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Improved Portable Engine for Agricultural Use.

The employment of steam power for agricultural purposes is one of the prominent features of this mechanical age. The latest among the important applications of steam, it bids fair to become one of the most important innovations of modern times. No living man can foretell the extent to which it may be carried, or conceive the immense revolution in modern industry it inaugurates.

We believe it, like all other advances in labor-saving appliances, is destined to greatly benefit mankind at large, and to hasten the period when man, emancipated from all heavy and exhausting toil, shall compel the brute forces of nature to perform all work, which is not in itself so pleasant as to be desirable as healthful exercise and recreation.

The inventive skill of the period has been tasked to produce a steam motor which will answer all the requirements of the plantation and the farm; and while many engines have strong claims to public favor few have succeeded in combining all the requirements for an entirely successful agricultural team engine.

It may not be amiss to enumerate such of these requirements as occur to us at the moment, although this subject has already received a large share of attention in these columns.

First, and above all other considerations, an agricultural engine should be sufficiently strong in all its parts, and each part should be simple in construction and easily accessible for adjustment and repair. Certain refinements admissible on marine and stationary engines, designed to be always under the supervision of skillful engineers, are wholly to be avoided on an engine designed to be hauled about from place to place, to be used in field or forest under very different circumstances, for sawing, pumping, plowing, thrashing and cleaning grain, grinding and expressing the juices of fruit and sugar cane, cutting fodder, etc. Nothing can compensate for lack of durability and reliability. The danger of break-downs in the midst of a harvesting campaign must be eliminated as far as is possible for human skill to do it, in conformance with the other conditions of the problem.

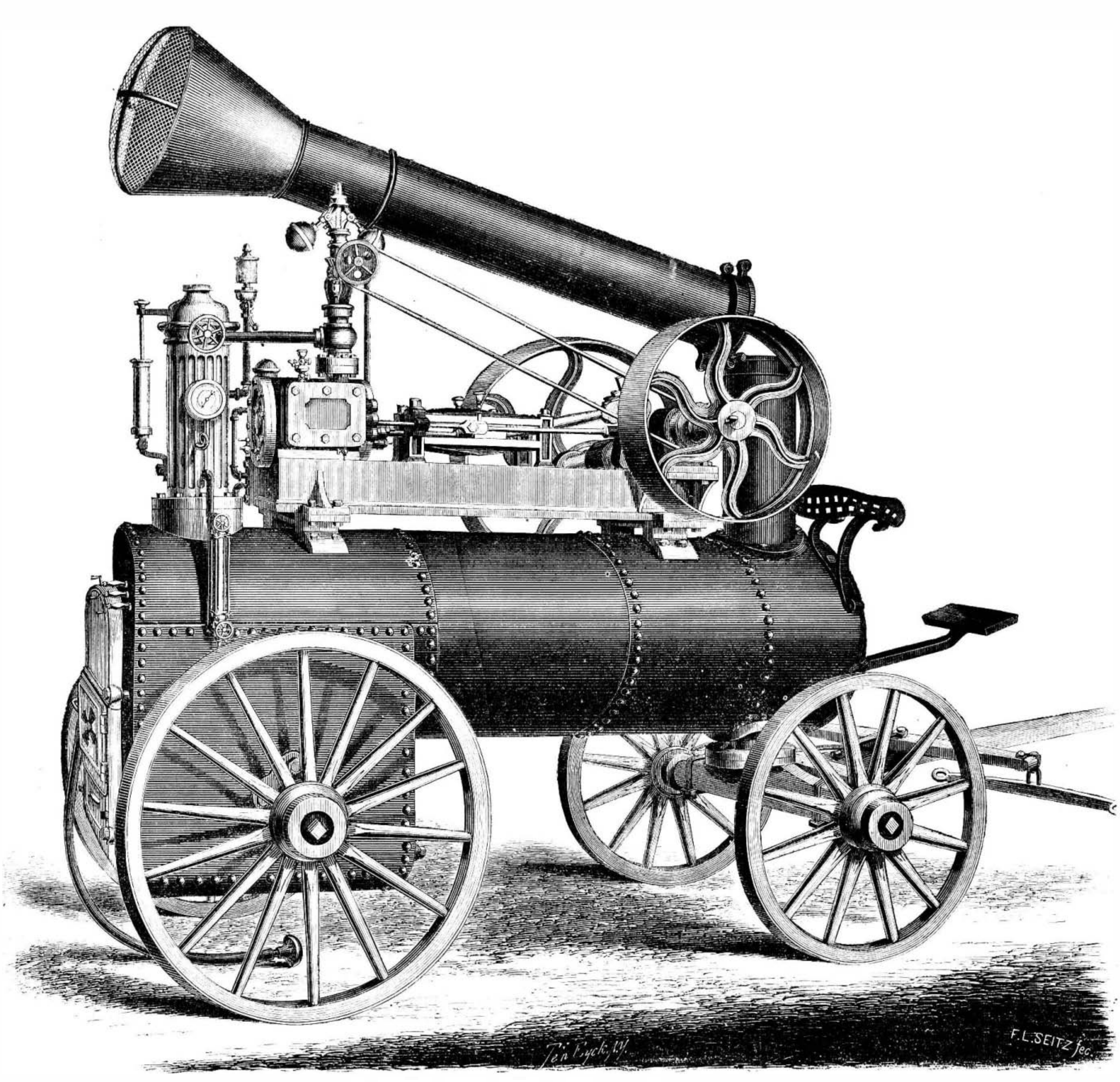
These fundamental requirements being fully secured, the question of economy may next be considered; and such details as are necessary to secure it may be added—always provided they do not too greatly interfere with the attainment of strength and durability.

Then the materials employed in construction must be so formed as to secure minimum weight with maximum strength. Surely here is enough to tax the highest engineering skill of the designer.

We think our readers will agree with us in according to the engine we herewith illustrate, the merit of combining, in a very large degree, all the fundamental requisites we have named, with others that will appear upon careful examination of the engraving.

Every part of the engine is constructed to a standard gage, so that duplicates can at any time be obtained that will fit or replace any part when required, and the work throughout is of the best kind, such as will bear the closest scrutiny from experts.

The boiler is of the locomotive pattern, and is made of such material as to insure safety, durability, and economy of fuel



AMES' PORTABLE ENGINE FOR AGRICULTURAL USE.

It is constructed of the best Pennsylvania iron of the proper thickness; and the furnace is constructed of the best solid fire-box plate, not ordinarily used in portable engines on account of its high price.

The tubes are the best American lap-welded, and the tube sheets are made of the proper strength and thickness. The bracing at the sides, and at the top and bottom of the furnace, is done after the method adopted by the best locomotive builders.

A special merit is, that the form of the furnace—obtained by extending a water space of ample size and semi-circular form, its under side forming an ash pan—allows the water to circulate freely; thus preventing sediment from accumulating and adhering, as it does in the ordinary form of locomotive boilers, in that part of the furnace below the grate.

This latter style of boiler very soon requires new "water legs," as, there being little or no heat below the grates, the water there is in a state of rest, which allows the particles of mineral and earthy matter to adhere to each other and the iron, thereby causing, in a short time, a mass as solid and compact as stone, which soon destroys that part of the boiler.

The circulating water bottom, on the contrary, by the constant movement of the water through it, keeps these particles in a state of suspension, so that they are at once removed from the boiler whenever the blow-off cock is opened. This shaped furnace is much stronger than any other, and obviates the expense and inconvenience of building a separate ash pit.

The smoke-box is a continuation of the shell of the boiler, making it as strong and durable as any other part, which is not the case when it is made of common iron, and merely bolted on to the end of the boiler. The tubes and smoke-box are perfectly accessible for cleaning, through a door, in a in a substantial and ornamental frame which covers this end of the boiler. The furnace front is handsomely designed, and carries the fire and ash-pan doors, and is so made that it can be readily removed, having a large entrance to reach the tubes and furnace for cleaning.

The fire door is made double—its inner part consisting of a heavy iron perforated plate—the outer door being provided with a register to admit air, to ignite smoke, gases, and other products of combustion.

The steam dome is of graceful form, and of ample size to give perfectly dry steam to the engine. The safety valve, as well as its seat, is made of composition well fitted, so that it can neither rust nor stick fast, and is connected to its lever by a device, made on the principle of the link, so that it works with great freedom and uniformity. The steam dome is also provided with a first-class steam gage and whistle.

The bed plate of the engine rests upon carefully and firmly secured saddles attached to the top of the boiler. The engine is of the horizontal style, designed to secure all the requisites of elegance, simplicity, strength, and convenience. All the parts are made in the most approved and workmanlike manner, and the steam is used expansively, according to the most approved modern practice; particular attention being given to adjust the lap of the valve to give the proper cut-off, and to proportion all the passages and ports so that the highest mean effective pressure in the cylinder may result from a given boiler pressure.

The heads of the cylinders are easily accessible, no parts having to be removed in order to reach them; and the cylinders are felted and handsomely lagged to prevent loss of heat by radiation. All the usual and useful appendages found on first class steam engines, such as oil-cups for the cylinders, pet-cocks, water gage, oil cups on slides, etc., are provided.

The governor is well made, and sensitive to any variation of load, and performs its office with ease and certainty.

A water heater is placed inside the bed plate, through which the exhaust steam passes, and is finally discharged into the smoke-pipe powerfully increasing the draft.

The pump is double-acting with composition valves, which can be removed for cleaning by taking out a single set screw. An important feature is connected with these pumps. A stop-cock placed in the suction pipe being always open, the pumps are never allowed to run dry, as is frequently the case in other engines; and by the use of a waste pipe with another stop cock—connecting with the discharge pipe from the pump to the boiler, it is easy to regulate the amount of feed water required for evaporation.

The crank shaft is double, extending a sufficient distance on either side of the engine to allow a band wheel of any size to run without interfering with the boiler. It is forged of the best American iron, and its diameter is considerably greater than is ordinarily seen in portable engines of equal power. It runs in boxes giving ample bearing, to insure steadiness of motion and durability.

The connecting rod is made of hammered iron, supplied with bronze boxes, and is fitted up in the best style, and in a very substantial manner.

In short all the appliances of the best stationary engines, if we except certain refinements above noticed, are to be found on this engine, and so arranged as to avoid undue complication.

The engine and boiler are placed on a very strong truck, as shown; the bolster being under the end remote from the furnace, and the bulk of the weight being placed upon the hind wheels of the truck. The axles of these wheels have been, in other truck engines, bolted to the sides of the boilers; but this plan renders them liable to be broken off or to give great local strain to the part of the boiler to which the axles are bolted. In the engine we are describing a better plan has been adopted, and the difficulty alluded to has been wholly removed.

The axles are made of three-inch square iron, and bent so as to form a complete bearing for the curved under surface of the fire-box. At the angles where they project to receive the wheels, brackets are bolted to the boiler which abut against the shoulders of the axles, bracing them against the effects of sudden twists and shocks. No weight rests upon the brackets, the boiler being sustained entirely by the bent axle. This gives very great strength to them, and removes all strain from the boiler in going over rough ground.

A Salter spring balance is used on the safety valve lever instead of a weight, as in locomotives. The smoke-pipe is hinged and provided with a spark arrester. Each engine is also provided with a flexible suction pipe, with a rose strainer, and has a convenient and comfortable seat for the driver of the team when the engine is being hauled from one position to another. It would seem that nothing has been omitted from consideration, in the construction of this engine, calculated to fit it for every requirement of a first-class agricultural steam motor, and as such it will meet an increasing want in many parts of the country.

These engines, of all sizes, from two to forty-horse power, may be seen at 38 Cortlandt street, New York, at the office of the general agent, Mr. Edward P. Hampson, to whom orders or letters for further information may be addressed.

METEORS.

[From All the Year Round.]

The Universe, of which our solar system is but an infinitely small fraction, is one in material constitution. The spectral analysis of light has shown that the most distant visible heavenly bodies contain substances exactly the same as those which make up the solid crust of the earth. Thus, Aldebaran (the star marked 8 in the Bull), has soda, magnesia, hydrogen, lime, iron, bismuth, tellurium, antimony, and mercury. Sirius, the Dog Star, likewise confesses to soda, magnesia, hydrogen, and probably iron; and not only the stars but many of the nebulæ have been made to avow their possession of similar, if not exactly identical elements.

In the Annuaire of the Bureau des Longitudes, for 1870, M. Delaunay confirms the theory of the unity of the constitution of the universe by a different set of facts and arguments which have all the charm of novelty. For ages, nobody knew what they meant; and we read his lucid explanation with the pleasure enjoyed in guessing a riddle which has long puzzled our brains, if we may compare the solution of a play on words with the satisfaction of obtaining the grandest views of nature. In the present "notice" he treats of what we may learn from the various kinds of meteors—a term which, in its Greek original, means merely something hanging aloft.

Spectral analysis has enabled us to study the material elements of the heavenly bodies; but this is not the only means we possess of discovering directly the secrets of the constitution of the universe. Certain phenomena, now to be examined, put it in our power to make a close inspection of a considerable number of bodies distributed in space. We can even handle some of these bodies, and analyze them by the various processes which our laboratories have at their command. The results have been valuable, from their verifying, directly and undeniably, the notions already derived from other sources respecting the condition and nature of the matter dispersed throughout celestial space.

While gazing at the starry heavens, we often see a bright point dart rapidly across the constellations, and then disappear without leaving any trace. This is what we call a shooting star. Sometimes the brilliant point marks the line of its passage by leaving behind it a luminous train, which lasts a few instants, but vanishes soon afterwards. The path of the shooting star is usually rectilinear or straight, or rather it would coincide with the arc of a great circle traced on the celestial hemisphere. In a few cases, which are very rare, the path presents successive sinuosities, or takes a decided bend, making an angle, sometimes very large, with the direction it followed at the outset. In other words, the shooting star seems to travel in a serpentine course, or rapidly to change its direction, and even, in certain instances, it seems to go back again, returning towards its starting-point. Shooting stars constitute a special class of luminous meteors, which appear at all times and seasons. Not a night passes without several of them being observed. The frequency with which they show themselves, as we shall see by-and-bye, is more or less great, according to circumstances.

From time to time, but much less rarely, there occurs a phenomenon, the same in kind, but much greater in intensity. A luminous body of considerable and appreciable dimensions rapidly traverses the heavens, shedding a bright light in all directions. It resembles a ball of fire, whose apparent magnitude is often comparable to that of the moon. This body generally leaves behind it a very visible luminous train. Often, during, or immediately after its appearance, an explosion takes place, and even occasionally several explosions, which are heard at different and widely distant places on the surface of the earth. Frequently, also, the explosion is accompanied by the bursting of the ball of fire into luminous fragments, which seem projected in different directions. This phenomenon constitutes what is called a meteor proper, or, by French naturalists, a bolide—a word which we might well naturalize, as it is used in that sense by Pliny, and is derived from a Greek verb to throw, to shoot out. The phenomenon occurs by day as well as by night—only in the first case the light it emits is very much diminished by the light of the sun, and, in fact, is only perceptible when developed with considerable intensity.

On the other hand, on the earth's surface we sometimes find solid bodies of a stony or metallic nature, which appear to have nothing in common with the soil on which they live. From time immemorial the vulgar have attributed to these bodies an extra-terrestrial origin. They were believed to be stones fallen from the sky. They have been designated pierres de foudre, pierres de tonnerre, thunderbolts, because they were regarded as matter shot by lightning to the surface of the earth. Many of these pretended thunderbolts have been recognized to derive their origin from the soil itself in which they were found. Such are the ferruginous pyrites, so commonly occurring in chalky strata. But, for a certain number of them, their extra-terrestrial origin has been indisputably ascertained. The name of aërolites (stones of the air) is given to them as a reminder that they fell to the earth from the depths of the atmosphere which envelops our globe. What relationship can possibly exist between shooting stars, bolides, and aërolites? A variety of opinions has been held on this subject. What strikes us most is the vagueness and indecision with which they have been offered, the slight actual knowledge possessed respecting the phenomena under consideration, and at the same time the incredulity with which philosophers have received the accounts furnished to them by the public.

First, as to their incredulity. In Kepler's Ephemerides, we read, "7—17 November, 1623. A fiery meteor, or globe of fire, was seen throughout almost the whole of Germany, flying rapidly from the west to the east. It is affirmed that in Austria something like a clap of thunder was heard. Nevertheless, I do not believe it; for nothing of the kind is to be found in the accounts that we possess."

In the Memoirs of the Académie des Sciences for 1700, Lémery writes: "We cannot reasonably doubt that the matter of lightning and thunder is sulphur, set on fire and shot out with great velocity. As to the lightning-stones with which the vulgar will have it that the thunder is always accompanied, I take their existence to be very doubtful, and am even inclined to believe that there never have been any real ones. None of these stones are to be found on the spots that have been struck by lightning; and even if we had found one, we should sooner believe that it came from some mineral matter melted and formed by the burning sulphur of the thunder in the earth itself, than that the stone had been formed in the air or in the clouds, and shot out together with the thunder."

Next, as to the vagueness and indecision of their views. Halley several times directed his attention to meteors, and the causes by which they may be explained. In a note, published in 1714, in the Philosophical Transactions, No. 341, he relates the occurrence of two remarkable meteors, one of which was seen in Italy on the 21st of March, 1676, the other in England, in the neighborhood of London, on the 31st of July, 1708. He demonstrates that, from the directions in which the latter meteor was seen at different places, its hight above the earth may be estimated at from forty to fifty miles. Then he adds, "I have deeply reflected on these circumstances, and I consider them the most important facts that have come to my knowledge relating to the phenomenon of meteors I am inclined to think that there must exist a certain quantity of matter in ethereal space formed by the fortuitous concourse of atoms, and that the earth meets it while traveling along her orbit, before it has acquired a great rate of speed in the direction of the sun." Here he "burned," as children say; he was within a step or two of what is now held to be the truth.

Some years afterwards, on the appearance of an extraordinary meteor, seen in England on the 19th of March, 1719 (whose hight above the earth Halley reckoned at seventy-three miles), the great astronomer put forth a different explanation, to the effect that the matter constituting the meteor had emanated from the earth, through the effects of the preceding unusually hot summer. Sulphurous vapors, he thinks, have no need of air to sustain them, but mount by a sort of centrifugal force; they then form a train, like a train of gun powder, and, when inflamed by spontaneous combustion, the fire runs along it from one end to the other. And that was the best explanation Halley could give of meteors and bolides.

Mussenbrock, in his "Course of Experimental and Mathematical Physics" (translated into French, 1769), in like manner attributes a terrestrial origin to the materials of which fire-balls consist. "All bodies," he says, "which form part of the universe, emit different emanations, which rise in the air, mingle with it, and are the matter and cause of meteors." And afterwards, "As these globes of fire spread, wherever they pass, an odor like that of burning sulphur, I can scarcely doubt that they are clouds principally composed of brimstone and other combustibles issuing from volcanoes which have opened fresh mouths among the mountains, and have discharged large quantities of sulphurous vapors before they have caught fire."

The opinion of the learned in the second half of the eighteenth century respecting stones fallen from the sky, may be gathered from a report made to the Académie des Sciences, in 1769, by the celebrated chemist Lavoisier, in the name of a commission appointed to give an account of a phenomenon of the kind which had lately happened in France. First, he expresses his skepticism. "In spite of the notions accredited among the ancients, true philosophers have always regarded as very doubtful the existence of these thunderstorms. And if it was considered suspicious at a time when philosophers had scarcely any idea of the nature of thunder, it must appear still more so at the present day, now that it is known that the effects of lightning are the same as those of electricity."

He then proceeds to relate the facts. On the 13th of September, 1768, at about half-past four in the afternoon, there appeared in the direction of the Château de la Chevallerie, near Lucé, a little town in the Maine, a stormy cloud, inside which was heard a short, sharp thunder-clap, very like the firing of a cannon. Then, throughout the space of two