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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

LESSONS OF THE RHEIMS AVIATION CONTESTS.

The series of aviation contests held last week at Rheims must ever stand out conspicuously in the history of man's age-long attempt to achieve the "conquest of the air." In speed, duration of flight, and stability under unfavorable atmospheric conditions, the achievements have shown a wonderful advance in the art of aviation. It is safe to say that the most significant feature of the contest—the one which is most prophetic of the future serviceableness of the aeroplane—is the way in which the various aviators dared the elements by bringing out their machines and making some of their best flights when the wind was of a strength which hitherto has been considered prohibitive. It was the unfavorable weather conditions, rather than the distance which he covered, that constituted Latham's spectacular flight of 96 miles at a speed of over 41½ miles an hour, the most remarkable performance since the Wright brothers made that first memorable half-mile flight in North Carolina with a power-driven aeroplane.

For it cannot be denied that the reluctance of the aviator to bring his machine from the shelter of its shed, except in the lightest airs, had shaken the faith of the public in the immediate, if not the ultimate, practicability of the aeroplane. That reckless daring of the Gallic character, which did so much to bring out the inherent high speed of the automobile, seems destined to work a similar result in the even more dangerous field of aeronautics. If the cabled accounts of Latham's flight are not over-seasoned with the inevitable enthusiasm of the moment, the behavior of his machine during the progress of a storm of wind and rain was indeed phenomenal. "For an hour," says the dispatch, "with fluttering wings it fought its way against the storm of rain and wind at an average height of 150 feet, mounting higher as the wind rose, until during the worst of the storm it was fully 300 feet above the spectators." But it was reserved for Farman, driving a biplane of his own design, to establish beyond all question the staying qualities of this type. His official record of 111.78 miles in 3 hours 4 minutes 56 seconds and his total flight of 118 miles in 3 hours 15 minutes has carried the long-distance record beyond the expectations even of the most sanguine.

At the present writing the results at Rheims seem to have established the superiority of the monoplane in speed and of the biplane in endurance. Bleriot with a monoplane holds the record for speed with a time of 7 minutes 47 4/5 seconds for a lap of 6.21 miles, although Curtiss in his beautifully designed and built biplane is a good second, with a record of 7 minutes 48 2/5 seconds. The compact little biplane of Curtiss, weighing less than half as much as those of his competitors, won the international cup, over a 12.42-mile course, in 15 minutes 50 3/5 seconds. Summing up the results, it may be said that the brilliant tournament at Rheims has established three facts: First, that the problem of stability has been solved; secondly, that an aeroplane motor has been produced which will run until the gasoline tanks are empty; and thirdly, that the problem of alighting without injury to man or machine is yet a long way from solution. Regarding this last feature, we offer the suggestion that, since the accidents are due largely to the widely extended and delicate wings or planes coming in contact with the ground, a great step toward the perfection of the aeroplane will have been achieved, if some method can be devised by which, at the moment of alighting, the planes can be thrown upward and backward, so as to imitate in some degree the folding of the wings when a bird alights. That the problem would present great mechanical and constructional difficulties, we admit. In a biplane, because of the rigid trussing, it would seem to be impracticable; but it is conceivable that the problem might be worked out in the monoplane.

A SANITARY DRAINAGE CANAL FOR BUFFALO.

The Chicago sanitary and ship canal, 22 feet deep, 160 feet wide, and 32 miles in length, which was cut through for the purpose of carrying the sewage of Chicago clear of Lake Michigan, and so preserving the purity of Chicago's drinking water, has proved to be a notable success. The city of Buffalo is now seeking permission to cut a similar drainage canal, to divert its sewage from the Niagara River, and thereby get rid of what is recognized to be a great menace to the inhabitants of the Niagara frontier. This good work is to be accomplished by the creation of certain artificial channels, into which the effluents from all the sewers can be discharged; and it is a fortunate fact that the geographical location of the city makes it possible to do this, by the construction of what is called the Erie and Ontario sanitary canal. It is proposed to draw 6,000 cubic feet of water per second from Lake Erie; reverse the flow in Buffalo River and Smokes Creek, and carry the diverted water to Lake Ontario through an entirely new canal, at a total estimated cost of $30,000,000.

The mean elevations shown on the United States topographic maps for Lakes Erie and Ontario are respectively 573 and 246 feet. Hence the total difference in level between the two lakes is 327 feet. The channel will be so located and constructed as to make the entire head of 327 feet, less a small loss in the necessary slope for flow, available for the development of power. This means that there will be an absolute conservation of the entire natural energy of the water; whereas most of the powers now existing along the Niagara River use less than one-half of the total head between the two lakes. That portion of the work which lies within the city limits will be built by the city itself. The rest of the canal will be built by private capital; and the residents on the Niagara frontier will be given the perpetual right to drain their sewage into the artificial channels thus created. Relief will thus be afforded to the people who live along the Niagara River, and are dependent upon that stream for their drinking water.

The excavation of the canal will commence at the point where Buffalo River crosses the city line on the east, and it will be excavated of sufficient depth and width to stop the crest of the south Buffalo floods by carrying off the waters of the Buffalo, Cayuga, Cazenovia, and Smokes creeks. The canal will be constructed below all the railroads that enter Buffalo from the east, and will pass through the divide at Williamsville through a tunnel four miles in length. After emerging from the tunnel it will be continued in open cutting as far as the State barge canal, below which it will be carried by a siphon. Here the two canals will be connected by a lock, through which the traffic of the barge canal can be floated to the freight yard at Gardenville and on to Lake Erie, thus providing a barge canal terminal at Buffalo in addition to that at Tonawanda.

If this ambitious scheme were being promoted simply for the development of the 150,000 horse-power for industrial purposes which is the estimated capacity of the canal, the chances of securing government consent to the withdrawal of additional water from the Niagara River would be very small indeed; for there is no question that the governments of the United States and Canada, and the people of both countries are strongly opposed to any further diminution of the flow at Niagara Falls. The hope of the scheme lies in the fact that it will effectually purify the supply of drinking water, not only of the second largest city of the State, but also of the country and towns adjacent to the Niagara River. It is estimated that the construction of the Chicago drainage canal has reduced the high rate of mortality in that city by 51.4 per cent, and similar results may be looked for in Buffalo. Though the Scientific American has always strongly opposed any further withdrawal of water from the upper Niagara River, we think that the withdrawal of 6,000 cubic feet per second to provide this important city with a pure water supply is a proposition which demands the separate and careful consideration of the Federal government.

WHY DO WATCH MAINSPRINGS BREAK?

Your watch has stopped without apparent cause, and you at once attempt to wind it. The crown turns with a new sense of ease; but the operation is endless. Then you learn that a fickle mainspring concluded to resign its task and, well—simply broke. Why? Here is a query that may stand in the company of "Who wrote the letters of Junius?" "Who was the Man with the Iron Mask?" and other unanswered questions of history. The best mainsprings have maintained their right to break ever since modern watches were invented, and they will do so until some secret of Nature, for which watchmakers are still searching, is revealed. Sudden electrical disturbance of the atmosphere, extreme changes of temperature, or contact with a cold substance, will occasionally result in a broken mainspring. Such contingencies are well understood by watchmakers. What is not so well understood is why a spring will sometimes snap in twain or in twenty pieces, despite the best of care. You may ascribe it to a fit of temper or to the dog days, or give any other reason that is neither logical nor horological. The fact and the mystery remain. This spring is a piece of tempered steel, usually about twenty inches long, coiled in a barrel between the upper and lower plates of the movement. It is the motive power of the watch. It is made in degrees of strengths, widths, and thicknesses suitable to the watch. As a mainspring is subjected to varying conditions, from that of highest tension when fully wound to that of comparative rest when the watch is run down, and as it is constantly undergoing a change in resistance as its coils unfold, it seems to be the only part of the watch, subject to casualties, against which even careful use cannot always provide.

It may be well to state, just here, that all watches of a given make and size do not properly take the same strength of spring. A variation in thickness of only two one-thousandths of an inch may be the measure of the difference between the right and the wrong mainspring for your watch. Here is the field of the qualified watch repairer. To fit a mainspring requires some deftness; but to fit the proper one demands practical experience and judgment. If your watch is worthy of a spring at all, pay a competent watchmaker a proper charge for a good one.

But the question, "Why do watch springs break?" remains unanswered, and the puzzle is still further complicated when we are informed by one of the largest manufacturers of watches in the world, that a sudden spell of hot weather is invariably succeeded by a noticeable increase in the number of complaints of broken watch springs. At first thought this information is puzzling. A sudden drop rather than a sudden rise in temperature would seem to be the natural predisposing cause. Cast metals show greater brittleness at low temperatures under all kinds of stress, and steel and iron, though at low temperatures they show but little loss of strength under static or under gradually applied stresses, show a marked loss under impact or sudden stress.

We can understand the breakage of a mainspring when, in very hot weather, the watch is taken from a heated trousers or vest pocket and laid suddenly on a cold marble or iron slab; but how shall we explain the sudden breaking of the spring while the watch is running undisturbed in the pocket? Here is a question which we commend to consideration and discussion by our readers.

THE FIRST VOYAGE OF THE "ZEPPELIN III."

The new "Zeppelin III." dirigible, after a trial flight of over two hours on August 26th, started on a trip from Friedrichshafen to Berlin at 4 A. M. August 27th. The journey was to be made *via* Nuremberg, Leipsic, and Bitterfeld, the total distance in an air line being about 400 miles. After covering 280 miles, the airship descended at Nuremberg, at 4:45 P. M., to effect repairs to one of the motors and also to one of the propellers. The first descent was made at Ostheim shortly before noon, for the purpose of taking on water ballast. The airship reascended at 2:30, and reached Nuremberg, 80 miles distant, in two and a quarter hours, an average of 35 miles an hour. From Friedrichshafen to Ostheim it averaged 25 miles an hour. Count Zeppelin awaited his new craft at Bitterfeld, which point it was expected to reach without a stop. It was his intention to pilot the airship himself from that place to Berlin, where the Emperor was awaiting him.

This new airship has two 150-horse-power motors, and is the most powerful air craft thus far produced.

In a new English gas works it was observed that incandescent gas mantles rapidly diminished in brightness and acquired a brown incrustation, which was found to consist of ferric oxide. By examining the gas at various stages of manufacture it was ascertained that the finished product contained the compound carbonyl of iron, formed by the action of the carbon monoxide of the gas upon the iron pipes through which the gas passed at comparatively low temperatures in the later stages of the process. No iron compound was found in the gas discharged by the retorts and the hottest pipes. Carbonyl of iron is not affected by dilute hydrochloric acid. When the gas is burned the carbonyl of iron is decomposed into iron and carbon monoxide. A few weeks later, the production of carbonyl of iron was found to have diminished considerably. Hence the conclusion was drawn that the interior of the pipes had become coated with tar and naphthalene which protected the iron from the action of carbon monoxide.