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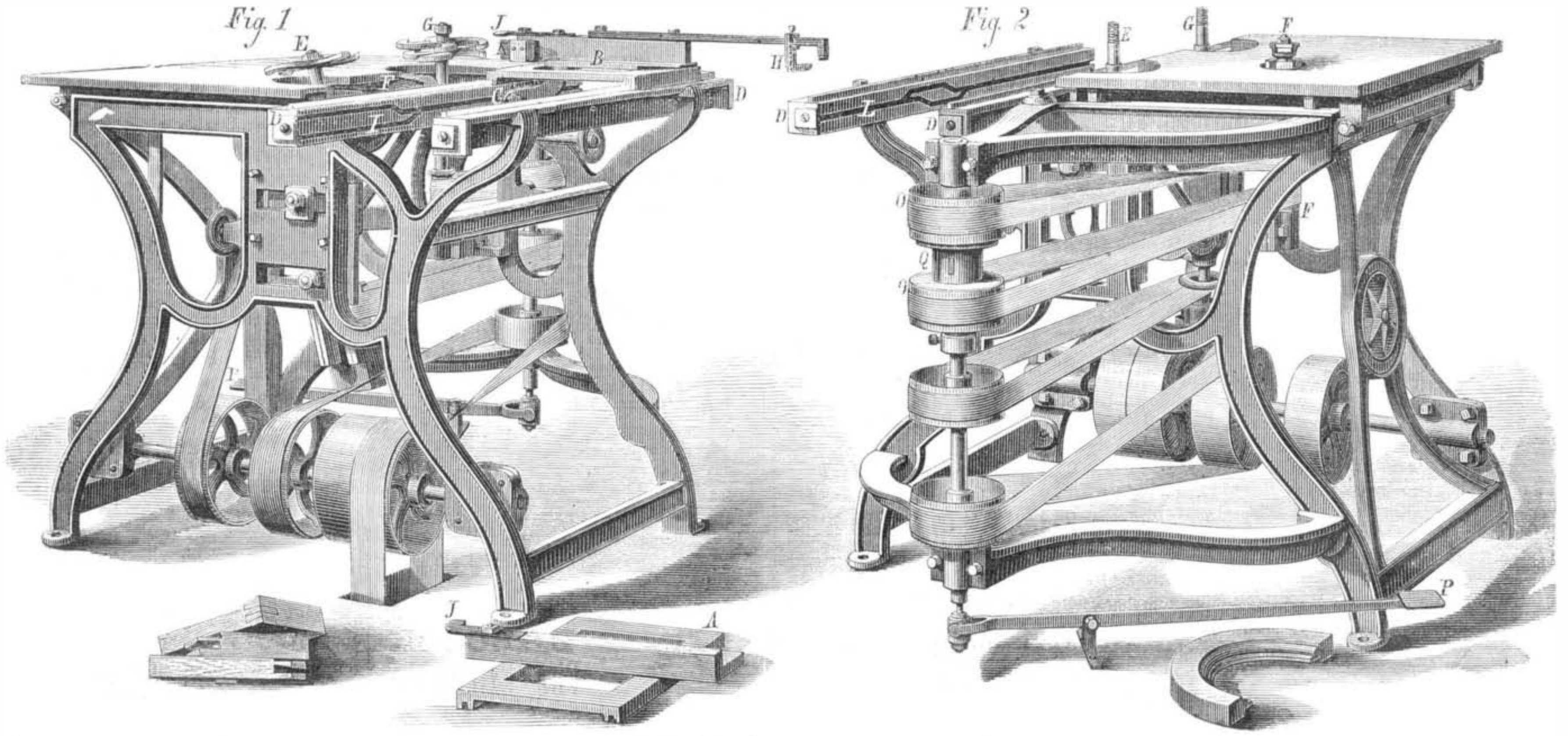
The Pennell and Zimmer Dovetail and Shaping Machine.

This machine is designed to supply a want long felt by all sash makers.

The formation of the dovetail mortises on the stiles, and tenons on the check rails, of sash have heretofore been the most tedious and expensive parts of sash making, requiring skilled labor, and the use of at least four different machines, as well as from six to ten times handling the material to accomplish the purpose. With this improvement, the work is all done on one machine, and more perfectly than is possible by any method we have seen employed. An ordinary hand can, it is claimed, make at least ten dovetail mortises or tenons per minute, or the joints for 1,500 windows per day, being the work of some twenty skilled men.



THE PENNELL AND ZIMMER DOVETAIL AND SHAPING MACHINE.

The rapidity of production, in comparison with the old modes, is sufficient to attract attention to this machine, yet there are other advantages quite as important.

A shoulder is formed on the side of the stile, which makes a perfect fit, and a much better and stronger joint. By a slight change, which requires but a few minutes, it is made to do the work of a shaping machine for circular sash or any irregular molding, thus obviating the necessity of a separate machine for that purpose.

Figs. 1 and 2 are front and rear views of the machine, and Fig. 3 is a detail view, showing the arbor, F, referred to below.

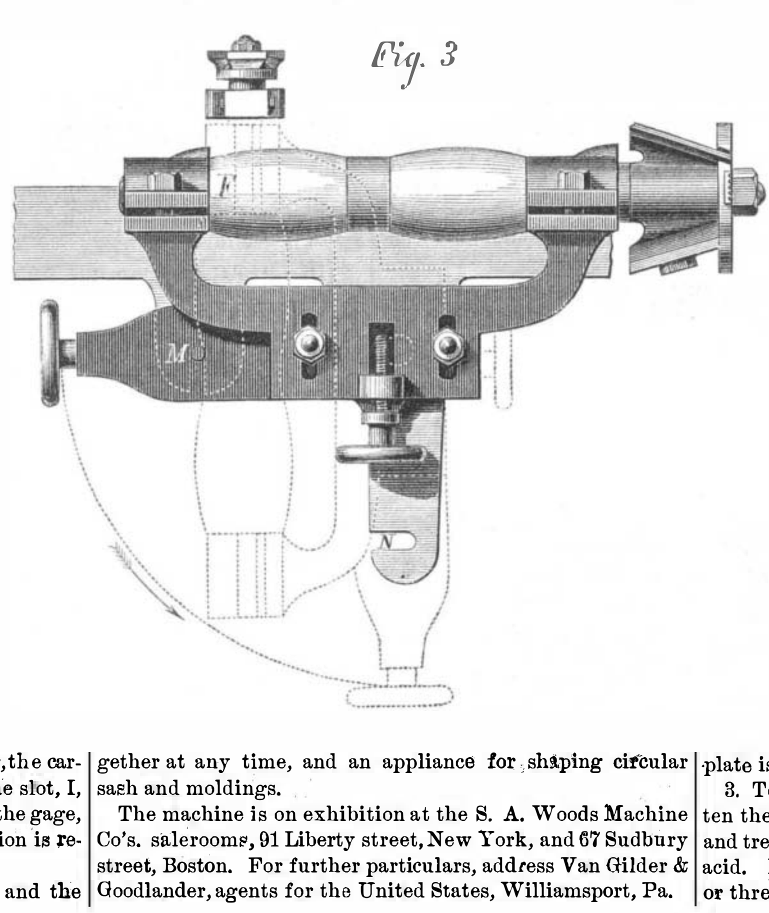
For dovetailing bottom stiles for check sash, the carriage, A, is placed on the rails, D. The arbor, E, is adjusted to the bevel desired for the dovetail. On the arbor, G, are placed two cutters, which form the straight side of the dovetail and the shoulder on the side of the stile, which is then laid on the carriage and passed through the cutters on E and G.

For top stiles, the cutters on the arbor, F, Figs. 1 and 3, are adjusted to form the shoulder on the face side of the stile. The upper cutter on the arbor G being removed, the stile is passed through as before.

For bottom, check, and common meeting rails, the carriage, B, is placed on the rails, D, (as shown in Fig. 1) with the lever pin, C, in the *lower* branch of the slot, I, and the arbor E is adjusted to a perpendicular position. The rail is placed between the chipbreakers, K, and passed through all the cutters. When returning, the carriage lever, C, is guided into the *upper* branch of the slot, I, and the rail is reversed, with the shoulder placed to the gage, H, (which gives the length desired) and the operation is repeated.

For top check rails, the carriage, B, is reversed, and the lever pin, C, is placed in the slot, L, (Fig. 2) and operated as for bottom rails.

For shaping circular sash or irregular moldings, the bolt, M (Fig. 3), is loosened, and that end of arbor, F, is dropped to the position indicated by the dotted outline bringing the bolt, M, into the hook, N, which places the arbor in a perfectly upright position. The belts are then put on the clutch pulleys, O, (Fig. 2) the upper belt being crossed. The motion of the arbor is reversed by a slight pressure of the foot on the lever, P, which connects with the clutch, Q. The cutters are so constructed that the work is done equally well with the arbor running in either direction to cut with the grain of the wood. It is claimed that by this machine are gained the advantages of rapidity of work, the obviation of the necessity of skilled labor, perfection and strength in the joints, and the means of manufacturing check rail sash as cheaply as common sash, with uniformity of work, so that parts may be made and laid away for future use and easily put together at any time, and an appliance for shaping circular sash and moldings.



The machine is on exhibition at the S. A. Woods Machine Co's. salerooms, 91 Liberty street, New York, and 67 Sudbury street, Boston. For further particulars, address Van Gilder & Goodlander, agents for the United States, Williamsport, Pa.

CHEMICAL EXPERIMENTS FOR YOUTHFUL READERS.

From the British Photographic Journal Almanac.

The series of experiments here presented are intended for the younger readers, for whose benefit they are presented in as attractive and even sensational style as possible, in the confident belief that no experiment here indicated will be performed by a youth without gaining by such trials an insight, however small it may be, into some chemical action of which he previously may have been quite ignorant; and they will thus serve an educational purpose as well as conduce to the occasional spending of a pleasant hour. All the chemicals to be mentioned can be obtained readily.

1. To make a milky liquid by the admixture of two colorless ones.—In one vessel, which ought to be made of glass, pour a little water, so as to half fill it, and add to it a few grains of common salt, which will speedily dissolve. In another vessel, also half full of pure water, dissolve a few grains of nitrate of silver. Both liquids will be bright and colorless. Now pour one of them into the other, and the resulting mixture is thick and white like milk. When a solution of common salt, which is the chloride of soda, is mixed with a solution of nitrate of silver, the nitric acid of the latter salt combines with the soda of the former, forming nitrate of soda, which is soluble in water, leaving the silver in combination with the chlorine, forming chloride of silver—a white powder which is insoluble in water, to which it therefore gives the appearance of milk. If paper were washed with one of these solutions, and then, after being dried, were brushed over with the other, the chloride of silver would be formed on the surface or in the texture of the paper. In this way is sensitive printing paper prepared.

2. To produce a yellow, cream-like liquid from two colorless ones.—To make cream instead of milk, it is only requisite to substitute for the common salt in the previous experiment a little iodide of potassium or any other soluble iodide. The resulting precipitated powder is iodide of silver. When an iodide of a soluble kind is dissolved in a clear varnish, such as albumen or collodion, a plate of glass coated with such a body becomes of a dense yellow color when immersed in nitrate of silver. This is what takes place whenever a plate is sensitized.

3. To make smoke issue from two empty tumblers.—Moisten the inside of one of the glasses with strong ammonia, and treat the other in a similar way with strong hydrochloric acid. Keep the glasses thus prepared at a distance of two or three feet from each other. Now, taking a juggler's li-

cense with facts, direct the attention of the spectator to the perfect emptiness of the glasses, and, taking one in each hand, hold them up and bring them together slowly mouth to mouth. When a few inches apart from each other, smoke will be seen to issue from them; and if they are held closely together, they will be seen to be filled with a dense white vapor, which will soon condense in the insides of each glass in the form of a white powder. This is a capital experiment for astonishing a few friends; but in performing it as a " trick," care must be taken that the previous preparation of the glasses is not shown. *Rationale:* The vapor from the hydrochloric acid, which is invisible, combines with the ammoniacal vapor, also invisible, and produces, by their combination, chloride of ammonium, or sal ammoniac, in the form of a white powder. If, instead of being moistened with the hydrochloric acid, the glass be filled with chlorine gas, the effect will be somewhat better.

4. To make a liquid that is blue when the bottle containing it is open, and colorless when corked.—Fill a small bottle with liquor ammonia, and place in it a few turnings or filings of copper, corking it immediately. It will remain colorless as long as it is closed, but after the cork has been removed for an hour or two, the liquid will have become of a blue color. Recork the bottle and it soon again becomes colorless; reopen it and it becomes blue as before. Ammonia has no action upon metallic copper; but when the copper is oxidized by exposure to the air it becomes soluble, the blue color being the result of a solution of oxide of copper in ammonia. When the bottle was again corked, the remainder of the metallic copper extracted the surplus oxygen from the portion that had been oxidized and dissolved. It is only when copper is highly oxidized that it produces a blue color in the above circumstances.

5. To produce fluids by the rubbing together of solid bodies.—Triturate an amalgam of lead with an amalgam of bismuth, and a fluid like mercury is immediately produced. By the trituration or rubbing together of any of the following pairs of solid bodies, a fluid will also be formed: Sulphate of zinc and acetate of lead; sulphate of soda and nitrate of ammonia; or sulphate of soda and carbonate of potash.

6. By the mixture of two highly odorous bodies to produce an inodorous one.—The pungent odor of ammonia is too well known to need comment. Into a bottle containing some of this liquid pour, some hydrochloric or nitric acid. The odor of each vanishes, the resulting mixture being quite inodorous. Muriate or nitrate of ammonia is formed by the admixture, and these salts are quite free from smell.

7. By mixing two inodorous bodies to form a highly odorous one.—Mix together in a mortar equal parts of sal ammoniac and quicklime. Ammoniacal gas is disengaged, which has a powerful and pungent odor.

8. To produce a very hot liquid by mixing two cold ones.—Half fill with water a small bottle capable of being easily held by the grasp, and then pour sulphuric acid slowly into it. The mixture will soon become so hot as to compel the person holding it to set it down. The bulk of the liquid, too, will be found to have diminished.

9. A fine solid green pigment made by mixing together a blue and colorless solution.—Have two solutions made, one of them being of sulphate of copper and the other of carbonate of soda. Pour a little of the latter into the former, and the richly colored paint known as French green will be immediately formed and precipitated. Remove the liquid by filtration. By this mixture, subcarbonate of copper, the pigment above named, is formed.

10. To convert two clear and colorless liquids into a solid mass.—There are several ways of performing this experiment, which never fails to excite intense wonder in those who are unacquainted with the working of chemical miracles. Here is the appearance presented by one of them, as I once saw it performed by a parlor magician. On the table stood two bottles containing apparently water, a glass tumbler, and two glass rods for stirring with. The " Professor " first poured into the tumbler a portion of the contents of one of the bottles, and then followed with some from the other, stirring the mixture briskly for a few seconds, when, to the surprise of all present, it became an opaque and almost solid mass. After this had been thoroughly examined by the astonished spectators, the " Professor," uttering a few meaningless words from the jargon of jugglery, touched the mass with the end of one of the glass rods, and immediately the whole was converted into a clear liquid. Explanation: One bottle contained a saturated solution of chloride of calcium, and the other a saturated solution of carbonate of potash. When they were mixed together, they were decomposed, chloride of potassium and carbonate of lime being formed; and as the latter absorbs the whole of the water of solution, a solid body is maintained. The cause of its becoming fluid on being afterwards touched with the glass rod is simply this: One of the rods was a hollow tube, and contained in its interior a little nitric acid, which, having been adroitly poured on the solid mass, immediately converted the insoluble carbonate of lime into the soluble nitrate of lime. There are other compounds by which results of a similar nature can be produced. To a saturated solution of chloride of calcium, add a few drops of sulphuric acid. Sulphate of lime (plaster of Paris) is formed by the reactions. One other method we give: Pour a saturated solution of caustic potash into a saturated solution of Epsom salts, and a similar result will follow. In this case, the sulphuric acid of the Epsom salt (which is sulphate of magnesia) leaves the magnesia to combine with the potash, the magnesia being precipitated as a white powder.

11. To produce an exceedingly intense light.—Into a dish like a child's saucer, put a small heap of saltpeter (nitrate of potash) that has been finely powdered and well dried. In the middle of this make a nest, in which place a bit of phosphorus the size of a small marble. Now turn down the lights in the room, and apply a lighted match to the phosphorus, which will then burn with a light so intense as to dazzle the eyes of those present. The heat caused by the burning phosphorus decomposes the nitrate of potash, and the oxygen thus liberated causes the flame of the phosphorus to become intensely luminous. The room in which this experiment is tried must be well ventilated, as the fumes of phosphoric acid are noxious.

12. Experiments with iron.—(*a*) Write or draw on paper with a solution of sulphate of iron. When dry, it will be invisible; but if a sponge moistened with a solution of gallic acid or pyrogallic acid be passed over it, the previously invisible writing is made as visible as if written with ordinary black ink. The sulphate of iron and the gallic acid react on each other, forming gallate of iron, which is of a black color. Writing ink is made from this mixture. (*b*) If, instead of the gallic acid mentioned in the former experiment, a solution of prussiate of potash be employed, the invisible image will be developed as a fine blue color. By mixing solutions of sulphate of iron and prussiate of potash, Prussian blue is formed; hence the blue color as the result of the experiment. (*c*) Make a rod of iron very hot (a white heat), and then apply the end of the rod to a piece of sulphur. The iron will immediately be fused and fall down in large drops, which must be caught in a vessel of water. If some of these drops be placed in a little sulphuric or nitric acid, they will readily dissolve, but in doing so a smell of an extremely offensive character will be emitted. This smell will be immediately recognized as similar to that for which decayed eggs are so justly noted. The hot iron combines with the sulphur when melting, forming sulphuret of iron. This dissolves in the acid with great readiness, attended by a copious liberation of sulphuretted hydrogen, the offensively smelling gas alluded to. To the presence of this gas in mineral waters is due their medicinal properties, and yet few gases are more poisonous. Before leaving this gas, here is a pretty experiment that can be performed with it: Draw on paper any invisible figures with sugar of lead, nitrate of bismuth, or nitrate of silver. These are invisible at first; but if a current of sulphuretted hydrogen be passed over the surface, everything is brought to light with the utmost distinctness in a beautiful dark brown color. If a current of the gas be passed into a bottle of ammonia, the liquid is converted into sulphide of ammonium—a substance of much use in chemistry.

Progress of Submarine Telegraphs.

Among the cables brought to a completion in 1871 are the China cables. These were, first from Singapore to Saigon and Hong Kong, and again from Hong Kong to Shanghai, from Shanghai to Nagasaki, and from there to Wladiwostock, where the company's lines join the Russian system. It will be seen that by these extensions we have two routes to China, the one by the Great Northern line through Russia, and the other by the various cables and lines to India, thence to Singapore and China.

The completion of the submarine cable from Java to Port Darwin, in Australia, has been too recent to admit of our obtaining details; but it is unquestionably the fact that we are at length telegraphically connected with our antipodes. How soon it will be before communication is established with the southern and most inhabited portions, we are unaware, but in all probability the difficulties of erecting the overland line have been found greater than was anticipated.

Among the other completions are the Holyhead and the several West India cables. The majority of the islands have been connected, and are now in telegraphic working order, but the largest extension, that from Jamaica to Panama, is still incomplete. It may be remembered that, in the attempt to lay this section, the cable broke, and, after some time spent in grappling, was temporarily abandoned, while the further extensions were proceeded with.

The principal of the new cables manufactured and laid during the past year are the German cable from Borkum (Emden) to Lowestoft, a four wire cable (Willoughby Smith's improved gutta percha) of very heavy construction; the cable in the Grecian and Turkish Archipelago, 564 knots; and the several cables for the French Government.

The Channel cable, it may be remembered, was prevented from departing by the Government, who had the opinion that it was a breach of the neutrality law. The cable and ship were, however, released, and the cable was laid for the French Government; but some little time after the war was over, a part of the cable was picked up to be used elsewhere. The Mediterranean cable was a greater undertaking, and was successfully laid between Marseilles and Algiers, over the route of the old cable, which had been speechless for some years. A fault, however, occurred after the laying and after some trouble the cable was successfully repaired by Mr. F. C. Webb. On this occasion, grappling was done in 1,000 fathoms, and the cable recovered, a great feat, considering the rough bottom of the Mediterranean.

A small amount of cable was laid in the Hebrides by the Post Office. This amount would have been increased but for the disastrous fire, which took place at the Silvertown Cable Works and destroyed a large amount of cable and machinery. The damage, however, was soon repaired, and the factory has been for some time again in working order.

A large amount of cable will be noticed as being manufactured for the Anglo-American and Falmouth and Malta Telegraph Companies; this was for repairs and alteration of routes. The Atlantic cables (both) were broken down during the early part of the year, and were not repaired until June. The 1866 cable, being found to be in very bad ground, as was imagined, was removed further south, and an extra amount of cable expended; they have since remained in good working order, and it is hoped they will remain so. The only other Atlantic interruption occurred on the Duxbury section of the French Atlantic cable. This was soon repaired, no interruption to communication being caused by it.

The repairs to the Lisbon and Gibraltar section occupied some time, and they not only included the removal of a portion of the cable from bad ground to a better place nearer the shore, but also laying a duplicate cable from Gibraltar, some little distance above the coast towards Lisbon.

Of the other lines, no interruptions have occurred except to the Great Northern, China, and Japan extensions, the Hong Kong cable having to be repaired; and the Japan section is now again in working order.

The Spanish Government have had their connection with the Balearic Isles renewed, and the Dutch Government have had a cable laid in the Straits of Sunda. The traffic from the West Indies to America has been found sufficient to allow of the duplication of the International Ocean Company's line from Punta Rossa to Key West (Florida).

From present appearances, the progress of submarine telegraphy this year will be small. A company appeared for the extension of a cable from Spain to the Cape de Verde Isles and to Brazil, but as several parties appeared to lay equal claims to the concessions, the project has for the present fallen through.

The silence for so long of two of the Atlantic cables seems to give talk of the laying of a fourth cable, and also of the possible acquisition by the British and American Governments of the existing cables. The laying of a fourth cable, we believe, is very likely to come to pass.

Pyroligneous Products.

One hundred kilogrammes of wood subjected to destructive distillation give 50 kilogrammes of a crude product containing: 2 kilogrammes of methylic alcohol, 3 of crystallizable acetic acid, 10 of tar, 15 of water, 20 of carbon remaining in the retort.

To obtain from this the acetic acid, requires a long and tedious process, consisting in saturating the acid with lime, precipitating this lime as sulphate by the use of sulphate of soda, which leaves acetate of soda, crystallizing this out and igniting it to drive out the tar, crystallizing and recrystallizing; and finally distilling with sulphuric acid, which gives the acetic acid. In manufacturing pyroligneous acid, the product of distillation is simply allowed to remain in contact with iron turnings until the acid is saturated. To purify the crude article, the author offers a new method, by which the acid may be sufficiently purified to be made to unite with soda, alumina, copper, etc., while the alcohol is saved. By distilling the wood with ten per cent sulphuric acid, the acetic acid may be readily separated; also by this method a yellow compound, insoluble in water cooled below 15°. On distilling dry wood at a high temperature (about 700°), gaseous products and an oil of extraordinary illuminating power are obtained. The method to be used is not precisely stated, but the author claims that a profit of over 18 francs can be made on every 100 kilogrammes of wood, by his process.—*M. Maiche.*

How to Bend Glass Tubes.

It is well known that it requires some tact to bend a tube with an even curve and without collapsing its sides, and many chemists never do succeed in bending them skillfully. Although having no particular skill in this matter, I never fail to bend them perfectly satisfactorily by using a flame different from the one usually employed; the flame is one given by the Bunsen burner, described in my article on alkali determination in silicates. (See *American Chemist,* Vol. I, page 407.) Use a Bunsen burner, having the extremity flattened out so as to give a short and thin but broad flame, something like the flame of an ordinary gas burner. The tube is placed in this flame and turned round and round until a good heat is given to the tube; it is then withdrawn from the flame and bent, when it does so with a perfect curve and no collapse of the sides of the tube. Of course this is only intended for the smaller tubes, but a tube of one third of an inch and more can be thus bent very readily.—*J. L. Smith.*

The San Gregorio Meteorite.

Six meteorites from this region have been thus far noticed five of which have been analyzed by the writer. Of the sixth, no specimen has as yet been detached. They were found within or very near the boundaries of the Mexican Desert, which is about 400 miles in width by 500 miles in length, and situated in the provinces of Cohahuila and Chihuahua.

Professor J. Lawrence Smith advances the conjecture, based upon his analysis and examinations, that five of these meteorites were derived from the same original mass, moving over the territory from northeast to southwest. Two of these meteorites are estimated to weigh three and four thousand pounds respectively.

The San Gregorio meteorite has an extreme length of six and one half feet, is five and one half feet high and four feet thick, and is estimated to weigh about five tons. An analysis gave: Iron, 95·01, nickel, 4·22, cobalt, 0·51, copper, a minute trace, phosphorus, 0·08.

THE WEST BLOOMFIELD GAS WELL.—Prof. S. A. Lattimore, of Rochester University, has recently made a careful photometric test of the illuminating power of the gas of the West Bloomfield well, and found it to be 14·42 candles. He estimates the flow of the well to be 800,000 feet per 24 hours. The main to convey the gas to Rochester is being rapidly laid down, and it is thought that the city will, before long, derive all its light from this well. Who knows but gas wells are to play a more important part in the world than oil wells?