SCIENTIFIC AMERICAN

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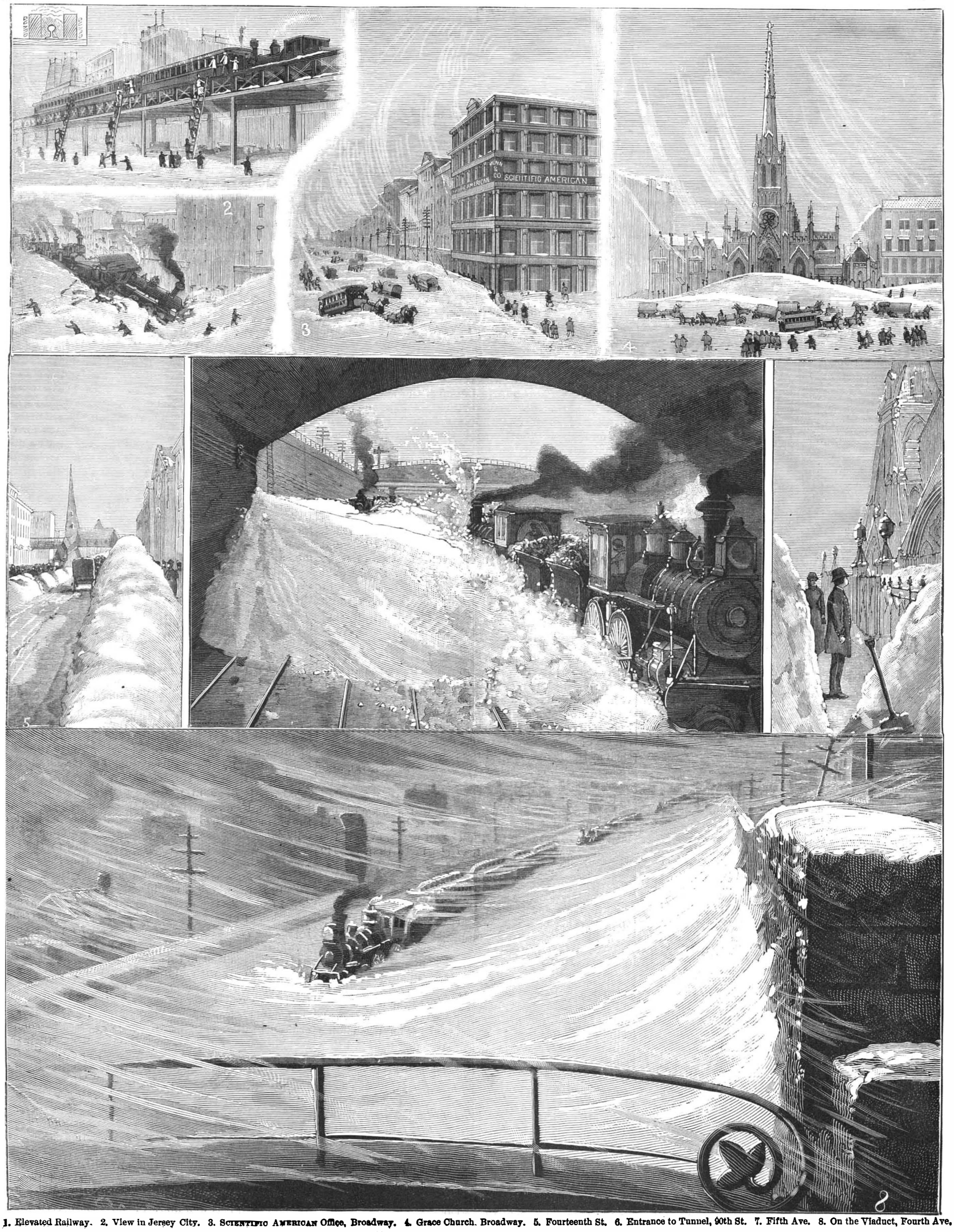

1. Elevated Railway. 2. View in Jersey City. 3. SCIENTIFIC AMERICAN Office, Broadway. 4. Grace Church, Broadway. 5. Fourteenth St. 6. Entrance to Tunnel, 90th St. 7. Fifth Ave. 8. On the Viaduct, Fourth Ave.

NEW YORK CITY—THE GREAT SNOW AND WIND STORM OF MARCH 12 AND 13.—[See page 178.]

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NEW YORK, SATURDAY, MARCH 24, 1888.

Contents.

(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.

THE GREAT STORM IN NEW YORK AND VICINITY.

A snow storm of very great severity, preceded by rain, visited New York and vicinity on the 11th, 12th, and 13th of the present month. For over 48 hours a very heavy northwest wind storm prevailed, and caused the snow to drift in all directions. In area the storm may be said to have reached from the line of Boston on the north to points south of Washington, and as far as the middle of the State of New York toward the west. New York City was about at the center, but the cities on the Hudson River suffered still more. In Troy and Albany the depths exceeded those reached in the metropolis.

At this and other ports there was considerable injury to the shipping.

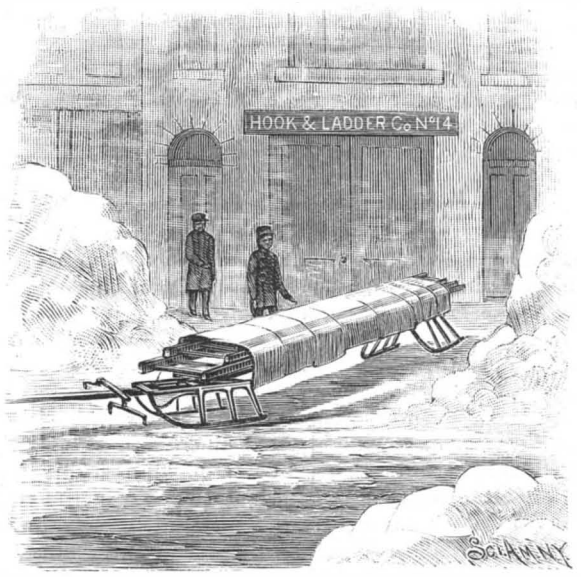
At the Delaware Breakwater, constructed for protection from easterly gales, much damage was also done, as the breakwater in this case was of little utility.

In and around this city the railroad communication was cut off, vessels were detained from reaching the harbor, telegraph lines were torn down, for two days an almost total suspension of business occurred, and for a week from the beginning of the storm its effects were still felt in the stagnation of business interests. Articles of food became scarce, milk was not to be had in the city, and patent condensed milk had to be used by all. The price of all provisions tended to rise, notably that of meat and poultry. In the suburbs, where many business men reside, thousands were detained either in their houses or on trains of cars. On all the roads the morning trains of Monday were stopped by the storm, and in some cases two nights were spent by the belated passengers on board the trains. The New Jersey railroads, and those running from the Grand Central Depot toward the north and east, suffered greatly. Where the trains were delayed at stations the capacity of the neighboring country was taxed to its utmost to provide food for the passengers. In many cases the houses in the vicinity afforded refuge to the passengers, and contributions of coffee and food in general were sent to the depots for the use of all. At some places long lines of cars and engines, representing ten or more separate trains, were snow-bound. The suspension of mail facilities was absolute for over 48 hours.

The great cause of trouble on the railroads here was the want of adequate snow plows. The snow, while in places very deep, on an average did not cover the tracks to a greater depth than three feet, and there is little doubt that a single really competent snow clearer plow, such as the rotary steam snow shovel, would have been enough to clear all the roads in a short space of time. Had a single road possessed such an apparatus, it could have run it up and down its own tracks and cleared them, and then transferred it to the next road, and thus secured an early resumption of traffic. But a storm like this is to be looked upon in the same light as an earthquake. It was unprecedented, and may never happen again in the lifetime of any of us.

The immediate effect of the storm in the city was to suspend all traffic on the surface street roads. The elevated roads, it would be supposed, would be free from trouble, but, owing to the position of their rails, on each side of which two heavy wooden guard rails are bolted down, they experienced much difficulty. The rain coated the rails with ice, snow was deposited upon the ice, and the increasing fall of snow rapidly filled up the space. burying the rail completely, and preventing transit over the road, not enough to keep it clear. In some instances the cars were all day in going the length of the road. The people, in many cases, came down from the cars on ladders, the trains being detained between stations. It is obvious there is room here for some method of keeping this space clear of snow, whether by the application of steam, which, in so limited a space, would seem practicable, or by the use of a proper scraper. The effects of the storm are shown in some of our views in various parts of the city.

We give a view of the scene in front of the office of



HOOK AND LADDER No. 14, ON 125th STREET.

the SCIENTIFIC AMERICAN on Broadway, where every effort was made to get the cars through, but it was without avail, and they were dragged by main force through the snow entirely off the track. Eventually the cars were abandoned, and the horses were returned to the stable. The same story was repeated all over the city. The entrance to the Fourth Avenue tunnel and the viaduct leading thereto were badly blockaded. On the viaduct south of the 98th Street bridge, a line of cars extended back as far as the eye could reach, and the entrance to the tunnel was completely blocked with snow. The New York Central had no plows capable of clearing their tracks.

In Jersey City a line of six locomotives had attempted to plow their way through the drifts, the leading locomotive being a very heavy six-wheeled engine of the Mogul type. At the Grove Street crossing, one much frequented by passengers, it was driven off the track. Fortunately no injury was done to the surrounding houses or to passers-by.

The fire department awoke to the necessities of the hour, by setting to work to build sleighs and hire all suitable ones, in order to use them for the transportation of engines, hose, and ladders to fires. The telephone company finding its wires were, in many instances, crossed by the electric light wires, it became necessary as a precaution against conflagration to shut off the light currents, so that the city was, for one or two nights, practically without illumination. Coal was delivered with great difficulty to many private residences. In this and other features of the situation, a powerful argument was found for the introduction of underground transportation. Thus the steam supply company supplied steam without interruption to all its customers. The gas companies supplied gas without trouble, while coal and all objects that had to be transported on the surface were only with great delay and at the cost of great efforts delivered to those requiring them.

To dispose of the heaps of snow various means were adopted. Fires were built against the heaps, and did some execution. In other places jets of steam were used to melt the accumulation. All these methods were more or less effectual, but the immense quantities of snow and the latent heat question made them a very secondary means of grappling with the problem. Carting the snow to the docks and dumping it into the river was the most efficient of the methods adopted.

The East River bridge was operated at a disadvantage, the cable transport having stopped. In the midst of the blockade thus occasioned an ice bridge formed across the East River, and several thousand people crossed upon it.

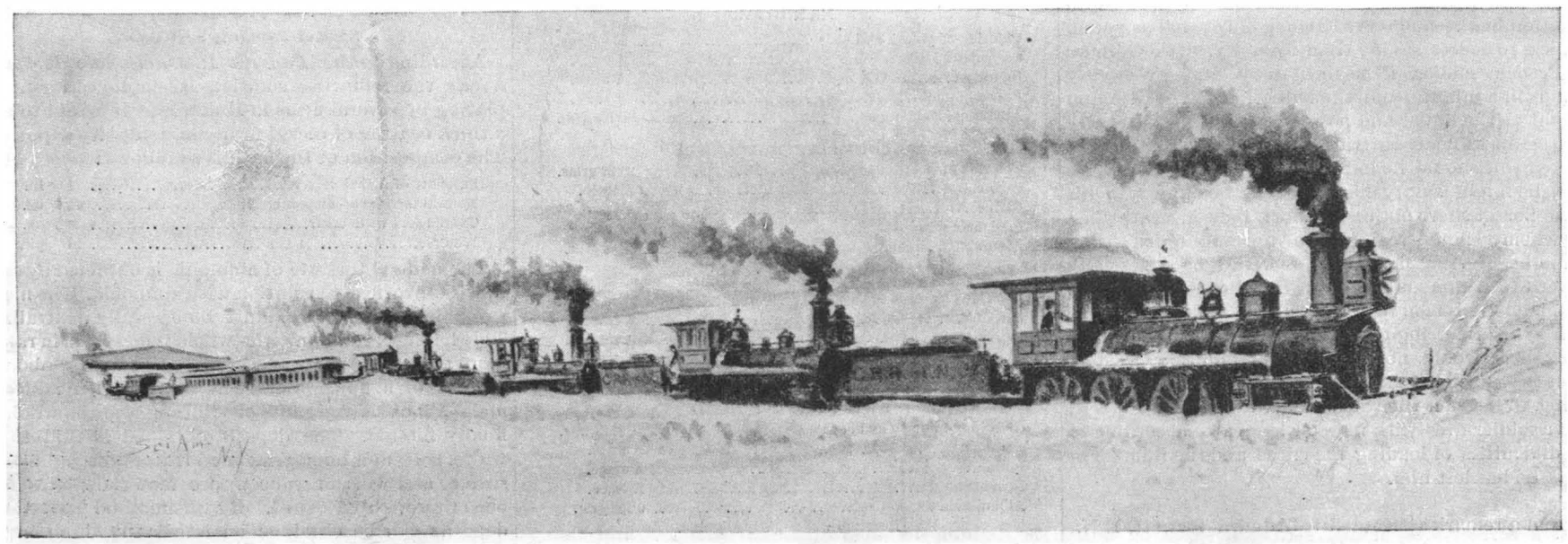
A very sad feature was the loss of life. Owing to the exposure, a number of people perished in the city and suburbs. It is yet too soon to say what the loss of life is, but it will include quite a large number when all is told. The storm is popularly called "the blizzard." It approached pretty closely to the Western definition of that type of storm, "three feet of snow and all of it in the air." It is quite conceivable that but for the thickly settled country a very great loss of life might have been among the effects of the visitation.

114th STREET LOOKING EAST.

Fire-Proofing.

We have observed what *The Sanitary News* well states, *i. e.*, that fireproof building material is coming in quite general use in the larger and finer class of buildings in our larger cities. Fire ruins show that porous terra cotta bricks and blocks best resist fire, water, and frost; next to these in the order of fire-resisting qualities come concretes and burned clay work. In the best work done, the iron work is incased in porous terra cotta, tile, or brick work in roof, floor, and tile construction. The hollow tiles are faced with vitreous tile, slate or any good weather proof coating, or with a single thickness of brick. Iron and steel framework incased in fireproof materials gives the best possible results. There is a growing preference for light porous walls of hollow material protecting an iron or wooden framework. Massive or heavy walls of brick or stone will do for architecture, but they are not as much of a mechanical necessity as they were regarded a few years ago.

A CONTEMPORARY truthfully says that grindstones, large or small, good or indifferent, are hopelessly ruined by running out of true. A wobbly grindstone and a nervous, passionate mechanic make a combination that will spoil every tool in the shop that needs grindstone treatment.



A TRAIN OF TWO CARS AND FIVE LOCOMOTIVES PLOWING THROUGH THE SNOW.

An Engineer's Life at Sea.

We continue from our issue of March 3 the article under the above title, from the *Practical Engineer*.

As soon as 12 o'clock comes, day or night, the third engineer goes on duty. His first care is to go round the engines to ascertain if all working parts are keeping cool, if the bilge pumps are at work, if the water is well up in the gauge glasses, if the firemen have relieved each other properly, and if all is in order in the stoke-hole. He must see if the oil boxes are full, and the lamps burning brightly. He must also go to the stern gland through the tunnel, to make sure that it is cool, and on the way up must see that the thrust block is not heating. He may also have to use his wits to prevent tricks being played upon him by the one whom he relieves, as sometimes affairs get unaccountably wrong as soon as the other is gone, and then upon him will rest the duty of putting them right. A common trick is to pour water on the plunger of the feed or bilge pumps to give a false idea of their being cool, or to make them suck in cold water through their pet cocks, that the tyro may imagine them to be properly working when they are not. It is therefore best to leave these pumps to be examined last, so that they may return to their normal condition before examining them. These and many other illusions one, in time, gets an adept at detecting; but on the first watch no one will try to impose on our tyro, and for the credit of engineers it may be added that it is a rare occurrence for any one to try to pass on anything seriously out of order, for each one knows well that when anything of serious import occurs, every engineer has to turn out to put it right.

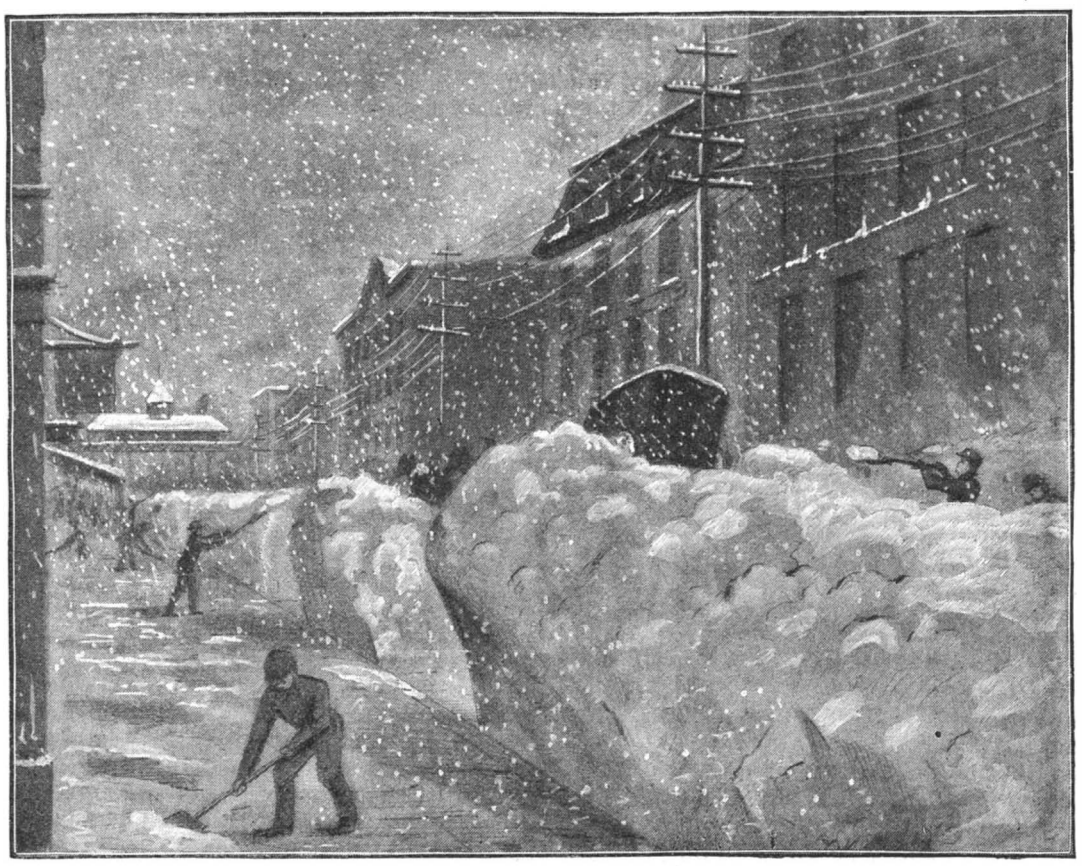
The third will relieve the second or the chief as may have been arranged by the latter when setting the watches, and he goes with a parting injunction to be sure and call him should anything go wrong or anything happen which is not well understood by the inexperienced one, who now finds himself left alone. The departing feet disappear up the ladder. He experiences a strange feeling of desertion. He is as one in a haunted room, surrounded by visionary possibilities of all kinds of disaster to the engines or to himself. He takes another look at the laboring monster beside him, but it is intent upon its work and makes no movement of recognition. He sees the crossheads flashing up and down with steady beat, with the pendulum swing of the connecting rods below, while in their strong grasp the cranks swiftly and ceaselessly revolve. The restless forces at work give our third a feeling of companionship during these midnight hours, though he likes also to remember that the firemen are not far off.

After seeing that all is working well, he must try to familiarize himself with the engines from every point of view. They are quite different to the same engines at rest, and from every new point of view they appear in a new aspect. From above and below, from front and back, they must be studied till all novelty about them disappears. Several watches pass before a thorough mastery of their details can be had, and to attain this the keenest observation is needed. No scrutiny can be too minute, and nothing is too trifling to be noticed and reflected upon. When the engines are well understood, perhaps the most striking point of view is from near the thrust block. By looking forward between the columns all the principal moving parts may be seen in one small field of view. Close by, in rapid swing, is the low pressure connecting rod, with its crosshead above, darting along its well-oiled guides. Behind it may be seen the eccentric rods crossing and recrossing each other in their erratic dance, with the curtseying quadrants above, while through their midst rushes the high pressure connecting rod, and crank brasses, intent only on their work. To the left are the circulating and air pumps, and the bilge and feed pumps, one behind the other, all driven from the low pressure crosshead by broad oscillating levers. To one really interested in the engines, as all good engineers are, these rushing, whirling masses of metal have a strange fascination, and force many curious thoughts on the solitary watcher who now alone is responsible for the safe working of the engines.

Next to familiarity with the engines, the third must get a correct idea of his relative position on board. This will soon be learned. As a rule, he will have to do the ordinary engineering work required on board, under supervision of the second, who also has the immediate control of the firemen, and is responsible to the chief for the correct carrying out of his instructions. The position of second is an arduous and responsible one. Every detail has to pass his inspection, and through him all orders pass to the third and to the firemen. The donkeyman, however, who goes on watch with the chief, and does all the work then required, is more directly under the control of the latter. With regard to the chief engineer, it will be found that the less he interferes with the work the more he will be respected, and the better will the work be done, if he has capable engineers under him. He compares notes with the second, consults him, and arranges with him what work is to be done when in port, or in reference to working of the men and engines at sea. His dealings should be entirely with the second, or the work will not be well done, and jealousy and bad feeling will soon appear. He may and must be firm, but the hand of iron should be as far as possible concealed under the velvet glove of courtesy. A bullying chief, or one who finds it necessary to display his authority, simply shows his weakness. He may be feared and disliked, but he cannot be respected. Whatever be the cause, whether imperfect education or roughness of up-bringing, it can hardly be denied that the self-assertive chief is too often to be met with, though there are many bright exceptions. As might be expected also, this unworthy kind of self-esteem is often in inverse ratio to a man's capabilities, or to his position, as for instance the most self-opinionated men may be found among the more inefficient of the firemen, to whom orders must be given, but who must never be reasoned with. Among firemen, however, as among engineers, may be found many noteworthy exceptions.

All the parts of human mechanism on board bear a certain analogy to those of the engines. The chief engineer may be compared to the steam which drives all, but which is most effective when least seen and heard. The second is like the main driving parts of the engine, the third like the main parts driven, while the firemen in their varying degrees of excellence form the rest of the mechanism. Only when each part is in its proper place, and fulfilling its proper functions, can there be peace among engines or men, so that the full effective power of each can be developed.

Thus we find that one of the first duties of a third is to understand not only the inter-relations of the various parts of the engines, but also his own relative position in the higher human mechanism of which he forms an important part.



VIEW ON GRAND STREET.

Poison in Respired Air.

Messrs. Brown-Sequard and D'Arsonval have communicated (*Compt. Rend.*, cvi., 106) the results of some interesting physiological experiments, which tend to show that an organic substance of a poisonous character is contained in the air expired by both human beings and animals. The object of the experimentalists was to prove that expired air participates largely in the production of pulmonary tuberculosis. They state that air to which 1 per cent of carbonic acid has been added is by no means so injurious as expired air containing the same amount of that gas, and that the ammonia always present in expired air will not account for the symptoms produced by inhaling the latter. The injection into the veins of animals of a liquid obtained by passing the expired air either of human beings or dogs through water was followed invariably by certain symptoms, including slightly dilated pupil, a marked slowing of respiratory movements, a considerable paralytic weakness, especially of the hinder limbs, and a rapid lowering of the temperature. Although the heart is not much affected at first, after three or four days it acquires a morbid activity. Larger injections of the liquid give rise to excessive contraction of the pupil, increased paralytic weakness, and a choleriform diarrhœa. The authors of the paper believe that it is to this poisonous principle, of which the exact nature is as yet undetermined, that the dangerous character of expired air is due. The liquid used in the above experiments had neither an acid nor an alkaline reaction, so that the principle would appear to be neutral in character.

How Business is Affected.

The *Iron and Steel Trades Journal* (London) notices that great surprise is being expressed in certain quarters with regard to the fact that the raw materials and labor do not rise in price so fast as the finished products. Crude iron is quoted about the price ruling in December, while finished iron and steel are from 10s. to 20s. per ton higher. We have never known, adds the editor, an improvement in trade to produce any other state of matters. In like manner, when a depressed period sets in, the crude products and labor reap a corresponding advantage, as the prices of finished articles always go down rapidly in face of a falling market. The cause is not obscure.

When a revival in trade is felt, there is a wider disposition to trust, and loanable capital that has been "fructifying in the pockets of the people" during the preceding depression comes into use and helps on the expansive movement. Confidence begets confidence. The necessary lubricant to loosen the wheels of the great industrial machine is easily procured in busy times. Thus we find that a much larger percentage of new companies are being successfully floated, and capital comes forth from its hidden corners.

When capital is willing, credit is always good, and there is apt to be much speculation not resting on a solid basis. When credit is good, undue rises in prices are, to a certain extent, delusive, and caution must be exercised in dealing with statistics founded on values. The recent long continued depression was more a depression of prices than a falling off in the volume of trade.

Railway Signals.

One pull of the bell cord signifies "stop."
Two pulls mean "go ahead."
Three pulls mean "back up."
One whistle signifies "down brakes."
Two whistles signify "off brakes."
Three whistles mean "back up."
Continued whistles indicate "danger."
Short rapid whistles, "a cattle alarm."

A sweeping parting of the hands on a level with the eyes means "go ahead."

A slowly sweeping meeting of the hands over the head signifies "back slowly."

A downward motion of the hands, with extended arms, signifies "stop."

A beckoning motion with one hand indicates "back."

A red flag waved up the track indicates "danger."

A red flag by the roadside means "danger ahead."

A red flag carried on a locomotive signifies "an engine following."

A red flag raised at a station means "stop."

A lantern swung at right angles across the track means "stop."

A lantern raised and lowered vertically is a signal to "start."

A lantern swung in a circle signifies "back the train."

IN the absence of plumbago, those who are annoyed by a creaking hinge on a door may be glad to know that by rubbing the end of a common lead pencil upon the offending part it will immediately be reduced to absolute silence. Blacklead is one of the best lubricators known.

The Pasteur Treatment in Barcelona.

The municipal authorities of Barcelona, as we announced last year, have established a municipal microbiological laboratory, mainly with the view of enabling persons bitten by rabid animals to obtain the advantages of Pasteur's method of treatment. To the post of director of the laboratory Dr. Jaime Ferran, whose name is well known as having proposed and carried out a system of anti-cholera inoculations, was appointed, and he has been assisted by Drs. Pauli, Commenge, and Lluch. A report of the work done from May 10 to December 10, 1887, has just been published in *La Independencia Medica*. Altogether eighty-five persons have been subjected to the treatment. Of these, twenty-five had been bitten by animals that were certainly rabid, fifteen by those which had been pronounced rabid by medical men or veterinary surgeons, and thirty-seven by animals which were believed to be rabid, but whose condition could not be verified by professional men. The remaining eight persons had not been bitten at all, but submitted to the process in order to prove its harmlessness. The duration of the treatment was more than three months in forty-three of the cases, more than forty days in sixty-three, and less than that in twenty-two cases. Not a single case, either of those who had been bitten or of those who had not, proved fatal. The wounds were caused by seventy-two dogs, two cats, and two mules. Two of them were not bites, but dissection wounds with instruments tainted with the virus of rabies. At first Dr. Ferran carried out the inoculations of his rabbits according to Pasteur's method—*i. e.*, by trephining. Recently, however, he has adopted a new, and, as he believes, an improved, plan—viz., the injection of a single drop of the emulsion of the medulla containing the virus into the anterior chamber of the rabbit's eye. This produces exactly the same effects in about the same time as the trephining method.—*Lancet.*

Workshop Management.

The selecting of foremen is one of the most difficult duties that can confront owners of manufacturing establishments. It is generally found that the man who is the most capable artisan, and well up in all matters relating to his trade, is entirely void of the force of character and power to command others which are essential features in a good foreman, while the man who possesses the latter qualifications is often a very inferior worker. We have heard of a manager of a great establishment, says the editor of the *Iron and Steel Trades Journal*, who appointed an artisan to be foreman, owing to having observed that he was always moving hurriedly between the workshop and the store. The appointment elicited the fact that the new foreman, being a poor worker, had been content to "run the messages" for the other workmen, and his alertness while on the trot between the workshop and the stores had led the principal manager to fancy that he was an exceptionally earnest, faithful, and capable servant, and worthy of promotion. It is also well known that a large percentage of workmen spend their evenings doubtfully, and are never fit for their duties till a good part of the working day is spent. It is only in the large establishments this is possible, but the evil prevails wider than most employers and directors fancy is possible. We have inquired very closely into this point, and regret that we must admit that a great deal of unnecessary laxness obtains in our workshops, and cheap foremen are generally without backbone and worthless. Those who superintend should be superior to those under them in every respect, know how every job should be done, and how every man in the works is employing his time.

IN New York the law makes it a misdemeanor for a keeper of a boarding house or restaurant to abuse the confidence of his patrons by substituting butterine or oleomargarine for true butter. It will be in order next for Michigan to protect her industries by prohibiting the use of salt produced by evaporating the waters of an ocean into which thousands of tons of sewage are daily poured. There is nothing like a paternal government.

EDISON'S NEW SYSTEM OF TELEGRAPHY.

We illustrate herewith a system of telegraphy recently introduced by Mr. Thomas A. Edison, and known as the phonoplex system. It is operated by an induced current, and may be used successfully upon lines 100 miles or less in length. It finds its principal use in connection with the ordinary Morse lines. The current used in operating the system has no effect whatever upon the instruments of the Morse system, neither does the current used in the Morse system interfere with the phonoplex apparatus. It may also be used in connection with duplex and quadruplex wires, thus enabling a long stretch of wire to be utilized in connection with intermediate stations.

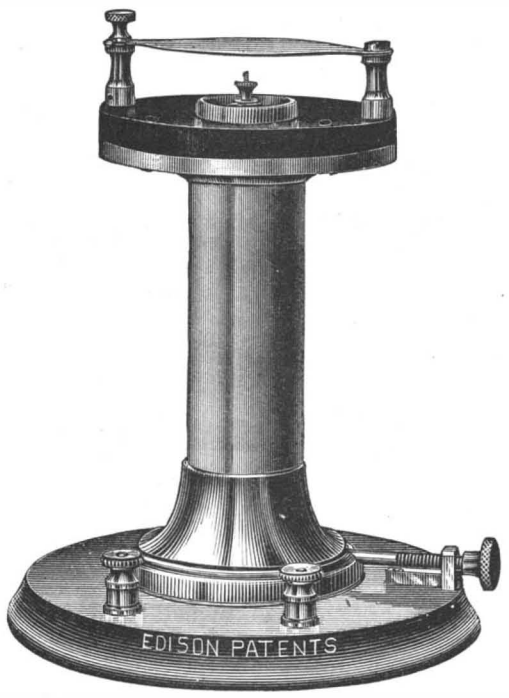


Fig. 1.—THE PHONE.

The equipment of an office consists of a key, a transmitter, magnetic coil, small resistance box, and the phone, two condensers, two cells of gravity battery, and four of electropoion, the whole requiring no more space than an ordinary Morse instrument.

The phone (shown in Fig. 1) consists of a hollow column of brass resting upon a wooden base inclosing magnets. At the lower end of the column is a rack and pinion by which the magnets can be adjusted. At the top of the column, in a suitable cell, is arranged the diaphragm, to the center of which is attached a screw-threaded pin provided with an adjusting nut and binder at the top. A split hardened steel ring, which is apertured transversely, is received upon the pin and rests upon the diaphragm. When a momentary current is sent through the coils of the magnets, the diaphragm is drawn down, throwing the ring violently against the top nuts, producing a sharp, loud click.

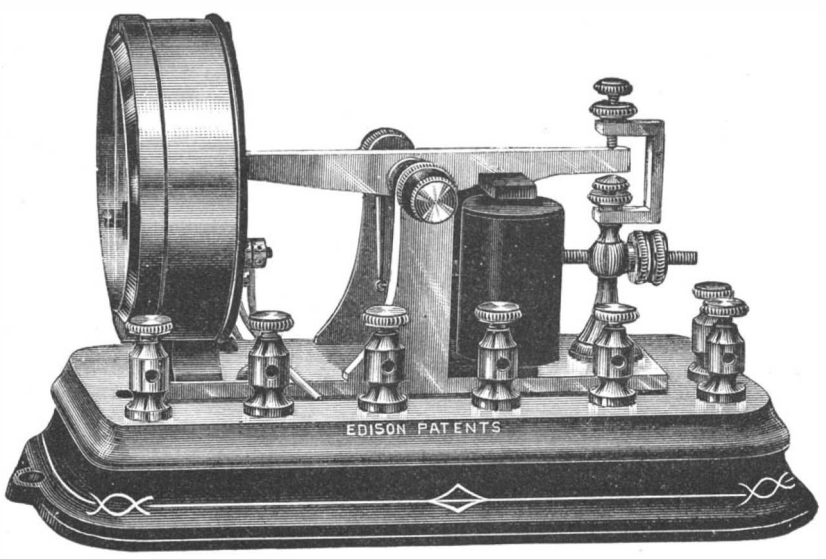


Fig. 2.—THE TRANSMITTER.

The transmitter (shown in Fig. 2) is interposed between the key and the magnetic coil. The key operates the magnet of the transmitter, and the arm of the transmitter is arranged to control the electrical contacts, as shown in Fig. 6.

Fig. 3 represents the small magnetic coil which is used to produce the induced current, by which the phones upon the line are operated.

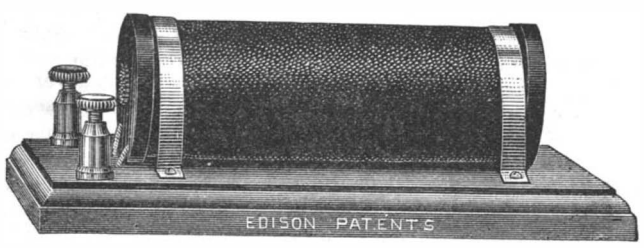


Fig. 3.—THE MAGNETIC COIL.

The key (shown in Fig. 4) is constructed so that when the lever is opened or thrown to the right, it closes the circuit around the magnetic coil through the points of the transmitter, and when closed or thrown to the left it opens this battery, and at the same time short-circuits the magnetic coil. This is necessary, as an open circuit electropoion battery of low resistance is used to transmit the signals, and it is desirable to cut out this battery at all times, excepting when signals are to be sent. By this arrangement the manipulation of the key is exactly the same as that of an ordinary Morse key, although the effects are different.

A small resistance box is placed in the circuit in such a way as to receive the current when the circuit of the coil is broken on the up stroke. The current passing through the spools of the resistance box thus produces an audible distinction between the up and down movements of the key as manifested in the phone, the upward movement being distinguished by a light stroke and the down movement by a heavy stroke.

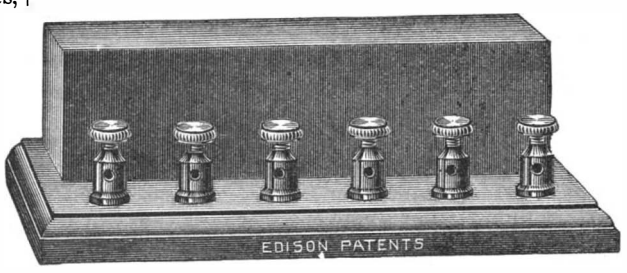


Fig. 5.—THE RESISTANCE BOX.

Fig. 6 shows the arrangement at station. ML is the usual Morse line, with Morse relay, A, and ordinary key, B, shunted by condenser, C, to keep the line closed to the induction impulses. At each office where it is desired to operate the phonoplex there are placed in the main line a magnetic coil and a phone. The armature of the transmitter responds to the action of the key, *a*, through the transmitter battery and wires, 1 and 2. These wires, 1 and 2, form a local circuit to excite the coil of the transmitter. The circuit around the magnetic coil, which is used to send the induction impulses to the line, starts at the right hand side of the magnetic coil, thence through coil, battery to post, *b*, on the key, *a*, through which it passes along wire, 3, to the armature of the transmitter. This circuit is completed to the left hand side of the magnetic coil from the transmitter points, C and E, and along wires, 7 and 9 or 8 and 9, depending upon the position of the armature, and whether it is attracted by its magnet or influenced by its spring.

When the lever of key, *a*, is thrown to the left or closed, the coil battery circuit is left open at point, *b*, and the magnetic coil is short-circuited through wires, 9, 8, spring, *e*, of transmitter, transmitter armature, wire No. 3 and wire No. 6 to main line. The coil battery is left open for the reason that it is of very low resistance and depreciates rapidly when left on closed circuit. The magnetic coil is short-circuited when not in use, so as to keep the resistance of the same out of the main line. When the lever of key is thrown to the right and makes contact with point, *b*, it breaks its contact at point, H, throwing the magnetic coil into the main line circuit and closing the circuit of the coil battery around the magnetic coil through transmitter points. This is done when the operator desires to send a message. With the lever in the above position, when the key is depressed, the local circuit being closed, the armature of the transmitter is attracted toward its magnet, thereby breaking contact at spring, *e*, and sending an impulse from the magnetic coil into the line. When the key is released the armature of the transmitter is also released, and the circuit is broken at point, *c*, thus sending another impulse into the line, but through resistance box, *d*. This forms the up stroke in the phone, and the resistance has the effect of making it lighter than the down stroke, so as to enable the operator to distinguish the difference between the two and avoid getting "back stroke." Wires 4 and 5,

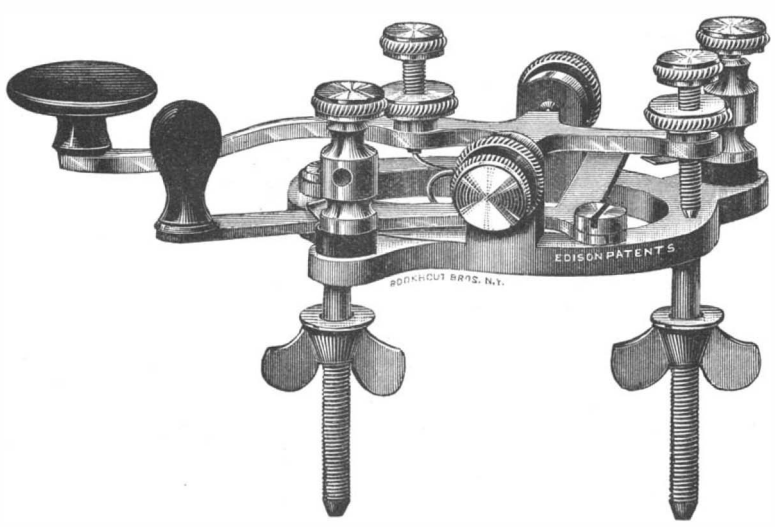


Fig. 4.—THE KEY.

leading to points, *f* and *g*, respectively, shunt the phone out of the main line while the home office is working; an insulated point attached to the lower point of the armature of the transmitter permitting the spring, *g*, to make contact with point, *f*, just before the circuit is broken at point, E, when the armature is depressed, and breaking contact again after the circuit has been opened at point, *c*, when the armature is released. The phone at the home office is silenced while the home office is working, for the reason that its responses to local induction impulses are very loud, and if it were permitted to work, some difficulty would be met with when the receiving operator desired to "break." The small condenser, *c*, is placed around the magnetic coil to quicken the impulses and prevent sparking at points, *c* and *e*.

The phonoplex system more than doubles the capacity of a line, as it may be used between any number of intermediate stations, any two of which may carry on telegraphic communication independently of the others and independent of the Morse system.

The cost of maintenance is very light—the only actual outlay required is for the provision of battery material. It is estimated that the cost of operating a single station will not exceed $1.50 per month.

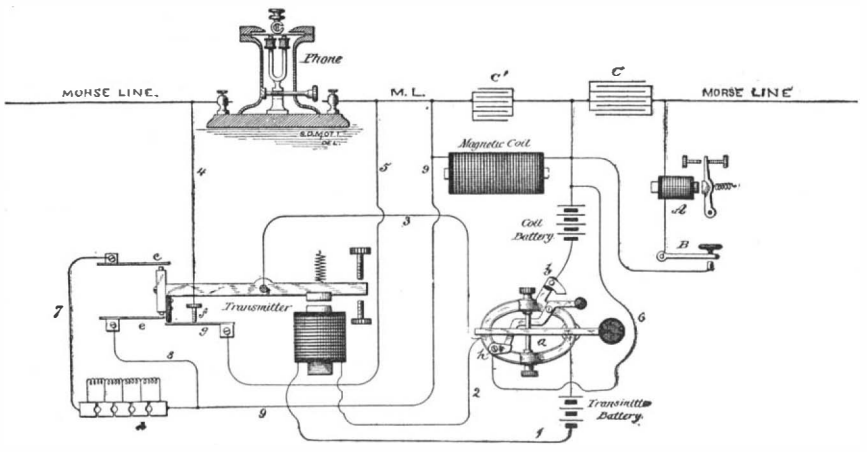


Fig. 6.—THE PHONOPLEX CIRCUIT.

Gaseous Explosions of Platinum.

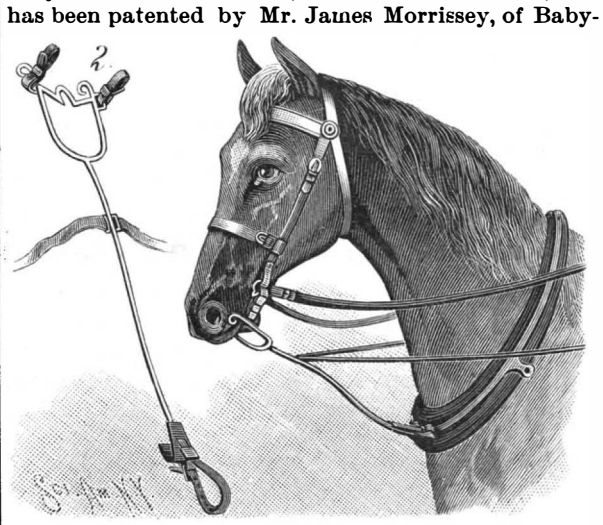
The curious fact was some time ago brought to light, says *Nature*, by Nahrwold, that solid particles are ejected from a platinum wire glowing under the influence of an electric current, and form a metallic incrustation upon the walls of a glass tube by which the wire is surrounded. The cause of the emission of these solid particles of platinum has, however, until recently, remained a complete mystery. In the number of the *Annalen der Physik und Chemie* just received will be found an interesting paper by Dr. Alfred Berliner, who, in the course of a series of experiments upon the occlusion of gases by platinum and palladium, has discovered the source of this singular phenomenon. Thin strips of platinum, before being charged with the gas under experiment, were inclosed in a narrow glass tube, and freed from all occluded gas by being heated to redness, *in vacuo*, by the passage of a constant electric current for several hours. At the expiration of this time the metallic incrustation was invariably found when occluded gas had been evolved. On charging the strips with various quantities of any particular gas, the amount of incrustation formed after the complete expulsion of the gas in each experiment was found to vary in the same proportion. Hence it appears pretty clear that the evolution of gas is necessary for the emission of solid particles. This result is strongly confirmed by the fact that palladium, which has such a remarkable power of occluding gases, produces a similar incrustation much more readily and at a lower temperature. It appears probable that the action is merely mechanical, that we have, in fact, an immense number of microscopic volcanoes or solfataras, evolving the occluded gases with such energy that portions of the crater walls are detached and carried away by main force, like their brethren on the large scale, the scoriæ and lapilli, to distances very considerable in comparison with the size of the vents.

The Effect of Gas upon Paper.

Herr J. Wiesner has sent to *Dingler's Journal* a further communication upon the discoloration of papers by light. He has already shown that papers containing woody fiber rapidly become yellow under the influence of light, owing to oxidation chiefly induced by the more refrangible rays, and that wood pulp papers would naturally be specially liable to discoloration. Gas light is less active than electric light in this respect, owing to the comparative absence of actinic rays from the former. It has lately been declared that gas acts prejudicially upon paper in other ways, and is therefore unsuitable for lighting libraries; and Herr Wiesner has instituted careful experiments with a view to test the truth of these assertions. He had before demonstrated that a wood paper after four months' exposure at a distance of 0·75 meter from an 8 candle power gas flame was not discolored more than by two hours' exposure to direct sunlight. He therefore now exposed wood paper to such other conditions as might be found in badly ventilated rooms lighted by gas. After an exposure of 5,400 hours, during which the temperature was not allowed to rise beyond 21° C. (70° Fahr.), it was found that the gases composing ordinary coal gas, unburnt, whether in their usual state or mixed with a fair proportion of oxygen, were incapable of acting upon the paper. Strips of paper were next placed in a dark room and in a shaded position in a chamber so badly ventilated that the illuminating power of the flame was distinctly diminished; other pieces being at the same time placed in a current of air in glass tubes exposed to the light of the flame. After about 20 weeks, the exposed papers, in common with all the other contents of the chamber, were covered with an equal depth of a light brown sooty deposit, while those in the glass tubes were unaltered. The woody paper alone had the faintest yellow coloration due to the action of the light. The products of combustion of coal gas do not, therefore, discolor or affect paper in any appreciable degree; and thus it follows that gas may be freely used in libraries that are properly warmed and ventilated.

AN IMPROVED BRIDLE BIT.

A fork bit, adapted for use with the ordinary bit, to cure horses of bad or vicious habits, and to improve the action and style of all horses upon which it is regularly used for a short time, is illustrated herewith, and has been patented by Mr. James Morrissey, of Babylon, Long Island, N. Y. It is made with a fork-like frame, consisting of a rigid metal bar, as shown in Fig. 2, the two prongs passing up outside the horse's jaws, and their ends being turned over to make eyes, the prongs being united by a transverse mouthpiece, the center of which has an upwardly projecting inverted U-shaped portion. Above the center of the metal bar are loops for attaching checks from the girths of the saddle or the traces of the harness, and integral with the outer side of the prongs, opposite the mouthpiece, are similar loops for cheek straps to hold the auxiliary bit loosely in the middle of the mouth. A pad or protecting strap is held in engagement with the inner flattened end of the metal bar, which has slots for retaining the strap by which the device is secured to a harness.



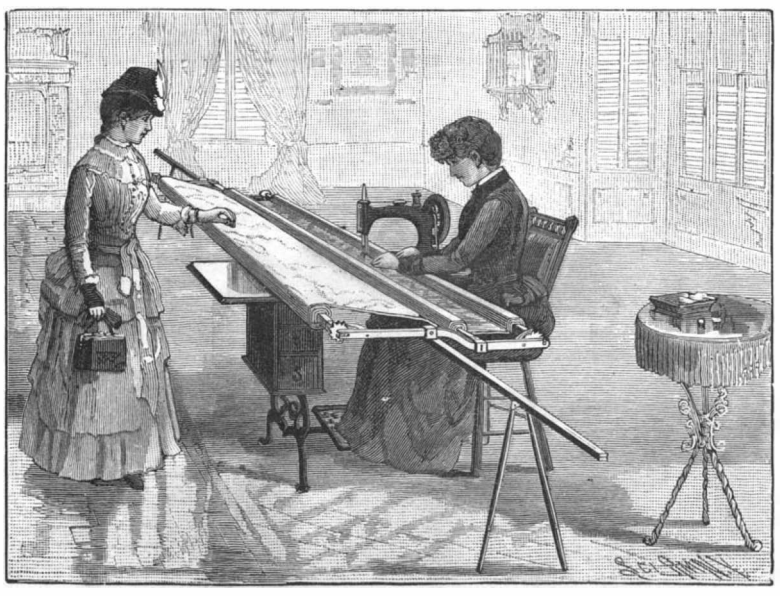
MORRISSEY'S BRIDLE BIT.

The Flying Man.

I believe that athletes such as those who first obtained mastery over the problem of the bicycle could very soon learn to float, to ascend, to descend, to ride upward, to soar, and so forth, in a way which would very decisively indicate the possibility of a much fuller mastery over the problem of flight later on. Experiments which have been already made prove decisively that a man's weight can be supported by planes or sails of very moderate extent—not much greater, proportionally, to his body than an eagle's wings—if only there is either rapid motion of advance or a strong current of air against their slightly slanted surface. But these experiments have not yet been so carried on as to show fully what can be done when practice in the art of balancing in the air and in making the adjustments necessary for changing the direction of flight has been sufficiently extended. Yet Mr. Charles Spencer, a teacher of gymnastics in England, was able, after obtaining no greater velocity than would be given by running down a small incline, to sustain flight by the supporting action of wicker wings for a distance of 120 feet. Besnier, indeed, toward the close of the last century, devised a method of supporting the body by pinions, which enabled him, after a sharp run, to fly across a river of considerable width. It is certain that very little is to be gained from the attempts which have been made to direct balloons. The velocity which can be given to a balloon in still air is very small. A very moderate breeze would carry a balloon one way despite all the mechanical attempts to direct it in another, let the balloon be shaped as it may. Moreover, all such attempts are dangerous, for the wind has a great hold on the necessarily large surface of a balloon, and going against the wind would subject the balloon to destructive influences. Whenever man attacks the problem of flight, seeking real advantage from its mastery, he will aim at much more than such mere floating power as the balloon gives—at more, even, than the rapid floating motion, with power of guidance, which may be obtained by the experiments suggested above. There must also be a power of energetic propulsion while still in the air. This might be obtained by suitable adjustments of levers to be worked by a man in actual flight. But while I believe flight to be possible for man in this way, I consider the only kind of flight which is likely to be really useful to men to be that of flying machines propelled, balanced, and directed by some one or other of the natural forces man has brought under his control. That man, who has learned to traverse the land more swiftly by mechanical means than its most actual denizens, and to make the wide seas his highways by similar devices, should be unable to travel in the air, which by natural selection alone has become the home of creatures descended from reptilian forms, is to me unthinkable.—*Richard A. Proctor, in Philadelphia Press.*

AN IMPROVED QUILTER.

Among the many inventions of quilting attachments for sewing machines made by Mr. Henry T. Davis, the accompanying illustration represents what is considered the most perfect of all quilters he has ever introduced. Among the main advantages it possesses over his previous inventions are the cheap price at which it can be manufactured, as some parts are entirely dispensed with which were formerly used, thus making it lighter and very much more simplified, so that any lady can operate it. The lining of the quilt is rolled up on the outside roller, and the top is rolled up on the roller near the needle of the machine. The cotton is placed on the lining, one layer at a time, and, as the quilting is made, every time a line is sewed the operator loosens the outside roller and rolls up on the inside roller, and these operations are repeated until the quilt or comforter is made. By the use of this quilter, which was patented January 31, 1888, all kinds of coat and cloak linings are quilted in a fast and very neat manner. It is a very valuable attachment for family sewing machines, and is made by the Davis Quilting Frame Company. For further information relative to this invention, address Mr. Henry T. Davis, inventor, Nos. 182 and 184 West Houston Street, New York City.



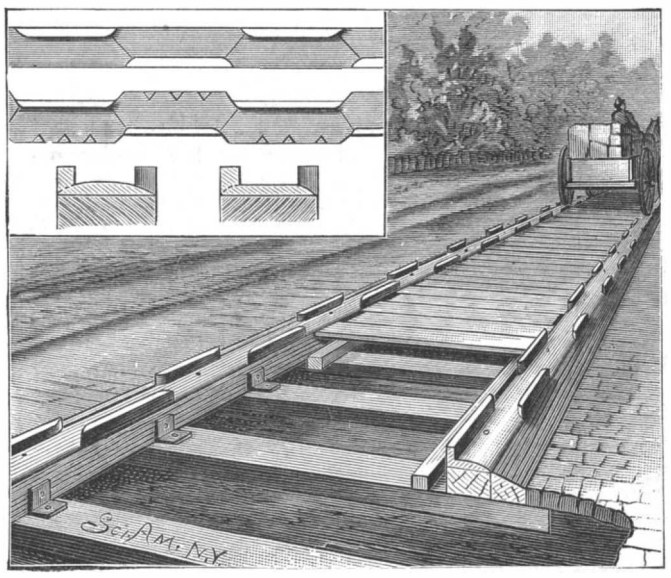
DAVIS' "1888" QUILTER.

Back Numbers.

New subscribers to the SCIENTIFIC AMERICAN, SCIENTIFIC AMERICAN SUPPLEMENT, or ARCHITECTS AND BUILDERS EDITION, who prefer to have their subscription commence with the year, can have the back numbers of either publication mailed to them from January 1, on signifying their wish by postal card or otherwise.

A RAILROAD FOR COMMON CARRIAGES OR WAGONS.

An improved road, to take the place principally of the ordinary plank road over much traveled thoroughfares where heavy hauling is done, has been patented by Mr. Timothy Whalen, and is represented in the accompanying illustration, the small figures showing plans and sections of the wheel tracks. The rails are preferably formed of iron or steel, placed at the proper distance apart to form tracks for the wheels of wagons or other vehicles, and fastened to string timbers at the surface of the ground, these timbers resting upon cross ties. The rails are formed with a bottom plate, the surface of which constitutes the tread for the wheels, there being raised flanges at the edges of the plate to prevent the wheels rolling off the tracks. These flanges are preferably divided into isolated parts or sections, the openings serving to allow the discharge of dirt, water, etc., a flange at one side being made opposite a space at the other side. A longitudinal timber is secured upon the ties immediately outside the rails, having its upper surface in whole or in part beveled and made even with the floor of the rail, to assist the wheels of vehicles in rolling smoothly on or off the track. The decided advantages of such a wagon railroad, in the facility it affords for transporting greatly increased loads with but little strain and wear and tear on horses and wagons, will be at once obvious.



WHALEN'S WAGON RAILROAD.

For further particulars in relation to the invention address Mr. John L. Whalen, 1 and 5 Whalen Court, Rochester, N. Y.

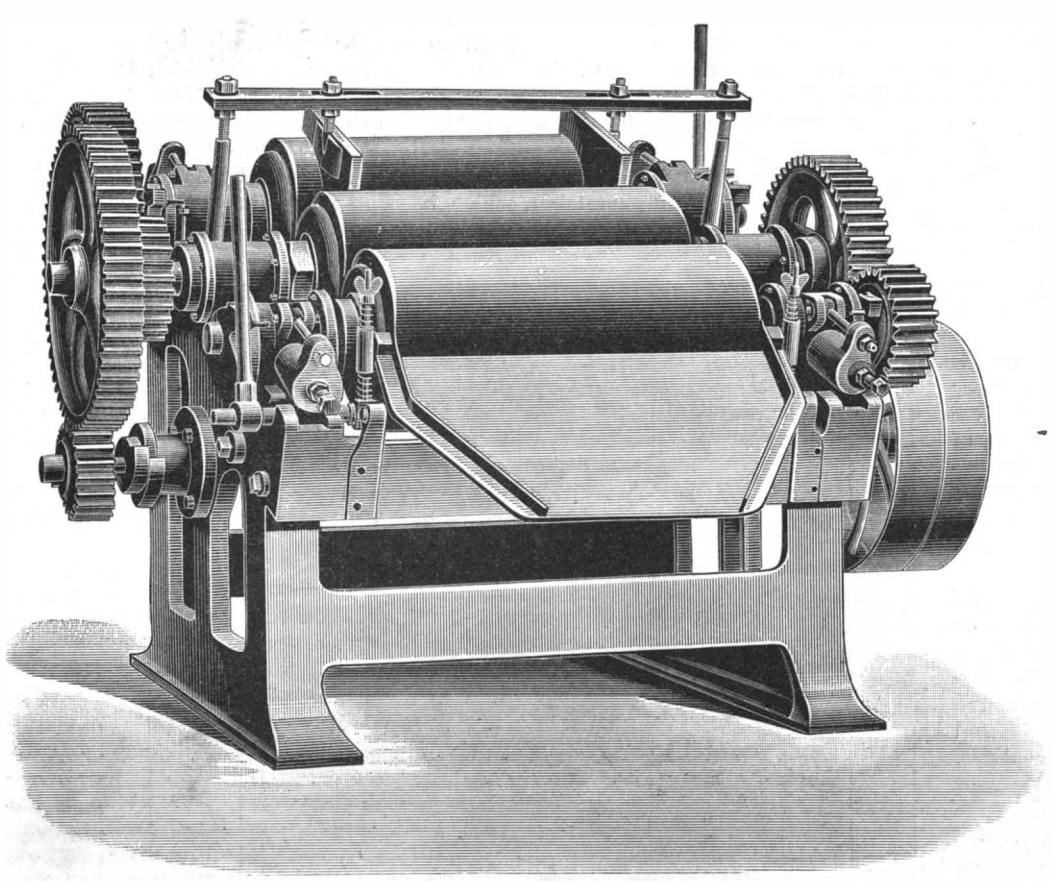
IMPROVED PAINT MILL.

The paint mill which we illustrate below was exhibited, says *Engineering*, at the late Manchester exhibition by the patentees, Messrs. Hind & Lund, of Preston, who, for a considerable time past, have paid special attention to the perfecting of this class of machinery.

These mills are used for grinding a great variety of substances, some of which would be seriously damaged by admixture with foreign matters; for instance, with such substances as paint, white lead, zinc white, soap inks, chocolate, cocoanut, starch, etc. It is highly desirable that they should be kept free from dirty lubricating oil, which in the old type of machine was very liable to escape from the bearings to the rolls. In the improved machines now manufactured by Messrs. Hind & Lund all the bearings are self-lubricated, and so arranged that it is almost impossible for oil to get on to the rolls.

The mill is provided with three rolls, the bearings of the center roll being a fixture, while the outer ones are provided with swing bearings. This method of swinging the bearings is found to be far superior to the old method of placing them in slides. The bearings are fixed upon an eccentric which is locked in position after the rolls have been set. The operation of setting is accomplished by means of a leveling plate.

To insure uniformly fine grinding, the mill should be examined from time to time and tested by the leveling plate in order to ascertain whether the rolls are in perfect contact. They can be readily adjusted if required by unlocking the eccentric and giving it a slight turn until the plate is perfectly level, and again locking it in its new position before restarting. The bearings are set up by means of screws; they are also provided with springs to allow the rolls to separate when any hard substance gets into the mill, and thus minimize the damage done to the rolls. By means of a handle on the side of the machine, the attendant can immediately relieve the rolls from all pressure when it is desired either to run them empty or to prevent them from clogging when standing idle for a time. By this device they can be immediately brought back to their original place without requiring any fine adjustments. The rolls are 30 inches long by 14 inches in diameter, of the best granite, and mounted on their spindles by collars and nuts at each end. They are turned and polished by special machinery made by the firm, by which means they are enabled to finish them in first-class style.



IMPROVED PAINT MILL.

CHLORAL camphor, with a drop of hydrochloric acid and a few drops of peppermint oil, gives a red color, which becomes violet blue on heating. On diluting, it passes through green to a blood-red fluorescence.

The Heeling Error of the Compass in Iron Ships.*

BY MR. WILLIAM BOTTOMLEY, C.E.

In this paper I do not propose to enter into the general question of the magnetism of an iron ship and the errors of the compass which it produces, but will confine myself to the consideration of the disturbance which is experienced when the vessel heels over. I will assume that, with the ship on an even keel, the effect of the magnetism of the ship's iron on the compass has been compensated by Airy's well known plan of placing magnets fore and aft and thwartship, to correct the semicircular error, and masses of soft iron on each side of the compass, for correcting the quadrantal error, and that the compass is correct on all courses when the ship is on an even keel. When the ship heels over, the altered position of the iron of the ship produces a change in its effect on the compass, and gives rise to the heeling error. The general effect of the heeling of the ship is to produce an error which is greatest when the ship's head is north or south, and which gradually diminishes as the ship turns round toward the east or west. With the ship's head east or west, there is no sensible heeling error. In general, when the ship is in the northern hemisphere, the north point of the compass card is drawn to the high side of the ship. In the southern hemisphere it is drawn to the low side of the ship.

The disturbance due to heeling arises from two separate causes: (1) The component of the ship's permanent magnetism which is perpendicular to the deck; (2) the magnetism induced in the soft iron of the ship by the vertical component of the earth's magnetism. The special object of this paper is to deal with the error which is produced by the second of these causes, that is to say, by the magnetism induced in the soft iron of the ship by the vertical component of the earth's magnetic force, and to show that the masses of soft iron which are placed on each side of the compass, to correct the quadrantal error when the ship is upright, exercise a most important part in correcting the heeling error when the ship heels over, if they are fixed to the binnacle and move with the ship. I have spoken of the magnetism induced in soft iron, and perhaps it would be desirable for me to explain very briefly the terms hard iron and soft iron, and the effects produced by magnetic force on these different kinds of iron. Soft iron is iron which becomes magnetized almost or quite instantly when brought under the influence of a magnetizing force, and which loses its magnetism as soon as that influence is removed. Hard iron, on the other hand, is iron which does not acquire magnetism so easily, but when once it is magnetized the iron retains its magnetism even when the magnetizing force is removed. I have here a bar of soft iron with which I will illustrate the effect of magnetism on soft iron. When I hold it in a vertical direction, or in the direction of the dip, it is brought under the influence of the earth's magnetic force, and it at once becomes magnetized. The upper part attracts the north-seeking end of this suspended needle, and the lower part the south-seeking end of the suspended magnet. Now, if the bar be reversed, end for end, its magnetism will at once become reversed. The lower end of the bar, which was uppermost before and attracted the north-seeking end, now repels it and attracts the south-seeking end. When the bar is held horizontally, with its length in an east and west direction, it loses its magnetic effects if it is perfectly soft. On the other hand, a piece of unmagnetized hard steel will not become magnetized unless acted on by a powerful magnetic force; but when it has been magnetized by a sufficiently great force, it retains its magnetism permanently.

The iron used in ship building is neither perfectly hard nor perfectly soft, and in consequence we find the effect both of hard iron and of soft iron on board an iron ship. By the hammering in riveting the iron of the ship becomes partially magnetized, so that the ship acts as a permanent magnet; but at the same time the iron of the ship also exhibits the properties of the soft iron, and becomes magnetized by induction from the earth's magnetism. In the northern hemisphere the whole of the upper part of the ship acquires magnetic polarity similar to that of the earth's north pole, while the lower part acquires polarity similar to the earth's south pole. Now, when the ship heels over, this induced magnetism shifts in position in the ship. The upper side of the deck becomes more powerfully magnetic than the lower side and attracts the north point of the compass toward it, and produces a heeling error, drawing the north point of the compass to the high side of the ship. In the southern hemisphere the opposite effect will be found. The upper part of the ship will acquire magnetic polarity similar to the earth's south pole, and when the ship heels over, the upper part of the deck will repel the north point of the compass and cause a heeling error, drawing the north point of the compass to the low side of the ship.

I wish now to show you that the soft iron correctors, which are used for correcting the quadrantal error when they are fixed to the binnacle and move with the ship, exercise a most important part in correcting the heeling error when the vessel heels over. They are made of soft iron, and become megnetized by induction from the earth's force. The upper part acquires northern polarity, and the lower southern polarity. When the ship heels over, the lower part of the quadrantal corrector on the upper side of the ship rises up toward the level of the compass needles, and having southern polarity, it repels the north point of the compass from the high side of the ship, and thus acts as a most important corrector for the heeling error. With regard to the amount of this correction, I may say that globes of soft iron, 8½ inches in diameter, when placed about 8 inches from the center of the compass, correct about 7 degrees of quadrantal error. This is a very usual amount on board a merchant ship.

These globes will correct about 1 degree of heeling error for each degree of heel of the ship; that is, if the ship heel over 10 degrees, the globes will correct 10 degrees of heeling error. Notwithstanding this large correction of the heeling error which is effected by the quadrantal correctors, it is found in practice that it is not sufficient to correct the whole of the heeling error, and it is necessary to apply a magnet perpendicular to the deck, underneath the center of the compass, to augment the correction of the heeling error which is effected by the quadrantal correctors.

* Abstract of paper read before the Philosophical Society of Glasgow, January 11.

HEATING BODIES TO A HIGH TEMPERATURE IN A COMPRESSED GAS.

How difficult it is in a laboratory to heat a body to a high temperature in a compressed gas is well known. An apparatus that I constructed several years ago permits of raising bodies to a temperature bordering on that of the melting point of platinum while in a gaseous atmosphere whose nature and pressure may be varied at will.

This apparatus (Fig. 2) consists of a block of steel, A,

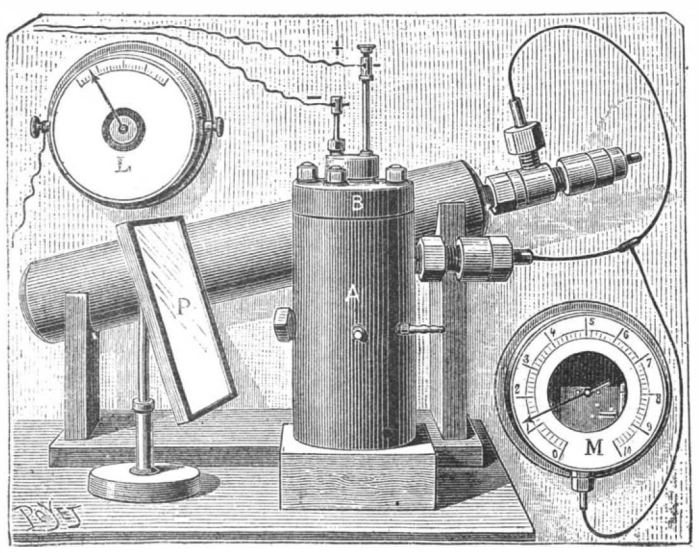


Fig. 1.—MR. CAILLETET'S APPARATUS.

A, steel block with cylindrical opening, and its cap, B (see detail, Fig. 2). P, mirror for showing the reaction. M, manometer. L, amperemeter.

in which there is a cylindrical aperture of a capacity of about eight fluid ounces, forming a sort of test tube which may be closed by a metallic cap, B, provided with a screw. Two copper rods are fixed to this movable piece, one of which, C, is insulated, while the other, D, is connected directly with the metal. To the extremity of these two rods are fixed, according to the needs of the experiment, either a piece of platinum hollowed out in the form of a crucible, or a platinum wire helix, a sort of muffle that receives the body to be experimented upon, and that is raised to the desired temperature through the passage of an electric current. Two or three accumulators suffice for these experiments. A fragment of gold placed in the spiral melts therein in a few instants. When it is desired to keep up the temperature for a long time, the exhausted accumulators are replaced by others under charge, through the simple movement of a commutator. In this way, advantage may be taken of the high temperature developed by the electric arc. In this case, we arrange two carbon rods, one of which is movable and fixed to the extremity of a screw, D, and is maneuvered from the exterior, so as to put it in communication with the other rod, E, which is insulated and has the form of a crucible.

The block of steel contains an orifice, F, which is connected by a metallic capillary tube with the reservoir that contains the compressed gas.

By using an inclined mirror, P, the phases of the experiment can be watched through the thick glass window, G.

Finally, by means of a screw cock, H, the gases contained in the apparatus may be collected, in case it is desired to analyze them.

The gas to be used in the experiments is compressed in advance in a receiver, by means of a mercurial piston pump. It is easy, too, to employ the carbonic and sulphurous acids furnished by commerce. A metallic pressure gauge fixed to the apparatus demonstrates that the pressure of the gases strongly depresses the temperature of the bodies that are heated by the electric current. Thus, the current that ordinarily melts platinum produces nothing more than a dark red heat when the pressure is sufficiently high. I have been able to attenuate the cause of the cooling by placing the body under experiment in a small glass test tube, which opposes the movement of the gases, and which is not represented in the figure. With this apparatus, I have repeated Hall's classical experiment on carbonate of lime. A fragment of chalk heated in the platinum helix sensibly diminishes in bulk, and is converted into a hard yellow-brown body, which slowly dissolves in acids and gives off carbonic acid gas. As was long ago demonstrated by our confrere, Mr. Debray, Iceland spar can be raised to a high temperature in carbonic acid without alteration and without a loss of transparency. I have found, too, that clear calc spar converted into lime on the surface by the action of heat at the ordinary pressure, takes back the lost carbonic acid, but does not resume its former transparency. I have not been able to fuse spar in the conditions of my experiments.

Upon the whole, the apparatus that I have the honor to make known, and which I have used for several years, in experiments upon the electric light under pressure—researches that I have undertaken with Mr. Violle in his laboratory at the Normal School—will, I hope, render numerous services to chemists as well as to mineralogists.—*L. Cailletet.*

Chloride of Nitrogen.

A striking new experiment, exhibiting the terribly explosive nature of chloride of nitrogen, is described, says *Nature*, by Prof. Victor Meyer in the current number of the *Berichte*. A few drops of the yellow chloride were prepared in the usual manner by inverting an exceptionally thin flask filled with chlorine gas in a leaden dish containing a solution of ammonium chloride. Instead, however, of gently agitating the apparatus so as to cause the drops to fall into a smaller leaden capsule placed beneath the mouth of the flask, they were allowed to float freely upon the surface. The whole apparatus was then inclosed in a cover box fitted with stout plate glass sides, through the top of which was passed a bent pipette, turning up below just under the mouth of the flask and connected outside with a dropping funnel containing chloride of ammonium solution and a few drops

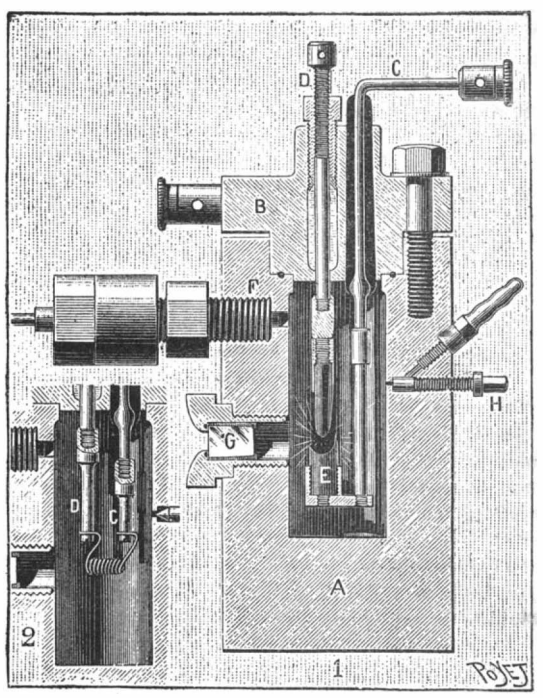


Fig. 2.—SECTION OF THE APPARATUS. EXPLANATORY FIGURE.

1. Arrangement for obtaining electric arc; the insulated carbon is cut in form of a crucible. 2. Arrangement with spiral platinum wire.

of turpentine. When sufficient chloride of nitrogen had collected, the tap of the funnel was carefully turned, so as to allow a little turpentine to slowly rise in the flask. After a moment or two it reached the surface and mingled with the chloride of nitrogen, causing a brilliant flash of light and a loud explosion, which Prof. Meyer likens to a thunder clap, so much more powerful is the detonation in a confined space. The flask, of course, was shattered, not into powder, but into tolerably large fragments. The plate glass box, however, even after many repetitions of the experiment, remained intact, a small door on the side away from the observers having been left ajar so as to prevent any notable increase of pressure. Curiously, the chloride of nitrogen never entirely exploded. A part remained in the distorted leaden dish and maintained an incessant fusillade for more than a minute.

A CHEAP ARTISTIC HOUSE.*

SYRINGING of the ears is sometimes provocative of coma, probably, as Dr. Middlemass Hunt explains it, owing to a nervous reflex starting either from the terminations of the auditory nerve in the semicircular canals and labyrinth or from the tympanic plexus.

* The dwelling house illustrated above is unique in design, cheap to construct, and from the floor plans and description which appeared in the ARCHITECT AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN of May, 1887, it is throughout a very convenient and well arranged house, fitted with all the best modern appliances. Copies of the SCIENTIFIC AMERICAN, ARCHITECTS AND BUILDERS EDITION, containing the plan views and further description of the house, may be had for 25 cents, at the office of this paper.

Correspondence.

Remedy for Ivy Poisoning.

To the Editor of the Scientific American:

I see that you are having a conference meeting over ivy poisoning, and therefore add my experience:

For many years I suffered terribly from this cause, but remembering that all poisons are acids, and that alkalies neutralize acids, I bathed the poisoned member in a strong lye made from wood ashes and obtained instant relief. Subsequently I found that the dry ashes alone, rubbed over the poisoned member, were equally effective. Since this discovery, I have had no further trouble, and having tried this simple remedy repeatedly on myself and on many others, with like good results, I am now thoroughly convinced that wood ashes will in every case prove a sure and sovereign specific for all cases of ivy poison.

W. W. DUFFIELD.

In Camp on Cumberland River,
near Pineville, Ky., February 26, 1888.

Storage Batteries for Social Illumination.

To the Editor of the Scientific American:

In your issue of February 18, under the head of "Fashionable Electric Lights," you state that the first time storage batteries have been used in America for furnishing temporary light for social occasions was at the residence of Mr. Ogden Mills, in New York City. I beg to correct this. On the occasion of the ball given by Mr. Robert Garrett, the then president of the Baltimore and Ohio Railroad, at his mansion in this city, one year ago, I superintended the illuminating of his conservatory with a number of incandescent lamps, ranging from two to six candle power. Some of these lamps were in the several fountains, others in the rockeries, and a number in the shrubbery, the general effect being very beautiful, and they were much admired by people from all parts of the country. Again, on the occasion of a noted dinner given by the same gentleman to a large number of the great railroad kings of this country (which occasion was the beginning of the negotiations for the much talked of "B. & O. deal"), I put the same number of lamps again in his conservatory, with the same fine results. Storage batteries were used exclusively on both of these occasions, and on several others I have used the storage battery with great success. On the first occasion mentioned, the batteries were connected at 8:30 P. M., and ran continuously until 5 A. M. Thus you will see that the New York parties were not the first to use storage batteries for social occasions; also that our lights were burned two and a half hours longer than those used at Mr. Mills'.

WM. S. PACA.

Baltimore, February 23, 1888.

How Natural Gas is Burned.

To the Editor of the Scientific American:

Natural gas is the fuel used in our town. Several places are heated by burning the gas in the cellar and conducting the heat and products of combustion into the rooms to be heated, without any special ventilation. Some have pipes as small as 2 inches, running horizontally out through a window, with no other draught, which is not much better. Attfield says that "more than 4 parts of CO_2 to 10,000 gives to confined air depressing effects, and 4 or 5 per cent rendering the atmosphere poisonous when taken into the lungs." Those who have been using the gas in this way for months say that they notice no ill effects. Is it advisable or healthy to do so?

Second. By turning on a full or large volume of gas a peculiar sickening odor is noticed in the room, which I believe to be acetylene, or partially burnt gas, caused by an insufficient supply of air in the mixer to insure complete combustion when a large volume is turned on. Am I correct, and what effect does it have on the system?

I have not noticed anything bearing on this subject in connection with the use of natural gas as fuel, or how to use it properly. The gas company here requires that every stove be provided with a close damper in the pipe.

A full understanding of this matter will no doubt be appreciated by many of your readers. A. L. B.

Sharon, Pa.

[On general principles the practice you allude to of allowing the products of combustion from fuel gas to escape into the room should be condemned. Adequate ventilation and smoke pipes should be certainly provided. At the same time, it must be remembered that the effects of an excess of carbonic acid in the air of rooms have hitherto been studied principally with reference to apartments overcrowded with human beings. In these cases, the carbonic acid gas is accompanied by other injurious compounds, such as the organic exhalations of the lungs. In such instances the depressing effects of the air are largely attributable to the last named substances. But when analyzed, it is always the carbonic acid gas that is determined, so that in many cases it is not the wrong doer, it is the organic exhalations that do the harm, and the carbonic acid gas is merely the indicator of their presence, and bears the blame of their transgressions. It is hard to believe that four or five per cent of pure carbonic acid gas would greatly injure air, except where it indicated the disappearance of and replaced its own volume of oxygen. Then the air would doubtless be rather dilute and weak. The other feature of natural gas burning is a distinctly bad one. The odor you describe is the one said to be acetylene, and which is familiar to all chemists. It indicates, whether acetylene or not, an imperfect combustion and probable production of carbon monoxide gas. The latter is a specific poison, and has a very depressing effect upon the system. It is the toxic agent in "charcoal" suicides, at one time so fashionable in Paris, if we may believe the novelists. If the consumers of natural gas can become accustomed to this odor, they have attained a development never reached by most chemists in their laboratory experiences with Bunsen burners. A close damper in a stove pipe is considered bad practice, and should not be tolerated, as the products of combustion should have free exit.—ED.]

Crow Roosts and Crow Roosting.

E. M. HASBROUCK.

Within the past few years much has been written concerning the common crow (*Corvus americanus*) as regards its relation to man; but until recently little or nothing has appeared pertaining to the roosting places of one of our most common birds. It is not generally known, even among those who consider themselves somewhat acquainted with the species, that during the winter they congregate in vast numbers at some chosen spot, scattering during the daytime in quest of food, but returning at night to seek rest and protection in each other's company.

It has been my good fortune to visit two such rookeries, and to observe closely the birds composing it, both at the roost and at a distance, so that a fair idea has been obtained of the place under nearly all circumstances.

The first of these two that I have mentioned is situated about two miles east of Syracuse, N. Y., in a woods known as "Tamarack Swamp," and lying between the Central and West Shore tracks. This swamp, once extensive, has been cut down to a narrow strip not exceeding four hundred yards in width by one and a half miles long; hemmed in on the north and south sides by hills, and drained by two constantly flowing streams, it has become what is known as a dry swamp, composed of maples, pines, birches, elms, beeches, tamaracks, and oaks. Midway in this strip is a stretch of young pines averaging twelve feet in height, and this spot, in preference to the more densely wooded portion, has been chosen as the winter home by the crows. The second (for I wish to draw a comparison between the two before proceeding further) is situated in Arlington Cemetery, at Washington, D. C. Here the ground is entirely different. Not only are the trees of a greater height and of a different variety, but the place itself is located on a hillside fully a hundred and fifty feet above the water and facing the Potomac river, from which it is distant scarcely an eighth of a mile. The only points of semblance between the two are that it is on a low elevation in a slight ravine which, being drained by two small streams caused by the elevation, is also perfectly dry. Both rookeries are nearly equal in size, the one at Syracuse covering about fifteen acres, and that at Arlington from ten to twelve.

A visit to these roosts in the daytime is interesting in the extreme, while another paid at dusk when the birds are coming in is even more so.

For convenience in description I shall start with the birds at early morn, following them throughout their wanderings until their return at night. Shortly after daybreak the vast throng of black bestirs itself; first a loud clamor betokens that the birds are awake, then with a shake or two they launch forth in quest of the morning's breakfast.

Leaving singly, in pairs, by dozens, and in flocks of hundreds, each group wings its way to where the previous day's meals were secured, or starts in search of new feeding grounds. After they are gone the roost is a sight indeed. On every hand the trees and ground beneath are literally covered with the excreta of the birds, having much the appearance of having been plentifully bespattered with whitewash. The air is foul with the odor mingled with that of the putrefying bodies of the dead ones that here and there dot the snow, while among the branches as well as on the ground are numbers of individuals too weak, emaciated, or otherwise disabled to participate in the daily flight. These are readily approached, and are often to be caught in the hands.

Nowhere outside of a rookery can a fair idea be obtained of the gregarious nature of the crow, for here on every hand is abundant evidence of this trait. Not only does the roost surround us, but the departure of the birds in flocks and the finding of them together subsequently in the day is of itself enough to establish this fact.

A drive through the surrounding country will now give a glimpse of their daily life during winter. Anywhere and everywhere they may be seen, each in search of that which alone will sustain life, but with the usual frozen condition of the ground this as a rule is difficult to obtain. Along the rivers and streams they may be seen walking on the ice in search of a possible dead fish or a stray mussel; breaking through the ice where not too thick, in order to get at the unfrozen mud beneath, and in many places the surface for a considerable area resembles the land more than the ice, from the quantities of this material thrown out. Here they of course secure considerable vegetable matter, mingled with an occasional shell fish, but the supply is poor at the best, for presently they take wing and fly to a barren field, where for a brief period they turn over the frozen lumps of earth or endeavor to dig into the icy ground itself. At this season of the year there is scarcely a spot unvisited by them, and the distance traveled in going to and from their feeding grounds is surprising. I have seen them at a distance of some twenty miles, high in the air, winging their way in the direction of the roost, and have no idea how far they may have come before observed. Up to about three o'clock the birds are busy feeding, and the average person would hardly believe that within an hour or even less these same birds will be miles away, and in company with tens of thousands of the same species. At this time an inclination to move is manifested by a few who fly away just over the tree tops calling loudly, as if to induce the rest who still tarry to follow. These, too, soon depart, and by four o'clock or half past, the sky is filled with the host *en route* for the rendezvous. An idea can best be gained now of the countless numbers that nightly resort to this place, for although it is impossible to attain anything like accuracy as to the numbers, we know that at this one place hundreds (and often thousands) pass over our heads, until it seems as if every crow in the country was being observed, but a station in an exactly opposite direction the next day will reveal a like number, and another the next day the same, until every point of the compass necessary has been covered, and as they return every night in the same direction, it is of course evident that the same flocks are not observed twice.

Having now traced them through their daily wanderings, it is in order to visit the roost again at nightfall and watch them come in. To secure the best results it is advisable to be there by four thirty at the farthest, and to take a stand in the center of the place close beside some tree, in order to be the less easily observed. At the hour above mentioned they begin to arrive either singly or in flocks, tarrying at times at some near at hand feeding grounds, but soon seeking the vicinity of the roost. Strangely enough, instead of repairing at once to their night's resting place, they gather in immense multitudes on the surrounding hills; coming as they do from all quarters of the country, the numbers increase until the fields, the trees, and the fences are covered with them. Long after the sun has set they continue to arrive. The noise is deafening, and when at times they rise and circle about in the air, it seems as if the heavens themselves were about to fall. As darkness begins to settle, first a few of the bolder ones enter the roost. These are followed by small bunches of fifty or so, and these in turn by other companies interspersed with stragglers. Suddenly, with a noise as of a hurricane, a vast host arises and makes a dive for the roost. These are closely followed by another, and another, and still another, until finally the numbers on the hill sides begin to show some signs of thinning out. As the darkness deepens, they come in any way; down they come pell-mell, brushing past the face, almost flying against one, alighting on the first branch they strike against (for they are now almost unable to see, and it is amusing to see hundreds flopping about waiting for luck to throw a branch in their way), often within arm's reach. Every tree and branch seems packed with them, and still they continue to pour down, finding a roosting place somewhere and adding clamor to the deafening babel already existing. Finally all appear to have arrived, and are busy settling themselves for the night. Utter now but so much as a syllable, and the entire army with renewed cries, and in the direst confusion, takes wing and seeks another part of the woods, only to renew the performance should the operation be repeated. I have never as yet remained in a roost long enough to ascertain whether or not the birds became absolutely quiet. I have remained until quite late, and on coming away could hear them for some distance, and doubt exceedingly if there is an hour throughout the night when there is not more or less noise and confusion existing. It might be well to add that these roosts are occupied each succeeding winter, the birds beginning to congregate with the approach of cold weather, and remaining until the milder approaches of spring.

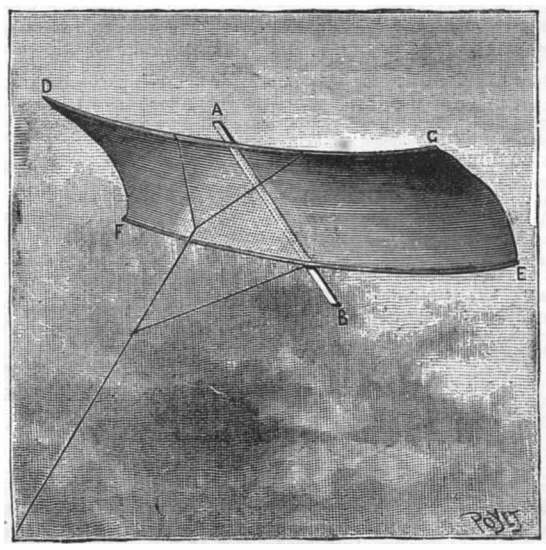
"WHAT did you do for milk?" asked a lady, referring to the recent snow blockade. "Why, we took hot water, and looked at it from a scientific point of view," was the reply. "It is 87 per cent milk, you know; that is to say, milk is 87 per cent water, which is about the same thing."

CHINESE KITES.

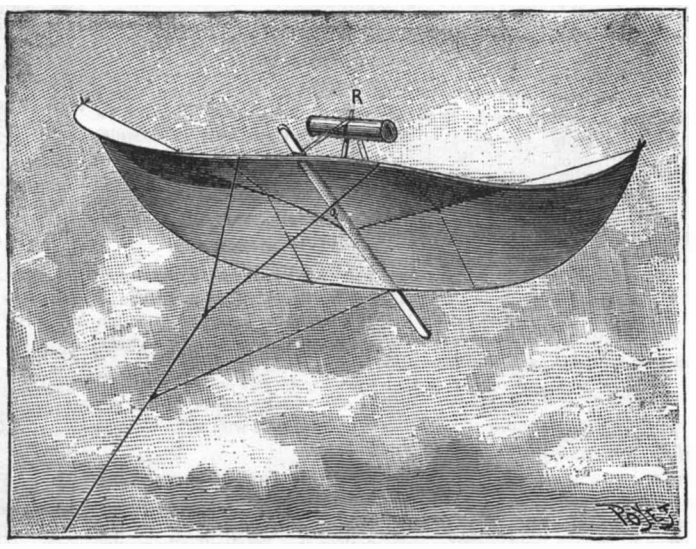
The art of constructing kites is much cultivated in the East, and the Chinese, who have at hand the bamboo, India paper, and thin silk, excel in the manufacture of very ingenious devices of varied forms.

One of our correspondents in China, Mr. Huchet, at present in Paris, has had the kindness to have made for our purposes, by a skillful Chinese manufacturer, a series of models representing the different types of kites used everywhere in China, Annam, and Tonkin, and which the same gentleman has been obliging enough to bring to us in person.

Fig. 1 represents the simplest form of these kites. Its frame is formed solely of a stiff bamboo stick, A B, and two slightly curved side rods, C D and E F. To this frame is pasted a sheet of paper, which is somewhat loose at the extremities, C E and D F, where, under the action of the wind, pockets are formed that keep the affair bellied and in an excellent position of equilibrium. Our engraving shows the mode of attaching the strings that serve to fix it. Kites of this kind are usually about three feet in width.

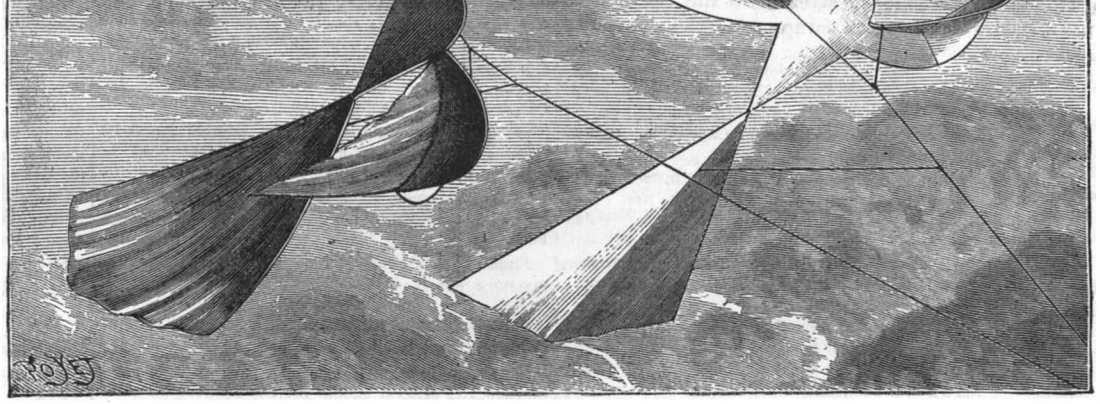


SIMPLEST FORM OF CHINESE KITE.



MUSICAL KITE, WITH BAMBOO RESONATOR.

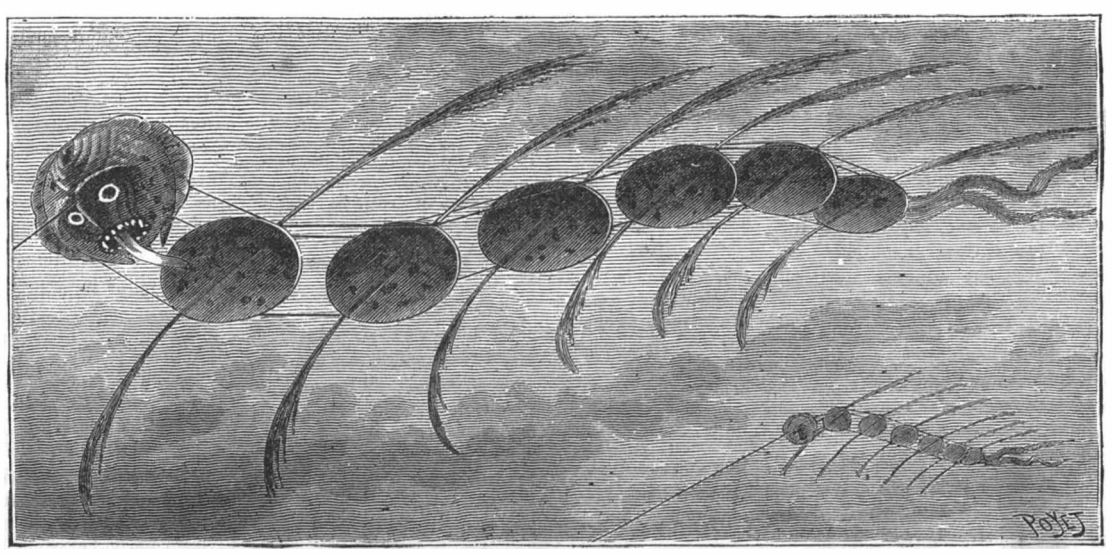
Fig. 2 shows the appearance of the musical kite, so called because it is provided with a bamboo resonator, R, containing three apertures, one in the center and one at each extremity. When the kite is flying, the air, in rushing into the resonator, produces a somewhat intense and plaintive sound, which can be heard to a great distance. This kite is somewhat like the preceding, but the transverse rods of its frame are connected at the extremities and give the kite the aspect of two bird's wings affixed to a central axis. This kite sometimes reaches large dimensions—say ten feet in width. There are often three or four resonators placed one above another over the kite, and in this case a very pronounced grave sound is produced. Mr. Huchet informs us that the musical kite is very common in China and Tonkin. Hundreds of them are sometimes seen hovering in the air in the vicinity of Hanoi. This kite is the object of certain superstitious beliefs, and is thought to charm evil spirits away. To this effect, it is often, during the prevalence of winds, tied to the roofs of houses, where, during the whole night, it emits plaintive murmurs after the manner of Æolian harps.



BIRD KITE, AND FRAME USED IN MAKING IT.

Fig. 3 gives us the aspect of a bird kite, the frame of which is represented at the right of the figure. The thin paper attached to the wings moves under the action of the wind and simulates the flapping of the wings. This kite is sometimes three feet in length.

The most curious style of Chinese kites is the dragon kite, shown in Fig. 4. It consists of a series of small elliptic, very light disks formed of a bamboo frame covered with India paper. These disks are connected by two cords that keep them equidistant. A transverse bamboo rod is fixed in the long axis of the ellipse and extends a little beyond each disk. To each extremity of this is fixed a sprig of grass, that forms a balance on each side. The surface of the foremost disk is slightly convex, and a fantastic face is drawn upon it, having two eyes made of small mirrors. The disks gradually decrease in size from head to tail, and are inclined about 45° in the wind. As a whole, they assume an undulatory form, and give the kite the appearance of a crawling serpent. The rear disk is provided with two little streamers that form the tail of the kite. It requires great skill to raise this device.—*La Nature.*



THE DRAGON KITE.

Malaria.

The circumstances under which malaria prevails as a local disease, though sufficiently marked, are yet in some degree complicated and perplexing. It is certain that the exciting cause of the disease is something present in invisible effluvia from the surface of the earth. It seems almost as certain that decomposing, or rather decomposed, vegetable matter is the source of the infection; yet the appearance of malaria in such a place as the rock of Gibraltar, which is characterized by an entire absence of vegetation, presents an apparent exception which prevents us from definitely deciding that vegetable matter alone can produce the malarial infection. Moisture is necessary to produce the poison; yet moisture alone, or even with the necessary degree of heat, is not sufficient; on the contrary, it appears that if only the soil whence malarial effluvia have arisen could be kept permanently soaked with moisture, there would be no infection. The soil must be for a while sodden with moisture, then dried, before the invisible effluvia—the marsh miasma—become dangerous. The heat necessary to produce the poison must be somewhat greater than 60 degrees, somewhat less than 80 degrees; between these limits, but not outside them, heat does its poison-generating work. We have in these conditions alone a certain power of influencing malaria, as has been shown by repeated examples. I remember that in my boyhood aguish fevers were very common in parts of Kent, near the shores of the Thames and Medway. The difference between the country and the towns in this respect was a subject of constant remark. But now, as I learn from relatives living in these regions, malarial troubles are much less prevalent, drainage having had a markedly beneficial effect. A similar change, on a larger scale, has been produced throughout the eastern counties of England, where formerly aguish fevers were once very common. It seems strange now to think of ague as one of the chief death-dealing diseases of parts of England, insomuch that even in London, where now it is unknown, hundreds formerly fell victims to it.

In Switzerland the drainage of swamps has almost entirely killed out malaria in certain regions where it was once prevalent. They widened the channels of rivers running out of lakes in such sort as to lower the level of the lakes, and the lakes thus lowered drained the swamps. On the other hand, the bog lands of Ireland are free from malaria, whether because peat moss does not contain the poisonous materials, or because the bogs remain too constantly moisture sodden, is not clear. It is stated also that malaria is unknown in the region of the Dismal Swamp. Elevation has a marked effect in regard to the prevalence of malaria, not only locally, but generally. Thus in certain shore tracts it has been noticed that near the sea level there is no malaria, while, again, above a certain height, as 300 or 400 feet, malaria is absent; but between these the disease is destructive and prevalent. Yet elevation alone does not prevent malaria from appearing.—*R. A. Proctor, Louisville Cour. Jour.*

A New Process of Electrical Welding.

A new system of electric welding has been perfected by Dr. Bernardo, of St. Petersburg. The process of electric welding hitherto practiced for joining bars, etc., is the device of Prof. Elihu Thomson, of Boston, Mass., and depends upon causing the bar to be traversed by an alternating current of electricity powerful enough to fuse the metal at the point of resistance caused by the break of continuity. In the new system, however, a continuous current from a charged accumulator is employed. The metals to be joined are attached to the negative pole of the accumulator; and a carbon pencil, such as is used in ordinary arc lamps, is connected with the positive pole of the battery. The result of bringing the carbon pencil into contact with the metal, and then slightly withdrawing it, is to start an electric arc, which fuses the metals at the desired joint until they run together. Carbon blocks may be used to retain the molten metal in its place, and sometimes a little sand is used as a flux. In this way boiler plates can be welded *in situ*, blow holes in castings filled up, and iron rods joined. Thus it appears that the new welding process is very like lead burning, the carbon pencil in its portable holder playing the part of the gas blow pipe in the latter process. It remains to be proved by tests whether this system is good for working with, or whether it is destined for shop and foundry use in doctoring flawed iron work.

FLUID extract of quebracho, according to a writer in *Arch. Med. Belges*, applied to a wound, burn, ulcer, or frost bite, is more healing even than iodoform. On evaporation the fluid extract leaves a tough adhesive brownish crust, under which the process of repair goes on rapidly. If desired, this can be removed by soaking in warm water.

AGRICULTURAL INVENTIONS.

A harrow has been patented by Mr. George Coffman, of Spearville, Kansas. The body of the harrow is made in two sections, each consisting of a series of parallel bars, held apart by inclined transverse end braces and a straight bar, making a harrow of light draught, adjustable to unevenness of surface, and which may be utilized to carry a plow or sacks of grain to the field.

A grain drill has been patented by Mr. William Nighswonger, of Peotone, Kansas. It is so constructed that a series of colters are made to act in conjunction with a series of hoes to pulverize the ground and cut down weeds in advance of the seed depositors, the seed box having a double row of seed openings whereby the feed may be operated in opposite directions within the box to insure an even distribution of seed.

MISCELLANEOUS INVENTIONS.

A buckle has been patented by Mr. James England, of New York City. It is so made that the greater the tension, the more firmly will a clamp be pressed against the clasped end of a strap, while by pulling on the free end of the strap, slack may be taken in as desired, the buckle affording great facility for adjustment with security of fastening.

A cleaner for blackboard erasers has been patented by Mr. James S. McClung, of Pueblo, Col. The eraser has a handle adapted to fit into a box with a slotted side and with a false bottom of wire cloth, the side slot of the box having elastic lips for inclosing the handle, whereby the eraser may be cleaned without the escape of chalk dust.

A sewing machine table has been patented by Mr. Joseph Wertheim, of Frankfort-on-the Main, Germany. The table top has in its upper surface a connected series of ramifying grooves to contain a liquid, the grooves being covered by a thin wooden plate, the object being to render the working of the machine noiseless.

A show case has been patented by Mr. James J. Kelly, of Albany, N. Y. It has a sectional cover, one part sliding over the other, and a detachable auxiliary outer bottom in which a shelf slides, a cord or chain connecting the shelf and sliding cover, whereby when the shelf is drawn out the sliding cover is raised, and *vice versa*.

A step ladder has been patented by Mr. Alfred M. Whiteley, of Brooklyn, N. Y. It is so constructed that the two hinged main limbs are capable of simultaneous expansion and contraction in an upward or downward direction, giving great stability, with increased facility for raising and lowering the ladder, and locking it at different heights.

An ore washer has been patented by Mr. Thomas Sharp, of Nashville, Tenn. It consists essentially of a water supply tank with regulating attachment, a chute with counterbalanced swinging barriers, and a means for discharging the water above the lower end of the chute, being more especially applicable for washing ores embedded in a clay matrix.

A feed trough has been patented by Mr. Alvin N. Main, of Pittsfield, Ill. It has upwardly extending pins and inclined sides having hinged bars on either upper edge, the hinged bars being provided with upwardly projecting pins, whereby animals are prevented from spilling the feed and the seed contained in the hay, clover, etc., are saved.

A neck scarf has been patented by Mr. Gustave Selowsky, of New York City. It has a band provided with a leader or tip secured to its outer extremity, the tip being of peculiar construction and of an approximate external length equal to the neck band passage, whereby a saving of material will be effected in making the band.

A portable fire escape has been patented by Messrs. George Gavin, Lawrence W. Cromer, and Frank Gilmor, of Eureka, Nevada. It consists of a casing with attached hook and carrier journaled therein, a cap bearing on the casing and compress to produce friction between the casing and carrier, and other novel features, making a strong and simple device which can be readily carried in a trunk or valise.

The construction of buildings forms the subject of a patent issued to Mr. Addison Smith, of New York City. The invention covers a form of construction for buildings on a diagonal street whereby the front of one building will not interfere with the view of another, the front entrance being at right angles to the side walls, and affording advantageous show window space.

A wrench has been patented by Mr. Walter L. Gibson, of Oviedo, Fla. The fixed jaw has a projection, and a movable jaw is pivoted to the fixed jaw, a block being formed with bearing surfaces approximately at right angles to each other, being pivoted to the fixed jaw, the parts being so arranged that if desired the device may be used as a pair of pincers or pliers.

A jersey stay has been patented by Messrs. Samuel Kramer and Jacob Levy, of New York City. It consists of a pin hook or a number of pin hooks of peculiar form fastened to the interior of the garment at its lower edge, with their prongs projecting upward and adapted to be caught in the undergarment, to prevent the jersey from working upward on the body of the wearer.

A wrench has been patented by Mr. George Gavin and Lawrence W. Cromer, of Eureka, Nevada. It has a stationary jaw with longitudinal recess and intersecting slot, a rod carrying a movable jaw working in the slot, having an outer screw-threaded end and internally screw-threaded sleeve, with collar connected to the sleeve, whereby the jaws are made to approach each other or separate.

A window screen and fixture has been patented by Mr. George H. Gould, of West Lebanon, Me. It is provided at opposite sides with deep grooves, and has series of holes in its side bars, in combination with side strips fixed to the window frame, and pins passed into the holes to bear on the guides, with other novel features, making a screen which can be readily fitted to windows of varying widths.

A velocipede has been patented by Mr. Allen M. Stoner, of Topeka, Kansas. The rear axle is arranged to support a vehicle body, while the forward axle is connected to this body by a novel form of swinging connection, the forward axle being arranged to be driven by treadles operated by the rider of the vehicle, and so that it may be turned as desired to carry the vehicle to the right or left.

A system of bailing wells has been patented by Mr. Solomon C. Rhodes, of Bradford, Pa. This invention covers an automatic bailer discharging device, for use in connection with water, oil, or other wells, whereby any two wells of a group within a distance of six hundred to a thousand feet of each other or from the driving power may be bailed out at once, and the operation be attended to by one operative.

A machine for making upholsterer's nails has been patented by Mr. Franz J. Bergmann, of Neheim on-the-Ruhr, Westphalia, Germany. Combined with an anvil is a pivoted lever carrying a punch, a reciprocating head and an arm connected therewith provided with a lug engaging the free end of the punch-carrying lever, with other novel features, forming an improved machine for making nails with an iron shank and a brass head.

A gauge attachment for cane shaving machines has been patented by Mr. Louis Janson, of Brooklyn, N. Y. Combined with a pair of knife disks and gears for turning them is a longitudinally moving rack bar engaging the gears, a movable block to which the rack bars are connected, and means for adjusting the block to move both bars simultaneously lengthwise, by which the knife disks are adjusted to present a new edge to the work and laterally to gauge the width of the strips.

SCIENTIFIC AMERICAN
BUILDING EDITION.

MARCH NUMBER.—(No. 29.)

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NEW BOOKS AND PUBLICATIONS.

THE WOMAN'S WORLD. From Cassell & Co., of New York and London, we have received copies of this new magazine, edited by Oscar Wilde, the apostle of personal æstheticism. It has upward of forty large octavo pages to each number, containing a variety of articles all more or less pertinent to the subject. As frontispiece in the last issue is a portrait in fac-simile of red crayon of Christina Rossetti by Dante Gabriel Rossetti, a pensive face, which from its associations with the life of the artist-poet is of peculiar interest. We also note a collection of literary and other notes by the æsthetic editor.

POCKET ATLAS OF THE WORLD. By John Bartholomew. New York: G. P. Putnam's Sons. Price $1.

This beautiful little volume, with 42 clearly printed maps, is necessarily restricted to giving the main features of the geography of the world, but it will be found to answer the purpose in a great majority of cases where one requires an atlas for general use, and save the necessity of the more troublesome reference to a large work. It contains also a very complete index, so made that any place mentioned can be readily found on the map, with a limited amount of the most commonly required statistical matter.

DISEASES OF THE DOG. By John Henry Steel. New York: John Wiley & Sons. Pp. 287. Price $3.50.

The author, a professor of veterinary science, has written this book as a manual of canine pathology, especially adapted for the use of veterinary practitioners and students. It aims to give a digest of such facts of anatomy, physiology, pathology, and other accessory sciences as bear on the actual details of diseases, all arranged in the form of a systematic text book. In the introduction the author says: "There is a delicacy of manipulation and a refinement in practice needed in the medical treatment of dogs which is not required so much in the larger animals; the tissues are very delicate, the nervous organization is high, while the patients can be more readily handled and controlled than the larger forms;" and although the author treats all questions from a professional standpoint, these lines indicate the spirit in which the book is written.

STAIR BUILDING IN ITS VARIOUS FORMS. Quarto. By James H. Monckton. New York: John Wiley & Sons. Price $6.

The author, a teacher for many years of the mechanical class in the General Society of Mechanics and Tradesmen's Free Drawing School of the City of New York, here presents a practical description, with working drawings, of the general field of stair building and hand railing. The book gives the one-plane method of hand railing as applied to drawing face moulds, unfolding the center line of wreaths, and giving lengths of balusters under all wreaths. The student or apprentice will here find detail instruction in stair building, from a step ladder to expensive and difficult staircases, and the experienced stair builder and expert rail worker will find simple rules for laying out the most complicated work, while the professional architect cannot fail to find valuable suggestions in design and construction from the 74 large plates of drawings with which the volume is illustrated.

ASTRONOMY FOR AMATEURS. By J. A. Westwood Oliver. London and New York: Longmans, Green & Co. Pp. 316. Price $2.25.

For those possessing small telescopes, and wishing to do something more than mere desultory star gazing for recreation or amusement, this volume affords an excellent practical manual. It especially advises and points out the methods of close and persistent scrutiny of individual objects or classes of objects in the heavens, either in solar, lunar, or planetary work, comet seeking, double stars, etc., according to the power of the instrument within reach of the amateur, in the hope that our sum of astronomical knowledge will be advanced by the efforts of such an army of observers as this class now includes, while the amateurs will in this way themselves receive more benefit than they would by the usual unsystematic work. A map of the moon is given, with its mountains, valleys, clefts or rills, craters, walled plains, etc., so designated that the amateur can readily find them with an instrument of quite moderate power.

CHEMISTRY, INORGANIC AND ORGANIC. By Charles L. Bloxam. Sixth Edition. Philadelphia: P. Blakiston, Son & Co. Pp. 788. Price $4.50.

Bloxam's Chemistry has been for too long a time a recognized standard among chemists and teachers of chemistry to call for any detailed review at our hands at this time. Especial interest, however, at

taches to this edition, from the fact of the author's death, in November last, after the completion of its thorough revision, with the design of giving a more comprehensive view of the chemistry of to-day. The work has been much enlarged, and the elementary knowledge of chemistry it is so important to possess in the prosecution of many of the industries is here presented in a form to be readily comprehended by those not specially trained to such study. One of the prime recommendations of this edition of the Messrs. Blakiston is its very complete index, while the type and printing are excellent.

THE FLOUR MANUFACTURE. By Friedrich Kick. Translated by H. H. P. Powles. London: Crosby, Lockwood & Co. Price $10.

This handsome volume, with 24 sheets of plates and 113 wood cuts, includes also a supplement by the same author, with four plates and 54 wood cuts, on recent progress in the flour manufacture. The first edition of the work was published in 1871, and it has since that period been accepted as a standard throughout Germany, and in Austria Hungary especially, where scientific milling was first brought to its present high state of development, the author taking particular pains to minutely describe the Austrian methods of high or middlings milling, which has since been largely adopted in England and this country. The book is primarily written for millers and milling engineers, and cannot fail to be valuable alike to the young miller and the most experienced, for the author is analytical in his methods of investigation, while setting forth only what has been acknowledged to be best in mechanical practice. The plates furnish detailed illustrations of a wide variety of machines, with plans for the construction of mills and arrangement of the machinery.

HUDSON'S TABLES. Vol. II. By John R. Hudson, C.E. New York: John Wiley & Sons. Price $1.

This is an engineer's manual for facilitating the calculation of the cubic contents of excavations and embankments, giving additional tables, and in some instances different methods of computation from those presented by the same author in the first volume, published in 1884.

The *Shoe and Leather Reporter Annual* for 1888 is the title of a neat octavo volume of more than 500 pages, nearly all of which are taken up by a directory of the shoe and leather trades and their collateral branches throughout the world. It is published by the paper whose name it bears, a journal which has unequaled facilities for attaining accuracy and completeness in such a volume.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) A. W. K. desires a harmless remedy which will prevent hair from turning prematurely gray. A. Nothing can prevent the hair from turning gray, any more than one can stop growing old. Sometimes, however, the following mixture is used, which acts for a time. Scald black tea 2 ounces with 1 gallon of boiling water, strain, and add 3 ounces glycerine, tincture cantharides ½ ounce, bay rum 1 quart. Mix well and perfume.

(2) F. M. D. asks: 1. What is used for putting on the bronzes that come in powder form? A. Copal varnish is good. 2. What for applying gold leaf? A. Gold size. Both of these articles can be purchased of any dealer in paints.

(3) J. T. D. asks for a comprehensive work on navigation, comprising both ordinary compass and log navigation, and also by means of sextants, etc.? A. We can supply you with Navigation and Nautical Astronomy, prepared for the use of the U. S. Naval Academy by Professor J. H. Coffin, 52 illustrations, $3.50.

(4) S. W. desires a recipe for making a good cement for fixing rubber tires on bicycle wheels. A. Use a mixture of asphalt and gutta percha melted together. See formulas for cements in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(5) W. W. G. asks the relative cost of fuel for 12 horse boiler, figuring coal $5.50 per ton, and kerosene oil 120° test at 8 cents per gallon. A. Your coal is less than ¼ cent per pound, and the oil costs 1¼ cents per pound. The evaporative power of oil is ⅛ greater than coal.

(6) W. M. F. asks: 1. Will ordinary pig iron remelt, in ordinary foundry cupolas, stronger than the original pig? If so, why? A. In remelting iron, some of the gases that are combined or mechanically mixed with new iron are given off, making the iron more compact and stronger than in new iron or from the previous melting. 2. Very often, in tapping iron from the cupola into the reservoir, and even after the iron is lying in it or being handled, numerous sparks are thrown off quite high in the air, which burst and fall in showers. A. The sparks are minute particles of iron thrown from the surface of the fluid metal by the liberation or bursting of gas bubbles from below the surface. They are ignited and burn by coming in contact with air in their flight. The gas bubbles may be carbonic oxide, hydrogen, or other gases, and probably some air carried into the metal by the stream of molten metal from the furnace. The nature of the gases contained in and liberated from metals in a fluid condition is a somewhat disputed point among chemists.

(7) J. M. S. writes: I have a razor the steel of which is quite soft. It can be quickly honed, but loses its edge with very little use. Can you suggest anything that will harden it so that it will retain its edge? A. We cannot. Razors are hardened thick and ground thin, and cannot be rehardened.

(8) W. D. E. asks when the circular saw was first used in America for sawing lumber. A. About 1802 such saws were first made here. They were adopted by the British Admiralty Board in 1804, having been previously used by Brunel for making ships' blocks, but circular saws were in use in 1790 and before that time for cutting the teeth of clock wheels.

(9) F. P. H. asks: What will prevent iron or steel which is constantly submerged in water from rusting? A. There is nothing lasting but good galvanizing. Asphalt varnish will be only a temporary protection. Boiled linseed oil and Prince's metallic paint, or red oxide of iron as a paint, well dried, make a fair preservative of iron surface under water. This is much used on ship work outside and inside.

(10) H. R. S. asks: About what would be the daily expense of a yacht, say one like Jay Gould's Atlanta? A. About $110 per day and upward, apart from owner's private expense in entertaining guests and luxurious living.

(11) W. W. P.—Your skate runner cannot be cemented or soldered to be reliable. A skillful workman might braze the parts together with copper or brass, but such joint would be of little value.

(12) H.—There was an error in the diagram of the simple electric motor described in No. 11 of current volume of SCIENTIFIC AMERICAN. The

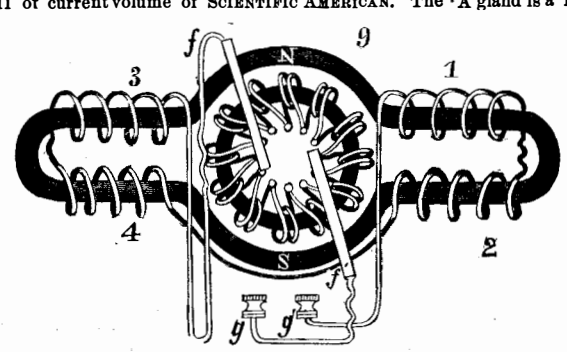

diagram is here reproduced with corrections. Complete working drawings of the motor will be given in SUPPLEMENT, No. 641.

(13) L. W. C. writes: I recently saw a frame maker working upon so-called bronze picture frames, by dipping the finger into a powder and rubbing it into the moulding, and after drying burnishing out certain portions with the common agate. What was the powder used and how prepared, and how was the moulding prepared to receive the bronze? A. The frames are painted with a thin coat of isinglass size or thin white glue. When dry a thin coat of gold size is applied with a camel's hair brush and dried, so as to be slightly tacky to the touch. Then rub gold bronze powder over the surface with a small piece of fur or a camel's hair brush, or the finger as you saw, which is very crude. Possibly the workman was only adding a little dry powder to facilitate the burnishing. The bronze can be purchased through the paint trade, as also the gold size, or you may make the gold size by mixing 1 part finely ground ocher, 2 parts copal varnish, 3 parts linseed oil (raw) 4 parts turpentine, 5 parts boiled linseed oil, all by weight. If too strong to flow thin, add more turpentine.

(14) C. A. E. D. asks: 1. What is the amount of wire in weight of primary and secondary in the induction coil described in No. 160, SCIENTIFIC AMERICAN SUPPLEMENT? A. About 2 pounds in the secondary and ¼ pound in the primary. 2. What is required size of battery to give the full spark, the surface of carbon and zinc in inches? A. You may use as many as six bichromate cells, each having 36 square inches of opposing faces of zinc and carbon. 3. Is the spark increased by the greater quantity of tin foil in the condenser? A. As soon as sufficient tin foil is introduced, there is no use in employing more.

(15) E. F. F. and H. L. W. desire (1) a recipe for type writer ribbon ink. A. Take vaseline of high boiling point, melt it in a water bath or slow fire, and incorporate by constant stirring as much lamp black as it will take up without becoming granular. Remove the mixture from the fire, and while it is cooling mix equal parts of petroleum benzine and rectified oil of turpentine, in which dissolve the fatty ink introduced in small portions by constant agitation. 2. The way in which carbon paper is manufactured. A. Mix lard to a paste with lamp black, rub this upon thin tissue or post paper, remove the excess with a rag, and dry the paper.

(16) W. B. B. asks (1) a receipt for making a copper dip such as is used in coating electric light carbons. A. They are coated electrically with a thin film of copper. Use a solution of sulphate of copper for the bath. 2. How are black lead crucibles made, and the proportions of the different ingredients used? A. They are moulded and baked, being made of poorer qualities of graphite with 10 per cent China clay, or more and poorer clay for the cheaper grades for base metals. 3. How to silver plate by battery, also kind of battery necessary, and how to make same? A. For silver plating see SUPPLEMENT No. 310, or an excellent work on the whole subject, Fontaine's Electrolysis, which we mail for $3.50. All kinds of batteries are described in SUPPLEMENT, Nos. 157, 158, and 159. 4. The name and address of paper wholly treating on machinery. A. We do not know of any paper treating of a wider variety of machinery than the SCIENTIFIC AMERICAN.

(17) C. E. P. asks: 1. Is there any metal easier to work than iron that could be used as parts of electrical apparatus to contain mercury, liable to be heated considerably by strong currents? Could not brass be used, and if the mercury corrodes it, be electroplated with nickel, or if necessary iron? Would this protect it? As the mercury expands by heat generated by strong currents, and this must be taken into calculation, can you give any rule to find the amount of expansion for say a rise of 25° or 50°, supposing temperature on starting to be about 75°, or that of an ordinary room warmed? Will the mercury evaporate or become less in time under above conditions? A. Platinum and iron are the best metals we can recommend. Brass, even if plated, will be liable from the least imperfection in the coating to be attacked by mercury. You will find tables of the coefficient of expansion of mercury given in manuals of physics. The trouble is that practically the coefficient varies with the nature of the inclosing vessel, as this also expands and contracts. Mercury slowly evaporates at summer temperatures.

(18) M. G. asks: 1. What would be the preservative effect of coal oil applied to wood, as pine posts in the ground dipped or soaked in petroleum? A. Coal oil would not operate as well as distillatory or tar products. It is not held in very high esteem as a preservative. 2. Is there any cheap substitute for white lead? That is, a light colored earth paint equivalent to the dark red and brown earths or mineral paint? How would white cement or lime work in oil? A. Sulphate of baryta, or the mineral barytes, is the favorite white lead substitute. Lime would decompose the oil.

(19) W. A. asks: What paste is used in mounting a map on canvas? A. Any good flour paste will answer, after which it is generally customary, but not necessary, to varnish the surface of the map.

(20) T. B. asks: 1. What is a gland? How do you pack one, and with what material? A. A gland is a flanged follower inserted in the stuffing box on the heads of engines, pumps, and other machinery that have piston rods or other sliding parts that require to be kept tight. The box is packed with various kinds of material furnished by dealers in supplies, woven or braided into yarn of square or round form, suitable in size for the open space under the gland; otherwise use twisted or braided flax or cotton, of the proper size. Wind it round the piston rod loosely, pushing into the stuffing box until it is full, then push down the gland and tighten with the screw nuts. Grease the packing before putting it in. 2. What is the difference between an automatic cut-off and a plain cut-off? A. An automatic cut-off is operated by the governor. Others are connected directly with the cam, and the governor throttles the steam. 3. What is meant by lead? A. Lead is the width of opening of a steam port for the admission of steam at the beginning of the stroke.

(21) C. H. B. desires a method of bleaching sponges after being used in surgical operations. A. Soak in diluted hydrochloric acid 10 or 12 hours, then wash with water and immerse in a solution of hyposulphite of soda to which a small quantity of diluted hydrochloric acid has been added.

(22) F. W. desires a recipe for making a paste polish that will clean and polish brass, nickel plate, copper, or any kind of metals. A. Take of oxalic acid 1 part, iron peroxide 15 parts, powdered rotten stone 20 parts, palm oil 60 parts, and vaseline 4 parts. Pulverize the oxalic acid and rouge and rotten stone, mixing thoroughly, and sift to remove all grit, then add gradually the palm oil and vaseline, incorporating thoroughly.

(23) G.—Engines are rated and sold by their nominal horse power, which does not designate their real or indicated horse power. The latter may be double the nominal horse power.

(24) W. H. S. writes: You state that carbonate of potash prevents rust on iron or steel. Will it injure the metal or not? I have never found anything that will prevent a gun from rusting in our climate, long at a time. A. It is not injurious to the metal. It is of no value for a gun that is handled or exposed to the weather, but only suited to finished work, as cutlery papered in a store.

(25) H. B. asks: When a cannon would shoot a ball 15 miles distance, how high would the ball go if fired up straight in the air, with the same amount of powder? A. The elevation of the gun to make a 15 mile range is necessary to a solution of this problem. Probably about 9 miles.

(26) H. O. D. asks: What flux can I use to obtain a clean, perfect weld in copper, and at what heat must it be worked? A. 3 parts phosphate sodium, 1 part boracic acid; pulverize and mix. Sprinkle on metal at red heat.

(27) W. A. M. asks whether a current water wheel could be successfully used or operated in the Missouri River. A. Current water wheels are only makeshifts, to be used when no other form can be operated. They require floats anchored or other devices to keep them at a proper immersion at all stages of the water. They are an ancient device, successful only on streams of little variation in flood level.

(28) J. L. C. asks: 1. Does a fatal shock of electricity produce rupture of physical tissue? A. A fatal shock of electricity is generally accompanied by some physical effect upon the animal tissues, yet there seems to be no reason why it should not kill by a purely nervous shock without any physical injury. 2. Does electricity travel upon the external surface or through the internal body of a conductor, such as a copper wire for instance? A. The entire substance of a conductor conducts electricity.

(29) S. C.—You cannot braze a lug on the double-barrel gun without injury to the gun. You can solder it with pure tin and make a good job. Tin the cleaned surfaces with a copper, put them together, and heat the parts until the tin melts, putting a little tin on the edge of the joint to make a perfect filling. If you are near a tinsmith, you should get him to do the tinning. Hard solder is brass, and requires a high heat to melt it.

(30) D. H. S. asks: If a ball falls from a certain point down on a spring, how far back will it rebound, and what is the best spring to use to throw the ball the highest? A. A rubber spring is probably the cheapest. A coiled steel spring is good, but difficult to guide without friction. A volute spring of steel, with a center pad of steel for the ball to strike upon, is probably the most efficient. The ball may return within from seven to nine tenths of the distance fallen through, according to the conditions of friction of the air, friction of impact upon the spring and perfection of contact between ball and spring.

(31) F. B. W. asks: 1. What is the most practical compound for safety match? A. Dip the splints in a paste composed of chlorate of potash 6 parts, sulphide of antimony 2 to 3, glue weighed dry 1. The paste for the rubbing surface is amorphous phosphorus 10 parts, oxide of manganese or sulphide of antimony 8, glue 3 to 6 weighed dry. The ingredients must be thoroughly mixed, and care must be taken not to mix the chlorate of potash in the dry state with the other materials; it should be mixed first with glue dissolved in warm water. The paste for the rubbing surface may be spread with a brush or spatula on the side of the box. 2. Is there any chemical that takes fire by blowing the breath on it? A. None that are practicable or serviceable in the ordinary way.

(32) W. P. asks (1) how the cheaper kinds of mucilage are made by compounding starch with sulphuric acid. A. The starch is first converted into dextrine or British gum, which is then soluble in water. The method is as follows: One part of starch is acted upon by ¼ part sulphuric acid and 2·8 parts water. The acid is mixed with part of the water, and the starch stirred up with the rest; the diluted acid is gradually poured upon the starch, and the mixture is kept for some time at 90° C. The dextrine is then precipitated by alcohol from the clarified solution. 2. There is an imported mucilage here containing a great quantity of lime or other alkali. Can you give its formula? A. You will have to have it analyzed. We do not know its composition. 3. I find it stated that a solution of silicate of potash will make a very strongly sticking mucilage. Can you tell me how the solution is made? A. Silicate of potash alone would be useless. See the article on "Water Glass," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 317.

(33) S. M. McK. asks how to make good first class printer's inking rollers. A. Take of Cooper's best glue 8½ pounds, extra sirup or New Orleans molasses 2 gallons, glycerine 1 pint, Venice turpentine 2 ounces. Steep the glue in rain water until pliant and drain it well. Then melt it, but do not cook it, the glue pot being held in an outside pot in which water is kept boiling. Next put in the sirup and boil ¾ of an hour, stirring it occasionally, and skimming off impurities arising to the surface. Add the glycerine and turpentine a few minutes before removing from the fire and pour slowly. Reduce or increase the glue as the weather becomes colder or warmer.

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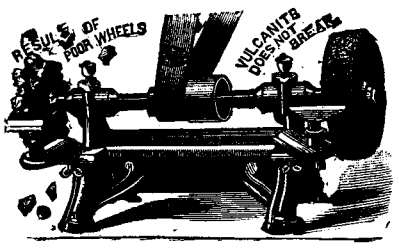

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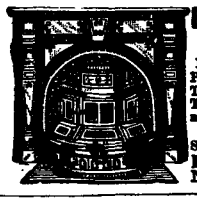

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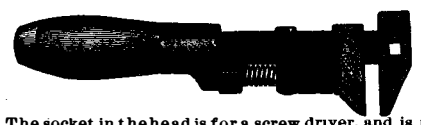

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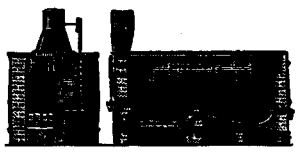

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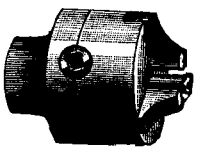

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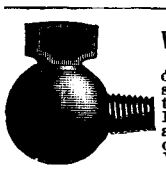

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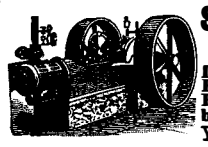

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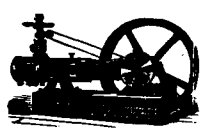

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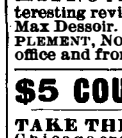

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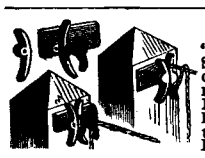

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