Dec. 3, 1935. T. E. AUD 2,023,351

LIFESAVING SUIT

Filed Feb. 27, 1934 3 Sheets-Sheet 1

Fig. 1.

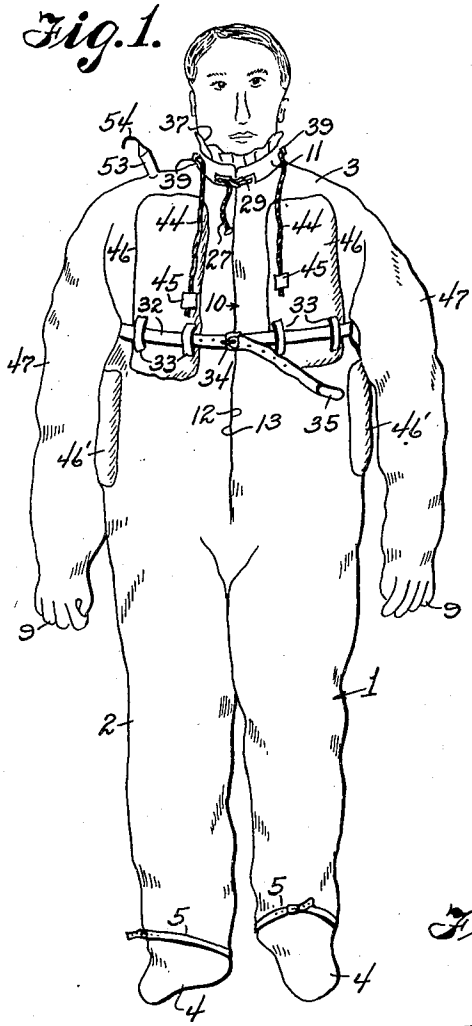


Fig. 2.

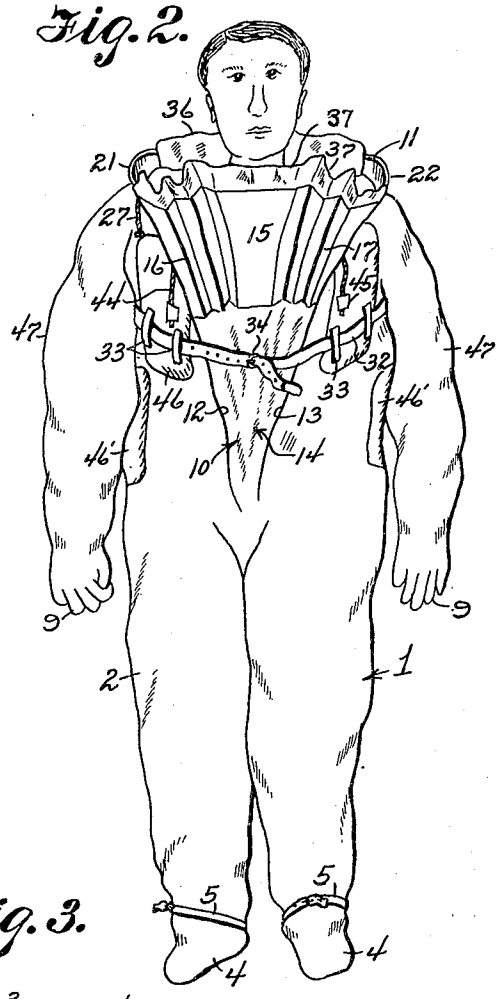
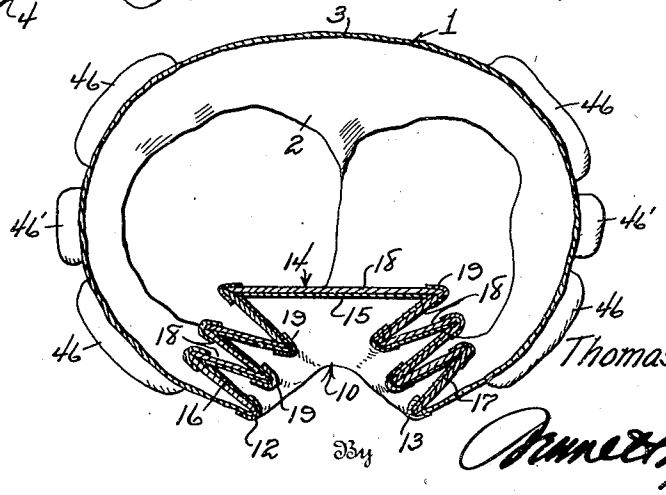


Fig. 3.



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Fig. 4.

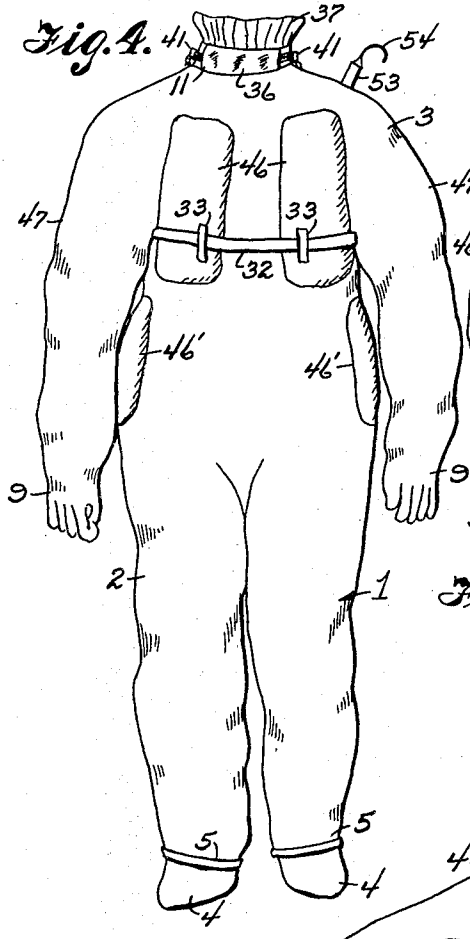


Fig. 5.

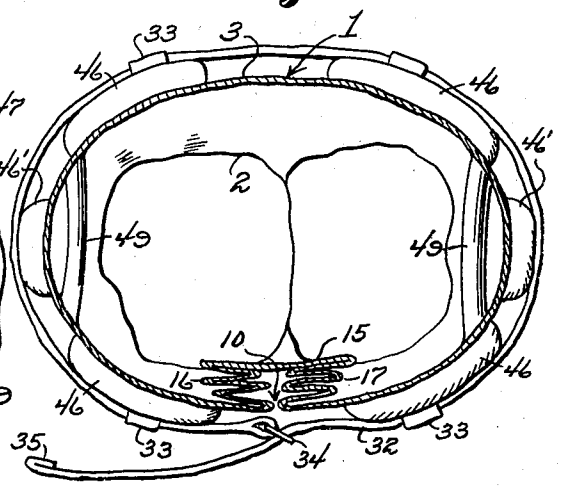


Fig. 6.

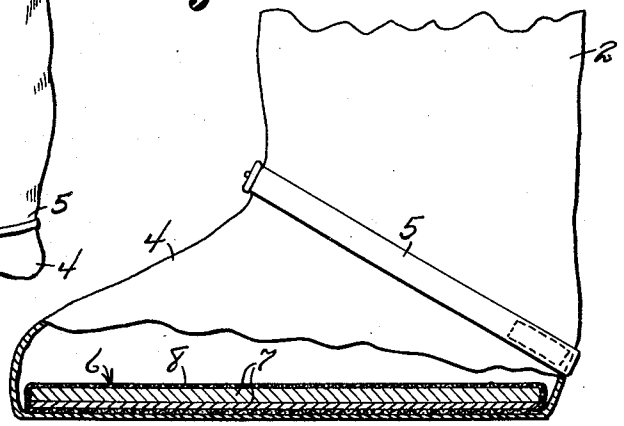


Fig. 7.

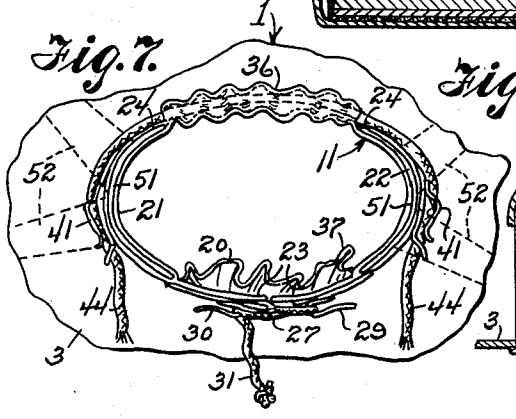


Fig. 9.

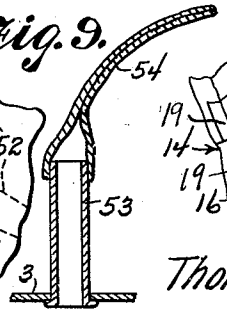
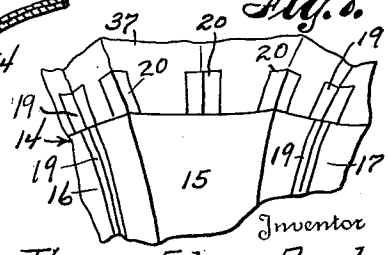


Fig. 8.



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Fig. 10.

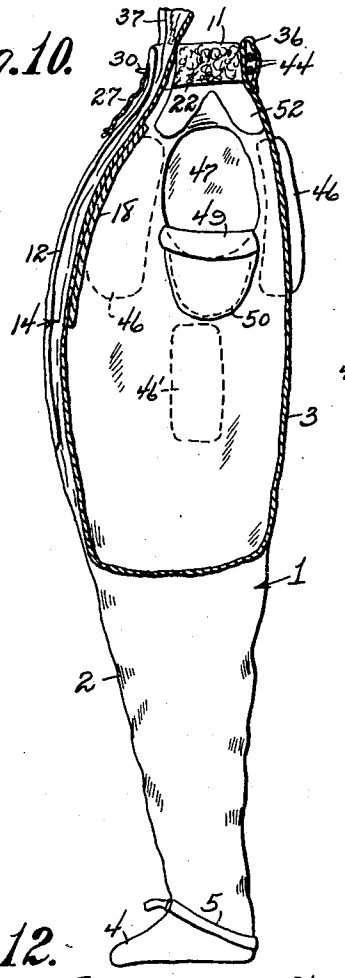


Fig. 11.

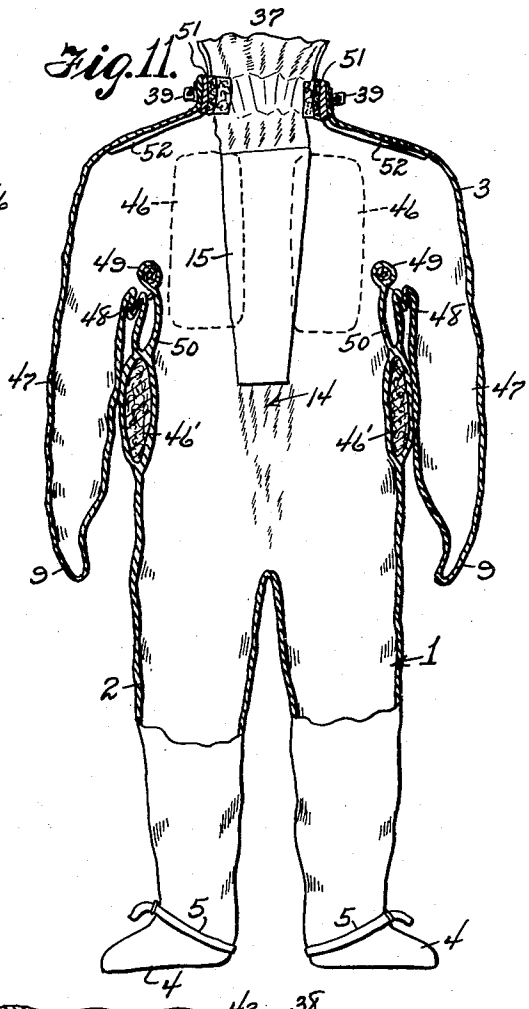


Fig. 12.

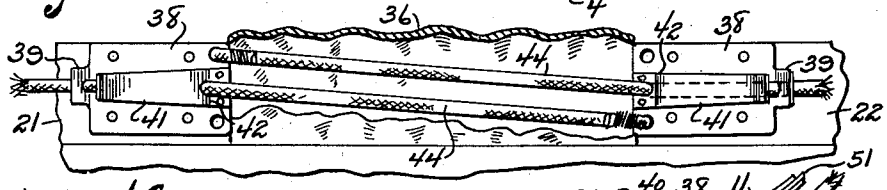


Fig. 14.

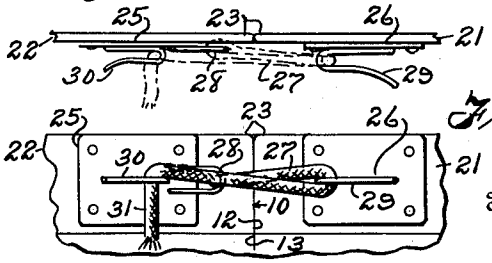


Fig. 13.

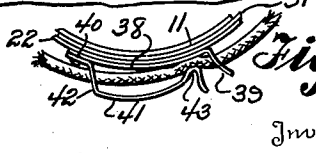


Fig. 15

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Patented Dec. 3, 1935 2,023,351

UNITED STATES PATENT OFFICE

2,023,351

LIFESAVING SUIT

Thomas Edgar Aud, Herndon, Va., assignor to Safety Devices Corporation, Dover, Del., a corporation of Delaware

Application February 27, 1934, Serial No. 713,230

3 Claims. (Cl. 9—20)

This invention relates to improvements in life saving suits or garments of the one-piece or union type, and particularly to improvements in one-piece garments of that kind in which the wearer, in donning and doffing the garment, steps into and out of the garment. More particularly the invention relates to improvements in life saving suits or garments of the general construction disclosed, for example, in Patent No. 1,909,180, granted to Elton B. Jackson, May 16, 1933.

A great desideratum in garments of this character using pull straps or drawstrings as a part of the fastening means for closing the garment and securing the garment in closed condition about the wearer, is the provision of such a fastening means in which the pull straps or drawstrings are so designed, constructed and arranged as to prevent the same from becoming entangled in any part of the garment or disarranged or displaced so as to cause confusion in manipulation or interference with a positive and instantaneous closing action.

One object of my invention, therefore, is to provide fastening means of the pull-strap or drawstring type which is free from such objections, which is always in position for use, which cannot become entangled with other portions of the garment, and which may be operated with certainty to positively close the garment and fasten it in closed position.

Another object of my invention is to provide drawstring means for drawing the sections of a sectional collar of the garment together so as to positively ensure closure of the collar in a watertight manner about the neck of the wearer and to prevent gapping of any sort allowing water to enter.

Still another object of the invention is to provide a novel and improved means which may be operated with certainty for reliably closing the opening in the neckband at the front of the garment.

Still another object of the invention is to provide a novel construction of neckband and front gusset whereby a closer and more comfortable fit of the garment about the person of the wearer is obtained.

Still another object of the invention is to provide means for holding the garment from undue upward movement on the person of the wearer, so as to prevent strain on the arms or other parts of the body of the wearer and possible injury to the wearer under conditions where the wearer is compelled to dive or jump from any considerable height, as from the deck of a vessel, into the water.

Still another object of the invention is to provide means for holding stability weights in the foot portions of the garment from shifting and distorting such portions of the garment or interfering with their proper use.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Fig. 1 is a view showing the garment as applied for use.

Fig. 2 is a similar view showing the garment applied but with the accordion pleated gusset in opened or extended condition.

Fig. 3 is a horizontal transverse section through the garment taken on a line between the arm pits and the shoulders and showing the accordion pleated gusset in partly folded condition.

Fig. 4 is a rear view of the garment shown in Figs. 1 and 2.

Fig. 5 is a sectional view similar to Fig. 3 taken on a line just below the arm pits and showing the garment in closed condition.

Fig. 6 is a sectional elevation through one of the foot portions and adjacent part of the associated leg of the garment.

Fig. 7 is a horizontal section through the neckband portion of the garment, showing the same in closed position.

Fig. 8 is a fragmentary view looking from the inside toward the accordion pleated gusset and showing the same outspread.

Fig. 9 is a sectional view through the air vent device.

Fig. 10 is a central front-to-rear section through the closed garment.

Fig. 11 is a vertical transverse section thereof.

Fig. 12 is a view in elevation, partly in section, of the neckband of the garment, showing the drawstring arrangement for drawing the neckband to closed position.

Fig. 13 is a view showing a feature of construction thereof.

Fig. 14 is a plan view of a portion of the neckband and means for securing the front meeting edges thereof in closed condition.

Fig. 15 is a front elevation of the same.

Referring now more particularly to the drawings, 1 designates the garment, which is made of suitable waterproof material and comprises the trousers portion 2 and jacket portion 3 integrally connected to form a one-piece or union garment.

The trousers portion 2 is provided at the free ends of the leg sections thereof with foot receiving portions 4. Each of these portions is provided with a fastening band or strap 5 to hold it in applied position about the foot of the wearer. Disposed in each foot portion is a weighted insole 6 comprising a single plate or two or more superimposed plates 7 of metal contained within an enclosing sheath or envelope 8 of fabric or other suitable material, which sheath or envelope is cemented or otherwise suitably secured to the bottom or outer sole of the foot portion. These weighted insoles in the foot portions are designed to keep the lower portion of the body of the wearer down in the water and thereby assist in maintaining the wearer in an erect position. The described arrangement of each insole provides for the use of any desired number of plates to make up a prescribed weight and the arrangement of the plates so that they can not shift in and distort the foot portions of the garment and render the use thereof awkward and inconvenient. The arm sections of the jacket portion of the garment are provided with mittens or gloves 9 to encase the hands of the wearer and which, as shown, are preferably integral with the sections of the garment of which they comprise a part.

The garment is provided with a normally closed opening 10 at the front, that is to say, the front of the garment is divided between the neckband 11 and the crotch to provide placket edges 12 and 13 terminally united at the crotch and thence free from connection up to and through the neckband so as to spread in V-fashion to a greater or less extent. This opening 10 is normally closed by an expansible and contractible gusset 14, which extends from the crotch to the neck, and is made, like the body of the garment, of waterproof material and permits of the use of a neck opening of adequate size to allow a person to step through the neck opening into and out of the garment, and also permits of the expansion and contraction of the gusset portion of the garment so that persons of any predetermined size or sizes may easily enter the garment, and then, by contracting the expansible and contractible portion, the garment may be drawn snugly about the body of the entered person.

The gusset 14 comprises a central, substantially flat section 15 and side wings or walls 16 and 17 connecting said section 15 with the placket edges 12 and 13. The walls 16 and 17 may be of unitary type and made of some soft and flexible waterproof material, and said walls are accordion pleated or consist each of a plurality of sections adapted to fold one upon the other accordion fashion, to permit contraction and expansion of the garment, Fig. 3 showing the arrangement when the pleated walls are partly expanded and Fig. 5 the arrangement when the pleated walls are collapsed or folded between the center or body wall 15 and the placket edges 12 and 13 to contract the garment about the body of the wearer. In order to prevent collapse of the wall 15 and to prevent the walls 16 and 17 from folding partly or wholly inside out and to ensure said walls automatically folding in a proper manner when the gusset is contracted, the inner face of the wall 15 and the inner faces of the folds of the walls 16 and 17 are provided with stiffening plies 18, made of some flexible, waterproof material of less flexibility than said walls and sufficiently stiff for the purpose. These stiffening plies are V-shaped to conform to the shape of the wall 15 and pleats of the walls 16 and 17 and are of limited vertical extent, that is, said stiffening members extend from the base of the neckband 11 to a point adjacent to but above the lower end of the sternum or breast bone, so as to prevent rigidity of the suit below such line, whereby the flexibility of the waist portion of the garment will not be interfered with and the wearer will be permitted to have free body movements at and in the region of the waist line. The portions of the walls 15, 16 and 17 are preferably connected at their corners or angles of intersection by flexible stays 19 which increase their strength at the bending points and permit them to be flexed without liability of injury. In addition, the upper edges of the wall 15 and folds of the walls 16 and 17 are preferably reinforced and somewhat stiffened by means of a reinforced band or strip 20 of some suitable relatively thicker and/or stiffer material, by the use of which the upper edges of said walls 15, 16 and 17 are prevented from bending or turning outward or inward during a folding action of said walls, thus allowing the use of very thin and flexible waterproof material in the formation of the walls and ensuring a correct automatic folding of the gusset and closure of the jacket of the garment by the simple securing movement of a closure or fastening member, and without the necessity of the wearer being required to manipulate the gusset in any manner to secure a correct folding action thereof.

The neckband 11 is of divided type and comprises permanent portions 21 and 22 separated at the front and rear of the garment to provide front and rear pairs of meeting edges 23 and 24 respectively. The front meeting edges 23 are continuous with the meeting edges 12 and 13 of the opening 10 and are adapted to open and close therewith. These edges 13 are adapted to be drawn together by a closure fastener comprising bracket plates 25 and 26 fastened to the respective edges 23 and 24 which are adapted for cooperation with a single drawstring or cord 27. One end of this string or cord 27 is permanently engaged with a retaining eye or hook 28 on the plate 25 and the cord is then looped and extended in one direction across the meeting edges 23 and engaged with a fastening hook 29 on the bracket plate 26, then passed in the opposite direction across the meeting edges 23 and engaged with a fastening hook 30 on the bracket plate 25, the opposite end 31 of the cord thence depending in the form of a free or manipulating portion which may be grasped to pull upon the cord and, by a single motion, draw the front meeting edges 23 of the collar and the meeting edges 12 and 13 of the opening 10 together to cause the folding of the gusset 14 and to effect the closing of the opening 10 at the front of the garment. The cord is in guided connection with the hooks 29 and 30 so as to run freely and loosely through said hooks when the meeting edges are open and so as to be drawn into the bights of the hook by the contraction of the cord loop in the drawing of the meeting edges together, the bights of the hook or cord receiving spaces between the same and the bracket plates being flared outwardly and diminishing in width inwardly or, in other words, being wedge shaped, so that in the contracted condition of the cord loop the portions of the cord engaged with the hooks will be wedged between the hooks and their bracket plates and held by the wedging action and spring tension of the hooks so as to effectually prevent casual loosening or disengagement of the fastened cord. The drawn cord, therefore, will keep the front of the garment

closed against any body movements of the wearer when the garment is in service, but at the same time, by a slight manipulation of the free end of the cord, the cord may be released to permit the opening 10 to be spread and the garment opened to permit it to be drawn off the wearer or the wearer to step out of it.

In addition to the draw cord a strap fastener 32 may be employed below the arm pits of the garment and between the same and the waist line for the purpose of preventing any gapping or bulging of the meeting edges 12 and 13 of the front opening 10 in the body movements of the wearer. This strap is continuous and passes at the front and rear of the garment through guide loops 33, and one end of the strap is provided with a buckle 34 and the other end of the strap is adapted to be passed through the buckle and secured to the tongue thereof, the latter-named end of the strap having a folded over portion or stop 35 to prevent it from being drawn outward through the buckle loop 34 so that such end of the strap will always be in position to be grasped for either a garment closing or a garment opening movement. According to circumstances, either the drawstring 27 or the strap 32 may first be manipulated for a closing action, in which they are successively manipulated, upon the operation of which the garment will be closed in an absolutely secure manner.

The rear portion of the neckband 11 is formed by an accordion pleated gusset-like section 36 of soft rubber or other soft flexible, waterproof material, which is connected to and closes the gap between the rear meeting edges 24 and which provides a contractible and expansible portion at the rear of the neckband to adapt such portion of the neckband to be drawn closely and in a watertight manner about the neck of the wearer. The front gusset 14 is provided with a neck portion or neck extension 37 which is also adapted to fold accordion fashion when the meeting edges 23 are brought together and which is designed to close the neckband at the front against access of water, this construction of the band adapting the band as a whole, when closed, to fit closely about the neck so as to prevent any water from entering the garment at this point. This neck extension 37 may be an extension of the thin material forming the accordion pleated walls 16 and 17. When the drawstring or cord 27 is pulled taut, the neck extension 37 is contracted and closed snugly about the neck. A closure fastener of drawstring type is also provided for drawing the neckband ends 23 together and contracting the rear section 36. This closure fastener comprises a pair of similar bracket plates 38 upon the meeting edges 23, each of which plates is provided at its forward end or edge with an outstanding guide lug 39 formed with a guide opening, and attached to the plate 38, adjacent to its rear end or edge, as at 40, is a combined guiding and clamping member 41 comprising a spring metal strip having an outbent, apertured guide lug or portion 42 adjacent to its secured end 40, and having a free portion bent to form a clamping jaw 43 which is disposed adjacent the lug 39. To each bracket plate 38 is secured one end of a drawstring or cord 44 which strings or cords extend in opposite directions through the folding neckband section 36, which is doubled or made hem-shaped to serve as a guide and retainer for such portions of the cords. The cords thence extend from the outside through the guide openings in the guide members or lugs 42 of the fasteners and between the bracket plates 38 and clamping jaws 43 and thence through the guide openings in the lugs 39 toward the front of the garment, the free ends of the cords 44 depending at the front of the jacket 3 and being permanently secured at their extremities, as at 45, to the breast portion of the jacket 3 on opposite sides of the opening 10. By this construction provision is made whereby, by simply grasping and pulling upon the depending front portions of the cords 44, the operator may draw the rear portion of the neckband tightly about his neck, in which operation the folding section 36 folds, accordion fashion, and draws the neckband closely and in a watertight manner about the neck. No further operation is necessary to maintain the neck in its closed condition, as in the operation of manipulating the cords 44 the cords will run freely through the guides 39 and 42 in the closing operation, in which they will slide past the clamping members 43, but, as soon as this pull on the cord ceases, the clamping members 43 will clamp the cords against the plates 38 against any possibility of casual movement under all ordinary uses of the suit. Provision is thus made by means of which, after the suit has been donned by the operator, and the jacket portion and front of the neckband are closed and secured by simple and readily understood and manipulated means, the rear portion of the neckband may be closed as a final operation to make the neck portion of the garment proof against entrance of water. It will be evident that as the draw cords 44 extend through the hem-like neckband section 36, such cords can not become displaced relative to the neckband section, that is to say, they cannot, for example, through confusion, mistake or accident, be displaced so as to lie on the inner side of said section, which might be the case if they were not retained and guided in this manner, and which would result in the section 36 lying outside the cords and not being drawn together and making the neck waterproof as designed, when the cords are drawn for the neck closing action. The construction described avoids this objection and provides a means which obviates the necessity of placing parts in prescribed positions, and the only thing required of the operator is to draw upon the cords for a closing operation.

It will be noted that there are no parts of the draw cords or strap which hang loose or dangle in such manner that they might become operatively displaced or entangled in any manner with the garment so as to cause confusion or mistake on the part of the operator and the liability of the operator putting the garment on incorrectly or closing it in an improper and insecure manner. While these closing advantages are gained, by my improved construction, it will be evident, also, that the closing devices may be easily and readily manipulated to quickly open the garment, after use, and leave it in open condition ready for immediate application when its use at any time is desired or required. The garment construction is such, furthermore, that a person may don it or doff it by simply stepping into it and out of it, and, when the suit is closed about a wearer, it not only is proof against access of water up to the point of the line of the chin of the wearer, but the flexibility of its gusset and neck portions permits the wearer to have free body and neck movements, without any discomfort or objectionable pressure of the garment at any point about the body of the wearer. The donning of the garment simply requires, first, the stepping of the person

into the garment and the drawing upon the ends of the draw cords and strap, which is a simple operation not requiring any pre-adjustments of parts for this purpose, so that the garment may be applied and fastened quickly and in a secure manner even by a person in agitated condition.

The garment is provided with a novel construction and arrangement of buoying and weighting means for keeping the wearer afloat in the water and preventing possible deleterious actions causing injury to the wearer This buoying means is arranged, with a particular exception, on the outside of the garment so that the garment may be drawn close to the person of the wearer and so that the formation of buoyancy-disturbing air pockets in the garment may be prevented. As shown, buoyancy sacks or members **46** and **46'** are disposed at the front, back and sides of the jacket **3** between the center of the garment and the shoulders, each sack or buoyancy member being elongated in a vertical direction and the front and back members **46** extending from a point near the waist line to a point near the shoulder, while the side buoying members **46'** are arranged upon the exterior of the garment at points below the arm pits. By being arranged in the manner described, the buoyancy members, which may consist of kapok or other suitable waterproof buoying material enclosed in a sack or casing of rubber or rubberized fabric sewed, cemented or otherwise secured to the garment, operate to make the buoyancy point or center just high enough to keep the wearer stably erect in the water, without making the garment unduly large or bulky at any point, or causing interference with the body or arm movements of the wearer. In addition to these buoying members **36**, I provide a special construction of the sleeves of the garment and arrangement of auxiliary buoying and weighting members for coaction therewith. As shown particularly in Figs. 10 and 11, each sleeve or arm section **47** is provided with a depressed, normally slack and normally full arm pit portion **48**, which, when the sleeve hangs pendent is in folded condition, and which portions **48** are adapted when the arms are raised to allow the sleeves and adjacent portions of the garment to move upwardly without imposing strain upon the arm pit portions of the garment. Hence a person wearing the garment may, when submerged in the water, raise his arms fully upward for purpose of grasping and climbing into a boat, or for the purpose of climbing up a ladder on the side of the vessel, without danger of causing strains which ordinarily might be sufficient to cause the arm pit portions to break, since the depressed or slack portions **48** will permit of this upward movement of the garment portions without strain.

Arranged on the underside of the garment and extending across the sides of each sleeve opening above the depressed portion **48** is a buoying member **49** of slightly curved or segmental form and made of kapok or the like enclosed in a flexible tubular casing allowing bending of said member in the arm movements of the wearer. From this member **49** depends a flexible apron or shield **50** which closes the space between the margins of said depressed portion and the buoying member, so as to prevent a person in donning the garment from sticking his arm into the sleeve below the buoying member instead of at the proper point. The function of these arm buoying members **49** is, while allowing free movement of the sleeve, to draw the garment upward on the body of the wearer, when the wearer is immersed in water, so that by contact with the arm pits of the wearer undue upward movement of the garment on the wearer will be prevented. By this means proper automatic positioning of the garment on the wearer is ensured, while at the same time the members **49**, in case of a short person being compelled to use a suit normally too long for him, will prevent the garment from rising too high on such person and the center of buoyancy, therefore, from being arranged at too high a point on the body of such person. Hence, even in the event that a suit is too long for a person of given size, such suit may be worn with perfect safety by the person.

It sometimes happens that a person after donning the garment is compelled to jump from a deck or other high elevation into the water. There is extreme danger of injury to the person doing this, for the reason that the buoying means of the suit tends to sharply counteract and arrest the descent of the suit when the wearer enters the water, with the result that the arms of the body of the wearer may be forced up with great suddenness and such force as to be broken or pulled out of their sockets. In order to prevent this, I provide the garment with counteracting weight members to keep the body of the suit down upon the body of the wearer. These weight members comprise stiffening plates **51** which are secured to the sides of the neckband or collar sections **11** and stiffen the same to maintain them in an upright condition, and such plates are covered on their inner sides by a suitable hot and cold insulating facing which may be formed by extensions from the gusset **14** or the gusset **36**. From each of these plates projects a forked weight member **52**, the fork arms of which project at an outward and downward angle so as to rest upon the underlying shoulder of the wearer of the suit. These weight members are thus so arranged as to hold the top part of the jacket **3** down upon the body of the wearer and oppose a resistance to the upward movement of the jacket on the body of the wearer, whereby any forcible upward movement of the garment under the conditions mentioned will be obviated and injury to the garment wearer prevented when jumping or diving from a height into the water.

Applied to the suit at a suitably high point is an air escape valve device comprising a rigid tubular stem **53** having a normally flat soft rubber tube **54** extending therefrom. Under pressure the member **54** will be dilated and opened to allow air to escape from the suit and will then collapse and close to prevent inlet of air thereto.

From the foregoing description, taken in connection with the accompanying drawings, the construction, mode of operation and advantages of my improved life saving garment will be readily understood and such advantages appreciated by those versed in the art. While the construction of parts shown is preferred, it will, of course, be understood that changes in the form, arrangement and construction of the parts may be made, within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim is:—

1. A life saving suit embodying a jacket having a collar divided at front and rear, means for uniting the edges of the collar at the front, a hem-like accordion-folding guide gusset uniting the edges of the collar at the rear, a retaining element at each side of the rear division of the

collar each having a pair of spaced guiding members and an intervening clamping member thereon, and a drawstring extending through the gusset and in running and clamping engagement with the guiding and clamping members of said retaining elements.

2. A life saving garment embodying a jacket having a collar divided at front and rear and provided with an entrance and exit opening extending at the front of the jacket between the garment crotch and the collar and intersecting the front division of the latter, an accordion pleated folding gusset closing said exit and entrance opening, means for uniting the edges of the collar at the front, a hem-like accordion-folding guide gusset uniting the edges of the collar at the rear, a retaining element at each side of the rear division of the collar each having a pair of spaced guiding members and an intervening clamping member thereon, and a drawstring extending through the gusset and in running and clamping engagement with the guiding and clamping members of said retaining elements.

3. A life saving suit having an entrance and exit opening and embodying a split collar having meeting edges communicating with the meeting edges of the garment at the sides of the opening, bracket plates on the meeting edges of the collar, bracket plates on the collar at opposite sides of and adjacent to said meeting edges, horizontally disposed hooks on the bracket plates having their entrances facing in opposite directions and away from the respective meeting edges, a third hook vertically disposed upon one of the bracket plates between the horizontally disposed hook thereon and the meeting edge to which said bracket plate is attached and having its entrance facing toward said hook, and a drawstring engaged at one end with said vertically disposed hook and adapted to be looped and engaged with the horizontally disposed hooks to hold the meeting edges of the collar closed.

THOMAS EDGAR AUD.