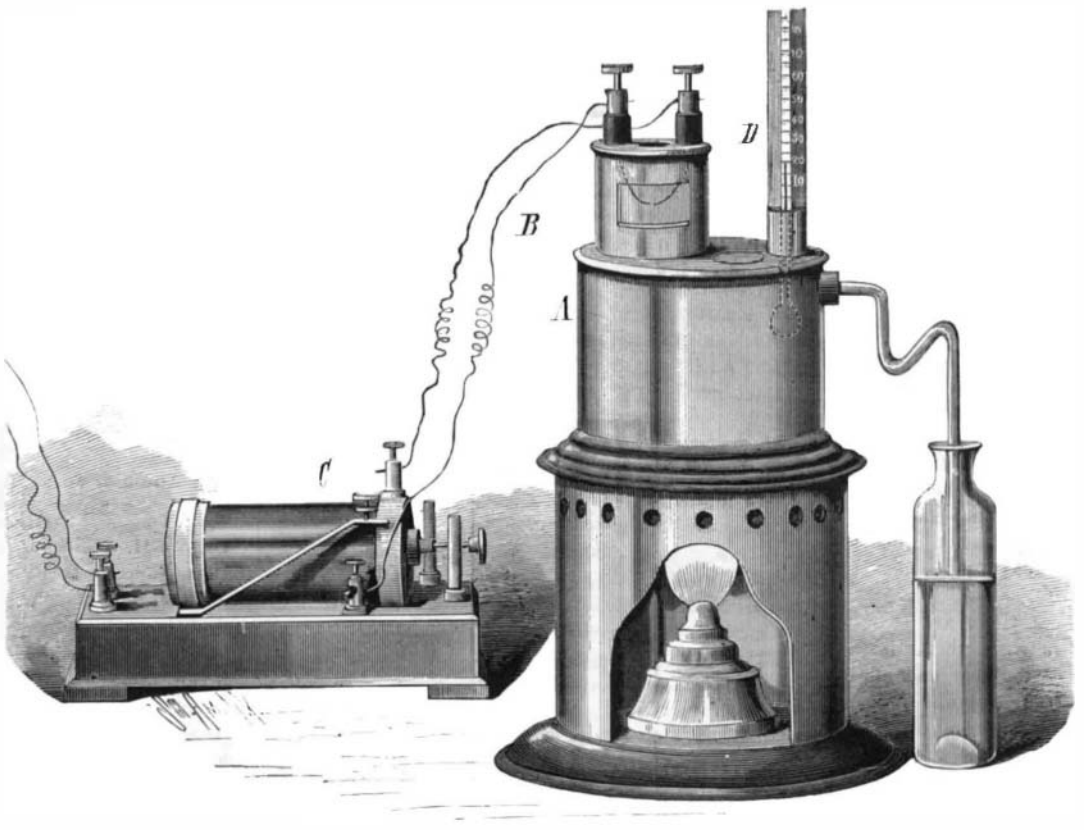
NEW OIL-TESTING APPARATUS.

The annexed engraving represents a new oil-testing device, recently patented by Mr. F. S. Pease, of Buffalo, N. Y., and designed for testing petroleum oils by electricity. A water bath, A, supported by a heating chamber, contains a cup for receiving oil, above which there is a dome, B, provided with two insulated binding posts, from which two or more electrodes project downward. These electrodes are provided with switches, by which one, two, or three sparks can be given at different points, and twenty or more changes can be made. The binding posts at the top of the dome are connected with the terminals of the secondary wire of an induction coil, C. A thermometer, D, is inserted in the top of the device to indicate the temperature of the oil, and an overflow pipe leads from the side of the oil cup near the top, and has a slight bend or trap formed in it to prevent the escape of vapors driven from the oil, while it admits of the overflow of the oil in case of its expansion, and always keeps the oil at a uniform height. The induction coil furnishes a constant means of igniting the vapor driven off from the oil, without the admission of air.

The ordinary closed and open test now in general use cannot be called absolutely correct, owing to the variations in expansion, the uncertainty in the application of the fire to the oil, there being no standard established as to the amount of fire to be applied or the point at which the vapor is to be ignited, the application of the point of light to the oil being optional with the operator. The new electrical test obviates all these difficulties, and secures tests which are always the same, and absolutely correct to a fraction of a degree. It determines the expansion of the oil, accounts for, corrects, and measures it; also prevents the escape of the hydrocarbon vapor, and regulates and keeps the oil at a fixed height and exact distance to the point of combustion, things never before accomplished. The electrodes are so arranged as to detect the vapor in its minimum quantity, and at any point relative to the surface of oil, and the igniting points being always at a determined distance from the oil. In testing refined oil the ordinary quantity used for the oil bath is about 3¼ fluid ounces, equal to 91·14 grammes; and properly refined, that is, an unmixed oil, when the distillation cut off at 52° Baumé, with a yield of, say 17 to 20 per cent, with a flash of 150° to 152° and fire test of 160° Fah., and market gravity of 45° to 46° Baumé, and real specific gravity of 800; such an oil, heated to its igniting point, expands four grammes, consequently the surface of the oil and vapor in the ordinary open or closed test approaches the fire at every degree of increase in the heat, and at its igniting point is 0·32 to 0·48 centimeter nearer than at the commencement of the test. No provision has ever before been made to compensate for this source of error.



PEASE'S OIL-TESTING APPARATUS.

In high test oils the amount of the hydrocarbon vapor is small, and is developed in detached quantities up to the point of combustion, and not of sufficient quantity to cover the oil test surface, and its tendency or attraction is to the moist sides of the oil bath; and when the test is usually made the vapor ignites at the side of the cup first, travels the entire circumference of the oil bath before flashing over the surface, while the center surface of the oil is comparatively free.

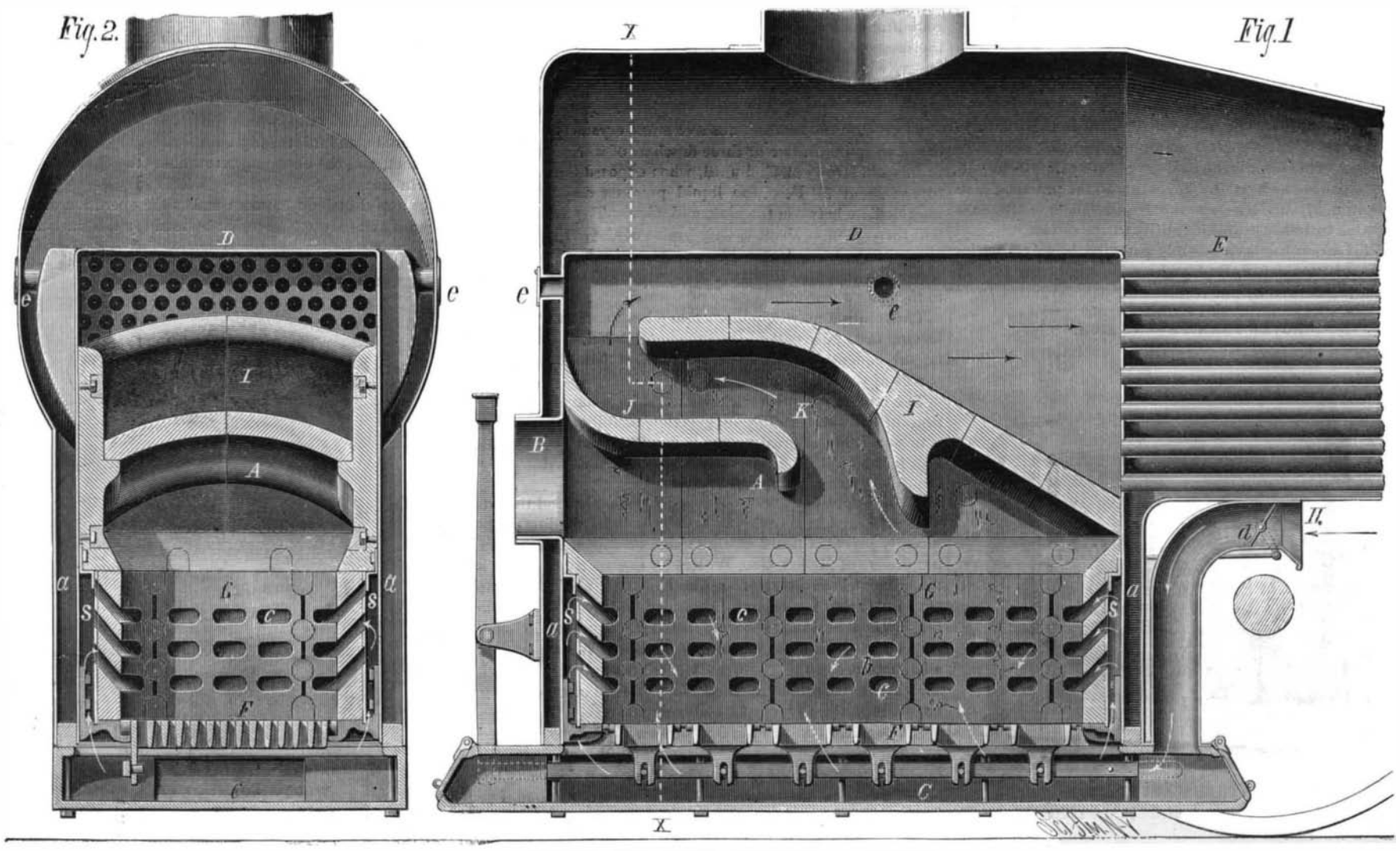
In low test oils the vapor is disengaged at every degree of increase in heat, making them more or less dangerous, and it only requires the half of one per cent of this vapor to make oils dangerous. Professor Chandler, of Columbia College, New York city, reports "that not one of seventy-eight samples selected at random throughout cities may be called safe."

Mr. Pease finds that refined petroleum oil is a good, if not a perfect, non-conductor of electricity; that by adjusting the two poles to a 0·32 of a centimeter apart, and placing them in the oil, a discharge from a powerful induction coil will not go through the oil, but will discharge between the two poles out of the oil, which are 1·92 of a centimeter apart. This fact enabled Mr. Pease to adjust and arrange a test to a minimum by arranging a pole in contact with the oil, with its point projecting upward toward a downwardly projecting point of the other pole, a moist surface of sufficient size being provided for the vapor. By this arrangement the vapor is detected, and explodes at the surface center of the oil bath as well as at other points, the spark being perpendicular to or from the oil. A horizontal discharge of sparks from the electrodes is a severe test, making a difference of one or more degrees for or against the oil. Mr. Pease's ingenuity has been displayed in a great many ways for the past 30 years, but it may be questioned whether his mechanical skill has ever better expressed itself than in the device referred to.

IMPROVED HOT-BLAST BOILER FURNACE.

In the minds of those conversant with the subject, no doubt exists as to the enormous waste going on in the majority of boiler furnaces in use to-day, and it is demonstrable that in many instances the better and even the greater part of the fuel goes out of the smoke stack unconsumed, and therefore unutilized. This is especially the case in the class of boilers used on locomotives and steamships, everything being sacrificed to compactness. Certain fundamental principles are involved in the combustion of fuel which seem to have been overlooked by inventors generally, and if not overlooked, the remedy for the evil results attending the non-observance of these principles seems to have been wanting. It is well known that boiler furnaces, as ordinarily arranged, are little else than gas retorts generating carbonic acid gas, carbonic oxide, and carbureted hydrogen: these gases under the conditions usually met in boiler furnaces are entirely wasted.

Carbonic acid is as incombustible as water, but if another portion of carbon be added or a portion of oxygen be withdrawn, carbonic oxide is formed, which, under the proper conditions, may be utilized and rendered a source of profit



PIKE'S HOT-BLAST BOILER FURNACE.

instead of loss, and, in some cases, even damage. These conditions are rarely or never met in ordinary boiler furnaces; they consist, first, in the introduction into the boiler furnace of a suitable amount of oxygen heated to insure its immediate admixture with the gases; and, second, in heating the mixed gases to the point of ignition before leaving the boiler furnace. These, all important requirements it is believed, are met in the boiler furnace shown in the accompanying illustrations. The distinctive features of this invention are the means by which air is heated and admitted to the fire box, and the means by which the combined gases are heated to the point of ignition before passing to the boiler.

Fig. 1 is a vertical longitudinal section of a locomotive fire box, showing the interior arrangement of fire walls and deflectors, and Fig. 2 is a vertical transverse section taken on line X X, in Fig. 1. In this boiler furnace, A is lined on all sides up to a certain height with firebrick, and is fed through the door, B, in the usual way. The ash pan, C, is provided with a blast pipe, H, having a flaring mouth opening toward the head of the locomotive, and capable of affording a more or less intense blast according as the locomotive is going fast or slow. The blast is also controlled by a valve, *d*, which may be operated by the fireman from the engine cab. The fire bricks, G, from the level of the grate, F, nearly up to the fire door and tubes, have a number of diagonal apertures, *c*, inclining downward toward the grate. These openings communicate with an air space, *s*, left between the bricks and the fire box, and opening into the ash pan below. By this arrangement the air entering the ash pan finds its way through the grates to support the combustion of the gases, and it also passes up the air space, *s*, and becomes highly heated by contact with the hot brick lining before it enters the fire box and the oxygen becomes mixed with the gases generated in the fire.

Between the fire bed and the crown sheet there are two peculiarly shaped arches, I, J, having between them the curved flue or throat, K, extending toward the rear end of the boiler. The main arch, I, extends from a point just below the tubes, upward and rearward, and is arched transversely and longitudinally, so that it cannot be displaced by any jarring or concussion that a locomotive is subject to in everyday use. The arch, J, is supported in a similar way, and both rest upon walls of refractory brick, the whole forming a complete self-sustaining arch.

In actual use the heated oxygen, and the gases generated from the burning fuel, are thoroughly mixed, and in their passage through the flue, K, between the highly heated arches, I J, becomes ignited, and is consumed before it can be sufficiently cooled to extinguish the flame. We are informed by eyewitnesses that the heat in this furnace, when in operation, is wonderfully intense, the entire interior of the furnace being in an incandescent state. The inventor states that a locomotive having this improvement applied, does not show a particle of smoke at the top of the stack, and that the useful effect of the coal is nearly doubled. As the blast is due to the advance of the locomotive, it follows that a free exhaust may be used, effecting a saving in fuel in another way. The peculiar manner of introducing the air to the ash pan has a great advantage besides that already referred to, that is: in case of snows, the draught is uninterrupted, as the air pipe is above the snow level. The fire box is supplied with windows, *e*, through which the operations inside the combustion chamber may be seen at any time.

This invention has been practically tested by the inventor, who has taken every measure to perfect his invention before bringing it to extended public notice. It has the indorsement of some of the most eminent engineers in this country, and promises to effect a great saving in operating all classes of boilers. This improvement deserves attention from railroad companies, as it is the invention of a practical man who thoroughly understands the requirements of the case and is able to demonstrate the utility of the device.

The invention has been recently patented by Mr. Charles F. Pike, of Providence, R. I., who will supply any further information desired by our readers.

NOVEL TRANSPARENT SIGN.

The annexed engraving represents an improvement in

CHILD'S TRANSPARENT SIGN.

transparent signs recently patented by Mr. Hubert Child, of Wichita, Kan. The invention is designed to furnish an attractive and durable sign; and it consists in "cutting in" a transparent letter on glass by means of an opaque color, and placing behind the glass another glass, and filling the interspace with broken glass, which may be either colorless or of different colors, so that when light shines through the transparent letter the plain character of the letter is broken up and diversified, producing very brilliant and striking effects.

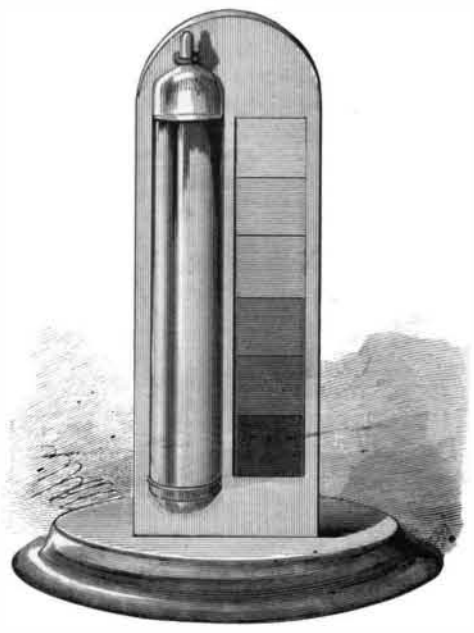
Frost and steam have no injurious effect on the sign. It will retain its character for an unlimited time, and will always look bright and fresh.

The inventor proposes to select different colors of glass and produce a brilliant panel, to be moved by suitable mechanism behind a sign having transparent letters, and thus give to the letters a kaleidoscopic effect.

Further information in regard to this invention may be obtained by addressing the inventor as above.

A NOVEL THERMOSCOPE.

When chloride of cobalt is dissolved in a definite quantity of strong wine spirit, or alcohol slightly diluted with water, a solution is obtained the color of which varies in a curious manner with the temperature of the surrounding air. Exposed to cold air it develops a bright pink color, which, as



COBALT THERMOSCOPE.

the temperature of the air increases, passes through various shades of color, until at last, when the liquid becomes quite warm, it assumes a strong blue or violet-blue hue. These color changes are primarily due to the fact that in the cold alcoholic solution the salt appropriates a portion of the water, and when heated it parts with this water of crystallization or hydration. When the proportions of the chloride of cobalt, alcohol, and water are properly adjusted, and the liquid is sealed in a narrow glass tube, it becomes quite sensitive to change of temperature, and the varied changes of tint when compared with a standardized color scale may serve, within certain limits, as a rough index of the temperature of surrounding bodies, thus constituting the little instrument, a thermoscope, if not entitling it to the name chromothermometer, which has been given it. The statements to the effect that changes of color are due to the action of light and electricity or atmospheric humidity, etc., are of course erroneous.

To prepare the solution dissolve a few crystals of chloride of cobalt (pure) in two or three drachms of warm water, and to this add strong alcohol until, when exposed to a temperature of about 70° Fah., the liquid presents a slaty color—intermediate between the pink and blue. The proportions will then stand at about twenty grains of the salt to the fluid ounce of alcohol. If too blue, more alcohol or a drop of water may be added to the solution; if it inclines too strongly to the pink a few more grains of the salt.

The solution may be poured into a long narrow test tube, leaving the upper part of the tube unoccupied, so that it may be subsequently drawn out, and sealed hermetically by means of the blowpipe.

The remarkable properties possessed by some of the solutions of this salt certainly suggest the possibility of applying it to something of greater practical utility than the curious toys in which it has thus far been chiefly employed.

IN the interest of every advance in mechanics and the arts we are pleased to note the favor in which the product of the recently invented board-cutting machine and steam seasoning presses of Messrs. Geo. W. Read & Co. are received. It is the universal sentiment of all who have once used their thin cut lumber that for strength, beauty of finish, and easy working, without shrinkage or warp, it is fully equal and in many respects superior to the sawed and planed. We observe in a late number of the *Cabinetmaker* the following editorial, showing that manufacturers on the other side of the Atlantic are availing themselves of its advantages:

"Messrs. Geo. A. Read & Co., of New York, have disposed of their French patents on drying presses and Bartlett's board cutting machine to a party in Paris, and this party has commenced the construction of one machine and three drying presses, and will shortly put up four more machines and twelve presses, to complete facilities for manufacturing on a large scale. According to the French law these machines are necessarily built in France."

The Edison Electrical Lamp.

To the Editor of the Scientific American:

I confess to no small degree of surprise at the article in your last edition, by Messrs. Morton, Mayer, and Thomas, on some electrical measurements of Edison's last lamp. I read the article with a great deal of pleasure, until I came to that portion comparing the light by gas from five pounds of coal with that by electricity from the same weight of coal, as developed in Edison's lamp, and my pleasure would not have been diminished, nor my surprise excited, if these gentlemen had compared the effect of that amount of gas used in *twelve* burners (instead of five) with twelve electric lamps. Messrs. Morton, Mayer, and Thomas certainly know that gas suffers nearly if not quite as much by subdivision as electricity, and why they should use a less number of gas burners than electric, is not at all clear. Let them give us the comparison between the two on an equal basis, and I apprehend there will be quite a difference in the figures.

It must be tolerably clear by this time that Edison's idea is the subdivision of the light, to make it practicable for domestic use, and I think he is entitled to great credit for having produced a lamp that will give us twelve such lights at an expenditure of only one and two thirds horse power, assuming Professor Morton's figures to be correct. And it would seem that we might expect men of national reputation, such as these gentlemen possess, to be just in criticising the results obtained by the advance guards of science.

W. A. CRAWFORD.

San Antonio, Texas, April 13, 1880.

Bleaching Teeth.

Dr. W. H. Atkinson, D.S., of this city, gives the following directions for treating discolored teeth: To bleach a tooth discolored by loss of its pulp: Carefully clean it out to the end of the root, going *through* the apex into the *always present latent abscess* at the end. After drying out as well as you can, proceed to fill nicely all the length of the canal in the root and the pulp chamber with oxychloride of zinc.

As soon as it is well hardened excavate out all the discolored dentine that can be spared without weakening the tooth. Then fill the nerve chamber with powdered alum, and wet it with Labaraque's solution of chloride of sodium (such as the laundress uses in washing). This will bleach any tooth that is stained by vegetable color. Now dry well and fill with such shade of oxide of zinc as will restore normal color. When hard cut out the surface and cover with gold. In case iron be the color agent, it may be removed by dissolving a few crystals of oxalic acid in the cavity; afterward proceed as before directed.

Faithfulness in following these instructions, the doctor says, will result in satisfaction to patient and practician, by perseverance.

NEW CORN GRATER.

We give herewith an engraving of an improved device for extracting pulp from green corn, recently patented by Mr Geo. Wood, 15 Warren street, Trenton, N. J. It is a very simple device, and it seems to be just what is needed for the purpose.

The curved upright metal standard is provided with jaws and a thumbscrew for securing it to the table, and supports at the top two parallel blades, one serrated, the other plain. These blades are made in one piece with the standard, and are slightly concaved to conform to the shape of the ear of corn.

The corn to be grated is moved across the blades, the toothed blade first tearing open the kernels and the plain one pressing out the pulp, which falls into the vessel below. The curved standard readily admits a bowl or dish under the blades, and the clamping screw holds the device steadily while in use.

This useful little instrument makes the operation of grating rapid and easy. The pulp obtained by this instrument

WOOD'S CORN GRATER.

is entirely free from hulls, and may be used in a great variety of dishes. The grater is tastefully and substantially made of galvanized or tinned malleable iron.

For further particulars address the inventor as above.