the danger involved, for it must be remembered that the racing of the propeller is a most frequent source of danger in a screw engine, besides the risk of breaking the main shaft and consequent total disablement of the boat. Further, there is continual risk of fouling the screw with wreckage, or breaking it when taking the ground, and, lastly, the auxiliary power derived from the sails would be greatly reduced by the dragging of the screw propeller through the water.

Therefore both these types of steam vessels, admirable as they are in their own particular spheres, must be always impracticable for lifeboat service, and having this in view, it was considered that the hydraulic principle alone remained. This type, therefore, having been finally adopted, it only remained to fit the machinery into a vessel sufficiently strong, light, seaworthy, handy, and fast. Neither time, pains, nor expense was spared in order to obtain a boat with the greatest possible strength compatible with lightness. The very best steel procurable was employed in her construction, having been first submitted to the severest cold tests. The riveting is a special feature, being far in excess of that usually employed in torpedo boats and similar vessels. This is attested by the fact that in this little vessel, only 50 feet in length, there are no less than 72,000 rivets, exclusive of screw bolts and fastenings in connection with the machinery. The strength and seaworthiness is further amplified by a complete system of subdivision of longitudinal and transverse watertight bulkheads, giving in all fifteen watertight compartments, each of which can be rapidly drained by bilge pumps and steam ejectors.

Great attention was paid to insure stability, and several tests were made, one being of a very practical nature. All the weights were placed on board, and a heavy parbuckle was passed completely round the vessel. The end of this was fastened to a powerful steam crane furnished with a dynamometer, and the boat was then inclined until she lay entirely on her beam ends. In this position lack of stability would have been apparent by her turning completely over, which she was quite free to do, but so confident were the designers of the accuracy of their calculations (which showed that the boat possessed righting powers to 110°), that two members of the firm of contractors remained on board during the whole experiment.

The well, perhaps the most important feature to a shipwrecked crew, is capable of comfortably accommodating thirty passengers, and is situated abaft the machinery space. The bottom and sides of this well are furnished with ten large freeing valves, which will promptly clear it of water in the event of its being flooded. It is surrounded by substantial teak lockers, forming seats, and its deck is covered with teak gratings. Under this deck are two water tanks, holding one ton each, and which represent the weight of a shipwrecked crew. When leaving for a wreck they will be full, but on returning the water can be pumped out if necessary by the donkey engine.

A number of visitors, among whom were Mr. Charles Dibdin, the secretary of the Lifeboat Institution, and Capt. the Hon. H. W. Chetwynd, R. N., Chief Inspector of Lifeboats, recently made a trip from Blackwall in the new boat, with a view to inspecting her capabilities. The measured mile sea trials gave a mean speed of 8·424 knots. Tests were also made with her maneuvering power, which proved to be remarkably good, both by rudder and turbine. Going at full speed, she made with rudder a half circle in thirty-five seconds, and the full circle in fifty seconds. Going slowly, with rudder and turbine, she made the full circle in forty seconds, and with turbine alone in fifty-two seconds. By working the levers on deck the boat was brought from full speed to a dead stop in thirty-two seconds, and from a dead stop to full speed in four seconds.

These tests, which were conducted with the greatest accuracy, proved conclusively how entirely the vessel is under the control of the officer on deck, without necessitating any communication with the engine room.

THE ELECTRIC RACE COURSE.

Whatever may be the opinion that is held as to horse races and their moral influence, it is none the less certain that they offer an irresistible attraction to a large number of persons, and that this growing passion prevails equally in all the degrees of the social scale. Bold innovators have seen a vein to be exploited in the racing mania, and the game of the miniature horse race, an always popular pastime at bathing resorts, is only one of the more happy forms given to true races with a view of prolonging the excitement of betting, of the unexpected, and of chance, at times when genuine racing could be done only with difficulty and would attract too small a number of persons. The electric race course that we are now going to present to our readers occupies a place just between genuine races and the miniature horse race. It is, in fact, a happy alliance of genuine races, the game just mentioned, hobby horses and electricity. Taken as whole, it consists of a certain number of hobby horses, half natural size, each moving over a circular track under the influence of an individual motor and receiving the current of a single generator, but in an independent manner, thus securing a perfect autonomy to each courser, qualified, moreover, by the surveillance of the electrician who directs the steeds and makes a sort of despotic anarchy of them. The horses are ridden by children and even by grown persons, and it is in this that they resemble hobby horses, although the possibility of imparting different speeds to them permits of their being passed by competitors and of passing the latter in turn, thus increasing the excitement of the riders. Bets may be made, of which the chances are just as certain as those of the play of odd and even upon the numbers of the hacks traversing the boulevards.

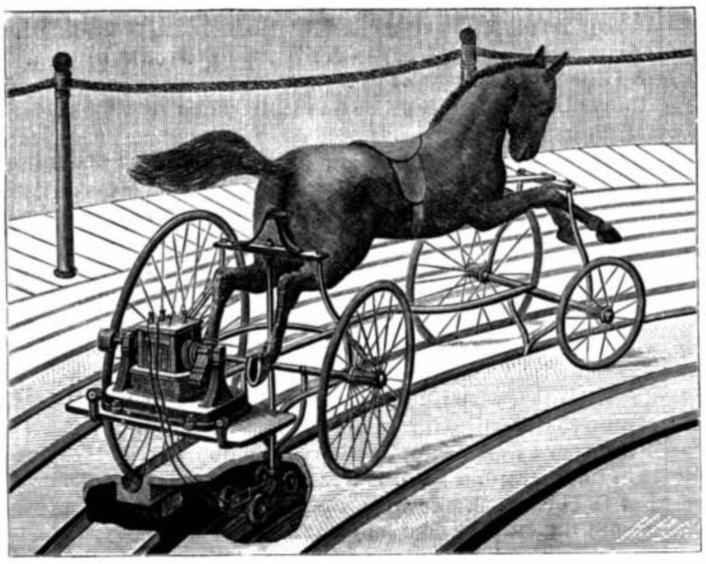

Fig. 2.—MECHANICAL HORSE.

Mr. Salle's race course constitutes an interesting application of the carriage and of the distribution of motive power by continuous currents. The installation realized at Nice (shown in Fig. 1) comprises a 12 horse power gas engine that actuates a Rechniewsky dynamo with double winding, which sends the current into six electric motors of a power of 1,000 watts each, mounted in derivation upon the machine and setting in motion a horse on wheels whose speed, starting and stopping, is, for each one, entirely independent of all the others.

Fig. 1.—ELECTRIC RACE COURSE AT NICE.

About the motor and dynamo there is nothing peculiar. The electric motor—a dynamo of small size—is arranged behind each horse (Fig. 2). When the circuit of the dynamo is closed, all the horses start at once and take on relative speeds that are so much the greater in proportion as the circle upon which they are placed has a greater radius. The speed of each horse, moreover, can be regulated at will by means of a rheostat interposed in its particular circuit. An interrupter permits of stopping any horse whatever without interrupting the movement of all the others. All the motions are controlled from the post of the electrician, who, standing upon a lateral stage, overlooks the entire track, and can watch and regulate what takes place upon it, for, upon a horizontally arranged board, he has all the maneuvering pieces necessary for the play. These pieces are, in the first place, a main commutator that cuts the circuit from all the horses at once, then six individual commutators for each of the horses, six rheostats interposed in the respective circuits of the six motors and permitting of regulating the angular speeds of each horse, and finally an exciting rheostat of the dynamo machine that permits of varying the speeds of all the motors at once in the same ratio.

It is, therefore, possible, by maneuvering these different pieces, to regulate the general or particular gait of each horse, and to stop any one of the horses almost instantly if an obstacle falls upon the track or if one of the riders becomes suddenly indisposed.

The driving of the motive wheel by the motor is done by direct contact. To this effect the large wheel is provided with a rubber tire, against which the pulley of the motor bears. The friction thus obtained is sufficient to carry along the vehicle, which, with the rider, weighs a little less than 650 lb. The mean speed is 13 feet per second, but the horses placed at the circumference can obtain a speed of 16 or 18 feet, a velocity that is not prudent to exceed, nor even reach, on account of the difficulty the rider would have in holding himself in equilibrium and the feeling of dizziness that he might experience.

The vehicle upon which each horse is mounted merits special mention, because of the arrangements made to prevent upsetting. Each of the four wheels has a different diameter. Their two axles converge toward the center of the circular track upon which each horse moves, and the axis inclines toward the center.

Each pair of wheels, therefore, constitutes a true rolling cone whose apex passes through the central point of the track situated upon the horizontal rolling plane. The inequality of the wheels naturally makes it necessary to employ but a single driving wheel, and to mount the four wheels loose upon the axles. Owing to these arrangements no tendency to derailment has shown itself, even with speeds of 22 or 16 feet per second upon curves of 13 feet radius.

Two small rollers placed upon the track tend to prevent an upsetting under the action of a lateral thrust or a strong impulsion. The track consists of a single tram rail, with which engage the two external wheels. This rail serves as a guide and suffices to prevent derailment. The current is led to each motor by two rollers moving over two circular metallic bands in direct communication with the poles of the dynamo, through the intermedium of the maneuvering board, thus permitting of varying the speed of each of the horses, and even of stopping the latter by interrupting the circuit.

In a course organized with a view to betting, we proceed as in the miniature horse race. The six racers having been started at full speed, the current is suppressed from all the horses at the same instant. They continue to roll by virtue of the velocity acquired, and stop successively in variable positions on the course. It is the horse that stops nearest the goal, but does not get beyond it, that wins the race.

Such are the principal arrangements of the electric race course that was operated at Nice last winter. Mr. Salle, in the presence of the success obtained, is constructing a larger model, which will form one of the attractions of the Exposition of Sciences and Arts that is to be opened next August at the Palace of Industry.—*La Nature.*

PHOTOGRAPHIC NOTES.

Correction of Eikonogen Formula.—We wish to correct a misprint in the first formula under "Various Eikonogen Developers," page 120 of the August 23d number, by substituting 40 for 4 ounces of water. The corrected formula will read:

Sodium sulphite (Merck's c. p. crystals)	2 ounces.
Eikonogen	1 ounce.
Water (distilled or rain water preferred)	40 ounces.

Belitzki's Formula for Removing Hypo from Gelatine Films.—A correspondent suggests a corrected formula which is said to work well:

Water	32 ounces.
Chloride of lime	300 grains.

Add to the milky liquid thus formed a solution of sulphate of zinc:

Sulphate of zinc	600 grains.
Water	3½ ounces.

Shake the mixture well and decant the clear solution. This supernatant solution of hypochlorite of zinc should be kept in a glass-stoppered bottle. One ounce mixed with sixty ounces of water will remove the last traces of the fixing soda. The solution remains active as long as it smells of hypochlorous acid.

The Photographers' Convention.—Among the papers read at the eleventh annual convention of the Photographers' Association, held at Washington, D. C., last month, was an interesting one on the "Automatic Operations of Photographic Apparatus," by Prof. D. P. Todd, Professor of Mathematics in Amherst College. He explained how a number of astronomical photo-instruments were automatically operated at different intervals by air pressure, regulated by valves which were called into action by the air passing through slits in a moving band of paper, very similar in appearance to the square holes and slits in music paper for small organs. By such means different instruments were given different exposures, and plates were automatically changed. Every second of time was utilized, and more exposures were made on one observation than would be possible if done in the old way.

Mr. G. Cramer, of St. Louis, read a paper on "Orthochromatic Photography," making the point that the best results in copying paintings, or colored objects, or in taking portraits of people with red hair and freckled faces, were obtained when the color dye was incorporated in the emulsion, and not when a yellow screen was used. The exposure required was twice as long as with the ordinary plate. Mr. T. C. Roche exhibited prints from orthochromatic negatives of a colored object, which demonstrated clearly their value. Plates thus prepared do not keep as long as those of ordinary manufacture.

Prof. Thos. Taylor, of the Agricultural Department, exhibited and set off, as against the usual magnesium compound, his new smokeless flash light compound, having for its principal ingredient the silky-like fibers of the milk weed plant. While his compound flashed with great rapidity, and could be flashed on a piece of tissue paper without burning it, the light emitted appeared to be more yellow in character and less actinic than the magnesium flash. Negatives were made separately by the aid of both lights.

C. H. Codman & Co., of Boston, were awarded a gold medal for the best photographic appliance. It consisted of a camera stand especially designed for studios. A platform is placed between two uprights hung by chains to coiled flat springs concealed in the top of each upright. The tension of the springs may be easily regulated to correspond with the weight of the apparatus put on the platform. Thus the same is balanced, and may be lowered to within thirteen inches of the floor or raised six feet high at will. In photographing children it is desirable to lower the camera sufficiently that the lens may be opposite their faces, and thus avoid a downward view.

Many varieties of hand cameras, backgrounds, photographic furniture, special exposing devices for bromide paper, lenses, camera shutters, burnishers, trays, and other useful things were on exhibition.

The display of photographs was not large, and consisted mostly of portraits. The grand prize, a bronze group, was awarded to Geo. W. Hastings, of Boston, Mass., for the best photographic representation of Tennyson's poem "Enoch Arden." A number of other prizes were awarded for the best foreign exhibits, retouching, enlargement, marine views, and landscapes.

Combined Celluloid Negatives.—According to the *Br. Jour. of Photo.*, more harmonious photographs can be obtained by making duplicate negatives of a given subject. It says:

"Celluloid films will frequently prove a great advantage for outdoor groups. Apart from the convenience with which an objectionable portrait in one negative can be exchanged for another from a different one, it often happens that a group has to be taken with a background that requires a different exposure from that for the figures; for example, a wedding party or team of cricketers in light costume against a background of dark foliage. Here we have the opportunity of taking one or more negatives, giving the exposure best suited for the figures, and afterward taking another in which the exposure is timed entirely for the background. Negatives thus taken are readily combined, and a harmonious whole secured; whereas, if only a single negative is depended upon, under the above conditions, unless exceptional skill is exercised in the exposure and development, either the background proves too heavy and lacks detail or the figures are too light or chalky.

"It is scarcely necessary to remind our readers when taking group negatives, which may afterward have to be combined, that neither the lighting nor the position of the camera should be altered between the taking of the different pictures, or that the same exposure should always be given; otherwise an incongruous result will necessarily obtain.

"Here is another direction in which celluloid films may prove of utility. In photographing the interior of a cathedral or church, for instance, the exposure necessary for one portion of the building, say the stalls or pews in the foreground, is generally widely different from that required for another, such as the chancel and windows. But one negative can be taken, exposing for the foreground, another with the exposure timed for the chancel, and even a third for the windows. Then, with judgment, the different negatives can be combined to form one harmonious picture."

Another excellent application of the double negative is in photographing a brook or rill under deep foliage. For the brook, expose with the shutter, then make a second time exposure of half a minute, if necessary, to bring out the details of the rocks and foliage. By combining the two negatives a harmonious picture is produced.

Proposed Convention of Amateur Photographers.—The Syracuse (N. Y.) Camera Club has undertaken the organization of a National Association of Amateur Photographers, the object of which, as stated in their circular, "is to diffuse a more widely spread scientific interest in the science of photography and to promote social intercourse among amateurs." Photography is now being practiced so universally, both for pleasure, profit, and in many branches of science, that it seems eminently proper for all thus interested to combine and support a national organization designed to promote the art simply as an art and science. We wish that the movement might be a success, and that under the fostering care of such an association there might be established an experimental "photographic college," where a reliable education in any one branch of photography can be obtained. Amateurs interested in the movement should address Mr. Arthur P. Yates, president of the Syracuse Club, Syracuse, N. Y.

Daguerre's Tomb.—While in this country an enduring and artistic memorial has been erected to Daguerre, news comes that his tomb at Cormeil-en-Parisis appears to be quite neglected. Says Leon Vidal about it, in the *Photo. News*: "The cure of this commune has informed the Photographic Society of the fact. The painting executed by Daguerre in the choir of the church requires considerable restoration. The Photographic Society and other photo clubs should cause these restorations to be promptly made, and thus conserve for all time the memory of the discoverer of photography."

Cements of Rubber and Gutta Percha.

In making a cement, one should know pretty thoroughly, says the *Rubber World*, what is to be expected of it before they could advise upon it. For instance, an ordinary rubber cement will hold on a host of different surfaces and with the best of success, except where there is continued dampness. For holding to damp walls, or surfaces where there is a constant presence of moisture, there is nothing equal to Jeffry's marine glue, the formula for which has been published and republished all over the world. It consists of:

1 part India rubber.
12 parts coal tar.
2 parts asphaltum.

The rubber after having been massed is dissolved in the undistilled coal tar, and the asphaltum is then added. This glue, as its name indicates, is oftentimes used for mending articles at sea, or patches, for instance, that are to be laid on surfaces that are to be under water, and it has been found to be a most excellent thing. Of glass cements there are a great many, rubber as a rule being dissolved in some very volatile solvent and some hard drying gum is added.

A gutta percha cement for leather is obtained by mixing the following. It is used hot. Gutta percha, 100 parts; black pitch or asphaltum, 100 parts; oil of turpentine, 15 parts. An elastic gutta percha cement especially useful for attaching the soles of boots and shoes, as on account of its great elasticity it is not liable to break or crack when bent. To make it adhere tightly the surface of the leather is slightly roughened. It is prepared as follows: By dissolving 10 parts of gutta percha in 100 parts of benzine. The clear solution from this is then poured into another bottle containing 100 parts of linseed oil varnish, and well shaken together.

Good rubber cement for sheet rubber, or for attaching rubber material of any description or shape to metal, may be made by softening and dissolving shellac in ten times its weight of water of ammonia. A transparent mass is thus obtained, which, after keeping three or four weeks, becomes liquid, and may be used without requiring heat. When applied it will be found to soften the rubber, but when the ammonia is evaporated it forms a kind of hard coat, and causes it to become both impervious to gases as well as liquids.

Davy's universal cement is made by melting 4 parts of common pitch with 4 parts of gutta percha in an iron vessel and mixing well. It must be kept fluid, under water, or in a dry hard state.

A very adhesive cement, especially adapted for leather driving belts, is made by taking bisulphide of carbon 10 parts, oil of turpentine 1 part, and dissolving in this sufficient gutta percha to form a paste. The manner of using this cement is to remove any grease that may be present in the leather by placing on the leather a piece of rag and then rubbing it over with a hot iron. The rag thus absorbs the grease, and the two pieces are then roughened and the cement lightly spread on. The two pieces are then joined, and subjected till dry to a slight pressure.

A solution of gutta percha for shoemakers is made by taking pieces of waste gutta percha, first prepared by soaking in boiling water till soft. It is then cut into small pieces and placed in a vessel and covered with coal tar oil. It is then tightly corked to prevent evaporation, and allowed to stand for twenty-four hours. It is then melted by standing in hot water till perfectly fluid, and well stirred. Before using it must be warmed as before, by standing in hot water.

A cement for uniting India rubber is composed as follows: 100 parts of finely chopped rubber, 15 parts of resin, 10 parts of shellac; these are dissolved in bisulphate of carbon.

Another India rubber cement is made of: 15 grains of India rubber, 2 ounces of chloroform, 4 drachms of mastic; first mix the India rubber and chloroform together, and when dissolved the mastic is added in powder. It is then allowed to stand by for a week or two before using.

Cement for sticking on leather patches and for attaching rubber soles to boots and shoes is prepared from virgin or native India rubber, by cutting it into small pieces or else shredding it up; a bottle is filled with this to about one-tenth of its capacity, benzine is then poured on till about three parts full, but be certain that the benzine is free from oil. It is then kept till thoroughly dissolved and of a thick consistency. If it turns out too thick or thin, suitable quantities must be added of either material to make as required.

An elastic cement is made by mixing together and allowing to dissolve the following: 4 ounces of bisulphide of carbon, 1 ounce of fine India rubber, 2 drachms of isinglass, ½ ounce of gutta percha. This cement is used for cementing leather and rubber, and when to be used the leather is roughened and a thin coat of the cement is applied. It is allowed to completely dry, then the two surfaces to be joined are warmed and then placed together and allowed to dry.

Cement used for repairing holes in rubber boots and shoes is made of the following solution: 1. Caoutchouc 10 parts, chloroform 280 parts. This is simply prepared by allowing the caoutchouc to dissolve in the chloroform. 2. Caoutchouc 10 parts, resin 4 parts, gum turpentine 40 parts. For this solution the caoutchouc is shaved into small pieces and melted up with the resin, the turpentine is then added, and all is then dissolved in the oil of turpentine. The two solutions are then mixed together to repair the shoe with this cement. First wash the hole over with it, then a piece of linen dipped in it is placed over it; as soon as the linen adheres to the sole, the cement is then applied as thickly as required.

American Machinery at the Iron Gates of the Danube.

The Ingersoll-Sergeant Rock Drill Company, of New York, has just received an order, from the contractors engaged in removing the Iron Gates of the Danube, for a large plant of submarine drilling apparatus. Mr. Bessier, a German engineer, recently visited this country, in the interests of the work on the Danube. He investigated thoroughly our American methods, and decided to adopt them as the best for the purpose. The work extends for twenty miles along the Danube River, and will cost about $5,000,000.

The removal of these obstructions has been attempted many times, one of the Roman emperors having made an effort to remove the rock. Recently an Austrian empress made a similar attempt, but without success. We have every reason to believe that American machinery will do the work economically and well.

THE expenditure for pensions for the year ending June 30, as now officially stated, amounted to $109,357,534. In the previous year we paid $87,644,779.11, while in the year before that we paid $80,288,508.77.