THE REALM OF SCIENCE

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ON January 18th, next, Professor Patty will give a lecture in the University auditorium, 25th and California streets, on Liquid Air, Radium and Wireless Telegraphy. He will have a whole series of brilliant and wonderful experiments. Liquid air is ordinary air liquified. Its temperature is extremely low, 312 degrees below zero, so low that in comparison with it ice is about twice as hot as steam is in comparison with ice. Steel may be made to burn in liquid air, so that we have temperatures of 3,500 degrees above zero alongside of 312 degrees below.

Radium is no less wonderful. It contains an enormous amount of energy, of which we have not yet learned to properly avail ourselves. And wireless telegraphy, with all that we know about it, is as interesting as ever, since our government is making the first grand national and successful effort to place the Secretary of War at Washington at all times in direct communication with every ship in the navy throughout all our vast possessions.

The scientific testimony given in court two years ago by Professor Rigge, in which the time of exposure of a certain photograph was found by means of a shadow, has been incorporated into a detective story entitled, "The Campaign Grafter," by Arthur B. Reeve in the November issue of Hearst's Magazine. The writer uses the identical figures and even the very same phraseology that appeared in The Scientific American, February 4, 1911.

A small but interesting instrument has lately been added to

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the physical cabinet. It is a piece of apparatus intended to illustrate rotational inertia. Two equal sliding weights at the extremities of a horizontal bar are made to swing round in a circle with any desirable speed. Cords are attached to the weights in such a way that we may draw them inward towards the center of the circle. When this is done, the weights fly around much faster, but reduce their speed again when the cord is relaxed. To one knowing only a little about mechanics, there seems to be a creation and annihilation of power. Further analysis, however, shows that the moment of momentum is always the same, that is, the product of the weights, their linear speed and their distance from the center. As the weights do not vary, it follows that as the distance is diminished the linear speed must increase in the same ratio, so that when the distance is one-half of what it was in the beginning, the linear speed is twice as great. As the circumference run is now one-half as great as at first, the weights rotate four times as fast. The area of the smaller circle is one-fourth that of the larger, so that the area over which the bar, mathematically the radius vector, sweeps in a unit of time, is the same as before. This is called the areal law, and is of the greatest importance in rotating bodies and in planetary motions.

Popular Astronomy for November contains a long article by the editor on "The Driving Clock and the Clamp and Slow-Motion Screws of an Equatorial." It is accompanied by five diagrams and three photographs illustrating the mechanism of the large telescope of the Creighton University Observatory. Besides explaining this mechanism, the text gives a condensed history of the Observatory and of the circumstances which led to the improvement of the telescope. The article is a technical one, but its untechnical features have already appeared in the Chronicle, Volume I, Number 6, and Volume II, Number 5.

The position micrometer presented by the Class of 1912, of the College of Arts, arrived on November 9th. It cost one hundred and thirty dollars, and was made by Gaertner & Company, Chicago. It is to be used in connection with the large telescope of the Observatory. Its object is to measure with the greatest possible accuracy the distances and directions between objects that may be seen in the same field of view, such as the distances and directions of the components of a double star system or of clusters of stars, the diameters of planets, the lengths of the shadows of lunar mountains, and the like. The double purpose of the instrument, the measurement of distances and directions, calls for a double principle in its construction. When the micrometer is in place on the telescope, one may see in its field of view a cross made of two spider wires at right angles to one another. These cross wires are called fixed, and their point of intersection is set upon one of the stars of a double star-system by moving the whole telescope, clamping it, and perfecting the adjustment by means of its slow motion screws. Parallel to one of the fixed wires we may notice a third one, called the movable thread. This is supported by a special frame and moved by a screw which has a hundred turns to the inch. The nut, drum or head of this screw is divided into a hundred parts, tenths of which are indicated by a pointer. The distance of the movable thread from the fixed one, to which it is parallel and with which it may be made to coincide, may thus be measured to one-tenth of one-hundredth of one-hundredth, that is, to one-hundred thousandth of an inch. But before we can proceed to measure, we must place the second fixed wire, to which the movable one is at right angles, in the direction of the second star. This is done by turning the micrometer box around until the wire is in the desired direction. The position of the wire, that is to say, the angle it makes with a north and south line (which last is at right angles to the apparent diurnal motion of the star wherever it may happen to be in the sky), gives the instrument its distinctive name of position micrometer. This position by itself, independently of the micrometer, is of greater advantage, and even of necessity, when one wishes to observe the beginning of a solar eclipse or the reappearance of a star from behind the moon, because it enables one to place the wires tangentially and radially at the very point when the moon will indent the sun or the star will emerge.

It stands to reason that all this accurate measurement is impossible, when the stars are not perfectly stationary in the field of view, that is, in other words, when the driving clock does not move the whole telescope as fast as the star moves in the sky and by this means holds the star in apparent absolute immobility on the wire. To this we must add the convenience, or rather necessity, of attaching the clock, clamping the telescope and operating its slow-motion systems on both axes, without removing the eye from the telescope or turning up a light. The large equatorial of the Observatory has only of late come into complete possession of all these necessary adjuncts, as one may read in former numbers of the Chronicle, or in the article entitled "The Driving Clock and the Clamp and Slow-Motion Screws of an Equatorial," in the November issue of Popular Astronomy. The presentation of the position micrometer is therefore most opportune, because it comes at a time when the telescope is fully able to respond to its refined measuring power.

While the new instrument can be used to best advantage only by expert observers and advanced students of astronomy, undergraduates may make themselves acquainted with it and the methods of its use. As the transit has two micrometer screws at right angles to one another in the eye piece, and two additional ones for reading its graduated circle, it was only proper that the equatorial should be fitted out with at least one micrometer and by this means make the transition from a seeing to that of a measuring telescope.

The possession of such fine measuring instruments as the equatorial, a transit, sidereal and solar clocks, a chronograph, a portable altazimuth, a sextant, a chronometer, two spectroscopes, and other minor apparatus, places the Creighton University Observatory in the front rank of students' observatories in the country. In point of equipment, site, building and extent of visible sky, we are not far wrong when we say that no college in the United States can compare with it.

The National Geographic Magazine devotes nearly the whole of its October number to the canals and art treasures of China, illustrating them by eighty-five excellent photographs. The canal system is truly wonderful. We Americans are apt to look upon the Panama canal as the greatest engineering feat ever accomplished. We are told by the Scientific American of November 9th, that if the material excavated at Panama had been taken from the United States, it might have made a canal ten feet deep and fifty-five feet wide, and reaching across the continent from Boston to San Francisco. And yet, this Panama canal, large as it is, is a mere pigmy in comparison with the canal system of China, Korea and Japan. If this were transferred to the United States, it would be equal in length to forty canals running from the Atlantic to the Pacific, and sixty from our northern to our southern boundary.

Of course, the Chinese canals were not built in a few years, nor even in one century; they are the result of the persevering work of many centuries. Their existence and maintenance are proof of a public spirit, of which any nation may be proud, and they show that Chinese statesmanship was of the highest order.

While the chief purpose of the canals was to serve as avenues of travel and of transportation throughout the empire, they were productive of still more vital results by means of the irrigation they caused. They not only rendered the land fertile by supplying it with abundant water, but they also kept up its fertility for all time by the rich loam and vegetable soil that they furnished. The mud dug out of the canals by Chinese farmers, was spread by them over the fields and thus rendered them absolutely inexhaustible. So rich has the land become in the agricultural sense, that an acre furnishes sustenance enough to support six persons for a year. This is the reason that China is so densely populated, and that artificial fertilizers, upon which other nations are so dependent, are altogether unnecessary.

The Mississippi river is carrying out into the Gulf every year as much fertile sediment as would cover three hundred and fifty square miles to the depth of a foot. All this is at present an absolute and irrecoverable waste. How much land would this mud render fertile! How many marshes would it convert into the best farm lands! We must admit that China has displayed greater foresight and made better use of its rivers.

The sewage problem which is forcing itself more and more upon our careful consideration has long ago been solved in China, where all this refuse is returned to the land and serves as the most efficient fertilizer. In addition to the two main purposes just mentioned, transportation and fertilization, the Chinese canals tap the large rivers and divert their swollen water in the times of floods to safer and more numerous outlets. While the rivers are not yet fully subjugated and still cause great damage at times, the evil is far less than it might be, and shows that in principle the system employed is the correct one.

The article entitled "A Shadow in Court—The Sequel," which appeared in the Scientific American July 20th of this year, has been translated into French and published in the Photo Magazine and Photo Revue of Paris, France, on November 17th.