SAFETY LAMPS.

The safety lamp, as originally introduced by Sir H. Davy, in 1816, consists essentially of a common oil lamp, whose flame is isolated from the external atmosphere by a metallic envelope perforated with numerous small holes, a cylinder of wire gauze being generally employed. The holes are large enough to allow air to pass into the flame, and the products of combustion to flow freely; but owing to the cooling effect of the wire bars or walls of the apertures no gases in a state of ignition can pass through, the temperature being reduced by the metal below that necessary for the production of flame, so that in fiery mines, where carbureted hydrogen gas is present in the air in sufficient quantities to form an explosive mixture, only such portions as may be brought into direct contact with the flame of the lamp can be ignited, the explosion being confined within the wire cage, if the apertures be sufficiently small. The limit of safety for gauze of iron wire is placed at 28 parallel wires to an inch, or 784 apertures to the square inch, or about 1-5,000th of a square inch surface for each hole.

Various modifications of the above principles have been adopted from time to time, with the intent of obtaining more light or greater safety, several of which are represented in the 23 specimens in the collection at the Museum of Practical Geology at Jermyn street.

The Two First Safety Lamps ever used in a Coal Mine.—They were sent by Sir H. Davy, in 1816, to the Rev. John Hodgson, at the time vicar of Heworth, and presented by him to Miss Emma Trevelyan. They are of small size, having cylindrical copper oil vessels surmounted by chimneys of thin brass wire gauze, of a much finer mesh than has been employed subsequently. The gauze is protected by a cage of three vertical bars of stout iron wire fixed to a flat brass roof, into which the carrying ring is secured by a swivel joint. These are not to be confounded with Sir Humphry Davy's first experimental lamp, in the possession of the Royal Institution.

Common Davy Lamp.—This is one of the simplest forms of safety lamp. It has a cylinder of black iron wire gauze of 784 apertures to the inch, set in a brass ring, which screws on the top of the lamp. Three upright wires are fixed to the ring, and are drawn into a loop at the top, through which the carrying link is secured. The top portion of the gauze chimney is made of two overlapping cylinders; this is rendered necessary by the destructive effects of the hot gases on the iron wire, a single thickness being liable to be burnt into dangerously large holes at this point.

Davy Lamp, by H. Watson, Newcastle-on-Tyne.—This resembles the preceding one, with a few slight modifications. The carrying link is attached to an arched brass roof, which protects the miner's hand from being scorched by the escaping products of combustion. The common method of locking the Davy lamp is also shown. This consists of a simple screwed bolt pointed at the end, with a square head fitted with a key resembling a common watch key, which passes through a nut cut in a square boss attached to one side of the oil vessel, until the point is received in a hole drilled through the lower brass ring of the cage carrying the gauze. The bolt is of such a size, that when the lamp is locked the key end is sunk level with, or a little below the outer face of the boss, so that it cannot be unscrewed by the mere use of the fingers. In all cases a vertical wire hooked at one end is provided for trimming the wick; it slides through a tube passing through the body of the lamp.

Davy Lamp, for Burning Gas.—This is an extra large lamp, which was, for experimental purposes, for the use of the Royal Commission on Mines. It has no special peculiarities, beyond the substitution of a common single jet gas-burner, for the oil lamps of the preceding examples. The gauze case is doubled through a considerable portion of its length, only about one inch immediately above the flame being single.

Davy Lamp, with Condenser, by Newman.—The gauze of this lamp is doubled in a similar manner to that of the following. The single part is covered by a plano-convex or bull's-eye lens, set in a square brass frame, attached to two of the stay bars of the cage, for the purpose of concentrating the light,

Davy Lamp, from Hetton Colliery.—This is more slightly built than the preceding lamps, and is almost entirely made of brass. A curved horn shade is arranged so as to slide on two of the stay bars; it is added to protect the light from being directly acted on by currents either of air or gas. Many accidents have taken place with Davy lamps when exposed to sudden discharges of gas from coal; when the gauze becomes red-hot, and if the flame is blown to one side, the wire network is no longer capable of preventing the external atmosphere from taking fire, as the flame will, under these circumstances, pass through the holes.

Dr. Clanny's Safety Lamp.—This differs from the Davy lamp in having the lower portion of the gauze cylinder, the part immediately above the flame, replaced by a stout glass tube for the purpose of giving more light. The glass is of larger diameter than the gauze cylinder; it is mounted between two brass rings, connected together by six vertical stays, and is attached by one locking bolt to the lamp below, and by a second to the cage carrying the gauze above. The air for feeding the flame enters through the lower part of the gauze, and has to travel downward, but there is no special contrivance directing it, or for forcing the draught. The advantage of the glass in this lamp is more apparent than real, as on account of the great thickness of the glass envelop, a notable proportion of the light is absorbed, and the illuminating power is not much greater than that of a common Davy lamp.

Self-extinguishing Lamp, used at the Earl of Lonsdale's Collieries at Whitehaven.—This lamp is so contrived as to become extinguished by the act of opening, in order to prevent the miner from converting his lamp into a naked light, as is not unfrequently done with the common locked lamp by men who have obtained possession of private keys. Externally it resembles a common Davy lamp, but the lower ring or cap of the cage is unusually deep. On the inner side of the cap, above the thread of the screw by which it is attached to the lamp, is a thin shelf or plate of iron cut through in two places opposite to each other, leaving two notches about half an inch in width, which are filled by two wedge-shaped arms movable about fixed centers. The tube holding the wick is also cut through, having two narrow slits opposite each other, extending through its entire hight. To the top of the oil vessels are attached two unequal-armed levers, but in such a manner that the arms make an angle of about 100° with each other; the longer ones are tapered to a narrow chisel edge, somewhat less in breadth than the slits in the wick-holder, and are maintained by steel springs in a nearly vertical position when not in use, the shorter arms being at the same time horizontal. The latter have peculiarly shaped tails, forming transverse wedge-shaped blocks, the thickened ends having the corners rounded off. When the cap is screwed on the long tapered wedges attached to the cap pass over the upper surfaces of the wedge-ended arms of the angle levers without moving them, but on reversing the motion the points of the hinged wedges come in and pass underneath those on the shorter arms of the levers, so that the longer arms are depressed, and drive the wick downward in its tube. The action of the springs bring the longer arms back to the vertical position, as soon as the notched part of the plates arrive opposite to them, but they are immediately driven down again by the second hinged wedge, the result being an irregular jerking pressure on the wick, which extinguishes the flame before the cap and gauze cage are completely unscrewed from the lamp.

Self-extinguishing Lamps.—The lamps of M. Dubrulle, Lille, France, are similar in principle to that last described, but are differently constructed. The oil vessels are urn-shaped, and are made of zinc; one has three equi-distant studs projecting from its outer surface, which fit into three corresponding clutches in a covering plate forming the lower part of the cage. The locking bolt is a bent iron wire contained within the oil vessel, with a straight portion at the upper end, which passes through a hole in the top of the lamp, and is received into a hollow boss lined with brass in the covering plate. The bolt is maintained in position by a curved copper spring, also within the oil reservoir. The wick, formed of a single thickness of flat cotton plait, is held at the lower end by an iron clip with a short projecting arm, carrying a screwed nut, through which passes a vertical screw for raising or lowering it. The iron locking bolt is also provided with a projecting arm, with a round socket or eye, through which the vertical rod passes loosely, and it is only when the lower edge of the collar on the wick-holder is brought in contact with this arm that the bolt can be withdrawn; but this can only occur when the flame is extinguished by the withdrawal of the wick within its case. In putting the cage on, when the lamp is trimmed, the open parts of the clutches are brought over the studs, sufficient pressure being exerted to press back the locking bolt; the cage is then turned through a small angle to make the clutches take hold of the studs, and when the latter are in position the bolt springs up into its seat, and cannot be again withdrawn without screwing down the wick, as described.—*London Mining Journal.*

ON THE REVIVIFICATION OF ANIMAL CHARCOAL

BY HENRY MEDLOCK, PH. D., F. C. S., M. P. S.

The principal source of expense in a sugar refinery is that of animal charcoal, and it is a great desideratum to the refiner, commencing with the use of new animal black, to adopt a means of keeping his coal in good condition, and retaining unimpaired its decolorizing powers after each successive use. I will treat the subject very briefly under the following heads:—

1st. The composition of bone and animal charcoal.

2d. Its decolorizing property, and the causes of its becoming inactive.

3d. The means of restoring its primitive powers of absorption and decolorization.

I. *The Composition of Bone and Animal Charcoal.*—Bone, as is well known to anatomists, is a solid structure, composed principally of phosphate of lime and osseine, a modified form of gelatin. The phosphate of lime, or solid portion of the bone, is composed of an infinite number of minute, almost microscopic cells, which are filled up by osseine, and bound thereby, as with a cement, into a solid mass.

The composition of bone, after the removal of adhering fat by boiling, is as follows:—

	Per Cent.
Phosphate of lime	63·1
Carbonate of lime	1·4
Phosphate of magnesia	2·1
Other salts	2·4
Osseine	31·0
Total	100·0

When submitted to heat in a closed vessel, to which air cannot gain access, the osseine is decomposed, evolving oily and ammoniacal products, which are, by suitable arrangements, collected and applied to many useful and economical purposes. In the retort remains the cellular structure of the bone in a most porous condition, each cell and pore being coated with a thin film of finely divided carbon, resulting from the decomposition of the organic osseine.

The purely chemical reasons why the porous animal charcoal should possess such extraordinary decolorizing and general absorptive properties, is a question I need not enter into, but I shall do so fully in a forthcoming pamphlet.

II. *The Decolorizing Properties of Animal Charcoal, and the Causes of its becoming Inactive.*—It is well known to the refiner that his charcoal too soon loses the power of decolorizing his sirups, and the question arises, what is this owing to? It is, *à priori*, assumed that it is owing to the grains of coal becoming coated on the surface with the slimy aluminous and mucilaginous matters contained in the raw sugar, which destroy to a great extent its porosity. This is, doubtlessly, one cause; but the principal, and by far the most serious, cause is the presence of lime in the raw sugar, and which in a short time effectually chokes up the pores, and in the process of reburning cannot be removed, although the mucilaginous materials are destroyed.

III. *The Means of Restoring its Primary Powers of Absorption and Decolorization.*—When the charcoal ceases to decolorize, it is usually washed with hot water to remove the sirup remaining therein, and then reburned in closed furnaces of various construction, the object of reburning being to carbonize the coloring matters extracted from the sirups. This restores to some extent the decolorizing powers of the charcoal; but at each successive reburning

the coal continues to lose its properties, and at last ceases altogether to act as a decolorizer, unless it is mixed, after each reburning, with a certain portion of new charcoal.

Another process, and one frequently adopted, is to destroy the organic matters by keeping the charcoal in water and allowing it to ferment for several days, adding fresh water containing about ¼ to ½ per cent of hydrochloric acid. The little acetic acid formed, and the hydrochloric acid added, dissolve a small quantity of lime, and so far act beneficially. But the good effect is more than neutralized by the fact of the acids attacking the structure of the bone itself, namely, the phosphate of lime, thus rendering the coal friable, and consequently making much dust and waste.

Having referred to the two methods in common use of revivifying the decolorizing powers of charcoal, and alluded to their inutility and defects, I will describe a new method, as simple as it is ingenious, of rendering old and comparatively useless charcoal as good, and, indeed, better than new. Corenwinder, an eminent German chemist, has, by numerous experiments, established the following axiom, namely:—

"That the decolorizing power of charcoal used in sugar refining is correlative to its power of absorbing lime."

In other words, the more the pores of the coal become choked up with lime the less is its power of decolorizing. Now, to remove the obnoxious lime without attacking the structure of the bone itself, is a question which has occupied for many years the ingenious mind of my friend, Edward Beanes, C. E., F. C. S.

Mr. Beanes, who, by his chemical researches on the sugar plantations of Cuba, has enabled the planters not only to produce much finer qualities of sugar, but considerably to augment their produce, has recently patented a process of restoring to charcoal its primitive properties of decolorizing sirups. Mr. Beanes found that charcoal, perfectly dry and hot, absorbs dry hydrochloric gas with the greatest avidity and in enormous quantity. The gas combines with the lime and converts it into soluble chloride of calcium. After the charcoal has been treated with gas, a portion of untreated charcoal is mixed up with it; the combined gas remaining in the pores of the former is taken up by the latter, and the whole becomes neutral; the chloride of calcium is then washed out—requiring only a few hours—and the charcoal is afterward burned in the usual way. It is then found that the decolorizing power of the charcoal is augmented at least 100 per cent.

The advantages of Mr. Beanes's process are as follows:—

1st. It removes the whole of the lime and carbonate of lime from the pores without attacking the phosphate.

2d. It augments the decolorizing powers of the coal upward of 100 per cent.

3d. It requires no expensive apparatus, and the process is almost costless, two saleable products being obtained nearly equal in value to the materials employed.

I have thus ventured to introduce Mr. Beanes's process to the notice of English refiners, not simply from feelings of personal friendship, but from the firm conviction that by its general adoption he will confer as great a benefit on his own countrymen as he has already conferred upon the sugar manufacturers of Cuba.—*London Chemical News.*

THE FAIR OF THE AMERICAN INSTITUTE.

The room is now filled with articles on exhibition, and the large attendance promises to make the fair a pecuniary success—a more favorable result than has been realized in many years. We continue our notice of objects of interest.

FRENCH SELF-FASTENING BUTTONS.

This invention is interesting principally on account of the high price for which the patent was sold—$125,000 in money. The shank is made separate from the button; it consists of a small plate, which comes against the back side of the cloth, and a central stud or hook. The hook is caught into the eye of a stout needle, which is passed through the cloth, dragging the hook after it; an india-rubber washer is then slipped over the hook, and the button is pressed upon it and given a quarter turn, which fastens it securely. A button is thus put on in an instant without any sewing. The agent of the company is W. B. Watkins, No. 80 Reade street, New York.

COLLECTION OF MINERALS.

Mr. C. Chipman exhibits an interesting collection of minerals, among them two masses of copper ore, weighing, one 300 pounds, and the other 240 pounds. They are mixtures of red oxide and native copper, containing 90 per cent of metal. They are from Del Norte County, California. The vein is from six to eight feet in width, five miles in length, and of unknown depth—one of the most valuable mines in the world. In the collection are the following minerals, all picked up by Mr. Chipman on this island:—

Serpentine, pyroxene, staurotite, graphite, tourmaline, mica, talc, molybdite, apatite, amianthus, garnet, actinolite, vivianite, lameller feldspar, apophyllite, rutile, epidote, pyrites, stilbite, quartz, magnetic iron.

TRAVELING INSTRUMENT.

Messrs. Schon & Hull, of Lafayette Ind., exhibit a very novel and ingenious machine for running lines of levels in surveying and making profiles of the ground. Two brass wheels, about 2½ feet in diameter, and following one after the other, support a light carriage which bears a heavy pendulum connected with clock-work. The pendulum maintains its vertical position, and the inclination of the carriage varies the position of a pencil pressing against a slowly revolving cylinder, so as to draw a line corresponding with the profile of the ground passed over; at the same time index hands are turned to give the altitude in feet and fractions. In ascending, the pencil must be carried outward along the cylinder with a rapidity proportioned to the rapidity of the ascent; in descending, it must be drawn in the opposite direction with the same relative motion; while on level ground, it must be held in a constant position. These motions are effected by a very simple device. A horizontal wheel has a vertical wheel pressing upon it and driving it by friction—the position of the vertical wheel depending upon the inclination of the carriage. When the vertical wheel presses upon the center of the horizontal wheel, the latter is not turned in either direction; when the vertical wheel is on one side of the centre of the horizontal wheel, the latter is turned in the direction to carry the pencil outward along the cylinder; and when upon the opposite side it is turned in the direction to carry the pencil inward.

This instrument would enable one man to run five to ten miles of levels in a day, instead of the three men usually employed to run from one to three miles, and it is probable that the levels would be sufficiently accurate for preliminary surveys. Of course, no engineer would trust to such a machine in the final location of a line, or in laying rails, though it might answer for taking cross sections and setting slope stakes.

BRICK-MAKING MACHINE.

Messrs. Chambers, Brother & Co., of Philadelphia, exhibit a working model of their novel brick-making machine. It consists of a conoidal iron vessel, with a rotating shaft in its axis, the shaft being furnished with spiral blades, which cut and temper the clay, at the same time forcing it along toward the smaller end of the vessel, where it is finally pressed out through a rectangular opening, in a continuous bar, of the proper size for a brick. This bar is borne along on an endless belt to a revolving wheel, carrying a knife, which cuts the bar into pieces of suitable length for brick.

THE PEOPLE'S CLOTHES WRINGER.

This machine has its rolls constructed from cork; in other respects it is like those usually sold. It is said to be very efficient and durable, being particularly adapted to wringing clothes hot. No. 494 Broadway, New York.

FLASS'S NIGHT-LAMP ATTACHMENT.

This invention consists of a novel appliance for closing the wick of a kerosene lamp so as to diminish the flame. It is stated to be free from the disagreeable odor attending the common method of lowering the flame. No. 110 East 29th street, near Third avenue, New York.

THE "KAPUO KATHAIRIC."

This somewhat ponderous title is affixed to several highly-finished wooden pipes of peculiar shape. It is defined by the inventor as "smoke purifying," and is intended to deliver smokers from the bad effects of the nicotine in the weed. It is constructed with a cavity at the bottom for the oil and another near the top of the bowl on one side, and still another cavity at the bottom; these are connected by passages which look like the letter N, the cavities being at the angles of the top and bottom. A piece of sponge is placed in the top, and the smoke is purified in passing through it.

LEAD BURNING.

A curious specimen of workmanship is shown by Paul Marcellin of No. 13 High street, Brooklyn; it consists in a peculiar process whereby sheets of lead are joined homogeneously by being burnt to each other—the point of junction being invisible and the surface almost as smooth as the sheet itself. It is very strong, and is much used by chemists and manufacturers.

BOILER-TUBE BRUSHER.

Brushes of wire arranged spirally have been used for some time in cleaning tubes which have become incrusted with soot and ashes. The New England Tube Brush Company exhibit some of these brushes made of flat wire, not round. They are made of spring-tempered steel wire, and act as cutters by reason of the square ends.

TOSHACH'S WINDOW CATCH.

This article is a very efficient one for the purpose. Car windows, as generally furnished with these things, are continually out of order, and can be set at certain points only. This catch allows the window to be set anywhere, and is easy to manufacture. Wm. Toshach, No. 54 William street, New York.

OSCILLATING ENGINES.

Wm. D. Andrews & Bro. make a large display of their peculiar oscillating engines. The cylinders of these engines take steam by vibrating past ports in a fixed chest at the bottom, and they work with great rapidity and ease. They are shown in connection with Andrew's centrifugal pumps, No. 414 Water street, New York.

CANNED FRUIT.

C. C. Williams, of No. 9 Barclay street, exhibits some beautiful specimens of canned fruit in self-sealing jars. Nothing can exceed the clearness of the sirups or the perfection of the colors in the several varieties.

A POCKET LANTERN.

This is a neat little affair, intended to shed light in dark places, and to be always found when wanted; in a word, to be carried in the pocket. It is made of tin, neatly lacquered; it folds up about the size of a small testament, and is a very useful thing to travelers and others. New York Lamp Company, No. 259 Pearl street.

A. & F. BROWN'S ENGINES.

This firm exhibit one of their oscillating engines and steam pumps; the engine is exceedingly neat in design, strong and well proportioned, and receives steam through an ordinary slide valve worked beneath the cylinder. Such an oscillating engine can be easily repaired, if necessary, by any mechanic, and is quite economical of fuel. Any length of stroke can be had, which is not the case with some other kinds. The exhibitors of these engines append a card to them stating thas they will be shown in motion when steam is up. From this we infer that steam is not generally "up," and we have been waiting some time to learn why. The pump shown by Messrs. Brown is highly approved of.

NO STEAM.

We have been waiting some time to see the steam pumps in operation, but have not been gratified. For some reason or other no steam is furnished to one half the machines, and those who go in the morning, as we do, are apt to be disappointed.

This is the second week of the Fair, but yet the concern is not complete or perfect, and engines are being erected and other operations carried on which ought to have been finished before the Fair opened. If the machinery is to be shown in motion, why not put it in motion, and not disappoint hundreds of people who come from a distance?