fourth of the area of the ſection G, it is plain that the ait muſt be moving four times faſter, and that its impulſe is 16 times greater. But the ſurface on which it is act­ing is the fourth part of that of the fly G ; the actual impulſe therefore is only four times greater, ſuppoſing both flies to be moving with the same relative velo­city in reſpect of the current ; that is, the rim of each moving with the same portion of the velocity of the current. This will be the caſe when the ſmall fly turns eight times as often in a minute as the large fly ; for the air is moving four times as quick at *g,* and the diameter of *g* is one-half of that of G. Therefore, when the ſmall fly is turning eight times as quick as the great one, there is a quadruple impulſe acting at half the diſtance from the axis. The momen­tum or energy therefore of the current is double. There­fore, ſuppoſing the pinion, wheel, and pulleys of both jacks to be the ſame, the jack with the ſmall fly, placed in the narrow part of the vent, will be 16 times more powerful.

By this example, more eaſily underſtood than a ge­neral proceſs, it appears that it is of particular impor­tance to place the fly in an elevated part of the vent, where the area may be much contracted. In order ſtill farther to increaſe the power of the machine, it would be very proper to lengthen the ſpindle ſtill more, and to put another fly on it at a conſiderable diſtance above the firſt, and a third above this, &c.

As the velocity of the current changes by every change of the fire, the motion of this jack muſt be very unſteady. To render it as adjuſtable as may be to the particular purpoſe of the cook, the pulley E has ſeveral grooves of different diameters, and the ſpit turns more or leſs ſlowly, by the ſame motion of the fly, according as it hangs in the chain by a larger or ſmaller pulley or groove.

Such is the conſtruction of the ſmoke jack in its moſt ſimple form. Some are more artificial and complicated, having, in place of the pulleys and connecting chain, a ſpindle coming down from the horizontal axis BC. On the upper end of this ſpindle is a horizontal contrate wheel, driven by a pinion in place of the pulley C. On the lower end is a pinion, driving a contrate wheel in place of the pulley E. This conſtruction is repreſent­ed in fig. 6. Others are conſtructed more simply, in the manner repreſented in fig. 7. But our firſt construction has great advantage in point of ſimplicity, and allows a more easy adjustment of the ſpit, which may be brought nearer to the fire or removed farther from it without any trouble ; whereas, in the others, with a train of wheels and pinions, this cannot be done without ſeveral changes of pins and ſcrews. The only imperfection of the pulley is, that by long uſe the grooves become ſlippery, and an ill balanced joint is apt to hold back the ſpit, while the chain ſſides in the grooves. This may be completely prevented by ma­king the grooves flat inſtead of angular (which greatly diminiſhes the friction), and furniſhing them with ſhort studs or pins which take into every third or fourth link of the chain. If the chain be made of the ſimpleſt form, with flat links, and each link be made of an exact length (making them all on a mould), the motion will be as eaſy as with any wheelwork, and without the leaſt chance of flipping.

It is always of importance to avoid this flipping of the chain by balancing the loaded ſpit. For this pur­poſe it will be extremely convenient to have what is called a *balance-ſkewer.* Let a part of the ſpit, imme­diately adjoining to the pulley, be made round, and let an arm be made to turn on it ſtiffly, ſo that it may be made faſt in any poſition by a ſcrew. Let a leaden ball be made to slide along this arm, with a ſcrew to faſten it at any diſtance from the ſpit. When the meat is spitted, lay it on the racks, and the heavieſt ſide will immediately place itſelf undermoſt. Now turn round the balance-ſkewer, ſo that it may point ſtraight up­wards, and make it faſt in that poſition by the ſcrew. Put the leaden ball on it, and slide it inwards or out­wards till it exactly balances the heavy ſide, which will appear by the ſpit’s remaining in any poſition in which it is put.

The greateſt difficulty is to keep the machine in re­pair. The moſt conſequential part of it, the firſt mo­ver, the fly, and the pinion and wheel, by which its mo­tion is tranſmitted to the reſt of the machine, are ſituated in a place of difficult acceſs, and where they are expoſed to violent heat and to the ſmoke and foot. The whole weight of the fly, reſting on the lower pivot I, muſt exert a great preſſure there, and occaſion great friction, even when this pinion is reduced to the ſmall­eſt ſize that is compatible with the neceſſary ſtrength. The pivot muſt be of hardened ſteel, tapered like an ob­trite cone, and muſt turn in a conical ſocket, alſo of hardened ſteel or of bell-metal ; and this feat of pressure and friction muſt be continually ſupplied with oil, which it conſumes very quickly. It is not ſufficient that it be from time to time ſmeared with an oiled feather ; there muſt be an iron cup formed round the ſocket, and kept filled with oil. It is ſurpriſing how quickly it diſappears : it ſoon becomes clammy by evaporation, and by the ſoot which gathers about it. The continued rubbing of the pivot and ſocket wears them both very faſt ; and this is increaſed by hard powders, ſuch as ſandy duſt, that are hurried up by the rapid current every time that the cook ſtirs the fire. Theſe, getting between the rubbing parts, cauſe them to grind and wear each other prodigiouſly. It is a great improve­ment to invert theſe rubbing parts. Let the lower end of the ſpindle be of a conſiderable thickneſs, and have a conical hollow nicely drilled in its extremity. Let a blunt pointed conical pin riſe up in the middle of the oil-cup, on which the conical hollow of the ſpindle may reſt. Here will be the ſame ſteady ſupport, and the ſame friction as in the other way ; but no grinding duſt can now lodge between the pivot and its ſock­et : and if this upright pin be ſcrewed up through the bottom of the cup, it may be ſcrewed farther up in proportion as it wears ; and thus the upper pivot *g* will never deſert its hole, a thing which ſoon happens in the common way. We can ſay from experience, that a jack conſtructed in this way will not require the fifth part of the repairs of one done in the other way.

It is of importance that the whole be ſo put toge­ther as to be eaſily taken down, in order to ſweep the vent, or to be repaired, &c. For this purpoſe, let the croſs bar which carries the lower end of the upright ſpindle be placed a little on one ſide of the perpendicu­lar line from the upper pivot hole. Let the cock which