WEDGING OF GASES WHEN CONFINED.

In remarking on the experiments made in England with guns, or rather steel tubes open at each end, we said, in our issue of June 23d, that we could account for the velocity imparted to the projectile only on the hypothesis that the air, in the rear of the charge, confined between two felt wads, was compressed laterally, changing its particles from the spherical to the cone-like form, and thus acting as wedges, producing a transverse strain upon the walls of the tube, and forming, at the instant of discharge, a diaphragm of resistance, acting as a solid breech.

Although not certain of being correct in venturing this supposition, which, however, was the only hypothesis on which we could found a theory accounting for the results of the experiments, we have some additional evidence that this is the path for investigating these facts. We give, with this article, a cut representing two conical bullets fired from a Colt's revolving rifle of thirty-one inches length of barrel and "44" caliber. The circumstances are these: One of our correspondents, H. W. S. Cleveland, of Danvers, Mass., in using the Colt's rifle at a target, left his wiper rod in the piece to attend to a temporary call, and when he returned, forgetful of what he had done, he fired his rammer at the mark. He fired again, and again, until he began to imagine from the appearance of the target that he had been shooting "wild." He found, on examination, that he had pierced the target with a queer shaped projectile. Disengaging it he found it as it appears

in the illustration. One ball, probably that which projected the wiping rod, had lodged in the barrel for want of projectile force to propel it and the rod beyond the muzzle. The next ball fired struck the lodged ball and drove itself against it, changing the form so much as to alter a cylindrical shot, with cone-like termination, into a cylinder, compressed in a concave form at the end which before was a cone, and expanding the barrel about ten inches from the muzzle. On the whole outward surface of this compressed cylinder the rifles or "gains" of the gun barrel are clearly impressed. It is evident, then, that the explosion, in connection with the obstacle interposed between the projectile and the atmosphere by the lodgment of the first ball in the barrel, changed the form of the projectile from that of a cylinder, convex at the top, to that which is represented in the illustration. The Colt's bullet offers only a portion of its surface to the effect of the discharge combined with the rifling of the piece. But this projectile is clearly marked with the "gains" of the barrel for its whole length. As this length is more than that given to an ordinary bullet, and, besides, as the illustration shows, the bullet is "upset" or contracted in length by the explosive force of the gas, it is evident that an agent differing from that employed in discharging a projectile from a gun was a means in producing this effect. The bullet, notwithstanding its compression, which changed its form from that of the ordinary projectile to that of a perfect cylinder perforated at one end, where before it presented a cone-like protuberance, is now a cylinder bearing on its entire length—which is almost as much as its original length—the marks of the rifling of the gun. It seems to be evident that another force than that of explosion, or percussion in a direct line, was exerted to produce this result.

Again, the appearance of the ball, which was lodged in the piece in advance of that which drove it out, is such that it is hardly possible to draw any other conclusion from its elongated and attenuated appearance than that the wedging of the gases against the walls of the gun tube contributed to compress the material of which it is composed.

Having some doubts as to the critical acumen of our informer, we had an interview with him, in which we plainly stated these doubts. We had the idea that possibly the bullet which showed the rifling on its surface was the first which left the gun, or, at least, the first which struck the target. Our doubts were removed when he told us that he found the double projectile in the target—a cedar post—the elongated bullet in advance of the other, and the two so firmly united that it required some force to separate them. Could the two bullets have changed their relative positions in the flight from the gun? This would be against the experience of gunners, or those who use the rifle. Undoubtedly the elongated projectile reached the target first, and its elongation was due to a compression it was subjected to before it reached the target; otherwise how could it appear lodged in the target in advance of the bullet which followed it, showing on its surface the rifling of the gun and the depression of the butt of the first bullet?

In regard to this singular matter, Mr. Cleveland makes the following statements:—

"The position of the first bullet in the barrel was about ten inches from the muzzle. To move that bullet forward would require but little force, as any one may prove by ramming a bullet through a barrel. It is obvious, therefore, that no portion of the enormous force required to expand the barrel could have been exerted against the bullet, or it would have given way instantly. The only conceivable mode in which this lateral pressure could be produced, is by the wedging together of the component particles of air. The process of the operation was therefore in the following order, although the whole performance was (to our apprehension) instantaneous. The column of air between the two bullets being compressed by the advance of the rear one, and wedged together by its lateral pressure, caused the barrel to expand at the base of the bullet which was fast in the gun. The moment this expansion commenced a space was opened round the bullet, which was instantly filled with the air, and the bullet being of soft metal, was compressed and elongated, thus relieving the barrel from the necessity of further expansion. At the same moment, this elongated bullet was struck by the one in the rear, the point of which was expanded by the blow so as to fill the threads of the rifle, and the two passed out together, firmly united, but with their momentum so far diminished that they made but a slight penetration of the target."

It seems plain that the principle of Hardy's non-recoil gun is at least worth investigating, and it shows, also, that our idea of the compression of explosive gases is the best means of accounting for such a singular phenomenon as this we illustrate.

We wait for further information. Evidently there is much in this matter that ought to engage the attention of our scientists and mechanics. If Hardy's plan for firing projectiles, from tubes open at both ends, has any value as a useful means of simplifying gunnery, it should be known, and it seems that such experiments as we have illustrated will do much toward giving that information.

NATIONAL ACADEMY OF SCIENCES.

This body has just held a session of five days at Northampton, Mass. A large number of the most distinguished scientists of the country were in attendance, and the proceedings were of a most satisfactory character to those attending, particularly to the learned men themselves.

It is unfortunate, in our opinion, for the country at large, that these gatherings do not assume a character of a more useful and popular nature. By many they are regarded as convenient occasions to ventilate speculations and theories looking to no useful result as their ultimate. Science should lead and direct art, but papers on abstractions, which, by no effort of the mind and no endeavor of the will, can be made to yield a particle of useful information, are altogether out of place in a meeting of scientific men. Whether language belongs to the field of physical science or to the domain of moral philosophy, does not appear to be a question that can in the remotest degree affect the improvement of the race. Such problems may do very well as amusements for hypercritical minds or transcendental tastes, but for all their benefit to the world at large we might as well have a treatise on the cause of lunacy in bedbugs.

It is pleasant to know that all the investigations and the amusements of this scientific society are not of this style. It may be well enough to allow some mere abstract speculator to ventilate his learned nonsense before a company of sympathizing *savans* and befogged listeners; but the true value of the Academy must be found in their useful labors.

Speaking of the labors of the Academy, the reporter for the *Tribune* says that "Professor Bache, the President, was in such intimate relations with the Government, and Mr. Lincoln set so high a value upon his services, that a Cabinet meeting was held in his office every week during the war. It was Professor Bache who made the Academy especially valuable to the Government. By his vast labors during the war, Professor Bache was entirely broken down, and for the last year has been utterly unable to work. It is to be most ardently hoped that he may soon recover and resume his great usefulness to the country and to science. Of the immediate usefulness of the Academy to the country, there is sufficient evidence in the fact that the annual report shows that the Government has referred to the Academy for reports on the following subjects:—

"In the first year, from the Navy Department, weights, measures, and coins, their decimalization, etc.; methods of protecting the national currency from being counterfeited; Saxton's alcometer, intended as a substitute for the hydrometer now in use. The protection of the bottoms of iron vessels from corrosion by sea-water and from fouling. The correction of the compasses of naval vessels, especially of iron vessels and iron-clads. The inquiries as to the expediency of continuing in their present form the publication, by the Navy Department, of the wind and current charts, and of the sailing directions. In the second year, from the Surgeon General—as to the best method of testing the purity of whisky employed for medicinal purposes. From the Navy Department—to conduct, witness, and report, upon experiments on the expansion of steam. From the Treasury Department—the examination of aluminum, bronze, and other alloys, for the manufacture of cent coins.

"On most of these subjects the Academy has already, by a committee, presented elaborate reports, which have been accepted as decisive and exhaustive so far as they claim to go. It will be seen that these subjects embrace matters of the utmost importance to the country. Thus the Academy has indorsed the French decimal system of weights and measures as against the anomalous and puzzling lack of system now in use in this country, and recommended its adoption. Should their suggestions be followed, their influence would reach almost every person in the country almost every day, and after the change was once made, affect him most desirably."

Bleeding from the Nose.

Some two years ago, while going down Broadway, in New York, blood commenced running from my nose quite freely. I stepped aside and applied my handkerchief, intending to repair to the nearest hotel, when a gentleman accosted me, saying, "Just put a piece of paper in your mouth, chew it rapidly, and it will stop your nose bleeding." Thanking him rather doubtfully, I did as he suggested, and the flow of blood ceased almost immediately. I have seen the remedy tried since quite frequently, and always with success. Doubtless any substance would answer the same purpose as paper, the stoppage of the flow of blood being caused doubtless by the rapid motion of the jaws, and the counter action of the muscles and arteries connecting the jaws and nose.

Physicians state that placing a small roll of paper or muslin above the front teeth, under the upper lip, and pressing hard on the same, will arrest bleeding from the nose—checking the passage of blood through the arteries leading to the nose. H. C. K.

THE London Pneumatic Dispatch, by which small parcels are transported from one part of the city to another, by means of the exhaustion of air from a tube, is familiar to our readers. It appears, from a report recently made by the directors of this company, that 120 tuns of goods can be transmitted through the tube every hour, at a speed of eighteen miles an hour, and that the cost is less than one penny (two cents) per tun for each mile. They anticipate large dividends from the line when completed to points outside the city.

Photographing Cannon Balls.

[From the British Journal of Photography.]

Some months ago when on a visit to Woolwich Arsenal, we were shown by Mr. M'Kinlay, Proof Master, some photographs taken of guns while being fired, which not unnaturally excited feelings of surprise. So rapid had been the exposure, and so well had the proper moment for the exposure been seized, that the projectile could be seen protruding from the cannon's mouth while in the act of proceeding on its distant mission. Mr. M'Kinlay kindly afforded us every requisite information relative to his invention for securing such wonderful results; and, from the fact that the comparative efficiency of certain kinds of small-arms and the influence they are now exercising in European affairs are at present receiving a large share of public attention, we think that it may not prove uninteresting to bring before our readers some matters of scientific interest in connection with our own "great guns," and the means employed for ascertaining by photography, and with the utmost possible precision, not only the path of a projectile in the air, but the time occupied in its progress between two or more points anywhere in the course of its flight. It will be obvious that when it is desired to obtain a photograph of a gun at the moment of discharge, the gun itself must be made subservient to the exposing and covering of the sensitive plate. It is impossible that any person, however delicate his eyes and ears may be, can operate so dexterously as to stop the exposure when the ball has been projected, say a few inches from the muzzle of the gun, and when it is consequently traveling at its greatet velocity. This can only be accomplished by automatic arrangements, aided by electricity.

Let us now suppose that a stereoscopic camera, fitted with powerful lenses of short focus, has a thin, light disk fitted up in front of the lenses, revolving on an axis between the two lenses. Two holes in this disk correspond with the apertures of the lenses, so that if a circular spring—like that of a pair of snuffers—cause the disk to make half a revolution with great rapidity, the holes or apertures will, when flashing past the apertures of the lenses, admit the light for an exceedingly brief period of time. This is the means employed in the Arsenal for effecting the exposure of the plate.

We shall now enter into the details of the manner of discharging and arresting the circular exposing diaphragm. The opening and shutting of the camera at the precise instant of time is, as we have said, by far too nice an operation to be accomplished by hand. It must be borne in mind that a gun commences to recoil as soon as the projectile is fairly clear of its muzzle. The picture which we examined had been taken when the projectile was yet emerging from the gun's mouth, and before it had got quite clear of it, and consequently before the recoil of the gun had commenced. The exposure was very rapid, but not so much so as to show the front edge of the emerging projectile with a sharp outline. Although the gun, from the recoil not having commenced, was quite sharp, the front edge of the projectile, was, so to speak, vignetted.

The gun is fired by means of the galvanic tube invented by Mr. M'Kinlay, and such as is used in proving ordnance. Inside of this there is a small platinum wire, which, when a current of electricity is passed through it, instantly becomes red hot and melts. Let us now see how this affects the operation of photographing the gun. When the gun is ready for firing, the disk in front of the lenses is wound up so that the rotating force of the spring in the center is at its maximum. It is retained in this position by means of a catch and trigger, the latter of which is operated on by means of an electro-magnet. The following, then, is what takes place: When the galvanic current is sent through the wire, the fine platinum wire imbedded among the gun powder of the discharging tube or fuse immediately becomes red-hot and melts. But while in progress of melting, it accomplishes two things—it transmits a current through it by which the electro-magnet becomes vivified and pulls the discharging trigger of the disk in front of the camera lenses; and secondly, it ignites the gunpowder and discharges the gun. But were this all, the exposure would be made before the powder had had time to ignite and consequently discharge the gun; hence it is important that the lenses be kept open until the gun really discarges its contents. The means for effecting this are as simple as they are ingenious and complete. When the trigger acts so as to release the disk from its enforced pent-up condition, it is propelled forward by the central spring until the apertures in the disk and those of the lenses coincide, where, by means of a stop, the disk is retained until the powder is ignited and the gun discharged, when, the platina wire being ruptured, the passage of the electricity is stopped, the electro-magnet simultaneously loosing the power by which it was enabled to arrest the rotatory progress of the disk, which thus darts forward and closes up the camera as the contents of the gun are in the act of being ejected from it.

Correspondence

Developing Heat.

MESSRS. EDITORS:—I see in your foreign correspondence, on page 98, current volume of the SCIENTIFIC AMERICAN that Mr. B. Stewart, at Kew, is conducting some new experiments for developing heat by rotating a disk in vacuo, and that this heat arises from causes unknown. Allow me to observe that this experiment is only a modification of the experiments of Arago, who rotates a disk under a compass needle, and so produces currents in the disk, which react on the needle, and Foucault, who turns a disk between the poles of an electro-magnet, and thus develops currents which strongly heat the disk.

In every rapidly-turned metallic disk, electric currents are induced by the influence of the earth's magnetism, and these currents will necessarily heat the disk. When the magnetic influence is weak, as is the case with the earth, the currents are weak, and the heat developed will be so slight, that it takes a thermo-electric pile to observe the rise of temperature. As the friction and disturbance of the surrounding air may produce much more heat, the disk is placed in vacuo in order to eliminate this influence, but when trying to neutralize the earth's magnetism by an opposing steel magnet, placed at a certain distance, we may neutralize the earth's action on the compass needle placed at a certain point, but the opposing neutralizing currents will be still there, and show their action in any moving metallic mass, by inducing electric currents, of which the existence is proved by the consequent rise of temperature. P. H. VANDER WEYDE, M. D.

Philadelphia, Aug. 10, 1866.

Fleas and Mosquitoes.

MESSRS. EDITORS:—In an article on page 82, current volume of the SCIENTIFIC AMERICAN, you state that oil or essence of pennyroyal is believed to be a specific against the attack of fleas. I have always used it when fleas were in my bed or about my clothing, and found that it would banish them entirely, and am now using it with equal success to banish musquitoes; they will not come near where it is. W. N. TAYLOR.

Steam Fire Engines.

MESSRS. EDITORS:—If any of your readers can give the greatest performance of an American steam fire engine, replies upon the following points are solicited:—Diameter of steam cylinder; stroke of do.; pressure of steam; diameter of water cylinder; pressure; number of strokes per minute; length of hose through which one stream was projected; diameter of nozzle and distance of projection. Length of hose of 100 feet is preferred. C. H. H.

New York, Aug. 10, 1866.

Preserving Green Peas.

MESSRS. EDITORS:—In answer to the inquiry concerning green peas, on page 69, current volume, I give the following:—

I have found that, by gathering peas when young, and in the best condition for immediate use, then podding and scalding, and drying thoroughly in the sun or oven, they will keep almost any length of time done up in paper bags. When wanted for use, soak them in mint tea until they swell again to their natural size. J. H. D.

AGRICULTURAL EXHIBITIONS.

Notwithstanding our best endeavors, we have not succeeded in procuring so complete a list of prominent fairs as we desired. We give a selection from the list we have.

The New England Agricultural Society and the Vermont State Society will hold a joint exhibition at Brattleboro, Vt., on the 4th, 5th, 6th and 7th days of September. The Agricultural and Mechanical Association of St. Louis will open an exhibition in that city Oct. 1st, to continue six days. The premiums amount, in the aggregate, to over $20,000.

STATE FAIRS.—American Pomological, St. Louis, Sept. 4; Canada West, Toronto, Sept. 24, 28; Illinois, Chicago, Sept. 24, 29; Indiana, Indianapolis, Oct. 1, 5; Iowa, Burlington, Sept. 18, 21; Kansas, Lawrence, Oct. 2, 5; Kentucky, Paris, Oct. 2, 5; Michigan, Adrian, Sept. 18, 21; Minnesota, Rochester, Oct. 3, 5; New Hampshire, Nashua, Sept. 18, 20; New York, Saratoga, Sept. 11, 14; Ohio, Dayton, Sept. 25, 28; Pennsylvania, Easton, Sept. 25, 27; Wisconsin, Janesville, Sept. 25, 28.

NEW YORK.—State and County:—Albany, Albany, Sept. 25, 28; Genesee, Batavia, Sept. 19, 20; "International," Rouse's Point, Sept. 18, 19.

MASSACHUSETTS.—State and County:—Bristol, Taunton, Oct. 2; Berkshire, Pittsfield, Oct. 2; Essex, Haverhill, Sept. 25; Hampshire, Franklin and Hampden, Northampton, Oct. 4; Hampden, Springfield, Oct. 2; Middlesex, Concord, Sept. 20; Norfolk, Dedham, Sept. 27 Plymouth, Bridgewater, Sept. 27.

NEW JERSEY.—State and County:—Monmouth, Freehold, Sept. 19, 20; Morris, Morristown, Sept. 11, 14.

PENNSYLVANIA.—State and County:—Bucks, Newtown, Sept. 25, 26; Chester, Westchester, Sept. 27, 29.

KENTUCKY.—State and County:—Warren, Bowling Green, Sept. 18, 20.

MICHIGAN.—State and County:—Jackson, Jackson, Sept. 26, 28.

ILLINOIS.—State and County:—Cass, Virginia, Sept. 4, 6; Peoria, Peoria, Sept. 19, 21.

WISCONSIN.—State and County:—Brown, Green Bay, Sept. 26, 27; Horse Show, Milwaukee, Sept. 11, 13.

IOWA.—State and County:—Cerro Gordo, Mason, Sept. 20, 21.

THE MARKETS.

Although there are many complaints of the general dullness in business, and there are no very encouraging signs of an early fall trade, yet prices are well sustained, and money is plenty and obtainable at low rates. The new tariff law, which went into operation Aug. 10th, has tended to enhance the prices of such imported articles as were subjected to a higher rate of duties. Reports of a damaged crop of cereals have not had the effect to stimulate speculation to any great extent, notwithstanding the facility of obtaining money. This is probably owing to the manifest unreliability of these reports; as it is morally certain the crop will be an unusually large one: at least, whatever occasional failure there may be in the wheat crop, induced by local causes, will be more than counterbalanced by the excess in the corn yield. The unsettled state of European affairs still threatens the peace of that continent, and although the European crop reports are generally favorable, we believe the demand for American grain will be large.

GOLD—Has held firmly at about 149. Exchange is dull and the rates in favor of the buyer. Money is obtained on call at 4@5 ₰ cent. Discount at about 6 ₰ cent.

ASHES—Pots are quite dull, but with continued light receipts, market steady; the sales are 30 bbls. at $8 37½@8 50. Pearls are nominal; we hear of no business.

BRICKS—Commou Hard have advanced to $12. Croton and Philadelphia are unchanged at $14@$15 for the former, and $40 for the latter.

COFFEE—Rio held firm. No disposition to sell. St. Domingo, 11½c., in bond, and Costa Rica at 17¼; both gold.

COPPER—Detroit, 31@31½; Portage Lake, 31.

COTTON—Market depressed. Prices have declined from 2@4c. Ordinary, 25@28; middling, 33@37c.

FLOUR—Slight advance. Common brands, $8 55@$9 85; Genesee extra, $10 25@$12 50; Canada not in demand.

MEAL—Dull.

GRAIN—Wheat advanced slightly. Milwaukee, $2 20@$2 22½ Amber, $2 75; North Carolina Red, $2 86. No exports. Rye, Western, 82c; Corn, 80@81c; Western Mixed, $1; Oats declined to 30@44 Chicago; 45@47 Milwaukee; 57 Delaware.

IRON—Market inactive. No. 1 American pig $47@$48. Scotch, $47@$50. Bar and scrap very quiet.

LATHS—Are firm, with sales of Eastern, at $4, three months.

LEAD—Pig is in better demand, and, though prices are without quotable change, the market is rather in sellers' favor; the transactions are 300 tuns Spanish at $6 75; 50 do., English (Cookson's), $7, all gold. Bar, Sheet, and Pipe may be quoted steady at 10½c., cash.

LEATHER—The market for Hemlock Sole continues dull, and prices are very firm. We quote Rio Grande and Buenos Ayres Light Weights, 33@34 cents; Middle do., 35@36; Heavy do., 36@37; California Light, 31@32; Middle do., 33½@34½; Heavy do., 34@35; Orinoco, &c., Light, 31@32; Middle do., 33@34; Heavy do., 29@32; Slaughter Upper in Rough, 31@33. Oak Sole is in light stock, and the market is firm. French and American Calf Skins are firm with a fair demand.

LIME—Rockland is in good demand. Common at $1 50; Lump is nominal at $2 00, cash. Rosendal Cement, $1 75, cash.

LUMBER—There is an active demand for Eastern Spruce, with sales at $26, usual terms.

MOLASSES—There has again been a more active demand for the low and medium grades Cuba, a considerable portion of which, we learn, is to pass into the hands of distillers. The operations, including two or three cargoes to arrive coastwise, are 1,704 hhds. and 84 tcs. Clayed Cuba, at 42@44c.; 430 hhds., 10 tcs., and 131 bbls. low grade Cuba Muscovado, 48c.; 484 hhds. do., 52@55; 197 hhds. and 28 tcs. English Island, 50; 65 hhds. Porto Rico, 60@70, 4 mos., the lower price for tart; and 450 hhds. and 75 tcs. Centrifugal Cuba, on terms not mentioned.

NAILS—Cut are very firm and scarce, with a tendency to advance; some sizes are scarce, and for these ¼ cent more is paid. We quote: Cut, 6¾@7 cents; Clinch, 8¼; Forged Horse, 32 Pressed do., 22@24; Copper, 50; Yellow Metal, 33; Zinc, 20; and Wrought Ship and Boat Spikes, 7@8 cents, as to sizes, net cash.

SUGAR—Prices have favored sellers, and we have to notice an advance of ⅛ of a cent ₰ ℔ on Refining grades, bringing Fair Refining Cuba to 10¾@10⅞ cents; Good, do., to 11@11⅛; and No. 12 Box to 11⅝@11¾, 4 mos. Grocery grades are without particular change, but are the turn dearer. Refined continues in good demand, but is less active than before. Messrs. Stuart quote their best Crushed, Granulated, and Ground, 16¼ cents; White A, 16¼; and Yellow C, 15⅝—the range of other manufacture is 16⅜@17 cents for Hard; 15¾@16¼ for Soft White (B and A only), and 14@15¼ for Yellow.

WIRE—Telegraph, 9c.@10c. for Nos. 7 and 11, and for hoop skirt, 55c. for No. 18 covered, and 35c. for uncovered.

WOOL—Market unsettled. Western Fleeces at 48@50c. for low grades, 55 for ordinary, and 65@72½ for choice—the latter price for Ohio picklock; super and extra pulled, 53@65; short staple at 35; Texas, 15@18 for inferior, 20@24 for ordinary, and 25@30 for superior.

ZINC—9½c. less 4 per cent. for gold; 13½c., currency, for Lehigh.