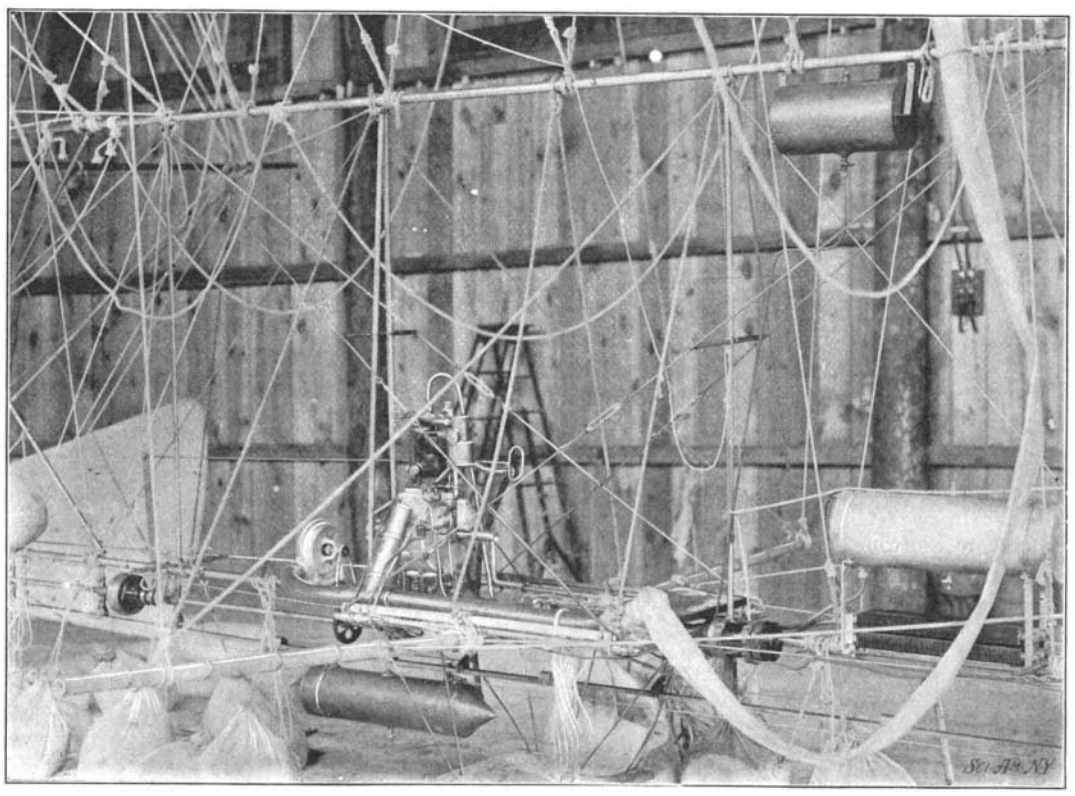
tank filled with sodium silicate, and remains immersed therein for two hours. The sodium silicate for this purpose is supplied as solid glass, containing about 70 per cent of silica, and is thus practically insoluble in cold water, but when the substance is digested at 60 pounds in a boiler, it dissolves in a few hours. When the uralite has become thoroughly impregnated with the sodium silicate, it is permitted to stand for a time to enable the superfluous solution to drain away. This accomplished, the sheets are once more stoved for 36 hours in a low temperature, and then redipped in another solution of bicarbonate of soda for 24 hours, which bath decomposes the silicate of soda. The uralite is then washed for two hours in another tank and once more stoved. These chemical impregnation processes exercise a powerful hardening effect upon the substance, but to insure absolute stability the sheets are again steeped in the baths of silicate and bicarbonate of soda respectively, washed and stoved. The sheets are then finally immersed in a solution of calcium chloride to remove the remaining traces of the soda. It is desirable that this latter chemical should be entirely removed, since if it be allowed to remain a white efflorescence appears on the surface of the material, which though not deleterious to the material is unsightly, although it will disappear after a short exposure of the uralite to the weather. This protracted chemical treatment of the uralite converts it into a solid, homogeneous mass, which cannot laminate, has no planes of cleavage, and is fire-resisting to the highest degree.

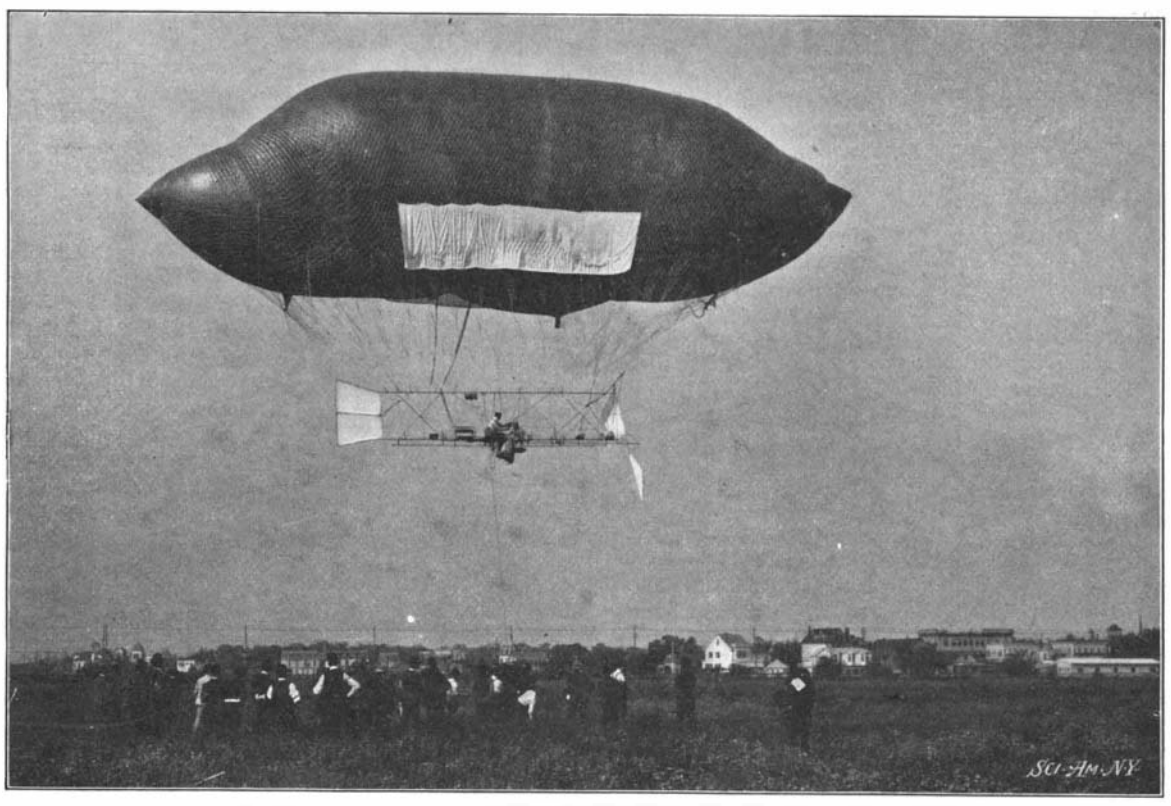
The most noticeable feature of uralite is the facility with which it may be handled and adapted to other materials as a protection against fire. It can be glued and nailed without any fear of its splitting during the latter process. It is specially available for paneling or other similar purposes, and can be grained or otherwise treated precisely as if it were wood. It does not swell or shrink under fluctuating climatic conditions, is waterproof, and is a complete electric insulator. The remarkable immunity of the material from climatic changes may be gathered from the fact that a piece of the substance may be plunged into boiling water and then immediately steeped into frozen mercury without showing any shrinking, disintegration or other change, physical or chemical. It is capable of withstanding a great strain—18 tons per square inch in comparison with Portland cement, which is only capable of supporting 9 tons—so that it is an ideal material for floorings and ceilings. Its cost is very low—7 cents per square foot.

A practical proof of faith in the fire-resisting capabilities of uralite is attested by the fact that in London the fire insurance companies have decreased their rates where this material is employed from $5.25 to $1.90. It is being adopted on the overhead railroad of Liverpool; in the Soudan for roofing purposes; and also by the Russian Admiralty.

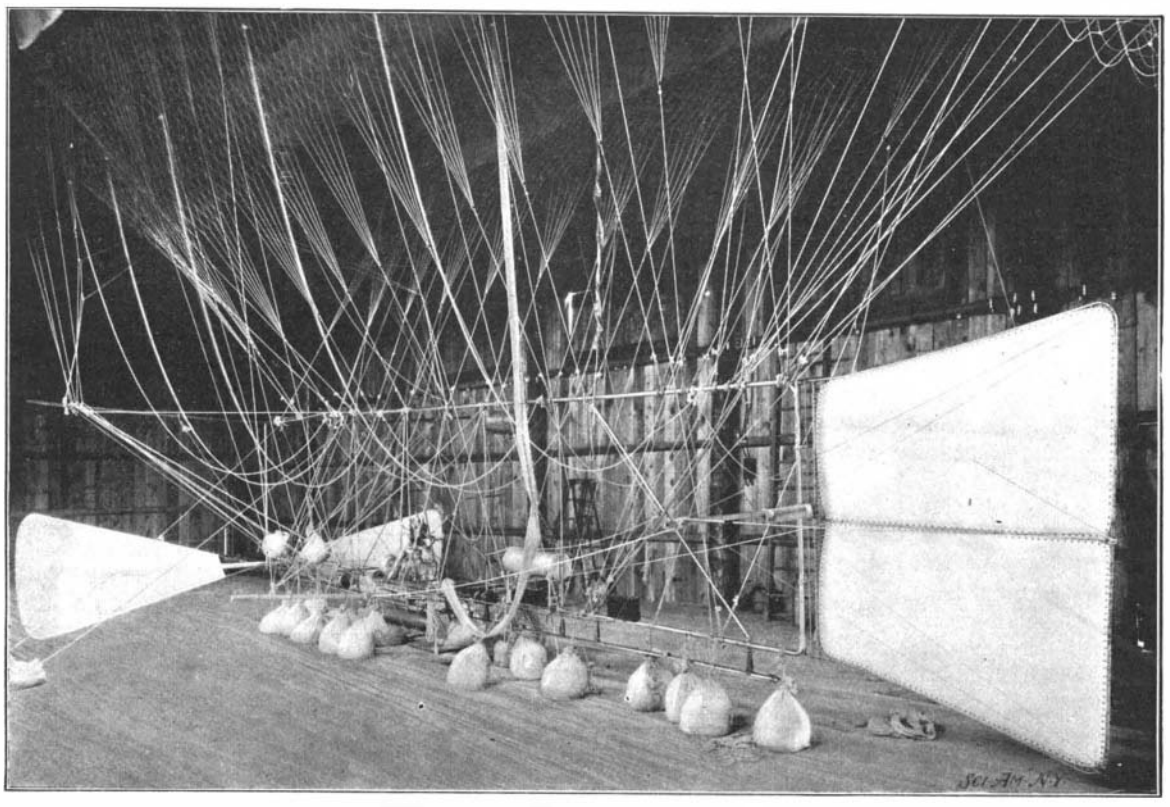
The refractory properties of this new substance are vividly demonstrated in the accompanying illustrations.



THE MOTOR AND THE SLIDING WEIGHT.



THE SECOND ASCENT OF STEVENS' AIRSHIP AT MANHATTAN BEACH.



GENERAL VIEW OF THE FRAMEWORK.

STEVENS' AIRSHIP.

The number of aeronauts who are attacking the problem of aerial navigation by means of dirigible airships has been increased by the advent of Leo Stevens. Manhattan Beach has recently been the scene of two ascents made by him in a flying machine of his own design. It cannot be said that much has been achieved. Despite the inventor's indomitable confidence in his contrivance the tests thus far made have not been satisfactory. At no time was a free ascent made. In both the trials made the airship was held captive by a stout rope, and was not allowed to rise more than 150 feet above the ground.

The construction of Stevens' flying machine, although substantially following the lines laid down by previous aeronauts, nevertheless presents novel minor features that should prove of interest to investigators in the same field. The gas-bag is inclosed in an outer envelope, of the usual cigar shape, with ogival ends. The space between the gas-bag and outer envelope is filled with air by means of a blower driven from the motor. During the airship's flight the air is allowed to pass down again through the flexible tube by which the space was filled, to the motor, in order that it may cool the cylinders, the air being driven down through the tube by the expansion of the interior gas-bag.

At each side of the gas-bag envelope a canvas-covered frame is mounted to swing in a vertical direction. The lateral surfaces thus formed act together as a parachute. As the machine rises it is obvious that they will hang down from the envelope and will in no way retard either the ascent or backward and forward flight. When the airship descends the parachute surfaces will spread by reason of the air's resistance, and will thus retard the velocity of the descent.

The net surrounding the outer envelope is secured by cords to the upper member of a rectangular steel frame by which the motor, propeller, rudder and ballast are supported. From our illustration it will be seen that the motor is placed approximately in the middle of the frame, and that the aeronaut takes up his position immediately behind it.

The propeller is mounted at the bow; the rudder at the stern. It therefore follows that the flying machine is not driven from the rear, but is rather drawn along. Tiller ropes lead from the rudder to the aeronaut's seat.

Along the bottom of the rectangular frame a rail extends upon which a weight is arranged to slide. It is the purpose of this weight to keep the flying machine in proper longitudinal trim and to permit the aeronaut to change the direction of his flight vertically. A somewhat similar principle was employed by Von Zeppelin in his colossal airship. By moving the

weight to the bow the longitudinal axis of the airship will be inclined downwardly; by moving the weight to the stern the axis will be inclined in the opposite direction.

The envelope containing the gas-bag in this airship is 86 feet long and 22 feet in diameter, and has a capacity of 22,000 cubic feet of gas. The motor is of 7½ horse power. The two blades comprising the propeller have a total length of 16 feet and are 4 feet wide. The rudder is 7 feet high and 5 feet wide. Mr. Stevens estimates the lifting power of the balloon at 1,400 pounds. The weight of the machinery is about 700 pounds.

In the last experiment made the failure of the airship to fly was attributed to the defective operation of a clutch. A more pertinent reason can be found in the inadequate power of the motor. Seven and one-half horse power is hardly sufficient to drive a flying machine of such dimensions. If the lifting power of the balloon is 1,400 pounds, and the total weight of the driving machinery is but 700, there seems no reason why a heavier and more powerful motor cannot be used.

The detailed illustrations which we present herewith picture the mechanical features clearly. The sliding weight previously referred to is the cylindrical object, pointed at either end, which figures in one of our illustrations. The fuel tank is secured to the top member of the rectangular frame.

The New Comet.

BY PROF. WILLIAM R. BROOKS, D.SC., F.R.A.S.

Comet B 1902, discovered by Mr. Perrine at the Lick Observatory on September 1, has been under observation at this observatory whenever conditions permitted.

For a few nights past the bright moonlight has effectually drowned out the light of the comet. This, however, was partially due to thick haze in connection with the moonlight. When the air was clear the comet could be seen in the ten-inch equatorial in the presence of a moon a day or two past the first quarter. When discovered the comet was of the ninth magnitude, but at my last observation it was much brighter than at discovery.

The comet's position at discovery was right ascension 3 h. 17 m. 49 s.; declination north 34 deg. 39 min. It was in the constellation Perseus, and about five degrees southeast of the star Algol, near which star it passed a few days later. The daily motion of the comet was about half a degree in a northwesterly direction.

The appearance of the comet was as follows: Slightly elongated head, tolerably well defined, nucleus, with a tail less than half a degree long.

The following parabolic elements have been computed by the discoverer:

Time of perihelion, November 23, 1902.
Perihelion minus node, 153 deg. 25 min.
Longitude of node, 49 deg. 56 min.
Inclination, 156 deg. 54 min.
Perihelion distance, 9.604.

The comet is slowly increasing in brightness and on October 5 it is computed to be twenty-seven times brighter than when discovered. From that time on the comet's light will slowly decrease, and at the time of perihelion it will be seventeen times brighter than at discovery.

On October 5, when the comet is at its greatest brilliancy, it will be in splendid position for observation, being about five degrees north of the star Alpha Cygni, and nearly pointed at by the upright beam in the cross of Cygnus.

The following ephemeris will show the path of the comet from that time to perihelion:

	R. A.	Decl. North.
October 5—	20 hours 56 min.	+ 50 deg. 20 min.
October 22—	17 hours 43 min.	3 deg. 53 min.
	R. A.	Decl. South.
November 8—	16 hours 57 min.	— 11 deg. 00 min.
November 23—	16 hours 13 min.	18 deg. 13 min.

It will be seen that after October 5 the comet moves rapidly in a southwesterly course. On October 22 it is in the constellation Serpentarius near the right shoulder. On November 8 it is on the right knee of the same figure, having passed south of the celestial equator early in the month. On November 23, when the comet is in perihelion, it is in Scorpio and about eight degrees north of Antares.

Smith Observatory, Geneva, N. Y., September 19, 1902.

The new armored cruiser "Drake" recently steamed 24 knots an hour, which places her foremost among the swift cruisers of the navy of Great Britain. The "Drake" was launched at Pembroke in March of last year. Her displacement is 14,000 tons, her length 500 feet. Her armament consists of two 9.2-inch and twelve 6-inch guns, with the usual subsidiary weapons. The "Drake" is one of the "armored 'Powerful'" cruisers and was originally designed to steam 23 knots.

New Steam Automobile Records.

On September 24 the mile and five-mile records for steam vehicles were broken, by Mr. Charles Cannon, in the rather peculiar steam racer which he designed himself. The former records were held by Cannon. The new mile record of 1 minute 6¼ seconds, which he made was covered at Narragansett under conditions wholly out of keeping with those required for record-breaking attempts.

Alexander Winton in his "Bullet" also competed, but the high winds proved too much for his car. Winton covered 6 miles in 6 minutes 39 3-5 seconds, making 5 miles in 5 minutes 30 2-5 seconds. His fastest single mile was made in 1 minute 5 3-5 seconds.

Cannon's new record for 5 miles, made on the same occasion, is 6 minutes and 5 seconds. Cannon's former record was 6 minutes 43 1-5 seconds. How swift was the pace at Narragansett may be gathered from the fact that the slowest of Winton's first 5 miles was faster than any time made by Fournier last year. He covered the first mile in 1 minute 6½ seconds; the second in 1 minute 5¾ seconds; the third in 1 minute 6½ seconds; the fourth in 1 minute 6¼ seconds; and the fifth, the fastest, in 1 minute 5 3-5 seconds. Cannon's time by miles in his 5-mile record was 1 minute 12½ seconds, 2 minutes 26¾ seconds, 3 minutes 41½ seconds, 4 minutes 54 seconds and 6 minutes and 5 seconds. His time by quarters in the mile record was 0:16½, 0:33, 0:49½, 1:05¼.

The Government's Scientific Boarding House.

Dr. H. W. Wiley, Chief of the Division of Chemistry of the Department of Agriculture, will open in the autumn, under the authority of Congress, a kind of laboratory boarding house for the purpose of testing the effect of various preservatives, coloring matters, and food admixtures upon normal, healthy persons, The young men in the scientific bureaus of the Agricultural Department will be drawn upon first, and after them the resident college students of the city of Washington. Dr. Wiley intends to ascertain the relative harmfulness of various substances as a part of the movement toward pure food legislation. The effect of borax on foods has not been quite definitely determined. The German government contends that our borax-treated meats are harmful, although its own medical authorities oppose that view. Dr. Wiley contends that the small amount of boric acid used in curing meat is not harmful. His experiments will either substantiate or refute that belief. Each boarder is to keep a diary and record of all facts concerning himself. He is to eat only what is set before him, and, in accordance with Scriptural injunction, is to ask no questions, for the sake of his conscience, if not of his stomach. Every boarder will be weighed upon rising in the morning. His temperature will be taken. A careful account of the water consumed and of the food eaten will be kept. Since it would be difficult even for a hardened boarder to eat "doctored" food continuously, a "relaxation" diet of thoroughly pure food will be served half the time.

The Current Supplement.

Archæological matters have received unusual prominence in the current SUPPLEMENT, No. 1396. Hadrian's Villa at Tivoli is made the subject of a copiously illustrated article. Besides this description of a famous Roman Emperor's country seat, an explanation of how the Romans heated their living rooms and baths should prove of interest. In the allied science of ethnology, an article entitled "The Moros and their Country" will doubtless be welcomed. Mr. Hunziker's elaborate review of the existing methods of cultivating anærobic bacteria is continued. One of the most important papers which has been published in the SUPPLEMENT for a long time is that of which the first installment appears in the present number. The paper in question is entitled "The History of Cold and the Absolute Zero," and comes from the pen of the noted physicist, Prof. James Dewar. Eugene C. Rost's entertaining account of Punta Arenas, the most southerly town on the globe, is most picturesque. Natural history is represented by an illustrated description of some animals in the Zoological Gardens in Berlin. The technologist has not been neglected. "The Testing of Cement" is the caption of a paper which will probably be of no little value to him. Some rather ingenious forms of electrically-operated air compressors are presented. A paper on acceleration tests of steam and electric trains made for the New York Central Road by Messrs. Arnold and Potter demonstrates how much more efficient electricity is than steam for tractive purposes.

The ostrich farming industry of Southern California represents an investment of three quarters of a million dollars, and the annual output of feathers is worth about $100,000.

Automobile News.

Two recent novelties are found in a railway inspection car that has just been brought out by the De Dion Company in France, and an agricultural motor that has made some interesting exhibitions in England. The former weighs but 660 pounds, is fitted with a 3½ horse power motor, and is capable of carrying three persons as fast as 36 miles an hour. The operator is seated on a saddle back of a cross-seat arranged for inspection purposes. The Ivel agricultural motor, the invention of Mr. Dan Albone, of Biggleswade, is designed to draw anything from a wagon to a plow, and it can be used when stationary for grinding corn, etc., about the farm. It is propelled by a double cylinder, 8 horse power motor. When used for plowing the cost of fuel worked out at about 16 cents per acre.

Active preparations are being made for the Automobile Club of America's New York-Boston Reliability Trial on October 9. Seventy-two vehicles will probably participate in the run, and from present indications there will be about 66 per cent more gasoline than steam machines. The club has published a pamphlet containing road maps and explicit directions for following the course, which will be marked out with suitable arrow guideposts. A noteworthy feature of the arrangements is that no repairing of vehicles will be allowed at controls except such as can be done by local mechanics from 7 to 9 A. M. each day. All the other conditions of the run are such as to imitate as closely as possible those under which the ordinary tourist travels, and the test should give a clear indication of the reliability for long-distance travel of the various American automobiles.

Owing partly to the automobile and partly to the trolley car, the horse is rapidly disappearing from various large cities of Europe. Thus in Paris the total number of horses in 1901, according to a municipal census of these animals, was 96,698, while this year it is only 90,796, a falling off of about 6 per cent. In London in the same period the equine population has decreased 10 per cent, while in Berlin, Vienna and even in St. Petersburg the same falling off is to be noted. In the United States the supercession of the horse by the trolley car has been absolutely astonishing in its extent. Probably to-day in New York there are not more than two-thirds as many horses employed as were used twenty years ago. So far the automobile appears to have made no great inroads into the horse business, and it is likely that the extension of the use of automobiles will have to wait upon the growth of more scientific ideas regarding street paving and road making. However, the decadence of the horse is upon us, and his disappearance may be looked for sooner or later. On this point the Electrical Review ventures the opinion that the progress of engineering will develop methods that will totally extinguish the horse as a beast of burden.

The question of military automobiles in Russia is making some progress, and the Minister of War is to have experiments carried out during the coming grand maneuvers which are to be held near Koursk. Eight automobiles of French make are to be used, each having about 8 horse power. If the trials prove satisfactory there is no doubt that the use of the automobile will become general in the Russian army. One of the greatest obstacles to their successful use in that country is the bad condition of the roads. This was one of the drawbacks during a recent test which was made with a military automobile in the neighborhood of Warsaw, where but few of the roads were found practicable. In England military automobiles are making great progress. The War Office is so well pleased with their performance that it has recently formed a volunteer company of chauffeurs, chosen among the owners of vehicles, and the Military Transport Commission has followed their example. Since 1895 steam tractors have been frequently employed for military use, and during the war in South Africa and in the grand maneuvers of 1898 they were used quite extensively. The War Office, however, wished to improve on these results and opened a concourse for automobile transport wagons and tractors. This concourse took place last year, and among the competitors was an English vehicle which, after some slight modifications, seemed to fulfill the requirements. The War Office then detailed the officers and men of the transport section to enter the works in order to study the construction of the vehicle and the method of operating. It has been decided, besides, to form two special automobile corps. This will be a somewhat original move. Each of the corps will be made up of 162 officers and soldiers.

De la Vaulx's Failure to Cross the Mediterranean.

Comte de la Vaulx recently made a second attempt to cross the Mediterranean in his balloon. He made a favorable start from Palavas on the coast of France. Five aeronauts accompanied him. The balloon was driven ashore and descended at Capite, between Villeroi and Les Salines.