upper air have floated around for days before finally dropping to the earth again. In the upper currents of air they might travel a hundred miles before descending low enough to be breathed in by people. It has been estimated by German experts, who have made more of a study of these questions than any other nationality, that tropical diseases have in this way been carried by the wind from the mainland to islands ten miles and more in distance. Heretofore it has been said that tropical diseases were more or less local, and that the germs rarely reached an altitude of a few feet. But this must be modified in the case of germs which are carried upward by means of fine dust. While not volatile enough to float to any great distance in the air, they might easily be carried up there by the wind, and then distributed around over a wide area before falling. The germs which are destroyed by the warm rays of the sun would, of course, be killed by this exposure to the direct sunlight, but many of our worst disease germs are not injured in any way by the hot sun. They could easily be carried around indefinitely.

When warm, moist, and "muggy" weather comes in our cities, we speak of it as disease-breeding weather, and this probably more aptly describes the conditions than anything else. But such disease-breeding weather would have no injurious effect upon our health if the germs of disease were not already scattered around. Sometimes a few days of warm dry weather, followed by wind, will produce the right conditions to fill the air with the germs. Right after a snowstorm or heavy rain the air is clarified, and there are fewer germs breathed in than at any other time. Every one feels the tonic of such air, and enjoys the mere breathing of it.

SOME AFTERTHOUGHTS ON THE AUTOMOBILE SHOW.

In reviewing the late automobile show in this city, we shall endeavor to indicate the general trend of design as to general external appearance, and its particular trend in mechanical details.

The New York show of a year ago, outside of the purely American types of steam and electric vehicles, had a most pronounced French aspect, especially in the gasoline car division; and while the 1903 show also, somewhat more modifiedly, presented this aspect, it was largely due to the number of imported French cars on exhibit, and the presence of some few new American cars which were of this type. Nevertheless the "Frenchiness" of style, if the term is allowable, was not as dominating as in the previous show.

As was expected by those familiar with the state of the art, three-quarters of the vehicles shown were of the internal-combustion cylinder type, i.e., gasoline cars. This increase was largely due to so many of the new makers who have entered the field adopting this type, as have some of the makers of steam carriages also.

Out of seventy different makes and distinct patterns of gasoline cars, forty showed front-motor construction, while twenty-five of the back-motor cars had bonnet fronts, leaving only a small fraction which had not wholly adopted the typical up-to-date front-motor bonnet construction of the body. The tubular frame has practically given way to the angle or channel-iron frame, or wood frames reinforced with steel plates, which the French call "*bois d'armée*."

Multiple-cylinder, vertical motors, having two, three, and four cylinders, are of course in the lead. The horizontal type is a good second, owing to the number of two-cylinder opposed style motors shown, exemplified in the Winton car; and, if the single cylinder, horizontal motors are added to these, the horizontal type may be said to lead, or nearly so. Only two makers show a three-cylinder, vertical motor (the Duryea and Toledo), the trend evidently not being in this direction. Four-cylinder vertical motors were shown by eighteen makers, a large gain in this type. Only one two-cycle motor (the Elmore) was shown. A new form of horizontal motor (the Shelby) having both ends of the cylinder open, and two pistons forced in opposite directions by explosion in a common center chamber, attracted considerable attention. This motor was constructed somewhat on the same lines as that employed by the Gobron-Brillié firm in France. The idea of this particular form of construction is, that by causing the explosion to occur between the two pistons and drive them apart, vibration is almost entirely done away with.

The surprising thing was the total absence of alcohol and kerosene motors, the reason probably being the high price of alcohol, and the difficulty of vaporizing kerosene without carbonization, which chokes the tubes and motors. No traction motors for hauling wagon trains for agricultural purposes on common country roads were shown.

Nearly all the cars had small hand levers, conveniently arranged on the steering pillar, to vary the speed by advancing the spark, or to control the motor by using the throttle valve, so as to avoid the use of the speed change gears. Foot levers to disengage the clutches, leaving the motor running free, and foot levers that freed the clutch and put on the brake at the same time were plentiful. The only thing that now demands the inventor's attention is to devise some method of starting under load, and to do away with the power-consuming transmission gears of the gasoline car, so that the motor will be as elastic as the steam engine under the throttle and the electric motor under the controller. High-speed motors were not very common, low-speed motors being mostly used.

A great many of the cars shown still had the wasteful plain bearings; but a decided tendency was shown to use roller bearings more largely than heretofore, the ball bearings seeming to bother the automobile maker, although a number of them were used, not only in the wheels and steering heads, but in the transmission gears, and on the shafts, to take up the end thrust, as on the Peerless. The only carriage in the show having ball bearings all over, including the motor, a practice that might well be adopted by other light-car makers, was a light electric Baker runabout.

The reigning European practice of mechanically-operated inlet valves was shown on about a dozen cars, the peculiar thing about it being its use on many of the small cars with single cylinders, as on the Olds, the Rambler, and the Thomas, and its comparative absence on the big cars having multiple cylinders, which still use automatic suction intake valves. Few air-cooled motors were shown. One of these was the Franklin, with a four-cylinder vertical motor of ten horse power, with flanges on the cylinder and head; while a well-known form exhibited was the waterless Knox, having pins like a porcupine's quills all over it, and a fan to aid in cooling. It was expected that electric generators would be more numerous than the batteries for sparking purposes, but a careful census showed the batteries to be in the lead. In some cars both systems were used, the battery merely being used for starting, and afterward being automatically switched out, the generator then furnishing the current. Of course the dry battery was more largely used than the storage cell, which was sometimes used to store the excess of current the generator furnished, so that in case the generator went wrong at any time, the accumulator could be called in and used for running continuously as well as starting the motor. Some of the makers, like the Electric Vehicle Company, who make a big gasoline car, the Mathewson and the Spaulding, announced that they had succeeded in abolishing the starting crank; but investigations proved these claims to be misleading and ambiguous, to say the least, the method consisting of leaving one or more cylinders, in a motor having vertical multiple cylinders, under compression, and then firing the charge with an electric spark from the battery. This, however, can only be done about once in every four trials, and then not at all, if the charge is left standing over two hours. It necessitates a very close-fitting piston and piston rings, with high compression, each of which has been had before on French cars and is not new. As proof that it is not absolutely reliable, the usual crank is provided, with a battery for furnishing the initial spark, for starting, and the generator to furnish the current when running.

Mechanical lubrication has almost wholly displaced gravity oil feeds.

Sliding and planetary gear transmissions are about equally in favor, the use of independent friction clutches coming next. Two new forms of electric and pneumatic control over the transmission gears were shown, both operated by very small valve handles at the side of the operator, thus doing away with the long change-speed levers that are in common use. The pneumatic control on the Country Club car was arranged so as to divert a minute charge of compressed gas from both cylinders into a storage tank, from which it was conveyed by piping to three small cylinders having pistons, each of which operated a clutch giving the speed desired, when the pressure was admitted through a three-way valve rotated by its controlling handle.

Single-chain drives are more popular than ever, although at the previous show it looked as if the double outside chain drive to both rear wheels from a differential countershaft would supplant this form; but the bevel-geared drives have crowded the double-chain drives out of second place. Of course, this construction carried with it the live rear axle, a large majority of the cars shown being equipped with these, which has led to a close fight for supremacy between the spur and bevel differential gear, the spur, however, being still in the lead. Direct drives on the high speed, without the use of intermediate gears, was one of the latest forms of modern practice shown.

Referring to the steam carriages exhibited, to the introduction of which the present popularity of automobiling is due, it is evident they are much more carefully constructed than formerly, and the details are better worked out. It was not to be expected that anything new would be shown in steam carriages, modern engineering having so thoroughly exhausted anything new in this line, so that all the makers in steam carriages could do was to adopt the best stationary practice to their use. Fire-tube boilers are in most common use, but flash boilers and condensers are shown on the White, which also uses a compound engine. Economy in the use of water is the desideratum, and in England condensers are a necessary adjunct, the law there not permitting the use of steam carriages on the road without condensers.

Prices at the show ranged from $500 to $8,000, and it is evident that the day of the $100 automobile, excepting the motor cycle, is a long way off. Prices on runabouts with single-cylinder motors average about $750; a heavier single-seat car, with a more powerful motor costs about $1,200; a touring car with a tonneau body costs from $850 to $8,000, the high-powered ones costing from $1,800 to $2,500, and some makes from $3,000 to $5,000; the lowest-priced steam carriage shown (the Mobile) costs $550—certainly a popular price to commend it to public favor. Many of the high-priced tonneau bodies are of the bulging shape known as the "King of Belgium" type. They are made of aluminium and can be bought separately of the carriage-body makers, to fit the *chassis*, two of the makers of these (the Berg and the Locomobile) announcing that they prefer to build and make the *chassis* only, leaving the purchaser to select the body, painting, and the upholstery elsewhere. No freaks were shown, and the entire absence of racing monsters was a sign of the tendency to build for comfort, economy, and efficiency, with moderate speed for touring purposes; and if touring over the country is not popular this coming season, it never will be. Eight makes of motor cycles were shown, but the poor man's automobile was rather overshadowed by the four-wheelers, as was the only three-wheel carriage at the show. A number of inclosed cars of the coupé type, by the Berg Company, and also the Limousine top style of the Ward Leonard, and other makers, mounted on the regular *chassis* of the gasoline cars, was shown, thus making the modern automobile an all-the-year-round vehicle instead of a summer car for the pleasant weather only. In commercial vehicles, the ponderous but yet handsome electric trucks of the Vehicle Equipment Company made the best showing, the lighter electric delivery wagons, with and without tops, sharing their popularity with the White steam and long-distance gasoline wagons of the same style.

SCIENCE NOTES.

The New York Aquarium added to its collection on December 13 a snapping turtle which was one of the best ever seen in captivity. Unfortunately, the creature died three days after it was received. It was a Mississippi snapper, and measured from the point of its beak to the tip of its tail 4 feet, 7½ inches. Its upper shell was two feet long. The total weight of the animal was 106 pounds.

A very striking instance of the deterioration of leather, produced under conditions demanding quicker tanning by the use of various chemicals, thus decreasing the durability of the material, is afforded by the fact that the British Museum expends $20,000 a year in rebinding books in leather. Modern leather is widely different from the material produced by what is now regarded as an effete process, its life being limited to fifteen years. In the search for cheaper and quicker processes of making leather, large quantities of sulphuric acid are used, and this chemical, in combination with others, causes the material to decompose rapidly in the course of a few years.

Franz, the German astronomer, published two years ago an exhaustive treatise on "The Mountains and Craters of the Moon." In this work the latitude and longitude of each mountain and crater were worked out, and since that time his book has been used in all the observatories of the world as the standard. Prof. Pickering, of Harvard, has been at work recently on a new atlas of the moon and discovered that no account has been taken heretofore of the altitude of the craters. He has discovered that the latitude and longitude measurements of each are greatly affected by the height. All previous measurements used in the study of the moon by astronomers will have to be corrected by the new series of tables, upon which Prof. Pickering is still at work.

Ever since Prof. Tyndall first discovered the movement of glaciers, attempts have been made by scientists to ascertain the exact depths of these natural phenomena by boring. Their efforts, however, have not been attended with very conspicuous success, owing to mechanical difficulties that have been encountered. But Profs. Blumcke and Hess, from Bavaria, who are well known for their studies of glaciers, have succeeded in boring through the Hintereis glacier in the Otzthal Alps, and found the ice to be 153 meters deep. The machine used for boring was driven by hand, and somewhat resembled that usually employed for experimental boring in mines, but was fitted with special arrangements for washing out fragments of ice from the bore hole to prevent their freezing together again. The expenses of the investigation, which is of incalculable benefit to science, were defrayed by the German and Austrian Alpine Clubs.