

(No Model.)

2 Sheets—Sheet 1.

A. T. WELCH.
PUMP AND MOTOR THEREFOR.

No. 519,825.

Patented May 15, 1894.

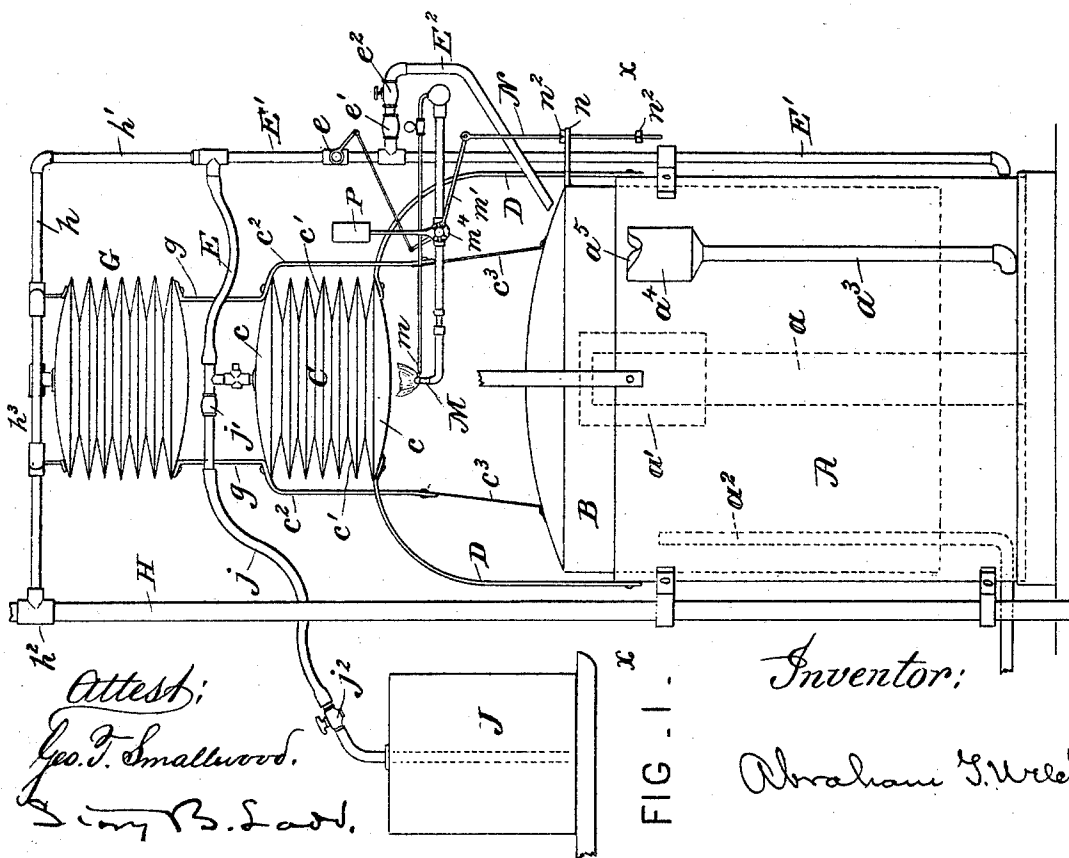
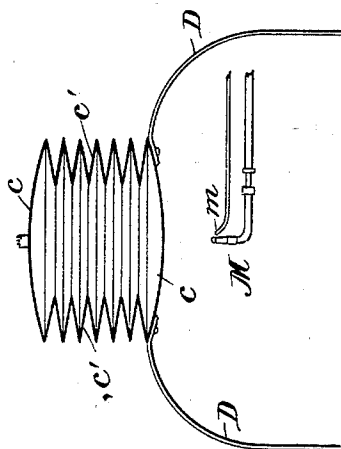
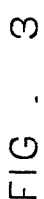
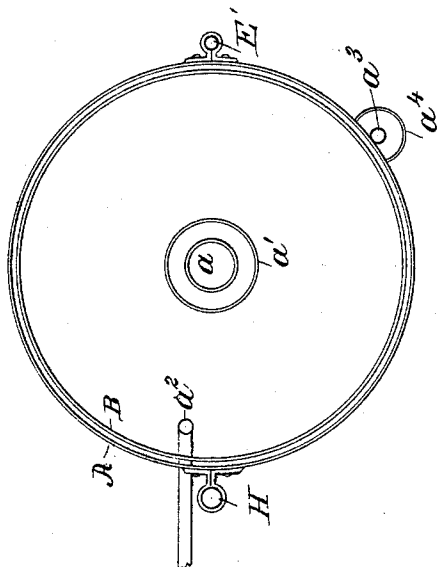
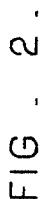


FIG. 1

Inventor: Abraham G. Welch

Attest:
Geo. T. Smallwood.
J. W. B. Seal.

A. T. WELCH.
PUMP AND MOTOR THEREFOR.

No. 519,825.

Patented May 15, 1894.

FIG. 5.

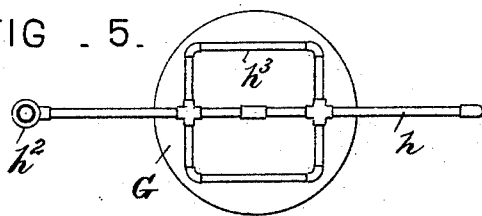
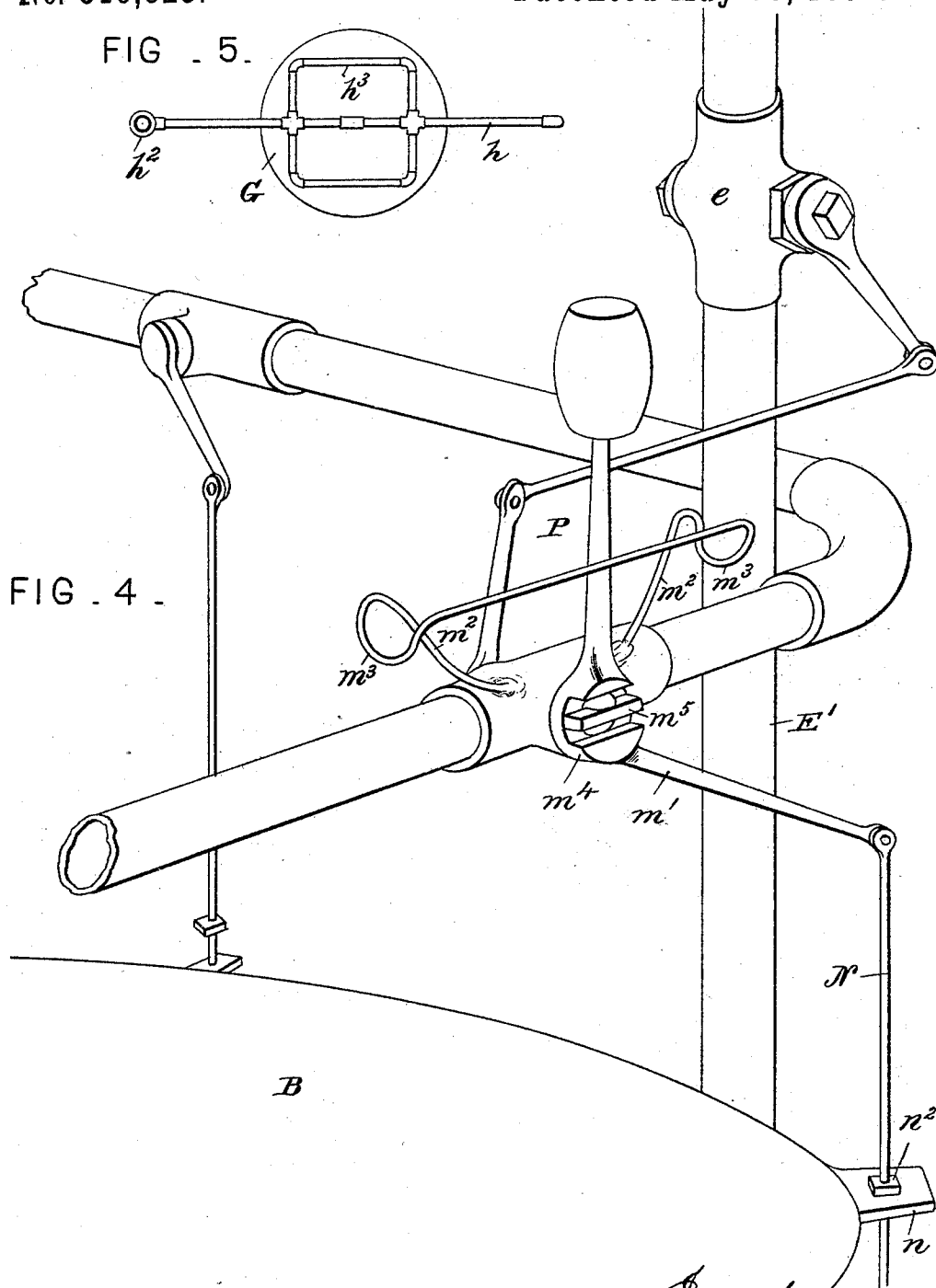


FIG. 4.



Attest:
Geo. T. Smallwood.
Scrib. V. S. Ladd.

Inventor:
Abraham T. Welch

UNITED STATES PATENT OFFICE.

ABRAHAM T. WELCH, OF WASHINGTON, DISTRICT OF COLUMBIA.

PUMP AND MOTOR THEREFOR.

SPECIFICATION forming part of Letters Patent No. 519,825, dated May 15, 1894.

Application filed May 17, 1892. Serial No. 433,381. (No model.)

To all whom it may concern:

Be it known that I, ABRAHAM T. WELCH, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Pumps and in Motors Therefor; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of the present invention is to provide a simple and efficient apparatus for pumping air or water and in connection therewith the invention involves a steam motor that from its simplicity of construction and operation is adapted for many uses other than that hereinafter described.

The primary object in view in the development of the invention has been an air pump for a gas machine or carburetor, where the work to be done is variable and intermittent, but the motor or engine is capable of general use and application, and the invention in its broadest scope extends to the engine or motor as hereinafter will fully appear, as well as to the special adaptation of the motor or engine in the pumping apparatus shown and described.

The main feature of the invention lies in an expansible steam vessel or cylinder which is both a boiler and an engine, it being built on the plan of an accordion bellows, capable of expansion under steam pressure when the steam is generated therein, and of contraction when the steam is condensed or allowed to exhaust. The boiler is heated by a gas burner or other source of gas supply, and suitable connections are provided whereby the gas is automatically shut off when the boiler or cylinder reaches the limit of its expansion, and an exit is opened for the steam to permit the boiler to contract, the gas being turned on again by the apparatus when more work is to be done. An ignition burner is provided to light the heating burner whenever the gas is turned on. I am thus able to make a motor or engine that is simple and automatic in its action without regard to the irregularity of the work to be done.

The invention further consists in combining with the expansible steam cylinder an air pumping cylinder which will rise and fall with the expansions and contractions of the steam cylinder.

The invention further consists in combining with the cock of the gas burner of the expansible steam boiler and the air pumping cylinder or other machine operated by the engine, connecting devices which will open and close the gas cock as the air cylinder falls and rises and thereby control the expansion and contraction of the steam cylinder according to the consumption of air by the apparatus.

The invention further consists of an expansible steam cylinder in connection with an air pumping cylinder working in a water seal, the expansible steam cylinder having an exhaust pipe leading down into the water apartment of the pump cylinder, whereby any vacuum in the expansible cylinder produced on the condensation of the steam is filled by the water being sucked up thereinto and also the condensation of the steam takes place in the water apartment.

The invention further consists in the combination with the expansible steam cylinder or boiler of a similar expansible cylinder with pipe connections and valves operating as a pump, whereby the same apparatus can be economically employed to pump water as well as air.

The invention further consists of certain details of construction and arrangement, all of which will be fully described and then pointed out in the claims.

In the drawings: Figure 1 is a side elevation of an apparatus embodying my invention. Fig. 2 is a horizontal sectional view of the same on the line *—*. Fig. 3 is a vertical sectional view of the steam cylinder or boiler. Fig. 4 is a detail view of the valve controlling mechanism for the gas burner. Fig. 5 is a top view of the supporting frame for the water pumping cylinder.

A is a tank and B an inverted bell within it forming the pumping cylinder of an air pump for a carburetor. The tank A has the air inlet pipe *a* extending up from the bottom and provided with the cap or hood *a'* forming a water seal for the air inlet pipe. The air outlet pipe shown at *a''* may lead to

the air storage tank of a carburetor. The tank A is provided with a pipe a^3 leading out from the bottom of the same and up to the top of the tank on the outside, terminating in an enlarged or funnel top a^4 having an overflow spout a^5 for a purpose hereinafter described. The bottom and top of the enlarged funnel top a^4 are on a level with the low and high water marks respectively of the water in the tank. Extending up from the top of the tank A there are four standards, more or less, D, supporting the expansible boiler or cylinder C, to the bottom head of which they are attached.

The expansible boiler or cylinder C consists of two heads, c c , and a series of intermediate flat rings c' of relatively thin metal connected alternately at their outer and inner edges to the adjacent rings, the end rings being connected to the edges of the heads, the whole forming a tight vessel that by reason of the accordion like arrangement of the ring plates allows of a wide range of expansion and contraction in the direction of the heads.

A flexible steam pipe E is connected with the top head at the center thereof and with a steam pipe E' leading down and opening into the water tank A at the bottom. The steam pipe E' has a valve e and an outwardly exhausting pipe E² below the valve e , the pipe E² having a check valve e' and a cock e^2 and the end of the pipe E² is over the top of the tank B so that the drip of the exhaust steam therefrom may run down into the tank A. If the cock e^2 is open the steam will exhaust through the pipe E², but when it is undesirable to have the exhaust steam discharge outward or where it is desirable to condense the steam back into the apparatus the cock e^2 is closed and then the exhaust steam passes down the pipe E' and condenses at the bottom, the water passing back into the tank. Attached to the top head of the steam cylinder there are four iron straps c^2 , more or less, extending down below the gas burner and to the lower ends of these are connected flexible straps or chains c^3 attached to the top of the inverted bell B, by means of which straps the bell is suspended from the top of the expansible cylinder. Above the cylinder C there is a second cylinder G exactly like the cylinder C in construction, the bottom head of the upper one being connected to the top head of the lower one by a number of rods or standards g . The top head of cylinder G is firmly secured to a fixed support, and I preferably construct the same of pipe sections and couplings, as making a strong frame construction of which the pipes can be utilized for water pipes. In the present case I have shown a solid rod section h' screwed into the top of a T union to which the pipes E and E' are connected, the rod h' being coupled at the top to one end of the horizontal pipe h , the latter at its opposite end being coupled by a T union h^2 to a vertical water pipe H which extends down to the well or tank from

which water is to be pumped. There are valves K, K' in the pipe H, above and below the pipe h . The top head of the upper cylinder G is firmly attached to the pipe h and the said cylinder also has a connection with said pipe. To afford a sufficiently firm attachment of the cylinder G to the pipe h , I form a square frame of rod sections h^3 carried by the pipe h , and attach the cylinder head to the frame at its corners.

A small tank J placed at an elevation a little below the level of the cylinder C supplies water for replenishing the loss due to evaporation or otherwise. This tank is connected by a pipe j with the pipe E and is provided with a check valve j' , cutting off any steam pressure through the pipe j and a cock j^2 for shutting off the tank connection entirely when desired.

The burner M beneath the cylinder C is supplied with gas from any source of gas supply and when the machine is used in connection with a carburetor, the gas is of course supplied by the carburetor.

m is an igniting burner that is always burning. In the pipe supplying the burner M there is a cock having an arm m' , which arm is connected to a vertical rod N that at its upper end is connected to the arm of the steam cock e , and at its lower end extends through an eye in a lug or arm n extending out from the edge of the inverted bell B. Adjustable collars n^2 on the rod N above and below the lug n form stops that cause the pumping cylinder B to actuate the rod N when the pump reaches the upper and lower limits of its stroke or movement. The arm m' is attached to the spindle of the gas cock by a slotted sleeve m^4 which permits a certain movement of the sleeve on the plug of the valve before the head m^5 of the valve plug is actuated, and attached to said slotted sleeve and extending upward therefrom there is a weighted arm or rod P. On either side of said weighted arm and attached to the fixed part of the valve there are spring arms m^2 having forked heads m^3 for the purpose of catching and supporting the weighted arm P as it is shifted from one side to the other, and limiting the movement of the arm P and the gas cock. The action of this cut-off will be readily understood.

The operation of the machine is as follows: It is assumed that it is desired to supply air to a carburetor and at the same time to utilize the surplus energy of the engine to pump water, for example from a well into a storage tank, and the present embodiment of the invention is adapted to do this work. The tank A should be filled with water to the point where it will just submerge the bottom of the hood a' of the inlet air pipe. The cylinder C, normally in its compressed position, being filled with water, the igniting burner m is lighted and the gas cock m' is set open for the start, the burner being of course also lighted. It will be understood that the connection be-

tween the gas cock m' and the steam valve e is such that when one is open the other is closed and vice versa. As the steam pressure in the cylinder C increases the upper head thereof rises, thereby raising the air pumping cylinder B and compressing the water pumping cylinder G, until the point is reached where the lug n strikes the upper stop n^2 on the rod N and lifts the latter. When the gas cock m' is open the weighted lever P is inclined toward the rod N and rests in the support m^3 nearest to the rod N. In this position of things the raising of the rod N causes the weighted rod P to be elevated into a vertical position and as soon as the weight passes the vertical position it falls over by gravity, turning the valve instantly and shutting off the gas, and through the connections with the valve e it at the same time opens the latter. The steam from the cylinder C then exhausts either through the pipe E^2 outward or through the pipe E' down into the water tank, according to whether the cock e^2 is open or closed. The cylinder C contracts or collapses and the air holder B, which it will be understood is to be weighted according to the air pressure required, settles in accordance with the amount of gas that is being produced by the carburetor. When the air holder B reaches its lowest position the lug n strikes the bottom stop n^2 on the rod N moving the latter downward, causing the weighted rod P to be raised past the vertical and to fall over as before, thereby in this case opening the gas cock and closing the steam valve. The expansible cylinder again heats up and makes another stroke. In this manner without regard to the length of time or intervals between the shifting of the valves, the steam cylinder will make a stroke when the air in the holder or pumping cylinder is drawn off and it reaches its lowest position. The action of the water pumping cylinder is well understood. There being no packed joints it is always tight and it throws the full volume of the cylinder at every stroke. When the steam exhausts the vacuum formed sucks the water into the cylinder and keeps it full, thus replacing the small amount that has passed off as steam. When the tank J is used this supply is naturally drawn therefrom, in other cases it sucks up from the water in the tank A. If the tank J is used, and the exhaust is allowed to condense into the tank A or drip back into it, the surplus water thus added to the tank A is allowed to overflow at a^5 .

I have thus fully described my invention and illustrated one practical application of it, but it is capable of many modifications.

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

1. The combination of an expansible boiler and a heat supply generating steam, or pressure, directly in the expansible boiler, substantially as set forth.

2. The expansible steam boiler herein described formed of end heads with intermedi-

ate plates connected accordion fashion in combination with a heat supply generating steam, or pressure, directly in said expansible boiler, substantially as and for the purpose set forth.

3. The combination with an expansible steam cylinder of a source of heat supply generating the steam, or pressure, directly in the cylinder, a valve for the same and an apparatus operated by the expansible steam cylinder and connected with the said valve, whereby the movements of the apparatus automatically let on and shut off the heat supply, substantially as and for the purpose set forth.

4. An expansible steam cylinder having an exhaust pipe and valve in combination with a gas burner for heating the steam cylinder, said gas burner having a valve, a pump or other machine to be operated and connecting devices actuated by a moving part of the pump and operating the exhaust steam and gas valves, substantially as and for the purpose set forth.

5. An expansible steam cylinder provided with a heater adapted to generate steam within the said cylinder and having an exhaust steam pipe in combination with a water supply tank a pipe leading from said tank to the steam cylinder and having a check valve, substantially as and for the purpose set forth.

6. An expansible steam cylinder having an exhaust pipe and valve, and a heater therefor adapted to generate steam within the said cylinder, in combination with an expansible water pumping cylinder substantially as set forth.

7. In a pumping apparatus, the combination of an expansible steam generator or boiler, an expansible pumping chamber or cylinder having pipe connection with a water supply and actuated from said generator or boiler, a heater generating steam in said generator or boiler and an automatic gas supply and cut-off device for said heater, substantially as specified.

8. In a pumping apparatus, the combination of an expansible steam generator, an expansible pumping cylinder or chamber actuated from said generator or boiler, a heater or gas burner, an automatic gas supply and cut-off device for said heater, and an ignition burner for said heater or gas burner, substantially as set forth.

9. In a pumping apparatus, the combination of an expansible steam generator, a heater adapted to generate steam within said steam generator, and an automatic supply and cut-off device for said heater, adapted to cut off and exhaust the steam from said generator, substantially as set forth.

10. In a pump, the combination of an expansible steam generator, an expansible pumping cylinder or chamber actuated from said generator, a gas burner or heater adapted to generate steam within the generator and automatic supply and cut-off device for said

burner or heater, comprising a valve actuated by the moving part of the air apparatus, substantially as set forth.

11. In a pump, the combination of an expansible steam generator or boiler, an expansible pumping cylinder or chamber actuated from said generator, a heater or gas burner, a valve arranged in the steam exhaust pipe of said pumping cylinder or chamber and a second valve arranged in the gas supply pipe of said burner, and means for actuating said valves by a moving part of the air-apparatus, substantially as specified.

12. In an air and water pump, the combination of an expansible steam generator or boiler, a pumping cylinder or chamber actuated from said generator, an expansible pumping cylinder or chamber, a heater or burner, a valve arranged in the supply pipe of the burner, and a valve arranged in the exhaust steam pipe of the pumping cylinder or chamber, and a rod carried by a moving part of the air apparatus and provided with spaced-apart stops acting upon the burner supply pipe valve, in turn actuating the exhaust-steam pipe valve, substantially as specified.

13. In an air and water pump, the combination of the expansible steam generator or boiler, the expansible pumping cylinder or chamber actuated from said generator, a heater or burner for said generator, a device for supplying gas to said burner and cutting the gas off therefrom and for exhausting the steam from said generator, and a water supply pipe connecting with said pumping chamber and with a tank or chamber, and means for actuating said valves from the air-pump, substantially as specified.

14. In a pump, the combination of an expansible steam generator or boiler, and its heater, the valve arranged in the supply pipe of said heater, the weighted arm or lever axially pivoted upon the stem of the said valve, and a

rod carried by a moving part of the air apparatus and provided with spaced-apart stops engaging a rod connected to an arm carried by said valve-stem, said weighted arm or lever having a throw or limited independent movement at each side of the central vertical axis of said stem, substantially as specified.

15. In a pump, the combination of an expansible and contractible steam generator or boiler and its heater, the valve arranged in the supply pipe of said heater and having its axial stem provided with an arm, a rod carried by a moving part of the air apparatus and with spaced apart stops engaging a rod connected to said arm and a weighted lever or arm having its axially pivoted end provided with opposite, interspaced shoulders engaged by a cross-pin carried by said stem, substantially as specified.

16. In an air and water pump, the combination of an expansible and contractible steam generator and pumping cylinder or chamber actuated from said generator, a heater for said generator, the valves, one arranged in a pipe connecting with said pumping cylinder or chamber, and the other arranged in the supply pipe of said heater, and having its axial stem provided, at one end, with a cross pin, and at the other end, with an arm having a rod connection with an arm of the axial pivot of the first named valve, and a rod carried by a moving part of the air-apparatus and provided with spaced apart stops to engage a rod connected to the arm at one end of the axial stem of the heater supply pipe valve, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

ABRAHAM T. WELCH:

Witnesses:

STORY B. LADD,
S. G. HOPKINS.