

J. REID & H. A. MAVOR.
DREDGER.
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1,062,926.

Patented May 27, 1913.

4 SHEETS—SHEET 1.

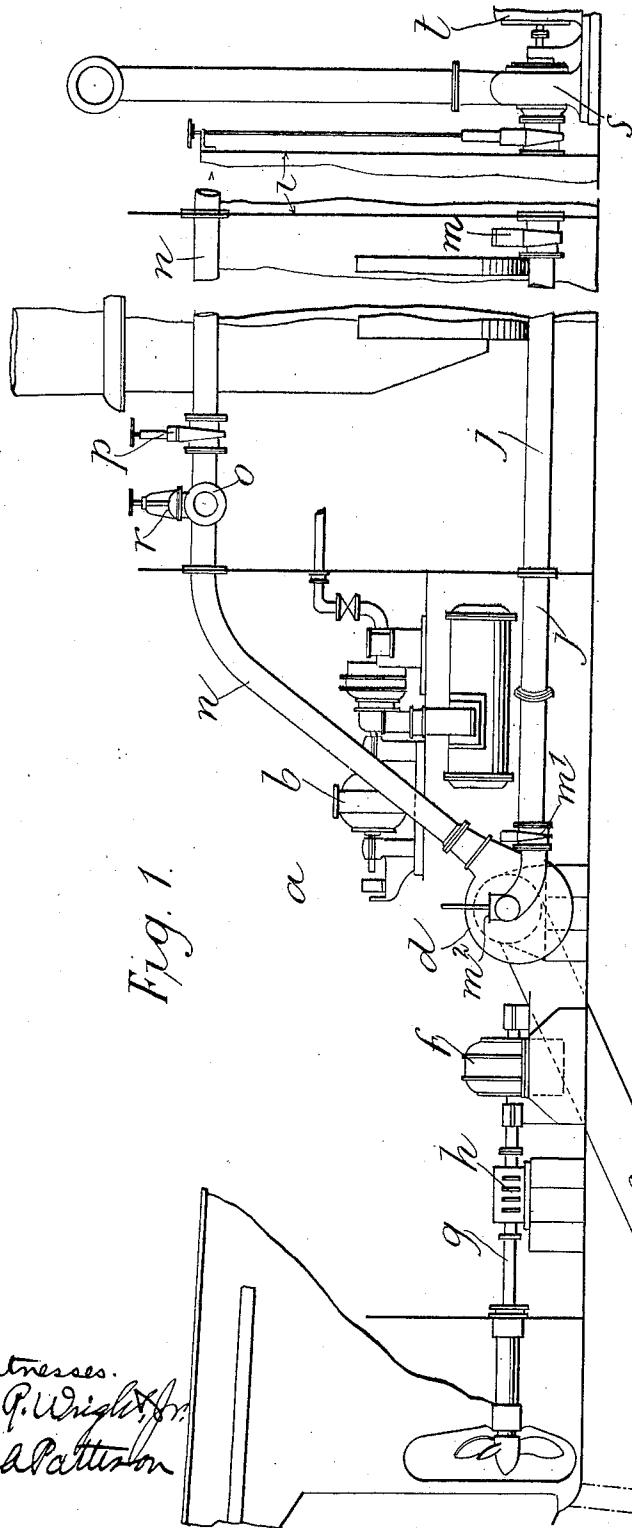


Fig. 1.

Witnesses.
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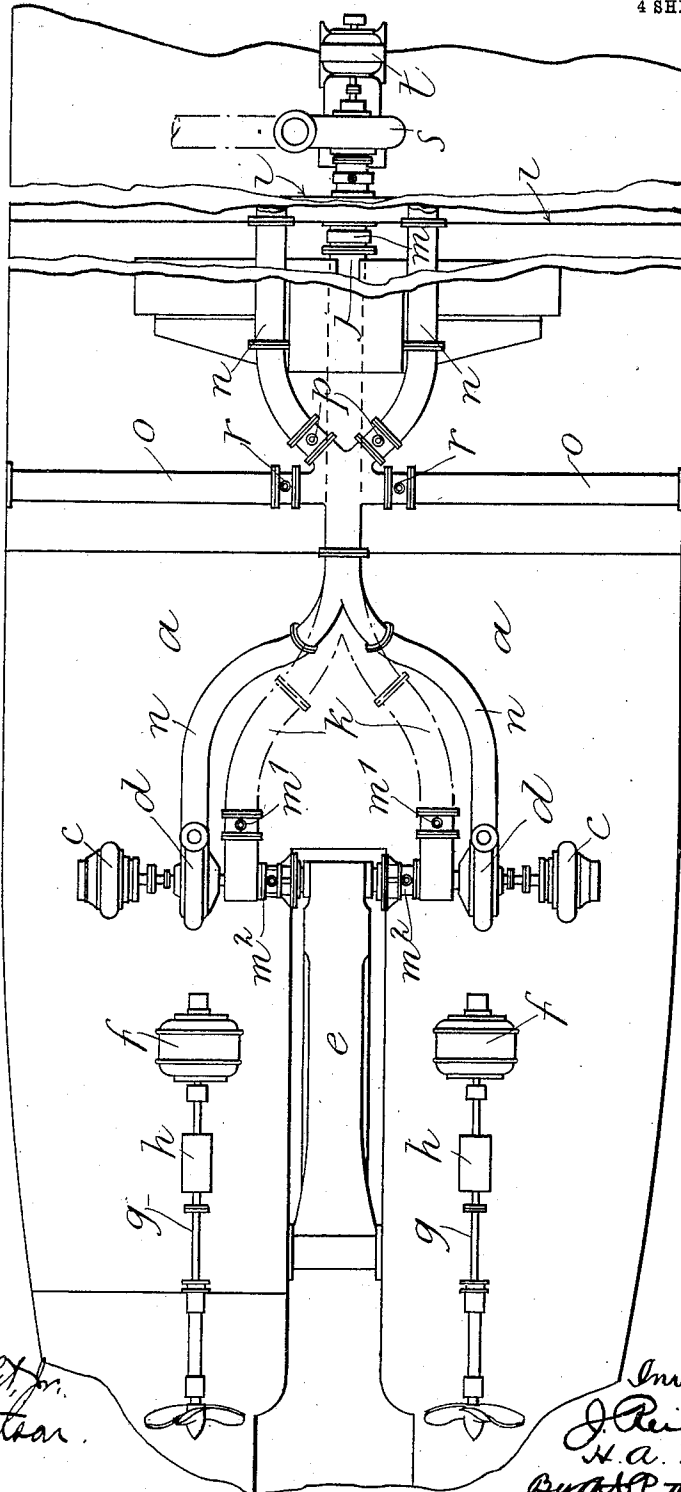
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4 SHEETS—SHEET 2.

Fig. 2.



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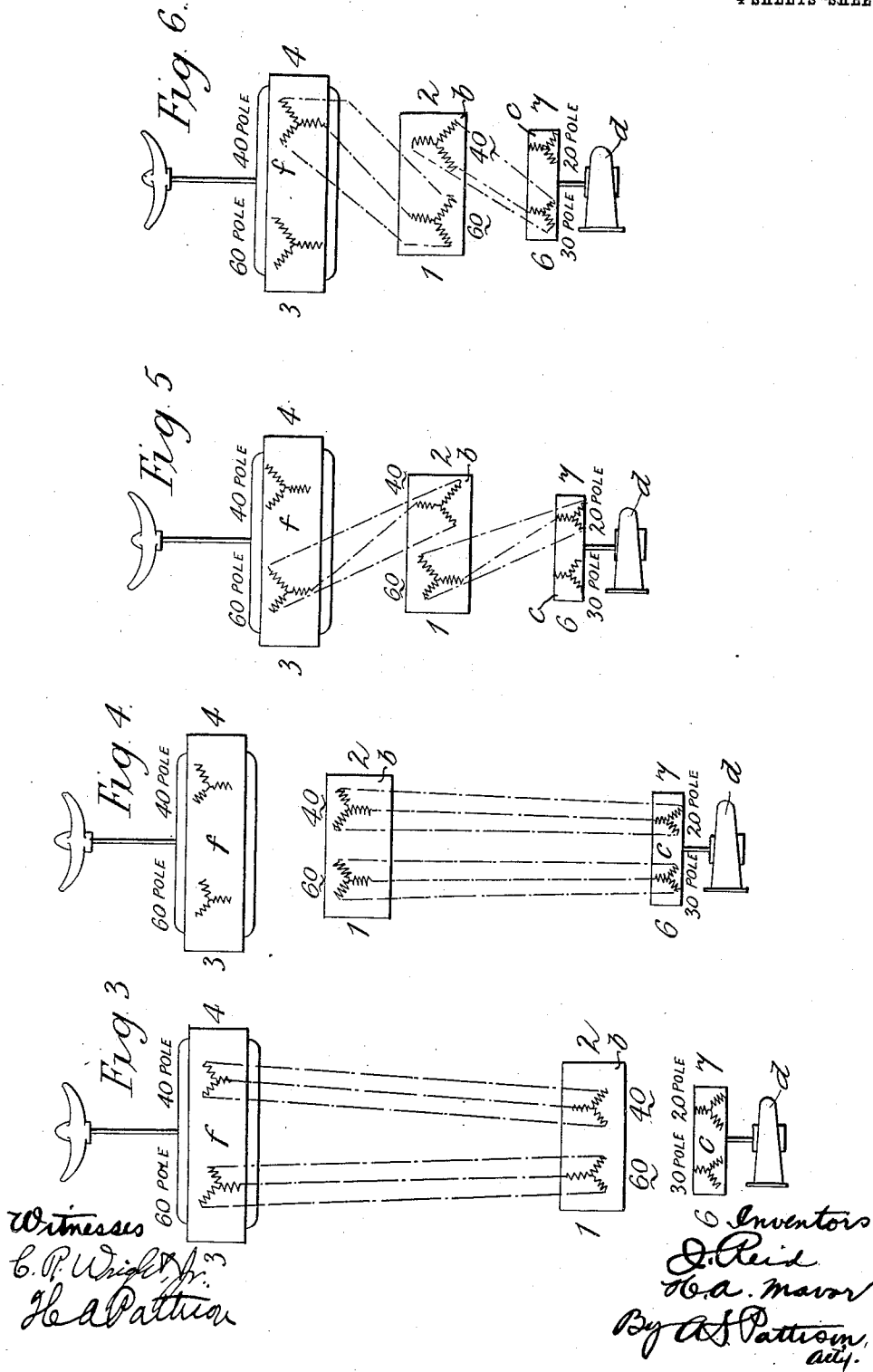
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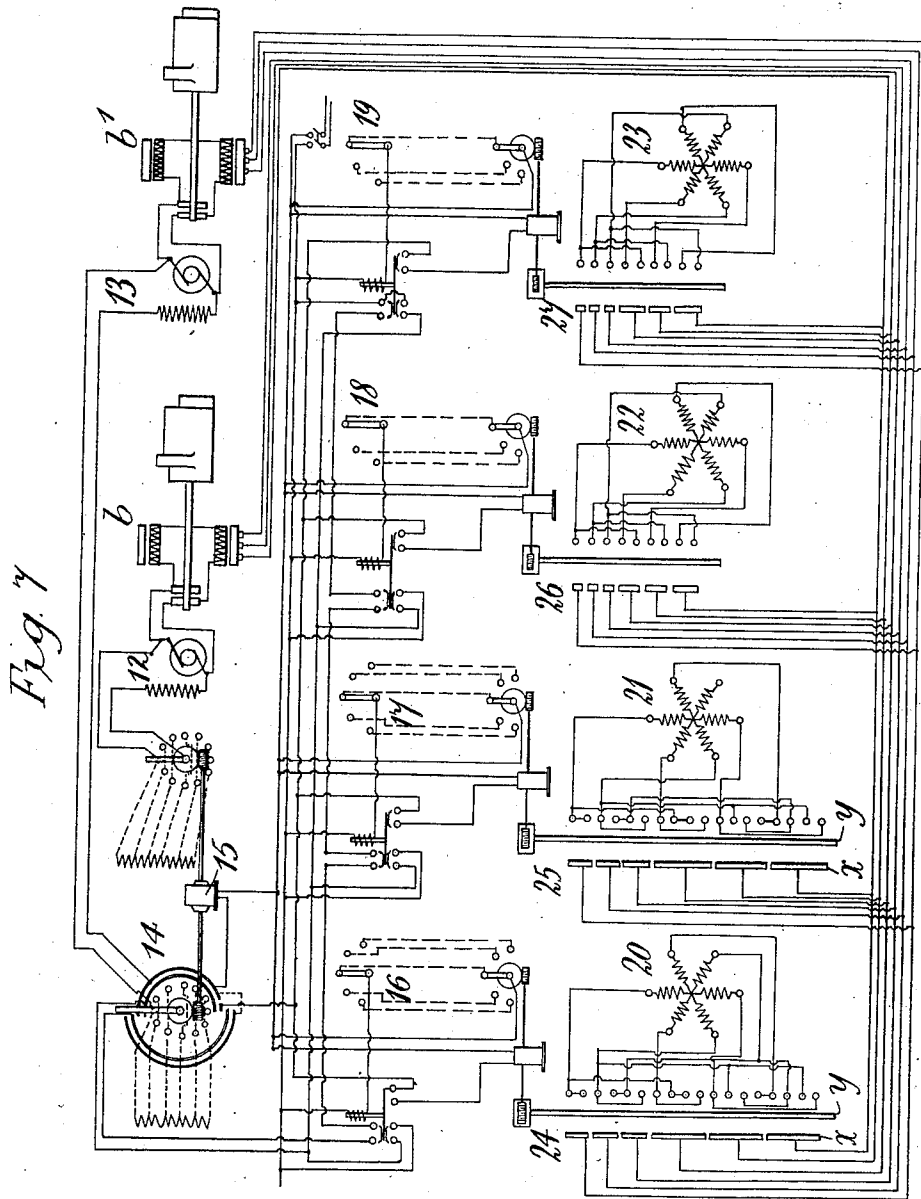


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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

JOHN REID AND HENRY ALEXANDER MAVOR, OF GLASGOW, SCOTLAND.

DREDGER.

1,062,926.

Specification of Letters Patent.

Patented May 27, 1913.

Application filed January 14, 1913. Serial No. 741,979.

To all whom it may concern:

Be it known that we, JOHN REID and HENRY ALEXANDER MAVOR, subjects of the King of Great Britain and Ireland, residing at Glasgow, Scotland, have invented Improvements in or Relating to Dredgers, of which the following is a specification.

It is known that a suction hopper dredger can be operated in a highly economical manner by installing one central electric power station equal in capacity approximately only to that required to propel the vessel since the pumping or auxiliary power, which may be assumed to be roughly equal to the propelling power, is only wholly required when the vessel is not utilizing much power for propulsion.

The object of the present invention is to provide an improved arrangement of parts for a suction hopper dredger equipped as above stated, the electric motors for propulsion and for dredging being under the control of the dredger master at a single control station, as hereinafter described.

In the accompanying illustrative drawings, Figures 1 and 2 are respectively an elevation and part plan representative of the hopper dredger arrangement according to this invention. Figs. 3 to 6 are diagrams showing electrical connections pertaining to the motor and generator plant. Fig. 7 is another diagram illustrating how the connections such as those of Figs. 3 to 6 are controlled.

Referring to Figs. 1 and 2 in the engine room *a* there is placed a generating plant, say a steam-turbo electric arrangement *b*. Current supplied from this generating set is conveyed to motors *c* driving dredge pumps *d*, which are fitted close to the trunnion at the point at which suction piping, such as the pipe *e* enters the hull. Similarly, power is conveyed to propelling motors *f*, keyed direct to the propeller shafting *g* just ahead of the thrust block *h*.

In order to dispense with bottom discharging doors, which are difficult to keep water tight or in good repair, the dredging pumps *d* are arranged to pump from the hopper, represented at *i*, and discharge overboard, *j* indicating a pipe, branched at *k*, connecting the suction inlets of the pumps *d* with the said hopper, *m*, *m*¹, *m*² control valves, *n* the pipe system enabling the pumps to fill the hopper, *o* branches leading overboard and *p*, *r* control valves. The

arrangement is such that when the hopper is being filled, the valves *m*¹ and *r* are closed. When however the hopper is to be emptied, the valves *m*¹ and *r* are opened and the valves *m*² and *p* closed. At the fore end of the hopper *i* another pumping unit *s* with motor *t* may be provided to assist in the discharge of the hopper by suction therefrom and delivering conveniently to any suitable place, such as overboard.

In a dredger such as referred to, where it is desired that the propeller can be operated either alone or simultaneously with suction dredging motors, the speed adjusting arrangements used must be constituted so that the propelling speed may be fast or slow, as required by the work, while the pumping speed is maintained constant or likewise varied. The necessary combination to produce this result is easily obtained by the use of multiple windings on the propelling motors as is now well known and as will be apparent from the diagrams shown in Figs. 3 to 6 inclusive, where 1 and 2 represent generator windings adapted to supply current of 60 and 40 periods respectively, 3 and 4 corresponding 60 and 40 pole motor windings associated with the propeller motor *f*, and 6 and 7 are 30 pole and 20 pole motor windings associated with the pump motor *c*. When the vessel is traveling at a moderate speed with full power, the windings 1, 2, 3, 4 are, as shown in Fig. 3, all in operation. When the dredger is stationary, the windings 1, 2, 6 and 7 will be in use, as shown in Fig. 4. When the vessel is running at a low speed in conjunction with the suction pumping apparatus, the combination of motor windings and generator currents is changed to that shown in Fig. 5, so that a lower frequency is employed for propulsion, the pump motor being at the same time driven at a greater speed. If, as shown in Fig. 6, the windings 1 and 4 be connected, propulsion will be effected at full speed.

In order to outline how the motors of an arrangement such as just referred to may be controlled from the bridge of the dredger, by means such as form the subject of Letters Patent No. 944453, Fig. 7 has been added. This figure shows diagrammatically the connections between two separate turbo-alternators *b*, *b*¹ of different periodicities, the exciters 12, 13 whereof are influenced by a rheostatic controller 14 operated by a motor

15 in accordance with the manipulation of any of the switches 16, 17, 18, 19. Two double-winding motors 20, 21, provided for propulsion, take the place of the spinner motors of the earlier Letters Patent referred to and two double-winding motors 22, 23 are provided for pumping purposes. The controllers 24, 25 for the motors 20, 21 embody contacts x y such that with the aid of switches 16, 17 the motor windings can be connected to the generator plant b , b^1 in two different ways for driving in one direction, and in an equivalent two ways for driving in the reverse direction. On the other hand the controllers 26, 27 for the pumping motors 22, 23 and the switches 18, 19 are only shown as adapted for connecting the motors to the generator plant b , b^1 in two ways for operation in one direction.

20 It is unnecessary here to describe in full detail the many combinations of which the system above set forth is capable, but it will be clear that by the use of current of two frequencies from the generators, and two groups of windings on the motors, a choice of three speeds is available, and that this choice may be increased by increasing the number of different periodicities provided for. Thus, with three periodicities, five speed changes are possible, and so on.

What we claim is:—

1. A suction dredger comprising in combination a power plant having a plurality of energy sources, each adapted to supply energy at a predetermined rate, a propulsion motor having a plurality of energy translating devices, each adapted to receive energy from any one of said sources, a suction pump motor having a plurality of energy translating devices, each adapted to receive energy from any one of said sources, and means for delivering energy from any one of said sources to any one of said translating devices.

2. A dredger, comprising in combination a source of electric power arranged to produce electrical energy approximately equal in amount to the maximum amount of energy required in the propulsion of the dredger, a propulsion motor arrangement including an electric motor having a plurality of windings of different pole numbers, a dredging motor arrangement including an electric motor having a plurality of windings of different pole numbers, and means for electrically connecting any winding of any motor to the source of power so that varying amounts of electrical energy can be delivered to said motors whereby the distribution of energy produced by said

source can be proportioned between said motors as desired.

3. A dredger, comprising in combination an electric generating plant arranged to deliver electrical energy of a plurality of different periodicities, the total amount of energy produced by said plant being approximately equal to the maximum amount of energy required in the propulsion of the dredger, a propulsion motor having a plurality of windings of different pole numbers, a dredging pump, an electric motor operatively connected to said pump and having a plurality of windings of different pole numbers, and means for delivering electrical energy of any periodicity generated by said plant to any winding of the propulsion motor and to any winding of the pump motor whereby the distribution of energy generated by said plant can be proportioned between said motors as desired.

4. A dredger, comprising in combination an electric generating plant arranged to deliver electrical energy of a plurality of different periodicities, the total amount of energy generated by said plant being approximately equal to the maximum amount of energy required in the propulsion of the dredger, a propulsion motor having a plurality of windings of different pole numbers, a dredging pump, an electric motor operatively connected to said pump and having a plurality of windings of different pole numbers, means for delivering electrical energy of any periodicity generated by said plant to any winding of the propulsion motor and to any winding of the pump motor whereby the distribution of energy generated by said plant can be proportioned between said motors as desired, and switching mechanism coöperating with said last mentioned means whereby said propulsion motor can be connected at will to said generating plant to produce a plurality of different speeds of said dredger in a forward or reverse direction and said pump motor can be connected at will to said generating plant to produce a plurality of pumping speeds.

Signed at Glasgow, Scotland, by the said HENRY ALEXANDER MAVOR this thirtieth day of December 1912.

JOHN REID.

HENRY ALEXANDER MAVOR.

Witnesses to the signature of John Reid:

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HELEN A. SOUTHARD.

Witnesses to the signature of Henry Alexander Mavor:

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WILLIAM MCARTHUR.