETERSEN 1,908,046

THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 1

Fig. 1.



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THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 2

Fig. 2.

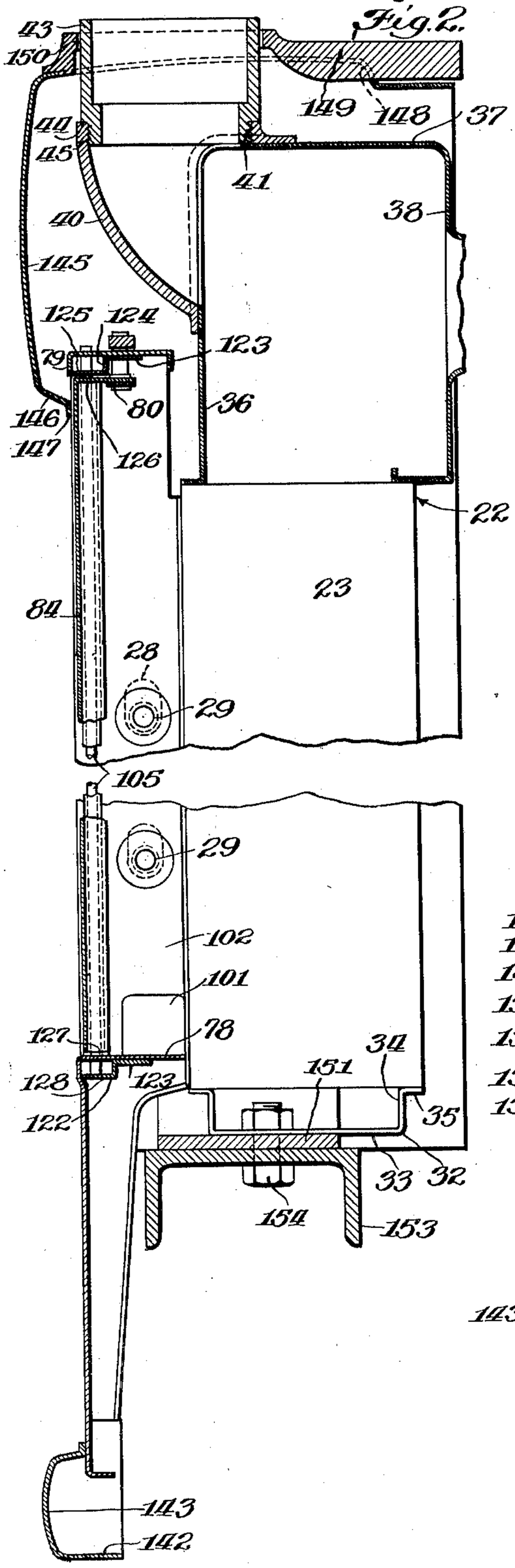
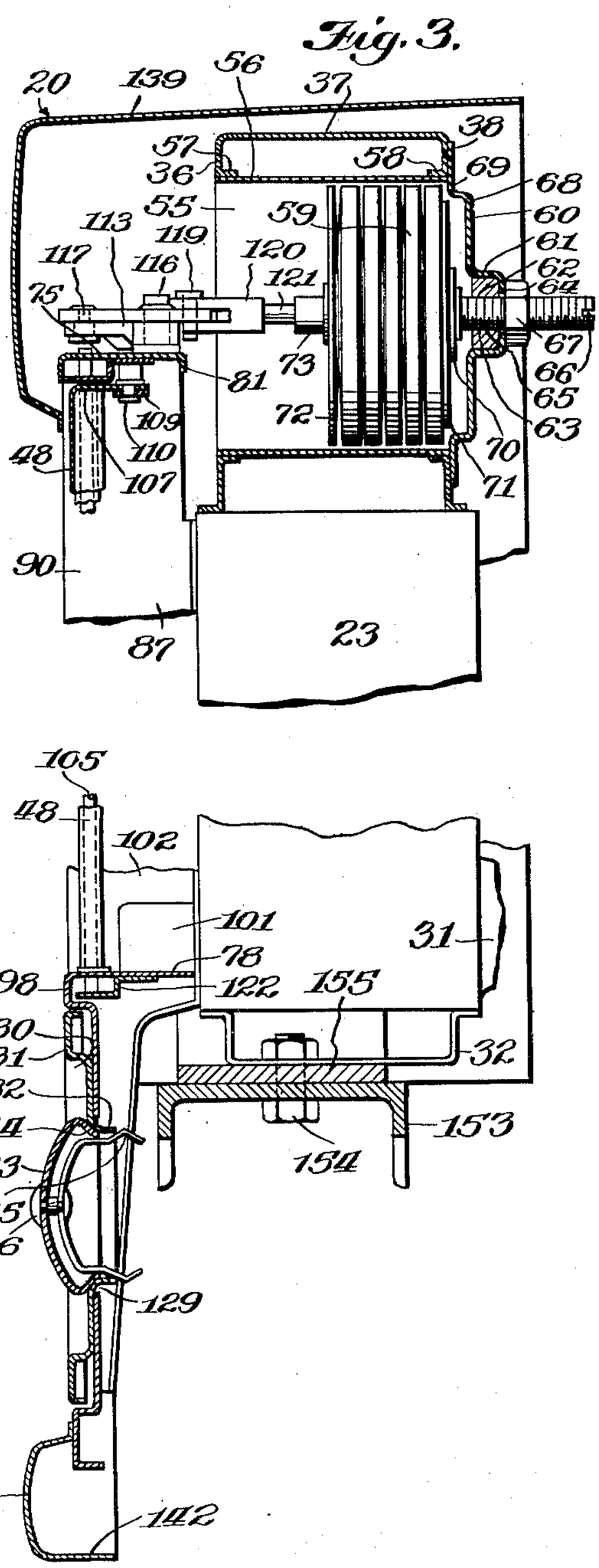


Fig. 3.



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THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 3

Fig. 4.

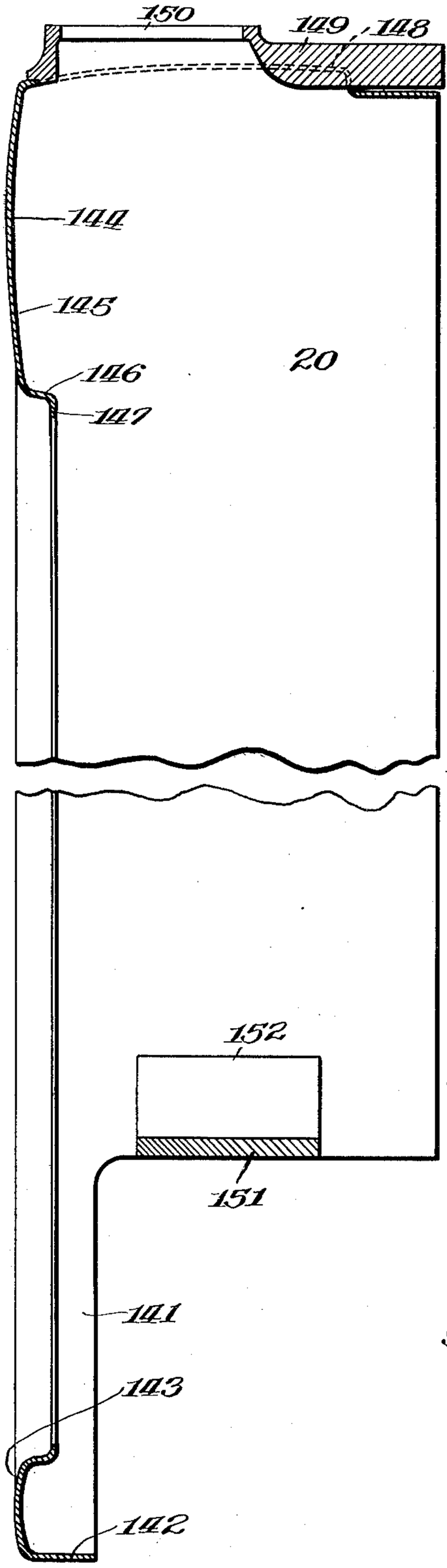


Fig. 6.

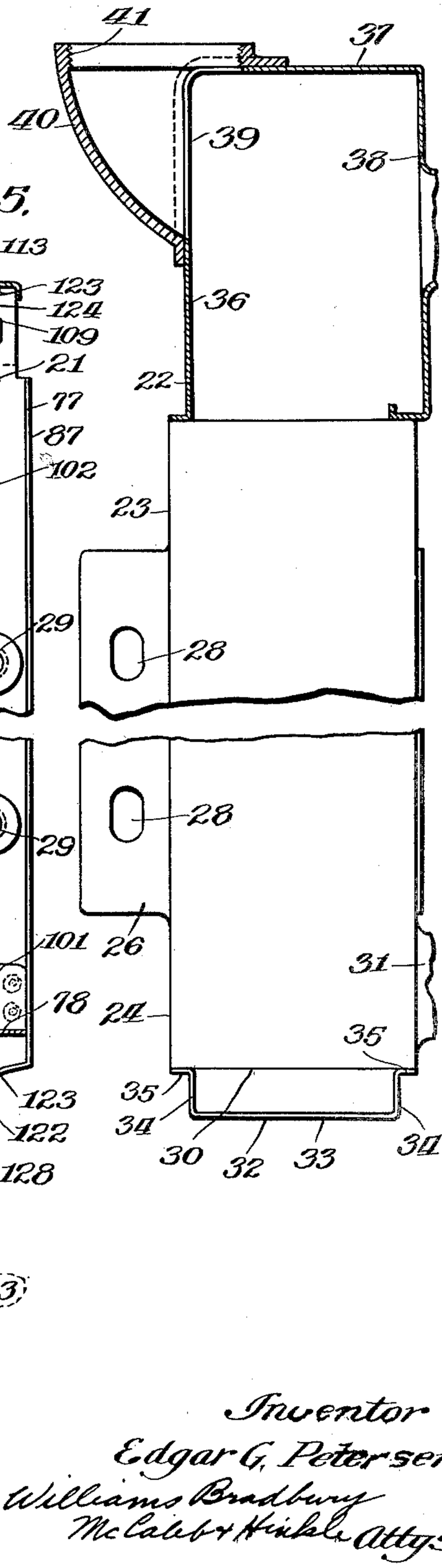
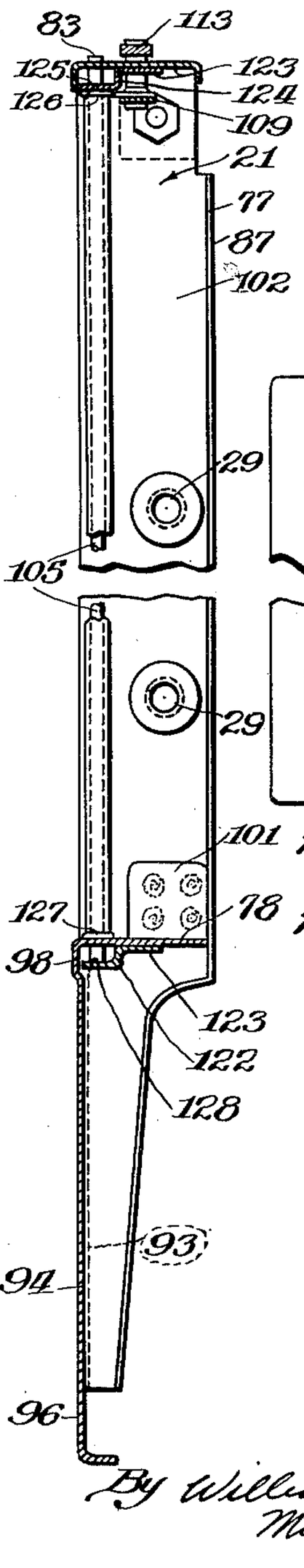


Fig. 5.



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May 9, 1933. E. G. PETERSEN 1,908,046

THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 4

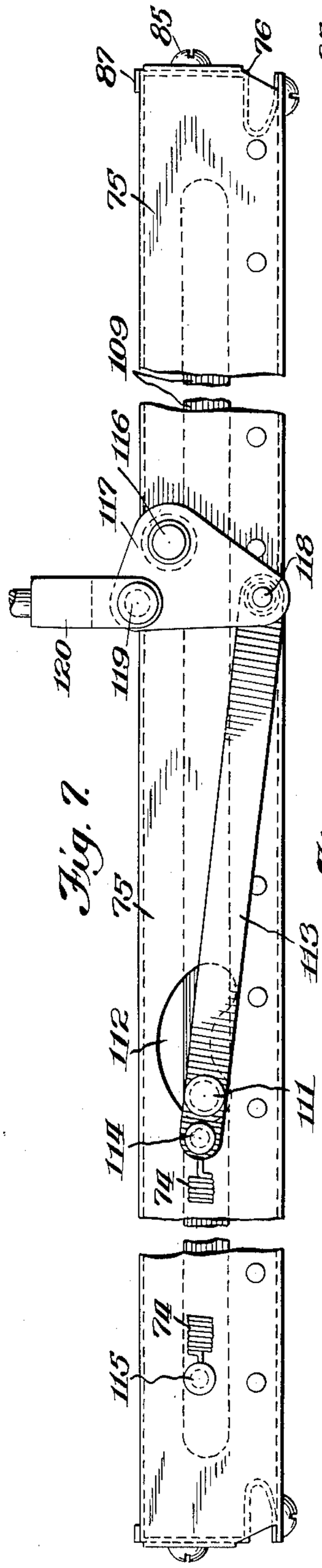

Fig. 7.

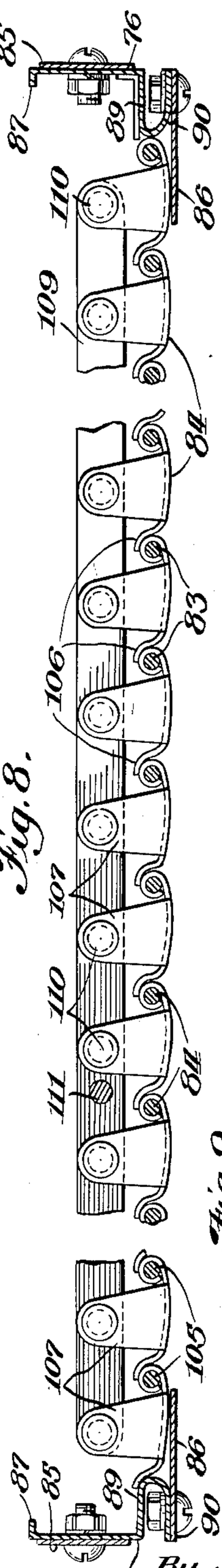

Fig. 8.

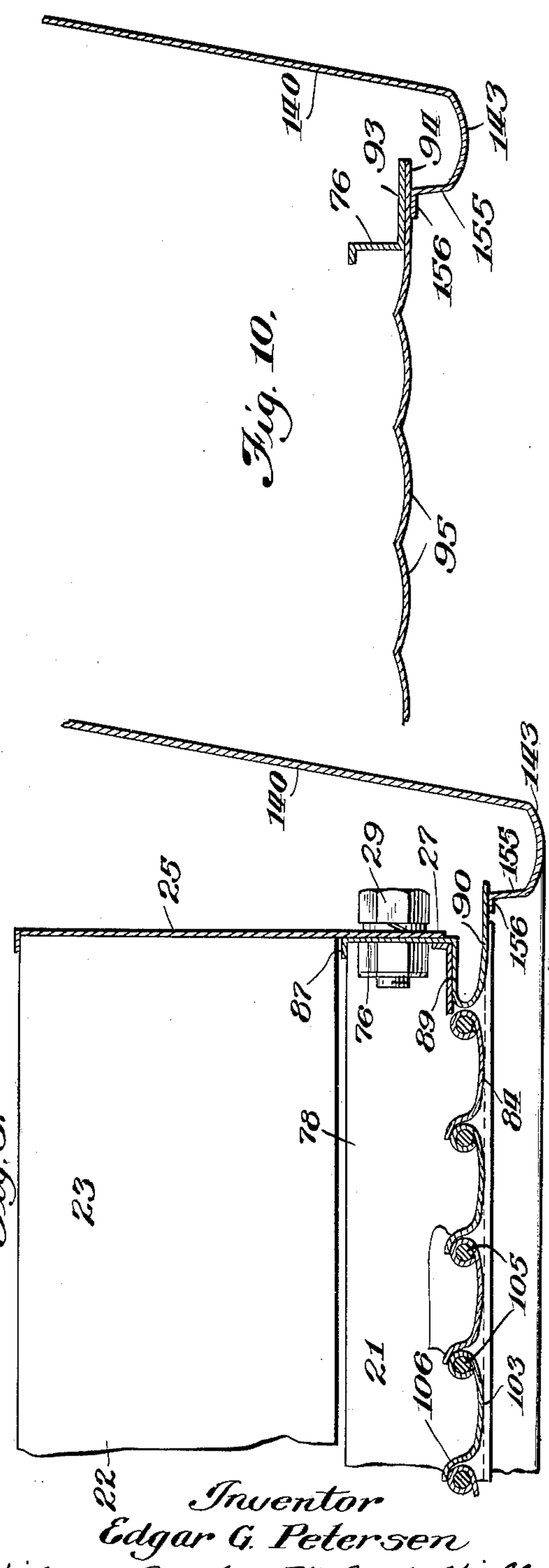

Fig. 10.

Fig. 9.

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May 9, 1933. E. G. PETERSEN 1,908,046

THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 5

Fig. 11.

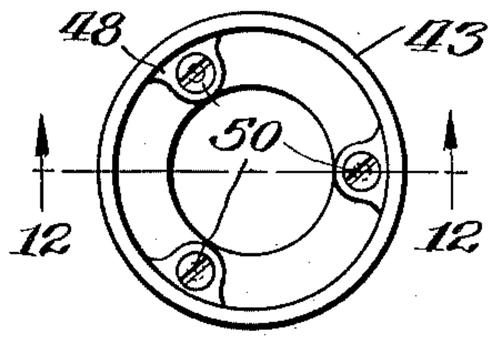


Fig. 12.

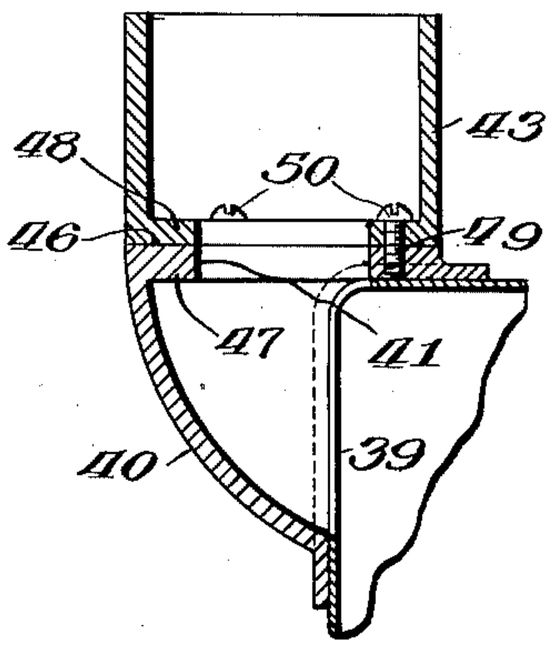


Fig. 13.

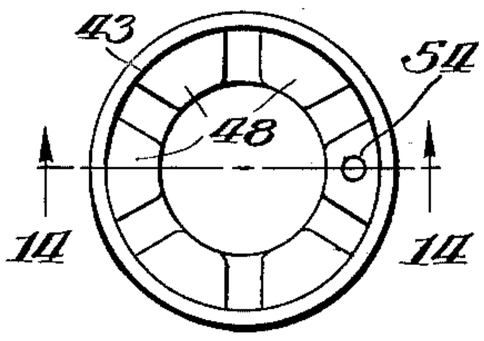


Fig. 14.

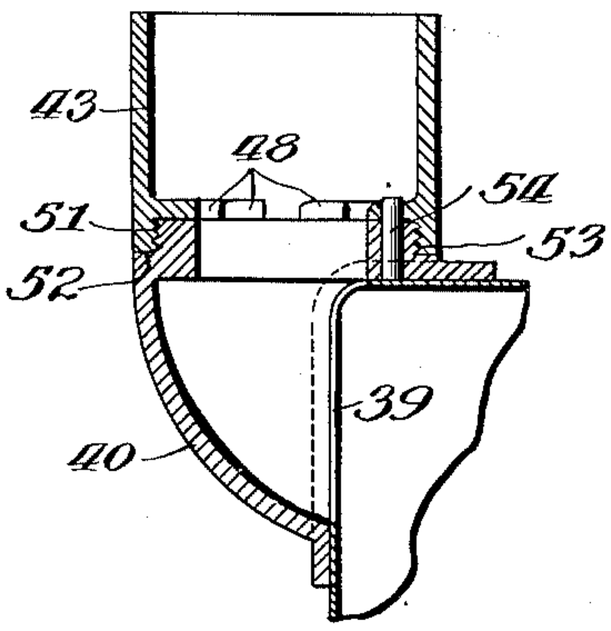
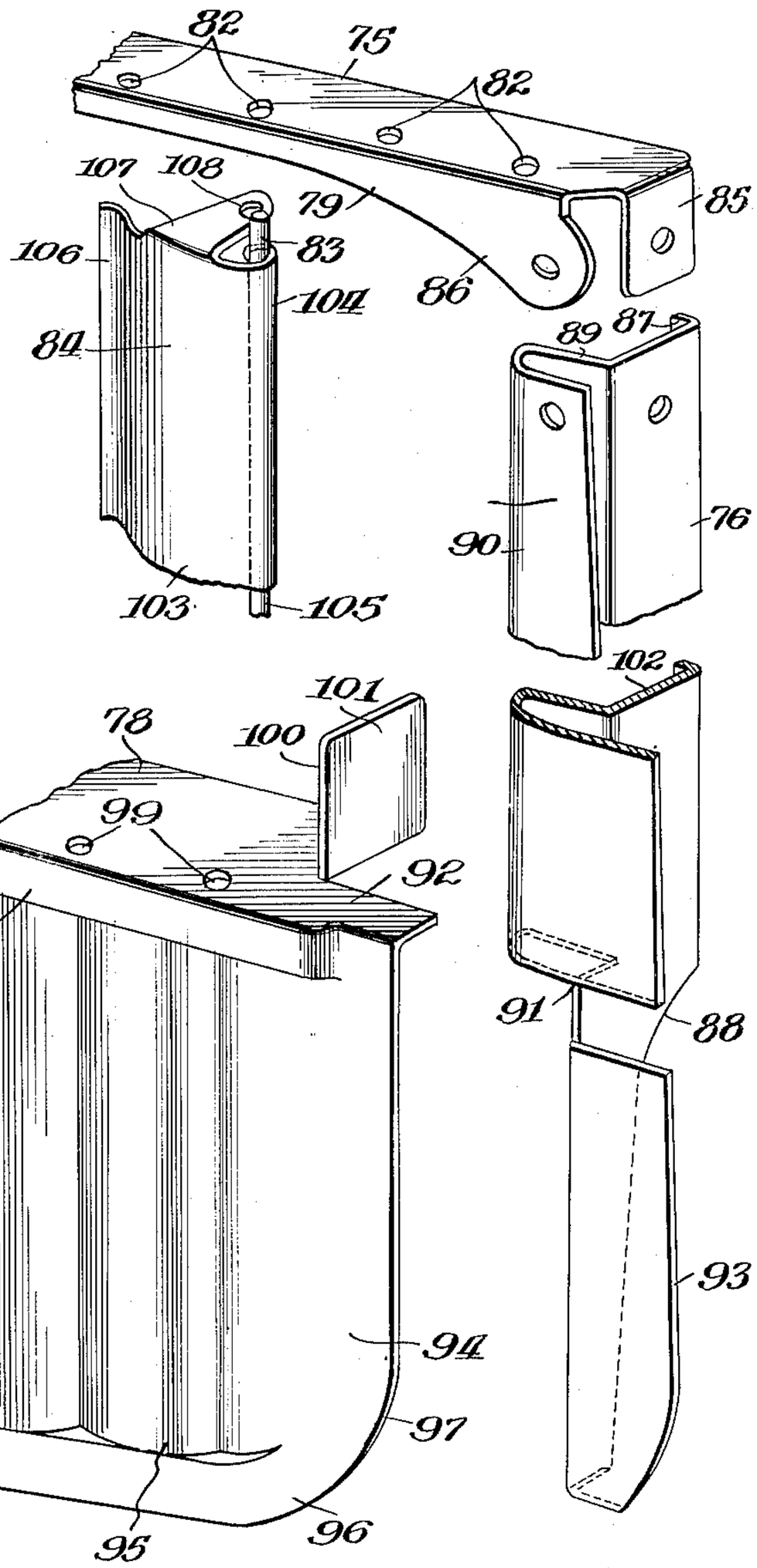


Fig. 15



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THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 6

Fig. 16.

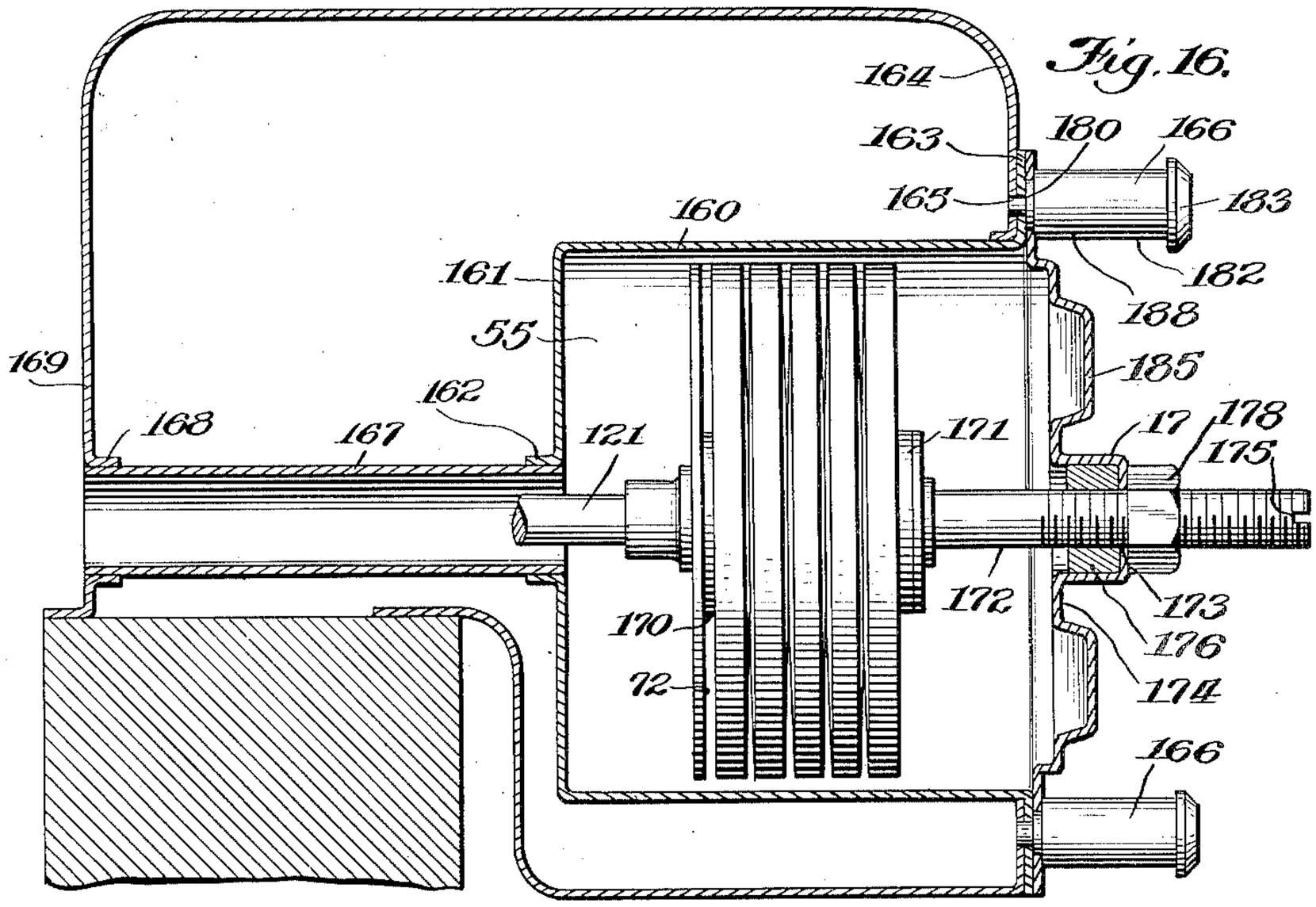
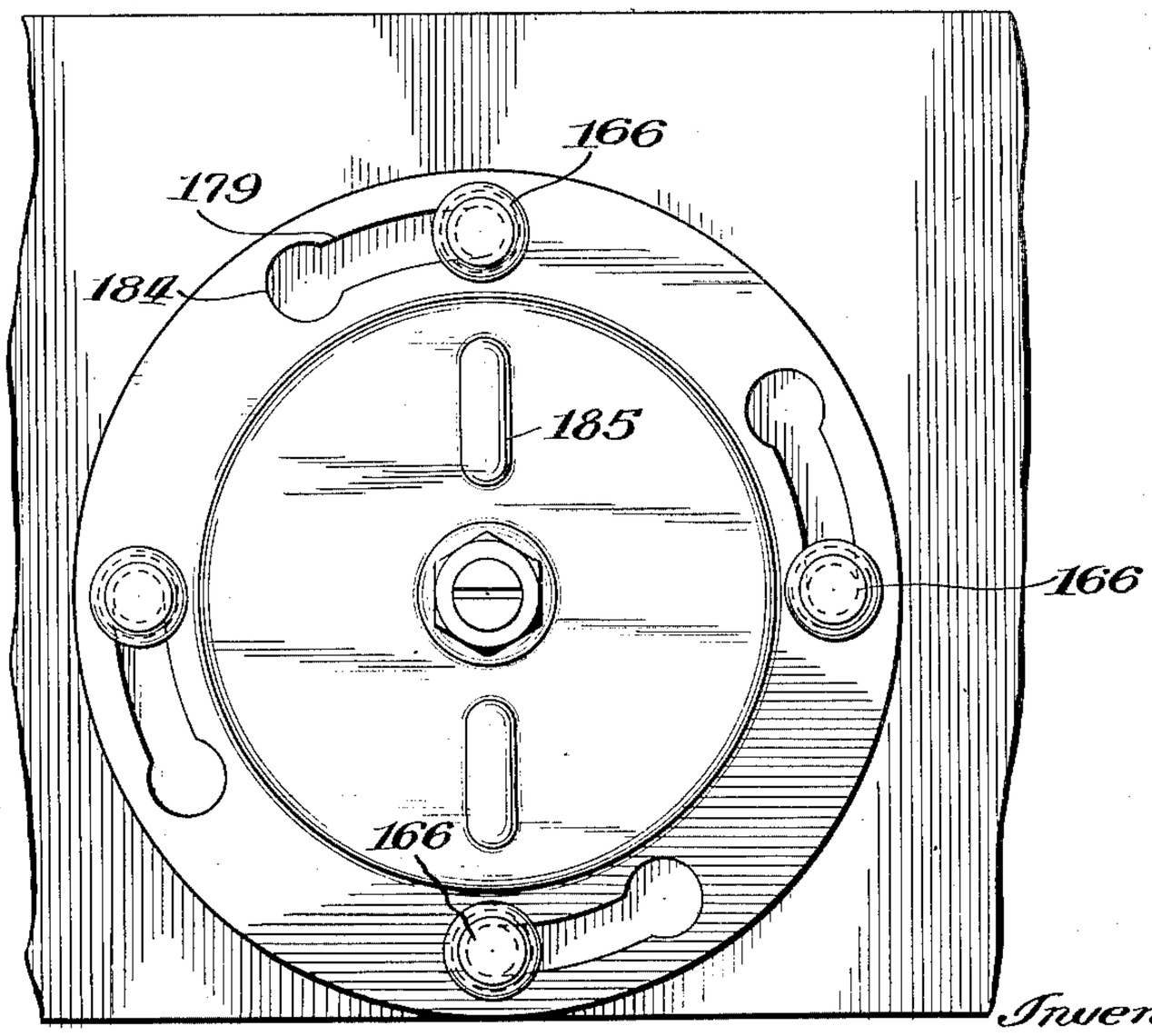


Fig. 17.



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THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 7

Fig. 19.

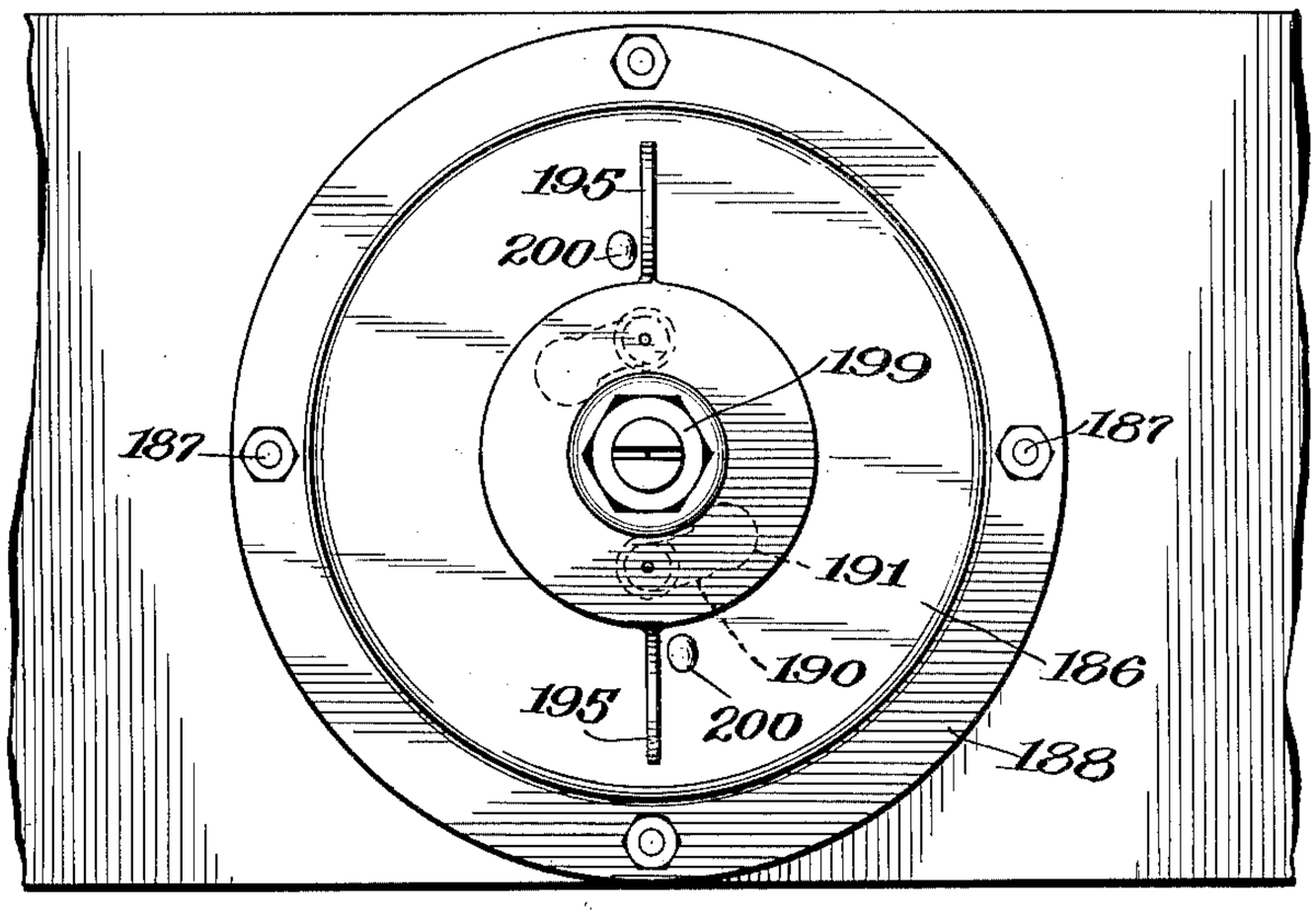
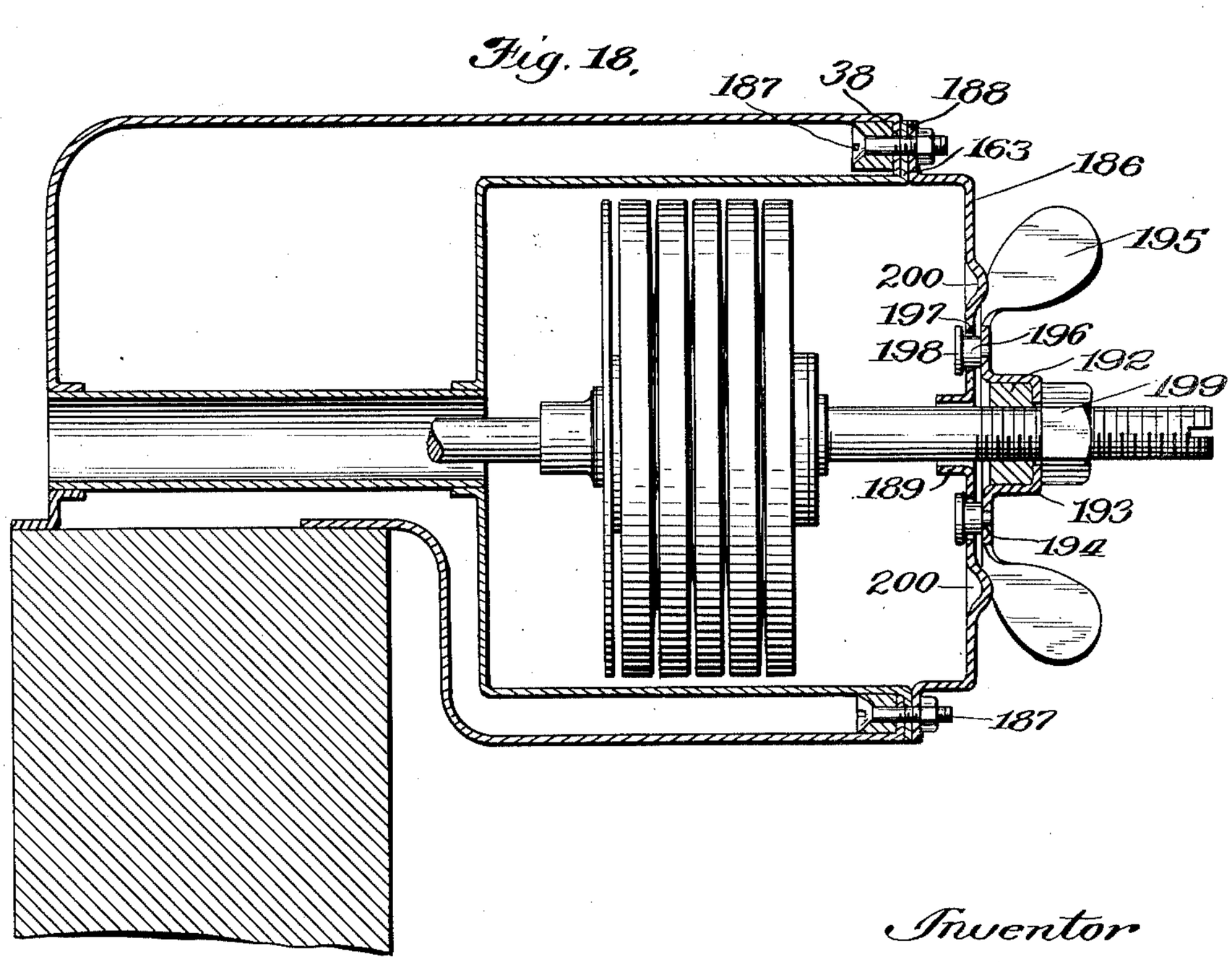


Fig. 18.



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THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original Filed April 9, 1928 8 Sheets-Sheet 8

Fig. 21.

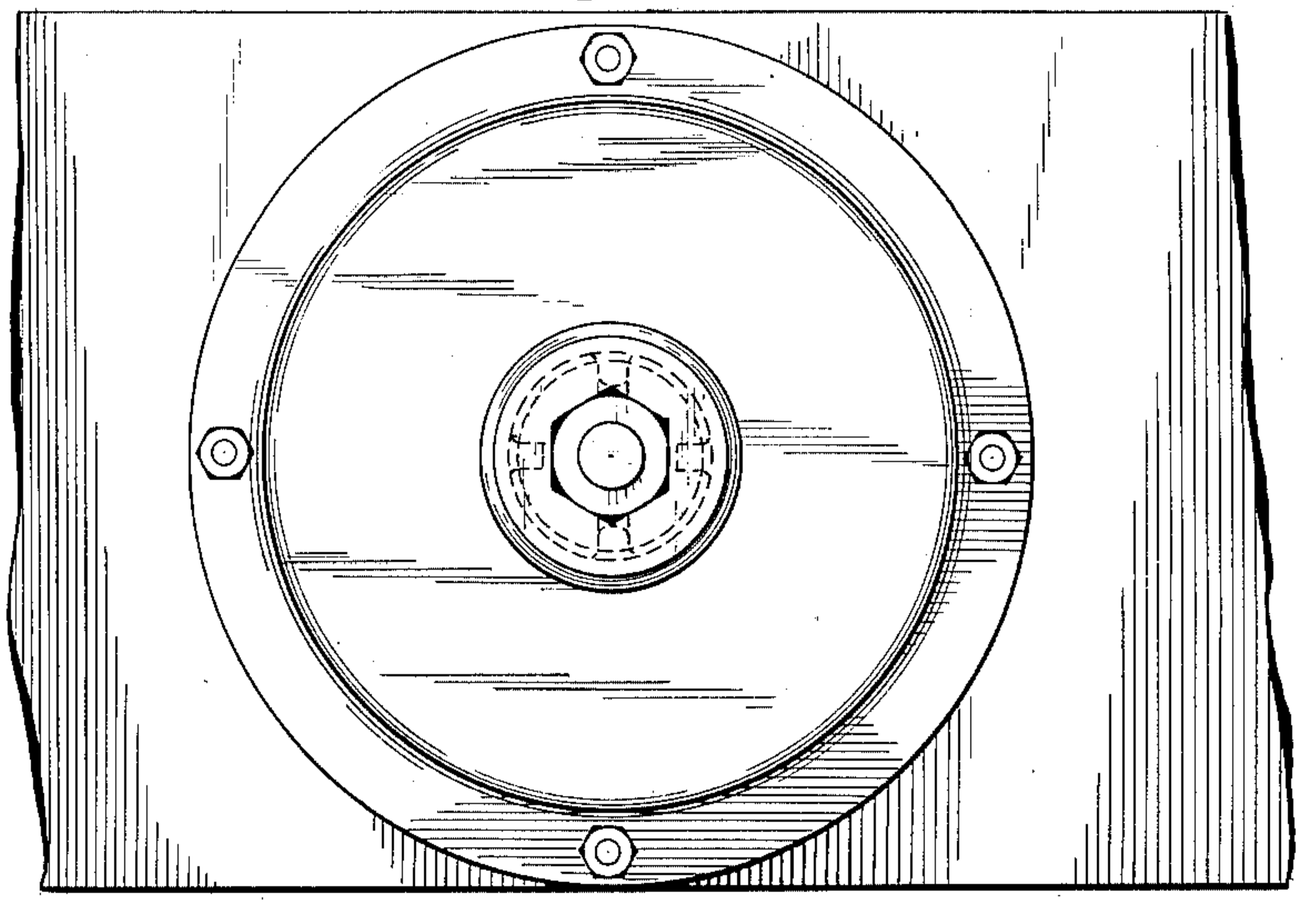


Fig. 20.

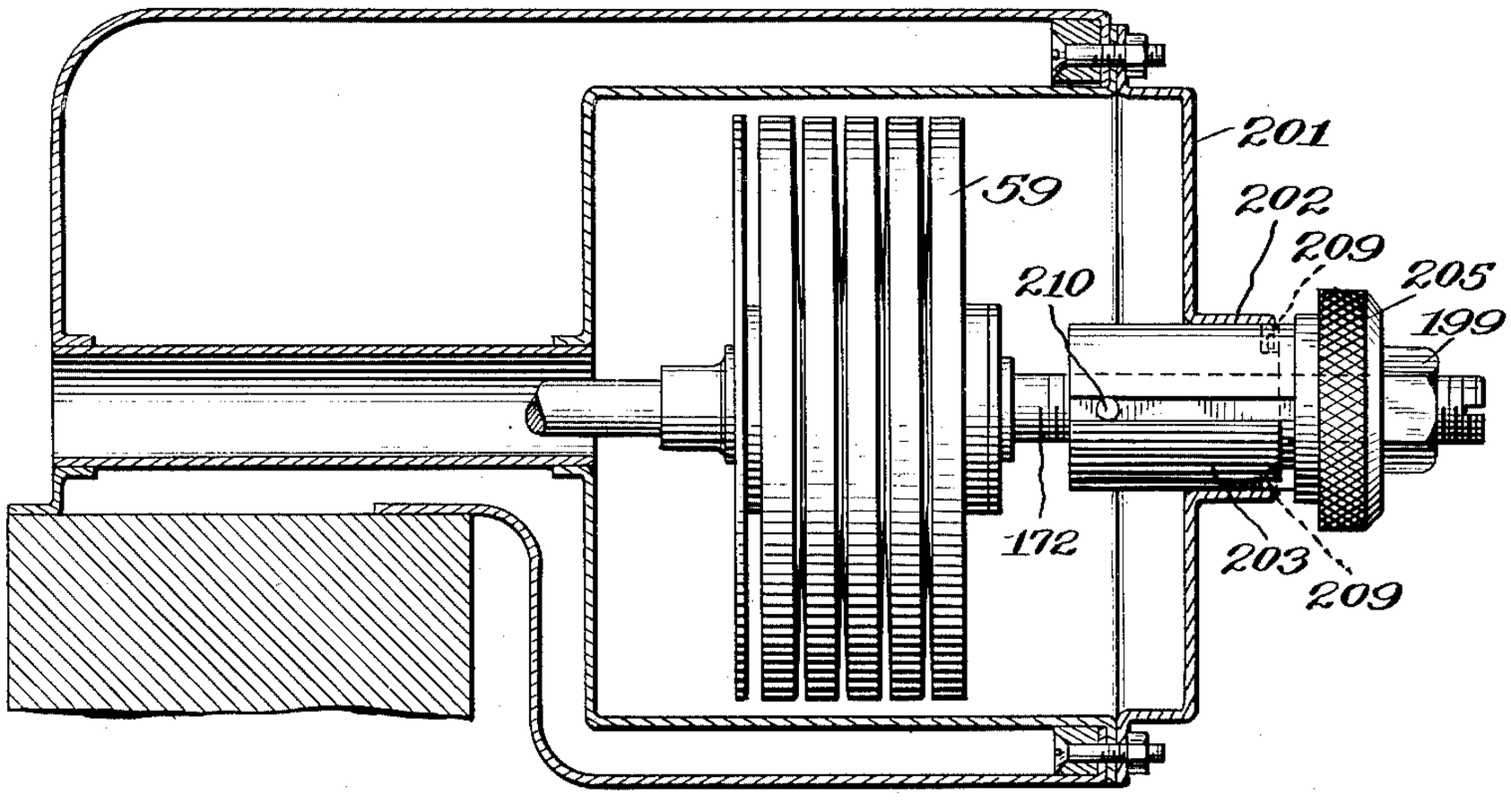
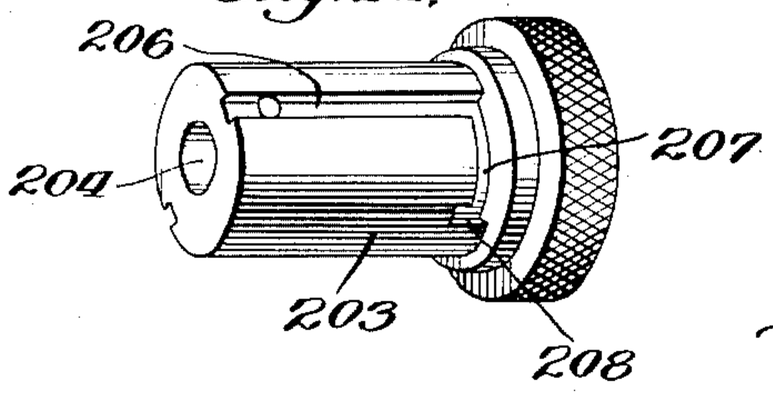


Fig. 22.



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Patented May 9, 1933 1,908,046

UNITED STATES PATENT OFFICE

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THERMOSTATICALLY CONTROLLED SHUTTER FOR INTERNAL COMBUSTION ENGINES

Original application filed April 9, 1928, Serial No. 268,491, and in Germany June 18, 1928. Divided and this application filed April 1, 1929. Serial No. 351,479.

The present invention relates to thermostatically controlled shutters for internal combustion engines, and is particularly concerned with the provision of an improved shutter of the built-in type.

The present application is a divisional application of my prior application, Serial No. 268,491, filed April 9, 1928, for radiator shutters.

One of the objects of the present invention is the provision of a novel radiator and shutter assembly, whereby the radiator core, shutters and shell are carried directly by the chassis of the vehicle, thereby relieving the radiator core of excess weight and diminishing the possibility of radiator leaks caused by the support of any structure upon the less durable parts of a radiator core.

Another object of the invention is the provision of novel means of support for a radiator core, radiator shutters and radiator shell, including means for carrying said parts directly from the chassis of a vehicle by independent supporting means, eliminating the fastening means between these elements which has been employed in the structures of the prior art.

Another object of my invention is the provision of a novel automatic thermostatic shutter and radiator assembly in which the thermostatic element is carried by a built-in receptacle, forming a part of the radiator core, said receptacle being provided with means for adjustably and releasably supporting said thermostatic element.

Another object of my invention is the provision of a novel adjustable thermostatically actuated shutter structure comprising a shutter and a thermostat with operative mechanical connections, both supported by a radiator core and means for adjusting the relative position of the thermostat in said core.

Another object of my invention is the provision of a novel shutter and radiator core assembly comprising a shutter frame supported directly upon integral flanges carried by the radiator core and eliminating the prior modes of support which are apt to damage the core structure.

Another object of my invention is the provision of a novel radiator core and shell assembly, whereby the shell may be secured to the core by the same securing means which supports the shell and core upon the vehicle chassis.

Another object of my invention is the provision of a novel radiator spout structure, consisting of a sectional radiator spout which permits a simple and efficacious mode of assembly and attachment of the foregoing parts without additional fastening means.

Another object of the invention is the provision of a novel built-in shutter assembly capable of long periods of service without rattling, and which includes a plurality of false shutters for permanently closing the lower openings of the radiator core where the cooling fluid is liable to freeze at extremely low temperatures.

Another object of the invention is the provision of a novel radiator shutter control including thermostatic means for actuating a plurality of shutters, means for adjusting the position of said thermostatic means to control said shutters and/or quickly detachable means for moving said thermostatic means to inoperative position.

Other objects and advantages of my invention will appear more fully from the following description and from the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings:

Fig. 1 is a front elevational view of my built-in shutter assembly partially broken away to show the shutter structure;

Fig. 2 is cross-sectional elevational view taken on the line 2—2 of Fig. 1;

Fig. 3 is a similar view taken on the line 3—3 of Fig. 1;

Fig. 4 is a medial cross-sectional view of the radiator shell;

Fig. 5 is a medial cross-sectional view of the shutter frame and shutters;

Fig. 6 is a similar view of the radiator core;

Fig. 7 is a top view of the shutter frame and actuating mechanism;

Fig. 8 is a plan cross-sectional view of the shutter frame and shutters with the top frame member removed;

Fig. 9 is a plan cross-sectional view of the radiator shutters, taken just above the lower end of the shutters;

Fig. 10 is a plan cross-sectional view of the radiator shell and shutter frame, taken below the shutters on a plane at right angles to the false shutters;

Fig. 11 is a plan view of one form of sectional radiator spout;

Fig. 12 is a medial cross-sectional view of the same, taken on the line 12—12 of Fig. 11;

Fig. 13 is a plan view of a modified form of radiator spout;

Fig. 14 is a cross-sectional elevational view taken on the line 14—14 of Fig. 13;

Fig. 15 is an exploded view of the shutters and shutter frame, showing in detail the attaching elements and conformation of these members;

Fig. 16 is an elevational view in partial cross-section showing a modified form of thermostat support;

Fig. 17 is a rear elevational view of the same;

Fig. 18 is a view similar to Fig. 16 of another modified form of thermostat support;

Fig. 19 is a rear elevational view of the device shown in Fig. 18;

Fig. 20 is a view similar to Fig. 16 of another modified form of thermostat support;

Fig. 21 is a rear elevational view of the same; and

Fig. 22 is a view in perspective of the supporting sleeve shown in Fig. 20.

Referring to Fig. 6, 23 indicates a radiator core having a pair of lateral frame members 24 and 25, preferably formed of sheet metal and forming the sides of a core of the usual construction having honeycombed channels, tubes or other members adapted to permit the circulation of water and to present an increased cooling area for the passage of air. The exact construction of the honeycombed portion of the core is immaterial, and does not affect the merits of the present invention.

The side frame members 24 and 25 of the core form the outer walls of the core, and are provided with integral forwardly projecting flanges 26 and 27 for the support of a shutter frame and shutters, further to be described.

The integral flanges 26 and 27 are provided with elongated apertures 28 for the attachment of the shutter frame by a plurality of bolts 29, the elongated apertures permitting a slight adjustment of the shutters and frame relative to the core. The base of the radiator core 23 may be enclosed by a sheet metal wall 30 and the back of the core provided with the usual conduit 31 for water circulation. Where the radiator core is of less length than required to rest upon the chassis member, I provide a channeled sheet metal member 32 for supporting the core directly upon the chassis. The channeled member 32 may have a supporting flange 33, transverse flanges 34 and a pair of outwardly turned attaching flanges 35 secured to the bottom wall of the core by spot welding or other convenient fastening means.

The upper portion of the radiator core includes a chamber having outside walls 36, 37 and 38, the rear wall 38 being provided with the usual conduit for connecting the upper portion of the radiator to the water jacket of an internal combustion engine. The upper wall 37 and front wall 36 are provided with an aperture 39 over which is welded a cast metal spout fitting 40 formed substantially like an elbow, and having an upper aperture 41 adapted to receive the radiator spout. The elbow 40 does not project above the body of the radiator core any substantial distance in such manner that the elbow is adapted to clear the top wall of the radiator shell when the channeled member 32 has been placed upon the supporting member 42 of the radiator shell (further to be described).

The elbow of the radiator is adapted to receive a sectional spout 43 of the top shown in Fig. 2, comprising a substantially cylindrical member having its lower end turned down to form a shoulder as at 44, and threaded as at 45 to fit complementary threads in the aperture 41. After the radiator shell has been placed upon the core, the spout 43 may be inserted from the top of the radiator shell and threaded into the elbow 40, thereby completing the assembly of the built-in shutter unit.

The exact construction of the sectional radiator spout may take the modified forms shown in Figs. 11 to 14 inclusive, the most essential features being that the spout shall be divided in two parts so that the core may be slid into the shell and the spout inserted through an opening in the top of the shell. In the construction shown in Figs. 11 and 12, the elbow 40 is formed with an upper flat surface 46 and a flange 47 bounding the aperture 41.

The spout 43 comprises a substantially cylindrical member having an inwardly turned flange 48 provided with a plurality of apertures 49 registering with threaded apertures in the flange 47, and the spout 43 may be secured to the elbow by a plurality of screw bolts 50.

In the embodiment shown in Figs. 13 and

14, the elbow 40 is provided with a reduced threaded end 51 forming a shoulder 52, and the spout 43 is formed with a complementary threaded end 53 adapted to screw upon the elbow 40. A pin 54 may be driven through the flange 48 of the spout into the elbow for permanently securing these elements against relative rotation.

At one side of the upper chamber of the radiator core, in order to clear the water conduit, I provide a thermostat chamber 55 comprising a substantially cylindrical sheet metal tube 56 of sufficient length to traverse the core, and secured at each end in a circular opening in the walls 36 and 38 bounded by inwardly turned flanges 57 and 58.

The thermostats 59 preferably consist of thermostatic wafers which are slidably mounted within the thermostat chamber 55 being supported at their rear end by an adjustably mounted plate 71.

The tubular chamber 56 may be secured to the flanges 58 by welding or riveting, and the rear end of the chamber 55 may be closed by a substantially cup shaped member 60. The cup shaped member 60 may be stamped from sheet metal, being formed with a small cup 61 adapted to receive a complementary nut 62, secured therein by a close frictional fit. The nut 62 and the cup 61 are provided with registering apertures 63 and 64, the aperture in the nut being threaded to receive the stem of a bolt 65, having a kerf 66 and a lock nut 67.

In the present case, the member 60 is also formed with a larger annular cup 68 surrounding the smaller cup 61, and is bounded by an outer flange 69 secured to the wall 38 of the core chamber by welding or other convenient fastening means. The threaded bolt 65 is adapted to be secured to a hub 70 on a supporting plate 71 by threading the bolt into said hub, and the chamber 55 is likewise provided with a second plate 72 carried by a similar hub 73 and operatively connected to the movable radiator shutters.

Between the plates 71 and 73 are confined a plurality of thermostatic wafers preferably of complementary form to the chamber 55 and adapted to slide in said chamber, both during expansion of the wafers and during adjustment of their relative position by the bolt 65. The plate 72 is kept in close engagement with one side of the wafers by a spring 74, which biases the shutters to closed position, and the thermostatic wafers 59 react against the plate 71 to actuate the shutters when the engine temperature rises a predetermined amount.

It will thus be observed that by means of the bolt 65 and supporting plate 71, the relative position of the thermostats 59 may be changed at will, and the temperature at which the thermostats are adapted to open the shutters, may be adjusted by means of the bolt 65, being secured in adjusted position by the lock nut 67. The opposite end of the thermostat may be directly connected to the movable shutters without any intermediate adjusting devices, and the adjusting device may be hidden beneath the hood of the internal combustion engine.

I shall now describe the radiator shutter unit 21, together with the operating mechanism between the thermostats and the shutters. Referring to Fig. 15, I have here illustrated the improved shutter frame construction, consisting of an end frame member 75 at the top, a pair of side frame members 76 and 77 and a second end frame member 78 at the bottom.

The end frame member 75 comprises a sheet metal strip, preferably of steel, having a downwardly extending flange 79 on its front side adapted to cover a non-rattling bearing strip 80, further to be described. The frame member 75 may also be formed with a depending flange 81 at its rear edge for stiffening the same, and is provided with a plurality of equally spaced apertures 82 for receiving the trunnions 83 of a plurality of shutters 84. At each end, the end frame member 75 may be provided with an attaching flange 85, bent down at substantially right angles, and the flange 79 may be widened as at 86 to provide an auxiliary attaching flange on the front of the frame member.

The side frame members 76 may be formed of a similar strip of sheet metal having a narrow flange 87 bent inward at substantially right angles on the rear edge to form a channel, except at the bottom 88, where the flange and a portion of the frame member have been cut away to accommodate the chassis of the particular vehicle to which it is applied. At its forward edge, the frame member 76 is provided with a flange 89 bent inward at substantially right angles and turned back on itself to form an apron 90, which tapers from the top of the shutters to the bottom and fills in the space between a rectangular fenestration for the shutters and the inner edge of the shell 20, where the shape of the engine hood tapers to the top.

The flanges 89 and apron 90 do not extend the full length of the frame member, but terminate at the lower end of the shutters where the main body of the frame members 76 is formed with an upwardly extending corner 91 adapted to fit beneath the horizontal flange 92 of the bottom frame member 78. The frame members 76 are also provided at their lower ends with an outwardly extending flange 93 located substantially in the plane of the apron 90 and fitting against the rear side of the false shutters 94 at their outer edge to reinforce and support the same.

The lower frame member 78 comprises a stamped sheet metal member, preferably of steel, having a plurality of false shutters 95 of the same size as the shutters 84 stamped therein, together with a substantially flat edge 96 for engagement with the inner edge of the shell 20. The outer edge 97 of the false shutter plate 94 conforms substantially to the inner boundary of the shell 20 projecting beneath said boundary and being engaged thereby. The frame member 78 may be formed with a pressed bead 98 at the upper end of the false shutters 95, one side of the bead comprising the horizontal flange 92, having a plurality of apertures 99 to receive the trunnions of the shutters 84. At each end the flange 92 is slit as at 100 and turned up to form an attaching flange 101 of sufficient width to be received in the channels 102 of the side frame members.

Centrally located in the false shutter plate 94 is an aperture 129 adapted to register with the engine shaft for the insertion of a crank, and this aperture may be finished by a stamped sheet metal ring 130 having an outer annular bead 131 and an inner flange 132 adapted to fit in the aperture 129.

The aperture may be closed by a stamped metal cap 133 having an inwardly turned annular flange 134, adapted to fit the boundary of the flange 132, and the cap 133 may be secured in place by a pair of spring fingers 135 engaging the flange 132 and secured to the cap by a rivet 136.

The false shutter plate 94 is thus adapted to permanently close the lower end of the radiator core, and provide a finished appearance simulating shutters which extend the full height of the front of the radiator.

The shutters 84 comprise strips of sheet metal, preferably steel, outwardly curved as at 103 and having one edge 104 curved about a rod 105 which projects at either end of the shutter and forms the trunnions 83. The opposite edge of the shutter is formed with a pressed curved groove 106 adapted to fit against the curved portion 104 of the adjacent shutter, to completely seal the intervening opening when the shutters are in closed position, and each of the shutters is provided with an actuating arm comprising an inwardly turned flange 107 at its upper end and having an aperture 108.

The shutters may be secured together for simultaneous actuation by a shutter bar 109, provided with a plurality of rivets 110 passing through the apertures 108 in the flanges 107 on the shutters. The actuating bar 109 bears a rivet 111 projecting upward through an arcuate slot 112 in the upper frame member 75, the rivet 111 providing a pivotal connection with a link 113. The actuating bar 109 and the link 113 are biased toward the left in Fig. 7 by a coil spring 74, secured to one end of the link 113 by being hooked about a rivet 114 and secured at its other end by being hooked about a rivet 115 carried by the frame member 75.

At a point opposite the thermostat chamber 55, the frame member 75 carries a rivet 116, which pivotally supports a bell crank 117, formed for convenience of a triangular piece of metal and pivotally secured as at 118 to the link 113. The other corner of the bell crank 117 is pivotally secured by rivet 119 to a yoke 120 in which a connecting rod 121 may be threaded or otherwise secured. The connecting rod 121 has its opposite end secured to the hub 73 of the plate 72, which bears against the thermostatic wafers 59.

The foregoing structure of the shutter and actuating mechanism may be assembled together as a whole up to and including the plate 72. The assembly of the shutter and frame members may be accomplished as follows:

The shutters 84 may be first pivotally connected by means of the shutter bar 109 and the side frame members 76 may be attached to the lower frame member 78. In attaching these frame members, the attaching flange 101 is received in the channel 102 and the lower edge of the apron 90 rests upon the upper flange 92 of the false shutter plate. The flange 89 and apron 90 project past the attaching flange 101 and provide a finished side for the front of the shutter frame, and the flange 101 may be secured to the side frame member by spot welding, riveting or other convenient fastening means. The shutters which are secured together by the actuating bar may then have their lower trunnions inserted in the apertures 99, and the upper frame member 75 may be put in place with the upper trunnions 83 in the apertures 82.

The attaching flange 86 of the upper frame member is adapted to be riveted, bolted or spot welded to the upper edge of the apron 90, while the attaching flange 85 is received in the channel 102 where it is similarly fastened. The cut-out space between these flanges receives the upper edge of the flanges 89 and the apron 90, permitting the foregoing method of assembly, which provides a frame member that is light, durable and very strong.

In order to guard against the rattling of the shutters 84, I prefer to provide resilient members 80 and 122 for pressing against the ends of the shutters and the ends of the lower trunnions respectively. The anti-rattling member 80 comprises a sheet metal strip having an attaching flange 123, a flange 124 at substantially right angles thereto and a flange 125 parallel to the frame member 75, and provided with a plurality of apertures which register with the apertures 82. The width of the flange 124 is substan-

tially equal to that of the flange 79 forming a box-like enclosure through which the trunnions 83 pass, and the flange 125 presses against washers 126 on the upper ends of the shutters, urging the shutters against washers 127 between the shutters and lower frame member 78. The anti-rattling member 122 is of similar form, but is not provided with registering apertures, its lower flange 128 resiliently engaging the ends of the rods 105 which form the trunnions for the shutters. Both the anti-rattling members 80 and 122 may be secured to the upper and lower frame members, respectively, by spot welding at the flange 123, or other convenient fastening means, and these members are preferably secured to the frame members before the shutter frame is assembled.

The radiator shell 20 comprises a finished sheet metal member having exterior walls 137, 138, 139 and 140 which conform to the shape of the hood desired. The exterior walls 140 and 137 merely extend down to a point sufficient to cover the radiator core, while the forward edges of these walls project downward as at 141 to enclose the outer edges of the false shutter plate. The bottom wall 142 may likewise conform to the boundary of the false shutter plate. The shell 20 is provided with an inwardly extending flange 143 on the walls 137, 140 and 142, this flange projecting over the apron 90 and the flange 96 of the false shutter plate. In order to provide a finished appearance for the shell, the flange 143 may be turned backward as at 155 and provided with a contacting flange 156 substantially parallel to the aprons 90 and to the boundary 96 of the false shutter plate. The upper front of the radiator shell is likewise provided with a depending flange or wall 144 adapted to project down over the shutter mechanism to a point just below the upper end of the shutters. The wall 144 is preferably outwardly curved as at 145, having an inwardly extending flange 146 at its lower boundary and a contacting flange 147 engaging the shutters when in closed position. The upper wall 138 of the shell is provided with an aperture 148 which is finished with a cast metal crown piece 149 having an aperture 150 located to receive the radiator spout 43.

In order to support the radiator shell directly upon the chassis of the vehicle, I provide a transverse frame member 151 comprising a relatively thick strip of metal having upwardly turned ends 152, which may be spot welded within the outer walls 137 and 140 of the shell. The supporting member 151 is adapted to rest directly upon a transverse frame member 153 of the chassis and provide direct support from the shell upon the chassis of the vehicle.

The method of assembly of the radiator core, shutter unit and shell is as follows:

The shutter frame is attached to the radiator core by a plurality of bolts or other convenient fastening means, passing through the side frame members 76 and the integral attaching flanges 26 on the radiator core, the spout 43 having been removed from the radiator core. The shell 20 as shown in Fig. 4 may be placed upon the combined core and shutter by tilting the upper end of the core backward so that the shell may be slid up from below with the false shutter apron projecting between the supporting member 151 and the lower flange 143. It should be observed that the difficulty here involved consists in placing the shell upon the core and shutter when a part of the shell goes behind the shutter and another part goes in front of the shutter, and this is accomplished by sliding the shell up about the false shutter apron.

When the shell has reached the proper elevation relative to the core and shutter frame, the top of the shell may be swung to the right in Fig. 2, over the top of the core until the aperture 150 registers with the aperture 41 of the spout, whereupon the spout 43 may be affixed as previously described. The core and shell may be secured together at their lower ends by bolts 154 passing through the supporting member 33 on the core through the supporting member 151 on the shell and through the chassis frame member 153, when the complete device is assembled upon the chassis of the vehicle.

It should be noted that when the supporting cross bar is used, the radiator shell, shutter and radiator core must be completely assembled before the assembly is installed upon the chassis of the automotive vehicle; but when the cross bar is not employed and some other means of support is used for the shell, the elements may be separately assembled with the chassis of the vehicle.

The operation of the automatic shutter is as follows:

When the temperature of the cooling fluid reaches the boiling point, the heated water and its vapor will come in contact with the thermostat chamber 56 heating the wafers 59 which expand, moving the plate 72 outward and rotating the bell crank 117 in a counterclockwise direction. The link 113 will then move to the right, drawing with it the shutter bar 109 against the tension of the spring 74, opening the shutters 84, which pivot toward the core. Upon cooling of the engine and the fluid in the water jacket, the wafers 59 will contract, permitting the spring 74 to return the parts to the position shown in Fig. 8. The temperature at which the thermostat will actuate the shutters, may be determined by relative position of the thermostats and the thermostats may be adjusted by means of the bolt 65.

Referring to Figs. 16 to 22, I have here illustrated several modified forms of support for the thermostatic wafers 59, and it is to be understood that these modified forms may be substituted for the device shown in Fig. 3. Each of these modified forms not only includes means for adjustably supporting a thermostat, but quickly releasable means for releasing the thermostat and causing the shutters to close when desired.

It is often desirable to close the shutters on an automotive vehicle immediately, although the engine and thermostats may be hot as when a car is driven in warm condition, to be washed. Under such conditions the shutters should be closed in order that the water may not penetrate the hood and spray upon the heated engine, and it has been found that mechanics will try to force the shutters shut, damaging the thermostats and forcing them out of adjustment.

It is also desirable to quickly close the shutters when parking the car in cold weather in order that as much heat may be retained in the engine as possible, and for this purpose I have provided means for moving the thermostat to inoperative positoin.

Referring to Fig. 16, the thermostat chamber 55 may be formed by a substantially cup-shaped member 160 having a flat bottom 161 and an outwardly projecting annular flange 162. The opposite end of the cup-shaped member 160 may be provided with an outwardly projecting flange 163 fitting snugly against the inside wall 164 of the radiator and the flanges 163 and 164 may be secured together by welding as well as by the rivets 165 formed upon the posts 166.

It should be noted that the thermostat chamber 55 in the present embodiment does not extend completely across the radiator core as in the previous embodiment and the forward end of the chamber 55 may communicate with a tubular conduit 167 through which the connecting rod 121 may pass to actuate the same mechanism shown in Fig. 3. The tubular member 167 may be welded to the annular flange 162 of the thermostat chamber and to the annular flange 168 projecting inward from the forward wall 169 of the radiator core.

The thermostats 59 are preferably thermostatic wafers filled with a volatile element capable of great expansion, and they are slidably supported in the chamber 55 and retained between the thermostat engaging plates 170 and 171. The thermostat engaging plate 170 is carried by the connecting rod 121, while the other plate 171 is connected by an adjustable member 172 and the plates 170, 171 are preferably of smaller area than the sides of the wafer in order that they may engage principally at the central portion of the wafer where expansive movement is at its maximum.

Under normal conditions the adjustable member 172 is fixedly secured in the position shown in Fig. 16, while the connecting rod 121 is biased toward the right in Fig. 16 by the spring 74 (Fig. 7) which biases the shutter to closed position, and the wafers 59 are resiliently held between the plates 170 and 171.

The adjustable member 172 may consist of a threaded rod or bolt passing through an aperture 173 in a cover plate 174. The adjustable rod 172 may be provided with a kerf 175 and is adapted to be threaded in a circular nut 176 which is fixedly secured in a small cup 177 formed in the cover plate 174. The nut 176 may be held by a close frictional fit in the cup 177.

The adjustable rod 172 is also provided with a lock nut 178 and it will thus be observed that the thermostat engaging plate 171 against which the thermostats react to actuate the shutters, may be moved back and forth by the adjustable rod 172 and the action of the thermostats may be controlled by adjusting their position relative to the radiator core and the shutter. This adjustment may be retained by means of a lock nut 178.

The cover plate 174 may be supported in position to close the thermostat chamber 55 and to carry the adjustable rod 172, by a plurality of posts 166. For this purpose the cover plate is provided with a circumferentially extending slot 179 for each of the posts 166, and the slots 179 are of sufficient width to slidably receive the reduced portion 180 upon the posts 166. The posts 166 are likewise formed with shoulders 181 between the reduced portion 180 and the cylindrical portion 182, and with heads 183, and the slots 179 terminate at similar ends in circular apertures 184 adapted to slidably support the covers upon the cylindrical portions 182 of the posts 166.

The cover is also provided with a pair of stamped radially extending lugs 185 and it will thus be observed that the cover may be rotated in a clockwise direction in Fig. 17 until the circular apertures 184 register with the cylindrical surface 182 of the posts, after which the cover will be slid out upon the posts until it engages the heads 183.

It will thus be observed that the cover plate 174 is provided with quickly releasable securing means for moving the thermostats 59 to inoperative position, and when the cover plate is in released position, the amount of expansion of the thermostats is not sufficient to actuate the shutters to open position. When it is desired to place the thermostats in operative position again, the cover may be slid on the posts 166 until it engages the rear wall of the radiator core when the cover may be turned in a counter-clockwise direction, engaging behind the

shoulders 181 upon the posts. The original adjustment of the thermostats is not disturbed by such a releasable device and the thermostatic shutter is adapted to retain its proper adjustment permanently.

Referring to Figs. 18 and 10, I have here illustrated another modified form of means for moving the thermostats to inoperative position. The structure of the thermostats and their chamber may be exactly the same as in the previous embodiment except that the cover plate 186 may be fixedly supported upon the radiator core by a plurality of bolts 187 passing through the flanges 38, 163 and the flange 188 upon the cover plate. The cover plate may then be formed with an inwardly extending annular flange 189 for guiding the adjustable rod 172 and the cover plate may be provided with a plurality of circumferentially extending slots 190, terminating at similar ends in circular apertures 191.

Instead of being carried directly by the cover plate 186, the rod 172 has its circular nut 192 fixedly secured in a cup 193 formed at the center of a plate 194 which also carried a pair of radially extending wings 195 like a wing nut. The plate 194 also supports a pair of posts 196 riveted thereto and provided with cylindrical surfaces 197 adapted to slide in the circumferential slots 190, and the heads 198 of the posts 196 are adapted to pass through the circular apertures 191.

The lock nut 199 is adapted to engage the outer surface of the cup 193 and retain the rod 172 in its adjusted position relative to the wing plate 194, but if it is desired to move the thermostats to inoperative position, this may be accomplished by turning the wing plate 194 in a counterclockwise direction in Fig. 19, and the heads 198 register with the apertures 191. The wing plate 194 may then be moved to the right in Fig. 18, removing the support from the thermostats 59 and permitting the shutters to close if they are then in open position. The cover plate 186 may be provided with one or more stamped projections 200 to frictionally engage the wing plate 194 and retain it in the position shown in Fig. 19.

Referring to Figs. 21 and 22, I have here illustrated another modified form of thermostat support in which the thermostat chamber and its cover plate may be supported in the same manner as in Figs. 18 and 19.

In this embodiment the cover plate 201 is preferably formed with an outwardly extending annular flange 202 capable of slidably receiving a supporting sleeve 203 which is threaded to receive the adjustable rod 172.

The supporting sleeve 203 comprises a substantially cylindrical member having a threaded bore 204 extending through the same and having a knurled annular head 205. The sleeve 203 is also provided with a pair of slots 206 extending from one end of the sleeve to the head and communicating with the circumferentially extending slots 207 which terminate in short slots 208 extending away from the head.

The cover plate 201 is also provided with a pair of inwardly extending lugs 209 carried by the annular flange 202 and the lugs 209 are adapted to project into the slots 206.

It will thus be observed that when the lugs 209 are engaged in the slots 208 as shown in Fig. 20, the reaction of the thermostats 59 and pressure of the spring 74 will tend to keep the sleeve 203 in such position, but the sleeve may be pushed inward by means of the knurled head 205 rotated counterclockwise in Fig. 21 until the lugs 209 reach the slots 206, whereupon the sleeve may be withdrawn to the right in Fig. 20.

In this embodiment as well, the rod 172 may be retained in adjusted position by the lock nut 199 and it will thus be observed that the position of the thermostat may be adjusted to control the action of the shutter. At the same time, the thermostats may be moved to inoperative position at any time by means of the sleeve 203 which is releasably carried by the cap 201. If desired, the slots 206 may be provided with pins 210 preventing complete withdrawal of the sleeve 203.

It will thus be observed that I have provided a novel radiator shutter assembly in which the core and shell are both directly carried by the chassis of the vehicle and the shutter frame is supported by integral attaching flanges carried by the core. My thermostatic mechanism is more quickly responsive to temperature conditions of the engine at a temperature point where it is desired to have shutters quickly actuated to the open position, and my thermostat may readily be adjusted to open the shutters at the desired point. The radiator and shutter assembly is capable of long periods of rough usage, without possibility of damage to the fragile parts of the radiator core and without causing any rattling.

My radiator shutter also includes means for adjusting the position of the thermostat to control the action of the shutters and quickly detachable means for moving the thermostats to inoperative position, whereby the shutters may be quickly closed at any time.

While I have illustrated and described a specific embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A built-in radiator shutter, comprising a radiator core having a water box, said core having a core band with integral forwardly projecting flanges, a shutter unit having a plurality of shutters carried by said flanges, a thermostat casing located in said water box and adapted to slidably support a plurality of thermostatic wafers, operative mechanism between said thermostatic wafers and said shutters, including a connecting rod having a pressure plate for engaging one side of said wafers, a cover plate for said thermostat casing, said cover plate having a quickly detachable connection with said water box, an adjustable pressure plate connected by said cover plate for engaging the opposite sides of said wafers and stop means carried by said water box for limiting the position of said second pressure plate when said cover plate is moved into position to release said thermostatic wafer.

2. A built-in radiator shutter, comprising a radiator core having a water box, said core having a core band with integral forwardly projecting flanges, a shutter unit having a plurality of shutters carried by said flanges, a thermostat casing located in said water box and adapted to slidably support a plurality of thermostatic wafers, operative mechanism between said thermostatic wafers and said shutters, including a connecting rod having a pressure plate for engaging one side of said wafers, a cover plate for said thermostat casing, said cover plate having a quickly detachable connection with said water box, an adjustable pressure plate connected by said cover plate for engaging the opposite sides of said wafers and stop means carried by said water box for limiting the position of said second pressure plate when said cover plate is moved into position to release said thermostatic wafer, said second pressure plate being adjustably supported upon said cover plate by a threaded member, and means for fixedly securing said threaded member in any adjusted position.

3. In a radiator shutter, the combination of a plurality of shutters for controlling the flow of cooling air about an internal combustion engine, with a thermostatic device for actuating said shutters, direct mechanical connections between said thermostatic device and said shutters, whereby said thermostat moves said shutters to open position at a predetermined temperature, and quickly detachable means against which said thermostat reacts in moving said shutters, said quickly detachable means being movable out of the range of expansion of said thermostat to render said thermostat inoperative to open said shutters.

4. In a controlling device for thermostatic shutters, the combination of a radiator core having a water box with a thermostat chamber located in said water box, said thermostat chamber comprising a substantially cylindrical member having a tube communicating with the opposite side of said water box, an actuating rod movably mounted in said tube, and having a pressure plate, a plurality of thermostatic wafers engaged by said pressure plate, a cover for said thermostatic chamber, quickly releasable means for supporting said cover on said thermostatic chamber, and a second pressure plate adjustably mounted on said cover to engage the opposite side of a series of said thermostatic wafers.

5. In a controlling device for thermostatic shutters, the combination of a radiator core having a water box with a thermostat chamber located in said water box, said thermostat chamber comprising a substantially cylindrical member having a tube communicating with the opposite side of said water box, an actuating rod movably mounted in said tube, and having a pressure plate, a plurality of thermostatic wafers engaged by said pressure plate, a cover for said thermostatic chamber, quickly releasable means for supporting said cover on said thermostatic chamber, a second pressure plate adjustably mounted on said cover to engage the opposite side of a series of said thermostatic wafers, and an adjustable connection between said second pressure plate and said cover, comprising a threaded member, and means for securing said threaded member in any adjusted position.

6. In a controlling device for thermostatic shutters, the combination of a radiator core having a water box with a cylindrical receptacle mounted in said water box and forming one of the walls thereof, a tubular member communicating with said receptacle and passing through said water box to the opposite side of said water box, a cover for said receptacle having a centrally located sleeve, said sleeve having a pair of radially projecting lugs, a plurality of thermostats in said receptacle, a support for said thermostats comprising a pressure plate and a threaded rod, and a guide for supporting said rod, said guide having axially and circumferentially extending slots for receiving said lugs, whereby said support may be removed from engagement with said thermostats to render a shutter inoperative.

7. In a thermostatic shutter installation, the combination of a radiator core having a water box with a radiator shutter unit carried by said core, a substantially cylindrical chamber formed in said water box, a thermostatic device slidably mounted in said chamber, means for engaging one end of said thermostatic device and actuating said

shutters, a cover for said chamber formed with a socket, quickly releasable means for securing said cover on said chamber, a member in said socket having a threaded bore, and a threaded member for engaging the opposite side of said thermostatic device, adjustably mounted in said bore to regulate the action of said shutters.

8. In a thermostatic shutter installation, the combination of a radiator core having a water box with a radiator shutter unit carried by said core, a substantially cylindrical chamber formed in said water box, a thermostatic device slidably mounted in said chamber, means for engaging one end of said thermostatic device and actuating said shutters, a cover for said chamber formed with a socket, a member in said socket having a threaded bore, a threaded member for engaging the opposite side of said thermostatic device, adjustably mounted in said bore to regulate the action of said shutters, a plurality of studs carried by said water box for engaging said cover, heads on said studs, and annular shoulders carried by said studs adjacent said water box, said cover being provided with slots with enlargements whereby the cover may be secured between said water box, and said annular shoulders are moved into engagement with said heads to release said thermostatic device.

9. In a thermostatic shutter installation, the combination of a radiator core having a water box with a radiator shutter unit carried by said core, a substantially cylindrical chamber formed in said water box, a thermostatic device slidably mounted in said chamber, means for engaging one end of said thermostatic device and actuating said shutters, a cover for said chamber formed with a socket, a member in said socket having a threaded bore, a threaded member for engaging the opposite side of said thermostatic device, adjustably mounted in said bore to regulate the action of said shutters, and a selective securing device interposed between said threaded member and said cover, whereby said threaded device may assume any one of a plurality of predetermined positions with respect to said cover to release said thermostatic device.

10. In a thermostatic shutter installation, the combination of a radiator core having a water box with a radiator shutter unit carried by said core, a substantially cylindrical chamber formed in said water box, a thermostatic device slidably mounted in said chamber, means for engaging one end of said thermostatic device and actuating said shutters, and adjustable means for engaging the opposite side of said thermostatic device for regulating the action of said shutters, comprising a cover for said chamber, said cover having an aperture and curved slots, a releasable member having a pair of headed studs adapted to be inserted in said slots and a thermostat supporting member projecting through said cover and carried by said releasable member.

11. In a thermostatic shutter installation, the combination of a radiator core having a water box with a radiator shutter unit carried by said core, a substantially cylindrical chamber formed in said water box, a thermostatic device slidably mounted in said chamber, means for engaging one end of said thermostatic device and actuating said shutters, and adjustable means for engaging the opposite side of said thermostatic device for regulating the action of said shutters, comprising a cover for said chamber, said cover having an aperture and curved slots, a releasable member having a pair of headed studs adapted to be inserted in said slots and a thermostat supporting member projecting through said cover and carried by said releasable member, said releasable member being formed with a socket for receiving a nut, and said thermostat supporting member comprising a rod having threaded engagement with said nut.

12. In a radiator shutter, the combination of a plurality of shutters for controlling the flow of cooling air about an internal combustion engine, with a thermostat for actuating said shutters, direct mechanical connections between said thermostat and shutters, whereby said thermostat actuates said direct mechanical connections to move said shutters to open position at a predetermined temperature, and quickly releasable means against which said thermostat reacts to actuate said shutters, said latter means being quickly releasable to remove said means from the range of reaction of said thermostat to render said thermostat inoperative to open said shutters.

In witness whereof, I hereunto subscribe my name this 28th day of March, 1929.

EDGAR G. PETERSEN.