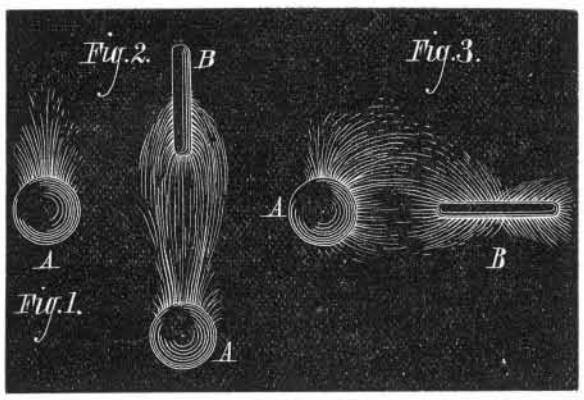
appears formed of an infinity of beautiful similar curves, the extremities of which are almost normal to the surface of the conductors. If now B is electrified and brought near A, in communication with the earth and carrying lycopodium powder, a similar jet will be produced; but if A is then insulated, the jet disappears, and is renewed only when the communication with the earth is restored, by which the electricity of the same kind as that in B is carried off. If a cylindrical, not charged, and not insulated conductor, carrying lycopodium at its extremity, is placed opposite a charged conductor, a jet will arise at that extremity, by which electricity of the same kind will pass off, repelled by the electrified body. And if we sprinkle lycopodium powder on the strongly charged conductor, A (Fig. 3), and on B, containing an induced current, three systems of curves or jets will be formed: one from A to B, another from B to A, and a third from B into the air. Similar, although fainter, curves are observed under the conductors. In all these experiments the particles have a rapid motion to and fro between the two conductors, because the moment they touch one, and are charged with the same electricity, they are repelled. Sometimes a few particles vibrate without touching them (like Franklin's gold fish) and move in the same trajectories.



I have made a great many other experiments with these powders, and I believe they may be useful to the study of that mysterious agent, electricity. The analogy of the curve of Fig. 3 to the magnetic spectrum of a pole of lodestone, A, inducing magnetism in a piece of soft iron, B, is evident.

Modena, January, 1876.

Coal Tar.

Its general properties vary with the coal used as well as with the temperature employed in the distillation of the gas. That obtained at rather high temperature varies from 1·120 to 1·150 in specific gravity. It cannot be burnt in ordinary lamps. If obtained at a lower temperature, it is lighter, and generally is combustible in common lamps. In England the yield is from nine to fifteen gallons per tun of coal.

The distillation is conducted on a large scale in some of our cities. The plan and operations with some are as follows: The liquid is poured into large iron retorts holding several hundred gallons. Heat is then applied. The first portions passing over consist chiefly of ammonia, and a few of the lighter hydrocarbons. As the distillation proceeds, heavier matters pass over, such as water containing a fetid brown oil which collects on its surface. After a little while, the water has all passed over and more oil comes, growing gradually heavier until its specific gravity exceeds that of water. This oil generally amounts to from five to ten per cent of the tar. It is purified by agitation with sulphuric acid and redistillation. The oil before purification contains several easily oxidizable substances, which are converted into a tenacious, dense mass by the action of the acid. The purified oil is called coal naphtha. On continuing the distillation after the naphtha has ceased to come over, a heavy, fetid dark oil, known as dead oil, comes. This usually amounts to about thirty per cent of the tar. In the latter part of the distillation, considerable naphthalin passes over and solidifies in the oil. The operation is usually stopped here, as the mass in the retort will solidify on cooling, and is used to form a black varnish for iron work.

If desired, however, a still higher heat will decompose the matters left in the retort, and a product may be obtained which when cool has the consistence of butter, and is called anthracene. At a still higher temperature, the distilled matters look like resin, and finally the substance passing over at a red heat condenses as a bright orange-colored powder, and is composed principally of chrysene and pyrsene. The residue in the retort is a coke which is very hard and difficult to burn.

The naphtha obtained as above is usually rectified with sulphuric acid again, and is separated into still lighter compounds and heavy oil. The distillate from this is free from naphthalin, does not change color on exposure, and is called "highly rectified." It varies in specific gravity from 0 860 to 0·900, and contains several oils which may be separated from each other by proper caution in distilling.

Mansfield succeeded in separating this into at least five different substances. No. 1 boiled between 140° and 158° and smelt like onions: probably a mixture of alcohol radicals. No. 2 boiled at 176° and consisted of benzol. No. 3 boiled at about 235° and consisted of toluol, mainly. No. 4 boiled between 288° and 293° and resembled cumol. No. 5 boiled between 338° and 342° and resembled cymol.

The dead oil is seldom purified. It consists mainly of carbolic acid, aniline, quinoline and several other bodies, mostly hydrocarbons, which boil 290° and 570°, and usually have considerable anthracene in solution. This oil is valuable for its antiseptic properties, and is used to preserve railroad ties in some places. It has been used in common lamps but is chiefly used to make lampblack. Probably the time is coming when this oil will be used for fuel in steam boiler and allied furnaces.

By a slight change in the order of collecting the products of distillation, a green oil may be obtained after the dead oil. This is used principally as a lubricant for railway engines and cars. In some cities the only use to which this tar is put is for roofing purposes. It is then boiled in the open air in pots holding comparatively but a few gallons. When enough of the more volatile products have passed off, the the wholeis run into barrels to cool. When wanted the barrel is knocked apart and the mass remelted.—*Professor H. Poole, in Scientific Commercial.*

The Sun's Atmosphere.

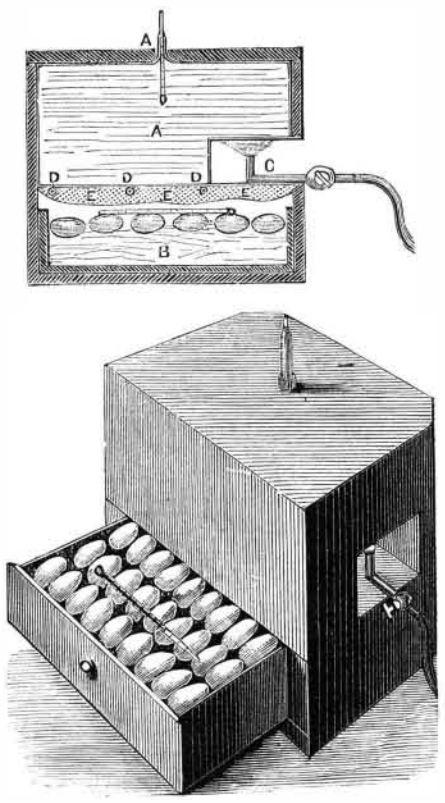
Professor Langley, of Alleghany Observatory, has lately published some results of his steady observations of the solar atmosphere, which, he states, is a thin stratum which cuts off one half the heat which otherwise would reach us. From this it appears that the existence of living beings upon the earth is directly dependent upon the sun's atmosphere, for should that envelope be increased twenty-five per cent in thickness, the mean surface of our globe would, it is estimated, be reduced 100° Fah., in temperature. It has been suggested that the glacial epoch through which the earth passed many ages ago might have been due to a fluctuation in the solar atmosphere.

A Telegraph Cable Pierced by Grass.

At a meeting of the Asiatic Society of Bengal, in Calcutta, says *Chambers' Journal*, a piece of telegraph cable was exhibited, showing that the india rubber covering had been pierced by grass. The piercing was so complete and the contact of the grass with the copper core was so perfect that "dead earth," as it is technically called, was produced, and the efficiency of the cable destroyed. The species of the grass, owing to its dried-up condition, could not be determined. It was suggested as a probable explanation "that the seeds had become attached to the core when under water, and had afterwards germinated when the core was stored."

IMPROVED INCUBATOR.

A correspondent of the *English Mechanic* has recently improved upon the incubator introduced by M. Carbonnier, and we publish herewith an illustration of the apparatus in its present form. "The apparatus," says the writer, "which I used with success, consisted of a box with a zinc case, A, filled with hot water, fixed in the top, and underneath a drawer, B, to put the eggs in, and in which is spread a quantity of hay, so as to line the bottom of the drawer completely C is a small gas burner sufficient to keep the temperature of the water at 110° Fah., for the eggs to become warmed to a temperature of 105° or 104°, to show which a thermometer is laid on the top of the eggs. The upper A is a pipe for supplying the basin with water and to receive the thermometer, which is immersed in the fluid, and shows the temperature. D D

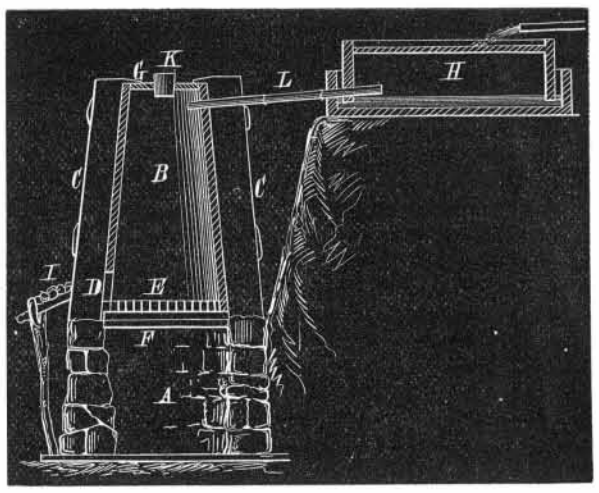


D are three iron rods fixed in from back to front of the box as a support for the zinc case. E is a layer of sawdust, suspended by a piece of muslin (or some such thin material) fastened by a few tacks to the inner side of the box, through which the heat passes, and is at the same temperature and as moist as that which would emanate from the body of a natural mother. The drawer is opened once or twice every day to turn the eggs; and after an incubation of twenty-one days, the chickens will be hatched without any further assistance."

IT is stated, upon German authority, that the unpleasant taste imparted to milk and butter by feeding turnips, etc., may be removed by simply throwing into each pan of milk of 4 or 5 quarts as much saltpeter as will lie on the point of a knife, when a gelatinous mass will separate from the milk and settle to the bottom

The Manufacture of Camphor in Japan.

Dr. A. von Roretz, of Otanyama, Japan, states that the only tree which yields the commercial camphor of Japan and Formosa is the *laurus camphoratus*, which the natives call *tsunoki*. It is very widely distributed in Japan, being equally common on the three islands Niphon, Kinshin, and Sikok; but it thrives best in the southern portion of the kingdom, namely, in the provinces of Tosa and Sikok. The sea coast, with its mild, damp air, agrees with it best; and



hence the chief production of camphor is in these provinces.

Camphor is collected the whole year through, but the best results are obtained in winter. When the camphor collectors find a spot with several camphor trees in the vicinity, they migrate thither, build a hut to live in, and construct a furnace for making the crude camphor. When that place is exhausted, the hut is torn down and carried to another place. The method observed in obtaining camphor is very simple. The workmen select a tree, and with a hollow-ground, short-handled instrument begin to chop off regular chips. As soon as the huge tree falls, the trunk, large roots, and branches are chopped up in the same way, and the chips carried to the furnace in baskets. The furnaces are mostly built on the side of a hill near a stream of water, and serve for the wet distillation of the chips. The furnace is of very simple construction. A small circular foundation, A, is built of stone, and upon this is placed a shallow iron pan, F, two feet in diameter, covered with a perforated cover, E, luted on with clay. This cover forms the bottom of a cylindrical vessel, B, forty inches high and tapering to eighteen inches at the top. Near the bottom of this vessel is a square opening, D, which can be tightly closed with a board. The whole vessel is covered with a thick coating of clay, C, held in place by strips of bamboo. The cover of this vessel, G, which is also luted on with clay, has an opening, K, closed with a plug. Passing through the side of the vessel near the top is a bamboo tube, L, leading to the condenser, H. This condenser is merely a quadrangular box, open below and divided up by four partitions into five compartments communicating with each other. The open side of this box dips into water and is kept cool by water drizzling over it.

The manipulations in the preparation of the camphor are as follows: The cylindrical vessel, B, is filled, after removing the cover, G, with chips of camphor wood; the lid is then luted on, and a definite quantity of water poured in through the hole, K, which moistens the chips and collects in the pan, F. It is now heated gently for twelve hours, a small fire being kept up as soon as the water in the pan begins to boil. The ascending vapors, passing through the chips, carry off all the camphor and oil in the wood, and both are deposited on the surface of the water in the condenser, H. At the end of twelve hours, the exhausted chips are removed through the square hole, D, and fresh chips and fresh water put in. At the expiration of twenty-four hours the process is interrupted, the whole apparatus cleaned, and the camphor collected in H is packed in barrels. Here it is very lightly pressed; and the oil, which amounts to at least 25 per cent, and is as clear as water, is poured off from the solid camphor, and both products are sent to market. At certain places the crude camphor is again pressed somewhat harder, when quite a good deal more oil runs through the crevices in the vessels. The tolerably dry product is sent mostly to Osaka, the chief export town for this important article of commerce. The camphor oil, called by the Japanese *shono abura*, is used by very poor people only as an illuminating oil; and in spite of its strong smell and smoke, it is burned in open lamps. Perfectly pure camphor is not exported, but the crude country product is first freed from the still adherent oil by further distillation in Europe. The exhausted chips are dried on a scaffold, I, by the side of the furnace, and are then used as fuel.—*Dingler's Polytechnisches Journal.*

The Planing Mill Controversy.

The *Northwestern Lumberman*, of Chicago, says; "Planing mill owners throughout the country will be interested to learn that the National Planing Machine Company, of Boston, Mass, recently negotiated in this city the sale of their substitutes for the Woodbury bar, for nine States of the West and South. The consideration we understand to have been $250,000. The purchasers are capitalists of this city and St. Louis; and they have organized a corporation for the purpose of putting the business of the manufacture and sale of their devices upon a sure and permanent basis."

A LITTLE common soap lather mixed with starch gives linen a good gloss.