

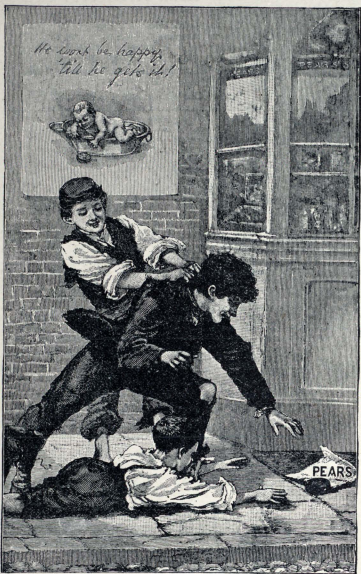
HARPER'S WEEKLY

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NEW YORK, SATURDAY, JULY 26, 1890.

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"practised hand" considers many points that would be overlooked by the novice. A preferably with a slight uneven surface, requisite. Where fishing is the principal object, the spot selected is necessarily near the waters of a lake, or a possible stream, to cool spring. In cold weather the comfort of camp life is much increased by placing the tent in a spot sheltered by a ridge or a single of large trees and exposed to the prevailing breezes are desirable. Any dead tree that might fall upon the camp must be cut down, or the tent pitched far enough from it to preclude danger to the inmates in the event of its toppling over. The site for the tent having been fixed upon, the clearing away the forest growth every bush and small tree must be carefully cut down to the roots, lest short stumps remain sticking up to disturb the repose of the campers. The tent is pitched to face the lower slope, and a little trench dug around the sides and rear carries away the surface water in case of rain. The part of the interior space that serves for a bed is slightly spread with soft, flexible hemlock boughs, laid out in a regular pattern, the end of each branch concealed and covered by the tips of those behind it, and thus it becomes the fluffiest, most fragrant, and so profuse of couches.

The true sportsman in camp rises early for the morning is the best hour for fishing or hunting. As a variation to the ordinary command summer sport—there is always the chance of a shot at something; a loon often comes in as an attractive and unobtainable target; a flock of wild ducks, moving in a straggling line, as the canoe, sailing with noiseless ripple and the soft splash of paddles, rounds some wooded point, or a rarer and more exciting event, a bear or wild-cat is seen on the shore or swimming in a stream, in which latter there must be some special work, for if a shot fall promptly to kill the bear, or the animal reach the light canoe, a disastrous reversal of conditions ensues, in which the hunter is put on the defensive, and the sportsman that it is time to return to the camp. Arrived there, the canoe is taken out of the water, and turned bottom side up to dry and dry, so that the interior may be smeared with resin before it is launched the next morning.

In the picture of camping scene in the Canadian forests, drawn by Mr. W. A. Rogers, the sportsmen, having returned from a fishing expedition, are preparing supper. Following the cleaning of the fish, the building of a fire, potatoes, oatmeal, and water for tea-making have been set to boil in tin kettles swung by natural hooks from the conveniently overhanging boughs of a tree. While one of the comrades is making ready to fry the fish he has just laid in the hot pan and sizzling slices of salt pork, the other occupies himself in plucking a duck, a trophy of the day's adventures. There is a delight and relish in this repeat of fish and fowl captured and prepared by the hunter, who are to eat it unknown to town dwellers, who must buy their supplies in market. The camper that contemplates the open life in the woods is keen, and there is no doubt that the supper served in the kettles and pans in which it is cooked, will be eaten with tin plates and spoons with a relish. The experienced camper, knowing the disadvantages of *impedimenta*, takes with him to the woods only what is really selected and sufficient in quantity, but simple in nature and variety. That this party has been duly provided is shown by the open box comfortably packed with various articles to help out such fare as they provide for themselves with the rod and gun.

Supper is succeeded by a restful suspension of pipes and the spinning of fishermen's yarns. Unless there is on hand some project of night hunting or fishing, the occupations of the remaining evening are comprised in the cutting of firewood for the morning and the repairing of clothes and camp tackle. Many a night, in the forest, to one who is sympathetic to its voices, is far from being still or lonely. There come from the forest darkness the whp-poor-will's call and the doleful wailing of the owl. From the blackness that shrouds the water rises the shriek of the loon, while nearer at hand are heard the occasional splashes of the muskrat and the crackling of limbs and bushes. Some animal with noiseless footfall reconnoitres the camp. But no sounds or sights are unseen visible to the eyes of the fishermen, who, mindful that they are to turn out early in the morning, soon retire to their blankets, and on the soft hemlock boughs, in cool beds, enjoy the sweet sleep that follows occupations so pleasantly interesting to the mind and healthfully wearisome to the body.

Their slumbers, usually dreamless and unbroken, are sometimes interrupted by some demonstration from the forest's native inhabitants. A party of wolves, or the howling of wolves, or the peculiar screeching cry of a bear may come from afar to their ears. Attracted by the sound, the sportsman Bruin may even venture within the precincts of the camp, to disappear unseen at the first movement of the inmates. A deer or a moose plunges through the stream or draws to the camp by his sense of curiosity, gazes at the fire with large luminous eyes; then

suddenly and unreasonably affrighted, crashes through the undergrowth in precipitate flight. Sometimes an intrusive and malodorous visitor, not to be rashly meddled with, appears in the shape of a prowling skunk, who makes vigorous and noisy efforts to secure the birds hung from a tree limb, or a muskrat, the dread of campers. He may indulge his noisy foraging in the interior of tents, to the consternation of the occupants, who try in the darkness to avoid an encounter, or the inquisitive beast, which at their first movement dashes headlong from the tent, parting generously with his quills to whoever or whatever he rubs against.

But these possible interruptions occur so infrequently as to give only a spile of excitement to the night in camp. At last one of the sleepers, waking refreshed, pulls aside the flap of the tent, and sees through the mist that the stars are paling in the faint but growing light of the morning. There is no time to lose. He rouses his comrade, and, raking the embers of last night's fire together, they hastily prepare coffee, and swallow a few mouthfuls of food. There will be time for a more extensive breakfast at a later hour, when fish will not be so scarce, and so easy to find. Before the eastern horizon has begun to flush pink in token of the coming sun, the sportsman has launched the canoe, and are off for the fishing wharves and water-courses of the sport.

CLARENCE PULLEN.

"BRIGHT DAUGHTER OF THE LAUGHING DAY."

Bear! dashed away of the laughing day,
Of noughted care, and sorrow,
Did Trouble never chase your way,
Nor any imp of care?
Why, sorrow, and weep, my Sweet,
They push each other on the street;
And every good that men pursue
Is haunted by a grief or two.
In church, in school, in play;
At shops, to please the law repair;
Before the prodigal and the play—
We have to come to grief and care.
Yet laugh, sweet Beauty, while you may;
Be reckless while you dare;
And keep with wrinkles and grey hair,
With every charm you bear;
Your morning looks might well defy
The tyrant of the watery eye,
And feast his covetous eyes on you,
Unseen to earth with so much sun!
Yet should we force at length the way,
And come with wrinkles and grey hair,
Your voice would make a dumber gay,
And set the monster dancing there.

DELA READ GOODELL.

A TORNADO'S POWER.

BY WILLIAM A. EDDY.
The abnormal condition of the weather so far in 1890 was well illustrated when a storm, which raged over New York city, on the 8th and 9th of July, did its worst in twenty-four hours. At the same time a series of terrific tornadoes swept through northern New York and the Adirondack wilderness.

On July 13th, at about 5 P. M., a bright Sunday afternoon, thousands of people at St. Paul, Minnesota, were enjoying a picnic in a park-like dense black clouds in the north-east. They correctly inferred that a tornado was about to strike, and they hurriedly ran into the city were greatly excited by the appearance of a funnel-shaped cloud moving toward the northeast, and some gigantic black balloons. The cloud first described as resembling a huge black humming-top, which, although only a few miles away, seemed to be spinning with frightful velocity, as indicated by large flying fragments of trees or houses. For a great distance, and as far as the eye could see in every direction, the clouds seemed to be moving toward a common center—the roaring tornado funnel. All floating masses of vapor near and about the funnel were blown toward the point of the funnel near the ground, and at once disappeared in the swaying mass of blackness, which was a common occurrence. The clouds were blowing and rumbling from the funnel-shaped clouds, like the deep tones of distant thunder.

The clouds that gave rise to this funnel first attracted attention because of their intense blackness. Mr. William J. Freaney, of St. Paul, carefully studied the formation of the clouds, and was accompanied by some other persons who accompanied the main tornado. He first noticed unusual activity in a bank of clouds rather near at hand and high in the air. The clouds were rapidly and gradually, as he watched them, and presently a circular motion began to be manifested by the adjacent clouds. The clouds were gradually formed, and soon absorbed all the patches of light floating clouds near it. As it moved along parallel to the direction by which the observer it gradually withdrew high up into the clouds and vanished. It was an instance where conditions of tornado development rarely occur, but not without sufficient force to enable the funnel to reach the earth. Meantime the main tornado was actively destroying the cottages occupied by summer visitors on the shores of Lake Gervais and Kohlmann's Lake, two small bodies of water less than a mile in diameter, situated about eight miles north of St. Paul. In the cottage occupied by Mr. J. H. Schurmer, shown in the illustration, it will be seen that the entire upper part of the

house has been torn away by the terrific force of the tornado, leaving only a few floor beams attached to the walls. This complete relative annihilation is rare, although in the Jamestown, Ohio, tornado of April 37, 1884, a log building with a cellar wall disappeared, leaving little more than an excavation in the ground. The heavy logs had been carried off by the wind, and the only remaining to tell that the log house had once existed. In the present instance the trees back of the house have been partly spared, but the surface of the earth has been almost clean in the foreground. A number of trees have been torn off some distance above ground, as shown in the other illustration, revealing the usual singular tendency on the part of tornado funnels to spare special trees and objects. The amount of broken timber left near the Schurmer cottage is exceptionally small, hardly much more than was left near the site of the log house at Jamestown. Usually large masses of debris, torn from or once forming part of neighboring houses, are thrown into the cellar or upon the position once occupied by the house.

The cottage of Mr. Good shows the same destructive power at work, and in some respects indicates the direction in which the storm was exerted even nearer the surface of the ground than in the case of the Schurmer cottage. It is going round in the amount of wreckage going round and about a tornado funnel is for the time very great, the destroying force is clogged in special places like the interior of the Schurmer cottage, Signal Corps, United States Army, whose elaborate works on tornado prediction show the same facts. In the case of these instances in which heavy cut-stone buildings have been torn down and the fragments entirely redistributed in irregular accumulations of debris over the ground.

People who were across the lake from the place where these cottages were torn to pieces were torn to pieces and scattered all over the lake, and some of them were killed and others injured. The loss of life occurred on the south side of the lake. As tornado funnels almost invariably move from the northeast, and as these dwellings doubtless faced northward, the occupants probably failed to see the approach of the storm. The people across on the north shore of the lake, whose view of the tornado as it came from the southward was not obstructed by trees, saw the time to seek refuge in their cellars, with the result that no lives were lost, although houses and trees near by were destroyed.

The bodies of people torn down into the lake were found some distance from the cottages in which they had been living, and the same indications that death had been caused by flying missiles propelled with great force by the wind. The bodies of three of those living in the Schurmer cottage were probably blown into the lake, from which they will doubtless soon be recovered.

Lieutenant Dunn, of the Signal Office in New York, points out the fact that just before this tornado a barometric depression, so mild as not to be worthy of the name of storm center, existed in some vague space of perhaps nearly a thousand miles long, and extended far above the Canada line. The wind was blowing from the east, and after a day of only eight miles an hour. But during several days an immense mass of heated air had been accumulating over a circular area of about six hundred miles in diameter, including Nebraska, Iowa, southern Minnesota, Kansas, and Missouri. At some points in this region the heat was intense. The thermometer marked 104° at Omaha, and 102° at both Kansas City and Des Moines. The above mentioned mild barometric depression in Canada, hardly marked enough to cause rain, acted as a centre toward which the intense lower air electrical energy of the air of 56° westward and northward along the Rocky Mountains also joined in this vast mass of blackness, which was a common occurrence. Then, at the two great valleys—St. Lawrence and Colorado air came within range of each other, there was an accelerating movement, in which the air current was driven upward by the surface currents, demonstrating the law, emphasized at so early a date by Lieutenant Finley, that tornadoes are caused by sharp contrasts of temperature over a limited area.

CHARLES FRANCIS BRUSH.

CHARLES FRANCIS BRUSH, M. E., Ph. D., the eminent electrical engineer, was born in Euclid Township, Cuyahoga County, Ohio, March 17, 1849. He is of purely English descent, his parents' ancestors being of the name of Brush, having come to this country from England in 1656 and 1660 respectively. Mr. Brush's early years were spent on his father's farm, having his attendance at a neighboring district school at Wickliffe, Ohio. While quite young the natural bent of his mind of the future inventor began to manifest itself in a number of small experiments at home and at school that indicated his special taste and aptitude for electrical physics, and his interest in chemistry and natural philosophy, as indeed in his other studies at school, young Brush was very proficient. At the age of thirteen

he entered the Shaw Academy, at Collierville, Ohio. While there his first experiments with static electricity, machines, electro-magnets, and batteries, all of his own construction, were made. Early in 1864 he entered the Cleveland High School, where he graduated with high honors in June, 1867. While at the High School in 1864 he became much interested in the subject of microscopes and telescopes, making a number of them for himself and his companions. He constructed every part of these instruments, even to grinding the lenses, and the next year he devised a plan for turning gas on the street lamps, lighting it, and then turning it off again—all by electricity. He soon after constructed a number of induction coils, and greatly amused himself and his school-mates by experiments with them. He also became greatly interested in photography, and did some very creditable dry-plate work, a process then almost unknown. During his high-school course he passed a rigid examination in physics without having studied the subject in any school. The study of chemistry was, however, his chief delight, and he made great progress in this branch of science. During his Senior year, the physical and chemical apparatus belonging to the school was destroyed by fire. In the early time Mr. Brush constructed an electric motor having its field magnets as well as its armature excited by the battery current. He also produced a number of electric arcs, a lamp and battery of his own construction.

The subject of his graduating oration was "The Conductivity of Matter." He then then recent work of Wille with his dynamo electric machine and single electric light in Englewood, Ohio. Mr. Brush traced the chemical energy of the earth to the vegetation of the carboniferous period to the coal subsequently formed therefrom, and then to the steam engine, thence to the mechanical power developed, the electric current, and the electric light, and the electric light having all the characteristics of the original sunlight.

Having graduated from the Cleveland High School, Mr. Brush, in September, 1867, entered the University of Michigan, where he took up a course of study particularly directed toward the study of electricity. He there graduated with the degree of Mining Engineer in 1869, being one year in advance of his class. Returning to Cleveland, he organized a laboratory and conducted the business of an analytical and consulting chemist for about three years, becoming known in 1869 for his work in this line, and the skill displayed in his manipulations. During this period he was employed as "expert" in some minor and litigious questions of chemistry.

In the spring of 1878 Mr. Brush formed a partnership with Mr. C. E. Bingham, of Cleveland, for the purpose of manufacturing and selling Lake Superior and other pig-irons and iron ores. While engaged in this business Mr. Brush was pursuing his investigations, and early in 1876 completed his first dynamo-electric machine. This machine was a distinctly new type, and embodied the first of Mr. Brush's inventions. It was an invention which have made him wealthy and famous the world over.

Early in 1878 Mr. Brush closed his partnership with Mr. Bingham, and from that date devoted his entire attention to the increase of his own wealth by his electrical invention. At that time he also made a partnership with "The Telegraph Supply Company," of Cleveland, by the terms of which that company was to manufacture and sell the sale of electric light and other apparatus patented to him, paying him a royalty thereon. In 1881 the name of this company was changed to "The Brush Electric Company" and its capital stock greatly increased. Early in 1877 Mr. Brush invented and constructed the first commercial arc lamp, and exhibited it in connection with one of his new type of dynamos at the Franklin Institute at Philadelphia, the requirements of which first carried off all the honors, in competition with the other best-known lamps and dynamos of that period. Soon after this, Mr. Brush invented his famous arc lamp, and also a regulating shunt circuit of high resistance. It was this invention which first made commercial success possible, and in it are based all the arc-light systems in use in the world at the present time. It was this invention that protected this fundamental, brilliant, and enormously valuable invention, having not been sustained, not because Mr. Brush was not its first inventor, but because his inventive competitors concluded that he was—but because his claims were not drawn with sufficient care to meet the rigorous technical requirements of which first obtained in the courts soon after its invention.

Among Mr. Brush's other inventions of early date may be mentioned his copper-plated carbon arc lamp, many models of which are now used monthly; his automatic cut-out for arc lamps, now universally developed and used; his arc lamp, and in it, his compound series-shunt winding for dynamo-electric machines, now very generally used for lighting by incandescence; and his multiple arc lamp, which has made his burning. The patent covering this important invention has recently been broadly sustained by the Supreme Court. Mr. Brush at an early date completed his fundamental storage-battery invention, consisting in the mechanical application of the active

material to the electrodes; and subsequently, after four years of constant litigation in the Patent Office, obtained patents therefor. The issue of these patents was followed by nearly four years more of fierce litigation in the United States courts, which has recently resulted in the complete vindication of his claims, securing to Mr. Brush the honor of this great invention, as well as giving him control of all forms of the modern storage battery. Mr. Brush may justly be considered the father of the arc electric lighting industry of this world, an industry in which it is estimated there is invested not less than two hundred millions of dollars at the present time in this country alone. His early commercial success in this direction no doubt stimulated others to doubt and perfect the incandescent electric light, out of which has grown another enormous industry.

Mr. Brush patented many of his earlier inventions abroad, and in 1880 sold these patents to the Anglo-American Brush Electric Light Corporation, Limited. He received in payment both cash and stock of the corporation, the subsequent sale of which, together with the cash payment, realized about a half million of dollars—a price for patents then almost unprecedented. From that time Mr. Brush's wealth has rapidly increased, until now he is many times a millionaire. Mr. Brush early adopted the policy of "keeping out of print." His contributions to the scientific journals have been meagre, and he has avoided technical interviews, preferring to give the world the actual embodiment of a complete and practical invention rather than devote his time to speculations and discussions of his investigations. His researches in chemistry, physics, and electricity have been profound, and his mind, like that of the late Dr. Arnold Guyot, is a storehouse of original knowledge. His conversation, therefore, affords rare pleasure to scientific men who come in contact with him.

Mr. Brush possesses an accurate and available scientific knowledge unsurpassed by that of any inventor. He is intensely practical, never sanguine, with no disposition to overestimate the value of his work; is an excellent business man in the management of his own affairs; and is an officer or director of many large corporations. In Mr. Brush we see one of the finest possible mental and physical specimens of the race—of magnificent physique, six feet two inches high, broad shouldered, with a deep and well-developed chest, and a form as straight as an arrow. It was of him that Gambetta remarked, as he saw the commanding figure of the great American inventor at the Paris Exposition in 1881, "I

do not know which to admire most, his extraordinary mental talents or his magnificent physique." Success has crowned his efforts; his researches have enriched and benefited the entire civilized world, and he has reaped both honors and pecuniary reward. He is Fellow of the American Association for the Advancement of Science, and a member of many engineering societies. At his graduation the University of Michigan conferred upon him the degree of M. E.; in 1880 the Western Reserve University invested him with the degree of Ph. D.; and in 1881, in connection with the Electrical Exposition held in Paris, the French government, in honor of his distinguished inventions and contributions to the world of science, decorated him Chevalier of the Legion of Honor. At the Michigan University he was a member of the famous Delta Kappa Epsilon college fraternity.

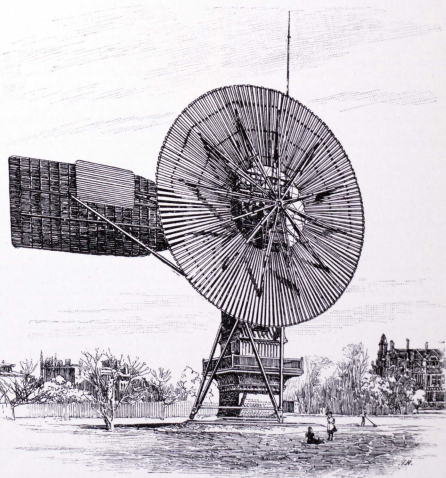
Mr. Brush was married October 6, 1875, to Miss Mary E. Morris, of Cleveland. He has two beautiful children, Edna and Hélène, aged respectively ten and six years. The home of Mr. and Mrs. Brush in Cleveland would form a fit subject for a separate article, located as it is in the best part of the famous Euclid Avenue, and surrounded by a private park of nearly seven acres. The residence, recently completed, occupied six years in building, and during that time was the subject of the constant thought and study of both Mr. and Mrs. Brush. Their individuality may be felt everywhere in the interior arrangements and decorations. The stained glass, mural decorations, hangings, furniture, metal work, and mosaic embody some of the best work of many of the most eminent artists and designers in this country; but the whole combination has been so carefully supervised and directed by the owners that the result is one harmonious whole from the basement to the ballroom, and has been styled by critics a "symphony in art." The building is very appropriately lighted by electricity, and is provided with nearly four hundred incandescent and several arc lights. Mr. Brush's method of operating these lights is, we think, unique. The power is furnished by an enormous windmill located in the park at the rear of the house, and about five hundred feet distant. This windmill is perhaps the largest in existence, the wheel having a sail surface of about eighteen hundred square feet. The tower carrying the wheel and its accessories is about sixty feet high, and is mounted on a massive wrought-iron gudgeon twenty feet long, and set deeply in heavy masonry, thus allowing the tower to turn on a vertical axis when the wind changes direction. The motion of the wheel is transmitted to a large dynamo in the tower by a system of belts and pulleys, the largest pulley being eight feet in diameter, and carrying a 32 inch double leather belt. There being no precedent for a windmill of this character, Mr. Brush had to design every detail and superintend its construction. The whole apparatus, including the electrical detail, is entirely automatic, and requires no attention except to keep bearings oiled. It has been in practical and perfectly successful operation nearly two years, and furnishes far more than sufficient electric current to charge the four hundred and eighty cells of storage battery located in the basement of the house, and connected with the dynamo by underground cables. These storage batteries, from which the house is directly lighted, are so constructed as to give off no fumes, and are perfectly odorless. They require scarcely any attention, and show no signs of deterioration after nearly two years of constant use.



CHARLES F. BRUSH, OF CLEVELAND, OHIO, THE CELEBRATED INVENTOR AND ELECTRICAL ENGINEER.
FROM A PHOTOGRAPH.—(SEE PAGE 583.)



MR. BRUSH'S HOME AT CLEVELAND.



THE COLOSSAL WINDMILL IN THE REAR OF THE BRUSH MANSION.