No. 863,152. PATENTED AUG. 13, 1907.

J. H. CLARK.

HOIST.

APPLICATION FILED MAR. 10, 1904.

Fig. 1.

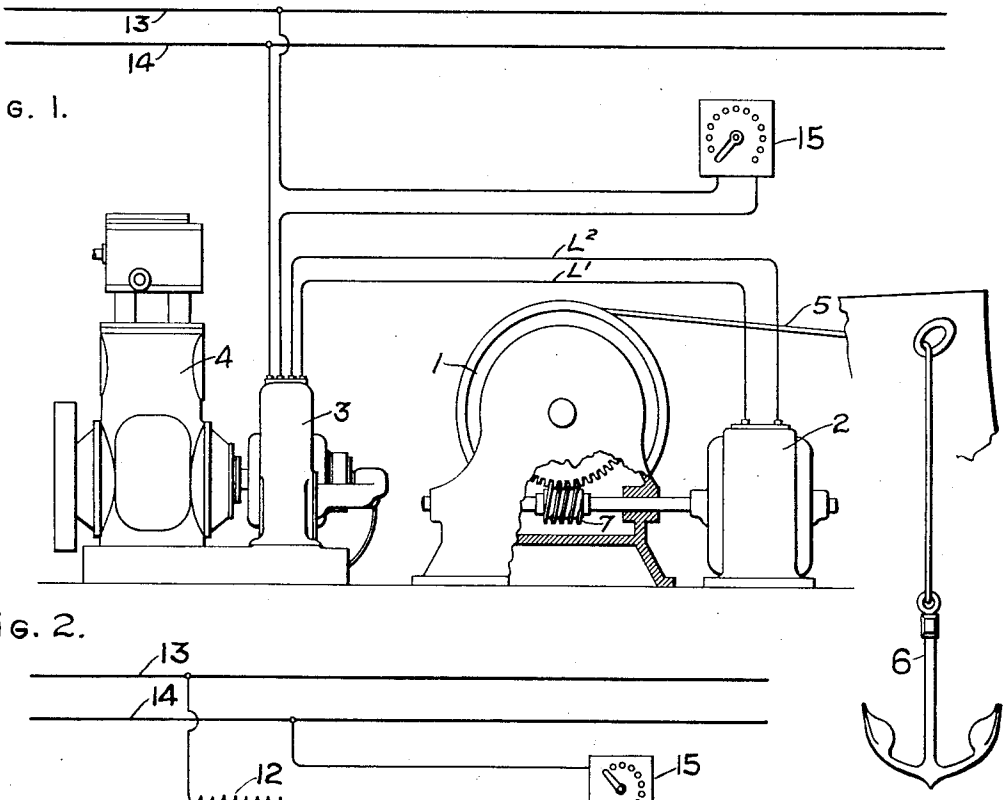


Fig. 2.

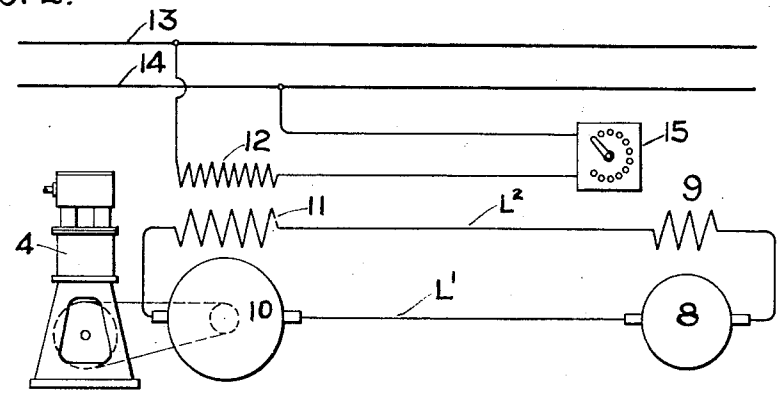
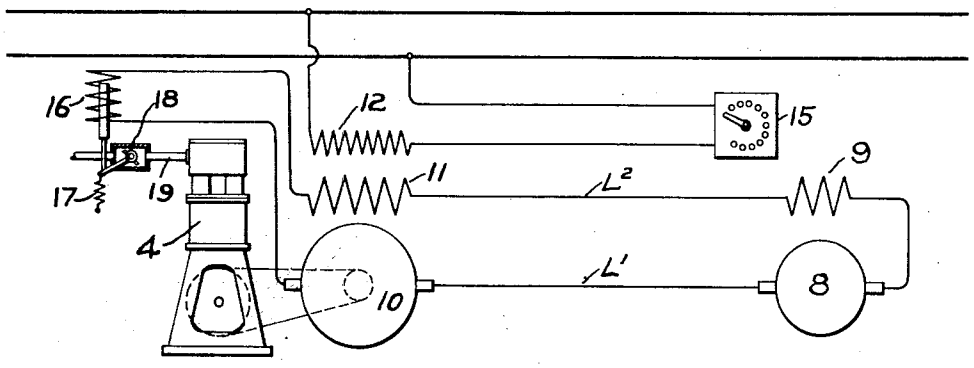


Fig. 3.



Witnesses:
Irving E. Steers.
Helen Orford

Inventor,
John H. Clark.
by Albert G. Davis
Atty.

UNITED STATES PATENT OFFICE.

JOHN H. CLARK, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

HOIST.

No. 863,152. Specification of Letters Patent. Patented Aug. 13, 1907.

Application filed March 10, 1904. Serial No. 197,511.

To all whom it may concern:

Be it known that I, JOHN H. CLARK, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Hoists, of which the following is a specification.

My invention relates to hoisting systems of the type in which the hoists may be overloaded and stalled without injury to the apparatus. Such hoisting systems are particularly useful on shipboard in raising anchors. In such service the anchor can be hoisted most efficiently and satisfactorily by exerting a continuous pull on the anchor chain sufficient to keep it taut and to take in the slack as the anchor gives way. Heretofore this has been accomplished by driving the hoisting drum by a steam engine of such capacity that it would be stalled when the resistance to the movement of the anchor became too great and would automatically start again when the resistance fell off. Such hoists however are objectionable for the reason that they possess all the defects incident to steam operation, such as expensive piping, condensation losses and the like. To overcome this objection it has long been desired to drive the hoisting drum by an electric motor but, as is well known, with the ordinary installation an overload on the motor such as this service requires would either result in blowing the fuses or operating the other protective devices in the motor circuit so often as to render the system impractical or else would burn out the motor.

The object of my present invention is to provide an electric hoisting system capable of withstanding and meeting the requirements of this service.

In carrying out my invention, I drive the hoisting drum by an electric motor supplied from a source of current, the capacity of which is so proportioned with reference to the capacity of the motor that it is incapable of furnishing at any time a current large enough to burn out or injure the insulation of the motor even when the motor is stopped by the load imposed by the anchor.

In the accompanying drawing which is to be considered in connection with this description, I have shown a hoisting system arranged in accordance with my invention.

In said drawing, Figure 1 is a view illustrating the general arrangement of such system; Fig. 2 is a diagram of the electrical connections of the system; and Fig. 3 is a diagram, similar to Fig. 2, of a modified arrangement.

Throughout these several views like characters refer to like parts.

The essential elements of the system consist of the hoisting drum 1, an electric driving motor 2, a generator 3, and a prime mover 4. The driving motor is geared directly to the drum 1 and is arranged to rotate it to draw in the anchor chain 5 connected to the anchor 6. The electric motor 2 is preferably a series motor having an armature 8 and field winding 9 supplied from the generator through suitable leads L^1 L^2.

The generator may be of any desired type but as herein shown is a compound wound generator comprising an armature 10, a series winding 11 and a winding 12 supplied from some auxiliary source of current through the mains 13 and 14. Through the agency of the rheostat 15 connected in series with the winding 12 and located adjacent the motor, the field strength of the generator 3 may be varied to change the speed of the motor 2 in a manner known in the art. The prime mover 4 in the present instance is a steam engine but might equally well be any other type of prime mover.

The essence of the present invention resides in so proportioning the capacities of the engine 4, generator 3 and motor 2 that when the motor is stalled the remaining elements will be unable to furnish it with an injurious current. This is preferably accomplished by making the engine 4 the weakest point in the system or, in other words, by giving it a capacity less than that of the generator 3 and motor 2.

In operation, assuming that the engine 4 is supplied with steam at constant pressure, it will run at practically constant speed on account of the action of the engine governor, irrespective of the load imposed by the generator 3 until the load becomes so great that the governor is no longer effective. From this point on, increases in load will produce corresponding reductions in engine and generator speed and each reduction in generator speed will lower the potential on the generator and motor, thereby causing a falling off in the speed of the motor. Further increases in load will further reduce the engine and generator speed and this in turn will produce further reductions in motor speed until finally with a sufficient load the motor will be stalled. When this point is reached, the load on the engine and generator is a maximum, and by reason of the relative capacities of the elements of the system, this load will not be injurious but will be well within the safe capacity of the generator and motor. While the motor remains stalled, the engine and generator continue to run at a reduced speed supplying maximum current to the motor and the motor exerts its maximum torque. But just as soon as the anchor gives way, the motor will begin to rotate and continue the hoisting operation, the reduction in load causing an increase in engine and generator speed with a corresponding higher voltage on the generator and motor, which in turn cause the motor to run faster. Thus, it will be seen that I have devised a system in which the hoisting drum will

be run at varying speeds dependent upon the resistance offered by the anchor and in which the motor may be stalled without injury to the system.

Instead of using a driving engine of a certain definite capacity at the engine 4, I may use an engine of larger capacity and provide means for throttling it whenever the current in the electrical part of the system becomes excessive; that is to say, I may provide an engine of large capacity but work it at less than its full capacity. In Fig. 3, in which I have shown such an arrangement, a solenoid 16 or equivalent device located in the motor supply circuit acts in conjunction with a spring 17 to open and close the throttle valve 18 in the steam pipe 19 of the engine 4. Normally, the valve 18 is held open by the spring 17 so as to admit steam to the engine, but when the load on the motor becomes unduly high, the large current supplied to the motor energizes the solenoid 16 and the valve 18 is closed more or less and the supply of steam to the engine thereby cut off. After the load on the motor becomes such that the current supplied to it begins to operate the valve, further gradual increases in load will gradually increase the current and further close the valve until a point is reached where the engine will be incapable of driving the generator at a speed sufficient to furnish the requisite current to overcome the load, and the motor will be stalled as in the preceding case.

In the present application I have disclosed the principle of my invention in simple forms and it is of course to be understood that it may be embodied in different forms without departing from the spirit and scope of the invention, and I therefore do not wish to be limited to the specific forms shown but aim to cover by the terms of the appended claims all variations and modifications thereof.

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

1. In a hoisting system, the combination of an electric hoisting motor, and current-supplying means for said motor of smaller capacity than said motor, whereby said motor may be stalled without injury to the system.

2. In a hoisting system, the combination of an electric hoisting motor, a generator for supplying current to said motor, and a prime mover for driving said generator, the capacities of said motor, generator and prime mover being so limited that the motor may be stalled without injury to the system.

3. In a hoisting system, the combination of an electric hoisting motor, a generator for supplying current to said motor, and a prime mover for driving said generator so limited in capacity that it can never cause the generator to furnish more current than the system can safely stand.

4. In a hoisting system, the combination of an electric hoisting motor adapted to be overloaded in the operation of the system, a generator for supplying current to said motor, a steam engine for driving said generator, and means for keeping the load within the safe capacity of the generator and motor.

5. In a hoisting system, the combination of an electric hoisting motor adapted to be overloaded in the operation of the system, a generator for supplying current to said motor, a steam engine for driving said generator, and means for governing the speed of the engine so as to keep the load within the safe capacity of the generator and motor.

6. In a hoisting system, the combination of an electric hoisting motor adapted to be overloaded in the operation of the system, a generator for supplying current to said motor, a steam engine for driving said generator, and means controlled by the current supplied to said motor for governing the speed of the engine so as to keep the load within the safe capacity of the generator and motor.

7. In a hoisting system, the combination of an electric hoisting motor, a generator for supplying current to said motor, a steam engine for driving said generator, and means for decreasing the output of said engine as the load on the motor increases.

8. In a hoisting system, the combination of an electric hoisting motor adapted to be overloaded in the operation of the system, a generator for supplying current to said motor, a steam engine for driving said generator, and a valve controlled by the current supplied by said motor and arranged to govern the speed of the engine so as to keep the load within the safe capacity of the generator and motor.

9. In a hoisting system, the combination of an electric hoisting motor adapted to be overloaded in the operation of the system, a generator for supplying current to said motor, a steam engine for driving said generator, a valve arranged to govern the speed of the engine so as to keep the load within the safe capacity of the generator and motor, and a solenoid in circuit with the motor for operating said valve.

10. In a hoisting system, the combination of an electric hoisting motor, a generator for supplying current to said motor having a series field winding, an auxiliary field winding supplied from an auxiliary source of current, means for varying the current in said auxiliary winding, and a prime mover for driving said generator, said prime mover being so limited in capacity that it can never cause the generator to furnish more current than the system can safely stand.

In witness whereof I have hereunto set my hand this 8th day of March. 1904.

JOHN H. CLARK.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.