

enormous supply of charcoal furnishes the iron foundries with a fuel that is comparatively cheap, owing to the profits derived from alcohol. In recent years it has been said that charcoal is the by-product and wood alcohol the leading product of the chemical plants; but certain it is that, without the distillation of the alcohol from the wood, the cost of the charcoal would materially advance. Consequently, there would be forced an advance in pig iron, and a great many industries would be affected thereby.

In order to increase the supply of wood alcohol, a number of new chemical plants have been established in the last few years in different parts of the lumbering region of New England, where the waste of wood is enormous. In the hardwood forests the waste of trees is large through crowding and the production of many inferior growths. Millions of acres of New England forest lands contain to-day hardwood trees that are too inferior to have any marketable value except for firewood. Their existence in the woods is a detriment to the rest of the trees, and it would be wise to remove them. To utilize these inferior hardwood trees, and also the tops and limbs of the marketable trees, has become a question of paramount importance to the wood-alcohol manufacturers, and the new plants have been established in the forests for the purpose of making them of service. Owing to the value of the charcoal, as well as that of the alcohol, the plants have always been established in iron-manufacturing regions where there would be a ready market for both products.

Besides alcohol as a by-product, the manufacturers of wood alcohol are to-day obtaining successfully and economically acetate of lime from the same kilns. The acetate of lime thus obtained as a by-product is used chiefly for the manufacture of acetic acid. The by-products that can be obtained from a charcoal kiln are almost too numerous to mention, but the two chief ones in the modern chemical plant are the wood alcohol and acetate of lime. These are to-day very profitable in New York and Pennsylvania, where every battery of charcoal kilns has its chemical plant adjoining, so that the smoke which was formerly wasted is now drawn down into the still and utilized. The value of each cord of wood that is used for charcoal to-day is thus greatly increased. Indeed, from seventy-five to eighty per cent of the tree, branches and all, is to-day utilized by the modern, up-to-date charcoal maker.

Our exports of wood alcohol have been large in the past ten years, because of the large supply manufactured in this country; but should the alcohol motor prove of value as a power producer, either the supply of the fuel would have to be increased, or the export trade cut off. The increased use of wood alcohol in the arts and trades would to some extent be checked if the alcohol motor should prove an economical factor in our industrial life. But the supply of wild woodlands suitable for charcoal making, and incidentally for alcohol distilling, is almost unlimited, and there is a possibility of industrial development in this direction that can scarcely be measured to-day. The annual fires in our forests consume wood enough to produce millions of gallons of alcohol, and this enormous waste is only a part of the loss. The lumber mills, in spite of their efforts to utilize all parts of the trees, waste millions of feet of wood that would furnish the charcoal burner with excellent material for his work. By extending the charcoal and wood-alcohol industry to new districts, the wealth derived from our forests would multiply rapidly, and incidentally the cost of wood alcohol might be reduced to a point where it would prove a most efficient and economical fuel for the alcohol motors of the near future. In Germany at least all confidence is placed in the alcohol motor, and exhaustive experiments are being conducted there under the auspices of scientific and industrial societies.

THE INTERNATIONAL AUTOMOBILE RACE.

For the fifth time there has been a race for the International Cup. It was won by M. Théry in his 85-horse-power Richard-Brasier machine over the Sallburg circuit, in Germany, the distance being 348 miles, and the time being 5 hours, 50 minutes and 3 seconds. The average rate of speed of the winner was 60 miles an hour. On the Continent even the war was forgotten for the "blue ribbon" of the automobile world. The scheme of having a circuit like a race track, is an excellent one, as the spectators have an opportunity of seeing the machine four times. At the end of the first round M. Théry was 32 seconds behind M. Jenatzy. At the second passage of the two racers before the grand stand, M. Théry was 1 minute and 40 seconds ahead, and his machine tore along the closely-guarded road at a speed that filled the spectators with the greatest possible excitement. As they swept past for the third time, M. Théry was leading by 9 minutes and 35 seconds. When those upon the grand stand realized that the gap was being widened, their interest and enthusiasm knew no bounds, and it is doubtful if the competitors were more excited than the vast audience. Never did a couple of hours seem so long. At last a trumpet call announced that the

racers were coming. The suspense at this moment was intense, and finally M. Jenatzy arrived, and was greeted with cheers. M. Théry had started 28 minutes after M. Jenatzy, and at the end of the last circuit but one he was leading by more than 9 minutes. If he passed the line inside of 19 minutes he would have won the cup, but if he passed 20 minutes later than his competitor, M. Jenatzy retained the prize of the "Motor Derby." Then began awful minutes of suspense, five minutes, ten minutes, eleven minutes passed, when suddenly the trumpets sounded. M. Théry flew across the finishing line like a great bomb, and those on the grand stands on both sides of the road gave a mighty roar of welcome to the victor, the German Emperor taking off his cap and waving it in the air. The effort of M. Jenatzy was almost equally good, and this was appreciated by the spectators, who warmly cheered the ex-champion. Troops guarded every foot of the paths and roads leading to the course, and virtually lined the entire circuit. The weather was superb, and the road was in perfect condition. There were eighteen automobiles, representing six nationalities, engaged in the contest.

The winning machine has many novel features. It is of the four-cylinder type, and as has already been stated, is of 85 horse-power; but it can in no way be considered as a freak machine. One of the novel features of this car is a new form of cushion suspension, that is so flexible as to make the car ride easier, and without bouncing on the road. It also has a pressed steel frame with a secondary tubular frame, which carries the engine and the transmission case. There is a triple joint in combination with a slide joint, which makes a perfect flexible connection between the motor and the running gear. The cooler is composed of flat vertical tubes surrounded by fins. No pump is used for the circulation of water, the circulation being obtained by the thermo-siphon system. The clutch is a cone operating in the flywheel. The record of winners in the International Cup Race is as follows:

Year.	Winner.	Machine.	Course.	Distance. Miles.	Time.	
					H.	S.
1900.....	France, M. Charron.....	Panhard.....	Paris-Lyons.....	351½	9	09 00
1901.....	France, M. Girardot.....	Panhard.....	Paris-Bordeaux.....	348	9	00 00
1902.....	England, F. S. Edge.....	Napier.....	Paris-Innsbruck.....	388	10	00 00
1903.....	Germany, M. Jenatzy.....	Mercedes.....	Irish Circuit.....	368½	6	36 00
1904.....	France, M. Théry.....	Richard-Brasier.....	Homburg Circuit.....	348	5	50 03

It will be remembered that the International Cup was given by Mr. James Gordon Bennett.

M. CURIE'S WORK ON RADIUM EMANATIONS FROM MINERAL SPRINGS.

M. Curie has been making some determinations of the radio-activity of gases which are given off by mineral waters. Elster and Geitel have already shown that the gases of the air and the soil have a certain electric conductivity and can set up induced radio-activity in other bodies. Later on, it was found that the gases given off from mineral waters also possessed these properties, but in a much greater degree, and it has been recently shown that these effects are due to the presence in the gas of an emanation which is analogous to that of radium. Quantitative determinations of the gases collected at different mineral springs have been made at M. Curie's laboratory, as it is necessary to know the numerical values in order to compare the active power of the different gases. The companies sent the gases to the laboratory in well-sealed flasks. After drying, the sample of gas is placed in a closed brass cylinder which forms the outer part of an electric condenser. The inner part of the condenser is a brass rod placed in the axis of the cylinder and well insulated. The cylinder is given a charge of 200 to 300 volts, and the inner rod is connected to an electrometer. The gas, which becomes a conductor owing to the emanation it contains, allows a certain current to pass from the cylinder to the rod, and this current is measured by an appropriate method. The current is set up as soon as the gas is admitted. It increases somewhat rapidly for several hours, owing to the formation of an induced radio-activity on the inside surface of the cylinder. The current then decreases slowly, and this generally occurs about twenty-four hours after the introduction of the gas. The rate of decrease is the same as for the radium emanation. M. Curie made a table for the gases of different mineral springs of Europe. The numbers correspond to the current measured after leaving the gas 12 hours in the condenser. Given the current and the dimensions of the condenser, he could obtain the quantity of emanation which each gas contains, but it is preferable to compare directly with a standard bromide of radium solution. Thus with a solution containing 0.00001 gramme of radium bromide in a wash-bottle, at the end of a certain time he draws off the emanation which has accumulated, by means of a current of air. The charged air is sent into the condenser and the current is measured as before. This gives a standard of comparison. A few of the highest values of the emanation from different mineral waters may be given here. The water from Bad Gastein (Austria) has by far the

strongest emanation, represented by the figure 360. After it come four samples of water from Plombières (France), at 47, 29, 28, 21 respectively. Banis les Bains and Luxeil (France) show 16 and 5.7. There is no doubt that the activity would be twice as strong if taken directly at the springs. A photographic plate is acted upon when left for a few hours under a bell jar with the Plombières water. M. Curie thinks that the action does not come from a radium salt dissolved in the water, but is due to some other cause which is not as yet explained. The presence of the emanation may account for the physiological action of some mineral waters, seeing that some springs have an action upon the system which is not to be explained from their chemical constitution.

CAMEOS AND THEIR HISTORY.

An interesting lecture was recently delivered by Mr. Cyril Davenport at the Royal Institution, London, dealing with the beautiful handicraft dating from Ptolemaic times—cameos. Mr. Davenport maintained that a first-rate intaglio on hard stone was the finest work of art which could be wrought by the hand of man. Intaglios, however, he explained, were normally intended for the purpose of making impressions, being therefore only a means to an end, whereas a cameo was complete in itself. He described the processes necessary to the production of a cameo, including the mysteries of the bow drill, cutting diamond point, and modern gem-cutter's lathe. A short account was also given of the early history of cameos on shells, eggs, and soft stones before the discovery of onyx as the material specially adapted for cameo-cutting. The Græco-Roman, and especially the Augustan, period was rich in cameos, and almost every great Roman wished to have his portrait cut in onyx. One of these, an exquisite portrait of the Emperor himself, which formerly belonged to the Strozzi collection, is perhaps the finest existing cameo. Such portrait cameos were practically indestructible, except by accident. The large cameos—the "Triumph of Bacchus" at the Vati-

can, the "Agate de Tibère" at Paris, and the "Gemma Augusten" at Vienna—were described in detail, and much curious information was given about the signatures on cameos. When these signatures were in relief they were undoubtedly genuine, but when in intaglio they might be forgeries, and many such signatures were known to have been forged during the Renaissance.

Regarding the glass pastes, the finest instances of glass cameos are to be found upon the Portland vase and the Auldjo vase, both in London, and on the Vase des Vendanges at Naples.

The remarkable change from the classical and mythological designs of Græco-Roman times to the Christian themes of the fourth century, when Constantine the Great became Christian, is curiously illustrated in cameos. Hercules was christened "David," Perseus and the Gorgon became "David and Goliath," and Venuses and Ledas were turned into "Virgin Marys;" and the great "Agate de Tibère" at Paris was only saved from destruction by being called the "Triumph of Joseph in Egypt." Then at the Renaissance they all went back again, and classical art recovered its lost position. The Renaissance cameo-cutters were very skilled workmen, but in spite of their general high level they had not succeeded in making any very important cameo, although the "Hymeneal Procession of Eros and Psyche" realized a high price. They were, however, eminently successful in the setting of gems. Pope Pius II. and Lorenzo de Medici bestowed high and learned patronage in the matter of engraved gems. Two very charming pendants with cameo portraits of Queen Elizabeth represented English work, and fine recent work has also been executed by Edward Burch, Marchant, Wray, and Brett. In Great Britain, however, the art was virtually lost, and Bernardo Pistrucci, chief engraver to the mint, who designed the beautiful group of St. George and the Dragon on the English sovereign coin, was really the last great cameo designer. In France fine work has been done in late years by Adolph David, Henri François, Georges Lemaire, and others.

Three submarines of an entirely new type have been laid down simultaneously at Cherbourg. They are to be known as the "Emeraude," "Opale," and "Rubis." They will have a double hull, as in the case of the "Narval" class. The length of each will be 147.64 feet; beam, 13.12 feet; displacement, 600 tons; motor, 600 horse-power, driven by electric power from accumulators when submerged, and by benzine or other vapor when on the surface; speed, 12 knots. According to the *France Militaire*, each boat will have two propellers, and carry six torpedo tubes.