this is its chief recommendation, for its power is greatly in­ferior to that of a wheel constructed in the usual manner.

2. The vanes may be arranged round the rim of the wheel, not like the sails of a wind-mill, but in planes in­clined to the radii, but parallel to the axis, or to the planes passing through the axis. They may either stand on a sole, like the oblique floats recommended by De Parcieux, as above mentioned ; or they may stand on the side of the rim, not pointing to the axis, but aside from it. This dis­position will admit the spout to be more conveniently dis­posed either for a horizontal or a vertical wheel.

We shall conclude this article by describing a contri­vance of Mr Burns, the inventor of the double bucketed wheel, for fixing the arms of a water-wheel. It is well known to mill-wrights that the method of fixing them by making them to pass through the axle, weakens it exceed­ingly, and by lodging water in the joint, soon causes it to rot and fail. They have therefore of late years put cast-iron flanches on the axis, to which each arm is bolted ; or the flanches are so fashioned as to form boxes, serving as mor­tises to receive the ends of the arms. These answer the purpose completely, but are very expensive ; and it is found that arms of fir bolted into flanches of iron are apt to work loose. Mr Burns has made wooden flanches of a very curious construction, which are equally firm, and cost much less than the iron ones.

This flanch consists of eight pieces, four of which com­pose the ring represented in fig. 15, meeting in the joints *ab, ab, ab, ab,* directed to the centre O. The other four are covered by these, and their joints are represented by the dotted lines *αβ, αβ, αβ, αβ.* These two rings break joint in such a manner that an arm MN is contained be­tween the two nearest joints *a'bf* of the one, and *α'β*' of the other. The tenon formed on one end of the arm A, &c., is of a particular shape : one side, GF, is directed to the centre O ; the other side, BCDE, has a small shoulder BC ; then a long side CD directed to the centre O ; and then a third part DE parallel to GF, or rather diverging a little from it, so as to make up at E the thickness of the shoulder BC ; that is, a line from B to E would be parallel to CD. This side of the tenon fits exactly to the corre­sponding side of the mortise ; but the mortise is wider on the other side, leaving a space GFK*h* a little narrower at FK than at G*h.* These tenons and mortises are made extremely true to the square ; the pieces are put round the axle, with a few blocks or wedges of soft wood put between them and the axle, leaving the space empty opposite to the place of each arm, and firmly bolted together by bolts between the arm-mortises. The arms are then put in, and each is pressed home to the side CDE, and a wedge HF of hard wood is then put into the empty part of the mortise and driven home. When it comes through the flanch and touches the axle, the part which has come through is cut off with a thin chisel, and the wedge is driven better home. The spaces under the ends of the arms are now filled with wedges, which arc driven home from opposite sides, till the circle of the arms stands quite perpendicular on the axle, and all is fast. It needs no hoops to keep it together, for the wedging it up round the axle makes the two half rings draw close on the arms, and it cannot start at its joints till it crushes the arms. Hoops however can do no harm when all is once wedged up, but it would be improper to put them on before this be done.

(b. b. b.)

WATERFORD, a maritime county of the province of Munster, in Ireland, is bounded on the north by the coun­ties of Tipperary and Kilkenny, on the east by that of Wexford, on the south by the Atlantic, and on the west by the county of Cork. It lies between 51° 55' and 52° 20' north latitude, and 6° 58' and 8° 10' west longitude ; ex­tending twenty-eight miles in its greatest length from north to south, and fifty-two in breadth from east to west, and comprehending an area of 736 square miles, or 471,281 acres, of which 353,247 are cultivated land, and 118,034 uncultivated mountain or bog. It ranks as the twenty- first county in superficial extent, and the twentieth in that of its cultivated land.

In the time of Ptolemy the geographer, it was inhabited by the tribe of the Brigantes, whose territory’ extended from Carnsore Point in Wexford, westward along the coast to the Blackwater. It was afterwards peopled by the Desii, who are supposed to have emigrated from a tribe of the same name in Meath ; and having spread themselves also over the plain country of Tipperary, those settled in Waterford were distinguished by the name of South Desii, and the others by that of North Desii. Here the Danes established a permanent settlement in the ninth century, making the city of Waterford their chief seat of govern­ment ; and though frequently involved in wars with the surrounding natives, they retained possession of the city and district until their subjugation by thc English, who, in 1170, under Strongbow, stormed Waterford, took their chieftain or prince prisoner, and brought the whole of the Decies into the possession of the English. Shortly after, Henry II. granted the greater part of the county to Robert le Poer, and the remainder, with that of Cork, then a petty kingdom, to Milo de Cogan, two of his followers. In 1210, King John erected the territory into a county, from which the city was excepted, being under a separate jurisdiction. In 1444 the county, together with the great­er part of the rest of Munster, was granted to James earl of Desmond. A few years after, both county and city were granted to John Talbot, earl of Shrewsbury, who was then created earl of Waterford ; but both lands and title were resumed by the king under the statute 28th Hen. VIII., which vested the lands of absentee proprietors in the crown. The county suffered severely in the reign of Elizabeth, through the rebellion of the earl of Desmond, and the Spa­nish invasion ; and also in the wars of 1641, during the first years of which, its possession was the subject of continued sanguinary contention between the English and Irish forces, until it was ultimately reduced under the authority of the English parliament by Cromwell. During the war of the Revolution, it took part with King James, and was reduced by King William’s forces under General Kirk, after the decisive battle of the Boyne.

The general character of the county is mountainous. The Knockmeledown ridge, the highest point of which is 2598 feet above the sea-level, ranges along its north-west­ern boundary, forming the line of demarcation on the side of Tipperary. The Cummeragh and Monevolagh Moun­tains lie in a direction nearly north and south from the east of Clonmel to Dungarvan ; their loftiest summit, Knockanafrian, is 2469 feet high. On several of the sum­mits of these mountains arc large piles of stones, apparcnt- ly of artificial construction, but of unknown origin. To the south of Dungarvan are the Drum Mountains, much lower than the preceding, but rugged and difficult of pass­age. They form the division between two of the baronies. The south-eastern district is low, of alluvial formation, and