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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 688.

For the Week Ending March 24, 1888.

Price 10 cents. For sale by all newsdealers.

HENRY BERGH.

The founder of the New York Society for the Prevention of Cruelty to Animals died at his home, 429 Fifth Avenue, on March 12, 1888. He was born in this city in 1823. He was partner in early life with his father, a shipbuilder, whose yard was situated at Corlaers Hook. In 1842 he retired from business and went abroad. He was appointed secretary of the American Legation in Russia by President Lincoln. On his return, as he passed through England, he became acquainted with the president of the English Society for the Prevention of Cruelty to Animals, and decided to found a similar society here. This became his life's work. The society was instituted in 1865. Statutory powers of prosecution and arrest were conferred upon it in 1866, and thenceforward without salary or compensation of any sort he devoted all his energies to the forwarding of his chosen cause. The results of the twenty-two years of work now closed are incalculable in extent of good. Abuse of the lower beings is now rarely heard of in this city. In this State there are 400 workers, and thirty-six other States have similar organizations. The headquarters of the society are in a building on the corner of Twenty-second Street and Fourth Avenue, which was erected about 1872. To it was devoted a legacy of $150,000, which was left to the society by Louis Bonard, a native of France, who had amassed a fortune in trading with the Indians. Every form of abuse of animals received his attention, and the officers of his society seconded his efforts. Cock-fighting, dog-fighting and rat-baiting were all attacked and practically suppressed by the society. His methods often seemed arbitrary and quixotic, but every one supported him, and public opinion was his justification for his most extreme acts. His appearance was remarkable, his height and slender figure and sad countenance attracting attention even where he was not known.

ROTARY STEAM SHOVELS.

The manufactory of the rotary steam snow shovel is located at Paterson, N. J., one of the suburb cities of New York. But it unfortunately happened that not one of these remarkable machines was present in the shop at the time of the recent great snow storm. All were in use out West, where their wonderful powers have been exhibited this winter to the greatest advantage in keeping open the roadways. Had but a single one of these machines been available in this vicinity last week, all of the railways leading to the metropolis might have been soon cleared, and the greatest portion of the losses to the railway companies and inconveniences to passengers and the public would have been avoided. One of these machines placed in front of a passenger train would have gone through any of the snow drifts we had, at the rate of twenty-five miles an hour, picking up and delivering the snow in a great stream, like a column of smoke, to a distance of one hundred and fifty feet from the track. It will thus be seen how quickly all the tracks around New York might have been opened.

In view of the great losses to the trade and commerce of this city by the recent storm, it would be a good investment for our municipal authorities to order and keep in storage a couple of these rotary shovels, for use in case of emergency. The parsimony and short-sightedness of the great railway companies that center here, such as the Pennsylvania, the New Jersey Central, the Delaware & Lackawanna, the New York Central, and New York, New Haven & Hartford, is such that they cannot be depended upon to do anything of this kind.

To have such machines on hand in readiness for use would be simply an insurance against loss, and would be a good investment for the city to make, even if the machines were not called into use more than once in ten years.

CAR STOVES.

If there is one thing more certainly demonstrated than another by the experiences of the late great snow storm, it is that every passenger car must be provided with first-class heaters and a supply of fuel, so that in case of necessity each car may be kept warm.

During the recent storm probably a hundred trains were stuck fast in the snow within a radius of 25 miles from New York; and had it not been for the presence of the stoves, great suffering would have ensued. The plan of heating by steam taken from the engine will not answer for extraordinary emergencies, like a genuine blizzard. It is generally necessary to detach the locomotive from the train to fight the snow, in which case the cars cannot be kept warm.

It is true many dreadful disasters have happened from badly constructed stoves, by collisions and derailments. But in every case where the improved forms of stoves have been used, properly secured, no bad results therefrom have taken place. It would seem to be within the range of legitimate invention to provide stoves that will not scatter fire, and also with extinguishing devices, whereby the fire will be instantly put out in case of accident to the car.

It is evident the recent legislation in some of the States aimed to banish independent heaters and stoves from passenger cars will need to be modified. The stoves are almost as necessary for the comfort of passengers as are seats to sit upon.

THE LESSON OF AN EMERGENCY.

The recent great storm will not have been without some good results if it energizes the efforts of those seeking to introduce some hitherto obviously needed public improvements, and puts spurs to government and municipal officials, heretofore all too tardy in recognizing what is incumbent upon them in the changed conditions of modern commercial and industrial life. Among such improvements that have long been urgently called for, one is that of putting underground at least a portion of the telegraph and electric light wires in all large cities, and burying some of the telegraph lines connecting the most important commercial centers. It would be ludicrous, were it not too serious a matter, to think of telegraphic messages being sent between Boston and New York *via* London, 6,000 miles under the ocean, as was necessary on March 12 and 13. While passenger and freight trains were stalled in snow drifts all the way from Boston to Baltimore, the telegraph service of the country was suddenly paralyzed, and the arc light wires, torn from their supports on poles and house tops, and crossing telephone and telegraphic wires, became at once a source of danger to human life and probable cause of conflagrations, an emergency which the companies prudently met by shutting off the electric light currents, leaving in darkness those who had depended upon them for light.

A New Water Supply for Paris.

It is well known that Paris is not well provided with regard to drinking water, having to draw its chief supply from the upper course of the Seine and the Canal de l'Ourcq, branching off from the Marne. A Swiss engineer, Herr Ritter, has submitted to the Paris municipality a plan by which the city may be furnished with an ample supply of water from an inexhaustible source—the lake of Neufchatel, Switzerland—at a cost of 300,000,000 fr., or £12,000,000. This heavy outlay would, however, be covered after construction by a safe revenue for interest and amortization. Herr Ritter is an engineer who has established his reputation for the construction of water works, and the success attending the works he erected at La Chaux-de-fonds has encouraged him to make the proposal in question to the Paris municipality. Some time ago another engineer, M. Beau de Rochas, proposed to furnish Paris with water from the Lake of Geneva, at a cost of 500,000,000 francs; but the scheme was not accepted, probably on account of the great expense. Herr Ritter is more moderate in his estimate, and there is a probability of its be ingaccepted. The principal details of the great undertaking are given as follows: The distance between the Lake of Neufchatel and Paris is 312 miles, and the surface of the lake is 1,620 feet higher than the mean level of Paris, its total area covering 350 square kilometers. This vast body of water, even if it were not replenished, would be sufficient to supply Paris for two years at a rate of 132 gallons per head per day, the level of the lake falling no more than three feet, and the water, which would flow with a speed of rather under 100 feet per second, would arrive at Paris at a temperature of 50° Fahr. But a lowering of the level of the lake is not to be thought of, for the lake has tributaries yielding a larger supply of water in the hot season than in winter. Herr Ritter does not intend to take the water from the surface of the lake, but to draw it off, as is done in the case of Chicago from Lake Michigan, by an underground heading 262 feet below the surface of the lake, where it has a temperature of only 43°. The water would be taken through a tunnel 22 miles long, under the Jura Mountains, to the Dessoubre Valley, in the department of the Doubs, and thence in an arched conduit along the slopes of the hills to Paris, where it would arrive still at an elevation of 394 feet. As the present reservoirs of Paris have an elevation of only 295 feet, raising the fall, or pressure, by 100 feet, with a flow of 4,400 gallons per second, would give a tremendous motive power. Herr Ritter has calculated that in this manner Paris could be furnished not only with an illimitable supply of excellent drinking water, but also with the electric light in all the streets and water power in all the workshops at a reasonable price, independently of the advantages accruing to the districts through which the conduit would be laid, and which could also draw their supplies from the same source. Herr Ritter estimates that it would take six years to complete the works along the whole line.—*London Morning Post.*

Look Out for Benzine.

According to the *American Exchange and Review*, "it is a little known fact that hard friction can develop sufficient heat to inflame benzine vapor, especially if the surface rubbed be varnished with shellac." They had also been informed by a competent and truthful mechanical engineer that the head of a "soldering iron," which it is well known is far below "red heat," had, in his own experience, been sufficient to set fire to an escape of benzine vapor.

Military Notes.

At some recent experiments made under the auspices of the aerostatic corps of the German army, good photographs were taken of the surrounding region while a balloon was poised 2,500 meters—about 1½ miles—in air. It will be remembered that, during previous tests of this kind, so many difficulties were met that the promise of any really practically valuable work seemed rather doubtful. Tireless German energy and study have at last succeeded in overcoming these difficulties, if we may judge from the *Militar Wochenblatt*, but in just what way we are not told, the reason for this being obvious.

The French *Societe d'Encouragement pour la Navigation Aerienne* is also hard at work. Just now it is completing an interesting system of aerial night signaling at great distances, which can scarcely fail to be of great value to an army in the field. A captive balloon, only large enough to support a depending incandescence light of about thirty candle power [a five foot gas jet is of sixteen candle power], is sent upward to whatever distance may be required, a silicious bronze wire, scarcely thicker than silk, connecting the balloon with the ground, and furnishing the electrical energy for the light from a dynamo below. By breaking and completing the current, the incandescence light under the balloon is made to flash at whatever intervals are required to form letters on the Morse telegraphic system of dots and dashes. Thus two armies in the field, widely separated, the one from the other, having similar apparatus at their several headquarters, may communicate freely, and the general in command be enabled to handle both as though they were at the same spot. Indeed, any number of corps, if within signaling distance, and this depends, of course, upon the clearness of the nights, could be kept in communication with each other and with the general staff. To prevent the enemy from reading the dispatches two circular cards, attached at the center, are provided, so that an alphabet on the one revolves around that on the other, and thus every message may be sent on a different and easily understood key. The entire apparatus with duplicate parts, in case of accident, is ingeniously arranged to be carried in a light two-wheeler that one man can readily pull along after him.

The maneuvers of the German torpedo fleet are attracting no little attention just now in Europe, and it is not at all surprising if the reports of its effectiveness are not exaggerated. Germany cut but a sorry figure on the sea, even when her armies in 1870–71 were carrying all before them, and there was a belief, when she began to build the big ships of the Koenig Wilhelm type, that she would vie with the other powers in collecting a great fleet of these monsters. But the Germans, a long-headed people, soon satisfied themselves that more was to be gained by torpedo boats than great ships, and they soon began to devote themselves to forming a fleet of these powerful little craft, and now, though they have an ocean line of battle of only 23 heavy armorclads, they possess considerably over a hundred torpedo boats, comprising two great fleets, the one at Kiel, the other at Wilhelmshaven. Each division of these is divided again into two *abtheilungen* of three companies or squadrons. A discipline like unto that maintained among the land forces prevails, maneuvers and experiments are constant and thorough, and there is reason to believe that a hostile fleet, however strong, would have its hands full should it approach the German coast in any other than stormy weather, and, under such conditions, it would be employed battling the elements.

In the new school of the soldier, called for because of the adoption of the magazine rifle, a principal difficulty, and one not yet met, is the prevention of reckless and wasteful extravagance in ammunition. A decided inclination has been observed among old as well as young soldiers to be less saving than formerly. The German or French soldier, if he likes, may fire say twenty rounds in a minute, and the reduction of the size and weight of the bullet and powder enables him to carry half again as many cartridges as before. In times of excitement, should he lose his head, that is to say, his wits, he might empty his cartouche box and also his bandolier at short notice, so short, indeed, that, when the enemy should really come up, and quick firing would be of vital moment, he would be practically powerless. A famous American Revolutionary General commanded his men to "wait till you see the whites of their eyes," referring to the enemy, and thus he made sure there would not be any ammunition wasted. After the same idea the German and French officers are trying to instruct their men, but they have discovered that a soldier fires with more or less care, according to the difficulties of loading his piece and the number of shots he has left him.

From a remark attributed to Admiral Hewett, R. N., during a reception given him recently by the municipal government of Genoa, it would appear likely that Italy intends to join England on the seas as well as the Austro-German alliance on the land. In answer to Signor Paresi's expressions of satisfaction at the present cordial relations between Italy and England, the admiral is reported to have said: "The bonds which unite us may in all probability find in the near future a practical illustration in the union of the Italian and English fleets." *L'Avenir Militaire*, commenting upon this, wonders how Italy can entertain the idea, and then guesses it is because she would force France to give up Nice and Savoy, following the general idea of "Italia irredenta." These two provinces, it says, remain with France from choice, and would not return if they could.

Internal Stresses in Ordnance.

From the failures which frequently occur with guns of large caliber, it would appear, says *Engineering*, that the initial stresses in the interior of the metal of the various rings, which have hitherto been treated in practice as negligible quantities, have an importance as yet not properly allowed for by their designers. The reason of such neglect is by no means obvious, as in the case of ordinary cast iron guns their importance has long been known and acted on in a practical way by Rodman and others, but in modern steel guns, where both theory and experiment concur in the conclusion that their effects are intensified, they have, until lately, been treated as non-existent. This increase, in the case of steel, is due to the higher elastic limit of this metal as compared with cast iron, for the internal stresses cannot exceed that corresponding to the elastic limit, or the metal will take a permanent set and relieve itself of the excess, and consequently the value of the stresses in question can attain a much higher value with the more modern material. The only person who seems to have fully understood the great importance of these internal stresses is General N. V. Kalakouski, of the Russian artillery, who has carried out a most painstaking and laborious series of experiments with a view to determining the actual values attained by these stresses in different cases, and of these experiments a fairly complete account is given in a recent issue of the *Revue d'Artillerie*. The plan adopted was to cut disks of metal from steel cylinders, and to engrave on the face of each a series of concentric circles, dividing the disk up into a series of annular rings, the diameters of which were then carefully measured. The rings were then turned off successively in a lathe, fresh measurements of the diameters being made between each operation. It was then found that the values of the diameters had in general changed, thus proving the existence of internal stresses, the numerical values of which could be computed from the diametrical alterations, and frequently amounted to many tons per square inch.

New York in Danger from Cholera.

The following report of Assistant Surgeon J. J. Kinyoun of analyses of the water of New York bay is important, because it shows that the bacillus of Asiatic cholera may live in salt water, and because Hoffman Island is believed to be infected by cholera germs:

"The cities and towns discharging their sewage into the New York bay have an estimated population of three millions of people. In view of this fact, a chemical and biological examination of the bay water was undertaken, for the purpose of determining its contents, and also to find how long it would support life of the different micro-organisms, more especially that of Asiatic cholera. Accordingly, specimens were obtained at different places, being collected in sterilized flasks. The first was obtained at the Narrows, the second alongside the steamship Britannia (lying in quarantine), the third at Hoffman Island, and the fourth at Swinburne Island. These different specimens were collected in thirty minutes, and just at incoming tide.

"Chemical examination of one liter:

NARROWS.

Chloride of potash and soda	20·8 grms.
Carbonates	A trace.
Iodine	A trace.
Free ammonia	A trace.
Albuminoid ammonia	0·158 grm.

STEAMSHIP BRITANNIA.

Chloride of potash and soda	20·82 grms.
Carbonates	A trace.
Iodine	A trace.
Free ammonia	A trace.
Albuminoid ammonia	0·158 grm.

HOFFMAN ISLAND.

Chloride of potash and soda	21·64 grms.
Carbonates	A trace.
Iodine	A trace.
Free ammonia	A trace.
Albuminoid ammonia	0·158 grm.

SWINBURNE ISLAND.

Chloride of potash and soda	21·814 grms.
Carbonates	A trace.
Iodine	A trace.
Free ammonia	A trace.
Albuminoid ammonia	0·158 grm.

Reaction was slightly alkaline.

"Plate cultivations were made from each of the different specimens, and at the end of five days had developed colonies of bacteria. Examination showing the number of micro-organisms:

Narrows	4,500 to cubic centimeter.
Britannia's anchorage	10,200 to cubic centimeter.
Hoffman Island	9,600 to cubic centimeter.
Swinburne Island	11,700 to cubic centimeter.

"The micro-organisms found in each were several varieties of micrococci and one of a large bacillus. These were transferred to cultivation tubes for further observations. On November 12, test tubes partly filled with sea water were thoroughly sterilized and inoculated in the usual manner, with pure cultivations of the spirilla of Asiatic cholera, and also of Finkler and Prior. Cultivation tubes were inoculated from the water from day to day for the purpose of determining the longevity of the growths. During the first five days the water seemed to exert a slight inhibitory influence over their development. It was further observed that until January 20, a period of sixty-nine days, the characteristic growth of the spirillum of cholera Asiatica could be produced in peptone gelatine. That of Finkler and Prior has a yet longer lease of life.

"Examinations made from time to time, both by the plate method and direct staining, show conclusively that these spirilla have not only been kept alive, but have also greatly increased in numbers.

"After closely studying the currents of the upper bay, I am led to believe that if dejecta from cholera patients should be thrown into the lower bay, cholera could gain a foothold on the contiguous shores, where every condition favorable to its development and propagation sometimes exist."

Breaking of a Large Steam Engine.

One of the largest condensing beam engines in Brooklyn was running the other day, apparently in perfect order, when suddenly there was a sharp snap, then a general grinding of heavy iron, steel rods, and bars, and the powerful engine was destroyed.

The engine was in the jute manufactory of Buchanan & Lyall, which is on President, between Hoyt and Bond Streets. Engineer Small was in charge of the engine, and was just about to stop it for the day when the crank pin strap broke. This strap is a piece of wrought iron six inches wide and four inches thick, which connects the crank by means of the connecting rod to the walking beam. The connecting rod was thus loosened at one end and went flying about, wrecking everything it touched. The fifty inch piston was thus released, and it descended to the bottom of the cylinder and cracked the lower head. The force of steam sent the piston up with great violence, and the upper head of the cylinder was also cracked and torn off. The engine room soon became filled with steam, and the work of destruction continued. The connecting rod in its descent struck a large brace, and thus made a lever of the walking beam that was being forced down with tremendous power. This force and resistance snapped off the three-inch bolts which hold the caps to the upper part of the gallows frames, and the frames, which were four inches thick and six inches wide, were broken to pieces. Large pieces of the wrecked engine were hurled in all directions, and everything in the room was more or less damaged. The plunger pump was a total wreck, and the air pump rods were broken as though they had been straws.

Engineer Small and his fireman stood bravely at their posts, and although the room was filled with steam, through which 100 pound chunks of metal were flying in all directions, they managed to reach the stop valves on the boiler and cut off the steam from the broken engine. The momentum of the big fly wheel was enough to keep the broken shafts and rods in motion for a few minutes after the engine had been a total wreck, and the broken pieces continued to smash things until at last they lost their power and quieted down like an expiring demon.

Nickel Plating Solution.

According to the *Bulletin Internationale de l'Electricite*, the following solution is employed for nickel plating by several firms in Hainault. It is said to give a thick coating of nickel firmly and rapidly deposited. The composition of the bath is as follows:

Sulphate of nickel	1 lb.
Neutral tartrate of ammonia	11·6 oz.
Tannic acid with ether	0·8 oz.
Water	16 pints.

The neutral tartrate of ammonia is obtained by saturating tartaric acid solution with ammonia. The nickel sulphate to be added must be carefully neutralized. This having been done, the whole is dissolved in rather more than three pints of water, and boiled for about a quarter of a hour. Sufficient water is then added to make about sixteen pints of solution, and the whole is finally filtered. The deposit obtained is said to be white, soft, and homogeneous. It has no roughness of surface and will not scale off, provided the plates have been thoroughly cleaned. By this method good nickel deposits can be obtained on either the rough or prepared casting, and at a net cost which, we are told, barely exceeds that of copper plating.