

H. TURRETTINI.
 PROCEEDING AND APPARATUS FOR HEATING LIQUID BY MEANS OF HEAT PRODUCED BY CHEMICAL
 REACTIONS IN CLOSED VESSELS.

1,303,618.

APPLICATION FILED MAR. 23, 1918.

Patented May 13, 1919.

2 SHEETS—SHEET 1.

Fig. 2.

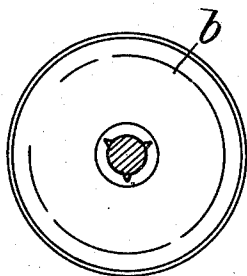
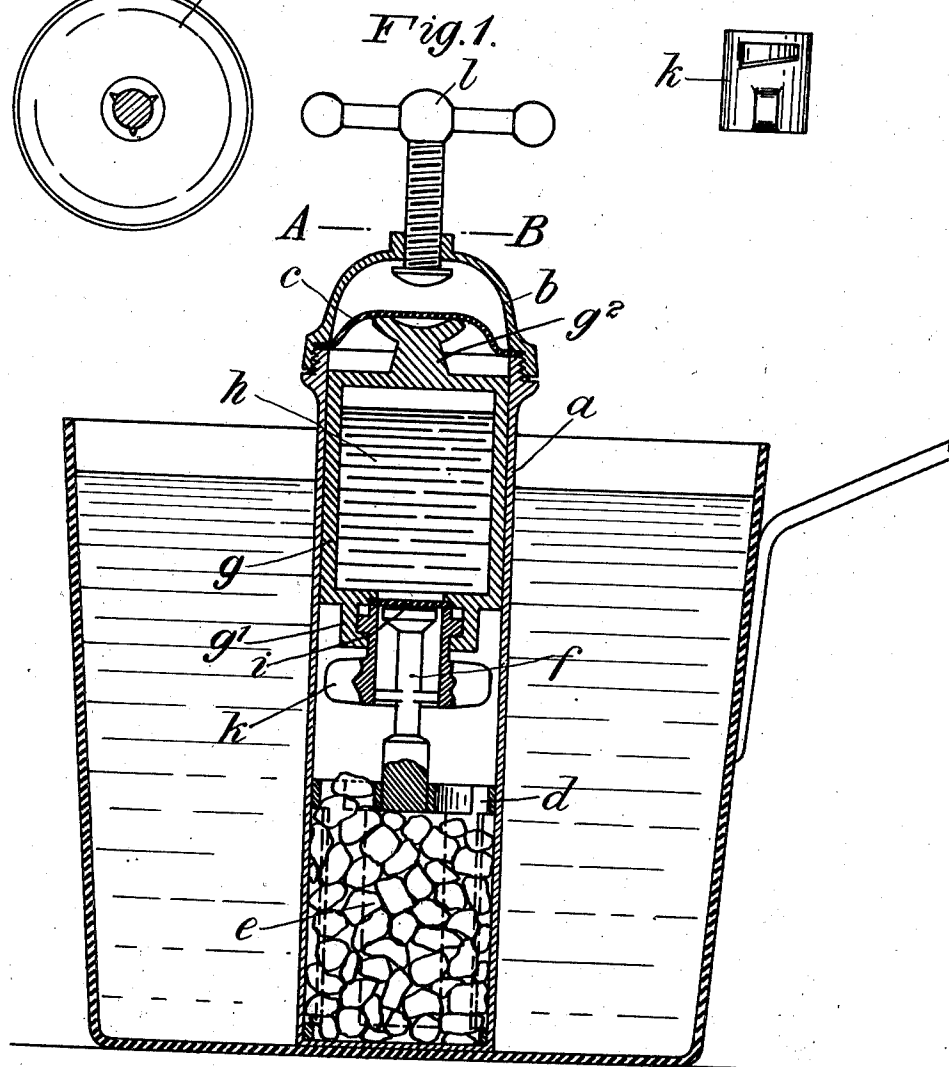
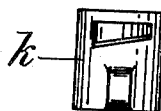


Fig. 3.



Inventor
 Horace Turrettini
 By *[Signature]*
 His Attorney

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2 SHEETS—SHEET 2.

Fig. 5.

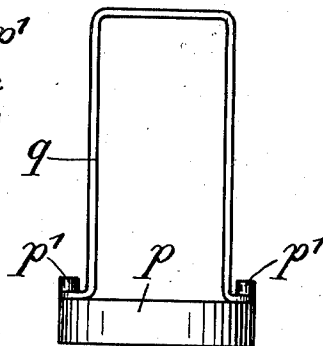
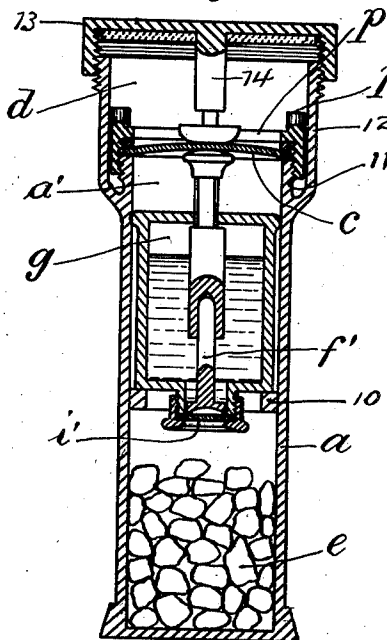


Fig. 6.

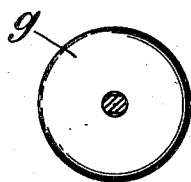


Fig. 8.

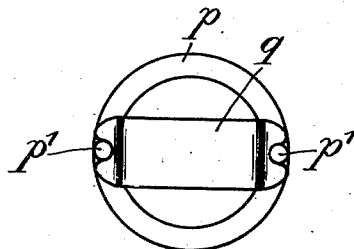


Fig. 7.

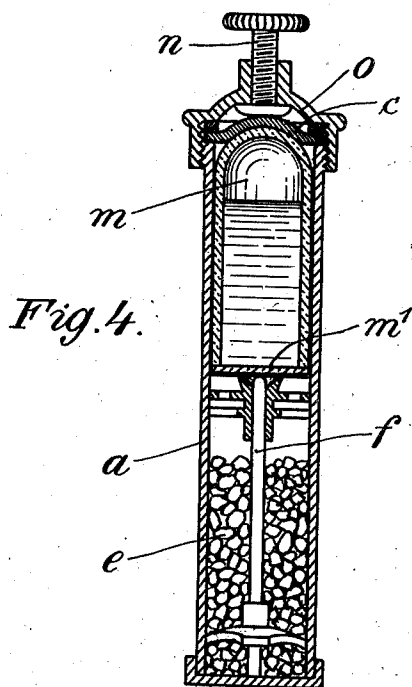


Fig. 4.

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UNITED STATES PATENT OFFICE.

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PROCEEDING AND APPARATUS FOR HEATING LIQUID BY MEANS OF HEAT PRODUCED
BY CHEMICAL REACTIONS IN CLOSED VESSELS.

1,303,618.

Specification of Letters Patent.

Patented May 13, 1919.

Application filed March 23, 1918. Serial No. 224,157.

To all whom it may concern:

Be it known that I, HORACE TURRETTINI, gentleman, a citizen of Switzerland, residing at Geneva, Canton of Geneva, in the Confederation of Switzerland, have invented certain new and useful Improvements in Proceedings and Apparatus for Heating Liquid by Means of Heat Produced by Chemical Reactions in Closed Vessels, of which the following is a specification.

The object of the invention is a proceeding for heating a liquid by means of the heat produced by chemical reactions, characterized by the fact that a determined volume of acid is thrown upon a determined volume of a base contained in a vessel which is immersed into the liquid to be heated.

The invention further comprises an apparatus for heating a liquid by means of the said proceeding consisting of a closed vessel in which the reaction of concentrated sulfuric acid on quick-lime takes place, the said vessel being immersed in the liquid sought to be heated.

The annexed drawing shows one form of execution of the invention given as an example.

Figure 1 is an axial section of the apparatus immersed in a liquid contained in a saucepan.

Fig. 2 is a section from A to B of Fig. 1.

Fig. 3 is a side-view of the tubular plug *k* with a winglet. Fig. 4 is a central longitudinal section illustrating a modified form of the invention. Fig. 5 is a view similar to Fig. 4, illustrating another form of the invention. Figs. 6 and 7 are an elevation and a plan respectively illustrating the cap as employed in Fig. 5 and the wrench or tool by which it is connected and disconnected, and Fig. 8 is a sectional plan of the box or cylinder for containing the acid as shown in Fig. 5.

a is a tubular cylindrical case, closed at its bottom and provided at its upper end with a cover *b* with a screw fastening on the case *a* a cap *c* made of lead and intended to close tightly the said case *a*. At the bottom of this case is lodged a cage *d* containing the quick-lime *e* and bearing a fixed piston *f*. Above the latter is mounted a box *g* containing the sulfuric acid *h* and the bottom of which is closed by a membrane of lead *i* maintained in its position by the tubular plug *k* engaging with a bayonet-device having two collar segments *g*¹ of the box *g*. The said segments

are provided with suitable inclined planes engaging with similar inclined planes of the tubular plug *k* (Fig. 3) in order that the membrane *i* be strongly pressed against the borders of the opening of the box *g*. The latter bears a head piece *g*² upon which rests the center of the cap of lead *c*.

A screw *l* passing through the cover *b* is intended to press down the box *g* in acting upon the head *g*² by means of the said cap *c*. This cap being made of lead, gives way under the pression of the screw *l*. On the other hand, the diaphragm of lead *i* is broken by the fixed piston *f* when the box *g* is pressed downward. Then the sulfuric acid contained in *g* will be poured on the quick-lime, the reaction will take place and the liquid into which the apparatus is immersed will be heated rapidly.

The box *g* is mounted sufficiently loosely in the case *a* as to permit any gas that is generated to pass between it and the walls of the case.

According to the construction just described the sulfuric acid is contained in a tightly closed vessel and it cannot escape from the said vessel before the rupture of the membrane *i*.

On the other hand, after this stamping out has taken place the gases cannot escape out of the top of the apparatus owing to the tight closing of the cap *c*.

In order to avoid any explosion in case the said gases produce a too considerable pressure in the apparatus, the cover *b* is provided, around the screw *l*, with a certain number of notches allowing the passage of these gases if they succeed in bursting the cap *c* by means of their pressure. Thus the said cap acts as a safety-valve.

But if the prescriptions given for the proportions of quick-lime and sulfuric acid to be introduced into the apparatus for its loading are strictly observed, the pressure of the gases will never overpass the limits represented by the resistance of the cap *c*.

The proportion of acid must be calculated so, that the base employed be saturated.

If for example 56 gr. of lime are taken, it will be necessary to employ 98 gr. of sulfuric acid.

In the case of lime and sulfuric acid being used, the chemical reaction will evolve, in the conditions under which it is used, about 300 to 350 calories for each gram of lime in the liquid to be heated.

Example: For heating 1 liter of water from 0 to 100°, 100 calories will be necessary; thus there is a need for about 300 to 330 gr. of lime.

5 The volume of the closed vessel must have about $3\frac{1}{2}$ times the weight of the lime employed, in order that the said vessel be able to contain the lime and the tube for the acid and that the pressure of the gases be not too strong.

10 Example: When 30 gr. of lime are taken, the size of the closed vessel will be of about 105 cm³, and if 1 liter of water is to be heated to boiling, the tube required must have a volume of about 1 liter.

15 In the annexed drawing the saucepan, as shown, containing the liquid to be heated, does not correspond to these proportions and therefore it does not show a case in which the boiling of the liquid would occur.

20 Instead of sulfuric acid, another acid could be employed, and in place of the quicklime, soda, potash, baryta or other material may be used.

25 The form of the invention illustrated in Fig. 4, includes a glass bowl or other similar receptacle *m* fitting within the case *a* and provided with a frangible bottom *m'* which is normally supported upon a rod *f* for maintaining the box or glass bowl *m* in position. In this instance, the lead gasket is indicated at *c* and is secured in place by a cap *o* through which the screw *n* passes. The use of the apparatus is precisely similar to that described in connection with the form of the invention as shown in Fig. 1.

30 In the form of the invention shown in Fig. 5, the box *g* is maintained in position on an internal flange 10 and the upper end of the case *a* is made with a double wall, parts of which are indicated at 11 and 12. In this structure, a ring *p* is adapted to be turned down on the wall 11 to maintain the lead gasket *c* in position to make a gas tight joint and for this purpose this ring *p* is provided with suitably placed lugs *p'* adapted to be engaged by the ends of a yoke-shaped tool *q* or otherwise by means of which as will be readily understood the ring may be turned to place or removed from the heater. In this structure also, the rod *f'* extends through the box *g* and is supported by the frangible member *i'* secured in position at the base of the box, the upper end of the rod *f'* being normally in contact with the lead gasket *c*. In this structure also, there is employed a cap 13 adapted to be screwed down on the wall 12 and having interiorly a rod 14 which at its inner end bears against the outer surface of the lead gasket *c* at a position opposite the end of the rod *f'* so that as will be understood, the turning of the cap 13 on the wall 12 will break the frangible member *i'* through the action of the rods *f'* and 14 to liberate the acid con-

tained normally in the box *g* and permitting it to descend and contact with the base contained in the bottom of the case *a*. In this structure, the space *a'* acts as a storing chamber for any gas which may pass between the box *g* and the case *a*.

I claim as my invention:

1. A heating apparatus comprising a casing adapted at its lower portion to contain a chemical base, a vessel containing acid in the said casing, a frangible bottom associated with the said vessel, means for supporting the vessel adjacent the top of the casing, means for closing the casing to make the same gas tight, and means operated from the exterior of the casing for breaking the frangible bottom of the said vessel to release the acid therein and permit it to come into contact with the said chemical base.

2. A heating apparatus comprising a casing adapted at its lower portion to contain a chemical base, a vessel containing acid in the said casing, a frangible bottom associated with the said vessel, means for closing the said casing to make the same gas tight, and means operated from the exterior of the casing for moving the said vessel therein to break the frangible bottom thereof, thus releasing the acid contained in the vessel and permitting it to come into contact with the said chemical base.

3. A heating apparatus comprising a casing adapted at its lower end to contain a chemical base, a vessel containing acid in the said casing, a frangible member normally closing an opening in the bottom of the said vessel, a support bearing against the said frangible member to support the said vessel, and means for moving the said vessel to break the said frangible member, thus releasing the acid and permitting it to come into contact with the said chemical base.

4. A heating apparatus comprising a casing, adapted at its lower end to contain a chemical base, a vessel containing acid in the said casing, a frangible member normally closing an opening in the bottom of the said vessel, a support bearing against the said frangible member to normally maintain the vessel in position, a flexible diaphragm extending over the said vessel at the top of the said casing, a cap for normally maintaining the said diaphragm in position to make the interior of the casing gas tight, and means operated from the exterior of the casing to move the said diaphragm and vessel to break the frangible member, thus releasing the said acid and permitting it to come into contact with the chemical base.

5. A heating apparatus comprising a casing, adapted at its lower end to contain a chemical base, a vessel containing acid in the said casing, a frangible member normally closing an opening in the bottom of the said vessel, a support bearing against

the said frangible member to normally maintain the vessel in position, a flexible diaphragm extending over the said vessel at the top of the said casing, a cap for normally maintaining the said diaphragm in position to make the interior of the casing gas tight, and a screw passing through the said cap and adapted to contact with the said diaphragm to move the same and the
10 said vessel to break the frangible member,

thus releasing the acid and permitting it to come into contact with the said chemical base.

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

HORACE TURRETTINI.

Witnesses:

ROD. DE WURSTEMBERG,
LOUIS H. MUNIER.