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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.


## RECLAMATION OF MARSH LANDS IN THE SOUTH.

The agricultural conditions of the coast and tidal river lands of South Carolina have been the subject of more or less discussion since 1878, at which time a report was submitted by a committee of the South Carolina Agricultural Society, suggesting certain radical changes in their management. Although many of the labor complexities then complained of have disappeared, the problem of the profitable utilization of these lands still confronts the proprietors. Mr. Elwood Mead, of the United States Department of Agriculture, has pointed out that the lands which may be used for agriculture are of two different classes—those of the coastal plain lying above high tide, a large portion of which are swampy and unfit for continued cultivation except in the most favored localities, and the bottom lands bordering the tidal rivers, which are unfit for use without the protection of banks or levees. Rice grows upon the river lands, and rice has long been a staple crop of the South Atlantic coast. It is a question, however, whether the plain lands may not be able to contribute more to the prosperity of their owners and the State than the more celebrated rice lands.

A strong sentiment has therefore developed in the eastern part of the United States for the drainage of tidal and swampy lands, especially in the South where large areas of swampy land abound, so infested with malaria-breeding mosquitoes that agricultural settlement and the successful establishment of manufacturing enterprises have been all but impossible. The irrigation and drainage investigators of the Department of Agriculture are co-operating with a drainage and sanitary commission appointed by the legislature of South Carolina for the purpose of improving the health of the communities about Charleston and increasing the land values. During the coming year plans for the drainage of new areas will be made, the work to be carried out by the State Drainage and Sanitary Commission with the aid of convict labor.

South Carolina and Virginia would, perhaps, be most benefited if the plans which have been formulated in various bills presented to Congress are carried out.

The surface of the watershed of the streams has been so modified by cultivation and especially by the removal of the primitive growths of timber and other vegetation, that the uniformity of flow in the streams found thirty years ago cannot be reasonably expected in the future. There has been, as a result, a falling off of the total annual rainfall, yet no apparent diminution in the maximum daily or monthly rainfalls. The flood height of the streams is greater at times, and less constant than formerly. The lesson taught by these observations are: First, that the diminution of annual rainfall does not necessarily lower the height of the river flood line, or the consequent height and strength of levees required to protect the land, though the maximum may not be reached as frequently as during periods of greater average rainfall; second, that the periods of light annual rainfall have a direct effect upon the quantity available at times when it is necessary to flood the rice. If this volume is too small the only water to be had is brackish or salt.

The South finds itself confronted by this dilemma: The growing of rice is too hazardous to be continued where there is danger from salt water. On the other hand, no other valuable field crop will grow on wet land.

In view of the investigation which was made by the Department of Agriculture, the area used for a century or more for the growing of rice must be abandoned and cultivated for other crops. The chief reason for this conclusion is to be found in the fact that the fresh-water supply required for flooding has become insufficient and uncertain. The use of brackish water and inadequate drainage has caused rice blight. No plantation along either the western or eastern branch of the Cooper River has any assurance of a fresh-water supply from that stream. In 1904 no less than 2,552 acres planted the previous year were abandoned because of salt water. In 1905 only 1,115 acres were planted on this branch, and 1,222 acres on the east branch, making a total of 2,337 acres, and of this acreage 300 were watered from reservoirs. Prior to 1904, 2,065 acres had been abandoned, so that since 1890 two-thirds of the acreage formerly planted on these two branches has been abandoned.

Three things should be done to solve the problem: The existing levees must be strengthened, rebuilt, and made high enough to withstand floods; the inclosed lands must be ditched so that soil water can be removed to a depth of three feet; pumping plants must be installed to remove all such drainage water as cannot be removed by gravity through sluices or trunks.

Ditches can be dug which will drain the soil to a depth of fully three feet, making it firm and suitable for the growing of dry land crops and the use of such machinery as will be required in their cultivation.

The improvement of the coastal plain lands, which are estimated to include an area of 400,000 acres, only 50,000 of which are under cultivation, is a matter of vital importance. These lands require a gravity drainage and proper cultivation to make them productive. The coast lands may be drained as were the mosquito-ridden prairie marshes of Illinois and Indiana, now among the most productive and fertile areas in the land.

The first benefit to accrue from the drainage of the low lands in the Carolinas will be to make them sanitary, free from malaria, and attractive to those who contemplate the purchase of farm homes in the Carolina climate, which is most salubrious. With a general drainage system, which may be easily constructed if equitable State drainage laws are enacted, the further drainage of all the lands by means of the more elaborate system of under-drainage, which has proved so efficient in the improvement of low lands elsewhere, can be prosecuted by land owners as desired. These lands, when drained, will require but a fraction of the artificial fertilizing used on the higher lands, and will be in such a condition that a rotation of crops suited to the climate may be followed and the fertility of the land be maintained. If looked into carefully it will be found that the value of commercial fertilizers used during two seasons upon the high lands will in many cases meet the expense of such a drainage system as will be required to make the low lands both healthful and productive.

The entire drainage problem may be put as follows: The coastal section of the State must be drained before it will be sufficiently healthful to attract thrifty and intelligent farmers. This can be done in such a way as to make the country sanitary, with the exception of the river lands, for $5 per acre, and for high-class cultivation for $10 or $15 per acre. The tidal river rice lands, which are injured by salt water, should be converted into drained fields, and planted in upland crops. This may be done at a cost of $15 per acre. If this were done on the two branches of the Cooper River, that section would be free from malaria and the finely-located residences could be occupied during the entire year.

A State drainage law should be enacted at the next legislature, and in the meantime the plans and estimates for the drainage of a few representative tracts should be made and discussed for the information of the public.

## AUTOMOBILE RACING AND TOURING IN FRANCE AND AMERICA.

Two of the main automobile events of the year—the French Grand Prix race and the American Glidden tour—have attracted the attention of all automobilists. Of these two contests, the former, which was held in France on June 26 and 27, is the substitute arranged by the Automobile Club of France for the Gordon Bennett race—unfortunately a rather sorry substitute for an event that had become a classic in automobile annals by reason of its six years' dramatic success.

The rules under which the trophy was contested for, provided for an annual international race to be held in the country which won the trophy during the year previous. Each country was allowed a team of three machines, and these were usually selected, in France and America at least, by eliminating races of domestic machines. Not content with having won four out of six races, the French last year demanded a greater proportion of their machines in the race—a demand unjustified by their previous success and decidedly unfair to other nations. Consequently, they returned the trophy to the donor and organized the Grand Prix race, in which any manufacturer was allowed to enter a team of three machines. As a result the event lost its international character, although foreign nations were not excluded. France and Italy, however, were the only countries represented. The rules under which this race was run were somewhat different from those used heretofore. The race lasted two days, and was run on the Sarthe circuit—a triangular course some 62¼ miles in length. Six rounds were made each day by the contestants. No repairs or renewals of tires were allowed other than those which could be made by the driver and his mechanic without outside aid. According to the rules, the racer was placed in a garage, at the end of the first day's run, and could not be touched until the start on the following morning.

The chief result of these regulations was the appearance of a new detachable rim. Fully-inflated tires were carried on extra rims. If a puncture occurred, it was only a matter of two or three minutes to remove the deflated tire and rim and apply a fresh one. Like nearly all high-speed automobile races, the Grand Prix was above all a comparative test of tires. Thus it was that a car fitted with the new device was able to win over more powerful cars which were dependent upon the usual method of repairing tires. A description of this rim will be found in the current SUPPLEMENT. It is a very useful device, especially for high-speed racing. We hope to see it fitted to some American cars in the coming Vanderbilt race.

Out of thirty-four cars entered in the race, but thirty-two started. Of these, nine only were foreign cars, six being Italian and three German. The cars were started at minute-and-a-half intervals, and one at least covered a first round at a rapid rate, the time of this French machine being 52 minutes and 19 seconds, which is equivalent to a speed of 74 miles per hour. Accidents and breakdowns came thick and fast, and more cars dropped out during the third round than in any other round of the race. One French machine overturned while its driver was trying to pass another car on a boarded-over portion of the road, due to the car's running off the boards and dropping into the sand. In some marvelous manner the driver escaped with his life, although he was pinned under the steering wheel as the car rested on its side. A mechanic was thrown twenty yards, but was merely bruised. One make of French car was fitted with wire wheels having very light spokes. In rounding a corner one of the rear wheels collapsed and the car was overturned, but without injuring the driver. Aided by his mechanic, he pluckily fitted no less than twenty spokes to the wheel and made a fresh start. Leaky radiators, cracked cylinders, flattened rims, and broken gear boxes, water pipes, and grease pipes, ended the careers of fifteen of the cars before the finish of the first day's race. The total distance of 384.44 miles was covered in the remarkable time, in view of the new regulation requiring the driver to make his own repairs, of 5 hours, 45 minutes, 30 2-5 seconds, or at an average speed of 66¾ miles an hour. The winner was Szisz on a 105-horse-power French Renault car. A Clement-Bayard driven by young Clement was second in 6 hours, 11 minutes, 40 3-5 seconds; while Nazzaro, on an Italian Fiat, was third in 6 hours, 26 minutes, and 53 seconds. The average speed of the second and third cars for this half of the race was 62.1 and 59.66 miles an hour respectively.

In the second day's race the competitors started at the same intervals at which they arrived the day before. Immediately after the start each competitor was obliged to fill up his tanks with gasoline and oil. The worst accident of the race occurred on this day, through the overturning of one of the French cars, presumably from the breaking of the frame. The frame of a similar car collapsed during the first day of the race, and it is supposed that some similar accident caused the upset of the car just mentioned. Its driver was badly injured, sustaining a broken thigh and several fractured ribs. The third of the wire-wheeled cars had a steering wheel break, and ran off the road just as the other two had done, and one other French car, of the same make as the winner, overturned during this stage of the race. Szisz had maintained his lead throughout the entire second half of the race, and when he completed this half in 6 hours, 28 minutes, 36 3-5 seconds, there was great rejoicing. His total time for the 768.89 miles was 12 hours, 14 minutes, and 7 seconds, which corresponds to an average speed of 62.84 miles an hour. Nazzaro finished second, beating Clement by 3 minutes only. Their respective times were 12:46:26 2-5 and 12:49:46 1-5. These times correspond to average speeds for the entire race of 60.2 and 59.9 miles an hour. The only team to finish was the one consisting of three Brazier cars. One of these took fourth place in 13 hours and 54 minutes, corresponding to an average speed of 51.9 miles an hour. This make of car, it will be remembered, won the Gordon Bennett race both in 1904 and 1905. These races were notable for steady running, although the average speed maintained was not great.

The Grand Prix race has demonstrated the futility of attempting to build a car of tremendous power and comparatively light weight. Such a machine serves merely the gruesome purpose of imperiling its driver's life. If these high-speed races must be run—and they seem to be a necessity to appease the craving for sport—some other method of classification than by weight must be devised in the future. Either the piston displacement or the cylinder capacity would serve as a good standard. At all events, some method should be procured whereby no sacrifice would be entailed for lightness.

The race for the Vanderbilt cup will be run this year on Long Island on October 6, and will be the only real international race of the year. At least four countries—France, Germany, Italy, and America—will be represented by five cars each. The rules governing the race will be practically the same as heretofore, and the course will be nearly the same as that of last year.

In contrast to the races just mentioned, there is now being conducted in this country and Canada the third annual tour of the American Automobile Association, which includes the contest for the Glidden trophy. This trophy is awarded annually to the touring car which makes the best performance in a 1,000-mile tour. Contrary to what was the case last year, the present contest is being conducted with some resemblan reliability run. The cars are required to make an average speed of nearly 20 miles an hour, and checking stations are located every 25 or 30 miles apart. No repairs, adjustments, or replenishments are allowed in the garage, but these must all be made during the cars' running time. While such a rule does very well for a high-speed race, in the present instance it tends to incite racing. This is not what is desired. Furthermore, the penalization of all cars that do not pass the checkers and arrive each day at the specified times, has not had the effect of stopping racing on the part of the contestants. This was shown on the first day's run of 135 miles from Buffalo to Auburn, New York. The contestants invariably reached the vicinity of the checking stations a considerable length of time in advance. They would then wait until the exact minute when they were due before they would pass the checker. From the working of this system during the first day's run, it would seem that a better way to attain uniform speed on the part of the contestants would be to oblige them to follow a pacemaker provided with an accurate speedometer. This would effectually stop all racing, save on the part of cars which broke down, and were obliged to make up time, if possible. A test of this character should be made to give all the information possible to be obtained from the actual running of cars under touring conditions. Official observers should be provided, and an accurate record kept of all stops, breakdowns, repairs, fuel and oil consumption, tire trouble, etc. With a loss of a specified number of points for all such happenings, it would be an easy matter to pick out the winning car. Besides this there would be considerable valuable information obtained regarding the different makes of cars, both domestic and foreign. In the present event but five foreign cars figure. While light cars are not excluded, they are decidedly in the minority. Almost all of the cars are of the four-cylinder type, and there is one new six-cylinder model of a type which will be marketed next year.

The result of the first day's run was the disablement of three of the cars, owing, it is said, to the roughness of the course. One of these broke its rear axle, another broke a spring, and the third gave out from some cause not as yet recorded. One of the steam cars of a well-known make was burned, owing to its catching fire while the gasoline tank was being filled. This accident was no doubt due to gross carelessness, as the make of car in question is well known for its reliability. Of the 69 starters, only 8 were absent at the end of the second day's run. Out of 51 contestants, 20 had perfect scores.

## AN ELECTRIC EXAMINATION OF EUROPEAN MINERAL WATER.

An electrical method of estimating the proportion of mineral matter contained in spring water has been devised by M. F. Dienert, of Paris, and presented to the Académie des Sciences. The subterranean water encounters soluble elements in the soil, and the solubility is increased by the presence of carbonic acid. Thus carbonate of lime and silica, which are but slightly soluble in pure water, are much more so in presence of the gas. In a given soil and for a certain pressure of carbonic acid gas, the underground waters contain a determined proportion of dissolved bodies, and we may estimate the average amount by means of the electric conductivity, using for this purpose the Kohlrausch method, which has already been used here. For several years past M. Dienert has been employing this method in order to follow the daily variations in the composition of the springs which supply the city of Paris. Thus we have a good check upon the variations in the mineral matter, and if these are great, we afterward seek the causes. The electric method is much more sensitive than chemical analysis. In cases where we find 50 ohms variation in electrical resistance, this being very clearly shown in the Kohlrausch apparatus, for the same water chemical analysis gives uncertain results, seeing that they fall within the limit of error. As an example, we may mention the values of the resistances of some of the springs which supply the city. The Breuil spring, for instance, has had about a uniform value, except in times of freshets, during the last three years, and its resistance is maintained very closely between 2,695 and 2,720 ohms. The Dhuys spring keeps between 2,120 and 2,140 ohms, while the Lunain spring lies between 2,350 and 2,375 ohms. Thus we find that some springs have a very constant mineral value. It is to be remarked that all these springs are very pure and usually contain colon bacilli when their resistance remains constant. Variations of the latter may be traced to different causes, such as were observed for several years past. These causes are due either to changes in the underground condition or again to the infiltration of surface water.

## A KEROSENE-OIL LAMP.

Experiments with a new lighting system have been carried out in Scotland, in which kerosene oil is used. The oil is stored in a tank, which is accommodated in the base of the standard carrying the lamp. In the top of this reservoir is a cylinder filled with compressed carbonic-acid gas, with a small oil container at the bottom holding from one-half to two gallons of oil, which automatically flows thereto from the larger receptacle. A reducing valve connects the oil container with the carbonic acid gas cylinder, and a fine tube leads to the burner, which has a vaporizer consisting of a jet and an air-mixing chamber, while the burner is fitted with an incandescent gas mantle. The oil is forced from the oil container to the vaporizer through the fine tube by the pressure of the carbonic-acid gas. On reaching the vaporizer the oil is converted into gas and passes through the flame spreader, where it combines with the air, and thence to the incandescent mantle. The lamp is economical in consumption, a light of 200 candle-power being obtained for 45 hours with a consumption of one gallon of oil, and the light is clear, bright, and of great penetrative power.

## INDUSTRIAL ALCOHOL: HOW IT IS MADE AND HOW IT IS USED.

The development of the use of denaturized alcohol for industrial purposes has probably reached a higher plane in the German Empire than in any other country. It took its rise from the fact that Germany is dependent upon outside sources for its supply of petroleum and petroleum products. When the explosive motor came into general use for governmental and military purposes, the German government realized that in case of war it might be shut off from these sources of supply, and that, therefore, it was advisable to procure a substitute for the mineral hydrocarbon fuel. With the active co-operation of the German Emperor, the growth of the alcohol industry for commercial purposes was both rapid and widespread. The government encouraged the invention and manufacture of alcohol motors for stationary and automobile purposes, of illuminating devices, cooking utensils, and other apparatus employing alcohol as a fuel. Extensive laws regulate the production and use of denaturized alcohol, and for several years it could be obtained in large quantities and at low cost. Unfortunately, the alcohol industry in Germany to-day has gradually come under the control of a trust and, in consequence, the prices have risen so rapidly that many of the benefits arising from the untaxed alcohol system have been lost. In France, England, Austria, Belgium, and other countries, the use of denaturized alcohol is extensive and it is employed in thriving and valuable industries, regulated by wise laws to safeguard the public and to prevent fraud. The passage of the free-alcohol bill in this country promises much good, and as very little is known regarding the subject on this side of the Atlantic, we must draw from the knowledge of the European manufacturers and users for information upon the product.

During the height of the interest aroused among the public in the earlier phases of the denaturized alcohol propaganda in Germany, the press of many countries was full of accounts concerning the sources from which alcohol might be derived, and an apparently authentic account was at one time circulated, in which it was stated that large quantities were produced from such substances as peat and garbage. It appears, however, that alcohol is not made on an industrial scale in Germany from peat or from garbage of any kind. Aside from the small amount that is produced for drinking and medicinal purposes from prunes, grapes, cherries, and other fruits, the great sources of alcohol for industrial and other uses are potatoes, grain, and the molasses derived as a secondary product from the manufacture of beet sugar. The crude molasses left as a refuse product of the raw beet-sugar manufacture contains from 40 to 50 per cent of sugar which cannot be crystallized, and this can also be utilized as a material for the production of alcohol. The spirits distilled from grain and molasses and the small quantities made from cherries, grape-must, plums, etc., are used mainly for drinking and the manufacture of medicines, perfumes, vinegar, and various other food preparations. The great source of industrial alcohol is from potatoes, and it is used for heating, lighting, and motor purposes, and for a vast number of applications in chemical and industrial manufactures. An interesting consular report from Maracaibo states that successful attempts have recently been made to produce alcohol from the hitherto useless bulb or husk inclosing the coffee bean. Should this report prove true, the alcohol industry will have received a new and vast source of supply, which will prove of great value, especially in coffee-growing countries.

Alcohol may be produced from substances containing sugar, or from those containing starch which may be converted into sugar. It may be similarly derived from cellulose, for instance, in the destructive distillation of wood, which results in the production of wood alcohol and various other substances. It can be obtained by distillation or by fermentation, but usually results from a combination of both. In making spirit from beets, sulphuric acid is used during the fermentative process, which is effected by adding yeast to the *wort*. The latter is the result of a process of saccharifying the starch in the substance undergoing distillation. The alcohol results from the decomposition of sugar, which by the process of fermentation is resolved into carbonic acid and alcohol. Sugar is, therefore, the direct source of alcohol, and for this reason sweet vegetables and fruits may be converted into spirits. The starch is readily converted into sugar by means of the substance called *diastase*, which is found in malt and in germinating seeds generally. It is for this reason that starchy vegetables, such as potatoes, as well as sweet vegetables, may be used in the manufacture of spirits. In using starchy vegetables, however, the intermediate process mentioned above of saccharifying the starch, technically known as *mashing*, is necessary. This consists in mixing the raw grain, or other substance, properly ground, with malt and with water at a temperature of about 150 deg. F. In using potatoes these are usually steamed before the malt is applied, for they contain a much smaller proportion of starch than the cereals, and by steaming the starch cells are thoroughly broken and the starch is reduced to a condition in which it is easily acted upon. The saccharine infusion resulting from the *mashing* is that technically known as the *wort*.

The fermentation is effected by adding either brewer's or compressed yeast to the *wort*, or to a saccharine liquid obtained from molasses, beets, or other sugar-producing fruits or vegetables. The fermentation process is carried to its furthest limit in order to produce the greatest amount of alcohol, and the liquid thus prepared for distillation is technically known as the *wash*. The *still* is the apparatus in which the wash is reduced to vapor and then condensed. Essentially and in its oldest form, the *still* consists of a copper vessel provided with a closed head and connected with a spiral tube called the *worm*. The latter is cooled by means of circulating water or refrigeration, and when the heat is applied at the still the spirit begins to rise in vapor along with more or less steam, and passes through the worm, where it becomes condensed by the cold, and trickles down into the *receiver*. The product of the first distillation is impure, and redistillation at a lower temperature is necessary to deprive it of the water and of the oils which have passed with the alcohol. To-day, by means of fractional stills the process has been greatly improved, and the alcohol may be obtained cheaply and of a high grade.

The industrial uses of alcohol are many and varied, as was demonstrated by an exhibition in Germany a few years ago, which was devoted exclusively to alcohol, its production and its uses for industrial purposes. While the general use of alcohol for industrial purposes, heating, lighting, and a vast range of chemical and other manufacturing purposes has steadily increased in Germany, the percentage of the whole product that is used for motor purposes is relatively small and, so far from increasing, is said to be rather diminishing, though to just what extent it would be difficult to prove. A few Germans, from patriotic motives, use alcohol for driving automobiles, freight wagons, motor boats, and farming machinery. It has been found by elaborate tests that the economy of alcohol as a fuel for gas motors is largely increased by its being carbureted through admixture with a certain percentage of benzole or other product of mineral oil. For a time it was believed that this admixture of benzole could not be safely carried beyond 20 per cent, but more recent experience has shown that a mixture of equal parts of alcohol and benzole can be used, especially in large motors, with entire safety and economical results. For automobile purposes the usual proportion is now about 30 per cent of benzole or gasoline, but at the previous cost of alcohol it could not compete on the score of economy with mineral hydrocarbons in a country where they were either produced or imported free of duty.

The industrial applications of alcohol are numerous; the chemical industries lead. Of these, the manufacture of vinegar from alcohol and acetic acid is one of the most important. This industry is mainly the growth of the period since 1887, and its extent may be

(*Continued on page 46.*)