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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 515,

For the Week Ending November 14, 1885.

Price 10 cents. For sale by all newsdealers.

THE WASTE OF WHISTLING.

The nuisance of the steam whistle in populated neighborhoods has been frequently mentioned, and in some localities municipal ordinances and railroad managements have restricted its use. But it is seldom that the cost, expense, and waste of the steam whistle is mentioned. And yet the blowing off of steam through locomotive whistles alone must entail an enormous waste of fuel. Steamboat whistles and the utterly useless stationary engine whistles must make, in the aggregate, an enormous waste to the purchasers of fuel for steam boilers. From recent reports it is seen that there are 1,940 grade crossings in the two States of New Hampshire and Connecticut. Probably not less than an average of twelve trains cross these roads daily; at each a locomotive whistles under a pressure of about 110 to 120 pounds the square inch. The aggregate amount of steam thus blown off into noise is very great.

The steam from a whistle escapes in an annular space around the bowl; and if the whistle is six inches diameter and the annular space is only one thirty-second of an inch wide, the total escaping space will be more than one-half square inch. That much steam is required to supply a steam whistle is evident from the fact that all steam whistles have for their connecting stems very generous steam pipes; and also from the fact, patent to every observer, that as dense a cloud of vapor is formed from the steam of the whistle as that escaping from the safety valve in the same time.

The superintendent of one of the most important railroads in the country, himself a practical engine driver, says that when he was a locomotive engineer he was requested by a committee of local political demonstration to persistently toot his whistle as he approached the depot from a point nearly a mile from the station. He did so, and ran his steam down so that his passengers had either to walk from the stationary train or wait until steam could be gotten up. The writer once in whistling two refractory oxen off his road ran his steam down from 110 to 80 within less than two minutes, and the fireman piling in the wood all the time. The superintendent to whom reference has been made believes that for the time the ordinary steam whistle is used, more steam is required than is used for driving the locomotive, with its double cylinders and pulling a train of cars. The whistle demand of steam is a constant one during its use—not intermittent like the admission of steam to an engine cylinder; and the size of the pipe—not less than one and a half inches—permits a very large amount of steam to escape under a pressure of 120 pounds to the square inch. This authority, with others of practical knowledge, says that thirty-five cents per day for the tooting of steam whistles on running trains is a very low estimate of the cost. This does not include depot yard work. And no estimation is conjectured as to the waste of steam and cost of fuel for the steamboat and steam tug whistles and those of stationary boilers. But for exactive legal enactment and obstructive legalized orders, much of the useless waste of whistling, and much of its abominable annoyance, could be stopped and abated.

A still more exact statement is that of a well informed railroad man, who says that the expenditure of fuel for each locomotive on the New York, New Haven, and Hartford road each day is about one-eighth of a ton; this only for the legally required soundings at grade crossings. This would make, for this one road, the cost of fuel, for grade crossing steam whistling alone, not less than $15,000 per year.

ASTRONOMICAL NOTES.

THE GREAT RUSSIAN TELESCOPE

is now in successful working order in the Observatory at Pulkowa. Herr Struve, the Director of the Observatory, was present at the eleventh meeting of the Astronomical Association, which was held at Geneva in the month of August. The distinguished astronomer bore testimony to his complete satisfaction with the working of the new telescope. He presented to the members of the Association photographs of the great refractor.

Professor Newcomb, of Washington, was also present at the meeting. He had been at Pulkowa, studied the instrument thoroughly for seven days continuously, and indorsed heartily Herr Struve's views regarding it, giving at the same time various interesting details. It is to be hoped that the telescope in the hands of so efficient a director will distinguish itself by making some brilliant discovery. It is at present the largest refractor in the world, the object glass being thirty inches in diameter.

The glass was prepared by Messrs. Alvan Clark & Sons, of Cambridgeport. Mr. Alvan Clark has received from the Czar of Russia gratifying proof of the appreciation of his work: It took form in the golden honorary medal of the empire "in acknowledgment of the excellent performances of the great object glass." The medal is given very rarely, and only for extraordinary merits. Only one other has been granted by the present Emperor.

THE AUGUST METEORS.

Mr. Denning, of Bristol, England, reports that the shower was more brilliant than usual, although he made no regular observations, on account of the overcast sky. Many meteors were, however, noticed in the clear spaces that occasionally occurred, and the display must have been a fine one, judging from the numbers visible in the small portion of the heavens available for observation. The August meteors are known as Perseids, because they radiate from a point in the constellation Perseus. On the nights of August 5, 8, and 13, thirty-seven Perseids were seen, though cloudy weather prevented a full observation. The shower continued until the 20th, though it was a very slight shower at the last, two Perseids only being seen in a watch of three hours and a half, when thirty-one meteors were recorded.

A REMARKABLE SOLAR PROTUBERANCE.

We find in "Ciel et Terre" an interesting account of a very brilliant solar protuberance, observed by M. Trouvelot, on the 16th of August, on the sun's eastern border. At first it appeared to be detached from the sun, and seemed to float above the solar surface like clouds in our atmosphere. Closer attention showed that such was not the case, but that it was attached to the chromosphere by a long and slender filament, inclined, and slightly luminous. The protuberance seemed to be composed of a single branching filament folded or rolled several times upon itself, thus forming a compact mass of a hemispherical form. The lower part extended 2′ 36″ from the sun, and the summit reached a height of 3′ 54″. An hour later, the protuberance, at first quiescent, showed signs of movement. It became dazzlingly bright, rising gradually above the sun until it attained a height of 4′ 51″. A curious phenomenon occurred during its ascent. As it rose it seemed to unroll, the principal mass appearing to unwind, and the branches first seen remaining easily recognized on the column, in spite of the changes of form it had undergone.

Half an hour later, it formed a long, branching column, brighter at the summit than at the base. As it rose, its luster dimmed. This is usually the case with protuberances that rise above the sun. At the end of the observation it was so faint that the summit alone was visible. A faint idea may thus be gained of the pent-up forces existing in the solar mass, when eruptions of flaming hydrogen take place like the one described. The tongues of flame must have reached a height of nearly 130,000 miles above the solar surface, moving with an amazing velocity, changing form with incredible rapidity, and beginning and ending during an observation of about two hours.

ASTEROIDS.

We have already recorded the advent of five asteroids in 1885, the last ranking as No. 249. Three new ones have since been added to the list. Dr. Palisa, of Vienna, won the honor of discovering No. 250 on the 4th of September. Dr. Palisa also discovered No. 251 on the 4th of October, thus raising the number of those found by him to forty-nine. Dr. Perrotin is latest in the field, announcing the discovery of No. 252 on the 28th of October. Thus far the three latest comers remain unnamed. It is becoming difficult to find names for this numerous family.

Percentage.

The reckoning of percentages, like the minus sign in algebra, is a constant stumbling block to the novice. Even experienced newspaper writers often become muddled when they attempt to speak of it. The ascending scale is easy enough: Five added to twenty is a gain of 25 per cent; given any sum of figures, the doubling of it is an addition of 100 per cent. But the moment the change is a decreasing calculation, the inexperienced mathematician betrays himself, and even the expert is apt to stumble or go astray. An advance from twenty to twenty-five is an increase of 25 per cent; but the reverse of this, that is, a decline from twenty-five to twenty, is a decrease of only 20 per cent. There are many persons, otherwise intelligent, who cannot see why the reduction of one hundred to fifty is not a decrease of 100 per cent, if an advance from fifty to one hundred is an increase of 100 per cent. The other day an article of merchandise which had been purchased at ten cents a pound was resold at thirty cents a pound, a profit of 200 per cent; whereupon a writer, in chronicling the sale, said that at the beginning of the recent depression several invoices of the same class of goods, which had cost over thirty cents per pound, had been finally sold at ten cents per pound, a loss of over 200 per cent. Of course there cannot be a decrease or loss of more than 100 per cent, because this wipes out the whole of the investment. An advance from ten to thirty is a gain of 200 per cent; a decline from thirty to ten is a loss of only 66 2-3 per cent. The New York *Sun* prides itself on the exactness and purity of its style, and indulges in frequent criticisms of its contemporaries; but in its Thursday morning's description of the great orchid sale, it affirms that "some of the highest priced plants brought 150 per cent less than Mrs. Morgan paid for them." Of course, if nothing was realized from them, this would only be 100 per cent less than they cost.—*Journal of Commerce.*

Zincography.

Mr. Mantel, director of the stereotype foundry of Dupont's printing house, describes as follows the process of converting a lithographic or copper plate print into a typographic block. The composition to be reproduced is drawn with a crayon or pen upon a lithographic stone, which undergoes all the preparation necessary for a proof upon transfer paper. It is then transferred to a plate of properly planed zinc, which has been washed with a solution of soda or potassa and dried with a rag. The transfer is made just as if it were a question of an impression upon stone. Care is taken to see that the fine lines of the drawing are all reproduced, and, if they are satisfactory, gum water, alone or with the addition of a decoction of nutgalls, is passed over the surface of the zinc. The gum combines with the zinc, and renders it proof against the contact of fatty matters.

After the plate has remained under gum for a little while, it is washed and then inked with thick ink by means of a lithographic roller, just as would be done for pulling a proof from stone. Then, by means of a cotton dabber, resin in impalpable powder is dusted over the entire surface—although finely powdered bitumen may likewise be used This resinous dust adheres to the oily parts, solidifies them, lodges in all the interstices formed where the inking has been slight, and forms a protecting envelope against the penetration of the acid. Care is taken to remove all the superfluous resin.

The edges and bottom of the plate are now covered with lac varnish or a solution of bitumen, after which it is immersed in a bath of water containing five per cent of nitric acid. After remaining in this for twenty minutes, it is taken out and gently rubbed with a piece of soft charcoal—an operation which, by removing the first layer of ink, allows the beginning of the conversion of the drawing into a typographic plate to be seen.

This first biting in is usually very slight. If it has proceeded regularly, a second inking is given before immersing the plate in the bath again for another twenty minutes. Upon being taken out the second time the ink is removed as before, and the plate is examined to see whether the acid has done its duty. Then a third inking is given, and the plate is immersed again for from twenty to twenty-five minutes.

At every biting in, the strength of the bath is increased two or three degrees by the acetometer. It is rarely the case that a fourth biting in is necessary. The trough containing the bath is of oak lined with either gutta percha or sheet lead. It is fixed upon a pivot that allows it to be given a continuous rocking motion while the plate is immersed. This agitation is indispensable in order that the acidulated water shall constantly flow over the plate and carry away the salts of zinc that are formed.

The transfer of the drawing from stone to the zinc plate is affected in a lithographic press. Only line drawings are treated by this process.

The zinc plates are prepared by specialists. Moreover, if it be desired to write, draw, or make a transfer upon a zinc plate, it is essential that the latter shall undergo various preparations, such as polishing, scouring, etc. If these operations have been properly performed there will be obtained good typographic plates that it will be only necessary to mount upon wood after the whites have been routed out. Finally, the blisters are removed with a graver, all the inequalities are straightened out, and all the small defects observed are remedied. As for typographic plates derived from an engraving on steel or copper, instead of making a drawing upon stone, the engraving is transferred thereto, and from this is pulled a proof upon India paper, which is transferred to the zinc plate.—*Chronique Industrielle.*

American Shipping.

The Maritime Exchange of New York city recently met to take action on the report of a special committee appointed to suggest a plan for the revival of the merchant marine. The committee was in favor of Congress enacting a law, based on the French bounty act, by which all steam and sailing vessels built in the United States and in the merchant service should be entitled to a bounty of 30 cents per ton for every 1,000 miles sailed. It also suggested that the bounty continue in force for ten years, and that at the end of that time the amount be reduced ten per cent each year. The wording of the suggestion is a trifle ambiguous. The Exchange, having had its purpose strengthened by favorable communications from Philadelphia, Boston, and San Francisco, and from the Commissioner of Navigation, passed a resolution instructing the committee to draw up a bill to be introduced into the next Congress.

At the present time the shipping business is greatly depressed in all parts of the world. In this country many vessels are idle, tied up to the docks, no cargoes to carry. In England hundreds of steamships are laid up, the ship building industry is greatly reduced, and thousands of workmen thrown out of employ. An additional act of Congress that would bring business for our present fleet would not be a bad project.

PHOTOGRAPHIC NOTES.

Graphic Method of Determining the Speed of Shutters.—Prof. L. H. Laudy, of the Columbia College School of Mines, in this city, recently exhibited before the Society of Amateur Photographers a simple apparatus for showing the speed of shutters. It consisted of nothing more than a common tuning fork, which can be purchased for five dollars, having fastened at one end, by glue or cement, a fine delicate style or hair. Upon the outside surface of the shutter was secured a narrow strip of glass, mica, or other transparent, smooth material, by means of four or five drops of melted paraffine. The exposed surface of the glass was smeared with lampblack, obtained by holding the glass over a candle or smoking lamp before adhering it to the shutter.

The lens, with the shutter set, is next placed in front of the tuning fork in proximity to the delicate style on the end, so that the same gently scrapes against the glass strip. With a common violin bow, vibration is imparted rapidly to the tuning fork, and immediately the shutter is made to fall, carrying along with it the glass strip. Taking the glass strip off of the shutter afterward, and examining it by transmitted light, a fine wavy transparent line is seen, the length of each wave increasing as the speed of the shutter was accelerated.

Knowing that the fork makes a certain number of vibrations per second, it is easy to count the different waves on the glass, and thereby determine accurately the time it took the shutter to fall.

When it was desired to maintain a constant vibration in the fork, a battery was provided which, by means of a make and break current, operated a magnet alternately. By careful experiment it was proved that the friction of the delicate style on the glass surface did not in any way affect the vibration of the fork. An ordinary gravity shutter was found to fall in about one-twelfth of a second.

Prof. Laudy stated that Mr. Muybridge, experimenting for the University of Pennsylvania, had succeeded in making a shutter which would operate in the one five-hundredth part of a second. He believed this was the fastest speed yet attained.

The advantage of the tuning fork method over the ordinary chronograph for recording the speed of shutters was its cheapness.

Specimen strips of glass made by operating the shutters of different speeds before the audience were immediately thrown upon the screen by the optical lantern, showing very plainly the remarkable simplicity and advantage of this graphic method. Some of the shutters, with two or three elastics attached, went off with a report as loud as a pistol.

Toning Lantern Slides.—The following useful method for imparting rich blue-purple tones to lantern slides was recently given by Mr. Ayres before the London and Provincial Photographic Association in a report in the *British Journal of Photography.*

He used bichloride of platinum, and could obtain a blue tone, and reduce any shadows which might be too heavy. Three baths were made, as follows:

No. 1.

Water	10 ounces.
Bichloride of platinum	2 grains.

No. 2.

Water	10 ounces.
Chloride of gold	2 grains.

No. 3.

No. 1	1 ounce.
No. 2	1 ounce.

It will be seen that No. 3 is a mixture in equal parts of No. 1 and No. 2. When the shadows of the slide looked too dense and heavy, he put it into No. 1; if, on removing, it then looked too cold in tone, he put it in No. 2 to warm it up. If he doubted whether it wanted warming up, he put it in No. 3. By means of the three baths he had the transparency under complete control, and had no difficulty in turning out good slides. He stated that the plan would do for prints on gelatine as well as on collodion.

With iron development and slow gelatine plates, the tone obtained after fixing is usually a chocolate brown; after well washing, the plate is treated as above stated, when the blue tone is produced.

Bachrach's Method of Developing in Two Solutions.—For the past eighteen months the following plan has been in successful use:

No. 1.

Boiling water	16 ounces.
Crystallized sulphite soda	3 ounces.
Schering's recrystallized pyrogallic acid	1 ounce.
Sulphate of soda	¼ ounce.

To the above add:

Salicylic acid	5 grains.

Dissolved in

Alcohol	1 drachm.
Glycerine	¼ ounce.

This solution will keep for months, and may be held in an ordinary covered dipping bath similar to that formerly used to hold the silver bath.

No. 2.

Crystallized carbonate of soda	½ ounce.
Crystallized sulphite of soda	1 ounce.
Water	12 ounces.

The plate is dipped in No. 1 for from a half to one minute, then removed and put into a developing tray containing sufficient of No. 2 to cover the plate. Should the plate be overexposed, a suitable restrainer is added to No. 2.

The plan of procedure is to develop the plates which are thought to be underexposed first, and finish with those fully timed, as it is found No. 2 acquires a little pyro from the plates.

The development of large batches of plates by this plan is not only rapid and economical, but also remarkably uniform in density and color.

With the whole amount of the No. 1 solution, two persons (one to dip in No. 1 and the other to develop) have frequently developed twenty-five 8x10 plates in half an hour, with results much more even and satisfactory than with the usual method.

The function of the addition of the sulphate of soda to No. 1 is to prevent the solution from attacking or softening the gelatine film, especially when plates are used prepared with a soft gelatine.

The Preservation of the Obelisk.

The New York Park Commissioners are taking the preliminary steps toward the protection of the obelisk in Central Park. They have decided to employ a paraffine process suggested by Prof. Doremus, and known as the Caffall patent process. The shaft is first gone over very carefully, and every loose particle removed from its surface. This is the most tedious part of the whole undertaking, but is considered absolutely necessary for a thorough treatment. The erection of the scaffolding required some little time, as it had to be built entirely independent of the monolith.

After this scraping, the surface of the stone, when thoroughly dry, is heated to a temperature slightly exceeding the melting point of the waterproofing mixture, about 140° F., by means of a series of small charcoal furnaces suspended from the scaffolding. The waterproofing mixture consists of paraffine, creosote, and turpentine, and is prepared as follows: One part by weight of creosote is mixed with five parts of turpentine, and the mixture boiled until clear. Twenty-five parts of paraffine are then added, and the whole brought almost to ebullition. The hot liquid is applied to the heated surface of the stone, and is absorbed to a depth of one or two inches, depending upon the depth to which the stone is heated. After treatment, the surface is hard and waterproof, the only visible effect being a darkening of the color. This, however, will improve the appearance of the monolith, as the syenite was originally darker than at present. The work will probably be completed some time during November, and is expected to cost about $550.

We publish on another page an interesting letter from a correspondent in Nashville, Tenn., who gives the results of practical experience in preserving stone structures.

The Explosion of Dynamite.

The chronoscope of Captain Noble showed that explosion is transmitted through trains of dynamite at the rate of 20,000 to 24,000 feet per second. At this rate the explosion of a cartridge a foot long must only occupy the 24,000th part of a second. A ton of dynamite cartridges of the usual size, about ⅞ inch in diameter, laid end to end in a line, would stretch a mile, and the whole train could be exploded in the one-fourth part of a second by firing a cartridge at either of the ends. If fired in the middle of the line, the explosion would be transmitted both ways, and would occupy only the eighth part of a second. The facility with which dynamite can be fired in trains offers great advantage in many engineering operations, such as where it is required to blow down an arch or a wall. It is enough to lay a train of cartridges along the crown of the arch, or along the bottom of the wall, and explode one cartridge in the usual way with a detonator. The whole train goes off instantly. The enormous velocity with which dynamite explodes explains the great violence of its action, and the tremendous local rupturing effects of even small quantities of it exploded in the open, and without being inclosed in a case of any kind. The detonation of a cartridge in the 24,000th part of a second must produce an enormous instantaneous pressure on the spot on which it explodes. For such a sudden explosion the pressure of the atmosphere itself is sufficient tamping.

Wind on Lake Erie.

During the prevalence of a strong east wind, the waters of Lake Erie were recently lowered two feet at the eastern end of the lake, and the work of loading boats in the Blackwell Canal had to be suspended. At Toledo the wind blew such a gale at the same time, but from the west, that the Maumee River dropped two feet below the accustomed level, and a steam barge could not leave port on account of low water. The two currents met in the lake off Port Stanley, Ont., and produced a noticeable elevation of the waters. Such an occurrence has never been known before on the lakes.