

Reported for the Scientific American.

GLEANINGS FROM THE POLYTECHNIC ASSOCIATION.

The regular meeting of this branch of the American Institute, was held on Friday evening, January 4th, Prof. Tillman presiding.

In continuing the subject laid over from the last meeting Mr Walling read a paper on the

THE NEBULAR THEORY.

All inquiries into the origin of the earth must be more or less speculative in character. Theories can only be formed when facts are sufficiently numerous to fully establish them. In the meantime those hypotheses which best explain all known facts, and include the greatest number under simple laws, seem most likely to be finally accepted; for this reason the nebular hypothesis has been so generally received by scientific men. A paper was read at the last meeting, opposing that portion of the theory which supposes the earth once a molten mass; and to point out the fallacy of the arguments then employed, is the object of this article.

Mr. Wood stated in that paper, first, that since force cannot exist independently of matter, no condensation of nebulae could have taken place, because the consequent radiation of heat into space where there was nothing to receive it, would be impossible. We know that the sun and fixed stars are continually radiating heat into space, and if force cannot exist independently of matter, we have the ether, a material medium, which can receive the radiations and transmit them indefinitely. His statement that solidification in a melted mass will commence at the center, is refuted by the fact that the maximum density of liquids is reached at a higher temperature than that at which they solidify.

LIQUIDITY OF THE EARTH'S INTERIOR.

Among the geological evidences that the earth once existed in a molten state and is now liquid at its center, are included, the regular increase of temperature from the surface downward, volcanoes and the connection between their eruptions and earthquakes, the gradual elevation and depression of continents and ocean beds, and the direction of mountain chains, as if formed by the contraction of a molten mass.

Mr. Wood attributes these phenomena to the influence of some central orb, which acted in some manner analogous to the influence of the moon in causing the tides. We know that the tides are due to gravity between the moon, sun and earth, but the force capable of producing such various changes without manifesting itself correspondingly upon the ocean, is widely different from any force now known to us.

The laws by which solidification takes place under great pressure are not well enough understood to show the truth or fallacy of the argument that fluidity of the earth's interior is counteracted by the pressure it sustains. Such experimental knowledge as we do possess points in the opposite direction, proving that pressure lowers instead of raising the freezing point.

By the nebular hypothesis, innumerable facts are explained which cannot be accounted for in any other way, and not a solitary fact in conflict with it can be brought forward.

COSMOGONY.

Dr. Bradley also read a paper on this subject, assuming as the fundamental principles of the nebular theory, the indestructibility of matter, the existence of ether filling all space, by or from which are developed all forces, and these like matter, are eternal, and all their modifications consist in varying the forms of undulations of ether. The inconceivable attenuation of the molecules of nebulae, find a counterpart in air, which though so distended, defies the philosophers to create a vacuum.

HOW THE NEBULE WERE FORMED.

Astronomers tell us that the solar system is rapidly moving in space, making a great revolution occupying billions of years for its completion, around the star Alcyon in the Pleiades. Is it not reasonable to suppose that, at some time, there should be a great astral winter, and again after the lapse of billions of years, an astral summer with a temperature many degrees higher than that required to gasify all matter or resolve it into nebulae? When in this state, the opposing forces, gravity and heat, would balance each other, and matter would be in a state of quiescence. But the mass is moving to a colder region, and gravity begins to act, contracting and drawing the molecules to a common center.

SOLAR SEGREGATION.

When a fluid is poured through a funnel rotation takes place: so it will be whenever a fluid, elastic or non-elastic, is gathered toward a center. In this case rotation begins, and continues with an accelerating velocity, an equatorial belt swells out, and thus an oblate sphere is formed. Condensation from cooling renders the exterior matter less mobile, the specific gravity is increased, the centripetal equals the centrifugal force, or force of gravity, and a ring is formed, which finally detaches itself, leaving the interior part to repeat the process: thus ring after ring is thrown off, till the sun has reached its present dimensions. Each of these rings still revolving, gradually contracts in volume, its diameter remaining the same, till another separation takes place, the inner portion collected revolving within an orbit. We note the rings of Saturn as proof of this hypothesis.

METEORS.

Satellites and the asteroids, were in like manner formed, but comets are due to the agency of the tangential force aided by heat, being thrown off from primaries, secondaries, or comets themselves, and may we not suppose some small comet performing its round every thirty-three years, which gives off a little spray at each perihelion passage, causing the tricennial meteoric displays?

THE SUN'S SPOTS.

As seen through the telescope, the spots are continually

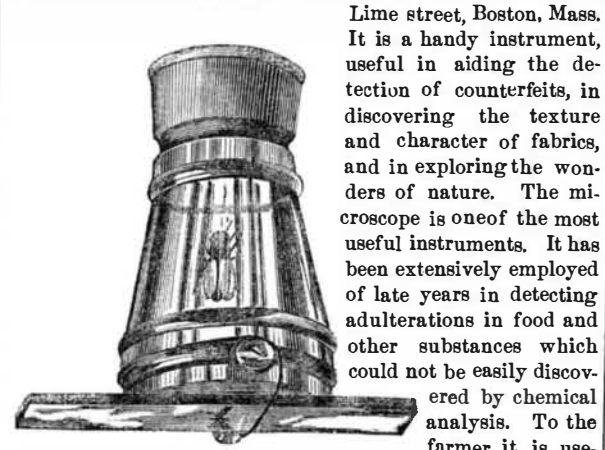
changing, and show all the signs of mobility characteristic of masses floating in a molten liquid, and melting and sinking away. To credit the fanciful notions often received to account for these spots would prostrate the doctrine of the conservation of force and undulations of ether. The hypothesis I would advance in regard to these spots, is based upon the assumption that they are the manifestation of an effort on the part of nature at incrustation. When molten matter crystallizes, it is lighter than the molten mass and floats upon it, but when the crystalline mass is cooled, it contracts and tends to sink.

Suppose a crystalline mass of the sun's surface, cooling on its upper surface, and enlarging on its lower, till the increasing specific gravity causes it to plunge beneath the surface of the molten mass.

Following Dr. Bradley, Professor Stevens made some interesting remarks upon the gold fields of North Carolina, explaining also the geological formation where the precious metal is found, and naming the widely-extended districts over which it is scattered. Space this week will not allow any further presentation of the facts brought forward by the erudite Professor.

A CONVENIENT AND CHEAP MICROSCOPE.

The engraving shows a complete microscope, full size and exact form, constructed and patented by O. N. Chase No. 3,



Lime street, Boston, Mass. It is a handy instrument, useful in aiding the detection of counterfeits, in discovering the texture and character of fabrics, and in exploring the wonders of nature. The microscope is one of the most useful instruments. It has been extensively employed of late years in detecting adulterations in food and other substances which could not be easily discovered by chemical analysis. To the farmer it is useful

in ascertaining the quality of seed bought, and in studying the structure and habits of insects injurious to vegetation. To the merchant and business man it is an aid in testing the genuineness of bank notes, the quality of cloths, etc., and to all it is a source of elevating and instructive amusement.

This little instrument, although perfect in every part, is retailed at the low price of one dollar. [See advertisement on another page.]

THE MANUFACTURE OF COTTON--THE MAKING OF ROVING.

In previous articles we have followed the cotton through the first cleansing and straightening processes. In all these it has remained only a soft, woolly filament, known as "cotton," or "cotton wool," an expressive although contradictory term. As it left the drawing frames it was merely "cotton wool," differing from its raw state in that it was cleansed and its matted fibers straightened and brought longitudinally side by side, and cohering somewhat by the pressure to which it had been subjected. It has in this state very little tenacity, having received no twist, except that in some factories the cans that receive it from the last drawing frames have a slow, rotary motion, giving it a very slight curve on its exterior surface. As it comes from the last drawing it is a cylindrical ribbon, about an inch or an inch and a quarter in diameter. Its weight, in comparison with its length, is noted and regulated at almost every step in its progress, so as to insure a certain grade of yarn.

After being put into this form the cotton is to be made into "roving" or "roping," as a preliminary to being spun into yarn. For this purpose some of the most ingenious machines ever invented are employed. The "fly frame" is one of the most remarkable machines used in this or any other manufacture. The drawing is fed in between rollers precisely as in the drawing frames, which have varying speeds, so that while the first course merely takes and delivers the cotton to the next, these, revolving faster, attenuate the cotton ribbon and deliver it to the third or front set, which receive it at a further increasing speed. By this means the fibers are more and more straightened. On the front of the machine are spindles, each one directly under the delivery of the cotton. The top of each spindle is furnished with a fly, having two dependent legs, extending down on each side of a bobbin. One of these is hollow and the other solid, the use of the last being merely that of a counterbalance. The cotton is introduced at the top axis of the fly, which is hollow, and traverses the pipe arm, from which, at the center, it winds on the bobbin. Of course, the supply delivered by the rollers is exactly proportioned to the speed of the fly spindles. The bobbins rotate with the spindles, while the flies rotate outside of them, and they have also a gradual reciprocating motion inside the flies, being carried up and down to wind the product evenly in concentric spirals on the bobbin. Beside these two distinct motions, the bobbins have a gradually retarding velocity as they are filled, as it may be supposed that if, when three inches in diameter, they revolved as fast as when only one, they would strain and break the slightly twisted cotton. In this provision for a gradually decreasing speed is seen the ingenuity of the inventor. We cannot, without numerous diagrams and a lengthy description, explain the operation of this very remarkable de-

vice. The fly frame is, all things considered, one of the greatest triumphs of mechanical skill.

There is another machine, much simpler, and which has, to a great extent, superseded the fly frame. It is known in this country and in Europe as the "Taunton Speeder," from the residence of the inventor, Mr. William Mason, of Taunton, Mass., a mechanic to whom the cotton manufacture is more indebted, probably, than to any other since the days of Arkwright. This machine is very simple, and altogether different from the complicated fly frame. It takes the drawing between sets of rollers precisely as does the fly frame, but the bobbins are run horizontally and rotated by rollers, on which they revolve. Being moved by their circumferences, their peripheries, of whatever size, run at a uniform speed. Therefore, the complicated mechanism of the fly frame for graduating the speed of the bobbins' revolution, is unnecessary on the "Taunton Speeder." The twist, which on the fly frame is insured by the rotation of the flies outside the bobbin, is effected on this machine by an endless belt that rotates rapidly the guiding tubes of the cotton as it comes from the drawing rollers of the machine. But while on the fly frame, using bobbins with heads like flanges, which give the same length to each successive layer of the "roving," the reciprocating movement—up and down—is equal throughout, by the process on this machine each successive layer is shortened, until the top layer is as much shorter as the circumference of the filled bobbin is greater than that of the empty core; so that the filled bobbin is a central cylinder, and the cotton forms on it a larger cylinder, the ends of which are frustrums of cones.

The product, as thus wound upon bobbins or cores, is in the condition called "roving," ready now for being spun into yarn. In this state it is a filament of cotton, cylindrical in form, and, perhaps, about the size of a common straw. The cotton has been almost entirely changed in texture and, to the superficial observer, in nature. The matted and snarled fibers, as they came from the cotton field and the press, are straightened, arranged in parallel form, and stretched. All these operations of cleaning and arranging by the "willow," "picker," "cards," "drawing frames," and "speeders," may be regarded as preparatory to the ultimate use and value of cotton as a material for textile fabrics. The operation of converting the soft cotton into obdurate yarn, possessing tensile strength and rigidity, by spinning, must be considered in another article.

Micro-Photo-Sculptures.

Some very curious applications of this photo-medallion process are described in the *Photographic News*. They consist in what are termed "Micro-Photo-Sculptures," or enlarged images in bas relief of microscopic objects, the material being plaster of Paris. Nothing can exceed the delicacy, sharpness and perfect rendering of these reliefs, which give practically an enlarged model of the original object. The tongue of a cricket is the most perfect of those before us; the tongue of a fly is also exceedingly good; a flea is from a somewhat imperfect negative, and lacks crispness; but this is in nowise due to the process. The perfection of the modelling depends, of course, on the perfection of the definition in the negative; and the amount of relief, other things being equal, on the intensity of the negative, although this may be considerably modified by management in the manipulation. Those before us are on round tablets about three inches in diameter, the amount of relief resembling the thickness of a skeleton leaf.

The result is exceedingly beautiful, and it is probable that the principle upon which they are produced will find other applications. It is only necessary to remark that it is imperative that the subject to be produced should be semi-transparent, and admit of being photographed by transmitted light, so as to secure the relations of form in a relief so produced.

Time and Longitude.

The determination of exact data on this subject can now be effected by careful experiment through the Atlantic cable and connecting telegraphic lines. Mr. Dean, of the U. S. Coast Survey, is engaged in this duty. The telegraph offices from Valentia, Ireland, to Chicago and New Orleans have been put in connection for time, but San Francisco had not been reached at the present writing, the California wires having been down. The results blunderingly reported through the daily papers (after turning some of their P. M.'s into A. M.'s and *vice versa*) approximate closely to the results of the old rule applied to the longitude of our common maps. The time at Valentia, Ireland, being 5h. 9m., P. M., that of Heart's Content, Newfoundland, was 2h. 8m., P. M.—difference, 3h. 1m.—and that of New Orleans was 11h. 50m., A. M.—difference, 5h. 19m. That of New York (not given) would have been in the neighborhood of 4h. 25m. earlier than Valentia, or 12:44 o'clock. The exact adjustment of chronometers and determination of the time lost in transmission, must be approximated by repeated and nice experiment. Mr. Dean estimates that each single flash is transmitted in thirty-five hundredths of a second. The methods of comparing time may be various. One way would be to have all stations successively mark a concerted hour—say 12 M.—by a single flash through the cable, after giving notice one minute beforehand. Or, better still, stop watches being employed at every station, all might be stopped at the same instant by a concerted signal, and the time recorded within a fraction of a second.

LARGE STEEL ROLLERS.—The largest steel rollers ever made in this country were manufactured at Waterbury, Conn., for the Royal Mint of England. They were 14 inches diameter, of solid steel and hardened, intended for rolling the precious metals.