

where there was lack of intelligent superintendence, the cheap labor did not appreciate the need for careful workmanship, and the result was the use of too little cement, or too little water, or improper mixing, followed by the collapse of the wall before it had reached half its full height. In several cases the concrete, while under construction, was allowed to freeze, and as soon as the forms were removed its inevitable collapse followed. In other cases the wooden molds or forms had not been properly cleaned out, and shavings, blocks of wood, and other refuse had been so imbedded in the concrete as to introduce a fatal weakness at important points in the building. In another case reinforcing rods were put in the wrong place, or omitted altogether, and these faults coupled with unsafe design, caused one of the most serious of the recorded wrecks of concrete buildings.

The popularity of hollow-concrete block construction has increased rapidly during the past year, and the report specifies six conditions which, if followed, will give the highest fire-resistance qualities in a hollow-concrete block building. First, the thicker the shell of the block, the better the resistance; secondly, the block should consist of a brand of Portland cement that conforms to the standards of the American Society of Civil Engineers, or some similar specification of high authority; thirdly, the block should contain not more than four parts of sand or other material to every one part of cement; fourthly, the best block is that which is made with the wettest mixture practicable; fifthly, the block should be carefully cured for not less than thirty days before it is used, and, during this time, it should be frequently moistened by water spray or steam; lastly, in hollow-block buildings, care should be taken to use solid blocks for the course on which joists or girders rest; that is to say, care should be taken never to allow the concentrated load of such members to rest upon or depend from the inner side of a hollow shell, since this may very readily break off.

THE GRAND PRIX INTERNATIONAL AUTOMOBILE RACE.

The third great international automobile race of the year was run on a triangular circuit near Dieppe, France, on the 2d instant, the result being the fastest time that has ever been made in any long-distance race of this character—70.77 miles an hour. The winning car was an Italian Fiat racer driven by Nazzaro. Szisz on a Renault was second, with an average speed of 69.46 miles an hour. Thus the positions of these two champions were just the reverse of their positions in the Grand Prix of last year, when Szisz won on his Renault at an average speed of 62.84 m.p.h., and Nazzaro was second on his Fiat at a speed of 60.2 m.p.h. The race last year was much longer, however, and it was run on two consecutive days. The total distance was 745 miles, while the course was 62 miles in length. The fastest circuits were made at 73 and 72 miles an hour. The Dieppe course was shorter and not particularly difficult. It extended southwest to Londinières, then north to Eu, and finally southwest to Dieppe. Its actual total length was 76.988 kilometers, or practically 77 kilometers (47.84 miles) in round numbers. Ten circuits of the course were required to be made.

No less than 37 machines, consisting of 2 English, 24 French, 3 German, 3 Italian, 3 Belgian, 1 Swiss, and 1 American make, started, and 16 of these completed the race. Of the one Italian, German, Belgian and seven French firms which entered three cars each, but one succeeded in bringing all three across the line at the finish. Three Brazier cars finished third, seventh, and twelfth, with their usual regularity. Accidents and breakdowns put most of the others out of the running, while tire trouble does not seem to have bothered the contestants greatly, presumably on account of the elaborate arrangements for tire renewal and the use of detachable rims. It was largely on account of these conveniences, no doubt, that the average speed has been raised nearly ten miles an hour in a single year.

The second annual Grand Prix race was run on the basis of fuel consumption, and it was lack of fuel which caused Lancia, who also drove a Fiat, to lose third place. His fuel gave out on the last lap, leaving him stranded by the roadside. The cars were allowed 61 gallons each, which required them to run 7.84 miles on a gallon. That one car should win the race at a speed of 70 $\frac{1}{4}$ miles an hour and still have nearly three gallons remaining, while another of the same make was unable to finish on account of lack of fuel, seems rather remarkable, and hardly explicable on the ground of difference in the driving of the two cars. Possibly Lancia, with his usual bad luck, lost some of his fuel. At any rate, he could not blame Walter Christie in this race for putting him *hors de combat*, as was done in the Vanderbilt Cup race of 1904, in which Christie just grazed the Italian as he was pulling out into the road after making tire repairs, and, by smashing his rear wheel, snatched the victory from him. Nor could Christie blame Lancia for his usual bad luck, as a result of which our patriotic countryman, who drove the only Yankee speed creation that participated, succeeded in completing only four rounds

at an average speed (including time lost for stops) of about 40 miles an hour. His engine is said to have broken a valve, and, according to cable reports, he also had trouble with one of his clutches sticking.

The race this year was noteworthy from the fact that, with only a single exception, all the machines that were entered started, and that most of them started at the time set. Heath with his Panhard was the only exception. On account of difficulty in starting his engine promptly, he was delayed for a minute or more at the start. Most of the contestants carried about a quart of gasoline in a separate can, for the purpose of priming the carbureter when starting at various places along the course.

Three minutes after the last machine had started, Lancia rushed past the grand stand at terrific speed, followed closely by Duray in his De Dietrich. Wagner, on his Fiat, made the first round in 39 minutes and 53 seconds, which was at the rate of 71.97 miles an hour. At the end of the third round he was leading and his chances were good, but on the fourth round something went wrong with the motor, and he was out of the race. For the remainder of the race Duray led, and was continually gaining on every competitor until just after he finished the eighth round, when a bearing broke and his car came to a stop. Lancia, Szisz, and Nazzaro were the other leaders. The Frenchmen hoped that Szisz would be able to increase his speed sufficiently to pass Nazzaro; but he failed to do this, and finally finished second in 6 hours, 53 minutes, and 10 seconds, as against Nazzaro's time of 6 hours, 46 minutes, and 33 seconds. Baras, on his Brazier, was third in 7 hours, 5 minutes, and 53 seconds (67.52 m.p.h.) and Gabriel on his De Dietrich, fourth, in 7:11:37 (66.5 m.p.h.). Two Darracq machines finished 59 seconds and 261 seconds after Gabriel. As stated above, a second Brazier car was seventh, and this was followed by two Bayard-Clement cars, the times of which were 7:34:16 and 7:39:56, respectively. Hemery, on a Mercedes, was tenth in 8:25:25; a Motobloc finished eleventh; the third Brazier, twelfth; a Renault, thirteenth; two Germans, fourteenth and fifteenth; and a second Motobloc sixteenth. The time of the last car was 10:24:57, which corresponds to an average speed of almost 46 miles an hour.

The fastest lap of the race was made by Duray on his De Dietrich car in 37 minutes and 54 seconds, which corresponds to an average speed of 75.73 miles an hour. The race is considerably the fastest that has ever been run, being nearly 5 miles an hour faster in its general average than the Ardennes race of last year. It was noticeable for the numerous breakdowns and for the failure of many of the French and German makers to make a good showing. It is the third great race that Nazzaro has won this year, the other two being the Targa Florio Stock Car Race in Italy, and the German Emperor's Cup Race in Germany, last month. The Italians have certainly made great strides in automobile manufacture, and in the development of a reliable and speedy car they are apparently second to none.

GASOLINE MOTOR CARS ADOPTED FOR BRANCH LINE SERVICE ON THE UNION PACIFIC RAILROAD.

An extremely interesting innovation in railway passenger transportation in this country will be inaugurated this month, during which, it is announced, the Union Pacific Railroad will place in service twelve gasoline railway motor cars. The cars are intended for branch-line traffic, where the fast and frequent service required cannot be maintained by ordinary trains except at a loss.

The latest type of these cars developed at the Omaha shops of the Union Pacific makes 60 miles an hour with a 300-horse-power engine, reaches high speed within six car lengths, and can be stopped within 120 feet. With these advantages the cars can be put on a much faster schedule than is possible with the steam locomotive.

Outwardly the newest of the cars, which are built entirely of steel, resemble a turned-over racing yacht. The forward end tapers sharply, and the roof and rear are rounded off to reduce the air resistance and avoid the vacuum produced by a square car. Rounded windows give to the passengers a wide range of outlook, and increase the nautical appearance of the car.

In cold weather the cars are to be heated by hot water from the cylinder jackets. They are lighted by acetylene gas shining through opalescent panels.

For sanitary reasons the floors of the cars are built so that they can be thoroughly cleaned by flushing with hot water. The familiar system of ventilation has been replaced by roof ventilators, which exhaust the inside air by suction, fresh air being taken in from the car roof in front. Vibration is reduced to a minimum by the way in which the motive power is balanced.

The cost of operating the cars varies from ten to twenty cents a mile, according to the density of the traffic, but the records kept prove beyond doubt that the railway motor car will make possible great improvements in handling branch-line passenger traffic.

SCIENCE NOTES.

An additional research is now being prosecuted at the Harvard College Observatory, with the object of determining the distribution of variable stars in various regions of the sky. The method is a photographic one, and consists of superposing negatives of a certain region on a contact print taken from a second negative of the same region, obtained at a different time. In the instances described, five negatives of each region were employed, four of which were compared with prints from the remaining one. The stars showing signs of change are marked, and on subsequent reduction, some of these may prove to be known variables, some to be new variables, some are still suspected of variability, and some may be due to photographic defects. From the number of actual new variables found by superposing plates of the same region, an estimate may then be made of the number still undiscovered. In the trials so far made the results appear so promising that it seems best to cover the whole sky by the method as soon as possible, and thus provide for determining the probable distribution, and later the work can be confirmed and extended by means of photographs with a larger instrument. As the result of this preliminary count, it appears that the greater proportion of existing variables have been detected, and of those still undiscovered it is probable that all are faint, none being estimated as brighter than the eighth magnitude, or having a range of variation of more than a magnitude.

The odor of plants is due to active constituents in the volatile essential oils, the proportion of which varies at different periods of the growth. In order to study the formation and distribution of the essential oil MM. Charabot and Lalowe have made a series of determinations of the amounts present in different stages in different parts of the plant, taking absinthine (*Artemisia absinthium*) as typical of an odor-forming plant. They find that in the first stage, a long time before blossoming, the roots are free from essential oil, while the leaves contain about eleven times as much as the stalks. In the second stage, the beginning of blossoming, the roots become richer than the leaves in the oil, though all the organs show a considerable increase, the proportion in the leaves, for instance, being about doubled. In the third stage, advanced blossoming, the accumulation of oil in the roots is more pronounced, but there is a diminution in the stalks, leaves, and particularly in the blossoms, showing that there is a consumption of odoriferous constituents in the process of fertilization. In a typical experiment the relative amounts yielded by the plant on July 10 and August 4 were 1,055 and 766 milligrammes. Hence it is evident that for the practical purpose of extracting the scent from flowers it is advisable to prevent fertilization, or, better still, to extract the essential oil at an earlier period. In the fourth stage, when blossoming is over, the relative proportion of oil in the roots is greater, and there is also a slight increase in the proportion in the stalks. The small absolute increase in the amount of oil then yielded by the whole plant is to be attributed to the appearance of new leaves.

Among the most recent finds which have been made at Carthage by Rev. P. Delattre are a number of sarcophagi which present a great interest. In many of these the top cover is sculptured in relief with a figure of life size, carved out of marble, and beautifully tinted in various colors. One very fine specimen was found in the necropolis at a depth of twenty-five feet. On the cover is a figure of a woman executed in the Greek style, with a long garment reaching to the ankles and a veil covering the head. Great technical skill is shown in treating the different tissues. The flesh parts are well polished, and the eyes are painted, giving a life-like aspect. The hair is gilded. Inside the sarcophagus were found the remains of the person, with some bronze objects. A second sarcophagus was that of a person supposed to be a priest. The sculptured figure has abundant hair and a curling beard. It wears a long robe with short sleeve. Here also the eyes are painted, and are very expressive. Among the remains are a massive gold ring with a portrait similar to the above, also three other gold rings, amulets, etc. One of the most recent finds was a sarcophagus with the sculptured figure of a woman wearing a long tunic of fine wool of a pinkish hue, with a gilded belt passing under the breast. The lower part of the body is enveloped in what appears to be two great vultures' wings, according to the Egyptian style. The whole figure bears traces of painting and gilding. As to the remains; they are imbedded in a resinous matter, as is often seen. M. Delattre examined the specimens carefully to observe the painting before they came up to daylight, as the colors faded almost at once, and he found the color and gilding to be quite brilliant both on the figures and on the moldings of the sarcophagi. These specimens form an important addition to the Carthage Museum.