Correspondence.

"Flying."

To the Editor of the Scientific American:

Notwithstanding all your amusing correspondent has cited in the issue of Feb. 22, concerning that remarkable turkey, the albatross still remains, I think, the largest flying bird, that is, it is the largest bird whose efforts at flying may be taken as a high example of the expenditure of vital energy for that particular form of locomotion; it is, in short, the highest type of "flying creature" considered essentially as such, and in flying will undoubtedly surpass any other large bird.

Though less perhaps in weight than the turkey, he spreads a far greater flying surface to the air and performs the mere act of flying in a far more representative manner than other birds of greater strength.

In the article to which Mr. Goodsell refers I think neither weight nor bulk, or more properly speaking volume, is meant, but rather that the albatross is simply the largest approximation to a flying machine that Nature has given us, and as such is the best model, and in so far he is undoubtedly right. In the next paragraph, however, your correspondent states that which is far more open to criticism.

"The bird," he says, speaking in a very general way, "has the same relative advantage with his wings in the air as the man has with his legs on the ground, has he not?"

Well, I should say most emphatically not, and at the same time I believe this same misconception lies at the base of most devices for flying that have been condemned on their first trial. There is no use in being scientific by halves, and I think, had the author of that interesting comparison between the five turkeys and the man made a simple diagram, illustrating what the turkeys may be fairly estimated to do at one end of the rope and what the man will do at the other, he would have seen the absurdity of the situation. And yet the birds do have in a certain sense greater muscular power than the man; but this assertion must not be taken with too broad a meaning; it only means that they have greater proportional strength for a particular purpose; in other words, exerted through a particular set of muscles; or, to be still more precise, of the total amount of vital energy of his system the bird can use a far greater proportional part in the exercise of those particular muscles adapted to locomotion than man or any vertebrate animal can do; and fortunately for the mechanic, to make things consistent, we find conversely that Nature has also made a far greater proportion of the entire machinery of the bird system subservient to this method of expending its energy. A muscle burns more or less carbon and develops more or less heat in proportion to its size. In no other animal do we find any muscles to compare in relative size to the breast muscles of the bird, consequently no such relative expenditure of the total energy of the system. It is for these reasons that the comparison instituted was absurd. Mathematically speaking, the quantities compared were not homogeneous. Aerial navigation is probably not beyond the contrivance of human ingenuity; aerial flight, however is, and is evidently not within the design of Nature.

F. JARVIS PATTEN.

U. S. Army.

The Bohemian Waxwing.

To the Editor of the Scientific American:

This erratic straggler from the north being rarely met with, and his habits as yet but imperfectly understood, it may not be amiss to record his visits to our latitude, which are both irregular and infrequent.

I have observed two small flocks of this species (*Ampelis garrulus*, L.) in the neighborhood of Burlington, Vt., which may have been the terminus of their southern migration, in the first instance on November 24, 1882, and latterly on the 21st of January. Their low, plaintive note, a sort of conversational undertone, first attracted my attention. Like other denizens of the frozen zone, they have not yet acquired a fear of man, and seem wholly indifferent to his presence. In one instance a party of eight individuals were perched on the lower branches of a cedar, leisurely preening themselves, making their toilet evidently before resuming flight. Though close upon them, their sleepy eyes took no apparent notice, and when wishing to see them fly, I had almost to shake them from their perch. They take to flight simultaneously, and are off in a flash, uttering, as they whirl past your head, their characteristic note of *zi-zi*.

It has been suggested that these birds are either forced to their southern migration by the scarcity of food in their polar home, or else are brought down by the great cold waves which are known to arise in high latitudes. Their trig appearance, when they reach us, at least, would suggest anything but a scanty diet; yet, as the food question is paramount among all animals, it may in this case partially determine their movements.

These dwellers of the hyperborean regions forsake their Alaskan and Siberian evergreens, and, borne, perhaps, on the crest of a wave, suddenly alight before your door.

The name *chatterer*, which has been frequently applied to them, as far as the species is concerned, is a cruel satire on its remarkably silent habits. The Bohemian waxwing is the personification of mystery, and seems to go about with a bundle of secrets under its wing. As evidence of this, but especially, of course, owing to his circumpolar residence, we see how long it has taken to collect the little information we now have respecting his history. Wilson, who traveled, as he tells us, ten thousand miles in the pursuit of birds, made no report of the species, which Bonaparte did not observe east of the Mississippi. Audubon met with it in Maine, and it has since been seen at rare intervals in the Northern states, Massachusetts being usually its southern limit for New England.

It is interesting to note the superstition with which this bird was in more ignorant times associated. His visits to Europe are historically recorded, and were looked upon as the precursors of war and pestilence, at times appearing in such numbers (as an old writer observed) as to obscure the sun.

Preferring the inhospitable forests which circumscribe the pole, he lives far from the haunts of men, only occasionally permitting them to form a brief acquaintance by his infrequent visits to their latitudes.

F. H. HERRICK.

Burlington, Vt., March 16, 1883.

Natural and Artificial Paraffines.

F. Krafft, of Basel, Switzerland, contributes an article to the *Chemiker Zeitung* on the identity of normal paraffines with the paraffines from brown coal, from which we translate the following:

Owing to their chemical actions and composition, we are wont to consider the paraffines as mixtures of the higher members of the marsh gas series, C_n+H_{2n+2}. (Marsh gas, CH_4, the first member of the series, is also called *methane*, and the other members, C_2H_6, C_3H_8, C_4H_{10}, etc., are called homologues of methane.) On comparing the observations made from time to time on the paraffines with recent investigations made on synthetic homologues of methane, this hypothesis of their identity gains much additional strength. In order to settle the question more definitely, Lützelschwab has carefully studied one of the commercial paraffines, which melted between 52° and 54° C. (125½° to 129° Fahr.), but began to soften at a lower temperature. He submitted it to systematic recrystallization from alcohol and ether, combined with fractional distillation, first in copper retorts, then in glass vessels heated in metal baths and under reduced pressure to prevent any change in composition from the action of heat. From the lower boiling portion of this paraffine we separated the normal hydrocarbons, $C_{22}H_{46}$ and $C_{24}H_{50}$, previously prepared by me, and also the two following, homologues, $C_{26}H_{54}$ and $C_{28}H_{58}$, which were readily and easily identified as "normal" substances, calculating their properties by interpolation in the table that I had previously given for this series. The results of this investigation, as compared with my previous experiments, can be seen in the following tables:

I. ISOLATED FROM COMMERCIAL PARAFFINE.

	$C_{22}H_{48}$.	$C_{24}H_{50}$.	$C_{26}H_{54}$.	$C_{28}H_{58}$.
Melting point	43° or 44°	50° or 51°	55½° or 56°	60° or 61°
Specific gravity	0 7778	0 7786	0·7792	0 7793
Boiling point........	224° to 226°	243° to 245°	261° to 263°	279° to 281°

II. ARTIFICIAL NORMAL PARAFFINES.

	$C_{22}H_{46}$.	$C_{24}H_{50}$.	$C_{26}H_{54}$.	$C_{28}H_{58}$.
Melting point..........	44·4°	51·1°	57°	61½°
Specific gravity	0·7782	0·7786	0·7790	0 7796
Boiling point..........	224½°	243°	261°	279°

[Degrees given in table are Centigrade, and boiling points were measured under a pressure of 15 mm., or about one-half inch.]

The perfect coincidence of the properties of these substances throughout both series, establishes their identity with great certainty. These four preparations obtained by us amounted to about 8 or 12 per cent each, and together made up about 40 per cent of the whole material used. Traces of homologues melting at higher and at lower temperatures were noticed. The larger intermediate portion of course still contained a considerable quantity of the above hydrocarbons, and perhaps others of the uneven members. Absolute proof of this would be tedious and offers no special interest, and there is still less need, at present, for such a study of the lower melting, and ordinary liquid paraffines, unless it should be necessary to prepare them in a pure state on a large scale for special uses.

All the lower members of the series obtained as secondary products from the action of strong heat on the higher normal paraffines, when freed from adherent olefines, are of course themselves normal. For scientific purposes the artificial products deserve the preference because they alone are perfectly pure paraffines.

On the other hand, the important question presents itself of how commercial paraffine is made from brown coal, and indirectly what is the best way to make it from this source.

From the foregoing it will be seen that the paraffines are mixtures of no less complicated nature than has been generally supposed.

The proof that has been adduced of the identity of their constituents recalls the fact that was recently mentioned by me also, that the higher members of the natural fatty acids, from capric to stearic acid, are all normal. The inevitable explanation of what at first seems strange, is that normal substances are more permanent than their isomers, and hence the greater tendency to their production.

Dr. Bolton on Chemical Symbols.

At a recent meeting of the New York Academy of Sciences, Prof. H. Carrington Bolton, of Trinity College, gave an interesting sketch of the history of chemical symbols from early times to the present day. Until less than a century ago letters were rarely used, and the hieroglyphics assumed many curious and grotesque forms, which served rather to conceal than elucidate the subject treated of. Dr. Bolton exhibited several rare old books containing lists of symbols, some of which he had transferred to large sheets of paper and hung about the room. One peculiarity of ancient alchemistic nomenclature was personification, using names of persons and animals for metals or compounds; thus, gold and silver were called the king and queen, antimony the wolf, iron was Mars, and sal ammoniac was the eagle, while the name of Mercury was given not merely to the fleet footed god, but also to quicksilver and to a planet. The well known symbol of the sun (a toothed wheel) was used for gold, that of the moon for silver, etc. But in addition to these, many substances had more symbols than they had names, nearly 90 being used for sodium chloride.

Dr. Bolton has attempted the classification of alchemistic symbols, making five groups. In one class the first letter or letters were used; in another they were pictorial, as waved lines for water, etc.; in another they were symbolic, like that of the sun for gold, of the moon for silver, etc.; in the fourth they were purely arbitrary, and no connection could be detected between sign and signification. In the fifth class he placed mixed symbols, as when a inverted delta or triangle combined with R is used for aqua regia, delta and F for aqua fortis, etc.

The various attempts to establish a scientific set of symbols were described, and their faults noticed, until, finally, Dalton, in 1787, hit upon the present simple and expressive code, which is hardly capable of further improvement.

On the Ammonia in the Air and in Rain, etc., at Great Heights.

It has long been known that the small traces of ammonia in the air are carried down to the soil by meteoric precipitates, and Schlösing has shown that it is fixed directly by the oxidizing action of the soil and of the leaves. In connection with these investigations he also called attention to the sea as the great reservoir which supplied the air with ammonia. He devised an ingenious method, which enabled him to operate on large quantities of air, and with it he examined the currents of air circulating near the ground.

Recently Muntz and Auber (*Comptes Rendus*, xcv., 788) have been estimating the amount of ammonia in the air on the top of Pic du Midi, which is 2,877 meters (nearly two miles) above the level of the sea. The tests were made morning and evening in a laboratory especially erected for the purpose. The average was 1·35 milligrammes in 100 cubic meters. These numbers, although so extremely small, do not differ perceptibly from those obtained at the earth's surface.

They also made 13 analyses of rain, 7 of snow, and 5 of fog. In rain water they found between 0·34 and 0·80 milligramme per liter, in fog 0·19 to 0·64 milligramme, and in snow 0·06 to 0·14 milligramme of ammonia per liter.

Fulfilling the Covenants in a Lease.

The absurdity of some of the "covenants" in leases is sufficiently illustrated by the advertisement of an out-going tenant, who advertises for five hundred rats and about ten times that number of weeds, he having covenanted to leave the premises in the same state as he found them. The rats, adds the humorous advertiser, must be able-bodied and no cripples. The advertisement is a practical, albeit humorous, commentary on many of the usual covenants contained in leases. The tendency of modern legislation, and of modern legal procedure, says the *Building Times* (London), is to prune the redundancy which once was the delight of the legal profession and the despair of litigants. The covenants were mostly of a sort which no person could keep altogether; and in effect they were and are generally broken. The advertisement we have alluded to is the *reductio ad absurdum;* obsolete covenants and provisos are, we trust, in a fair way to be consigned to the same place as many other legal absurdities.

Artificial Coffee.

At the present low price of coffee it would hardly seem the best time to bring out a new substitute, but a M. Sornani, of Pavia, in the *Ann. di Chim. appl. Farm. et Med.*, announces that he has discovered quite a new and serious adulteration of coffee, which is being practiced by the manufacture of artificial berries. These berries are composed of the meal of beans and acorns, with chicory and some quartz powder to bring the mixture to the requisite specific gravity. A dough is made of these ingredients, which is cut by a special machine into the shape of coffee berries, and after drying has exactly their color. Sornani says he has found as much as 50 per cent of these artificial berries mixed with the genuine. On roasting they take just the same color as the genuine, but they are discovered by soaking in water, when the false berries soon fall to pieces.

THE Belgian Academy of Sciences offers a prize of $600 for the best treatise on the destruction of fishes by the pollution of rivers. Those competing for the prize must send in their work before October, 1885.

Treatment for Snake Bites and Hydrophobia.

At a recent meeting of the Lower Rhenish Philosophical and Medical Association, held at Bonn, Professor Binz described an interesting series of experiments carried on under his direction, with a view of testing various antidotes to the poison of serpents. He remarked that numerous specifics are heard of among the native population of India, which, as a rule, are found to be of themselves inoperative. Professor Binz stated his opinion that when a real Indian poisonous snake has bitten a person in the usual manner, spirits can only serve to prevent or to alleviate the spasms of suffocation which are induced by the action of the poison on the respiratory nerves. Atropine and other specifics against imminent results of an analogous character, caused by narcotic influences, have been found ineffective against this deadly virus. The most favorable tests made were with chloride of lime, a filtered solution of which was injected into the same place where the fatal virus had previously been introduced. In seventeen trials made in succession, the poisoned animal survived without the slightest disturbance of its healthy condition. In five succeeding experiments, when a relatively insufficient dose of the antidote was administered, or when animals suffering from disease were operated upon, the chloride of lime served only to retard the fatal effects of the poison. The suggestion was made by Professor Binz that the adoption of this treatment in cases of the bites of dogs suffering from rabies might possibly be attended with favorable results, inasmuch as chloride of lime has been shown to have much greater power than any of the caustic substances now usually applied to dog bites, which have been proved to be scarcely, if at all, effective against the consequences of snake bites.—*Lancet.*

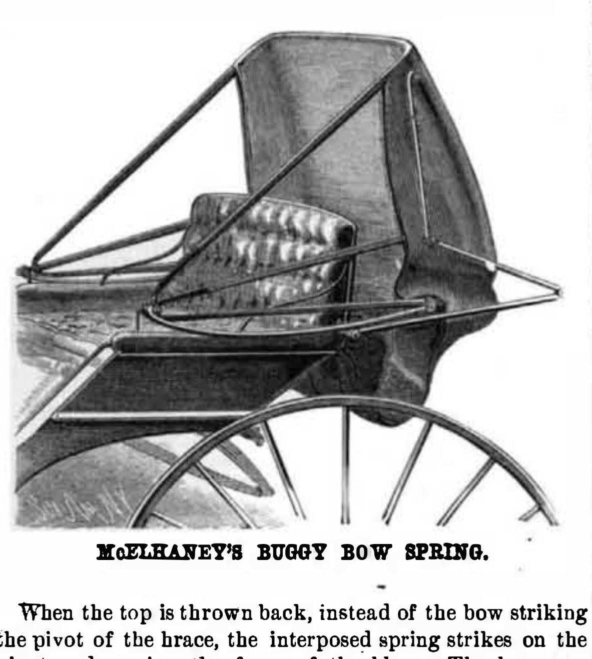
Ammoniacal Liquor as a Fertilizer.

The *Journal des Usines a Gaz*, on the subject of the use of ammoniacal liquor as a manure, states that it was so highly appreciated by the Belgian agriculturists that the entire production of the gas works at Malines was bought up in the crude state at the rate of 1 fr. 25 c. per hectoliter (say $1 per 100 gallons) on the spot. Upon newly cleared ground the liquor was used just as it left the works; but for irrigation purposes it was diluted with three or four times its bulk of water. The effect produced on the soil by the use of the liquor is stated to be exactly the same as when stable dung (which is usually considered to be the best kind of manure) is employed. The writer found that in rainy seasons the liquor might be used in an undiluted condition; and when spread over the ground in the proportion of about 1,500 gallons to the acre, a perfect dressing was obtained. In dry weather, however, the liquor had to be diluted with an equal bulk of water, and a double quantity of the mixture used, to produce similar results. But even in this condition it was found to possess the same value for agricultural purposes as stable manure.

BUGGY BOW SPRING.

The engraving shows a device to be attached to the rear bow of a buggy top for the purpose of guarding against the breaking of the bow when the top is suddenly thrown back, and to carry the weight of the top when down.

The device consists of a curved spring of steel or other suitable material, pivoted at its lower end on the bolt, which forms the pivot on which the bows are hinged, and fastened at its upper end to the rear bow by means of a clip. The spring is a curve, of which the rear bow is the chord, their only points of contact being at the ends of the spring, and the curve lies wholly on the rear side of the bow.



McELHANEY'S BUGGY BOW SPRING.

When the top is thrown back, instead of the bow striking the pivot of the brace, the interposed spring strikes on the pivot and receives the force of the blow. The bows are rigid, and it frequently happens that when the top is thrown back suddenly the force of the fall breaks the bow, whereas when the device shown is used, the yielding spring acts as a cushion, and breakage is impossible. When the top is down the weight is borne by the spring, which rests on the bolt, and forms a yielding support, taking off the strain caused by any sudden jar from inequalities in the roadway passed over.

This useful invention has been patented by Mr. Samuel McElhaney, of Polo, Ill.

IMPROVED HAT HOLDER.

We give an engraving of a very simple, inexpensive, and efficient holder to be applied to the backs of opera seats, church pews, seats of public halls, to the sides of railroad coaches, and to be used wherever a thing of this kind is applicable. It is formed of Bessemer steel wire bent into the form of the treble clef in music, the straight portion being secured to the back of the seat by suitable fastenings, which permit of swinging it out for use or out of the way and against the back of the seat when not in use. The upper loop of the holder is capable of springing sufficiently to receive the brim of any hat, and the lower coil will receive an umbrella or cane, as shown in the engraving. The wire is in a single piece, and where it crosses itself is left free to move, so as

LINDSEY'S HAT HOLDER FOR OPERA SEATS, ETC.

to accommodate itself to the object to be held by it. The lower end of the wire is provided with a hook which may be brought into engagement with the adjacent loop. It may be provided with a simple round knob to give it a finish, and to prevent the clothing from catching in it. These holders are nickel plated and nicely finished, and an ornament to the seat rather than otherwise. This improvement is being put in theaters of several large cities, and it is now regularly manufactured in Baltimore.

This useful invention has been patented by Mr. George W. Lindsey, of Baltimore, Md. (P. O. Box 797).

Basic Furnace Linings.

It appears, from a recent paper issued by Junghaug and Uelsmann, in *Dingler's Polytechnisches Journal*, that soda and potash carbonates are used instead of the corresponding chlorides of those metals, and that the durability of the lining is said to be increased by the addition of cryolite. The following modification of the usual method of preparing the lining has been found to answer admirably: The raw or calcined masses of lime, dolomite, or magnesite are ground and mixed with the flux; the mixture is then burnt to dust and worked up into bricks, the dust being rendered plastic with tar treated with 3 per cent of flux. When the flux is made up of alkaline carbonates, ground calcined phosphate or bone black, with the addition of a few per cent of the alkaline carbonates, are used in the preparation of basic bricks, muffles, etc. André states that the basic masses are to be burnt at a high temperature, then pounded and ground, and the powder thus obtained is formed into bricks by the addition of freshly prepared lime sulphate. Two per cent of the lime sulphate suffices to form a plastic material. Borsig proposes to mix dolomitic limestone, either in a crude, calcined, or finely divided form, with from 2 to 2·5 per cent of crude boracic acid, or 3 per cent of fused and pounded borax. The mixture is used in a dry or wet condition for lining furnaces or for the preparation of bricks.

According to the Society of Mines of Hörde, and the Rhenish Steel Works at Ruhrort, limestone, free from magnesia, containing not more than from 15 to 20 per cent of silicic acid, alumina, iron oxide, and manganese oxide may be used for the preparation of basic linings. The quantity of iron oxide present should not exceed 6 per cent. It was, further, found that phosphorus can be got away in the slag without the after blow, by the use of fluor spar equivalent to one-tenth part of the tribasic lime phosphate formed. Instead of fluor spar, alkalies, alkaline earths, or cryolite may be used. The dephosphorization is also effected by blowing air into a reverberatory furnace having a basic hearth. Immediately before the introduction of the metal into the converter lined with basic bricks, it is recommended to add lime or a mixture of eight parts of lime and one of ferric oxide. The mass is heated and air blown in for from six to ten minutes, when the converter is emptied, and the metal treated with a mixture of from two to three parts of lime and one part of ferric oxide free from silicic acid. The quantity of flux in the first blowing amounts to twice the weight of silicium and phosphorus contained in the original charge, while the quantity used in the second operation depends on the durability of the converter. The object of the addition of the second flux is to obtain a slag containing more than 36 per cent of lime and magnesia. The basic flux may be replaced partially or wholly by manganese ores, cryolite, fluor spar, and caustic or carbonated alkalies, while phosphorite or bone-black, mixed with clay or asphalt, is used as a lining. After the decarburation of the iron bath the oxidation of the remaining phosphorus is effected by the introduction of oxidizing agents, as ferric and manganic oxides, into the iron. This operation takes the place of the after blow.

Purifying Carbon Disulphide.

Palmieri recommends the following practical method of purifying carbon disulphide on a large scale. After removing the water that usually covers the commercial article, 2 or 3 per cent of dehydrated copper sulphate are added and then shaken. After the blackened sulphate settles and no more odor of sulphydric acid is observed, it is filtered or decanted.

To get it absolutely pure the carbon disulphide is rectified over anhydrous copper sulphate, when it loses all unpleasant odor. To preserve it odorless it must be left in contact with copper sulphate, which can be regenerated by igniting, treating with sulphuric acid, and igniting it again.—*J. Prac. Chem.*

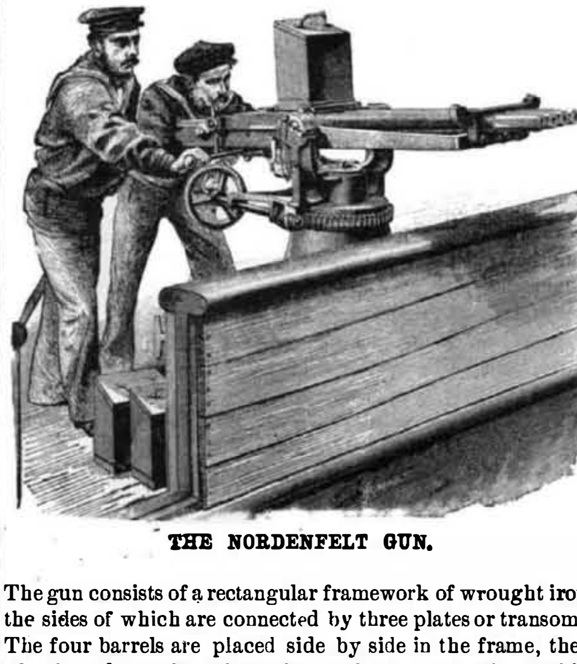
THE NORDENFELT GUN.

The gun has been adopted by the British Admiralty. The report of trials proved that the hardened steel bullet of 7¼ ounces weight, at a range of 300 yards, penetrated, at an angle of 45 deg., the side and boiler of a torpedo boat, as represented by a $\frac{1}{16}$ inch steel plate 18 inches in front of a second steel plate ½ inch thick. When firing directly end on at a torpedo boat, the bullet penetrated the steel bow plate $\frac{1}{16}$ inch thick, at an angle of 10 deg., and four bulkheads at right angles; striking the boiler, the bullet then indented the half inch steel plate representing it, to a depth of half an inch. At a subsequent trial at Portsmouth, under similar conditions, the plate was perforated altogether.

The accuracy was found most satisfactory, the mean deviation at 300 yards, of 10 rounds fired slowly, being 5·6 inches, while the mean deviation of 24 rounds fired in rapid volleys was 18·3 inches.

The rapidity of fire ashore at one trial was 108 shots in thirty seconds. During another the gun was fired at sea from H. M. S. Medway when running at a speed of 9 knots. In this case the target was the bow of a model torpedo boat; during a run of 1 min. 45 sec. and over a range of from 500 yards to 100 yards, 115 hits were made out of 135 shots fired, equal to 65 hits per minute. In a subsequent trial at Spithead in July, 1880, the gun was placed on board H. M. S. Iris. On this occasion two runs were made at a speed of 17·2 knots, directly against the bow of a torpedo boat model. Firing from 700 yards distance until close up, both runs occupying 2 min. 19 secs., 110 shots hit the target out of 213 rounds fired, so that even at this high speed 48 hits per minute were recorded. Running past the torpedo boat at 200 yards range and at a speed of 17 knots, 58 rounds were fired in 22 seconds, and of these, 38 shots hit the torpedo boat, being at the rate of 103 hits per minute.

The four barrel gun is illustrated by the perspective view.



THE NORDENFELT GUN.

The gun consists of a rectangular framework of wrought iron, the sides of which are connected by three plates or transoms. The four barrels are placed side by side in the frame, their muzzle ends passing through the front cross piece, while the breech ends are screwed into the middle transom.

In rear of the middle cross piece is the action block, which is capable of movement backward and forward. In front of this action block are four breech plugs, corresponding to the barrels. These are of steel pierced with a channel, in which a firing pin or striker moves freely, and they are furnished with an extractor on the right side. Behind each plunger is a hammer, with a projecting tenon, and behind the hammer a strong spiral spring.