# The Vision of Viscount d' Amecourt

**"to spread through the air the domination man exercises on the continents and on the sea, to soar as an eagle, to climb vertically like a lark, to scrape the earth like a swallow, and to devour space like a bullet at 400 meters a second."**

*Translation by Alfred L. Wolf

"All that is possible will be achieved." —Nadar

"Man should be a thing of beauty in making himself fly; he will only be a turkey and a farcical one, at that." —Theophile

Theophile is a nickname; out of respect for the meritorious scientist who wrote that quotation, I won't reveal his identity; the nickname I gave him suits him; the Greek name Theophile means God's friend, the friend of Him who says, "Each of you love each other"—He who preaches progress guided by law and reason.

Theophile sins uncharitably by complaining about inoffensive men who demand progress for humanity from science; his spirit betrays his heart. If Theophile is not impeccable, is he then infallible? I move on.

I am not anxious to burden the public with my research; but so much has been said for so long on the question on today's agenda that I asked Mr. Babinet to give me this time to say what I can respecting what I have done to solve wholly the problem of aerial navigation, to train the wind, to make a pedestal of the element which produces the hurricane; as one might make a mechanic or messenger of the element which produces thunderstorms, to spread through the air the domination man exercises on the continents and on the sea, to soar as an eagle, to climb vertically like a lark, to scrape the earth like a swallow, and to devour space like a bullet at 400 meters a second.

I arrive boldly at the question, one can see. I will add that I approach it coldly without illusions and, consequently, without any possible misconception. I am happy to arrive there and put the question because the public obstinately fails to understand it. I arrive at it out of love of science and truth because it is truth and science which I serve. There are those that one insults when one casts sarcasm and sophism in a workman's face because he is devoted to their creed.

Birds fly! It is at this point that we begin. Will you deny the flight of the bird?

*Privately published in France in 1863 under the title "The Conquest of the Air by the Helix—Demonstration of a New System of Aviation." The reader is referred to the editorial, "We'll Tramp on the Wind," in the last issue.*

Not only does the well adjusted bird, like a bird of prey, sustain and direct himself in the air, but also the less well adjusted bird like the bird in the chicken yard . . .

Not only does a bird, but a fly, the butterfly, and even a fish, but also mammals; look at the bat.

A thousand millions of aerial mechanisms travel in the air. Do you cry: Miracle! No. You only say, Marvelous, and I repeat with you Marvelous! Marvelous! Marvelous!

The fact is that a miracle is strange to the laws of nature; whereas, only this marvel is a phenomena, without doubt admirable, but accomplished because of these laws.

The bird is a marvelous mechanism, but it is not only a mechanism! There are the muscles powering levers; it has an organic system which reacts to the slightest loss of equilibrium. It is a machine to achieve flight. Doubtless there is an incorporeal engineer in some part of this little engine's brain to which the levels and drive belts respond; if you want, call it "life", or, "soul," if you dare, but agree that the apparatus and the engineer are two; the wing is no more the bird than the plough is the farmer, the vessel the pilot, the locomotive its stoker, or man, God. Then how does a bird fly? By pushing on the air with its wings extended.

Is the air, then, a prop? Yes, a fleeting prop but also as real as solid matter provided that one prevents it from running away or that one reaches it before it departs; an elastic prop surer than solid matter since it offers less danger of shocks.

"But how does one evaluate the resistance of this prop?" My goodness, in a simple way, a surface that moves in a still fluid and a still surface in moving fluid give the same pressure on the fluid equal to the speed of movement; this truth is apparent. Thus, we are able to appreciate air's resistance in our task and the power with which we strike when putting air in motion, is it not the same as wind pressure? The wind, when it blows, exerts on the large sail of a boat a force equal to 400 horses, and when it rages it can hold a liquid mountain in suspense or blow off the masts of boat, or in passing over a forest,

**"It does so well it uproots**
**The one whose head neighboured the sky."**

But its fury stops; after the storm has blown out, it is

Translator's Foreword: My 50-year addiction to France renders entertainment of French visitors to Pennsylvania one of my regular pleasures. The deVienne family's love of small game shooting made son, Odon, welcome to Wingover, my home, during his apprentice years in Philadelphia. Our mutual aim never strayed enough from pheasant to include attention to the family name of the girl he married while here. And, on leaving, he invited me to s[…] in France the following sp[…] We meticulously set the [...] Sunday, Sept. 26, 1971. I [...] ranged a week in France car[…] ly including that day.

The previous Wedne[…]

asthmatic; it is conquered; the air becomes calm. What speed did it make during this feverish moment? 45 metres a second! Only 45 metres. At 45 metres the wind is on its last legs, but man does not yield! A locomotive races almost with the wind, a bullet travels 10 times faster. That which the air can't do to us, we can do against it. We'll tramp on the wind the way we do on the earth and better, calmly and quietly confident about our future conquest, we will cradle ourselves in its breast and play with its caprices.

Another calculation: a man weighting 70 kilograms would be able to walk on a column of air moving upward at 45 metres a second whenever the soles of his shoes measured an eighth of a metre in area. Let's say, the resistance of air increases by the square of its speed, then it follows that if you double the airspeed the resistance is quadrupled. Then the same man can walk barefoot on a column of air ascending at 90 metres a second.

So much for air resistance, and to return where I left off. I repeat my conviction that a man of sound mind must understand with the protection of reason which I know can't deceive me, because it is God-given lucidity and the Lord doesn't deceive. I can say certainly "two times two makes four divided by two makes two." Therefore, I repeat, a bird flies, the air is a support, science provides a footboard for man.

But when shall this progress be achieved?—I don't know . . . in a century perhaps . . . It was not possible yesterday . . . . , it is perhaps today . . . , it certainly shall be tomorrow. It is necessary that science advances enough, that the incubation period be achieved, that the time has come.

How will it be achieved? By the balloon? No.

By a mixed system, that is to say, a balloon connected with a machine? No.

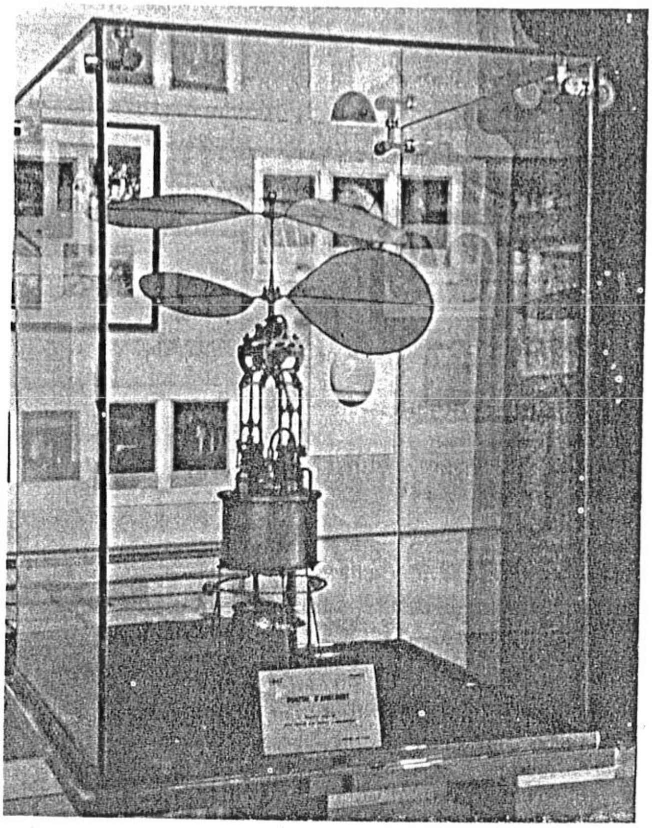
Will it be by a pure machine? Yes.

Why not a balloon? Because a balloon, like a cloud, rests absolutely inert in atmosphere and necessarily moves with its surroundings.

Why not a balloon plus a machine? Because each kilogram of lift a balloon gains costs a cubic metre of gas; because the gas bag requires a large surface; because this large surface tends to block the motion it may make; because the envelope's fragile skin doesn't permit hope of conquering air resistance.

An engine attached to a balloon is movement tied to immobility; it is a moored ship with sails as if one wanted to break loose; it is a locomotive chained to a cathedral which one tries to budge. I said before, and say again: "Fasten an eagle to a balloon, the king of the sky captive, a plaything of the winds carrying his ball and chain, and in turn dragging it, trying in vain to battle against the least atmospheric disturbance."

But all this is an argument against the balloon. Don't you then believe in the balloon? What was Theophile doing then, when the hue and cry arose over your works, proving at length in great essays what you set forth in a few lines? What were all the people doing who scribbled papers to say you invented a new balloon? They are simply missing the question. They speak of something they do not bother to look into; they swing sabres in the thin air; they take wind-mills as enemies and their blades for targets.



A d'Amecourt model encased in a cabinet at the Musee de l'Air, Meudon, France.

You don't protest?—I shrug my shoulders. If you knew how many wise men I saw and heard swear a bird couldn't fly if he lacked the means of filling up with air to become lighter as it got warm; when a little common sense tells us that assuming the air lightens 1/10th of its weight through heat from the bird, an eagle weighing 5 kilograms would need to ingest 50 cubic metres of air to ascend. When you hear someone repeat this insanity, dear reader; do as I do; shrug your shoulders. Didn't people say of the first locomotive: "It will slip but it will not advance"? Didn't people say of the first photographer: "Look at this boob pretending to attach his portrait to a mirror"? Did not the illustrious Lalande condemn in 1782 the balloon which belied him the following year?

All right then, let's get on and tell us about machines you imagine can take to the air. All right, here I go:

These machines provisionally divide themselves in two groups which I call generically Orthopters and Helicopters. The orthopter is used to lift weight, pushing against the air normally. A bird's wingbeat is an orthopter motion. The helicopter lifts weight by striking the air

**d me wandering about unted in the great, cavernous ar at Meudon, France's nt Musee de l'Air. In the t of its too many relics, I on an 1863 patent for a heter. Having been with rotating wings through the first autogyros, I couldn't believe I was learning yet more, and the name of Gustave Ponton d'Amecourt, the inventor, stuck in my memory.**

**On Sunday, en route to Barbey, where we were to shoot on the lands of the chateau of its mayor, Odon's father-in-law, we failed to rush through the glorious countryside and, as a result,**

**(Continued overleaf.)**

# The Vision of Viscount d' Amecourt

conclusion*

**Twenty times you wanted to interrupt me to say 'And the motor!' Yes, the motor, that is the great question . . . the key to success, which is why I tell you 'This was not possible yesterday, perhaps not today; it surely will be tomorrow.'**

Translation by Alfred L. Wolf

To this point, reader, all goes well; the theory is almost irreproachable, very seducing, indeed; the application remains, and twenty times you wanted to interrupt me to say "And the motor! The motor!"

Yes, the motor, that is the great question, that is the key to success, which is why I tell you: "This was not possible yesterday, perhaps it's not today, it surely will be tomorrow."

Also it is to the aspect of the motor that my studies and efforts tend today.

In the little helicopters that I have built the motor consists of a simple watch spring; from the moment the spring is loosened, the motive force is extinguished, the machine falls back to the ground. A spring is a bad motor; the work it performs is work that ought to be previously stored up; one would need a steam engine to wind up the spring as much as it unwound, and I believe it would be more valuable to apply the steam directly to turn the helixes. Anyhow, I can't consider springs to make a large machine work.

The bird flies; this is my point of departure, and I willingly return to it; what is the power of a bird's muscle, I don't doubt that man's genius is not able to equal it with the materials God has put at his disposal. I don't doubt that one can make a motor capable of producing as much work relative to its weight as an eagle produces relative to its own. I know that there have been terrific calculations published on bird flight. Theophile teaches us, following Navier, that a bird is 72 times stronger than man relative to its weight; that the amount of action developed by a bird in a second to acquire, in calm air, a speed of 15 meters, is about equal to that which would be necessary to lift its own weight to 390 meters heighth, and assuming a mean 35 wingstrokes a second. These figures, I avow, would be of slight encouragement were they the words of the Gospel, but they seem to refute themselves. I don't know exactly the number of wingbeats of the wren and the sparrow, but I can affirm that the swallow and the eagle fly very well without beating their wings 35 times per second. If the work of a stork or a swan can lift their weight 390 meters high in a second, it is astonishing that they have not considered using these domestic birds in industry because suppose they weighed 5 kilograms, they would be able to lift a kilogram 1,950 meters high in a second, which equals the work of 26 horses. A pigeon would produce the work of a horse and cost less to feed the animal.

Pardon me, reader, for this disgression; let us direct our attention to the immense progress, accomplished in our time, on the study of motor power, think of the prodigious expansion force that compressed gas possess, powder, carbonic acid possess; let us muse that science is far from having said its last word on all this, and for the moment, let us not disdain to believe that water vapor will suffice, I am sure of it, to gain our goal.

The problem thus set is; to find the motor capable of giving the greatest amount of power relative to its weight.

Bear in mind people scarcely concerned themselves up to now with the lightness of motors.

A locomotive is heavy because we want it to be; it only adheres to the rails by its weight and by that means can haul the train.

A factory engine is heavy because it is sold by weight and the builder is interested in making it heavy.

A transportable steam engine is heavy because people don't know how to make it light.

Let's try together, reader, to make a truly light motor with water vapor.

The entire theory of steam machines rests, you know, on utilizing the force of expansion of water, which when it passes from a liquid state to a gaseous state occupies a thousand times the space it occupied before.

To have a steam engine, you must first make steam; to make steam, you need fire and water, from which the result is that a steam engine is composed of two things: machinery itself and a steam generator.

The machinery consists of a cylinder in which a piston travels; a slide-valve conducts the steam alternately before and behind the piston, from the fore and aft motion of the piston and its shaft which, outside the cylinder, is articulated with a connecting rod to turn a wheel; that's all. These organs are essential, greatly perfected, consequently hardly susceptible to be still perfected, but also very slightly cumbersome and very light, relative to the working power they transmit. One must no more consider decreasing them than atrophying the chief wing muscle of a bird.

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* *This article began in the Sept./Oct. issue and was the subject of an editorial in Vertiflite for July/August.*

The generator, that is another thing. In the present state of the industry, it is ten times heavier than the machinery itself; we will render it ten times lighter than the machinery that is to say one hundred times lighter than it is presently. If that's not enough, we will look to it.

What is needed to heat water? Fire and a heating surface.

Fire doesn't bother us; a few litres of gaseous liquid will provide combustible material we will lead by means of "ramps" (pierced tubes with many little holes) close to the surfaces we want to heat. Do you want less weight? You will have less cumbersomeness, we will carry a supply of illuminating gas, which is lighter than air. Do you want something better? We will make the fire in a closed chamber and all the gases the combustion will produce shall become collaborators with the steam before it is lost in the atmosphere.

I come to the heating surface. It is an essential point; the more surface we have to heat, the more steam we produce. Put a water warmer in a dish and the same amount of water in a flask. The water in the dish will boil before that in the flask because the bottom of a dish has more surface than a bottle. It is the surface in contact with the fire that one calls the heating surface.

What can be done to increase the heating surface? You know tubular boilers have been made; that is to say, one has put in the closed vessel that contains the water a certain number of tubes in which are circulated the flame and superheated gas produced by combustion; as these tubes are steeped in the water all their walls become heating surface and contribute to create the steam.

These perfected boilers produce much more steam than the elementary boilers, but they are heavier; they are of necessity closed vessels since they can't emit any steam or boiling water and furthermore they are very voluminous closed vessels; not only must they contain the amount of water necessary to supply the machine, but also all the tubes through which runs the flame. Then what happens to a closed vessel of a certain capacity? The compressed fluids exercise an enormous pressure on the walls; there is danger of explosion. The only preventative means one can bring against this inconvenience consists in giving great thickness to the walls. The authorities themselves intervene; as a public safety measure, they put out a wealth of commendable precautions, formalities, and tests, and if this prevents accidents, assuredly it does not lighten the boiler.

What then should be done? It should be necessary that the diameter of the boiler be quite small but have plenty of heating surface.

It should be necessary; it is necessary to omit the tubes encumbering the closed vessel.

It will be necessary, one must minimize, minimize again, minimize ever the diameter of the boiler.

But there it is cut down to a diameter of 30 centimeters!

It is not enough; reduced! 10 centimeters; the diameter of an ordinary bottle!

This isn't enough, reduce more.

3 centimeters! The neck of the bottle!

Not enough, always reduce.

1 centimeter! So be it, let's stop there. 1 centimeter in diameter, this will give in round figures 3 centimeters of spreading out; on the wall of this tube gas compressed by 10 atmospheres will exert a pressure of about 30 kilograms for each linear centimeter, 1 gram of metal will be enough to hold it; 100 grams for 1 linear meter, 1 kilogram for 10 meters or 3,000 square centimeters of heating surface which, put to good use, will produce a horsepower. One can do better, nevertheless I accept provisionally this dimension; a tubular boiler of 1–5 meters diameter receives on its outside walls a pressure of more than 450 kilograms for each linear centimeter and each atmosphere, which makes 4500 kilograms for 10 atmospheres, and more than 2 million kilograms on all the outside walls if they measure 4 meters long; I like more carrying aloft those of 1 centimeter diameter.

But can you consider making a boiler 10 meters long per horsepower?

Why not? I take the tube, I roll it, I make a twist of it, a reel, a cone, a table, I plunge it in the brazier and only keep towards me the two extremities which I place to connect with a cold water container. The water enters by one end, heats, becomes vapor while circulating and leaves by the other end where it forms an impetuous jet of superheated steam; I plunge this jet in the container, the steam condenses there and gives its heat to the cold water; shortly it reenters the tube again, a current is established, circulation persists, the steam only becomes water to become an instant later steam, and if my container is a closed vessel, it will find itself charged in a little while with high pressure steam; I will take it there and make my machine work.

You replace the boiler with a twist, that's understood, but that doesn't dispense with having a container and to provide a water supply for your machine; this container must be accompanied by a steam chamber, all in a closed vessel and you can't escape from high pressure, from thick walls and the weight they comprehend.

Pardon me; without doubt I have a container on which my machine is built, but it is of small capacity; a very small amount of water suffices to supply my motor, because the operation itself of my flying machine provides a marvelous way always to use the same water. On leaving the cylinder the steam does not lose itself in the atmosphere; I collect it in the cooling tubes which form a kind of conical table above the lower helix; the air column put in motion by the helix produces almost instant condensation of my steam; tubes gave me promptly an abundant heating surface, other tubes now give me a cold surface, and to the extent the water condenses, it returns because of its own weight into my container, thanks to an ingenious spigot with a notched rod or a double connected spigot operated by the machine itself and proportioning the amount of water that it replaces to the amount of steam displaced by each stroke of the piston. In this way a spherical container the size of a cannonball or a bomb suffices to hold the necessary water supply, sending liquid to the heating tubes where it becomes steam, sending steam to the cooling tubes where it becomes liquid after having done its task. This container possesses a chamber or ventricle which is its steam box; it is proper to call it the heart of the machine.

The heart, itself, also has its compartments and ventricles, it sends the blood to purify itself in the lungs by a kind of combustion, it takes it back purified and replaces it in the arteries which transmit it to the veins, whence it returns vitiated but having fulfilled its task. The same blood circulates forever; it is not perpetual motion—it is life.

Then let's go! You make us a theory; this can be ingenious but it is neither practice nor is it practical; are you going to make us believe that in breathing on your machine you will bring it to life, as God made man? No, never; man is a spirit served by organs; we will be able to roughly copy the organs, but to communicate to them anything incorporeal, to give them the breath of life, never. With regard to my playing on your credulity in setting forth a vain theory, just a minute; thank heaven for the method and the brilliant method that I teach you. A little good sense was sufficient to lead me to experiment on generating steam in narrow tubes; I achieved on the first attempt the spontaneous circulation that I foresaw; I got it at simple atmospheric pressure, I got it at high pressure, I have applied it with the most complete success in all industrial and domestic uses, and it is only after these trials and good performance that I am speaking; but it is an imitation of the Creator's work; this generator with little tubes possessing slight volume and a trivial weight an enormous heating surface, isn't this a gross imitation of the lung? And happy enough, through my encounter with the Good Lord, I am seized with admiration for these marvelous works of nature which we are allowed to imitate, but which we shall never know how to reproduce, I am seized with recognition of Him who has delivered these models to us and made us kings of His creation.

There, dear reader, is how I conceive the solution of the problem I put above; "To produce the most steam with the least possible weight" or, in other words, "to produce the most work relative to the weight of the motor."

To multiply the production of steam, it is simple to increase the length of the generator tubes, if all the telegraph wires of the world were little tubes, I'd make a ball of them, I would throw it in Vesuvius and I'd make the Mediterranean Sea boil. I beg you, reader, don't hold me to my word; it is a figure of speech, but it explains my thought. This figure tells you what my little tubes can do as steam generators; and would you like to learn through another figure what the steam generated by these feeble organs can do? Give me a warrior's bomb; let us put a few centilitres of water in it; I will fit to it several meters of my Lilliputian generators, and without putting the bomb near the fire I will make it explode before my tubes burst.

Do you think for a minute that man's genius would not accomplish producing by a machine work equal to that of the bird, accepting as true Navier's figures?

For my part, I believe, and strongly believe, that on this question it suffices to wish in order to achieve; I believe people haven't tried because they don't understand the utility. If all the great discoveries had their precursor as I hope to be the one of aerial navigation, these prophets, I was going to say these poor Cassandras, could be heard being said around them "Of what use is the art of printing? We have hands with which to write." "Of what use the New World? The Old World is big enough." "Of what use steam? We have motive power." "Of what use a locomotive? We have diligences." "Of what use the electric telegraph? We have mail service" .... and going further, "What's the good of making wool into thread? We have lambskins." "What good is it to forge metal? We have flint tools ... "And one can say again WHAT IS THE USE OF before the least progress is ever made. Man would regret having inhabited the world too soon if he did not feel keenly the needs that remain to be satisfied in the future. One says that one is always rich when he considers those poorer than himself, and our small vanity is satisfied when we compare our century with past centuries; but we are not on earth to enjoy selfishly the treasures acquired by our antecedents and to stop progress; let's dream that perfectibility is our most glorious endowment, that progress is our law, that we owe well-being to future generations just as we owe education to our children, as we owe giving them ease. We pass on, but our passage should be marked by some progress and on the paths which we have opened posterity can write the words: "They passed their lives doing good." pertransierunt benefaciendo.

## Conclusion to my Reader

I don't know if I have been fortunate enough to convey my convictions to your mind, my dear reader, but if you believe, it is necessary that your faith acts. Whatever you may be, savant, capitalist, worker, writer, man of the world, or a meditator, you can strive for this great work, you can indeed affix your name to its execution.

The idea makes its way, this idea which came to me as a revelation some ten years ago under the great trees of the countryside, from the simple sight of a linden seed that the October wind caused to drop at my feet, it was one of those seeds that nature's genius has provided with a kind of parachute, so that the breeze which detaches it from the tree serves to carry it a distance. I thought this over a long while. One day, under the same shade, I communicated my thought to my friend G. de la Landelle, this old Navy officer, the one who had found himself so often grappling with the hurricane between heaven and the waves of the sea, was he going to treat as great folly my pretension to brave the atmospheric currents;—far from it; the historian and the poet of navigation became the prophet and apostle of aviation; he consecrated to the new theory a chapter of his "Picture of the Sea," he is devoting a new book to the new theory. At the same time a French savant, whose job keeps in Rio de Janeiro, Mr. Liais, finished his studies on birdflight by a thesis on a system similar to mine, finally an artist, a man of letters known to and loved by the public, an intrepid aeronaut, Mr. Nadar, embraced the same doctrine and became its ardent propagator. In a well attended meeting inspired by him my little helicopters were exhibited, one of them planted itself up in a model of a balloon hung from the ceiling in place of the chandelier. This was the signal that aviation was going to declare war on aerostation. From various levels of our Society, the new system has gained numerous adherents, and I would not know how to let go unmentioned the powerful affirmation when it was divulged by a man who occupies a prominent position in science and the press, Mr. Babinet, whom I will thank here publicly if my personality is not submerged in such a great question. The old pioneers of the airways have brought me their sympathy; the Aerostatic and Meteorologic Society of France gave me the honor of naming me its president, and newly come to aeronavigation, I have the good fortune to collaborate with the companions of the first aeronauts, with an honoured old-timer who nobly carries the name Montgolfier, with the last remnants of the Fleurus (ed. French Revolution) balloonists, with Dr. Dupuis-Delcourt, dean of the French aeronauts, author of the excellent "Manual of Aerial Navigation," perpetual secretary of The Aerostatic Society.

The problem now is to build the first machine capable of lifting a man; the problem also is to support the newspaper "Aeronauta," which Mr. Nadar is founding; another task is to create an aeronaval museum and, to start with, to place there the three thousand so interesting exhibits which Mr. Dupuis-Delcourt possesses, the unfortunate Mrs. Blanchard's nacelle, the stirring remains of the first disasters sustained by man in his bold battle against the immensity; there remains to reunite the many flying machine models, these separated experiments, doomed to destruction, quite useful, however, to those who wish to make science advance and avoid errors already committed.

All advice, all calculations, all publicity, all collaboration shall be received with gratitude, and all kinds of communications that anyone wants to direct to Paris, 20 Rue Madame, will come to me.

VICOMTE DE PONTON D'AMECOURT
24 September, 1863