part of the fixed air will be abſorbed into the water, as will appear by the end of the crooked tube being considerably under the ſurface of the water in the vessel. The ſhaking them for two or three minutes will be ſufficient for this purpoſe. Theſe veſſels must not be ſhaken while joined to the under one A, otherwiſe too great an efferveſcence will be occaſioned in the latter, together with the ill conſequence above mentioned. After the water and air have been ſufficiently agitated, looſen the upper veſſel C, ſo that the remaining water may fall down into B, and the unabſorded air pass out. Put theſe veſſels together, and replace them into the mouth of A, in order that B may be again half filled with fixed air. Shake the veſſels B and C, and let out the unabſorbed air as before. By repeating the operation three or four times, the water will be ſufficiently impregnated.

Whenever the efferveſcence nearly ceaſes in the veſ­ſel A, it may be renewed by giving it a gentle ſhake, ſo that the powdered chalk or marble at the bottom may be mixed with the oil of vitriol and water, above it ; for then a greater quantity of fixed air will be diſengaged. When the efferveſcence can be no longer re­newed by ſhaking the veſſel A, either more chalk muſt be put in, or more oil of vitriol ; or more water, if neither of theſe produce the deſired effect.

Mr Magellan has ſtill further improved this contri­vance. He has two ſets of the vessels B and C. While he is ſhaking the air and water contained in one of theſe ſets, the other may be receiving fixed air from the vessel A. By this means twice the quantity of water may be impregnated in the same time. He has a wooden ſtand on which to fix the veſſels B, C, when taken off from A, which is very convenient. He has a ſmall tin trough for meaſuring the quantity of chalk or mar­ble requisite for one operation, and a wide glaſs funnel for putting it through into the veſſel A, to prevent its flicking to the ſides, as mentioned before.

He has alſo contrived a ſtopper without a hole, to be uſed occasionally inſtead of the perforated one *p.* It muſt be of a conical figure, and very looſe ; but ſo exactly and ſmoothly ground as to be air-tight merely by its preſſure. Its uſe is to compreſs the fixed air on the water, and thereby increaſe the impregnation. For by keeping the air on the water in this compreffed ſtate, the latter may be made to ſparkle like champaign. And if the veſſels are ſtrong, there will be no danger of their burſting in the operation.

The water thus impregnated may be drawn out at the opening *k.* But if it is not wanted immediately, it will be better to let it remain in the machine, where it has no communication with the external air ; other­wiſe the fixed air flies off by degrees, and the water be­comes vapid and flat. But it may be kept a long time in bottles well stopped, especially if they are placed with their mouths downwards.

Dr Withering of Birmingham has lately contrived a new apparatus for impregnating water with fixed air, which, he ſays, is preferable to that in common uſe, becauſe it can be made at less expence, and is more eaſily prepared ; becauſe the whole quantity of fixable air produced is converted to uſe, without any waste of the vitriolic acid ; becauſe it impregnates three times the quantity of water at one time more completely and with leſs trouble; and the impregnated water will al­

ways retain its virtue, if the joints and cocks of the machine are made perfectly air-tight ; for which pur­poſe they ſhould once a-year be ſupplied with a ſmall quantity of unſalted lard. This apparatus is exhibited by fig. 2. and consists of a glaſs veſſel A, about ten inches high in the cylindrical part, and six inches and a half in diameter ; another glaſs veſſel B, about twelve inches high in the conical part, one inch and a half in the neck, and five inches in diameter at the bottom ; a copper pipe C paſſing through the ſtopper of the veſſel B, and tied faſt in the flexible tube D, made of ſtrong leather, air-tight, and kept hollow by means of a ſpiral wire paſſing through its whole length ; a conical braſs pipe E, with a ſtop-cock fattened to the tube D ; ano­ther conical pipe F, with a ſtop-cock G, into which the end of the tube E is accurately ground ſo as to be air-tight, and cutting off all communication with the atmoſphere when the pipe E is removed ; two large hog’s bladders H, H, each of which ought to hold two quarts ; a ſtop-cock I to prevent the water riſing into the bladders when the veſſel A is agitated ; a bladder K tied to the crooked tube with the ſtop-cock L, which occaſionally opens or ſhuts the communication with the veſſel B ; a glaſs funnel M, accurately fitted with the glaſs ſtopper N ; an aperture O, fitted with a glaſs ſtopper or a ſilver cock, from which the impreg­nated water is to be drawn for uſe ; and, laſtly, the tube P opening into the veſſel A. When this appara­tus is uſed, let the veſſel A be filled with pure water, and any other ingredients that are required, in a proper proportion ; into the veſſel B put as much marble or whiting, in ſmall lumps, as will cover its bottom to the height of about two inches, and pour in water to the height repreſented by the dotted line ; let the mouth of the veſſel A be well fitted with a cork, and through a hole in the cork paſs the tube P, putting upon the cork melted sealing-wax of the ſofteſt kind, or model­ling-wax, ſo as to make the whole air-tight. Let the mouth of the veſſel B be flopped with a piece of ma­hogany, turned into a conical figure in a lathe, and of a ſize ſomewhat larger than the mouth of the glaſs will admit ; put this piece of wood into melted bees-wax, and heat the wax till the wood begins to grow black: when cool, turn it again till it fits the mouth of the veſſel : the tubes C, L, and M are fitted into holes and bored through the wooden ſtopper previous to its being immerſed in the wax ; puſh theſe tubes through the holes, and preſs the ſtopper into the orifice of the vessel B, and cement the whole with ſealing or model­ling-wax ; ſhut the ſtop-cocks I and L, having previouſly preſſed the air out of the bladder K : open the ſtop-cocks G and E ; then ſqueeze the air out of the bladders H, H, and afterwards preſs the conical pipe E into the pipe F ; pour about a large ſpoonful of oil of vitriol through the funnel M, and ſtop it with its ſtooper N. The fixable air let looſe by the efferveſcence in the veſſel B, riſing through the tube C, paſſes into the bladders H, H, and diſtends them. In this caſe open the ſtop-cock I, and from the aperture O draw out about a quart of water ; and the ſpace before occupied by the water will be filled with fixable air, which ſoon begins to be abſorbed by the remaining water, and is ſtill ſupplied from the bladders H, H, and from the eſſerveicing mixture in the veſſel B. When the bladders are considerably collapſed, more vitriolic acid muſt be added through the