

[For the Scientific American.]

ON TUNGSTEN.

BY PROFESSOR CHARLES A. JOY.

Associated with tin occurs a black mineral of a partially metallic luster, sometimes in crystals of considerable size, to which the early miners gave the name of wolfram, from the German word *wolfrig*, because it behaved like a wolf among the other metals, and often appeared to devour them. Another mineral of a white color and extraordinary weight was also found in tin mines, and for a long time was looked upon as an ore of tin. Cronstedt called this mineral "tungsten," meaning in the Swedish language heavy earth, and no wonder, for it has a specific gravity of six, and is heavier than many metals.

The renowned Swedish chemist Scheele decomposed this tungsten mineral in 1781, and found that it contained a peculiar acid associated with lime, and the mineral was afterwards called, in honor of its discover, "scheelite."

The original black mineral known as wolfram was analyzed by two Spanish chemists named d'Elhujar, in 1783, who found that it contained the same acid as the scheelite, combined with manganese and iron. The question now arose, what name it would be wise to give to the new element, and Berzelius favored calling it wolframium, others preferred tungsten, and a few scheelium. The latter name has been dropped and a compromise effected between the others by generally calling the metal tungsten, while the symbol employed to represent it is W. Within five years some French chemists have announced that the so-called tungsten was a compound body made of several elements, and they claim to have prepared a series of salts, chlorides, and oxides, as different in their properties as would be the similar compounds of iron, nickel, or cobalt. The announcement is rather a startling one; but as the leading chemists of France have not adopted the new notion, we must still consider tungsten as entitled to be called an element.

Thus we have given the principal points in the history of this interesting metal, and may now say something about its occurrence.

Tungsten is a rare metal. The number of ores in which it is found is exceedingly limited, though one of them occurs in considerable quantity in a few localities.

The mineral tungsten (*tung*—heavy, *sten*—stone) or scheelite, is chiefly tungstate of lime, containing 78 to 80 per cent of the acid. It is found in Cornwall, Cumberland, South America, Bohemia, Saxony, Sweden, Connecticut, Massachusetts, North Carolina, and Nevada, and is usually associated with crystalline rocks in connection with tin ore, topaz, apatite, molybdenite, and wolfram, but is nowhere found in considerable quantity. The mineral wolfram is the tungstate of iron and manganese, and is found in much the same localities as mentioned above, and often in large quantities, so that it would become the chief ore of tungsten in the event of that metal being extensively used in the arts.

Cupro-scheelite, or tungstate of copper and lime, is described by Professor Whitney as occurring in California; other minerals are stolzite (tungstate of lead), tungstite (tungstic ocher), and Huebnerite (tungstate of manganese)—all of them exceedingly rare.

It is an interesting fact that the metal indium has been found associated with tungsten in wolfram.

METALLURGY OF TUNGSTEN.

The metal tungsten has been prepared in various ways not however in a fused state, but is a dark gray powder or as a brilliant mirror or glass.

Junot, in 1853, obtained tungsten by electrolysis of a solution of carbonate of soda, treated with oxide of tungsten, and saturation of the liquid with prussic acid, and addition of cyanide of potassium and boiling. Thus prepared it was a brilliant silver-white metal.

Woehler prepared the metal by passing a mixture of chloride of tungsten, and dry hydrogen gas through a heated glass tube. A specimen prepared in this way, and now deposited in the cabinet of Columbia College has the following properties: It forms on the glass a brilliant, steel-colored metallic mirror, from which it can be separated in thin leaves; it is brittle and very hard, and has the specific gravity of 16.54, which is considerably lighter than that afforded by the metal prepared in another way; heated strongly in the air it burns to the yellow acid; it is not attacked by ordinary acids, not even by aqua regia, nor by caustic potash, but is dissolved in a mixture of potash and hypochlorite of soda.

Riche, in 1853, prepared tungsten by passing hydrogen gas over the acid, heated strongly in a porcelain tube; it was in the form of crystalline grains, which assumed a metallic luster when rubbed, and were hard enough to scratch glass; it could not be fused in the highest heat of the iron furnace, but yielded to 200 pairs of Bunsen elements; it was soluble in acids after continuous action for several days. Water has no effect upon it.

Bernouilli, in 1860, reduced tungstic acid by charcoal, but was entirely unable to fuse the dark gray powder to a metal in furnaces that melted porcelain and Hessian crucibles. He found the specific gravity of the metal obtained in this way to be 17.1 to 17.3, and when reduced by hydrogen to be 17.9 to 18.2—this latter determination would place tungsten next to uranium in the order of specific gravity, as follows: osmium, 21.4; iridium, 21.15; platinum, 21.15; gold, 19.3; uranium, 18.4; tungsten, 18.20.

Attempts to alloy tungsten with other metals, such as copper, lead, zinc, antimony, bismuth, cobalt, and nickel, were generally unsuccessful, and produced mixtures that were infusible. Iron alone can be mixed in all proportions with tungsten, but where there is more than 80 per cent of the latter metal, the alloy is difficult to fuse.

At the London Exhibition of 1862, Versmann showed a small button of the pure metal, which he claimed to have obtained by exposing about an ounce of the powder to the strongest heat of a Griffin's furnace. In this operation no graphite or Hessian crucible was found to stand. The fusion was accomplished at last by heating the metal for three hours in a crucible made of freshly-burnt lime. Despretz also fused tungsten by the aid of a galvanic battery composed of 600 pairs of Bunsen elements, to a mass resembling steel in its fracture, and of a sufficient hardness to scratch ruby.

The specific heat of the metal, according to Regnault, is 0.03242. It is not magnetic, is crystalline in texture; is harder than steel, according to some authors, and according to others is malleable, ductile, soft, with the color and luster of gold. From all of these observations it will be seen that authorities differ in reference to this rare metal, and it is probable that the perfectly pure element has never yet been prepared.

THE USES OF TUNGSTEN.

We cannot do better, under this head, than to quote from the admirable "Treatise on Metallurgy," by Crookes and Roehrig, just published by John Wiley & Son, where the authors discuss the properties of tungsten steel:

"It was long known that the celebrated Damascus sword blades contained tungsten (0.05 to 0.1 per cent), and De Luynes employed an addition of tungsten for the production of artificial damasked steel.

"In 1855, Jacob first produced tungsten steel experimentally on a large scale. The steel showed an exceedingly fine, conchoidal, silk-like fracture; it combined great hardness and density, and was superior in tenacity and weldability to all other steel.

"Next, tungsten steel was produced on a large scale at Leoben, and in different steel works of Germany, England, and France. A patent has been obtained for the manufacture of metallic tungsten alloys (including tungsten steel) by Mr. R. Oxland, as a communication from Messrs. Jacob and Koeller. The steel is prepared by melting with cast steel or even with iron only (at the puddling process), either metallic tungsten, or, preferably, what has been termed the native alloy of tungsten, in the proportion of two to five per cent. The native alloy is obtained by exposing to strong heat in a charcoal-lined crucible, a mixture of clean powdered wolfram with fine carbonaceous matter; it is a black steel gray, spongy mass, resembling metallic tungsten. The composition of the alloy is shown in the following statement of the composition of wolfram:

Tungstic Acid.	Oxide of Iron.	Oxide of Manganese.
Tungsten, 76.25	Iron, 17.75	Manganese, 6.00—100.00
Oxygen, 19.06	Oxygen, 5.07	Oxygen, 1.71—25.84

"Wolfram is sometimes used as an addition to the ore mixture for the production of pig iron. According to Bernouilli, when an intimate admixture of finely divided gray cast iron and tungstic acid is heated to a very high temperature, the graphitic carbon is burnt by the oxygen of the tungstic acid and steel is formed, which alloys with the reduced tungsten. No diminution in the amount of carbon was, however, perceptible when the experiment was repeated with spiegeleisen, or ordinary cast iron, carbon in the combined form being apparently unable to effect the reduction of tungstic acid. Siewert examined eight samples of so-called tungsten steel; the following analyses show that the samples contained no tungsten:

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Iron.....	—	95.75	—	96.37	—	—	—	—
Tungsten...	1.05	2.84	3.05	2.71	—	4.75	0.9	—
Manganese...	—	—	—	(trace)	—	—	—	—
Carbon.....	—	—	1.04	1.03	—	—	—	—

"No. 1 is tungsten steel from Vienna. Nos. 2, 3, 4, 5, and 6, such steel from Bochum. No. 7, hard tungsten steel from Döhlen. No. 8, soft tungsten steel from Döhlen.

"It is frequently maintained that tungsten steel, owing to its superior qualities, is particularly adapted for the manufacture of cutting tools, swords, and the fine machinery of watches, and that a small addition of it would improve the inferior kinds of steel. Appelbaum found the tungsten steel inferior to Huntsman's steel, but superior to common English cast steel; it could also be more easily welded without the application of artificial fluxes, and on hardening required a higher temperature than the English cast steel before cooling. Notwithstanding its reputed qualities, tungsten steel has not been generally introduced, probably owing to the high price and the scarcity of wolfram. Perhaps steel was sold as tungsten steel which did not contain any tungsten, or else its reputed qualities are somewhat exaggerated."

According to Siemens, if tungsten be mixed with iron or steel, the magnetic power of the metals is greatly increased. A one pound ordinary horseshoe magnet will sustain seven pounds, while a tungsten steel magnet of the same weight, will sustain twenty pounds. He also claims that the tungsten steel retains the magnetic property longer than the metal usually employed. This discovery points to the use of tungsten steel for magnetic needles and for magneto-electric machines, and in the manufacture of telegraphic apparatus and is one that ought to be more fully investigated.

Captain Caron, the amiable and accomplished engineer in charge of the Museum of Artillery in Paris, was kind enough to communicate to us the results of his experiments upon the alloys of tungsten, and to contribute some specimens for the cabinet of Columbia College. Although he had a furnace capable of melting steel with the greatest care, he was unable to fuse tungsten to a homogeneous button, and the specimen he gave to us was in the form of a dark gray powder. M. Caron found that the addition of tungsten increased the toughness of metal employed in the manufacture of rifles; it

also imparted great hardness to steel. His efforts to produce better bronze and cannon metal were unsuccessful, as tungsten will not alloy with copper, tin, and gun metal, notwithstanding patents have been taken out in England for this purpose.

By fusing cement steel with five per cent tungsten he obtained a regulus so hard that turned steel was blunted in contact with it; the alloy was, however, malleable. M. Caron at that time (1865) seemed to think that tungsten steel was destined to become an important article of manufacture—a prediction that has not been fulfilled, as in the Paris Exhibition of 1867 we did not find this article playing the part that its friends had anticipated for it; tungsten colors, however, were largely represented, as were many of its salts, the uses of which are becoming better known, and may serve as the basis of a future article on this subject.

Previous articles on tungsten may be found in the SCIENTIFIC AMERICAN, New Series, Vol. III., 1860, pages 256 and 309; Vol. X., 1864, page 105.

[For the Scientific American.]

CIRCULATION OF WATER IN STEAM BOILERS.

BY CHAS. E. EMERY, ENGINEER.

If heat be applied to the bottom of a glass flask, which has been partly filled with water, containing a little bran, it will be seen that the water rises at the center, as its gravity is reduced by heat, being displaced by colder water, which flows downward along the sides and in at the bottom, and is there heated and crowded up in turn by cooler particles, so that all the water quickly becomes heated, and after a time reaches the state of ebullition, when the surplus heat passes off in steam, and the water currents continue as before. This movement of the water is known as "convection" or "circulation," and must exist in some form in all apparatus designed to heat fluids. If the bottom of a flat shallow pan, containing water, be heated uniformly at all points, the heated water and bubbles of steam will rise directly to the surface, and the cooler water can only find its way back between the bubbles, which is so difficult that if the heat be forced, the whole mass of water will be raised into foam, and the pan will "boil over." This is an example of retarded circulation. Similar action often takes place in steam boilers of bad design. The water is displaced from some part of the heating surface by bubbles of steam which, in extreme cases, become so hot as to allow the sheet to be overheated, and when the circulation is dull the steam bubbles prevent free access of water to the heating surface, so that its efficiency for producing steam is greatly reduced.

Circulation in a steam boiler is then an absolute necessity, and to secure it provision must be made for both ascending and descending currents. We propose to show also that it is necessary that these currents should have separate channels so as not to conflict with each other. Take the simplest plain cylinder boiler. If the fire be applied underneath, the water will rise in the center and flow down at the sides the same as in the flask, but if the heat be spread around the whole of the shell below the water line, it is easy to see that the ascending bubbles at the sides will hinder the down flow at that point and the circulation be, to say the least, retarded. Indeed it is not difficult to imagine that the heat would occasionally be so applied as to reverse the currents and cause the steam and hot water to move outward up the heated sides and the colder water to fall down in the middle. To secure this action is the object of a late foreign invention, which consists in putting within and below the water level of a boiler a concentric sheet-iron shell, which directs the currents up the heated sides and permits the water to return through large pipes attached to the middle of the shell—the space about the pipes forming a still-water reservoir for the collection of deposits.

In cylinder boilers containing tubes the water and steam rise between the tubes and move not only to the sides but also to the cooler rear end of the boiler; and then down the sides, and along the bottom till sufficiently heated to again rise. This has been proved by experiments. A similar action takes place in the Harrison cast-iron boiler and in the Babcock and Wilcox sectional boiler. In the Gerner boiler the steam and heated water rise and pass to the rear around an interior steam chamber, and the rear of the boiler being larger the water rises and flows to the front as it is heated with great velocity.

The drop flue boiler has been a favorite with many engineers, from the fact that the products of combustion descend from one series of flues through two others in the same boiler before reaching the chimney, and thus the coldest gases heat the coldest water—a fine theory, which fails to give any practical advantage from the fact that the system prevents proper circulation unless the boiler be forced to its utmost. These boilers give trouble also from unequal expansion—being hot at the top and cold at the bottom.

In marine boilers a passage for the descending water currents is provided by separating the nests of tubes which belong to each furnace. In the Hicks vertical boiler the ascending and descending currents are kept separate by surrounding the tubes inside the boiler with a short jacket, the water flowing over it and passing between it and the shell of the boiler and entering the tubes beneath it.

A number of boilers are made of tubes sealed at one end and opening at the other into a suitable chamber. In some cases the tubes are set vertically with the sealed ends downward, the circulation being secured by an internal pipe to carry down the cooler water. The fire-engine boiler of a Seneca Falls company, in New York State, is made in this way. On a similar principle Miller makes a boiler in which the tubes are inclined and the inner tubes are supplied from the

front side of a diaphragm in which they are secured and which separates the two currents—the steam and heated water coming out around the inner tube and rising to the surface of the water, and the cooler water going down the other side of the diaphragm, and entering the inner tubes. Two of these boilers are in use at the Beach Pneumatic Tunnel under Broadway, in New York city. Sargent has a similar boiler in which each tube is divided into two parts by a diaphragm running its full length. The oldest boiler of this form was probably made by the German engineer Alban, who used some ingenious means to separate the circulating currents in the connecting chamber, but left them to take care of themselves in the tubes.

BOILER INCRUSTATIONS.

[Condensed from the Engineer.]

Incrustation is injurious in three distinct ways: It increases the consumption of fuel, it injures the boiler, and can even compromise its safety. Incrustation less than one eighth thick allows the passage of only one quarter of the heat it would if the plate were clean. One way in which incrustation injures the boiler is by its requiring the fires to be forced, thereby furthering the oxidation, diminishing the strength, and tending to tear away the plates of the boiler. The very cleaning of the boiler tends to injure the plates and structure. The cleaning of the boiler of a large steamship costs from fifty to sixty pounds in labor alone. At the same time, there is no doubt that a thin incrustation protects the surfaces of the plates against corrosion, and that it often closes up the joints and prevents escapes.

The foreign matters contained in the water can be divided into three kinds: Those that remain insoluble and in suspension, forming a non-adhesive mud, which only incrustates on highly-heated surfaces. Secondly, the salts soluble in water, such as, for instance sulphate of potash, and the chloride of calcium, and the chloride of sodium, found so abundantly in sea water. These remain in solution, and only form deposits when in considerable quantities in the water; and this can be prevented by blowing off. The third class consists of substances relatively little soluble in water, such as carbonate of lime and sulphate of lime. With these, this degree of saturation is soon attained, and they are deposited in the boiler, either in powder, which falls into the interior parts, or in crystals covering the wetted surface. The soluble salts can thus be got rid of by simply renewing the water; the muds produced can be taken away pretty easily by washing; but the incrustations produced by this successive precipitation of insoluble, or only slightly soluble, salts can only be got off by the hammer and chisel. This is generally true, but the relative quantities present in different kinds of water modify these results.

It is a fallacy, exploded forty years ago, that explosions are produced by the sudden contact of the water with the red-hot plates, on the cracking off of the incrustation, causing either "an enormous development of steam," or "decomposing the water with an attendant disengagement of a great quantity of hydrogen."

The means of encountering incrustation are of two main kinds: The water can be purified before being fed in, or different apparatus, applied inside the boiler, can be used for the purpose. Before feeding it in, water can thus be purified by (1) chemical reactions; (2) by heating it; (3) it can be distilled by using the condensed steam as feed-water. In the case of the presence in the water of carbonate of lime, held slightly in solution in the form of bicarbonate, the state of solution being aided by the presence of a slight excess of carbonic acid, by saturating, by means of a sufficient quantity of lime, the excess of carbonic acid, the greater portion of the neutral carbonate will be deposited on account of the very slight solubility of that salt. This plan has been used in England, and also especially by the French Orleans and the North Railway companies. Carbonate of soda can also be employed for the preliminary purification of some waters. It is largely used in some of the Lancashire districts, but it has the inconveniences of causing priming and of favoring leakages.

As the carbonate and sulphate of lime are very slightly soluble at 120° or 130° Cent., and nearly absolutely insoluble at 140° to 150° Cent., the water can be sometimes purified by heating it. The feed-water heater adapted by M. Belleville to his water tube boilers, in order to prevent their being filled up with incrustation, works on this principle. The water, forced in by a pump, is thrown from below against the top plate of a large vertical cylinder, which communicates at the top with the steam collectors of the boiler, and at about the middle of its height with the water collector. The water injected falls in rain into a chamber wherein flows the steam, on a plate partly occupying the transverse section of the cylinder. From thence it flows into the water reservoir, the level of which is about the same as that of the boilers. The water is heated to nearly the temperature of that in the boiler, and the salts dissolved are precipitated to the bottom of the cylinder, whence they are from time to time blown out.

As regards marine boilers, blowing off with low-pressure and surface condensation in tubular high-pressure boilers, are the only methods now used in practice to encounter incrustation. It is thus mainly in marine engine work that surface condensers have been adopted, though their success at sea is slowly leading to their use on land.

The processes employed within the boiler consists in—(1) blowing out; (2) mixing the water with substances modifying the incrustations either chemically or mechanically; (3) employing the circulation of the water for extracting the matters in suspension; (4) applying electricity against the in-

crustations. In the Imperial Marine the boilers are continually blown out. As regards the different substances introduced, a volume could be written about them, so numerous are they. In France very good results in preventing solidification have been obtained by the use of logwood shavings. The steam, though the boiler does not prime, is of a violet color, no doubt from its taking up a little water. Logwood is also employed in a liquid composition used on the Orleans Railway. One of the most legitimate means, because inexpensive and obtainable by construction, for getting rid of boiler deposits, evidently consists in utilizing the circulation and the natural tendency of heavy substances towards the bottom. Merely setting the boiler to a slight incline from the fire is, as we know, often very effective; and a conical vessel riveted to the bottom at a spot chosen for its slow circulation is often very useful.

The action of Baker's electric anti-incrustator is very capricious in preventing the solidification of incrustation. It is clear that it acts by electricity, and not magnetism; and evidently by frictional electricity, produced by the friction of the steam on the points of the star. Nothing should be neglected to obtain good feed water; and the chemical qualities of the water to be used should be determined before the form of the boiler to be used is settled upon; then the mode of getting rid of the incrustation is to be chosen—treating the water before its introduction into the boilers being almost always the best method.

[For the Scientific American.]

THE HOME OF THE PERFUMES.

We are in the south of France, on the coast of the Mediterranean, where the three cities of Nizza, Grasse, and Cannes form a sort of triangle. A rich, but yet a light soil; to the north, a range of mountains, which shut out of the cold blasts of north winds—these advantages, combine with a soft sky resembling that of Italy to make this the most charming and the most fertile part of France. It is, therefore, with a true national pride that the peasants of this district are wont to say: "Plant a walking-stick, and a flower will bloom from its handle."

Plants, which everywhere else are cultivated in gardens as ornaments, form here the main product of the soil. There are no gardens here, for the entire district is a bed of fragrant flowers. The jessamine, the tuberose, the orange blossom, the daffodil, the rose, the acacia, and many other plants are bud and bloom almost the year round. The exuberance of these lovely children of Flora affects the character of the inhabitants as well as their mode of living. A stranger is affected by the fragrance as if drugged by some narcotic.

The culture of these flowers is almost the exclusive occupation of the peasants. During the summer months all hands are busy among the flowers—weeding and watering. Old and young are occupied in gathering the leaves of flowers, of which it takes so many to make a pound.

The following statistics will show to what extent this business is carried on: The product of one year has been 1,475,000 lbs. of orange blossoms, 530,000 lbs. of roses, 100,000 lbs. of jessamine, 75,000 lbs. of violets, 45,000 lbs. of acacia, 30,000 lbs. of geranium leaves, 24,000 lbs. of tuberose, 5,000 lbs. of daffodils, besides a large quantity of lavender, and many other flowers.

The quantity of perfume contained in this mass of leaves may be imagined, yet the peasants themselves do not understand the art of extracting the delicate odors from the flowers, among which nature has thrown them, and it is the chemist who has to continue the work. Thus we behold in the midst of these fields of flowers the signs of modern industry, the numerous tall chimneys of the different laboratories. It is the same here as everywhere else; the first producer has to content himself with but a small profit; and the landowners consider it a good business if they receive from the chemists one third of the total profit.

In these laboratories every spark of poetry connected with the beauty of flowers disappears. The leaves are turned into a solid mass; the balmy essence takes the place of the emblematic interpretations—a chemical process has finished the work.

Oils or greasy substances are impregnated with the odoriferous elements of the flowers by three different operations. Two of these depend upon the fact that oils or fats brought in contact with the flowers, absorb and retain their fragrance. If afterward these perfumed fats and oils are thrown into pure alcohol, the latter extracts the perfume from the oils or fats, and thus an essence is obtained.

These two methods of working are called in France "enfleurage" and "maceration." For the process of "enfleurage" a sort of a frame with shelves is used. Between the wooden shelves are glass tablets, upon which the purified fat is spread. Upon these are laid the fresh-picked flowers. Some forty to fifty of these shelves are piled up and left for twenty-four hours, after which time the old flowers are removed, and fresh ones put in their places. This process is continued until the fat is sufficiently impregnated with the odoriferous principle of the flowers; then the fat is melted from the glass at a moderate heat, and separated from the leaves which may have adhered to it, after which it is packed in jars and boxes, and is then ready for exportation.

"Maceration" is performed by soaking the flowers for a certain length of time in the fat or oil. Practice has shown that not all flowers will yield their perfumes in this way; some discharging their perfume with more facility than others. The acacia is particularly adapted for "maceration."

Of late years another process has been introduced, consisting in treating the flowers with various ethers, etc., but it is not yet in general use. Lastly, the odor of some flowers is

obtained by distillation; but delicate odors are injured or dispersed by this operation.

The essence of orange blossoms obtained by "enfleurage" is far superior to that gained by distillation. Lavender is almost the only plant which does not lose by distillation.

Extracts obtained through "enfleurage" or "maceration" are the condensed odors of the living flowers, while by distillation we obtain only a second-class perfume.

It has been a question of considerable importance how to obtain the extracts of flowers of tropical countries. Experiments have been made in Algiers, but without favorable results. However pure the fat or oil used maybe, it soon turns rancid in a hot climate. If the process of etherizing is brought to perfection, the flower culture of the south of France will doubtless diminish, for the tropics of America alone would furnish enough perfume to supply the entire western hemisphere. I. C.

How to Cure a Cold.

Dr. G. Johnson, Professor of Medicine in King's College, London, in a recent lecture gives the following cure for a cold:

"The popular domestic treatment consists in the use of a hot foot-bath at bed time, a fire in the bed room, a warm bed, and some hot drink taken after getting into bed, the diaphoretic action being assisted by an extra amount of bed clothes. Complete immersion in a warm bath is more efficacious than a foot bath; but the free action of the skin is much more certainly obtained by the influence of hot air—most surely and profusely, perhaps, by the Turkish bath. The Turkish bath, however, is not always to be had, and even when available, its use in the treatment of catarrh is attended with some inconvenience. In particular, there is the risk of a too speedy check to the perspiration after the patient leaves the bath. On the whole, the plan which combines the greatest degree of efficiency with universal applicability, consists in the use of a simple hot air bath, which the patient can have in his own bed room. All that is required is a spirit lamp, with a sufficiently large wick. Such lamps are made of tin, and sold by most surgical instrument makers.

The lamp should hold sufficient spirit to burn for half an hour. The patient sits undressed in a chair with a lamp between his feet, rather than under the chair, care being taken to avoid setting fire to the blankets, of which an attendant then takes two or three, and folds them around the patient from his neck to the floor, so as to inclose him and the lamp, the hot air from which passes freely around the body. In from a quarter to half an hour there is usually a free perspiration, which may be kept up for a time by getting into bed between hot blankets. I have myself gone into a hot air bath suffering from headache, pain in the limbs, and other indications of a severe incipient catarrh, and in the course of half an hour I have been entirely and permanently freed from these symptoms, by the action of the bath.

Another simple and efficient mode of exciting the action of the skin consists in wrapping the undressed patient in a sheet wrung out of warm water, then, over this, folding two or three blankets. The patient may remain thus "packed" for an hour or two, until free perspiration has been excited."

A Milwaukee Steam Engine.

If our memory serves we have before heard of something like the following attempt of a Milwaukee inventor to avoid the use of the crank in steam engines. The papers of that city are making predictions that it will work a revolution in steam engineering. We copy the following description from the *Daily Milwaukee News*.

"The engine is very simple, and consists of a cylinder 12 inches long and 6½ inches bore (in the one already built), with the shaft passing through the center of it. The cylinder is furnished with a piston at each end, precisely like the pistons of common crank engines; to these pistons are connected short rods, with a friction roller at the outside end working in the inside of an elliptical ring, which passes around the shaft outside of the cylinder; outside of the ellipse is another friction roller, connected to the piston by compensating levers in such a manner that when the pistons are moving towards the center of the cylinder, the rollers act on opposite sides of the ellipse, both pulling directly towards the center, thus causing them to move forward on the ellipse, and communicating a rotary motion to the shaft. After the rollers have passed forward to the shortest diameter of the ellipse, the steam is exhausted from the ends of the cylinder and let into the middle, between the pistons, pressing them outward, causing the rollers in the ends of the piston rods to act on the inside of the ellipse, and continuing the forward motion of the shaft until they arrive at the long diameter, when the steam is exhausted from the middle of the cylinder, and is again applied at the ends. The results obtained were surprising, and can hardly be credited by believers in the infallibility of the crank motion. The cylinder is about the size of the cylinder of an eight-horse crank engine, with a stroke of three inches for each piston, and the power evolved was at least 22-horse power, and some present at the trial placed it as high as 25-horse power, with a speed of 100 revolutions per minute, and 50 pounds of steam, consuming about the amount of fuel required for a 10-horse engine."

TO CLEAN OLD BRASS WORK FOR LACQUERING.—First boil a strong lye of wood ashes, which you may strengthen with soap lees; put in your brass work, and the lacquer will immediately come off; then have ready a pickle of aquafortis and water, strong enough to take off the dirt; wash it immediately in clean water, dry it well and lacquer it.