(No Model.)

3 Sheets—Sheet 1.

B. HEFTYE.

ELECTRIC PUMP.

No. 581,204. Patented Apr. 20, 1897.

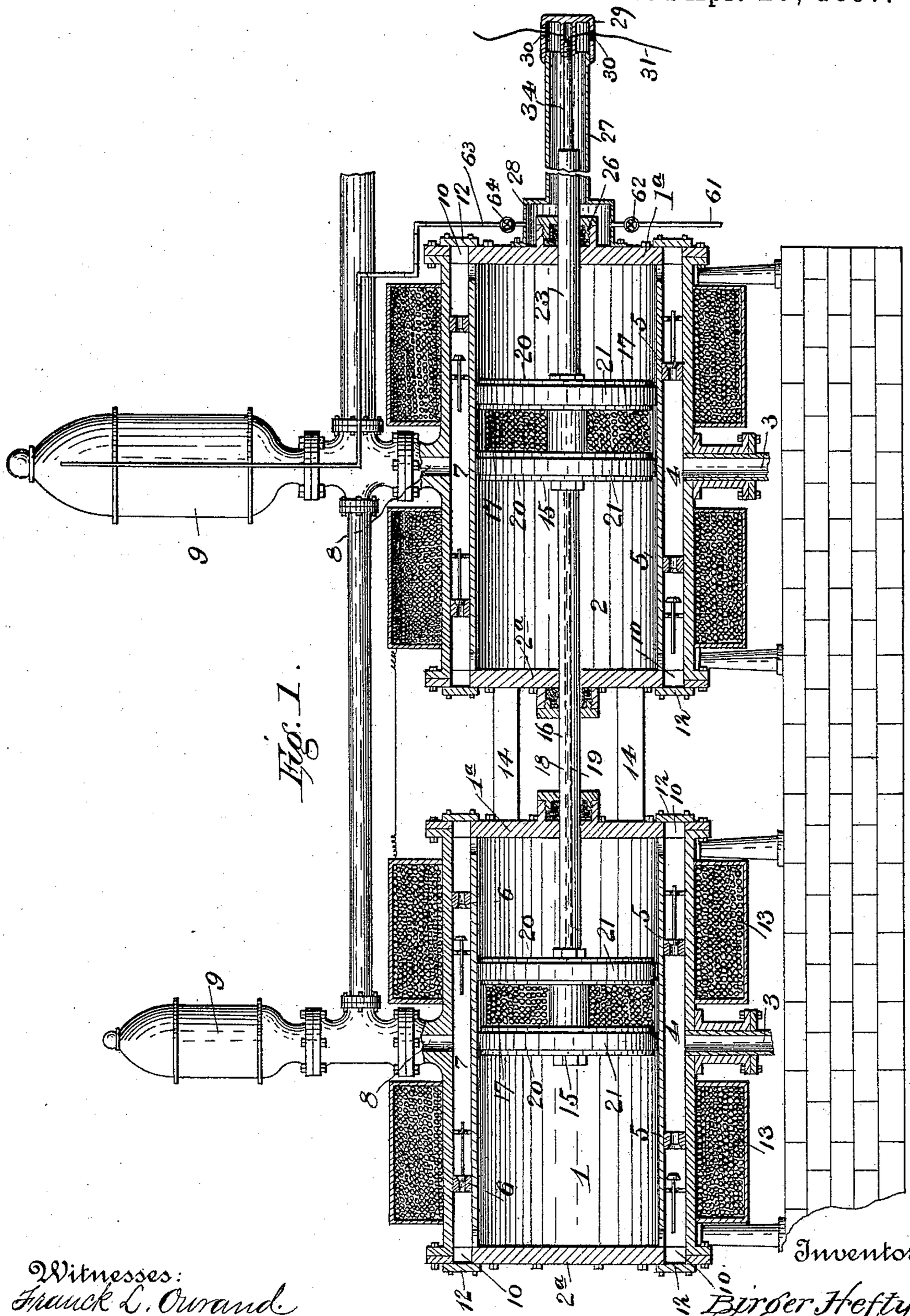

Fig. 1.

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J. W. L. Coombs

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Attorneys.

(No Model.) 3 Sheets—Sheet 2.

B. HEFTYE.

ELECTRIC PUMP.

No. 581,204 Patented Apr. 20, 1897.

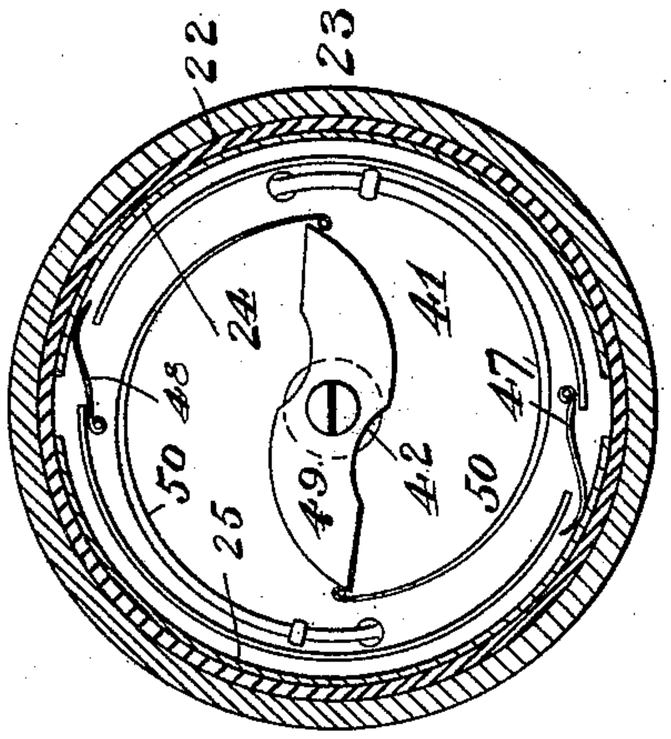

Fig. 4.

Fig. 2.

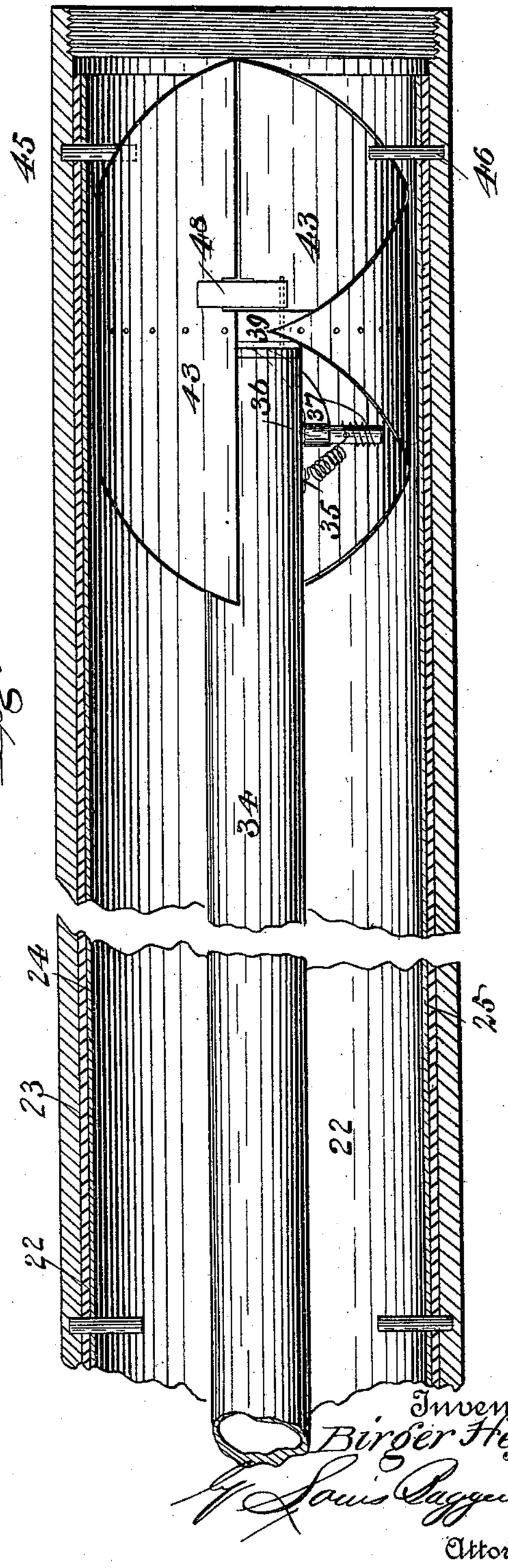

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

B. HEFTYE.

ELECTRIC PUMP.

No. 581,204. Patented Apr. 20, 1897.

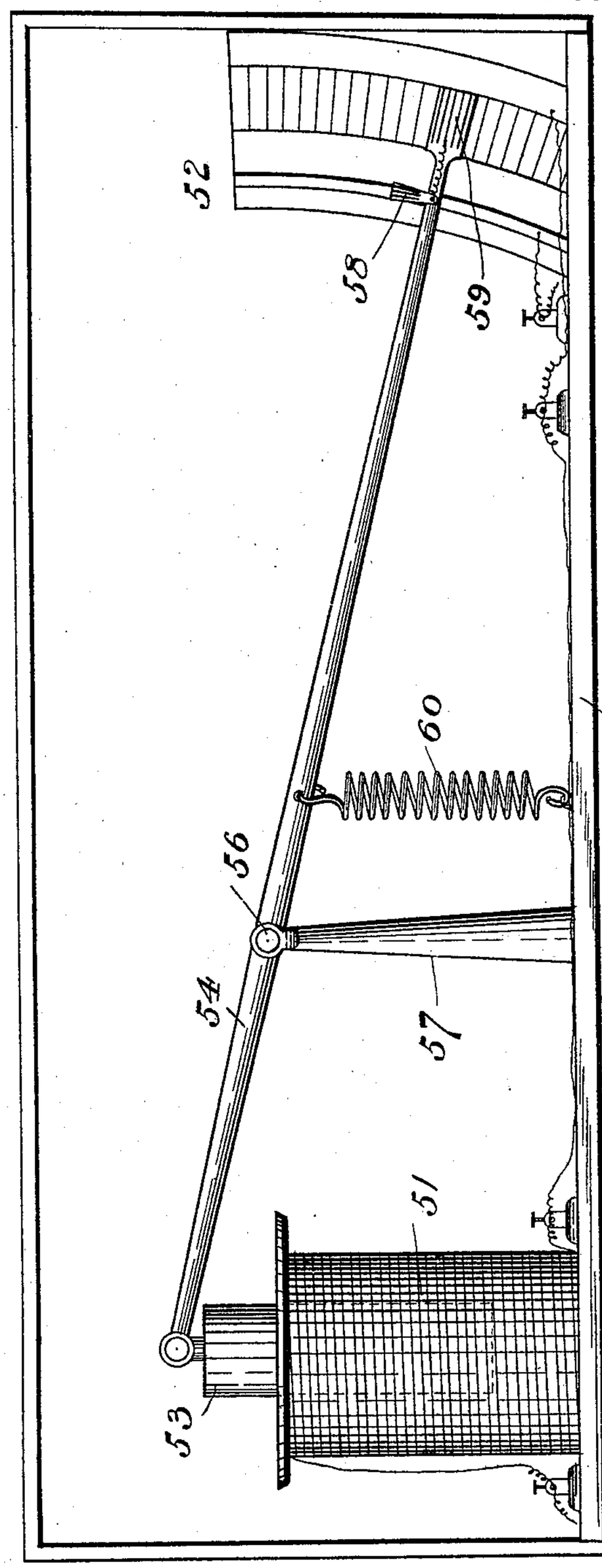

Fig. 5.

Witnesses:
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UNITED STATES PATENT OFFICE.

BIRGER HEFTYE, OF TUXPAN, MEXICO, ASSIGNOR OF ONE-HALF TO ROBERTO S. BOYD, OF SAME PLACE.

ELECTRIC PUMP.

SPECIFICATION forming part of Letters Patent No. 581,204, dated April 20, 1897.

Application filed October 10, 1896. Serial No. 608,488. (No model.)

To all whom it may concern:

Be it known that I, BIRGER HEFTYE, a citizen of the Republic of Mexico, and a resident of Tuxpan, in the Province of Vera Cruz and Republic of Mexico, have invented certain new and useful Improvements in Electric Pumps; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to improvements in electric pumps; and its object is to provide an improved construction whereby the usual electromotors are dispensed with, the pump-cylinders and pistons themselves constituting an electromagnetic engine.

In carrying my invention into effect I employ two pump-cylinders, each wound with insulated electric wires, through which, when the pump is in use, passes a constant electric current in one direction, so that the polarity never changes. The cylinders thus form hollow electromagnets or solenoids, in each of which is located a piston, also wound with insulated wire, through which an electric current passes, forming electromagnets which are independent of the cylinders. The current at each stroke of the pistons is reversed, so as to shift the poles, whereby the pistons are reciprocated. These pistons are connected together and are provided with a packing-ring of non-magnetic material which separates them from the cylinders, yet makes them a water-tight joint. Means are provided for shifting the poles of the pistons at each stroke thereof, so that they will be alternately attracted toward opposite ends of the cylinders to cause their reciprocation.

The invention consists in the novel construction and combination of parts hereinafter fully described and claimed.

Having thus briefly outlined the nature of my invention, I will now proceed to describe the same in detail, referring to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of an electromagnetic pump constructed in accordance with my invention. Fig. 2 is a transverse sectional view, on an enlarged scale, of the commutators, showing the means for shifting the poles of the pistons. Fig. 3 is a horizontal sectional view of the same. Fig. 4 is an end view. Fig. 5 is a side elevation of the governor for diminishing the spark in shifting the poles.

In the said drawings the reference-numerals 1 and 2 designate two cylinders, which may be provided with a lining or not, as may be desired. Each of these cylinders is provided with an inlet-pipe 3, communicating with a horizontal passage 4, leading to near each end of the cylinder and provided with oppositely-working valves 5. Diametrically opposite the cylinders are provided with eduction-valves 6, passages 7, and discharge-pipes 8, which communicate with the air-chambers 9. These cylinders are also provided with manholes 10 and covers 12 for affording access to the valves.

The parts just referred to may be of any ordinary or suitable construction as they form no part of my present invention.

The cylinders are provided with hollow or motor coils 13, (shunt or compound winding,) connected as if they were one coil, in order to make the cylinders hollow electromagnets or solenoids. There should be two of these coils or bobbins for each cylinder electrically connected with each other, so as to afford a space for the suction and discharge pipes. The coils of said cylinders are respectively connected with a dynamo or other electric generator, and a continuous current is always passing therethrough when in use in one and the same direction, the poles never being changed or shifted. The cylinder-heads 1^a and 2^a form the pole-pieces. The cylinders are connected by a yoke 14, of brass, bronze, or other non-magnetic metal. Located in said cylinders are pistons 15, of soft iron, connected by means of a piston-rod 16. I prefer to employ two piston-rods, so as to prevent the pistons from turning, one or both of which has a central longitudinal hole for the passage of the wires, hereinafter described. These pistons are provided with bobbins or coils 17, connected together by wires 18 and 19, running through the hole in the piston-rod, which coils are electrically connected

with a dynamo, as hereinafter described, so as to form electromagnets independent of the cylinders. Each piston has two iron heads 20, provided with phosphor-bronze packing-rings 21. These rings are necessary to keep the piston-heads out of contact with the magnetized cylinders and also for preventing water from passing.

For changing the current or shifting the poles of the pistons I provide the following means: The numeral 23 designates a horizontal metal tube screwed on the piston-head of cylinder 1. Located inside of this tube is another tube 22, of hard rubber or other insulating material, to which are fastened two copper commutator-strips 24 and 25, approximately semicircular in cross-section with a space between the edges thereof. The tube 23 passes through a stuffing-box 26 in the cylinder-head. The commutator strips or segments are electrically connected with the bobbins or coils of the pistons, being the two terminals thereof.

The numeral 27 designates an outwardly-projecting horn consisting of a metal tube having its inner end enlarged, forming a cylindrical chamber 28, which is screwed or otherwise secured to the cylinder-head The outer end of the horn is closed by a screw-cap 29, formed with two holes 30, through which the positive and negative wires 31 and 32, electrically connected with a dynamo, pass. Secured to this cap is an inwardly-extending brass tube 34, which is about the same length as tube 23 and which is located in the tube 22. The latter tube is slightly longer than the stroke of the pistons, in order to allow for a screw-head on the end for fastening it to the piston-head.

The feed-wires 31 and 32 pass through holes in tube 34 and run along the inside thereof to near the inner end, where they pass through nipples 35, of insulating material, to binding-posts 36 on the outside of the tube 34. Connected with these binding-posts are brushes 37 and 38, which contact, respectively, with connecting-rings 39 and 40 on the outer face of a rotatable disk 41, loosely mounted or journaled on a stud-shaft 42 in the inner end of the tube 34 so as to freely turn thereon. Secured to this disk, diametrically opposite each other, are two cams 43, each consisting of a triangular metal plate, which is curved longitudinally so as to conform to the periphery of the disk and screwed or otherwise secured thereto. The front and rear edges of these cams are adapted to be alternately struck by pins 45 and 46, secured to the tube 23, as the latter is reciprocated by the piston to which it is attached, thereby oscillating the disk. Pivoted to the inner side of the disk are brushes 47 and 48, electrically connected with the rings 39 and 40, which brushes contact with the copper commutator strips or segments 24 and 25. Secured to the end of the stud-shaft 42 is a stationary cam-dog 49, with which engage curved springs 50, secured to the disk 41, the tendency of which is to press toward the center of the disk. The object of this construction is to throw the brushes 47 and 48 across the spaces between the edges of the commutator strips or segments in shifting the poles of the pistons. The dog also acts as a washer to hold the disk in place.

For the purpose of diminishing the spark caused by the current being broken as the brushes cross the spaces between the commutator-strips I provide a governor (see Fig. 5) comprising a base 50, of insulating material, upon which is mounted a solenoid 51, one terminal of which is connected with the negative wire of the dynamo, while the other is connected with a rheostat 52, of any ordinary or suitable construction. The other terminal of the rheostat is connected with the positive wire of the dynamo. The upper end of the core 53 of the solenoid at its upper end is pivoted to the lever 54, fulcrumed at 56 to a standard 57, secured to the base. The opposite or free end of this lever is provided with two brushes 58 and 59, which slide on the contacts of the rheostat. Between the end of the lever and its fulcrum is a coiled spring 60, secured to said base and lever, of sufficient power to counteract the weight of the core when the solenoid is short-circuited and cause the brushes to slide down the contacts of the rheostat, thereby reducing the current fed to the cylinders and pistons.

In order to prevent water from accumulating in the horn 27 through leakage from the stuffing-box, the enlarged inner end is provided at the lower side with a pipe 61, having a check-valve 62, and opposite thereto with a pipe 63, having oppositely-working check-valve 64. When the piston-tube is drawn into the cylinder, air will be sucked into the horn through pipe 63, and on the return stroke it will force the air and water out through pipe 61 and thus keep the horn dry. The horn does not contact with the reciprocating piston-tube, but serves to protect the same from injury and from water.

All the coils are intended to be provided with a brass casing surrounding the same, with a filling of resin or other suitable material, so that the pump can be submerged without liability of the entrance of water.

The operation is as follows: An electric current being passed through the coils of the cylinders and pistons, the cylinders and pistons will be converted into electromagnets. The coils of the cylinders are so wound with respect to each other that their opposite poles will be in reverse directions, and when the north pole of cylinder 1 and the south pole of its piston are opposite to each other the north pole of the other cylinder will be opposite the north pole of its piston. As the piston in cylinder 1 is drawn to the north end of the cylinder by the mutual attraction therebetween and reaches the end of its stroke, the poles of the pistons will be reversed by the

shifting mechanism, when the north pole of cylinder 2 and the south pole of its piston will be opposite each other, and the piston being attracted thereto will cause the return stroke. The operation will thus continue, the poles of the pistons being alternately shifted, so as to keep up a constant reciprocation of the pistons.

The pole-shifting mechanism operates as follows: Supposing the piston to be in the position shown in Fig. 1, with the north pole at the left of cylinder 1, opposite the south pole of its piston, the latter will be attracted to said end, carrying with it the other piston with which it is connected, the circuit being as follows: from dynamo to the cylinder-coils and then back to dynamo, and from positive dynamo to the horn, to the tube 34, to one of the binding-posts, near the inner end thereof, to the brushes and conducting-ring 37 and 39, to brush 47, to commutator strip or segment 24, to the coils of the piston, thence by wire 18 to piston-coils in cylinder 2, to wire 19, commutator-segments 25, brush 48, conducting-ring 37, to brush 38, to the other binding post or tube 34, to negative wire of dynamo. As the pistons reach the end of their stroke the pins 46 will strike the outer curved edges of the cams 43, rotating the same and the disk 41, to which they are secured, and forcing the springs 50, secured to the disk, outward by means of the stationary dog 49. When the brushes 47 and 48 pass off of the commutator-segments, the resiliency of the springs will rotate the disk still further, throwing the brushes across the break or space into contact with the other commutator-segments, reversing the current and shifting the poles of the pistons, so that the north poles of the cylinder 2 and its piston will be opposite to each other, and the piston in the said cylinder 2 will be attracted to the right, causing the return stroke of the pistons. This operation will be alternately repeated, causing a constant reciprocation of the pistons.

Having thus described my invention, what I claim is—

1. In a magneto-electric pump, the combination with the pump-cylinders provided with induction and eduction valves and pipes and wound with motor-coils adapted to be connected with an electric generator, forming electromagnets, the opposite poles of which are in reverse directions, of the connected pistons located in said cylinders wound with motor-coils adapted to be electrically connected with an electric generator and forming electromagnets independent of the cylinders and means for shifting the poles of said pistons, substantially as described.

2. In a magneto-electric pump, the combination with the pump-cylinders, provided with induction and eduction pipes and valves, wound with motor-coils adapted to be connected with an electric generator to form electromagnets the opposite poles of which are in reverse directions, of the connected pistons located in said cylinders wound with motor-coils adapted to be electrically connected with an electric generator to form electromagnets independent of the cylinders, the piston-heads, the packing-rings of non-magnetic material and means for shifting the poles of the pistons, substantially as described.

3. In a magneto-electric pump, the combination with the pump-cylinders, provided with induction and eduction pipes and valves, and wound with motor-coils adapted to be connected with an electric generator, to convert the cylinders into electromagnets, the opposite poles of which are in reverse directions, of the pistons wound with motor-coils adapted to be electrically connected with an electric generator to form electromagnets independent of the cylinders, the piston-rod having a hole extending therethrough for the passage of wires electrically connecting the coils of the cylinders, substantially as described.

4. In a magneto-electric pump, the combination with the pump-cylinder provided with induction and eduction valves and wound with motor-coils adapted to be connected with an electric generator to convert the cylinders into electromagnets, the opposite poles of which are in reverse directions, of the connected pistons, wound with motor-coils to form electromagnets independent of the cylinders, the tube secured to one of said pistons and extending through the cylinder-head, the insulating-tube, the semicylindrical commutator strips or segments, with spaces between the edges, to the inner ends of which segments the piston-coils are electrically connected, and means for changing the current to shift the poles of the pistons, substantially as described.

5. In a magneto-electric pump, the combination with the pump-cylinders, provided with induction and eduction pipes and valves and wound with motor-coils adapted to be connected with an electric generator to form electromagnets, the opposite poles of which are in reverse directions, of the connected pistons wound with motor-coils and adapted to be electrically connected with an electric generator to form electromagnets independent of the cylinders, the tube secured to one of said pistons projecting through the cylinder-head, the insulating-tube secured thereto, the separating semicylindrical commutator strips or segments secured to said insulating-tube, to the inner ends of which the piston-coils are electrically connected, the stationary tube projecting into the said insulated tube, the oscillating disk mounted on said stationary tube, the brushes carried by said disk and connecting with said segments, the wires electrically connected with said brushes and with an electric generator, and means for oscillating said disk to change the said brushes

from one segment to the other and shift the poles of the pistons, substantially as described.

6. In a magneto-electric pump, the combination with the pump-cylinders provided with induction and eduction pipes and valves, and wound with motor-coils adapted to be connected with a dynamo to form electromagnets, the opposite poles of which are in opposite directions, of the connected pistons wound with motor-coils adapted to be electrically connected with an electric generator to form electromagnets independent of the cylinders, the tube secured to one of said cylinders and extending through the cylinder-head, the insulating-tube located therein and secured thereto, the commutator strips or segments to the inner ends of which the piston-coils are connected, the stationary tube projecting into the insulating-tube, the oscillating disk on the inner end thereof, the concentric conducting-rings secured to said disk, the brushes carried by said disk, contacting with said segments and electrically connected with said rings, the brushes contacting with said rings and secured to said stationary tube, and the wires connected with said last-mentioned brushes and adapted to be connected with an electric generator and means for oscillating said disk to shift the poles of the pistons, substantially as described.

7. In a magneto-electric pump, the combination with the pump-cylinders provided with induction and eduction pipes and valves, and wound with motor-coils adapted to be electrically connected with an electric generator to form electromagnets the opposite poles of which are in reverse directions, of the connected pistons wound with motor-coils to form independent electromagnets, the tube secured to one of said pistons, and projecting through the piston-head, the pins secured to said tube at each end thereof, the insulating-tube located in and secured to said tube, the separated commutator strips or segments secured to said insulating-tube, to the inner ends of which the piston-coils are connected, the stationary tube projecting into said insulating-tube, the oscillating disk on the inner end of said stationary tube provided with concentric conducting-rings, the brushes carried by said disk electrically connected with said rings and contacting with the commutator-segments, the brushes carried by said stationary tube, contacting with said rings, the wires connected with said brushes and adapted to be connected with an electric generator, the cams secured to said disk adapted to be struck by the pins on the tube secured to the piston to oscillate the disk and shift the poles of the pistons, substantially as described.

8. In a magneto-electric pump the combination with the pump-cylinders provided with induction and eduction pipes and valves, and wound with motor-coils adapted to be electrically connected with an electric generator to form electromagnets the opposite poles of which are in reverse directions, of the connected pistons wound with motor-coils to form independent electromagnets, the tube secured to one of said pistons projecting through the piston-head, the insulating-tube located in and secured to said tube, the separated commutator strips or segments secured to the said insulating-tube, to the inner ends of which the piston-coils are connected, the stationary tube projecting into the insulating-tube, the oscillating disk on the inner end of the stationary tube provided with concentric conducting-rings, the brushes carried by said disk electrically connected with said rings and contacting with the commutator-segments, the brushes carried by said stationary tube, contacting with said rings and adapted to be connected with an electric generator, the springs secured to said disk, the stationary cam-dog on the end of said stationary tube with which the said springs engage and means for oscillating said disk to shift the pole of the piston, substantially as described.

9. In a magneto-electric pump, the combination with the pump-cylinders provided with induction and eduction pipes and valves and wound with motor-coils adapted to be connected with an electric generator to form electromagnets, the opposite poles of which are in different directions, of the connected pistons wound with motor-coils to form independent electromagnets, the tube secured to one of said pistons projecting through the cylinder-head, the pins secured thereto at each end, the insulating-tube located in and secured to said tube, the separated commutator strips or segments secured to said insulating-tubes, to the inner end of which the piston-coils are connected, the stationary tube projecting into said insulating-tube, the oscillating disk on the inner end of said stationary tube provided with concentric conducting-rings, the brushes carried by said disk electrically connected with said rings and contacting with the commutator-segments, the brushes carried by said stationary tube contacting with said rings and adapted to be connected with an electric generator, the springs secured to said disk, the cam-dog on the end of the stationary tube with which the said springs engage, and the cams secured to the disk with which the pins on the tube secured to the piston engage to oscillate the disk and shift the poles of the pistons, substantially as described.

10. In a magneto-electric pump, the combination with the pump-cylinders provided with induction and eduction pipes and valves, and wound with motor-coils adapted to be connected with an electric generator to form electromagnets, the opposite poles of which are in different directions, of the connected pistons wound with motor-coils to form independent electromagnets, the tube secured to one of said pistons and projecting through the cylinder-head, the insulating-tube located in and secured thereto, the commutator-seg-

ments secured to said insulating-tube, the horn having an enlarged inner end secured to said cylinder-head provided with opposite pipes and check-valves, the screw-cap at the outer end of the horn, the stationary tube secured thereto, and projecting into the insulating-tube, the wires adapted to be connected with an electrical generator and extending therethrough, the brushes connected therewith, the oscillating disk, the conducting-rings, the brushes carried by said disk and means for oscillating the disk, substantially as described.

11. In a magneto-electric pump, the combination with the pump-cylinders provided with induction and eduction pipes and valves, and wound with motor-coils adapted to be connected with an electric generator, to form electromagnets the opposite poles of which are in reverse directions, and the connected pistons wound with motor-coils adapted to be electrically connected with an electric generator, to form independent electromagnets and means for shifting the poles of the pistons, of the rheostat in the circuit between the generator and the cylinder and pistons, substantially as described.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

BIRGER HEFTYE.

Witnesses:
Z. F. MERRILL,
S. S. POND.