turns in a cock fixed on the side wall oſ the chimney ; ſo that this axle is parallel to the front of the chimney. On the remote end of this horizontal axle there is a ſmall pulley C, having a deep angular groove. Over this pulley there paſſes a chain CDE, in the lower bight oſ which hangs the large pulley E oſ the ſpit. This end of the ſpit turns looſely between the branches of the fork of the rack or raxe F, but without reſting on it. This is on the top of a moveable ſtand, which can be ſhifted nearer to or farther from the fire. The other end turns in one of the notches of another rack. The number of teeth in the pinion A and wheel B, and the diameters of the pulleys C and E, are ſo proportioned that the fly G makes from 12 to 20 turns for one turn of the ſpit.

The manner of operation of this uſeful machine is eaſily underſtood. The air which contributes to the burning of the fuel, and paſſes through the midſt of it, is greatly heated, and expanding prodigiouſly in bulk, becomes lighter than the neighbouring air, and is there­fore puſhed by it up the chimney. In like manner, all the air which comes near the fire is heated, expanded, becomes lighter, and is driven up the chimney. This is called the *draught* or *ſuction,* but would with greater propriety be termed the *drift* of the chimney. As the chimney gradually contracts in its dimenſions, and as the ſame quantity of heated air paſſes through every ſection of it, it is plain that the rapidity of its aſcent muſt be greateſt in the narroweſt place. There the ſty G ſhould be placed, becauſe it will there be expoſed to the ſtrongeſt current. This air, ſtriking the fly vanes obliquely, puſhes them aſide, and thus turns them round with a conſiderable force. If the joint of meat is ex­actly balanced on the ſpit, it is plain that the only re­sistance to the motion of the fly is what ariſes from the friction of the pivots of the upright ſpindle, the friction of the pimion and wheel, the friction of the pivots of the horizontal axis, the friction of the ſmall end of the spit, and the friction of the chain in the two pulleys. The whole of this is but a mere trifle. But there is fre­quently a conſiderable inequality in the weight of the meat on different ſides of the ſpit : there muſt there­fore be a sufficient overplus of force in the impulſe of the aſcending air on the vanes of the fly, to over­come this want of equilibrium occaſioned by the unskilfulneſs or negligence of the cook. There is, how­ever, commonly enough of power when the machine is properly conſtructed. The utility of this machine will, we hope, procure us the indulgence of ſome of our readers, while we point out the circumſtances on which its performance depends, and the maxims which ſhould he followed in its conſtruction.

The upward current of air is the moving power, and ſhould be increaſed as much as poſſible, and applied in the moſt advantageous manner. Every thing will in­creaſe the current which improves the draught of the chimney, and ſecures it from ſmoking. A ſmoky chim­ney muſt always have a weak current. For this parti­cular, therefore, we refer to what has been delivered in the article Pneumatics, n⁰ 359 ; and in the article Smoke.

With reſpect to the manner of applying this force, it is evident that the beſt conſtruction of a windmill ſails will be nearly the beſt conſtruction for the fly. Ac­cording to the uſual theory of the impulſe of fluids,

the greateſt effective impulſe (that is, in the direction of the fly’s motion) will be produced if the plane of the vane be inclined to the axis in an angle of 54 degrees 46 minutes. But, ſince we have pronounced this the­ory to be ſo very defective, we had better take a deter­mination founded on the experiments on the impulſe of fluids made by the academy of Paris. Theſe authoriſe us to ſay, that 49 1/2 or 50 degrees will be the beſt angle to give the vane : but this muſt be underſtood only of that part oſ it which is cloſe adjoining to the axis. The vane itſelf muſt be twiſted, or *weathered* as the mill­wrights term it, and muſt be much more oblique at its outer extremity. The exact poſition cannot be determined with any precision ; becauſe this depends on the proportion oſ the velocity of the vane to that of the current of heated air. This is ſubject to no rule, being changed according to the load on the jack. We imagine that an obliquity of 65 degrees for the outer ends of the vanes will be a good poſition for the generality of caſes. Meſſinger deſcribes an ingenious contrivance for changing this angle at pleaſure, in order to vary the velocity of the motion. Each vane is made to turn round a midrib, which ſtands out like a radius from the ſpindle, and the vane is moved by a ſtiff wire attached to one of the corners adjoining to the axle. Theſe wires are attached to a ring which slides on the ſpindle like the ſpreader of an umbrella ; and it is flopped on any part of the ſpindle by a pin thruſt through a hole in the ſpindle and ring. We mention this briefly, it be­ing eaſily underſtood by any mechanic, and but of little conſequence, becauſe the machine is not ſuſceptible of much precision.

It is eaſy to ſee that an increaſe of the ſurface of the vanes will increaſe the power : therefore they ſhould oc­cupy the whole ſpace of the circle, and not conſiſt of four narrow arms like the ſails of a windmill. It is bet­ter to make many narrow vanes than a few broad ones; as will appear plain to one well acquainted with the mode of impulſe of fluids acting obliquely. We recom­mend 8 or 12 at leaſt ; and each vane ſhould be ſo broad, that when the whole is held perpendicular be­tween the eye and the light, no light ſhall come through the fly, the vanes overlapping each other *a very ſmall matter.* We alſo recommend the making them of ſtiff plate. Their weight contributes to the ſteady motion, and enables the fly, which has acquired a conſiderable velocity during a favourable poſition of things, to retain a momentum sufficient to pull round the ſpit while the heavy side of the meat is riſing from its loweſt poſition. In ſuch a ſituation a light fly ſoon loses its momentum, and the jack flaggers under its load.

It is plain, from what has been ſaid, that the fly ſhould occupy the whole of that ſection of the vent where it is placed. The vent muſt therefore be brought to a round form in that place, that none of the current may paſs uſeleſsly by it.

It is an important queſtion where the fly ſhould be placed. If in a wide part of the vent, it will have a great ſurface, and act by a long lever ; but the current in that place is slow, and its impulſe weak. This is a fit ſubject of calculation. Suppoſe that we have it in our choice to place it either as it is drawn in the figure, or far­ther up at *g,* where its diameter muſt be one half of what it is at G. Since the ſame quantity of heated air paſſes through both ſections, and the ſection *g* has only one-