placed beyond danger of the infiltrating waters of the highest tide.

At rest the animal assumes various positions; the two most familiar are shown in the accompanying illustration. It rolls itself up in a ball with its fore feet tucked under its bill, its hind feet pressed tightly over it, and its tail drawn down over all, or else it lies on its back with its four feet stretched upward in languid delight.

The natives aver that the female lays eggs, and that the male inflicts poisonous wounds with its spur, both of which stories, formerly received with credulity, have been abundantly disproved.

The Trade in Modern Antiquities.

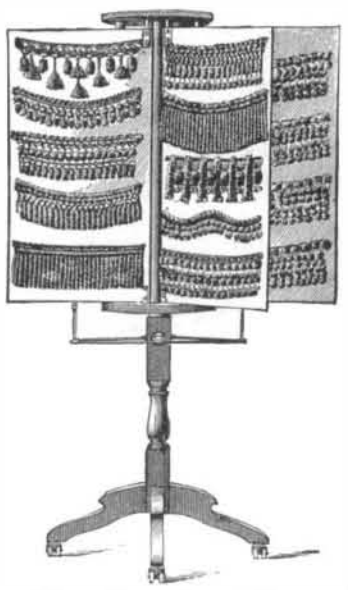
One of the chief delights of Continental travel, as every person of experience will admit, is the unlimited opportunities it affords for buying antiquities. The statuary, the coins, and the pictures that may be purchased in Italy are a score of never failing interest to English travelers and of never failing profit to Italian dealers. Andalusia, again, is a huge curiosity shop. Being once upon a time in Seville, we came across a retired British grocer or tailor, or something of that kind, who had just purchased a Madonna and Child—unhappily, unsigned—which he had picked up for a few pounds in a dingy back street. He was going to send it to the Exhibition of Old Masters, and, if he ever did so, he probably found that it was worth only a pound or thirty shillings at the outside. It is the same, indeed, throughout Spain. The altar cloths, the broken fans, the inlaid tables and cabinets, as resplendent as anything in the convent of the Cartufle at Granada, the wonderful chairs, and the still more extraordinary scraps of ancient lace, upon which all who have ever traveled in Spain have spent much money—these abound from Malaga to Irun, and naturally one is inclined to speculate a little on the odd circumstance that the supply is more abundant than ever, although the demand is fairly brisk. Tangiers is, we should say, a hotbed of modern antiquities, and even Mr. Chamberlain bought some of them when he was over there a year or so ago. He ought to have known something about this class of goods, being a Birmingham man, but the childlike faith of the President of the Board of Trade in all things ancient is notorious. America, oddly enough, has taken to this business of manufacturing the antique Dutch cabinets that, with bronze panels, dingy and marked with the cracks of fictitious centuries, are turned out every day from Chicago furniture stores, and for some purposes they are quite as useful as if they had indeed belonged to some departed burgher in the dead cities of the Zuyder-Zee. New York experts in this sort of forgery make a specialty of Queen Anne chairs and tables, and the imitation is so perfect as to deceive all but those who have studied such things minutely in Europe. The explorer of furniture stores may come upon magnificent specimens of English Gothic chamber pieces or ancient-looking Chippendale and Sheraton chairs,* which might have belonged to Queen Elizabeth but for the fact that they did not. It must be puzzling at first to discover in New York shops stamped leather chairs of the time of Louis Treize, plentifully ornamented with brass nails, whose heads are fully an inch in diameter, and the citizens of that enterprising city are invited to become the happy possessors of as many of these treasures as they like on ridiculously low terms. If, however, the explorer is inquisitive, and the furniture venders are in a tolerably candid mood, the visitor may be conducted into some back yard where these gems of high art are produced. A Queen Anne's chair just made can, for instance, be supplied with worm holes by the simple process of tilting it bottom side up and firing a charge of pigeon shot into the bottom and front of the seat. Old armor, too, is a good line in this business, the drawings required for the purpose being made from the collection in the Grand Opera House, in Paris. It is said that Birmingham knows something about this branch of the trade, and that helmets, shields, casques, breast plates, and complete suits of mail are regularly manufactured for the gratification of credulous oil speculators and retired pill manufacturers. If a man starts a lot of ancestors he likes to have dummies of them in his hall rigged in their mediæval ironmongery. If Birmingham did not gratify him, Germany would. It is astonishing how many tons of antiquities are annually sold along the Rhine, and it is even asserted that in Castle Colburg, where Martin Luther threw his inkstand at the devil—and unhappily, missed him—the original splash was cut up and sold long ago; but that, as the timber is massive, the place is carefully reinked every night for the purposes of sale next day. We cannot say how much truth or falsehood there may be in this particular story. There might have been some excitement in seeing the original transaction if both the distinguished parties to it were present. There can be none in gazing on a patch of ink. The trade in modern antiquities, however, is a curious reality, as real as the sale of old clothes or tombstones. It is a fact calculated to weaken one's faith in life.—*The British Trade Journal.*

THE *American Journal of Railway Appliances* says there is money for some one who will devise a practical skid for freight cars; one that is part and parcel of the car is necessary, so that it may not be detached except for repairs, and there should be one to each door. It is not possible to convert a portion of each door to this purpose, the editor adds.

* For examples of both the Chippendale and Sheraton styles of furniture see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 389 and 391.

IMPROVED ROTATING SAMPLE STAND.

The engraving represents an invention recently patented by Mr. C. A. Schmidt, of 449 and 451 West Fourteenth Street, New York city, which provides a simple and convenient means for effectively displaying samples of fringes and other goods. The rotary sample stand is constructed with an upright standard, in the upper end of which is a socket, in which revolves a pivot attached to the under side of the upper disk. Near the base of the standard is a second disk, rigidly attached to the upper one, and between the two are hinged skeleton wings, upon which are arranged samples of the goods to be shown. As it revolves, the



outer edges of the wings come in contact with a spring attached to a stationary support, each wing being detained as long as the salesman may desire in order that the samples may be inspected.

By the use of this stand the salesman is permitted to display goods which have been previously arranged harmoniously and in order, thus presenting the most pleasing appearance. Any wing can be selected and brought forward instantly, the construction enabling them to be turned equally well either backward or forward. The time of the salesman and customer is saved, as a large and varied stock can be quickly shown. Since goods are not removed from the shelves until sold, the damaging effects resulting from repeated handling and lying about on the counter are obviated.

IMPROVED PAIL.

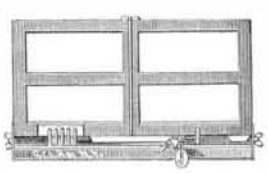
To the upper edge of the body of the pail is seamed the outer edge of an inwardly projecting rim, in the under side of which, near its inner edge, is formed an annular recess to receive an iron ring. The edge of the rim is spun down into a rabbet in the ring, so as to leave the mouth of the ves-

sel neat and smooth. With this construction the annular top of the vessel is strengthened so that it will not be liable to be bent by an accidental blow or by pressure. The cover of the pail is made of such a size that its edge will overlap the inner edge of the rim. An annular plate of rubber or other suitable material, held to the under side of the cover by a flange, serves as a packing between the cover and rim. To the center of the cover is secured the middle part of a spring rod, A, which is made of such a length that its ends will extend a little beyond the ears to which the bail is hinged. In the opposite side edges of the ears are formed recesses to receive the ends of the rods. The cover is thus held securely in place by the elasticity of the rod, and the escape of unpleasant odors is prevented.

This invention has been patented by Mr. Charles H. Paulus, of Irvington, N. J.

IMPROVED MUSIC LEAF TURNER.

Glued to the bottom of the rack is a narrow wooden lath which raises the book so that the pages in turning will



clear the strip formed on organs and pianos, and which prevents the trigger from striking the piano. In a groove in the center piece of the rack are placed wire arms, secured in such a way as to cause their elasticity to incline to the left when they are bent over to the right. On the ends of the wires are metal clamps which grasp the sheets of music. On grasping a page the wire is laid over to the right, and passed down a slot in an upright at the end of a plate from which its escape is prevented by a trigger. Each wire with its page is similarly treated. The wire arms are of unequal lengths.

Upon the trigger being moved downward, it allows the escape of the upper arm, which then turns the sheet attached to it. The surface of the trigger can be increased, so that the performer, by blowing upon it, can cause it to descend, thereby releasing the upper wire with its page. He is thus enabled to turn the pages of the music before him successively without removing his fingers from the keyboard. That end of the plate upon which the upright is secured can be raised or lowered in order to adjust the clamps to any required height to reach the pages of thick books without bending the wire arms.

Further information concerning this convenient device may be obtained from the manufacturers, Messrs. Wittman and Wimmer, of St. Mary's, Pa.

Rainbows.

Professor Tyndall lately delivered a lecture on rainbows before a crowded audience at the Royal Institution of Great Britain. The lecturer commenced by saying that the earliest historical record of the rainbow was that known to all present—"I do set my bow in the cloud, and it shall befor a token of a covenant between me and the earth." The sublime conception of the theologian exceeded that desire for exact knowledge which was characteristic of modern science. Whatever the ultimate cause of a rainbow might have been, the proximate cause was physical, and the aim of science was to refer a rainbow to its physical principles. After referring to the labors of Kepler and Willebrord Snell in investigating the phenomenon of the rainbow, Professor Tyndall said the explanation of the rainbow was due to Descartes. Descartes looked at the drops of rain, he pictured one a liquid sphere falling in the air, he pictured the rays of the sun falling upon a liquid sphere, he saw that certain portions of the light would be refracted, would be driven to the other side of the drop, back again, and would be again refracted on their emergence from the drop. He took a pen in his hand and calculated the entire course of the rays through the drop and their direction after their emergence from the drop. He found that the vast body of the rays after quitting the drop diverged at one particular angle; they came out as a parallel sheaf. There was a certain form of emotion called intellectual pleasure. It might be caused by poetry, literature, nature, or art, but he (Professor Tyndall) doubted whether there was a pleasure of the intellect more pure and concentrated than that of a scientific man, who, looking at a difficulty that had challenged the human mind for ages, saw that difficulty melt before his eyes and recrystallize as an illustration of a law of nature. Such pleasure, he thought, must have been that of Descartes, when he succeeded in uncovering the laws which ruled the appearance of the most brilliant meteor in nature. The lecturer referred to the experiments and conclusions of Descartes, Newton, Young, Miller, and Airy, and by means of diagrams explained the manner in which the rays of light were refracted in the rain drop. He also, by means of a shower of the fine spray of filtered water thrown by a minutely punctured jet suspended from the ceiling, caused a rainbow to appear in the room. The lecturer also described the appearance and cause of a very rare phenomenon known as the white rainbow, which was observed by him on Christmas day, and concluded his experiments by mixing the spray of some high flashing paraffin with that of some water, which, when illuminated with a strong ray of light, exhibited to the spectator two bows, the ordinary water bow surrounding the more luminous and more concentrated bow due to the paraffin oil.

The Dust Cloud from Krakatoa.

With reference to the Krakatoa eruption, Prof. Alph. Milne-Edwards read at the Paris Academy of Sciences, on January 28, a letter from a correspondent in Réunion, in which it is stated that the intensity of the sky-tints was always greatest where the showers of volcanic ashes had been observed. Thus the path of the volcanic cloud can be traced step by step, and its trajectory found to be that of an ordinary cyclone. M. Wolf showed how a study of the curves registered by the barometer establishes two atmospheric waves starting at the same time from Krakatoa, one toward the east and the other toward the west; the former to reach us had to traverse 11,500 kilometers, and the latter 13,500. M. Wolf showed that the rate of progress was that of sound, and on the basis of this and the distances, he found the eruption to have taken place on August 27, at 11 h. 43 m. A. M.

To Protect the Alligators.

The trunk, satchel, and pocket book manufacturers of New York city and Newark, N. J., have resolved that they will hereafter refuse to buy any skins that will not measure five feet in length. They have published notice to this effect to prevent the indiscriminate slaughter of small alligators by the hunters before the skins are large enough to become of much value. We do not suppose, however, that this resolution will have any effect in limiting the amount of imitation alligator leather made, or determining to what age the sheep shall live whose pelts supply so much of it.

William Atwood.

William Atwood, Superintendent of the Portland Kerosene Oil Works and President of the Atwood Lead Works, both of Portland, Me., died on February 17 at his residence, near Portland, of heart disease. Mr. Atwood was widely known in connection with his inventions and devices for the more economical manufacture of coal-tar products, in which he had been engaged for nearly thirty years; formerly in company with his brother, the late Luther Atwood, a notice of whose death appeared in the SCIENTIFIC AMERICAN in the winter of 1868. But Mr. William Atwood was also an analytical chemist of remarkable skill, whose services were often called in use in cases of litigation, and always with entire certainty as to his accuracy and his perfect integrity. He was an omnivorous reader in general science, experimented largely with the spectroscope and microscope, and during many years never missed reading thoroughly every issue of the SCIENTIFIC AMERICAN, to which he has often been heard to attribute his thorough acquaintance with the progress of modern science. In 1873 Mr. Atwood was elected to the Maine Legislature, in which he served his term faithfully, retiring from politics and public life at its close, and returning to his scientific studies with renewed zest. In 1878 he was put in charge of the Queens County Oil Works, at Hunter's Point, L. I., where he remained until June, 1882, when he was recalled to his old position in Portland, where he continued until his death.

One of the most reticent and retiring of men, Mr. Atwood seldom gave one the opportunity to gauge his mental capacity or his acquirements; yet as to both he was remarkable. A clear-headed thinker and cogent reasoner, his integrity and splendid moral purpose entered into everything he did, so that it was as impossible for him to give a false or erroneous judgment as it was for him to commit intentionally a wrong act. Men, many years his senior, respected and admired in him the expression of a type of manhood so broad, and a knowledge and understanding so ripe, that age could not possibly improve either. A man who was never known to commit an injustice or unkindness, or even to speak unkindly of another, he was remarkable for a tenderness of nature and a beautiful geniality and generosity of spirit very rarely found in man or woman. A Royal Arch Mason and Knight Templar, he was buried with Masonic honors on February 20, the entire force of the works in his charge accompanying his remains through a blinding storm to the grave, while a delegation traveled from New York to Portland, that his friends here and the Queens County Oil Works should not be unrepresented at his funeral. Mr. Atwood's loss is a grave one to science and practical art, and must ever be a source of regret to those who knew him and honored him for his simple, manly nature, his earnestness, and his unswerving devotion to principle.

Milk Caseine for Sizing Paper.

Before the introduction of machinery for making paper, when each individual sheet was dipped by hand, animal size was almost exclusively employed. It was made from bones or gristle. When paper came to be made by machinery, a resin and alumina soap was substituted. This was a decided advantage for the manufacture on a large scale, but it often happens that paper sized in this way does not resist the penetration of ink very well, and a recognition of this fact has led, in recent times, to an increased inquiry for animal size on the better quality of paper. This paper is almost exclusively air dried, which takes time.

Muth, of Carlsruhe, has devised a method of making a machine paper of equally good quality and avoiding these disadvantages.

Albuminoid substances possess the greatest resemblance to animal glue, hence the supposition that they could be substituted for it. Egg and blood albumen are too expensive for use on a large scale, but the caseine of milk can be had in dairies in large quantities. It is but slightly soluble in pure water, but if the water is made slightly alkaline it dissolves, forming a milky liquid, and in this form can be used as a size. As the alkali employed is generally ammonia, the preparation is called ammonium-albumen.

Its use in paper making is the same as that of glue, and it is adapted to surface sizing or may be introduced into the pulp and used with the resin soap.

When employed for surface sizing, the sized paper is dried and then heated to 266° Fahr., at which temperature the albuminoids become totally insoluble, so that if this paper gets wet and is then dried again it will take ink as well as before it was wet.—*Chem. Zeitung.*

Which Way do You Circle?

One generally reads that persons walking without landmarks perform a large circle and cut their old tracks again. This circling, as far as my present knowledge goes, is *to the left.*

My present theory is that in most persons the right leg is the stronger and the more forward to step over any obstacles, and hence that it slightly outwalks the left; this theory involving as further consequences that those in whom the left leg is the stronger would circle to the right, while those whose legs are of equal strength would either keep straight on, or would wander either way indifferently. I imagine this "outwalking" of one leg by the other to be similar to the manner in which a body of troops wheels to one side or the other.

In the following I use the expression "*right-legged.*" By this I mean that the right leg is that chosen to kick with, jump from, etc.

My negative evidence is as follows:

1. I myself am right-legged, and in a mist I always circle to the left. I have only come across cases similar to my own in these respects. On the other hand, my left arm has been trained (by always rowing on the bow side) to be stronger than my right for rowing purposes; and in sculling I always circle to my right side.

2. Those savages of whom I have read that they could keep a straight course without any landmark, were also represented as using both arms (and legs?) impartially.

I have given the above evidence chiefly to show how weak it is, in the hope that some of your readers will try to collect data of the following nature from any of their acquaintance who have had experience in the matter:

(*a*) To which side, if any, do they circle?

(*b*) Are they right or left armed, right or left legged; or are the two sides equally strong?

It might also be interesting to learn from boating friends if they have observed any connection between the side on which they have been accustomed to row and the side to which they circle in sculling; such connection as that indicated above.

Finally, I may suggest that more might be known on the question of the heredity of right or left sidedness; and as to whether persons are often right-armed but left-legged, etc. But it must be remembered that tendencies of this nature are often "educated out" in childhood.—*W. Larden, in Nature.*

A New Submarine Telegraph.

The Canary Islands, a Spanish possession on the west coast of Africa, are now connected with the continental telegraph system of Europe, by means of a cable extending from Cadiz to Teneriffe. The laying of this cable, which has just been inaugurated, has been undertaken by an English company—the Spanish National Submarine Telegraph Company—which obtained a concession from the Spanish Government and negotiated with the India-Rubber, Gutta-Percha, and Telegraph Works Co. for the laying of the new submarine communication.

The points telegraphically connected are Cadiz and Santa Cruz de Teneriffe, Teneriffe and Palma Island, Teneriffe and Gran Canaria, Lanzarote and Gran Canaria. On its part, the French Government has addressed itself to the English company in order to have the Spanish cable extended from Teneriffe to Saint Louis de Senegal. The distance from the latter point to the Canaries is about eight hundred nautical miles.

By the terms of the convention signed at Paris, and which has received the approbation of the two Chambers, the company is to lay this cable and operate it for twenty-five years. Communication between the frontiers of France and the point of landing of the cable in Spain will be secured by means of a direct wire that traverses the Spanish Continent and is specially set apart for such traffic. The tariff from France to St. Louis is fixed at two francs fifty centimes per word, including the charges of transit across Spain. This is a very small charge, the tariff having been up to the present four francs per word for submarine transmission from Lisbon to Saint Vincent alone.—*La Lumiere Electrique.*

Tea Bricks.

The process of making tea bricks out of the leaf and dust broken from the teas during preparation is a very primitive one. Mr. J. P. Cowles, Jr., of Foo Chow, China, sends us a specimen of his tea bricks and a sketch of the manufacture, which shows a number of Chinamen hanging to the end of a lever, which carries the mould for the bricks. With respect to the latter, he says that tea dust thus compressed is about as good as tea, while its reduced price, about 20 cents per pound, brings it within the reach of all. An additional advantage of these bricks consists in the fact that, since the air is excluded, they keep their flavor a long while, so that after a year or two they infuse nearly as well as when first pressed.

Compulsory Examination of Engineers.

The Franklin Institute of Philadelphia has been debating the question whether the examination of stationary engineers should be made compulsory. A committee of five was appointed to report, but the majority, including Messrs. Washington Jones and Coleman Sellers, Jr., were adverse to such compulsory examination, which was strongly advocated by the chairman, Mr. Nystrom.

The details for an effective system of compulsory examination and licenses undoubtedly admit of some sharp differences of opinion, but there is no doubt a strong public desire therefor, and that they should be made as comprehensive and searching as possible. With the greatly increased use of steam in places where the lives of many would be endangered by an ignorant or negligent engineer, the safeguard should certainly be sufficient to protect the public from incapacity.

A character for being sober, watchful, and attentive to duty cannot very well be given by any board of examiners, but if such board had the right to rescind a license formerly granted, for failure in these particulars, it would be to the interest of employers and the public alike to help strengthen the hands of the examiners by supplying the particulars which go to show character.

High Pressure Water Power.

At a recent meeting in this city of the American Society of Civil Engineers, a paper on "Water Power with High Pressures," by Hamilton Smith, Jr., M. Am. Soc. E. C., was read.

For the purpose of supplying water to the placer mines in California, numerous ditches were constructed on the western slope of the Sierras Nevadas, and in many cases the mines having been exhausted or abandoned, the water is now used for power for various purposes, and it is probable that as manufacturing assumes larger proportions, much of the motive power required will be obtained from these ditches, which in the aggregate would afford several hundred thousand horse power.

The problem presented has been the utilization of a small quantity of water—few of the ditches carrying more than 70 or 80 cubic feet per second with high heads ranging from 280 to 600 feet. Turbines have not given satisfactory results, because the great speed due to the high head resulted in excessive wear and tear. Partial turbines or tangential wheels had better success. In some cases large overshot wheels were built, one having a diameter of 65 feet. A wheel of a very simple form, called the "hurdy-gurdy," was introduced some twenty years ago, and has almost superseded all other hydraulic motors. It has been improved from time to time, and now gives an astonishingly high percentage of useful effects.

As at first used, the "hurdy-gurdy" was a narrow wood disk fastened to a cast iron spider frame; the faces of the large wheels being from 4 to 6 inches wide, the buckets being iron castings, and such wheels were built as large as 21 feet in diameter. These wheels cost little, required but light foundations, and when large really acted as fly wheels. There was, also, nearly entire immunity from accidents. With the flat bucket an efficiency of not more than 40 per cent could be obtained. Daubisson describes somewhat similar horizontal wheels used in the Alps, the water being led to them by steeply inclined troughs. Probably the use of a jet escaping from a pipe is a California invention.

The first improvement on these wheels was made by putting flanges on the side of the rim with curved sheet iron buckets between. Useful effects of from 35 to 45 per cent were obtained from these wheels; the best results being obtained with the use of comparatively large nozzles discharging the water.

The next important improvement was what is known as the Knight wheel, made of cast iron with curved buckets set close together, the nozzle being a narrow slip curved to fit the outer edge of the wheel, in order that the jet might strike the buckets as close as possible. An efficiency of from 54 to 65 per cent was obtained from these. The wheel known as the Collins wheel gave still more effective results, running up to an efficiency of 70 per cent. The latest so far used is known as the Pelton wheel, which has a bucket constructed so as to split the jet as it strikes the wheel, the bucket consisting of two sections of circles intersecting at the center of the wheel, and with convex surfaces presented to the jet.

Details of various experiments upon these wheels were given, showing an efficiency of from 82½ to 87 per cent, and the writer believes that with heads above 100 feet, or even less, a larger amount of work can be gotten out of water by the "hurdy-gurdy" than by any other form of wheel. Possibly water pressure engines may give as good, or even better results, but their cost is very much greater. Where a wheel is so placed that it will at times be submerged, the turbine is preferable; in other respects, however, the "hurdy-gurdy" possesses the advantage.

A description was then given of the method of using water power for drilling the North Bloomfield tunnel in California, which was accomplished by the use of the "hurdy-gurdy" wheel. The water was carried by a pipe main of single riveted sheet iron, No. 14 gauge, in lengths of 20 feet, put together stovepipe fashion, with the joints made tight by tarred cloth strips and pine wedges, the diameter of the pipe being 15 inches at the penstock, diminishing to 7 inches at the lower end. The aggregate length of the main and branches was about 10,000 feet. The pipe was laid on the surface of the ground, the range of temperature being from 10 degrees to 107 Fahrenheit in the shade. Both the pumping and the working of the diamond drills were done by the use of the "hurdy-gurdy" wheel. The head of water here averaged from 280 to 550 feet.

Descriptions were also given of the water power in use at the Idaho gold mines in California, where the supply main is of wrought iron 22 inches in diameter, 8,700 feet long. The pipe is placed in a bath of boiling coal tar and asphalt before laying. This pipe is double riveted and has riveted joints, the head being about 525 feet. Seven "hurdy-gurdy" wheels are employed driving air compressors, pumps, hoists, and stamp mill. The power is transmitted by Manila rope at high speed.

The writer also referred to the wrought iron pipe used for the water supply of San Francisco, which had been laid for a number of years, and seemed now to be in perfectly good order and without tubercles.

A Prize for Electricians.

The Italian Government has determined to offer, on the occasion of opening the Turin Exhibition, a prize of 10,000 francs for the most practical process for the transmission of electricity.