To all whom it may concern:

Be it known that I, RODERICK MACRAE, a subject of the King of England, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Sail-Controlling Systems, of which the following is a specification.

My invention relates to an improved sail controlling system and mechanism for vessels.

In the operation of sailing vessels the greatest source of expense is the large crew necessary for handling and operating the various sails. The object of my invention is to provide a system of power control and operation of the sails, and to reduce the necessary man power to a minimum.

Broadly, my invention involves the use of the electric motor controllable from a distance to provide the power for raising and lowering sails, rolling them up, or adjusting them. Square sails adapt themselves very readily to such power control and one of the objects of my invention is to provide an arrangement which will combine the advantages of fore and aft sails with those of the square sail.

On the accompanying drawings the various features of my invention are clearly illustrated. In these drawings—

Figure 1 is an elevational view of a mast with a sail supported thereon.

Fig. 2 is a vertical sectional view on plane 2—2 of Fig. 3 of the sail and the electrically controlled operating mechanism therefor.

Fig. 3 is a sectional view on plane 3—3 of Fig. 2, and

Fig. 4 is a perspective view of a yard arm showing the manner of securing the sail thereto.

On Figs. 1 and 2, 5 represents the deck of a vessel. 6 represents a mast suitably supported on the deck. 7 represents a platform having the opening 8 for receiving the mast and mounted on the base 9 from which the mast extends, the platform being rotatable around the mast, but confined against upward movement by the collar 10 secured to the mast. Extending across the platform and supported thereby is the channel shaped beam 11 which forms a support and shelter for various sail operating mechanism. Extending upwardly from the ends of the beams 11 are the arms 12 and 13 forming bearing supports for the roller 14 for the sail 15. The sail is lashed at its lower end to the roller in any well known manner, and at its upper end is lashed or otherwise secured to the upper yard arm 16, which has the guide block 17 receiving the mast.

At one end the roller 14 has the sprocket wheel 17 secured thereto and connected by chain 18 with the sprocket wheel 19 on the shaft 20 which is within the beam 11. The shaft is journaled in the bearings 21 and 22 secured to the beam. Mounted on the platform 7 is the driving source 23, which may be a gas engine, steam engine or electric motor, an electric motor being shown.

Pinion 24 of the motor meshes with the gear 25 secured to the counter-shaft 26 which is journaled in bearing frames 27 on the platform. Adjacent to and parallel with the counter-shaft 26 is the stationary shaft 28 supported in frames 29. Rotatable on the shaft 28 is the worm wheel 30 connected with a sprocket wheel 31, which is engaged by the chain 32 leading to the sprocket pinion 33 on the roller driving shaft 20. On the counter-shaft 26 bevel pinions 34, 35 and 36 are rotatable and adapted to be secured to the shaft 26 by clutch mechanisms 37, 38 and 39 respectively. In a suitable frame 40 mounted on the platform 7 is journaled the cross shaft 41 having at its front a bevel gear 42 which meshes with the bevel gear 43 on the shaft 26. The shaft 41 also carries the worm 43 which meshes with the worm wheel 30 on the shaft 28. With this arrangement when the gear 34 is clutched to the shaft 26 the said roller operating shaft 20 will be rotated and the roller operated. The sprocket pinion 33 is preferably loosely mounted on the shaft 20 and adapted to be secured therein to by suitable clutch mechanism 44.

At the top of the mast is secured the bracket 45 which journals the pulley 46, which receives the endless cable or chain 47. The cable or chain at its lower end passes around the sprocket 48 which is secured to the worm wheel 49 rotatable on the shaft 28. The cross shaft 50 at its inner end carries the worm 51 which meshes with the worm wheel 49, and at its front end has the bevel gear 52 meshing with the gear 53 on the shaft 26. When the gear 35 is clutched to the shaft 26 the belt 47 will be driven to raise or lower the sail depending upon the direction of rotation of the motor.
In order to set the sails and adjust the angle thereof as desired, means are also provided for horizontally rotating the platform 7. On the shaft 28 the worm wheel 53 is rotatable and carries the sprocket wheel 54. Around this sprocket wheel passes the chain 55 whose ends are anchored to the deck at either side of the mast, as indicated at 56 and 57, Fig. 3. Intermediate its ends the chain passes around guiding pulleys 58 and 59, which are supported within the channel beam 11 as clearly shown. The worm wheel 53 is engaged by the worm 60 on the cross shaft 61 which in its front end carries the bevel gear 62, which meshes with the gear 36 on the shaft 61. When this gear is clutched to the shaft by the clutch mechanism 39 the platform 7 and consequently the sail roller mounted thereon will be swung horizontally, depending upon the direction of rotation of the motor.

The clutch mechanisms 37, 38 and 39 are preferably controlled electrically from a distance. As shown the electro-magnetic structures 63, 64 and 65 are mounted on the platform, and their circuits controlled from a distance to cause operation by the devices of the clutch arms 66, 67 and 68 connected with the clutch mechanisms 37, 38 and 39 respectively. The switches for controlling the circuits for these electro-magnetic devices can be placed in the captain's station, together with a switch mechanism for controlling the connection and operation of the motor 25.

When a sail is to be raised on a mast the motor associated with that mast is started and the circuit for clutch device 64 adjusted to connect the gear 35 with the shaft 26 to cause rotation of the worm wheel 49 and the belt 47, the guide block 17 of the upper yard arm 16 of the sail being secured to this belt as indicated at 69, Fig. 2. The operation of the belt in the proper direction will cause the sail to be unwound from the roller 14 and raised, the clutch mechanism 44 being set to release the shaft 26 during such unwinding operation of the sail. This clutch may also be operated by electro-magnetic means controlled from a distance.

When the sail has been raised to the desired height, the sprocket 55 is clutched to the shaft 50 so that the roller is locked against rotation by the locking engagement of the worm wheel 50 with the worm 49. If the sail is to be lowered the motor is operated in the proper direction for rotating the belt 47 for this purpose, and the sail can be dropped entirely and its roller then clutched in for operation to take up the sail, or the sail can be alternately dropped a distance and then the slack taken up on the roller.

If, after the sail is raised, the angle is to be adjusted with reference to the wind, the clutch mechanism 65 is operated to clutchr the gear 36 to the shaft 26 whereupon the sprocket 54 engaged with the chain 55 to cause the platform 7 with the sail roller thereon to be swung to carry the sail to the proper angle. Thus by merely pressing proper push buttons, or operating simple switches the proper mechanism is set in operation to adjust the sail as desired.

The sail shown is a square sail and unless stiffened properly it would pocket and its efficient use would be interfered with. To stiffen the sail and keep it straight I provide transverse pockets 70 at intervals for receiving stiffening rods 71. I also preferably provide intermediate yard arms 72 to which the sail can be quickly detachably secured. As shown the strips sewed to the sail to form the pockets 70 have flaps 73 provided with the eyelets 74. The yard arms 72 have hooks 75 for receiving the loops 76 formed by the rope or cable 77 threaded through the eyelets 74. These yard arms assist the stiffeners 71 in keeping the sail taut and flat and serve also to hold the sail parallel with the mast and prevent ballooning thereof.

When the sail is lowered the cable or rope 77 can be readily unhooked from the intermediate yard arms, and when the sail is raised the rope can readily be received by the hooks so that the yard arms will be raised with the sail. In order to prevent undue strain on the sail, chains or cables 78, 79 extend from the ends of the upper yard arms 16 to the ends of the channel beam 11 on the platform 7. These cables or chains may also be secured to the outer ends of the intermediate yard arms 72. The sail can be raised until the cables 78 and 79 become taut and the sail is thus protected. At the same time the cables assist in steadying intermediate yard arms.

With the above arrangement a square sail can be controlled entirely automatically, and at the same time possess all the advantages of a fore and aft sail.

My invention is particularly adaptable on the smaller vessel, that in addition to considerable sail area, are adapted to be propeller driven usually by a gas engine. Where such mechanical power is available electric power can readily be generated for the sail operating and controlling motors, and the switch board for all the circuits of the sail operation controlling devices can be located at the captain's station. The captain can therefore directly and quickly accomplish adjustment and operation of the sails without depending upon man power.

Having described my invention, I claim as follows:

1. In a sail operating system the combination with a mast, of a platform at the base of said mast rotatable thereon but confined against vertical movement, a sail roller jour-
naled on said platform for supporting a sail, a motor mounted on said platform, a driving train for connecting said motor with said roller, and means for controlling the connection of said motor with said driving train.

2. In a sail operating system the combination with a mast, of a platform rotatable horizontally at the base of said mast, a roller journaled on said platform for supporting a sail, a motor mounted on said platform and controllable from a distance, a driving train for connecting said motor in driving connection with said sail roller, hoisting means connected with the sail on said roller, and means for controlling the driving means between said motor and said hoisting connection.

3. In a sail operating system the combination with a mast, of a sail, a roller for winding up said sail, hoisting mechanism for hoisting said sail, a motor, driving trains between said motor and said roller and hoisting mechanism, and electro-magnetic mechanism for controlling the connections of said driving trains with said motor.

4. In a sail operating system the combination with a mast, of a rotatable platform at the base thereof, a sail winding up roller journaled on said platform, hoisting mechanism for hoisting the sail from said roller, mechanism for turning said platform, a motor, and means for selectively connecting said motor in driving relation with said roller, hoisting mechanism or turning mechanism.

5. In a sail operating system the combination with a mast, of a horizontally rotatable platform at the base of said mast, a roller journaled on said platform for winding up the sail, hoisting mechanism extending between said mast and platform and adapted for connection with the sail, turning mechanism for said platform, and a common motor for operating said roller, hoisting mechanism or platform turning mechanism.

6. In a sail operating system the combination with a mast, of a platform rotatable horizontally at the base of said mast, a roller journaled on said platform, a sail secured at its lower end to said roller to be wound up thereon when the roller is rotated, hoisting mechanism extending from said platform to said mast and connected with the upper end of said sail, a motor mounted on said platform, driving trains extending from said motor to said roller and hoisting mechanism respectively, and electro-magnetic means for controlling the driving connection of said motor with said driving trains.

7. In a sail operating system the combination with a mast, of a roller journaled at the base thereof, a sail secured at its lower end to the roller to be wound up thereon when the roller is turned, hoisting mechanism connected with the upper end of said sail for hoisting said sail on said mast, intermediate yard arms on said sail connected with said mast, fabric strips on said sail forming transverse pockets, stiffening rods in said pockets, hooks on said intermediate yard arms, eyelets in said strips, and cable threading through said eyelets and engaging with said hooks to detachably secure said sail to said intermediate yard arms.

In witness whereof, I hereunto subscribe my name this 18th day of February A. D., 1919.

RODERICK MACRAE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."