the walls, perhaps not yet thoroughly dry, preserve a dampneſs in the air of the room which keeps the wood­work ſwelled and cloſe. The doors and the ſaſhes too, being worked with truth, ſhut with exactneſs, ſo that the room is as tight as a ſnuff-box, no paſſage being left open for air to enter except the key-hole, and even that is ſometimes covered by a little dropping ſhutter. Now if ſmoke cannot riſe but as connected with rare­fied air, and a column of ſuch air, ſuppoſe it filling the funnel, cannot riſe unleſs other air be admitted to ſup­ply its place; and if therefore no current of air enter the opening of the chimney—there is nothing to prevent the ſmoke from coming out into the room. If the motion upwards of the air in a chimney that is freely ſupplied be obſerved by the riſing of the ſmoke or a feather in it, and it be conſidered that in the time ſuch feather takes in riſing from the fire to the top of the chimney, a column of air equal to the content of the funnel muſt be diſcharged, and an equal quantity ſupplied from the room below, it will appear abſolutely impoſſible that this operation ſhould go on if the tight room is kept ſhut ; for were there any force capable of drawing con­ſtantly ſo much air out of it, it muſt ſoon be exhauſted like the receiver of an air-pump, and no animal could live in it. Thoſe therefore who ſtop every crevice in a room to prevent the admiſſion of freſh air, and yet would have their chimney carry up the ſmoke, require inconſiſtencies, and expect impossibilities, Yet under this ſi­tuation it is not uncommon to ſee the owner of a new houſe in deſpair, and ready to ſell it for much leſs than it coſt ; conceiving it. uninhabitable becauſe not a chim­ney in any one of its rooms will carry off the ſmoke unleſs a door or window be left open. Much ex­pence has alſo been made to alter and amend new chim­neys which had really no fault : in one houſe particu­larly which Dr Franklin knew that belonged to a no­bleman in Weſtminſter, that expence amounted to no leſs than L. 300, after his houſe had been, as he thought, finiſhed and all charges paid. And after all, ſeveral of the alterations were ineffectual, for want of underſtanding the true principles.

*Remedies.* When yon find on trial that opening the door or a window enables the chimney to carry up all the ſmoke, you may be ſure that want of air from with­out was the cauſe of its ſmoking. “ I ſay from *with­out* (adds Dr Franklin), to guard you againſt a com­mon miſtake of thoſe who may tell you the room is large, contains abundance of air ſufficient to ſupply any chimney, and therefore it cannot be that the chimney wants air. Theſe reaſoners are ignorant that the largeneſs of a room, if tight, is in this case of ſmall import­ance, ſince it cannot part with a chimney full of its air without occaſioning ſo much vacuum ; which it requires a great force to effect, and could not be borne if ef­fected.”

It appearing plainly then, that ſome of the outward air muſt be admitted, the queſtion will be, how much is abſolutely neceſſary ? for you would avoid admitting more, as being contrary to one of your intentions in having a fire, viz. that of warming your room. To diſcover this quantity, ſhut the door gradually while a middling fire is burning, till you find that before it is quite ſhut the ſmoke begins to come out into the room ; then open it a little till you perceive the ſmoke comes out no longer. There hold the door, and obſerve the

width of the open crevice between the edge of the door and the rabbet it ſhould ſhut into. Suppoſe the di­ſtance to be half an inch, and the door eight feet high; you find thence that your room requires an entrance for air equal in area to 96 half inches, or 48 ſquare inches, or a paſſage of 6 inches by 8. This, however, is a large ſuppoſition ; there being few chimneys that, having a moderate opening and a tolerable height of funnel, will not be ſatisfied with ſuch a crevice of a quarter of an inch : Dr Franklin found a ſquare of *6* by 6, or 36 ſquare inches, to be a pretty good medium that will ſerve for moſt chimneys, High funnels with small and low openings may indeed be ſupplied through a leſs ſpace ; becauſe, for reasons that will appear here­after, the force of levity, if one may ſo ſpeak, being greater in ſuch funnels, the cool air enters the room with greater velocity, and conſequently more enters in the ſame time. This, however, has its limits ; for ex­perience ſhows, that no increaſed velocity ſo occaſioned. has made the admiſſion of air through the key-hole equal in quantity to that through an open door, though through the door the current moves ſlowly, and through the key-hole with great rapidity.

It remains then to be conſidered, how and where this neceſſary quantity of air from without is to be ad­mitted ſo as to be leaſt inconvenient : for if at the door, left ſo much open, the air thence proceeds directly to the chimney, and in its way comes cold to your back and heels as you fit before your fire. If you keep the door ſhut, and raiſe a little the ſaſh of your window, you feel the ſame inconvenience. Various have been the contrivances to avoid this ; ſuch as bringing in freſh air through pipes in the jams of the chimney, which pointing upwards ſhould blow the ſmoke up the funnel; opening paſſages into the funnel above, to let in air for the ſame purpoſe. But theſe produce an effect con­trary to that intended : for as it is the conſtant current of air paſſing from the room through the opening of the chimney into the funnel which prevents the ſmoke from coming out into the room, if you ſupply the funnel by other means or in other ways with the air which it wants, and eſpecially if that air be cold, you diminiſh the force of that current, and the ſmoke in its efforts to en­ter the room finds leſs reſiſtance.

The wanted air muſt then indiſpenſably be admitted into the room, to ſupply what goes off through the opening of the chimney. M. Gauger, a very ingenious and intelligent French writer on the ſubject, propoſes with judgment to admit it above the opening of the chimney ; and to prevent inconvenience from its cold­neſs, he directs that it may be ſo made, that it ſhall paſs in its entrance through winding cavities made be­hind the iron back and ſides of the fire-place, and under the iron hearth-plate ; in which cavities it will be warmed, and even heated, ſo as to contribute much, in­ſtead of cooling, to the warming of the room. This invention is excellent in itſelf, and may be uſed with advantage in building new houſes ; becauſe the chim­neys may then be ſo diſpoſed as to admit conveniently the cold air to enter ſuch paſſages : but in houſes built without ſuch views, the chimneys are often ſo ſituated as not to afford that convenience without great and expenſive alterations. Eaſy and cheap methods, though not quite ſo perfect in themſelves, are of more general utility ; and ſuch are the following.