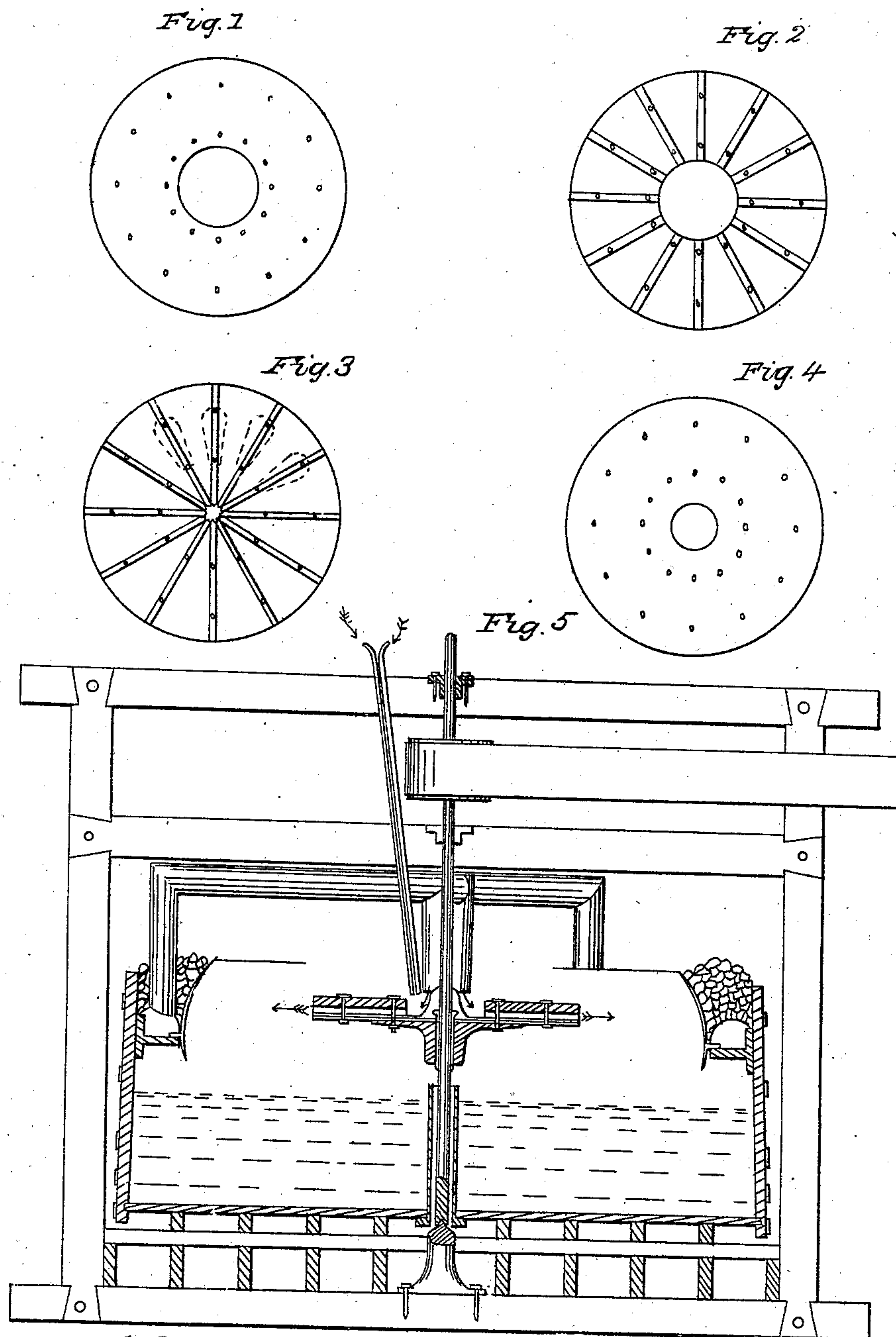


G. M. MOWBRAY,
Manufacture of Nitro Glycerine.

No. 106,606

Patented Aug. 23, 1870.



WITNESSES
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GEORGE M. MOWBRAY, OF NORTH ADAMS, MASSACHUSETTS.

IMPROVEMENT IN APPARATUS FOR THE MANUFACTURE OF NITRO-GLYCERINE.

Specification forming part of Letters Patent No. 106,606, dated August 23, 1870.

To all whom it may concern :

Be it known that I, GEORGE M. MOWBRAY, of North Adams, in the county of Berkshire and State of Massachusetts, have invented a new and Improved Apparatus for Manufacturing Nitro-Glycerine, of which the following is a specification :

The nature of my invention consists in combining the glycerine with a mixture previously cooled (consisting of sulphuric acid, six parts, and nitric acid, three parts, to one part of glycerine) by means of centrifugal motion.

The advantages of this apparatus are, that the precision of a machine is substituted for the irregularity of hand-labor.

By diminishing the number of hands employed the risk of accident is diminished, as are also the sources of danger.

Given the motive power and the requisite ingredients, and one man, with suitable centrifugal apparatus, can manufacture as much nitro-glycerine as ten men by hand-labor.

The process is as follows: Motion being given to a whirling table or plate, a supply of sulphuric and nitric acid, each containing from seventy-nine to eighty per cent. of real acid, is mixed in the proportions previously described, and cooled down to 32° Fahrenheit. A supply of glycerine, 30° Baumé gravity, is now cooled down to about 40° Fahrenheit.

Separate pipes, each having a fall of several feet, lead from the several containing-vessels of the mixed acids and of the glycerine, and their delivery-apertures having been adjusted so as to deliver nine parts of the mixed acids and one part of glycerine, the several apertures are caused to deliver a stream of their contents in the above relative proportions, and at a sufficiently moderate rate of delivery or flow, so as not to heat the mixture as it distributes over the plate beyond the refrigerating power of the apparatus. This is known by the mixture developing heavy, dense, red fumes of nitrous acid, and indicates the formation of oxalic acid instead of nitro-glycerine.

I have found a speed of from two hundred and fifty to three hundred revolutions of a whirling plate, whose diameter is five feet, or at the rate, at the periphery of the table, of from three thousand seven hundred and fifty

feet to four thousand five hundred feet per minute, sufficient.

In such a plate I deliver the liquids side by side, at a point about twelve inches from the center of the plate.

Motion is given to the plate or whirling table before the liquids are allowed to flow.

The result of the centrifugal motion is to effect a thorough mixture of the acids with the glycerine. As they are simultaneously impelled in a thin film from the center toward the periphery of the table, nitro-glycerine forms, and nitrous fumes, to a moderate extent mixed with air, are evolved, the nitro-glycerine with the sulphuric acid in excess, also some nitric acid in excess, are thrown off the periphery of the plate, assume an extremely fine state of division, favorable to eliminating the nitrous fumes rapidly, and as it strikes a receiving-band or series of glass plates, or cast-iron enameled plates, at right angles with the plane of the whirling table, which plates are maintained at an ice-cold temperature by means of ice, or a freezing mixture of ice and salt, behind them, the acid mixture collects into a thin sheet of fluid and streams into a tank of water, whose contents combine with the free acid and precipitate the nitro-glycerine.

When the supply of either the glycerine or the acids is exhausted, or both of them have ceased to flow, a hose, with a supply of water, is directed to the center of the plate for a few seconds, so as thoroughly to wash off all the acid, the centrifugal movement is stopped, the acid-water is drawn off from the receiving-tank, the nitro-glycerine collected and thoroughly washed to remove adherent acid, in the usual manner.

The accompanying drawing may be consulted by parties who are not familiar with the centrifugal or whirling machine.

Figures 1 and 2 show the underneath and the upper surfaces, respectively, of the cover or upper portion of a whirling table. Fig. 4 shows the underneath surface of the whirling table proper, Fig. 3 shows the surface over which the liquids flow, with the radial divisions, to assist in more equally distributing the flow. Oval boxes, containing ice, or a

mixture of ice and salt, may be introduced by casting the aperture indicated in the dotted lines to receive them, thereby increasing the refrigerating power of the apparatus.

It will be observed that, when the radial arms of Figs. 2 and 3 are brought to correspond and bolted together, Fig. 3 being beneath and Fig. 2 above, they are then ready for fitting onto the cast-iron hub shown in Fig. 5, which is a sectional view of the whole apparatus mounted *in situ*, with receiving-tank, cast-iron enameled collecting ice-plates, arrangement for cooling and conveying cold air to the center of the whirling table, to be distributed to the periphery, the delivery-pipes for the acids and the glycerine leading to the center, &c.

By inclosing the whole of the above apparatus in an air-tight vessel, allowing the spindle to pass through a stuffing-box, the process may be conducted *in vacuo*, which has two advantages—first, it increases the rapidity of the process; second, as fulminates do not explode *in vacuo*, it is safer; but it takes great power to maintain the vacuum and keep down leakage, and in letting in air it must be done very

gradually, to avoid percussion of the nitro-glycerine.

I do not claim the invention of nitro-glycerine, nor its use as an explosive agent, as these are well known. Nor do I claim the manufacture of nitro-glycerine by a continuous process, by bringing together a stream of acids and a stream of glycerine, as that is described in the patent of Alfred Nobel, August 14, 1866, reissued in two divisions April 2, 1867; but my invention relates to improved modes and devices for bringing together and cooling the streams of acids and glycerine.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The centrifugal apparatus shown in Fig. 5, whereby the materials are mixed and scattered, in manner substantially as described.

2. The revolving table, with radial arms, or divisions, or disks, or plates with radial grooves, substantially as described.

GEO. M. MOWBRAY.

Witnesses:

GEORGE V. MASH,
JOHN VAN VELSON.