An Etching Ink for Glass.

For writing on glass with an ordinary steel pen, Dr. M. Muller prepares an ink containing fluorine. Equal parts of hydrofluoric acid, fluoride of ammonia, and dry precipitated barium sulphate are rubbed together in a porcelain mortar. When intimately mixed the mass is transferred to a dish made of platinum, lead, or gutta percha, and fuming hydrofluoric acid poured over it successively and rapidly stirred with a gutta percha rod, shaped like a pestle, until the impression left by the rod quickly vanishes. Glass written on with this ink is etched immediately, and the etched portions are so beautifully roughened that they are visible at a long distance. The ink only needs to act for fifteen minutes on the glass, and a longer action may be harmful, as the edges lose their sharpness.

In making good etching ink, the quality of the barium sulphate is of great consequence. It must be prepared by precipitating the solution of a barium salt (the chloride) with an excess of sulphuric acid, washing well by decantation, filtering, and drying at 248° Fahr. (120° C.). It is only in this manner that it can be obtained sufficiently fine and impalpable.

This ink cannot, of course, be kept in glass bottles, but only in gutta percha vessels closed with corks protected with wax or paraffine. Owing to its greater specific gravity, the barium compound used to thicken it naturally settles, hence it must be well shaken each time before using. It can be preserved in glass bottles that are protected within with a layer of wax or paraffine, which can be easily applied by warming the bottle over an alcohol or other smokeless flame, dropping in a piece of wax, and continually turning the bottle to bring the melted wax in contact with all sides. Even fuming hydrofluoric acid can be kept in such a bottle.

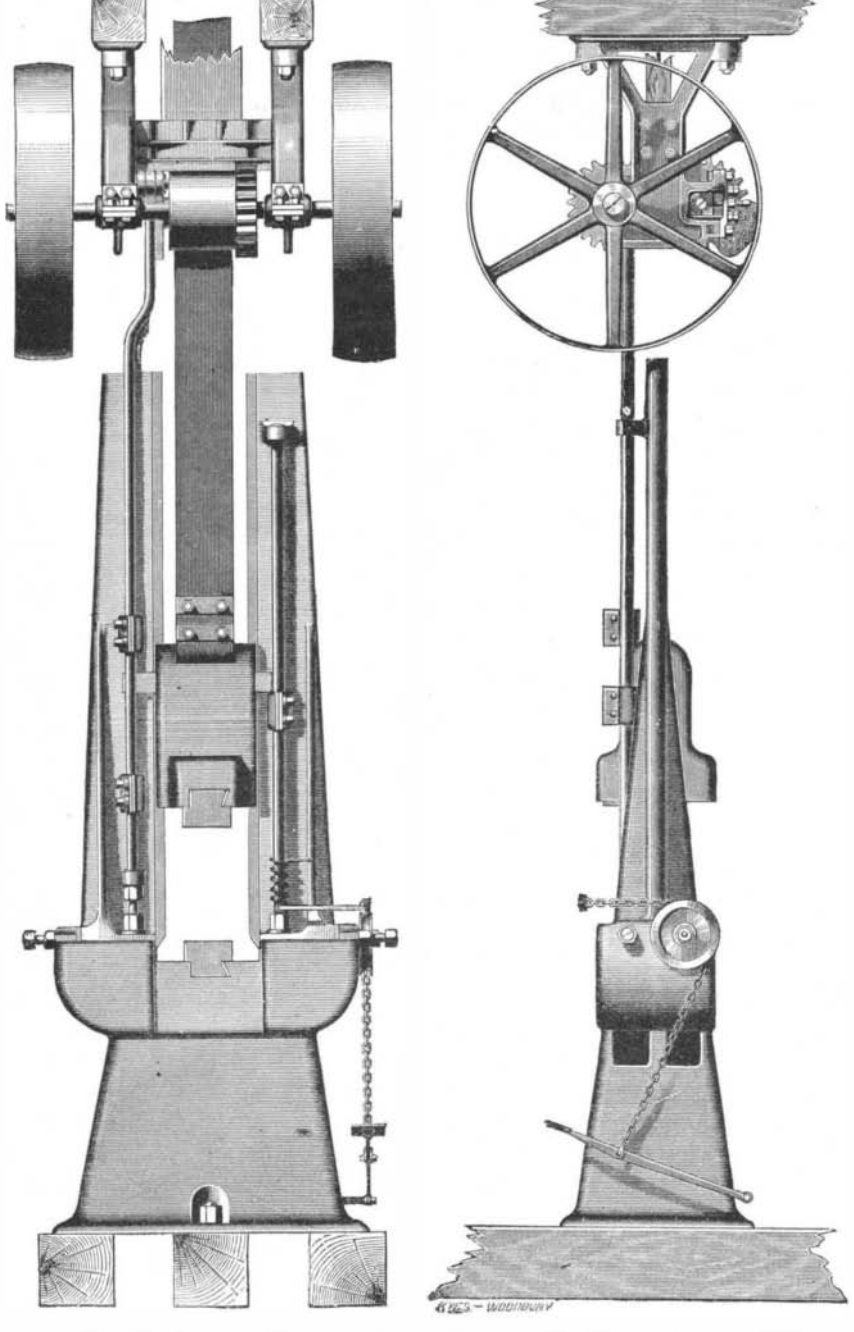
Concentrated hydrofluoric acid may cause serious inflammation and even ulcers, if left in contact with the skin for some time, so that care should be taken both in making and using the ink not to touch it to the fingers.

To make the etchings more distinct, and visible at a greater distance, it is frequently necessary with delicate lines, especially on graduated chemical ware, burettes, eudiometers, etc., to rub some red lead, soot, or clay over them. A small quantity adheres to the roughened surface, but it soon rubs off. The etchings made with this ink are so much rougher that if a strip of metal is rubbed over the lines some will adhere, and they acquire the color and luster of the metal. If a name is written on glass with this ink, and then the spot is rubbed with a thick brass wire, the name will appear in golden letters, and may be protected by a thin, colorless varnish. Lead may also be used, but for chemical apparatus, Dr. Muller employs platinum. —*Neue Erfind. und Erfahrungen.*

THE REMINGTON DROP HAMMER.

The Remington drop hammer, the cut of which appears on this page, is of that class in which the hammer is raised by a stiff belt or board passing up between two friction rolls, and is so well known that we only describe the improvements.

These consist in the lifting arrangements being detached from the upright ways, and in such a manner that the lifter gets no jar from the hammer, as it does in other drops. The lifter is made of a peculiar style adapted to this class of machines, very strong in all its parts. The friction rolls running parallel with each other are keyed strongly on a three inch shaft, and run in fixed bearings. One of the shafts is turned on an eccentric, and on the end of this there is a shackle or adjustable lever, which is connected with a rod which runs down by the ways, and is connected with the base. On this rod are two clamps, which are easily adjustable, to vary the height of the hammer, in order to give a light or heavy blow. An automatic trip is connected with the catch bar in such a manner as to enable the operator to readily give any number of blows he may require, and at the same time have free use of his hands. The lifter can be used with any other drop. For further information address E. Remington & Sons, Ilion, N. Y.



REMINGTON DROP HAMMER WITH DETACHED LIFTER.

DURING the gales of the 26th and 27th of Jan., unprecedented wind pressures were experienced at the Forth Bridge works. Mr. Benjamin Baker reports that the strongest gusts gave a momentary pressure of 35¼ pounds per sq. ft. on a large board, 300 sq. ft. area, and no less than 65 pounds per sq. ft. on a small board, containing 1·5 sq ft.

IMPROVED STEAM ENGINE.

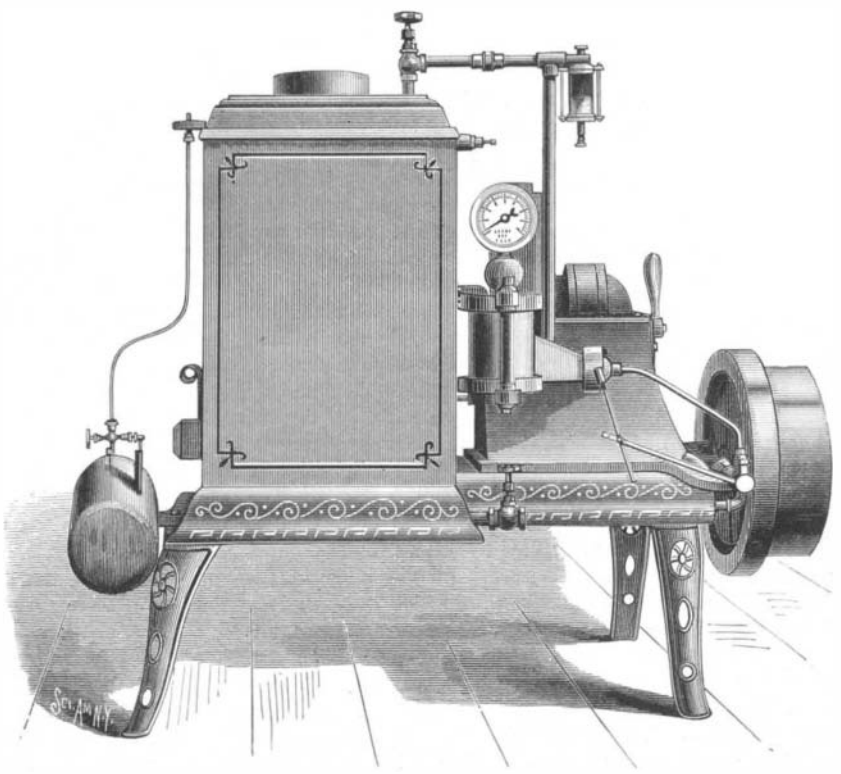
The annexed engraving shows a compact and light steam engine and boiler of simple construction, manufactured by Mr. A. H. Shipman, of Rochester, N. Y. The boiler is made from cast iron sections, having wrought iron tubes screwed into them, and bolted together. Radiation is prevented by double jackets of sheet iron having an air space between them. An intense blast of fire is formed by pressure of air or steam flowing through an atomizer which throws a fine spray of kerosene into a fire box in the boiler, the fire being so placed as to be completely surrounded by water. This plan insures the combustion of all the oil, does away with smoke stack, and utilizes the heating power of the fuel. A diaphragm controls the fire, so that an even pressure of any desired amount can be carried at all times. As the pressure in the boiler increases, the diaphragm closes, and the amount of steam admitted to the atomizer diminishes accordingly, thereby regulating the quantity of oil burned.

A lowering of the pressure produces a contrary effect, and the fire is increased. The tank of oil can be kept at any distance from the engine and brought to it by a pipe. An automatically regulated pump, with plunger connected direct to main shaft by an eccentric, keeps the boiler constantly supplied with the proper quantity of water. The engine is placed in close proximity to the boiler, so that loss resulting from the use of long connections is avoided.

The cylinder and its parts are inclosed in a steam tight box in which the steam exhausts. This keeps the cylinder hot, and insures the complete oiling of all the parts.

The engine has two cylinders, with steam chest between them, and two piston heads, one to each cylinder, connected with a small rod. The pistons are hollow, and as the movement is vertical there is no friction caused by their weight. The lower piston head is connected with the pitman, which is attached direct to the main shaft, no crosshead or slides being used. The valve is balanced. A governor acting direct upon the valve is applied to engines for stationary work.

The engine is especially designed for propelling small boats because of its small size, light weight, little attention required and the small amount of room needed for storing fuel; when it is to be used for this purpose it is made reversible. The engine shown in the cut is furnished with a balance and band wheel for stationary work.



SHIPMAN'S IMPROVED STEAM ENGINE.

Building up Milling Tools.

If a solid mill intended for dressing a width of six and sometimes eight inches is broken at any portion of its length, its usefulness will be impaired by so much as the break removes from the teeth their cutting surface. No remedy exists but annealing, turning down, recutting, and rehardening. Consequently, built up mills, are used for wide stretches, disks of three-quarters of an inch thickness, or less, being placed side by side on the same arbor and held by a set-up nut. If one of these breaks a tooth, it is a matter of slight consequence compared with the loss when a long mill breaks; the broken disk may be removed and a whole one substituted.

But these built up mills leave necessarily behind them narrow uncut ridges, showing where the disks met side by side, and thus making imperfect work. An ingenious device has remedied this defect and made the built up milling tool as perfect in the results of its work as the solid and expensive mill. The sides of the mill disks are cut into radial projections to the depth of the teeth, an alternate projection to an alternate depression—understood by recalling the old-fashioned shaft couplings cast with lugs on their engaging sides, so that they locked together. By this method of forming the mills any number may be placed on a spindle, or arbor, and interlocked, making a solid mill that will leave no circumferential tracks on its work.

This mill has another advantage. Inside the circumference of alternate projecting teeth is a turned and finished portion extending from the center hole out to the root of the teeth, forming the solid bearing of one disk against those next to it when they are assembled and set together with the common binding nut.

If two disks side by side make a cut exactly one and a half inches wide, which it is desirable to widen to one inch and nine-sixteenths, this may be done by introducing "skims" or washers of paper without impairing the face continuity of the built up mill.

How to Increase the Temperature of Furnaces.

There is one application of gas as a fuel which was discovered by Mr. Fletcher two years ago, but is not generally known. This is the addition of a very small quantity of coal gas or light petroleum vapors to the air supplied by a blower or chimney draught to furnaces burning coke or charcoal.

The instant and great rise in temperature in the furnace, and the great stability of the solid fuel used, are extraordinary.

This is in fact, a practical application of the well known flameless combustion, the only sign that the gas is being burnt being the great rise in temperature and a decreased consumption of solid fuel; indeed, solid fuel is not necessary.

To polish tarnished nickel, use chalk or rouge mixed with tallow.

How to Raise Early Flowers from Seeds.

The season is approaching when every one interested in gardens feels the desire to begin operations. The weather for the next thirty days will allow little to be done out of doors in this latitude, but much may be done in doors, both in flowers and vegetables, cheaply and simply, by sowing seeds. No horticultural occupation is more interesting than that of sewing seeds to produce plants for resetting in the open ground when the season is warm enough.

All the leading kinds of flower seeds can be bought for five dollars. A writer in the *Evening Post,* who evidently has a practical knowledge on the subject, gives the following directions: The best way of sowing seed is not in flower pots, as is too often done; these are too porous and dry too quickly, particularly in the atmosphere of a sitting-room, where the air is necessarily much drier than in the greenhouse or hot-bed. Our best florists no longer sow seeds in earthenware, but use shallow boxes instead. Common soap boxes, cut into three or four pieces, making a depth of not more than one to two inches for the soil into which the seeds are to be sown, are convenient. Of course any size of box will do, but it should not be of greater depth than two inches, otherwise the soil will get too wet, and become sour. Care must be taken that the bottom of the box is left open sufficiently to allow the water to escape when given in excess. Almost any good soil will suit, which, for convenience, had better be procured from a florist.

After placing the soil in the boxes make the surface perfectly level and smooth, then sow the seed evenly over it, press it into the soil, and cover it. The rule is that all seeds should have a covering of soil equal to the size of the seed.

When covered, water gently with a fine rose watering pot; this one watering will usually be sufficient until the seeds come up; in any case, the soil should not be again watered until, by its light color, it shows indication of being dry. Although seeds will germinate in the dark, the moment that they break the surface of the soil they should be placed in the lightest possible place.

The temperature best suited to the germination of nearly all seeds is about 60° at night with 70° during the day. After the seeds have started to make the rough leaves, they should be replanted from the seed boxes into similar boxes at distances from an inch to an inch and a half apart, where they can remain to be set out in the open ground, from the middle to the end of May.

It is very important to get the proper kinds of flower seeds, because there are hundreds of varieties offered in the seedsmen's lists that it would be useless for the amateur to attempt to cultivate. For want of discrimination in selection, much disappointment ensues. The kinds recommended to give the most general satisfaction are asters in variety, balsams (camellia flowered), candy tuft in variety, cockscombs, chrysanthemum, tri-color, coleus, convolvulus, cypress vine, geraniums, marigold (gold-striped), mignonnette, pyramidal and spiral, pansy in variety, Phlox drummondii, petunia, single and double, stocks, verbenas, and zinnia.

Another plan, very satisfactory with amateur gardeners raising flowers, is to purchase very small plants from the florist about the first week in April, which at that season can be had at about one-third the price they are sold for in May. These plants are shifted into pots a size larger, and can be kept in the sitting-room where there is plenty of light. By the time of planting out in May they will have grown to be large and fine plants. They will require but little care. The kinds of plants best suited for summer flowering that can be safely grown in the sitting-room are begonias, chrysanthemums, carnations, geraniums of all kinds, fuchsias, heliotrope, and monthly roses. There are many others, of course, but these are the simplest and such as will be most satisfactory.

A tea rose that bids fair to be a treasure is the "Mme. Ched. Gunniroisseau," a monthly, of magnificent yellow tint, something like the "Isabella Sprunt," only much finer.

Unconscious Bias in Walking.

Mr. G. H. Darwin, in *Nature,* states that some ten years ago he made a few experiments upon the subject of "Unconscious Bias in Walking." He began by walking himself, and getting various friends to walk, with eyes shut in a grass field. All walked with amazing crookedness in paths which were not far removed from circles. Two of the circles described were not more than fifty yards in diameter, although the pedestrians thought they were going straight. All diverged to the right excepting one, who was strongly left-handed.

"I then got eight village schoolboys, from ten to twelve years of age," continues Mr. Darwin "and offered a shilling to the boy who should walk straightest blindfold. Before the contest, however, I dusted some sawdust on the ground, and after making each of the boys walk over it, measured their strides from right to left and left to right. They were also made to hop, and the foot on which they hopped was noted; they were then made to jump over a stick, and the foot from which they sprang was entered; lastly, they were instructed to throw a stone, and the hand with which they threw was noted. Each of these tests was applied twice over.

"I think they were all right-handed in throwing a stone, but I believe that two of them exhibited some mark of being partly left-handed. The six who are totally right-handed strode longer from left to right than from right to left, hopped on the left leg, and rose in jumping from that leg. One boy pursued the opposite course, and the last walked irregularly, but with no average difference between his strides. When I took them into the field, I made the boys successively take a good look at a stick at about forty yards distance, and then blindfolded them and started them to walk, guiding them straight for the first three or four paces. The result was that the left-legged boys all diverged to the right, the right-legged boys diverged to the left, and the one who would not reveal himself won the prize. The trial was repeated a second time with closely similar results, although the prize winner did not walk nearly so straight on a second trial.

"I also measured the strides of myself and of some of my friends, and found the same connection between divergence and comparative length of stride. My own step from left to right is about a quarter of an inch longer than from right to left, and I am strongly right-handed."

Mr. Darwin believes that nine out of ten strongly right-handed persons are left-legged, the reason being that every active effort with the right hand is almost necessarily accompanied by an effort with the left leg, and a right-handed man is almost compelled to use his left leg more than the other.

IMPROVED STEEL HORSE COLLAR.

The accompanying illustration represents a horse collar manufactured by the Steel Horse Collar Company, of Fitchburg, Mass. It is provided with a hinge at the top and a spring latch at the bottom, which instantly locks the collar on the horse when the sides are pressed together. The rapidity with which this collar can be securely fastened has recommended its use in a great many fire departments throughout the country, and praise in its favor has been general. The collar is strong, light, and durable, and presents a very neat appearance, being made of steel, and as no hames are used, the weight on the animal's neck is much reduced, and the liability of sore necks lessened. It has a uniformly smooth surface, and always keeps its perfect shape. It being a good conductor of heat, scalding of the skin of the animal is obviated. The collar and pad are

IMPROVED STEEL HORSE COLLAR.

covered with zinc, which has a healing effect, and it is claimed that sore necks and shoulders can be healed under this collar while the animal is continuously at work.

This collar is well adapted for the use of canal men and farmers. The draught on a tow line or plow team being continuous generates excessive heat on the animal's shoulder, which soon produces sores. The same collar can be fitted to horses with necks of different sizes and shape, as each collar is adjustable at the top and bottom. Pressure upon the windpipe and the possibility of choking are prevented by the shape of the collar at the bottom. This collar has been thoroughly tested in extreme hot and cold wet weather, and for light and heavy draught, and it has given good results and is highly spoken of by those using them.

Doctors and Disease in Central Asia.

Among the peculiar diseases which prevail in Asia there are three which are interesting from the limited area they infest, viz., the *rischta,* leprosy, and the sartian sickness.

The *rischta,* thus designated by the natives of Turkestan, is a nematoid worm belonging to the family of the filarides. It is peculiar to many places in Turkestan and Bokhara. The cities of Djizak and Karchi abound in it; it is found elsewhere, but in far fewer numbers. The disease itself is caused by the presence under the skin of a worm which sometimes attains the length of 90 cm. At this point a red tumor forms, from the apex of which emerges a white spot, which is the anterior extremity of the worm. The disease is sometimes accompanied by fever symptoms, pains in the bones, and a general swelling of the part attacked. The rischta buries itself by preference under the skin of the hands, arms, or legs. Abandoned to itself, it slowly comes out from its retreat, but takes many weeks and usually is ruptured, suffering a group of smaller worms to escape in the wound. The disease is then greatly aggravated, for the whole brood of embryos secrete themselves in the surrounding muscles and tissues, where it is very difficult to destroy them.

The only method of radically curing the disease is to destroy the worm as soon as he makes his appearance in the abscess. The native doctors are very skillful in performing this, and rarely fail to effect a cure. The *Tabib* for this purpose takes a needle, and raises the skin around the diseased spot over an area of many centimeters. Then enlarging the wound, he passes his lancet beneath the worm, which he raises, while he catches the free extremity of the rischta in the fork of a little stick of wood slit at the top. Pushing from below up with the lancet, and rolling the worm around the stick according as he disengages himself, the doctor succeeds in extirpating the parasite in less than two minutes. Sometimes many individuals are lodged together in the same spot.

The rischta passes its early life as a cyclops or small crustacean in stagnant water. The second phase of its existence is completed in the human body. The cyclops imbibed in drinking passes into the alimentary canal. Here the reproductive organs of the worm are developed, and fecundation follows. The males die, and the pregnant females traversing the walls of the digestive tube follow the blood capillaries and finally lodge in the subcutaneous tissues.

The rischta is the result of sewage contamination. The cities of Turkestan are supplied with water from innumerable canals called *aryks,* which traverse the cities in all directions and become receptacles and conduits of sewage. This water is never drunk by Europeans unless filtered or boiled, and they consequently suffer less from these loathsome troubles.

The sartian malady, known in a great number of places under a variety of names, consists in the formation of excrescences, generally only one, rarely many in the same place, and appearing ordinarily upon the hands or face. These tubercles secrete a serous liquid, then cover themselves with a white crust, while they increase in size, invading a larger portion of the patient's body. They cause no pain. The disease is cutaneous, not attacking the bones or the mucous membrane. Left to itself it disappears at the end of a period more or less long, leaving, however, deep scars, and sometimes removing the side of a nose, a portion of a cheek, or an end of an ear. It is a frequent occurrence to encounter in the streets mutilated figures. It arises from the contaminated and impure water. It attacks women more readily than men. Fortunately the native doctors are learned in its treatment, and effect cures without causing disagreeable scars. They employ pomades or unguents, into the composition of which there frequently enters sulphate of iron, honey, vinegar, oil, oxide of lead, cantharis probably, etc.

The most serious endemic disease of these countries is leprosy. It attacks, however, only a limited number of individuals. The regions nearest to Turkestan where lepers are found are the Caucasus, Lower Volga, Don, and Crimea.

In Turkestan there can be seen three characteristic forms of leprosy: the tuberculated, spotted, and anestherique. Leprosy is a constitutional chronic malady which especially affects the mucous membranes and the skin, producing either red, yellow, brown scaly spots or pustules or tubercular or diffuse infiltrations, ulcerous or not, and frequently leading to the loss of the organ attacked.

Leprosy can be cured to-day by hygiene, hydropathy, and galvanism, but in Central Asia no cure is known for a leper, and every individual attacked is consigned to a death more or less slow. In 1869 Dr. Saveljeff found twenty-nine inmates of a leper refuge near Tachkent. Almost all were covered with the characteristic scales. Some had pustules upon the hands and upon the body; others were blind. With four of them the disease had made the fingers and toes fall from the hands and feet; another was a monster; all attacked in various degrees. The traveler will find them at the gates of the cities, waiting for some passer-by to take compassion on them and give them alms—a sad, wretched group of huddled and beseeching victims.

Most frequently they unite their miseries, inhabiting the same place, generally the leper refuges. These quarters or establishments are veritable ghettoes, with no communication with the inhabited regions round about.

One can imagine the miserable life led by these unfortunates. Prey to corporal torments sometimes terrible, reduced to live upon public charity, despised, isolated from all the world, dead before the end of life, hopeless, and in beggary. This picture, however, is overdrawn. The interval between enjoyment and suffering is not a great one among barbarous peoples; they have fewer needs, and soon attain a personal contentment not very intense or enviable. In the same way, their ills are not so insupportable. And even the lepers in their miserable fellowship and absolute relief from all civil duties seem to experience a certain sort of satisfaction.

The cause of leprosy has never been defined clearly, and in general terms is assigned to climatic terrestrial influences favoring its development. Turkestan is a favorable nidus for the nurture of this horrible complaint, and those who wish to study its etiology should visit the regions of Central Asia, where its manifestations are various and where it exists in an unmodified form. It has been averred that leprosy is not hereditary. It certainly is so in Central Asia, where the offspring of lepers fall almost invariably victims to its horrible ravages.—*From Revue Scientifique.*

Compressed Air Locomotive.

Col. Beaumont, whose many successful mining locomotives hauled by compressed air are now extensively used in Europe, states as one of the results of his practical experience that one cubic foot of air under a pressure of 1,000 pounds to the square inch will take a load of three tons for one mine on any of the colliery tracks.