any station, to have it right again both at home and with the world.

The adoption of such a standard would not necessitate the substitution of new time-pieces for those now in use, nor expensive alteration of them. A very simple, inexpensive way of adapting existing watches to the suggested change would be to etch the Greenwich dial upon the watch-crystal in a little smaller circle than that of the dial proper. The crystal could then be set to indicate the difference of time between the given place and Greenwich, and secured by a little white wax. Clocks could be similarly changed also.

If the hours are to be read from one to twenty-four, as seems desirable, and as some roads have already agreed to do, this will necessitate not only a change in the rate of motion of the hour-hand of time-pieces, but in the dial also. Now, since a change is to be made anyway, why not avoid twice changing by reconsidering at once the action already taken, and move immediately in the direction Mr. Schott has suggested. This would avoid the necessity of publishing in time-tables local times; while the traveller would have simply to consult his time-table, and refer to his Greenwich dial, to know at what moment to take a public conveyance, not only anywhere in the United States, but anywhere in the civilized world. Train-men and station-hands could experience no inconvenience in being guided by their Greenwich dial, it being necessary simply to make that dial the more conspicuous which is to be consulted oftenest.

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THE DUTY ON IMPORTED SCIENTIFIC TEXT-BOOKS.

AT the last meeting of the American association for the advancement of science, there was some discussion of the effects of the existing tariff on foreign text-books on our school system. This is the first considerable effort to call the public attention to the results of our Chinese commercial policy upon the education of our youth. That system of policy is such a vast elaboration of rules, and the effects of its regulations are so hard to trace in the machinery of our society, that it has derived a strength and a safety from its very magnitude and its obscurity. The ordinary mind shrinks from the effort to trace the complication of its effects on great labor-employing industries like pig-iron manufacture. It requires the courage of a great soldier to give battle to the tariff on such fields; for, however convinced the free-trader may be of the right of his cause, he sees that his victory will mean destruction to many whom he cannot regard as foes. But here and there around the tariff jungle there are places that may be improved without danger of any serious consequences to great interests. Some years ago, in a lapse into discretion, if not into rationality, the tariff men took off the duty on quinine. A few score men had to seek other employment, probably to their serious but not permanent inconvenience, and that greatest of all helpers of the sick was free to go untaxed to its users.

As real though less sympathetic claim may be urged for the removal of the tax on educational materials and methods. Even in our money-earning state of society the amount that can be spared for the education of our children is so small that such money should be the last thing to receive the burden of taxation. What would have been thought, if in the fiercest struggle of the war, when we were taxing the physician's right to minister and the drug's power to heal, if some legislator had proposed to tax each college-student, say, three dollars a year, for the privilege of pursuing his education in the most effective manner? Taxes on this principle may be warranted in a besieged city; but even on our darkest day such a measure would have been laughed out of Congress, would have been denied even the rites of decent burial in a committee. Yet substantially this is what is practically done in this day of unparalleled prosperity, when, for the first time in all history, a government is sore burdened with its revenues. A commission of well-paid experts, charged to contrive some means to clear away this excess of income, retains this amazing tax after a year of pondering on the subject!

The singular character of the tax is evident enough in the most general statement of its nature, but close inquiry shows us that it becomes even less comprehensible the better we understand its details. The books excluded by the tax are not the spellers, readers, arithmetics, etc., that are made by the million. Against these, no foreign books would stand any chance whatever, unless they were introduced to the schools through the existing publication-houses. The books that are affected by the law are those that have at best a narrow sale. They are principally books in French, German, Latin, or Greek, used only in college classes for special purposes, which it would not pay any American publisher to reproduce. But let us suppose that the English, German, or other printers could furnish a set of school-books so decidedly better and cheaper than our own that our thrifty publishers should be driven from the field: will any reasonable man say that we should continue to maintain them by a head-money tax on the pupils of our schools?

There is no good reason to fear that our publishers would lose by a free trade in educational materials. If the change be made in such fashion that they may have as good a chance in foreign markets as foreigners should have in our own, we can trust the business

capacities, and the stimulated energies of our text-book makers, to keep our place in the struggle. But grant the truth of the sad presages of those who see the deluge in free trade, can we afford either the principle or the effects of levying a poll-tax on education?

WHIRLWINDS, CYCLONES, AND TORNADOES.[1]—VIII.

THE barometer was falling more and more rapidly, and the wind blowing with increased violence from the north, in the example that was described. Then, if a transparent storm-card, drawn to proper scale after the pattern of fig. 9, be placed on the chart so that its strong north wind shall pass the position of the vessel, it will give the best indication of the general form of the hurricane; and a course may be laid by which the dangerous centre will be avoided. In this case, the safest course will be to run southward, or a point or two west of south, till the barometer begins to rise; and then, if desired, a more easterly course may be followed. Even if the vessel be on its way to a European port, this will be its safest method of avoiding the storm; for, in attempting to beat against the wind and leave the storm to the south, there is too much risk that its increasing strength will prevent the vessel making sufficient headway to escape being caught in the central whirl: it would be better to sail around the southern side of the storm, and, after the centre had passed on the west, then shape a north-easterly course with the wind on the starboard beam. Sometimes it has happened from ignorance of such sailing-rules as these, or from inability, even with their aid, to escape from the sudden violence of a storm, that a vessel finds itself on the storm-track at the time of the passage of the centre; and there is then observed the peculiar and dreadful calm within the whirl, to which sailors have given the name of 'the eye of the storm.' Let us suppose, in the example given above, that the vessel endeavored to force its way against the increasing north wind, and, failing in this, remained on the path of the storm till the centre advanced on it. During its approach there will be no very marked change in the direction of the wind; but its force increases even beyond what seems its greatest possible strength, and goes on increasing, blowing in tremendous and terrible gusts, till the vessel is stripped of its canvas, and the yards and masts are cracked and broken away, and the hull lies helpless and unmanageable. Rain falls in driving torrents, and the sea rolls in great broken waves. The roaring of the winds rises to a screaming pitch; and when at its most fearful strength, it suddenly dies away. In five minutes, perhaps even less, the air is quiet; and only the heavy sea, and the commotion of the clouds, and a distant fading sound of the retreating wind, tell of the violence that has passed by. The vessel is in a cushion of quiet air left under the core of the storm. There is generally but a short time given to suffer the suspense of this unnatural quiet. In half an hour or an hour, according to the size and rate of motion of the storm, the centre passes away, and the opposite side of the whirl suddenly falls on the unhappy wreck, coming again with all the roar and fury that was felt before, but now blowing in the opposite direction,—a terrific hurricane from the south, chopping the waves into the dreaded cross-sea, where the water rises in pyramids instead of in linear crests, and changes its form so rapidly and with such broken rhythm as to strain great leaks in the worn-out hull, and leave it to founder in clearing weather, while the storm goes on in its destructive path.

There is yet much to be learned concerning the curves followed by the winds in these storms. The diagrams, as described above, are based on observation and theory, but must be regarded only as provisional until proved by the average of many more observations than have yet been made. Rules for various cases may be easily devised on the plan above described, but they are not infallible: there is still much to be done in perfecting them. Only one additional point need be mentioned: care is needed to avoid sailing after and overtaking a slow-moving storm, and so falling into its power. This would seldom happen in our latitude, but might well occur in the Indian Ocean, where some storms have been found to rest almost stationary over one district of the sea for more than a day. A case is reported where a vessel thus fell into the dangerous whirl, and could not escape, but was carried round and round the centre, while scudding under bare poles, till it made five complete revolutions before the storm left it behind.

There remains to be described the storm-flood produced when a storm runs upon a low shore, as often happens at the head of the Bay of Bengal. The cyclone advances with growing strength till it reaches the flat delta of the great Indian rivers. It finds the land here perfectly level, and so little raised above the water that its cultivated surface has to be pro-

[1] Continued from No. 48.