

(No Model.)

2 Sheets—Sheet 1.

H. CLAY.
MOTOR.

No. 603,173.

Patented Apr. 26, 1898.

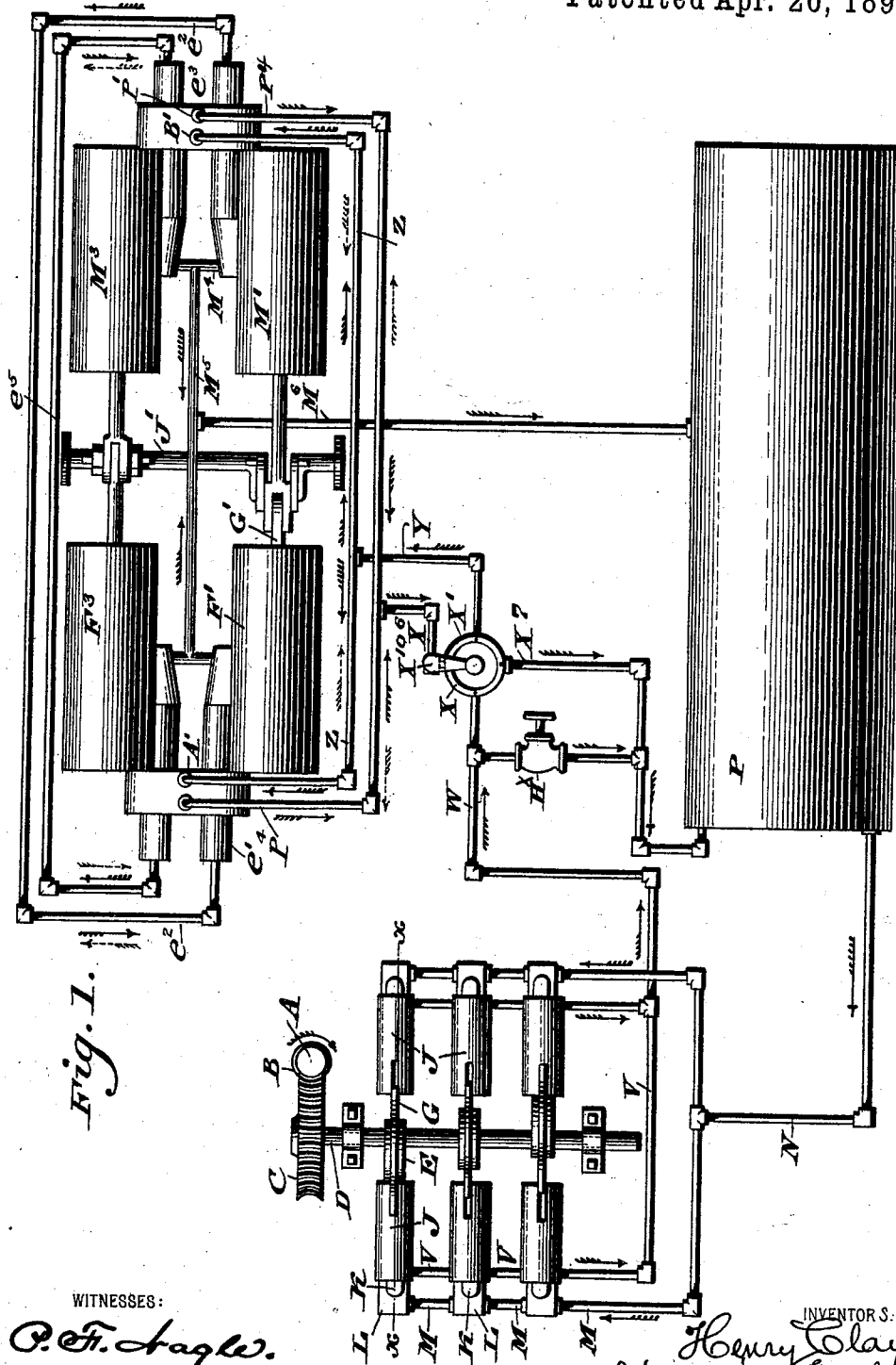


Fig. 1.

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MOTOR.

SPECIFICATION forming part of Letters Patent No. 603,173, dated April 26, 1898.

Application filed August 9, 1897. Serial No. 647,517. (No model.)

To all whom it may concern:

Be it known that I, HENRY CLAY, a citizen of the United States, residing at Fernwood, in the county of Delaware, State of Pennsylvania, have invented a new and useful Improvement in Motors, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of a novel assemblage of mechanism whereby I am enabled to convert a maximum speed with a minimum power into a maximum power with a minimum speed, the novel features of the invention being hereinafter fully set forth, and particularly pointed out in the claims.

Figure 1 represents a diagrammatic plan view of a motor embodying my invention. Fig. 2 represents a horizontal sectional view through the upper portion of Fig. 1, showing the relation of the cylinders, valves, ports, and their adjuncts to each other. Fig. 3 represents, on an enlarged scale, a section on line *xx*, Fig. 1. Fig. 4 represents a plan view of Fig. 3. Figs. 5 and 6 represent horizontal sectional views of a reversing-valve employed. Fig. 7 represents a sectional view of said valve, the section being taken on line *yy*, Fig. 5.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates the main shaft of an electric or other high-speed motor or other initial source of power, the same having a worm B mounted thereon, which is adapted to mesh with the gear C, the gear being secured to the shaft D, which rotates in suitable bearings.

E designates a series of eccentrics or cams which are mounted on the shaft D, the working faces of which cams engage the adjacent yokes F, the ends G of which are attached to the plungers or pistons H, which are caused to reciprocate in their cylinders J, there being a set of cylinders on each side of the shaft D, and since the description and operation of each set is substantially the same a description of one set will suffice for all, reference being therefore had to the left of Figs. 1 and 3.

K designates a pipe leading from the end

of the cylinder J to the compartment S of the valve-chest L.

M designates a suction-pipe for each of the valve-chests, the same being connected with the pipe N, which communicates with the reservoir P, which is filled with glycerin, oil, or other suitable fluid.

Q designates the suction-chamber of the valve-chest L, the same having a port leading therefrom into the compartment S, said port being controlled by a check-valve R, which in the present instance seats downwardly, as indicated at the left of Fig. 3.

U designates the discharge-chamber of the valve-chest L, the same having a port leading thereto from the compartment S, said port being controlled by the downwardly-seating check-valve T.

V designates the discharge-pipes, which lead from each of the discharge-chambers U, the same being connected and finally discharging into the pipe W, which leads to the reversing-valve X, said valve consisting of a casing X', in which the plug X² is rotatably mounted, said plug being held in position by the ring X³ and having the passage X⁴ extending therethrough, by means of which communication is had with the pipe Y, which is connected with the pipe Z, which latter leads to the points A' B'. The valve-plug X² has a port X⁵ passing therethrough at an angle to the port X⁴, and when the ports are in the position seen in Fig. 5 said port X⁵ communicates with the pipes X⁶ and X⁷.

X⁸ and X⁹ designate passages or ports in the valve-plug X², which are arranged substantially parallel to the port X⁴.

X¹⁰ designates a suitable handle whereby the valve-plug X² is manipulated.

The rotation of the shaft A, by reason of the intermediate connections, will cause the reciprocation of the plungers or pistons H, thereby effecting a continuous flow of liquid from the reservoir P through the pipe N to the pump-cylinders J and thence through the pipes V, W, Y, and Z to the points A' B'.

The liquid after reaching the point A' (reference being had to the left of Fig. 1 and especially to the left of Fig. 2) flows through the port C', past the neck C² of the valve b, 100

into the port D', against the piston E', contained in the cylinder F', thereby forcing said piston forward or to the right and effecting the rotation of the shaft J' by means of the connecting-rod common to said piston and to the crank H' of said shaft, the piston L', contained in the cylinder M', simultaneously moving to the right by reason of the connection of the connecting-rod K' thereto. The piston E' moves forwardly until the full stroke is made, at which point the port d is uncovered, into which the liquid flows against the valve b, thus forcing the same to the left and closing the passage between the ports C' and D', the neck C² being now opposite the port d², which is thus opened. As the valve b moves to the left the fluid in the chamber e' is forced through the pipe e², around to the chamber e³, against the end of the valve b', thus forcing the latter to the left, the port d³ being then closed and the port d⁴ open, since the neck b⁴ is now opposite said latter port. The piston L' is now occupying a position at the extreme right of its cylinder M' and is in proximity to the port N', which leads to the ports d⁴ and d³, at which point the bridge M² allows a communication between the ports M³ and pipe M⁴, whereby the liquid is permitted to escape from the chamber e⁴ to said pipe M⁴ and thence through the pipe M⁵ to the pipe M⁶ and back to the reservoir P. When the piston L' moves from the position seen in Fig. 2 to the right, it forces the fluid in the chamber M^x through the ports N' and d³ to the port P', the fluid being exhausted thence into the pipe P⁴, thence to the pipe X⁶, and, through the port X⁵ of the valve X to the pipe X⁷, to the reservoir.

The operation above described takes place in the cylinders F³ M³, and a detailed description thereof is therefore deemed to be unnecessary, the fluid in the pipe e⁵, which serves the same function for its valve-chests as the pipe e², moving back and forth alternately in the direction indicated in full and dotted arrows.

To reverse the motor, the valve-plug X² is turned into the position indicated in Fig. 6, the fluid passing in at pipe W, through the port X³, to and out pipe X⁶, to the pipe P⁴, and then to the valve-chests in the direction indicated by dotted arrows, the exhaust taking place through the pipe Y, port X⁵, and pipe X⁷, back to the reservoir.

The speed is controlled by the throttle-valves H^x, the maximum power being obtained from the shaft J' when said valve H is closed, the opening of the valve H furnishing a by-pass for a portion of the fluid passing through the pipe W, and thus reducing the volume and pressure through the pipe Y, thereby reducing the power applied to the shaft J', from which latter it is of course understood that power may be transmitted to any desired point.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. In a motor, a reservoir, a plurality of cylinders, valve-chests therefor, ports in said chests leading into the ends of said cylinders, controlling-valves for said ports, pressure-chambers at the ends of said valves, the chamber located at one end of each of said valves being adapted to be thrown into communication with the adjacent cylinder, and the chambers at the other ends of the said valves having a connection common thereto, an exhaust connection from said cylinders to said reservoir, and means for conducting fluid-pressure to said valve-chests.

2. In a motor, a source of power, a pumping device actuated thereby, a reservoir, a suction-pipe leading from said reservoir to said pumping device, a discharge-pipe leading from said pump to a reversing-valve, a discharge-pipe leading from said reversing-valve to said reservoir, a connection intermediate said discharge-pipes having a throttle-valve therein, cylinders oppositely arranged, a plurality of valve-chests, valves in the latter, ports common to said valves and cylinders and controlled by said valves, pressure-chambers at the ends of said valves, the chamber located at one end of each of said valves being adapted to be thrown into communication with the adjacent cylinder and the chambers at the other ends of said valves having connections common thereto and pipes leading from said valve-chests to said reversing-valve.

3. In a motor, a source of power, a pumping device actuated thereby, a reservoir, a suction-pipe leading from said reservoir to said pumping device, a reversing-valve, a discharge-pipe leading from said pump to said reversing-valve, a discharge-pipe leading from said reversing-valve to said reservoir, a plurality of cylinders oppositely arranged, pistons in said cylinders, a crank-shaft intermediate of said cylinders, connections common to said pistons and crank-shaft, a plurality of valve-chests, automatically-operated valves in said chests, ports common to said chests and cylinders and controlled by said valves, pressure-chambers at the ends of said valves, the chamber located at one end of each of said valves being adapted to be thrown into communication with the adjacent cylinder and the chambers at the other ends of said valves having connections common thereto, pipes common to each set of valve-chests and a connection from each of said pipes with said reversing-valve.

4. In a motor, a pumping device, means for actuating the same, a reservoir, a suction-pipe leading from said reservoir to said pumping device, a plurality of cylinders, valve-chests therefor, a discharge-pipe leading from said pumping device to said valve-chests, ports leading into the ends of said cylinders, controlling-valves for said ports, pressure-

chambers at the ends of said valves, ports d and M^3 , common to each of said cylinders and its chest, said ports d and M^3 leading from said cylinders to the adjacent pressure-chambers, the pressure-chambers at the other ends of said valves having connections common thereto, and pistons in said cylinders, said pistons having a bridge therein, said bridge being adapted to enable a communication to be made from said ports d and M^3 to said reservoir.

5. In a motor, a reservoir, a plurality of cylinders, valve-chests therefor, ports in said valve-chests leading into said cylinders, the inlet-ports of each adjacent set of cylinders being in communication, controlling-valves for said ports, passages in said valve-chests in communication with said inlet-ports, offset therefrom, and controlled by said valves, pressure-chambers at the ends of said valves, the chamber at one end of each of said valves being adapted to be thrown into communication with the adjacent cylinder, and the chambers at the other ends of said valves, having a connection common thereto, an exhaust connection from said cylinder to said reservoir, and means for conducting fluid-pressure to said valve-chests.

6. In a motor, a reservoir, a plurality of

cylinders, valve-chests therefor, ports in said chests leading into said cylinders, controlling-valves for said ports, pressure-chambers at the ends of said valves, the chamber located at one end of each of said valves being adapted to be thrown into communication with the adjacent cylinder, and the chambers at the other ends of said valves having a connection common thereto, an exhaust connection from said cylinders to said reservoir, pipes for conducting fluid-pressure to said valve-chests and a throttle and reversing-valve in said pipes.

7. In a motor, a plurality of cylinders, valve-chests therefor, ports in said chests leading into said cylinders, controlling-valves for said ports, pressure-chambers at the ends of said valves, the chamber located at one end of each of said valves being adapted to be thrown into communication with the adjacent cylinder, and the chambers at the other ends of said valves having a connection common thereto, and means for conducting fluid-pressure to said valve-chests.

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Witnesses:

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