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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.

THE SUCCESSFUL DEFENDER OF THE INTERNATIONAL MOTOR BOAT CUP.

The surprising speed shown by "Dixie II." in a series of trials over a mile course, which were held on the day succeeding her successful defense of the British International Motor Boat Cup, establishes her position as the fastest motor boat in the world. The details of her performance in the international race, when she defeated with comparative ease two boats, each of double her own horse-power, will be found on another page of this issue. With a view of determining exactly how fast "Dixie" could be driven, her owner decided to have the boat tried out on the measured 1.1-mile course of the New York Yacht Club in Hempstead Harbor, which was surveyed by the United States government for such trials. In four runs over this course, two with and two against the tide, the "Dixie II" made an average speed of 31.05 knots. In view of the fact that the boat might possibly establish a world's record, the greatest care was taken to have the timing perfectly accurate. The times were taken at one end of the course by Messrs. J. Frederick Tams and Ernest E. Lorillard of the Regatta Committee of the New York Yacht Club, and at the other end by the yachting editors of the New York Sun and of the SCIENTIFIC AMERICAN, a system of cross checks on the timing being used to eliminate any possibility of error. This fine performance marks the "Dixie" as the fastest boat of her size in the world. The best previous speed over the measured mile was made last spring by the "Wolseley-Siddeley," when she averaged 30.3 knots on the measured Admiralty mile in Stokes Bay, England.

The success of "Dixie II" proves that the race is not always to the strong; for her two competitors carried, in the case of the "Wolseley-Siddeley" two 200-horse-power engines operating twin screws, and in the case of "Daimler II" three 175-horse-power engines driving three screws. Each of the three boats is just under 40 feet in length. The English, who sought to obtain high speed by the use of big horse-power, concentrated their attention upon the engine, apparently considering the hull merely as a weight carrier; and they neglected those refinements of form which are so essential to success, particularly at the higher speeds. The American boat was designed by Clinton H. Crane, of the firm of Tams, Lemoine & Crane of this city, who decided that the chances of success would lie with the boat which embodied great refinement of form with moderate horse-power; that is to say, moderate in comparison with the enormous engines carried by the challenging boats. The lines of the "Dixie" were developed as the result of careful towing-tank investigations made at the government model basin at Washington. The hull is constructed with extremely light but carefully proportioned scantling, covered with a single skin of mahogany sheathing. The engine is of the 8-cylinder, V type, with the cylinders inclined at 45 degrees from the horizontal; and although it is capable of developing as high as 230 horse-power, its weight is but 2,150 pounds. It was designed by Mr. H. M. Crane, brother of the designer of the "Dixie II," specially for this type of boat; and its running, as observed by the writer during a short trip at 31 knots, was remarkably smooth and free from vibration. The propeller, which has been developed from experience gained with previous high-speed boats, showed in tests the high efficiency of 70 per cent. The total displacement of the boat when she ran her mile trials was only 4,700 pounds with full equipment aboard. The success of the "Dixie" is rendered the more creditable, when it is known that she had but one week available for tuning up; and her brilliant victory is to be compared in its international importance with the success which has attended the defense of that coveted trophy of the sailing yacht, the "America" cup.

A CRUISER-BATTLESHIP HOLDS THE TRANSATLANTIC RECORD.

When the "Lusitania" recently broke the transatlantic record by covering the distance from land to land at a speed of 25.01 knots, it was presumed that she had placed the figures at a mark where they would stand for many months to come. Outside of her disabled sister, the "Mauretania," there was apparently no vessel in sight that could come within several knots of that speed. Certainly, it was not for a moment supposed that a cruiser-battleship carrying an armament of eight 12-inch guns would be able to set out and better the performance; yet this is what has been done by the "Indomitable," one of three "Dreadnought" type of cruisers recently built for the British navy. The feat was accomplished on her return with the Prince of Wales from the Quebec celebration. It is claimed that on her trials the ship made 27 knots for several hours; and advantage was taken of the opportunity for a long ocean test to drive the ship under full power from land to land. The average speed of the "Indomitable" for the whole course was 25.13 knots, and for four hours in the early part of the voyage she made 26.4 knots. Incidentally, she also captured from the "Lusitania" the record for the highest single day's run to the westward, by steaming 605 knots from noon to noon. The vessel was not in any way stripped for this performance. All the heavy guns were on board, the magazines were filled with ammunition, and she carried the full equipment of active service. The best previous transatlantic trip by a warship was made by the cruiser "Drake," on her return trip from America a few years ago, when she averaged 19 knots. Our own cruiser "Columbia," more than a decade ago, established the first record of this kind by steaming from the British coast to Sandy Hook at an average speed of 18 knots.

This performance of the "Indomitable" will be hailed with delight in the camp of those naval strategists who believe in the strategic value of high speed in warships. Here, they will say, are three huge vessels of between 17,000 and 18,000 tons displacement, the "Indomitable," the "Inflexible," and the "Indefatigable," mounting among them no less than twenty-four 12-inch guns, or as many guns of that type as are carried on any six of our battleships, which, in five days' time from the date of leaving the British shores, could drop anchor off Sandy Hook. It can no longer be questioned that the great improvement in the reliability of the marine engine, due to the perfecting of the steam turbine, has greatly increased the value of speed in warships. It is conceivable that situations might arise in the course of a naval war, in which this power of concentrating a large number of high-powered, armor-piercing, guns swiftly at some point where the strategical situation of the enemy was weak, might change the whole character of a campaign. Three "Indomitables" attached to an admiral's fleet might have the same important bearing upon the issues of a season's campaign as Stonewall Jackson's swiftly-marching and hard-hitting brigade in the earlier years of the civil war.

THE ZEPPELIN AIRSHIP DISASTER.

The SCIENTIFIC AMERICAN shares sincerely in the universal sympathy which has been expressed for that indomitable inventor, Count Zeppelin, in the sudden and absolute destruction of his great airship. Although it has for many years been our conviction that, because of the great area which it exposes to the wind, the dirigible balloon is at its best a precarious means of air navigation, we have always appreciated the intelligence and courage with which the Count has persevered in his attempts to bring the practical out of the impractical. The failure is not to be set down to any lack of skill or forethought on his part; it is due rather to certain fundamental principles, which govern the whole theory of the dirigible balloon—principles which, like sunken rocks at sea, are an ever-present menace, and are liable to wreck the ship of the air with the swift and unheralded destruction which marks so many marine disasters. We refer to the fact that the very size and bulk which give to the airship its undoubted advantages of buoyancy, steadiness, and lifting power, expose this type to almost certain destruction, should it be struck by a sudden squall when it is anchored near the earth. Moreover, it is by no means certain that the dirigible, though constructed with the skill shown by Count Zeppelin in his latest airship, would be able, even if far above the earth, to stand the wrenching and twisting stresses, and the fierce vortices, which are liable to occur in a heavy windstorm.

The dimensions of the wrecked balloon have not been given out officially; but it is believed to have been something less than 450 feet in length by 45 feet in diameter. It is probable that the projected area in a longitudinal vertical plane, if we include the supporting framework, the engines, propellers, and working platform, was not far short of 18,000 square feet. Engineers, in determining the wind stresses to which bridges and tall buildings are exposed, adopt a maximum of 30 pounds to the square foot as representing the average pressure in a heavy wind storm over a large surface. The strength of the first rush of wind in a thunder storm, such as that which wrecked the Zeppelin airship, might possibly be sufficient to reach the 30-pound unit pressure, in which case the whole structure would be subjected to a broadside pressure of over 250 tons. End-on, the pressure would not be much less than 28 tons on the projected area. But even in a moderate breeze, the area is so great that the side pressure would easily amount to from 20 to 30 tons. It is evident at once that, under such conditions, the balloon, if anchored, must necessarily be swung over and dashed against the ground; and that, when in the air, even if it possessed sufficient strength to resist the distorting strains of uneven and fierce air blasts, there would be no alternative but to be blown before the gale.

Shortly after the completion of its 220-mile 12-hour flight from Lake Constance to Lake Lucerne, as described in previous issues of this journal, the Zeppelin airship "No. IV." was considerably damaged by being blown against the side of its floating shed when it was being towed out, and about a fortnight was spent in effecting repairs. On August 4, at 6:30 A. M., Count Zeppelin made his final attempt at accomplishing the 500-mile, 24-hour journey required by the German government before it would purchase the airship. The weather was propitious, and the huge air vessel made another record-breaking flight. Its objective point was Mayence, on the Rhine; and accordingly the course followed was westerly along this river to Schaffhausen and Basle and then northerly above it. About nine hours after it started, the airship descended upon an island in the Rhine at Oppenheim, some eight miles from its destination. The distance covered was about 260 miles, so that an average of 29 miles an hour had been maintained, despite the fact that the airship had stopped to perform evolutions above some of the cities it passed over. Several hours were spent in repairing the driving mechanism of one of the four propellers, and finally, about 9 P. M., the huge air craft reascended, and 1½ hours later was seen above Mayence. It started at once upon the return journey, but the 110-horse-power motor in the forward car gave trouble, thus making it impossible to travel at more than half speed. During the night, the airship was sent to an elevation of 6,000 feet, and the loss of gas occasioned by this maneuver made it necessary to land. The airship alighted without trouble at Echterdingen, near Stuttgart, and some 75 miles from Friedrichshaven, about noon on August 5, and its navigator telegraphed for extra cylinders of gas, and set his mechanics at work repairing the motor. The airship was anchored in a large field, and was guarded by a detachment of soldiers. While Count Zeppelin was at lunch at a nearby inn, a storm suddenly arose and buffeted the airship so heavily that it broke away and burst. The hydrogen ignited in some mysterious manner, and the colossal airship was quickly destroyed.

It is true that, at the present stage, the aeroplane, although its exposed area as compared with the dirigible is insignificant, is hampered by its lack of stability and the difficulty of control in strong winds. Moreover, like the dirigible, it is at present severely handicapped by the necessity for having a smooth, wide, and level space for starting or alighting. Brilliant as the work of Farman has been in France, there is a world of significance in the fact that his ascents at Brighton Beach were made only when the wind had died to a gentle zephyr. Some day, however, the problem of automatic control will have been introduced into the aeroplane. The weight per horse-power of the engine will have been even further reduced; and the speed will have been raised to such a high figure, that the aeroplane of the future will be able to rise from an area of ground of reasonable dimensions and alight upon the same, in winds of considerable strength; and, when once in the air, it will be as perfectly poised and manageable as a well-found yacht upon the water. But that time is, as yet, far removed; although the Wright brothers and Farman believe it is much nearer than the public generally suppose.

MAY A MANUFACTURER BUY A PATENT, NEVER USE IT, AND SUE FOR INFRINGEMENT?

In an infringement suit brought by the Eastern Paper Bag Company against the Continental Paper Bag Company, the question came up: Can a manufacturer buy a patent, tuck it away in a pigeon hole without ever using it, and then sue another manufacturer for infringement? It is held by the Supreme Court of the United States in an opinion written by Mr. Justice McKenna that a court of equity has full power to restrain the defendant in such a case, whether or not the complainant unreasonably withheld from the public the benefits to be derived from the invention covered by the patent.

That the decision is sound follows from a consideration of an inventor's rights under the patent laws of this country. The inventor receives nothing from the law that he did not already possess. A patent operates merely to restrain others from making and using for a limited period what he has invented. If he so chooses, an inventor may keep his discovery to himself. He is given a monopoly by patent in order that he may be induced to disclose it. The franchise which a patent grants consists altogether in the right to exclude every one from making, using, or vending the thing patented without the permission of the patentee. If the patentee sees fit not to use his device, he has but suppressed his own. His title is exclusive. He is no more compelled to work his patent, than the owner of a piece of real estate is compelled to build a house upon it.

COLOR-BLINDNESS.

BY J. F. SPRINGER.

When you stand upon some mountain top gazing at the wonderful display of colors emblazoning the western horizon just after the fiery globe of the sun has sunk from sight, do you ever wonder whether the friend by your side sees precisely the same thing? When you see that stream of red in the sky, what does he see at the same place? Something beautiful, no doubt, and something he calls red as well, as you. But is his red your red? When he points admiringly to another point of the sky, and you join in his wonder and enjoyment, is it just the same sensation that is produced in both minds? These are questions that can not be answered with certainty now, and perhaps science may never be able to do so. Still, we continually assume that what one person sees or hears or smells, another perceives—the one sensation being the duplicate of the other. And there is a very great probability that this assumption is correct or approximately so.

But John Dalton, the celebrated originator of the atomic theory, had a vivid awakening on this subject in his boyhood. While he was watching a British military display, he wondered at the comments made on the gorgeous red coats of the soldiers. When he asked wherein the color of the coats differed from that of the grass, he was answered with derision. Then he awoke to the fact that his vision was different from that of others. He was what we now term color-blind. This was a new thing then. In fact, it was the researches of this same distinguished man that attracted the attention of the scientific world to the subject. He described his own case with great minuteness and care, and compared it with other cases. Pink appeared to him by daylight nearly equivalent to sky-blue. Crimson was muddy blue.

The subject of color-blindness has attracted a great deal of attention from Dalton's time to the present. This has been due in part to the fact that colored signal lights are in common use on shipboard and in the railway service. Hence the subject has assumed a practical aspect.

It is interesting and rather curious to know that few women (less than one per cent) are color-blind. On the other hand, about three or four per cent of males have this defect of vision. Color-blind persons are not all affected in the same way. Thus Dalton was red-blind, while Prof. Nagel of Germany, one of the principal investigators of this subject at the present time, is green-blind. These are instances of the two great classes constituting well nigh the whole number of those affected. There are in addition a very few cases of violet blindness and total color-blindness. Persons blind to one fundamental color are technically called *dichromats*. Those who have no color sense, but perceive merely differences of shading, are called *monochromats*.

There are numerous methods of testing for color-blindness. One of the most popular is the Holmgren test. In accordance with this method, the subject has placed before him a large number of skeins of worsted colored a great variety of shades. The person being examined is requested to sort the shades, placing those belonging to a dominant color together. If he is a typical red-blind person, he will put the red shades with the grays, unless they contain more or less yellow. The greens he will put with the yellows, unless they contain blue. If he is green-blind, he may be expected to have a tendency to put the greens with the grays and the reds with the yellows.

Such persons are evidently unfit for an engineer's position in the railway service. The railways accordingly seek men without these defects.

The subject is of importance to the traveler because the night signal for danger is a red light, and that for caution is a green one. As an engineer has a number of duties to perform in addition to watching for signals, and as the signals, moreover, may appear under very unfavorable circumstances, it would seem to be the greatest of follies to put in charge of the engine a man who doesn't know red or doesn't know green when he sees it.

But is it enough merely to eliminate the man who is distinctly color-blind? Prof. Nagel has called attention in a very emphatic manner to the unsuitability of a class of persons intermediate between the normal and the color-blind. These would be able to pass the usual tests. At the same time, under unfavorable circumstances they are liable to make mistakes in distinguishing colors. Some of these unfavorable circumstances are precisely those which occur in practical railroading. Thus a very faint light or a number of differently colored lights shown simultaneously lead to errors. And even when the correct decision is ultimately reached, there is frequently so much vacillation and hesitation that the swift and unhesitant decision that may become necessary at any moment in the engineer's cab is something not to be depended upon. These abnormals (or color-weak persons) should not be employed in a position where lives may be lost through their inability to read the signals with quickness and certainty. In fact, when we consider that signals must often be read through smoke and rain, or hail, or snow, or mist, and that they are often obscured through discolored glasses and on account of dimly-burning flames, we feel that none but the very best of normal eyes should look through the windows of a cab.

However, Prof. Nagel has not left this matter of the unfitness of the abnormals to academic discussion. He has designed and carried out a number of experiments upon color-weak persons, and has reached pretty conclusive results. The experiments referred to were performed in the laboratory. The subjects were allowed all the time they wished, so that they may be regarded as having been favored by the fact that they were tested indoors. Their errors must be looked on as a minimum. That is to say, if they had been upon the road in actual service, the mistakes would probably have been more. The subjoined table represents

EXPERIMENTS UPON THREE ABNORMALS (COLOR-WEAK PERSONS).

Experiment 12, Subject: K. (Red-Abnormal.)		Experiment 15, Subject: S. (Red-Abnormal.)		Experiment 14, Subject: Dr. A, (Green-Abnormal.)	
Shown.	Named.	Shown.	Named.	Shown.	Named.
w 2	w	....	....	....	.....
r 2	r	r3 r4 w3′	r? r? g	g3	w
r 3	r	w3 g4 g3	r w(g) w(g)	w5′	w
g 3	g	g6 w6′ r3	g w r	r3′	r
g 2	g	r6 r6 w3	r r g	g2	g
w 1	w	r5 r3″ r6	r g r	g4′	g
r 4″	r	g6 g3″ g6	g g g	g6″	w
r 2″	(r?)g	w2 r3 w6	? r w	r6″	r
g 1	g	w4 r6 w6″	g r g	w5″	r(w)
r 2	r	w2 w6 w6	? w w	g3	r
r3 w3 r3′	r w g	r4 r2′ r6	r g r	g3′	r
r2 w2 r2	r(g) w g(r)	r6 r2′ r6	r g r	w3″	g
r2 w1 r2	r g r	r 2	r?	w3′ r4 r5	g w w
g 1′	g	g 6	g	w3 w5 w6′	g g w
w3″ r3 r3	g r g	g 5′	g?	r3 r5′ r6′	r r r
r3 w3″ r3	r g g	r 2	r	r3 w5 r6	r g r
w3 w3″ w3	w r w	w 4′	(w, r?)	r6 w6″ r6	w g r
g3 r3″ g2	w r g	w 2′	(w, g?)	r6 r3″ r6	r g r
r6 w3″ r5	(w)r g r	w 3	r	.....	...
w3 r3 r5	r w r	....	....	.	.....
w3″ r3 r5	g r (g)r	....	....	.....	.....
w3″ r3 r5	g r (g)r	....	....	.....	.....
w6 r6 g6	g r g	....	....	.	.....
w 6	w	....	....	.....	.....
w 6″	g	....	....	.....	.....

three different experiments. The letters *w*, *r*, *g* represent the three railway colors, white, red, and green. The figures placed after the letters represent openings of six different sizes through which the lights were shown. The sizes varied from 1 to 6 millimeters in diameter. The object of this was to imitate the conditions of lights placed at various distances. The marks ′ and ″ are to be taken as indicating the insertion of one and two ground glass screens for the purpose of dimming the lights.

It will be noticed in experiment No. 12 that the subject actually pronounced a red light (*r*2″) to be green, although a single light at a time was shown. Looking at the single exposures of experiment No. 15, it will be noticed that the subject seemed to waver a great deal, and even pronounced a white light (*w*3) to be red. In the single lights of experiment No. 14, there are a number of positive errors. Observe next the cases in all three experiments where three lights were shown simultaneously, and it will be seen that errors are quite numerous. It should be borne in mind that these persons were not color-blind, but merely color-weak.

Prof. Stratton of the Johns Hopkins University has been bringing a pretty strong indictment against the lights themselves, even in the case of the normal eye. Thus, the light of safety is the so-called white light; that is, the ordinary house light uncolored. When such lights are out at locations on the road where they should be burning, the engineer should suspect something wrong. As this light is precisely the same as that used for ordinary household purposes, there is always present the danger that the safety light may in reality be out, but the engineer may think it is burning and that consequently all is clear because he sees some other light which in reality has nothing to do with the railway service. This is not merely a theoretical objection. Several cases of wrecks are cited due to this cause.

The green light—warning to be cautious—is very susceptible to smoke. This constant incident of railroads has the effect of rendering green lights pale and sickly. They are then liable to be mistaken for white; that is, for a safety signal. The point is obvious.

The objections against the red light are peculiarly weighty. This is the danger signal. Accordingly, there should be nothing weak or uncertain about its note of warning. The color itself is good. When brilliant, it is very effective. But, in order to get a red light, a piece of red glass is placed in front of a colorless light. The red glass arrests all the rays from the colorless flame except the red ones. These it permits to pass through. And thus the light appears to shine with a red glow. But this effect has been secured at the expense of a great loss of intensity. The rays which have been stopped and not allowed to pass are of course ineffectual in acting upon the eye. Only a remnant (that is to say, the red rays) of the light proceeding from the flame actually reach the eye. It is calculated that the intensity should be about one-fifth. But actual tests show that the red was weaker than even this paltry amount. Apparently, the tests have been made with lights barely able to be discerned. Outside, where smoke favored the red, it was found necessary to increase the red to about fourteen times the intensity of the white light in order to render it visible, and in the laboratory, to about eighteen times. But these are best results. On the average, about thirty to one is the ratio.

Prof. Stratton advocates discarding the color system in favor of signaling by a *movement* of the light, or by showing signal lights which depend upon their form for their significance. The suggestion is made in connection with the latter to use the horizontal, the slant, and the vertical lines. With incandescent lines of considerable length and marked intensity. this would seem to yield a capital system.

MILITARY BALLOONING IN JAPAN.

It is well known that up to the time of the Russo-Japanese war, military ballooning was organized in a somewhat rudimentary fashion in the Japanese army. During the siege of Port Arthur the two adversaries made a frequent and successful use of strategic observations which were carried out in balloons. It appears that Japan is to take up the question of military ballooning from now on, recognizing the great services which this will render for the army, and the latter will no doubt be equipped with an aerostatic corps analogous to the ones which the other leading armies employ. A special commission was sent not long since from Japan to Europe in order to observe the organization and material of the different armies and to become familiar with the different features of ascensions and handling of balloons. At present this commission is in Germany, where it has been for some time past. It has already purchased two balloons in that country, and these will no doubt be employed for military use rather than for sporting purposes, although the latter may also find a development in Japan before long.

THE CURRENT SUPPLEMENT.

A graphic account of a trip in the Zeppelin airship opens the current SUPPLEMENT, No. 1702. A system of storing and distributing benzine and other inflammable liquids without danger of explosion is described. William O. Webber writes on the comparative costs of gasoline, gas, steam, and electricity for small powers. "New Forms of Steel for New Uses" is a review by R. B. Woodworth of the development of structural shapes rendered necessary by the increasing use of steel for building. In an article entitled "Weight of Marine Turbines" some new and valuable information is given. The fact that ozone is an efficient destroyer of odors of every kind is generally recognized. Ozone is employed extensively in Germany for purifying the air of rooms. Dr. G. Erlwein, to whom credit for the German system is largely due, contributes an article on the subject which will prove most interesting to American ventilating engineers. W. F. Stanley's excellent paper on Prehistoric Man is concluded. June 19, 1907, a new phenomenon disclosed itself in the Saturnian ring system. Prof. Percival Lowell describes the phenomenon under the title "The Tores of Saturn."

Attention is again called to the approaching meeting of the First International Congress for the Repression of Adulteration of Alimentary and Pharmaceutical Products to be held in Geneva on September 8, 1908. A large number of members from the United States have already joined, but it is desirable to have the largest representation possible from this country. The congress is held under the auspices of the White Cross Society and the Swiss government. The fee for membership is $4. Dr. H. W. Wiley, of Washington, D. C., chairman of the American committee, will undertake to forward names of members and their subscription. Reduced rates will be given on steamship lines and on European railroads. Information will be sent by Dr. Wiley to all persons who desire to be apprised regarding the details of the congress. Intending members are urged to send in their subscription at once.