Correspondence.

THE ACTION OF A CUTTING EDGE.

To the Editor of the SCIENTIFIC AMERICAN:

The true action of a cutting tool or edge is not fully understood by the common machinist, I have noticed. It is not realized that it does not cut as the word is usually understood, but tears the material apart. No matter how fine the edge, the tool tears the fibers, but the finer the edge the fewer fibers it tears. To divide the material without tearing a cutting edge of absolutely no thickness would be required, but this is an impossibility. On microscopic examination the edge of the finest razor is shown to be composed of irregular saw teeth, while the edge of an ordinary lathe tool is very rough and blunt.

Springfield, Mass. GEORGE CLARK-RAYMOND, JR.

THE DISCOVERERS OF THE HUDSON.

To the Editor of the SCIENTIFIC AMERICAN:

The following dates and facts may be interesting to your readers:

1524—Verrazano saw Sandy Hook, which he called Cape of St. Mary. He entered New York Bay and explored it. He noted the difference between high and low tide to be eight feet in the bay. He sent a boat ashore at Rockaway Beach and again at Quogue.

1525—Gomez entered New York Bay. He called it St. Christobel. He called the cape that Verrazano had christened Cape of St. Mary, Sandy Cape, which was afterward transformed into Sandy Hook. But on a map made in 1527 we find Sandy Hook called by the name that Verrazano gave it, Cape of St. Mary.

1541—On Mercator's globe, made this year, the Hudson is called the Grande River.

1542—Allefonsce sailed through Long Island Sound, described Hell Gate and the Palisades. He noticed that the waters of the great river were salty for eighty-eight miles. He sailed its whole length, as far as it was navigable. But was he the first white man to sail up the Hudson? Did not some of the French traders on Manhattan Island precede him?

1609—Henry Hudson, eighty-five years after Verazzano, entered New York Bay, and sixty-seven years after Allefonsce sailed up the river, now called by his name.

Mr. William Harper Bennett, in the first chapter of "Catholic Footsteps in Old New York" gives these and other facts, and in an extensive bibliography shows us where to look for further information; but it is a pity that he or some one else has not gathered together all the facts concerning the pre-Hudson trips up the Hudson. J. F. SHEAHAN.

Poughkeepsie, N. Y.

WELLS AND DARWIN, AND THE DOCTRINE OF EVOLUTION.

To the Editor of the SCIENTIFIC AMERICAN:

The pioneer work in evolution of William Charles Wells, M. D., of Charleston, S. C., is written up in the following scientific journals: Medical Record, February 15th, 1908, February 13th, 1909, and The Journal of the American Medical Association, March 15th, 1909.

It appears to the writer that European scientists have overlooked some points which may entitle America to a large share in the honor of the discovery of the principle of natural selection and the law of the survival of the fittest. Possibly Darwin's statements have been underestimated, while his opinions have been overrated. In the historical sketch of the later editions of "The Origin of Species," Darwin furnishes the following facts: Dr. Wells "distinctly recognizes the principle of natural selection, and this is the first recognition which has been indicated; but he applies it only to the races of man, and to certain characters alone." "As far as the mere enunciation of the principle of natural selection is concerned, it is quite immaterial whether or not Prof. Owen preceded me, for both of us, as shown in this historical sketch, were long ago preceded by Dr. Wells and Mr. Matthews."

Study of the historical sketch seems to invite the belief that Wells's distinct recognition, application, and precedent enunciation do not raise Wells's work, in Darwin's estimation, above that of some who appear to have done little more than imperfectly copy what Wells had already discovered, clearly applied and enunciated.

The discovery of the principle of natural selection seems to be claimed by several scientists, and only some writers have given Wells's work the credit of its important influence upon evolutionary thought; but all writers seem to consider both the claims of Darwin and of Dr. Alfred Russel Wallace, who, independently and almost coincidentally, discovered the principle of natural selection.

NORBURNE BARNARD JENKINS, M. D.

New York, N. Y.

A Novel Rudder Indicator.

A rudder indicator is now made which indicates the position of a rudder at night without the use of any light in the wheel house. The device is made entirely of bronze and is attached to the steering wheel. An arrow traveling over a dial indicates the exact position of the rudder, swinging as it does with the rudder so that the position of the rudder may be seen instantly in daylight. At night, the scale remains dark if the rudder is amidship. If the rudder is to port, a red light illuminates a translucent shield, thus notifying the helmsman immediately of the general position of the rudder, while the arrow gives the exact angular deflection. If the rudder is to starboard, the shield glows green. In no instance is any bright light shown to interfere with or obscure the wheelman's vision, which is the case wherever a light is turned on in the wheel house.

Common Ignition Troubles.

BY E. Q. WILLIAMS.

If we were to judge by some of the things we read, all ignition troubles are common enough, but if one takes into consideration the number of outfits that are in unskilled hands and the treatment they frequently receive, the wonder grows, not that there are some troubles, but that there are not a great many more.

One of the commonest troubles is weak batteries. When starting out everything runs all right and perhaps continues until the car is so far away that a new battery is not to be had, when skipping or misfires begin, and continue to grow worse until perhaps the engine stops.

In cases of this kind an ounce of prevention is worth several pounds of cure, but when the ounce is not used, it is necessary to do the next best thing. If in a boat or auto, there are frequently some used-up dry cells lying around in the odd corners, and among them may be one or two that still have some life in them. Adding these to the others in series may help one to limp along to where new batteries may be secured, even though 8 or 10 cells are used in series. If all cells are in about the same condition, putting two, or even more sets if you have them, in parallel will help amazingly. If you are near a drug store or where you can get some sal ammoniac, try drilling three or more holes deep into the cell—clear to the bottom won't hurt anything—and pouring in a strong solution of sal ammoniac in water. Let it soak in well; then put in some more. Keep doing this for 10 or 15 minutes and it will help out, though it takes some time for it to soak through and get thoroughly at work. Dilute sulphuric acid is also recommended for this purpose, though the writer has never tried it and cannot say how well it will work. If one were near a source of direct current, putting the cells in series with a bank of lamps—with the positive pole of the line to the carbon of the cells—and running the current through for a time, will rejuvenate them, though as one can nearly always get new cells where current can be had, this scheme doesn't amount to much.

Broken wires and bad connections are also responsible for their share of troubles. Broken wires can usually be located easily if one goes at it right.

When your engine stops, turn it over once or twice and if nothing happens, or if you have a spark jump and you do not hear anything buzz, some main connection has gone; if one or two cylinders work and the rest do not, then the individual wires to the dead cylinders are the ones to investigate.

The first place to look is at the wires that move; for instance, the timer wires; these frequently break at the binding post on the timer. Next look at any loose places where the wire may jar up and down; it may be broken inside of the insulation. If you have an extra piece of wire handy—and it is an excellent plan to have some of what is called "annunciator wire" coiled up in your kit—run it across in the place of the suspected wire, connecting it in. Then try your motor again, proceeding in this way until you find the trouble.

An excellent plan is to leave the motor on contact so that, in the case where it has jump spark ignition, the vibrator of the coil will begin to buzz as soon as the trouble is found; or if the engine has make-and-break igniters, touching the wire which has been taken off the electrode to the frame will tell the story.

Sometimes the jarring of the motor will break the ground wire or make its connection work loose; sometimes a wire will break with apparently no reason and in places where apparently it is absolutely certain that there is no possible way for it to break, so that in hunting trouble, never take it for granted that anything is right, but consider that it is liable to be wrong until it is proved right.

Sometimes the battery connectors break off, or the binding posts jar loose and the current passing through a poor connection turns it black, so that it does not carry the current as it should; this is sometimes difficult to find, but when it is suspected, the best thing to do is to go over the connectors, giving each a strong pull on each end; then go over each of the binding nuts with a pair of pliers and tighten them up so that they are solid. If a battery tester is at hand, try testing the battery clear across from the first cell to the last. This will show whether all connections are carrying current or not, though even if this test shows all right, the jarring from running may make loose connections show trouble.

One of the worst things to ferret out is a trouble that comes and goes. Perhaps everything will work all right for a few minutes or hours, and then the trouble breaks out, and after a few minutes' hunt it is gone only to reappear later.

Such troubles are usually caused by a poor connection, a wire broken inside of the insulation, etc. Perhaps the timer pulls so far around that it grounds a contact; sometimes a lever in a certain position will crowd a wire so that the insulation wears off. But in any event, when trouble of this kind comes, careful study and thought about all the conditions will do wonders in locating it. Above all things, don't get rattled and begin to pull things to pieces, but go at it slowly and carefully, thinking over all the circumstances that might cause it, and your trouble will soon be found.

Bacterial Fertilizers.

Plants assimilate nitrogen only in the form of nitrates, and it is now known that the nitrogen of organic manures is converted into nitric acid in the soil, by the agency of certain bacteria. This discovery led to the manufacture of fertilizers which contained, in addition to organic nitrogen and lime, strong cultures of selected nitrifying bacteria, but the results expected were not fully obtained. There are two reasons for the failure. In the first place, bacteria bred in the laboratory become less prolific when they are suddenly placed in the soil, a medium to which they are not accustomed. In the second place, the few millions of bacteria thus introduced into the field are utterly inadequate to the task imposed upon them, unless they multiply very rapidly.

Stoklasa, director of the Prague experiment station, has devised a method of accustoming laboratory cultures to the soil by cultivating them, for a time, in a mass of earth. This earth was then employed as a fertilizer and was found to increase the crop by one-third. Stoklasa recommends the following method: 2,500 parts of earth are mixed with 50 parts of dephosphoration slag and sprinkled with a mixture of 100 parts of molasses and 1,000 parts of water. A culture liquid is prepared by adding 2 parts of glucose, 1/5 part of carbonate of lime, and 1/20 part of potassium phosphate to 100 parts of water. To this liquid are added a few drops of pure cultures of two very active nitrifying bacteria, *Radiobacter* and *Azotobacter*. When the liquid has become filled with bacteria it is sprinkled over the heap of prepared earth. A few days later this earth is applied to the land in liberal doses, about four tons to the acre. This novel fertilizer can be made very cheaply. It will be observed that the bacteria, in their transition from the laboratory culture medium to the soil of the field, pass through two media of intermediate composition and thus become acclimated by easy stages.

Preserving Wood with Insoluble Fluorides.

The impregnation of wood with solutions of fluorides exerts an excellent preservative action, but insoluble fluorides would be still more effective, as they could not be washed out. Their insolubility prevents their application in the usual way and they can be introduced only by forming them within the wood. For example, the insoluble fluoride of lead, which is instantly precipitated when solutions of a lead salt and of an alkaline fluoride are mixed, could be deposited in the fiber of the wood by impregnating it successively with those solutions. But a similar result can be produced with a single liquid. When a dilute solution of an alkaline fluoride is mixed with a dilute solution of a salt of zinc, copper, iron or chronium, no precipitate falls at once, but an almost insoluble fluoride is precipitated when the liquid is heated to from 140 to 212 deg. F. This precipitate may be a normal, basic or double fluoride, or an oxyfluoride, according to the salts employed and their proportion. Hence it is only necessary to impregnate the wood with the cold mixed solutions and then to heat it to the temperature of precipitation. The minimum quantity of alkaline fluoride used is that required for the formation of the neutral fluoride, but in view of the possible formation of a basic salt, it is preferable to use an excess of alkaline fluoride.

The Death of John D. Hall.

John D. Hall, one of the most prolific of American inventors, died in New York on April 20th at the age of eighty years. Mr. Hall was both a mechanical and a civil engineer. He received his early education in a country school and later matriculated at Union College, from which he was graduated in 1854. It was in California during the gold fever that he first patented an invention, a contrivance for separating gold from ores. When he returned East he became chief engineer for a Philadelphia manufacturer of thermometers. In that capacity, his mechanical genius was displayed in his invention of improved processes of manufacture. His inventions brought him a large fortune in royalties.

Glass containing a large amount of manganese acquires a violet tint after a month's exposure to sunlight. Glass containing only traces of manganese becomes discolored in less than a year, and the tint deepens with time. The color, however, is not necessarily produced by the presence of manganese, for Jena glass contains manganese but is not discolored by sunlight. A violet background appears to accelerate, and a brown or black background to retard, the effect of sunlight on glass discolored by it.