

March 1, 1927.

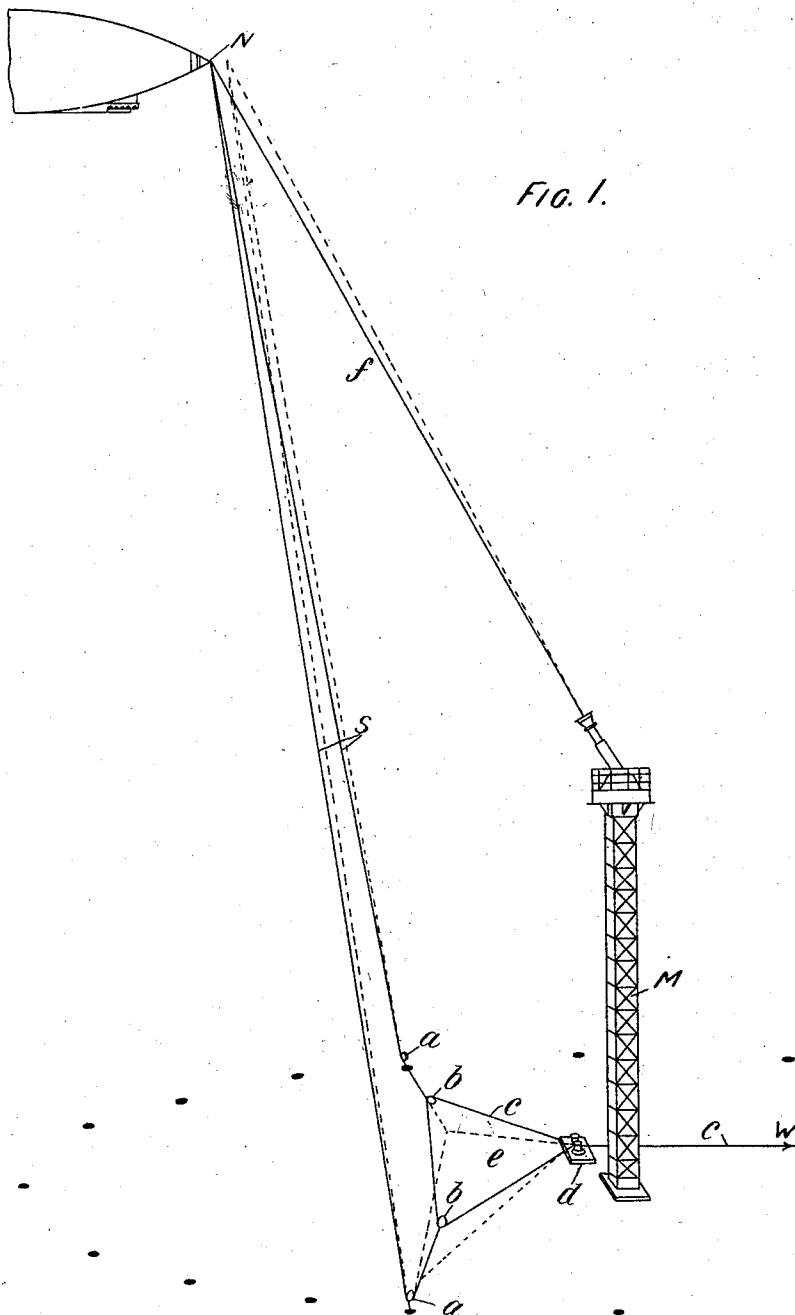
V. C. RICHMOND ET AL

1,619,680

MOORING GEAR FOR AIRSHIPS

Filed Sept. 8, 1926

2 Sheets-Sheet 1



Inventors
Vincent C. Richmond
George H. Scott
By *Samuel L. Norton*
Attorney

UNITED STATES PATENT OFFICE.

VINCENT CRANE RICHMOND AND GEORGE HERBERT SCOTT, OF CARDINGTON, ENGLAND.

MOORING GEAR FOR AIRSHIPS.

Application filed September 8, 1926, Serial No. 124,247, and in Great Britain May 20, 1925.

This invention relates to improvements in mooring gear for airships and the like. In U. S. Patent No. 1,448,089, granted March 13, 1923, to George H. Scott one of the present applicants, is described mooring gear comprising a mooring mast with mooring fittings for cooperating with corresponding fittings on the bow of the ship and anchor points spaced around the mast in a horizontal circle with the mast as centre, the anchor points to leeward of the mast and to port and starboard of the ship being used in pairs to control the movements of the ship by means of lines or side guys, which are connected with winding gear and are rove through the anchor points and connected with the nose of the ship, while the ship is being hauled in by a mast line.

According to one feature of the present invention, in mooring gear for an airship or the like comprising a mooring mast and anchored side guys for controlling the movements of the ship while being hauled in by a mast line or lines, the side guys are adapted to allow of lateral movement of the airship in the early stages of the mooring operation, and to prevent such movement in the final stage of the mooring operation to ensure that the ship is moored without damage to the hull due to gusts causing lateral movement. The side guys may be rove through blocks which move laterally under lateral motion of the ship during the early stages of the mooring operation, and remain stationary and prevent lateral movement of the ship at the end of the mooring operation.

According to another feature of the invention, the side guys for mooring an airship, after being led through blocks at or attached to a pair of anchor points, instead of being attached to separate ground lines which are led to drums on a winch, are attached each to a separate movable block, through both of which movable blocks is rove a single ground line arranged in the form of a triangle. The blocks are situated at the base of the triangle, and the apex of the triangle is situated on or near the mooring mast, or on or near the centre of the circle intersecting the anchor points. In this arrangement one end of the ground line is anchored at the apex of the triangle, and the other end of the line, after being led through the blocks attached to the ends of the side guys is rove through a leading block at the apex of the triangle and lead to a winch drum. The side guys thus are normally under uniform tension, while at the same time the disposition permits the triangular arrangement of the ground line to be varied in shape accordingly as the blocks attached to the ends of the side guys are pulled, by any lateral movement of the airship, more or less towards their respective anchor points. When the ground triangle is distorted from an isosceles triangle by lateral movement of the airship, the tensions in the side guys are not the same, the tension on the weather guy increasing and the tension on the lee guy decreasing, thus forming an elastic or flexible system tending to stabilize the airship. As the mast line is hauled in and as the side guys are hauled in by the ground line, the triangular movement of the latter is gradually reduced in size, until eventually at a predetermined radius of the nose of the ship from the mooring mast, the block attached to the ends of the side guys come close to the apex of the triangle, and any further lateral movement of the airship is prevented.

According to another feature of the invention, the side guys for mooring an airship, after being led through blocks attached by a four-point arrangement of bridle to a pair of anchor points, converge towards the mast and are led to a winch or winches, so that when the side guys are not hauled in the four-point bridle permits lateral movements of the ship which imposes unequal tensions in the guys which tend to stabilize the ship, and when the side guys are hauled in into alignment with the port and starboard sides of the four-point bridle, further lateral movement is prevented. The anchor points may be carried on booms which are adjustable about the mast as a centre.

One arrangement of mooring gear according to the invention is illustrated more or less diagrammatically in perspective view, and by way of example, in the accompanying drawings, in which Fig. 1 is a perspective view, and Fig. 2 is an elevation of a detail; Fig. 1^a is a modification in perspective.

In the arrangement shown in the drawings M indicates a mooring mast, which may be of the type described in U. S. Patent No.

1,448,088, granted to George H. Scott, one of the present applicants. Fixed anchor joints a are arranged around a circle with the mast in the centre. f is a mast or landing wire attached to the ship's bow at N and passing down the centre of the mast lever and the mast, and s are side guys rove through fixed blocks at two of the anchor points a and connected with movable blocks b . A ground line c is attached at one end to a fixed anchor point d , and is rove through the two movable blocks b and through a fixed block at the anchor point d . The ground wire c then passes to a winch at W. The ground line thus forms a triangular arrangement between the points d , b , b . The winch at W by means of the ground line hauls in the side guys simultaneously and with a uniform tension, while the triangular arrangement of the ground line is laterally flexible or distortable, as shown by the dotted lines, under lateral movements of the nose of the ship. The length of the side guys s is arranged so that when the nose of the ship is hauled in to a certain radius or distance from the lever on the mast head, the area of the triangle c (or d , b , b) is nil or very small. Thus at the final stage of the mooring operation, the facility for lateral displacement at the point N almost or quite disappears, owing to the blocks b no longer being free to move relatively to one another, but being held close together by the small triangular arrangement of the ground line. Under these conditions the ship may be secured to the mast head without danger due to any irregular movement of the ship's bow.

Double or multiple purchases or mechanical advantages may be interposed between the points bd , Na , ab , bb , or dW , as may be necessary or desirable to alter the relative rates of haul or lengths of line.

The fixed anchor point d may be located on the mast, at the top, at the foot or at any intermediate position, or at any radius from the foot of the mast.

In the arrangement shown in the accompanying drawings, the side guys s for mooring an airship are led through blocks B attached by a fixed bridle d to anchor points a , and from the blocks B the side guys are led through blocks or fairleads at the top of the mooring mast M to winches W, see Fig. 1^a.

The fixed bridle which carries the blocks B is led from one anchor point a to a complementary anchor point a at or about 120° around a circle of which the mast is the centre. The blocks B are fixed at intermediate positions in the bridle, and the lengths of the various parts of the bridle are such as to form a quadrilateral with two equal and opposite sides and two unequal sides. The larger of the unequal sides is represented

by the ground. The arrangement is such that if the equal sides are produced to meet and form an isosceles triangle, the length of each equal side of this isosceles triangle is equal to the distance from the fixed anchor points a to the top of the mast.

Instead of the fixed anchor points a being arranged around a circle with the mast as the centre, they may be arranged on the end of booms, as shown, which are adjustable about the mast as a centre.

f is a mast or landing wire attached to the ship's bow at N and passing down the centre of the mast lever and the mast. The side guys s and the middle part of the fixed bridle d form a triangle NBB which is attached to the anchor points a by the legs of the bridle d .

It will be seen (Fig. 2) that when the ship is some distance from the mast head, the nose of the ship can move laterally against an increasing resistance by distorting the quadrilateral $aBBa$. As the side guys s are reduced in length by being hauled in, the possible lateral motion of the nose of the ship decreases until, when the guys s come into the same lines as the legs of the bridle d no lateral motion of the nose of the ship is possible. Under these conditions the ship may be secured to the mast head without danger due to any irregular movement of the ship's bow.

The middle part of the bridle between the blocks B is taut when the ship is at the mast head.

Stated in another way, it will be seen that an angle θ exists between the side parts of the bridle and the guys s , as shown in Fig. 2, and the dotted lines in this figure indicate that it is possible for the ship to yaw without slackening either guy through a limited angle. As the ship nears the mast and the angle the side guys make with the horizontal decreases, the flexibility of the system disappears owing to the angle θ disappearing, so that the final mooring to the mast is made with a stiff three-wire system.

Having thus described the nature of the said invention and the best means we know of carrying the same into practical effect, we claim:—

1. Airship mooring gear, comprising a mooring mast and anchored side guys for controlling the movements of the nose of the ship while being hauled in by a mast line or lines, blocks through which the side guys are rove, said blocks being movable laterally under lateral movement of the nose of the ship during the early stages of the mooring operation and remaining stationary and preventing such lateral movement at the end of the mooring operation.

2. Airship mooring gear as claimed in claim 1, wherein the side guys, after being led through blocks at or attached to a pair

of anchor points, are attached each to a separate movable block, through both of which movable blocks is rove a single ground line arranged in the form of a triangle, so that when the ground line is not hauled in, its triangular arrangement permits lateral movement of the nose of the ship, and when the ground line is hauled in its triangular arrangement is reduced in size to prevent further lateral movement.

3. Airship mooring gear as claimed in claim 1, wherein the side guys after being led through blocks attached by a four-point

arrangement of bridle to a pair of anchor points, converge towards the mast and are led to winch gear, so that when the side guys are not hauled in the four-point bridle permits lateral movement of the nose of the ship, and when the side guys are hauled in into alignment with the port and starboard sides of the four-point bridle, further lateral movement is prevented.

In testimony whereof we have signed our names to this specification.

VINCENT CRANE RICHMOND.
GEORGE HERBERT SCOTT.