Danger of Reversing the Screw when Going at Full Speed.

Captain John Bain, of Glasgow, a well known Clyde nautical assessor, lately communicated a paper on this subject to the Institution of Engineers and Shipbuilders in Scotland. The opinions which he offered on the subject were, he said, obtained from personal experience in the handling of half a dozen large screw steamers, dating from 1873; and in corroboration of his conclusion he cited endeavors which were made in 1875 by Professor Osborne Reynolds, C.E., F.R.S., of Owens College, Manchester, and a committee of the British Association, to investigate the phenomena that had then been observed in the steering of screw steamers. In pointing out the danger attaching to the reversing of the screw while the vessel was going full speed, he instanced several collision cases which had been heard in the Admiralty and other courts, where the reversion of the screw of one or both of the steamers colliding appeared to him to be the ultimate cause of the accidents, and which, he regretted, were not taken into consideration either by those who had charge of the vessels at the time of the collision or by the bar or bench to whom the facts of the case were presented in the course of the inquiry.

In addition to a number of other cases referred to, Captain Bain quoted, as an illustration of the effect of putting the helm hard a-starboard and reversing full speed at the same moment, the collision between the Thistle, of Liverpool, and an unknown schooner; and, as an example of putting the helm hard a-port and reversing full speed, he adduced the case of the collision between the Thorsa, of Leith, and the Otto, of Hull, in the Baltic last year. Although there were dozens of collisions of a similar nature which he could mention, where the reversion of the screw just previous to the collision was perfectly plain, he contended that those two cases were about as clear and traceable to the effect named as any to be found on record. Stated briefly, Capain Bain said that his contention was as follows:

That if the helm is put hard a-port on board a steamer having a right-handed propeller, and going full speed or nearly full speed ahead, and at the same moment the engines are stopped and reversed full speed, the vessel's head will cant to port instead of to starboard as, mechanically considered, it ought to do, or, in other words, that the vessel's head will in 15 or 20 seconds after the screw is reversed stop canting to starboard, and swing 15 or 20 degrees in the direction of the danger which it was intended to avoid. On the other hand, he held that if the helm is put hard a-starboard in such circumstances as those mentioned, the result will be that the moment the engines are "over the center" to go astern the vessel's head will swing to starboard, as if on a pivot, with amazing rapidity, and so increase rather than diminish the distance between her and danger.

Dwarf Races.

According to Dr. T. H. Parke, the genuine pygmy races, about whom we possess reliable information, are the Batwas, discovered in 1886 by Dr. Ludwig Wolf, occupying the Sankuru region in the mid-Congo basin; the Mkaba tribe, near Lake Akkas, of Central Africa, with whom Emin Pasha's people would connect the dwarfs of the Central Forest. Of these the average height has been respectively reported to be: the Mkaba, 4 feet 1 inch; the Batwas, 4 feet 3 inches; and the Akkas, 4 feet 10 inches. Related to them in shortness of stature are the Bushmen of Southern Africa, averaging about 4 feet 7 inches in height; the Andaman Islanders, whose stature is under 5 feet; the Javan Kalangs, the Malayan Samangs, and the Ætas of the Philippine Islands. The Lapps are also notoriously of diminutive stature, so are the Fuegians, the Ainos, and the Veddahs, although a little taller.

Dr. Parke's experiences of the forest dwarfs of Africa during his travels were very varied. He had many narrow escapes from their archers, and certainly owed his life to one of their women. He purchased the latter from a slave owner for a handful of beans, twelve cups of rice, and six cups of Indian corn. But of course he did not buy her into but out of slavery. Dr. Parke was obliged to be very marked in his kindness to her at first to prevent her running away; but when she ceased to be afraid of cruelty, her devotion knew no bounds. Had it not been for her unwearying attention and care, Dr. Parke would have endured absolute starvation through months of forest life.

The first of the forest dwarfs measured was exactly 4 feet high. In marked opposition to the giants, dwarfs are very often strong in proportion to their size, active, well proportioned, and very intelligent. In regard to his own experience, Dr. Parke says:

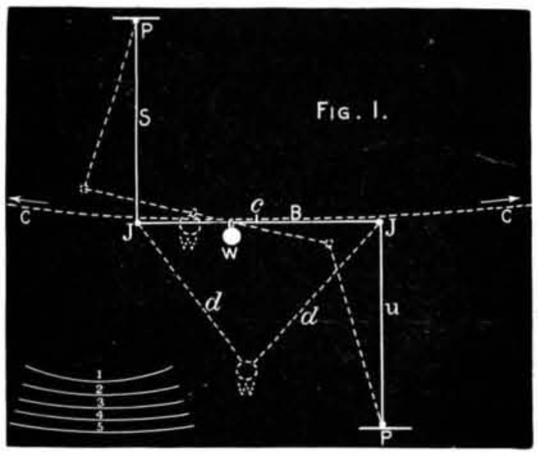
"The intellectual inferiority of the dwarf specimens whom I have myself met with was not at all in proportion to their relative bulk. I would rather try to teach a pygmy than a Nubian any day, and feel certain that after a few months' intimacy I could turn him out as reliable in intelligence and in honesty as his overgrown negro brother."—Illustrated Mission News.

SLOW BEATING PENDULUMS.

BY C. R. SUMMERS.

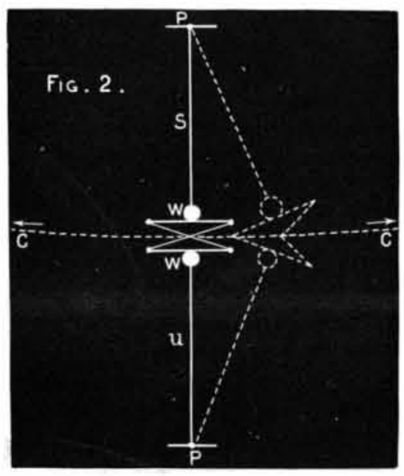
An ordinary pendulum that would make four vibrations per minute would have to be 731 feet long, and would, therefore, be impracticable. The experiments illustrated show how very slow pendulums may be brought within comparatively small compass.

Fig. 1 shows two pendulums, S U, parallel with each



other, one of them, S, being suspended from a fixed pivot, P, the other, U, standing upright from a fixed pivot, P, the two connected together at their free ends to a horizontal bar, B, J J being the joints. The weight, W, can be placed anywhere between the center, C, of the bar, B, and the joint, J, of the suspended pendulum, S. The nearer it is to the center of the bar, the slower will be its vibrations, and the nearer the joint, J, of the suspended pendulum, the faster will be its vibrations. (The motion given in the direction of the length of the bar, B.)

The weight, when placed near the center of the bar

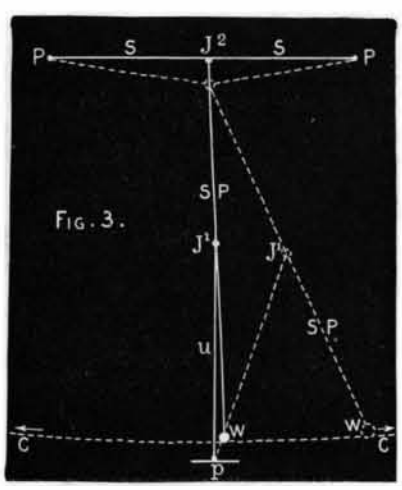


and on the side toward the suspended pendulum, moves in the arc of a circle of immense size; the radius can be calculated by the time of its vibrations.

I have a model of this kind (not delicately hung), which beats four times in one minute, when going its slowest. An ordinary pendulum, going at this rate, would have to be several hundred feet in length.

The segments, 1, 2, 3, 4, 5, show curves made by the weight at different positions on the bar.

The tendency of the lower pendulum to form a knee joint at its junction, J, with the end of the bar, B, when at the outer limits of its vibrations, is overcome by



the weight being hung below to a stiff triangular frame, shown by the dotted lines, d d.

A much better arrangement is made by suspending the hanging pendulum, S, directly over the upright pendulum. U, as shown in Fig. 2, the free ends of the pendulums nearly touching.

A cross bar, fastened across near the ends of each pendulum, the outer ends of the cross bars being the same distance from their pendulum's pivots, P P, as the free ends of the pendulums are from the same pivots.

To the right end of the bar, on the upper pendulum, is tied one end of a cord and the other end is tied to the left end of the bar on the lower pendulum, the cords crossing each other between the ends of the pendulums and resting against them, the pendulum ends being widened to keep them from slipping off.

Weights, W W, are placed on the free ends of the pendulums, being careful to make the weight on the upper pendulum the heaviest, the difference of weight of the two pendulums causing the difference of time of vibrations.

When the weight of the upper pendulum is only a very little more than the lower, the vibrations are slow indeed.

The model I have made of this kind makes slower vibration than the first described pendulums did.

The principle of Figs. 1 and 2 is the same.

The center of weight in Fig. 2 makes a segment of a great imaginary circle, the center of which is a great height above the earth.

I tried still another system, shown in Fig. 3.

Between the stationary points, P P, is fastened a string, S S. The upper end of a stiff bar pendulum, S P, is pivoted at the center of the string at J 2.

An upright pendulum, U, resting on its pivot, P, and extending a little more than past the center of the long pendulum, S P, having a joint at J 1.

When the weight, W, on the lower end of the bar pendulum, S P, is made to sway back and forth, J 2 rises and lowers slightly, the elasticity of the string being sufficient for the purpose.

The degree of curvature made by the weight, W, in its vibrations depends on the distance the joint, J 1, is above the center of the long pendulum, S P. The nearer the center, the slower will be its vibrations, and at the center it draws a straight line. Below the center, the same as the other pendulums, the curve is more in the direction of the curve of the lower pendulum; consequently it falls and will not rise.

So far as I can learn, these are the first experiments on slow beating pendulums. I have not had the opportunity of studying the experiments of others with pendulums, but cannot see why, if this were known before, pendulums of this kind were not used for certain kinds of clocks, or at least for philosophical experiments.

It is certain that they could be made, under favorable conditions, to beat as slow as desired, there being no friction against the air on account of slowness. The only friction would be at the pivots.

Keep the Skin Clean.

The importance of cleanliness for the healthy performance of the functions of life is the subject of a lecture delivered at the London Institute by Professor Vivian Lewes, and published in Nature. We may, says Professor Lewes, live for days without giving our stomach any work to do, the liver may cease action for several days before death ensues, but it is impossible to survive for the same length of time if the functions of the skin are entirely stopped. Indeed, the professor cites the case of a child which, being gilded all over to pose as a statue, died in a few hours. The sudoriferous ducts, of which there are about 3,500 to the square inch of skin, perform the important function of throwing off the moisture produced during the combustion of waste tissue by the oxygen of the blood, and secrete about 23 ounces of perspiration in the twenty-four hours, which evaporates without producing any sensible moisture of the skin. This throwing off the perspiration and its evaporation is a beautiful natural contrivance for regulating the temperature of the body, as the conversion of the perspiration into vapor renders latent an enormous amount of heat, which, being principally derived from the body, keeps it in a state of comparative coolness. A bath heated to 120° Fah. is almost unbearable, but one may be exposed for some time to a temperature of 325° Fah., in an oven. The perspiration keeps the body cool. The 23 ounces of perspiration secreted daily contains about one ounce of solid matter, which is left behind on evaporation. Apart from this there are sebaceous glands which secrete oily and resinous matters, of which the wax in the ear is a type; these, mixing with the solid matter and dirt adhering to the skin, form a compound which tends to clog the pores of the skin; and it is the removal of this, by the morning tub and rough towels, which is responsible for the refreshing influence of the bath.

EARTHQUAKES AND ELECTRICITY.—One of the greatest living authorities on earthquakes, Professor John Milne, of the Japanese Imperial University, in a recent article in the Seismological Magazine, July, says that the results of experiments and investigation on a possible connection between earthquakes and magnetic and electric phenomena do not allow us to admit any such connection. It is not likely that earthquakes ever result from electric disturbances, and it has not yet been proved that they ever give rise to any such, though when large masses of rock are displaced, as in Japan in 1891, slight local changes in magnetic curves have resulted.