

Feb. 23, 1954

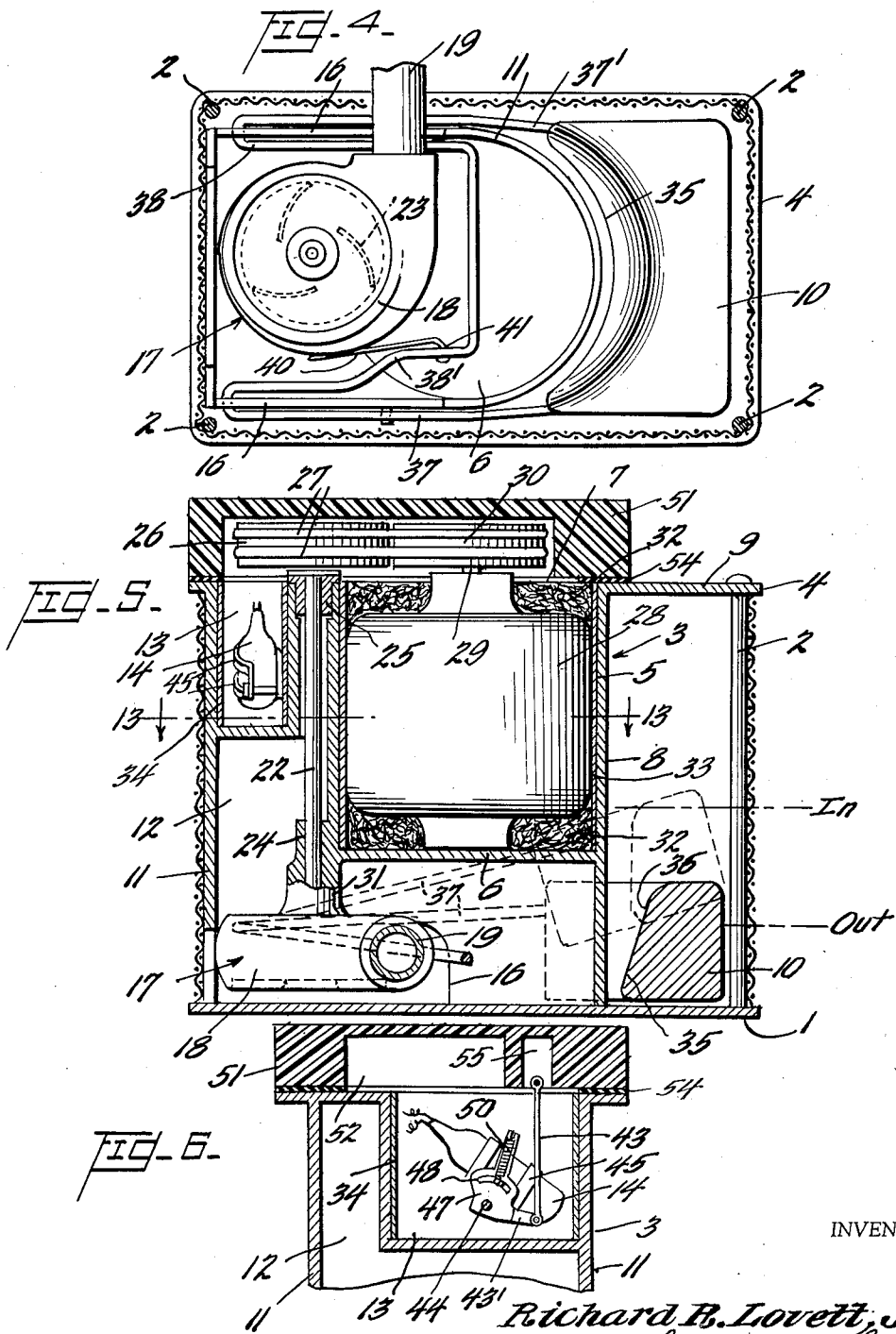
R. R. LOVETT, JR

2,669,934

SUBMERSIBLE AUTOMATIC BILGE PUMP

Filed March 12, 1952

5 Sheets-Sheet 2



INVENTOR

Richard B. Lovett, Jr.,

BY *Parker Cook*

ATTORNEY

Feb. 23, 1954

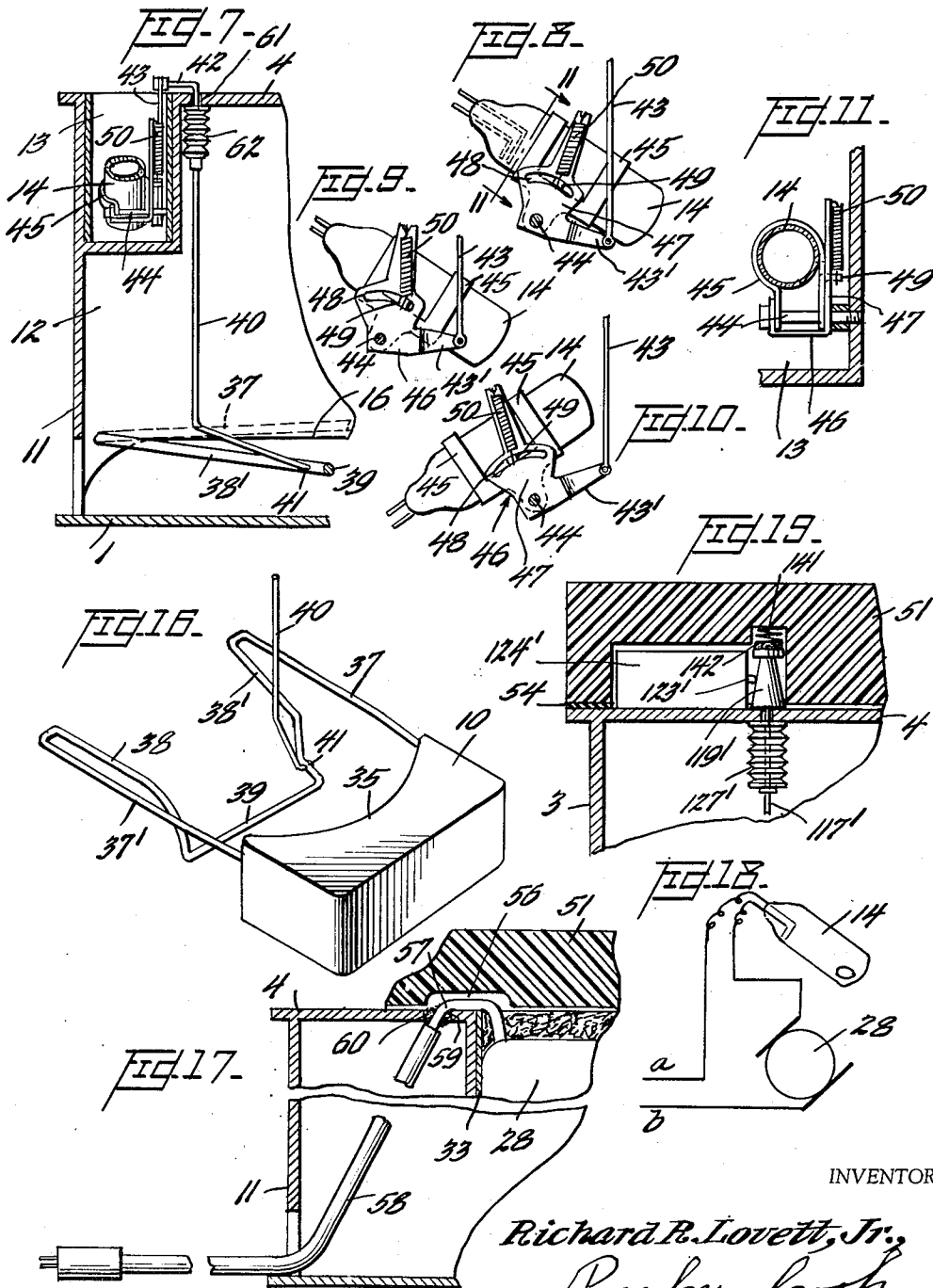
R. R. LOVETT, JR

2,669,934

SUBMERSIBLE AUTOMATIC BILGE PUMP

Filed March 12, 1952

5 Sheets-Sheet 3



INVENTOR

Richard R. Lovett, Jr.

BY

Parker Cook

ATTORNEY

Feb. 23, 1954

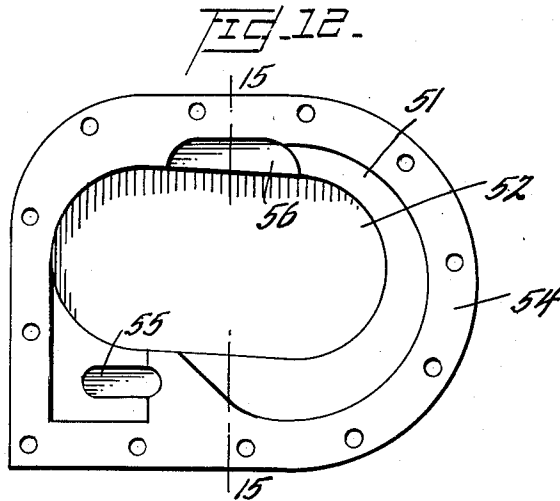
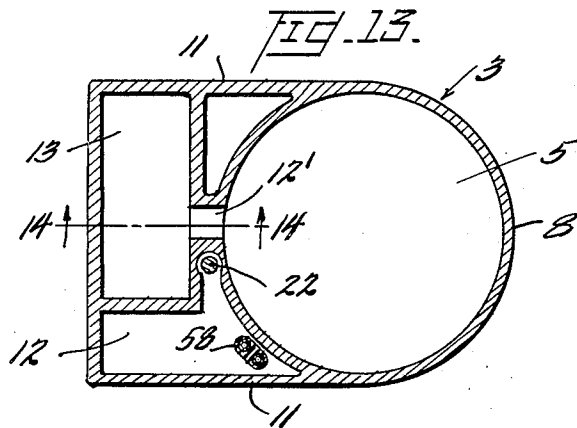
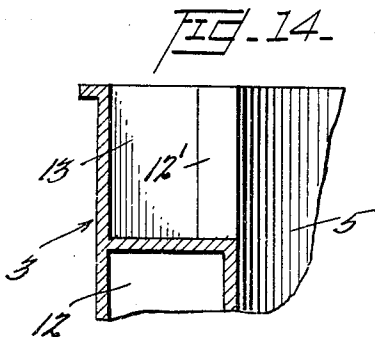
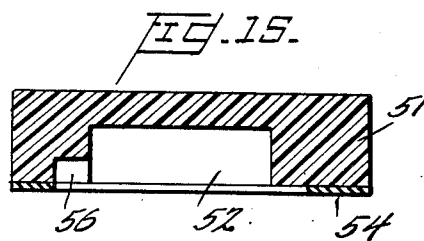
R. R. LOVETT, JR

2,669,934

SUBMERSIBLE AUTOMATIC BILGE PUMP

Filed March 12, 1952

5 Sheets-Sheet 4



INVENTOR

Richard R. Lovett, Jr.

BY

Parker Cook

ATTORNEY

Feb. 23, 1954

R. R. LOVETT, JR

2,669,934

SUBMERSIBLE AUTOMATIC BILGE PUMP

Filed March 12, 1952

5 Sheets-Sheet 5

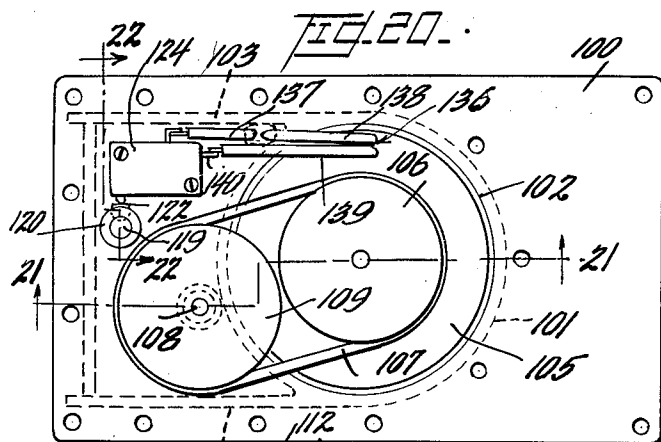
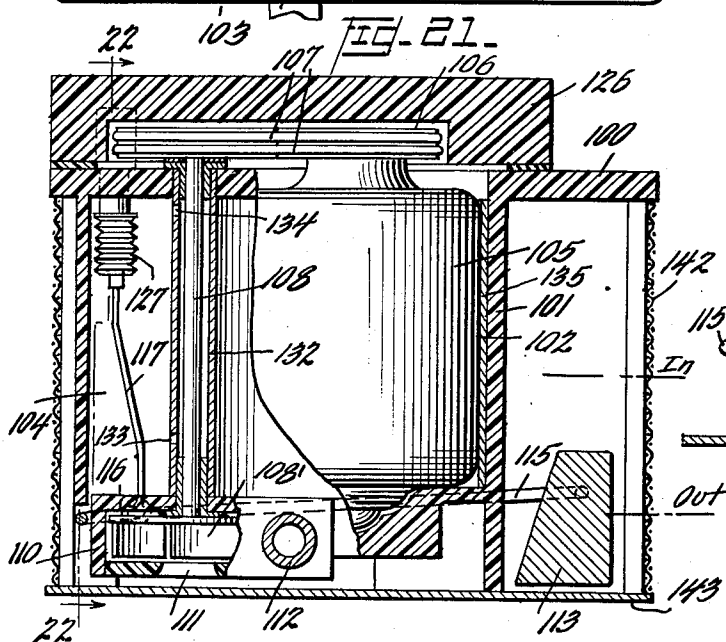
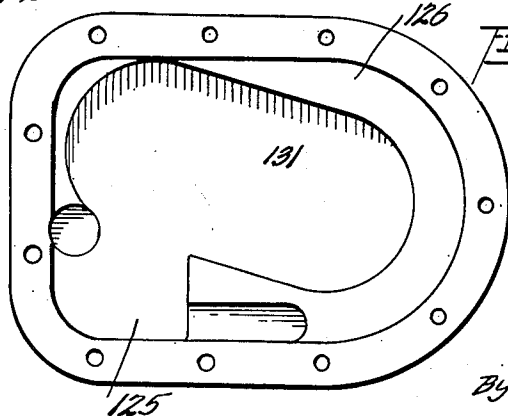
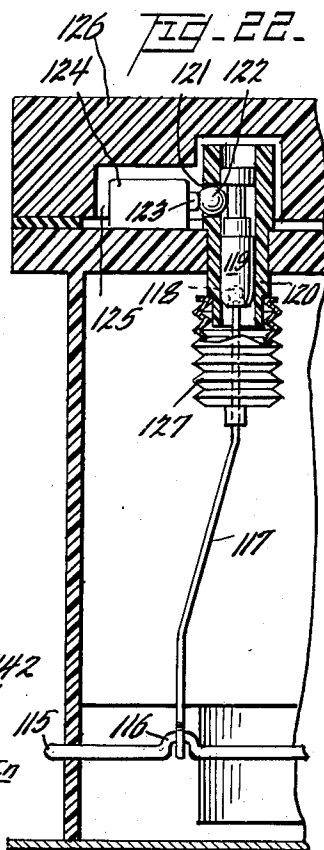


FIG. 24.

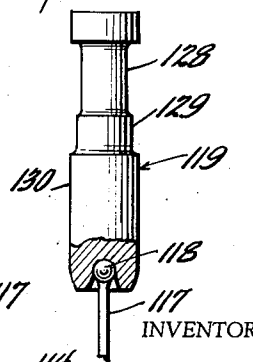
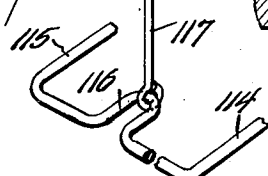


FIG. 25.



Richard R. Lovett, Jr.
BY Parker Cook ATTORNEY

UNITED STATES PATENT OFFICE

2,669,934

SUBMERSIBLE AUTOMATIC BILGE PUMP

Richard R. Lovett, Jr., Longport, N. J.

Application March 12, 1952, Serial No. 276,086

11 Claims. (Cl. 103-26)

1

My invention relates to a new and useful improvement in submersible automatic bilge pumps and has for an object to provide a pump that may be fastened to the top of the inner keel of a boat, the pump to be set in an upright position at the lowest point in the bilge, to which the water will drain.

Another object of the invention is to provide a bilge pump unit that will not only be fully automatic so that as the water rises the pump will start operating, but also to provide a unit wherein there is no likelihood of the water reaching certain parts of the unit to affect the motor or the driving parts of the pump or the automatic switch.

With most bilge pumps with which I am familiar, after a few months of service, water will leak around the drive shaft of the pump or motor, or the operating rods of the float, or around the inlet cable to the motor, to affect the windings of the motor, or the terminal points of the cable, or the contact points of the switch mechanism; and, if the bilge pump is used on a boat in salt water, the connections become corroded so that it is necessary at the end of the boating season, if not before, to repair the unit and/or substitute new parts for those parts that have been damaged by the salt water.

Also, with a number of pumps with which I am familiar, moisture or condensation of water will work up through the unit and cause considerable damage, calling for repairing or rebuilding the unit.

Another object of the invention, therefore, is to provide a submersible automatic bilge pump unit wherein a number of the working parts are hermetically sealed in respective chambers, while the inlet for the cable and the drive shaft of the pump, and the tip-up or activating rod for the switch all extend through a trapped air pressure chamber, so that even though deeply submerged, due to the air pressure in the air pressure chamber, no water can enter around the parts above mentioned.

Still another object of the invention is to provide a unit in which there is a trapped air chamber in the lower portion thereof and a tightly sealed chamber on top, of much less air capacity, so that when the pump is submerged water may only rise to a certain height due to the air pressure in the trapped air chamber.

Still another object of the invention is to provide a pump wherein the air trapped in the inverted air chamber when the unit is submerged prevents the water from rising in proportion to

2

the pressure or depth. Of course, the deeper the submersion, the higher the liquid will rise in the air chamber.

Still another object of the invention is to have the upper chambers so relatively small compared with the lower air chamber that mathematically the pump could be submerged to a great depth without the water rising high enough in the trapped air chamber to affect the parts heretofore mentioned.

Still another object of the invention is to provide a unit having an air pressure chamber in which the shaft of the centrifugal pump is located, and to have a small chamber in the cover or dome of the unit with a very small clearance for the driving means.

Still another object of the invention is to have the inlet cable for the motor enter at the top of the trapped air chamber, so that there is no possibility of water reaching the motor.

Still another object of the invention is to mount the motor in an upright position and drive the pump shaft from within the upper chamber or dome and to provide a very small clearance for the driving parts of the shaft to thus keep the ratio of cubic air in the upper chamber low with respect to the amount of cubic air in the trapped air chamber.

Another object of the invention is to provide an automatic submersible bilge pump where, in addition to the trapped air chamber in the lower portion of the unit, the shaft of the drive pump may be further protected (as will later be mentioned) from any water passing around the same and up into the upper dome or cover, which otherwise might occur from a rocking of the boat.

Still another object of the invention is to construct a unit with an integral well for the motor, the well being lined with a cork insulation, and a trapped air chamber partly surrounding the well, so that the motor heat is controlled by the cork insulation where the heat of the motor might come in contact with portions of the housing directly cooled by water. The motor heat may then be dissipated through the portions of the housing which are in contact with the air in the interior of the trapped air chamber, and also be discharged through a plastic cover or dome (which will be hereinafter mentioned) over the drive.

Still another object of the invention is to insulate the well with cork and to combine the same with a non-conductive drive to thus eliminate any possibility of induced electrolytic action

due to any slight leak which might be present in the motor windings, but which would not necessarily impair the motor power output.

With these and other objects in view, the invention consists in certain new and useful improvements and combination of parts as will be hereinafter more fully described and pointed out in the claims.

Referring now to the drawings, showing the preferred form and two modifications,

Fig. 1 is a side elevation of a boat hull and showing the position of the bilge pump,

Fig. 2 is a side elevation of the unit with parts broken away, and other parts in section, for clearness of illustration,

Fig. 3 is a top plan view with the plastic dome or cover removed,

Fig. 4 is a bottom plan view of the unit with the lower plate removed,

Fig. 5 is a vertical, sectional view taken on line 5—5 of Fig. 3, the dotted lines showing the position of the float when in its raised position,

Fig. 6 is a fragmentary, vertical, sectional view, showing the chamber and the mercury switch, taken on line 6—6 of Fig. 3,

Fig. 7 is a fragmentary, vertical section, showing the mercury switch and the linkage to the float, taken on line 7—7 of Fig. 3,

Fig. 8 is an enlarged, detailed view, showing the mercury switch and its linkage in its cut-out position,

Fig. 9 is a similar view, but showing the linkage in position about to actuate the switch,

Fig. 10 is a similar view, but showing the mercury switch in its cut-in or operative position,

Fig. 11 is a detailed, sectional view of the mercury switch, taken on line 11—11 of Fig. 8,

Fig. 12 is a bottom plan view of the cover or dome,

Fig. 13 is a horizontal section of the motor casing and well, taken approximately on line 13—13 of Fig. 5, the motor being omitted,

Fig. 14 is a vertical, sectional view taken on line 14—14 of Fig. 13,

Fig. 15 is a vertical, sectional view through the dome, on line 15—15 of Fig. 12,

Fig. 16 is a perspective view, showing the float and its linkage for operating the mercury switch,

Fig. 17 is a fragmentary, sectional view, showing the lead-in cable passing up through the top of the trapped air chamber to the motor, taken approximately on line 17—17 of Fig. 3,

Fig. 18 is a diagrammatic view showing the circuit controlling the motor by the mercury switch,

Fig. 19 is a detailed sectional view, showing a modified form wherein a micro-switch is used rather than a mercury switch,

Fig. 20 is a top plan view of a still further modified form of unit or bilge pump, also showing the micro-switch instead of the mercury switch,

Fig. 21 is a vertical section taken approximately on line 21—21 of Fig. 20,

Fig. 22 is a vertical, transverse section taken on line 22—22 of Figs. 20 and 21,

Fig. 23 is a bottom plan view of the plastic dome of the modified form of unit,

Fig. 24 is an elevation of the micro-switch operating cam with the lower end in section, and

Fig. 25 is a fragmentary perspective of the connection between the float arms and operating rod for the micro-switch cam.

At the outset, it might be mentioned that the unit is primarily a bilge pump, but it will be understood that the same with a larger motor and parts may efficiently be used wherever it is

desirable to have a submersible pump, such as in cellars or basements, etc.

Referring now to Figs. 1, 2 and 3, it will be seen that the unit comprises a base plate 1, which is to be secured to the upper surface of the keel in the bilge of a boat; while threaded within the plate 1, at the four corners are the supporting posts 2. On these supporting posts 2 is supported the remainder of the unit. By supporting the unit in this manner, the same may be removed quickly from the base plate 1 when and if necessary.

Referring now more particularly to the unit, there is shown the metal housing 3 having an integral top plate 4, through which the aforementioned posts 2 pass to support the unit on the plate 1. Integrally formed on the under-surface of the top plate 4 is a well 5 closed at its bottom 6 and open at its top 7.

As may be seen in Figs. 2 and 5, the top plate 4 extends out beyond the rear wall 8 of the well 5 as at 9, while partly encircling this rear wall 8 is the metal float 10, which will rise and fall beneath the over-hanging part 9 of the top plate 4.

Also depending integrally from the top plate 4 is a metal casing 11 whose rear portion in reality forms the rear wall 8 of the aforementioned well 5. The side walls of this casing 11 are tangent to the well 5 to form a trapped air chamber 12 which extends to the front of the well 5 and partly around the sides thereof.

Thus, there is a top plate 4, a depending casing 11, and a well 5 within the casing 11, a part of the casing 11 forming a part of the well 5, and the well 5 less in area than the casing 11 to provide a resultant trapped air chamber 12, partly around the well 5 and extending up to the top plate 4, in front and to the sides of the well 5.

Glancing for the moment at Figs. 2, 3, 5, 6 and 7, there will be seen another relatively small chamber 13, for housing a mercury switch 14 (hereinafter to be mentioned). This chamber 13 is open at its top 15, while the walls 13' depend from the top plate 4; or, in other words, this integral chamber 13 is located in the upper portion of the trapped air chamber 12.

Without considering the dome or cover (to be hereinafter mentioned), it will be seen that in the air chamber 12 there is a well 5, in which is to be housed a motor (to be hereinafter mentioned), and a small chamber 13 for housing the mercury switch 14.

It is desirable to keep the amount of air in the unit (cover or dome) above the trapped air chamber 12 to a minimum, as the ratio of the trapped air to the untrapped air in the unit will regulate the height to which the water may rise within the trapped air chamber 12.

Along the lower edge of the casing 11 the walls of the casing 11 are cut away at 16 (as may be seen in Fig. 2) so that the water may enter through the bottom of the centrifugal pump 17, which bottom is spaced slightly above the lower plate 1 (as may be seen in Figs. 2 and 5). This centrifugal pump 17 consists of the casing or housing 18 with its outlet 19, which will be connected to a small hose 20 (shown in dotted lines in Fig. 1) and discharge as at 21 above the water line of the boat.

Extending down within the housing 18 of the centrifugal pump 17 is the driven shaft 22 on the lower end of which is threaded the impeller 23. The shaft 22 fits within an aperture 24, which is an integral part of the walls of the well 5, and

also extends between the aforementioned chamber 13 and a wall of the well 5. There is a bearing 25 near the upper end of the shaft 22, and on this shaft 22, extending above the top plate 4, is a small, horizontally positioned pulley or drive-wheel 26, which is grooved to receive two or more endless coiled springs 27.

In the well 5 may be seen the motor 28, in the present instance a relatively small one, one of forty-two watts that operates on a six-volt battery, the motor 28 being set in a vertical position with the drive shaft 29 extending upwardly. At the end of this drive shaft 29 is a like pulley wheel 30, which is grooved to receive the endless coiled springs 27. Thus, when the motor 28 is switched on, it will drive the centrifugal pump 17 through the aforementioned endless coiled springs 27 and the pulleys 26 and 30.

It will be understood that although I have shown endless coiled springs for the drive between the driving means and the driven means, other forms of belts might be used; or, a frictional drive or meshing gears may be substituted.

With a small motor as mentioned, I have found that the pump can discharge approximately five gallons of water in one minute.

The centrifugal pump 17 has a boss 31 that extends to the bottom wall 6 of the well 5. There is no packing or seal in this boss 31 through which the shaft 22 extends, and thus the problem of the centrifugal pump 17 becoming airbound is eliminated. When the water rises in the centrifugal pump 17, the air passes out through the clearance around the shaft 22 and the pump 17 is primed even though the discharge line may be trapped.

When the pump 17 starts operating due to the float 10 rising, as will be mentioned shortly, the water will have covered the inlet port of the pump 17, and the air will be drawn out of the pump 17 and the water will rise slightly above the top of the pump 17, at which time a small portion of water is forced through the bearing and boss 31, which water will act as a lubricant, a coolant, and also an effective seal. It will be understood that there is no seal or packing around the shaft 22 or in the boss 31, so that the air can be forced out of the pump 17, and then a small amount of water is also forced through the bearing to effect a water seal. The absence of a packing also permits the free rotation of the shaft 22.

It will also be noticed, especially from Fig. 5, that filling up the well 5 around the motor 28 is an asbestos or a mastic, or any other desired filling 32. This filling 32 is also under the motor 28 so that any air space not occupied by the motor 28 in the well 5 will be filled, to thus reduce the air space to a minimum.

It will also be noticed around the inner walls of the well 5 there is a cork insulation 33 which controls the dissipation of the heat and tends to overcome any condensation of moisture about the motor 28, and also eliminates the possibility of any electrolytic action which might be caused by a slight electrical leak.

It will also be noticed that I cork-line the switch chamber 13 with a like cork insulation 34.

Referring next to the float mechanism 10 and its linkage with the aforementioned mercury switch 14, reference is made to Fig. 11, where there is shown a hollow metal sealed float 10 which is arcuate on its inner face as at 35 and tapers slightly upwardly on its inner face as at 36 (as may be seen in Fig. 5) so that it will clear

the outer wall 8 of the well 5 as it rises from its lower position.

Extending rearwardly from this metal float 10 are the opposite arms 37 and 37' which extend rearwardly and then bend back on themselves at 38 and 38' and then are connected by the cross-bar 39. Extending upwardly from an arm 38' is the actuating rod 40 which is pivoted at its lower end at 41 to said arm 38', and then passes (as may be seen in Fig. 7) through the top plate 4, and is then bent as at 42 to connect with an arm 43, which is part of the mercury switch 14.

Referring now for the moment to the mercury switch 14 (shown in detail in Figs. 8, 9 and 10) there will be seen a small supporting screw 44 on which is pivotally supported the mercury switch 14 that has the bands 45, through the lower ends of which pass the aforementioned supporting screw 44. There also may be seen the bracket 46 of which the arm 43' is an integral part, which bracket 46 is likewise pivotally supported on the aforementioned screw or post 44. In the body portion 47 of the bracket 46 there is an arcuate slot 48 through which passes the nib 49 on the lower part of the bands 45 that encircle the switch 14 and support the switch 14 on the post 44.

To insure the tripping of the mercury switch 14 when actuated by the rod 40, which in turn is actuated by the rise and fall of the float 10, there is fastened a small spring 50 connected to the rear of the bracket 46 and to the aforementioned nib 49.

Thus, when the rod 40 rises, the mercury switch 14 is forced from its cut-out position to its cut-in position. As soon as the mercury switch 14 passes the dead center the spring 50 will tend to snap the mercury switch 14 to its cut-in position. This insures a positive and quick movement of the mercury switch 14.

In Figs. 8, 9, 10 and 11, the mercury switch 14 is shown in detail. Fig. 8 shows the mercury switch 14 in its cut-out position and as the actuating rod 40 is raised, the end wall of the arcuate slot 48 will eventually contact with the nib 49 and tip the mercury switch 14 to the position shown in Fig. 10. When the rod 40 is lowered, the operation is just the reverse.

Due to the arcuate slot 48 and the time that it takes the end wall of the slot 48 to contact with the nib 49, will let the water rise in the air chamber 12 to the line marked "in" on Fig. 5. The pump 17 will then operate to lower the water to the line marked "out" as shown in Fig. 5, when the pump 17 will cease to operate. In other words, the arrangement of the mercury switch 14 and the arcuate slot 48 prevents the pump 17 from continually cutting in and out on just a slight rise of the water.

Also, by having the small spring 50 shown, it assists in tripping the pump 17 over the dead center.

In Fig. 14 there is diagrammatically shown the lead-in wires *a* and *b* and the mercury switch 14 and the motor 28, showing that the motor 28 is controlled by the movement of the aforementioned mercury switch 14, which in turn is actuated by the float 10.

Referring now to the plastic cover or dome 51, as shown in Figs. 2, 5, 6, 12 and 13, there will be seen that it is made out of heavy transparent plastic, which is milled or formed with a chamber 52, which is just large enough to encase the aforementioned pulley wheels 26 and 30 and allow for their free movement, but to hold air space

down to a minimum. This plastic dome 51 is held in place by numerous screws 53 which are in turned secured in the top plate 4, there being a gasket 54 between the top plate 4 and the said dome or cover 51 to make the same air-tight and water-tight.

There is also milled in this dome or cover 51 the relatively small chamber 55 into which extends the top of the trip rod 40 for operating the mercury switch 14. Also, the dome or cover 51 is milled out slightly as at 56 (as may be seen in Fig. 12) to receive a bend 57 of the main inlet cable 58, which in turn leads to the switch 14 for the control of the motor 28.

Thus, in the dome or cover 51 there is the largest chamber 52, the very small chamber 55, and the small cut-out portion 56 for the lead-in cables 58. Thus the air space in the dome 51 is kept as low as possible so that the water will not rise too high in the aforementioned trapped air chamber 12. By having this dome or cover 51 made of transparent plastic, the working parts, that is, the pulleys 26 and 30, and the switch 14 may be seen, and in case of repair, the cover 51 can be removed quickly and easily.

Referring for the moment to Figs. 3 and 17, it will be seen that the inlet cable 58 passes into the unit 1 at its lower edge through one of the openings around the casing 11, and passes upwardly through the trapped air chamber 12 and through the small opening 12' between the chamber 13 and the well 5, for connection with the switch 14. Thus the water being under pressure in the air chamber 12 will never reach the opening 59 and the top plate 4 to pass into the dome 51 and over the motor 28. However, to guard against splash in the event of heavy rolling and pitching in rough seas, there is a mastic or seal as at 60 about the cable 58 where it passes through the top plate 4 and up into the dome 51. Thus the cable 58 is cemented into the unit merely as an added precaution.

Also, as may be seen in Fig. 7, the tip-up rod 40 passes up through the top plate 4 at the top of the trapped air chamber 12 so that there is little possibility of water leaking around the orifice 61 in the top plate 4 through which the aforementioned rod 40 passes.

However, to avoid any possibility of water splashing from a heavy rocking or rolling of the boat, and as an extra safeguard, I secure a small boot or bellows 62 to the tip-up rod 40 near the upper end of the tip-up rod 40 and bearing on the under-surface of the upper plate 4, to thus doubly prevent any water from passing up through the orifice 61 and from this orifice 61 possibly into the motor switch chamber 13.

It will be seen that by providing a trapped air chamber 12 through which the upper part of the cable 58 passes to the mercury switch 14, and the top part of the tip-up rod 40 passes through the base plate 1 and the top of the trapped air chamber 12 and the drive shaft 22 of the pump 17 also passes through this air space, there is no likelihood of any water passing up into the dome or cover 51 where it would run down into the electrical parts to damage the pump.

Around the unit there may be seen a screen 68 to keep any foreign substances from getting into the bilge pump.

It will be seen that I have provided a very compact unit measuring around $4\frac{1}{4}$ " in width, 7" in length, and $6\frac{1}{4}$ " in height, so that it can easily be placed on the keel and not interfere with the floor boards of the boat. Furthermore,

by having the unit secured to a base plate which in turn is secured to the keel, the unit can be removed quickly from the base plate.

The plastic cover or dome 51 permits easy inspection and can be removed quickly and readily if ever necessary to renew the belts, although I have found in actual practice that they show no signs of wear in a thousand hours of use.

The operation of the pump is extremely simple. As the water rises in the bilge to about the top of the line marked "in" (Fig. 2) the float 10 will have raised to its upper position to in turn snap the mercury switch 14 to its cut-in position; and the pump will be primed and immediately start to pump the water from the bilge. This will continue until the water again lowers the float 10 to its cut-out position, which will in turn operate the mercury switch 14 to thus cut out the motor 28.

Referring now to Figs. 20 to 25 inclusive, there is shown a modified form of bilge pump or unit, wherein the principles and most of the structure are substantially the same as in the preferred form, the main differences being that rather than employing a mercury switch I employ a micro-switch, which takes up less room in the unit and may be mounted in the dome or cover, to thus do away with casting a switch chamber in the casing proper, as in the preferred form.

There is shown in Figs. 20 and 21 the top plate 100, the casing 101 in which is included a well 102, and the tangent side walls 103 of the casing 101 with the resultant trapped air chamber 104, similar to the construction shown in the preferred form.

There is also shown the motor 105 which drives through the pulley 106 and the belts 107, the pump drive shaft 108 on which there is a pulley 109 similar to the pulleys 106.

The drive shaft or impeller shaft 108 is provided with the impeller 109 that fits within the pump or casing 110, similar to the preferred form, the inlet being at the bottom 111 and the outlet of the pump being shown at 112, which will discharge above the water line of the hull.

There is a float 113 which is connected by the two arms 114 and 115 which are pivoted at their rear ends in the casing walls similar to the preferred form, but these arms 114 and 115 form a loop as at 116 (see Fig. 25) at their rear, to which is connected the actuating rod 117, which extends upwardly (as may be seen in Fig. 22) and has a small ball 118 which fits in the bottom of the vertical cam 119, which cam 119 in turn operates within the collar 120 (as may be seen in Fig. 22), the cam 119 being raised and lowered by the action of the float 113 and its linkage 114 and 115 and the actuating rod 117.

In this collar 120 there is an aperture 121 (Fig. 22) in which is mounted a small ball bearing 122 which presses against the stub arm or nose 123 of a micro-switch 124. The micro-switch is not illustrated in detail, but as is well known, it operates on a movement of substantially ten-thousandths of an inch.

It will be noticed that this microswitch 124 is located above the top plate 100 and in a small chamber 125 that is formed in the plastic dome or cover 126, which will be referred to shortly.

Located on the upper end of the tip-up rod 117 is a boot 127 that encases the lower part of the collar 120, and this boot or bellows 127 contracts or expands with a movement of the actuating rod 117 to prevent any splash or moisture from working up around the cam 119.

It will be remembered that this collar 120 and boot 127 are located within the trapped air chamber 104 so that the water never rises to a level of the boot 127, and the boot 127 is added as an extra precaution.

The cam 119 has a reduced face as at 128 and is slightly enlarged at 129 and has a still greater circumference at 130. Thus when the cam 119 is in the position as shown in Fig. 22, the micro-switch 124 is cut out and as the float 113 rises to in turn raise the cam 119 as the ball 122 contacts with the enlarged cam surface 129, it will start pressing in the nib 123 of the switch 124 and cut the switch 124 in when the enlarged cam surface 130 finally contacts with the aforementioned ball 122.

In this micro-switch 124 the linkage 114 and 115 to the float 113 do not have to rise and lower to the same extent as in the preferred form, making it possible to mount the actuating rod 117, as shown, at the rear of the arms 114 and 115.

After the pump has operated some time, to lower the water the float 113 will, of course, descend; and in turn the cam 119 will lower and continue to lower until the water reaches the level marked "out" in Fig. 21, and the ball 122 and cam 119 will again be in the position shown in Fig. 22.

In the cover or dome 126 (as shown in Fig. 23) the air capacity 131 for the aforementioned pulley wheels 106 and 109, the micro-switch 124 and the collar 120 of the chamber 104, is kept to a minimum so that the air capacity in the dome 126 is relatively small to the air capacity in the trapped air chamber 104.

Another difference of importance is that surrounding the shaft 108 there is located a tube 132 which extends from the pump casing 101 up and through the upper plate 100. As also may be noticed, near the lower end of the tube 132 there is a small opening 133 and a like small opening 134 at the upper end of the tube 132 just below the plate 100. Thus a small amount of water may pass around the shaft 108 through the aperture 133 to lubricate and cool the same, and any air may also pass in or out of the tube 132 through the orifice 134. The amount of water mentioned is just a drip and will go back into the bilge.

The well 102 is cork-lined as at 135 to absorb any heat from the motor 105.

In Fig. 20, there is shown the cable 136, one wire 137 leading to the micro-switch 124 and the other one 138 leading to the motor 105, and then from the motor 105 at 139 to the other terminal of the micro-switch 124 as at 140.

In Fig. 19, there is also shown a slightly further modification of the cam, and in this instance the tip-up rod 117' has the bellows 127' fastened to the upper end thereof and this tip-up rod 117' in turn actuates a truncated cone 119' to in turn actuate the micro-switch 124'. There is a small spring 141 that holds a felt wick 142 on the upper end of the cone 119' to provide a lubricated surface between the truncated cone 119' and the nib 123' of the micro-switch 124'.

Thus, it will be seen that as in the preferred form, the modification shown in Figs. 20 to 25 inclusive, has the actuating rod and the cable and the pump drive shaft all passing through the top plate of the unit into the dome through the trapped air chamber 104.

It will be understood that the dome or cover 126 is formed of transparent plastic and in fact the entire casing of the unit may be formed of plastic.

As may be seen in Fig. 21, I place a screen 142 around the unit to keep foreign substances from passing up into the centrifugal pump 110; and it will be understood that the unit is fastened on a base plate 143 similar to the preferred form. In fact, the unit is the same, with the exception of those features pointed out, that is, a difference in the linkage, a difference in the operating cam, the provision of a chamber 125 for holding the micro-switch 124 in the plastic dome 126 rather than in the body of the unit, and the tube 132 about the pump shaft 108.

From the foregoing, it will be seen that in all forms I have provided an automatic bilge pump that occupies but little space, being exceedingly compact; is efficient in service; and is so arranged and constructed that there is no possibility of water passing through the unit up into the dome to in any way affect the mechanical or electrical mechanism.

Furthermore, after long usage, in case of any repairs being needed, it is a simple matter to remove the hermetically sealed dome and get at any of the working parts that might need attention.

It will also be seen that there is no necessity of lubricating any of the parts, and no bearings to be re-packed or sealed, so that the pump should give thousands of hours of service without attention.

Many slight changes might be made without in any way departing from the spirit and scope of the invention.

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

1. In a submersible automatic bilge pump, a casing having a top plate and an integral well, closed at its bottom and depending from said top plate, the side walls of said casing being tangent to said well and forming a trapped air chamber under a part of the top plate and partially around said well; a vertically positioned motor in said well and having its drive-shaft extending upwardly through and above the said top plate; a centrifugal pump also having its drive-shaft located in said trapped air chamber and the upper end of said shaft extending through said top plate; means extending between the drive-shaft of the motor and the pump shaft for driving said pump shaft; a hermetically sealed dome secured to and extending over the said top plate and housing said above-mentioned means; an electric switch remote from the water level in circuit with said motor; a float mechanism including a rod connected to said switch for cutting in and out said switch as the water rises and falls above the bilge pump; an electric feed cable passing through the trapped air chamber and the said top plate and connected to said switch and said motor above the said trapped air chamber; and the said rod connecting said switch and the said pump shaft also passing through said trapped air chamber into said hermetically sealed dome.

2. In a submersible automatic bilge pump, a casing having a top plate and an integral well, closed at its bottom and depending from said top plate, the side walls of said casing being tangent to said well and forming a trapped air chamber under a part of the top plate and partially around said well; a vertically positioned motor in said well and having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump also having its drive

shaft located in said trapped air chamber and the upper end of said shaft extending through said top plate; means extending between the drive shaft of the motor and the pump shaft for driving said pump shaft; a hermetically sealed dome secured to and extending over the said top plate and housing said above-mentioned means; an electric switch remote from the water level in circuit with said motor; a float mechanism including a rod connected to said switch for cutting in and out said switch as the water rises and falls above the bilge pump; an electric feed cable passing through the trapped air chamber and the said top plate and connected to said switch and said motor above the said trapped air chamber; the said rod connecting said switch and the said pump shaft also passing through said trapped air chamber into said hermetically sealed dome; and additional means for sealing the cable and the said rod connecting said switch where they pass from the trapped air chamber into said top plate.

3. In a submersible automatic bilge pump, a housing having a top plate and an integral well closed at its bottom depending from said top plate; the walls of said housing forming a trapped air chamber under a portion of the top plate and partially around said well; a vertically positioned motor in said well, having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber, and the said shaft also extending at its upper end through said top plate; connecting means extending between the drive shaft of the motor and the pump shaft for driving said pump shaft; a hermetically sealed dome extending over the top plate and having a chamber therein, said connecting means housed in said chamber; an electric switch in circuit with the motor; a sealed chamber for said switch, located above the said trapped air chamber; a float mechanism including a rod connected to said switch for cutting in and out said switch as the water rises and falls about the bilge pump; an electric feed cable passing through the trapped air chamber and the top plate and connected to the said switch and said motor within the chamber in the sealed dome; and the said rod connecting said switch and the said pump shaft also passing through the trapped air chamber into the hermetically sealed dome to prevent any water from reaching the motor or the said switch.

4. In a submersible automatic bilge pump, a casing open at its bottom and having a top plate, an integral well closed at its bottom and the walls of the casing forming a trapped air chamber under a portion of the top plate; a vertically positioned motor in said well and having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber; the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber in the casing remote from the water level for housing an electric switch; an electric switch in said chamber and in circuit with the motor; a float mechanism including a rod connected to said switch for cutting in and out

said switch as the water rises and falls about the bilge pump; an electric feed cable passing through the trapped air chamber and the top plate and connected to the said switch and to the said motor, the connections being within the dome; and the said rod connecting said switch and the said pump shaft also passing through said trapped air chamber and into said hermetically sealed dome.

5. In a submersible automatic bilge pump, a casing including a top plate, an integral well closed at its bottom for housing a motor, the side walls of the casing being tangent to the said well, forming a trapped air chamber under the top plate and partially around said well; a vertically positioned motor in said well and having its drive shaft extending upwardly through and above said top plate; a centrifugal pump located near the bottom of the casing and having its drive shaft passing through said trapped air chamber; the upper end of the said shaft extending through the said top plate; means extending between the drive shaft of the motor and the pump for driving said pump; a hermetically sealed plastic dome extending over the top plate and having a chamber to receive the above mentioned means; an electric switch in circuit with said motor and also located above the top plate and within the hermetically sealed dome; a float mechanism including a rod for cutting in and out said above mentioned switch as the water rises and falls about the bilge pump; an electric feed cable passing through the trapped air chamber and the top plate and connected to said switch and the said motor, the connections being within the chamber in said dome; the said cable, the said rod cooperating with said switch and the upper end of said pump shaft all passing through the said trapped air chamber into the chamber in the hermetically sealed dome.

6. In a submersible automatic bilge pump, an open casing having a top plate, an integral well closed at its bottom, the walls of the casing forming a trapped air chamber under a portion of the top plate; a vertically positioned motor in said well and having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber, the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber in the casing just below the top plate for housing an electric switch; a tip-up mercury switch in said last mentioned chamber and in circuit with the motor; a float mechanism including a rod connected to said switch for cutting in and out said switch as the water rises and falls about the bilge pump; an electric feed cable passing through the trapped air chamber and the top plate and connected to the said switch and to the said motor, the connections being within the chamber in the dome; and the said rod connecting said switch and the said pump shaft also passing through said trapped air chamber and into said hermetically sealed dome.

7. In a submersible automatic bilge pump, an open casing having a top plate, an integral well closed at its bottom and the walls of the casing forming a trapped air chamber under a portion

of the top plate; a vertically positioned motor in said well and having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber; the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber in the dome above the top plate for housing an electric switch; an electric micro-switch in said last mentioned chamber and in a circuit with the motor; a floating mechanism including a rod connected to said micro-switch for cutting the same in and out as the water rises and falls about the bilge pump; an electric feed cable passing through the trapped air chamber and the top plate and connected to said micro-switch and the said motor, the connections being within the chamber in the dome; and the said rod connecting said micro-switch and the said pump shaft also passing through the said trapped air chamber and into the said hermetically sealed dome.

8. In a submersible automatic bilge pump, an open casing having a top plate, an integral well closed at its bottom and the walls of the casing forming a trapped air chamber under a portion of the top plate; a vertically positioned motor in said well, having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber, the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber in the dome above the top plate for housing an electric switch; an electric micro-switch in said last mentioned chamber and in circuit with the motor; a float mechanism including a rod having a cam on its upper end cooperating with the micro-switch for cutting in and out said switch as the water rises and falls about the bilge pump; an electric feed cable passing through the trapped air chamber and the top plate and connected to said switch and to the said motor, the connections being within the chamber in the dome; and the said rod connecting said switch and the said pump shaft also passing through the said trapped air chamber and into the said hermetically sealed dome.

9. In a submersible automatic bilge pump, an open casing having a top plate, an integral well closed at its bottom and the walls of the casing forming a trapped air chamber under a portion of the top plate; a vertically positioned motor in said well, having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber, the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving

means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber in the dome above the top plate for housing an electric switch; an electric micro-switch in said last mentioned chamber and in circuit with the motor; a float mechanism including a rod; a cam on the upper end of the rod cooperating with said micro-switch for cutting in and out said micro-switch when the float has risen respectively to its maximum position and cutting out the switch when the float is in its lowermost position; an electric feed cable passing through the trapped air chamber and the top plate and connected to the said switch and to the said motor, the connections being within the chamber in the said dome; and the said rod connecting said switch and the said pump shaft also passing through the said trapped air chamber into the said hermetically sealed dome.

10. In a submersible automatic bilge pump, an open casing having a top plate, an integral well closed at its bottom and the walls of the casing forming a trapped air chamber under a portion of the top plate; a vertically positioned motor in said well, having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber, the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber in the dome above the top plate for housing an electric switch; an electric micro-switch in said last mentioned chamber and in circuit with the motor; a float mechanism including a rod; a cam on the upper end of the rod cooperating with said micro-switch for cutting in and out said micro-switch when the float has risen respectively to its maximum position and cutting out the switch when the float is in its lowermost position; an electric feed cable passing through the trapped air chamber and the top plate and connected to the said switch and to the said motor, the connections being within the chamber in the said dome; the said rod connecting said switch and the said pump shaft also passing through the said trapped air chamber into the said hermetically sealed dome; and a bellows secured on the upper end of the said rod to provide an additional sealing about the rod where it passes into the dome and to prevent any water or moisture reaching the cam or the said micro-switch.

11. In a submersible automatic bilge pump, an open casing having a top plate, an integral well closed at its bottom, the walls of the casing forming a trapped air chamber under a portion of the top plate; a vertically positioned motor in said well, having its drive shaft extending upwardly through and above the said top plate; a centrifugal pump having its drive shaft also located in said trapped air chamber, the said shaft at its upper end extending through the said top plate; means extending between the drive shaft of the motor and the pump shaft for driving the latter; a hermetically sealed dome extending over the said top plate and provided with a chamber for housing the driving means extending between the drive shaft of the motor and the pump shaft; a further sealed chamber

15

in the dome above the top plate for housing an electric switch; an electric micro-switch in said last mentioned chamber and in circuit with the motor; a float mechanism including a rod having a cam on its upper end cooperating with said micro-switch for cutting in and out said switch as the water rises and falls about the bilge pump; a casing about said cam, provided with an aperture therein; a ball within said aperture and cooperating with the cam face; an electric feed cable passing through the said trapped air chamber and the top plate and connected to the said switch and to the said motor, the connections

16

being within the chamber in the said dome; and the said rod connecting said switch and the said pump shaft also passing through the trapped air chamber and into the said hermetically sealed dome.

RICHARD R. LOVETT, JR.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,812,874	Hedgion	July 7, 1931