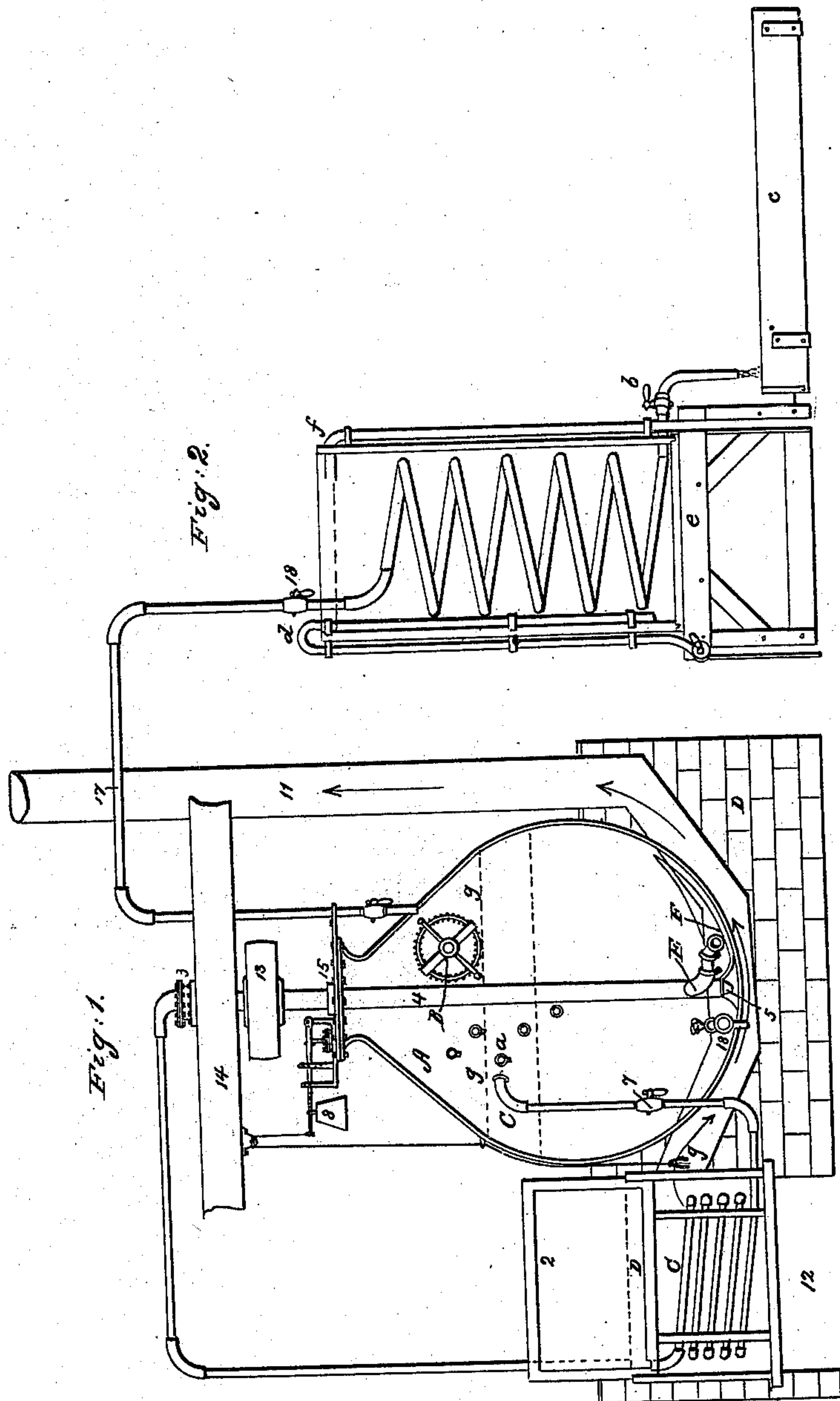


B. HARDINGE.

Apparatus for Dissolving Silica.

No. 12,819.

Patented May 8, 1855.



UNITED STATES PATENT OFFICE.

BENJAMIN HARDINGE, OF NEW YORK, N. Y.

APPARATUS FOR DISSOLVING SILICA.

Specification forming part of Letters Patent No. 12,819, dated May 8, 1855; Reissued January 22, 1856, No. 344.

To all whom it may concern:

Be it known that I, BENJAMIN HARDINGE, of the city of New York, in the county of New York and State of New York, have invented a new and Improved Apparatus for dissolving silicates, silicates of soda, and other like substances, holding the silex largely in excess in its aqueous solution as a base when combined with other substances in the formation of concrete conglomerate, artificial marble, and other stone; which I verily believe has not been known or used before; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings and the figures and letters of reference marked thereon.

The nature of my invention consists in an apparatus for applying steam heated (almost to its point of decomposition) to the under strata of a ton or more of the ground silicates in the proportion of four parts water, while the upper stratum is continually being relieved of steam by a pipe leading from the upper part of my (strong egg-shaped) boiler and coiled through a cold-water tank; thus relieving the upper strata of steam and hydrated silicious globules as soon as solution begins to take place, easing the pressure from the safety valve, saving the waste hydrous silicates which pass through said pipe in the form of minute capsules, and applying the same to use in making plastic masses of coarser kinds, while the dissolving process is going on.

The nature of my invention also consists in what I have named a horn-pipe brazed onto the lower end of the vertical shaft-pipe, and crooked backward and upward, jetting out the heated steam in a circuitous direction (among the lower heavy, strata) thus disseminating the heated steam away from a particular point in the bottom of the boiler, thus preventing the destruction of the boiler, and also easing resistance by the jet being in a contrary direction from the turning of the shaft-pipe agitator and scraper to which it is attached.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation—

I construct a large strong boiler holding from four to five hundred gallons, of nearly an egg form, Figure 1, letter, A. This form, for three reasons; first; the common well

known fact that it is stronger—secondly; it is the best shaped bottom to move the mass around in by the scraper; and, thirdly; the apex of the cone being cut off near the top affords a strong support and bearing to the upright shaft-pipe, 4, which turns also in the brass coupling box 3. This boiler, A, being otherwise provided with gage cocks and man-hole in the usual manner is set in a common furnace in its vertical position. I proceed to put in my batch of silicates of the cheapest of any of the solvent salts say soda ash 500 lbs, mixed with half a ton of the snow-white sand (of Berkshire Massachusetts) and ignite the same to a perfect flux in pots which I have made for that purpose with a common open top; and the same as are used for making the commonest green glass. These, and similar silicates I grind (in what is termed Borgardus's mill) to almost an impalpable powder. If the soda ash is concentrated, a much less quantity is required. I put this or other similar substances to be dissolved into the manhole B, immediately adding its proportion of four parts water, which should be filled several inches above the entrance of pipe, C, near the gage cock, *a*. This pipe, C, is coiled in layers nearly fitting the inside of furnace D, and containing about sixty feet of coiled pipe, which is coated inside with what I term my kaolin cream made up of kaolin liquor of flints and other substances (not the subject of this patent claim) fused on inside and outside; only on the outside I introduce a copious addition of white fine sand and let it frit among kaolin cream in the fusion; this is to prevent the pipe, C, from destruction by fire and oxidation. All being now ready and the pipe C, also filled with the water from boiler, A, up to its common level, a wood fire is fed in among the coiled pipe, C, by the door, 2, of furnace D. The fire is at the same time carried under boiler A, by the flue *g*. The mass is soon heated to the boiling point; there is a smoke pipe, 11, also to furnace D. The advantages of my double process of heating are now realized; together with the advantage of my relief pipe, 17, with its stop cock, 18. This pipe being attached to the upper part of boiler A, is conducted into and coiled down through the cold-water tank Fig. 2, and out into and among the plastic mass in a suitable reservoir, to be worked in the mixing

trough, with beach-pebbles and angular quartz interspersed with mica, ferruginous and argillo-calcareous carbonates of lime, &c. &c, first roasted and ground for the purpose and worked by a process which is not the subject of the present application for a patent.

The tank, Fig. 2, is constantly being supplied (during the operations) with cold water by the pipe *d*, from any common source most convenient; it has a stop cock down near the bench, *e*. There is a waste pipe, *f*, at the opposite side of the tank Fig 2, to carry off the hot water, inserted just below the level of neck of pipe, *d*, while the latter pipe, *d*, reproduces the cold water, as aforesaid, conducting down low in the tank. The horn pipe E, and scraper F, being fastened together and all secured to the rotary shaft-pipe, 4, are turned by a belt around pulley, 13, by a one and a half horse power of steam, or any other power. The scraper, F, is indispensably necessary to prevent the hot silicated hydrates from adhering to boiler A in an immovable mass and destroy the boiler; whereas by this arrangement there is not the least danger of such an event. There is a grate and ash-pit, 12, in furnace, D. There is a cock, 18, which projects through the mason-work into the boiler, A, near the bottom to draw off the siliceous liquor, when the operation shall have been completed. There is a stop cock, 7, in pipe, C. There is a common safety valve, 8, at the top of boiler A. There are three bearings and supports to the rotary shaft-pipe, 4, viz, bearer, 14, and 3, upon which the brass coupling box rests; also a collar and set screw, 15, at the top of boiler A. The other is by plugging the lower end of the rotary shaft-pipe, 4,

forming a case hardened steel gudgeon, 5, which turns easily (without any pressure downward) in a step secured on the inside of the bottom of boiler A,—a precaution which will at once be obvious.

By this combined apparatus, as above described, two men will easily turn out forty hogsheads of liquor of flints per week as clear as any solid crystal, varying the thickness and consistency of the different batches according to the various purposes desired.

I do not claim in the present application to have discovered any new solvent principle for silex either by the above named alkaline salts or steam under high pressure, as these facts have long since been known to chemists.

I do not claim the heating the steam in coiled pipe and thereby forcing it to the bottom of the boiler A.

I do not claim any originality of structure of the furnace or the manner of setting the boiler with its man-hole or gage cock.

I do not claim as original with myself the structure of the cold water tank itself.

I claim the filling the pipe, C, with the water from the upper stratum in boiler A, so constructed as to find its common level in pipe, C, in furnace D, from whence the heated steam is forced over and down into the under-stratum of the heavy silicates, by the horn-pipe E, while the steam pressure is relieved from the surface by my relief pipe, 17, which coils through the tank Fig. 2, of cold water for the purposes described.

BENJAMIN HARDINGE.

Witnesses:

WASH. R. NICHOLS,
C. T. GREENE.