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COMPLETE SPECIFICATION.

Improvements in Sails.

I, NATHANIEL GREENE HERRESHOFF, residing at Walley Street, in the Town of Bristol, in the County of Bristol, and State of Rhode Island, United States of America, Engineer and Naval Architect, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention applies to all approximately triangular sails, as jibs, foresails and staysails.

Sails are exposed to tensile strains in all directions, but the forces in different directions widely vary. The greatest strain in a sail of this form practically coincides with the directions in which it is most important to attain permanence of dimensions. The parallel cloths in the upper and lower parts of my sail receive the greatest strains in directions substantially transverse to their lengths, and the arrangement also attains permanence of dimensions in the same directions. In the central area the tapering cloths each extend smoothly and continuously across the sail, and the upper and lower parts are properly joined by continuous seams which extend quite across, and all oblique junctions, with the weakness, elastic yielding and liability to shrinkage incident thereto, are avoided.

It is common to manufacture sails from comparatively narrow strips of canvas, technically cloths, strongly and smoothly sewed together, and much attention has been given to the arrangement thereof. As sail canvas is usually manufactured it is stronger and firmer and less subject to stretching and shrinking transversely than longitudinally of the cloth, and it is desirable to so arrange the strips in sails that the cloths shall be presented transversely to receive the heaviest strains and to maintain the most permanent dimensions. Arrangements have been proposed and tried with more or less success to attain this end, but as heretofore carried out, such arrangements have, in triangular sails, been believed to require a diagonal seam across the sail and oblique junctions of the ordinary seams therewith. There are objections to such, for the reason, among others, that there is an unavoidable want of uniformity in the elastic yielding, stretching and shrinking between such bias junctions and the other portions of the sail. I have discovered that it is practicable to avoid such angular junctions and attain the desired presentation of the cloths over a large portion of the sail area, and to present the cloths all in continuous lengths each extending quite across the sail.

In my improvement, instead of employing the usual diagonal or mitered seam running across the sail from the clew to the luff, and joining the upper and lower parts which have the cloths extending in different directions, I make the sail so that the upper and lower parts are composed of ordinary parallel cloths, joining them by means of cloths cut tapering, the seams of which radiate from a point or from several points on or outside the luff of the sail and opposite the clew. From the edges of these tapering cloths, parallel breadths are joined by sewing or in any other manner, until the whole sail is completed. These parallel cloths may be perpendicular to the leech in the upper part and perpendicular to the foot in the lower part. I prefer arranging them perpendicularly to imaginary lines running to the head and tack from a point in the sail a little distance inside of the clew. The invention keeps the weft of the fabric in the general direction of the greatest.

[Price 8d.]

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strain when the sail is in use, and at the same time avoids the use of the oblique joints.

The accompanying drawings form a part of this Specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a side view of a jib.

The remaining figures are on a smaller scale.

Fig. 2 shows a modification in which the seams in the fan-like portion radiate from more than one center.

Fig. 3 shows the invention applied to a sail in which the length of the foot is greater relatively to the length of the leech.

Fig. 4 is a jib-headed topsail.

Fig. 5 is a yacht yard topsail.

Fig. 6 is a barge's topsail.

Fig. 7 is a yacht's stay foresail.

All show the joints plainly marked by single lines. It will be understood that the joints may be made with double seams, and with all the ordinary or suitable provisions for strength and smoothness.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

Referring to Figure 1, I will describe the entire sail area as divided into three parts, A indicating the upper portion, and B the lower portion. An imaginary center line *c, a*, extends from the head *a* to a point *c* near but considerably within the clew *d*. The cloths in the portion A are of full breadth and arranged at right angles to this line. The cloths in the portion B are similarly of full breadth and arranged parallel to each other and at right angles to an imaginary line *c, b*, which extends from the same point *c* to the tack.

D is the area of the sail between the parts A and B. For this the cloths are cut tapering and are inserted fan-wise, with their broader ends presented to the leech and foot respectively, and the narrower ends to the forward edge, the luff, of the sail.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention.

In Figure 1 I have shown the taper as converging to a single point considerably forward of the luff. I prefer such in order to give an attractive appearance, but this may be varied. Thus the uppermost of the several cloths in the part D may taper at such rate that if continued the boundaries would come to a point at a certain distance beyond the luff, and the adjacent tapering cloth may converge at a different rate so as to come together at a more distant point. Figure 2 shows such an arrangement.

In Figure 3 the tapering cloths all converge to a single point, as in Fig. 1, but the proportions of the sail are different.

In Figure 4, a jib-headed topsail,—the area D bears a larger proportion to the areas A and B, but the arrangement of the gores is the same.

Figure 5 shows the application of my invention to a sail in which the form departs slightly from the triangular or jib form. In this the area of the part D is less than in the last.

In Figure 6 the seams in the part D range towards a point which is only a little outside of the luff rope.

Economy may be attained with my tapering forms of the cloths in the mid portion by reversing the arrangements of the cloths, cutting sufficient lengths of ordinary fabric obliquely longitudinally, retaining one selvedge on each portion, and utilizing both the tapering pieces thus produced by turning one relatively to the other. This presents the yarns but slightly oblique and may serve for ordinary use, but in preparing the sails for the best class of yachts, such economy may be overruled, and the required taper be given by cutting equally from each side of each of the tapering cloths. For small sails with sufficiently wide material it is possible to make the part D of a single cloth properly tapered.

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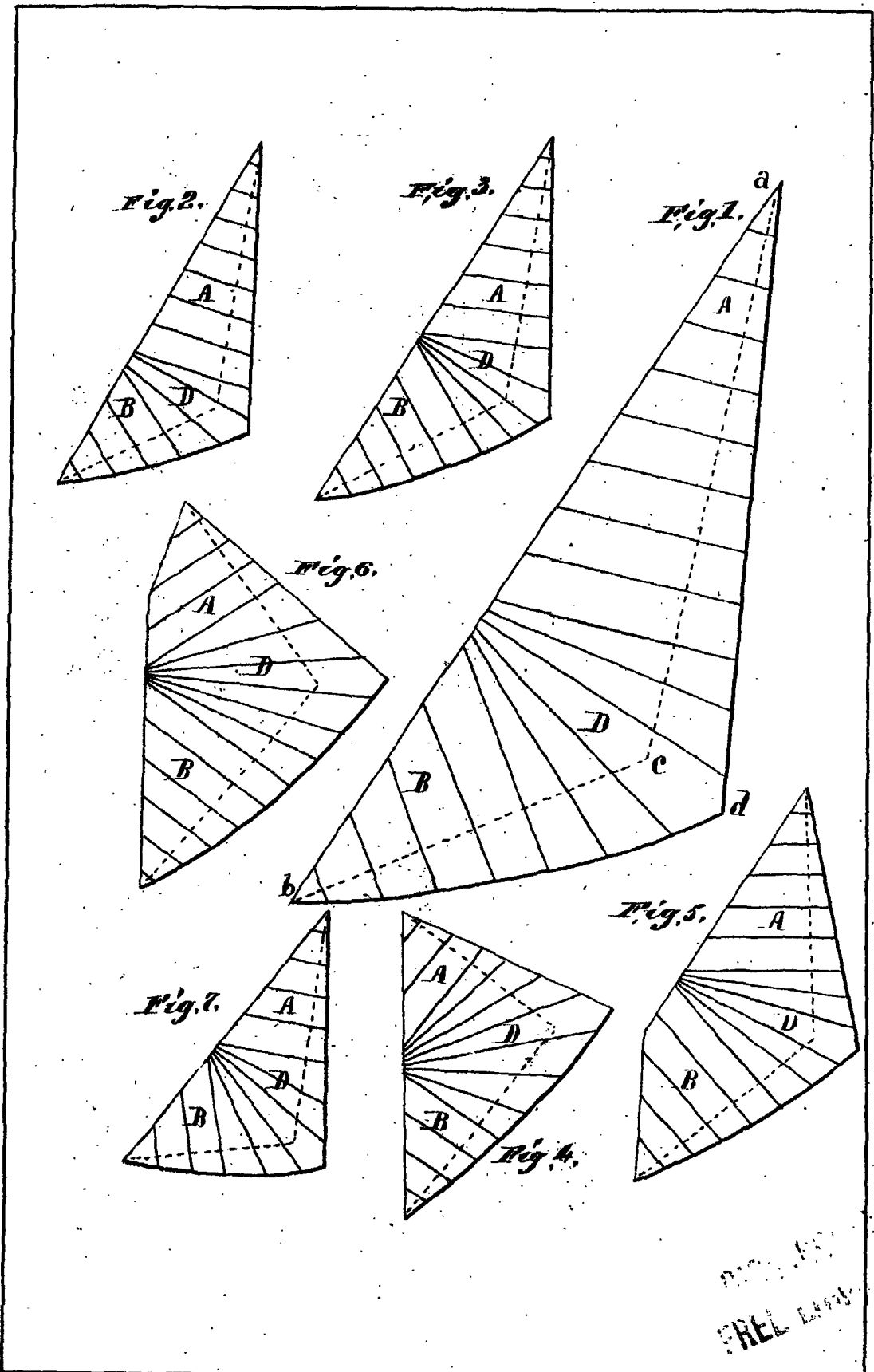
Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

- 5 1. In the manufacture of jibs or other approximately triangular sails, the combination of a middle portion having tapering cloths arranged fan-wise and extending each continuously across the sail, with two other portions, one above, in which the seams are parallel and run across the sail from the leech to the luff, and the other below in which the seams are parallel and run across the sail from the foot to the luff, as herein specified.
- 10 2. In a triangular sail manufactured with the seams in the upper portion extending perpendicularly to a line near the leech and in the lower portion perpendicularly to a line near the foot, connecting the two portions with a portion in which one or more tapering cloths are used, arranged radially so as to fill up the space between the upper and lower portions substantially as herein
15 specified.
3. A sail in three portions with the cloths extending in different directions, all constructed, combined and arranged to serve substantially as herein specified.

Dated this 23rd day of April 1895.

ALLISON BROS.,
Agents for the Applicant.

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[This Drawing is a reproduction of the Original on a reduced scale]

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