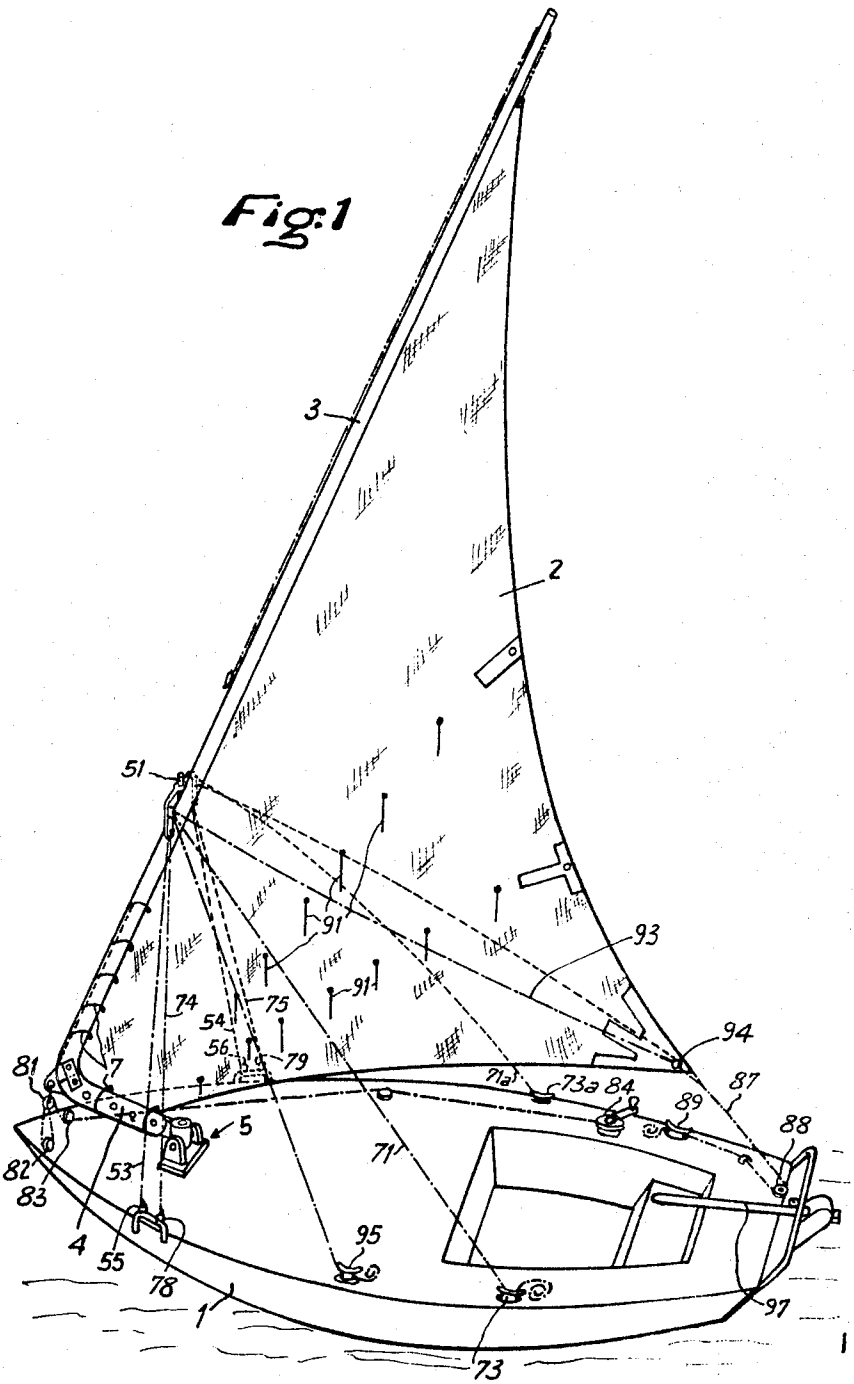
Sept. 13, 1966 D. DE MONFREID 3,272,167

SAILING-BOAT

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Fig. 1



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Fig:2

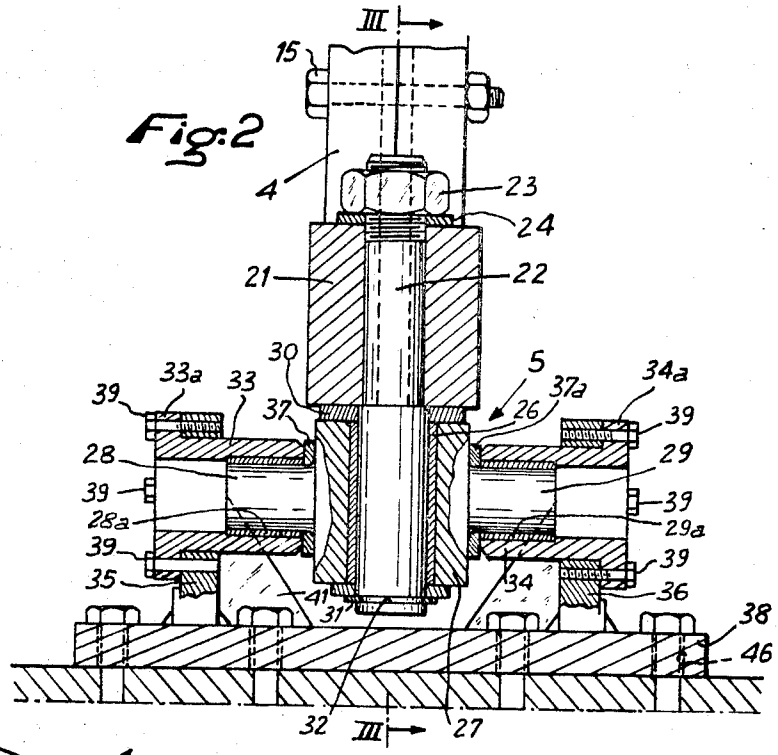
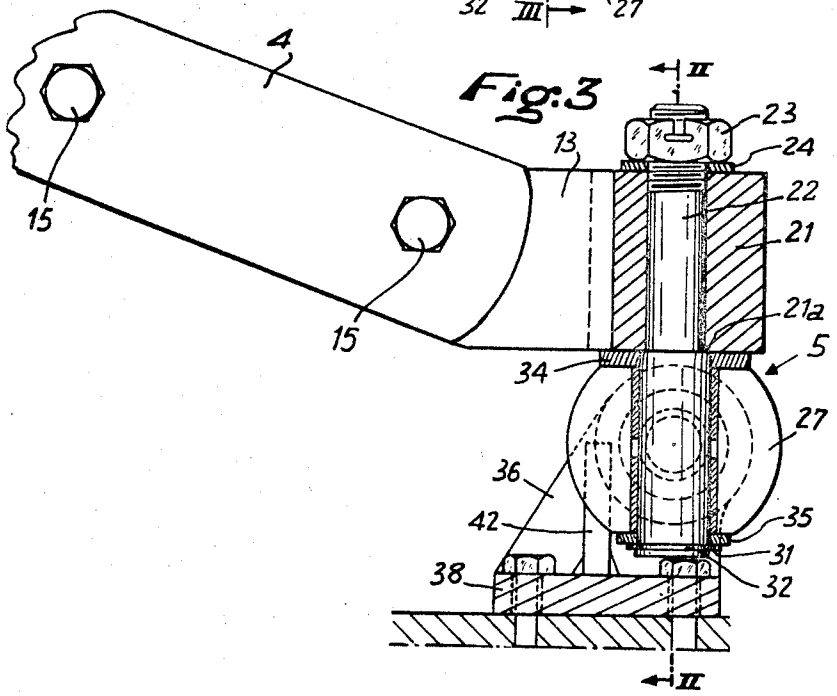


Fig:3



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SAILING-BOAT

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Fig:4

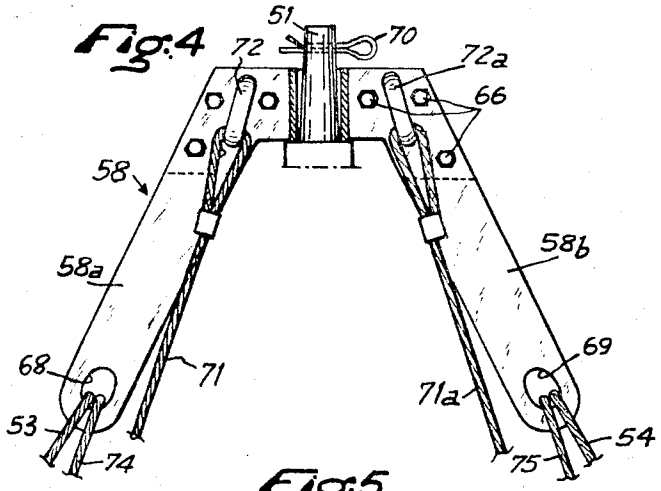


Fig:5

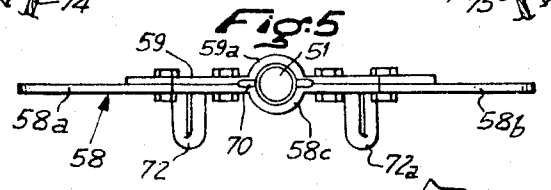
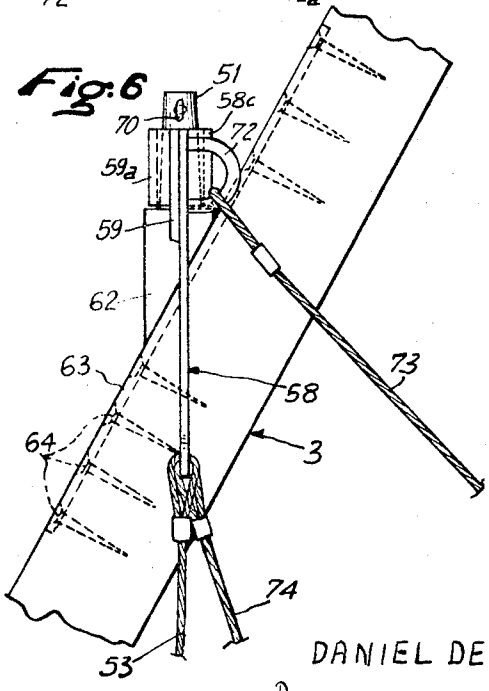


Fig:6



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SAILING-BOAT

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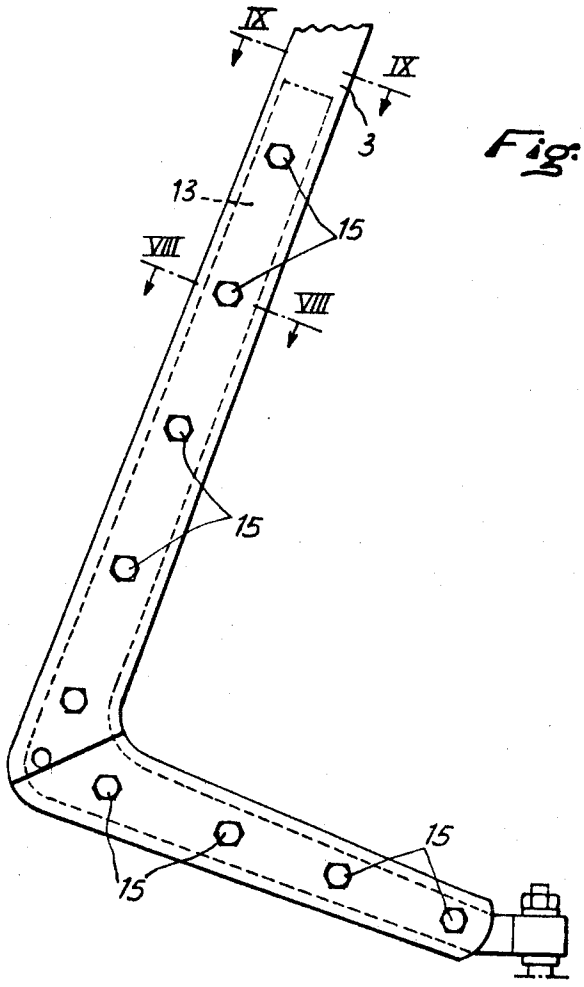


Fig: 7

Fig: 8

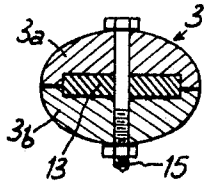
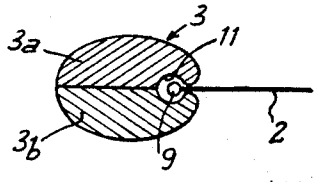


Fig: 9



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Fig: 10

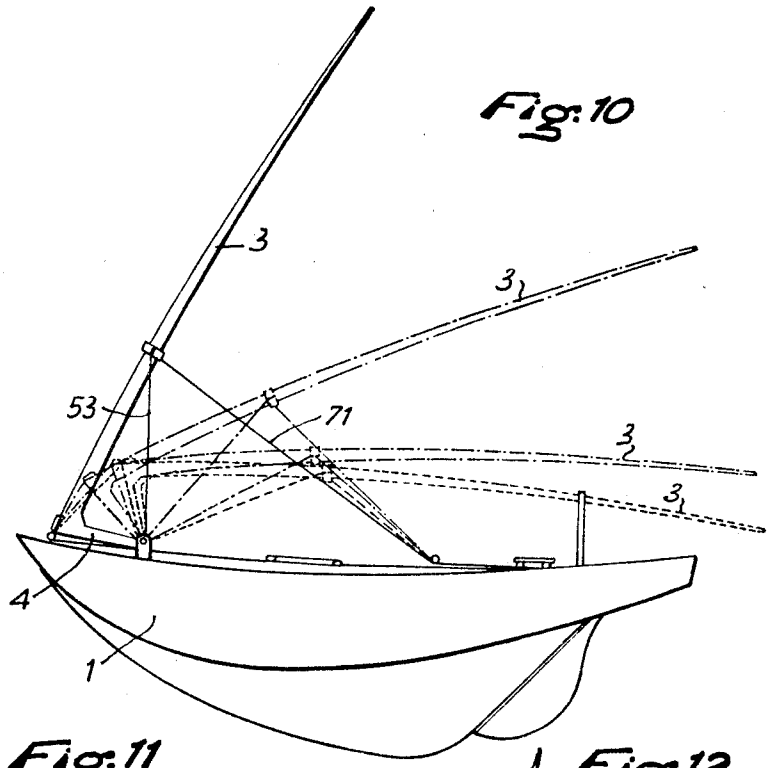


Fig: 11

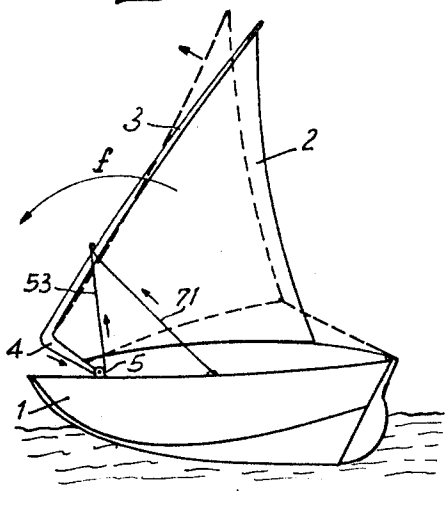
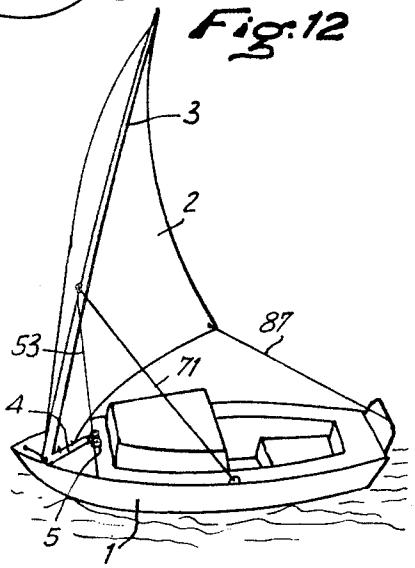


Fig: 12



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3,272,167

SAILING-BOAT

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Filed Mar. 17, 1965, Ser. No. 440,415
Claims priority, application France, Mar. 27, 1964, 969,031
8 Claims. (Cl. 114—39)

This invention has for its object a sailing-boat in which the rigging consists of a single sail of the lateen type or preferably of the Arab type and essentially comprises a slanting sail-yard or lateen yard provided at the lower end with a rearwardly elbowed extension which is pivoted at its extremity to the deck of the sailing-boat by means of a universal joint, an intermediate point of the said sail-yard being continuously maintained in the fore-and-aft vertical mid-plane of the boat by means of a system of two retaining guys of which the upper extremities are coupled to the said intermediate point of the sail-yard whilst the lower extremities of the said guys are attached respectively to the two sides of the hull on a geometrical axis which passes horizontally athwartships through the centre of the aforesaid universal joint whilst a stay which joins the aforesaid intermediate point of the sail-yard to a point of the hull of the boat which is located aft of the universal joint restrains the said sail-yard forwardly thereof and the lower end of the said sail-yard is fitted with a retaining tackle which is secured to the hull, the aftermost corner of the sail being retained by a clew-line.

It is essential to recall that the action of the wind in an Arab sail is comparable with that which is produced on the jib of a conventional sailing-boat. In other words, a general upwardly directed component is created and the compressive stress which is produced on the boat by the conventional mast is relatively low since the said stress results only from one of the forces of the overturning couple whereas the other force is exerted on the guy-wires in the form of a tensile stress.

As will readily be apparent, it is therefore wholly within the bounds of possibility to devise an Arab sailing-boat in which the outspread sail no longer requires a mast, such a sail thus playing the part of a kite and the general component is directed upwards. In actual practice, however, a sailing-boat is also subjected to the motion of waves which is frequently opposed to the force of the wind, thereby producing in an intermittent manner compressive stresses which are consequently directed downwards.

According to the characteristic structural arrangement provided by this invention as hereinabove defined, the mast with which a sailing-boat is usually equipped is in fact dispensed with, and the intermittent secondary compressive stresses are taken up by the universal joint which couples the lower extension of the sail-yard to the boat.

The result achieved is therefore exactly the same as if the sail-yard were pivotally attached to the head or upper extremity of a fictitious mast, the foot of which is located in the same position as the universal joint to which the elbowed extension of the sail-yard is pivotally coupled.

This rig in accordance with the invention offers a whole series of advantages which are summarized hereunder:

The complete rigging can be lowered at any moment, which constitutes a considerable safety feature in the case of small sailing-boats.

The fact of being able to lower the sail also makes it possible for a sailing-boat to travel on rivers and to pass underneath bridges.

The sail is effective for the purpose of sailing against the wind and is excellent when sailing off the wind, that is to say when the angle made by the direction of the wind and the course of the boat is of the order of 50° at least.

The handling of the rigging according to the invention is basically extremely simple since all operations are effected from the after end of the boat and can be carried out with ease by a single person.

Tacking against the wind and wearing before the wind are incomparably easier than in the case of conventional sailing craft since the sail thurns into the wind automatically and of its own accord.

In heavy weather, the sail is reefed by lowering the sail-yard to a suitable height and by furling the sail from the botom of the yard.

When the boat is in harbour, the sail-yard can serve as a support for the rain-awning which covers the entire boat and beneath which it is possible to move freely.

Finally, the great simplicity of the rig permits of easy checking; in fact, since the sail-yard can be lowered very rapidly at any moment, each component thereof can readily be inspected.

The invention also has for its object embodiments which comprise at least one of the following characteristic features:

(a) The aforesaid intermediate point of the sail-yard is provided with a swivel-pin, the geometrical axis of which passes through the centre of the universal joint, the said swivel-pin being designed to carry a transverse restraining member to which are attached the upper extremities of the two side guys and the upper extremity of the stay.

(b) The lower end of the sail-yard and the yard extension are strengthened by a metal angle brace preferably consisting of a flat corner-type bracket of sheet steel which is set within the sail-yard and sail-yard extension.

(c) The retaining tackle comprises three pulleys wherein one pulley as well as the standing end are attached to the said-yard elbow whilst the two other pulleys are attached to the deck sides at the forward end of the boat and the tackle-fall which controls the said tackle is joined to a winch which is preferably placed at the after end of the boat.

(d) Two safety guys couple the intermediate portion of the sail-yard to two points of the respective sides of the boat which are located aft of the points of attachment of the retaining guys.

(e) The sail is fitted with reef-points for the purpose of furling the sail from the bottom when reefing.

A better understanding of the invention will be gained fom a perusal of the following description and from a study of the accompanying drawings which show by way of non-limitative example one form of embodiment of a sailing-boat in accordance with the invention.

In these drawings:

FIG. 1 is a view in perspective showing the complete sailing-boat.

FIG. 2 is a view on a smaller scale and in cross-section taken along the line II—II of FIG. 3, and showing the universal joint for the pivotal attachment of the elbowed bottom extension of the sail-yard.

FIG. 3 is a cross-section taken along the line III—III of FIG. 2.

FIG. 4 is a front view also on a larger scale, looking on the rear face of the yard-restraining member.

FIG. 5 is a plan view corresponding to FIG. 4.

FIG. 6 is a profile view corresponding to FIG. 4.

FIG. 7 is a view in elevation, on a larger scale, of the lower portion of the sail-yard and of the yard extension.

FIGS. 8 and 9 are partial cross-sections taken respectively along the lines VIII—VIII and IX—IX of FIG. 7.

FIG. 10 is a profile view of the sailing-boat showing the sail-yard in different lowering positions, and

FIGS. 11 and 12 show diagrammatically the behaviour of the rigging under different conditions.

The rigging of the sailing-boat, the hull of which is designated by the reference **1** in FIGURE 1, comprises a single sail **2** of the Arab sail type which is carried by a sail-yard or lateen-yard **3**. The said sail-yard is provided at the lower end with a rearwardly elbowed extension **4** and the foot of the sail-yard is secured to the deck of the boat by means of a universal joint which is generally designated by the reference **5**.

The sail **2** is attached to the yard **3** by any suitable conventional means, for example by means of lacings such as **7**, to the lower portion of the yard and to its extension **4**. The said sail is attached to the remainder of the yard up to the upper extremity by means of a system consisting of a rope **9** (shown in FIG. 9) which is integral with the edge of the sail and which is fitted within a longitudinal channel **11** of the after edge of the said yard.

The lower portion of the yard **3** and elbowed yard-extension **4** are reinforced by means of an angle brace **13** of sheet steel (as also shown in FIGS. 7 and 8), the said brace being set within the thickness of the yard which is made up of two halves respectively designated by the references **3***a* and **3***b*, the assembly being effected by means of bolts **15**.

In the embodiment which is illustrated, the universal joint **5** is a cardan-type coupling and comprises a hub **21** (as shown in FIGS. 2 and 3) which is integral with the lower extremity of the right-angle brace **13**, the said hub being secured to a pin **22** by means of a nut **23** which is screwed onto the upper threaded extremity of the said pin. A washer **24** is interposed between the nut **23** and the top face of the hub **21**, the underface of which is in contact with an annular shoulder **21***a* of the said pin.

The lower portion of the pin **22** has a slightly larger diameter than that of the upper portion thereof and is rotatably mounted through the intermediary of a bronze bush **26** in a sleeve **27** which is fitted with two diametrically opposite lateral trunnions **28, 29**. The lower portion of the pin **22** is held axially in position within the sleeve **27**, at one end of the said lower portion, by the underface of the hub **21** and, at the other end thereof, by means of a flexible retainer-ring **31** which is fitted within a corresponding annular groove **32** formed in the lower extremity of the said pin. A bronze washer **30** is interposed between the hub **21** and the sleeve **27** and another bronze washer **35** is interposed between the sleeve **27** and the flexible retainer-ring **31**.

The two trunnions **28, 29** are rotatably mounted in bronze bushes **28***a*, **29***a* respectively fitted in the bores of two bearing-bushes **33, 34** which are in turn held within two supports **35, 36** formed by two vertical plates welded to a base-plate **38**. Two bronze washers **37**, **37***a* are interposed between the sleeve **27** and the corresponding extremities of the two bearing-bushes **33, 34**. The two bearing-bushes **33, 34** are fixed to the plates **35, 36** by means of screws such as the screw **39** which traverse two annular flanges **33***a*, **34***a* respectively of the said bearing-bushes **33, 34** and the ends of which are screwed into corresponding tapped holes of the two vertical plates **35, 36**. Two stay-plates **41, 42** serve to brace the two plates **35, 36** on the base-plate **38**.

The base-plate **38** is secured in a flat position to the deck of the boat, for example by means of bolts **45** which pass through corresponding holes **46** of the said plate.

An intermediate point of the sail-yard **3**, which is materialized by a swivel-pin **51** (as shown in FIGS. 1 and 4 to 6) and the geometrical axis of which passes through the centre of the universal joint **5**, is continuously maintained in the fore-and-aft vertical mid-plane of the boat by a system of two guy-wires **53, 54**. The lower extremities of the two guy-wires **53, 54** are attached respectively to two U-bolts **55, 56** which are secured to the two corresponding sides of the boat on a theoretical geometrical axis which passes horizontally athwartships through the centre of the universal joint **5**. The upper extremities of the said two guy-wires **53, 54** are attached respectively to the lower extremities of the two arms **58***a*, **58***b* of a yoke-shaped restraining member which is generally designated by the reference **58** and the central portion **58***c* of which is so shaped as to form together with the associated portion **59***a* of a back-plate **59** a kind of socket which is fitted in such a manner as to be capable of rotating on the swivel-pin **51**. The said swivel-pin forms part of a boss **62** forming one piece of a plate **63** which is fixed to the front face of the sail-yard **3** by any suitable means represented in this example in the form of wood-screws **64**.

In the embodiment which is illustrated in the drawings, the yoke **58** consists of a member of sheet steel which is suitably cut out and die-stamped so as to form the half-socket **58***c*, the back-plate **59** being thus made up of a sheet steel member which is cut out and die-stamped so as to form the half-socket **59***a*, the yoke and back-plate being joined together by any suitable means, for example by means of bolts **66** or alternatively by means of spot welds. The upper extremities of the two guy-wires **53, 54** are passed through eyes **68, 69** of the two yoke-arms. A cotter-pin **70** prevents the yoke from passing upwardly out of the swivel-pin **51**.

That point of the sail-yard **3** which is located at the level of the swivel-pin **51** can therefore describe in space a portion of circumference which is located in the fore-and-aft vertical mid-plane of the boat and the centre of which is located at the centre of the universal joint **5** while the radius thereof is equal to the distance between the said centre and the swivel-pin **51**.

The theoretical geometrical straight line which joins the cardan-type coupling **5** to the swivel-pin **51** constitutes a fictitious mast, the forward inclination of which is limited by means of one of two stays **71**, **71***a*, the upper extremities of which are attached respectively to two rings **72**, **72***a* of the yoke **58** and the lower extremities of which are secured to two belaying-cleats **73**, **73***a* which are fixed to the sides of the boat.

As a safety measure, provision is made for a second guy **74, 75** on each side of the boat; the upper extremities of these safety guys are attached to the yoke **58** within the same eyes as the upper extremities of the retaining guys **53, 54** whilst the lower extremities thereof are attached respectively to two U-bolts **78, 79** which are located a short distance aft of the U-bolts **55, 56** to which the retaining guys are attached in such a manner as to stretch under the action of the wind when the sail-yard reaches the highest position to which this latter can be raised by slackening the stay **71**.

There is attached to the lower end of the sailyard **3** the standing end of a retaining tackle comprising three pulleys **81, 82, 83**, the tackle fall of which is wound onto a control winch **84** placed on one side of the deck at the after end of the boat. The pulley **81** of the said retaining tackle is fixed to the yard elbow whilst the two other pulleys **82, 83** are secured on each side of the bow.

There is attached to the aftermost corner of the sail a clew-line **87** which passes over a stern pulley **88** and which is retained by a cleat **89** such as a clamping cleat.

There have also been shown at **91** reef-points which serve to reef the sail by furling this latter from the bottom according to requirements, as well as a brail **93** which starts, for example, from the ring **72***a* of the yoke, passes through an eye or clew **94** provided in the aft gore of the sail **2**, then through the other ring **72** of the yoke and is finally attached to a belaying-cleat **95** fixed to the side of the deck, with a view to brailing up the sail against the yard in a conventional manner. Finally, the tiller has been indicated at **97**.

The operation is as follows:

Under the action of the wind, when the lateen yard is raised by slackening the stay **71**, the yard **3** swings forward under the thrust of the wind and assumes a more or less high orientation depending on the length of stay which has been released. The angle which is made by the plane of the yard **3** and yard extension with the fore-and-aft vertical mid-plane of the boat is adjusted by turning the winch **84** either in one direction or the other, depending on whether it is desired to shorten or lengthen the cable of the retaining tackle **81**, **82**, **83**. The sail-yard can therefore swing about the fictitious mast according to the length of cable which is left slack to run through the tackle. As the wind becomes an aft wind, so the sail-yard will have a tendency to turn and set athwartships and can only reach this position if a sufficient amount of slack is given to the winch **84** so as to lengthen the portions of cable which are carried by the retaining tackle.

The safety guys **74** will come into action only in the event that the stay **71** has not been shortened to a sufficient extent.

The sail which is spread by the wind therefore turns into the wind of its own accord and can readily be adjusted on the one hand by paying out more or less cable to the retaining tackle **81**, **82**, **83** so as to permit the orientation of the sail-yard about the fictitious mast and, on the other hand, by paying out or drawing in the clew-line **87** so as to permit the sail to belly to a greater or lesser extent. The boat is in a balanced condition when it is no longer necessary to exert any effort on the tiller **97** in order to hold the boat on its set course.

Any tendency to a general forward swing as indicated by the arrow *f* in FIG. 11 is counteracted by the guy-wires **74**, **75** and by the stay **71** or **71***a* which is in service.

The bending stresses which are induced by the action of the wind in the lower portion of the sail-yard are taken up by the steel angle-bracket **13** whereas the upper portion of the said sail-yard bends in the upward direction as shown in broken lines in FIG. 11 while stretching the sail and exerting a compressive force on the universal joint **5** through the intermediary of the elbowed bottom extension **4** of the sail-yard.

The combined assembly of sail and yard is capable of pivoting about the fictitious mast which joins the swivel-pin **51** of the yard to the foot of this latter which is located at the universal joint **5** and this movement is limited by the forestry of the tackle which retains the yard elbow in the desired position as shown in FIG. 12.

FIG. 10 shows the sail-yard in full lines in the sailing position and in chain-dotted and broken lines in a number of successive positions during the lowering of the yard.

All the advantages which are attached to the rig and which have been indicated earlier arise directly from the constructional design which has just been described. These advantages are self-explanatory and consequently do not need to be dwelt upon further.

As will be readily apparent, this invention is not limited to the form of embodiment which has been described and illustrated but can be extended to include a large number of modifications without thereby departing either from the scope or the spirit of the invention.

What is claimed is:

1. A sailing-boat having a hull with a deck; a slanting sail-yard the lower end of which is formed with a rearwardly elbowed extension which is pivoted at its extremity to the middle of the fore portion of said deck by means of a universal joint; means adapted to maintain an intermediate point of said sail-yard in the fore-and-aft vertical mid-plane of said hull; means for limiting the shifting of said intermediate point of said sail-yard forwardly substantially to the vertical extending through said universal joint; means of adjustable length connecting the lower end of said sail-yard to the fore portion of both sides of said hull, respectively; a four-sided sail having one side secured to said sail-yard, another side secured to said elbowed extension, while the other two sides thereof are free and form an aft gore of said sail; and a clew line of adjustable length connecting said aft gore of said sail to the rear portion of said hull.

2. A sailing boat according to claim **1**, wherein said means adapted to maintain an intermediate point of said sail-yard in the fore-and-aft vertical mid-plane of said hull are constituted by a pair of maintaining guys whose upper extremities are connected to said intermediate point of said sail-yard and whose lower extremities are attached, respectively, to the two sides of the hull on an axis which extends horizontally athwartships through the centre of said universal joint.

3. A sailing boat according to claim **1**, wherein said means for limiting the shifting of said intermediate point of said sail-yard forwardly substantially to the vertical extending through said universal joint, are constituted by a stay which joins said intermediate point of said sail-yard to a point of said hull located aft of said universal joint.

4. A sailing boat according to claim **1**, wherein said means of adjustable length connecting the lower end of said sail-yard to the fore portion of both sides of said hull, respectively, are constituted by a retaining tackle having three pulleys, one of said pulleys as well as the standing end of said tackle being attached to the lower end of said sail-yard, at the point thereof where said elbowed extension merges with said sail-yard, while the other two pulleys of said tackle are attached, respectively, to the sides of said hull, the tackle-fall, of said retaining tackle being connected to a winch mounted on the after end of said hull.

5. A sailing-boat having a hull with a deck; a slanting sail-yard the lower end of which is formed with a rearwardly elbowed extension which is pivoted at its extremity to the middle of the fore portion of said deck by means of a universal joint; a swivel pin secured to said sail-yard at an intermediate point thereof and whose axis passes through the centre of said universal joint; a transverse restraining member carried by said swivel pin; a pair of maintaining guys whose upper extremities are connected to said transverse restraining member and whose lower extremities are attached, respectively, to the two sides of the hull on an axis which extends horizontally athwartships through the center of said universal joint in order to maintain said intermediate point of said sail-yard in the fore-and-aft vertical mid-plane of said hull; a stay which joins said transverse restraining member to a point of said hull located aft of said universal joint, in order to limit the shifting of said intermediate point of said sail-yard forwardly substantially to the vertical extending through said universal joint; means of adjustable length connecting the lower end of said sail-yard to the fore portion of both sides of said hull, respectively; a four-sided sail having one side secured to said sail-yard, another side secured to said elbowed extension, while the other two sides thereof are free and form an aft gore of said sail; and a clew line of adjustable length connecting said aft gore of said sail to the rear portion of said hull.

6. A sailing boat according to claim **1**, wherein the lower end of said sail-yard and said extension thereof are

strengthened by a metal angle brace set within said sail-yard and extension.

7. A sailing boat according to claim 2, further comprising a pair of safety guys coupling said intermediate point of said sail-yard to two points of the respective sides of said hull which are located aft of the points of attachment of said maintaining guys.

8. A sailing boat according to claim 1, wherein said sail is provided with reef-points for the purpose of furling said sail from the bottom for reefing.

No references cited.

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