The Art of Printing.

We may trace the footprints of creation in the enduring rocks that underlie the earth's surface. The physical world bears the imprints of the Almighty Hand by which it was created; and reading this wondrous page in the light of modern science, curious inquiry is ever encouraged by new discovery to fresh research. Even the birth of man, and the manner of his coming into this world of ours as an animal, is now a problem of which many claim to hold the key. They can even speculate shrewdly as to when this animal became the proud possessor of that intelligence which distinguishes him from his humbler fellow creatures—when man began to think.

But there is a point in the world's history from which we may reason with approximate certitude. Beyond, and back of that. all is confusion, doubt, and superstition. Tradition, which transmits its facts by impression upon the shifting tablets of memory; the spoken word, that fades into silence or is lost in the confused babel of tongues, that loses its import on being repeated, is not a trustworthy guide by which to trace the growth of thought. When men began to *write*, thought for the first time began to assume an enduring form. Then books were made, and the mental achievements of one age were handed down as a legacy to the next.

And even the written page, whose words were traced "in the unvexed silence of a student's cell," to be read only by the unquestioning disciple whose highest aspirations were to understand the *dicta* of the sage, whose prodigious wisdom was taken for granted, proved but a halting advance in the world's mental progress. Not until the art of multiplying books by impressions from movable types was discovered, was human thought emancipated for all time. Its first charter of inalienable liberty was the printed page. Books, open to criticism, capable of countless reproduction, render the mental labors of one century as legible to future generations as they were to the age in which they were first given to the world. They live with their truths side by side with their errors. They endure as records of past achievement, and their prophecies are subjected to the test of the world's riper experience. To destroy the results of this wondrous invention, it would not suffice to burn all the great libraries of the world. Nothing less than a flame that would wrap the earth could undo the work of movable types, or blot out the records of human progress. — *B. and C. Printer.*

Poor Prospects for the Panama Canal.

Civil Engineer A. G. Menocal, U. S. Navy, was ordered by Secretary Chandler last fall to proceed to Nicaragua for the purpose of revising the estimates for the construction of the Nicaragua Interoceanic Canal. In compliance with his instructions he had occasion to cross the Isthmus of Panama, and availed himself of the opportunity to thoroughly examine the progress of the work on the Panama Canal. His report to the Secretary of the Navy furnishes additional evidence of the magnitude of the task which M. De Lesseps has undertaken, and of the apparently insuperable difficulties which render so improbable the success of his project. Mr. Menocal finds as a result of his survey that 70 per cent of the whole distance of the canal is as yet untouched, that the excavation is less than 6 per cent of the total cube to be removed, and that as the work has thus far been confined to the surface, these percentages do not represent the proportional cost of the work done, which he estimates at not more than 4½ per cent of the total cost.

Moreover, it is generally conceded that the canal must be protected from the freshets of the Chagres River. This it is proposed to accomplish by the construction of a dam a mile long and from 150 to 170 feet high across the valley of the stream, the hydrostatic pressure at the base of which is estimated at 12,000 pounds per square foot. In this connection the estimates which Mr. Menocal puts upon the entire cost of the undertaking are significant. He says: "It may be safely stated that the canal cannot be completed for less than $275,000,000, exclusive of interest on capital, commissions, etc., in addition to what has already been spent, or a total cash for the actual cost of the works of $375,000,000. Now, to raise this sum of money and the annual cash interest, with the present credit of the company unimpaired, and supposing that the canal will be completed in fourteen years, will raise the obligations of the company to $661,000,000.

AN Æolian harp is an instrument so simple in construction that any boy, unskilled in the use of tools, can make one. Stretch in parallel lines, over a box of thin deal, catgut or wire strings. The box is to have sounding holes cut in the top. The strings being tuned in unison, the instrument is placed in a current of air, and harmony is produced.

THE IMPROVED GATLING GUN.

The accompanying engravings show the improved Gatling gun in various positions, ready for firing. As now constructed, the gun can be fired at any angle, up or down, and is capable of a wide lateral range; it is provided with a positive feed, which is absolutely certain in action, both in placing the cartridges and removing the shells, no matter in what position the gun may be put; in addition, the feed mechanism cannot be deranged by ignorant or irregular handling. Fig. 1 shows a gun, 10 barrels, mounted on the United States Army model carriage, in position ready to fire. In the boxes on the axle are 12 "feeders," holding in all 1,260 cartridges. The second figure shows the depression at which the gun can be fired. Fig. 3 shows clearly a gun having the Accles' positive feeder, one feeder being on the gun ready for firing and the other on the ground. The remaining figures show the gun (6 barrels) mounted on the carriage or tripod ready for firing.

Usually, the Gatling gun has 10 barrels and 10 corresponding locks, which revolve together during the working of the gun; but in addition to this, the locks have a forward and backward motion of their own. The forward motion places the cartridges in the chambers of the barrels and closes the breech at the time of each discharge, while the backward motion extracts the cartridge cases after firing. The gun is loaded and fired only when the barrels are in motion from left to right. When the gun is in action, there are always five cartridges going through the process of loading and five cartridge cases in different stages of being extracted; the several operations are continuous while the gun is being

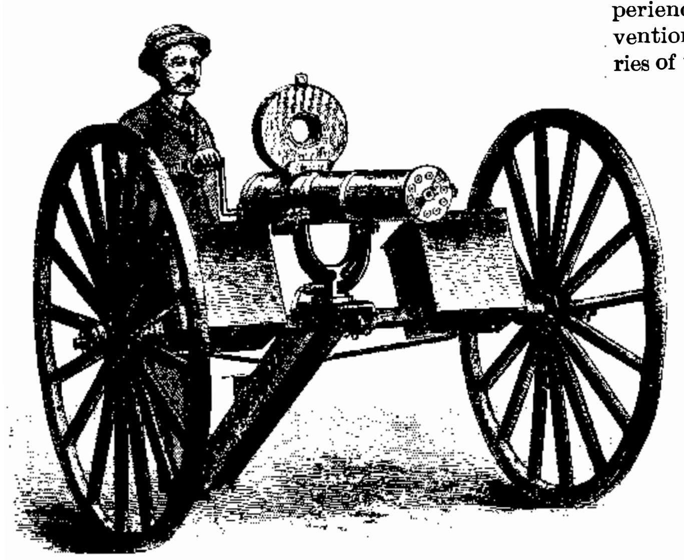

Fig. 1.—GATLING GUN MOUNTED ON U. S. A. MODEL CARRIAGE.

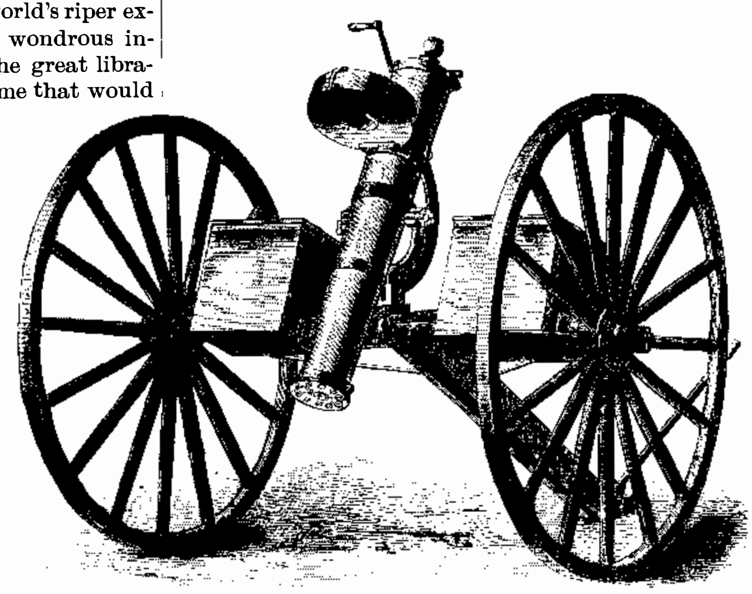

Fig. 2.—SHOWING DEPRESSION AT WHICH GATLING GUN CAN BE FIRED.

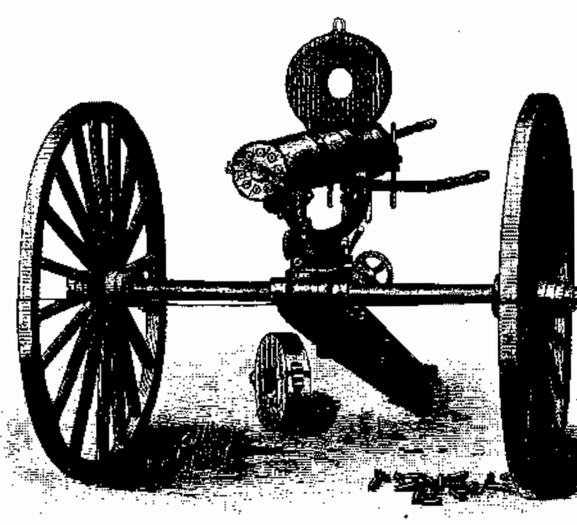

Fig. 3.—GATLING GUN SHOWING ACCLES' FEEDER.

Fig. 4.—GATLING GUN MOUNTED ON TRIPOD.

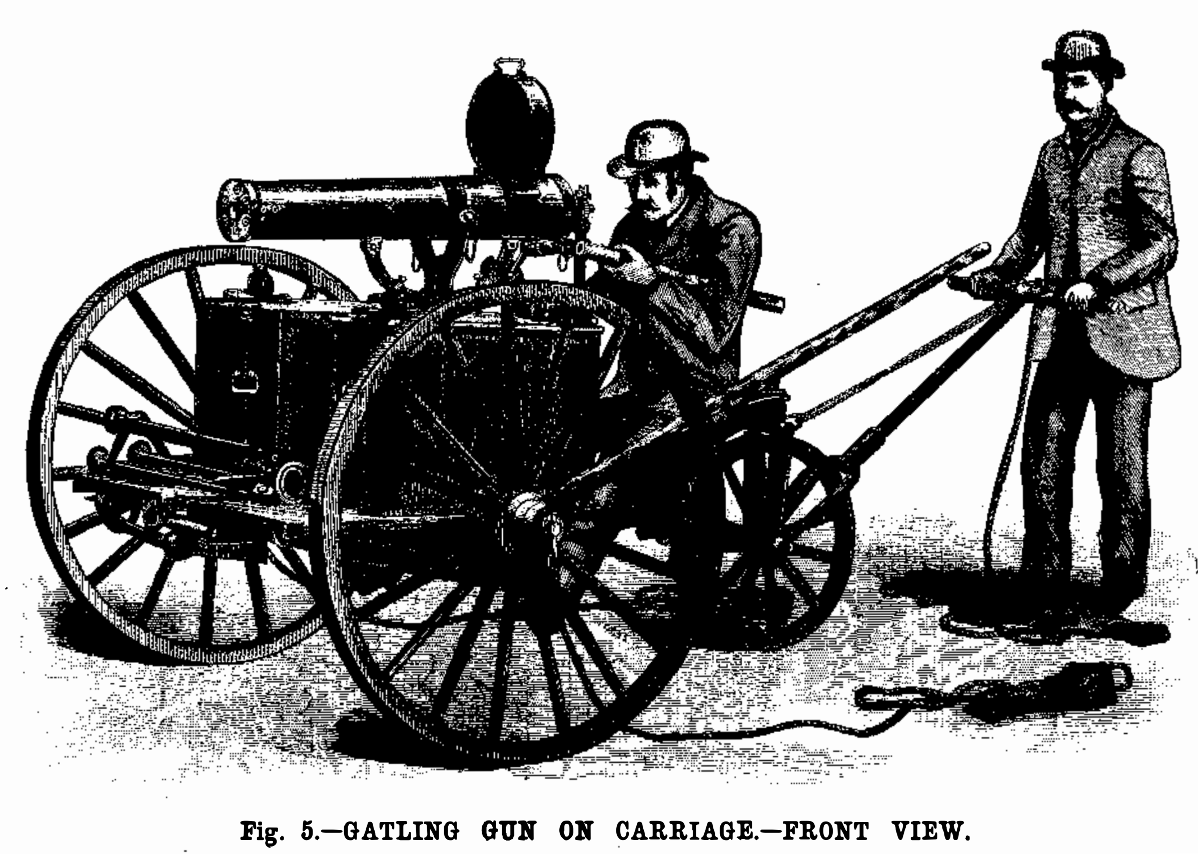

Fig. 5.—GATLING GUN ON CARRIAGE.—FRONT VIEW.

worked. As long as it is fed with cartridges, loading, firing, and extracting are carried on automatically, uniformly, and continuously.

In the old methods of supplying ammunition to the gun, it was possible for the cartridges to jam in feeding down from the cases into the receiver, but in the improved feed the mechanism never loses control of the cartridges from the time they leave the feed magazine until they enter the chambers, are loaded, fired, and the empty cases extracted. This improvement not only greatly increases the rapidity and certainty of fire, but allows the gun to be fired at the rate of over 1,200 shots per minute, and at all degrees of elevation or depression. By firing the gun at proper elevations, ascertained by means of a quadrant, the bullets can be made to fall upon men behind breastworks or intrenchments at all distances from 200 to 3,500 yards from the gun. Experiments have proved that musket-size balls, fired from a Gatling gun at high angle, strike the ground with sufficient force to penetrate from two to three inches of timber. As about 1,200 shots per minute can be fired, a hailstorm of bullets can be rained on the heads of men behind intrenchments, thus making such positions untenable in a short space of time.

The lock is so constructed that the firing pin does not project in front of the face of the lock until, released from the cocking ring, it flies forward and discharges the cartridge. The cocking ring can be thrown out of action at will, thereby allowing firing motion, during drill, to take place without snapping and injuring the hammers.

The gun represented in Figs. 4, 5, 6, and 7 has six 30 inch barrels, its whole length being 43 inches. The man who fires the gun points it at the same time, and it can be given an all-round fire, and at the same time elevated or depressed 55 degrees, and oscillated from 0 to 50 degrees. The weight of the gun is 107 pounds, and the weight of the tripod and mount is 47 pounds. The feeders, containing 64 cartridges each, weigh 14 pounds. The time required to fire one feeder is $2\frac{3}{10}$ seconds, and 768 cartridges can be fired in one minute. The number of feeders that can be carried in the carriage is twelve. The cartridges are received from the magazine at the top of the gun, and fired at the bottom. In case of an accident with a defective cartridge, the fire or gas cannot reach the live cartridges in the magazine and thus cause a premature explosion. This renders the gun so safe that it is impossible for an accident to happen to the man handling it. No tools are required to take gun and feeds to pieces. The tripod can be carried on the end of the carriage, as shown in Fig. 5.

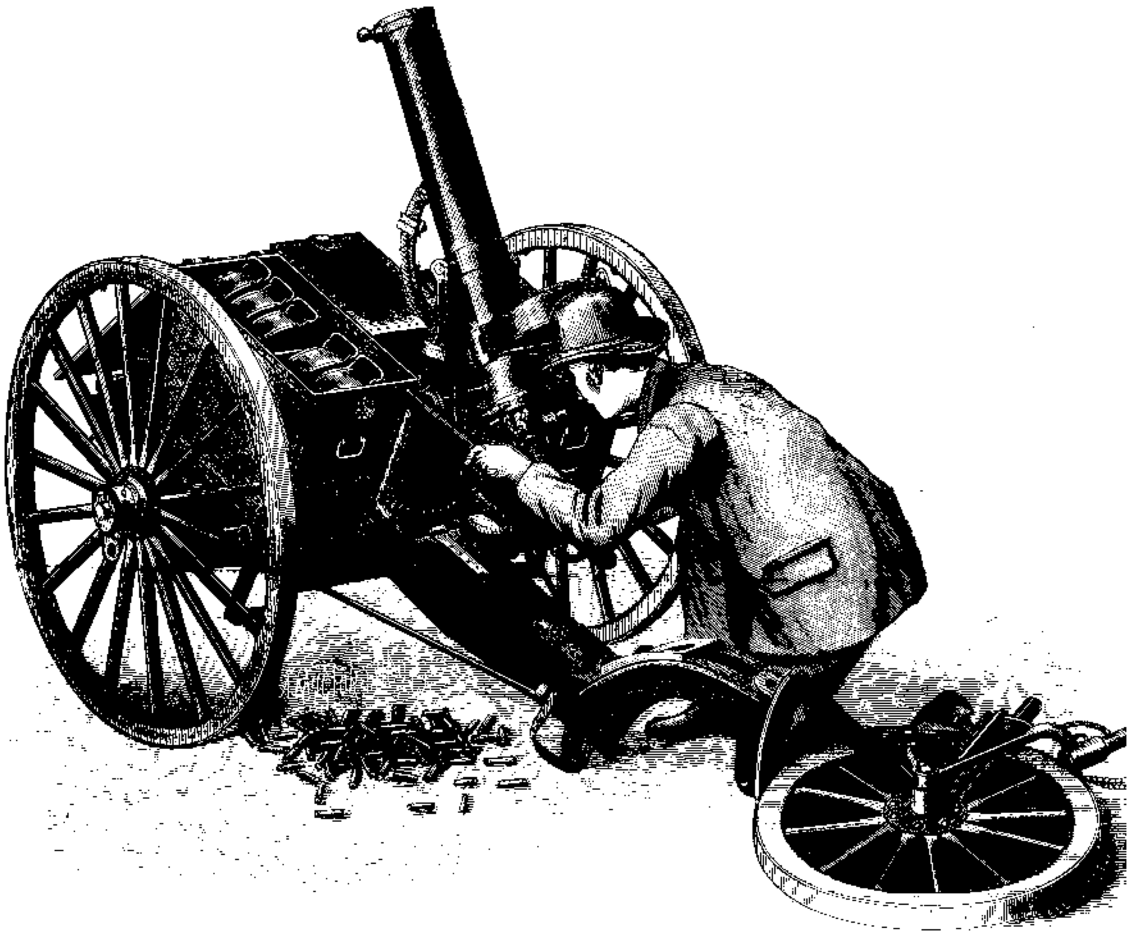

Fig. 6.—GATLING GUN MOUNTED ON CARRIAGE.—HIGH ANGLE FIRING.

The performance of these guns in actual warfare, in direct firing, in "high angle" firing, and in firing down from the foretop of a vessel, has demonstrated their eminent practicability and effectiveness, while repeated series of severe tests have proved their superiority in rapidity of firing, ease of handling, accuracy at all inclinations, and reliability. These guns are made by the Gatling Gun Company, of Hartford, Conn.

Highest Jump of the Salmon.

Prof. A. Landmark, chief director of the Norwegian Fisheries, has, says *Nature*, published some interesting particulars of his studies of the capability of salmon to jump waterfalls. He is of opinion that the jump depends as much on the height of the fall as on the currents below it. If there be a deep pool right under the fall, where the water is comparatively quiet, a salmon may jump 16 feet perpendicularly; but such jumps are rare, and he can only state with certainty that it has taken place at the Hellefos, in the Drams River, at Haugsend, where two great masts have been placed across the river for the study of the habits of the salmon, so that exact measurements may be effected. The height of the water in the river of course varies, but it is as a rule, when the salmon is running up stream, 16 feet below these masts. The distance between the two is 3½ feet, and the Professor states that he has seen salmon jump from the river below across *both* masts. As another example of high jumping, he mentions some instances of Carratunk waterfall, in Reumbec, in North America, where jumps of 12 feet have been recorded. Prof. Landmark further states that when a salmon jumps a fall nearly perpendicular in shape, it is sometimes able to remain in the fall, even if the jump is a foot or two short of the actual height. This, he maintains, has been proved by an overwhelming quantity of evidence. The fish may then be seen to stand for a minute or two a foot or so below the edge of the fall in the same spot, in a trembling motion, when with a smart twitch of the tail the rest of the fall is cleared. But only fish which strike the fall straight with the snout are able to remain in the falling mass of water; if it is struck obliquely, the fish is carried back into the stream below. This Prof. Landmark believes to be the explanation of salmon passing falls with a clear descent of 16 feet. The Professor believes that this is the extreme jump a salmon is capable of, and points out that, of course, not all are capable of performing this feat.

S. WROBLEWSKI says liquid oxygen and nitrogen rank among the most perfect insulators. The resistance of copper decreases much more rapidly than the absolute temperature, and approaches zero at a temperature not very remote from that obtained by evaporating liquid nitrogen in a vacuum.

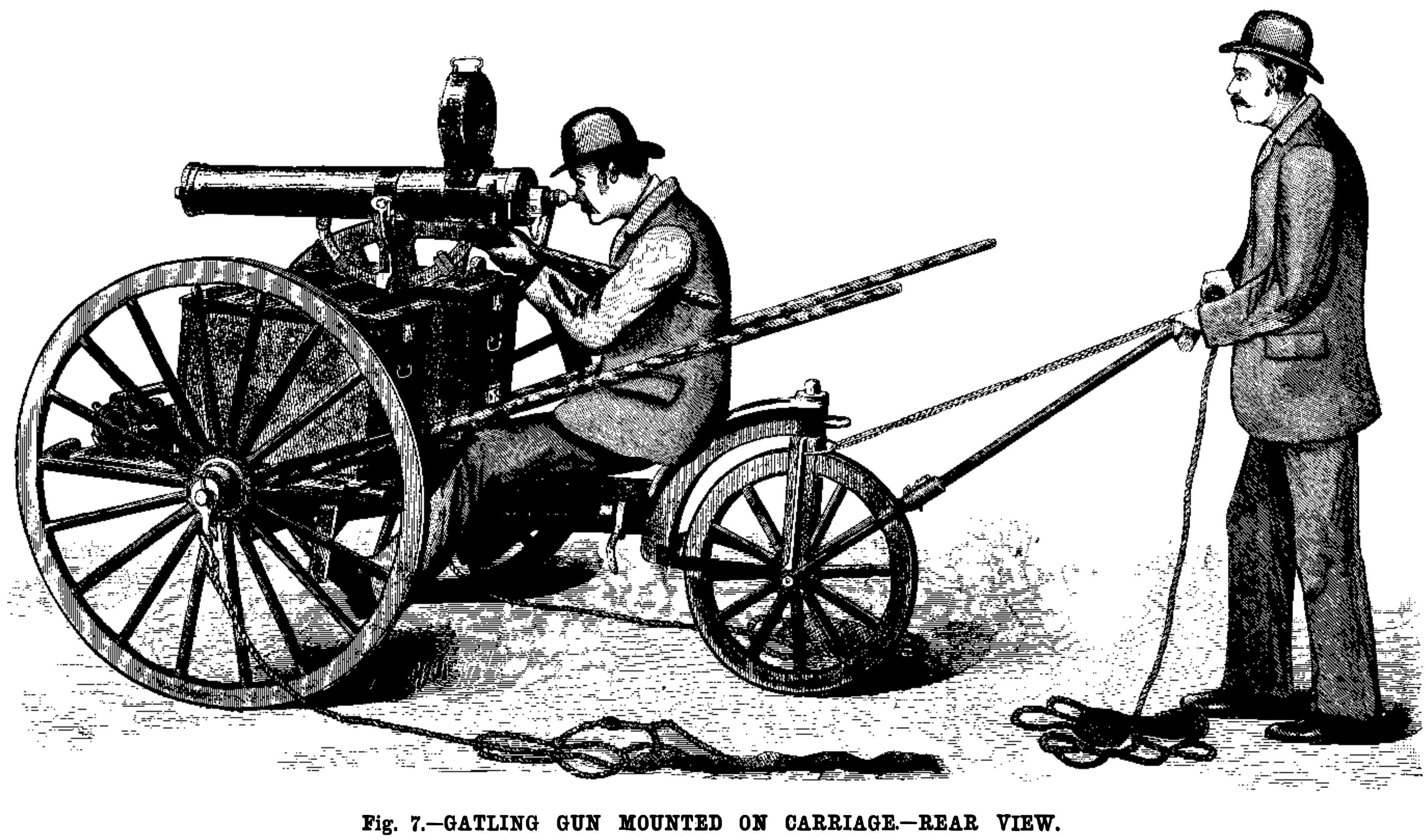

Fig. 7.—GATLING GUN MOUNTED ON CARRIAGE.—REAR VIEW.

Foundation Walls.*

It is strange that, with all our boasted progress in engineering and practical architecture, we are really little better off than the Romans were in the construction of basement walls that shall resist moisture. In looking over the resources of the builder in such matters, we discover very little that is really new, although modern authors would sometimes have us believe we are greatly in advance of all that pertains to constructive expedients. To take, as an example, the modes by which walls in a damp position and forming a basement may be built. The hollow or cavity wall is not new. Vitruvius, writing 25 B.C., says: "If a wall is liable to continual moisture, another thin wall should be carried up inside it, as far within as the case will admit, and between the two walls a cavity is to be left, lower than the level of the floor of the apartment, with openings for the air at the upper part, also openings must be left at the bottom; for if the damp does not evaporate through these holes above and below, it will extend to the new work. The work is then to be plastered with the 'potsherd' mortar made smooth, and then polished with the last coat."

We have here a most perfect description of the best principle upon which hollow walls can be built, and the explanation given of the use of the openings for evaporation describes in the most scientific manner the reason of the failure of many modern hollow walls. How few builders of such walls take care to make the cavity extend below the level of the floor, or see that openings are left! When there is no space for another wall, Vitruvius recommends a construction of hollow tiles placed against the outer side of the wall, with channels leading to the open air. He says: "Then tiles of the size of 2 feet are placed on one side of the channel, and on the other side piers are built of 8 inch bricks, on which the angles of two tiles may lie, that they may not be distant more than one palm from each other. Over them, other tiles with returning edges are fixed upright from the bottom to the top of the wall, the inner surface being carefully pitched over that they may resist the moisture; they are to have air holes at the bottom and top above the vault," etc.

Such is the description which is illustrated in Perrault's French edition of Vitruvius' treatise. The tiles spoken of may be more clearly understood if we call them trough-like in section (—), these being laid endwise so as to form a series of square openings up the wall to be protected, the bottom course resting on brick piers, having below a gutter or drain between them and the wall. These vertical terra cotta or stoneware tiles are placed with their unclosed side against the wall, the inner edges of which are pitched. Though there have been several similar modern tiles made upon this plan, we do not think they are so simple—and they are certainly seldom employed. The Romans constructed their camps with due regard to dryness. When the wall was exposed to the ground on one side, the hollow wall was introduced. The concealed area is no new invention. The camp of Adrian at Tivoli showed a double wall. We read of walls being constructed in three sections, the outer and inner walls built of regular courses, and the center cavity filled up with small stones without mortar, which served the object of a drain. The inner and outer walls were cramped with iron.

The concealed area is still a good plan for protecting the outside wall from dampness, but is very seldom adopted. The area may form a drain, intercepting the moisture from the soil and carrying it away, or it may be simply a passage covered in below the ground level outside the building. The area may be covered at the top by a semi-arch, cemented or asphalted at the top to form a watershed just below the surface, perforated tiles or bricks being introduced for ventilation. The area bottom should form a drain to intercept and carry away the moisture.

Another form of concealed drain is that of an egg-shaped sewer, with openings left in the outer wall of area, for the moisture from the earth. The invert and inner wall can be built of concrete, and the sloped watershed over the arch can be also of this material. Viollet le Duc describes a similar method of protection, composed of a slanting top of concrete to throw off the surface water from the building, and slits in the side wall of area for intercepting the water, and a hollow invert or bottom of concrete for conveying it away. But there are simpler methods. A cheap method of treating outer walls exposed to dampness is to excavate a trench twice as wide as that required, the space between the outer face of wall and the excavation to be filled with broken stone or bricks. The "filling" then performs the office of an intercepting drain.

Such a treatment is not sufficient for porous stone or brick walls, and some other precaution becomes desirable. In addition to the rubble drain, the outside of wall may be protected by a thin wall of bricks bedded and faced in asphalt, or the Hygeian composition, commencing from the damp-proof course and extending upward above the surface of the ground. The cellar floor should also be paved with asphalt. The drain or bottom of external excavation, filled with rubble, is better made below the footing of the wall, so that the water should not unnecessarily be brought into contact with the wall; a tile drain of small diameter laid below the footings may be of service. Sometimes the interior wall is built of brick to form a hollow, allowing an air space of about 2 inches to 4 inches. A good plan is to make the outer face of wall above the ground overhang the wall below, by which means the water trickling down is arrested and cut off by the outer filling. Projecting sloped tiles of stoneware may be introduced into the joints above the ground level for the same purpose. Such a tile course forms a useful watershed to throw the water off from the wall, and where hollow tiles are used as a wall casing such as we have described, its use is of great moment in covering the upper openings.

By the combined means of asphalt for damp roof courses and facings, and dry areas or hollow walls, there is no difficulty in making an underground cellar perfectly impervious to moisture. The chief points are in taking care to have the hollows or areas sufficiently below the level of floor, to make the coating of asphalt continuous from the cellar floor through the wall, and to the surface of ground outside. The ties used for hollow walls are various. Iron ties, of cast and wrought iron, if galvanized or coated with pitch or asphalt, serve the purpose admirably, though several kinds of brick ties are manufactured, which give a good tie without breaking the bond, and prevent the passing of moisture along the upper surface of the brick. Wedge-shape ties are also made. There are a variety of cheap wall linings made of enameled or glazed bricks, terra cotta slabs, glazed stoneware, and compounds of different kinds. Tile facings and damp-proof courses afford a very inexpensive means of arresting the moisture, and providing a good substitute for a dry area or hollow wall. Simple and, in some cases, efficient protection is rendered by water-sheds constructed along the exposed wall, and slanting downward at a certain angle some 3 feet or 4 feet in projection; it may be of a course of brick asphalted, the first course being grooved into the wall. But a well sloped pavement of asphalt answers the same purpose of protecting underground walls. Wherever it can be built, however, an open area next the basement wall is the healthiest mode of making a dry lower story. Open to the light and air, they are purifying as well as protective, but in every case should be provided with a drain to carry off the surfac water.

* *The Building News.*

New Process of Photo-Engraving.

BY H. REINBOLD.

Though the processes of Meisenbach and Ives have given splendid results, they are too expensive and too uncertain. In the Meisenbach process three photographic plates have to be made, and, as a matter of course, this makes it slow, dependent on the light; and as many of the fine details are lost by copying the subject three times, most of the plates have to be worked over with the tool.

As is well known, the above-named processes of producing photo-engravings from nature, so as to give it the appearance of a photograph, are based on the dissolution of the photographic tints into dots and cross lines.

The inventor of the process described herein has long experimented with the Meisenbach process, and has been a practical photo-engraver for several years. But all the various methods he tried did not prove satisfactory, and at last he tried to find a method of producing a plate which will print on the printing press, and give the engraving the appearance of lichtdruck or heliotype. The method is simple, and the cut prints clear.

It is known that gelatine, if mixed with bichromate salts, will be tanned and get hard or insoluble if exposed to the sunlight, because the light decomposes the bichromate salts, and the liberated chromic acid sours the glue. The amount of bichromate salts mixed with the gelatine, together with the manner the gelatine is dried. makes the fineness of the grain when the gelatine is put into water, as the bichromate not only decomposes in the light, but also heat and the oxide of the air have some influence on it, and part of the chromic acid, which is the tanning agent, is freed.

The less bichromate salts is used, the grain will be finer; the same as is the case when the gelatine is dried slowly. But there are other means of getting a fine grain on a gelatine surface. It was found by experimenting that this way of producing a grain was not practical, the grain is too narrow, and therefore the plates have not enough contrast; the pictures look flat and dead. There were also difficulties in printing it. The grain must be open to produce more contrast between the lights and shadows, the more as it is impossible in this process to get any high lights at all.

Here is the description of the process: Pieces of clean plate glass are leveled in a dark room, and spread with a solution of:

10 parts of water,
2 parts of silicate of soda,
5 parts of albumen,
¼ part of thymol. well mixed and filtered.

Set the plates up on one corner until they are dry; then cover them with the following mixture:

10 oz. water,
1½ oz. Nelson's X opaque gelatine,
4 oz. bichromate of ammonia.

A few drops of chromic acid, glycerine, and carbolic acid. The gelatine must be soaked first for fifteen minutes, and when it has taken up all the water it is heated, but not boiled. Then add the glycerine, the bichromate ammonia, and the acids. Before the solution is put on the plates, add ¼ of an ounce of best glacial acetic acid, filter, and cover the plates. These should then be dried in a heat of about 90 degrees, when they are ready to be used. Put as much solution on the plates as they will hold.

The negatives or positives have to be well intensified by the use of sulphide of copper and bromide of potash solution, and nitrate of silver afterward. The darkest parts in the negative should be perfectly black and untransparent; but care should be taken not to intensify too much, as then the details in the light parts will be lost. The success of the method depends largely on the negative used. No dry plates should be used in this process.

When the negative is ready, it must be laid upon the gelatine plate, and is exposed under a printing frame for fifteen minutes in full sunlight, and thirty-five or more in dispersed light. When the transparent parts of the negative get perfectly brown, the plate is taken out and put into warm water of about 50 degrees, in which tannic or gallic acid has been dissolved, and left in it for five minutes. Then it is taken out and put into cold water which contains subsulphide of iron. In this it may be left for hours, and even days if desired.

From the plate obtained in this way a plaster cast is produced, and from this an electrotype. Sometimes it happens that the plate is not quite as deep as it should be, the cause of which lies in the change of the temperature, the moisture of the air, and the qualities of the chemicals. In this case the electrotype is inked over with lithographic ink, with a fine roller, and when all details are up it is covered with a solution of sesquichloride of iron in 90 degrees of alcohol, and left in it for five minutes. It is advisable to spread the solution on the electrotype with a fine camel's hair brush. The iron etches the copper to any desired degree, but it should not be left on too long, as the picture may be hurt when it is put under heavy pressure. The process has given very good results, though there is no doubt that there is a chance for further perfection.

Protection against Lightning.

Mr. Calladon recently, addressing the French Academy of Sciences, said that there was no truth in the popular supposition that a building with a metal roof, or with metal in its construction, is more likely to be struck by lightning than a building composed wholly of non-conducting materials, provided there is no means of electric communication between the metal and the earth. A house in Neufchatel, Switzerland, had been struck by lightning and burned, and somebody suggested that a lot of old iron stored in the attic had attracted the electric fluid. It was this suggestion that brought Mr. Calladon to his feet. He said that the iron had had nothing to do with attracting the lightning, but had probably been a cause of the burning of the building after it had been struck. The explanation of that is that a combustible substance placed between two conducting surfaces (in this case the humid atmosphere and the pile of iron) is generally sure to take fire when an electric current is passed through it from one conducting surface to the other. The lightning having struck the house, concludes the scientist, it found its way to the metal within, and ignited whatever combustible material it passed.

Gold in Michigan.

Announcement was recently made of the discovery of a vein of gold-bearing sugar quartz on section 35, town 48, range 28 west, Michigan. The property on which the discovery has been made belongs to the Lake Superior Iron Company. The correspondent of the Detroit *Free Press* says that this gold boom is no heedless clamor of inexperienced men. The men who are backing it are miners of experience. Assays have been made which show well. Average pieces taken from among the best specimens gave $8,965 in gold and silver, nearly all being gold. These choice specimens varied in weight from six ounces to as many pounds, and this was their average value. The second assay was made from the leanest piece of quartz which could be found in the rock taken from the vein. In this there was no free gold visible to the naked eye or distinguishable with the aid of an ordinary prospector's pocket glass. It gave $62.64 to the ton, nearly all in gold also. It is said that a vein of this quartz four feet wide has already been traced over seven hundred feet.

Eatables on Ocean Steamers.

Few persons are aware of the extensive nature of the victualing on board the great ocean steamers. Such a vessel is provisioned as follows for the passengers and crew: 3,500 lb. of butter, 3,000 hams, 1,600 lb. of biscuits, exclusive of those supplied for the crew, 8,000 lb. of grapes, almonds, figs, and other dessert fruits; 1,500 lb. of jams and jellies; tinned meats, 6,000 lb.; dried beans, 3,000 lb.; rice, 3,000 lb.; onions, 5,000 lb.; potatoes, 40 tons; flour, 300 barrels; and eggs, 1,200 dozen. Fresh vegetables, dead meat and live bullocks, sheep, pigs, geese, turkeys, ducks, fowls, fish, and casual game, are generally supplied at each port, so that it is difficult to estimate them. Probably two dozen bullocks and 60 sheep would be a fair average for the whole voyage, and the rest may be inferred in proportion. During the summer months, when traveling is heavy, 25 fowls are often used in soup for a single dinner.

GREENHOUSES AND CONSERVATORIES.

The time of year is now approaching when many who have been experimenting with the cultivation of plants or flowers during the past season bethink themselves of the possibilities of continuing, and perhaps enlarging, their work during the winter months, provided their means go hand in hand with the tastes which this pleasurable occupation usually begets, while others who have before done something in this line should not longer delay the making of contemplated enlargements and improvements. To all such the design herewith presented, of an English country house and conservatory, will afford suggestions for a roomy, highly ornamental, and yet not very expensive structure, which may be used both to raise and display plants. The chimney, built into the side of the house, suggests where the furnace should be placed, and in the most convenient place for so dividing the interior, either by permanent fixtures or sliding partitions, as to get the different temperatures required for various plants. A cool greenhouse is one intended simply to protect tender plants during the winter season, and the temperature may be as low as 35° to 40° F., but plants are not expected to grow in such a house; for flowers the day temperature must be at least 60°, with a minimum of 40° at night. It is evident that an abundance of light and ventilation are afforded by a conservatory of the design herewith shown. For heating such houses, the plan now most generally adopted is by hot water flues, though formerly, and at present in some of the smaller houses, the furnace flues alone are used, conducted around the house before entering the chimney. In the hot water system a pipe runs from near the upper part of the furnace hot water reservoir all around the house, under the different benches holding the plants, and returns to the boiler near its lower part, the fire in the furnace causing a constant circulation. A house constructed as the one shown gives great opportunities for display as well as for the cultivation of plants requiring different temperatures.

AN ORNAMENTAL CONSERVATORY.

The Nutmeg Plant—Myristica (*Var. Sp.*).

BY F. L. S.

ANALYSES OF NUTMEG.—(*M. fragrans.*)

	Ordinary kind. Bonastre, 1823.*	Ceylon nutmegs. 1880.
Volatile oil	6·0 per cent.	8·21 per cent.
Liquid fixed oil	7·6 "	35·76 "
Solid fat	24·0 "	
Acid	0·8 (?) "	....
Starch	2·4 "	1·85 "
Gum, etc	1·2 "	
Nitrogenous matter	..	6·70 "
Mineral matter	..	6·23 "
Cellulose and loss	54·0 "	33·73 "
Water	.. (?)	7·52 "
Loss	4·0 "	..
	100·00	100·00

The volatile oil of most species of *Myristica* seems to vary but slightly as to composition and physical characters, although it differs widely as to quantity. Some (Bentley and Trimen) assert the yield at "2 to 3 per cent," but the true nutmeg normally contains a great deal more than that, the wonderfully aromatic "nut" of Ceylon containing nearly 8¼ in 100 parts. The specific gravity of this variety is stated to be 0·927 by the author of the 1880 analysis, but from 0·920 to 0·948 has been named as the extreme limits, or range. *Myristicene*—a hydrocarbon—stated by Cloetz to constitute about three-quarters of the ordinary oil, but Dr. Gladstone has detected the presence of a small quantity of an oxygenated product, isomeric with menthole; for this the name of *Myristicole* is suggested. It appears to have the same properties as menthole when locally applied for the relief of neuralgia, etc.

The expressed oil of nutmegs—*Oleum Myristicæ Expressum*, or nutmeg butter—consists, of course, of a mixture of the volatile and of the fixed oils, and the yield is given, by Fluckiger and Hanbury, at 28 per cent of the nuts. It is chiefly imported from Singapore in square or oblong tablets or cakes, and some, recently measured, were found to be about 9½ inches long by 2¼ inches wide, of an orange-brown tint, fragrant and aromatic. The fixed oil, or non-volatile basis, of this "butter" contains several saponifiable fatty acids, *Myristicene* being the most prominent of these.

The method of preparing this "expressed oil" is to bruise the nutmegs and subject them first to the action of steam, and then to place in bags between the tested surfaces of large plates of iron previously heated, and subject them to great pressure, collecting the escaping oil in the usual manner. An important ingredient in the warm plaster and the *Emplastrum Picis* of the British Pharmacopœia, the "expressed" oil, either with or without mixture with *Lin. saponis*, is exceedingly useful as an external application for the reduction of sprains and the amelioration of paralysis, gout, and chronic rheumatism, etc.

The quantity of nutmegs annually imported into England amounts at present to from 640,000 to 660,000 pounds. France is content with something like half as much, and America imports about 470,000 pounds per annum.

The *Myristica sebifera* appears to be indigenous to the Brazils and British Guiana, and it is also found abundantly in Cayenne. It grows to about twice the height of *M. fragrans*, that is to say, 50 or 60 feet in height. The latter is said to contain no starch whatever; but this statement the present writer is able to deny, although the quantity of starch present in this nut is less than in most of the other varieties.

By drying the fruit in the sun, passing through rollers to break the shell, which is subsequently separated, crushing the kernel and throwing it into boiling water, some 29 per cent of fat is obtained, valuable for soap and candle making purposes.

The *M. laurifolia*, of Martinique, is very little known at present. A small specimen was placed in the hands of a well known analyst, who found 34·5 per cent of fat or oil.

M. punctata is chiefly remarkable for being without smell or taste. This variety is used in Brazil—its native habitation.

From the same country as the preceding comes the "ucu-uba," the fruit of *M. officinalis*. The flavor is amygdalaceous, but it has little or no taste; 18 or 20 per cent of fat is yielded upon macerating in hot water, and pressing, and this is much in demand for the purpose of soap and candle making, and as an ointment for the cure of asthma, tumors, and rheumatic affections. It begins to melt at 106° F., and forms a yellow fluid at about 170° F. This fatty matter dissolves in 3·1 parts of ether, 28·1 parts of hot absolute alcohol, but in the cold 105 parts are required to dissolve it.—*Br. C. and Druggist.*

* *Jour. de Pharm.*, 1823, pt. ix., p. 281.

Focal Distance of Spectacle Glasses.

Place the ends of a measure of 30 or 40 inches in length against a smooth wall or other suitable ground, in plain view of some well defined object a few rods distant, as, for instance, a building or window on the opposite side of the street. Then place the edge of your lens on the measure, and move it backward or forward until a spectrum is formed, or in other words, until a clear and distinct outline of the distant object is produced on the ground against which your measure rests. This point will represent sufficiently near for all practical purposes the exact focal distance of the lens, and will correspond in inches with the number on all properly marked convex spectacles.

Boring for Natural Gas at Cleveland, Ohio.

The Cleveland Rolling Mill Company of that city has been drilling for gas on its property in the Eighteenth Ward since October 10, 1884. At the depth of 715 feet a small vein of gas was found, but it was soon exhausted. After passing through the shale the drill entered a vein of limestone, 260 feet in thickness. Below this, hard gray sandstone was encountered. While the drill was pounding in the sandstone at a depth of 1,700 feet, the well suddenly filled with water, which, being pumped out, was found to be strongly impregnated with salt. The drilling was continued until a depth of 1,985 feet had been reached, when pure rock salt was found. This vein was 169 feet in thickness, and it required 36 hours to drill through it. The drillers were not in search of salt, but gas, and they continued with the work. The big salt vein was encountered about a month ago. Two weeks later, after drilling through a considerable amount of rock, another but smaller vein was encountered. The drill was still driven downward until it had reached a depth of 2,680 feet, and the drillers were treated to another surprise. This time they found petroleum. Evidences of oil were found in the shape of a peculiar odor about the borings. The drill was passing through very hard rock, and it therefore proceeded very slowly. Every time the sand pump was put down into the well it was filled with oil and water, and several barrels of petroleum were taken out in that manner. The oil is said to be of very fine quality. What has already been found seems to have trickled through the rock from a pocket near the well. No gas has been found since the drill passed below 1,000 feet. It is now producing about one barrel of oil daily. The hole has reached a depth of 2,700 feet, and according to the *American Gas Light Journal*, there are slight indications of gas, but it has not yet been discovered in paying quantities.

How Bees Predict the Weather.

No. 17 of *Die Natur* contains an article by Herr Emmerig, of Lauingen, on German bees as storm warners. From numerous observations, the writer advances tentatively the theory that, on the approach of thunder storms, bees, otherwise gentle and harmless, become excited and exceedingly irritable, and will at once attack any one, even their usual attendant, approaching their hives. A succession of instances are given in which the barometer and hygrometer foretold a storm, the bees remaining quiet, and no storm occurred; or the instruments gave no intimation of a storm, but the bees for hours before were irritable, and the storm came. He concludes, therefore, that the conduct of bees is a trustworthy indication whether a storm is impending over a certain district or not, and that, whatever the appearances, if bees are still, one need not fear a storm.