The Speech of Animals.*

That animals have a means of communication among themselves through certain vocal sounds is a well established fact; that these vocal sounds are of sufficient range to express other than mere physical ideas, and thus to assume the importance of a language, is probable, although as yet unproved. It is toward the final settlement of this question that I wish to add my mite, and, while there is much that might be said, in the present instance I will confine my observations to a field but little explored—the attempts of animals to communicate with man.

For the last three years I have had a tame fox squirrel of which I have made a great pet. Polly has occupied a cage in the laboratory where she has been, for the most part, shut off from the sights and sounds of the outside world. Although at times the laboratory has had other tenants in the shape of squirrels, rabbits and guinea pigs, she has formed no particular attachment for any of them, but when I am about she is usually close to me, either on my shoulder or following me about like a dog.

Unconsciously at first and later with a definite purpose, I have talked to her much as one would talk to a young child. About a year ago she began to reply to my conversation. At first it was only in response to my questions as to food, etc, but later her "*talk*" has assumed larger proportions, until now she will, of her own accord, assume the initiative.

Her vocabulary appears to be quite extensive, and while, for the most part, it pertains to matters of food and personal comfort, there are times when it seems as though she were trying to tell me of other things.

When I first go out where she is in the morning she immediately asks for food, and until that want is supplied she keeps up a constant muttering. Later when her hunger is appeased she will ask to be let out of the cage. Often when playing about the room she will climb onto my shoulder and "*talk*" to me for awhile in a low tone and then scamper off. Unless she is sleepy, she will always reply to any remark made to her.

Her speech is not the chattering ordinarily observed in squirrels, but a low guttural tone that reminds one both of the low notes of a frog and the cluck of a chicken. Some of the notes I have been able to repeat, and invariably she becomes alert and replies to them. Unfortunately the effort to reproduce her tones produces an uncomfortable effect on my throat, and I have been obliged to desist from further experiments in that direction. The sounds that she makes are quick and in low tone; so the attempt to isolate words is very difficult, yet there is as much range of inflection as in German.

Another reason why I believe she is endeavoring to communicate with me is that she has used the same sounds toward other squirrels confined in the same cage, and that, while she will answer any one who addresses her, she voluntarily will only talk at length to me. That she understands what is said to her is beyond question, and, furthermore, she will distinguish between a remark made to her and one made to some one else.

I have had many pets that would answer in monosyllables to a question asked them or indicate by actions their desires, but this is the first instance that has come under my observation in which an animal has attempted more than that.

When Polly first commenced "*talking*," I regarded it merely as idle chattering, but further observation shows that it is not such and that the sounds she makes have a definite meaning. Moreover, the sounds she makes in "*talking*" are not the shrill notes of anger or alarm, but low, clear sounds that are unmistakably articulate.

In my fondness for my pet, have I overestimated the value of the sounds she makes, or am I right in assigning to them the characters of speech? Why should an animal not attempt to communicate with man? The higher animals are possessed of a well formed larynx and vocal chords. Why, then, should we deny or ever question the possibility of articulate speech? And, if they can converse among themselves, why may they not attempt to communicate with man?

Any one who has owned a well bred dog can relate numerous instances in which his dog has clearly understood what was said to it, and the readiness with which a dog learns a new command shows an intelligence of a high order. Although a dog's vocabulary is of limited range, it has certain definite sounds that possess an unmistakable meaning. There is the short, sharp bark that expresses a want, the low, nervous bark that means discomfort, the sharp, quick bark of joy, the low whine of distress, the growl of distrust, the deep growl of anger, the loud bark of warning and the whimper of fright. When to these is added the various movements of the body, cowering in fear, crouching in anger, the stiff bracing of the body in defense, leaping in joy, and many special actions, as licking the hand of the master or pulling at his clothes, we find that a dog can express his likes and dislikes, his wants and his feelings, as clearly as though he were human. Any one who, in a time of sorrow or depression, has had his dog come to him and lay its head in his lap and has looked down into those great brown eyes so full of sympathy and love, can never doubt that the dog understood all, and in its own way was trying to comfort.

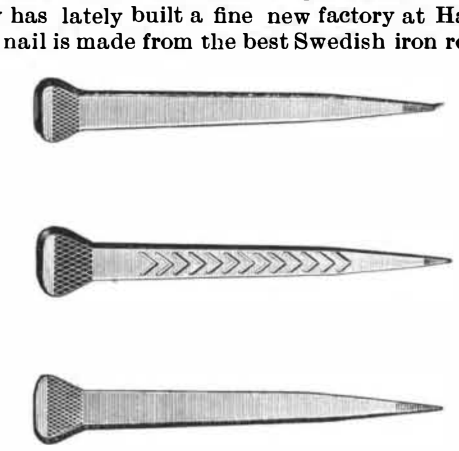
A friend's cat has an unmistakable sound for yes and no. The former is a low meyouw, while the latter is a short, sharp m'yoww. If Tom wants to go out, that fact is made manifest by a quick meyouw'. If, perchance, any one should be in the chair Tom regards as his especial property, no regard for propriety restrains him from indicating that fact and unceremoniously ordering the intruder out. His me'youw' on such an occasion cannot be mistaken. Instances of this sort are not uncommon and ordinarily fail to attract attention, but is there not here a field that will well repay a careful investigation?

Until my pet squirrel commenced her performances I regarded these things as a matter of course, but her chattering has raised with me the question, Is it not possible that our animal friends are endeavoring in their own way to talk to us as we talk to them?

*By Howard N. Lyon, M.D., Chicago, in *Science*.

THE CAPEWELL HORSE NAILS.

The Capewell Horse Nail Company, with factories at Hartford, Conn., and London, England, has experienced a steady and rapid development of its business in all sections of the country, notwithstanding the dull times which have been so prevalent. The company has lately built a fine new factory at Hartford. This nail is made from the best Swedish iron rods, improved in tenacity and uniformity of temper by the Capewell process, forming a nail of great strength.



THE CAPEWELL HORSE NAILS.

These nails are made in two styles of head, styled the "regular" and the "city" head, as shown in the illustration, and in both cases, as more plainly shown in the small cut, there is a distinct angle, and not a curve, where the head joins the blade.

The nail has a gentle convexity on its flat surface, and on the opposite surface a distinct bevel at the point, the point of the nail being reasonably sharp and the edges of the tapering portion near the point sharp and keen. This nail has been in use about twelve years, and has proved itself eminently adapted for both heavy and light work. The corrugated nail is a recent introduction which finds much favor, the slight ridges on its surface forming no obstruction to the passage of the nail through the hoof, but forming a secure hold without the necessity of clinching. The American factory of the Capewell Horse Nail Company is at No. 41 Governor Street, Hartford, Conn.

A Revolution in Telegraphy.

The *Boston Commercial Bulletin* says the days for the use of the primary battery for telegraphy in this country are numbered. It will not be long before the batteries that are now used in the various stations of the New England States will be relegated to antiquity. At the main Boston office, where 14,000 cells were employed for sending messages the first of the year, occupying one-fifth to one-sixth the space, there are now motor dynamos which take up but a small room in the basement. The advantages of the motor dynamo or transformers, as they are generally called, are many.

The saving alone over the old system is said to be between 40 and 45 per cent. This remains to be demonstrated, however. Then, again, the new practice has the great advantage of cleanliness and steadiness.

With the use of the cells the voltage varied from 26 to 36 points from the standard of 180 volts supposed to be delivered. With the motor dynamo as a generator of current, there is hardly any variation; at the most, two or three volts. The motor dynamo transforms or reduces the ordinary direct incandescent light current into one of small volume for the telegraph business.

In the Western Union Company's Boston office the current is taken in a commutator on one side of the machine and sent out from a commutator on the opposite side, the transformation being effected by two different windings on the armature.

The Boston plant has at present nineteen of these transformers in use and will put in addition probably ten more. Of the machines now in use five are of three horse power each, three are one horse power, two are one-half horse power, two are one-quarter horse power, and seven are one-sixth horse power. The potential of these machines varies anywhere from 25 up to 260 volts.

The farthest point to which a message has to be sent from Boston is Buffalo, N. Y., and this can be accomplished by throwing one large machine of 260 volts into service or several connected in tandem or in series. The small machines which are wound for from fifty to seventy volts are thrown into what is known as the loop from New York to Portland, thus necessitating the sending of but one message.

Aerial Ropeways.

At the San Andreas de la Sierra Mines, in Durango, Mexico, there is an aerial ropeway, furnished by the Vulcan Iron Works, of San Francisco, Cal., which is one of the boldest structures of its kind attempted thus far. The line is 15,517 ft. long, not being so remarkable in that respect, but the inclination is over 4,000 ft. in that distance, and two single spans are over 1,600 ft. between supports. This ropeway was put in to carry wood and charcoal to the mill. A great saving is made by this system, as the material had to be packed over a very circuitous route on mule-back. The country over which the line travels is exceedingly rough, and it crosses gorges 600 ft. deep. At one place the grade is at an angle of 48°.

The Vulcan system of ropeway consists mainly of an endless wire rope supported at convenient intervals on grooved sheaves, which are elevated on supporting structures, the height and construction of which will vary with the character of the ground; and passing around large grip wheels at ends of line. Carriers of suitable shape to hold the material to be transported—such as ore, wood, sugar cane, or any other similar material in sacks or in bulk—are fastened to the rope at intervals dependent on the amount to be transported. The ideal ropeway is one with sufficient grade to run by gravity, the loaded buckets pulling the empty ones back to the base of supplies. In any case, however, the power required to operate a very long ropeway is very small, for the friction is low. The surplus power generated on gravity lines is taken up by friction brakes at the terminals, which are automatic in their action.

Fireproof Floors.

In a paper recently read before the Civil Engineers' Club of Cleveland, Mr. Wm. Sabin describes the forms of fireproof flooring most commonly adopted in America. The oldest method was to place floor beams about 5 feet apart and turn a 4-inch brick arch between them, the beams being tied together to resist the thrust of the arches. The space above the arches was leveled up with concrete, in which were bedded strips of wood for the flooring. The plastering was applied directly to the bottom of the arches and over the flanges of the supporting beams. When exposed to a fire, however, it soon cracked off, and a special tile skewback is now used. Such a floor weighs about 70 pounds per square foot, exclusive of the weight of the floor beams. Its cost in America is about $1.44 per square foot. A similar floor in which the brick arch is replaced by one of corrugated iron has also been tried, but as the metal is exposed to the heat, it has no advantages. Its weight is 70 pounds and its cost $1.39 per square foot. The next improvement was the use of flat arches of terra cotta. In this case the beams were placed 6 feet to 7 feet apart, the tiles being 10 inches deep, and the weight of the floor was reduced to 40 pounds per square foot and its cost to $1.34. A further reduction of weight was effected by the use of porous terra cotta, obtained by mixing sawdust with the clay. The weight of floor was thus brought down to 35 pounds per square foot, while its cost was $1.36. In a test made at Denver an arch of porous terra cotta 4 feet wide and having a span of 5 feet bore a load of 15,145 pounds with a deflection of 0·65 inch, and it took 11 blows of a weight of 134 pounds falling from a height of 6 feet to 8 feet to entirely destroy the arch. Both systems of terra cotta floor have successfully withstood severe fires. In a method of construction now being largely adopted, the span of the floor is increased to 12 feet and it is supported by 12-inch I-beams. Between these beams is strained a galvanized wire net, said to be capable of carrying 1,000 pounds per square foot. A center board is fixed below this net, and the space between it and the top of the floor filled with a very light concrete, made with crushed coke, cork, cement and a little sand. This floor is 8 inches deep, the bottom flanges of the I-beams being protected by carrying the cement around them. Its weight is only 18 pounds per square foot, and it has been tested with a load of 580 pounds per square foot, the deflection being only one-half inch. Its cost is about $1.05 per square foot. In connection with the above prices, it should, perhaps, be mentioned that I-beams are very costly in the States.

Electric Towing on the Bourgogne Canal.

There has just been inaugurated upon the Bourgogne Canal, which connects the Seine and the Saone, the first system of electric towing, properly so called, that is to say the first system in which the motive power is furnished by an electric current. This system, established by Mr. Gaillot, government engineer, has, for about two months past, replaced the old system of steam and chain towing, which has been employed upon the canal since 1867. This canal, 3½ miles in length, connects the two sides of the English Channel and the Mediterranean. The electric energy by which the towing is effected is furnished by water falling from two sluices at each extremity of the junction canal. The fall on the Seine side is 24½ feet in height and discharges one and a half times more than that of the Saone side, whose fall is 26 feet. The powers disposable thus have a ratio of 11 to 8, with a feeble variation according to the needs of the canal's supply—a variation that does not practically affect the ratio.

Each plant actuates a Gramme dynamo, the powers of the dynamos being in the same ratio as that of the powers of the falls. These dynamos are excited in derivation and mounted in tension, that of the Seine side having to furnish normally 380 volts (1,200 revolutions per minute) and that of the Saone side 270 volts (900 revolutions per minute). The mounting in tension is effected through a bronze line three-tenths of an inch in diameter connecting the positive pole of one generator with the negative pole of the other. The two other poles are connected with two wires stretched parallel above the canal and open at their other extremities.

The motive series mounted upon the tow boat is branched between these two wires through the aid of two trolleys mounted upon poles 20 feet in length and that press upward against the wires, as in American tramways. The electric motor, by means of a belt, actuates a train of gear wheels, the last of which controls the chain pulley.

The discharge varies according to the load of the convoy in tow. Use is then made of a second train of gearings of slow speed, giving for the same velocity of the receiver a running speed of nearly half that that would correspond to the high speed gearings.

The receiver of the boat is constructed for making 1,000 revolutions per minute, normally. It does not differ much from this figure in practice.

The current is rendered regular by means of accumulators, which are capable also of storing up the electric energy produced during the stoppage of the towing. The accumulators are of the type of the Societé pour le Travail Electrique des Metaux. There are 250 elements capable of discharging 15 amperes. The regulation of the turbines is done by the generators. The induction current passes through a solenoid whose armature takes a position which is variable according to the intensity of the said current, that is to say, according to the electromotive force of the machine. In changing position it establishes contacts that send the current of a Lalande battery of four elements of wide surface into Bovet magnetic clutches. The gate of the turbine opens or closes according as the dynamo produces too much or too little.

The illumination of the three thousand yard tunnel is effected through a derivation established upon the line, and that is now provided with automatic arrangements for keeping it constant despite the variations in discharge resulting from the towing. Such are the principal arrangements of this original installation, due to the initiative and studies of Mr. Gaillot. It will effect a great saving in the consumption of coal, which is done away with, as well as in the cost of labor, since there is no longer any need of stokers, and the sluice keepers can occupy themselves with the small hydraulic and electric plants situated at each extremity.—*L'Industrie Electrique.*

History of the Calla Lily.

This was first introduced to Europe from Southern Africa in 1687, and has become a great favorite with cultivators all over the world. It does not like a very warm temperature nor a very cold one. It will live out in American waters, provided it is deep enough to be below the reach of absolute ice. It fills the ditches and narrow creeks in Cape of Good Hope, much the same as our spatterdock would here. It was removed, by Kunth, from the genus *Calla*, and called *Richardia Africana*, but it is not easy to get rid of a name which once gets into general use, hence it still goes by the name of *Calla*. The spotted one, common in cultivation during the last few years as the *Richardia albo-maculata*, was also introduced from Southern Africa in 1859. This is well known by its spotted leaves. Another one was brought from the same country in 1857, under the name of *Richardia hastata*—the spathe being of a yellowish color, but very small, and is not yet much known. On account of the common calla blooming most freely in the spring of the year, it has come into general use for Easter decorations; and not unfrequently receives, with a number of other plants, the common name of Easter lily.—*Meehans' Monthly.*

Correspondence.

CARRYING LINES ASHORE FROM WRECKED VESSELS.

To the Editor of the Scientific American:

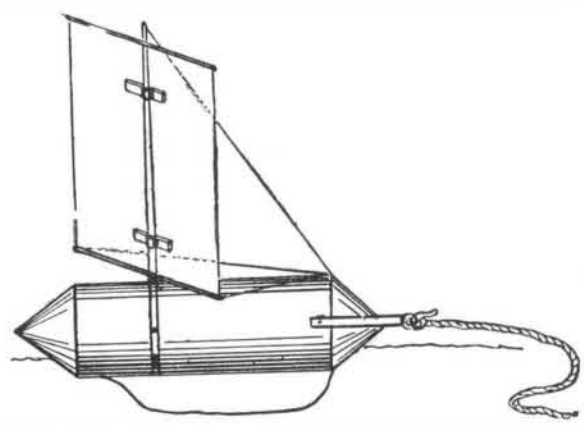
I read an article in your latest paper, that is last week's, on the wreck of the Louise H. Randall, which was cast ashore on Long Island last week. Now, according to the article in your paper, she lay about six hundred yards from shore. The paper says the crew took to the rigging and stayed there. In the meantime the United States life saving crews were exerting their utmost power to get a line to the wreck. According to the account in the paper, they failed. The last resort was a tug from New York to the rescue.

What I want to say is this: I have lived on Jersey's shore for the past twenty years and have experienced the most severe storms. During this time I have witnessed every vessel which struck Jersey's shore from the Highlands to Asbury Park, and in all cases the United States life saving crews have had all they could do to get a line to the stranded vessel, unless she came ashore in fog, when the sea was so smooth one could go off in a flat bottomed boat. In all cases when a vessel is blown ashore on this coast the wind blows so hard that it is almost impossible to stand on the bluff.

Now, when a mortar is placed in position to throw a line, it must and will have to throw straight in the wind, which never blows less than forty miles per hour. Now, it is a hard matter to get a line off under these circumstances.

Now, my idea is this: Why not let vessels carry an arrangement which can be thrown overboard as soon as a vessel strikes, attach a line to it, and let the wind and waves bring it to shore? It can be done. I witnessed the wreck of the Germania off West End, Long Branch, and she was loaded with kerosene barrels. The vessel broke into pieces, and I noticed that the barrels were on shore in a very short space of time.

Now, why not rig an arrangement for vessels to carry on board ship, and in case a crew on shore fails



to get a line off, let this be thrown overboard with a line attached and let wind and wave bring it ashore, which would be in a short space of time?

Referring to the diagram, the main body is a round iron can about the size of a large copper boiler used in connection with a range; it is air tight and the bottom is weighted with lead, so that no matter how rough it is handled it will stand up to wind and sea. It is all made of iron. CHAS. L. HOWLAND.

Long Branch, N. J., December 10, 1893.

Artesian Wells in South Dakota.

To the Editor of the Scientific American:

Thinking something regarding artesian wells in Jim River valley, South Dakota, might be of interest to your readers, and having had about two years' experience in drilling wells in that country, I thought I would inform them of a few points of interest that have come under my observation. I have tested a number in regard to pressure and volume and found the largest volume is an eight inch well at Chamberlain, 640 feet deep; volume, 3,500 gallons per minute, with 90 pounds pressure to the square inch closed, and with a three inch opening it will throw a stream of water 150 feet high and holds 60 pounds pressure.

The well is now used to run a large flouring mill. This well is estimated to develop 60 horse power. This well is shallow for that country, which is accounted for by its being near the bed of the Missouri River. The wells further up the valley have a higher pressure, as high as 175 pounds to the square inch, and run in depth from 800 to 1,000 feet. We have what is called the first or lighter flow, with a pressure from 75 to 145 pounds to the square inch. This water is, as a general thing, soft and first class for domestic purposes. The second flow is the heavier, with a much larger pressure. The geological formations are about as follows: First drift, shale, with layers of iron pyrites from 4 to 12 inches thick. The water-bearing rock is mostly pyrites in the sea shell form, and layers of sand and porous rock. These wells derive their supply from the northwestern mountains.

There is one well at Pierre, S. Dak., which has a volume of 500 gallons, the temperature of the water being 92° and perfectly soft. This well is no doubt fed from the same veins which feed the celebrated geysers in the Yellowstone Park. All these wells could be used for power, irrigation, farm use, etc., and many of them are being utilized right along. Hoping this may prove of interest and profit to some one, I am, respectfully yours, PHIL. EYER.

A Good Suggestion for Short Telephone Lines.

To the Editor of the Scientific American:

The patent covering the use of the permanent magnet in combination in the Bell receiving telephone will expire January 30, 1894.

The use of the magneto-telephone as a transmitter, as at first established, was discontinued because the backward currents from several electromagnets in the same line, as in the bells, rendered the battery transmitter very desirable if not absolutely necessary on account of its greater current.

A plan to remove this difficulty and render the use of the magneto-transmitter available has been devised for a line here about 20 miles long, having about eight offices upon it. This plan is to run an extra line upon the same poles and use one line for the bells and the other for the telephones—transmitters and receivers. All telephones will be automatically, or otherwise, switched out of the talking line and remain so normally. When a call is rung on the independent call line and answered thereon, the two parties, *only*, who desire to communicate will take down their telephones, and thus have a clear line, without either bells or telephones (other than their own) in circuit. The slight resistance of the line will make the magneto-transmitters preferable to the battery transmitter, which latter is still held by the Bell Company by later patents. This segregation of the functions of the telep' one into a call-bell line and a talking line, it will be seen at a glance, simplifies the matter. M. L. BAXTER, M.D.

Derby Line, Vt., December 25, 1893.

The Best Preservative Paint for Ironwork.

Mr. W. Thomson recently read a paper before the Manchester Association of Engineers, on "The Influence of Some Chemical Agents in Producing Injury to Iron and Steel," in which reference was made to the effects of different paints and varnishes used for the preservation of structural iron and steel from rust. From experiments made by himself, Mr. Thomson has arrived at the conclusion that red lead paint is the best preservative. This result had struck him as remarkable, because red lead is a highly oxidizing substance; but the reason was found to be that the red lead had the effect of producing a skin of the unoxidizable and protective black or magnetic oxide on the iron itself under the paint. The author has also found that other oxidizing agents, such as manganese dioxide, form a paint which preserves iron from rusting; and this discovery he regards as of great industrial importance. Mr. Thomson explained that, having been required some time ago to make a considerable number of experiments to ascertain the most suitable paint for protecting a large iron structure from the action of sea water spray and rain, he arrived at the conclusion that red lead paint was the best he could find for the purpose. Mr. John West, a vice-president of the society, who presided on the occasion of the reading of the paper, supported the statements and views of Mr. Thomson that red lead is the best preservative paint for iron work. The chief novelty brought out in the paper was the reason why red lead is so efficient in protecting iron.

How to Preserve the Natural Colors of Flowers.

It is over a quarter of a century since the following appeared in the *Gardeners' Monthly*. Coming back again to America after its long travel, it is still worth republishing.

"The following ancient method, which comes from America as new, may be worth repeating and trying: Take very fine sand, wash it perfectly clean, and when dry sift it through a fine sieve into a pan. When the sand is deep enough to hold the flowers in an upright position, take some more sifted sand and carefully cover them. A spoon is a good thing to take for this, as it fills in every chink and cranny without breaking or bending the leaves. When the pan is filled solidly, leave the flowers to dry for several days. It is a good plan to warm the sand in the oven before using it, as the flowers will then dry more thoroughly. In taking the sand off, great care must be taken not to break the leaves, as they are now dry and brittle. Pansies preserved in this way will keep their shape and brilliancy of color all winter, and many other flowers can be equally successfully treated—anything, in fact, where the full pressure of the sand comes on both sides of the leaf; otherwise they will shrivel. To fill in flowers with cup-like shapes it is better to lay them on the sand, and with small spoon fill in and around each flower. Ferns when preserved in this way have a more natural look than when pressed, and the maiden hair fern looks almost as well as when it is freshly gathered."