

Test for the Presence of Gold in Solutions.

Protosulphate of iron gives a brown precipitate, which acquires a metallic luster when rubbed. Proto-chloride of tin gives a purple or blackish precipitate, insoluble in muriatic acid. Sulphuretted hydrogen and hydrosulphuret of ammonia give a black precipitate, insoluble in simple acids. Ammonia gives a reddish-yellow precipitate (fulminating gold) with tolerably concentrated solutions, either at once, or on boiling the liquid. Liquor of potassa gives, with neutral solutions of gold, a similar precipitate to that formed by ammonia, insoluble in excess.

AN ANCIENT HAND WARMER.

Our illustration represents a curious old article of comfort, which is almost forgotten now-a-days, but which once formed one of the many objects carried by ladies at their chatelaines. It is a hand-warmer, and consists of a small



spirit lamp hung in gimbals in several circles of metal, so that it stands always horizontal. It is enclosed in two hemispheres of copper, which are hinged together. The contrivance was clasped between the palms of the hands, and thus kept the latter warm.

IMPROVED SELF-FEEDING DRILL.

The annexed engraving represents a new self-feeding drill for boring iron, steel, etc. The feed is adapted for all classes of work and all sizes of drills, and therefore needs no adjustment. A is the drill shaft, having at its upper end the flywheel, B. This shaft is rotated by the bevel gearing shown, which is revolved by hand by means of the crank. On the bevel pinion is a feather which enters a keyway on the shaft, A, so that although said shaft is turned by the pinion it can be moved vertically within the latter. To the upper part of the shaft are attached collars, and between them is a sleeve which is secured for vertical movement upon the shaft by means of the collars, and prevented from revolving with it by the set screws which attach it to the beam, C. It will be observed that the shaft, A, is free to move vertically within certain limits, and that its vertical position is regulated by the beam, C, which is attached to the shaft by the sleeve above referred to. The short end of the beam is connected by a link to the frame. The long arm is notched so that the weight may be adjusted upon it to cause more or less downward pressure on the shaft. This beam is operated by means of a lever, D, the short arm of which is cogged and engages with the cogs of the bell crank shown, which latter is connected to the beam by means of clevises. By raising the lever, the long arm of the beam is depressed, and consequently also the drill shaft. In order to limit the motion of the beam and through it of the shaft, an adjustable stop, E, is provided which may be secured in any desired position. The table is likewise adjustable, and is placed as desired by means of the dog, F, which engages with a rack upon the standard.

The machine is strongly constructed and is in all particulars a very excellent and useful tool, especially adapted to the needs of the general machinist. For further particulars address the manufacturers, Messrs. Combs & Bawden, Freehold, N. J.

The Atmosphere of Mars.

Mr. R. S. Newall, F.R.S., at the observatory, Gateshead, England, states that on August 23, during the total eclipse of the moon, he observed that Mars is surrounded by a whitish envelope, the diameter being about twenty times that of the planet. He saw it again on September 7 and 19 distinctly. It has a well-defined edge, and is densest nearest to Mars. Small stars were seen through it.

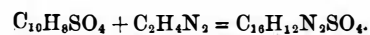
A New Dyestuff.

Not long since a new dyestuff made its appearance in the German market, which consisted of a slightly crystalline powder of a light red color, similar to mercuric iodide. According to Professor A. W. Hofmann's experiments it is the soda salt of an organic acid, mixed with a not inconsiderable quantity of alumina. It dissolves quite abundantly in hot water, less so in hot alcohol, with a deep brownish-red color; the solutions, which dye a beautiful orange inclined to red, crystallize on cooling. The salt is insoluble in ether. The salt will endure quite a high temperature without decomposition. At a high heat it swells up almost like Pharaoh's serpents, and leaves behind almost exclusively a mass of carbon, which burns only with very great difficulty.

In order to obtain the acid the commercial product was dissolved in boiling alcohol and the solution treated with concentrated hydrochloric acid. From the deep violet-colored liquid there separated on cooling fine hair-like red needles, to which some of the mineral substance adhered most tenaciously. By frequently repeated crystallization from alcohol and acid the last trace of incombustible matter was at length removed.

The pure dye consists of beautiful reddish-brown needles, which are quite soluble in water, still more so in alcohol, but insoluble in ether. Free alkalies as well as ammonia dissolve it with a brown color. From the last named solution the dye is precipitated in a crystalline form upon the addition of an acid. In this case the liquid acquires a deep violet color. The composition of the dyestuff dried at 100° C. corresponds to the formula $C_{10}H_{12}N_2SO_4$, and that of the silver salt to $C_{10}H_{11}AgN_2SO_4$.

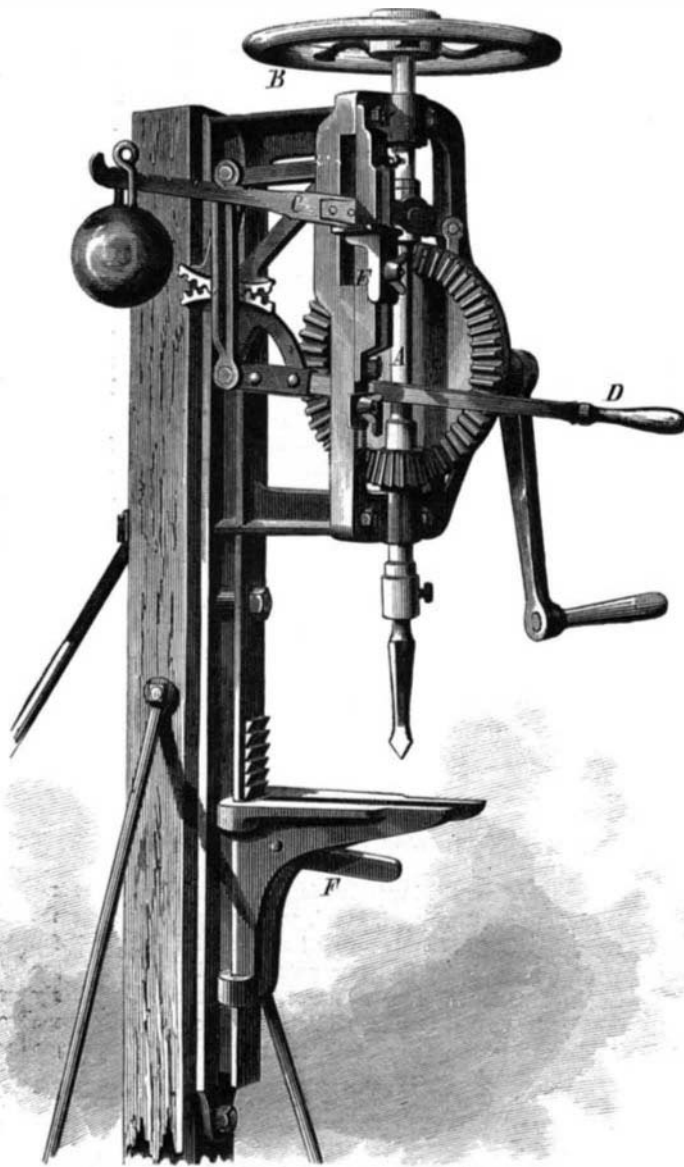
Such a substance could be obtained by the union of 1 molecule of naphtholsulfo acid with 1 molecule of diazobenzol:



In fact the new orange was obtained by the action of diazobenzol upon alphanaphtholsulfo acid. The last named acid was prepared by digesting naphthol with sulphuric acid upon the water bath. The lead salt was first prepared and the lead then removed with sulphydric acid, and the solution of the free acid concentrated and saturated with sodic carbonate. When the solution of this salt was mixed with a solution of aniline nitrate and potassium nitrite, a deep red precipitate was at once formed, of remarkable coloring power, but still impure. It was dissolved in ammonia, when a resinous mass remained undissolved. A purer substance was precipitated by acids; and after re-crystallizing several times from a boiling mixture of hydrochloric acid and alcohol, it was obtained in the same fine hair-like needles which were obtained from the commercial product.

Underground Telegraph Wires in England.

A considerable mileage of overground telegraph in the United Kingdom has been replaced by underground wires during the past year. At the time of the transfer of the telegraphs to the Post Office the total length of underground

**SELF-FEEDING DRILL.**

wire in existence was a trifle under 2,000 miles. On the 31st of March last it had been increased to a trifle over 8,000 miles, being more than four times as much in 1877 as in 1870. A considerable proportion of the increase in the mileage of buried telegraphs during the year has been in London alone. The aerial system was fraught with danger to life and property in the neighborhood of the wires. Under the new arrangement the telegraphic system generally will be less liable to interruption when the frosts and snows of winter set in.

A NEW FLOATING OIL BURNER.

The annexed engraving represents a new floating oil burner for night or other lights in which a long wick may be used. It consists of a cup-shaped float, having a convex top. A tube passes through the float, extending both above and below it. The lower end of the said tube is loaded to



maintain it in a vertical position. A slot is cut in the side of the wick tube, near its upper end, to receive the edge of a serrated wheel, by which the wick is raised or lowered. A curved handle is attached to the top of the float, for convenience in handling the burner. A ball is placed in the float which may be shifted so as to counterbalance the heavier side and cause the float to set evenly in the oil in which it is placed. The float is airtight and formed of thin sheet metal, and hence does not become oil-soaked.

This invention was patented through the Scientific American Patent Agency, September 18, 1877, by Mr. Oscar Tamagno, of New York city.

Mountain and Balloon Ascents.

In our number for August 9, we briefly noticed the ascent made by Mons. Wiener, of the mountain Illimani, one of the highest—if not the highest—of the Bolivian Andes, which forms a noble object from the city of La Paz, and was formerly reputed (by Mr. Pentland) to have an altitude of no less than 24,200 feet. Mr. Wiener, however, makes its height only 20,112 feet, while Mr. Minchin, as we have already observed, places its altitude at 21,224 feet. If the latter estimate be correct, Mons. Wiener has, we believe, not only made the highest ascent which has been made in the Andes, but has attained a greater altitude than has been reached on the earth out of Asia, and in Asia has only been beaten by Mr. Johnson, who some years ago got to a height of 22,300 feet in Cashmere. As the recorded ascents to the height of 21,000 feet are extremely few, we shall be glad to hear further particulars respecting Mons. Wiener's exploit, and more especially whether he experienced much exhaustion through the rarefaction of the air. Practised mountaineers who have climbed to a height of 17,000 to 18,000 feet have been of opinion that even at such altitudes there is a very important and perceptible diminution of the bodily powers, and think it probable that the height of 25,000 or 26,000 feet will be found to be about the limit which will ever be reached on foot. As a set-off to this opinion we may mention the facts that hunters in the Himalayas frequently pursue their game at heights exceeding 20,000 feet without experiencing any notable inconvenience from the low barometric pressure; and that natives living on the base of Demavend, near Teheran, often ascend to its summit to gather sulphur from its crater without any great difficulty. The height of this mountain, there is reason to believe, also exceeds 20,000 feet, although it has never been accurately determined. If, therefore, severe work can be done with impunity at such elevations, it seems not unreasonable to suppose that much greater heights might be attained by men who had previously accustomed themselves to life at high altitudes. Aeronauts, anyhow, have