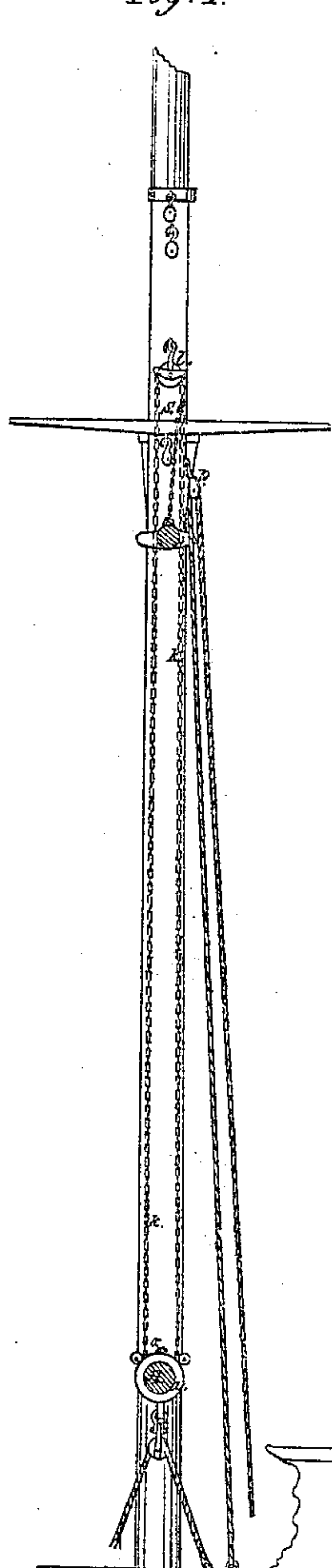
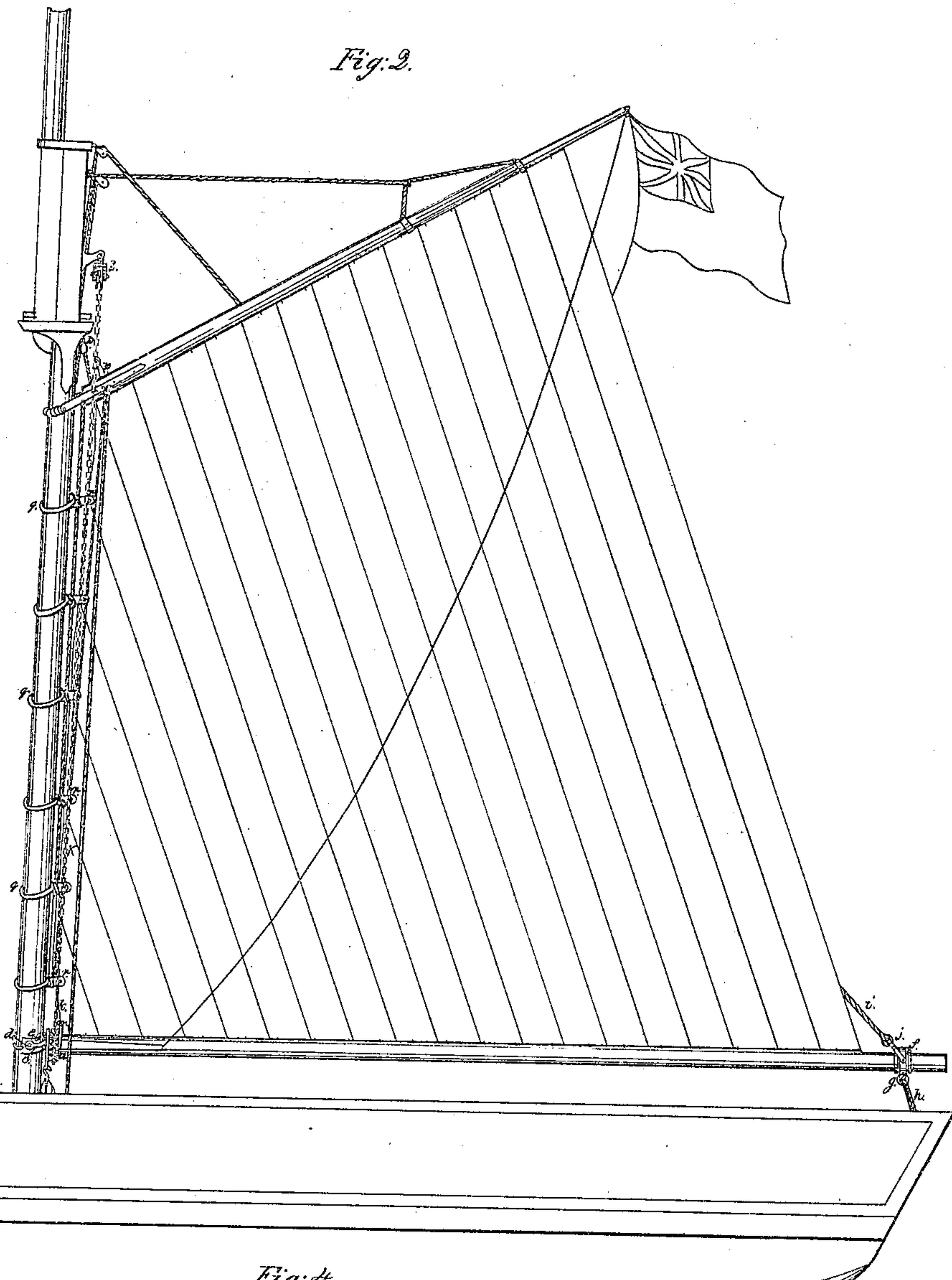


*J. Hart,*  
*Reefing Fore & Aft Sails,*  
*No 51,529,* *Patented Dec. 12, 1865.*

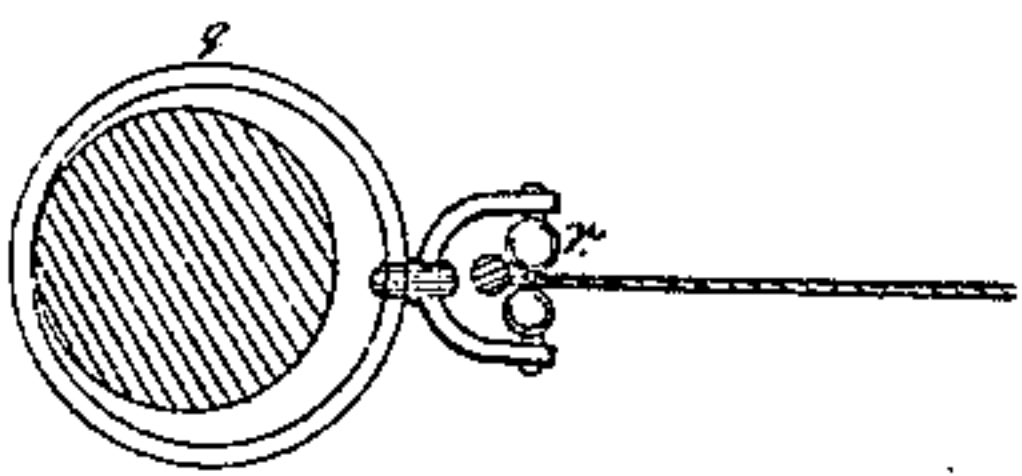
*Fig. 1.*



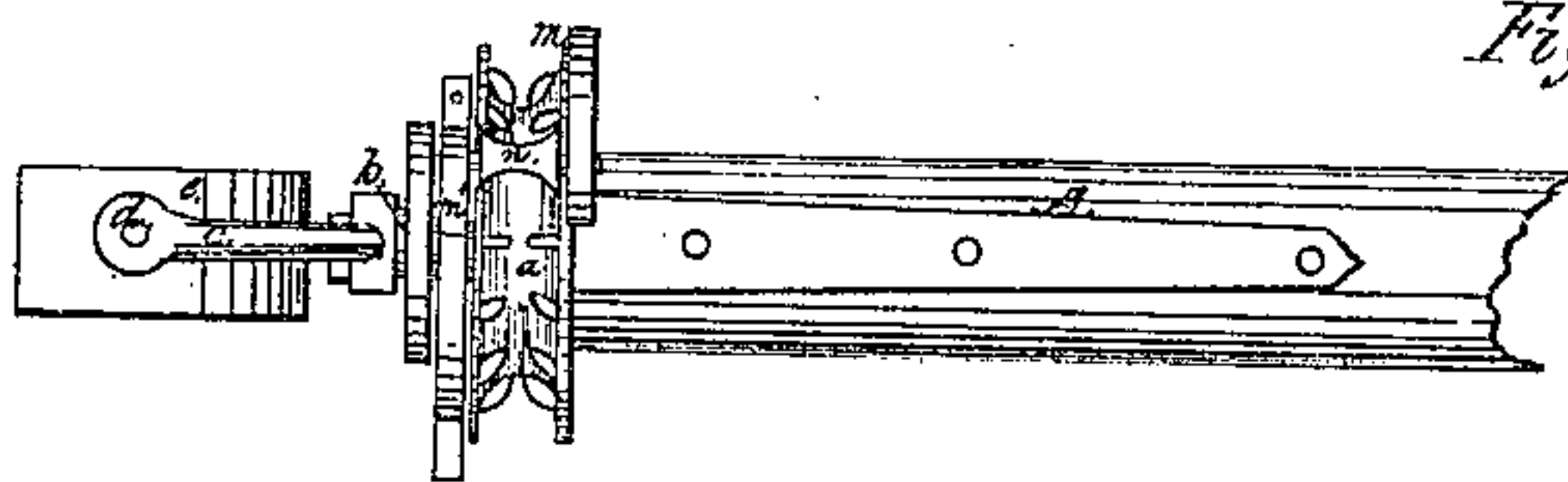
*Fig. 2.*



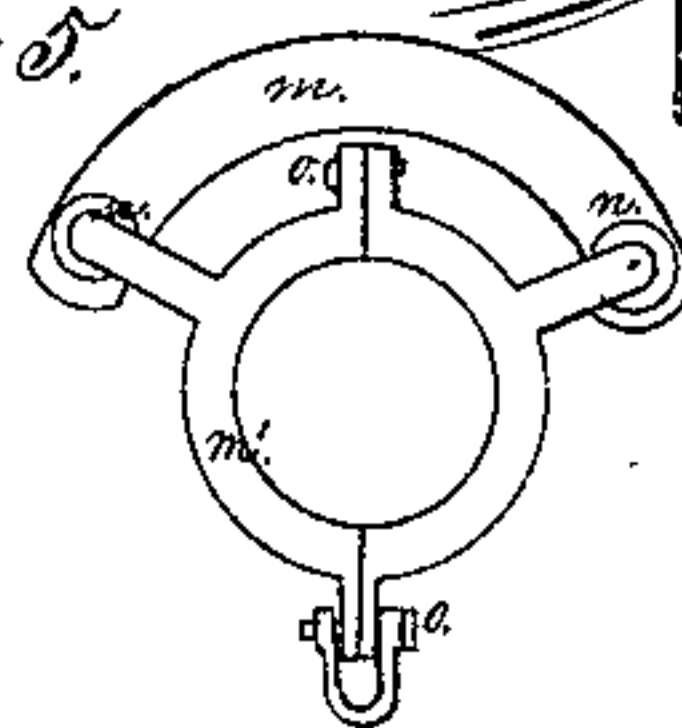
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



*Witnesses:*  
*Flies Lussell*  
*W. W. Burroughs*

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*Jno Hart*  
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*Attys*



# UNITED STATES PATENT OFFICE.

JOHN HART, OF SUNDERLAND, ENGLAND.

## IMPROVED DEVICE FOR REEFING FORE-AND-AFT SAILS.

Specification forming part of Letters Patent No. 51,529, dated December 12, 1865.

*To all whom it may concern:*

Be it known that I, JOHN HART, of Sunderland, in the county of Durham and Kingdom of England, have invented new and useful Improvements in Reefing Fore-and-Aft Sails; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a sectional elevation of this invention. Fig. 2 is a side elevation of the same. Fig. 3 is a horizontal section of the mast. Fig. 4 is a detached side elevation of the throat end of a boom or gaff constructed according to my invention. Fig. 5 is an end view of the guard detached, the three last figures being in a larger scale than the previous figures.

Similar letters of reference indicate like parts.

This invention consists in making either the boom or the gaff so that the same will revolve, and that by revolving it the sail will be caused to roll upon and off the same. For this purpose the throat end of the boom or gaff is fitted into a socket, from which projects a strong pin on a line with the axis of the boom or gaff. This pin has its bearing in a hole in the middle of a pair of what may be termed "outer jaws," and in this hole it works as a swivel. The two ends of the outer jaws are fastened to the two sides of a pair of what may be termed the "inner jaws" by pins or other means, so as to form two joints, on which the boom or gaff and the outer jaws swing up or down without altering the position of the inner jaws. The position of the boom or gaff is adjusted by traveling bands, one near the outer end or peak thereof and one near its throat end, and a suitable rope or chain tackle serves to impart to said boom or gaff the desired revolving motion. This chain or rope passes round a suitable grooved wheel secured to the boom or gaff near its throat, and a hoop, with suitable guards, attached to the traveling band at the throat, prevents the chain or rope from unshipping.

The drawings represent the application of my invention to the boom only; but it will be easily understood from the following description that the same is equally applicable to the gaff, though the main feature of the invention—viz., to make the boom revolving—can-

not probably be applied with good advantage to the gaff.

A represents the boom, which is fitted at its throat or fore end in a socket or boss, *a*, from which extends a pivot, *b*, into a hole in the middle of the outer jaws, *c*, and the ends of these jaws are fastened by pins *d* or other suitable means in a pair of inner jaws, *e*, which have a semicircular form, and embrace the mast, as shown. The boom and the outer jaws can thus be made to swing up and down without altering the position of the inner jaws, and said inner jaws are free to move up and down and round the mast. The swivel and the inner and outer jaws together form a universal joint, allowing the boom to revolve at the same time freely round its own axis. The middle of the outer jaws is strengthened at the point where the pin passes through by being increased in thickness. At this point and immediately over the pin itself a set-screw may be applied at right angles to the pivot *b* in such a manner that said pivot can be fastened and prevented from revolving in the swivel. At the after end of the traveling boom is a traveling band, *f*, with a middle ring, which has an eye, *g*, on its lower side, to which eye the sheet *h* is fastened. The topping-lift *i* is attached to an eye, *j*, on the upper side of the traveling band *f*, or said topping-lift is furnished with an eye at its end, which works on and along a curved bar of iron fastened at each end to the middle ring. A similar traveling band may be attached to the gaff, or ordinary throat and peak halyards may be used for the purpose of operating the same.

An endless chain, *k*, has one bight passing through and over a common block, *l*, at the mast-head, and the other bight passing under the boss *a* at the fore end of the boom, and one part of such endless chain passes on each side of both the gaff and boom, as shown in Fig. 1; or this endless chain, instead of being carried upward and passed over a block above the gaff, may be shorter and carried downward and round a bossed winch, placed either on or below the deck and worked by manual labor or power.

To keep the endless chain from slipping off the boss *a*, I use a guard or guide, (marked *m*,) consisting of two pieces of iron or brass pinned together at the ends and placed above the boss, as shown particularly in Fig. 4. Both parts



of the endless chain pass through this guard or guide, and to ease the friction a roller, *n*, is placed on each pin between the side pieces of such guard or guide. Said guard or guide is either left loose, or it may be fixed to the mast or to the boss by rigid or hinged standards. In the drawings it is shown as being fastened to the boss *a*, which, for this purpose, is provided with a projection that is embraced by a ring or hoop, *m'*, so loosely that the boss may revolve without causing the hoop or ring to revolve also. From the upper part of this hoop or ring extend two standards, to which the guard is attached, and it is made in two halves, which are secured together by screws *o* or other suitable means. The lower screw holds a shackle to which a rope is attached, which, being made fast on deck, holds the hoop or ring *m'* from revolving with the boss. If one or both of the screws *o* be screwed tight, so as to make the hoop or ring grip the projection of the boss, said boss and the boom are prevented from revolving.

A tackle, *p*, hooked to the descending part of the endless chain, as high from the deck as possible, forms the down-haul. Upon the masts I use the ordinary hoops, *q*, which are provided with travelers *r*. These travelers consist of rollers secured to the hoops by forked brackets or by a strip of canvas, or any other suitable means, and they catch over the weather of the sail, which is strengthened by a thicker rope than usual. The traveler, by embracing that rope, keep the weather of the sail in position with reference to the mast, and at the same time they slide up and down the weather of the sail to be rolled upon and off the boom. A short piece of chain or rope, *s*, is made fast by one end to the top of the throat of the gaff, and its other end is hooked to the descending part of the endless chain.

To reef the sail, I slack the peak and throat

halyards, which causes the weight of the gaff to bear down upon the endless chain. I also haul on the down-haul, and as the lower bight of the endless chain passes under and round the boss *a* it causes the boom to revolve, and the sail is thus rolled round the boom. To make sail, I slack the down-haul and hoist upon the peak-halyards and throat-halyards, as usual, which rolls the sail off the boom again.

If the gaff is made to revolve instead of the boom, a revolving ring has to be secured to the peak end of the gaff to keep the lee of the sail extended during the operation of reefing, and in place of the endless chain *k* a reef-tackle of chain is employed to impart the requisite revolving motion to the gaff.

Instead of making either the boom or gaff to revolve, as above described, I place at intervals from the traveling band to the boss hoops or rings, with eyes in each ring for four or five rods. These rods form a frame upon which the sail is bent, and the frame is made to revolve by means similar to those before described for making the boom or gaff to revolve.

What I claim as new, and desire to secure by Letters Patent of the United States of America, is—

1. The combination of the boss or socket *a*, pin *b*, jaws *c d*, and chain *k*, with the boom or gaff, as and for the purposes specified.

2. The guard *m*, in combination with the chain passing round the boss or socket at the fore end or throat of the boom or gaff, as set forth.

3. The combination of the travelers *r* with the mast-hoops and sail, as and for the purpose described.

JOHN HART.

Witnesses:

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ALBERT EDWD. OVERELL.