2 Sheets—Sheet 1.

W. H. JOHNSTONE.

Stiffened Jacket or Envelope for Supporting Various Parts of the Human Frame.

No. 224,784. Patented Feb. 24, 1880.



Fig. 6

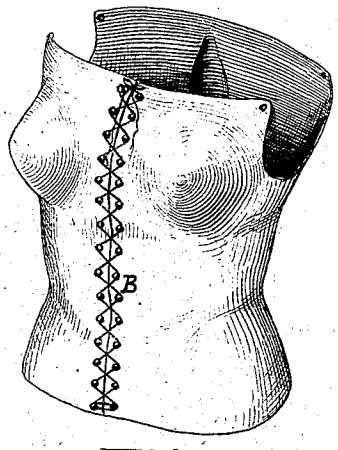


Fig. 1



Fig. 7

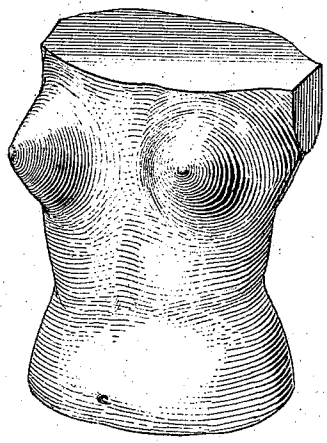


Fig. 2

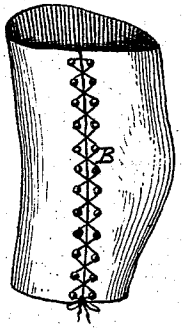


Fig. 4

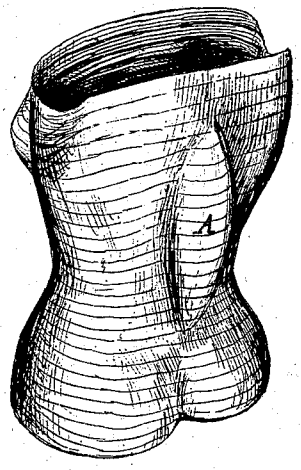


Fig. 3

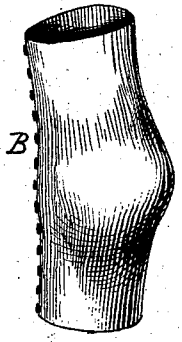


Fig. 5

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2 Sheets—Sheet 2.

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Stiffened Jacket or Envelope for Supporting Various Parts of the Human Frame.

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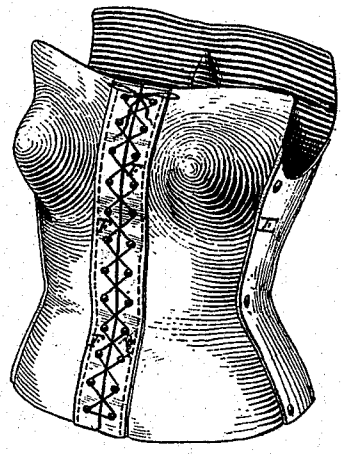


Fig. 8.

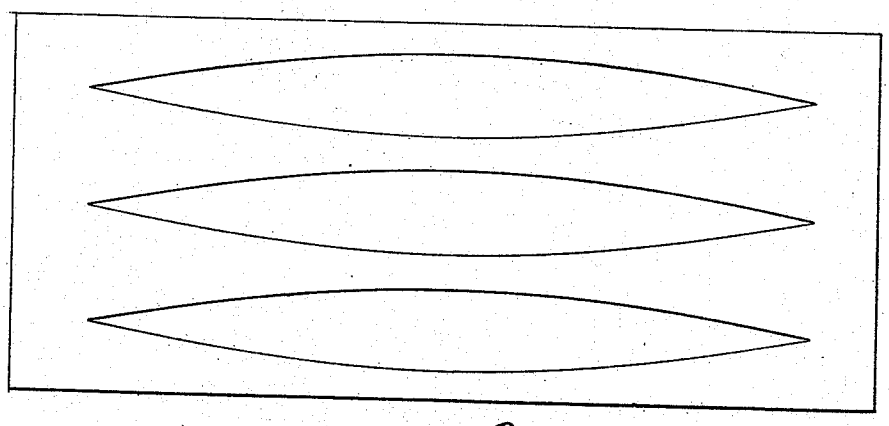


Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM H. JOHNSTONE, OF PHILADELPHIA, PENNSYLVANIA.

STIFFENED JACKET OR ENVELOPE FOR SUPPORTING VARIOUS PARTS OF THE HUMAN FRAME.

SPECIFICATION forming part of Letters Patent No. 224,784, dated February 24, 1880.

Application filed August 13, 1879.

To all whom it may concern:

Be it known that I, WILLIAM HAMPDEN JOHNSTONE, of Philadelphia, State of Pennsylvania, have invented certain new and Improved Stiffened Jackets or Envelopes Adapted to Conform to and Support Various Parts of the Human Frame; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawings, making part hereof.

The nature of my invention will fully appear from the following specification and claim.

The object of my invention is to provide a stiffened envelope for any part of the human frame which it is desired to support or sustain, and, while several layers of woven cloth stiffened with shellac might suffice for this object, I prefer to employ a material which I call a "compound felt" as one best adapted to the ends which I have in view, and which I have fully described in an application for a patent filed simultaneously with the application for this patent.

To enable others skilled in the art to make and use my invention, I will describe its construction and operation.

In the drawings, Figure 1 is a perspective view of one of my jackets; Fig. 2, a similar view of the body or trunk which the jacket shown in Fig. 1 is designed to fit; Fig. 3, a similar view of a wrap and plaster mold or cast made upon the body shown in Fig. 2, also showing a hollow protuberance to fit and support a deformity in the back of the person whom it is designed to fit; Fig. 4, a perspective view of an envelope or support for the knee or arms; Fig. 5, a similar view of an envelope for another class of deformity of the knee or arm; Fig. 6, a sectional view, showing the construction of the felt which I use in my jackets or envelopes, consisting of a layer of short-fibered felt in the interior, loosely felted, and an exterior layer upon each side of long fibers, more closely felted; Fig. 7, a similar view, showing more clearly the difference in length of fiber between that of the interior layer (the dark fiber) and that of the exterior layer, (the lighter fibers,) there being only two layers shown here; Fig. 8, a view similar to Fig. 1, showing the strengthening supports or re-enforcements; Fig. 9, a view of a textile fabric for taking casts.

A, Fig. 3, represents a protuberance in the cast made by the deformity in the body which it is designed to support and strengthen, which in this case is a spinal weakness. B, Figs. 1, 4, and 5, is the lacing. C is the inner layer of loosely-felted short fibers; D D′, the outer layers of closely-felted short fibers.

Suppose that the body or trunk shown in Fig. 2 is to be fitted with a jacket such as is shown in Fig. 1, in order to support a weakness of the spine, such as is indicated in the mold shown in Fig. 3. It is first necessary to take the mold of the form of the body, and to do this I proceed as follows: I place the person to be fitted in the best position to establish extension of the spine. I previously prepare a solution of plaster-of-paris, silicate of soda, paraffine, or any other suitable substance or material. In this solution I saturate a long bandage or series of strips of fabric—say muslin—and I pass the saturated strip smoothly and rapidly around the trunk of the person to be fitted, applying the bandage in a sufficient number of layers to preserve when dry, in a stiff or rigid state, the exact form of the body of the individual, including any deformed part. When this mold is firm and hard I remove it by cutting it carefully up the front or other desired part, and remove it from the body.

I can take this mold over a tightly-fitting sleeveless undershirt; or, which I prefer, it may be taken upon the bare body, which should be carefully oiled as a preliminary step to prevent the hair and skin from sticking to the mold; or I take a solid mold with pure plaster-of-paris.

Now, when the mold above described has grown firm and hard and has been cut away, it will be found to have retained within exactly the contour of the whole surface of the body, as well as of the deformed part. The result will be a mold such as is shown in Fig. 3, excepting that it is not shown to be cut in that figure. I now take a piece of my above-described felting and cut it to a size suitable to cover the length and round of the body. I now prepare the solution in which to soak the felt so cut to stiffen it. In preparing this so-

lution I prefer to use shellac as the stiffening agent, though other good agents known to the arts may be used. I employ a proportion of about four pounds of shellac to one gallon of alcohol, and to a proportion of about twenty-eight square feet of compound felt I absorb about one and one-fifth gallon of the solution. I take the piece so cut and saturate it thoroughly in this solution. Now, as the interior of this felt is more loosely felted than the outer layers, the interior will receive and retain by absorption more of the shellac than the outer parts. I then pass the piece through the cold calender-rolls, placed at just the same distances apart as is equal to the thickness of the interior layer of felting—that is, of the interior lap. This rolling of the saturated fabric has the effect of equalizing the distribution of the shellac and of compressing nearly all of it out of the exterior laps, and of forcing it into the interior lap, leaving the outer layers soft and smooth. The material must be thoroughly dried.

While the cloth is being thus prepared I take a plaster-of-paris cast in the form of a solid block by filling the mold, Fig. 3, with plaster-of-paris. When this cast is dry it will be an exact reproduction in form of the body of the person to be fitted, including the deformity above spoken of and every irregularity of surface. I now take the piece of saturated felt and place it in a steam-box to be softened. The action of the hot live steam upon the shellac in the felt is much to be preferred to that resulting from plunging it into hot water. Hot water is apt to cake the shellac or run it together in a hard caked mass, while steam gently softens it and does not destroy the porosity of the fabric. After the felt has thus been softened it is wrapped about the above-named cast, Fig. 2, of the body, so as to bring the opening in front, to provide for subsequent lacing. Then all parts of the felt are gently pressed into the inequalities of the cast—that is, the felt is blocked upon the cast of the body—and as soon as it assumes sufficient stiffness (which ensues almost immediately thereafter) I proceed to cut off all superfluous parts of the felt—that is, I cut out the arm-holes and mark and cut the overlapping edges in front, so as to make a joint to be brought together by lacing, all as shown in Fig. 1.

Instead of using lacers for keeping the jacket or envelope closed tightly about the person, hooks and eyes may be used, or, instead of either of these methods, bandages may be wrapped about the envelope to keep it closed. Also, if it is desired to further strengthen or re-enforce that part of the jacket being formed which is to directly support the weak part, a piece of felt similarly saturated, dried, and softened is blocked against that part of the conformed jacket which it is so desired to strengthen, so as to be made to conform therewith; or a piece of steel-plate or brass or other metallic plate, or thick leather or hard rubber, can be so used, excepting the last-named materials will be more difficult to conform to the exact shape. Leather and rubber can be softened, however, for the purpose. The jacket is then removed from the cast, and will be found to exactly conform to every part of the body of the person to be fitted which it is desired to support.

The re-enforcement can be riveted in place, as is shown in the case of a side re-enforcement at E, Fig. 8. A re-enforcement can also be carried around the outside of the jacket in the general form of a belt. These re-enforcements are fitted upon the jacket while it is upon the plaster cast, and they are warmed and softened so as to conform to it. Hooks or hooks and eyes, or, if desired, buckles and straps, are then affixed to the two front edges of the jacket, as shown at B in Fig. 1, and it is then ready for use. As it is desirable to so strengthen these front edges that the hooks will neither pull out nor, by being drawn tightly, break the edges down, I place a supplemental strengthening-strip of felt or leather along each edge, as shown at F, Fig. 8, through which only the shank of the hook or eye is to pass.

As the disease for which the patient is being treated yields to the treatment, and as it will then be desirable to lace up the jacket more tightly, it will become necessary to pare off these edges of the felt jacket, so as to make the space inclosed by the jacket smaller. In view of this contingency I place the two rows of hooks or hooks and eyes back some distance from the edges to allow for the paring; but when I use the leather strip F, I simply stitch it to the jacket upon that edge of the leather strips which is farthest away from the edges of the jacket, respectively, and when it becomes necessary to pare the edges of the jacket I rip out the stitching and set the strips back to a distance corresponding with the width of the parts cut off. I thus form a jacket which presents to the body of the person wearing it a soft, smooth, felted surface, while it possesses all the rigidity necessary to support the weak part, and also is rendered very comfortable, as it does not press unduly upon any one irregularity of the surface, since it conforms therewith.

Laced splints for deformities of the limbs are made in substantially the same way as those above described for the body, and are shown in Figs. 4 and 5. These laced splints are peculiarly valuable for caries, anchylosis, and sprained joints.

For common splints for broken joints, &c., excepting that I employ my newly-devised felt, I use the ordinary form shown and described in Ahl's patents of May 17, 1859, October 15, 1861, and September 4, 1877—that is, the splints are made in two sections, one for one side of the limb and one for the other. They are warmed and applied to the limb so as to conform to it.

The difficulty with the material of all the old felt splints was that the felt was of uniform density and the shellac remained, to a great

extent, upon the surface, instead of passing to the interior. This, when dry, rendered the surface harsh and disagreeable to the patient. Because the alkaline solvent in the shellac gradually so disintegrated it that it was rendered liable to break upon the least bending, it would in a short time pulverize at points of strain and fall out, thus taking away the element of stiffness from the splint. My fabric, however, has two soft surfaces, while the shellac, being dissolved simply in alcohol and protected from attrition by the soft surfaces, retains its body and strength.

In preparing felt splints heretofore a sulphuric-acid bath has been used to give hardness to the shellac and to overcome the ill effects of using an alkaline solvent; but this resulted invariably in giving a brittle character to the shellac, which rendered the felt liable to snap or break, instead of springing. It destroyed its elasticity and flexibility. I therefore use the pure shellac and employ only a solvent which will evaporate without any deleterious influences upon the shellac, using no bath subsequently but the steam bath to soften.

There is another method of taking the mold and cast, which may be described as follows: I use a strip of muslin or other suitable fabric, either in one, two, or three layers, cut or slashed, as shown in Fig. 9. This I saturate with the solution of shellac above described and dry it. It is then ready for use. I use it by first heating it, either in warm water or steam, to soften the shellac, then wrap it about the body or limb of which a mold is to be taken. The slashes will allow the edges of the material to overlap, instead of doubling up or folding. The material should be handled quickly, as it will soon cool and become stiff again. When it has dried upon the form of the person it is cut off, and will be found to be a perfect mold thereof, from the interior of which a plaster cast can be easily taken.

Instead of plaster-of-paris for the cast, I can use any of the various kinds of cements known in the arts and used for similar purposes.

It will be observed that my laced jacket or splint can be removed at will from the body of the wearer. This enables the patient to wash, and also permits intervals of relaxation, in which the patient can exercise or rest.

Buckles and straps may be used instead of the lacing and hooks.

In using the simple splints for fractures, where one section of the splint is clapped upon one side of the limb and the other upon the other side, I use an endless rubber band or bands to hold the splints in place, instead of using a long strip of muslin. I thus provide for the swelling of the fractured part going down and guard against the splints becoming loose, for the bands will contract as the pressure from within grows less.

Instead of my envelopes being open at only one side, I can have them open upon several sides and lace up at each opening.

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

The process herein described of forming a stiffened close-fitting jacket by first taking a mold of that part of the person which is to be fitted, taking a cast from the mold, and fitting the jacket by blocking it upon the cast, substantially as described.

WILLIAM HAMPDEN JOHNSTONE.

Witnesses:
HENRY V. BUCKLEY,
WINFIELD S. JOHNSON.