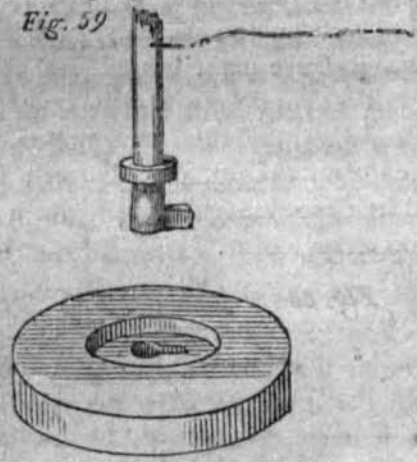
aſhes ſeen between the top of the heater and the bottom of the ſtew-pan. By the quantity of aſhes ſuffered to remain on the upper ſurface of the heater, the heat communicated to the ſtew-pan is to be moderated, and regulated.

The heater is perforated in its center, by a hole of a peculiar form, which ſerves for introducing an iron hook, which is uſed in taking it from the fire, and placing it in the earthen diſh.

The form of the hook, and the ſhape of the aperture through which it paſſes in the heater, may be ſeen in the following figure:

Fig. 59



The circular excavation in the heater, on each ſide of it, ſurrounding the hole (which is in the form of the key-hole of a lock) by which the hook is introduced, ſerves to give room for the hook (or key, as it might be called) to be turned round when the heater is laid upon, or againſt a flat ſurface. As this excavation, as well as the hole through which the key paſſes, may be caſt with the heater, this arrangement will cauſe no additional expence.

CHAP.

CHAP. XI.

Of the uſe of PORTABLE FURNACES, *for culinary purpoſes.—Deſcription of a portable Kitchen Furnace, for Boilers, &c. on the common conſtruction.—Deſcription of a ſmall Portable Furnace of caſt-iron, for heating tea-kettles, ſtew-pans, &c.—Deſcription of another, of ſheet-iron, deſigned for the ſame uſes.—Deſcription of a Portable Kitchen Furnace of earthen ware.—An account of a very ſimple Apparatus for Cooking, uſed in China.*

IN China, and in ſeveral other countries, all, or nearly all the fire-places uſed in cooking are portable; and real advantages might certainly be derived, in many caſes, from the uſe of portable kitchen fire-places in this country. Convinced of the utility of this method of cooking, I have taken conſiderable pains to inveſtigate the ſubject experimentally, and to aſcertain the beſt forms for the furnaces and utenſils neceſſary in the practice of it.

Portable furnaces for cooking are of two diſtinct kinds: The one has a fire-place door for introducing the fuel—the other has none: and either of theſe may, or may not, be furniſhed with a tube for carrying off the ſmoke into the air, or into a neighbouring chimney.

When a portable kitchen furnace is conſtructed without a fire-place door, as often as fuel is to be introduced, it will be neceſſary to remove the boiler, in order to perform that operation. When the boiler is ſmall, that may eaſily be done;

done; and when the furnace ſtands out of doors, or on the hearth within the draft of a chimney, or when the fuel uſed produces little or no ſmoke, it may be done without any conſiderable inconvenience; but if the boiler be large, it cannot be removed without difficulty; and when the furnace is placed within doors, and the fuel uſed produces ſmoke, or other noxious vapours, the removing of the boiler, though it were but for a moment, would be attended with very diſagreeable conſequences.

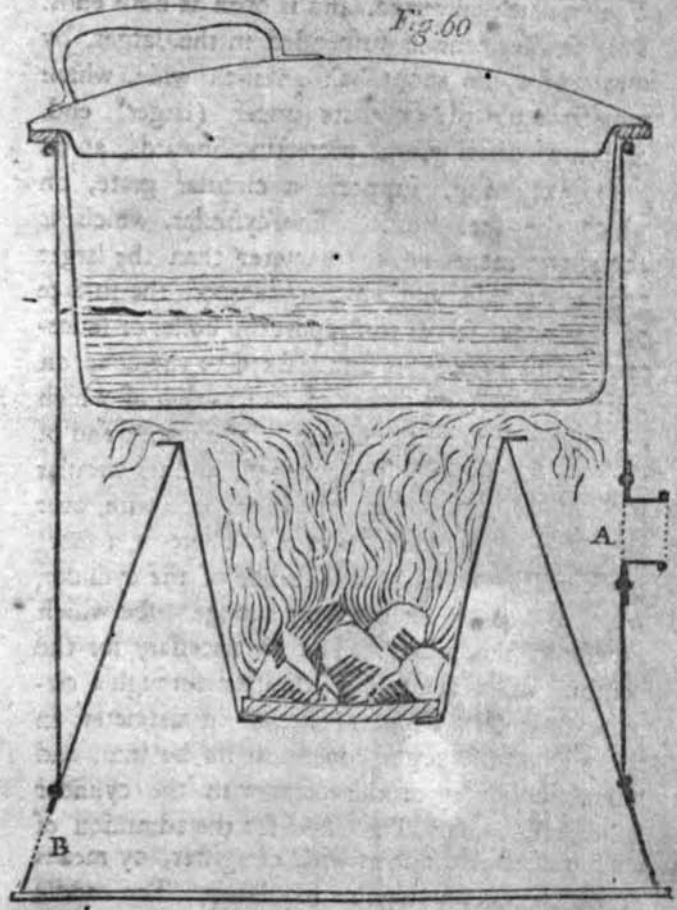
Small portable furnaces, without fire-place doors, may may be uſed within doors, provided they be heated with charcoal; but it will in that caſe always be adviſable to furniſh them with ſmall tubes of ſheet-iron, for carrying off the unwholeſome vapour of the charcoal into the chimney. Without ſuch tubes to carry off the ſmoke, they would not, it is true, be more diſagreeable, or more detrimental to health, than the ſtoves now generally uſed for burning charcoal in kitchens; but I ſhould be ſorry to recommend an invention to which there appear to me to be ſo great objections.

I have cauſed a conſiderable number of portable kitchen furnaces, of both the kinds above-mentioned, to be conſtructed; and I ſhall now give deſcriptions of ſuch of them as ſeem to anſwer beſt the purpoſes for which they were deſigned. They may all be ſeen at the Repoſitory of the Royal Inſtitution.

A very

A very ſimple and uſeful portable kitchen furnace, with its ſtew-pan in its place, are repreſented by the following figure :

Fig. 60



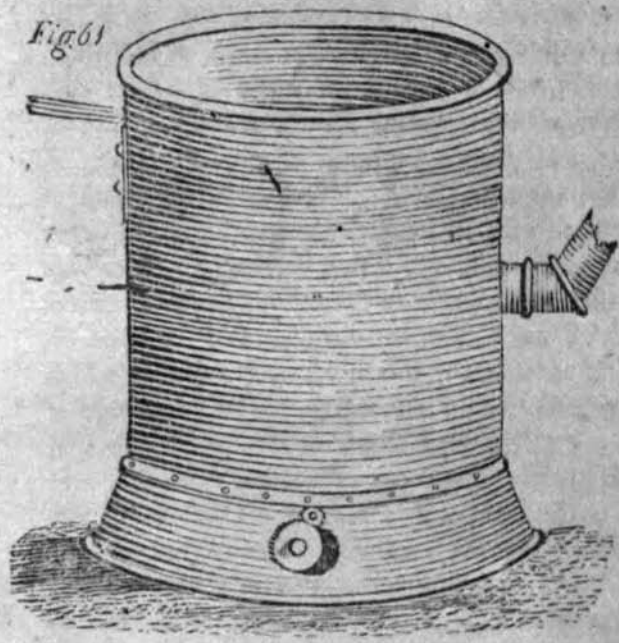
This furnace is made of common ſheet-iron, and it may be afforded at a very low price. It is compoſed

compoſed of an hollow cylinder, and two hollow truncated cones of different ſizes. The large cone, which is erect, is cloſed at its baſe, or lower end: The ſmaller is inverted, and is open at both ends. This ſmaller cone is ſuſpended in the larger, by means of a rim about half an inch wide, which projects outwards from its upper (larger) end. A rim of equal width, projecting inwards, at its lower extremity, ſupports a circular grate, on which the fuel burns. The cylinder, which is about two inches leſs in diameter than the larger cone at its baſe, and which reſts upon the ſurface of that cone, ſerves to ſupport the boiler or ſauce-pan. This cylinder is firmly fixed to the cone on which it reſts, by means of rivets, two of which are repreſented in the figure. The upper end of this open cylinder is ſtrengthened, and its circular form preſerved by means of a ſtrong iron wire, over which the ſheet-iron is turned. There is a ſhort horizontal tube (A.) on one ſide of the cylinder, which is deſtined for receiving a longer tube which carries off the ſmoke. The air neceſſary for the combuſtion of the fuel is admitted through a circular hole (B.) about 1¼ inches in diameter, in the ſide of the larger cone, near its bottom, and below the joining of the cone with the cylinder which reſts on it. This hole for the admiſſion of air ſhould be furniſhed with a regiſter, by means of which the fire may be regulated. The handle of the ſtew-pan is omitted in this plate, for want of room, as is alſo that of the fire-place. This figure is drawn to a ſcale of four inches to the inch.

The

The following figure (which is drawn to a ſcale of ſix inches to the inch) is a perſpective view of one of theſe portable furnaces, without its ſtew-pan.

Fig. 61



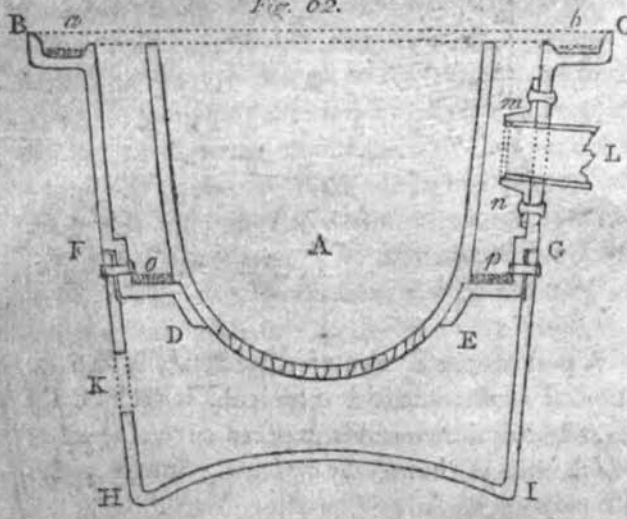
A part of the handle of this furnace is ſeen on the left hand; and the ſhort tube is ſeen on the right hand, that receives another tube, (a part of which only is ſhewn) by which the ſmoke paſſes off.

The ſtew-pan repreſented in the 60th figure, is ſuppoſed to be made of copper, and to be conſtructed on the principles recommended in the ſeventh

ſeventh chapter of this (tenth) Eſſay. Theſe portable furnaces are peculiarly adapted to kitchen utenſils, conſtructed on thoſe principles, and alſo to boilers and ſtew-pans with ſteam-rims, which are not made double; but for double or *armed boilers*, ſtew-pans, &c. the furnace muſt be made in a different manner. The ſimpleſt form for portable furnaces adapted to armed boilers, is that repreſented by the figures 55, 56, and 57: but I ſhall now give an account of a furnace of this ſort, conſtructed on different and better principles.

The following figure repreſents a vertical ſection of a ſmall portable kitchen furnace, of *caſt-iron*.

Fig. 62.



On examining this figure, it will be found that care has been taken in contriving this furnace, to divide it in ſuch a manner into parts, and to give

to thoſe parts ſuch forms as to render the whole of eaſy conſtruction. It conſiſts of three principal parts, namely, of the fire-place A, which is a hollow cylinder, or rather an inverted hollow truncated cone, 7 inches in diameter above, meaſured internally; 4 inches long, or high, ending below with a hemiſpherical hollow bottom, 6 inches in diameter, perforated with many holes for the admiſſion of air.

This fire-place is ſuſpended in the axis of the furnace by means of the projecting hollow ring D, E, belonging to the upper and principal piece, B, C, D, E, of the furnace. At the upper part of this piece there is a circular cavity, *a*, *b*, about one inch wide, and a quarter of an inch deep, which is deſtined to receive the lower extremity of the hollow cylinder in which the boiler is ſuſpended. At L, is a circular hole 1 ½ inches in diameter, which receives the end of the tube by which the ſmoke is carried to the chimney. A part of this tube, which is of ſheet-iron, is repreſented in the figure. To give it a more firm ſupport in its place, there is a ſhort tube, *m*, *n*, of caſt-iron, which projects inwards into the furnace about ½ of an inch. This ſhort tube is caſt with a flanch, and it is faſtened to the inſide of the piece which conſtitutes the upper part of the body of the furnace, by means of three or four rivets. Two of theſe rivets are diſtinctly repreſented in the figure.

The lower part of the body of the furnace conſiſts of the piece F, G, H, I, and it is faſtened

to the upper part by means of rivets, two of which are ſeen at F. and at G. In one ſide of this lower part there is a circular hole at K, about 1 ¼ inches in diameter, which ſerves for the admiſſion of air, and which is furniſhed with a regiſter ſtopper. The bottom of this furnace, inſtead of being made flat is ſpherical, projecting upwards; which form was choſen in order to prevent, as much as poſſible, the heat from the fire from being communicated downward. This furnace will require no handle, as its projecting brim will ſerve inſtead of one.

It will be obſerved, that all the pieces of which this furnace is compoſed, are of ſuch forms that the moulds for caſting them will readily deliver from the ſand; and that circumſtance will contribute greatly to the lowneſs of the price at which this moſt uſeful article of kitchen furniture may be afforded.

The perforated caſt-iron bowl, A, which conſtitutes the fire-place, is not confined in its place, and its form and its poſition are ſuch that its expanſion with heat can do no injury to the outſide of the furnace.

When the two pieces which form the body of the furnace are faſtened together, their joinings may be made tight with cement.

A little fine ſand ſhould be put into the hollow rim, *a*, *b*, of the furnace, in order that it may be perfectly cloſed above by the lower end of the hollow cylinder of its boiler; and a little ſand or aſhes may be thrown upon the bottom of the cir-

cular cavity *o*, *p*, into which the ſmoke deſcends, before it goes off by the tube L, into the chimney. This laſt precaution will prevent the air from making its way upwards from the aſh-pit directly into the cavity *o*, *p*, occupied by the ſmoke, without paſſing through the fire-place.

The regiſter ſtopper to the opening K, into the aſh-pit, may be conſtructed on the ſame principle as that of the blow-pipe of a roaſter. One of theſe ſtoppers is repreſented on a large ſcale in the figure 17, at the end of the ſecond part of this (tenth) Eſſay; or what will be ſtill more ſimple, and quite as good, the admiſſion of the air may be regulated by a regiſter like that repreſented in the preceding figure, No. 61.

This portable kitchen furnace will anſwer a variety of uſeful purpoſes; and, if I am not much miſtaken, it will come into very general uſe. It is cheap and durable, and not liable to be broken by accidents, or put out of order; and it is equally well adapted for every kind of fuel. No particular care or attention is required in the management of it, and it is well calculated for confining heat, and directing it.

As the fire-place belonging to this furnace is nearly inſulated, and as it contains but a ſmall quantity of matter to be heated, a fire is eaſily and expeditiouſly kindled in it; and the fuel burns in it under the moſt favourable circumſtance.

It will be found extremely uſeful for boiling a tea-kettle, eſpecially in ſummer; when a fire in

the grate is not wanted for other purpoſes; and, when the tea-kettle is conſtructed on the principles that will preſently be deſcribed, a very ſmall quantity indeed of fuel will ſuffice.

But the moſt important uſe to which theſe portable furnaces can be applied, is, moſt undoubtedly, for cooking for POOR FAMILIES. I have hinted at the probable utility of a contrivance of this kind in ſome of my former publications, but ſince that time I have had opportunities of examining the ſubject more attentively, and of aſcertaining the fact by the teſt of actual experiment.

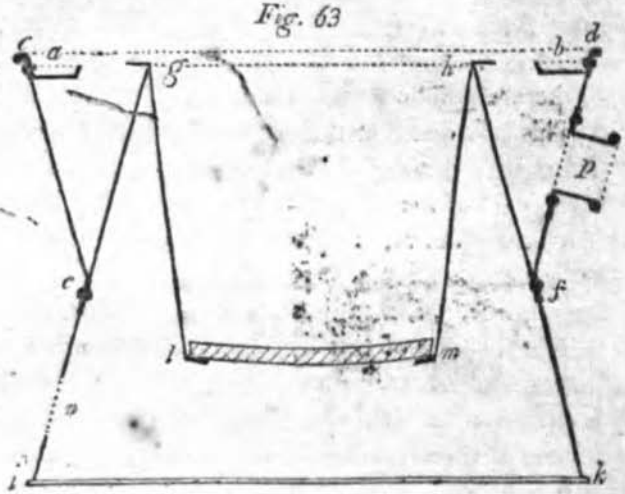
As the ſubject ſtrikes me as being of no ſmall degree of importance, I ſhall make no apology for enlarging on it, and giving the *moſt particular account* of ſeveral kinds of *portable kitchen furnaces*.

That juſt deſcribed (of caſt-iron) is, it is true, as perfect in all reſpects as I have been able to make it, and will probably be found to be quite as economical and as uſeful as any that I ſhall deſcribe; but caſt-iron is not every where to be found, and even where founderies are eſtabliſhed for caſting it, moulds muſt be provided, and theſe are expenſive, and not eaſy to be had. As it is probable that ſome perſons may be deſirous of being provided with portable furnaces of this kind, who may not have it in their power to procure them of caſt-iron, I ſhall now ſhew how they may be conſtructed (by any common workman) of ſheet-iron, and alſo how they may be made of earthen-ware.

Of ſmall Portable Kitchen Furnaces conſtructed of ſheet-iron.

The following figure repreſents a vertical ſection of one of theſe furnaces, drawn to a ſcale of 4 inches to the inch.

Fig. 63



The conſtruction of this furnace will be eaſily underſtood from this figure. The circular hollow horizontal rim *a*, *b*, which I ſhall call the *ſand rim*, is $8\frac{8}{10}$ inches in diameter within, and $12\frac{4}{10}$ inches in diameter without. Its width at its bottom, which is flat, is juſt 1 inch. Its ſides are ſloping, and of different heights; that which is towards the center of the furnace is $\frac{3}{4}$ of an inch high; but the ſide which is outwards is $\frac{1}{2}$ an inch in height.

The ſand-rim is confined and ſupported in its place by being faſtened by means of rivets or

otherwiſe, to an inverted hollow truncated cone, *c*, *d*, *e*, *f*, which forms the upper part of the body of the furnace. This inverted cone, which is turned over a ſtrong circular iron wire at its upper edge, *c*, *d*, is 12 $\frac{4}{10}$ inches in diameter above, meaſured within the wire, and 5 $\frac{4}{10}$ inches in height, meaſured from *c* to *e*, or from *d* to *f*; and is 9 $\frac{4}{10}$ inches in diameter, from *e* to *f*, where it is faſtened to the erect hollow truncated cone, *g*, *h*, *i*, *k*.

This laſt mentioned erect cone, which is cloſed below by a circular plate of ſheet-iron, forms the lower part of the body of the furnace: it is 7 inches in diameter above, 12 inches in diameter below, and its perpendicular height is juſt 9 inches. Its ſloping ſide, *g*, *i*, meaſures about 9 $\frac{6}{10}$ inches.

The *fire-place* of this little portable furnace is an inverted hollow truncated cone, *g*, *h*, *l*, *m*, which is 7 inches in diameter above, at *g*, *h*; and 5 $\frac{1}{2}$ inches in diameter below, at *l*, *m*; and its length is 6 $\frac{1}{2}$ inches, meaſured from *g* to *m*. This conical fire-place has a flat rim above, which is $\frac{1}{2}$ an inch wide, and turned outwards; and another below of equal width, which is turned inwards. The firſt ſerves to ſuſpend it in its place; the ſecond ſerves to ſupport its circular grate, on which the fuel burns.

The air is admitted into the fire-place through a hole, *n*, about 1 $\frac{1}{4}$ inches in diameter, in the ſide of the furnace. This aperture muſt be furniſhed with a regiſter ſimilar to that ſhewn in the figure 6.

The proviſion for carrying off the ſmoke is ſimi-

lar

lar in all reſpects to that uſed in the portable furnace above deſcribed, conſtructed of caſt-iron; and it will eaſily be underſtood, from a bare inſpection of the figure (63), without any farther explanation.

Having ſhewn how this portable kitchen furnace may be conſtructed of caſt-iron, and alſo how it may be made of ſheet-iron, I ſhall now ſhew how it may be made, partly of caſt-iron, and partly of ſheet-iron. A fire-place of caſt-iron, like that repreſented in the 62d figure, may be uſed in a furnace of ſheet-iron; but when this is done, the fire-place muſt be caſt with a prejecting rim above, in order that it may be ſuſpended in its place. The ſand-rim may likewiſe be of caſt-iron, and it may be faſtened to the inverted hollow cone, *c*, *d*, *e*, *f*, by rivets.

The ſhort tube *p*, which ſerves to ſupport the tube which carries off the ſmoke, may alſo be made of caſt-iron, and it may be faſtened to the outſide of the furnace by three rivets. As it may be made of ſuch a form that its mould will deliver from the ſand, it will coſt leſs when made of caſt-iron than when made of ſheet-iron; and it will have another advantage: its form on the inſide will be more regular, and it will be better adapted on that account for receiving the end of the tube, which it is deſigned to receive. Its length need not exceed 1 inch or 1 ½ inches, and its internal diameter may be about 1 ½ inches at its projecting extremity, and ſomething leſs at its other end, where it joins the ſide of the furnace.

Of ſmall Portable Kitchen Furnaces conſtructed of Earthen-ware.

The following figure repreſents a furnace of this kind (of earthen-ware) deſtined for heating boilers of the ſame kind, and of the ſame dimenſion as thoſe proper to be uſed with the two (iron) furnaces laſt deſcribed:

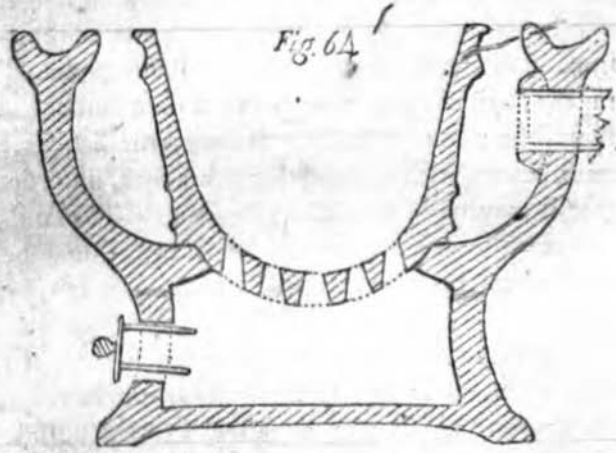


Fig. 64.

This figure repreſents a vertical ſection of the furnace, drawn to a ſcale of four inches to the inch; and it gives an idea ſo clear and ſatisfactory of the form of this furnace, that a detailed deſcription of it would be ſuperfluous.

The fire-place is diſtinct from the body of the furnace, and its form and poſition are ſuch that it cannot crack and injure the body of the furnace by its expanſion with heat. It reſembles very much the caſt-iron fire-place juſt deſcribed, and the ſame

principles regulated the contrivance of both of them. It ſhould be bound round with iron wire, in order to hold it together, in caſe it ſhould crack with the heat of the fire. Two places for the wire, one near its brim, and the other lower down, are ſhewn in the figure.

The aperture by which the air enters the aſh-pit is cloſed by a regiſter-ſtopper, repreſented in the figure, or a conical ſtopper of earthen-ware may be uſed for that purpoſe.

If ſuch earths are uſed in conſtructing theſe ſmall portable furnaces, as are known to ſtand fire well, there is no doubt but theſe furnaces may, with proper uſage, be made to laſt a great while;—and for confining heat, they are certainly preferable to all others.

The portable kitchen furnaces in China, are all conſtructed of earthen-ware; and no people ever carried thoſe inventions which are moſt generally uſeful in common life to higher perfection than the Chineſe. They, and they only, of all the nations of whom we have any authentic accounts, ſeem to have had a juſt idea of the infinite importance of thoſe improvements which are calculated to promote the comforts of the loweſt claſſes of ſociety.

What immortal glory might any European nation obtain by following this wiſe example!

The Emperor of China, the greateſt monarch in the world, who rules over one full *third part* of the inhabitants of this globe, condeſcends *to hold*

the

the plough himſelf one day in every year.—This he does, no doubt to ſhew to thoſe whoſe example never can fail to influence the great bulk of mankind, how important that art is by means of which food is provided.

Let thoſe reflect ſeriouſly on this illuſtrious example of provident and benevolent attention to the wants of mankind, who are diſpoſed to conſider the domeſtic arrangements of the labouring claſſes as a ſubject too low and vulgar for their notice.

If attention to the art by which food is provided be not beneath the dignity of a Great Monarch; that art by which food is prepared for uſe, and by which it may be greatly *economized*, cannot poſſibly be unworthy of the attention of thoſe who take pleaſure in promoting the happineſs of mankind.

As the implements uſed in China for cooking are uncommonly ſimple, it may perhaps be amuſing to the reader to be made acquainted with them. They conſiſt of the two articles repreſented below:

Fig. 65

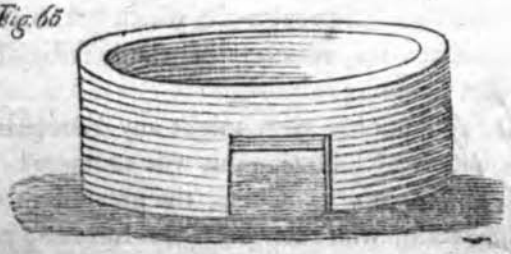
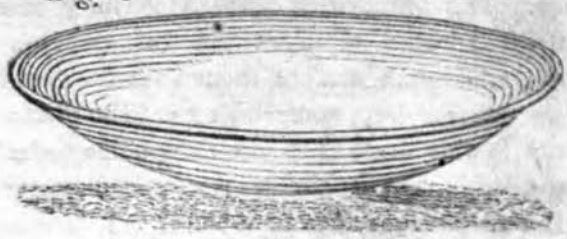


Fig.

Fig. 66



This figure 65, which is made of earthen-ware, is the fire-place, which is ſet down on the ground. The ſhallow pan repreſented by the figure 66, is of caſt-iron, and ſerves for every proceſs of Chineſe cookery. It is caſt very thin, and if by any accident a hole is made in it, their itinerant tinkers mend it, by filling up the hole, which they do with ſo much dexterity that ſcarcely a mark is left behind.

When the dinner conſiſts of ſeveral diſhes they are all cooked in this pan, one after the other, and thoſe which are done firſt are kept warm till they are ſent to table.

I leave it to the ingenuity of Europeans to appreciate theſe ſpecimens of Chineſe induſtry.

But to return from this digreſſion, to our portable kitchen furnaces—Although theſe furnaces are peculiarly adapted for heating boilers and ſtew-pans that are *armed*, yet boilers on the common conſtruction, or ſuch as are not ſuſpended in cylinders, may eaſily be uſed with them. When this is to be done, a detached hollow cylinder or cone muſt be uſed, in the manner deſcribed in the preceding

preceding chapter. and repreſented in the figure 50. This cylinder or cone (which may be conſtructed either of ſheet-iron, of caſt-iron, or of earthen-ware) muſt be about an inch higher than the boiler is deep, with which it is to be uſed; and juſt ſo wide above as to admit the boiler to be ſuſpended in it by its circular rim. Its diameter below muſt be ſuch as to fit the ſand rim, in which it muſt ſtand, when it is uſed.

CHAP.

CHAP. XII.

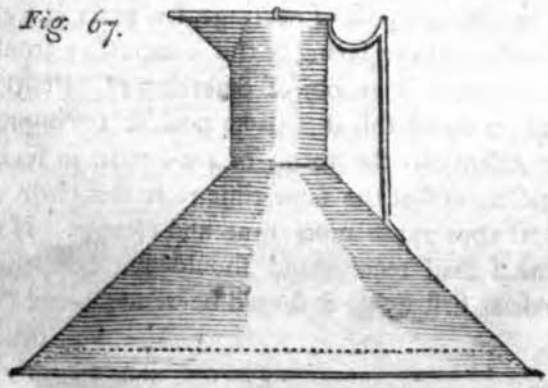
Of the conſtruction of TEA-KETTLES, *proper to be uſed with Regiſter-Stoves, and portable Kitchen Furnaces.—Theſe utenſils may be conſtructed of tin, and ornamented by japanning and gilding.—When they are properly conſtructed and managed, they may be heated over a ſmall portable furnace in a very ſhort time, and with a ſurprizingly ſmall quantity of fuel.—Deſcriptions of four of theſe tea-kettles of different forms and ſizes.—Deſcription of ſeveral very* SIMPLE *and* CHEAP STEW-PANS *for portable Furnaces.—Deſcription of a* STEW-PAN *of* EARTHEN-WARE, *on an improved conſtruction.—This will probably turn out to be a moſt uſeful utenſil for cooking with portable furnaces.*

AS Tea-kettles are ſo much uſed in this country, and as they occaſion ſo great a conſumption of fuel (a large fire being frequently made in a grate, or kitchen-range, morning and evening, for the ſole purpoſe of heating a few pints of water to make tea) the ſaving of this unneceſſary trouble and expence is an object deſerving of attention. And in doing this it will be poſſible to improve very eſſentially the forms of tea-kettles in ſeveral reſpects, and at the ſame time to render their external appearance more neat and cleanly. If the forms I ſhall recommend ſhould not happen to pleaſe at firſt ſight, it ſhould be remembered that utility,

utility, cleanlineſs, and wholeſomeneſs are objects of more importance in caſes like that in queſtion than mere elegance of form—and after all, I am not ſure whether the forms I ſhall propoſe are not in reality quite as elegant as thoſe with which they will be compared. They will, no doubt, at firſt ſight appear uncouth to many perſons, but the eye will ſoon become accuſtomed to them; and their ſuperior cheapneſs, cleanlineſs, and uſefulneſs, will in the end procure them that preference which they deſerve. They may, no doubt, be conſtructed of the moſt elegant forms, on the principles I ſhall recommend, but I ſhall confine my deſcriptions to ſuch forms as are moſt ſimple, and of the eaſieſt and leaſt expenſive conſtruction, leaving it to thoſe to beautify the article whoſe buſineſs and intereſt it is to ſet off their goods to the beſt advantage.

The following figure repreſents a tea-kettle of the ſimpleſt form, ſuited to a regiſter kitchen ſtove, or to a portable furnace, ſuch as has juſt been deſcribed:

Fig. 67.



This

This tea-kettle is conſtructed of tin, and it may be japanned on the outſide to prevent its ruſting, and to give it an elegant and cleanly appearance. Its bottom, which is 11 inches in diameter, is not flat, but it is raiſed up about half an inch in the manner pointed out by a dotted line. The body of this tea-kettle is of a conical form, ending above in a cylinder, 3 inches in length and 2 inches in diameter. The ſpout, which reſembles that of a coffee-pot, is ſituated at the top of this cylinder, and it has a flat cover, faſtened by a hinge, which prevents duſt or ſoot from falling into it when it ſtands on the hearth. When this tea-kettle is put over the fire it ſhould not be filled higher than to the top of the cone, or lower end of the cylinder, otherwiſe it will be liable to boil over. The kettle, ſo filled, will contain 4 pints of water, and if it be heated over one of the ſmall portable furnaces deſcribed in the foregoing chapter, it may be made to boil in about 10 minutes, with 6½ oz. of dry wood, which at the price at which wood is commonly ſold in London, would coſt ⅜ of a farthing.*

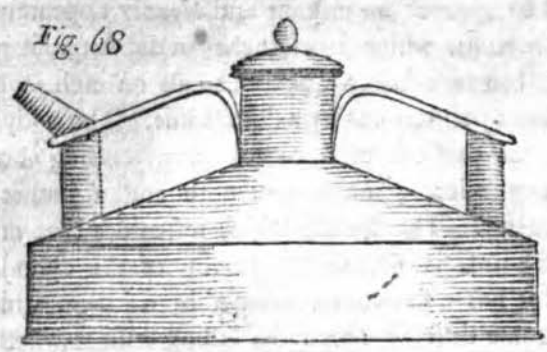
The tea-kettle repreſented by the following figure is rather more complicated, but ſtill its form is more ſimple, and more advantageous in ſeveral reſpects, than thoſe which are in common uſe, and it is well adapted for the fire-places we

* One pint of water only being put into this tea-kettle, over a very ſmall wood fire, made in the portable furnace repreſented in the foregoing figure 63 (ſee page 293) it was heated and made to boil *in two minutes and an half*.

have

have recommended. It is drawn to a ſcale of 4 inches to the inch:

Fig. 68



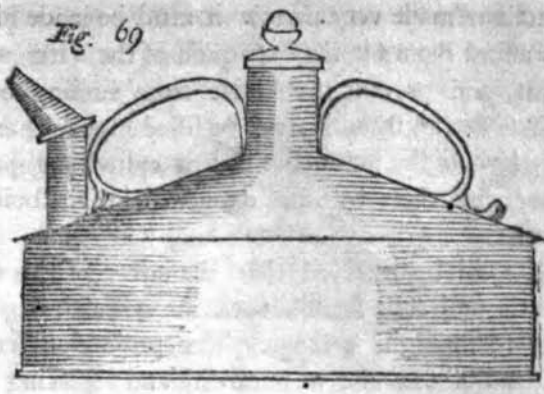
This kettle has two handles, each of which is ſupported on the outſide, or near the circumference of the kettle, by a ſmall vertical tube $\frac{1}{4}$ of an inch in diameter, and $1\frac{1}{4}$ inches in height. That on the left hand is open, and forms a part of the ſpout; but that on the right hand is cloſed at both ends. The bottom of this kettle, alſo the bottoms of thoſe repreſented in the two following figures, like that of the laſt (figure 67) is not flat, but is raiſed up about half an inch above the level of the lower part of the cylindrical ſides of the kettle.

This kettle holds about 3 quarts of water, which can be made to boil with the combuſtion of $9\frac{1}{2}$ oz. of wood.

The following kettle holds about 1 gallon, and may be made to boil with $\frac{3}{4}$ lbs. of wood: which would coſt juſt $\frac{1}{4}$ of a farthing.

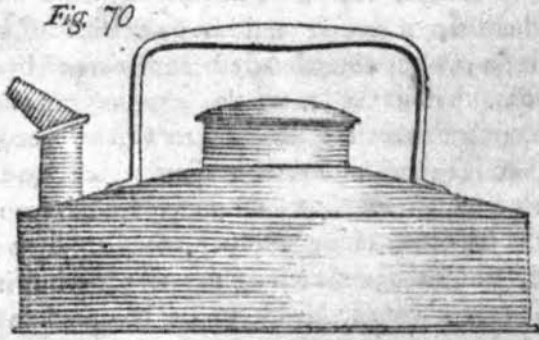
Fig.

Fig. 69



The following kettle is not eſſentially different from thoſe two laſt deſcribed, except in the form of its handle. It holds about 3 quarts.

Fig. 70



The cylindrical opening of this kettle above, where the water is introduced, is conſiderably wider than thoſe in the two foregoing figures. It was made wider, becauſe it was neceſſary to make it lower, in order to make room for the hand without raiſing the handle too high. When this part of a tea-

kettle is made very narrow it muſt be made high, to afford room for the expanſion of the water with heat, and prevent the kettle from boiling over. Theſe kettles ſhould never be filled higher than to the level of the lower part of this cylindrical ſpace, otherwiſe, there will be danger of their boiling over *.

It will be obſerved that the cover of this tea-kettle projects a little beyond the cylindrical opening to which it belongs. This projection ſerves inſtead of a handle in removing and replacing the cover. The cover of a tea-kettle is uſually furniſhed with a knob for that purpoſe; but theſe knobs are in the way when the kettle is lifted up by its handle, unleſs the handle be made much higher than otherwiſe would be ſufficient.

It has, no doubt, already been remarked by the reader, that all the tea-kettles here recommended are of forms that are perfectly eaſy to be executed in tin. There are ſeveral reaſons which have induced me to give a decided preference to that material for conſtructing culinary utenſils. It is not only wholeſome—which copper is not—but it is alſo very cheap, and eaſy to be procured in all places, and it is eaſily worked: it is moreover light and ſtrong, and not liable to be injured by accidents; and if meaſures be taken to prevent the effects of ruſt, it is very durable.

* I find by experiments made ſince the above was written, that tea-kettles of this kind ſhould never be filled above two-thirds full, otherwiſe they will be very apt to boil over.

The

The four tea-kettles repreſented in the four laſt figures are all particularly deſigned to be uſed with the portable furnaces deſcribed in the laſt chapter; and for that purpoſe they are well calculated, although they are not ſuſpended in cylinders. They may likewiſe be uſed with the regiſter kitchen ſtoves deſcribed in the tenth chapter of this Eſſay. As their bottoms are raiſed up, and as their diameters are ſuch that their conical or vertical ſides enter into, and fit the ſand-rims of thoſe furnaces and ſtoves, the heat is effectually confined under them, and their outſides not being expoſed either to flame or to ſmoke, may be japanned, and they may eaſily be kept ſo clean as to be fit to be placed upon a table, over a lamp, or upon a heater, placed in a ſhallow diſh of china or earthenware. They are even capable of being elegantly ornamented by gilding or painting, or both.

They are likewiſe well calculated for being heated by a lamp; and if an argand's lamp be uſed for that purpoſe, they may be made to boil in a ſhort time, and at a ſmall expence. Placed on a handſome tripod, on a table, with an elegant argand's lamp under it, one of theſe kettles, handſomely ornamented by japanning and gilding, would make no mean appearance, and would coſt much leſs than the commoneſt tea-urn that could be bought.

But it is not ſolely for making tea that theſe kettles will be found uſeful; they will anſwer perfectly well for boiling water for many other purpoſes; and if portable kitchen furnaces ſhould come into uſe, boiling hot water will often be want-

ed for filling ſauce-pans and ſtew-pans; and no utenſil can be better contrived for heating and boiling water over a portable kitchen furnace than theſe kettles.

In conſtructing them care ſhould be taken to fill all their ſeams well with ſolder, which, by covering the naked edges of the iron, will contribute more than any thing to the prevention of ruſt, and the durability of the article; and they ſhould likewiſe be well japanned on the outſide in every part except the bottom, which ſhould not be japanned.

The reaſon why I have not made theſe tin tea-kettles double, is this: tea-kettles are commonly uſed merely for *making water boil*, which, with the kettles here recommended, can be done *in a very ſhort time*, conſequently much heat cannot poſſibly be loſt during that proceſs, in conſequence of the top and ſides of the kettle being expoſed naked to the cold air of the atmoſphere. Were theſe utenſils deſigned for *keeping water boiling hot* a great length of time, the caſe would be very different, and then it might be well worth while to make them double, in order more effectually to confine the heat in them.

The *ſaving of time* in making them boil, by making them double, would be very trifling indeed, for till the water has become very hot, there is but little loſs of heat through the ſides and top of the kettle; the communication of heat being rapid in proportion as the temperature of the hot body is high, compared with that of the colder body into which the heat paſſes.

If

If a tea-kettle, filled with water at the temperature of the atmoſphere at the time, on being put over a fire, be brought to boil in 10 minutes, it will, during that time, have loſt only half as much heat as it will loſe in the next ten minutes, if it be kept boiling hot during that time.

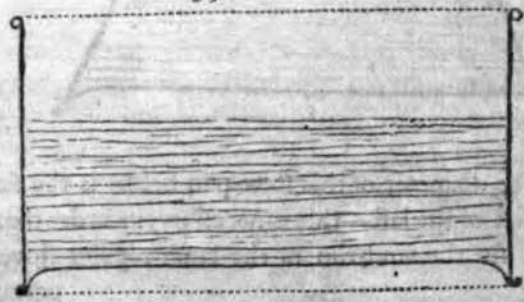
All theſe kettles are of ſuch forms as will render it very eaſy to cover them, ſhould it be thought adviſable to make them double; and by covering them with plated or gilt copper, they may be made very elegant at a ſmall expence.

Of the conſtruction of cheap Boilers and Stew-pans to be uſed with ſmall Portable Kitchen Furnaces.

The beſt boilers and ſtew-pans that can be uſed with theſe furnaces, are undoubtedly thoſe which were deſcribed in the 10th chapter of this Eſſay, but utenſils on a ſimpler conſtruction may be made to anſwer very well, and may perhaps be preferred by many on account of their cheapneſs.

The following figure repreſents a vertical ſection of a ſtew-pan on a much more ſimple conſtruction than any of thoſe already deſcribed:

Fig 71

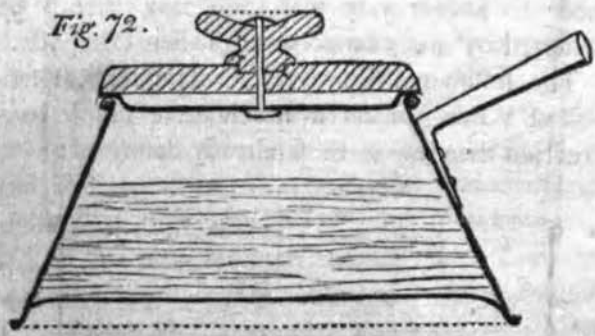


This ſtew-pan (which is drawn to a ſcale of four inches to the inch) being of a proper diameter below to fit the ſand-rim of the portable furnace, and its bottom being raiſed up about half an inch, in order to allow its vertical ſides to deſcend into that ſand-rim, it is plain that it may be uſed with the furnace, in the ſame manner as the tea-kettles juſt deſcribed are uſed with it. It may likewiſe be uſed with the regiſter-ſtoves deſcribed in the 10th chapter of this Eſſay.

In order that this ſtew-pan may the more eaſily be kept clean, the joinings of its bottom and ſides ſhould be well filled up on the inſide with ſolder.

The following figure repreſents another, and ſmaller ſtew-pan, conſtructed on the ſame principles with that juſt deſcribed, and deſigned for the ſame uſe:

Fig. 72.

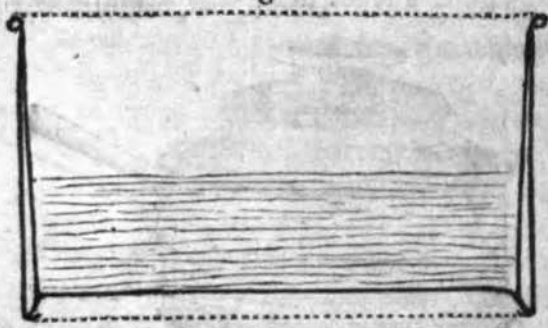


The diameter of this ſtew-pan below is the ſame as that of the laſt—this is neceſſary, in order that it may fit the ſand-rim of the ſame regiſter ſtove or portable

portable furnace—but its diameter above is much leſs; and it is alſo leſs deep, conſequently its capacity is much ſmaller. The cover of this ſtew-pan is of wood lined with tin. It is in all reſpects like that repreſented by the figure 35 (ſee chapter VII. of this Eſſay, page 222). Both theſe ſtew-pans are ſuppoſed to be conſtructed of tin; but they might be made of tinned copper. The handle of the ſtew-pan repreſented by the figure 71, is omitted for want of room.

The following figure repreſents a vertical ſection of a double, or armed ſtew-pan, on a very ſimple conſtruction:

Fig. 73.



The ſtew-pan, (which is drawn to a ſcale of four inches to the inch) is ſuppoſed to be made of tin, and it is ſuppoſed to be turned over a wire at its brim. The cylinder by which it is ſurrounded is of ſheet-iron, and the ſtew-pan and the cylinder

are faſtened together by, the former being driven into the latter, with ſome degree of force, and ſticking in it above, where they come into cloſe contact. The lower edge of the cylinder being turned inwards forms a narrow rim, on which the lower end of the ſtew-pan reſts.

Of the conſtruction of Stew-pans of EARTHEN-WARE *and* PORCELAIN, *to be uſed with Regiſter Stoves and Portable Kitchen Furnaces.*

The following figure ſhews how, by means of a hoop, or cylinder of ſheet-iron, a ſtew-pan, or ſauce-pan, of earthen-ware, or of porcelain, of a ſuitable form and ſize, may be fitted to be uſed with a regiſter kitchen ſtove, or portable furnace.

Fig. 74

This figure is drawn to a ſcale of ſix inches to the inch. The form of the lower part of the ſtew-pan is pointed out by a dotted line. The top and the bottom of the cylinder of ſheet-iron are both turned over circular iron wires. The handle of this

this ſtew-pan is of iron, and it is fixed to the cylinder by rivets. The ſtew-pan is firmly faſtened to its metallic hoop or cylinder, firſt, by making this cylinder of a proper ſize to fit it; and ſecondly, by wedging it both above and below with very thin wedges, made of narrow pieces of ſheet-iron, and by filling up the vacuities, above and below, with good cement.

The cover of this ſtew-pan, which is of earthenware (or porcelain) is made of a peculiar form. It has a kind of foot inſtead of a handle, which ſerves for ſupporting it when it is taken off from the ſtew-pan, and laid down in an inverted poſition. By means of this ſimple contrivance it is rendered leſs liable to be dirtied on the inſide, and of communicating dirt to the victuals.

If an earthen ſtew-pan, of the form repreſented in this figure, be made of good materials, that is to ſay, of a proper mixture of the different earths, well worked, and if its bottom be made thin, and of equal thickneſs in every part of it that is expoſed to the fire, there is little doubt, I think, of its ſtanding the heat of a regiſter ſtove, or of a ſmall portable kitchen furnace; and if this ſhould be the caſe, I ſhould certainly never think of recommending any other kitchen utenſils in preference to theſe.

It appears to me to be very probable that unglazed Wedgewood's ware would be as good a material as could be found for theſe ſtew-pans. The intelligent gentleman who directs Mr. Wedgewood's

wood's manufactory, cauſed ſeveral of them to be made, after drawings which I gave him, and thoſe I found, upon trial, to anſwer very well.

If it ſhould be found that kitchen utenſils, conſtructed and fitted up, or mounted, on the principles here pointed out, ſhould anſwer as well as there is reaſon to expect; as nothing would be eaſier than to make earthen boilers with *ſteam-rims*, and to form *ſteam-diſhes* of earthen-ware to fit them; every utenſil for cooking, by *boiling* and *ſtewing*, might be conſtructed of that moſt cleanly, moſt elegant, and moſt wholeſome material—*earthen-ware*.

I heſitated a long time before I reſolved to publiſh this laſt obſervation;—for however anxious I am to promote uſeful improvements, and eſpecially ſuch as tend to the preſervation of health, and the increaſe of rational enjoyments, it always gives me pain when I recollect how impoſſible it is to introduce any thing new, however uſeful it may be to ſociety at large, without occaſioning a temporary loſs or inconvenience to ſome certain individuals, whoſe intereſt it is to preſerve the ſtate of things *actually exiſting*.

It certainly requires ſome courage, and perhaps no ſmall ſhare of enthuſiaſm, to ſtand forth the voluntary champion of the public good:—but this is a melancholy reflection, on which I never ſuffer my mind to dwell. There is no ſaying what the conſequences might be were we always to ſet down before we engage in a laudable undertaking, and

meditate profoundly upon all the dangers and difficulties that are inſeparably connected with it. The moſt ardent zeal might perhaps be damped, and the warmeſt benevolence diſcouraged.

But the enterprizing ſeldom regard dangers, and are never diſmayed by them; and they conſider difficulties but to ſee how they are to be overcome. To them *activity* alone is life—and their glorious reward, the conſciouſneſs of having done well. *Their* ſleep is ſweet when the labours of the day are over; and they await, with placid compoſure, that reſt, which is to put a final end, to all their labours, and to all their ſufferings.

CHAP.

CHAP. XIII.

Of cheap Kitchen Utenſils for the uſe of the Poor.—The condition of the lower claſſes of Society cannot be improved without the friendly aſſiſtance of the Rich.—They muſt be TAUGHT *economy, and they cannot be inſtructed by books, for they have not leiſure to read.—Advice intended for their good muſt be addreſſed to their benevolent and more wealthy neighbours.—An account of the Kitchen Utenſils of the poor itinerant Families that trade between Bavaria and the Tyrol.—Theſe utenſils were adopted by the Bavarian Soldiers.—An account of ſome attempts that were made to improve them.—Deſcription of a very ſimple cloſed Fire-Place conſtructed with ſeven looſe Bricks—How this Fire-Place may be improved by uſing three Bricks more, and a few Pebbles.—Deſcription of a very uſeful* PORTABLE KITCHEN BOILER, *of caſt-iron, ſuitable for a ſmall family.—An account of a very ſimple method of* COOKING WITH STEAM, *on the cover of this Boiler.—Deſcription of a* STEAM-DISH *of earthenware, or of caſt-iron, to be uſed with this Boiler.—Deſcription of a Boiler ſtill more ſimple in its conſtruction, proper to be uſed with a ſmall Portable Kitchen Furnace.—The cooking Apparatus here recommended for the uſe of the Poor, may, with a ſmall addition, be rendered ſerviceable for warming their dwellings in cold weather.*

AMONGST the great variety of enjoyments which riches put within the reach of perſons of fortune

tune and education, there is none more delightful than that which reſults from doing good to thoſe from whom no return can be expected; or none but gratitude, reſpect, and attachment. What exquiſite pleaſure then muſt it afford, to collect the ſcattered rays of uſeful ſcience, and direct them, *united*, to objects of general utility!—to throw them in a broad beam on the cold and dreary habitations of the poor! ſpreading cheerfulneſs and comfort all around!

Is it not poſſible to draw off the attention of the rich from trifling and unprofitable amuſements, and engage them in purſuits in which their own happineſs and reputation, and the public proſperity, are ſo intimately connected? What a wonderful change in the ſtate of ſociety might, in a ſhort time, be effected by their *united efforts!*

It is hardly poſſible for the condition of the lower claſſes of ſociety to be eſſentially improved without that kind and friendly aſſiſtance which none can afford them but the rich and the benevolent. They muſt be *taught*, and who is there, in whom they have confidence, that will take the trouble to inſtruct them? They cannot learn from books, for they have not time to read: and if they had, how few of them would be able, from a written deſcription, to comprehend what they ought to know! If I write for their inſtruction, it is to the rich that I muſt addreſs myſelf; and if I am not able to engage *them* to aſſiſt me, all my labours will be in vain. But to proceed:

In

In contriving kitchen utenſils for cottagers, two objects muſt frequently be had in view; viz. the cooking of victuals, and the warming of the habitation; and as theſe objects require very different mechanical arrangements, ſome addreſs will be neceſſary in combining them.

Another point to which the utmoſt attention muſt be paid, is to avoid all complicated and expenſive machinery. Inſtruments for general uſe ſhould be as ſimple as poſſible; and ſuch as are deſtined for the uſe of thoſe who muſt earn their daily bread by their labour, ſhould be cheap, durable, and not liable to accidents, or to be often in want of repairs.

As food is more indiſpenſably neceſſary than a warm room; and as the moſt common proceſs of cookery is boiling, I ſhall firſt ſhow how that proceſs may be performed in the moſt economical manner poſſible; and ſhall then point out the means that may be uſed for rendering the kitchen-fire uſeful in warming the room in which cookery is carried on.

One of the cheapeſt utenſils for cooking, for a family, that ever was contrived, is, I verily believe, that uſed by the itinerant poor families that trade between Bavaria and the Tyrol, bringing raiſins, lemons, &c. from the ſouth ſide of the mountains (which they tranſport in light carts drawn by themſelves) and carrying back earthenware.

As theſe poor people have no fixed abode, and

never ſtop at an inn, or other public-houſe, but, like the gipſies in this country, ſleep in empty barns, and under the hedges by the road ſide, they carry with them in their cart all that they poſſeſs; and among the reſt the whole of their kitchen furniture, which conſiſts of *one ſingle article*—a deep frying-pan of hammered iron, with a ſhort iron handle.

In this they bake their cakes—boil their brown ſoup—make their haſty pudding—ſtew their greens, —fry their meat—and in ſhort perform every proceſs of their cookery; and when their victuals are done, their boiler ſerves them for a diſh, which, being placed on the ground, the family ſit round it, each individual, capable of feeding himſelf, being provided with a wooden ſpoon.

This is preciſely the ſame kind of kitchen utenſil as that uſed by the Bavarian wood-cutters, when they go into the mountains to fell wood; (ſee Eſſay III. page 295, vol. 1.) and it is likewiſe uſed by many poor families in the Tyrol and in Bavaria.

Theſe broad ſtew-pans—with the addition of a tripod of hammered iron—were adopted, many years ago, in Bavaria, for the uſe of the ſoldiers in barracks; and they ſtill continue to be uſed by them: ſome ſucceſsful attempts to improve them, have, however, lately been made, and it was the experiments which led to thoſe improvements, that firſt induced me to turn my attention to this uſeful article of kitchen furniture.

Before

Before I proceed any farther in my account of theſe ſhallow pans, and of the improvements of which they have been found to be capable, it may perhaps be proper to give an account of the manner in which they are conſtructed, and of the price at which they are ſold.

All thoſe which are uſed in Bavaria come from the Tyrol, or from Styria, where there are conſiderable manufactories of them; and they are ſold at Munich, by wholeſale, at 22 creutzers (about 7 ½*d.* ſterling) the pound, Bavarian weight, which is at the rate of 6 *d.* ſterling per lb. avoirdupois weight.

One of theſe pans of large dimenſions, namely, 18 inches in diameter above, or at its brim, 15 inches in diameter below, and 4 inches deep, bought at an ironmonger's ſhop at Munich, coſt me three ſhillings ſterling.

In manufacturing theſe pans, five of them, one placed within the other, are brought under the hammer at the ſame time; and, in being hammered out, and brought to their proper form and thickneſs, they are frequently heated red hot. When they come from the hammer they are carried to the lathe, and are turned on the inſide, and made clean and bright, and their edges are turned and made even. They are then packed up, one within the other, or, in neſts (as theſe parcels are called) and are ſold by weight.

The following figure repreſents one of theſe pans in its moſt ſimple ſtate, placed on three ſtones, over a

fire made with ſmall ſticks of wood, on the ground, in the open air.

Fig. 75.

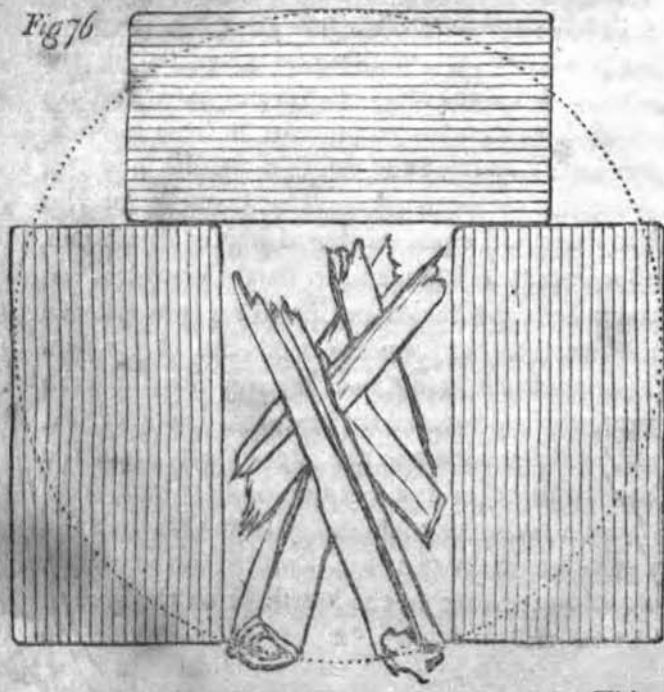
The pan uſed by the Bavarian ſoldiers, which, as I juſt obſerved, is placed on a tripod, or trivet, of iron, is about 20 inches in diameter above, 16 inches in diameter below, and 4 ½ inches deep.

As a great part of the heat generated in the combuſtion of the fuel that is burnt under this pan eſcaped by its ſides, to prevent, in ſome meaſure, this loſs, I incloſed the pan in a circular hoop, or cylinder, of ſheet-iron. The diameter of this hoop was juſt equal to the diameter of the pan, above, or at its brim, and its height or width, was ſix inches, and the upper part of it was faſtened by rivets to the upper part or brim of the pan. This alteration, and a double cover fitted to the pan, which prevented the heat from being carried off by the cold air of the atmoſphere, from the broad ſurface of the hot liquid in the pan, produced a ſaving of conſiderably more than half the fuel, even when this fuel—which was dry pine wood—was burnt on the hearth, or on the ground

in the open air, and no means were uſed for confining the heat on either ſide. But the ſaving was ſtill greater when the fire was made in a cloſed fire-place.

For a pan of this kind of 14 or 15 inches in diameter at its brim, a very good temporary fire-place may be conſtructed in a moment, and almoſt without either trouble or expence, merely with ſeven common bricks: Six of them, laid down upon the hearth, in pairs, one upon the other, in the manner repreſented in the following figure, form the fire-place; and the ſeventh, placed edge-wiſe, ſerves as a ſliding door, to cloſe this fire-place in front, more or leſs, as ſhall be found beſt.

Fig 76



This

This little fire-place, which is better calculated for wood, or for turf, than for coals, is repreſented filled with fire-wood ready to be kindled, and a dotted circular line ſhews where the bottom of the circular hoop of ſheet-iron (in which the pan is ſuſpended) ſhould be ſet down upon the top of the three bricks which are uppermoſt.

If, in conſtructing this fire-place, its walls be made higher, by uſing nine bricks, inſtead of ſix, (laid down flat upon one another, by threes) and if a few looſe pebbles, or ſtones of any kind, about as large as hen's-eggs, be put into it, under the fuel, theſe additions will improve it conſiderably. The fuel being laid upon theſe pebbles, inſtead of lying on the hearth, or on the ground, the air neceſſary for its combuſtion will the more readily get under it; which will cauſe the fire to burn brighter, and more heat to be generated.

Theſe ſmall ſtones will likewiſe ſerve other uſeful purpoſes. They will grow very hot, and when they are ſo they will increaſe the violence of the combuſtion, and the intenſity of the heat; and even after the fuel is all conſumed, they will ſtill be of uſe, by giving off gradually to the pan, the heat which they will have imbibed.

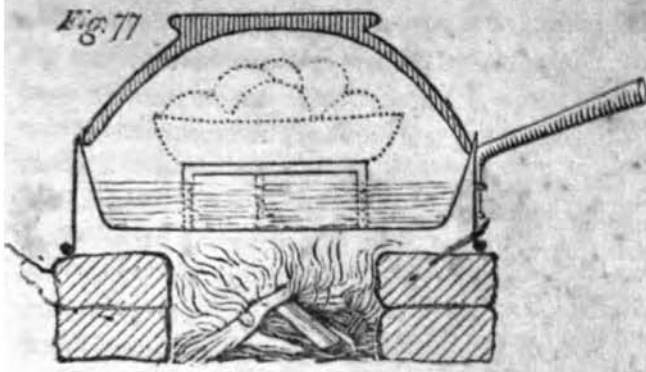
Savages, who have few implements of cookery, make great uſe of heated ſtones in preparing their food; and civilized nations would do wiſely to avail themſelves, oftener than they do, of *their* ingenious contrivances.

I have already mentioned, that a conſiderable ſaving of fuel was made in conſequence of furniſhing the broad and ſhallow boilers of the Bavarian ſoldiers with double covers; but for boilers of this kind, that are deſtined for poor families, I would recommend wooden or earthen diſhes, turned upſide down, inſtead of theſe double covers; which diſhes may alſo be uſed for ſerving up the victuals after it is cooked. By this contrivance an article neceſſary in houſe-keeping will be made to ſerve two purpoſes; and beſides this advantage, as a deep bowl, or platter, turned upſide down, over the ſhallow boiler, will leave a conſiderable ſpace above the level of the boiler, which, as ſteam is lighter than air, will always be filled with hot ſteam, when the water in the ſhallow pan is boiling, notwithſtanding that the joinings of this inverted diſh with the rim of the pan will not be ſteam-tight, a piece of meat much larger than could be covered by the water in this ſhallow pan might be cooked in it, or potatoes or greens, placed above the ſurface of the water in the pan, might be cooked in ſteam.

The following figure, which repreſents a vertical ſection of one of theſe ſhallow iron boilers, 14 inches in diameter above, ſurrounded by a cylindrical hoop of ſheet iron, for confining the heat, and covered by an inverted earthen diſh, will give a clear idea of the propoſed arrangement.

Fig.

Fig. 77



The fire-place repreſented in this figure, is that ſhewn in the preceding figure (76) and is conſtructed of ſix looſe bricks. The brick which occaſionally ſerves to cloſe the opening into the fire-place in front, is not ſhewn.

A ſhallow diſh is repreſented (by dotted lines) ſtanding on a ſmall tripod above the ſurface of the water in the boiler, and filled with potatoes, which are ſuppoſed to be boiled in ſteam.

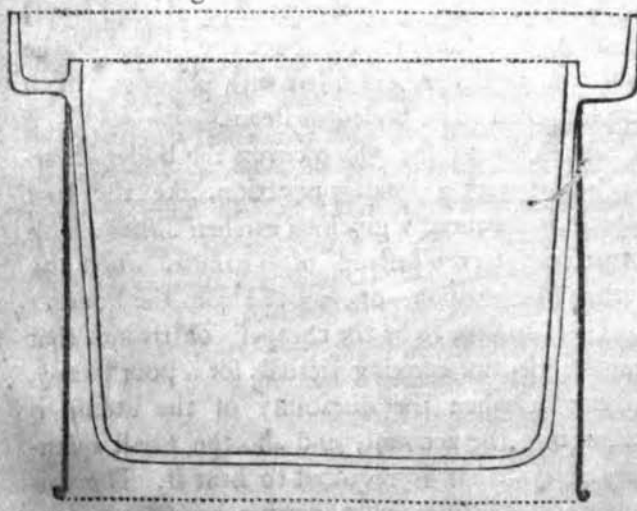
The earthen diſh, which covers the boiler, is repreſented with a ſmall projection, like the foot which is frequently given to earthen diſhes: This projection ſerves inſtead of a handle, when the diſh is placed upon, or removed from the boiler.

This I believe to be the cheapeſt contrivance that can be uſed for cooking victuals for a poor family, eſpecially when the durability of the utenſil is taken into the account, and alſo the ſmall quantity of fuel that is required to heat it. The following contrivance will however be found more convenient, and not much more expenſive:

Deſcription of a very uſeful portable Kitchen Boiler, of caſt-iron, ſuitable for a ſmall family.

The form of this boiler is ſuch that it may eaſily be caſt, and conſequently it may be afforded at a low price; and it is equally well calculated to be uſed with one of the ſmall temporary fire-places juſt deſcribed, conſtructed with ſix, or with nine looſe bricks, or to be heated over one of the ſmall portable kitchen furnaces, of which an account has been given in Chap. XI. It may be made of any dimenſions, but the ſize I would recommend for a ſmall poor family is that indicated by the following figure, which is drawn to a ſcale of four inches to the inch.

Fig. 78



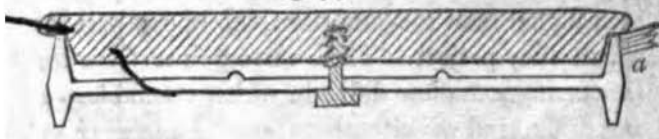
This

This boiler is 10 ½ inches in diameter above, on the inſide of the ſteam rim; 9 ½ inches in diameter below, and 8 ½ deep, meaſured from the top of the inſide of the ſteam rim; conſequently it will hold about 3 gallons. Its greateſt diameter at its brim is 13 ½ inches, and total height to the top of its ſteam rim is 9 ¼ inches.

The hollow cylinder of ſheet iron in which this boiler is ſuſpended, and which confines the heat by defending its ſides from the cold air of the atmoſphere, is 8 ½ inches high, and juſt 11 inches in diameter.

When this boiler is uſed for preparing only one diſh of victuals, or for cooking ſeveral things that may, without inconvenience, be all boiled together in the ſame water, it may be covered with the cover repreſented in the following figure.

Fig. 79.



This cover is compoſed of one piece of caſt-iron, covered above with a flat circular piece of wood, which ſerves for confining the heat. The wood is faſtened to the iron by means of a ſtrong wood ſcrew, with a flat ſquare head, which paſſes through a hole in the centre of the piece of caſt-iron.

The handle of this cover muſt project on one ſide, and muſt be faſtened to the metal and not to the wood. A piece of it is ſeen, (at *a.*) in the figure. It may either be caſt with the cover, or it may be of wrought iron, and faſtened to it by rivets.

The figure, which is a vertical ſection of the cover, ſhews the form of it diſtinctly, and it will be perceived that the piece of caſt-iron is of a ſhape which renders it eaſy to be moulded and caſt. The two ſmall projections on the right and left of the hole in the center of the cover are ſections of a circular projection, about $\frac{2}{10}$ of an inch in height, which, as will be ſeen preſently, is deſigned to ſerve a particular purpoſe. In the circumference of this horizontal projecting ring there are three equi-diſtant projecting blunt points, each about $\frac{3}{10}$ of an inch high above the level of the upper flat ſurface of the cover, or about $\frac{1}{10}$ of an inch higher than the ring from the upper part of which they project. Theſe three points ſerve for ſupporting a ſhallow diſh, in which vegetables or any other kind of victuals is put in order to its being cooked in ſteam.

Of the manner of uſing this ſimple apparatus for cooking with Steam.

This may eaſily be done in the following manner: The flat circular piece of wood belonging to the cover of this boiler, being removed, and the

(caſt-iron) cover being put down upon the boiler, a ſhallow diſh, about 2 inches leſs in diameter than the cover, at its brim, or upper projecting rim, containing the victuals to be cooked in ſteam, is to be ſet down upon the cover, juſt in the centre of it, and an inverted earthen pot, or any other veſſel of a form and ſize proper for that uſe, being put over it, the ſteam from the boiler paſſing up through the hole in the centre of the cover, will find its way under the ſhallow diſh, and paſſing upwards by the ſides of this diſh, will enter the inverted earthen-pot, and, expelling the air, will take its place, and the victuals in the diſh will be ſurrounded on every ſide by hot ſteam.

Inſtead of an earthen-pot, an inverted glaſs-bell may be uſed for covering the victuals in the ſhallow diſh, which will not only render the experiment more ſtriking, and more amuſing, but will alſo, in ſome reſpects, be more convenient; for as the proceſs that is going on may be ſeen diſtinctly through the glaſs, a judgment may, in many caſes, be formed, from the *appearance* of the victuals, when they are ſufficiently done, without removing this veſſel, by which the ſteam is confined.

I would not, however, recommend glaſs veſſels for common uſe, as they would be too expenſive for poor families, and too liable to be broken. For *them*, a pot, of the commoneſt earthen-ware, or a ſmall wooden-tub, would be much more proper.

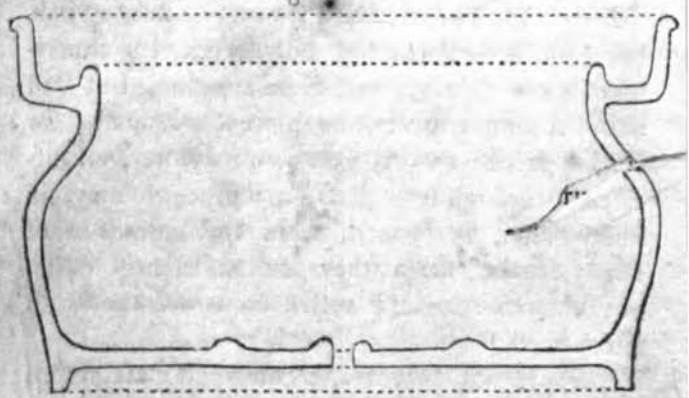
But

But for thoſe who can afford the expence, and who find amuſement in experiments of this kind, the glaſs-bell will be preferable to an opaque veſſel.

The manner in which this ſimple apparatus for cooking with ſteam is to be arranged, will be ſo eaſily underſtood from what has been ſaid, that a figure can hardly be neceſſary to form a clear and ſatisfactory idea of it. I ſhall therefore now proceed to a deſcription of another method of cooking with ſteam with theſe ſmall portable kitchen boilers.

The following figure, which is drawn to a ſcale of four inches to the inch, repreſents a vertical ſection of a ſteam-diſh of earthenware, proper to be uſed with the boiler repreſented by the figure 78:

Fig. 80.



The following figure repreſents a vertical ſection of an earthen bowl, which, being inverted, may be uſed occaſionally as a cover for the ſteam-diſh repreſented above, or as a cover for the boiler:

Fig. 81

When this diſh is not in uſe as a cover for the ſteam-diſh or the boiler, it may be made uſe of for other purpoſes. It may, for inſtance, ſerve for bringing the ſoup, or any other kind of food, upon the table, or for containing any thing that is to be put away. In ſhort, it may be employed for any purpoſe for which any other earthen bowl of the ſame form and dimenſions would be uſeful.

In like manner the ſteam-diſh may be made uſe of for many other purpoſes beſides cooking with ſteam.

This ſteam-diſh, and the bowl which ſerves as a cover to it, may both be made of caſt-iron; but when this is done, they ſhould be tinned on the inſide, and japanned on the outſide, to give them a neat and cleanly appearance, and prevent their ruſting. They may likewiſe be made of pewter; or by changing their forms a little they may be made of tin. The choice of the material to be employed in conſtructing them muſt, in each caſe, be determined by circumſtances.

The

The inverted bowl which covers the ſteam-diſh may be uſed likewiſe for covering the boiler, when the ſteam-diſh is not in uſe:—or, the coverof the boiler which is repreſented by the figure 79, may be made uſe of, inſtead of the inverted bowl, for covering the ſteam-diſh, and the bowl may be omitted altogether. One principal reaſon why I propoſed this bowl was, to ſhow how, by a little contrivance, an article uſeful in houſekeeping might, without any inconvenience or impropriety, be made to ſerve different purpoſes.

It is the intereſt of ſo many perſons to *increaſe* as much as poſſible the number of articles uſed in houſekeeping, and to render them as expenſive as poſſible, that I could not help feeling a ſtrong deſire to counteract this tendency in ſome meaſure, at leaſt in as far as it affects the comforts and enjoyments of the poor.

The natural, and the fair object of the exertions of the induſtrious part of mankind, being the acquirement of wealth, *their* ingenuity is employed and exhauſted in ſupplying the wants, and gratifying the taſte of the rich and luxurious.

It is not *their* intereſt to encourage the practice of economy, except it be *privately*, in their own families.

Though I ſometimes ſpeak with indignation of ſome of thoſe ridiculous forms, under which unmeaning and oſtentatious diſſipation too often inſults common decency, and mortally offends every principle of good taſte and elegant refinement, I am

very,

very, very far, from wiſhing to diminiſh the expences of the rich.

I well know that the free circulation of the blood is not more eſſentially neceſſary to the health of a ſtrong athletic man, than the free and *rapid* circulation of money is neceſſary to the proſperity of a great manufacturing and commercial country, whoſe power at home and abroad is neceſſarily maintained at a great expence.

Thoſe who would take the trouble to meditate profoundly on the influence which taxes and luxury neceſſarily have, and ever muſt have, in promoting that circulation, would, I am confident, become more reconciled to the preſent ſtate of things, and leſs alarmed at the progreſſive increaſe of public and private expence.

It is apathy, and a general *corruption of taſte* (which is inſeparably connected with avarice and *a corruption of morals*)—and not the progreſs of elegant refinement, that is a ſymptom of national decline.

But to return to my ſubject.—The boiler above recommended (ſee figure 78) is peculiarly well adapted for being uſed with the ſmall portable furnaces deſcribed in the *eleventh* chapter of this eſſay; and as theſe furnaces will not be expenſive, I would ſtrongly recommend them for the uſe of poor families, to be uſed with the utenſils I have juſt been deſcribing.

A caſt-iron portable furnace, with one of theſe boilers, and one of the cheap tea-kettles deſcribed in the laſt chapter, which might all be purchaſed for

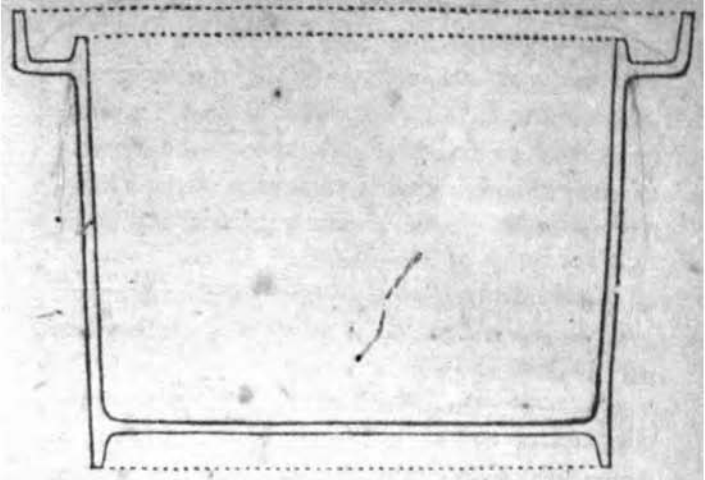
for a ſmall ſum, would be a moſt valuable acquiſition to a poor family. It would not only ſave them a great deal in fuel, and in time employed in watching and keeping up the fire in cooking their victuals, but it would alſo have a powerful tendency to facilitate and expedite the introduction of eſſential improvements in their cookery—which is an object of much greater importance than is generally imagined.

The boiler in queſtion (repreſented in the figure 78) is made double, or rather it is ſuſpended in an hollow cylinder of ſheet-iron. This hollow cylinder is certainly uſeful, as it ſerves to confine the heat about the boiler; but as it renders the implement more expenſive, and may wear out, or be deſtroyed by ruſt, after a certain time, I ſhall now ſhew how a boiler, proper to be uſed with one of the portable furnaces before recommended, may be ſo conſtructed as to anſwer without an hollow cylinder.

The following figure repreſents a vertical ſection of ſuch a boiler, of caſt-iron, drawn to a ſcale of four inches to the inch:

Fig.

Fig. 82.



The eſſential difference between this boiler and that laſt deſcribed, conſiſts in a rim of about ¼ of an inch in depth, which deſcends below its bottom, and forms a kind of foot, on which it ſtands. This foot being made of ſuch diameter as to fit the ſand-rim of the furnace, into which it enters when the boiler is placed over the furnace, the flame and ſmoke of the fire are confined under the bottom of the boiler, quite as effectually as if the boiler were ſuſpended in a cylinder.

It can hardly be neceſſary that I ſhould obſerve here—what would probably occur to the reader without my mentioning it—that ſtew-pans and ſauce-pans for regiſter-ſtoves, and for portable furnaces of all kinds, with ſteam-rims, might be conſtructed on this ſimple principle.

It

It is on this principle that the tea-kettles are conſtructed that were recommended in the laſt chapter.

I ſhall finiſh this chapter by a few obſervations reſpecting the means that may be uſed for combining the method of cooking here recommended for poor families, with the warming of their habitations in cold weather. This can moſt readily be done by uſing an inverted, tall, hollow, cylindrical veſſel, of tin, thin ſheet-iron, or ſheet-copper, as a cover to the boiler (or to the ſteam-diſh, when that is uſed).

This will change the whole apparatus into a ſteam-ſtove, which, as I have elſewhere ſhewn, is one of the beſt kinds of ſtoves that can be uſed for warming a room.

Whenever this is done, care muſt be taken to ſtop up the chimney fire-place with a chimney-board, otherwiſe all the air warmed by the ſtove, and rendered lighter than the external air, will find its way up the chimney, and eſcape out of the room. A ſmall opening muſt, however, be left for the tube which carries off the ſmoke from the portable furnace into the chimney.

But whenever it is intended that a portable kitchen furnace ſhould be uſed occaſionally for warming a room by means of ſteam, it will be very adviſeable to conſtruct the furnace with an opening on one ſide of it, for the purpoſe of introducing the fuel, without removing the boiler.

But even ſhould no uſe whatever be made of this cooking apparatus in warming the room, the uſe

of

of it will nevertheleſs be found to be very economical. The quantity of fuel conſumed in preparing food will be greatly diminiſhed; and as a fire may at any time be lighted in one of theſe portable furnaces, almoſt in an inſtant, there will be no longer any neceſſity, nor any excuſe, for conſtantly keeping up a fire on the hearth in warm weather, which is but too often done in this country, even in places where fuel is neither cheap nor plenty. And even in winter, when a fire in the grate is neceſſary to render the room warm and comfortable, it will ſtill be good economy to light a ſmall ſeparate fire in a portable furnace, or other cloſed fire-place, for the purpoſe of cooking; for nothing is ſo ill-judged as moſt of thoſe attempts that are ſo frequently made by ignorant projectors *to force the ſame fire to perform different ſervices at the ſame time.*

The *heat* generated in the combuſtion of fuel is a *given quantity*, and the more *directly* it is applied to the object on which it is employed, ſo much the better, for the leſs of it will eſcape, or be loſt on the way; and what is taken away on one ſide for a particular purpoſe, can produce no effect whatever on the other—where it is not.

CHAP. XIV.

Miſcellaneous obſervations reſpecting Culinary Utenſils of various kinds, &c.—Of cheap Boilers of Tin, and of Caſt-iron, ſuitable to be uſed with Portable Furnaces.—Of earthen Boilers and Stew-pans proper for the ſame uſe.—Of LARGE PORTABLE KITCHEN FURNACES, *with fire-place doors.—Deſcription of a very cheap* SQUARE BOILER *of ſheet-iron, ſuitable for a* PUBLIC KITCHEN.—*Of* PORTABLE BOILERS *and Fire-places that would be very uſeful for preparing food for the poor in times of ſcarcity. Of the* ECONOMY *of* HOUSE-ROOM *in the arrangement of a Kitchen for a large family.—A ſhort account of the* COTTAGE GRATE, *and of a ſmall* GRIDIRON GRATE *for open chimney fire-places.—A deſcription of a* DOUBLE DOOR *for cloſed fire-places.*

ALTHOUGH my Eſſays are profeſſedly *experimental,* and I ſeldom or never preſume to trouble the Public with mere ſpeculations, or to recommend any mechanical contrivance till I have been convinced of its utility *by actual experiment,* yet my inquiries have been ſo numerous, and ſo varied, that I am frequently apprehenſive of embarraſſing my reader, and perhaps tiring and diſguſting him by too great a variety of detail. To avoid that evil (which would be fatal to all my hopes) I ſhall, in this chapter, paſs as rapidly as poſſible over a great number of different objects, many of

which will, no doubt, be conſidered as curious nd important. And to relieve the attention of the reader, and alſo to make it eaſy for him to paſs over what he may have no curioſity to examine, I ſhall divide my ſubject as much as poſſible, and ſhall treat each diſtinct branch of it under a ſeparate head of inquiry.

I ſhall likewiſe make a liberal uſe of figures, for by means of them it is often poſſible to convey more ſatisfactory information at a ſingle glance, than could be obtained by reading many ſentences. Whenever I ſet down to write, I feel my mind deeply impreſſed with a ſenſe of the reſpect which I owe, as an individual, to the Public, to whom I preſume to addreſs myſelf; and often conſider how blameable it would be in me, eſpecially when I am endeavouring to recommend economy, to trifle with the time of thouſands.

Too much pains cannot be taken by thoſe who write books, to render their ideas clear, and their language conciſe, and eaſy to be underſtood.

Hours ſpent by an author in ſaving *minutes*, or even *ſeconds*, to his readers, is time well employed. —But I muſt haſten to get forward.

Of the conſtruction of cheap Boilers and Stew-pans, of tin or caſt-iron, proper to be uſed with ſmall Portable Furnaces.

Theſe utenſils, when they are made of tin, may be conſtructed on the ſame principles as the tea-kettles deſcribed in the laſt chapter; that is to ſay,

their bottoms being raiſed up about half an inch above the level of the lower part of their conical or cylindrical ſides; and being moreover made of a proper diameter to fit the ſand-rim of the furnace, they may be uſed without being made double—when they are of caſt-iron, they may be made of the ſame form below as the boiler repreſented by the figure 82, and particularly deſcribed in the laſt chapter.

Of earthen Boilers and Stew-pans proper to be uſed with Portable Furnaces.

Although the earthen ſtew-pan repreſented by the figure 74 (ſee chapter XII.) is of a good form, yet thoſe repreſented by the two following figures have likewiſe their peculiar merit. They are of forms which render them well adapted for being ſuſpended in hollow cylinders of ſheet-iron, and for their being defended by thoſe cylinders from being broken by accidental falls and blows. From a bare view of them the reader will be able to appreciate their relative merit; and alſo to diſcover the particular objects had in view in the contrivance of them. The ſecond (figure 84.) has a ſteam-rim, and conſequently may be uſed for cooking with ſteam by means of a ſteam-diſh.

Fig.

Fig. 83

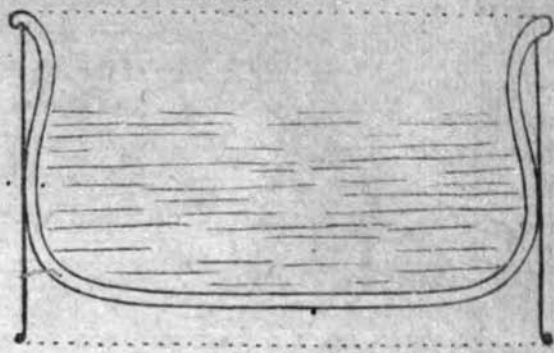
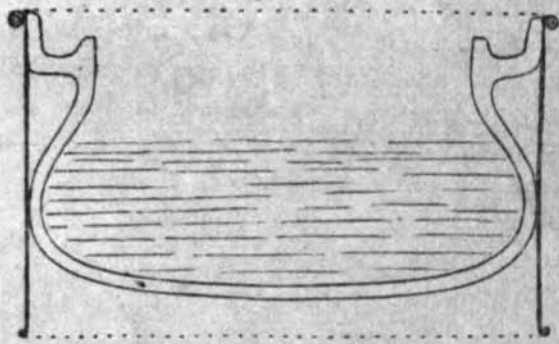
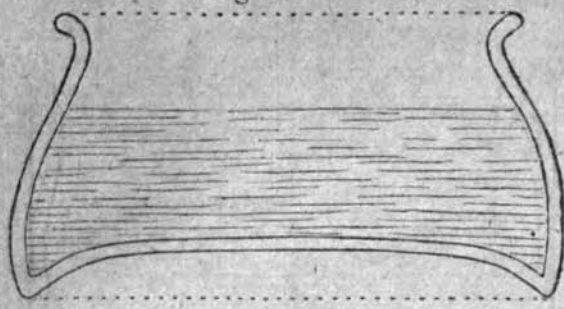


Fig. 84



It would, no doubt, be very poſſible to conſtruct earthen boilers and ſtew-pans of ſuch forms as to render them capable of being uſed with portable furnaces without being ſuſpended in hollow cylinders. An earthen ſtew-pan or ſauce-pan, of the form repreſented by the following figure, would probably anſwer for that purpoſe:

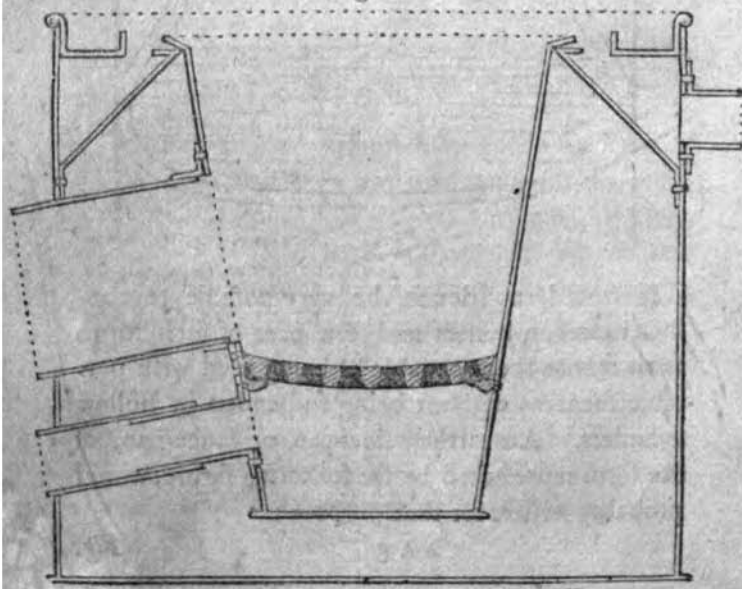
Fig. 85



Of large Portable Kitchen Furnaces, with Fire-place Doors.

The following figure repreſents a vertical ſection (drawn to a ſcale of 6 inches to the inch) of a portable furnace of this kind, conſtructed of ſheet-iron:

Fig. 86.



Furnaces of this kind might, I am confident, be made very uſeful in many caſes. Wood, coals, charcoal, or turf, might, indifferently, be uſed with them; and no contrivance is better calculated for promoting both the economy of fuel, and that of houſe-room.

Portable furnaces, on this principle, might eaſily be made of caſt-iron, which would be both cheap and durable; or, they might be conſtructed partly of caſt-iron, and partly of ſheet-iron, in the manner recommended in the eleventh chapter, in reſpect to portable furnaces without fire-place doors.

The door belonging to this fire-place is not repreſented in the foregoing figure. It may be an hollow cylindrical ſtopper made of ſheet-iron.

Deſcription of a very cheap ſquare Boiler, of ſheet-iron, ſuitable for a public Kitchen.

As ſome of the moſt wholeſome and nouriſhing, as well as moſt palatable kinds of food that can be prepared, are rich and ſavoury ſoups and broths; and as many of theſe can be afforded at a very low price, eſpecially when they are made in large quantities, there is no doubt but the uſe of them will become more general, and that they will in time conſtitute an eſſential, if not the principal part of the victuals furniſhed to the poor, in every country, from public kitchens; and alſo to thoſe who are lodged in hoſpitals, or confined in priſons. And,

as the rich flavour, and nutritious quality—or in other words, the *goadneſs* of any ſoup, depends very much on *the manner of cooking it*;—that is to ſay, on its being boiled, or rather *ſimmered* for a long time, over a very ſlow fire, the form of the boiler, and the form of the fire-place, are both objects of great importance.

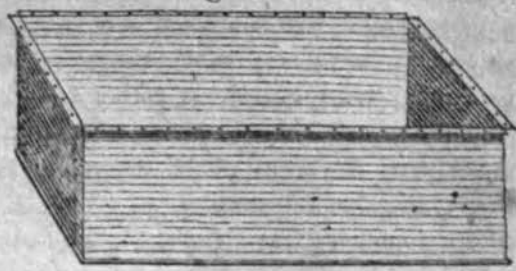
The ſimplicity and cheapneſs of the machinery, and the facility of procuring it in all places, and getting it fitted up, are alſo objects to which much attention ought to be paid. Refined improvements, which require great accuracy in the execution, and much care in the management of them, muſt not be attempted.

The boiler I would propoſe for the uſe of public kitchens, is ſimilar in all reſpects to that which has been adopted at Hamburgh, after a model ſent from Munich; for although there is nothing about this boiler that indicates the diſplay of much ingenuity in its contrivance, yet it has been found to anſwer very well as often as it has been tried; and its great ſimplicity renders it peculiarly well adapted for the uſe for which it is recommended.

A perfect idea of this boiler may be formed from the following figure, where it is repreſented without the wooden curb to which it is fixed when it is ſet in brick-work:

Fig.

Fig. 87.



This boiler is 24 inches wide, 36 inches long, and 15 inches deep, conſequently, when it is filled to within 3 inches of its brim, or when the liquor in it ſtands at the depth of 12 inches, it contains 10364 cubic inches, which make above 36 ¼ beer gallons.

It ſhould be conſtructed of ſheet-iron tinned on the inſide; and when it is not in uſe, care ſhould be taken to wipe it out very dry, with a dry cloth, to prevent its being injured by ruſt; and as often as it is put away for any conſiderable time, it ſhould be ſmeared over with freſh butter, or any other kind of animal fat, unmixed with ſalt.

The ſheet-iron will be ſufficiently thick and ſtrong if the boiler when finiſhed weigh 40 pounds; and as the beſt ſheet-iron coſts no more than about 3 ½ *d.* per lb. the manufacturer ought not to charge more than 6 *d.* per lb. for the boiler when finiſhed, which, if it weigh 40 lb. will amount to 20*s.*

To ſtrengthen the boiler at the brim, it muſt be faſtened to a curb of wood, which may be a frame

of

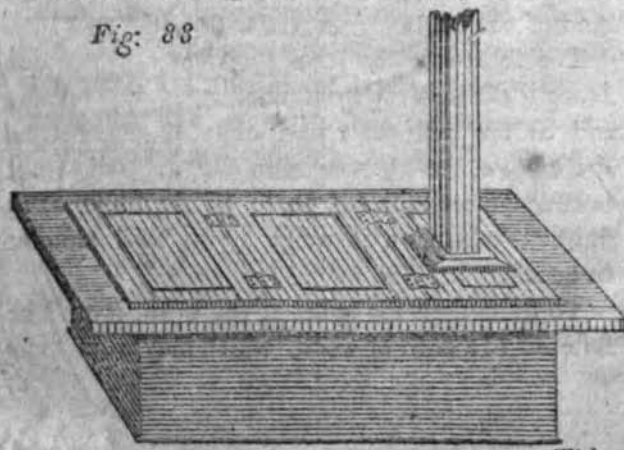
of board 1 ¼ or 1 ⅛ inch thick, 5 inches wide, and juſt large enough to allow the boiler to paſs into it, and be ſuſpended by its projecting brim. This brim, which may be made about an inch wide, muſt be faſtened down upon the wooden curb with tinned nails, or with ſmall wood ſcrews.

This curb will be 3 feet 10 inches long, and 2 feet 10 inches wide; and as the ſtuff uſed is 5 inches wide, it will meaſure very nearly 2 ½ feet, ſuperficial meaſure, which, at 6 *d.* the foot (which would be a fair price in London for the work when done) would amount to 1 *s.* 4 ½ *d.*

The boiler muſt be furniſhed with a cover, which may be made of wood, and ſhould conſiſt of three diſtinct pieces, framed and pannelled, and united by two pair of hinges, as they are repreſented in the following figure.

This cover will meaſure about 7 ſuperficial feet, and, at 7 *d.* the foot, will coſt 4 *s.* 1 *d.* The hinges may coſt about 4 *d.* the pair, conſequently the cover will coſt, all together, about 4 *s.* 9 *d.*

Fig. 88



This

This figure repreſents the boiler fixed in its wooden curb, and with its cover in its place.

The firſt diviſion of the cover (which is 12 inches wide) is laid back on the ſecond (which is 14 inches wide) whenever it is neceſſary to open the boiler to put any thing into it, or to take any thing out of it, or merely to ſtir about its contents. When the boiler is to be waſhed out and cleaned, the opening into it is made larger, by throwing back the firſt and ſecond diviſions of its cover, folded one upon the other, and leaning them againſt the ſteam tube, which ſtands upon the third diviſion of the cover, which diviſion is firmly fixed down upon the curb of the boiler by means of wood ſcrews.

The ſteam tube (which ſhould be of ſufficient length to carry the ſteam from the boiler out of the room into the open air, or into a neighbouring chimney) may be made of four ſlips of ¼ inch thick deal boards, faſtened together (by being grooved into each other, and nailed together) in ſuch a manner as to form an hollow ſquare trunk, meaſuring about 1 ½ inches wide in the clear.

In ſetting this boiler in brick-work, the flame and ſmoke from the fire ſhould be made to act on its bottom only, but its ſides and ends ſhould be bricked up, in order more effectually to confine the heat. The maſs of brick-work ſhould be juſt 3 feet 8 inches long, and 2 feet 8 inches wide, in order that the curb of the boiler may cover it above, and project beyond it, horizontally, on every ſide, about half an inch. The bars of the fire-place on which

which the fuel burns, ſhould be ſituated 12 or 14 inches below the bottom of the boiler, in order that the boiler may not be injured when the fire happens, by accident, or by miſmanagement, to be made too intenſe.

It is not neceſſary that I ſhould mention here any of the precautions which are to be obſerved in ſetting boilers of this kind in brick-work; for that ſubject has already been ſo amply treated in various parts of theſe Eſſays, that, to add any thing to what has already been ſaid upon it, could be little better than an unneceſſary and tireſome repetition.

This boiler would be ſufficiently large for cooking for about 300 perſons. If it were neceſſary to feed a much greater number from the ſame kitchen, I would rather recommend the fitting up of two or more boilers of this ſize, than conſtructing one large boiler to ſupply the place of a greater number of others of a moderate ſize; for I have found by much experience, that very large boilers are far from being either economical or convenient.

Large boilers of ſheet-iron, and eſpecially ſuch as are not kept in conſtant uſe, are always *very expenſive*, on account of their being ſo liable to be deſtroyed by ruſt.

Of Portable Boilers and Fire-places, that would be very uſeful for preparing Food for the Poor in times of Scarcity.

There is always much trouble and inconvenience,

and frequently much danger in collecting together great numbers of idle people; and theſe aſſemblies are never ſo likely to produce miſchievous effects as in times of public calamity, when it is peculiarly difficult to preſerve order and ſubordination among the lower and moſt needy claſſes of ſociety.

I have often trembled at ſeeing the immenſe crowds of poor people, without occupation, who were ſometimes collected together at the doors of the great public kitchens in London during the ſcarcity of the year 1800.

Two or three hundred people may, without any conſiderable inconvenience, be ſupplied with food from the ſame kitchen; but when public kitchens are not connected with aſylums, or houſes or ſchools of induſtry, where the poor aſſemble to work during the day; and when there is no other object in view, but merely to enable the poor to purchaſe good and wholeſome food at the loweſt prices poſſible, without any interference at all with their domeſtic employments or concerns, it appears to me that it would always be beſt to ſelect from amongſt the poor a certain number of honeſt and intelligent perſons, and encourage them to prepare and ſell to their poor neighbours, under proper regulation and inſpection—ſuch kinds of food, and at ſuch prices, as ſhould be preſcribed by thoſe who have the charge of providing for the relief of the poor.

A plan of this ſort might be executed at any time on the preſſure of the moment, without the

ſmalleſt

ſmalleſt delay, and almoſt without either trouble or expence, if each pariſh, or community, were to provide and keep ready in ſtore, a certain number of portable kitchen furnaces, with boilers belonging to them, to be lent out occaſionally to thoſe who ſhould be willing to undertake to cook and ſell victuals to the poor on the terms that ſhould be propoſed.

If theſe boilers were made to hold from 8 to 10 gallons, they would ſerve for preparing food for 60 or 70 perſons; and as they would require very little fuel, and ſo little attendance, that a woman who ſhould undertake the management of one of them, might perform that ſervice with great eaſe, by devoting to it each day the labour of half an hour, and giving to it occaſionally a few moments of attention, which would hardly interrupt her in her common domeſtic employments; this method of preparing food would be very economical—perhaps more ſo than any other;—and, with proper inſpection, it would be little liable to abuſe.

How very uſeful would theſe portable boilers and furnaces be for providing a warm and cheap dinner for children who frequent ſchools of induſtry?

No furnace could, in my opinion, be better contrived for this uſe than that repreſented in the figure 86, and the boiler might be made either of ſheet-iron tinned, or of copper tinned, or of caſt-iron. It cannot be neceſſary that I ſhould give any particular directions reſpecting its form;—and its dimenſions may eaſily be computed from its capacity, when that is determined on.

A portable

A portable cooking apparatus of this kind, which is deſigned as a model for imitation, may be ſeen in the repoſitory of the Royal Inſtitution.

Of the economy of Houſe-room in the arrangement of a Kitchen for a large Family.

There is nothing which marks the progreſs of civil ſociety more ſtrongly than the uſe that is made of houſe-room; and nothing would tend more to prevent the too rapid progreſs of deſtructive luxury among the induſtrious claſſes, than a taſte for neatneſs and true elegance in all the inferior details of domeſtic arrangement. The pleaſing occupation which thoſe objects of rational purſuit afford to the mind, fills up leiſure time in a manner that is both uſeful and ſatisfactory, and prevents *ennui*, and all its fatal conſequences.

The Poor cook their victuals in the rooms in which they dwell; but thoſe who can afford the expence—and many indeed who cannot—ſet apart a room for the purpoſe of cooking, and call it a kitchen. I am far from deſiring to alter this order of things, for I think it perfectly proper. What I wiſh is, that each claſs of ſociety may be made as comfortable as poſſible, and that all their domeſtic arrangements may be *neat* and *elegant*, and at the ſame time *economical*.

I always fancy that teaching induſtrious people economy, and giving them a taſte for the improvement of all thoſe uſeful contrivances, and rational enjoyments, that are within their reach, is ſomething

thing like ſhewing them how—without either toil or trouble—and with a good conſcience—they may obtain all thoſe advantages which riches command, together with many other very ſweet enjoyments which money cannot buy. And whoſe heart is ſo cold as not to glow with ardent zeal at a proſpect ſo well calculated to awaken all the moſt generous feelings of humanity?

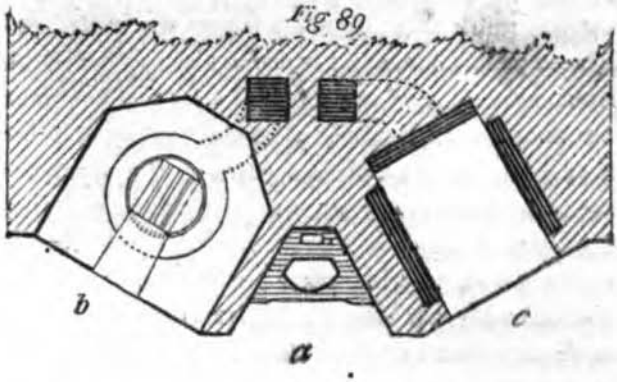
But to return from this digreſſion:—There are various methods that may be uſed for economizing houſe-room, in making the neceſſary arrangements for cooking. If the family be ſmall, the uſe of portable furnaces and boilers will be found to be very advantageous.

For a large family I would recommend what I ſhall call a *concealed kitchen:* There are two very complete kitchens of this kind, which have been fitted up, under my direction, at the Royal Inſtitution;—the one, which is ſmall,—is in the houſe-keeper's room; the other is in the great kitchen. Theſe were both made as models for imitation, and may be examined by any perſon who wiſhes to ſee them.

There are alſo two kitchens of this kind in my houſe at Brompton, in two adjoining rooms; which have been fitted up principally with a view to ſhewing that all the different proceſſes of cookery *may* be carried on in a room, which, on entering it, nobody would ſuſpect to be a kitchen. The following figure is the ground plan of one of them:

Fig.

Fig 89



a is the opening of the fire-place, which is brought forward into the room about 14½ inches. This was done in order to give more room for the family boiler, which is ſituated at *b*, and the roaſter, which is placed on the other ſide of the open chimney fire-place at *c*.

The two broad ſpaces on the two ſides of the roaſter, by which the ſmoke from the fire below it riſes up round it; and another at the farther end of it, by which the ſmoke deſcends, are diſtinguiſhed by dark ſhades, as are alſo the two ſquare canals by which the ſmoke from the roaſter, and that from the boiler, riſes up into the chimney.

The top of the grate is ſeen which belongs to the open chimney fire-place; it is repreſented by horizontal lines. It is what I have called a *cottage grate*, and what is ſold in the ſhops under that name. The retail price of this grate, with its fender and trivet, is *ten ſhillings and ſix pence*. The Carron Company entered into an engagement with

me to furniſh them by wholeſale to the trade, delivered in London, at *ſeven ſhillings and ſix pence.* A front view of this grate may be ſeen in the next figure. As this figure (89) is deſigned merely for ſhewing *where* the different parts of the apparatus are to be placed, and not *how* they are to be fitted up, none of the details of the ſetting of the roaſter or boiler were in this place attempted to be expreſſed with accuracy. Information reſpecting thoſe particulars muſt be collected from other parts of the work.

The grate repreſented in this figure is calculated for boiling a pot, or a tea-kettle, and for heating flat-irons for ironing. Its bottom is ſo contrived as to be eaſily taken away, and replaced. By removing it at night, or whenever a fire is no longer wanted, the coals in the grate fall down on the hearth, and the fire immediately goes out. This contrivance not only ſaves much fuel, which otherwiſe would be conſumed to waſte, but it is alſo very convenient on another account: As all the coals and aſhes fall out of the grate when its bottom is removed, on replacing it again the grate is empty, and ready for a new fire to be kindled in it.

The top of this grate, which is a flat plate of caſt-iron, has one large hole in it for allowing the ſmoke to paſs upwards, and another, behind it, which is much ſmaller, through which it is forced to *deſcend* into what has been called a *diving flue*, whenever the boiler belonging to this fire-place is uſed; which boiler is ſuſpended in an hollow cy-

linder of ſheet-iron, about 11¾ inches in diameter, reſembling in all reſpects the boilers uſed with the regiſter-ſtoves deſcribed in the tenth chapter of this eſſay.

I intend, as ſoon as it ſhall be in my power, to publiſh a particular detailed account of this grate, and alſo of ſeveral others, for open chimney fire-places, which, at my recommendation, have lately been introduced in this country; in the mean time I avail myſelf of this opportunity of pointing out one fault which has been committed by almoſt all thoſe who have undertaken to ſet *cottage-grates* in brick-work: they have made what has been called the *diving flue* much too deep. It is more than probable that the name given to this flue has contributed not a little to lead them into this error. When properly conſtructed it hardly deſerves the name of *a flue*, for it ought not to be above *two inches deep*, meaſured from the under ſurface of the flat plate of caſt-iron, which forms the top of the grate. There are two important advantages that reſult from making this opening in the brick-work for the paſſage of the ſmoke *very ſhallow*;—the one is, that in this caſe it may eaſily be cleaned out, when coals happen to fall into it, by accident, when it is left uncovered;—and the other is, that the back wall of the fire-place, againſt which the fuel burns, may, in that caſe, be made thick and ſtrong, and not ſo liable to be deſtroyed by the end of the poker in ſtirring the fire, as it is when there is an hollow flue juſt behind it.

Both theſe are important objects, and for want of due attention being paid to them, cottage grates have, to my knowledge, often been diſgraced and rejected. When they are properly ſet and properly managed, they are very uſeful fire-places where coal or turf is burnt; and it never was deſigned that they ſhould be uſed with wood.

When kitchens are fitted up on the plan here recommended, in places where wood is uſed as fuel, the open chimney fire-place, which is ſituated between the roaſter and the boiler, may be conſtructed *of the form* repreſented in the foregoing figure, but without any fixed grate; and the wood may be burnt on andirons, or on a ſmall moveable *gridiron-grate* placed on the hearth.

Theſe *gridiron-grates* are very ſimple in their conſtruction, cheap, and durable; and they make an excellent fire, either with coals or turf, or with wood, if it be ſawed or cut into ſhort billets. Five of theſe grates may be ſeen at the houſe of the Royal Inſtitution; one in the great lecture-room, one in the apparatus-room, one in the manager's-room, one in the clerks room, and one in the dining-room. They have hitherto been made of two ſizes only, namely, of 16 inches and of 18 inches in width, in front. The width of the back part of the grate is always made juſt equal to half its width in front, and the two ſloping ſides, or ends of the grate, are each juſt equal in width to the back. The form and dimenſions of the grate determines the form and dimenſions of the open

chimney fire-place in which it is uſed, for the back of the fire-place muſt always be made juſt equal in width to the back of the grate, and the floping of the covings muſt be the ſame as the floping of the ends of the grate.

From what has been ſaid of the proportions of the front, back, and ſides of theſe grates, it is evident that the covings and backs of their fire-places muſt make an angle with each other juſt equal to 120 degrees. This angle I have been induced to prefer to one of 135 degrees, which I formerly recommended for open chimney fire-places: the reaſons for this preference will be fully explained in another place. To give them here would take up too much time, and would moreover be foreign to my preſent ſubject.

For the information of the public, and to prevent, in as far as it is in my power, exorbitant demands being made for theſe uſeful articles, I would juſt obſerve, that the ſmalleſt, or 16 inch *gridiron-grate*, together with all the apparatus belonging to it, ought to coſt, *by retail*, no more than *ſeven ſhillings*. This apparatus conſiſts of a caſt-iron fender; a trivet for ſupporting a boiler or a tea-kettle over the fire; and a ſmall plate of caſt-iron (to be faſtened into the back of the chimney) by means of which, and a ſmall bolt or nail, the grate is faſtened in its place on the hearth.

The ſecond ſized, or 18 inch *gridiron-grate*, with all its apparatus (conſiſting of the three articles mentioned above) ought to be ſold, by retail, for *ſeven ſhillings and ſix pence*.

The *wholeſale price* of theſe articles, at the Carron Company's warehouſe in London (Thames-ſtreet, near Blackfriar's-bridge) to the trade; and to gentlemen who buy them by the dozen to diſtribute them to the poor, is

For the gridiron-grate, N° 1. with the articles belonging to it } *four ſhillings.*

For that N° 2, with the articles belonging to it - - - - - } *four ſhillings and ſix pence.*

Theſe are the wholeſale and retail prices which I fixed with the agent of the Carron Company, at their works in Scotland, in the autumn of the year 1800, when I made a journey there for the purpoſe of eſtabliſhing theſe regulations; and when I made a preſent to the Company of all my patterns which I had got made in London, and which had been rendered as perfect as poſſible by previous experiments—namely, by getting caſtings taken from them by the beſt London founders, and altering them occaſionally, till they were acknowledged to be quite complete.

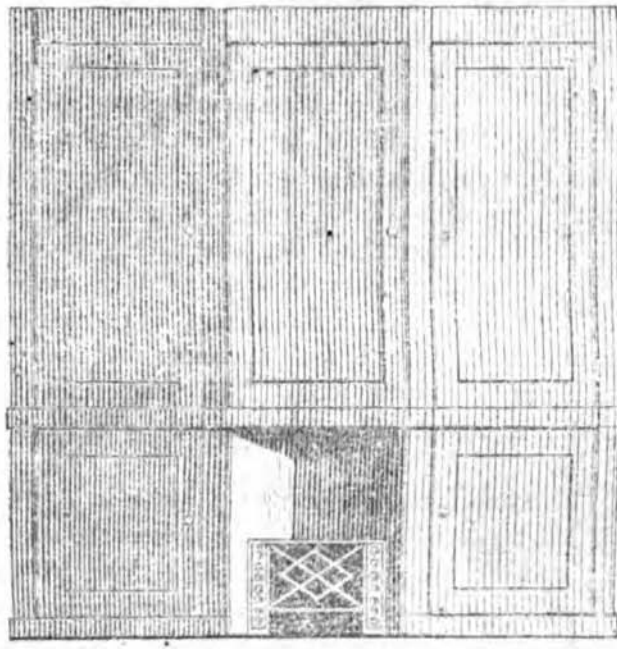
If it had been poſſible for me to have done more to prevent impoſitions, I ſhould have done it with pleaſure; and I ſhould have felt at the ſame time that I had done no more than what it was my duty to do.

But to return from this long digreſſion:—I ſhall now haſten to finiſh my account of the means which have been uſed in one of the rooms in my houſe (that deſtined for the large kitchen) for concealing the roaſter and the family boiler.

The

The following figure is an elevation of that part of the ſide of the room where theſe implements are concealed:

Fig. 90



The open chimney fire-place, and the front of the grate, are diſtinctly ſhewn in the middle of this figure, in the lower part of it. The pannelled door, immediately above the mantle of the chimney fire-place, which reaches nearly to the ceiling of the room, ſerves to ſhut up a ſmall cloſet, with narrow ſhelves, which has no connection with culinary affairs, but is uſed for putting away candle-

ſticks, and any other ſmall articles uſed in houſe-keeping, which are occaſionally laid by when not in actual uſe. The two other pannelled doors by the ſide of it ſerve, the one (that on the right hand) for concealing the roaſter—and the other for concealing the family boiler.

The two (ſhorter) pannelled doors, on the right and left of the open chimney fire-place, and on the ſame level with it, ſerve for concealing the fire-place doors, and aſh-pit doors of the cloſed fire-places of the roaſter, and of the boiler.

The ſteam from the boiler (after paſſing through the ſteam-diſhes, when they are uſed) is carried off by a tin tube into a ſmall canal, which conveys it into the chimney in ſuch a manner that no part of it comes into the room. The ſteam from the roaſter is carried off in like manner by its ſteam-tube.

If a void ſpace, about 2 or 3 inches in depth, be left between the outſide of the door of the roaſter, and the inſide of the pannelled door, which ſhuts it up and conceals it, and if this pannelled door, be lined on the inſide with thin ſheet-iron, the proceſs of roaſting may be carried on, with perfect ſafety, with this door ſhut. And if ſimilar precautions be uſed to defend the other pannelled doors from the heat, they may alſo be kept ſhut, while the proceſſes of boiling and roaſting are actually going on.

By theſe means it would be *poſſible* to prepare a dinner for a large company in a room where there

ſhould

ſhould be no appearance of any cooking going on. But I lay no ſtreſs on this particular advantage reſulting from this arrangement of the culinary apparatus. The real advantage gained by it is this, that the kitchen is left an *habitable*, and even an *elegant room*, when the buſineſs of cooking is over.

The kitchen in Heriot's Hoſpital at Edinburgh, which was fitted up in the autumn of the year 1800, is arranged in this manner; with this difference however, that all the pannelled doors are omitted. The boiler is ſhut up by a door of ſheet-iron, japanned; and the door of the roaſter, and the two fire-place doors, and two aſh-pit regiſter doors, are expoſed to view.

As the brick-work is white waſhed, and kept clean, and as the doors are all either japanned black or kept very clean, the whole has a neat appearance.

The roaſter and principal boiler in the great kitchen of the houſe of the Royal Inſtitution, are put up nearly in the ſame manner as thoſe in Heriot's Hoſpital, excepting, that in the former there is a hot-cloſet, which is ſituated immediately above the roaſter, whereas there is none belonging to the latter.

In one of the kitchens in my houſe, there is—in the place of the roaſter—a roaſting oven, with a common iron oven of the ſame dimenſions placed directly over it, and heated by the ſame fire.

The door of my roaſter, and that of my roaſting oven, are made ſingle, of thin ſheet-iron, and they

are

are covered on the outſide with pannels of wood, for confining the heat. Inſtead of doors to their cloſed fire-places, I uſe ſquare ſtoppers, made of fire-ſtone, or hard fire-brick, faſtened to flat pieces of ſheet-iron; to which knobs of wood are fixed, which ſerve inſtead of handles.

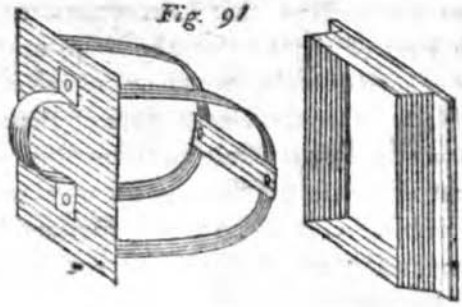
Theſe ſtoppers anſwer for confining the heat quite as well, and perhaps even better, than double doors, and they coſt much leſs. They are fitted into ſquare frames of caſt-iron, (nearly ſimilar to that repreſented in the figure 91) which are firmly fixed in the brick work by means of projecting flanches, which are caſt with them. The front edge of this frame, or door-way, is ground, and made perfectly level, and the plate of ſheet-iron which forms a part of the ſtopper being made quite flat, ſhuts againſt the front edge of this door-way, and cloſes the entrance into the fire-place with the greateſt accuracy.

The entrance into the aſh-pit is likewiſe cloſed by a ſtopper, which is ſo contrived as to ſerve occaſionally as a regiſter for regulating the quantity of air admitted into the fire-place.

As this *Regiſter-ſtopper*, for the aſh-pit of a ſmall cloſed fire-place, is very ſimple in its conſtruction, and as I have found it to anſwer very well the purpoſe for which it was contrived, I ſhall preſent the reader with the following ſketch of it; which will, I truſt, be ſufficient to enable a workman of common ingenuity to conſtruct, without difficulty, the thing which is repreſented.

Fig.

Fig. 91



The box, with a flanch at each of its ends, forms the door-way into the aſh-pit; it is of caſt-iron, and its opening in front is 7¼ inches wide, and 3¼ inches high. It is concealed in the brick-work in ſuch a manner that its front edge only is ſeen, projecting about ⅛ of an inch before the brick-work.

When the regiſter-ſtopper belonging to this door-way, (which is ſhewn in this figure) is puſhed quite home, its flat plate comes into contact with the front edge of the door-way, and cloſes the paſſage into the aſh-pit ſo completely that no air can enter. By withdrawing this ſtopper more or leſs, more or leſs air is admitted.—The narrow, thin, elaſtic bands of iron, the ends of which are faſtened by rivets to the flat plate of the ſtopper, ſerve to confine the ſtopper in any ſituation in which it is placed, which ſervice they are enabled to perform (in conſequence of their elaſticity, and of their peculiar ſhape) by preſſing againſt the ſides of the door-way.

The

The only objection, that I am acquainted with, to this kind of regiſter for the door-way of the aſh-pit of a ſmall cloſed fire-place, is, that it is not quite ſo eaſy to ſee the preciſe ſtate of the regiſter as it is when the air is admitted through an hole in the front of the aſh-pit door, in the uſual manner; but this objection is of no great importance, eſpecially as means may eaſily be deviſed to remedy that trifling defect.

The door-way frames to all the cloſed fire-places in my own kitchen, are in all reſpects like that repreſented in the foregoing figure (91) with this difference only, that they are 5 inches high inſtead of being 3¾ inches in height. An account has already been given of the manner in which their ſtoppers were conſtructed.

It is right that the reader ſhould be informed, that although I have made uſe of ſtoppers to cloſe the paſſage into each of the cloſed fire-places in my own kitchen, yet very few perſons have adopted this ſimple and cheap contrivance. The reaſon why it has not come into more general uſe might eaſily be explained; but I fancy it will be beſt that I ſhould ſay nothing now on that ſubject. Inſtead of recommending what nobody would find much advantage in furniſhing at a fair price, it will be more wiſe and prudent to give a ſhort deſcription of a more complicated, more elegant, and more expenſive contrivance, which has already found its way into the ſhops of ſeveral of the moſt reſpectable ironmongers in London: As this contrivance has often

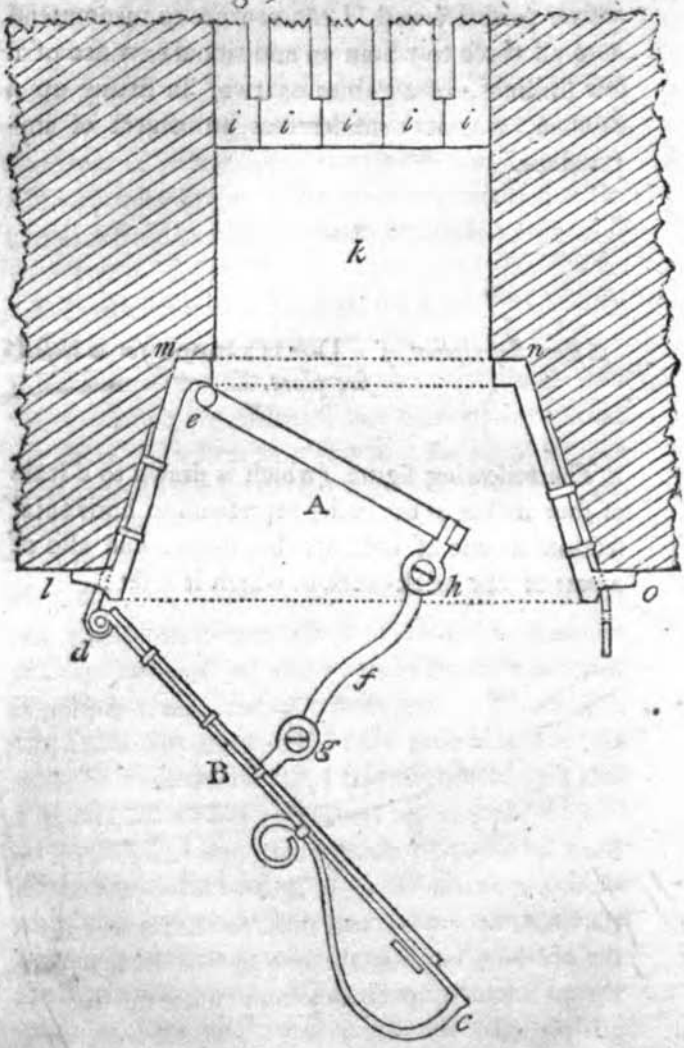
often been uſed, and has always been found to anſwer perfectly well, I can venture to recommend it to all thoſe to whom an additional expence of a few ſhillings, or a guinea or two, in fitting up a kitchen, is not conſidered as an object of importance.

A ſhort deſcription of a DOUBLE-DOOR *for a cloſed fire-place.*

The following figure (which is drawn to a ſcale of four inches to the inch) repreſents an horizontal ſection of one of theſe double-doors, and alſo of a part of the brick-work in which it is ſet;

Fig.

Fig 92



A, is the inſide door, and B is the outſide door —Theſe

—Theſe doors are ſo connected, by means of a crooked rod of iron *f*, and the two joints *g* and *h*, that when the outſide door is opened, or ſhut, the inſide door is neceſſarily opened, or ſhut, at the ſame time. The inſide door, which is of caſt-iron, and near ¼ an inch in thickneſs, is moveable on two pivots, one of which is repreſented at *e*. The outſide door is moveable on two hinges, one of which is ſhewn at *d*.

c, is the latch by which the outſide door is faſtened. This is of ſuch a form that it may be uſed as a latch, and may ſerve at the ſame time as an handle for opening and ſhutting the door.

The door-way, which is of caſt-iron, is in the ſhape of an hollow truncated quadrangular pyramid, with a flanch in front, about an inch wide; which flanch, when ſeen in front, ſeems to form a kind of frame to the outſide door, the flanch, which is about ¼ of an inch in thickneſs, projecting before the vertical front of the brick-work.

l, *m*, *n*, *o*, repreſents an horizontal ſection of this caſt-iron door-way. The brick-work in which it is ſet is diſtinguiſhed by diagonal lines.

k, is the paſſage leading to the fire-place; it is 6 inches wide, in the clear, from *m* to *n*;—5 inches high, and 6 inches long; meaſured from the inſide of the inſide door, when it is ſhut, to the hither ends of the openings between the iron bars of the fire-place; through which openings the air comes up from the aſh-pit into the fire-place. The hither ends of theſe bars, (five in number) are repreſented in the figure: They are each diſtinguiſhed by the letter *i*.

The

The opening of the inſide door-way is 6 inches wide, and 5 inches high in the clear; and the door itſelf is 6 ½ inches wide, and 5 ½ inches high.

The outſide door-way is 10 inches wide, and 9 inches high, in the clear; and the door, which is about $\frac{2}{10}$ of an inch in thickneſs, is 10 ½ inches wide, and 9 ½ high. The extreme width of the door-frame to the outward edge of the flanch is 12 ½ inches, and its extreme height is 11 ½ inches.

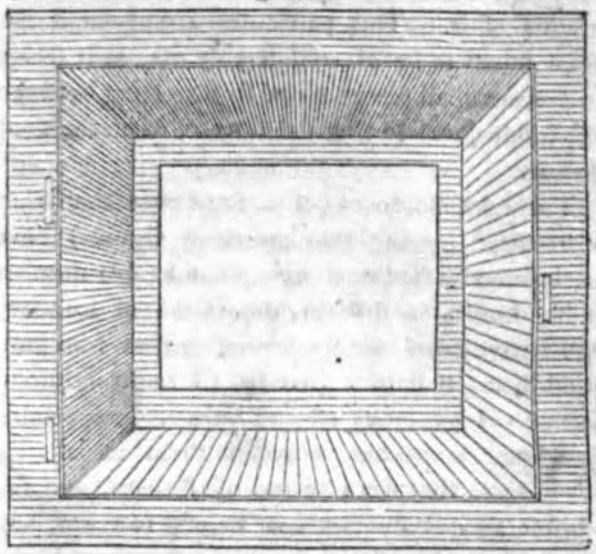
The two ſtraps of iron to which the hooks of the hinges of the outſide door are faſtened, paſs through two holes in the flanch, provided for them in caſting the door-way, and are rivetted to the ſloping ſide of the door-way on the left hand ſide of it.

Theſe holes are each $\frac{7}{8}$ of an inch in length from top to bottom, and about ¼ of an inch in width. There is another ſimilar hole in the flanch on the oppoſite ſide of the door-way, through which a ſtrap of iron paſſes, the end of which projecting forward before the level of the front edge of the door-way, ſerves as a catch or hook, into which the latch of the door falls, when the door is cloſed.

Theſe three holes in the ſide flanches of the door-way are diſtinctly repreſented in the following figure, which is an elevation, or front view of this door-way, without its doors;

Fig.

Fig. 93.



It appears by this figure, but ſtill more diſtinctly by the laſt (92.) that the flanch or front of this door-way is not quite flat. It is raiſed at its inward edge, which projects forward about ¼ of an inch. This projecting rim, which is caſt as thin as poſſible, is ground upon a flat ſand-ſtone, and made quite level, in order that the outſide door, which is flat, by ſhutting againſt the front of this projecting edge, may cloſe the opening into the fire-place with the greateſt poſſible accuracy.

It will likewiſe be remarked on examining this figure (93.) with attention, that the opening which is cloſed by the inſide door is not preciſely in the middle of the vertical flat ſurface againſt which

that door ſhuts, being ſituated a little above the middle of it. This particular arrangement has been found to be of conſiderable uſe, as it ſerves to prevent ſmall pieces of coal from getting between the inſide door and that flat ſurface, when the door is ſhut.

Theſe double doors (of a ſize larger than that repreſented by the two preceding figures) have lately been introduced in a conſiderable number of hot-houſes in the neighbourhood of London; and I have been told by ſeveral perſons who have tried them, that they have been found very uſeful indeed. I was lately aſſured by a very reſpectable gardener, who has adopted them in all his hot-houſes, that ſince he has uſed them, and the regiſter aſh-pit doors which belong to them, and are always ſold with them, and ſince he has altered the conſtruction of his fire-places, his conſumption of coals has been little more than half as much as it uſed formerly to be.

In ſetting theſe double doors in brick-work, great care ſhould always be taken to make the entrance into the fire-place of ſome conſiderable length, or to keep the hither ends of the iron bars on which the fuel burns, at ſome diſtance from the inſide door; otherwiſe, if the burning fuel be near that door, it will heat it and its frame red hot, which will ſoon deſtroy their form, and prevent the door from cloſing the entrance of the fire-place with accuracy.

I have found it to be a good general rule to place

place the hither ends of the bars, which form the grate of the fire-place, as far beyond the inſide door, as that door-way is wide, in the clear. And it will be found to be an excellent precaution to defend the door from the heat, if that part of the paſſage into the fire-place which lies beyond the inſide door, be kept conſtantly rammed quite full of ſmall coals; or, what would be ſtill better, of coal-duſt, mixed up with a certain proportion of moiſt clay.

I have already, in a former part of this Eſſay, mentioned how neceſſary it is in ſetting double doors in brick-work, to take care to *maſk* the farther end of the door-way, in ſuch a manner (by means of bricks interpoſed before it, or between it and the fire) that the rays from the burning fuel may never fall on it. The manner in which this is to be done is clearly repreſented in the figure 92.

All theſe precautions for preventing theſe double doors from being injured by exceſſive heat, will be the more neceſſary in proportion as the fire-places are larger to which they belong.

There is one eſſential part of this apparatus, which, for want of room, was omitted in the two laſt figures;—that is, the ſtraps of wrought iron, by means of which the door-way is firmly fixed in the brick-work; but this omiſſion can be of no conſequence, as every common artificer will know, without any particular directions, how that part of the work ſhould be executed. Theſe ſtraps muſt of courſe be faſtened to the caſt-iron door-way by means of rivets.

CHAP. XV.

Apology for the great length of this Eſſay.—Regret of the Author that he has not been able to publiſh plans and deſcriptions of the various culinary inventions that have lately been put up in the Kitchen belonging to the Houſe of the Royal Inſtitution, and in the Kitchen of Heriot's Hoſpital at Edinburgh.—A ſhort account of a BOILER, *on a new conſtruction, lately put up at the Houſe of the Royal Inſtitution, for the purpoſe of* GENERATING STEAM *for warming the Great Lecture Room.—This Boiler would probably be found very uſeful for* STEAM ENGINES.—*An account of a Contrivance for preventing metallic* STEAM-TUBES *from being injured by the alternate expanſion and contraction of the metal by heat and cold.—An account of a ſimple Contrivance which ſerves as a ſubſtitute for* SAFETY-VALVES.

I CANNOT finiſh this Eſſay without apologizing for the great length of it. I had no idea when I began it that it would ever have grown to ſuch a voluminous ſize, but I am not conſcious of having inſerted any thing that could well have been omitted.

I was very deſirous of laying before the Public compleat plans and deſcriptions of the various culinary inventions that have lately been put up in the Great Kitchen of the houſe of the Royal Inſtitution, in Albemarle-ſtreet; and alſo of thoſe

erected

erected in Heriot's Hoſpital at Edinburgh, in the autumn of the year 1800; but my ſtay in this country will be too ſhort for me to undertake ſo conſiderable a work at this time. I am happy, however, that theſe new contrivances, ſome of which have already been proved to be very uſeful, are ſituated in places of public reſort, where perſons deſirous of examining them may at all times obtain free admiſſion.

There are alſo ſeveral other new and uſeful contrivances at the houſe of the Royal Inſtitution, which I ſhould have had great pleaſure in laying before the public, had it been in my power; as I am perſuaded that correct accounts of them would have been very acceptable to men of ſcience, and to all thoſe who take pleaſure in promoting new and uſeful mechanical improvements.

I ſhould, in particular, have been very glad to have given plans and deſcriptions of all the various parts of the ſteam-apparatus that has been put up for the purpoſe of warming the Great Lecture Room. The boilers for generating the ſteam are, if I am not much miſtaken, well worthy of the attention of thoſe who make uſe of ſteam-engines; and as the ſubject is of infinite importance in this great manufacturing country, where the numerous advantages which reſult from the uſe of machinery are known, and every day more and more felt by individuals, and by the public, I cannot reſiſt the ſtrong inclination which I feel, to attempt, in a

few words, to give a general idea of this contrivance. Thoſe who wiſh to know more of the matter, may get all the information reſpecting it which they can want, by applying at the houſe of the Royal Inſtitution.

A ſhort account of the BOILERS *lately put up at the Houſe of the Royal Inſtitution for* GENERATING STEAM *for warming the Great Lecture Room.*

Over an oblong cloſed fire-place, furniſhed with double doors, aſh-pit regiſter door, &c. are placed two cylinders of copper, laid down horizontally, by the ſide of each other, over the fire, each cylinder being 15 inches in diameter and 48 inches long.—Immediately over theſe two cylinders, and reſting on them, are placed two other cylinders of copper, of the ſame length and diameter; and over theſe laſt, and reſting on *them*, are placed two other like cylinders, making ſix cylinders in the whole, all made of the ſame material, and being of the ſame dimenſions.

The fire-place being ſituated under the hither ends of the two lower cylinders, the flame runs along under them to their farther ends, where it paſſes upwards, and comes forward between the upper ſide of the two lower cylinders, and the lower ſides of the two cylinders immediately above them. Being arrived at the front wall of the brick-work, it there riſes up again, and then paſſes along

along horizontally between the two middle cylinders, and the two upper cylinders, till it comes to the back wall; and, paſſing up by the farther ends of the upper cylinders, it comes forwards horizontally, for the laſt time, in an arch, or vault of brick-work, which covers the two upper cylinders. Being arrived once more at the front wall of the brick-work, it there enters a canal, (furniſhed with a good damper) by which it goes off into a neighbouring chimney.

Theſe cylinders are confined in their places by being placed in pairs, over each other, between two parallel vertical walls, which are built juſt ſo far aſunder as to admit two cylinders, placed horizontally, by the ſides of each other; and the flame is prevented from finding its way upwards between the two cylinders which lye by the ſides of each other, or between the outſides of thoſe cylinders and the ſides of the vertical walls with which they are in contact, by filling up the joining between them with good clay, mixed with ſmall pieces of fire-bricks.

The farther ends of all the cylinders are cloſed up, and all the tubes which are neceſſary for the admiſſion of water, and for the paſſage of the ſteam, are fixed to a circular plate of metal which cloſes, (by means of flanches and ſcrews) the front ends of the cylinders.

In conſequence of this particular arrangement it will be perfectly eaſy to make all the cylinders of *caſt-iron*, even when theſe boilers are deſtined

for ſteam-engines of the largeſt dimenſions. The number of ſets of cylindrical boilers, which in each caſe it will be neceſſary to put up, muſt be determined by the ſize of the cylinders, and by the quantity of ſteam that will be wanted. Six cylindrical boilers put up in a ſeperate maſs of brick-work, in the manner above deſcribed, I call *one ſet*.

It will always be found to be very advantageous to have at leaſt three or four ſets of cylindrical boilers to each ſteam engine, inſtead of having one ſet of larger cylinders; and this not only on account of the wear and tear of ſmall fire-places being incomparably leſs expenſive than in thoſe which are large; but alſo on account of the economy of fuel which will be derived from that arrangement, and the great convenience that will be found to reſult from the uſe of ſmall boilers, which may at any time be heated and made to boil in a very few minutes; and from the advantage of being able at all times to regulate the number of ſets of boilers in uſe, to the load on the engine.

It is quite impoſſible to make a ſmall fire in a large fire-place, without a great loſs of heat; but by having a number of ſmall ſeparate fire-places, an engine may be made to work with a light load, with almoſt as ſmall a proportion of fuel as when it is made to perform its full work.—But to return to our cylindrical boilers.

The two lower cylinders, and thoſe two which lie immediately over them, being deſtined for the gene-

generation of ſteam, are kept conſtantly about half full of water, which water they receive, already hot, from the two upper cylinders; in which laſt the water ſhould never boil.

Theſe upper cylinders communicate, by an open pipe, with a reſervoir of water which is ſituated ſeveral feet above them, conſequently, as faſt as they furniſh water to the four cylinders which lie below them, that water, ſo furniſhed, is immediately replaced by water which comes from the reſervoir above.

As the pipe which brings this water from the reſervoir enters the cylinders ſome conſiderable diſtance below their centers, and as the pipes which convey the water from them to the cylinders below are fixed in their centers, as cold water is heavier than warm water, it is evident that the water which enters them cold from the reſervoir, will take its place at the lower parts of theſe cylinders, while only the lighter, hot water, will be furniſhed to the cylindrical boilers below.

The method of regulating the admiſſion of water into the boilers below, where the ſteam is generated, is ſo well known, that it would be ſuperfluous to give a particular account of it.

In the ſet of boilers that has been put up at the houſe of the Royal Inſtitution, the open ends of all the cylinders are on one ſide, that is to ſay, they all come through the *front wall* of the brick-work. This arrangement was rendered neceſſary

in

in that particular caſe, by local circumſtances; it would however have been better if only the lower and upper pairs of cylinders had come through the front wall, and the open ends of the middle pair had paſſed through the back wall; for in that caſe it would have been eaſier to provide a paſſage for the flame round the ends of the middle cylinders.

One evident advantage that will be derived from conſtructing ſteam-engine boilers on the principles here recommended is, their ſuperior ſtrength to reſiſt the efforts of the ſteam; which will render it poſſible to uſe very thin ſheet-copper, or ſheet-iron, in conſtructing them, when they are made of thoſe materials. Another advantage will be the great facility of removing and repairing any of the cylinders which may happen to leak, or which may be found to be damaged, or worn out. When ſeveral ſets of cylinders are put up for the ſame engine (which I would always recommend, even for engines of the ſmalleſt ſize) any of theſe occaſional repairs may be made without ſtopping the engine.

If theſe cylindrical ſteam boilers ſhould be found to be uſeful for ſteam engines, they cannot fail to be equally ſo for generating ſteam for heating dyers coppers by means of ſteam,—for bleaching by means of ſteam; and in general for every purpoſe where ſteam is wanted in large quantities.

They muſt, I think, be peculiarly well adapted for dyers; for as water leſs hot than boiling water

is frequently wanted by them in the courſe of their buſineſs, the upper cylinders will at all times afford a plentiful ſupply of warm water; which may, without the ſmalleſt inconvenience, be drawn off whenever it is wanted.

To prevent, in the moſt effectual manner, the loſs of heat which is occaſioned by the paſſage of ſteam through the ſafety-valve, that ſteam which ſo eſcapes out of the boiler may be carried off in a tube provided for that purpoſe, and conducted into the upper cylinders, or into the reſervoir which feeds them. In doing this, care muſt be taken to cauſe the ſteam to *deſcend* perpendicularly from the height of eight or ten feet, before it enters the water where it is intended that it ſhould be condenſed; and the end of the tube through which the ſteam deſcends and enters the water, ſhould be plunged to a certain depth below the ſurface of the water.

I ſhall finiſh this chapter, and conclude this eſſay, by giving a ſhort deſcription of two very ſimple contrivances, which have been put in practice at the houſe of the Royal Inſtitution, and which have been found to be very uſeful. The one is a contrivance for preventing moſt effectually the bad effects of the alternate expanſion and contraction by heat and cold of the metallic tubes which are uſed in conveying ſteam to a conſiderable diſtance; and the other is a ſubſtitute for ſafety-valves in an apparatus for heating rooms by means of ſteam.

Of

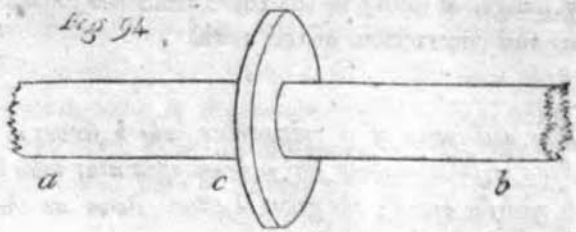
Of the means that may be uſed for preventing metallic ſteam-tubes, of conſiderable length, from being injured by the alternate expanſion and contraction of the metal by the different degrees of heat and cold to which thoſe tubes are occaſionally expoſed.

We will ſuppoſe the tube in queſtion to be of copper, and eight inches in diameter (which is the ſize of that uſed for warming the Great Lecture Room at the Royal Inſtitution). Let this tube be made in lengths of ten feet, and inſtead of joining the ends of theſe tubes together, immediately, to form one long tube, let a very ſhort tube, or cylinder, of only one or two inches in length, and 24 inches in diameter, cloſed at each end with a flat circular plate of ſheet-copper, like the head of a drum, be interpoſed between their joinings. Theſe two circular ſheets of copper, which form two ends of this very ſhort cylinder, muſt be perforated in their centers with holes eight inches in diameter, to give a paſſage to the ſteam, and the ends of the tubes muſt be firmly faſtened to them by means of flanches and rivets.

The following figure, which repreſents an outline of a portion of a ſteam-tube conſtructed in this manner, will give a clear idea of this contrivance.

a, *b*,

Fig 54.



a, *b*, are portions of two of the tubes which are united together by means of the ſhort flat cylinder *c*.

Now if we ſuppoſe one of theſe tubes (10 feet long) to be immoveably fixed *in the middle of its length* to a beam of wood, or to a ſolid wall, the increaſe or diminution of the length of each half of it, ariſing from its being occaſionally heated to the temperature of boiling water, by ſteam, or cooled to the mean temperature of the air of the atmoſphere, being free, will cauſe its two ends to puſh inwards, or to draw outwards, the two flat ends of the two neighbouring ſhort cylinders to which they are attached; and as theſe ſhort cylinders are 24 inches in diameter, while the tube is only 8 inches in diameter, the elaſticity of the large circular thin plates of metal will allow it to be preſſed inwards, or drawn outwards, without injury, much more than will be neceſſary in order to give room for the expanſions and contractions of the tubes.

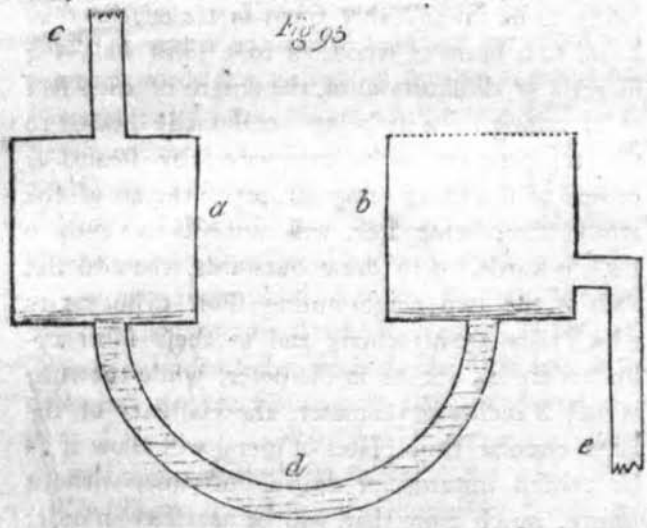
Hence it appears, that by this ſimple contrivance, ſteam may be conveyed to any diſtance, however great, in cloſed metallic tubes, without any

any danger of injury to the tubes from the expanſions and contractions of the metal.

A ſhort deſcription of a contrivance which ſerves inſtead of ſafety-valves for a ſteam-apparatus which is uſed for heating the great Lecture Room at the houſe of the Royal Inſtitution.

The following figure, which repreſents a vertical ſection of this contrivance, will give a clear idea of it, and of the manner in which it acts.

Fig. 95.



a, and *b*, are two cylinders of copper 6 inches in diameter, and 6 inches in length, placed in an erect poſition. The cylinder *a*, is cloſed both above and below;—the cylinder *b*, is cloſed below, but is open above.

The

The ſemi-circular tube *d*, which is repreſented filled with water, ſerves to connect the two cylinders together.

By the tube *c*, the water which reſults from the condenſation of the ſteam in the ſteam-tubes which warm the room, returns to the reſervoir which feeds the boiler. This water, after falling into the cylinder *a*, paſſes through the ſemi-circular tube *d*, into the cylinder *b*, and then goes off from that cylinder, and is conveyed, ſtill warm, to the reſervoir, by the tube *e*.

This ſimple apparatus ſerves as a ſafety-valve in the following manner: when the ſteam in the ſteam-tubes is redundant, it deſcends through the tube *c*, and forcing the water out of the ſemi-circular tube *d*, into the cylinder *b*, it follows it through that tube, and eſcapes into the open air through the open end of that cylinder. When the ſtrength of the ſteam is ſufficiently diminiſhed, a ſmall quantity of water, ſtill remaining in the lower part of the cylinder *b*, returns back into the tube *d*, and cuts off the communication between the external air and the inſide of the ſteam-tubes.

When, in conſequence of the fire under the boiler being extinguiſhed, or being much diminiſhed, a vacuum begins to be formed in the ſteam-tubes, the external air preſſing againſt the ſurface of the ſmall quantity of water remaining in the lower part of the cylinder *b*, forces it through the ſemi-circular tube *d*, into the cylinder

der *a*, and following it into that cylinder, opens for itſelf a paſſage into the ſteam-tubes, and prevents their being cruſhed by the preſſure of the atmoſphere, on the condenſation of the ſteam.

When the fire is gone out, and the whole apparatus becomes cold, the ſteam-tubes will be entirely filled with air.

When, on lighting the fire again, freſh ſteam is generated; as this ſteam enters the large ſteam-tubes in the *higheſt* or *moſt elevated* part of them, and as ſteam is ſpecifically lighter than atmoſpheric air, the ſteam remains above the air which ſtill occupies the ſteam-tubes, and accumulating there, preſſes this air downwards, and by degrees forces it out of the apparatus through the ſame paſſage by which it entered; the water in the ſemi-circular tube ſupplying the place of a valve,—or rather of two valves, in theſe different operations.

END OF THE TENTH ESSAY.

ESSAY XI.

SUPPLEMENTARY OBSERVATIONS

CONCERNING

CHIMNEY FIRE-PLACES.

CONTENTS OF THIS ESSAY.

Obſervations concerning Open CHIMNEY FIRE-PLACES.—*An account of various Faults that have been committed by workmen, in England, who have been employed in altering Chimney Fire-places, and fitting them up according to the Method recommended by the Author, in his Fourth Eſſay.—Conſequences which have reſulted from theſe Miſtakes.—Neceſſity of adhering ſtrictly, and without deviation, to the Directions which have been given.—Thoſe Particulars are pointed out in which Workmen are moſt liable to fail.*

ESSAY XI.

Of Chimney Fire-places.

I WAS much flattered on my return to England, in September 1798, after an abſence of two years, to find that the improvements in the conſtruction of chimney fire-places, which I had recommended in my Fourth Eſſay, publiſhed in London in the beginning of the year 1796, were coming into uſe in various parts of the country; and I have ſince taken a good deal of pains to find out how they have anſwered, and what faults and imperfections have been diſcovered in them: And as the information I have obtained by theſe inquiries has enabled me to make ſeveral remarks and obſervations relative to the conſtruction and management of theſe fire-places, that may be of uſe to thoſe who have introduced them, or may be deſirous of introducing them, I feel it to be my duty to lay them before the public.

It has been objected to theſe fire-places, that they ſometimes occaſion duſt and aſhes to come into the room when the fire is ſtirred. I have examined ſeveral fire-places ſaid to have been fitted up on my principles, that have certainly had that fault; but I have commonly, I might ſay invariably found, that their imperfections have ariſen from faults in their conſtruction. Either the grate has been brought out *too far* into the room, or the opening of the fire-place in front has been left too wide—or too high—or the workman has neglected

to lower and to round off the breaſt of the chimney—or, what I have often found to be the caſe, ſeveral of theſe faults have exiſted together, in the ſame fire-place.

When the throat of a chimney is ſituated very high up above the mantle, and eſpecially when the mantle and breaſt of the chimney, or the wall that repoſes on the mantle, are very thin, workmen who are employed to alter chimnies, ſetting about the work with their minds ſtrongly prepoſſeſſed with what they conſider as the *leading principle* in the conſtruction of theſe fire-places, namely, that the throat of the chimney ſhould not be more than four inches wide, they are very apt to bring the grate too far forward. In dropping their plumb-line from the breaſt of the chimney, they do not reach up high enough into the chimney, but take a part of the breaſt, where it ſtill goes on to ſlope backwards, for the bottom of the perpendicular canal of the chimney. They alſo very often commit another fault, not leſs eſſential, and that has the ſame tendency, in neglecting to *bring down the throat of the chimney nearer to the fire*, when it happens to be ſituated too high.

This I have not only recommended in my Eſſay on Chimney Fire-places, but have given the moſt particular directions how it is to be done (ſee Eſſay IV. page 362) and to mark the importance of the object ſtill more ſtrongly, have accompanied thoſe directions by an engraving.

It is indeed a very important point, that the throat

throat of the chimney ſhould be near the fire, and it ſhould always be carefully attended to. It is likewiſe very important to "*round off the breaſt of the chimney*;" though this I find is very often intirely neglected, even by workmen who have had much practice in the conſtruction of the fire-places I have recommended.

The breaſt of a chimney ſhould always be rounded off in the neateſt manner poſſible, beginning from the very front of the lower part of the mantle, and ending at the narroweſt part of the throat of the chimney, where the breaſt ends in the front part of the perpendicular canal of the chimney. If the under ſurface of the mantle is flat and wide, it will be impoſſible to round off the breaſt properly; and that circumſtance alone renders it indiſpenſably neceſſary, in thoſe caſes, to alter the mantle, or to run under it a thinner piece of ſtone, or a thin wall of bricks, ſupported on an iron bar, in order that the breaſt of the chimney may be brought to be of the proper form, and the throat of the chimney may be brought into its proper ſituation.

If the under ſide of the mantle be left broad and flat, it is eaſy to perceive that the cloud of duſt or light aſhes, that riſes from a coal fire nearly burnt out, when it is violently ſtirred about with a poker, ſtriking perpendicularly againſt this flat part of it, muſt unavoidably be beat back into the room; but when the breaſt of the chimney is properly rounded off, the aſcending cloud of

duſt and ſmoke more eaſily finds its way into the throat of the chimney, and is even directed and aſſiſted in ſome meaſure by the warm air of the room that gets under the mantle, and is going the ſame way.

Another very common fault that I have obſerved in chimney fire-places, that have been altered on what have been called my principles, and which has a direct tendency to bring duſt, and even ſmoke, into the room, is the ſloping of the covings too much, and leaving the opening of the fire-place in front too wide. I have ſaid, in my Eſſay on Chimney Fire-places, that where chimnies are well conſtructed, and well ſituated, and have never been apt to ſmoke, in altering them the covings may be placed at an angle of 135 degrees with the back; but I have expreſsly ſaid that they ſhould never exceed that angle, and have ſtated at large the bad conſequences that muſt follow from making the opening of a fire-place very wide, when its depth is very ſhallow, (ſee page 338.) I have alſo expreſsly ſaid, (page 358) that for chimnies that are apt to ſmoke, the covings ſhould be placed *leſs obliquely*, in reſpect to the back, than in others that have not that fault. But moſt of the workmen who have altered chimnies, ſeem to have paid little attention to theſe diſtinctions, and I have frequently found, and ſometimes in fire-places that have been remarkably ſhallow, that the covings have been placed at an angle even more oblique than that above-mentioned.

Another

Another cauſe that ſometimes has conſiderable effect in bringing duſt and ſmoke into rooms, from the fires that are made in them, is the great nicety with which the doors and windows are fitted in their frames, which prevents a ſufficient quantity of freſh air from coming into the room, to ſupply a briſk current up the chimney. It is however evident, that all the alterations in fire-places on the common conſtruction, that have been recommended in order to improve them, muſt tend directly and very powerfully to leſſen this evil; but nothing will ſo completely remedy it as lowering the mantle, and diminiſhing the width of the fire-place.

How many fire-places in cloſe rooms have been cured completely of throwing puffs of ſmoke and duſt into the room, merely by placing a regiſter-ſtove in them? But there is ſurely nothing peculiar to a regiſter-ſtove that could enable it to perform ſuch a cure, but merely as it ſerves to diminiſh the width and heighth of the opening of the fire-place; and how much eaſier could this be done with marble, or other ſtone, or with bricks and mortar, plaiſtered over and encruſted in front with proper ornaments in ſtucco, or in artificial ſtone?

I am the more anxious that ſomething of this ſort ſhould be introduced, as the openings of chimney fire-places are in general certainly too wide, and too high, and as I am convinced that there is no way of reducing them to a proper ſize, that

would be ſo cheap, or more effectual, or that could be made more ornamental.

Thoſe who are fond of the glitter of poliſhed ſteel, and have no objection to the expenſe of it, or to the labour that is required to keep it bright, may ſurround their fire-places *in front* with a border of it, for *there* it will do no harm, and may uſe grates and fenders of the moſt exquiſite workmanſhip; but if they wiſh to have a pleaſant, cheerful, and economical fire, the covings of their fire-places muſt be placed obliquely, and they muſt not be conſtructed of metal; and if the ſides and back of the grate be conſtructed of fire bricks inſtead of iron, the fire will burn ſtill brighter, and will ſend off conſiderably more radiant heat into the room.

I have abundant reaſon to think, that if in conſtructing or altering chimney fire-places, the rules laid down in my Eſſay on that ſubject are *ſtrictly* adhered to, chimnies ſo fitted up will very ſeldom be found either to ſmoke, or to throw out duſt into the room; and ſhould they be found to have either of theſe faults, there is a remedy for the evil, as effectual, as it is ſimple and obvious: *Bring down the mantle, and the throat of the chimney lower; and if it ſhould be found neceſſary, reduce the width of opening of the fire-place in front, and diminiſh the obliquity of the covings.*

Theſe alterations will certainly be effectual, to prevent either ſmoke or duſt from coming into

the room *when there is a fire burning in the grate*; but it ſometimes happens, and indeed not unfrequently, that duſt and ſoot are drawn down a chimney in which there is no fire, to the great annoyance of thoſe who are in the room, and to the great damage of the furniture. When this happens, it is commonly occaſioned by a very ſtrong draught up *another chimney*, in which there *is a fire*, in an adjoining room, and when that is the caſe, the moſt ſimple remedy is to alter that other chimney, and conſtructing its fire-place on good principles, to reduce its throat to reaſonable dimenſions. But if the paſſage of the air down a chimney in which there is no fire, is occaſioned by ſtrong eddies of wind, there is no remedy for that evil but placing a chimney pot, of a peculiar conſtruction, on the top of the chimney, which ſhall counteract the effects of thoſe eddies, or by cloſing up the throat of the chimney occaſionally, by a door made for that purpoſe of ſheet iron.

If the door-way that is left in the back of the fire-place for giving a paſſage to the chimney ſweeper, inſtead of being cloſed with a tile, or with a flat piece of ſtone, ſet in a groove made to receive it, according to the directions given in my Fourth Eſſay, it be cloſed with a flat piece of caſt iron, or of plate iron, fixed at its lower end, to the lower end of the door-way, by a hinge, or moveable on two gudgeons; this plate may eaſily be ſo contrived as to ſerve occaſionally as a regiſter,

giſter, or door, for diminiſhing, or cloſing, the throat of the chimney.

As this plate, ſituated at the *back part* of the chimney, could not produce any of thoſe bad effects, that have with reaſon been attributed to the regiſters of common regiſter ſtoves, (which are placed on the breaſt of the chimney) it appears to me to be very probable, that it would be found uſeful as a regiſter for occaſionally altering the ſize of the throat of the chimney, and regulating its draught; as well as for occaſionally cloſing up that paſſage intirely. It would certainly be worth while to try the experiment.*

Before I quit this ſubject, I muſt mention another fault, which workmen employed in altering chimney fire-places, that are furniſhed with grates or ſtoves with ſloping backs, are very apt to make. They leave the back of the grate in its place, and inſtead of carrying up the back of the fire-place perpendicularly *from the bottom of the grate*, they firſt begin to carry it up perpendicularly from the top of the iron plate that forms the back of the grate; and as this plate not only ſlopes backwards conſiderably, but riſes ſeveral inches above the level

* Since the introduction of the cottage and gridiron grates, this contrivance has come into very general uſe, and experience has ſhewn it to be extremely uſeful. I would ſtrongly recommend it to thoſe who fit up chimney fire-places on theſe principles, never to omit this regiſter; it coſts a mere trifle, and is very uſeful on many accounts.

level of the upper bar of the grate, this neceſſarily throws the fire very far into the room. This tends to bring both ſmoke and duſt into the room, not only becauſe it brings the fire too far forward, but alſo becauſe it occaſions the air of the room, that ſlips in by the ſides of the covings, to get behind the current of ſmoke that riſes perpendicularly from the fire, which air frequently crowds the ſmoke forward, and cauſes it to ſtrike againſt the mantle. This is a great fault, and I am ſorry to ſay, that I have found it very common in many parts of England, where attempts have been made to introduce the fire-places I have recommended. Where grates *with ſloping backs* are uſed in fitting up theſe fire-places, theſe backs muſt either be taken quite away, or bricked up, and the new back part or back wall of the fire-place, muſt be made to ſerve as a back for the grate, againſt which the burning fuel is laid.

As I am giving an account of the miſtakes that have been made by ſome of thoſe who have been employed in fitting up chimney fire-places on the principles I have publicly recommended, it will naturally be expected that I ſhould take ſome notice of thoſe numerous *improvements* that have been announced to the public, ſaid to have been made in ſtoves, grates, &c. to which advertiſers in the newſpapers have thought proper to affix my name. As I am extremely anxious not to injure any man, either in his reputation for ingenuity, or in his trade, or in any other way, I ſhall not ſay one word

word more on this ſubject, than what I feel it to be my duty to the public to declare, namely, that I am not the inventor of any of thoſe ſtoves or grates, that have been offered to the public for ſale, under my name.

Having mentioned the inconveniences that ſometimes ariſe from doors and windows being fitted to their frames with ſo much nicety, as not to give a ſufficient paſſage to air from without, to get into the room to ſupply the current up the chimney, which muſt always exiſt when a fire is burning in the room, I embrace this opportunity of mentioning a contrivance for remedying this defect, which I am perſuaded would not only be found moſt effectual for that purpoſe, but would at the ſame time contribute very eſſentially to rendering dwelling houſes more ſalubrious, and more comfortable, by facilitating the means of warming them more equally, and ventilating them more eaſily and more effectually.

In building a houſe an *air canal*, about twelve or fifteen inches ſquare, in the clear, and open at both ends, may be conſtructed, in, or near the center of each ſtack of chimneys; and two branches from this air canal, both furniſhed with regiſters, may open into each of the adjoining rooms; one of theſe branches opening into the fire-place, juſt under the grate, and the other over the fire-place, and near the top of the room, or juſt under the ceiling. Each of theſe branches ſhould be about four inches ſquare, in the clear; and to prevent