No. 618,692. Patented Jan. 31, 1899.

F. LAMPLOUGH.

PROCESS OF MANUFACTURING A SUBSTANCE HAVING INSULATING PROPERTIES.

(Application filed May 31, 1898.)

(No Model.)

Fig. 1.

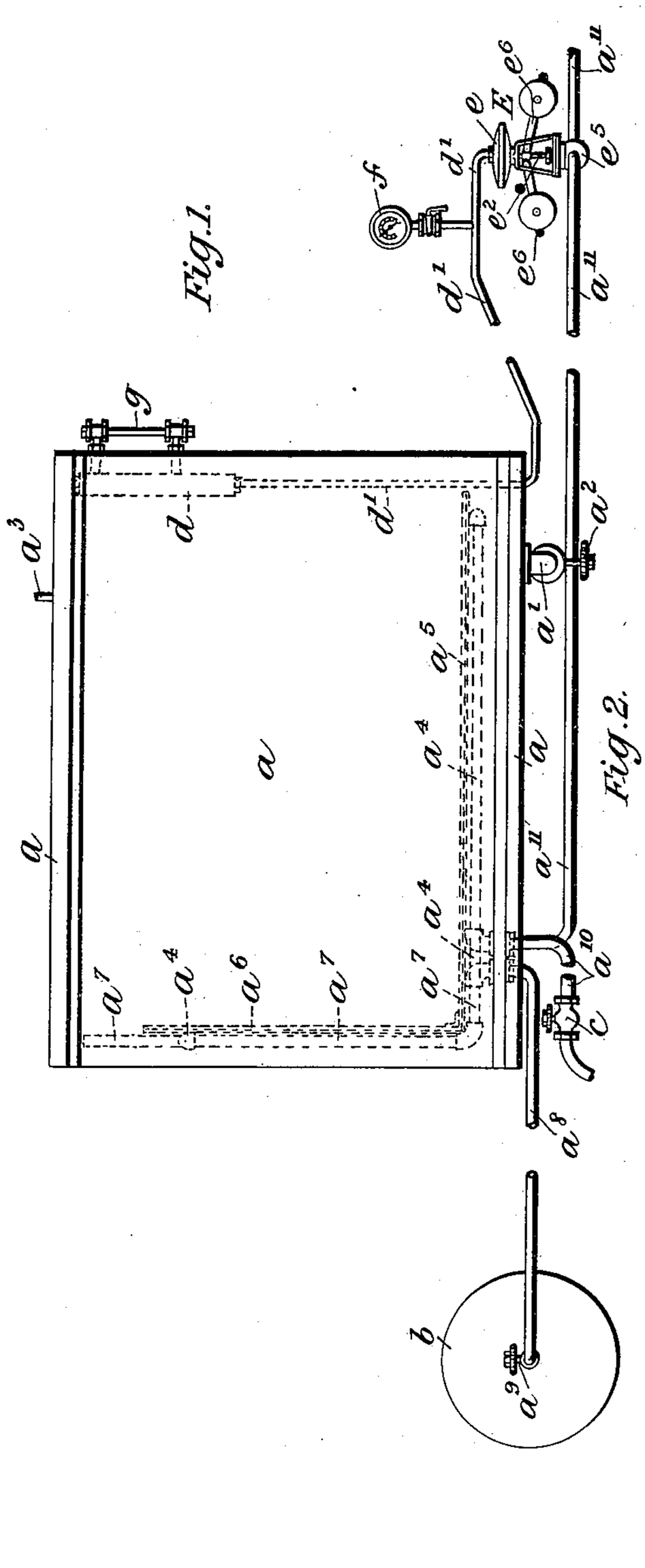
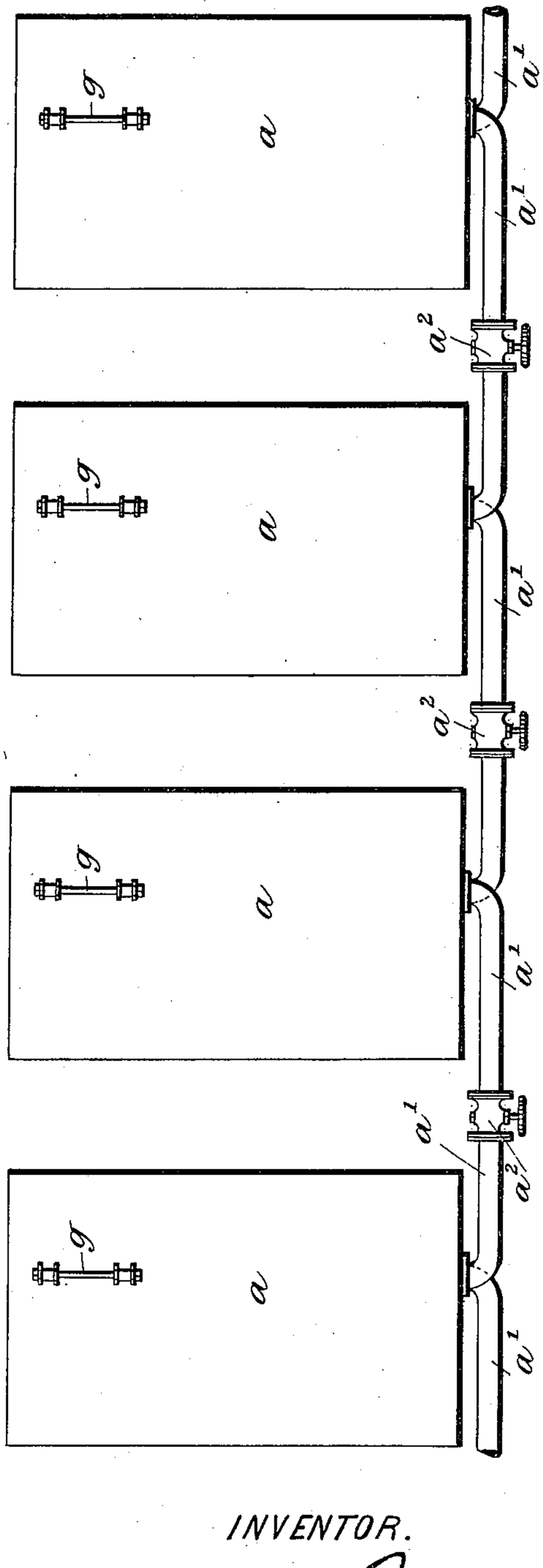


Fig. 2.



WITNESSES.

Walter J. Kerlin

Albert Towny Dyer

INVENTOR.

Frederick Lamplough

UNITED STATES PATENT OFFICE.

FREDERICK LAMPLOUGH, OF LONDON, ENGLAND, ASSIGNOR TO THE VOLENITE, LIMITED, OF SAME PLACE.

PROCESS OF MANUFACTURING A SUBSTANCE HAVING INSULATING PROPERTIES.

SPECIFICATION forming part of Letters Patent No. 618,692, dated January 31, 1899.

Application filed May 31, 1898. Serial No. 682,203. (No specimens.)

To all whom it may concern:

Be it known that I, FREDERICK LAMPLOUGH, a subject of the Queen of Great Britain, residing at London, England, have invented a certain new and useful Improved Process of Manufacturing a Substance having Insulating and other Properties, of which the following is a specification.

The invention relates to a process of treating fibrous materials for the production of material to be used for insulating and other purposes.

In carrying out the process there is employed a resin, resins, or resin-oil, or both, which is conveyed into a mass of fibrous material by means of a suitable non-oxidizable oil, which will act as a vehicle and have sufficient penetrating effect to carry the resin into the material and thoroughly saturate it therewith, the complete process including other steps, among which are the driving off by a destructive distillation of the non-oxidizable oil and the oxidizing of the rest of the mass. By the employment of resins as the base a material having excellent electrical insulating properties is obtained and one which has no acid reaction to affect any metal conductors used therewith.

The invention will be described by the aid of the accompanying drawings, in which—

Figure 1 is a general view of a suitable apparatus for the purpose which is shown in side elevation, and Fig. 2 is an end elevation showing an arrangement of four tanks and their connections.

I have fully described in an application for a patent filed November 11, 1898, Serial No. 696,170, this apparatus; but, briefly, it consists of two suitably-arranged sealed tanks a, capable of withstanding both heat and pressure. At Fig. 2 there are represented four of these tanks arranged side by side, with discharge-pipes a' and valves a^2 so arranged that any pair of adjacent tanks can be so connected and used that either may serve as the primary tank, while the other serves as the secondary or storage tank. It may be here remarked that other numbers of tanks may be employed, and when using more than two they may be so connected that any one of them may be used as the primary tank and any other as a secondary or storage tank.

The tanks may be heated by gas-jets acting on the bottom thereof or by other means, that which is preferred consisting, as represented in the drawings, of a steam-coil a^4, arranged within the tank at the bottom and up one end thereof, and in order to effect a circulation of the fluid contents of the tank a circulation-plate a^5 is fixed over that part of the steam-coil which is at the bottom of the tank and another circulation-plate a^6 over that part of the steam-coil which is at the end of the tank, so that the more highly-heated fluid matters shall rise within the space between the end circulation-plate a^6 and the end of the tank and shall flow over the upper edge of such plate a^6, and thus maintain a constant circulation of such fluid matters. The tanks are also each provided with an air-pipe a^7 at one end, connected to a compressed-air reservoir b by a tube a^8, fitted with a stop-cock a^9, and such reservoir b is supplied with compressed air by a suitable pump. One end of the steam-coil a^4 is connected by a pipe a^{10} to a steam-trap c, while the other end is connected by a pipe a^{11} to a boiler. On this pipe a^{11} is fixed an automatic heat-regulating device E, which operates in the following manner:

In the tank a is suspended a metal tube or flask d, which is charged with a volatile fluid, such as alcohol, water, or the like. This flask is by a pipe d' connected to the device E, which is constructed as follows: e is a chamber fitted with an elastic diaphragm. The pressure from the tube or flask d acts on one side of this diaphragm, while the latter by its other side acts on one end of a valve-rod e^2, on the other end of which is a valve acting in connection with a seat in a valve-body e^5. Thus on the desired temperature being reached in the tank the pressure generated in the tube or flask d is caused to impinge on the diaphragm, which in turn reduces the supply of steam to the coil a^4 and maintains a constant temperature throughout the operation. Adjustably-weighted arms e^6 act on the valve-rod e^2 to keep it in contact with the diaphragm. If, however, gas is used as the heating medium, then the regulating device

would be fixed on the gas-pipe and the supply of gas to the burners regulated to that necessary to maintain the required temperature.

A pressure-gage *f* is fixed on the pipe *d'* to facilitate regulation of temperature, and a gage-glass *g*, in communication with the tube or flask *d*, is fitted to each tank.

The fibrous material to be treated may be either hemp, cotton, wood fiber, peat fiber, or other loose fiber, or it may be in the form of millboard or in any other convenient form. When the fibrous material is in the form of millboard, it is placed on edge within the tank *a*, which for the time being is used as the primary tank and, preferably leaning at an angle against the sides thereof to allow of properly draining off the superfluous oils with which the material is to be treated previous to the said primary tank being emptied after the process. When in the form of loose fiber, the material is placed in trays or cages suspended in the tank to allow of the drainage of the oils therefrom.

For the purpose of saturating the material the primary tank is charged with readily-oxidizable resins or the like or resin-oil, or both resins and resin-oil or similar suitable resinous bodies and a proportion of refined non-oxidizable oil, preferably a fish-oil, which has been produced by a process in which the fish is treated in boiling water or water somewhat under that temperature, the oil given off being immediately removed, such as by a current of water, so that it is pure and uncontaminated, a feature not possessed by fish-oils produced by the ordinary process of steaming at a high temperature, wherein the oil is contaminated by a prolonged contact with the blood and mass, besides being affected by the high heat employed. The fish-oil produced by the improved process aforesaid is preferably refined in the usual way before use. Such oil is both pure and very penetrating in its action, which causes it to form an excellent vehicle for conveying the resins into the fibrous mass. It has been found that ordinary fish-oils are not as effective and in most cases quite unsuitable, as they contain gummy and objectionable matters, which destroy their properties as a vehicle for carrying the resins. The present invention, however, is not confined to the use of this one oil, as other non-oxidizable oils which will act as a vehicle and are otherwise fully suitable may be employed. Together with the other materials there may be added powdered sulfur, if required. The temperature within the tank is now gradually raised to slightly above the boiling-point of water for the purpose of expelling all air and dampness that may be in the material under treatment. The gases are driven out from the tank through an exit-pipe a^3, which may terminate in any ordinary condensing apparatus. When the whole of the air and water has been extracted, the temperature within the primary tank is gradually increased, everything of a volatile nature being distilled over and passing away by the pipe a^3 until what is herein termed the "vulcanizing" point or temperature is reached. At this point the material is completely saturated with the resins. This point has to be varied according to the material under treatment, some fibrous materials saturating at a much lower temperature than others. The effect of this saturation at the above temperature is to change the vegetable fiber into a homogeneous mass, which, after subsequent treatment, will have the characteristics of vulcanite. After being kept at this temperature for some hours, the time being usually determined after a few experiments, the material is ready for the next process—viz., that of oxidizing. This can be done in many ways. One which has been found to answer consists in suspending the material in a warm current of perfectly dry air, from which it will readily extract the oxygen, which, combining with the resinous portion of the mixture held in suspension by the material, causes it to harden; but in the first instance it is necessary before leaving the tanks (it being too tender to handle) that a protective coat or skin should be formed. To do this, a communication between the tank which for the time being is used as the primary tank and that which is used as the storage-tank is opened by means of the cock or valve a^2 on the pipe a', and on air being pumped into or compressed air being admitted to the primary tank from the reservoir *b* the fluid contents of said primary tank are discharged into the storage-tank and the communication cock or valve a^2 is closed. The air is then allowed to accumulate at a pressure of a few atmospheres, being constantly changed for a few hours, by which time the material is sufficiently oxidized to be removed from the tanks. After these two steps it is subjected to a hydraulic pressure for the purpose of increasing its density and removed to any suitable arrangement of desiccating-chamber and kept at a suitable temperature until the necessary hardness is reached, when it can be removed ready for the market.

The principal point to be observed in the successful production of the material is the treatment of the materials at a uniform temperature during the process. This is accomplished by means of the automatic heat-regulating device *d* E, as hereinbefore described.

Completely satisfactory results have been obtained by treating the following materials in the various proportions at the several temperatures and for the different periods stated, viz: Fiber, ten parts, by weight; resin, five parts, by weight; resin-oil, four parts, by weight; fish-oil, two parts, by weight; temperature, 130° centigrade; time, four and one-half hours. Fiber, eight parts, by weight; resin, four parts, by weight; resin-oil, three parts, by weight; fish-oil, two parts, by weight; sulfur, one part, by weight; temperature, 150° centigrade; time, two and one-half hours. Fiber, nine parts, by weight; resin, three

parts, by weight; resin-oil, three parts, by weight; fish-oil, three parts, by weight; temperature, 120° centigrade; time, four hours.

The above temperatures and periods are those applying to the saturation and vulcanizing process after the air and water have been driven off from the materials under treatment and previous to the oxidizing process.

What I claim is—

1. A process for the manufacture of material to be used for insulating and other purposes, consisting in submitting vegetable fibrous material together with an oxidizable resin, and a non-oxidizable oil, to the action of destructive heat and oxidation substantially as and for the purpose described.

2. A process for the manufacture of material to be used for insulating and other purposes, consisting in submitting vegetable fiber, together with an oxidizable resin, and a non-oxidizable refined fish-oil, to the action of a heat which is destructive to the non-oxidizable oil, and to oxidation, as and for the purposes described.

3. A process for the manufacture of material to be used for insulating and other purposes consisting in submitting vegetable fiber in presence of oxidizable resinous bodies and a proportion of non-oxidizable oil to a gradually-increasing heat until all air, dampness and volatile matters are driven off, continuing the action of such heat upon the material until the non-oxidizable oil is destroyed and until the vegetable fiber is changed into a homogeneous mass, and then removing the fluid portion, and oxidizing, pressing, and drying the material, substantially as and for the purpose set forth.

4. A process for the manufacture of material to be used for insulating and other purposes, consisting in submitting vegetable fibrous material, oxidizable resins, and a proportion of non-oxidizable refined oil, to a gradually-increasing heat until all air and dampness are expelled, gradually raising the temperature until everything of a volatile nature has been distilled over and the desired temperature reached, maintaining this high temperature until the vegetable fiber is changed into a homogeneous mass, separating the fluid contents from the material, admitting air under pressure to the material, and constantly changing it to oxidize same and thereby produce a protective coat or skin to enable it to be handled, submitting the material to a further oxidizing, and to hardening, and pressure to give it density, and finally desiccating until the necessary hardness is reached substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FREDERICK LAMPLOUGH.

Witnesses:
W. M. HARRIS,
ALLEN PARRY JONES.