

with and attraction to the particles of water).

It is possible to scull a much longer stroke than can be rowed. The reach forward of the body has the same approximate limits in each case. If anything, a sculler can reach his hands an inch or two farther forward than the oarsman, for the latter just at the end of his reach has his handle a little inside of him, his arms sloping across him, and not square to his body. The sculler is not thus cramped; his arms shoot out square to his body on each side. But it is in the swing back that the sculler gains mostly in reach. If the oarsman goes too far back before bending his arms, the end of his oar-handle lies inside his body, and his power of finish, especially with the inside arm, is hampered, for the forearm can then no longer be parallel to the body. If his oar were made long enough inboard to enable him to go as far back as a sculler, it would cause his arms to be lying outside his body when the oar was at right angles to the gunwale, the period of the stroke when the mechanical power is greatest. A sculler, on the other hand, is always able to throw his weight in a direct line; his hands, though nearer or farther from each other at various periods of the stroke, always bear a strain corresponding in direction in the case of each, i. e., the joint direction of the two powers, right and left according to a 'parallelogram of forces,' would be in a line with the keel of the boat. Thus, however far the sculler goes back, his hands jointly never pull out of the line of keel. So that it comes to this: the stroke of the oarsman is limited in length, because, beyond a certain angle of the oar with the gunwale, the body and arms cannot do their work in the plane of the keel nor in the same plane with each other. The stroke of the sculler is unfettered in this respect, and is limited eventually only by mechanical requirements (the limit of the angle which the scull can make with the thowl, without locking) and by the demands of recovery. This latter, even on a fixed seat, is easier work than in rowing, for the body when far back can pull up to the sculls. In rowing, as said above, this pulling up is not practised, because (1) with a medium swing back it is not wanted, and the body should continue to go back until the hands overtake it; (2) with a swing back as far as sculling admits of, an oarsman would be unable to recover himself squarely by his oar-handle, for it would be outside his body, and out of the true plane. If, therefore, recovery is a matter of greater ease in sculling than in rowing (compared to the length of reach), even on a fixed seat, it is obvious that on a sliding

seat there should be less difficulty in the return swing. The fact that the arms of the sculler are always jointly working in a line with the keel, and thus he is enabled to take a longer swing than in rowing, explains why, as a matter of practice, double-sculling is faster than pair-oar rowing.

Since, therefore, the body should swing farther back in sculling than in rowing, and slide should always be extensive with swing, it is obvious that the legs must extend themselves more slowly in sculling than in rowing, else the body will have no leg-work left to drive it back the latter portion of the swing. As in rowing, the slide should never be so long (or the stretcher too far from the seat) as to allow the legs to be straight at the end of the slide. If they are allowed to straighten, not only is the latter portion of the swing weakened, but the powers of recovery are also hampered, for the muscles of the legs, when straight, being 'at a dead point,' start at a disadvantage.

The sculler should be careful not to let the finish of stroke with the arms be anything like a jerk. As said above, the body should be just commencing to recover during the last part of the bend of the arms. If the body waits for the arms, and the latter come into the chest with a 'swish,' the only result is that the boat's head is buried, and 'way' lost. On a sliding seat the sculls, like oars, should be a trifle longer inboard, and, of course, in proportion outboard. This is to prevent the hands being too far apart at the extreme reach forwards and backwards. Sculls for a sliding seat may be as much as six or six-and-a-half inches overhand, if the sculler make sure of going back till his hands clear the ribs at the finish on each side of his body. If he does not go so far back at this, then he will do better with less overhand sculls, but with the first-named work and action of body he will command most pace. A sculler may take this as a rule, that his arms should remain straight and his body be going back till after his sculls have 'opened' in the swing back, i. e., till they are no longer overhand. This he can only secure by keeping a judicious reserve of slide and leg-work up to the last.

Since the shorter the stretcher is, the more power will be attained, it is necessary that the hands should clear the knees on the recovery as soon as possible, else even in smooth water they will not get by afterwards. When once the hands have got in front of the knees the slide forward should, as in the recovery of rowing, be completed rapidly, in advance of the body, thus giving an impetus