Correspondence

Rifled Ordnance and their Projectiles.

[For the Scientific American.]

Rifled guns and projectiles adapted thereto, have for many years been the subjects of careful investigation and experiment, by persons of high scientific attainment in the art of gunnery; many important and valuable improvements are the results of their study. Lately the attention of American inventors has been directed to rifled ordnance, by the dire necessity of using (and the consequent increased demand for) the best and most efficient weapons of the class discussed.

As yet no particular plans have been decided upon as the best to be observed in general rules for rifling guns or the conformation of their projectiles. Believing as we do that all facts and practical information bearing upon the subjects alluded to have their value, we are induced to offer, as the result of many careful experiments, much practical observation and labor, a few suggestions in relation to the matter here considered.

The great end to be obtained by the employment of rifled guns is acknowledged to be accuracy, velocity of projectile, and great length of range, with the least possible liability to burst, strain, or injure the gun, as well as the most economical use of the charge. It is well known that a certain degree of velocity in rotation is necessary to give accuracy to the projectile, and that it requires power to produce that rotation; also that a body moving in a right line receives rotation more readily and with less expenditure of power than a similar body at rest; also that the greater the resistance offered by the projectile to the propelling power the greater the liability to burst or injure the gun. Hence in order to accomplish the ends sought and previously set forth, and to apply, economically, the force from the agent employed to propel the projectile, we claim that it is necessary that the rifling of the gun should be gradual and progressive from the breech to the muzzle, ending by giving to the projectile at its exit from the weapon a proper velocity of rotation. Such motion, we are fully satisfied by many practical tests, as a general rule, should be equal to one revolution of the projectile, in from ninety to one hundred diameters of the bore of the gun for all ordnance of less than $4\frac{1}{2}$ inch caliber. In no instance should said rotation be more rapid than that of one turn in every ninety diameters. For larger ordnance the velocity of rotation should be less than that just named, but in no case should it exceed one revolution in every one hundred diameters. We are aware that the length of projectiles has much to do with their capacity for retaining rotary motion, and that those which exceed twice their diameters in length require more rapid rotation than shorter ones; hence the greater necessity of adapting the length of projectiles to certain standard rules with reference to the speed of their revolution.

Numerous and thorough experiments, made by competent experts of the present day, have demonstrated most clearly that the rotation imparted to projectiles of suitable conformation, in accordance with the system of rifling guns herein proposed, is amply sufficient to secure the utmost accuracy and the greatest length of range; therefore the force ordinarily employed in accordance with the present recognized systems of gunnery in creating a higher speed of rotation is, to that extent, a direct and needless tax upon the propelling agent. A more rapid revolution than is absolutely necessary is also objectionable, from the fact that projectiles are liable to drift in the direction of their rotation and in ratio therewith; excessive rotation is therefore detrimental to accuracy as well as expensive in power.

In order to harmonize the length of projectiles with the best known system of rifling guns, before described, in such manner as to produce the most desirable results and to reduce the same, as nearly as possible, to a general rule, it is believed that projectiles for ordnance of small caliber should in no instance exceed twice their own diameters in length; and for guns exceeding $4\frac{1}{2}$ inches in caliber, from $\frac{1}{2}$ to $1\frac{3}{4}$ diameters is preferred; and for very large ordnance, in cases wherein great length of range is required, the projectile should not exceed $\frac{1}{2}$ of its diameter in length.

Recent experimental tests have proved that projectiles of more than twice their own diameters in length are liable to tumble or change ends during their flight and before they reach their proper destination; also that the direct line of motion of such projectiles can only be sustained, even for an inconsiderable distance, by excessive rotation.

Now when we take into consideration that the long projectile must receive its rapid rotation from the excessive twist or rifling of the gun, and that in proportion to its weight it exposes much smaller superficial area against which the propelling force can act than the shorter projectiles, it will at once be seen that immense charges of powder are required, and that danger of injuring the gun is thereby involved. It may also be stated that the long projectile, moving with like velocity and rapidity of rotation, is more likely to deviate from its proper line of flight than the shorter ones.

This may be accounted for partially upon the hypothesis that the pressure of the air is not equal and uniform at the apex and at the base of the moving projectile; hence the longer the projectile, the greater the atmospheric leverage to overcome, to keep its horizontal axis parallel with its line of motion. Another argument in faver of the shorter projectile is that at the instant of discharge, it is seized by the gun at a point nearer its shorter axis than the longer one can be, owing to the location of the expansive portion of the projectile; its longer or horizontal axis is therefore more likely to receive direction in harmony with its line of motion.

In case we succeed by means of the system herein set forth in obtaining greater accuracy, higher velocity, and longer range (with less danger of injuring the gun) than have been accomplished by other methods, which we are convinced is the truth, then the plan is worthy of some consideration, and the object of these remarks will have been attained.

The Electric Wave.

[For the Scientific American.]

The electric current does not run in a line of narrow limits; neither does it run in a straight line. On the contrary it extends in a wave (as indicated even by an ordinary galvanometer) of more than a foot from the axis of motion. Be the essence of the electric force a fluid or whatever it may be, its direction is that of a spiral. These facts are demonstrated by the galvanometer, as follows:—

Put the single cups of a galvanic battery, about six inches apart, in connection in the usual way. Place the galvanometer in the direct line of the current, and the needle is deflected ninety degrees. In proportion as the galvanometer is withdrawn from this line, the deflection of the needle diminishes; till at length, at a distance of twelve inches from the line of motion, with an ordinary galvanometer, the needle ceases to respond to the electric impulse and remains at rest, north and south. Thus it is demonstrated that the wave or electric current extends twelve miles from the axis of its motion.

The spiral course of the electric current is shown by the different points of the compass toward which the needle points when the galvanometer is placed above or under its line of motion. To illustrate the subject, form a wire into a spiral shape in a deviation the reverse of that of a corkscrew. Now place this wire in a direction north and south, and suppose the course of the current is from south to north. If the galvanometer be now placed over this spiral wire, the needle is deflected to the east; if placed under, it will be deflected to the west. The same effects take place, of course, if the wire be straight. I introduce the spiral wire to illustrate the course of the current.

I think it is this same electric law that regulates the direction of those species of plants which grow spirally, such as the bean, the convolvulus, or morning glory, &c. These follow the electric law. You will always find them twining around the pole, string, or whatever it may be, just in the same direction as the spiral wire bent in the opposite direction to that of the corkscrew, and taking the very same course as that of the electric current. Doubtless it is this same electric force, passing around th earth from east to west, that causes the needle of the compass to point north and south. It is well known that when a rod of iron is made magnetic by a current of electricity being made to pass around it, through wire insulated with cotton, the poles of the rod thus magnetized are at a right angle with the course of the electric current.

I will now mention a circumstance which occurred to me some years ago, when I was engaged in making four or five hundred small magnets for miners' use in California, for separating the particles of iron from the gold. I made the magnets in a small room in which were shelves on every side of it. In making magnets the process requires several days. No more than a certain amount of magnetic virtue can be imparted to the steel on the first day—say four pounds. The magnets then are laid up on the shelves and the poles of each closed by a strip of iron, to prevent the diminution of the magnetic power. The next day the same process of magnetizing is repeated again, and several pounds weight more of magnetic weight is gained. In this way the process was repeated, day by day, till the maximum power was obtained, which was that of eight pounds. Now I noticed that every magnet which was placed on the shelf with its poles south, gained, during the twenty-four hours it remained in that position, about half a pound of magnetic power more than it had when laid on the shelf; while those which were placed with their poles east or west gained no more power. This was not accidental, because I repeated the experiment several times, and always with the same result.

Now it seems to me this fact indicates that there is a current of electricity constantly passing around the earth in a direction either from east to west, or from west to east. When the galvanometer shows us that the electric current passes spirally from east to west, the irresistible inference is that the electri current which passes around the earth is from eas to west. The electric current of the earth, coming in contact with the magnet on the shelf, with its poles south, passes around it at a right angle with the axis of its poles, and thus magnetizes it; just in the same way that the electro-magnet receives its magnetic properties, by the current of electricity passing around it at a right angle with its pola axis. This is the way, too, that the vines to whicl I have alluded grow. If you want to know which way one of these vines will grow up around a pole you have only to place the spiral wire, bent as have described, alongside of it, and it will be foun that the vine takes the same course as the spiral c the wire. This arises from the electricity in th earth following the same eternal law that govern the same element everywhere. From the earth i forces up the plant, and rises with it as the soul c that plant.

How philosophically incorrect is it to say tha there are different currents in electricity. The di ference produced by it is not because there are di ferent electricities, or different currents in electricity but because the electric current, under differe modifications, produces different results. Take, fo instance, the chloride of lead; pass through it current of electricity, and it is decomposed. Th lead is liberated at the *cathode* or negative pole, an the chlorine at the *anode*, or positive pole. So agai with water; subject it to the action of the electr current—it is decomposed, and its constituents, ox gen and hydrogen, are respectively liberated at th positive and negative poles of the same curren Then again, pass through a person a sensational intensifying direct current—say from the elbow the hand—and at the same time a to-and-fro curre from the other hand to the hand in contact with th direct current, and you feel two different intensitie but it is the same current that produces these diffe ent intensities. The difference of the intensity ari from different modifications of the current made the sudden change in its polarity.

In the above experiments it is evident enough any one that the current which passes out at t cathode, or where the lead and the hydrogen are l erated, is the very same current that entered at t anode, where the chlorine and the oxygen were l erated, and where the sensational effect was consid ably less energetic.

It is a pity that on a subject so sublime and important as electricity and its concomitant, magnetism, there should be such vagueness and confusion of ideas. We have seen that all those different and wonderful effects just spoken of were produced by one and the same current. Why are we not, then, bound to admit that all the wonderful phenomena of electricity are from the same source, and that all these varied and wonderful effects are produced solely by the different modifications of the electric current and not by different currents?

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Greek Fire or Pyrophori.

Chemists are acquainted with several substances which take fire when exposed to the air; they are termed pyrophori or fire-bearers.

The liquid bodies, alkarsin and cacodyl, poured from a vial into the air, spontaneously take fire and burn with a white flame, evolving at the same time a most intense skunk-like stench, the very smoke from which is deadly poisonous. These deadly pyrophori would appear as though they had been pumped up from a well near the River Styx. There are also pyrophori of a grain or powder form: one of these is made by roasting acetate or sugar-of-lead in a close vessel, the other from alum and flour in the same way. We may keep them bottled up in safety, but only let the air come in contact and they become "on fire." These latter are by no means new discoveries, for a recipe for making them was published more than a century ago.

The exigencies of modern war have added to their number, and one in particular so dangerous and so inflammable, that it has been compared to the Greek Fire, with which the Byzantine twice delivered Constantinople from the sieges of the Arabs and Saracens, more than eleven hundred years ago.

The ancient Greek Fire is said to have been invented by one Callinicus, a native of Heliopolis, in Syria; its composition was held as a state secret. Gibbon observes—"The art of making it was preserved at Constantinople as the palladium of the state. All the weapons of war might occasionally be lent to the allies at Rome, but the composition of the Greek Fire was concealed with the most jealous scruple, and the terror of the enemies was increased and prolonged by their ignorance and surprise."

A knight, who despised the swords and lances of the Saracens, relates with heartfelt sincerity his own fears and that of his companions, at the sight and sound of the engines that discharged a torrent of fire.

The composition of it is now pretty well known to be naphtha, sulphur, bitumen and most probably niter. Vast quantities of naphtha or petroleum abound between the Tigris and the Caspian Sea; sulphur must have been common at Rome on account of the proximity to Sicily, where it is mined, and niter is a natural efflorescence on the shores of the Dead Sea. Chemistry was most assiduously studied in Egypt, so that taking into consideration that the natural products of the earth almost put into the hands of Callinicus the necessary materials, we are not surprised that with his alchemical skill the terrible war fire was compounded.

Yet if the brave and warlike Saracens were affrighted from their enthusiasm by this fire, which after all bears no comparison to the effect which a bombshell charged with gunpowder can produce, what would they have imagined if they could have seen the modern pyrophori? It will be seen that we are acquainted with bodies in the form of powder or grain which become fired when in contact with air; but we are now introduced to a true liquid fire, which, dashed over anything, spreads itself like water, then in a few minutes of insiduous attraction and evaporation, bursts into a flame in every part! This liquid is a solution of phosphorus in disulphide of carbon, which can be almost as easily and as cheaply made as gunpowder. Disulphide of carbon, a transparent spirit-like liquid, was discovered by one Lampadius, as far back as 1796. The making of phosphorus at a very cheap rate dates within a very recent period; the combination of these two bodies has resulted from the demands of present war.

We are inclined to be political in our remarks by observing that the more destructive the war agents are the shorter will the war be. The wars of the kings of Egypt, even of Charlemagne, fought without gunpowder, were almost interminable, whereas the wars with gunpowder have been of comparative short periods. The actual destruction of the soldier has been greater, but the quick decision has benefitted the people of the nations at war at large. We, the people, not engaged in war, have therefore everything to hope from modern discoveries, which will reduce the period of political wars from years to days. The phosphosulphided carbon, the Greek Fire of today, does not require to be ignited before it is thrown at an enemy, which was necessary with the fire of Callinicus. We have only to direct a shell full to the place desired—splash! The evaporation of the disulphide is rapid, leaving a thin coat of phosphorus —then all is flame. Mr. Septimus Piesse, F.C.S., to whom we are indebted for the chemical facts herein stated, suggests a pleasant thing in this way, which is a ball of gun-cotton soaked in sulphide of carbon.

Silicon: A New Compound, Sensitive to Light---Leukon.

The following interesting information is condensed from the *Photographic News* (London):—

"The photographic action of light upon all matter was some time ago a favorite subject of discussion and experiment. The researches of Herschel, Hunt, and others went far to prove that the chemical change which light was capable of inducing upon mineral and vegetable bodies was not confined to a few substances only, but extended generally to a vast number of substances in each class. The addition of a new member to a class of bodies is always of interest, but the discovery of a new and very sensitive photographic body is of especial value, more particularly, if entirely new ground is opened out by it, and the stranger comes before us as the representative of a new series of elementary bodies hitherto unsuspected of the slightest tendency to photographic change. If we had had to hazard a prediction as to the body whence the next photographically sensitive compound would be derived, certainly the last substance which would have suggested itself would have been common flint or silica. Until the last few years, silicium, the basis of this, was about the most uninteresting substance in chemistry; but now, through the researches of Wöhler, it bids fair to rival any of the other elements in the number and interest of its compounds. This chemist has recently discovered several new compounds of silicium which are of the highest importance. The starting point of them all is a curious, metallic-looking alloy of silicium and calcium, which is easily prepared by fusing together silicium, chloride of calcium, and sodium, with certain precautions. The silicide of calcium is then obtained in a button of a lead gray color and perfect metallic luster. In water this slowly disintegrates, forming a mass of lustrous scales like graphite, some impurities being extracted from it by this solvent. Strong nitric acid does not attack the silicide, and this acid affords the best means of obtaining it free from impurities. The most remarkable action of the silicide of calcium is its behaviour with hydro-chloric acid, by which it is changed into an orange-yellow substance, a brisk evolution of hydrogen taking place. This yellow body is called by the discoverer *silicon*, an inappropriate name, we may state *en passant*; as the metallic basis of silica, *silicium*, is often called silicon, and is generally known under that name in chemical books. Silicon is prepared in the following way:—The silicide of calcium, purified as above, is treated with concentrated hydrochloric acid in a vessel which must be placed in cold water to prevent the heating of the mixture. An evolution of hydrogen soon takes place, and the silicide is gradually transformed into silicon. The mixture must be often stirred to bring the powder entangled in the froth in contact with the acid, and then left for some hours in a dark place until the evolution of gas has ceased. It is then diluted with six or eight times its volume of water, the silicon filtered off, carefully protected from the light, well washed, then pressed between bibulous paper, and finally dried in a vacuum over sulphuric acid, the bell glass being covered with a black cloth. Silicon is of a bright orange-yellow color. It is composed of transparent yellow laminæ. It is insoluble in water, alcohol, and other solvents; when heated it becomes of a dark orange yellow. On applying a stronger heat it takes fire with a faint deflagration and some sparkling, leaving a residue of silicic acid.

"The behavior of silicon when exposed to the light is very remarkable. In the dark, even when moist, it remains quite unchanged. In diffused light it becomes paler; but in direct sunlight it, in a short time, becomes perfectly white, and hydrogen is given off. When placed under water in sunlight, hydrogen begins to be evolved immediately, and continues like a fermentation until the silicon has become quite white. The purer the substance the more quickly does the change take place, and several grammes are transformed in a few hours. If, however, it has not been perfectly protected from the light in the course of preparation, it is much longer before the whole is altered in sunlight. The formula of silicon is not accurately settled; but it contains silicium, hydrogen, and oxygen, and is supposed to resemble an organic body, in which silicium replaces the carbon. Professor Wöhler, indeed, suggests that it may, perhaps, be the type of an entire series of similar bodies, and it would then open the prospect of a special chemistry of silicium as of carbon.

"The behavior of silicon with metallic salts is curious. In the presence of an alkali, even of dilute ammonia, it is gradually changed into silicic acid, with evolution of hydrogen. When mixed with an alkali, whilst this decomposition is going forward, it acts as a powerful reducing agent on the salts of the heavy metals. Solutions of copper or silver salts soon become black, and gold solutions brown. From solutions of chloride of palladium and osmic acid, on the addition of an alkali, it immediately precipitates a black powder. A solution of lead in caustic soda is precipitated in the metallic state as a gray mass. The reducing agent in all these cases is evidently the hydrogen in a nascent condition. When silicon is thoroughly acted on by light, it is converted into a white body, to which the name Leukon has been given. The composition of this is also a matter of doubt, but it is a body of a somewhat similar composition to silicon, and in the presence of alkalies it behaves in the same way with some metallic salts. The mode of formation of leukon from silicon, under the influence of light, is also obscure; the most probable theory is that 4 atoms of water are decomposed, 4 of oxygen and 1 of hydrogen uniting to the silicon, and the other 3 of hydrogen being set free. According to this view, silicon is $Si_8 H_4 O_6$, and $Si_8 H_7 O_{10}$."

Sentence of Captain Stone of the "Africa."

An English journal says:—"Captain Stone is the first Commander of the Cunard Line who has been condemned by a Court of Inquiry, for a culpable want of caution in not having either slowed his engines or used the lead, when the steamer *Africa*, under his charge, had been driven to the meridian of Cape Race on the 12th of October last. Great sympathy has been expressed for Captain Stone, and the suspension of his certificate for six months must be felt as a severe blot on his professional reputation. Those who have voyaged with Captain Stone and know him as a skillful and urbane seaman, will sympathize with him in his misfortune, in common with his friends in Liverpool, and be pleased to see him on the quarterdeck again in his former capacity. At a meeting of Captain Stone's friends, Captain Judkins remarked that Captain Stone was not called upon to use the lead on the occasion in question. The accident to the *Africa* was not caused by the non-use of the lead, but by an unaccountable northerly under-current. Captain Judkins stated that if a whistle or any other signal had been placed on Cape Race the accident to the *Africa* would have been avoided, and many other sad disasters also prevented. He strongly blamed the British government for refusing an American invention of a steam-whistle which had been offered to them, and hoped that when the inventor came to this country with his signal that he would be better treated."

The sentence of Captain Stone is severe, it must be admitted; but the danger is great. So many accidents have happened at this point that the proprietors of the Cunard line owe it to their passengers and patrons to take decided action, so that disaster shall not occur in future.

Improved Water Meter.

The object of the machine herewith illustrated is to measure accurately and automatically all kinds of hot and cold liquids. The action of the apparatus is regulated by the fluids themselves, and all parts continue to work so long as the tank is supplied. The several details are all designated by similar letters in both figures; the larger of the two showing the general arrangement and external appearance, with a portion of the casing broken out to disclose the interior, while the smaller is a section of the mercury chamber.

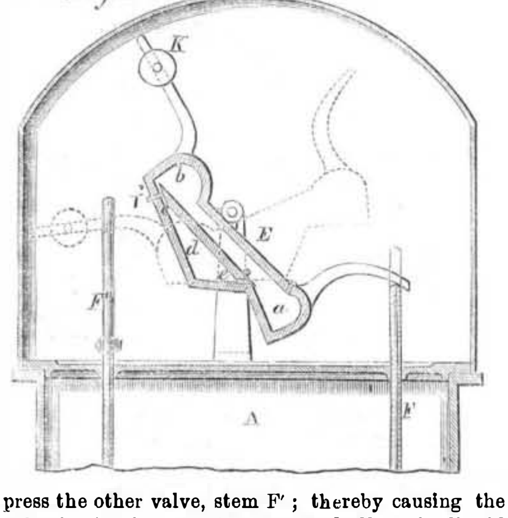
Fig. 1 shows a large metallic tank (A) of any form or dimensions desired; this is supported by four legs and has two chambers, B and C, at the bottom. These chambers are fitted with valves, the seats of which are at D (inside of course) and the valves themselves open downward. The top of the case carries the mercury chamber E, supported on a pivot and provided with elongated ends which reach over the valve stems F'; in connection with this chamber is the float G, jointed at its back end to the case. The train of wheel-work moves counters for registering the amount of liquid passed through the meter, and is contained in the frame H. The small counter balances on the right of the engraving are merely to aid in restoring the valves to their seats after the action of the liquid has caused them to open.

The operation of this apparatus is thus described by the inventor:

The fluid flowing into the case A will, on reaching a certain hight, raise the float G. To this ball the rod F is connected. This rod, in rising, will elevate the mercury chamber E. By doing so the mercury in the chamber *a* (see fig 2) will flow by its own gravity into the chamber *b*.

By the alteration of the position of the mercury chamber the valve in the bottom chamber, connected with the stem F', will be closed; thereby preventing more fluid flowing into the case A. The mercury chamber then assumes the position indicated by the dotted lines, and will de-

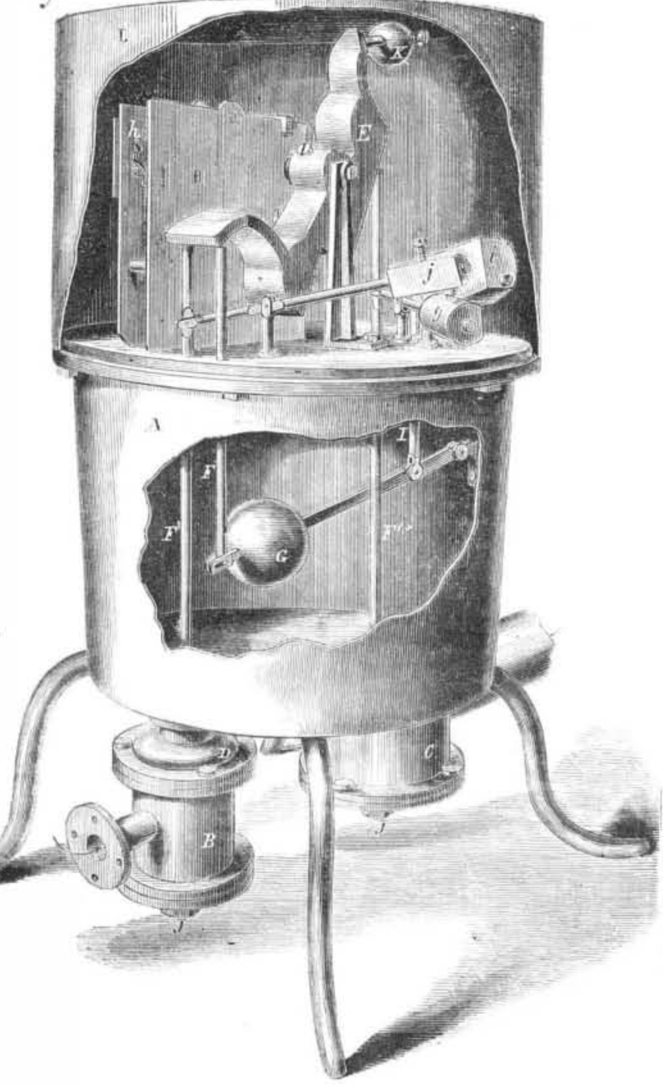
Fig. 2



press the other valve, stem F'; thereby causing the valve in the chamber C to open and allow the liquid to flow speedily out of the case A. The quicksilver in the chamber *b* (see fig. 2) will now commence to flow through the chamber *c* into the compartment *d* and through the channel *e* back into the chamber *a*; thereby causing the mercury, after a certain time, to return to its first position, and to close the valve in C and open the one in B.

By adjusting the small screw *f* the channel G will be increased or diminished in size, thereby fixing the time during which the valves remain open or closed; *g* and *j* are counter balance-weights for the purpose of keeping the valves shut during the time the apparatus does not press on the stems; *i* is a counter balance-weight for the rod I connected with the float, which increases its lifting power. There are screws, J, which can be taken out in order to re-

Fig. 1



GERNER'S WATER METER.

move any sediment or impurities deposited by the fluid in the chambers.

The wheels *h* register the quantity of fluid passed through the meter in a simple manner, by counting the vibrations of the mercury chamber.

The weight, K, serves to aid in adjusting the mercury chamber. The locked cover, L, protects the working parts of the meter from derangement caused by any means whatever.

A patent on this water meter has been ordered to issue through the Scientific American Patent Agency to Henry Gerner, of this city. Further particulars can be had by addressing him at 20 Bleecker street.

An Opportunity for an Experiment.

If foreign Governments desire information or the test of actual battle upon their iron-clads, they should send one over here and pit it against the forts in Charleston harbor. They have furnished the rebels with ships as a purely commercial venture, and they may now obtain further knowledge of the qualities desirable in an iron-clad vessel in the manner described. We have no doubt but that our Government would cheerfully afford our English friends every facility for attacking the most stubborn and formidable battery the rebels now hold; such a chance for practical information ought not to be lost by the Lords of the Admiralty. Send over the *Royal Oak* or the *Normandie*, and let the rebel rifles have a chance at their "impenetrable armored" sides; that will be a capital test of their invulnerability.

The Power of Belts.

It has been found that a belt 8 inches wide moving over the circumference of a smooth pulley at the rate of 100 feet per minute, communicates one horse-power. According to this datum, what is the power, say, of a 3-inch belt working over a 2-foot pulley, making 146 revolutions per minute. To obtain the velocity of the belt per minute, 146×2×3.14 16= 917.3472 feet: therefore 917,3472×3÷800=3.44 horse-power, or nearly 3¼ horse-power; and so on for all other breadths of belts. The divisor in this case is the horse-power 800. To ascertain the breadth of belt for a given horse-power, multiply the latter by 800 and divide by the velocity in feet per minute. This rule is sufficiently accurate for all common puraoses. The rules are simple, and the unit of breadth pnd speed of belt per horse-power may thus be set down at 1-inch breadth of belt with 800 feet speed per minute. There are some hand-books for mechanics which contain formulas for calculating the power of belts and the breadth required to communicate a certain amount of power; but they are an imposition on common sense, because no explanation is given how the formula has been derived.

DAY'S KEROSENE LAMP.

The annoyance of cleaning and filling kerosene lamps is one of the greatest drawbacks attending their use, and we have often expatiated in the Scientific American upon this disagreeable task; certainly every one who uses them knows full well the truthfulness of our statement. The lamp herewith illustrated differs materially from others heretofore illustrated by us, in that it has no screw on the collar where it enters the lamp, such detail being un-

necessary in its construction. In place thereof the tube, A, is formed with two spiral grooves, B, opposite each other, said grooves being received by short pins inside of the collar; these pins are stationary, and act as a nut; for when the burner and its attachments are pushed down, the same slowly rotate and fit tightly upon the seat. This affords a quick and easily-operated burner; the hole, C, is provided to fill the lamp without removing the burner or chimney. This attachment can be fitted to any old lamp as well as to new ones, by simply removing the ordinary screw collar and replacing it with this improvement.

This kerosene lamp burner was patented by C. T. Day, of Newark, N. J., on Oct. 20th, 1863, through the Scientific American Patent Agency. For further information address the inventor at Newark, N. J.

Value of Plows.—Among the Kaffirs agriculture is considered to be a kind of labor unworthy of a warrior, and is therefore entirely left to the women. When they first saw a plow at work they gazed at it in astonished and delighted silence. At last one of them gave utterance to his feelings: "See how the thing tears up the ground with its mouth! It is of more value than five wives!"