The cross head, K, supports all the parts of the main grip.

To the two rear cross bars of the frame are secured triangular plates, P, slotted to receive a cross head which supports all the working parts of the auxiliary grip. The triangular plates are set wide enough apart to allow for the side motion of the car when passing curves or irregularities of the track, without impeding the passage of the grip through the slot. That portion of the auxiliary grip operating in the conduit is the same as the corresponding portion of the main grip. In the upper end of the sliding plate, B, is a spring inclosing a guide bolt attached to a block sliding vertically in the plate. To the sliding block is connected the lever, N, having at its other end a pawl, L, acted upon by a pin in the cross head, K, of the main grip.

The operation of the device will be easily understood. By operating the lever, R, the movable jaw of the main grip is closed, and the carrier pulleys are passed under to secure the position of the cable between the jaws. Then, by operating the lever, S, the main grip is raised high enough to clear the pulleys in the conduit. Simultaneously the cable is raised into the jaws of the auxiliary grip, and they are closed so as to barely grasp the cable by the connection of the lever, N, with the cross head of the main grip.

By further operating the lever, R, the jaws of the main grip are closed until the cable is firmly held. Thus by manipulating the lever, R, the cable can be sufficiently released, without its being dropped, to allow of stopping the car. Also the cable can be entirely released from both grips, and by means of the lever, S, can be instantly picked up. On arriving at the flange, D, the roller, C, of the main grip passes up, and raises the main grip and cable. When it has lifted a short distance, the pin on the end of the cross head, K, acts on the pawl, L, of the lever, N, thereby closing the jaws of the auxiliary grip firmly on the cable. At the same time a projection on the opposite end of the cross head operates the lever, Q, which, through suitable connections, releases a catch on the lever, R, which is then moved by a spring, and the jaws of the main grip are opened to drop the cable.

As the roller, C, passes on, the flanges, E and F, are closed to form a path over the crossing cable. As the cross head, K, descends, it acts on the pawl to open the jaws of the auxiliary grip; the cable is then grasped by the main grip as before. It will be seen that the car is propelled over the crossing cable by the positive action of its own cable, and under any conditions the grips are not liable to come in contact with the crossing cable. The claims of this grip have been most satisfactorily demonstrated by a model one-fourth working size.

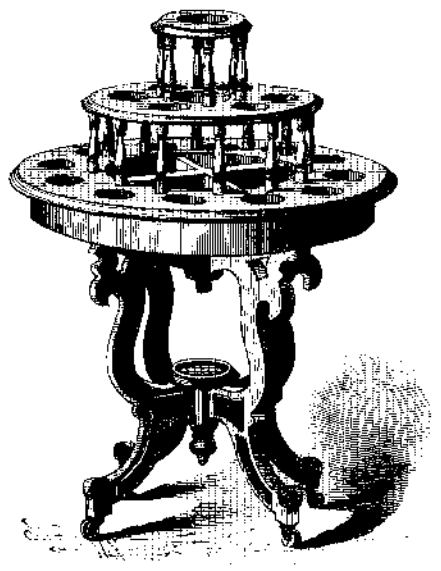
Further particulars regarding this invention can be obtained from E. C. Hine, M.D., 1834 Green Street, Philadelphia, Pa.

Hatched by a Cat.

A remarkable cat lives at No. 93 Fifteenth Street, South Brooklyn. From an early age she has displayed a great fondness for hatching out chickens. She sits on eggs like an old hen, until the feathered young break the shell, and then she cares for them as affectionately as if they were orthodox kittens. Four families of chickens have been hatched by this cat, and she is now busily engaged on the fifth, with a very fair prospect of success. The animal is the property of Mrs. Leonard, an intelligent Irishwoman, who resides with her husband in a cottage at the above address. A *Herald* reporter called at the house yesterday afternoon to see the wonder. In one corner of the kitchen, partitioned off from the rest of the room, was a large birdcage, around which a dozen chickens were strutting and picking up a meal. Inside the cage, on a bed of straw, was a cat of unprepossessing appearance, but of stalwart proportions, covering four eggs. The latter were disclosed to view as the reporter approached the cage, and the animal left her nest to play with a chicken. Then she returned to her task, extending her body at full length over the eggs and completely hiding them. The chickens she had already brought into the world seemed to possess as much filial affection as is generally shown by little chicks for their natural mothers, and they pirouetted about the cat in the most familiar way, climbing on her back, enjoying her warm coat of fur, until a movement of her body tumbled them off. After she had become weary of sitting, the cat made a tour among her young, and carried them to different parts of the inclosure. Her method of transportation was by the neck, and the chickens did not seem to mind this kind of transit any more than if they were kittens. She has been very kind to them, and has never made a meal of her offspring. It is related that when her first chicks appeared, she carried one of them by the neck up the cellar stairs. The flesh of the young biped being very tender, and the journey somewhat long, blood soon flowed. Instead of devouring the chick after she had tasted its blood, she applied her tongue daily to the neck until the wound healed. The cat came to Mrs. Leonard's house about a year ago, unheralded and unknown, and the next day was found on a nest of eggs, deserted by a hen who should have been sitting. She was driven off repeatedly, for fear she would break the eggs; but, persisting in her purpose, brought forth a brood of chickens that astonished the household. About a score of chickens have been brought into the world through her agency.—*N. Y. Herald.*

FLOWER STAND.

The top of the standard is so shaped as to receive a metal funnel, from which a tube projects downward to the top of a recess formed in the standard and adapted to receive a vessel, the neck of which fits on the lower end of the conducting tube. Cross pieces secured on top of the standard extend over the funnel, and from their intersections a pivot projects upward and through the intersections of cross pieces on a hollow circular top formed with an annular track resting on rollers pivoted in the top of the standard. On the projecting ends of the cross pieces is secured an annular trough provided with gutters leading into the upper part of the funnel. The revolving top has three



BURCH'S FLOWER STAND.

or more risers formed with holes for receiving the flower pots, which rest upon plates secured to the under side of the steps. The drip water from the pots on the two inner steps drops directly into the funnel, and the water from the pots on the outer step is led by the gutters to the funnel. The vessel to receive the drip water is not shown in the engraving.

This flower stand, the invention of Mrs. Nancy E. Burch, of Carthage, Mo., may be made very attractive in appearance; the flowers in the pots can be watered without soiling or wetting the floor, and the top can be easily turned so that each pot can be reached.

Infectious and Parasitic Pneumonia.

Mr. Germain See (*Comptes Rendus*, xix., pp. 931–3) finds that pneumonia may be epidemic, and has endeavored to see whether such attacks are distinct from ordinary pneumonia; such a view is demonstrated to be erroneous, and it is clear that there is no pneumonia due to cold; whether sporadic or epidemic, it is always parasitic in origin. The parasite is in the form of an oval micrococcus 1 μ to 1·5 μ long and 0·5 μ to 1 μ broad; it may be separate, or as a diplococcus, or in short chains of four. The capsule described by Friedlander is not regarded by See or Talamon as anything else than the result of the method of preparation. Inoculated into animals it produces common pneumonia, such as is seen in man; in many cases the microbe has extended beyond the lungs, and, by invading the neighboring organs, giving rise to pleurisy and pericarditis of the same nature as the pulmonary inflammation.

Pneumonia, then, may be considered as a specific parasitic disease, which may be reproduced in animals, but cannot be brought about by physical or chemical irritations introduced into the lungs. It may be absolutely distinguished from such other forms of acute inflammation as bronchitis or broncho-pneumonia, for in them microphytes play but a secondary role, and the first cause of them is cold. Parasitic pneumonia has a regular and definite course, just like erysipelas; its duration does not extend over nine days; for a week there is fever, which then suddenly dies down.

In fine, the course of the disease is cyclical. See has found that *antipyrine* is a specific, and that it is well to support the strength of the patient by alcohol.—*Jour. Royal Microscop. Soc*

In France some experiments have recently been made in supplying cows with cold and warm water to test the effect on them as milk givers. The food given was the same in both cases, but it was found that those supplied with water heated to 113° F. yielded one-third more milk than those given cold water.

Finger Arithmetic.

Herr J. Menges describes, in a recent number of *Globus*, says *Nature*, the language of signs employed in trade in Arabia and Eastern Africa. This appears to have been invented to enable sellers and buyers to arrange their business undisturbed by the host of loafers who interfere in transactions carried on in open markets in Eastern towns, and it enables people to conclude their business without the bystanders knowing the prices wanted or offered. It is especially in use in the Red Sea, and its characteristic is that beneath a cloth, or more generally part of the unfolded turban, the hands of the parties meet, and by an arrangement of the fingers the price is understood.

If one seizes the outstretched forefinger of the other, it means 1, 10, or 100; the two first fingers together mean 2, 20, or 200; the three first, 3, 30, or 300; the four, 4, 40, or 400; the whole hand, 5, 50, or 500; the little finger alone, 6, 60, 600; the third finger alone, 7, 70, 700; the middle finger alone, 8, 80, 800; the first finger alone and bent, 9, 90, 900; while the thumb signifies 1,000. If the forefinger of one of the parties be touched in the middle joint with the thumb of the other, it signifies one-half, and if the same finger is rubbed with the thumb from the joint to the knuckle it is one-fourth more; but if the movement of the thumb be upward to the top instead of downward to the knuckle, it means one-fourth less. An eighth more is marked by catching the whole nail of the forefinger with the thumb and finger, while the symbol for an eighth less is catching the flesh above the nail, *i. e.*, the extreme tip of the finger, in the same way.

It will thus be seen that, by combinations of the fingers of the seller and buyer, a large range of figures can be represented. It is, of course, understood that average market value of the article is roughly known, and that there can be no confusion between, for example, 1, 10, 100, and 1,000. This language of symbols is in universal use among European, Indian, Arab, and Persian traders on the Red Sea coasts, as well as among tribes coming from the interior, such as Abyssinians, Gallas, Somalis, Bedouins, etc. It is acquired very rapidly, and is more speedy than verbal bargaining; but its main advantages are secrecy and that it protects the parties from the interruption of meddlesome bystanders, who in the East are always ready to give their advice.

Heat Consumed in a Blast Furnace.

Hanns von Jueptner, an Austrian metallurgist, has contributed to the *Chemiker Zeitung* the results of an experiment to draw up a balance sheet of the heat supply and consumption of a charcoal furnace. During the week in question the furnace was charged with 249·6 metric tons of ore, 6 tons of scrap, 26·1 tons of limestone, 106·48 tons of charcoal, and it produced 114·6 tons of pig iron, 64·6 tons of cinder, 3·275 tons of dry flue dust, and 6 tons of scrap. The average temperature of the blast was 350° Celsius; the average temperature of the gases, 127°; the mean blast pressure, 60 mm. of water; and the diameter of the nozzles of the tuyeres, 55 mm. After giving in detail the analyses, computing to a basis of 10 tons of pig iron, and calculating the heat consumed for the different purposes, Herr von Jueptner makes the following balance sheet:

A.—HEAT PRODUCED.

	Calories.	Per cent.
Hot blast	3,055,398·2	9·23
Hot materials	87,127·3	0·26
Produced in furnace	29,940,736·0	90·51
Total	33,082,736·5	100·00

B.—HEAT CONSUMED.

	Calories.	Per cent.
For chemical processes in furnace	16,521,893 5	49·94
For evaporation of moisture in stock	2,545,978·8	7·69
For melting pig and cinder	5,743,730·0	17·36
Loss of heat by dust	24,456·3	0·07
Loss by heat conducted and radiated	6,447,447·6	19·51
Loss by waste gases	1,799,230·3	5·43
Total	33,082,736·5	100·00

Measuring Heights of Trees.

A writer in *The Garden* reproduces an old but convenient method of ascertaining the height of a tree as follows:

Suppose I want to find the height of a tree which throws a shadow of 20 feet. In the first place, I should cut a stick, say 3 feet long, stick it up opposite the required tree, and measure the shadow of it. We will suppose the stick throws a shadow of 2 feet; now all I have to do is just to make a simple proportion sum of it.

Shadow of stick		Shadow of tree		Height of stick
2 feet	:	20 feet	: :	3 feet
		3		
		2) 60		
		30		

The height of the tree throwing a shadow of 20 feet would be 30 feet; because as 2 feet is to 3 feet, so is 20 feet to 30 feet. By this method you can measure any tree that the sun shines upon, provided there is nothing to hinder measuring its shadow.

Utilizing the Power of Niagara.

Mr. Benjamin Rhodes, C.E., in an interesting paper read last year before the annual convention of the American Society of Civil Engineers, says:

The power of Niagara can be estimated very approximately. The average flow of the river, according to the many careful measurements of the United States Lake Survey, is 275,000 cubic feet per second; total height of the fall, 230 feet; total power, seven million horse power.

To utilize this amount of power by water wheels, generate electrical currents, and transmit to various cities within 500 miles, would necessitate a plant representing at least five thousand million dollars. Such figures as these give some idea of the enormous amount of power here in reserve.

The greatest power now in use at Niagara lies outside of the State Park. The hydraulic canal is a work of great importance. It was constructed about 1855, and is cut through solid rock across the peninsula on which the village of Niagara Falls is built, taking the water from the extreme head of the rapids and discharging below the Falls, giving opportunity to use the entire head of 230 feet. The lower end of the canal is at such a distance from the Falls that the "busy roar and hum" of the factories will be quite unheard by the romantic visitors, who see only beauty, not utility, in the great cataract. The canal is nearly one mile long, and was planned 100 feet wide and 10 feet deep. It has been excavated but 70 feet, and half the distance only 35 feet wide, and is at present partially filled with debris, being at certain points no more than 5 feet in depth. At the lower end is a basin nearly at right angles to the canal, which may be extended as needed along the river frontage belonging to the Hydraulic Power Company. The canal lay idle for a quarter of a century, and it remained for an enterprising citizen of Buffalo, possessed of large capital as well as zeal, to open up the great power to the world. At the time of his purchase in 1878, there was only one water wheel on the canal. There is now a large and increasing number of buildings for manufacturing purposes distributed along the high bank of the river, using an aggregate of nearly or quite 5,000 horse power. The wheels in these buildings are set under heads of from 50 to 100 feet, and discharge the tail water over the side of the precipice, the various streams falling over 100 feet to the river below, making a sight of rare beauty, but suggestive to the engineer of great loss of power. Some of these wheels are of large size when the head is considered, several being capable of giving 1,000 to 1,500 horse power each. The use of wheels of so great power was a step in advance of anything previously attempted in this line, and, as in all cases where there is lack of experience, difficulties were met. Without going into detail, it will suffice to say that fragments of water wheels may be found in the vicinity of all the wheel pits where high heads are used, and that water wheel manufacturers seem to be learning a lesson long ago taught to bridge builders—to use no cast iron. The last few years have seen great improvements in the making and setting of wheels, and the working of all the mills is now regular and continuous.

Further development of power at Niagara may be largely made at moderate expense. The hydraulic canal can be deepened and widened to keep pace with the demand for power, and with further experience wheels may be set under greater heads; the total amount thus made available here being equal to the necessities of many years. It may safely be said that the use of Niagara has just begun. Low water is unknown, troubles from ice are slight, hours of use are not limited to 8 or 10, but 24 hours in the day and 365 days in the year unlimited power is ready, making this the most reliable as it is the grandest water power in the world.

The rental of power at Niagara Falls, in large quantities, may be assumed at $10 per horse power per annum delivered on the shaft. Mr. Rhodes shows there would be no difficulty in transmitting power from Niagara to Buffalo, for electrical purposes, and that the saving over steam on a plant for 1,000 arc lights would amount to the snug sum of forty thousand dollars yearly.

He further shows that the power of Niagara can be transmitted to a distance of 25 miles, with a great saving over the power of steam, and that with improvements in storage batteries and electromotors, this distance can be increased with economy to 100 or 150 miles. With further improvements in dynamos and insulating material to permit the use of currents of higher intensity, such as may be confidently looked for, the economical distance may be still further increased, until some of the present generation may see the prophesy of Sir William Thomson literally fulfilled, and the power of Niagara used in all the large cities of this country.

ACCORDING to "Science pour Tous," hay fever and *coriza a rosarum odore* can be traced as far back as the 16th century.

Test Types.

An interesting paper concerning test types was read by Dr. W. S. Dennett at the Ophthalmological Society, which met at New London last month. Attention was called to the fact that the test type ordinarily in use was inaccurate for the purpose of testing visual acuteness. Of the ten or dozen letters of equal height composing a line on the test card in general use, some, with an emmetropic eye, can be seen clearly at half the distance of others. Oculists up to the present time have been testing eyes at a fixed distance, not understanding the distance value, so to speak, of each of the letters. This has been determined by Dr. Dennett after a series of experiments performed in the following manner: The light was excluded from a bowling alley except that given by Edison lamps, whose illumination was so arranged as to give an equivalent of one candle power at a distance of ten centimeters from the type. The letters were made of India ink on white paper. Each letter was properly arranged, and the observer slowly advanced to the place where he could distinguish it from one or two of those it most resembled, and with which it was most likely to be confused. This plan was found to work better than exploring all the letters at once. The result was, A, L U, V, and I were always seen at the greatest distance, and B and S at the least.

As a result of these experiments, Dr. Dennett exhibited to the Society a test card on which were displayed letters of a size made in accordance with mathematical laws, to give them all a uniform value.

It is not a little singular that it should have been left until to-day to make the demonstration of the inaccuracies of a test which has been constantly employed by oculists for twenty years.

It may be remarked that many who make the eye a specialty have recognized the fact that some letters of the same size are much more easily distinguished by patients than others, but Dr. Dennett has discovered the true scientific reason, and has placed the matter on a basis of physics and accuracy.—*Medical Record.*

Lime and Clinker Bricks.

A further communication upon the utilization of clinkers has appeared in the *Genie Civil.* M. Gouvy has described the treatment of clinkers in a factory in Meurthe-et-Moselle, where this economy appears to have been highly developed. Here the clinkers from all the furnaces of the establishment are passed through a revolving screen, which separates them into dust, nuts, and large pieces. The dust is used in brick making, and the nuts are washed in order to recover the small pieces of coke mixed with them. The coke saved in this way is equivalent to from 4 to 5 per cent of the total consumption of coal in the furnaces. The dust already mentioned is ground up in a mortar mill with slaked lime, in the proportion of 10 to 3, and the mixture is pressed into bricks by a machine. These bricks are merely air dried, and are capable of being used for partition walls or paneling, or any position in which they are not subject to heavy loads. About 2,500 bricks are made from a cubic meter of lime, and the cost of the bricks (not counting the clinker dust as of any value) is about 11 d. per 100. The bricks gain strength with age, and should be made six or seven months before use. A great proportion of the works buildings has been constructed of this material.

The machine used to compress the bricks is a specially designed apparatus, consisting simply of a brick mould for the mixture, placed in a frame under a monkey weighing about 200 pounds, which, like that of a piledriver, can be raised to the top of the frame and dropped upon the mould. A belt and pulley give continuous revolution to a shaft across the top of the frame which carries a drum; and the monkey is raised simply by the workman holding on the fall of a rope which is made fast to the monkey and passes over the drum. By this means the moulder can graduate the force of the compressing blows of the monkey upon the mould by loosing the rope at any desired height. The block, after having been moulded, is removed by a foot lever raising it out of the mould. A man and a boy are sufficient to attend to the machine. The pale gray color of these lime and clinker bricks is admired as a relief to the ordinary red clay bricks made in the same district.

Warehouses Found at Rome.

An interesting discovery illustrating the commerce and the luxury of ancient Rome has been made close to Monte Testaccio and the English cemetery. The whole of that district to the west of the Aventine outside the Porte Tragemina was occupied by granaries and warehouses for the storage of imports of all kinds. Between the northern side of Monte Testaccio and the Tiber there still exist colossal remains of the great emporium built by Marcus Emillius Lepidus and Emillius Paulus nearly 200 years before the Christian era. In the year 1868 a considerable portion of the quays was discovered, together with some six hundred blocks, many of them of large size, of rare, variegated marbles of all kinds, lying just where they were landed from the galleys which had brought them from Numidia, the Grecian Islands, and Asia Minor fifteen centuries ago.

Now, in the course of the building operations in this locality, two warehouses have been discovered, one filled with elephants' tusks and the other with lentils. It is curious to find such products stored side by side, but as bags of lentils were sometimes shipped as ballast, they may have served that purpose. The discovery would have been a very valuable one if, unfortunately, the ivory had not been much decayed. The *Popolo Romano* states that it is the intention of the Syndic to remove the bronze equestrian statue of Marcus Aurelius from the piazza of the Capitol to a museum, and to erect a bronze reproduction in its place. The reason for this change is scarcely apparent. The statue certainly does not occupy its original position, but, to employ Michael Angelo's opinion of it, it is a "living monument of ancient Rome."

It has stood in the sight of the people—one might almost say of the world—for more than 1,700 years; and although the gilding has nearly disappeared, it has in other respects suffered no injury during this lapse of years. It endured much rough handling in the course of removal, and when wine was made to flow from the nostrils of the horse in the time of Rienzi. Standing where it does, it forms an integral part of the ancient magnificence of the city, and affords a vivid illustration of its splendor; but removed to a museum it will simply be part of a collection of works of art.—*London Times.*

Improvement in the Uses of Chloroform.

According to *La Nature*, experiments have shown that the vapor of thirty grammes of chloroform, mixed with a hundred liters of air, will kill a dog in a few minutes; while a dose three times as strong, if diluted with a cubic meter of air, produces a sleep without danger, lasting two hours. The tension of the vapor, rather than the quantity, determines the effect; but the operator, in administering the anæsthetic, has to take into account the quantity; so that, under apparently the same conditions, very different results are obtained; and hence arises the difference of opinion among surgeons as to its use.

Six grammes in a hundred liters of air have very little effect upon a dog; ten grammes produce insensibility for an hour and a half; while fourteen grammes cause death in forty-five minutes, and twenty grammes in five minutes. In the case of man, with an inspiration of half a liter, these results are produced by three, five, seven, and ten centigrammes of chloroform respectively. It will be seen that the difference between the harmless and the dangerous proportions is very slight. Accordingly, the use of choloroform has always been considered dangerous; and in order to make it less so, Mr. Paul Bert has made experiments upon animals, and afterward applied them to man. His experiments with man have extended over two hundred cases, including patients of all kinds of temperaments, with always the same result. He uses ten grammes of chloroform vaporized in a hundred liters of air—a dose agreeable to some, and to none disagreeable. The most disagreeable effects of the anæsthetic have always been felt in the period of repulsion; but Mr. Bert almost entirely removes this. The period of excitement is not great, and only lasts from one to two minutes; while in the case of more than one-third of the adults it is entirely absent. The pulse is a little accelerated during the period of excitement, but remains perfectly normal and regular during sleep. Complete insensibility is produced in from six to eight minutes, and is maintained during the whole time of respiration. After the patient becomes insensible, the quantity of chloroform is reduced to eight grammes, and later to six. Painful operations have no effect, except that the respiratory movements are slightly accelerated. There is no nauseation, and the amount of chloroform administered is not enough to cause poisoning; while there is no fear of asphyxia, for the amount of oxygen is reduced only by a hundredth. Indeed, with the exception of cerebral congestion and faintings, none of the ordinary dangers need be feared.

Another Electrical Exhibition in Paris.

The project for a new electrical exhibition in Paris has been announced. It is to be held next spring, and will be organized by the International Society of Electricians. Probably it will be a second edition of the exhibition held at the Observatoire a few months ago, with all the modifications and extensions that may be dictated by experience. It is intended to obtain a more central and convenient locality, and to make a special feature of electrical experiments and demonstrations, which will certainly insure for the undertaking a large measure of popularity.

ITALY seems to experience some difficulty in getting the 121 ton Krupp guns transported to points where they are wanted. They require, in the first place, a 39 ton car for their transportation, and the railways and bridges are not strong enough to bear the great weight, so the authorities are in a dilemna.

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.

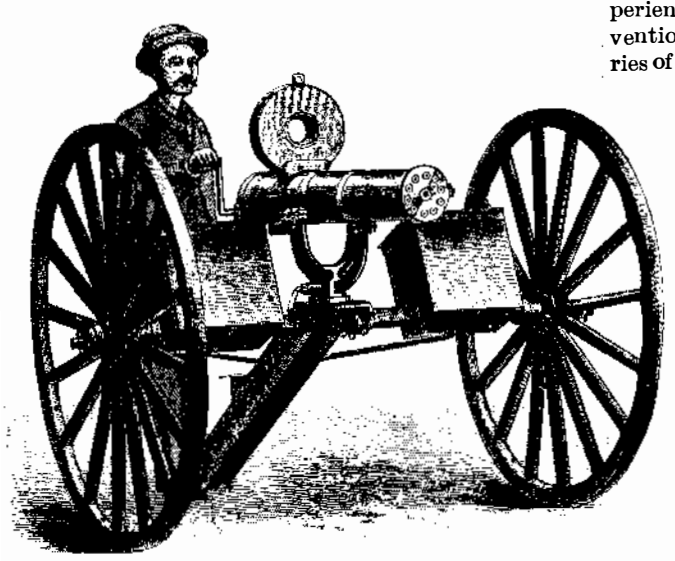


Fig. 1.—GATLING GUN MOUNTED ON U. S. A. MODEL CARRIAGE.

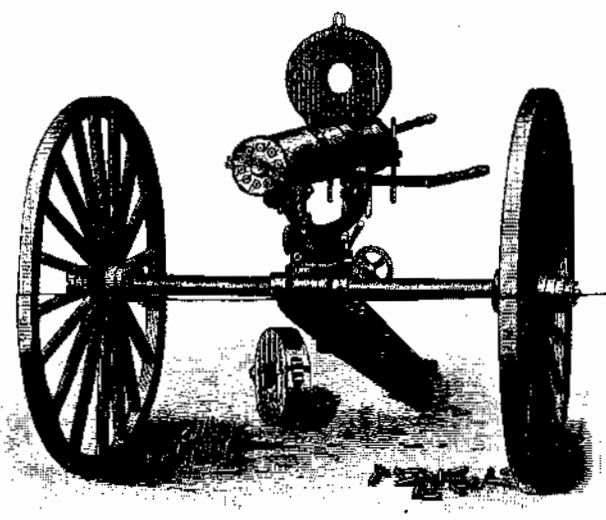


Fig. 3.—GATLING GUN SHOWING ACCLES' FEEDER.

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 out; 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.

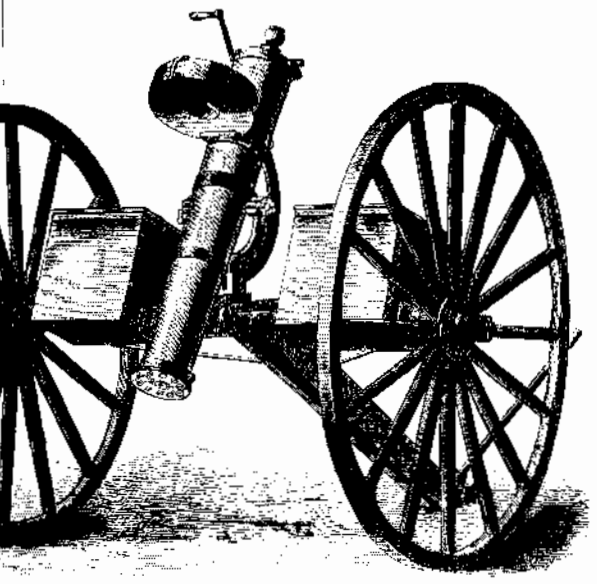


Fig. 2.—SHOWING DEPRESSION AT WHICH GATLING GUN CAN BE FIRED.

Fig. 4.—GATLING GUN MOUNTED ON TRIPOD.

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

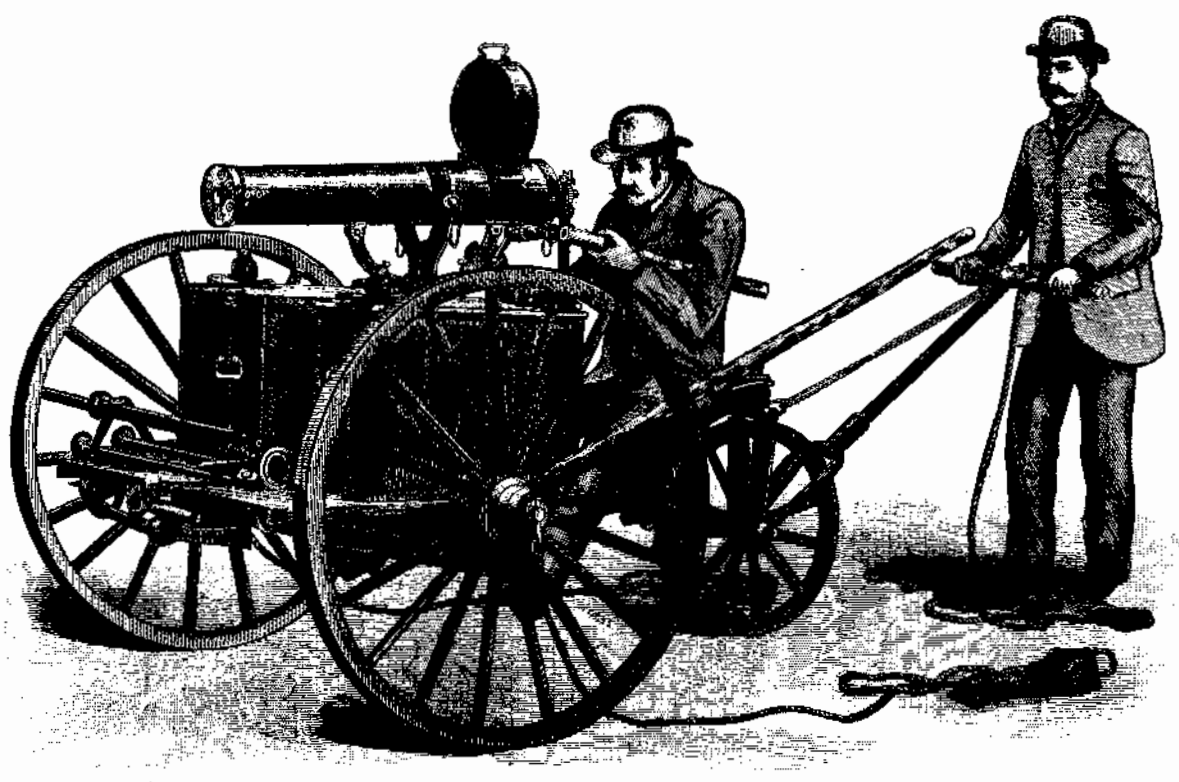


Fig. 5.—GATLING GUN ON CARRIAGE.—FRONT VIEW.