clever workman to tamper with. In this lamp the difficulty is got over by making the upper part screw into the lower, while inside the lamp there is a catch or pawl, which, as in a common ratchet, prevents the screw from being turned the opposite way. Hence, that the lamp may be unscrewed, the pawl must be drawn out of place. In the overseer's office this can be accomplished by means of a powerful horseshoe magnet. The pawl has a tail, which is attracted by the magnet when the latter is placed in contact with the side of the lamp. The tail moving toward the magnet, the pawl moves in the opposite direction, and so allows the upper part of the lamp to be unscrewed, while the lower is held as if in a vise by the same magnetic power.

Now, here we have a simple and beautiful contrivance for effecting an important practical object. It is merely the application of a well known scientific principle to solve a special problem in construction ; but it never could have been invented except by one to whom the resources of science and the needs of art were equally familiar—who was at once a physicist and an engineer. Now, it cannot be questioned that in England we can boast many of the highest authorities in science, many men of the highest skill in practical construction; but the union of the two is comparatively rare, and yet it is this very union—the application of the scientific spirit to the things of common life—which is the vital necessity of the age.

We by no means wish to imply that no progress is being made in the direction here pointed out. The work undertaken by the City and Guilds Institute, the foundation of scientific colleges, such as those at Birmingham, Sheffield, Leeds, Nottingham, and elsewhere, the appointment of a Committee on Technical Education, the delivery of scientific lectures at the Institution of Civil Engineers—these are all signs that the gap existing between art and science is at last recognized, and that endeavors are being made to draw them together. Moreover, the old "rule-of-thumb" engineer is rapidly passing away, and a new generation is springing up, who, if they do not possess much science themselves, are at least alive to its value. The testing machine, for instance, is becoming a recognized institution in large workshops, where not many years ago it would have been scouted as absurd. In the skillful hands of a practical engineer, Mr. Wicksteed, of Leeds, it has been made to record its own variations of stress by a self-drawn diagram, and this record seems likely to throw fresh and unexpected light on the physical problems of extension and rupture. The same gentleman has both discovered and applied a new and most remarkable phenomenon in friction; the fact, namely, that if we give a rotary motion to a body which is in contact with another, not only is the friction diminished in the direction of motion, but the friction in the perpendicular direction is also diminished, apparently in at least an equal degree. Hence, for instance, by rotating the leather packing of a hydraulic ram, it becomes quite free to move in its cylinder in obedience to a difference in pressure on one side or the other. Here we have, once more, science helping art, and art in return throwing light upon the path of science.

These facts, and others like them, are encouraging signs, but we must repeat that something more than signs is needed. The work must be not only begun but finished, the bonds of union must be drawn close, and that quickly, or England will find that it is too late, and that she is once more ready to do the work of the world just when the world has left her no work to do.—*Nature.*

Opera by Telephone.

When the new opera "Lauriana" was produced recently for the first time, at the Lisbon Opera House, the King and Queen of Portugal were in mourning for the Princess of Saxony. The etiquette of courts prevented their royal highnesses from attending, and their despair thereat added to their grief at the loss of the Princess was like to have overwhelmed them. If Mohammed could not go to the mountain, the mountain must come to Mohammed. And so he brought the opera to their royal highnesses—by telephone.

Six microphone transmitters were placed about the front of the operatic stage in multiple arc. They were mounted on lead and soft rubber pedestals to prevent disturbance from the vibration of the building. Each transmitter was fed by three sets of batteries, which were switched on every twenty minutes in succession to keep on the current strength. There were receivers at the palace end for the use of the royal family, who thus heard the opera from beginning to end.

Germs at Sea.

It has generally been thought, and direct observation has confirmed the notion, that the air above the sea is singularly free from the low forms of organic life. MM. Moreau and Plantymansion have taken advantage of their leisure during a voyage in the Gironde from Rio de Janeiro to Bordeaux to obtain some data bearing on this question. They have found that over the open sea, at a distance from the vessel, the air contained very little solid matter. The land breezes appear to become rapidly free from the multitude of organisms which they carry with them from populous districts. M. Miguel, of the Montsouris Observatory, regards the fall of germs into the sea as a reassuring fact; breezes blowing from the distant continents, which might otherwise bring epidemics with them, become purified, it is supposed, in crossing the ocean. The gentlemen above named have found that the atmosphere immediately about the vessel practically swarmed with micro-organisms; the vessel seemed to be surrounded by an "atmosphere of microbes."

Correspondence.

Illustrations of Electrical Phenomena.

To the Editor of the Scientific American:

Having occasion to illustrate in a lecture some of the phenomena of atmospheric electricity, I desired to obtain as long strokes as possible. With the apparatus at hand the longest stroke I could obtain in air was 4¼ inches. I tried iron filings sprinkled on varnished glass, paper, and wood, but the results were not satisfactory. After several experiments I hit upon the following exceedingly successful method:

I fastened dry boards together to make a plane surface, 4 feet long and 3 feet wide. One side of this I varnished, and before it was dry pressed over its entire surface sheets of tin foil. After letting it stand over night to dry slightly, with a ruler I passed a sharp knife across the foil in lines about one-eighth to one-quarter inch apart. Allowing it to dry again a short time, I passed the knife across it right angles

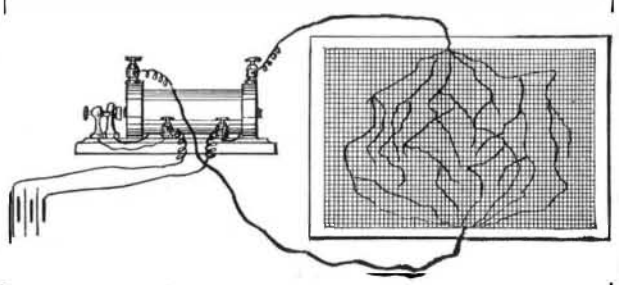


Fig. 1.

to the former lines, thus cutting the foil into squares, separated by very short distances—only the thickness of the knife edge. Connecting the poles of my coil to opposite ends of the board, a phenomenon of dazzling beauty was produced. Every time the circuit broke, from six to twenty streaks of lightning zigzaged from one end of the board to the other. These were exceedingly brilliant in the dark, when the circuit was broken only about 180 to 200 times a minute. Judging from the resistance of vacuum tubes placed in the circuit at the same time, I believe I can obtain strokes from 15 to 20 feet in length by this method, if the foil be placed in a narrow strip along a pole of that length.

The drying mentioned above is necessary, as it is very slow under the foil, and the strips will be pulled out of their places in the second cutting.

REYNOLD JANNEY.

Wilmington, O., March 16, 1884.

My coil is made on the same plan as that given in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, and contains about 30,000 feet of No. 36 naked copper wire. The circuit break is a combination of the ordinary platinum contact break and a mercury break, so that either can be used at will. The mercury break produces much better effects. It consists of a platinum wire dipping into mercury covered with alcohol.

The condenser consists of 40 sheets of tin foil, 6 inches by 12 inches, with varnished paper between.

The battery consists of three cells of the Grenettype, each containing about 50 square inches of zinc surface, counting both sides.

With this battery and coil I to-day obtained strokes in air 4½ inches long between a brass disk, 1½ inches in diameter, and a point.

Over a tin foil surface as described I obtained a stroke 10 feet long, with sufficient force to make it much longer had I had a greater length of tin foil.

There is one peculiarity about these strokes depending upon the connections. If the opposite ends of the board

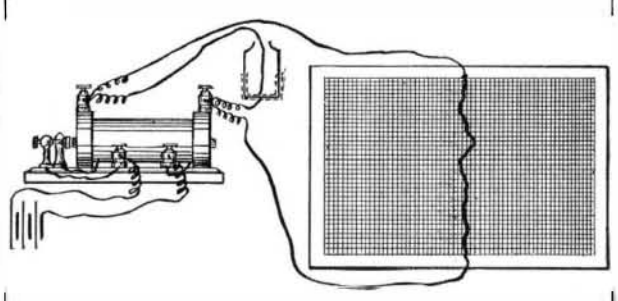


Fig. 2.

covered with the foil be connected directly with the poles of the secondary coil, the discharge seems to scatter over the whole surface, making several simultaneous strokes and producing a very beautiful appearance. (See Fig. 1.)

If the connections remain as in Fig. 1, but also the poles of the coil be connected one with the inside and the other with the outside of a small condenser containing about 4 to 6 inches of tin foil, the electricity no longer scatters over the board, but makes only one much more direct and more intense stroke. (See Fig. 2.)

REYNOLD JANNEY.

Wilmington, O., June, 1884.

Intermarriage of Cousins.

To the Editor of the Scientific American:

There is a popular belief that the intermarriage of first cousins is likely to produce offspring imperfect in intellectual or physical development.

Is this belief sustained by scientific observation and statistics? S.

[*Ans.*—The prevalent idea that the offspring of the intermarriage of first cousins are specially liable to be below the average intellectually and physically is not found to be sustained by good evidence. Mr. G. H. Darwin, in a very carefully prepared paper, before the Statistical Society of London, comes to the conclusion, as the result of close comparison of all the records available, that the evidence will not "enable any one to say positively that the marriage of first cousins has any effect in the production of insanity or idiocy. . . . With respect to deaf mutes, there is no evidence whatever of any ill results accruing to the offspring in consequence of the cousinsbip of their parents." And again, "It tends to invalidate the alleged excessively bigh death rate among the offspring of cousins." And once more, "The safest verdict seems to be that the charge against consanguineous marriages on this head is not proven."—EDS. S. A.]

Dangers of the Proposed Treaty.

To the Editor of the Scientific American:

I write to call attention to a great danger which hangs over the patent interests of the United States. It lies in the proposed new reciprocity treaty. The danger is just in this: There are a great number of patented machines making *goods* that are not patented. The patent is on the machine; remove the tariff, and what is to prevent the Canadians building the machine, and killing the patent. The Canadian patents have had but small value, for the conditions are not favorable to a numerous class of patents, such as are obtained to protect a line of manufacture which, from its nature, should be held in the hands of one party, so as to secure uniformity of quality and degree of excellence. This treaty will kill all such patents, to the injury of the public and to the ruin of those who, on faith in protection, have made large investments.

Any treaty entered into with Canada which virtually destroys protection obtained in good faith should not be entered into, and the foundation of such treaty should be founded upon a reciprocity of patent protection. R. T. SMITH.

Nashua, N. H., June, 1884.

Soda Water Profits.

Under the caption of "A Business that Pays," a large dealer in soda water apparatus thus enlightens the trade on "the profits which dealers in carbonated beverages may reasonably hope to make," which he says "can be readily inferred from the following accurate estimate of the cost of manufacturing each beverage." In the "dispensing department"—that is, selling from the fountain—the following are the actual costs:

One glass of plain soda water costs one-tenth of a cent.

One glass of soda water with sirup costs one cent and a half.

One glass of mineral water costs one cent.

One glass of root beer costs one cent.

One glass of ginger ale costs one cent and a quarter.

One glass of fine draught champagne costs four cents.

In the "bottling department" the following scale of costs, prevails:

Plain soda water, best quality, put up in bottles closed by corks and fasteners, costs eight cents per dozen.

Ditto, with gravitating stoppers, costs three cents per dozen.

Soda water, with sirup, in bottles closed by corks and fasteners, costs fifteen cents per dozen.

Ditto, with gravitating stoppers, costs ten cents per dozen.

Ginger ale, in bottles, with corks and wires, costs seventeen cents per dozen.

Ditto, with gravitating stoppers, costs twelve cents per dozen.

Mineral waters in siphons costs three cents per siphon.

Sparkling champagne (domestic), best quality, costs twenty-five cents per quart bottle.

From a simple comparison of the foregoing scale of costs, and the well known retail charges for the same articles, the inference drawn by the manufacturer, that it is "a business that pays," appears to be a correct one.

Then a list is given of the materials included in the outfit for this business. We find in this catalogue the following items:

Sulphuric acid and marble dust to make the carbonic acid gas, which gives the sparkling quality.

Chemical extracts for the flavors.

Coloring to imitate raspberry, strawberry, and other fruits.

Gum foam to give it an artificial foam, which enables the retailer to sell half a glass of soda as a brimming glassful.

Tartaric and citric acid to do duty for lemon soda.

Coloring for making something sold for sarsaparilla.

There is one item called an "acid dispenser," which appears to be essential in handling "acids and other corrosive" ingredients. We are not informed if such acids and corrosive substances are eliminated during the manufacture or during their passage into the human stomach. Such facts remain among the mysteries of "a business which pays."

French Academy Prizes.

In mechanics the extraordinary prize of $1,200, offered by the French Academy of Sciences, has been awarded in part to M. Taurine for his "Study of Marine Engines," in part to M. Germain for his "Treatise on Hydrography," and in part to M. A. De Magnac for his work on "New Astronomical Navigation." M. Taurine's book contains the results of numerous original experiments bearing upon the art of shipbuilding. M. De Magnac's new method of navigation is that suggested by Sumner, and practically tried by Sir W. Thomson several years ago. It depends on the fact that a knowledge of the hour of the first meridian at the moment when the altitude of a star is observed, enables the mariner to describe a terrestrial circle, on which the ship must necessarily be. By observing two different stars simultaneously, or very soon after each other, two circles are obtained, which at their intersection mark the position of the ship. This method has been adopted in the French navy.

The Montyon prize has been awarded to M. Leon Francq, civil engineer, for perfecting a fireless locomotive of the kind invented by Mr. Lamm, of New Orleans. The Fourneyron prize has been awarded to M. Marcel Deprez for his well known experiments on the electric transmission of power. The Lacaze prize has been bestowed on M. Henri Becquerel, the eminent physicist, for his researches on the magnetic rotation of solids in liquids and gases, and other valuable discoveries. The Lacaze (chemical) prize has been awarded to M. Cailletet for his researches on the liquefaction of gases. In aerial locomotion the Academy has awarded the Penaud prize in equal parts to M. Gaston Tissandier, M. Duroy de Bruignac, and M. V. Tatin. M. Tissandier's experiments on the application of electricity to ballooning are well known; M. De Bruignac has invented a compound aeroplane combining a small balloon with sheltering surfaces; and M. Tatin has modeled the helix used by Tissandier, besides constructing artificial birds which fly by actual strokes of the wing.

New Febrifuge—Kairin.

The reports of the remarkable antipyretic effect of kairin continue to augment. Most observers seem to agree that it is best to begin in adults with a dose of about 12½ grains, to repeat this two hours later, then to administer 9 grains every two to three hours, until the desired effect—decrease of temperature—has been obtained, when a smaller dose, about 5 grains, employed ever three hours, usually suffices to keep down the temperature. But at the least indication of the temperature falling below normal, the remedy must either be omitted or given in small doses and at very long intervals, say 3 grains every twelve hours. Should, however, the temperature nevertheless again ascend, the same course as described must be gone through anew.

Tamarinds.

There are but few people to whom the flavor of preserved tamarinds is not agreeable, but do those who frequently use tamarinds know how they are prepared? They come into commerce both from the East and West Indies; the latter, it would seem, are simply the fruits, or, rather, pods from which the shell or epicarp has been removed, and the pulp, together with the strong fibrous framework upon which it is built, and the seeds are placed in alternate layers with powdered sugar in a cask or jar, over which boiling sirup is afterward poured. In the East Indies it seems they are prepared by first removing the epicarp and seeds by hand, after which the pulpy portion is usually mixed with about 10 per cent of salt, and trodden into a mass with the naked feet. Of these tamarinds several qualities are known in the market, the best being free of fiber and husk, and the worst containing both, together with the hard, stone-like seeds, which are commonly eaten in the East Indies after being roasted and soaked to remove the outer skin, and then boiled or fried, when they are said to be tolerably palatable. West Indian tamarinds are alone officinal in the British *Pharmacopœia;* while on the Continent those from the East Indies are alone employed. Besides the tamarinds sent to Europe they are also shipped in large quantities from Bombay to Persia and other northern countries.—*Gardeners' Chronicle.*

PORTABLE ELECTRIC TESTING APPARATUS.

Electric light engineers often have occasion to ascertain the resistances of the machines and circuits with which they have to deal, under conditions which make it inconvenient to have at hand the comparatively cumbrous apparatus which is usually provided for the purpose. The instrument of which we this week give an illustration has been designed with a view to portability, and to enable it to be used without much time being lost in setting it up. It is made by Messrs. Latimer Clark, Muirhead & Co., and although the last and improved pattern is somewhat larger than that originally introduced, it is still of so small a size that electricians can easily carry it with them. The range and sensitiveness of the instrument are amply sufficient, and it is further capable of forming a useful adjunct to more delicate apparatus in the laboratory, seeing that it is always set up

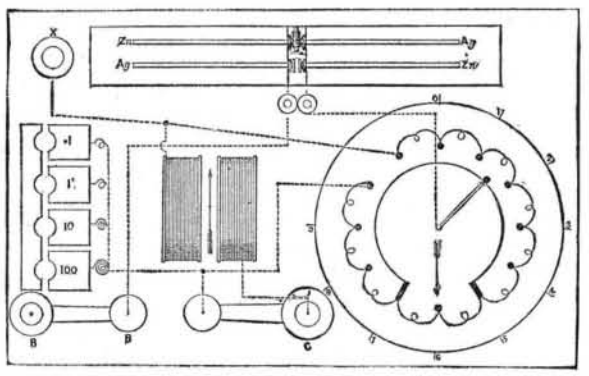


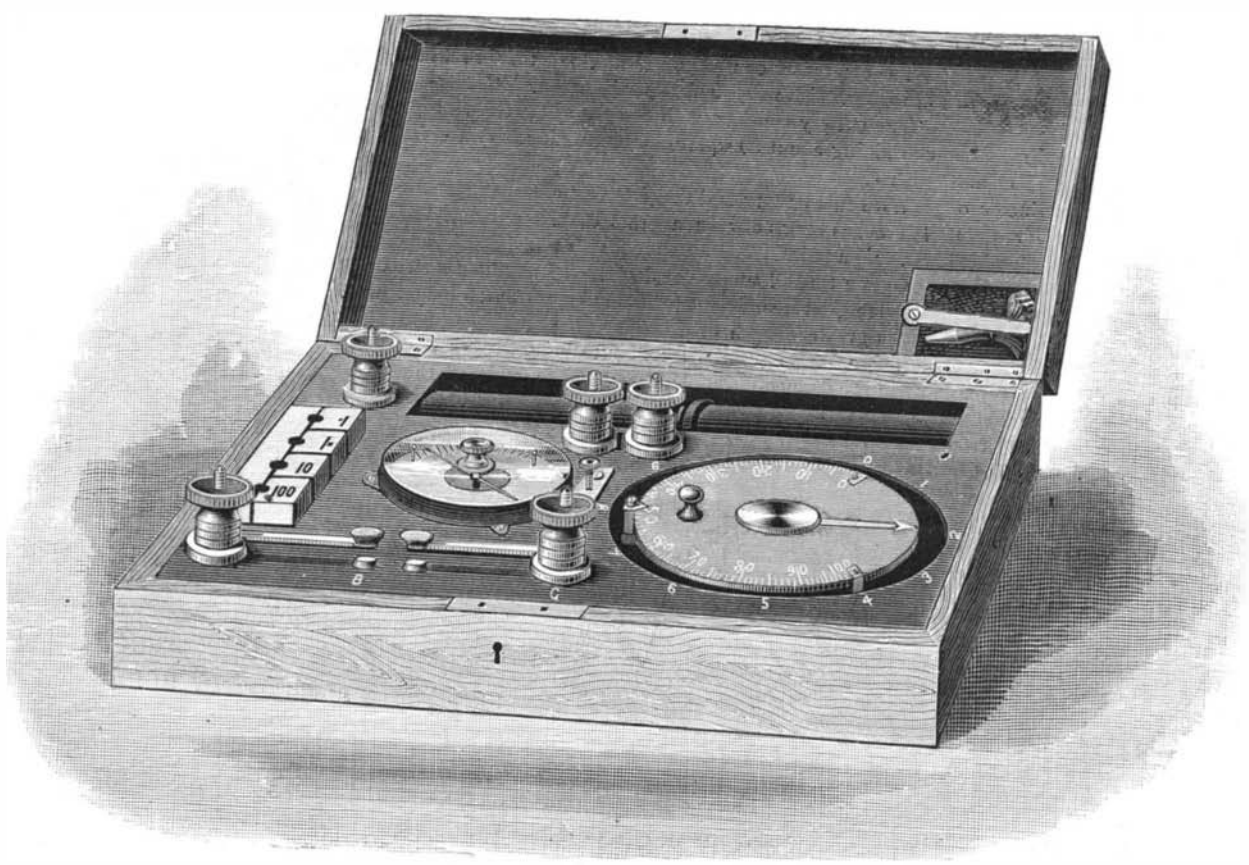
DIAGRAM OF CONNECTIONS.

ready for instant use, and that measurements can be made with great rapidity. To combine in such small compass so many different parts in a practical form, and to insure correct reading with the minimum of skill on the part of the operator, necessarily required some little evolution, yet the result has been obtained by taking advantage of known methods without embodying any new principle.

Chloride of silver elements, wrapped in blotting paper moistened with a solution of zinc chloride, supply the current. The galvanometer needle is astatic, suspended from a torsion head by a silk fiber, and can be set to zero without it being necessary to adjust the position of the instrument relatively to the magnetic meridian.

A single plug, which, when not in use, is placed in the cover as shown; serves to vary the comparison coils from 0·1 to 100 ohms. A battery and a galvanometer key prevent the extra current due to induction disturbing the balance.

The arrangement of branch coils, while, as in the ordinary "meter" bridge, permitting of continuous variation in values being read, provides a length of wire the resistance of which bears a due proportion to the other resistances in circuit. The principle is derived from Messrs. Thomson and Varley's well-known slide resistance box. Eleven coils, with contact pieces, are arranged in series in the base beneath the turntable, this latter carrying two contacts, which serve to embrace two of these coils; a wire having double



PORTABLE ELECTRIC TESTING APPARATUS.

the resistance of a single coil is stretched round the edge of the table and joins the two contacts, being for final adjustment capable of subdivision at any point by the index arm which carries the battery current. When used for taking resistances, the connections are made to the two terminals marked X and B. The table is then set with the arrow pointing to such a number as on trial gives the smallest deflection of the needle, a final adjustment being obtained by moving the index arm. The number pointed to by the arrow is then read off as hundreds, that indicated on the table itself as tens and units. The instrument, as we ourselves have observed, gives fairly correct readings from 0·005 to 2,000 ohms, but will give approximate readings of a much higher value.

Two terminals (shown close together in the perspective view and diagram) are also provided for the insertion of extra battery power should it be desired to take insulation tests with a higher E. M. E. It would also be possible to measure the sectional resistance of cells by Mance's method, by taking out the ordinary cells, bridging over the two battery terminals, connecting the cell to be measured at X and B, and adjusting the galvanometer either by the torsion head or by an external magnet.

Lastly, the instrument can be used as a simple detecter by joining up to B and C, and using the left hand key.—*Electrical Review.*

Curious Case of Cause and Effect.

During a storm at Greenville, R. I., May 9, the lightning ran by the telephone wire to the Windsor Mill, where there is no telephone, but the wire is disconnected just outside the building. The lightning was led by the wire to the corner of the mule and weaving rooms, and entered the building under the jet. It followed the water pipe and set the sprinklers going, and at the same time fired the stock in the mules. By this singular provision of an active extinguishing agent at the moment the fire started, serious loss was prevented, as the fire was soon drowned out. Many of the spindles in the mules lost their temper, and some of the belts were burned, but the mill was saved.

Eggs by Weight, Count, and Measure.

There is a great deal of difference in the size of eggs, and therefore a difference in the nutritive value per dozen when used for domestic purposes.

From time to time the newspapers take the subject up, and argue the propriety of selling eggs by weight, instead of by the dozen, as is the custom in the Eastern and Middle States. But in California, we believe, not only eggs, but fruit and many kinds of vegetables, that are sold in New York and other Eastern cities by the dozen and measure, are sold in San Francisco by weight only, and we cannot help but think that the latter is the most equitable mode of dealing to both the seller and purchaser.

In the great market, the "Halles Centrales," Paris, France, the egg dealers do things still differently. The eggs are assorted, according to their size, by passing them through rings, which, like all other measures, have to be stamped. These rings have a diameter of 38 and 40 millimeters, and eggs which do not go through the larger ring are first quality; those which go through the first but not through the second are second, and all others which go through the second are third quality.

The Aasgeier and the Telephone.

According to the *Brazilian Germania* of Rio de Janeiro, the telephone wires in that city have found a formidable enemy in the "aasgeier," a large bird of the vulture species—a kind of John Crow—which flying very low, as it passes over the tops of the houses in scavengering the streets, hits the wires and breaks them or else becomes entangled. Good wire is very expensive in Brazil. In consequence of the damage done by these birds, the telephone people are compelled to keep up a large force of men for repairs. No sooner are the wires mended in one part of the city than report comes of interruption in another part, owing to the operations of the aasgeier. It is against the law to kill these birds, and as a result they increase very rapidly in number.

The *Provinzia*, too, says that nothing positively remedial can be done at present. The telephonists must wait until the bird learns by experience that it will enjoy more personal comfort by flying higher. It would be interesting to know whether anything similar to this has been noticed in other tropical or subtropical towns in which telephone wires have been strung. The advocates of underground systems may feel disposed to look on these John Crows as very sensible birds, engaged in making a laudable protest against aerial electric wires.