Correspondence.

A Hydraulic Rudder.

To the Editor of the Scientific American:

If all large sea-going vessels were supplied with the below described auxiliary to the rudder for steering, the accident to the Alaska's rudder would not have endangered the vessel or have been of greater import to her owners than the mere cost of replacing the broken part. The attachment works admirably with smaller craft, either as an assistance to the rudder or alone and without any rudder, and I see no reason why all steam vessels should not have it, considering how trifling the cost.

It consists simply of two discharge pipes, placed one at each side of the vessel's stern as far below the water line as possible, connected with a steam pump capable of forcing a powerful stream of water through the pipes, which, impinging upon the water in contact with the vessel, forces it (the vessel) to the side opposite to that from which the stream is issuing. A one-half inch nozzle operates very well for a boat 30 feet long; a vessel of the size of the Alaska would probably require a 6 or 8 inch pipe. To vessels of war it would be particularly useful to enable them to turn quickly, or even without headway. A. P. WHITTELL.

San Francisco, Cal., April 4, 1885.

Bumble Bees and Honey Bees.

To the Editor of the Scientific American:

In your issue of April 11, you note a curious article of export for New Zealand, viz., bumble bees, but question why honey bees would not do as well. Honey bees cannot extract the honey from red clover. Their proboscis is too short, consequently they never disturb it; it is the white clover they seek. This is not the first shipment of bumble bees; the same experiment was tried with Australia some years since, and with success. It is a fact that without the bumble bee in two years we would be without clover, one of the best fertilizers known to agriculture. Few bumble bees live over the winter, and their number is not sufficient to fertilize the first growth of clover, as not more than 5 per cent of the first crop has seed; but by the time the second crop comes on the bees have increased, and as a consequence we get seed, with sapling clover.

JAMES M. HENDRICKS.

Shepherdstown, W. Va., April 13, 1885.

The Extensive Action of Ocean Waves.

To the Editor of the Scientific American:

During a long experience on the several oceans, I have noticed that the heavy waves caused by winter storms in high latitudes often move far beyond the limits of the winds which produce them. The strong northwest gales which sweep over the north Atlantic abreast the British provinces and New England often send gigantic waves to the southwest far within the trade wind region. These waves at times invade the western coast of Africa from Morocco to Cape Verd, so that vessels have been swamped by heavy rollers while at anchor in the open roadsteads, notwithstanding light winds and calms prevailed on the African seas. The shores of the tropical Cape Verd Islands are also dashed by heavy waves from the northwest. The island of St. Helena, situated in 16° south latitude, is reached by heavy seas from the same direction, which make it impossible to land while they are in force, and at times vessels anchored near the shore are wrecked. The southwest gales of the southern ocean often send their waves far into the tropical latitudes, reaching the shores of Peru and Central America in the Pacific Ocean, and the beaches of Guinea in the Atlantic. These waves show their greatest volume during periods of torrid calms, as they have not force sufficient to cross a tropical ocean in the face of a strong trade wind. In consequence of the prevailing gales of the high latitudes being westerly the western shores of continents are dashed by heavier waves than their eastern coasts, even in the tropical regions where the prevailing winds blow from the eastward. C. A. M. TABER.

Wakefield, Mass., April 9, 1885.

Oil on the Waves.—A Guide to Fishermen.

To the Editor of the Scientific American:

I recently read of a writer who was unable to account for the numerous smooth tracks he had seen upon the ocean when no vessels were in sight from which oil or grease could have been thrown to cause them. Had he been acquainted with the nature and habits of fish even in a small degree, the mystery would easily have been solved. The menhaden, or moss bunker, is an especial victim for all biting fish, and they, being of a very oily nature, will when bitten by other fish exude oil, which immediately rises to the surface. Thus it will be readily understood that when a large body of bluefish, weakfish, or sharks fall upon a shoal of menhaden, and follow them up for miles, it will produce the smooth tracks which the writer referred to could not account for.

If any one is inclined to doubt the statement above, let him take a few bunkers on the bay or river, when the wind is blowing fresh, and score their sides, then cast them in the water and watch the result.

The first appearance of a "slick" (as fishermen term it) is eagerly watched for by fly net men, as it generally denotes the exact locality of blue or weak fish in the act of feeding upon bunkers or other small fish. I have seen a thousand or more bluefish taken at a single haul by simply casting a net around one of these smooth spots when it first appeared on the surface, and no other sign of the presence of fish could be seen.

A few years ago a whale was washed ashore near Fire Island inlet, and the action of the surf and sand chafed the skin until the oil began to ooze out, causing the surf to smooth down for a considerable distance each way, and when the wind was from the north would make a smooth streak out on the ocean, a mile or more in width, as far as the eye could reach. A dead shark or porpoise at sea will produce the same thing. So the smooth tracks upon the ocean need not longer be a mystery. W. L. WEEKS.

Bay Shore, N. Y.

Why Certain Kinds of Timber Prevail in Certain Localities.*

It has often been observed that in certain localities a certain species of timber will prevail, or be more numerous than any, and sometimes than every, other kind. It has been further observed that when any prevailing timber has been cleared away, and the land allowed to grow up again in timber, some other species will prevail. This, I think, has often been erroneously attributed to the inability or indisposition of the soil to reproduce the former prevailing timber. I have observed much on this subject, and I never could see any important difference in the ability or disposition of the soil to nourish any of the different kinds of native trees, and also no important difference in the success in planting and starting them.

My observations convince me that it all, or mainly, lies in the favorable condition of the ground to receive the seeds of the various species of timber when it happens to fall thereon. A sycamore in the Wabash region will grow as large and rapidly on the uplands, where they are seldom found, as in the sandy bottoms along the margins of the streams, where they seem to best thrive. A white oak when planted will grow as well in the low river bottoms, where they are never or seldom found, as on the hills and ridges near by, where they seem to be the spontaneous product of the ground.

But if an acorn should be blown from a white oak on the hills into the low bottoms beneath, it would fall on ground very unfavorable to the sprouting of such acorns, and it would rot where it fell. So, on the other hand, if a sycamore ball (which contains one thousand to two thousand seeds) should, in the spring time, be blown to pieces after the winter's freeze, and the needle-like seeds be blown upon the adjacent hills, very few of them would light on ground favorable to sprouting them. Occasionally we find a lone sycamore on the uplands, standing among the oak, beech, poplar, and other upland timber, and every year bearing its quota of seed and shedding them on the adjacent ground by the million, none, or very few of which ever take effect, and for reasons before hinted at, but which will be more fully explained further on.

The sycamore seed must fall on ground warm, very moist, but not absolutely wet, and sufficiently bare for the sun to shine on it the greater part of the day. Otherwise it may not sprout. The acorn, on the other hand, falls a little while before the leaves fall. If it falls on very moist ground, it rots. If it falls on the leaves of the former year, and is shaded enough to prevent drying or baking from the sun, and is covered lightly by the fall of the current year's leaves, or by a chance wind has the old leaves drifted on top of it, a slow rain with subsequent sunshine will sprout it. It will send out little rootlets, which bore through the underlying old leaves and penetrate the ground, and once started, no weather or climatic conditions will kill it. The same is true of the seed of the hickory, beech, sugar maple, and other upland trees.

During the past two years my work has been on and about the Wabash River banks and its bottoms (flood plains), and I have discovered why it is that in some parts of these bottoms one kind of timber, as sycamore, will take complete possession of a few acres, while at or near by the cottonwood will prevail almost to the exclusion of everything else, and at other places the soft or water maple will do likewise, and still at another the water elm will monopolize all the space on which a grown tree can stand for several acres.

It comes about in this way: The balls of the sycamore, after undergoing the winter's freeze, are dissolved so that the separate needle-like or more properly pin-like seeds (as the outer end has the germ of the root, and swells into a bulb like a pin head) are blown by the wind, the little "fuzz" they hold enabling them to float a great way both in wind and on water. They begin falling early in the spring months, and if a flood is receding at the time, they stick to the soft, moist banks wherever they touch them, and particularly along the highest part of the sand bars. Were it not for the subsequent floods the same spring, there could no other trees grow, as the sycamore, being the first to shed, would seed all the tree-growing space (each large tree bearing one hundred and fifty million seeds), and their broad leaves would shade the ground till nothing else could sprout. But during their early infancy they are easily killed by an overflow, and this ill fortune happens to the greater portion of them.

The cottonwood is the next in order of shedding seed. If another flood is receding while the cottonwood is shedding, this flood will have killed all the sycamores, which it covered for only a few days, and will sprout all the cottonwood seed that may fall on and along the banks and bars. As the earlier floods are generally the highest, there will be some sycamores not reached by the following floods, and they will hold sway along that margin. If, when the cottonwoods are a few inches high, another flood follows, they too will be killed to the extent that they are kept under water for a few days.

Next to the cottonwood the soft, or bottom, maple sheds its seed. If a flood is receding, this seed will occupy all the space, as, having a smaller leaf than the sycamore or cottonwood, they will grow closer together. They in turn may be killed by a flood when they are very young.

I have forgotten the exact time that each of these trees sheds its seed; something will of course depend on the forwardness of the spring. But along the Wabash banks, last spring, I could see three belts of young trees, and distinguish them by their general appearance. The farther off, the plainer these belts show, till lost to view. The upper belt was sycamore, the second (downward) cottonwood, and the third soft maple. In June following there came a bigger flood than any that caused the seeds to sprout, and killed all of them. There was a bigger flood in the preceding February, but no seed fell then.

It will sometimes happen that the flood that plants the sycamores will be the last one for that year, and when they have lived through one summer they are safe from any danger from overflow. In still other seasons it will happen to favor the cottonwood, or the maple, or elm, or willow. New bars are all the time extending from the lower ends of the old ones; and as the elevation of these will be such as to be sometimes flooded once and not again for that year, the trees that shed their seed with the flood that barely covers such bars will plant them to overflowing fullness of their kind, and once they are secure from other floods they live out their time of two hundred to three hundred years.

The upper surface of the interior of the bottoms (back from the rivers) is built up by sedimentation, and when built above the height of the average floods, the burr oak, black walnut, buckeye, pawpaw, and bottom hickory make their appearance. Such sycamores, cottonwoods, and maples as live long enough to be relegated to the interior (as very few of them do) by the bottoms building riverward away from them, do not and cannot reproduce themselves, as the conditions that sprout their seeds have moved away from them. They die at the end of three hundred years at most, and leave no heirs to the soil.

How do the occasional lone, stray sycamore and cottonwood find their way to the uplands? I can see how in one case it was not only possible, but very probable. Five miles southeast of where I am now writing (Rockville, Indiana) is a pasture of hill land, so fenced as to include a section of a small stream at the foot of a hill facing north. There stand several half-grown sycamores which bear and shed their seed in this corner watering place. There these seeds are sprouted. There the cattle and horses resort for water. Every thimbleful of mud that may stick to their hoofs is liable to contain from one to five half-sprouted seeds, which are carried up the hillside and on the upland, as the cattle and horses return to their grass, and drop where the sun takes up the unfinished work of growing the tree. The result is that on every square rod of ground near this watering place stand one to five sycamores, varying in age from one to ten years, and they diminish in number as the distance from the watering place increases. It has been used as a pasture about ten years. I remember when it contained no sycamore at all. Just outside of the pasture fence, to the eastward, the land has never been fenced. The cows may drink where they please, and there are no sycamores scattered over the adjacent hills. If any seeds are thus carried there, the forest leaves and shade prevent their sprouting and growing. But along the little sand and gravel bars of the stream they sprout as thick as grass, only to be killed by the floods from the early summer showers.

From this I infer that two hundred to three hundred years ago the deer, elk, and buffalo, in their many wanderings across streams and over hills, have occasionally carried in their hoofs partly sprouted seeds, and dropped them on the hills where the sunshine was unobstructed, and the trees thus got their footing, and once getting it were able to stand afterward. These are the only kinds of trees I have observed, but I presume a similar law governs the distribution and self-planting of them all.

*By John T. Campbell, in the *American Naturalist*