SAILCLOTH, now more commonly called canvas (*q.v.*), usually a double warp, single weft fabric of the same structure as bagging (*q.v.*), although it is sometimes made with single threads of warp. Hemp and ramie are occasionally used in the manufacture of this cloth, but flax and cotton are the chief fibres employed. Many of the sails of fishing smacks and similar vessels are made entirely of cotton—the fabric sometimes retaining its natural colour, but more often dyed or stained tan. Since most of the larger vessels are now driven by steam, the quantity of cloth used for sails is comparatively small. A large quantity of cloth, however, is used on steamships for covers, and for coal bags, sailcloth buckets, &c.

The very best kind of sailcloth is made from long flax, as this fibre possesses flexibility, lightness and strength combined. The number of threads per inch of warp varies from 14 double threads to 48 double threads, and from 12 to 36 shots per inch of weft, while the usual widths are 18, 24, 30 and 36 in. Cotton canvas has for its limits about 26 to 54 threads of warp per inch, and 15 to 46 shots per inch; the warp yarn for cottons may be 2, 3 or several ply.

Great care has to be exercised in the manufacture of canvas for the British Admiralty. The yarns must be made wholly from long flax, well and evenly spun, and properly twisted. They must also be free from blacks, and be twice boiled in order to remove all injurious matter. From the grey state to the cleaned state the yarns must lose 10% of weight, and no deleterious substance whatever must be used in any stage. The mill washing and first boiling reduce the weight about 8%, while about 2% is removed during the second boiling. Finally, the yarn is thoroughly washed to remove all traces of alkali. The successive processes which the yarn is subjected to remove all impurities, and leave the yarn in the best condition for weaving. Canvas is made in sixteen different qualities: the heaviest is No. oooo, then follow Nos. ooo, oo, o, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. Of these sixteen varieties Nos. 1 to 8 are mostly in use. Nos. 1, 2, 4, 6 and 7 are used for royal navy canvas, and Nos. 4 and 6 for the merchant navy. The canvas for the Admiralty is 24 in. wide, and the pieces, termed bolts, should be as nearly as practicable 40 yds. of legal measure in length, and to be completely manufactured—particular attention being given to the weaving; the selvages to be evenly and well manufactured, the thrum to be left on each end of the bolt, and to be made as nearly as possible in the proportion of weights given below.

The breaking tests for red and grey canvas are 5% below those for white canvas.

Canvas Number.	Weight of Warp.	Weight of Bolt.	Length of Bolt.	Reed.	No. of Threads.	Breaking Test for Warp.	Breaking Test for Weft.	Dimensions of Testing Strip.
	lb.	lb.	yds.	Score.	Double.	lb.	lb.	in.
1	26	46	39	16½	660	340	480	24×1
2	24	43	39	16½	660	320	460	24×1
3	22	40	39	16½	660	300	440	24×1
4	21	36	39	17	680	280	400	24×1
5	19	33	39	17	680	260	370	24×1
6	18	30	39	17	680	250	350	24×1
7	15	27	40	20	800 single	330	390	24×1½
8	14	23	40	20	800 ,,	310	380	24×1½

Sailmaking is a very ancient industry, but it is, naturally, much less important than it was before the introduction of steamships. The operations of the sailmaker may be stated as follows. The dimensions of mast and yards and sail plan being supplied, the master sailmaker is enabled to determine the dimensions of each sail—after due allowance for stretching—in terms of cloths and depth in yards—if a square sail, the number of cloths in the head, number in the foot and the depth in yards; if a fore-and-aft sail (triangular), the number of cloths in the foot and the depth in yards of the luff or stay and of leech or after-leech; if a fore-and-aft sail (trapezium form), the number of cloths in the head, number in foot, and the depth of mast or luff and of after-leech. These particulars obtained, there is got out what is technically termed a "casting," which simply means the shape, length, &c., of each individual cloth in the sail. These figures are given to the cutter, who proceeds to cut out the sail cloth by cloth in consecutive order, numbering them 1, 2, 3, 4, &c.; the series of cloths thus cut out are handed over to the workman, who joins them together by carefully made double flat seams, sewn with twine specially prepared for the purpose, with about 120 stitches in a yard. In the heavy sails the seam is about 1½ in. in width, and in the British navy stuck or stitched in the middle of the seam to give additional strength; the seams in the lighter sails are about 1 in. wide. The whole of the cloths are then brought together, and spread out, and the tabling (or hemming, so to speak) is turned in and finished off with about 72

stitches to a yard. Strengthening pieces or "linings" are affixed where considered necessary, in courses and top-sails such pieces as reef-bands, middle-bands, foot-bands, leech-linings, bunt-line cloths; in top-sails (only) a top-lining or brim; in other and lighter sails such pieces as mast-lining clew and head, tack and corner pieces; holes, such as head, reef, stay (luff), mast, cringle, bunt-line, &c., are also made where required, a grommet of line of suitable size being worked in them to prevent their being cut through. The next thing to be done is to secure the edges of the sail. Bolt-rope, a comparatively soft laid rope made from the finer hemp yarn (Italian) is used for this purpose; in the British navy it ranges from 1 in. (increasing in size by quarter inches) up to 8 in. inclusive; it is then neatly sewn on with roping twine specially prepared, the needle and twine passing between and clear of every two strands of the rope in roping. Where slack sail has to be taken in, it is the practice to leave it to the judgment of the sail-maker; but where possible it is better to set up the rope by means of a tackle to a strain approximate to what it will have to bear when in use, and whilst on the stretch mark it off in yards, as also the edge of the sail in yards, so that by bringing the marks together in roping the sail will stand flat. In the British navy the largest size of rope sewn on to a sail is 6 in; sizes above this are used for foot and clew ropes of top-sails and courses, being first wormed, parcelled (that is, wound round with strips of worn canvas), tarred and served over with spun yarn; the foot of the sail is then secured to it by being marled in. Where two sizes of bolt-rope used in roping a sail have to be connected, it is effected by a tapered splice. Cringles (similar to the handle of a maund) formed by a strand of bolt-rope, mostly having a galvanized iron thimble in them as a protection, are then stuck where necessary, as at the corners, sides or leeches, mast or luff; they are required either for making stationary or hauling "taut" by tackle or otherwise certain parts of the sail when in use. Fore-and-aft sails, such as spankers, gaff-sails and storm try-sails, are reduced in size by reef-points made of stout line (4 to 20 lb), crow-footed in the middle, a hole being pierced through every seam; one-half of the point is passed through and the crowfoot sewn firmly to the sail; the number of reefs depends upon the size of the sail, and the reefs are placed parallel to the foot. The sails—now finished in respect of making—have to be fitted, that is, such ropes have to be attached to each of them as are necessary for proper use; such ropes may be summarily stated as follows: head-earings, robands, reef-earings, reef-lines, spilling and slab lines, reef-tackle pendant, reef-points, bow-line bridles, bunt-line toggles, bunt-becket, leech-line strops and toggles, toggles in clews, sheet ropes, down-haul, lacings, head and stay, tack-rope (gaff top-sail), tack lashing, bending strops, matting and gaskets.

The tools and appliances of a sailmaker are not very numerous: a bench about 7 ft. long and 15 in. high, upon which he sits; palms for seaming and roping to fit the hand, made of hide lined with leather, a plate properly tempered being fixed in it having chambers to catch the head of the needle, thus acting as a thimble; needles of various sizes, that for seaming being the smallest; and fids, splicing, serving and stretching knife, rubber, sail-hook, bobbin for twine, and sundry small articles. (T. Wo.)