

No. 640,116.

Patented Dec. 26, 1899.

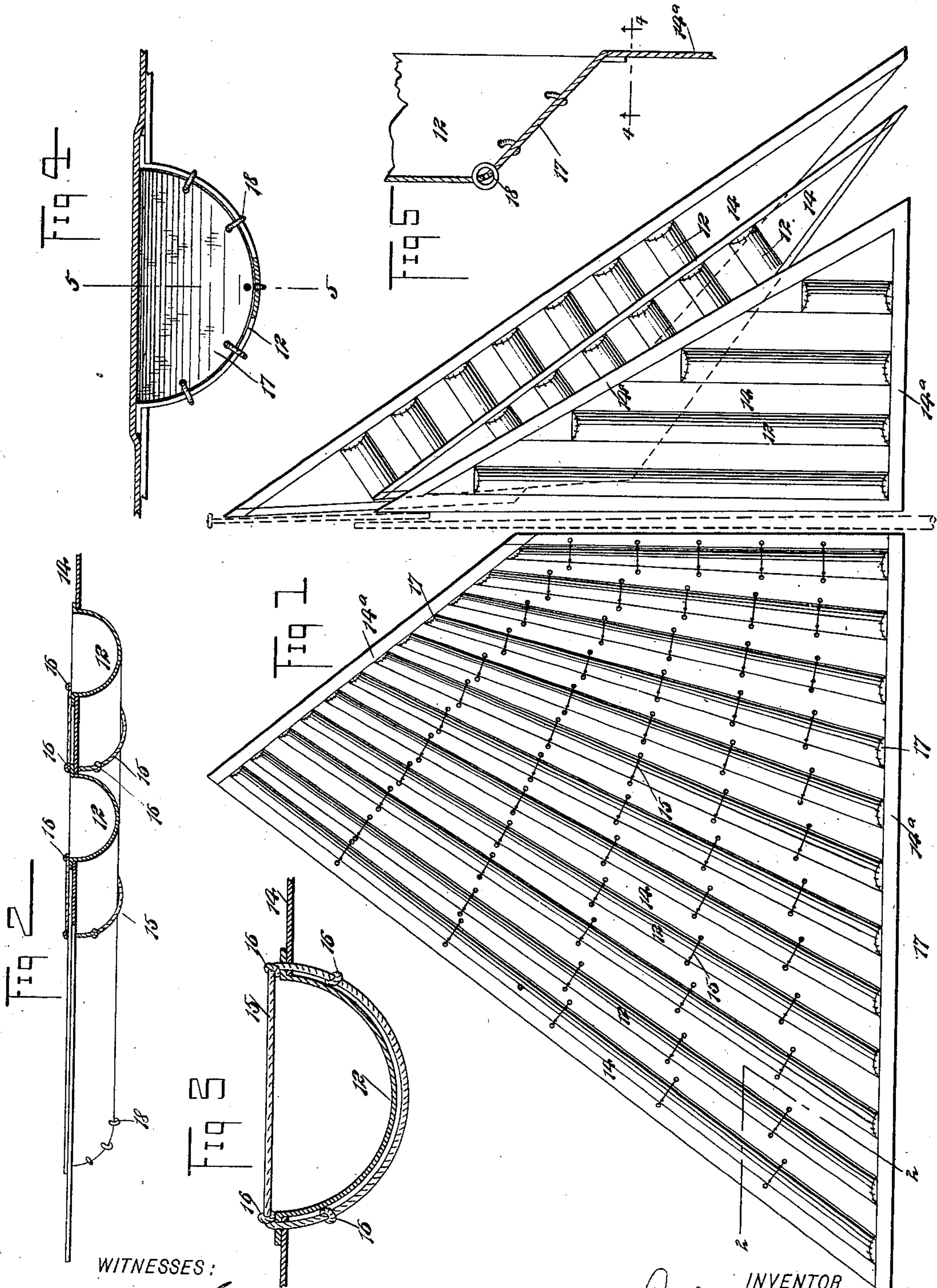
J. DUTHIE.

SAIL.

(Application filed June 21, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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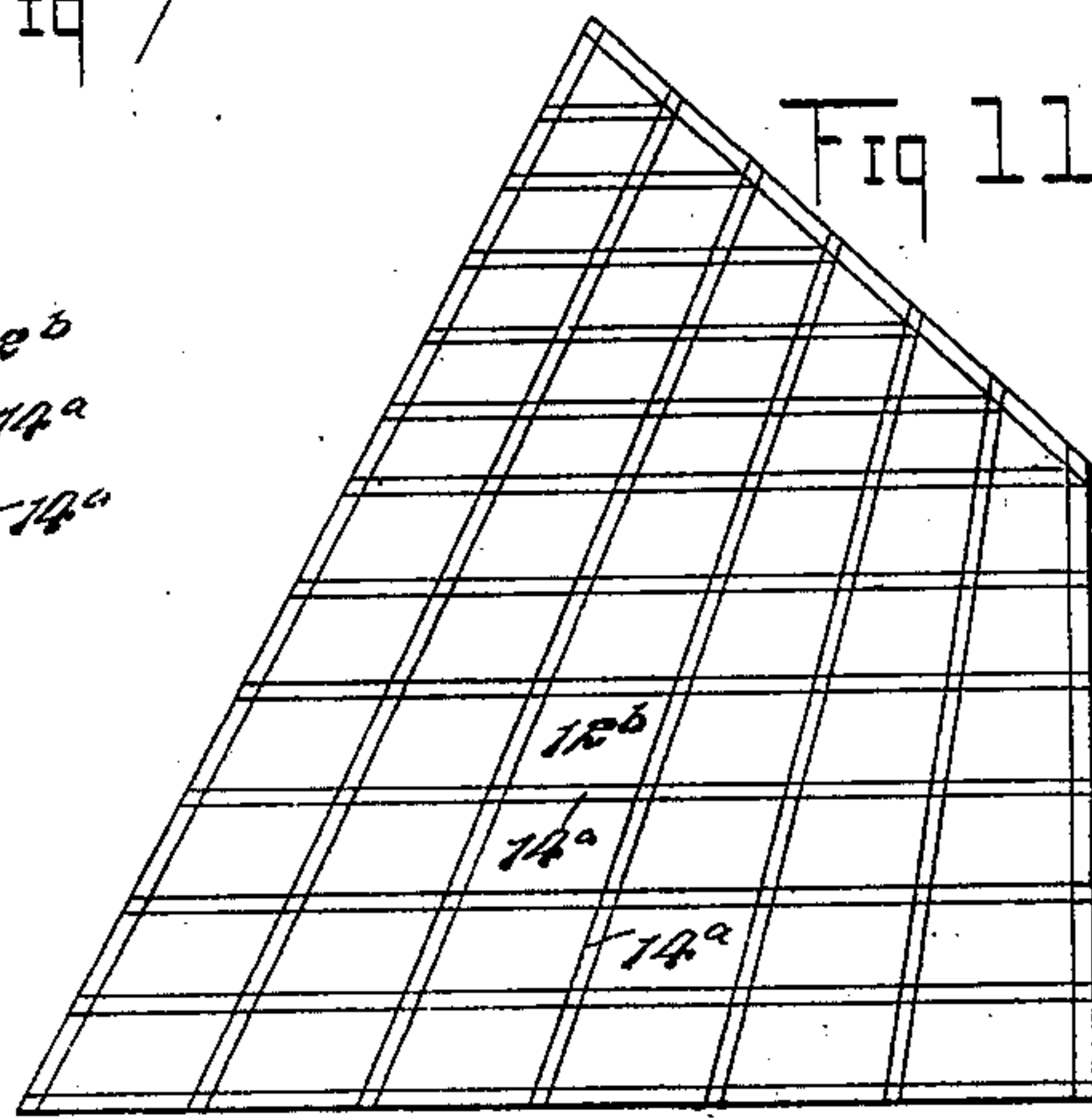
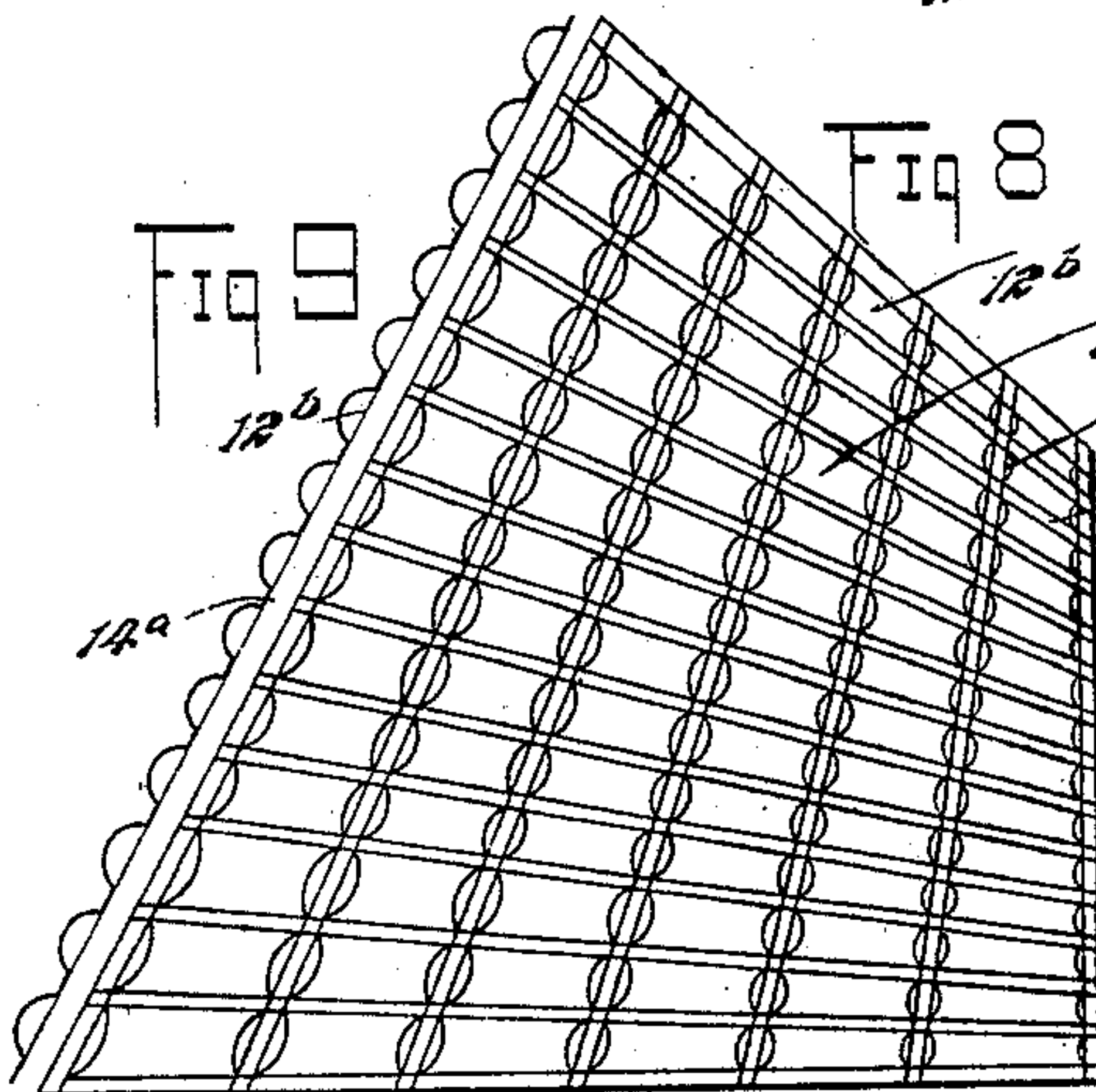
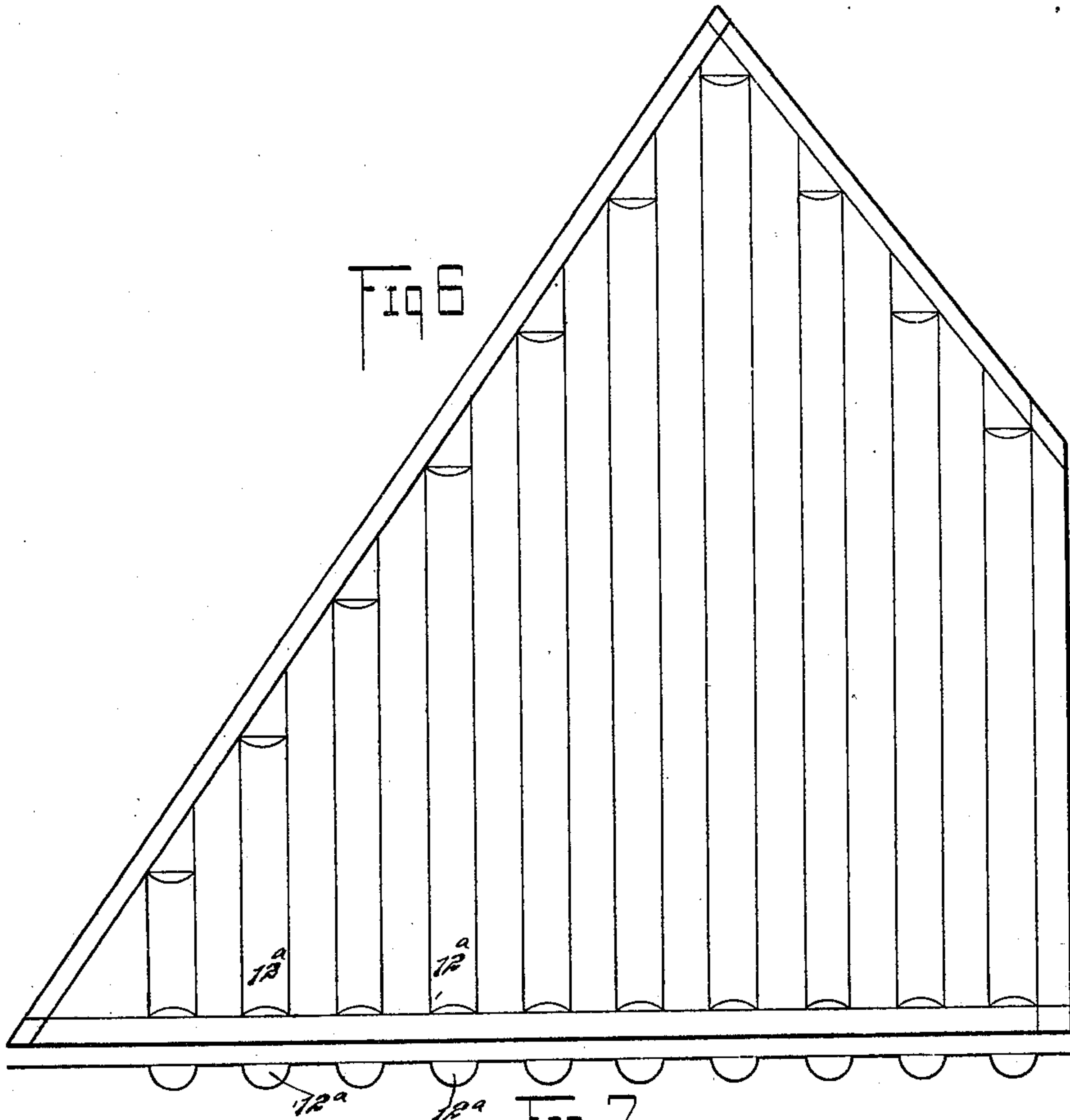
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Fig 10

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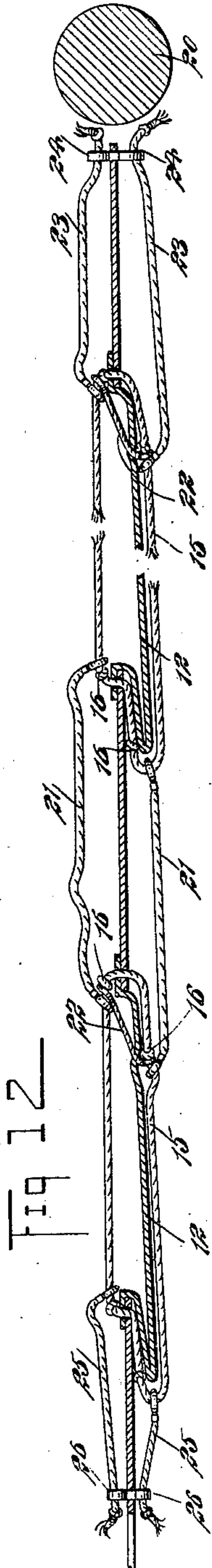


Fig 12—

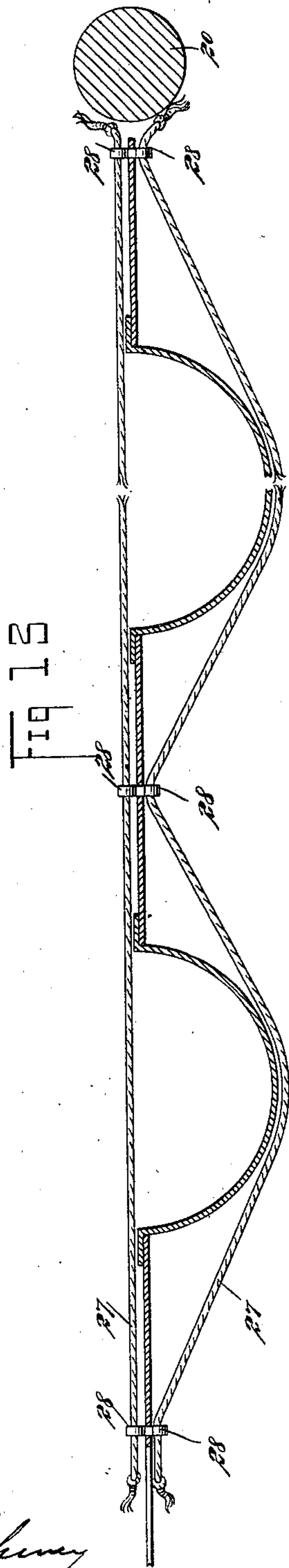


Fig 13—

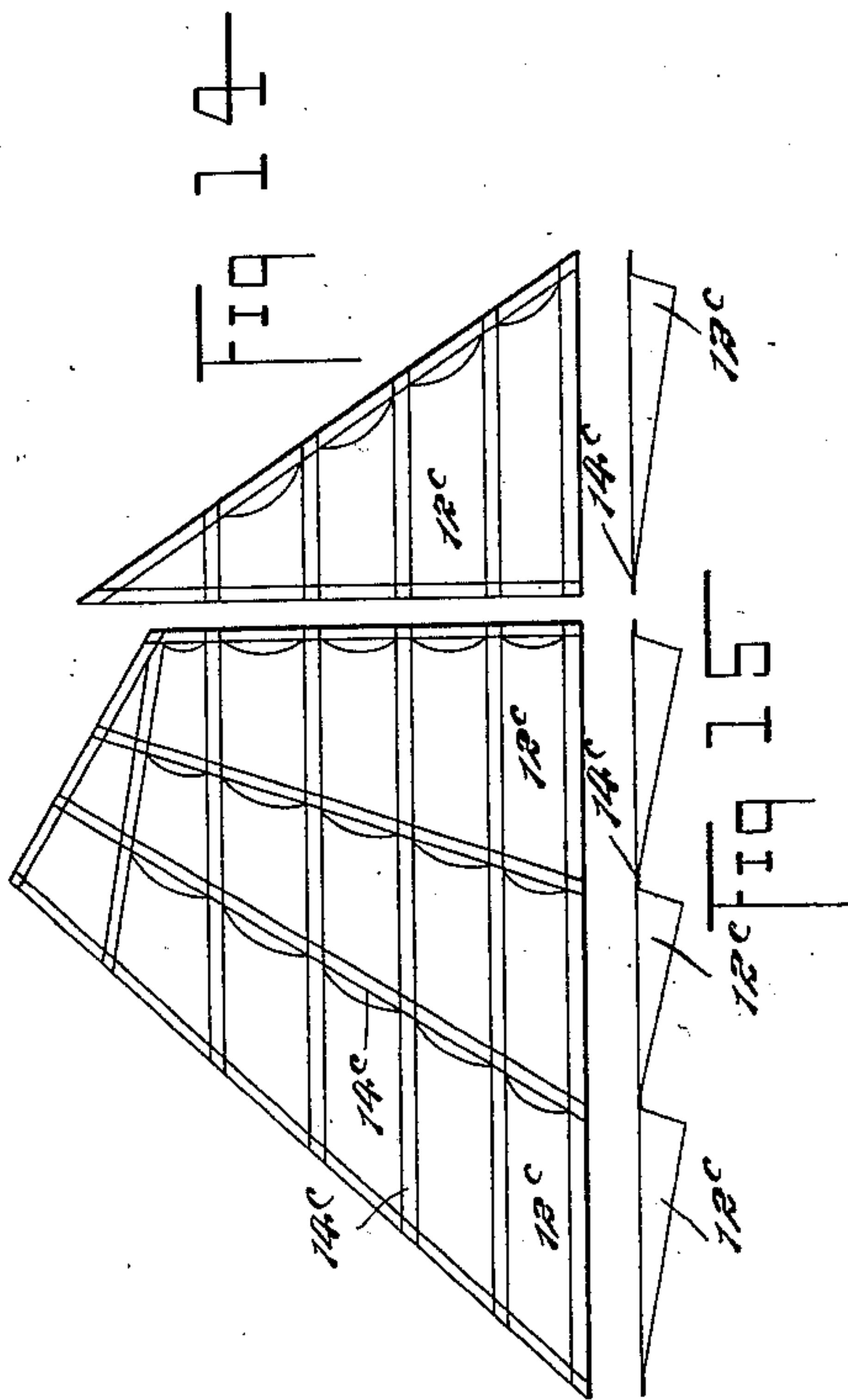


Fig 14—

Fig 15—

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UNITED STATES PATENT OFFICE.

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SPECIFICATION forming part of Letters Patent No. 640,116, dated December 26, 1899.

Application filed June 21, 1899. Serial No. 721,334. (No model.)

To all whom it may concern:

Be it known that I, JOHN DUTHIE, of Portland, in the county of Multnomah and State of Oregon, have invented new and useful Improvements in Sails, of which the following is a full, clear, and exact description.

The purpose of this invention is to provide a sail for both square and fore-and-aft rigged vessels, which sail for a given size will provide a greater area for the engagement of the wind, and consequently will drive a boat faster than the type of sail now in use. This end I attain by forming the sail with a number of concavities or recesses, produced by loose sections of canvas and arranged to reverse as the vessel changes from one tack to the other, such concavities or recesses serving to gather and retain the wind, and thus increase the efficiency of the sail.

This specification is the disclosure of several forms of my invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side view of sloop or cutter sails constructed according to my invention. Fig. 2 is a fragmentary section on the line 2 2 of Fig. 1. Fig. 3 is an enlarged section taken transversely through one of the recesses of the sail. Fig. 4 is a detail section on the line 4 4 of Fig. 5. Fig. 5 is a detail section on the line 5 5 of Fig. 4. Fig. 6 is a view illustrating a modification of the sail. Fig. 7 is a diagrammatic view illustrating a horizontal section taken through the foot of the sail shown in Fig. 6. Fig. 8 is a side view illustrating an additional modification. Fig. 9 is a diagrammatic section through the construction shown in Fig. 8, the line of section being parallel with the leech of the sail. Fig. 10 is a diagrammatic sectional view of the structure shown in Fig. 8, the line of section in Fig. 10 being parallel with the foot of the sail. Fig. 11 is a view of still further modification. Fig. 12 is a sectional view of an arrangement for lacing up the recesses or cavities. Fig. 13 is a similar view of an auxiliary lacing device. Fig. 14 is a view of a further modification, and Fig. 15 is a diagrammatic section taken parallel with the foot of the sails in Fig. 14.

Referring to the first five figures, the sails are constructed with a number of elongated gutter-shaped recesses or concavities 12, between which intervene taut or plane sections of canvas 14. These concavities or recesses 12 in the mainsail-shown in Fig. 1 are shown as disposed in fan-like order, the recess at the luff of the sail being parallel with the luff and the recess at the leech of the sail being parallel with the leech. In the head-sails of the rig shown in Fig. 1 the recesses may run perpendicularly to the foot of the sail, as shown with respect to the staysail in the figure referred to, or they may run at angles thereto, as shown with respect to the jib and jib-top-sail in Fig. 1. Figs. 2, 3, 4, and 5 illustrate the construction of these recesses or concavities 12. The recesses or concavities are formed each of a loose strip of canvas, which may blow out on either side of the sail, so that as the vessel goes about the concavities are always open to the windward side of the sail, so as to receive the wind and cause the wind to act upon the sail in such a manner as to increase the power and efficiency of the sail. For bracing the canvas forming the recesses or concavities 12 I provide a gromet-like brace or structure 15, which is formed of cordage and provided with two pairs of knots 16, the braces being passed through the eyes at the sides of the recesses or concavities 12, and the knots 16 serve to limit the movement of the braces in the eyes. The knots 16 are spaced apart, so that a certain limited movement of the braces may be had, by which arrangement the braces serve to sustain at both sides of the same the canvas forming the recesses or concavities. The terminals of the recesses are formed by diagonally-disposed sections of canvas 17, which are joined to the material forming the recesses 12 by means of links or rings 18 and which are joined also to the straight or plane sections 14^a of canvas, which form the head and foot of the sail.

The form of sail shown in Figs. 6 and 7 is the same as that shown in the figures just referred to, except that the recesses 12^a are all run parallel with the luff of the sail.

The construction shown in Figs. 8, 9, and 10 differs from the other forms in that the recesses 12^b instead of running throughout the width or height of the sail are divided by a

number of plane sections 14^a, which cross each other at right angles. In this form the braces 15 are not necessary.

The form of the invention shown in Fig. 11 is exactly the same as that shown in Figs. 8, 9, and 10, except that the horizontal plane strips 14^a are all parallel with the foot of the sail, which avoids waste in cutting the sail.

When the vessel is hauled close on a wind, it may sometimes be desirable to lace up the loose sections of cloth, so as to close the cavities, and thus produce a flat sail, which is more effective under such circumstances. For this purpose I provide the gear shown in Figs. 12 and 13, which represent horizontal sections of the mainsail shown in Fig. 1, the mast being indicated at 20 in Figs. 12 and 13. The gromet-like braces 15 are connected with each other at each side of the sail by short lines 21, each provided at each end with an eye receiving the adjacent brace, as shown in Fig. 12. Passed through an eye in each loose section 12 of cloth is a short line 22, which lines have each an eye in each end, such eyes receiving the corresponding brace 15 at each side of the sail and respectively bearing against the knots 16 of the braces 15. To the braces 15, which are immediately adjacent to the luff of the sail, I attach to each two hauling-lines 23, which are located one at each side of the sail and are respectively rove through cringles 24 at the luff of the sail. From these cringles 24 the hauling-lines 23 pass downward to the boom, so that they may be reached by the crew. At the leech of the sail lines 25, similar to the lines 23, are provided, and these lines 25 are rove through cringles 28 and passed down to the boom. By hauling on either the lines 23 or the lines 25 the braces 15 may be drawn flat against the sail and the loose sections 12 of the cloths will be laced up and the sail rendered flat, fit for windward work. Fig. 12 shows the starboard-leech hauling-line 25 hauled aft to lace the sail, and when so hauled the line may be made fast to a cleat or pin on the boom. The purpose of providing the hauling-lines at both sides of the sail is to permit the sail to be laced up on either tack, and the purpose of providing the hauling-lines at both the leech and luff of the sail is to permit the hauling to be done from the point most convenient to the crew.

If desired, the sail may be provided at points intermediate the braces 15 with horizontal lacing-lines 27, supplemental to those just described, so that by hauling the lines 27 the bellies in the loose portions 12 of the sail be-

tween may be drawn up to render the sail still flatter. The lines 27 are at each side of the sail and are rove through cringles 28 on the same.

The form of the invention shown in Figs. 14 and 15 shows cavities or recesses 12^c formed in the sails in the same arrangement relative to each other as in Fig. 11, but a change is made in the sail to the end that it may be better adapted to windward work. This is effected by forming the recesses or cavities tapering toward the leech of the sail, so that the after end of each cavity runs out into the plane portions 14^c of the sail. Now when the sail is hauled on a wind the tapering forms of the loose cloths forming the cavities 14^c will cause the sail to trim flat and will enable the vessel to lie as close as with the usual sail.

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

1. A sail, having loose sections of cloth, which intervene between taut or plane sections of the cloth and which loose sections of cloth may blow out to either side of the sail thus forming recesses or cavities always opening to windward of the sail.
2. A sail, having a loose section of cloth which may blow out to either side of the sail, whereby to form a recess or cavity in the sail, such recesses or cavities always opening to windward of the sail, and a gromet-like brace serving to strengthen the loose sections of cloth and having limited sliding movement in the sail.
3. A sail, constructed of a number of plane sections of cloth, between which are secured a number of loose sections of cloth adapted to be blown out to either side of the sail to form recesses or cavities therein, whereby to enlarge the area of the sail.
4. A sail, having a number of recesses or cavities formed therein by loose sections of cloth, and means for lacing up said loose sections of cloth to render the same plane.
5. A sail, having a number of recesses or cavities formed therein by loose sections of cloth, gromet-like braces surrounding said loose sections of cloth and having limited movement in the sail, and hauling-lines in connection with said braces, for drawing on the braces to lace up the loose sections of the cloth, whereby to render the sail plane.

JOHN DUTHIE.

Witnesses:

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