with the most modern machinery for lifting water, and nearly all are operated by steam power.

Of recent years the supply from the streams of water has been sufficient to meet requirements even during the season of the greatest drought. In Southwestern Louisiana, however, are strata of gravel at 125 to 200 feet under the surface of the entire section, containing a generous supply of water, which will of its own pressure come so near the surface that it can be readily pumped. Repeated tests have proved that there is a bed of gravel nearly 50 feet in thickness underlying this section of Louisiana, which carries a large amount of soft water with sufficient pressure to bring it nearly to the surface.

A 6-inch well will furnish a constant stream from a 4 to 5-inch pump. A system of such wells may be put down 30 to 40 feet apart, and each one will act independently and furnish as much water as if it stood alone. Such a combination of wells may be united just below water level, and all be run by one engine and pump. Water rises naturally in these wells to within 20 feet of the surface, and a number of flowing wells have been secured. The lift is not greater than from rivers, lakes, or bayous into canals. Eight 4-inch wells united at the top can be run by one 16-inch pump and a 50-horse power engine, and will flood 1,000 acres of rice. The total cost of an irrigating plant sufficient for flooding 200 acres is from $1,500 to $2,500. It requires about seventy days' pumping for the rice season.

These canals where well constructed and operated have proved entirely successful, and have made the rice crop a practical certainty over a large section of country. They range in irrigating capacity from 1,000 to 30,000 acres. The usual water rent charged the planter by the canal company is 324 pounds of rough rice per acre watered.

The operations of harvesting and threshing the rice crop in Southwestern Louisiana are performed with the self-binder and the steam thresher. The use of the former is favored by the size of the fields, and by the character of the soil. The use of the latter, while it frequently involves the breakage of considerable grain, is a cheap, rapid, and effective method of separating the rice from the straw. Without the use of such machines the large cultural operations of this section would be impossible. In fact, the employment of machinery in the rice fields of the Southwest similar to that used in the great wheat fields of California and the Dakotas is revolutionizing the methods of cultivation and greatly reducing the cost. The American rice grower, although employing higher-priced labor than any other rice grower of the world, will ultimately be able to market his crop at the least cost and the greatest profit. If, in addition, the same relative improvement can be secured in the rice itself, if varieties which yield from 80 to 90 per cent of head rice in the finished product can be successfully introduced, American rice growers will be able to command the highest prices for their product in the markets of the world.

So extensive have become the interests engaged in rice and other cultivation in Louisiana and Texas that a number of companies have been organized with ample capital, each company controlling areas ranging as high as 5,000 and 6,000 acres. The Duson Canal system is one of the largest in the Southwest; and supplies the necessary irrigation to a series of the most extensive rice plantations in the world. The indications are that with the area recently placed under cultivation in the Southwest the United States will possibly in time supply more than the combined countries of the world. Although the cultivation has already assumed large proportions in Louisiana and Texas, it is claimed that the outlook for the further extension of the industry is very promising. According to the best estimates there are about 10,000,000 acres of land in the five States bordering the Gulf of Mexico well suited to rice cultivation. The amount which can be sucessfully irrigated by present methods, using the available surface and artesian flows, does not exceed 3,000,000 acres. The balance of the land could probably be brought into cultivation were it necessary, but the cost would, perhaps, be prohibitive at present prices. The best results require rotation of crops; consequently only one-half of that amount, or 1,500,000 acres, would be in rice at any one time. At an average yield of 10 barrels (of 162 pounds) per acre, 1,500,000 acres of rice would produce nearly 2,500,000,000 pounds of cleaned rice, nearly six times the amount of our present consumption.

As already stated various products are raised through means of irrigation, but, of course, a large mileage of the canal system has been constructed principally for rice culture. In the same section, however, sugar cane, cotton, and corn yield largely, while the cultivation of garden vegetables has assumed quite large proportions, sufficient moisture being afforded by the irrigation system, which also furnishes drainage to the lower lands when necessary.

Correspondence.

Cause of Transparency for Heat and Actinic Rays.

To the Editor of the SCIENTIFIC AMERICAN:

Is carbon in organic compounds the cause of their transparency for heat rays?

Nigrosine, a coal tar color used in dyeing ($C_{30}H_{27}N_3$), and which is very rich in carbon, is dissolved in chloroform or alcohol by scientists and used as a ray filter to cut off all rays except the heat rays, which it transmits freely.

All the other coal tar dyes have been found to be very transparent for the heat rays, but opaque for ultra-violet rays, and almost opaque for light rays. (Proc. Roy. Soc., vol. 38, pages 77 to 83.) These dyes all contain a relatively large amount of carbon.

Liquids which contain a high percentage of carbon are the most transparent for heat rays; for example, carbon bisulphate, benzine, iodide of methyl and ethyl, chloroform, alcohol, naphtha, amylene, xylol, essence of lavender, essence of turpentine, etc.

Many of the lines of absorption in these compounds in the infra-red region coincide and are due to hydrogen. Bisulphide of carbon and several other diathermanous substances, which do not contain hydrogen, do not show these absorption lines, which are present when hydrogen is contained in the molecule. (Proc. Roy. Soc., vol. 31, Abney and Festing.)

Lampblack, which is almost pure carbon, when a thin coating is spread on a rock salt prism, cuts off all the rays except heat rays (it transmits long heat rays), and it has been discovered that this substance does not absorb all rays, as stated in most text-books, but is somewhat transparent for heat rays.

Substances containing a large amount of carbon are opaque to light rays, as is the case with some of the coal tar dyes, lampblack, charcoal, diamonds (when heated and converted into graphite), graphite, etc., but when hydrogen is added to carbon, as in the hydrocarbons, such substances are transparent for light rays.

When hydrogen is added to the colored elements chlorine and iodine, colorless gases result.

When hydrogen is added to dyes, by reduction, what is known as leuco compounds of the dyes are formed, which compounds are colorless. They are converted into the dyes by oxidation; i. e., elimination of hydrogen and substitution therefor of radicals, etc. All of the dyes of the triphenyl-methane group (rosaniline, aurin, and eosin group), indigo, methylene blue, safranine, and other dyes, are capable of yielding such leuco compounds. (See "Organic Chemistry," by A. Bernthsen.)

Water is highly transparent for light rays and actinic rays, but absorbs more heat than any other liquid (Tyndall). The great absorption of heat by water is undoubtedly due to the fact that it contains no carbon. The transparency for light rays may be due to hydrogen, and transparency for chemical rays may be due to oxygen.

Is oxygen the cause of transparency for chemical or actinic rays?

The evidence on this point is very conclusive, and yet in no book or magazine is this fact stated.

Quartz (SiO_2) is used in the form of prisms when the ultra-violet or chemical rays are to be examined, as these prisms transmit the ultra-violet region more completely than those made of glass or any other material.

Water (H_2O) is highly transparent for these rays.

The normal alcohols and fatty acids, which all contain oxygen, are more or less transparent for the ultra-violet rays.

The transparency for the ultra-violet rays is the greatest in those acids which contain the most oxygen. Citric acid, which contains seven atoms of oxygen, absorbs but a small portion of the ultra-violet spectrum, while acetic acid, which contains two atoms of oxygen only, absorbs nearly the whole of this spectrum. In the case of the sulphates, sulphites, and hyposulphites, the former contain the most oxygen, and are the most transparent for ultra-violet rays. (See article by Dr. W. A. Miller, Jour. Chem. Soc., 1864.)

Hydrocarbons, which do not contain oxygen, appear to be unable to allow these rays to pass through them. Thus benzine (C_6H_6), terpenes with the composition $C_{10}H_{16}$ and $C_{15}H_{24}$; anthracene, and naphthalene, and other hydrocarbons are almost opaque for the ultra-violet rays. (See Landauer's "Spectrum Analysis" and Jour. Chem. Soc., 1898.)

There is a difference of opinion among investigators as to whether open chain hydrocarbons, such as the paraffines, absorb the ultra-violet rays, but Prof. W. N. Hartley, who is perhaps the best authority on such questions, states in The Journal of the Chemical Society (1893), that all open chain hydrocarbons exert continuous absorption in the ultra-violet region.

Solutions of gelatine, starch, glycoses, and saccharoses are transparent for these rays. (Landauer's "Spectrum Analysis.")

Oxygen gas itself, whether in the gaseous or liquid state, has been found to be more transparent for the ultra-violet rays than for other rays. When this gas is under great pressure, or in the liquid condition, it is dark colored or bluish, and no doubt if it could be obtained in an absolutely pure condition it would be black. A very small amount of gas mixed with oxygen or hydrogen affects its absorption of light and other rays. WILLIAM SCHUSITER.

Chicago, Ill.

Automobile News.

Her Imperial Majesty Augusta Victoria, Empress of Germany, has been added to the list of royal chaffeuses.

Chicago authorities have granted licenses to six women to operate automobiles. They were all for running electrical vehicles.

It is probable that an automobile service will be established between Bologna and Modena. It is said that the cars will have a very large seating capacity.

The race from Paris to Rouen, in which fifty-two vehicles used alcohol, has resulted in a decided drop in the price of gasoline; forty-one of the carriages succeeded in finishing.

The Committee on Sport of the Automobile Club of France has decided that the international club race will take place in the first week of May, and it will be run on the Paris-Bordeaux itinerary. The choice of the French team has not yet been made.

The Central Passenger Association has decided that automobiles are not baggage and that they cannot be checked. Some of the theatrical companies thought they were entitled to have them checked, but the Passenger Association ruled to the contrary.

M. Lenoir died recently in Paris in poor circumstances. In 1860 he was granted a patent for an electrically ignited motor driven by an explosive mixture of air and gas. It was not thought, however, that the invention was of any value, but two years later his carriage made a number of short trips through Paris streets. On many accounts he may be regarded as the father of one type of automobile.

On December 21 a severe snowstorm visited Atlantic City, the fall being twelve inches. The result was that railroads, trolley cars and nearly all the public conveyances were unable to make trips; the electric automobiles, however, continued to operate with almost the same degree of regularity as under normal conditions. An automobile at Lakewood has also proved to be highly successful in snowstorms.

An interesting trial of electric cabs for city use was recently held at Vienna. The tests, which were of an official character, were superintended by M. Peyron, Prefect of Police; Dr. Waas, M. Kienast, Councilor of the Prefecture, and the Chief of the Fire Brigade, M. Muller. They started from the city hall in two electric cabs, and made the tour of the main streets in the center of the city, and then after a number of detours in the narrower side streets came back to the starting point. These tests have given very satisfactory results, and the vehicles made a good showing. The batteries will carry a sufficient charge for a 30-mile run. The judges were especially impressed with the ease with which the automobiles went through their evolutions, starting and stopping instantly. There is some talk of constructing one or more electric fire-pumps for the city.

This year will see a number of important automobile races in Europe, among which may be mentioned that of the Gordon Bennett cup, the Paris-Amsterdam and the Paris-Berlin and the Berlin-Vienna races. For the Gordon Bennett cup at least three clubs will compete, the Automobile clubs of Great Britain, America and Germany; the former club will hold a series of preliminary races, and the winners alone will be allowed to compete for the cup. The German club intends to be represented by five vehicles, two Daimler, one Benz and two Canello-Durkopp. It is probable that America will be represented by the Winton machines. It is probable that Belgium will enter the race with Bollee or German machines. As will be remembered, the cup was won last year by Charron, representing the Automobile Club of France, although owing to various misunderstandings the race was unsatisfactory, owing to the fact that all the competitors did not run. Another interesting event will be the Paris-Berlin contest, which will be held in May. The Emperor William, whose interest in automobile matters is well known, is to give a prize for this race. Shortly after will be held the Berlin-Vienna contest, organized by the "Auto-Velo" in co-operation with the German and Austrian Automobile clubs. The distance from Berlin to Vienna is 350 miles, over a good road, and the run may be made in less than one day. A number of prizes of considerable value will be offered. If the competitors in the Paris-Berlin race continue to Vienna, they will have covered a total distance of 1,070 miles, and if they make the return trip to Paris this will make 2,140 miles; this will be a good opportunity to observe the endurance of the machines.