No. 877,193. PATENTED JAN. 21, 1908.

D. L. HOLDEN.

HYDRAULIC ELECTRIC ICE MACHINE.

APPLICATION FILED JUNE 28, 1906.

3 SHEETS—SHEET 1.

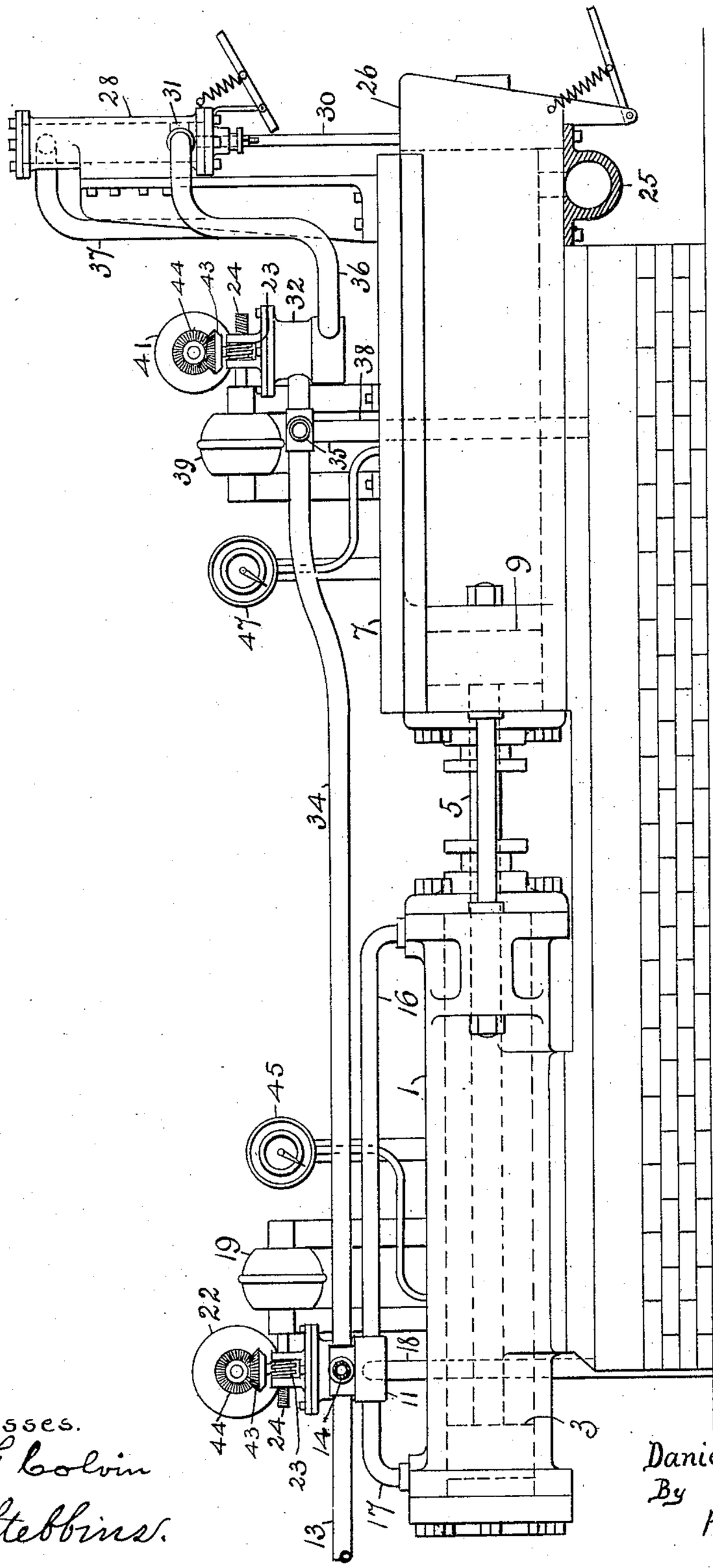

Fig. 1

Witnesses.
Henry F. Colvin
F. E. Stebbins.

Inventor.
Daniel L. Holden
By R. C. Wright
Atty.

No. 877,193. PATENTED JAN. 21, 1908.

D. L. HOLDEN.

HYDRAULIC ELECTRIC ICE MACHINE.

APPLICATION FILED JUNE 28, 1906.

3 SHEETS—SHEET 2.

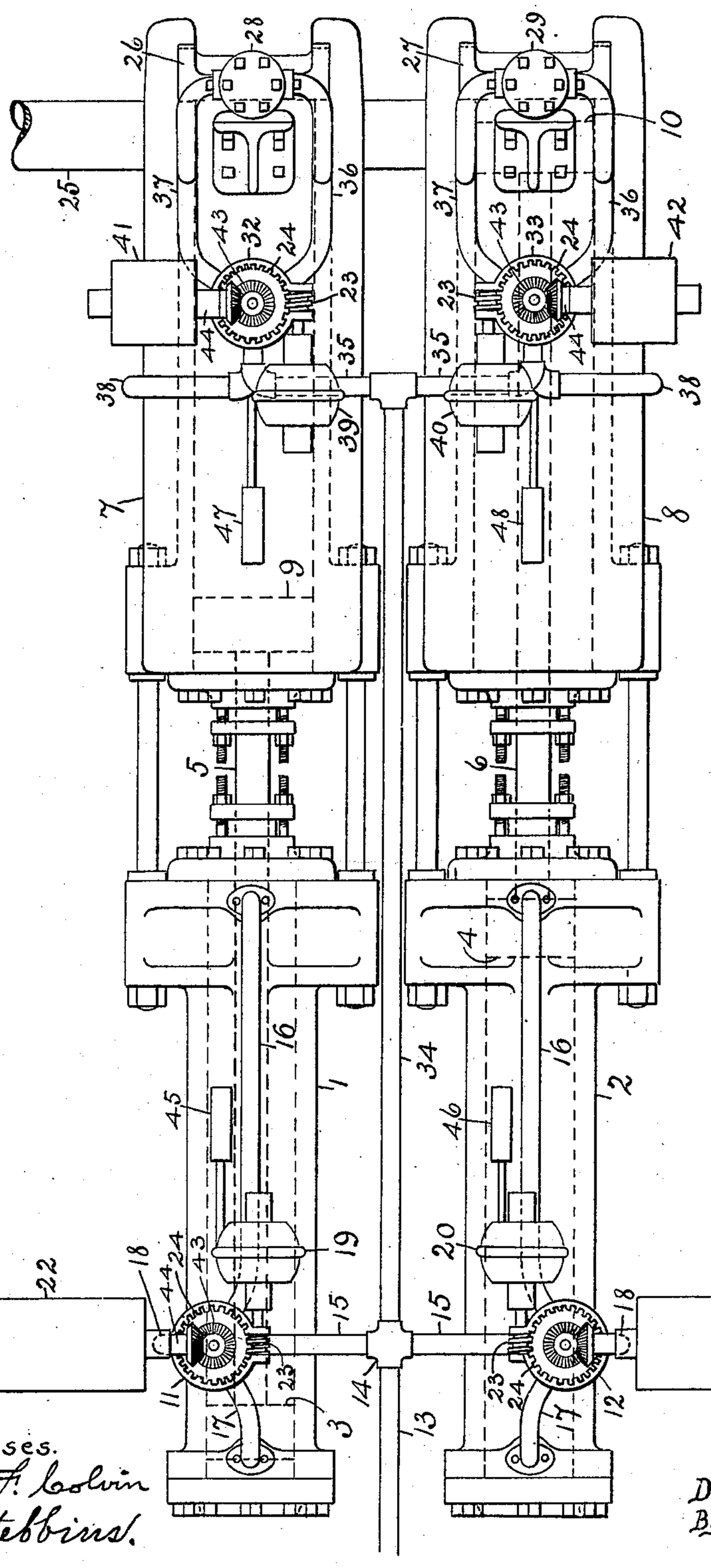

Fig. 2.

No. 877,193. PATENTED JAN. 21, 1908.

D. L. HOLDEN.

HYDRAULIC ELECTRIC ICE MACHINE.

APPLICATION FILED JUNE 28, 1906.

3 SHEETS—SHEET 3.

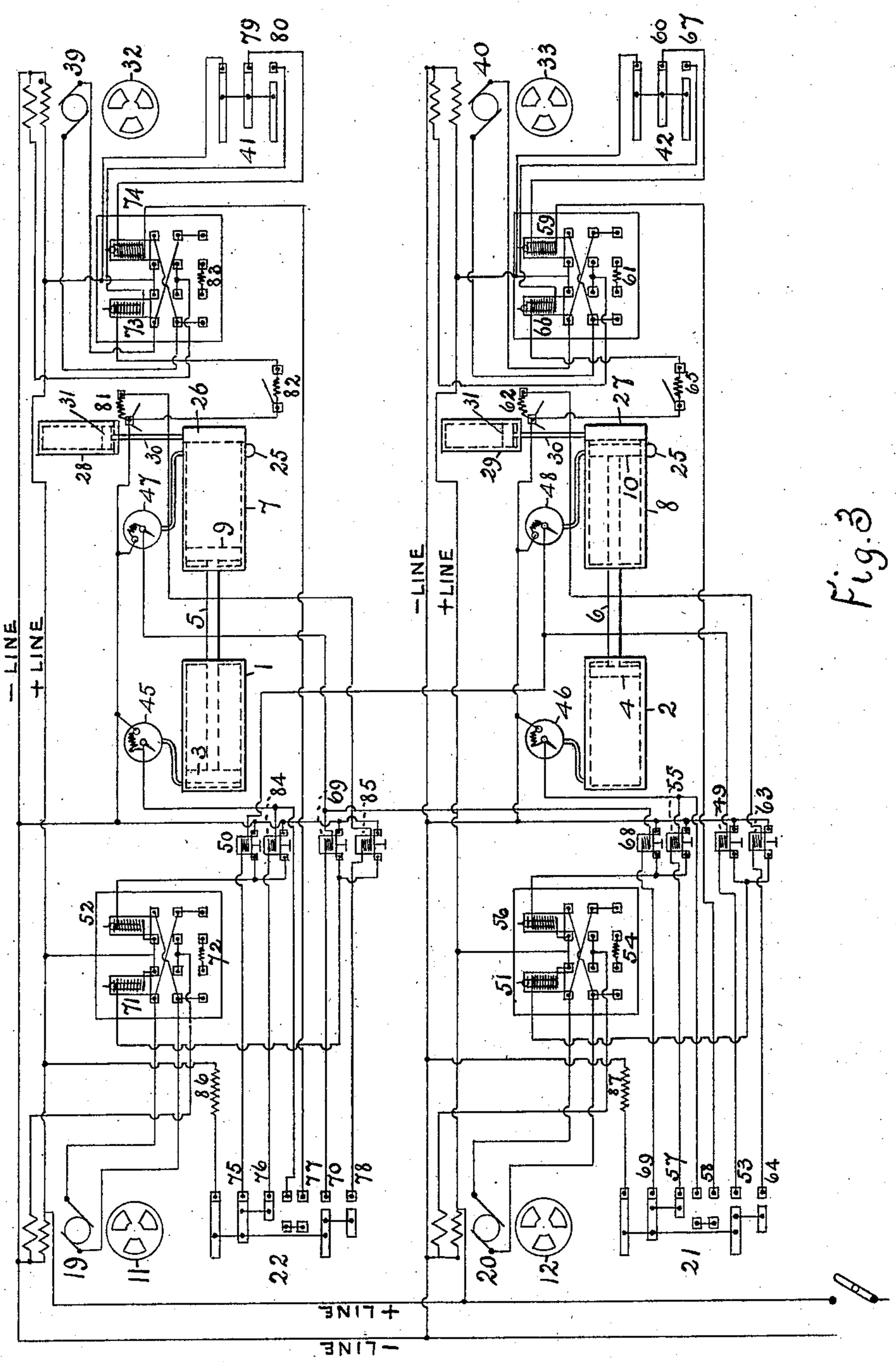

Fig. 3

Witnesses.
Henry G. Colvin
F. E. Stebbins.

Inventor.
Daniel L. Holden
By R. C. Wright
Atty.

UNITED STATES PATENT OFFICE.

DANIEL L. HOLDEN, OF NEW YORK, N. Y., ASSIGNOR TO FEDERAL ICE COMPANY, A CORPORATION OF NEW YORK.

HYDRAULIC-ELECTRIC ICE-MACHINE.

No. 877,193. Specification of Letters Patent. Patented Jan. 21, 1908.

Application filed June 28, 1906. Serial No. 323,763.

To all whom it may concern:

Be it known that I, DANIEL L. HOLDEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Hydraulic-Electric Ice-Machines, of which the following is a specification.

This invention relates to ice machines wherein presses are fed with ice particles, which are pressed and regeled into merchantable blocks of convenient shapes and sizes, by hydraulic pressure, the actions of the machine being electrically and automatically controlled, so that when once started the operation is continuously carried on without any hand manipulation whatever. The machine is duplex, so that when one press is being charged with the ice particles, the opposite press is forming a block, then ejecting it, and vice versa. To avoid a possible stoppage from any derangement of the generator a storage battery will be interposed between the generator and the appliances governing the movements of the machine.

The invention is illustrated in the accompanying drawings, where similar parts are designated by similar reference characters, in which—

Figure 1 is a side elevation of a cylinder, its press and their attachments. Fig. 2 is a plan or top view. Fig. 3 is a diagrammatical view of the appliances, electrical and mechanical, and the electrical circuits and connections.

The machine is provided with hydraulic cylinders 1, 2 with pistons 3, 4 and rods 5, 6 which extend into the presses 7, 8 and carry rams 9, 10 therein. Cylinders 1, 2 have hydraulic valves 11, 12, such as are described in my application 301,795 filed Feb. 19, 1906. A pressure supply pipe 13 connects to a cross 14 from which are branch pipes 15 which enter the valve cases above the valves. From the under side of the valve cases there are pipes 16 which lead to the inner ends of cylinders 1, 2 and pipes 17 which lead to the outer ends of the cylinders, and opposite pipes 15 there are waste or discharge pipes 18. Pipes 16, 17, 18 are attached to the case 120° apart. Valves 11, 12 are provided with compound reversible motors 19, 20 and drum type limit switches 21, 22. The motors have worms 23 which operate worm wheels 24 for the valves 11, 12.

Under the outer ends of presses 7, 8 there is an inlet pipe 25 which delivers the ice particles to the presses from the source of supply (not shown). At their outer ends the presses are open, and vertically movable gates 26, 27 operated by hydraulic cylinders 28, 29 close the presses when the ice blocks are being formed, and open them when the ice blocks are to be ejected. Piston rods 30 connect gates 26, 27 with pistons 31 in the cylinders 28, 29. The operation of the gates is controlled by hydraulic valves 32 for cylinder 28 and 33 for cylinder 29, of similar construction to valves 11, 12.

The valves are supplied with pressure by a pipe 34 connected to cross 14, with branch pipes 35 to the valve cases, above the valves, with a pipe 36 leading to each cylinder below its piston, and a pipe 37 leading to the cylinder above its piston, and waste pipes 38 pass from the valve cases at 120° from pipes 36, 37. Valves 32, 33 are provided with compound reversible motors 39, 40 having worms 23 operating worm wheels 24 of the valves, and drum type limit switches 41, 42. The drum switches are rotated 120°, reversely by gears 43 on the valve stems and a gear 44 on the switch. Pressure gages are provided as follows, for cylinder 1 gage 45, for cylinder 2 gage 46, for press 7 gage 47 and for press 8 gage 48.

The operation of the mechanism is as follows; assume cylinder 1 and press 7 have their pistons 3, and ram 9 in the positions after discharging an ice block, with gate 26 down to close the press, at the same time the ram 4 of cylinder 2 and piston 10 of press 8 are in position to permit ice particles to pass from pipe 25 into the press, the gate 27 being down to close the press. Ice particles continue to flow in until a pressure of 6 lbs. per sq. inch is reached by gage 48 when its needle will make a contact with a rider which contact will energize relays 49, 50 which in turn will complete the circuit to two solenoid control switches 51, 52 respectively, through limit switches 21, 22, the closing of switch 51 will start motor 20 to turn valve 12 and establish communication between pipes 15, 17 for pressure and 16, 18 for discharge and force piston 4, and ram 10 to compress the ice particles in press 8. The closing of switch 52 will start motor 19 to turn valve 11 and establish communication between pipes 15, 16 for pressure and 17, 18 for discharge and return piston 3,

and ram 9 to the inactive position assumed at the commencement of the operation.

In turning valve 12 to admit pressure, the circuit to relay 49 is broken at 53 limit switch 21, which opens the circuit to solenoid 51 which in turn opens the circuit to motor 20 and applies brake 54 to stop motor 20 and valve 12 quickly. Pressure in cylinder 2 accumulates until gage 46 indicates 1,000 lbs. per sq. in. at which time the needle of the gage makes contact with its rider and energizing relay 55 which in turn will energize solenoid operated switch 56 to start motor 20 to turn valve 12 to a neutral point to equalize the pressure against piston 4; at this time the circuit is opened to relay 55 at contact 57 limit switch 21, the opening of relay 55 opens the circuit to winding of solenoid switch 56 which opens the circuit to motor 20 and applies brake 54; when the valve 12 reached the neutral position contact was made at 58 limit switch 21 to energize solenoid switch 59 to start motor 40 and valve 33. When valve 33 reaches its full open position the circuit will be opened at 60, limit switch 42, to solenoid switch 59 which in turn will open the circuit to motor 40 and apply brake 61, when the gate 27 reaches the limit of its travel it closes an electric contact 62 which completes a circuit to relay 63 through contact 64 of limit switch 21, relay 63 completes circuit to solenoid switch 51 which completes the circuit to motor 20 and turns valve 12 to again admit pressure to cylinder 2, when valve 12 moves to its full open position to admit pressure to piston 4 the circuit to relay 63 is opened at 64 limit switch 21, relay 63 then opens circuit to solenoid 51 which opens circuit to motor 20 and applies brake 54.

When the ice block is forced out by piston 10 it causes an electrical contact to be made at 65 which closes to circuit to solenoid 66 which starts motor 40 to turn valve 33 to its full open position to admit pressure through pipe 37 above piston 31 of cylinder 29, and discharge the pressure under the piston through pipe 36 to close and hold down the gate 27. When valve 33 reached its full open position the circuit to solenoid switch 66 is opened at contact 67 limit switch 42 and solenoid 66 in turn opens circuit to motor 40 and applies brake 61. Piston 4, and ram 10 are now inactive, press 8 closed, and ice particles are flowing into press 7; when its gage 47 indicates a pressure of 6 lbs. per sq. in. a circuit will be completed through relay 68 through limit 69, limit switch 21 and relay 68 will close the circuit to switch 56 which will start motor 20 and valve 12; when valve 12 has reached its full open position to admit pressure through pipe 16 the circuit to relay 68 will be opened at 69 limit switch 21, and the opening of the relay will open the circuit to solenoid switch 56 which in turn opens the circuit to motor 20 and applies brake 54. When gage 47 made contact to close relay 68 it also completed circuit to relay 69 through contact 70 limit switch 22 which relay completed circuit to solenoid 71 to start motor 19 and open valve 11, when the valve reached its full open position to admit pressure to cylinder 1 and force its piston 3 the circuit was opened through relay 69 at contact 70 limit switch 22, the opening of relay 69 opened the circuit to solenoid switch 71 which in turn opened the circuit to motor 19 and applied brake 72.

The remainder of the operations for cylinder 1 and press 7 will be the same as already described for cylinder 2 and press 8, understanding that solenoid switches 71 and 52 perform the same functions as 51, 56, for their respective equipments. The same relations hold good as to solenoid switches 73, 74 and 66, 59. In the limit switch 22 the contacts 75, 76, 77, 70, 78 control the operations of cylinder 1 and press 7 the same as the contacts 69, 57, 58, 53, 64 do for cylinder 2 and press 8, already described. In limit switch 41 the contacts 79, 80 control the operations of gate cylinder 28 in a like manner to the operations already described for gate cylinder 29. Switch 81 performs the same functions for gate cylinder 28 as already described for switch 62 for cylinder 29. Switch 82 controls cylinder 28 and gate 26 the same as already described for switch 65 for cylinder 29 and gate 27. Brake 83 performs for cylinder 28 the same function as 61 performs for cylinder 29. Relays 84, 85 perform the same functions as relays 55, 63. 86, 87 are relay resistances.

I claim.

1. In an ice machine, the combination with cylinders and presses having co-acting pistons, of valves and motors for the cylinders; having end gates and cylinders for the presses, valves and motors for the gates, and an electrical contact formed by the ejection of ice blocks from the presses to open a circuit to the press-gate motors to lower the gates, a brake for the motors and an open circuit to the cylinder motors to move the valves to position which will admit pressure to return the pistons to their positions at the opposite ends of the cylinders, and presses.

2. In an ice machine, the combination with hydraulic cylinders their valves, motors and limit switches and pistons controlled thereby; of open ended ice presses having pistons coöperating with the cylinders rams; means to feed ice particles to the presses; gates to open and close the ends of the presses, valves, motors and limit switches for the gates; pressure gages for the cylinders and for the presses; relays, solenoid controlled switches brakes actuated first by circuits formed by the press gages to start the

cylinder motors, open the valves, force the rams and thereby the press pistons to press the ice particles until the accumulation of a certain pressure is reached in the cylinders; a circuit closed by the cylinder gages to stop the cylinder motors and the pistons and rams, open a circuit to the press gate motors to lift the gates and stop the gate motors; a circuit then formed to start the cylinder motors and force the pistons to eject the ice block a circuit completed by the dropping of the ice block to start the press motors and close the gates a circuit formed by closing the gates to again start the cylinder motors to return the pistons to the starting point, there to remain passive until there is again an operative accumulation of pressure of ice particles in the presses, all substantially in the manner and form set forth.

3. In an ice machine, the combination with hydraulic pressure cylinders, their valves, motors and limit switches, of ice presses arranged for coöperation with the cylinders, pistons in the cylinders and rams in the presses; gages for the cylinders and for the presses; valves, motors, limit switches, relays, brakes and solenoid controlled switches for the cylinders; end gates, cylinders, valves, motors, limit switches, relays, brakes, and solenoid controlled switches for the presses; and electrical conductors and contacts for the operation of the electrically controlled and operative devices as aforesaid, and whereby the cylinders and presses are alternately operated to press and eject the ice blocks, in the manner and form substantially as fully set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DANIEL L. HOLDEN.

Witnesses:

LEWIS H. REDNER,

RANSOM C. WRIGHT.