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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 441,

For the Week ending June 14, 1884.

Price 10 cents. For sale by all newsdealers

THE BROWN STONE QUARRIES OF CONNECTICUT.

Probably the most extensive quarries of red free stone or "brown stone" in the world are on the Connecticut River at Middletown and at Portland, on opposite sides of the river, fifteen miles below Hartford, the capital of the State. The Portland quarries on the east side of the river have been most extensively worked, and the place gives a local name to the stone as "Portland stone."

A recent article in the *Hartford Daily Times* gives an array of facts concerning these celebrated quarries, some of which are quoted in this article. It appears from undoubted historical evidence that these quarries were worked in 1645, 239 years ago, as there is an ordinance alluding to them at that time. The deposit of brown sandstone at Portland covers an area of 200 acres, and is practically inexhaustible. It lies in horizontal strata, usually with each stratum in the upper levels varying a trifle from the other in fineness of the sand. Occasionally there is found an intermixture of fine pebbles. Generally speaking, the deposit is not unlike that of silt upon a beach. In one of the three quarries now worked, several acres have been quarried to a depth of 200 feet below the surface. As an experiment, some years ago, to decide for business reasons the probable depth of the sandstone, a diamond drill was started downward from the 200 foot level. It was driven 312 feet, making 512 feet in all, and without reaching the bottom of the deposit! A core that was taken out showed no material change in the character or quality of the rock.

"The sandstone" says Prof. Rice, of Middletown, "was deposited in a long, narrow estuary, extending from New Haven nearly to the northern boundary of Massachusetts. No fossils have been found except trunks of trees and tracks. The latter are probably not tracks of birds, but of reptiles and amphibia." The latter opinion, it will be noted, is directly contrary to the popular belief in the "bird tracks," for which the Portland quarries are widely known. The sandstone lies in horizontal strata, usually, and every few feet there is a well defined horizontal crack. On lifting a flat section of stone, the tracks are found on the surface of the stone beneath, with corresponding projections of the upper stone fitting into them. Professor Dana, in that model text book, "The Geological Story briefly Told," coincides with Professor Rice that the tracks are those of reptiles and amphibia. The late Edward Hitchcock, father of the present State Geologist of New Hampshire, and a famous writer on geological topics, was the first to assign to these fossil tracks in the Connecticut Valley sandstones their true significance in geology. His views were received with incredulity at first, but have since been adopted by the scientific world.

The stone is removed by blasting and by drilling and splitting. The blast is generally of powder in a single hole—from 25 to 60 pounds of powder in a nine inch hole 15 or 20 feet deep. The object of this is to shatter the rock, so that it may be easily broken into rubble for foundations. When large and regular blocks are required, a chiseled cut is made one or two inches wide and of varying depth, into which wedges are driven with sledges, and the block slides off at the interception of a horizontal seam. Flood, the California millionaire, has given the Middlesex Quarry Company an order for the stone for the grand mansion he is to erect in San Francisco. It calls for 40,000 cubic feet of best quality, such as is used for monuments. This will make twenty-five schooner loads. It is shipped to Newark, N. J., there dressed, boxed, and sent to New York, to be shipped for a four months' voyage around Cape Horn. The freight is $7 per ton, and Flood pays, therefore, $28,000 extra over the cost of putting up a similar building in New York. It is estimated that the bill for stone, when set in the walls of his residence, will amount to $200,000, but this is a small amount for the mere shell of the house, whose total cost will be nearly $2,000,000.

GAUGES FOR MECHANICAL WORK.

In a lecture delivered before the Franklin Institute a short time ago and recently published, Mr. George M. Bond spoke of the modern accuracy in the work of the machinist as compared with former crudity. James Watt, in a letter to a friend, claimed that he had attained remarkable accuracy in boring a cylinder of a steam engine and fitting its piston so closely that "the thickness of a half crown could not be introduced between them." Standard gauges are now made that show errors of one one-hundred-thousandth of an inch, and work is exacted to one fifty-thousandth of an inch. Such accurate work is not, however, generally necessary, except in the construction of gauges; but these standard gauges are the means provided for keeping within proper, useful, and practicable bounds in the production of thousands of pieces of the same size and shape in which oftentimes a certain amount of variation is allowed both *plus* and *minus*. A certain amount of looseness must be allowed, for instance, in the fit of journals and bearings, the amount to be determined according to the length and size of the journal; but this variation should be referred to some particular gauge as a standard.

This allowance of difference is necessary in the fittings of bearings and journals, as, if made with the extreme accuracy of gauge work, the surfaces would cohere and speedily destroy each other. This is seen in the construction of end measure pieces as gauges; where two are pressed together by their ends they will cohere even in a vacuum. In the perfect fit of plug and ring gauges where the plug is inserted in the ring, both being of hardened steel and both at the same temperature, it is necessary to keep the plug moving, or the easy sliding fit will change to a driving fit. In fact, there is no room for one to expand and not the other. A plug gauge of three-quarters of an inch diameter, but which is three-ten-thousandths of an inch smaller than the ring, is a loose fit which can be tested by feeling; and if the plug and ring are clean and of the same temperature, the plug will drop through the ring.

In order to make standard gauges within the limit of accuracy necessary for interchangeability, to fulfill the requirements of modern shop practice, line measure is the best standard for practical reference. This measurement is by means of engraved lines on a ruled steel bar, the tests being made by the microscope. For this purpose a hardened steel bar is used, the subdivisions being ruled or engraved by a diamond.

OUR NEW SUPPLEMENT CATALOGUE.

A new catalogue of valuable papers contained in the SCIENTIFIC AMERICAN SUPPLEMENT is now ready, and will be supplied gratis to all readers who choose to send us their names.

This catalogue exemplifies the astonishing progress that is now being made in the various branches of science and the arts. Not quite ten years have elapsed since the publication of the SUPPLEMENT was begun; yet within this brief period many important discoveries have appeared and many great works have been undertaken or completed. Among them the Telephone, the Electric Light, the Panama Canal, the Brooklyn Bridge, the St. Gothard Tunnel, are conspicuous. The SUPPLEMENT records the complete history of these and many other useful achievements; it presents in compact form the most recent papers by eminent writers in all the principal departments of general, technical, and theoretical science, embracing Biology, Geology, Mineralogy, Natural History, Geography, Astronomy, Archæology, Chemistry, Electricity, Mining, Mechanical Engineering, Technology, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. The array of authors is great; it includes almost every prominent name connected with science, such as Huxley, Tyndall, Crookes, Maxwell, Siemens, Reynolds, A. M. Mayer, Bessemer, Tissandier, Dumas, Gladstone, Newberry, Remsen, Leeds, Mallet, Thompson, Hughes, Hopkins, Trowbridge, Ericsson, Copeland, Sellers, Eads, MacCord, Hammond, Loomis, and hundreds of others. Most of the papers contained in the SUPPLEMENT are illustrated, many of the drawings being to scale.

The new catalogue occupies 24 large quarto pages, same size as SCIENTIFIC AMERICAN. The extensive range of its subjects will be understood when we state that it includes over 5,000 titles. Stereotype plates of all the issues of the SUPPLEMENT have been preserved, thus enabling us to supply, on call, any particular numbers that may be desired, at 10 cents per copy. No periodical in the world offers so large and varied a collection of scientific, technical, and useful papers, all of them readily available to the public at a low price, as the SCIENTIFIC AMERICAN SUPPLEMENT. As before stated, the new catalogue will be sent, free of charge, to any desired address. Send for it to Munn & Co., 361 Broadway, New York, office of the SCIENTIFIC AMERICAN.

A SUGGESTED LATHE IMPROVEMENT.

The ordinary back-geared engine lathe of the machine shop is not a special tool, it being used generally for turning, boring, and screw cutting, and frequently for drilling and chucking. There are, however, special lathes, as boring lathes, pulley lathes, and others. It is proposed to add to the list of special tools for the machine shop a screw cutting lathe of a pattern somewhat different from the ordinary back-geared lathe. In constructing a special machine recently, on which the principal rotating spindle had to be reversed in motion instantly and frequently, the superintendent introduced a supplemental spindle carrying two step cones with their small ends contiguous. These turned freely on the spindle, and were belted to run in opposite directions. Between them was a sliding friction clutch that by a very slight movement of a lever could be made to engage with either cone, as desired. The arrangement suggested the possibility of an improvement in screw cutting lathes by constructing the lathe head in a similar manner, and dispensing with the overhead clutch, which requires so long a lever that the time used up in shipping interferes with accuracy of work.

The details are not completed as yet, but the superintendent, who is a skillful mechanic, is confident that much is to be gained in the way of positive and instantaneous reversing by having the clutch directly under the operator's hand.

A REMARKABLE STRAIGHT EDGE.

Some notice was made in the SCIENTIFIC AMERICAN of March 29, 1884, of a trio of remarkable straight edges made by the Pratt & Whitney Company, Hartford, Conn., which are each 12 feet long and wonderfully exact. These straight edges are castings of iron, forming a chord and a segment of a circle, the extreme radius in the center, from the chord or straight line to the highest point of the curve, being 20 inches, the depth gradually tapering on a curve. The width on the face is about 2½ inches, making a face 2½ inches by 12 feet. Between the chord and the curve the casting is a honeycomb of diagonal braces. Recently some remarkable tests have been made with these straight edges, one of them being a test of flexure. The straight edge was placed on a true and perfectly clean planer bed, with a slip of tissue paper under

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each end. These slips raised the entire straight edge, so that another slip of tissue paper could be moved under its face from end to end. Then a man weighing 220 pounds sat on the center without deflecting the straight edge a particle. But in order to avoid all opportunity for error on account of the possible inequality of the planer platen, two of the straight edges were placed face to face, one on the other with the shims of tissue paper between, and the superimposed weight of a heavy man, with the same result; the middle slip of tissue paper could be slid between the two faces at any point between the end shims. It is doubtful if better accuracy has ever been secured.

Milk Testers.

The instruments used for testing milk are the thermometer, the cream gauge, the lactometer, the lactoscope, the pioscope, and the lacto-butrometer. The value of milk testers has, however, according to the *Farmers' Gazette* (Dublin), been but little appreciated by British dairy farmers in the past.

"In all those countries with which British dairy farmers have to compete the farmer would be laughed at," adds the *Gazette*, "who would attempt the making of either cheese or butter without testing apparatus. A dairymaid would be surprised if you proposed to make butter or cheese without a thermometer, and even a complete set of testing apparatus, to enable her to go to work scientifically and successfully." It is therefore satisfactory to note "that dairy farmers and town dairymen in England are becoming alive to their position in competition with the continent of Europe, the United States of America, and our colonies."

The proportion of cream in any sample of milk can be determined by the cream gauge, which is simply a glass tube, about five inches long, graduated from zero downward. The milk to be examined is poured into this tube up to zero, and allowed to stand about twelve hours, at the end of which time the cream will have raised to the top, and its percentage may be read off. This instrument, although very useful to those who sell cream, is not reliable in detecting the adulteration of milk.

The lactometer, or hydrometer for milk, indicates the specific gravity of milk; that is, the relative difference in weight between milk and water. The specific gravity of water is 1,000, and that of milk may be taken to average about 1,030.

The specific gravity of milk varies, however, not merely with the amount of water it contains, but with the amount of butter fat in its composition, and for this reason the lactometer used alone is of little or no practical value. As cream is lighter than milk, and of nearly the same specific gravity as water, it follows that when milk is very rich, or contains a large proportion of butter fat, its specific gravity is less than the ordinary standard, and if tested by the lactometer alone might give the idea that it had been watered. A cream gauge should therefore always be used in connection with the lactometer, in order to test the amount of cream or butter fat in milk.

The best instrument for testing the value of milk hitherto invented is the so-called lactoscope. This shows, with considerable accuracy, the percentage of fat; and fat, being the most valuable constituent of milk, forms a safe gauge as to the purity and value of the milk.

The action of this instrument depends upon the fact that the opacity of milk is chiefly caused by the globules of cream So that when water is added to milk until we can see through a certain proportion of it, we are able to do so because we separate the cream globules to that extent that light can pass through between them with a certain degree of clearness. Then, if we measure the amount of water added, we have quite an accurate gauge for comparing different samples of milk.

Overcrowding the Principal Cause of Diphtheria.

Dr. T. J. Hutton has, within the past three years, treated sixty-four cases of diphtheria, occurring in Minnesota, and says in the *Medical Record*: These cases were all in comparatively new houses, in a belt of country where white men never lived before, so that the soil contained no sewage and had no accumulation of surface filth. Diphtheria had never before been there, and could not have been brought by visitors; it was of a malignant type, and some families lost five and six members each. All of the cases were included in seventeen rural outbreaks, three of which were in summer and fourteen in winter, and every house attacked was small and greatly crowded. Many of the winter outbreaks happened when the temperature was 30° to 40° F. below zero, which would have been death to all ordinary surface germs, and in one instance the thermometer registered 60° below, when the surface of the earth and all bodies of water were frozen solid. From the experience thus derived, of all the details of which a careful record was kept, Dr. Hutton adopted a plan of treatment, which he summarizes as follows:

1. Diphtheria is caused by ochlesis, or crowd poison. 2. It is an emergency—"an event or combination of circumstances which calls for immediate action or remedy." 3. It is at first a local disease, resembling the animal poisons—snake bite, mad dog bite. Properly treated in this stage, it is one of the most curable of diseases. 4. It is contagious and infectious, and the poison may retain its vitality from three months to two years. 5. This poison is not identical with that of measles, croup, or scarlet fever, nor is it intimately related to them. 6. Diphtheria may occur sporadically; any small overcrowded, ill-ventilated house may prove a diphtheria factory. 7. Its period of incubation is from twelve hours to several days. 8. Directly, temperature none; indirectly, much. Crowding can occur in any temperature; practically it occurs most in cold weather. 9. In the local stage there is but one indication—to destroy the false membrane already formed; prevent further formation and spread. For this only two remedies are required as a rule. 10. In the stage of systemic infection there are two indications—the foregoing, and to support the system. A remedy or combination, internally, with food and stimulants meets this indication. 11. An abundance of pure air is the first requisite in treatment. 12. Being an asthenic disorder, and prone to heart failure, rest in the recumbent position and warmth to the extremities assist in the cure. 13. The physician must not only prescribe, he must administer the local treatment, when present, and see to it that food and medicine are administered punctually in his absence. 14. The physician should visit severe cases three times a day; all cases at least once a day for the first nine days. 15. The physician should not despair, though called late. I have seen patients, apparently moribund, restored by fresh air and food alone. So have other observers.

The two remedies used in the local stage are lunar caustic and chlorate of potassa. Twenty grains of the former in one drachm of water is applied thoroughly every hour or two to the affected parts, and continued so long as there is formation of membrane, whether two days or seven. A saturated solution of the chlorate is used as a gargle every fifteen minutes. One ounce and a half of potassa is ordered to eight ounces of water. The latter administered internally, if the patient be too young to gargle. I use none but Squibb's. Common liquid food. This has been the sole treatment when called early.

With the second stage, or to forestall it, comes the second indication, to support the system, "the disease being perhaps of more lowering character than any other with which we are acquainted." As a rule, three remedies meet this indication: Chlorate of potash, tincture of iron, and quinine. For adults these formulæ are used:

Tincture ferri chloride, ʒ v. Quin. sulph., gr. xvj. Sirup cort aur., Aq. M. P., āā q. s. ad ℥ iv. A teaspoonful every two hours.

Potass. chloral, ʒ iv. Aq. dest., ℥ iv. A teaspoonful every two hours.

These are administered alternate hours, night and day, if patient be awake.

Five remedies—lunar caustic, chlorate of potassa, tincture of iron, quinine, and carbolic acid—meet both indications fully as a rule. In all cases carbolic acid is used as a disinfectant, and in nasal cases it is used in the form of a vapor, or in glycerine, or in a one per cent aqueous solution.

In the septic stage the diphtheria patient can hardly be overfed or over-stimulated. Many die for want of food and stimulants to tide them over, the popular notion being that sick people do not require food, especially those who manifest febrile action. Two quarts of milk, each pint holding a fresh egg in solution, one cupful of homemade beef essence, properly seasoned, a pint of pure port wine, or half that quantity of pure brandy, form a fair skeleton of one day's rations for an adult. Food and stimulants are administered every hour.

How Paper Pails are Made.

At a paperware factory in Syracuse, N. Y., intended to turn out 500 paper pails a day, the process of making is thus described in a local paper:

Rags and paper waste are steamed in vats for a few hours, and then thrown into beating troughs partly filled with water. The "beating" is done by a revolving cylinder with fifty knives set at different angles. The knives reduce the rags to a dirty purple pulp, and change the newspaper wrappers to a soft mass. About 400 pounds of material are put under each beater. When paper and rags are each reduced to pulp, the opening of a trap lets it run into the stuff chest in the cellar. One part of rag pulp to three of paper is run into the chest. When pumped from the stuff chest into the trough of the winding machine, the future pail looks like thin water gruel. A hollow cylinder covered with brass wire splashes around in the trough, and the pulp clings fast to the wire. After the cylinder has performed a half revolution it comes in contact with another cylinder, covered with felt, that takes off the pulp. As the large cylinder goes down on the return trip, and just before dipping into the trough again, all little particles of pulp sticking to the wire are washed off by streams of water from a sieve. On the inside of the cylinder is a fan pump that discharges the waste liquid.

From the felt covered cylinder the pulp is paid on to the forming cylinder, so called. It is about the shape of the paper cone caps worn by bakers and cooks, but made of solid wood and covered with zinc, with the small end or bottom part of the pail toward the workman. The forming roll drops automatically when pulp of the required thickness is wound around it. From here the now promising pail is put in the pressing machine, which looks something like a silk hat block, in six sections, with perforated brass wire upper faces. The sections move from and to a common center, and the frame is the exact size of the pail wanted. The workman drops his damp skeleton of a pail into the frame, touches a lever, and the sections move to their center and squeeze the moisture out of the pail. The pail is still a little damp, and spends a few hours in the drying room at a temperature of about 150°. The sections of the pressing machine mark the bands which are seen on the finished pail. After it is dry the pail is ironed, or calendered, as it is called. The pail is drawn, like a glove, over a steel forming roll, which is heated, and is ironed by another revolving calender, with steam thrown on the pail to keep it moist as if it were a shirt bosom. The pail, or rather its frame, is pared at each end, punched with four holes to fasten on the handle, and corrugated, or channeled, for the putting on of the iron hoops. A wooden plate large enough to spring the pail so that the bottom can be put in, is inserted and the paper bottom held under a weight which drops and knocks the bottom where it belongs. The factory has a machine of its own invention for the bending of the hoop into shape.

After it has been cut to the proper length and width, the straight strip of iron is run over a semicircular edge of steel, on which it is held, and drops on the floor a round hoop with a fold in the middle to catch the top and bottom edges of the pail. After a waterproof composition is put on, the pail is baked in a kiln for about forty-eight hours at a temperature between 200 and 300 degrees. It is dried after its first coat of paint and sandpapered, and then takes two more coats of paint, with a drying between, and a coat of varnish which is baked on, before—with its wooden handle and brass clamps—the pail is ready for the hand of the dairymaid, hostler, or cook.

Insect Pests.

A subscriber to the *American Cultivator* relates how it sometimes happens that the destructive pest known as the canker worm makes its appearance on the apple tree all of a sudden, even where it has not been in the habit of visiting. Then, of course, it is too late to use any preventive, therefore a cure must be sought. I have found, says the writer, under certain conditions that this worm can be destroyed by the use of Paris green. Put a heaping teaspoonful of Paris green into a pailful of water, apply the mixture with a force pump, throwing the water through the tree thoroughly. This should be done as soon as possible after the presence of the worm is ascertained. I found one application to be sufficient. Soon after the application of the liquid, the worms can be seen to let go and string down from the tree.

The present is the time for looking after the currant bushes, and if the currant worm makes its appearance, apply powdered hellebore. Place the powder in a common dredging box, and sprinkle the bushes when the dew is on. I have usually found it necessary to go over them when in blossom, then again after the fruit is set and of considerable size. This remedy has never failed with me, and does not injure the fruit.

The Corrosive Action of Cements upon Metals.

The late Mr. J. C. Trautwine, civil engineer, published a brief memorandum, giving the result of some experiments which he had made to determine the corrosive action of hydraulic cements upon metal embedded in them. The cements used were English, Portland, and Louisville; in addition to which he tried plaster of Paris pure, and also mixed with equal measures of the cements. All were of the consistency of common mortar; and all were kept in an upper room during ten years, unexposed to moisture other than that of the indoor atmosphere. The metals were partly embedded in the pastes, and partly projected from them. They consisted of cut iron nails, some of which were galvanized; smooth iron wire nails; brass in both sheet and wire; zinc in sheet; copper wire; and solid cylinders of lead ⅜ inch diameter. The result at the end of the ten years was that all the metals in both the pure cements were absolutely unchanged; and this was also the case with the plaster of Paris, with the exception of the ungalvanized nails, which had become covered with a thin coating of rust, as were also those in the mixtures of plaster and cement, but to a less degree. Mr. Trautwine concludes from his experiments that if dampness be excluded, both cement and lime mortar will protect from injury all the metals employed in ordinary constructions for an indefinite time.

Forbidden Coloring Materials in France.

Serious accidents have frequently resulted from the employment of wrapping paper colored with poisonous materials for packing alimentary substances. The "Prefecture de Police," Paris, have therefore issued the following regulations:

Manufacturers and dealers in all kinds of food are forbidden to use the undermentioned colors, and will be held personally responsible for any accident which may occur from such use of them.

MINERAL COLORS.

Containing copper—"Cendres bleues," mountain blue. Containing lead—Massicot, minium, pale orange, oxychloride of lead, Cassel yellow, Turner's yellow, Paris yellow, white lead, ceruse, silver white, Naples yellow, sulphate of lead, chrome yellow, Cologne yellow, chromate of barium. Containing arsenic—Arsenite of copper, Scheele's green, Schweinfurt green, vermilion.

ORGANIC COLORS.

"Aconit Naples;" fuchsine and its immediate derivative, such as Lyons blue, eosine; coloring materials containing nitrous compounds; such as naphthol yellow, Victoria yellow; tropeolines, xylidine red, etc.

Children's toys must not be colored with poisonous pigments.

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The Cod Liver Oil City—Hammerfest.

If we pass the wonderful Lofoden Islands, and continue the route toward the north, we arrive at Hammerfest, where we quit the birds for the fishes. As for the city itself, imagine a town watered by cod liver oil, and you will have some notion of the odor. The captain had warned the party beforehand, but their handkerchiefs steeped in eau de Cologne were but a slight defense. This horrible smell is due both to the important manufacture of the oil and to the thousands of fish on burdles drying in the sun.

The two to three thousand inhabitants of Hammerfest, the most northern town in the world (71° N.), are all occupied in this trade. Suffice it to say that a single boat well equipped, well stocked with bait, and in a good place can take from 500 to 600 cod a day. The scientific estimate that the ovary of a female of ordinary size contains nine million eggs. This is the mode of preparation:

First they remove the head and abdominal viscera; the ovary serves for bait; the liver yields the oil. Not long ago the heads were wasted; now they are dried and powdered and used as manure for poor land.

The body, dried hard and rolled in sticks, is called stockfish, which is imported chiefly into Greece, Italy, France, and Spain.

The fresh livers are piled in barrels, slightly pressed, and the virgin oil runs out, unfortunately a kind rare in pharmacy, though its quality is beyond doubt superior. Then the livers are treated by a press similar to those used in Normandy for cider.

This is oil, second quality; color, reddish brown.

The waste livers are subjected to strong heat, and an oil is produced, third quality and black.

Whales afford an industrial occupation at Hammerfest.

The day before the arrival of Monsieur Labonne, the fishermen had caught a whale without trouble. The creature had stuck in a small creek which made a sort of natural trap, and it was unable to regain the open sea. The captain was asked what might be the value of the fish; and he replied 6,000 crowns (£336). They begin with selling rather dearly the 600 or 700 fins or whalebones; then they make great profit out of the immense quantity of fatty matters contained in the huge creature. This fat, improperly called oil, is naturally liquid, and is used for dressing skins. Beside the oleine, margarine, and phoceine, there is a volatile principle of the odor of leather, which gives the latter its characteristic smell.

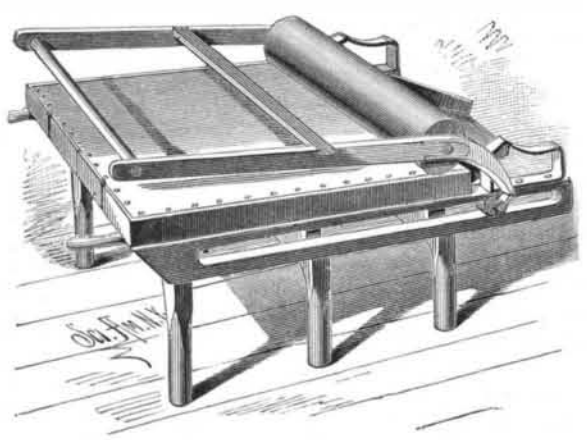
Turning to quite a different train of ideas, there is a monument at Hammerfest erected to the memory of Struve, who measured an arc of meridian from Ismail on the Danube to the frozen ocean precisely at this spot.

Farther north all cultivation disappears, and tree vegetation ceases—nothing but an underwood of stunted birch and willow.

Fish, even the largest, is caught with extreme ease; the large red hooks are scarcely plunged into the water than up comes an inhabitant of the sea, not a miserable specimen, but weighing some pounds at least.

MACHINE FOR WORKING BUTTER.

Upon each side of the stationary portion of the working platform, which is fastened to the middle of a common frame, are hinged parts that have handles at the outer back corners to aid in raising them when it is desired to throw the butter on to the middle of the table. When the leaves are open, the top of the table is a plane surface with a slight incline forward to carry off the water from the butter; and to prevent the water running over the edges, small grooves are made near the edges of the leaves. The connecting arms are made of iron, one end being firmly bolted to the levers and the other end being provided with a roller which travels in a groove in the side of the frame. The levers carry the working roller. This construction of the lever admits of a



WASSON & HITT'S MACHINE FOR WORKING BUTTER.

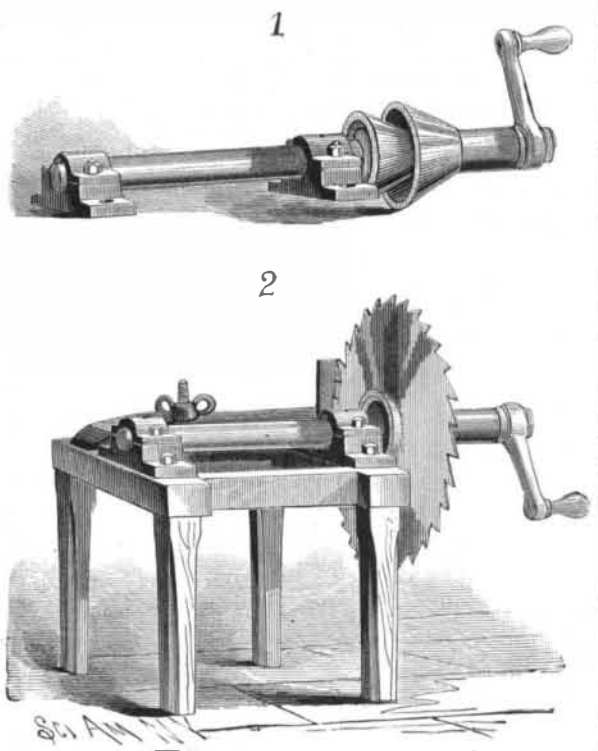
free motion backward and forward, or upward, at the option of the operator. A sheet of white cambric or flannel is fastened over the entire table.

The machine is operated by placing the butter in the center of the table, and then working the roller backward and forward by means of the lever handle. When the butter has worked its way nearly to the outer edges, it is thrown back upon the center of the table, by first raising the lever out of the way and then lifting the side leaves.

This invention has been patented by Messrs. J. Wasson & R. T. Hitt, of La Porte City, Iowa.

IMPROVED SAW ARBOR.

The engraving represents a cheap and effective device for holding circular saws for the purpose of jointing, setting, and filing them. The saw arbor or mandrel is journaled in bearings on a suitable frame, and at one end is made cone-shaped as shown. A corresponding hollow cone and shaft fit over the arbor and cone; the hollow shaft being of less length than the inner one. When it is desired to clamp a saw upon the arbor, the hollow cone is removed, and the hole in the saw placed so as to rest upon the face of the cone when the hollow cone is replaced and its end pressed against the face of the saw. The sleeve is then washered up



HACKET'S IMPROVED SAW ARBOR.

until the washers abut against the nut on the end of the shaft. Upon tightening the nut the saw is pressed against the cone and held firmly in place. Means for revolving the arbor, either by pulley or crank, are provided. The file is carried upon the end of the upper of two cross bars, which are adjustably clamped upon the upper and under surfaces of the side bars of the frame by a bolt and nut, as shown in the perspective view. With this device saws having eyes of different sizes, from the diameter of the shaft to the greatest diameter of the cone, can be held securely in place.

This invention has been patented by Mr. T. N. Hacket, of Emporium, Pa.

Electricity and Vital Power.

If we wish to judge of the electrical condition of the atmosphere, we do not examine for that purpose a paving-stone, the trunk of a tree, or the surface of a lake. They undoubtedly experience the effects of the changes for which we are looking, but they are not fitted to show them, and we select instruments which are *sensitive;* that is, those whose structure enables them to make manifest the changes as they occur. And we must apply precisely the same method of common sense if we would fairly learn how real and decided is the effect of atmospheric electricity on human health. We are well aware that the degree of individual susceptibility to the influence of external causes varies most remarkably, and this is true of morbific causes as fully as of any others. The "seeds of disease," to adopt a popular term (whether we accept the *germ theory* or not), are floating about us in myriads without number, and are inhaled by us with every breath, and yet the diseases are manifested only here and there, wherever the "seed" finds a susceptible point for its growth. In the same manner, though the electrical influence may come alike upon all, yet is its effect made manifest to us in certain cases with great power, while in others we fail to detect it.

Inasmuch as the two forces have so much in common, it is reasonable to infer that any disturbance of the nerve force should be greatest and most easily seen and measured where the vital powers were in an enfeebled condition, and most strikingly of all where the nervous system itself was in an irritable hyperæsthetic state; and this is precisely what is noted in constant clinical observation. Every physician whose line of practice brings under his charge many patients suffering from depression of nerve force, that which is of late recognized as *neurasthenia*, sees daily proof that they are more sensitive to electrical changes than any electrometer. The approach of a thunder shower is felt and mentioned by them often twelve hours or more before its arrival. Sometimes it causes an intense pricking and tingling of the skin, "like ten thousand needles," as they express it. Not unfrequently it induces active and even violent disturbance of the bowels, which will not subside without assistance, even after the cause has passed away.

Very often, in those hysterically inclined, it brings on hysterical unconsciousness, lasting many hours. And where no physical demonstrations occur a heavy mental depression, what they often term "a fit of the blues," gives evidence that the electrical force is bearing down the nerve force sadly. And it must be noted that these effects are not to be confounded with those produced by fear of the thunder; to those we make no reference.

Still again, without any electrical display in the form of lightning and thunder, there often come similar conditions of the atmosphere, continuing for, it may be, many days, and during the whole of that time every nervous patient is under a burden, though commonly ignorant of the true cause, and disposed to attribute such bad feelings to this thing or to that, as may be, and to try the patience not a little of friends, and perhaps of the physician, unless he recognizes the truth.

We set forth this class of sufferers as the nerve-electrometers, only because they manifest the changes so conspicuously. But whenever the vital force is enfeebled by specific or organic disease it is entirely easy to see how powerfully the electrical conditions of the atmosphere may intervene to determine the probabilities of life or death. When the power of life is barely able to hold its own in the struggle, a very slight cause of depression may be sufficient to turn the scale, and death will be the result; and it is sure that we have in atmospheric electricity a force which is capable of producing that result.

We have thus far been discussing only one side of the question, but very fortunately there is an opposite influence. Those degrees of tension which are seeking relief by discharges more or less violent, we have seen to weigh heavily on the vital force, but the stages of greater equilibrium show, as we might expect, precisely antagonizing effects. Even those of us who are in perfect health notice it. We say that the air is "bracing," etc., and it is perfectly sure that the sensitive, hyperæsthetic patients, of whom we have been speaking, respond to the influence, and the physician on his rounds learns to expect it, and is not disappointed as he finds one after another of them, like an old-fashioned weather-glass, pointing to "set fair."

No sufficiently extended observations are as yet on record to enable us to judge how closely the condition of atmospheric electricity is associated with the spread and continuance of epidemics of various diseases. That is yet to come.

W. O. A.

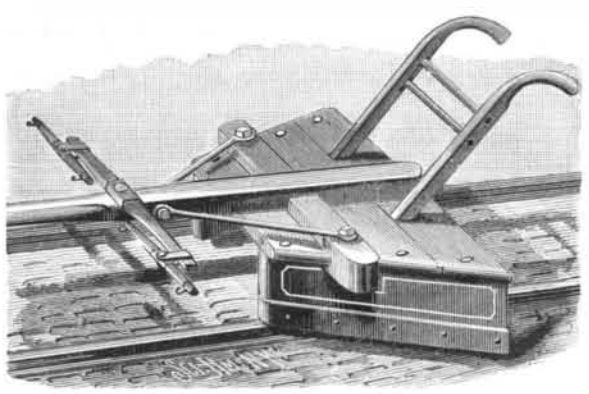
[Our correspondent makes some very strong assertions; but he fails to present any evidence for the support of his electrical theory. Our impression is the humidity, varying pressure of the atmosphere and fluctuations of temperature, would account for nervous disturbances better than the theory of atmospheric electricity.—EDS. S. A.]

Successful Men.

In every class of business the princes of the trade are the men who began with nothing, and who look around on all the attainments of their age with the honest gratulation that they have been dependent for their success and prosperity upon their own integrity, fidelity, and skill. And the circumstances of the commencement of active business life should not be regarded as a reason for regret or a cause for sorrow, for there is no other process less painful or harassing which will so surely stir up the gift which may be in a man, and bring out for circulation and use the veins of gold which may be embedded in his hidden mines. If he be faithful, honest, honorable, his early straitness of condition will be an everlasting blessing. It is a soil that will yield to appropriate cultivation the richest and most lavish fruit. But it will involve care, thought, labor, purpose, and unshrinking honor to prevent its becoming not merely a perplexity in occupation, but a poison to the soul.—*U. S. Economist.*

CAR TRACK CLEANER.

The device herewith shown is for clearing snow, mud, etc., from horse car tracks, and was recently patented by Messrs. J. G. Holden and J. E. Coe, of Danville, Ill. The scrapers are made of wood and are shod at their lower edges with steel plates; they are attached in oblique positions to the cross bars, as shown in the cut, so that the forward ends are a less distance and the rear ends a greater distance apart



HOLDEN & COE'S CAR TRACK CLEANER.

than the rails. To the rear are secured handles by which the cleaner may be placed upon and guided upon the track. The tongue which carries the ordinary whiffletrees for attaching the team to the cleaner is secured to the heavy cross bar and is braced by rods.

The cleaner is to be used after an ordinary snow plow has been passed over the track, and while being drawn along the track it will be so guided by a person at the handles that the shoes will run fairly upon the heads of the rails. The shoes are made thin and sharp, so that they will effectually remove all snow and ice.

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