

TELEPHONE BELL'S SHEEP.

Famous Inventor Has Originated a Peculiar Breed on His Nova Scotia Farm—
Twin Lambs as a Regular Thing One of His Hopes.

Queer Scientific Studies in Experimental Evolution—The Carnegie Institute Interested—Dr Bell's Latest Flying Machine, Which Has Carried a Man—The Question of a Flying Motor—Says Dr Langley Was Unjustly Criticised Before His Death.



TELEPHONE BELL,

His Latest Photograph, With His Aerial Vehicle in the Background.

WASHINGTON

Every man, woman and child has heard of Dr Alexander Graham Bell, who, by inventing the telephone, annihilated distance in our social and business intercourse, and brought the mouths and ears of the human race together. Every deaf person reveres Dr Bell as the promoter of his



father's invention of visible speech, whereby the so-called dumb talk and understand their fellows, and the scientific world knows him for his many experiments along original lines and just now especially for his new discoveries as to aerial navigation.

There is, however, a field in which Dr Bell has been working of which the world knows nothing. It is a strange field for him, but, like the others in which he has been so successful, one where practical results are being reached by the patient application of scientific principles. It is in experimental evolution, and that more especially as related to stock breeding.

Dr Bell has been working in this field for about 15 years, and his work has already resulted in the origination of a new breed of sheep. It has also brought forth the discovery of principles, which, if carried out to their full, may in time make great changes in our sheep industry and in the physical make-up of that race of animals throughout the world.

Sheep Breeding.

Dr Bell's discoveries are not like anything attempted in the past. That sheep can be improved by selective breeding is well appreciated in all the great grazing countries. Take, for instance, Australia. I have seen rams sold there at auction at \$5000 apiece for their wool-growing qualities, and have been told

that the average fleece of seven pounds had been increased to 10 pounds on flocks of thousands.

In New Zealand, the chief mutton country of the world, the weight of the lambs has been greatly bettered by proper breeding, and here in the United States, where we have something like 60,000,000 sheep, our best stockmen in the same way adding to their pro-

on wool and mutton.

Indeed, the breeding of fine sheep is now considered quite as important as the breeding of fine cattle. Wool is selling for over 30 cents a pound, and we are shearing from 40,000,000 to 50,000,000 sheep every year. If we can add a pound to every fleece the increase in our wool clip will be 40,000,000 pounds per annum, and at present prices will add \$12,000,000 to its value.

An even greater result can be obtained if we could have more and better lambs, for they form one of the chief receipts from our sheep industry. They numbered 22,000,000 at the last census and were the offsprings of 32,000,000 ewes, averaging about two lambs to every three ewes. Had each of the ewes had twins our lamb crop would have equalled 64,000,000 instead of 22,000,000, and would have sold for three times as much.

Dr Bell's Sheep.

These facts give some idea of the practical side of Dr Bell's experiments. The scientific side is even more interesting and far-reaching in its possibilities, and it is the one which appeals especially to him. The work is going on steadily upon his country estate near Baddeck, N S, and now also at the farm of the Carnegie institute on Long Island, where studies in experimental evolution are being made.

Dr Davenport, the head of the Carnegie farm, has been furnished with some of Dr Bell's sheep, and a set of carefully recorded experiments will be made by him under the auspices of the Carnegie institution.

But I will give you the story as Dr Bell told it to me just before he left for Nova Scotia a few weeks ago.

"I do not know that you are acquainted with sheep," said he. "Many people are not. I have had farmers scoff at the idea that sheep have no upper front teeth, and have seen them surprised to find this the case. Indeed, I myself knew little about sheep until 1889, when I bought the farms at Beinn Bhreagh which now compose my summer home in Nova Scotia, near Baddeck. Upon one of these farms I found a flock of 51 ewes, and the following spring I observed that about one-half of the lambs produced were twins. Some of the ewes had but one lamb, but many had two, and I began to wonder if there was not some characteristic which would enable me to distinguish the twin-bearing ewes.

To find out I made a careful examination of the milk bags of all the mothers. Now the ordinary sheep bag has but two nipples, and it is from those that the lamb draws all its milk. This was the case with my sheep. I noticed, however, that upon some of the bags were embryonic nipples in addition to those of usual size. In some cases these were barely perceptible, and in none were they larger than good-sized pimples. Upon looking farther I found that the ewes bearing the embryonic nipples had far more twins than those not so marked. Of the ordinary ewes only 24 percent were twin-bearing, while of those which had these marks of an undeveloped milk supply 43 percent had twins. This seemed to indicate that the marks meant something, and I then began to experiment to find out how much."

Queer Experiments.

"Please tell me just what you hoped to ascertain, Dr Bell?" I asked.

"In the first place, I wanted to find whether by selective breeding those now dead embryonic pimple-like nipples could be made alive and useful. I wanted to know whether they would grow and fill with milk; and whether, if they did so, the sheep growing them would yield a greater milk supply. In the second place I wanted to know whether, after I had produced a sheep with four good live nipples instead of two, that sheep would have twins oftener than sheep not so developed."

"What did you find?"

"In the first place," said Dr Bell, "I experienced little difficulty in developing the embryonic nipples. I was soon able to raise sheep having four nipples all yielding milk, and, indeed, for several years past nearly every one ewe born on my farm has had four live functional nipples instead of two. In recent years I have produced a large number which have six such nipples, and I think there is no doubt but that I could eventually produce a six-nippled variety of sheep. Indeed, I have already produced a four-nippled variety. Of the lambs dropped this year eight have six nipples and in addition we have now, for the first time, a lamb with eight nipples. This is the only one of that character that I have produced and the only one I have ever heard of."

The Question of Twins.

"How about the twins, doctor?" I asked.

"As to that part of my investigations I have not been so successful. The proportion of twins born has been small, and the sheep with the four or six nipples have not proved more fertile than those of the ordinary kind. I believe, however, that by using twins only for breeding purposes it may be possible to raise a twin-bearing stock, and that is what I hope to do now. I feel that I have accomplished what I set out to perform as to my first proposition, and that by using my multi-nippled varieties and breeding only from twins I will eventually have a breed of sheep which will almost always produce twins.

"Were these sheep all born on your farm?"

"The most of them were," replied Dr Bell. "My investigations, however, have not been confined to my own sheep. I have a catalog which I published in 1904 containing the records of about 800 sheep of which 655 were born on Beinn Bhreagh, the others having been purchased by me. The catalog gives a record of every sheep as to the matters under investigation, and it covers our work from 1890 until 1904. In addition I have the records for 1905 and 1906."

"My search for sheep of this character," continued Dr Bell, "was not confined to my own flock. I was anxious for specimens from other flocks, and I gave the butchers of Baddeck a standing offer of \$10 for any six-nippled ewe they might bring in. This offer has been open for several years, but it has resulted in my securing only one such sheep out of the many thousand they have handled for killing, and that sheep was poorly marked. A year or so ago I imported some horned Dorset ewes from Uxbridge, Ont. The Dorsets are very prolific, and each of them gave me twins last year. This year one has given

birth to twins and another to triplets, so that I have had nine lambs within two years from these two ewes. The Dorset sheep frequently have lambs twice in one year. It is that variety that I expect to use in my attempts to produce a breed of twin-bearing sheep."

"Do you consider the additions you have made to the milk bag a valuable one?"

"We find that it is so," replied Dr Bell. "Ewes having such bags can raise twins quite as well as the ordinary sheep can raise a single lamb. Indeed, they are far more successful with their twins than the ordinary sheep."

"Tell me something of the experiments which the Carnegie institution is making with your sheep."

"It is too soon to know what will be the result of that work," replied Dr Bell.

"Dr Davenport, the head of the Carnegie institution experimental farm, has now one six-nippled ram and two five-nippled ewes, which I sent him about a year ago. One of his ewes is black and the other white. I recently heard from him to the effect that the white ewe has produced twins, one of which has six nipples and the other four nipples."

Aerial Navigation.

The conversation here turned to Dr Bell's most recent experiments in solving the problems of aerial navigation. He has a large laboratory on his farm in Nova Scotia and this work goes on steadily throughout the summer. He has made great advances since I talked with him about two years ago. He has discovered the unit of which the flying machine of the future is to be built, and something of the shape in which it should be put together. He has, in short, ascertained the character of his building material. He now knows that he can make a body which can be sustained in the air, and he will now experiment on the motive or propelling power, which will send such a body along its way through the air and guide it hither and thither at the will of its engineer.

In a former letter I described this unit, when writing of Dr Bell's aerial vehicle. The unit is of the shape of a tetrahedron, and when I last talked with him such units were put together around large open spaces. Dr Bell now finds that they can be massed close together, and that they will fly equally well. In other words he can make almost any kind of a structure he pleases of such units, and it will be easily supported by the atmosphere.

A Dangerous Flight.

During the past season Dr Bell had a body—I do not like to call it a kite, for the word kite gives a wrong impression of the importance of the discovery—he had a body of this kind which was about 10 feet high and 20 feet long. It was composed of 1300 of these tetrahedral cells arranged more closely together than ever in the past, and yet it flew successfully. While it was high up in the air fastened by a rope to a stake in the ground Dr Bell instructed one of his men to take hold of the rope and run a short distance and then jump into the air so that his photographers might take a snapshot of a man apparently flying. To his horror the kite carried the man about 40 feet from the ground, and the picture showed a flying ma-

chine with a man attached to its tail. For a time the doctor was greatly alarmed, and his alarm kept up until the man reached the earth again.

Inventing a Propeller.

In my talk with Dr Bell, he spoke of possible propellers for flying machines, saying:

"That is the question I shall now attempt to solve. We have discovered the unit out of which the body of our aerial vehicle is to be made. We know that it will fly, and what we need now is something to move it onward and turn it this way or that when it has once risen from the ground.

"You may remember that many of my experiments have been upon the water, and that I have constructed aerial vehicles which would float and which, when towed along by boats, at a certain speed, would rise into the air and fly. I shall experiment in somewhat the same way to ascertain the best motive power to propel such bodies through the air.

"I do not expect to attempt to invent an entirely new motor, but shall begin with the best of our small commercial motors and work with them. We may possibly use a bicycle motor at the start. We shall attach this to a boat in such a way that the motor will work in the air and be subject to the ordinary aerial currents. We shall have a framework built up above the boat and the motor will be placed upon it. It will be made to move the boat along under the same conditions that it is to move the flying machine along. So far the experiments with such motors have been made within doors, where there are no currents of winds to disturb them and where the conditions are different from the outside.

"We shall experiment in the same way with our rudder; and if we find that we can produce satisfactory results in moving and steering the boat, we shall feel that we have gone a long way toward the discovery of the proper motor to be used when we ascend from the water to the air."

When We Shall Fly.

"Can you predict anything as to the future of the flying machine. When will man be able to successfully navigate the air?"

"I can make no predictions as to that," replied the scientist. "We can only say that we are making great strides in the direction of aerial navigation. So far, all our discoveries have been more or less experimental. I know that I have ascertained the peculiar form in which all bodies to be maintained in the air should be made. I have, in short, discovered the unit of the flying body, and I am now ready to go on to experiment as to the massing of such units. I have given an order for 10,000 tetrahedral cells to be sent to my laboratory at Baddeck. This will enable us to form almost any kind of structure or structures we wish."

"But have not great successes already been made in the line of aerial flight?"

"Yes; the Wright brothers of Dayton are doing remarkable work. They have covered a distance of 24 miles in 38 minutes on an aeroplane moved by a gasoline engine, and at the same time have carried 40 pounds of pig iron as a dead weight in addition to their own weight. I have not seen their machine, but there

is no doubt but that it has flown successfully through the air."

"What do you think of Walter Wellman's plan for reaching the north pole?"

"It is one of great risk, and the man is indeed daring to make the attempt. Nevertheless, I think he has a chance of success."

Dr Langley and His Machine.

"You saw the first flight of the Langley model, Dr Bell. Was his large machine adapted to successful flight?"

"I have no doubt but that it would have flown had it been properly launched," was the reply. "The machine was caught on leaving the boat and thrown down into the water. It was never sent out into the air and it is no more proper to say that it would not have flown than to assert that a ship, which had been caught half way down the launching stage and had never touched the water would not be able to float if properly placed in the water.

"Indeed, I do not think that Dr Langley was fairly treated as to his flying machine, and I believe that the criticism which he received was largely the cause of his death.

"The last days of Sec Langley were sad ones," continued Dr Bell, "and still there was one pleasant thing which came to him before he died. This was a tribute from the Aero club, an organization made up of some of the chief scientists of the United States, and especially of those interested in aerial navigation. At one of its meetings this club passed a resolution testifying to its high regard for Dr Langley for his scientific work and honoring him as the pioneer in aero dynamics. That resolution was forwarded to the Smithsonian institution, and it was sent out to Dr Langley's house two days before his death. He was quite ill at the time, but he was able to understand it when it was read to him. It pleased him much, and when his friends asked what he would like to have done with it, he replied: "Publish it." He felt, I doubt not, that it was, after all, an acknowledgement of his work and a defence against the unjust criticism and ridicule which had been visited upon him."

Frank G. Carpenter