

Specification of James Anderson : apparatus and building arrangements for promoting consumption of smoke, warming, ventilating, &c.;

Contributors

Anderson, James.

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A.D. 1801 N° 2474.

S P E C I F I C A T I O N

OF

JAMES ANDERSON,

APPARATUS AND BUILDING ARRANGEMENTS FOR PROMOTING CONSUMPTION OF SMOKE, WARMING, VENTILATING, &c.

LONDON:

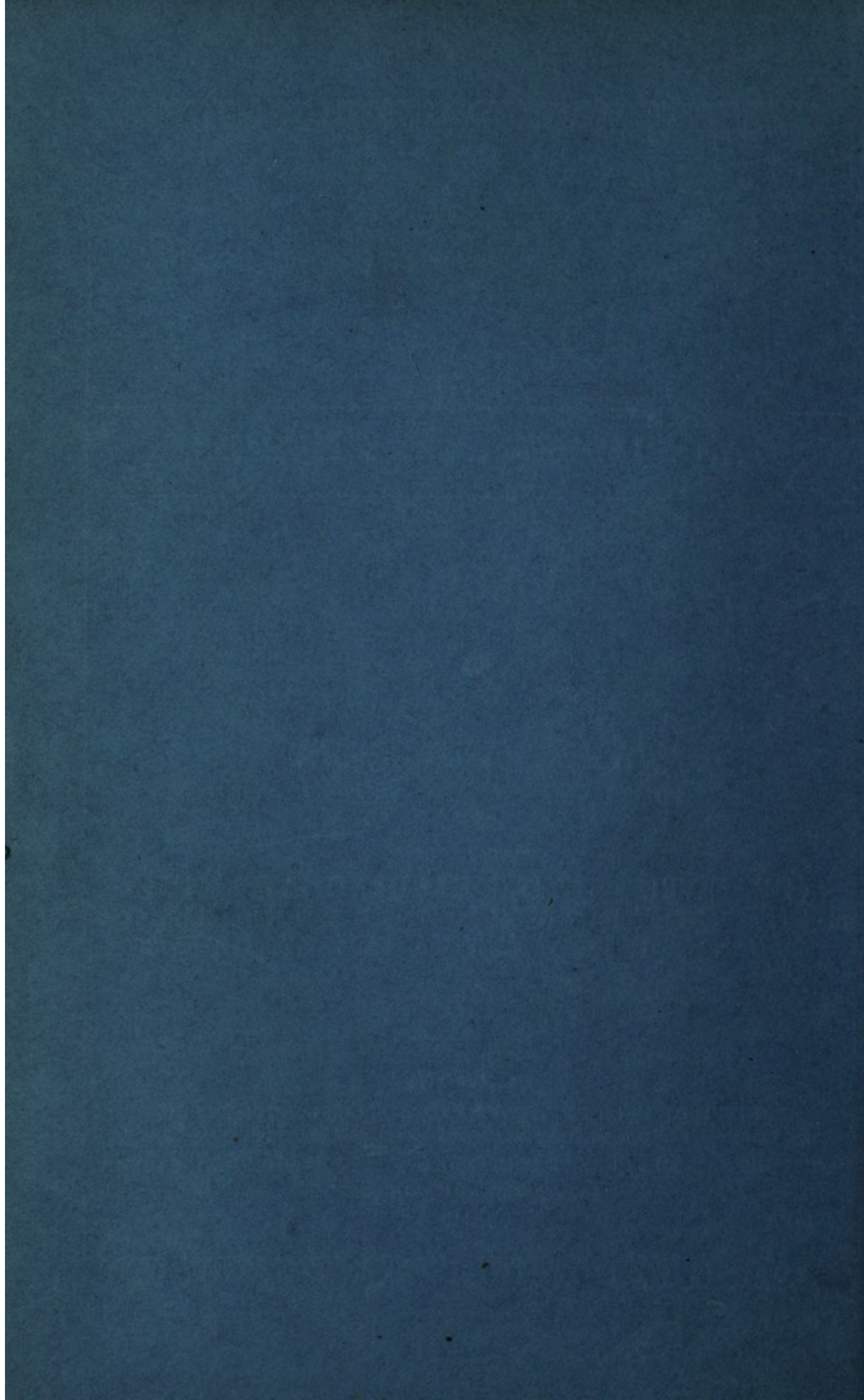
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A.D. 1801 N° 2474.

**Apparatus and Building Arrangements for Promoting
Consumption of Smoke, Warming, Ventilating, &c.**

ANDERSON'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES ANDERSON, of Mounie, in the Shire of Aberdeen, Doctor of Laws, send greeting.

WHEREAS His most Excellent Majesty King George the Third did, by
5 His Letters Patent, under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Tenth day of February, in the forty-first year of His reign, give and grant unto me, the said James Anderson, His special licence that I, the said James Anderson, during the term of years therein mentioned, should and lawfully might make, use, exercise, and
10 vend, within England, Wales, and the Town of Berwick upon Tweed, my Invention of "A METHOD FOR ECONOMISING FUEL IN THE HEATING OF HOUSES, AND FOR IMPROVING THE CONSTRUCTION OF HOT-HOUSES, BY A NEW APPLICATION OF KNOWN PRINCIPLES;" in which said Letters Patent there is contained a proviso obliging me, the said James Anderson, by an instrument in writing under
15 my hand and seal, to cause a particular description of the nature of my said Invention, and in what manner the same is to be performed, to be inrolled in His Majesty's High Court of Chancery within six calendar months after the date of the said recited Letters Patent, as in and by the same, relation being thereunto had, may more fully and at large appear.

20 NOW KNOW YE, that in compliance of the said proviso, I, the said James Anderson, do hereby declare that my said Invention is described in manner following, that is to say:—

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Let the heated smoke as it issues from the fire be conducted into a chamber that will be most commodiously situated beneath the floor of the house or apartment intended to be heated, extending the whole of its length and width, if it can conveniently be done, leaving only a vacuity between the inner side of the wall of the house and the wall of the smoke chamber all round, of two feet or 5 thereby, no precise nicety as to its dimensions being requisite. This chamber for the smoke may be of any form or dimensions, so as to suit the situation, and from two to six feet or more in depth, as circumstances will admit (the deeper always the better), and the roof of it ought to be below the level of the floor of the house or apartment intended to be heated, so as to leave a 10 vacuity thereof one foot at least in depth, and if two feet or more, so much the better. The roof and sides of this smoke chamber should be made air-tight, and may be constructed of plates of metal or of any other matter that is capable of bearing heat, and of easily transmitting it, and of being made air-tight. The grate where the fuel is to be consumed ought to be placed lower than the floor 15 of this chamber, if it can be conveniently done (but this is not indispensably necessary), and the chimney leading from the fire ought to rise upwards within the smoke chamber, till it reach within about one foot of its roof, where it should be discontinued and left open, having a spark stone or cover laid over it to spread the heat. The chimney for carrying the smoke from this chamber, 20 and for making the fire burn, should communicate with the chamber near the floor or bottom of that chamber, and in no other place, unless occasionally for particular purposes, by an opening formed into it immediately below the roof of the smoke chamber, which is shut in general by means of a valve that can be opened at pleasure. This chimney may either rise directly to the height of the 25 building without interruption, or it may be made to open into a succession of chambers, of a similar construction to the smoke chamber just described, as far as respects the transmission of the smoke, though they may be varied in all other respects to suit the circumstances of the case in infinitum; that is to say, these chambers may vary in size, shape, proportions, in position, being either above or 30 below, or upon the same level with the original chamber, and so on. But although the best position for the smoke chamber be directly beneath the building to be heated, yet should obstructions prevent this, it may be placed without it, or under some other building, as near the building that is to be heated as may be. Connected with the original smoke chamber there may be formed 35 another of an auxiliary sort, which should also be air-tight, in the roof and sides. This auxiliary smoke chamber should communicate with the first by means of two pipes that can be closed or opened at pleasure, one placed immediately above the floor, and the other next the roof of the principal smoke chamber;

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and it should also communicate with the open air by another opening or pipe, issuing from the bottom of that auxiliary chamber; this last pipe ought to have a valve, to stop or open at pleasure, and should always be closed when the fire is burning, and opened whenever it is extinguished, the lower
 5 opening into the principal smoke chamber being closed at the same instant that the other is opened; and if there be no auxiliary smoke chamber, an opening of this sort must be made into the principal smoke chamber. Either at the top or in any other convenient part of the chimney, should be fitted a valve or stopper, which admits of being opened or perfectly closed at pleasure. When closed, it
 10 will stop circulation, and soon extinguish the fire. Whenever it is closed the air hole of the furnace (if the heat be not required for another chamber) ought also to be closed, and the fire will then be instantly extinguished; and the chamber being full of heated smoke, will gradually transmit that heat through its cover and sides to the air chamber which surrounds it. The hottest part of
 15 the air thus heated will rise to the top. As the heat in the smoke chamber gradually abates, it will of course contract in bulk, and by thus forming a kind of vacuum, must then draw in a supply of air from the auxiliary smoke chamber to supply that want. As the higher opening into that chamber alone is now open, it must draw in only the hottest part of the air, while the air from
 20 without is drawn into the bottom part of the auxiliary chamber; and as it will continue to occupy the lowest place, no cool air can be drawn in until the whole of the heated shall be exhausted. The vacuity immediately above and around the principal smoke chamber is intended for an air chamber, the floor above which, and its sides all over, must be impervious to air or water,
 25 and may be formed of flooring tiles, or stones, or any other material proper for such uses, that can be got cheapest at the place. From this air chamber let a pipe or pipes pass into the apartment intended to be heated, that can be opened or closed at pleasure, and that can admit at pleasure also of being opened either immediately below the floor or at
 30 any greater depth, so as to allow air more or less heated, as shall best suit the purpose, to pass into the apartment intended to be heated. This heated air may (when thus admitted) be either allowed to spread in the apartment immediately above the floor, so as to heat the whole of the apartment, or it may be conveyed nearly to the roof before it is let loose; so that the upper part
 35 of the apartment may be heated to a great degree without affecting the lower part of it, if it should be so required. Connected with the air chamber may also be an auxiliary air chamber, capable of retaining the heated air, between which two chambers there should likewise be a communication by means of a

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pipe, and this auxiliary air chamber should also communicate with the common air by an opening just above the floor of it, in the lowest place, and nowhere else. The pipe that communicates between the air chamber and its auxiliary should be so made as that the end of it which enters into the principal chamber should be placed just above the floor, and the other end of it should open into 5 the auxiliary chamber high up, very near the upper part of it, and should never be closed. In consequence of this arrangement, when the air in the principal chamber for heated air comes to be heated, if the pipe communicating with the apartment above be kept shut, then as the air expands, in consequence of the heat acting on it from the smoke chamber below, the coldest part of the air 10 in that air chamber will be forced to pass into the auxiliary air chamber, which in its turn will force some from thence into the open air. In this way, after the cold air is all discharged from the principal air chamber, some part of the heated air will be driven into the auxiliary air chamber, in which, assuming the highest place, it will there be retained, forcing the colder air below to pass 15 out into the atmosphere. This process must be continued as long as the air in the internal air chamber continues to augment in heat; but when a portion of that heated air is let off into the apartment above, or when the fire is slackened so long as to communicate no more heat to it, then in that case a suction will be made from the inner chamber, so as to draw in air from 20 the auxiliary air chamber; but as the pipe opens into the higher part of the chamber, it will draw back only the hottest part of the air in it, and so on it will continue to draw back the superfluous air, so as to derive the whole benefit of it without any waste whatever. But although this auxiliary air chamber will be of great utility, it may nevertheless be dispensed with if 25 the owner so chooses, but the opening into the air chamber below is indispensable. If the apartment placed above and communicating with the principal chamber of heated air, be intended to be employed as a hot-house, its walls ought to be made of glass all round, if circumstances will admit of it, on the north as well as towards all other points of the compass, thus to obtain not only the 30 benefit of the sun's heat to the fullest extent, but also to obtain as much light as possible, which is of the utmost utility to plants of all kinds, as without it they cannot be preserved in good health. The whole should be made air-tight. The under part of each of the front glasses should be so formed as to admit of being opened or to shut quite close at pleasure. A row of windows or air 35 holes, that admit of being opened at pleasure, should be placed along the north or other sides, towards the top, with this single variation, that they should be made to open alternately from below, rising upwards, or from above, falling

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downward, but so as always to admit of being shut so close as to be air-tight. These openings are to serve the purpose of emitting the air at pleasure, and assisting in ventilating the house. The edges of the door should be also so made as to shut quite close. For the purpose of a
5 pinery or vinery, or peach-house, and most other uses to which a hot-house is usually applied, the roof of the apartment (in other words, the hot-house) should be placed in a horizontal position, or nearly so, something like the ceiling of an ordinary apartment, only that that ceiling should be made of glass instead of plaster, and should be fixed to the joists above, and
10 made altogether air-tight. The vines or other fruits intended to be forced, may be extended close under the glass. The bed in the stove should be raised so high as to be as near the roof glasses as the leaves of the plants in it will permit. Pipes of different lengths, which may be opened or shut at pleasure, ought to be passed through the upper part of the hot-house
15 for the purpose of letting off the heated air to that degree which shall be deemed eligible at the time, and should reach to that depth in the house that shall be thought proper. For the purpose of regulating the heat of the stove and keeping up an equality of temperature at all times without any attendance from the gardener, the stove being first made air-tight every
20 where, let a pipe be placed in the floor communicating directly with the chamber of heated air below, and let the top of that pipe be closed by means of a light valve that opens upwards. Let another pipe be placed above, that may communicate with the open air, if judged proper, having a light valve upon its upper end, opening upwards also. Let an opening be then made
25 into the stove near the floor, so as to admit a free communication by that means with the open air. Lift up then the valve of the bottom pipe. The heated air will rise upwards through it into the stove, gradually filling it, while the cool air that was in the chamber is imperceptibly driven off through the opening below into the atmosphere. When the stove has thus gradually
30 acquired the degree of heat required (say ninety degrees on Fahrenheit's thermometer) shut the opening below and all others quite close. The hot-house now being air-tight, it must follow, that if more heated air arises from below, it will tend to expand the air already in the hot-house, in other words, to raise the temperature above ninety degrees. But in consequence of that
35 expansive effort from within, an effect will be felt to close the lower valve (as is felt in a bellows when the two handles are pressed together), so that no more heated air can find access by that means. The same expansile burst will have a necessary tendency to open the upper valve, and thus heated air will be allowed to escape until the air in the chamber has come into an equilibrium

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with that of the atmosphere, or, in other words, till it be at ninety degrees, at which temperature alone it ever can, as thus regulated, attain that equilibrium. If, however, from the coldness of the night air, or from any other cause, the heat of the stove should be diminished so as to fall below ninety degrees, the bulk of the air in it will be at the same time contracted, and 5 a kind of vacuum be experienced. In that case, in consequence of the suction inwards, the upper valve would be firmly closed, so that no cold air can be there admitted; and from the same cause the lower valve will be opened, so as to admit heated air again from below. In this way, as soon as the temperature shall attain the ninetieth degree, or such other regulated 10 degree of heat as shall have been fixed upon, the lower valve would be closed, and thus an equal temperature would be kept up within the house at all times, whatever variations might take place in the atmosphere, without the attendance of any person whatever. If care be taken to keep up the heat in the air chamber above ninety or the regulated degrees, and provided the apartment 15 above it (the stove) be perfectly air-tight, the variation of heat that could prove hurtful to the tenderest plant could never be experienced. In the vinery, peach-house, and others that require nearly a similar temperature, where the sun becomes the principal, if not the sole source of heat, an auxiliary chamber ought also to be provided for receiving the heated air when 20 there is an excess of it, and for restoring it back again during the night time when the cold or other circumstances render the contraction within sensible. This auxiliary chamber should be constructed exactly in the same manner with those already described. In this case also, as in the former, though the pipe of communication opens also into the auxiliary chamber near its roof, it 25 ought to be made to issue from the hot-house itself, either higher or lower at pleasure, which may be effected by fitting upon its orifice pipes of different lengths. As it may be convenient to rear vines entirely on the outside of the house, proper openings ought to be provided for introducing the vines from without, and for withdrawing them at pleasure. These openings may be made either 30 immediately under the roof of glass, or occasionally just above the floor of the hot-house, as shall suit the inclination of the owner. They should consist of horizontal slits of a length and depth sufficient to admit of the shoots being passed through them with ease, and admit of being closed either with a case with glass in it, or a wooden frame, the openings between the shoots being 35 closed up with soft moss, close rammed, so as to be air-tight, or with a plaister of grafting loam, or any other soft material that is fitted to prevent the passage of the air without too much cramping the shoot. Peaches and cherries, which require the influence of the open air, in the winter may be raised in large tubs

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or boxes that admit of being removed, and if the stems be trained perpendicular nearly as high as the horizontal roof glass, and then bended over, and trained horizontally, they may be admitted into the house, or withdrawn from it through horizontal slits similar to those above described, which admit of
5 being closed in the same manner. For the purpose of forwarding lettuce or other low growing plants in winter, or strawberries early in the spring, let a set of frames be provided, consisting of open spars, strong enough to support the weight that is to be put upon them; each of these frames should be of such dimensions as to hold three rows of pots of the usual size for that purpose,
10 and of a length the whole width of the house, wanting two feet or thereby. A set of pans or boxes, made of any light material that can hold water, and having edges turned up about one inch, should be provided, to be laid on these frames, and into these pans or boxes the pots should be placed. These frames may be suspended from the ceiling or roof of the chamber by means
15 of cords passed over pulleys, so as to admit of being raised or lowered into a warmer or cooler region of the chamber at pleasure. The plants may be supplied with moisture by pouring water into the pans without lowering them, and the fruit can be seen without moving them thro' the glass above. Hitherto it has been the practice to have no hot-houses of more than one stage
20 or story in height, but upon the present plan, in situations where they can be secured from effects of wind, nothing is to prevent them from being of two or more stages or stories; and where this can be safely done, it will prove a considerable saving, on account of the roof. In that case, all the difference that will occur between the first and higher stages is, that the floor of these last, as well as the
25 roof, will be of glass; a footpath of wood or grating for the gardener should be always in that case formed along the inside of the north wall, having a slight rail on the inside of about three feet high, like the ruff tree of a ship, or otherwise, to guard against accidents; and a loose deal ought also to be provided, to be shoved along the top of the joists when wanted, as a platform for
30 the necessary purposes; over the highest stage or story must be thrown a roof, the south side of which and the east and west ends may be made of glass, and the north side either of glass or proper opaque materials. This may be so constructed as to be employed for the purpose of a vinery and at the same time of a reservoir chamber for heated air, which may be freed from its super-
35 fluous heat, when that becomes too great, by means of a tube from the top, which admits of being opened or closed at pleasure. With a view to obviate the bad effects that might occasionally result from too great a degree of heat in the higher regions of the hot-house, continued too long through accidental inadvertence in the gardener, the following apparatus may be used:—Take a

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bladder or other flexible bag that is impervious to air; turn the mouth of it while it is open, upwards, and heat it then to a considerable degree before a fire or otherwise; when it has been made to attain a degree of heat higher than that of the hot-house, tie the neck close while it is not yet fully distended, tho' nearly so, taking care previously to fix a string to the bottom of it by 5 tying in a part of it, or otherwise; then attach it to some fixed object; afterwards bring the house to its proper degree of temperature, and while it is in that state, fasten the string that proceeds from the bag tight to some other object; the consequence must be, that when the heat augments, the bag will become more distended, and consequently will augment in diameter and con- 10 tract in length, so as to tighten the cords; and when the heat abates, it will become more flaccid, and of course slacken the cords, so that this may be employed as a moving power to open or close a valve as it contracts or dilates, and it will necessarily regulate the heat of the house by its spontaneous movements, without requiring attention from any one. For the purpose of agitating 15 the air in the house at pleasure, without the necessity of introducing air from without, and for many other indispensable purposes, the following apparatus has been contrived:—Make a cylindrical box, of a construction similar to that of a drum; pass through it lengthways an axle carrying arms of thin wood or other light and firm material, to act when put in motion as a fan. This axle 20 is to be properly supported at each end, and in such manner as to leave an opening at one or both of the ends for the purpose of admitting air to the fan; the fan may be moved by means of a simple handle, or if greater velocity is wished, by a large wheels at one end acting upon a pinion upon the end of the axle, or by a large sheeve acting upon a small one, connected together by 25 a band, belt, or chain. On one side of the cylindrical part of the drum, leave an opening for the passage of the air when the fan is in motion, to which can be fitted at pleasure a pipe that admits of movements and of being occasionally lengthened or shortened. It may be flexible or otherwise, as shall suit the circumstances of the case, terminating in a small nozzle, to admit of its being directed 30 to any point where it may be wanted. Let the mouth of another pipe, similar to the above, be so formed as to cover the end opening or openings of the drum for the supply of air, so that all the air that can pass into the drum must first pass through this pipe. By means of this apparatus the air can be sucked up by the machine from any part, either within or without the house, and spouted out 35 into any other part of it, with a greater or less degree of violence, as circumstances shall render eligible. The machine itself may be driven either by the hand, like a common winnowing machine, or it may be driven by means of a vane, moveable by the wind, placed on some convenient part of the building, or by

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water, or steam, or horses, or any other moving power which circumstances may render eligible. Or this kind of ventilation may be produced by means of a bellows, having pipes of the sort above described, adapted to the nozzle and the under valve of the bellows. With a view farther to economise fuel, when
5 that becomes necessary, for the production of heat, care should be taken to have the whole of the smoke that arises from the burning fuel consumed. To effect this, let a fire-place be constructed in the following manner:—Let this fire-place have two grates, so connected as to admit of communicating alternately with each other; each grate should have two air holes opening into the
10 cavity below the grate, being close every where else; one of these air holes should communicate with the atmosphere directly in front of the grate, and the other with a passage below, that goes directly from the one grate to the other. These two air holes should admit of being opened or closed at pleasure, but so as they can never be both open at the same time unto the same grate; this
15 may be conveniently effected by a shifting door or valve, which, when it closes the one hole, must necessarily open the other. For the sake of distinctness, let one of these grates be called N^o 1, and the other N^o 2. When the fire is to be lighted, let the air hole in front of the grate N^o 1 be opened, and the other air hole to that grate will of course be closed. The coals in N^o 1 being then
20 kindled, the smoke, as it issues from the fire, should be conducted at first right upwards for a small distance, and it should then bend in the same plane with the wall, so as to assume a horizontal position, and in a direction pointing towards the other grate N^o 2; it should then bend downward, still in the same plane, and proceed in that direction until it comes into the passage that leads
25 from the one grate to the other, beneath the level of the grates respectively. As the opening from this passage unto the grate N^o 1 is at this time closed, the air hole in front being open, the smoke must pass on towards the other grate N^o 2, whose air hole in front being now closed, it can receive no air to keep alive the burning fuel but that which comes through that passage, and as this
30 air conveys along with it the whole of the smoke that came from the burning fuel in the grate N^o 1, that smoke, in passing thro' the fire N^o 2, will be inflamed and entirely consumed, thus tending greatly to augment the heat; it being always understood that the fuel in the grate Number 2 is at this time in the state of charred coal, having been kindled previously
35 to that in Number 1. After passing through the grate N^o 2, the heated air rises at first thro' the chimney of N^o 2 in a perpendicular direction, to the same height as that of N^o 1; it then bends in a horizontal direction towards N^o 1 in the same plane with the wall; from thence it bends backwards in a horizontal direction for a small space, and may be then carried off through

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a chimney in any other direction that convenience can suggest. But when the fuel that had been put upon the grate N° 1 shall be so far consumed as to emit little smoke, let the front air hole of number 2 be opened, and fresh fuel be put upon it, the other air hole of that grate being necessarily closed when the front air hole is opened. The smoke arising from thence will now pass upwards as before, 5 but instead of going back into the chimney, as before, a moveable door or a valve there, being shifted, that opening is then closed, and another opening made into the same chimney to receive the vapour arising from the fire N° 1. The smoke will then be obliged to pass downwards, and should be conducted in the same manner as that before described of N° 1, into the passage that 10 communicates between the two grates, and thus be forced to go under the grate N° 1 (the air hole leading from that passage to Number 1 having been previously opened by shutting the air hole in front), where it must pass thro' the fire and be inflamed, from whence it rises up and passes off through the chimney, as that from N° 2 did before. Observe, that at the place where the 15 smoke enters from above into the passage that leads between the two grates, there is a moveable valve, which is opened at the same time that the side air hole into the chimney on that side is shut, the same valve when it opens thus closing the similar opening belonging to the other grate. Thus may the two fires have fresh fuel put upon them alternately, and be interchangeably shifted as 20 often as can be wanted, so as always to consume the whole of the smoke. The form and situation of these chimneys, grates, and valves may be varied at pleasure, preserving the principle of causing the unconsumed smoke to pass through the fire that has ceased to smoke. For the purpose of obtaining steam when wanted, let the upper part of the chimney above described, where it runs 25 in a horizontal position between the two grates, be made of such a width as shall be deemed convenient, and that upper surface should consist of the flat bottom of a pan, or a flat pan may be placed above any kind of grate. Let a chamber be made above that, whose top and sides are formed by a vessel containing water, flat above, but projecting downward all round to the depth of 30 several feet, so that water shall surround the chamber on all sides except the bottom part, which is the pan. The edges of the water chamber should go an inch or two lower than the pan, being wider than it, and an opening should be left below the edges of the water chamber. Within this chamber and immediately over the pan, let there be placed another vessel containing water; the 35 pan is to be used for boiling and evaporating water. It is to be supplied with water from this inner vessel in proportion as it is evaporated, by means of a ball-cock or float, and that vessel in its turn is to be in like manner supplied with water as it is drawn off from the outer vessel that surrounds the chamber, so

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that it will be always heated before it can reach the evaporating pan. The steam that is first raised will fill the chamber above described, where it will accumulate until that chamber be wholly filled, so as to make its escape below the bottom of the sides, from whence it may be conveyed by a proper conduit into
5 a house, when it is there wanted; a pipe should also be taken thro' one of the sides close below the upper part of what may be called the ceiling of the water chamber, that admits of being opened at pleasure, by means of which the whole of the steam can be let off when it shall be judged proper. But as it may often happen that steam will be wanted only in moderate quantities and at
10 particular times, so as to render it unnecessary to continue the evaporation of water during the whole time that the fire burns, in that case the following apparatus may be resorted to:—By means of a bellows formed for that purpose, or a forcing pump, throw in a small shower of water from time to time into the dry bottom of the pan, properly guarded by tiles laid above the bottom, so as to cover
15 it when it is fully heated, which will be instantly converted into steam, and after a short interval another and another, until as much steam shall be generated as shall be wanted at that time, when the evaporation may be discontinued. For the purpose of obtaining a moderate degree of heat occasionally, without being under the necessity of lighting a fire in the house, the following apparatus
20 may be adopted:—Make a hollow cylinder of metal or other matter that is capable of retaining smoke and transmitting heat, open at bottom but close at top. This cylinder ought to be of considerable proportional depth, and of a size proportioned to the use intended by it. The sides of this cylinder may do for some purposes if only single, but in general it ought to be double, leaving an
25 opening between the two cylinders all round, of about an inch or more in the clear. These two cylinders should be joined close together at the bottom, and the outer cylinder should rise somewhat higher than the inner one, tho' that also should rise higher than the part that closes the inner cylinder above. Round the top of the outer cylinder should be formed a horizontal rim, of such a breadth
30 as to admit of being depressed into a circular groove all round it, for the purpose of receiving a perpendicular rim, running round the lower part of the cover, like that of the lid of a tea-pot. The cover itself may be made of such shape and dimensions as shall best suit the purposes intended at the time. Let the cylinder thus prepared be heated to the degree wanted by an Argands lamp placed within it,
35 which, instead of a glass tube to receive the flame, has one made of metal fitted to it, which is of such a length as to reach from the lower hedges of the cylinder till within half an inch of the top of the inner cylinder, or it may be heated by suspending it over a good fire upon a crow or otherwise until it be sufficiently warmed, when it may be carried into the place where it is wanted, and there

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suffered to stand till it communicates its heat to the surrounding bodies. If water be put into the upper cavity, above the top of the inner cylinder, the cover being at the same time taken off, steam in small quantities may be raised; in the house where a great degree of heat is wanted, and for long continuance, this apparatus may be made of very large dimensions, and of any form that 5 may best suit, and fixed in its place; the sides may be made of bricks or other solid substances, and a culinary fire adopted instead of the lamp, so that its power may be thus augmented to such a degree as to answer many important purposes.

In witness whereof, I, the said James Anderson, have hereunto set my 10 hand and seal, the Eleventh day of June, in the year of our Lord One thousand eight hundred and one.

JA^s (L.S.) ANDERSON.

Signed and sealed by the within-named James Anderson (being first duly stamped, and seventy-three words interlined and fifteen words cancelled in the first skin, and ninety-one words interlined and twenty-four words cancelled in the last skin) in presence of

15

CHA^s BERRY.

0

NICH^s SMITH.

AND BE IT REMEMBERED, that on the same Eleventh day of June, in the year above mentioned, the aforesaid James Anderson came before our Lord the King in His Chancery, and acknowledged the Specification afore- 25 said, and all and everything therein contained, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute in that case made and provided.

Inrolled the Thirteenth day of June, in the year above written.

LONDON :

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Printers to the Queen's most Excellent Majesty. 1854.