Correspondence

Some Magnetic Experiments.

BY R. FISCHE, M. D.

1. Electro magnetic Action of the Human Body.—100 yards of copper-wire No. 30, covered with cotton and shellac, are coiled upon a wooden frame, and an astatic needle, consisting of two No. 7 sewing needles, magnetized and joined about one inch distance with a piece of wood, is delicately hung up in the open space, left for this purpose, by a silk-fiber seven inches high. Between the upper needle and the wire a dial with circular measure is interposed. The coil is fastened into a square wooden box, and closed with a glass bell against the current of air. The ends of the wire leave the box near its foot, and a handle of sheet-zinc is attached to the inner end, another one of sheet copper to the outer end. The instrument is put on an immoveable stand fixed to the wall of the building, and the wire-ends are fastened in such a manner, that the grasping of the handles does not disturb the needle. The coil stands continually in the magnetic meridian, determined by a single needle. The astatic needle takes a more or less equatorial position, the upper north-pole usually pointing north-east. No disturbances of this needle have been observed so far, and if any should occur, they can be controlled by another double needle hung up for the purpose of observing magnetic disturbances in another room.

The galvanometer shows the following strength. If the naked ends of the wire half an inch apart are immersed one-eighth of an inch into one dram of distilled water contained in a flat watchglass, the upper north-pole shows a northern deflection of 2° 30′ from its position north-east. If the inner end of the wire is armed with one sixty fourth of one grain of zinc and immersion takes place in the same manner, a northern deflection of 5 follows. If one drop of sulphuric acid is added to the water, and the naked ends are immersed as above, the deflection toward north is 5°, and, if the inner end is armed with zinc as above, and the ends are immersed as described, the deflection in northern direction amounts to 300°, and generally more. The deflection increases still more, when the upper north pole stands south of the equator, and then is of the southern direction.

The electromagnetic action of the human body upon this multiplier is shown by the following simple operation. The person to be experimented upon grasps the handles in his hands and holds them until the maximum of deflection of the needle is reached. The deflection ensues, and varies according to the different personalities and their momentary conditions. Sometimes the needle will not move at all, or very slowly a few degrees, and sometimes a rapid rotation through the whole circle and more ensues. The other day, immediately after having done some handiwork, I got a rotation of four circles.

This experiment promises to become a valuable aid in the estimation of the conducting power of the nervous system, as also in the examination of various secretions and excretions of the human body, objects of importance in physiology, pathology, and therapeutics. And I do use it in fact for the purpose of diagnosis.

2. Magnetic Paradox.—On operating with the astatic needle in the above described apparatus, some curious facts were elicited, which seems to demand explanation.

Some cut iron nails, presented with their head or point to a single oscillating magnetic needle, invariably attract either north or south pole. If, however, the heads of such nails are pointed towards the upper north pole of the astatic needle, the north pole is repelled to a quarter of a circle and more. The same occurs whether the single or the double needle first be tried. In fact, those nails prove indifferent to a single needle and polar to a double one. This observation moreover is corroborated by testing upon another astatic needle of different size and proportion. The same phenomenon has been observed with other pieces of iron which I happened to try, such as soft iron-wire, cast-iron, cast-iron screws, forged iron, &c.

Curiously enough, I found some other pieces of iron such as cast-iron nails, sewing needles, watch-spring, and a piece of iron rod, all of which repel the upper north-pole of the above described astatic needle, attract the upper north-pole of another one, and equally attract north and south-pole of the single needle.

3. Direct Magnetic Action of the Human Body.—A gentleman of considerable mesmeric power, single, 32 years old, had drawn my attention to this subject, after he had noticed several times and shown to me, hat a pair of scissors, he inclosed in his hands for a minute or two, deflected the needle of a delicate pocket-compass visibly more, than it had done before.

Nov. 7, 1861.—The same gentleman pointed his right forefinger directly toward the upper north-pole of the above described astatic needle as near as the covering would admit without touching it, while at the same time I grasped with both my hands his left hand, and thereupon followed a distinct deflection of 5°.

4. Difference of Momentum between the opposite Poles of Magnetic Needles.—Before I hit upon the new magnetometer described in No. 25, Vol. V. of the Scientific American, I tested small magnetized needles upon a common single rhomboidal needle by presenting both respective north-poles to each other. The deflection of the oscillating needle would give the desired result. On applying then the south-poles to one another, it was observed, that the deflection amounted to 20° more than before, at the north-pole. Similar observations were made upon the astatic needle, one of which is mentioned above in subject No. 1.

It appeared to me singular, that the south-pole should swing further, than the north-pole on application of the respective poles of one and the same needle, since not only the needle is carefully poised on the pivot, but also the one end moved of course has to carry the opposite end in equal ratio. This leads to the following reasoning.

The rhomboidal needle is broader in the middle than at both ends. The angle of inclination is by this arrangement diminished and almost neutralized, because the gravitation of the central portion by far surpasses the amount of inclination, so that it escapes direct ocular observation. There is, however, probably, an infinitesimal angle of inclination left, if the needle is correctly poised in the middle, which may account for the difference in momentum. The south-pole, therefore, is actually more remote from the center of rotation by the moment of inclination, and swings round with a corresponding centrifugal force, greater than that of the north-pole on application of the soliciting south-pole of the testing magnet.

The needle, then, resembles a lever of the first kind, the deflection of which is inversely as the sines of the respective arcs on application of an equal force upon either pole, and the consequence is, that the moment of the south-pole increases with the angle of inclination of the north-pole.

Brooklyn, N. Y., May 16, 1861.

Experiment with Steel-Pointed Bullets.

Messrs. Editors:—I noticed in a late issue of the Scientific American a communication advocating the use of lead for cannon projectiles. Just before, I had been engaged in trying an Enfield rifle, carrying a conical ball 14 to a pound, at a target consisting of 2-inch plank, defended by one plate of half-inch cast iron and another of cast steel of about one-eighth of an inch, placed at an angle of about 40°, at a distance of 40 yards. In accordance with an idea which struck me after reading an account of the "Battle of the Monsters," I furnished several of the bullets with sharp steel points, like a punch or cold chisel. Only one of the bullets which were not pointed penetrated the cast steel (the others glancing off), and that not until it had furrowed it for several inches and came in contact with the edge of the cast iron. The pointed bullets, on the other hand, penetrated both plates and one inch of the plank.

It seems to me that a point of well-tempered steel would do away with the objection to the softness of the metal, and that such a projectile would be the least likely to glance off from inclined iron plates.

C. W. H.

Charlottetown, Prince Edward Island, April 19.

The Plan of Taxing Money Receipts.

Messrs. Editors:—I do not suppose that it will amount to any thing, but you will pardon me for addressing you to say how much I was pleased with an article on page 307, last number, Scientific American, on taxation. I have read with much interest different articles that have appeared on this subject, and also the proceedings of Congress, but none have seemed to me to reach the main object in so easy a manner as the one above alluded to, viz., the collection of a sufficient revenue to carry on the government without oppressing the people either really or apparently. I was living in Maryland while the stamp tax, as it was called, was in operation. This was something similar to your proposition, but referred more particularly to promissory notes, sales of property, &c. It did not include receipts for moneys. My recollection of it is that the people did not find it at all oppressive, because it fell on those that were best able to bear it. I should be much pleased to see you elaborate your proposition more fully, and bring it before the public in such a way that shall receive the attention it deserves. These stamps or notes, bills, receipts, &c., could be distributed over the country, by means of the post offices, with comparatively little expense.

Allow me, also, to embrace this opportunity of congratulating you on the continued and unwearied excellence of your paper during these troublous times. I have been a subscriber from the second year of its existence, and at no time have I been more interested in the different numbers than during the last winter and spring. Not one of them but what I find more knowledge and instruction in than could be purchased elsewhere for the price of a year's subscription.

John Oliphant.

Fairchance Iron Works, May 14, 1862.

The Motion of a Rifle Ball.

Messrs. Editors:—It is a disputed point with some as to whether a long or Minié-shaped ball, shot from a rifled cannon at any proposed elevation, maintains its polarity so that when it strikes the object it will have its point elevated to the same extent that it was when it left the gun, or whether it will keep precisely point foremost as it passes through its curve, so that at a great elevation it will fall with its point as much depressed as it was elevated at the start. Those who think that its longer axis will remain parallel with the bore of the gun, contend that it is held in position by the principle that the gyroscope is intended to illustrate, or that keeps a boy's top standing on its point while the center of gravity is at one side of the base. Those who take the other view give it as conclusive that they have tried the experiment—that they have been at camp and have seen cannon, and have heard the gunners and officers say that it was just as they state it, and that if it were not so it would spoil all their calculations of gunnery.

Please give your opinions in the Scientific American, with such illustrations as all can understand. Supposing the gun, in order to throw the shot to the proper mark, say a side of a fort, requires an elevation of 45°, will it strike point up 45°, or point down at the same inclination, or will it accommodate the gunner by striking at right angles with the shorter axis of the bullet?

W. E. Lukens.

Sterling, Ill, April 28, 1862

[There is no doubt that the tendency of a rotary motion in a body is to preserve its axis parallel to itself, and if this tendency is not overcome by other forces, it will always hold a projectile discharged from a rifled cannon with its axis parallel to that of the gun, as illustrated on page 234, Vol. IV. Scientific American. But if the center of gravity is much forward of the center of mass, as in the case of a wooden arrow with a metallic head, the resistance of the air will turn the projectile so that its axis will be nearly parallel with the line of flight.—Eds.]

Yield of Lake Superior Copper Mines.

Messrs. Editors:—I take the liberty to send you a statement of the product of the copper mines of Lake Superior for four years, commencing with 1858:

In 1858 the product was	5,942 tuns.
In 1859	6,041 tuns.
In 1860	8,614 tuns.
In 1861	10,337 tuns.

The above statement may be relied upon as correct.

A. A. B.

Eagle River, Lake Superior, April 16, 1862.

Spontaneous Generation.

The following account of the researches of Pasteur, respecting the theory of spontaneous generation, was translated and condensed for the *American Journal of Science and Art*, by M. C. White, M. D.:—

The theory of spontaneous generation was long since proposed to account for the origin of beings whose germs were too minute or too obscure to attract attention. One after another the different organisms supposed to arise from spontaneous generation have been proved to originate from germs. At present the question of spontaneous generation concerns only the origin of *entozoa* and those minute organisms which can be studied only with the aid of the microscope, as molds (minute fungi) and infusoria, both animal and vegetable. The common theory that the spores or germs of these minute organisms are constantly floating in the atmosphere ready to start into activity whenever they meet with a suitable nidus, has found an able advocate in M. Pasteur, of the Normal School of Paris, who has published in the *Comptes Rendus* a series of valuable papers on this subject, the substance of which I have translated.

In order to collect and examine the solid particles floating in the atmosphere, Pasteur placed soluble gun cotton in a glass tube, and, by means of an aspirator, caused a current of atmospheric air to pass through it for several hours. The cotton was then dissolved in a mixture of alcohol and ether, and the atmospheric dust deposited at the bottom of the fluid in a conical glass was examined in the microscope. The sediment thus collected contained grains of starch and such other dust as is ordinarily found on surfaces exposed to the air. When submitted to the action of concentrated sulphuric acid, the starch was soon dissolved, while other particles remained undissolved and had all the characteristics of the spores of ordinary mucedines, which are known to resist the solvent properties of concentrated sulphuric acid. [It is worthy of notice, that certain minute fungi are capable of decomposing a solution of sulphuric acid. A few years since, a little mold developed in the solution of sulphate of copper, used for electrotyping in the department of the U. S. Coast Survey, at Washington, proved an intolerable nuisance. It decomposed the salt, assimilating the sulphuric acid, and rejecting the copper which was deposited around its threads in a metallic form. From this it appears that sulphuric acid does not prevent, but may rather assist the growth of certain fungi.—*Tr.*]

To determine the action of atmospheric air, and of atmospheric dust upon fermentation, putrefaction and the appearance of organization, Pasteur adopted the following methods:—

A flask was about half filled with a fluid consisting of water, containing in solution about ten per cent of sugar and from two to seven parts in a thousand of the scum of beer. The neck of the flask was drawn out in the flame of a lamp and attached to a platinum tube, $\frac{1}{25}$th of an inch in diameter, which was then heated to redness. The fluid was boiled for two or three minutes to expel all air from the flask, when it was allowed to cool very gradually, and as it cooled the air which entered the flask was calcined, and all organic germs it contained were destroyed by passing through the red-hot platinum tube. When the flask had thus cooled to the temperature of the surrounding air the neck was hermetically sealed. The flask was then removed to an oven, and kept at a temperature of 80° or 90° Fah., for an indefinite period, without producing any organisms, or undergoing any change whatever.

To test the influence of atmospheric dust upon a fluid thus hermetically sealed, Pasteur placed a pledget of cotton or abestos in a small tube, and caused a current of common air to pass through it by means of an aspirator. This small tube, containing the cotton or asbestos, loaded with atmospheric dust, was then transferred to a larger T-shaped tube, one end of which was connected by india rubber with the sealed flask, another end was connected with a platinum tube heated to redness, and the third being connected with an aspirator, the apparatus was easily charged with calcined air, and all the common air was expelled. The neck of the flask was then broken within the T-shaped tube, and the small tube containing the atmospheric dust was passed into the flask, with access only of calcined air. The neck of the flask was then again hermetically sealed by means of the blowpipe. Many flasks were prepared in this way, and in every case, after standing in a warm situation for from twenty-four to thirty-six hours, vegetation appeared in the same manner as if the contents of the flask were exposed to the open air; but the mold or mucedines appeared first in the little tubes carrying the cotton, which was often thus filled to its extremities. The organic growths which appeared were the same as in flasks exposed to the open air, viz., of infusoria, *bacterium*; of mucedines, the *penicillium*, *ascophora*, *aspergillus*, and some others. When calcined asbestos alone was introduced no vegetation appeared.

It was thus demonstrated that amongst the dust suspended in ordinary air there are always organized corpuscles, and that these powders, when mixed with a suitable liquid, in an atmosphere of itself inactive, give origin to *bacteria* and *mucedines*, such as are furnished by the same liquid in the open air.

Pasteur confirmed these results by another method. Similar quantities of the same fermentable liquid were introduced into a series of flasks in all respects alike. The necks of the flasks were all drawn out over the flame of a lamp, and bent into a variety of different forms, but the tubular neck of each flask was left with an opening $\frac{1}{25}$th of an inch or more in diameter. In some of the flasks the liquid was boiled for several minutes, but three or four were not heated to the boiling point. All the flasks were then set away in a quiet place, free from currents of air. After twenty-four or forty-eight hours, according to the temperature, the flasks in which the liquid was not boiled after being put into them (although all the liquid had been boiled before it was put into the flasks) were found to be troubled and covered little by little with mucor. The liquid which had been boiled in the flasks remained limpid, not only for days, but even for entire months, although all the flasks were left open. There can be no doubt that the curves and sinuous forms of the necks served to secure the contained fluid from the fall of germs.

The common air entered these flasks as they were cooling, but so slowly during the gradual cooling of the hot liquid that the germs were either destroyed by the heat or were deposited in the curvatures of the narrow necks of the flasks, so that no viable germs reached the liquid. When the neck of one of these flasks was broken off, and the remaining portion placed vertical, in a day or two the liquid became moldy or filled with bacteria. This method, which so well explains the preceding, and which can be so readily practiced by any one, carries conviction to unprejudiced minds. It gives also peculiar interest to the proofs which it presents to us, that there is nothing in the air except its dust, which is a condition of organization. It thus appears that oxigen acts only to sustain life furnished by germs, while of gas, fluids, electricity, magnetism, ozone, things known or unknown, there is nothing in the air, except the germs which it carries, which can originate organic life.

[To be continued.]

Improvements in the Oxy-hydrogen Light---The Magnesia Light---Arborescent Crystallization on Photographic Plates.

[From the Photographic News.]

Some improvements have recently been made in the oxy-hydrogen light, which cannot fail to be of value to photographers. One objection to the employment of this light for photographic purposes, is the very feeble amount of chemical rays which it emits when evolved by the ordinary means. The earth lime is universally employed as the body which is to be rendered incandescent by the heat, and this is about one of the worst agents for actinic purposes which could be employed. Mr. Fryer has lately been making a series of experiments with this light, with a view to determine what substance, when made incandescent, produces the greatest amount of light. He has operated on various salts of calcium, magnesium, strontium, barium, and also upon some other substances. The best results were obtained from magnesium compounds. The sulphate of magnesia, when baked, was found to yield a bright light, but was decomposed by the heat; and the sulphurous acid escaping, was very unpleasant. Calcined magnesia succeeded the best of all; but when the powder was used, the gases blew it away. When the powder was mixed with water and afterward dried, the cake was friable; and when the dry powder was pressed into a mold, by means of hydraulic pressure, the cake split up into laminæ when subjected to the current of ignited gases. After many experiments with the materials in different proportions, it was found that sulphate of lime one part, and calcined magnesia two parts, mixed with water and modeled into a cake and dried, produced the best results. This, however, is not all that could be desired, as in time the cake becomes cracked and fissured by the gas. The illuminating power is exactly double that of lime, the ratio being, pressure and volume of gas being equal, as 54 is to 27. The experiments were conducted with oxygen, and the coal gas supplied to Manchester. The jet used was a form supplied by Mr. Dancer, a jet of oxygen being surrounded by an annular jet of the coal-gas. Mr. Dancer has further improved the jet by allowing the oxygen pipe to project beyond the hydrogen, and by not contracting the aperture of the hydrogen, or coal-gas pipe. At the last meeting of the Manchester Literary and Philosophical Society, Mr. Fryer exhibited this light; its effect is said to have been very striking.

Some remarkable appearances of crystallization have been noticed by Mr. Petschler in the preparation of glass plates with bichromate of potash and gelatine, for photographic purposes. The striking peculiarity is, that the inorganic salt in contact with the organic matter produces vegetable forms; specimens on glass plates representing mosses, ferns, and algæ in beautiful ramifications, which vary in many ways, dependent upon the strength of the solution, temperature, state of the atmosphere, and other causes. The plates were prepared in different ways. Some were first coated with collodion, on the surface of which a hot mixture of gelatine and bichromate of potash was poured, and then allowed to cool and dry spontaneously. In a few hours the crystals began to form and ramify themselves over the plate. The gelatine mixture was composed of three parts of gelatine and water, twenty grains to the ounce, to one part of a saturated solution of bichromate of potash. Several other plates were prepared in which the order of application of the ingredients was varied, or some of them omitted, all of which gave beautiful, tree-like crystalline forms. The great variety and beauty of these vegetations must be seen to be appreciated, as they can with difficulty be represented by drawings. Mr. Petschler believes that no chemical combination takes place between the salt and the gelatine, but that the latter acts simply as a medium. The gelatine, when firm, retains a certain quantity of water; but when the moisture is driven off by heat, the crystallization is suspended. There is great similarity in appearance, and there is, possibly, some connection in cause between these arborescent crystallizations and the ramified form in which the salts of some metals are found naturally in agate, slate, and even trap rock, where the oxide of manganese is frequently found to have assumed similar forms. Mr. Mosley has suggested that the arborescent appearances might, perhaps, arise from the density of the solution, from the resistance of the gelatine to allow of crystallization in the usual rhombic form, and possibly to the subtle electrical or galvanic action supposed to be excited during crystallization. He has stated that some years ago he obtained from a solution of bichromate of potash, tree-like forms with spreading branches and pendent rhomboids, which, under the polariscope, appeared like a tree with gems of rich colors for fruit.

The arrangements for the conveyance of the water from Springhead to Stoneferry, England, have now fairly got into operation, under the superintendence of Mr. Dale, the engineer. About three hundred yards of the trench have already been made, and in digging, at the depth of about ten feet from the surface, a boat has been discovered lying right across the trench. The boat is of oak, and is evidently a Roman relic, and must have been buried for at least a thousand years.

A French naval officer holding a high command has tendered his resignation, in order to devote himself to the completion of a new fulminating spur which he has invented for iron-cased ships, which will not only drive in the side of any ship, but will lodge in its interior an explosive shell of the most dangerous character.

Improved Breech-Loading Gun.

The accompanying engravings represent a very effective breech-loading gun, recently invented by Henry Berg, of Davenport, Iowa; Fig. 1 being a side elevation, Fig. 2 a vertical longitudinal section, and Fig. 3 a horizontal section. A is the stock and B the breech, which are rigidly connected together. Movable face plates, C, cover the breech on each side. D is the barrel, provided with arms, *d d'*, by means of which it is pivoted to the breech. E is a horizontal bolt, passing through a slot in the breech, which slot is narrow horizontally, so as to confine the bolt endwise of the gun, but wide vertically, to allow play to the bolt in that direction. *e e* are flanges formed upon the bolt, E, near its ends, and fitting in eyes at the ends of the arms, *d d'*; the said flanges being eccentric to that portion of the bolt which fits within the slot of the breech, a rotation of the bolt will move the barrel forward or backward.—This rotation is effected by means of a lever or crank, F. *f* is a spring catch, which retains the lever, F, in either position. The front of the breech is formed with a circular flange, *b*, fitting in a corresponding annular groove or socket in the rear of the barrel, in order to form a tight joint when the barrel is drawn back into position for firing.

Fig. 1

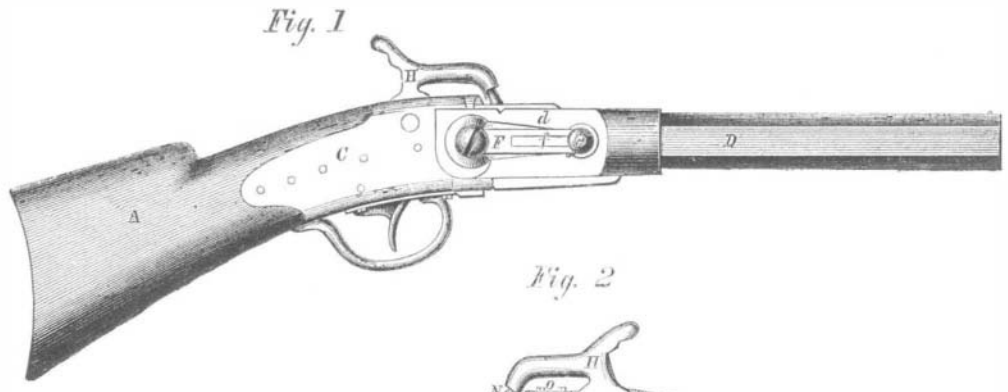
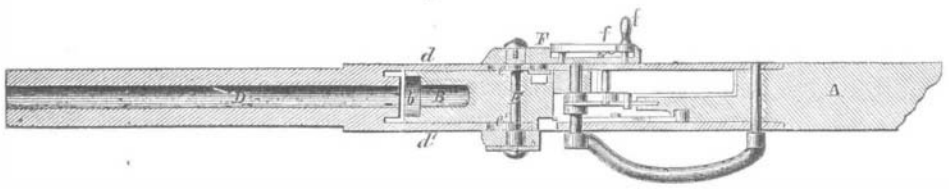


Fig. 2

Fig. 3



BERG'S BREECH-LOADING GUN.

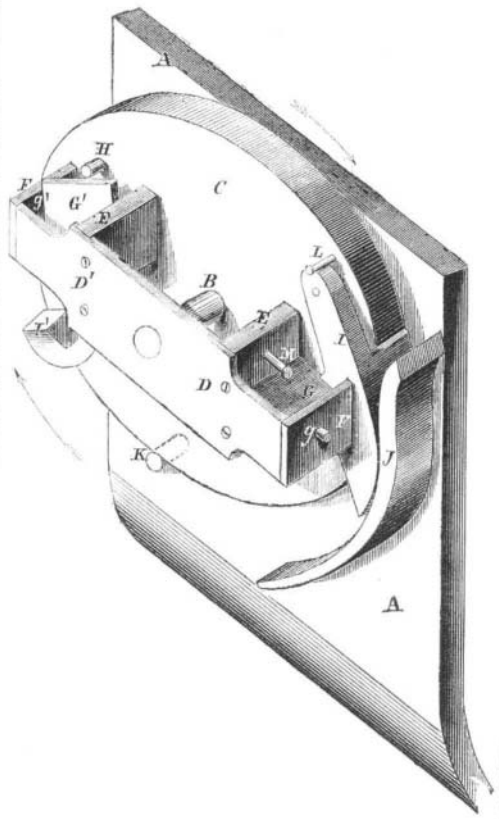
The main portions of the lock being of common construction require no description. The hammer, H, is also of common construction, but is provided with a stud or pin, *h*, projecting horizontally from it, for the purpose of raising it by the action of the barrel. G is a chamber to contain tape priming, which extends up through a passage, M, to the nipple, N. L is a feed band, pivoted to the lower part of the hammer stock, and employed to forward the priming up the passage, M, at every elevation of the hammer. *m* is a cutter upon the hammer, which severs a suitable piece of the priming at each stroke. O is an adjustable-elastic plate, fitting over the orifice of the passage, M, but movable, so as to permit the withdrawal of the priming when desired.

The manner of using the arm is as follows:—The parts being in the position shown in Figs. 1 and 2, (which is the position for firing) if it be desired to load the piece, the finger and thumb are applied to the pin, *f'*, of the crank lever, F, and the catch, *f*, at the same time is retracted by a slight pressure. The lever is then drawn up and over to the position shown in Fig. 3, which, by the action of the eccentrics, *e e'*, throws the barrel forward. The barrel is then allowed to fall back over the shoulder of the operator, in a position at right angles with the breech, the latter being held in a vertical position to receive the charge. The charge being inserted in the breech, the latter, with the stock to which it is attached, is restored to a horizontal position, and the barrel falls by its own weight to a line with the breech, in the position shown in Fig. 3. This descent of the barrel raises the hammer to full cock, through the medium of a lever engaging beneath the pin, *h*, of the hammer. At the same time the feed band, L, being, by the motion of the hammer, driven up the passage, M, carries forward the tape priming, causing it to project over the nipple. The hammer may be cocked by hand, in customary manner, if preferred, and, by means of a sliding catch, the parts may be disconnected so that the movement of the barrel will not act upon the hammer. The tape priming can be withdrawn at any time and percussion caps used in its place.

With this invention the entire operation of loading and firing can be readily performed with one hand, by resting the barrel over the arm or shoulder; it is, therefore, of great value in carbines for mounted service, but is applicable, also, to other arms. It is claimed to excel both in rapidity and accuracy of firing.

A patent for this invention was procured through the Scientific American Patent Agency, March 25, 1862. Any information as to the sale of rights, or other matters relating to the invention, may be obtained by addressing the inventor, Henry Berg, Davenport, Iowa.

KEPNER'S FEATHERING PADDLE WHEELS.



Various expedients have been devised to relieve the buckets of paddle wheels from the injurious vertical resistance experienced from the water at the back part of the stroke. The annexed cut represents a simple and effective device involving less waste of power than most contrivances for this purpose. It operates in connection with a pivoted bucket holding the said bucket rigidly during its downward and backward movement and relieving it the instant it begins to ascend, so as to permit it to assume a position in which it will pass through the water with the least possible resistance.

A represents a portion of the side of a vessel. B is a shaft carrying a disk, C, and radial arms, D D, connected to the said disk by bars E and F, which are parallel with the shaft but at different distances therefrom, the bars, F, being at the extreme periphery of the wheel, as shown. G G are buckets adapted to turn upon radial pivots, *g g*, which pivots are placed somewhat nearer to the arms, D D, than the disk, C. Pins H (one shown) project from the face of the disk, C, in such position as to receive and sustain the inner or longer ends of the pivoted buckets as they fall into position on the descending side of the wheel. I I are gravitating latches by which the buckets are held in their closed position during a proper part of their revolution. J is a segmental cam fixed to the vessel's side concentrically with the wheel and employed to hold the gravitating latches, I I, inward upon the buckets. K is a stationary pin employed to throw the latches outward in order to release the buckets at the proper time. L are pins (one shown) which support the latches, I, when thrown off the buckets. M are pins (one shown) which support the buckets so as to prevent them falling too far outward to admit of their returning to a closed position by their gravity, at the proper moment.

The operation of the wheel is as follows:—As each bucket begins to descend it falls into a closed position and its latch, I, falling over it and passing within the segmental cam, J, secures the bucket firmly against the action of the water. The bucket is thus held in the most effective position during such part of its revolution as it can act advantageously, but immediately that it begins to ascend, or reaches a position where the force exerted upon the water will not be so directly applied to the propulsion of the vessel, the latch, I, passing under the fixed pin, K, is thereby thrown from the bucket and the latter swings back to such a position as to adapt it to pass upward through the water with the least possible resistance. The pins, L and M, are so placed as to prevent the latches and buckets falling back too far and to support them in such positions that the buckets first and the latches immediately after, will return to the closed position by their own gravity as they begin to descend. The bucket, G, and latch, I, show the closed positions and the bucket, G, and cord, I, the open. The constant lubrication afforded by the water causes the device to operate with less friction than might appear at first sight. In the engraving but two arms and buckets are shown. In practice they will of course extend completely around the wheel. Arms may also be substituted for the disk, C, if preferred.

A patent for the above was procured through the Scientific American Patent Agency on the 15th of April, 1862. It is the invention of Solomon Kepner, of Pottstown, Pennsylvania, of whom further information may be obtained.

REMEDY FOR BRONCHITIS.—The following is given as an excellent remedy for bronchitis:—Take common mullin leaves, dry and rub fine, and smoke them three or four times a day in a new pipe, taking care to draw the smoke well into the throat.

WITHIN the past ten years 1898 new streets have been opened in Paris.