SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid, £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ....$3.00 a year
Scientific American Supplement (Established 1876) .... 5.00 "
Scientific American Building Monthly (Established 1885)........ 2.50 "
Scientific American Export Edition (Established 1878) .... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, MAY 27, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

HIGH EXPLOSIVES ON FREIGHT TRAINS.

In speaking of the recent tragedy on the lines of the company near Harrisburg, the Superintendent of Passenger Transportation of the Pennsylvania Railroad is reported to have said: "It was an accident which could not have been avoided. Every precaution known in train operation was in effect, and so far as I can see, there was not a single violation." It is probable that this official, speaking as an employe responsible for the observance of the rules of this company, was strictly within the facts; but the traveling public is surely justified in asking whether the rules for the acceptance, loading, and carriage of high explosives have been drawn with as strict an eye for the safety of the public as they have for the convenience of the railroads. We understand that dynamite and other high explosives are considered as ordinary freight, and that as far as any special precautions are concerned, it is loaded into cars in common with other boxed freight, the only difference being that the car containing it is usually labeled "High Explosives." Now, that such a condition of things is full of peril is proved by the fact that disastrous explosions resulting from the carriage of high explosives are not by any means infrequent. It is only when such deadly freight, as in the present case, becomes the cause of an explosion that results in a disastrous loss of life, that the attention of the public is forcibly drawn to this very serious peril. It is to be hoped that the legislation which is certain to be introduced with a view to rendering the transportation of high explosives more secure, will with better success than the recent attempt of Senator Elkins, chairman of the Interstate Commerce Commission, to put through a bill placing the regulation of this matter in the hands of the Commission. The mere tacking of an insignificant label upon a freight car that contains high explosive is surely a very inadequate means of warning and safeguard. A more sensible method would be for the railroads to reserve special cars for such freight, and give them a broadly distinctive color or a badge that would at once distinguish them from the cars for ordinary freight. The railroads, of course, would argue that such cars would be running for a large part of the time with but a fraction of a full load. But that could be compensated by charging a rate sufficiently high to meet the extra cost and inconvenience involved.

AN OFT-REPEATED QUESTION.

One of the questions from correspondents that comes to this office with persistent reiteration, is that of the possibility of one or other of the pair of wheels on a railroad axle, in passing around the curve, slipping on the rail over which it is rolling, while the other wheel does not slip on its rail. Although we have frequently explained how this condition is possible, the question is one that evidently continues to puzzle a great many people—in which respect it is first cousin to that other much-debated fact, that the portion of the periphery of a rolling cartwheel that is near the ground is moving more slowly with relation to the earth than is the rest of the periphery. In the case of the two wheels on any axle of a railroad or trolley car that is passing around a curve, it is evident that in a given length, say 100 feet of the curve, measured on a line lying centrally between the two rails, the inner rail will be shorter than the outer rail, and this for the reason that it is struck to a radius that is about 4¾ feet shorter. Now, when a pair of wheels passes around the curve, it follows that, because of the difference in length of the two rails, either the inner wheel must slip backward on the inner rail, or the outer wheel must slip forward on the outer rail; for the two wheels being fixed on the same axle, move at the same peripheral speed over different lengths of rail in the same time.

It is probable that the excessive wear of rails on curves is due chiefly to this slipping of the wheels. Not long ago some remarkable facts on rail wear on curves were brought out in the course of a paper read before the New England Street Railway Club by the Roadmaster of the Boston Elevated Road. This road is exceedingly crooked, over 40 per cent of the line consisting of curves, many of which are very sharp. There are eighteen of less than 100-foot radius, and sixteen others with a radius of less than 150 feet. On the sharpest curve, which is of only 82-foot radius, and where it is claimed that the traffic is heavier than that on any other steam or heavy electric railroad, the life of ordinary steel rails averages only forty-four days, the head of the rail wearing down from 0.60 to 0.77 of an inch in that time. The great inconvenience caused by the constantly-recurring repairs led the company to experiment with hardened steel rails, and when some nickel-steel rails were put in on the curve, the wear was reduced to 0.53 of an inch in 204 days. A manganese-steel rail is now being used with good results, and the wear on these is only about 33 per cent as rapid as that of the nickel-steel rail, and about 6 per cent as rapid as that of the carbon-steel rails.

COAL SUPPLY OF THE FUTURE.

The report of the Royal Commission on the question of the amount of coal still available below the surface of Great Britain, comes as a flat contradiction of those alarmists who take pleasure in telling us that, within such and such a limited time, we shall have dug all the coal out of the earth, and shall have to depend upon some other kind of fuel. The conclusion arrived at by the Commission as to the amount of coal underlying the United Kingdom that is available for working is that over one hundred thousand million tons can be obtained whenever future generations see fit to bring it to the surface. During the last thirty-four years nearly five and three-quarter billion tons of coal have been mined in Great Britain, and the amount still available is, to give the exact figures of the report, 100,914,668,167 tons, so that if coal were to be mined at the average rate per year of the past thirty-four years, there is enough coal available to last for over six hundred years to come. The Commission states, however, that the above figures do not cover the full resources, since they refer merely to the supply available in the coal fields lying at a depth of less than 4,000 feet, and in seams over one foot thick, these being known as the "proved" coal fields. It is estimated that there will be found in the unproved fields at less than 4,000 feet depths about 40,000,000,000 tons, which amount added to that of the proved coal makes a total of over 140,000,000,000 tons that are still available. This is about twenty-five times as much as the total output of the last thirty-four years. Furthermore, it is estimated that there are in the proved coal fields 5,239,000,000 tons at a lower depth than 4,000 feet, while it is estimated that off the coast of Cumberland and South Wales, there is over one billion tons of coal lying below the sea bed. Although the rapid increase in industrial development, and the consequent increase in demand for coal, render it certain that the next thirty-four years will see a vastly greater consumption than that which has taken place since 1870, it must be remembered that new oil fields are certain to be exploited, and the use of oil fuel widely extended, and that the present activity in the development of the world's water-powers will also assist in keeping down the total demand for coal. It must be admitted that, all things considered, if the condition of things in Great Britain may be taken as representative, the exhaustion of the world's coal supply will take place at such a remote date that it need give us no concern.

BATTLESHIP STRENGTH OF THE NAVIES OF THE WORLD.

The British government has recently published its annual return showing the comparative strength of the seven leading naval powers of the world, from which it appears that of first-class battleships Great Britain possesses 53; France, 20; Russia, 14; Germany, 16; Italy, 14; United States, 12; and Japan, 5; while of armored cruisers, Great Britain has 24; France, 17; Russia, 6; Germany, 4; Italy, 6; the United States, 6; and Japan, 8. Of battleships under construction, Great Britain has 8; France, 6; Russia, 5; Germany, 6; Italy, 4; the United States, 12; and Japan, 2; while of armored cruisers under construction, Great Britain has 4; France, 2; Russia, 4; Germany, 1; Italy, 3; and the United States, 2. In this connection we draw attention to the fact that the argument made in Congress against the construction of the two battleships that were recently authorized, on the ground that we have more battleships building than any other nation, is very misleading. If our battleships were built with the rapidity with which foreign nations do similar work, several of these twelve battleships would now be in commission. It is because we are in arrears, and for that reason only, that our list of battleships under construction is so large. If we do not continue to authorize ships at a certain rate per year, we shall ultimately find that in spite of the large number under construction at any given time, we shall ultimately drop behind such a navy as that of Germany, which is being built on a predetermined plan that calls for the placing in commission of a certain number of new ships every year.

SUPERSTITIONS THAT PREVAIL IN RURAL SECTIONS.

That superstition exerts a powerful influence over the affairs of mankind may be ascertained by a residence in almost any rural community in the country. It cannot be said that only the ignorant and uncouth classes give credence to dark sayings. There are thousands of persons who do unacknowledged service to the mysterious and unknown, whose training and education have not succeeded in entirely destroying the effect of potencies and charms learned and believed in youth. Especially is this true if the individual be southern born, for the association and influence of darkies may not be dismissed at a word, and there is no more superstitious class than the southern negro.

It is remarkable how generally sayings of superstition have spread over the country. No section may claim to be above harboring any such beliefs, or rather, practices; for it may not be claimed that all believe in the efficacy who practise and observe certain forms or take cognizance of defined circumstances. Nevertheless, there are, as a matter of fact, few persons who care to pass a pin lying on the ground if the point chance to be toward them. Almost invariably that pin will be picked up. An experiment of this kind was made in Chicago, in an office building, the occupants of which and their visitors should be as free from any touch of superstition as any set of men on earth. But fifteen men out of twenty who passed stooped to pick up a bright pin laid on a dark spot of the velvet carpet in the corridor.

How many persons will confess to a weakness for seeing the new moon over their right shoulder unobscured by any bushy tree top? A greater number will deny the belief in the efficacy who will at the same time confess that they would rather see the moon "right." This remarkable superstition prevails in all parts of the world. Its very universality almost compels belief in its potency.

If one would learn the popular superstitions of any community he must have been reared among the people, for if a stranger were to ask for a list of superstitions prevailing in any one place it is possible no person could recall, or make a list of them. They crop out under suitable circumstances and as occasion calls for their observance.

Below are some of the common sayings in a community made up of descendants of Pennsylvania Dutch, who settled in the Keystone State shortly after the colony was organized:

If in washing the dishes, or in cleaning the table before a meal, the cook drops a dish rag, some one is coming hungry.

If the dish rag is dropped while washing the dishes after a meal, "some slut is coming, if she is not already there."

The crowing of a rooster before the front door early in the morning foretells the visit of a stranger.

If a red bird flits about the yard and chirps merrily, a young girl gayly dressed and light-hearted may be expected soon.

The crowing of a rooster in the night is a sign of hasty news. Thus many a rooster, by a single crow, has cast a gloom over an entire family.

The howling of a dog at night foretells some dire calamity such as a tragic death.

If a dog lies on his back in the front yard with feet extended upward, some member of the family to which he belongs is sure to die soon.

The screaming of a screech owl three nights in succession in or about the front yard, is a sign that some one in the house is in danger of death. To cause the owl to leave, stick the shovel in the fire.

The crowing of a chicken hen portends bad luck. It always results in the death of the hen without delay, for no good woman would allow a crowing hen to live longer than it takes to cut off its head.

In ironing a garment if the smoothing iron is dropped the owner of the garment will never live to wear it out.

Friday is an unlucky day. If a piece of work is begun on that day it will not prosper and possibly the one who begins it will not live to finish it. It probably is true that not ten women out of every hundred can be found who would as willingly start a garment on Friday as on some other day.

If the individuals of a hunting party, in crossing a fence, go over the same section luck will be good, but if several sections be crossed the hunt will be a failure.

If in strolling two persons go on opposite sides of a tree, one or both of them will meet disappointment before the day is over.

Looking at a new moon for the first time through obstructions, as through a tree top, foretells misfortunes during that moon. To see it over the right shoulder and in a clear space brings good luck.

The rabbit always carries omens of ill fortune. If you meet him on going from home you may look for trouble before you return; if going toward home there will be trouble in your family.

Ashes must not be taken from a fireplace in a sick room. The death of the patient would follow. Nor must the bed of a sick person be turned over. It is actually true that this last provision is believed and actually followed in numberless homes where wealth and culture abound.

No one ever saw a negro meet a corpse. The most courageous darky will go out of his way or turn back upon his path rather than encounter such a calamity. It is said that if you meet a corpse your time will come next. If the corpse is stopped on the way to the grave another member of the family will soon follow.

Kraut must be made in the dark of the moon if it is to be sour.

It is the height of folly to cut a child's finger nails before it is a year old, for then it will pilfer and steal. The nails must be broken and bitten off.

Potatoes and all roots must be planted in the dark of the moon, when it is decreasing or going down in size; likewise crops that grow above ground must be planted in the light, or increase of the moon.

Hogs must be butchered when the moon is increasing, otherwise the meat will shrivel up and fry away in cooking.

A family must never move except in the light, or increase, of the moon. This will secure prosperity and increase of possessions. They will grow as the moon grows. This is another superstition that is in almost general practice in all classes of society.

If a child is allowed to look in a mirror before it is a year old teething will be difficult.

If a coffin containing a corpse be placed so that it is reflected in a mirror, there will be another death in that family inside a year.

The tying of a small sack containing the fore feet of a ground mole assures a full set of pretty teeth. If in teething the child's gums are sore it may be cured by rubbing the gums with rabbit brains hot from the head. Both of these remedies are too commonly practised to excite comment among the people who observe such things.

To remove a wart from the body steal a piece of bacon, rub the wart with it and then bury it under the eaves. Say nothing about this and the wart will soon disappear. The writer removed a number of warts from his own hands when a boy by doing this.

A stray black cat in the back yard foretells good luck.

If a woman is making soap and a man stirs it, all will be well and the soap will be fine, but if a woman comes the soap will spoil in the making.

If you sing in bed you will cry next day. If you sing before breakfast you will cry before night.

If you want a cat to stay at your home, rub its paw on the stove.

To keep a new dog, measure his tail with a cornstalk and bury the latter under the front step.

If you sleep with your feet toward the door you will soon be carried out a corpse.

If an infant is puny and does not grow satisfactorily it must be measured for the "undergrowth." A pow-wow doctor, usually a woman, will strip the child, measure it with a string the same color as its hair, say some "words," bury the string in a secret place and repeat the performance three times. The child will get well. There are dozens of children in a certain Dutch community that were measured in this way and are now pointed to as examples and proof of the efficacy of the method.

In setting out fruit trees a woman must hold the tree while a man sets it and tamps the dirt about the roots. This makes it a sure bearer. This also is practised in numberless communities.

To kill a toad will cause the cow to give bloody milk.

THE FIRST OBSERVATIONS WITH "BALLONS-SONDES" IN AMERICA.

There have been dispatched in Europe frequently during the past ten years *ballons-sondes*, or small balloons carrying only instruments that record automatically the temperature and pressure of the air, thus enabling the temperatures to be determined at the successive heights reached, the place and time at which the balloons fall indicating approximately the direction and velocity of the upper currents. The "aeronautical concourse" of the St. Louis Exposition, says Science, afforded an opportunity to undertake these investigations in this country. Accordingly, the work was taken up by Mr. A. Lawrence Rotch, director of the Blue Hill Observatory, in co-operation with Col. J. A. Ockerson, chief of the Department of Liberal Arts at the Exposition, and a series of very satisfactory experiments has just been completed.

The balloons used in the experiments are the closed rubber balloons devised by Dr. Assmann, director of the Prussian Aeronautical Observatory. These balloons are inflated with about 100 cubic feet of hydrogen gas; they expand in rising until they burst, and then the attached parachute moderates the fall. In some cases two balloons, coupled tandem, were employed, and, as only one balloon bursts, the other is borne slowly to the ground and serves to attract attention. The instruments, which were furnished by M. Teisserenc de Bort, of Paris, record the temperature and barometric pressure upon a smoked cylinder, turned by clockwork; and the lightest of them in its basket weighs about one and one half pounds. A notice attached to each requests the finder to pack the instrument carefully in a box and return either to St. Louis or to Blue Hill, with promise of a reward for the service.

Owing to delays in obtaining the gas and apparatus, the experiments were not begun until the middle of September, during which month four ascensions took place. All of the balloons fell within a radius of fifteen miles, about fifty miles east of St. Louis. Twice the height of nine or ten miles was attained where a temperature of 68 deg. F. below zero was recorded. These experiments were conducted by Mr. S. P. Fergusson, of the Blue Hill Observatory staff. Another series of ten ascensions was executed by Mr. H. H. Clayton, meteorologist at the Blue Hill Observatory, during the last part of November and the first days of December, mostly after sunset, in order to avoid the possible effect of insolation. Fortunately, all these balloons were also recovered, though the stronger upper air currents carried them further from St. Louis, three of them traveling more than two hundred miles, and two, at least, with a speed exceeding one hundred miles an hour, the direction of every balloon being toward the easterly semi-circle. Ten of the fourteen ascensions furnished good records, and the reduction of the later ones reveals lower temperatures than in September, for example, 72 deg. below zero at the height of seven and three quarters miles on November 25, and 76 deg. below at six and one quarter miles on the following day.

The fact that all the balloons were recovered indicates the excellent topographical situation of St. Louis for dispatching them.

A METHOD FOR PUTTING PRINTED MATTER ON FINISHED LANTERN SLIDES.

BY J. A. HONEKING.

Those who make lantern slides know that the best slides, those having the most detail, are those made from negatives first hand, either by contact or by direct reduction in the camera. When a slide is to be made from a photograph or picture of any kind, titles or printed matter of any nature can be copied at the same time the negative is made from which to make the slide; but if a slide be made from a negative first hand, that is without making a print and again copying, as is often done, it is not so easy to put printed matter on the negative so that it will appear on the finished slide.

The following is a method devised by the writer whereby printed matter of any kind may be made to appear on the finished slide, no matter how the slide be made, by contact or by direct reduction from any sized negative. Have the title, phrase, or sentence, or whatever printed matter is desired on the slide, printed in good clear type on smooth white paper, just as you would have it appear on the slide. The printing may be of any convenient size, two or three times as large as you wish it to appear on the slide, or even larger. Place this printed matter on the copying board, and make a negative of it, any size, but not larger than 4 x 5 inches. Develop this negative until the background is quite black or until the printed matter shows slightly on the back side of the plate when viewed by reflected light in the dark room. Printed matter for a dozen or more slides may be copied at the same time on one plate if so desired. When this negative is fixed, washed, and dried, mat out everything, except what is wanted, with black paper. Now place this negative in good light, with the clear sky for a background, or a good white screen of any kind about two feet back of the negative makes a good background. Turn the negative so the printing will be wrong side up and the glass side of the negative toward the camera. By measuring, determine just where you would have the printing occur on the finished slide. Now adjust the camera until the printing shows plainly just where, and just as large as, you wish it to appear on the slide when finished. Next put a lantern-slide plate in the plate holder, and expose twenty to thirty seconds, and develop just as you would a lantern slide.

When this plate is fixed, washed, and dried, it is to be used as a cover glass by placing the film side in contact with the film of the lantern slide.

The printing will now read as it should, and will be in good focus when the picture on the slide is in focus in the lantern.

If the slide is too dense for the printing to show through, the cover may be fitted on the slide and marked, and then by means of a ruler and a sharp knife a space large enough for the printing can be cleared away.

This process may appear to be somewhat long, but in practice is much shorter and easier than it appears, especially when several slides are to be prepared in this way.

It is necessary to first copy the printing, and then copy the positive side of the negative as directed above, in order to make the printing read correctly and at the same time have the film of the cover and the film of the slide bound together, so both may be protected and both in focus at the same time.

SCIENCE NOTES.

The British Museum has approved of a suggestion for the preservation of phonograph records of the voices of prominent singers, orators, actors, and the works of instrumentalists. When the idea was first submitted to the trustees, the objection was raised that the records would not be of a sufficiently permanent character. This objection has, however, now been removed; and the records for the national collection will be master records of nickel, from which records for service may be molded as desired. A similar collection is already being formed in Italy. The collection for the British Museum is to be started immediately. All the most prominent public men, singers, and musicians of the day will be requested to make records. As years go by, the collection will increase in value and size, and it is certain to become one of the most valued of the nation's treasures. The records, however, will not be available for immediate use, but will be reserved for reproduction in the next generation.

If the open country is to be made attractive to the best minds, it must have an attractive literature. There must be a technical literature of the farm, and also a general artistic literature portraying the life and the ideals of the persons in the country. The farm literature of a generation ago was largely wooden and spiritless, or else untrue to actual rural conditions. The new literature is vital and alive. The new, however, is yet mostly special and technical, with the exception of the growing nature-literature. Artistic literature of the farm and rural affairs is yet scarcely known. Where is the high-class fiction that portrays the farmer as he is, without caricaturing him? Where is the collection of really good farm poems? Who has developed the story interest in the farm? Who has adequately pictured rural institutions? Who has carefully studied the history of the special farm literature that we already have? Who has written the biological evolution progress that attaches to every domestic animal and every cultivated plant? We need short and sharp pictures of the man at his work and the woman in her home—such quick and vivid pictures in words as an artist would throw on his canvas. There is nobility, genuineness, and majesty in a man at useful work—much more than there is in a prince or a general or a society leader, whose rôle it is to pose for the multitude. The man holding the plow, diggin. ditch, picking fruit, the woman sweeping or making bread—what stronger pictures of human interest can there be than these?

It is said that Dr. D. Dakin has discovered how to prepare adrenalin from coal tar. Adrenalin is the active principle of the suprarenal glands whose isolation has made bloodless surgery possible. Dr. Jokichi Takamine, the Japanese chemist, originally showed the world how to make adrenalin. Over the kidneys of men and animals are two little glands shaped like a cocked hat and, in man, about as big as marbles. Their function was long a mystery to physiologists. Even now, it is not thoroughly understood. It has long been known, however, that they had some effect on the circulation of the blood, and that their secretion is a powerful astringent. Physiologists and chemists began experimenting with this secretion. In 1893 two European investigators discovered that it had a strong effect in driving away blood from living surfaces to which it was applied. In its fresh state it was not of practical use; what science wanted was its active principle. Chemists worked at it for years, and finally, in 1901, Dr. Takamine succeeded. It turned out to be one of the important discoveries in surgical chemistry. In the first place adrenalin drives away the blood from any living tissue to which it is applied. This makes it especially useful in delicate surgery, especially of the nose and throat. Formerly, an operation in the nasal passages, for example, was followed by a rush of blood which hid his work from the operator. Now the surface is treated with adrenalin, and it can be cut like fresh meat. Adrenalin is used by oculists in relieving congestion of the eye. Moreover, it is the most powerful heart stimulant known. Surgeons inject it into patients dying from the shock of operations. It drives the blood ahead of it, giving the heart a quick squeeze, which will sometimes start the engine going after it has practically stopped. Adrenalin is used to relieve violent inflammations and to stop hemorrhages of all kinds—persistent nose-bleed for example. It is rather a costly drug, however, since the process of manufacture from the glands of sheep is long and delicate. A cheap mechanical process of manufacture would greatly extend its use.