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To facilitate cleaning and repairs, the boiler shell is made in two parts united by a bolted joint, as shown, the upper part of the shell sliding on the uptake or chimney. This uptake passes through a stuffing-box at the top of the boiler, the part of the uptake which traverses the stuffing box being thickened and screwed to receive a deep brass nut which bears upon the top of the stuffing-box, as shown, and through which pass screws for setting up the gland. This arrangement enables the uptake to act as a stay between the crown of the fire-box and the shell, while at the same time, by slacking back the brass nut just mentioned, the upper part of the shell is left free to be raised when the bolted joint which unites it to the lower portion is broken.

To secure dry steam, the steam pipe is made to communicate with an annular chamber in the steam space, as shown in Figs. 1 and 2, this chamber having slots formed on its top for the admission of steam, while its bottom is made to slope towards one side of the boiler, a drain pipe—led down below the water line—being provided to take away any water which may be carried into the chamber by the steam. In addition to this chamber, the boiler, of which we are now speaking, is provided with an external separator, as shown in the perspective view.

The principal dimensions of the boiler are given in the engravings. The area of the firegrate is 4 square feet, and of the heating surface 162 square feet, this latter being made up of 38 square feet of fire-box surface and 124 square feet of tube surface.

**TELLURIUM.**

BY THEODORE BERDELL.

Tellurium is one of the rare minerals, and up to the present time has been found but in small quantities. As there is no use in the arts for this metal, it is worthless, and is mined only for the gold and silver it contains. As a very complete description of all the varieties exists in Dana's "Mineralogy," the names need only be given here as follows: Native tellurium, tetradymite (Bi<sub>2</sub>Te<sub>3</sub>); Joseite, same, with the Te replaced by S and Se; Wehr-lite, same, with Bi replaced by a little Ag; Altaite, Pb Te; Nagyagite, same, Pb replaced by Au Ag; Hessite, Ag<sub>2</sub>Te; Petzite, same, Ag replaced in part by Au; Sylvanite (Ag Au), Te<sub>2</sub>; Montanite, TeO<sub>2</sub>·BiO<sub>3</sub>; Melonite, Ni Te; Calavarite, Au Te; Coloradoite (new), Hg Te, discovered by Professor F. A. Genth from the Mount Lion Mine; Magnolico Lionite; and, lastly, one variety the writer claims to have discovered from Mt. Lion Mine. Analysis: Te 53, SiO 35, FeO 4, Au 1.75, Ag 10. Deducting the SiO, this would be almost native tellurium. It has, however, an entirely different crystallization and resembles an artificial product very much like a matte. I have only found a very little of it. One of the simplest tests for tellurium is boiling in SO<sub>3</sub>, giving the purple color. SO<sub>3</sub> does not dissolve a very large quantity, and soon becomes saturated when the tellurium is thrown down, the same as if water had been added. Another very good test is by the use of the blowpipe as follows: Put a small sample well pulverized on a porcelain dish; direct the flame; TeO<sub>2</sub> is formed, and gives a coating, of course white. While still warm, add a drop of SO<sub>3</sub>, and the purple color appears. This is very distinct from any of the other metals. Tellurium dissolves in NO<sub>2</sub> to TeO<sub>2</sub>, which is again dissolved by HCl, and can be precipitated by H<sub>2</sub>O. The TeO<sub>2</sub> can be reduced to the metallic state by mixing with powdered charcoal and smelting quickly in a muffle. This process gives a very pure article. Another way consists in melting raw ore with a very quick and readily fusible flux in a crucible, leaving it in the muffle, which should be at a red heat, only long enough to form the slag, say five minutes. The metallic button thus obtained, which is only Te, Au, and Ag, is again fused at a low heat in a stream of chlorine gas. The tellurium goes off as TeCl, and is collected in water precipitated as TeO<sub>2</sub>, and smelted as before. By this method some of the tellurium is lost in the first melting. Probably about three or four per cent. By roasting, gold is brought to the surface. The tellurium at the

surface is volatilized, leaving the gold thereon. This is one of the ways our miners find the richness of their ore themselves, for the gold is their only aim. It can be done in any ordinary stove by placing the specimen on the hot coals. A better plan is to use a muffle admitting a good supply of air. The muffle is kept at a low red heat which, towards the last, is raised. The tellurium burns with a light-blue flame, and gives off the white dense fume of TeO<sub>2</sub>; the other is the tellurium in the natural state. The mines producing the richest ore in tellurium are the Smuggler, John Jay, Mt. Lion, and Keystone, Colorado. I have had specimens (deducting the quartz) that yielded from 92 to 97 per cent tellurium. The largest amount I have ever seen was about 400 lbs., shipped from the John Jay Mine; this

as any found. This has given great encouragement. At present capital is needed for opening the mines. Denver, Col.

**Vitriol Vinegar.**

The Board of Health of the District of Columbia has condemned five car loads of vinegar sent there from Chicago, on the ground that it is not a genuine article, and is injurious to health.

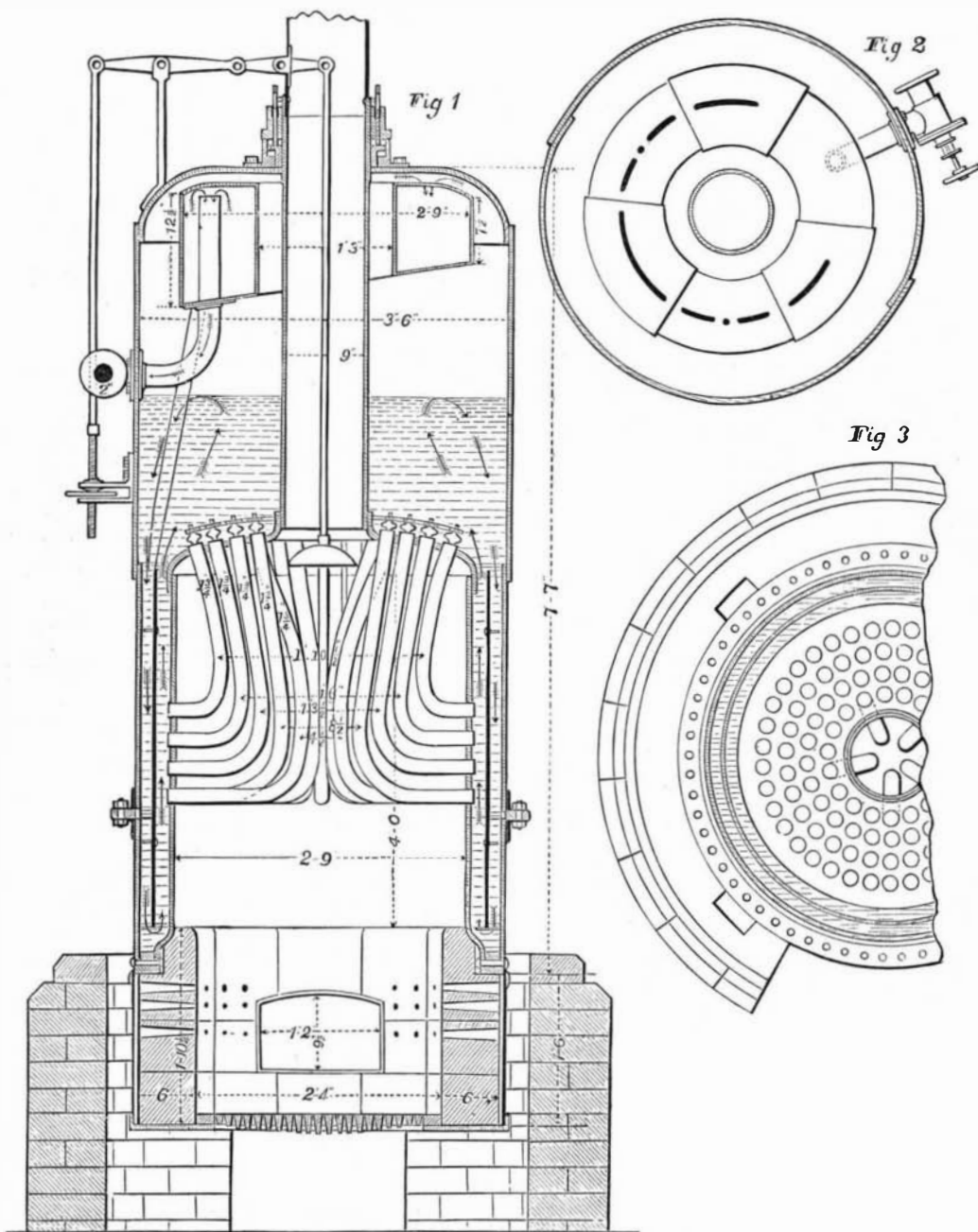
An analysis of the so-called vinegar has been made. It appears, according to the report of the Board of Health, that the vinegar contains 54.5% grains per gallon of anhydrous sulphuric acid, combined with lime, to form a sulphate of lime equivalent to 117.5% grains of gypsum per gallon, and besides that, five grains of free sulphuric acid per gallon. The Board also reports that this sample was taken from an invoice of more than 1,000 barrels brought there to be sold as vinegar, and that it is likely to find a ready sale on account of its low price. The report concludes as follows: "When we think that oil of vitriol (sulphuric acid) can be bought at five cents per pound, and that a pound of said acid would render a barrel of fluid as acid as the strongest vinegar, the wonder will cease that it is sold cheap. This, therefore, is a fraud upon commerce, and a dangerous substitute for vinegar." The fraud and danger are more general than the great mass of people will readily believe. It is asserted that probably one half the vinegar sold at city groceries is a rank poison with either sulphuric or other objectionable acids for its base.

**ANOTHER MYSTERIOUS CLOCK.**

M. Cadot, an ingenious clock-maker of Paris, who has already devised several forms of clocks which apparently work without works, has recently invented still another time-piece, calculated to puzzle even those who are familiar with Robert Houdin's arrangement of the double glass plate. Houdin's invention, which we explained not long ago, consisted in two glass disks placed parallel and contained in the same circular frame. On one was marked the dial, while the other turned on its center and was attached to the minute hand. The turning of the disk was imperceptible, and was effected by mechanism concealed in the surrounding frame. M. Cadot's new clock, an engraving of which, from the *Bulletin* of the French Society for the Encouragement of the National Industry, is given herewith, cannot, it is evident, be constructed on any such principle, because the glass plates are square, and, besides, they appear to be firmly set in the base support. The trick, however, will be readily understood from the diagrams. There are two plates, one of which, *a*, is fixed to the base, and on this the dial is marked. Both plates are enclosed in a single frame, *b*, but this frame is loose enough to let the rear plate oscillate a little. The lower middle figure represents the bottom of the plate which rests on a balance beam, *h*. In the space, *c*, of the standard, the clockwork is concealed, and this rotates a ratchet wheel, *e*, which has 30 teeth, once in an hour. The teeth of the wheel, *e*, engage in turn the hook, *f*, move the bell crank attached thereto, and thus give an up and down reciprocating motion to the rod, *g*, which pushes against the bottom of the movable glass plate. By means of this arrangement and the spring, *i*, the plate is thus caused to oscillate isochronously. In an aperture made through the center of both plates is the ratchet gearing, represented in the upper middle figure, and this communicates the motion of the plate to the minute hand. Finally, the latter in turn, by very simple concealed mechanism, operates the hour hand.

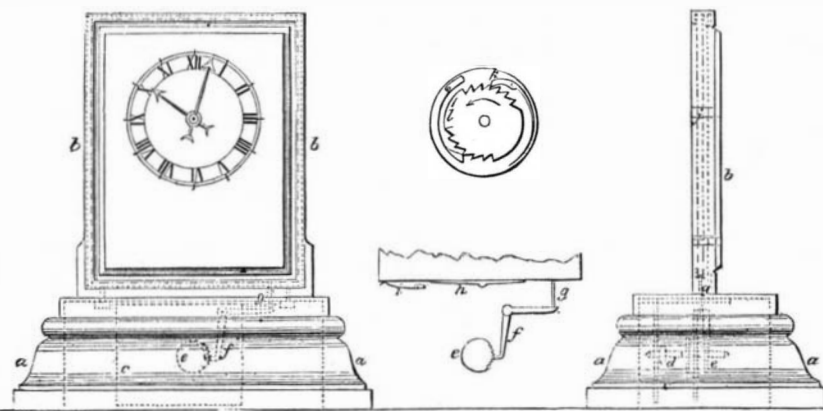
**Cement for Fastening Knives and Forks into their Handles.**

Take one pound rosin and half pound of powdered sulphur; melt together, and mix in about twelve ounces of fine sand or powdered brick. Fill the cavity of the handle with this mixture, melted. Make the shank of the knife or fork quite warm and insert in place and let it remain until cold, when it will be found to be firmly fixed. The handles of knives and forks should not be put in hot water.



ALLISON'S VERTICAL BOILER.

would run about 50 per cent tellurium. The ores containing the most silver and gold are at Gold Hill and Sunshine, being the Red Cloud, American, and Malvina mines. I have made assays as high as \$125,000 in gold and silver, and have assayed samples of lots of ore sold to the smelter running as high as \$18,000 to the ton. Such lots are, however, the exception. The average value of the ore taken and sold to the smelter, from these mines, is from \$300 to \$800 per ton. It has been a question of how deep these tellurides extended;



ANOTHER MYSTERIOUS CLOCK.

as these mines have only been worked for a short time, the developments have not been very great. An enterprise known as the Corning Tunnel started a tunnel under Gold Hill; and after running about 800 feet, struck a vein about 500 feet below the surface, which contained as fine telluride