

Specification of William Brunton : fire grates, &c.;

Contributors

Brunton, William.

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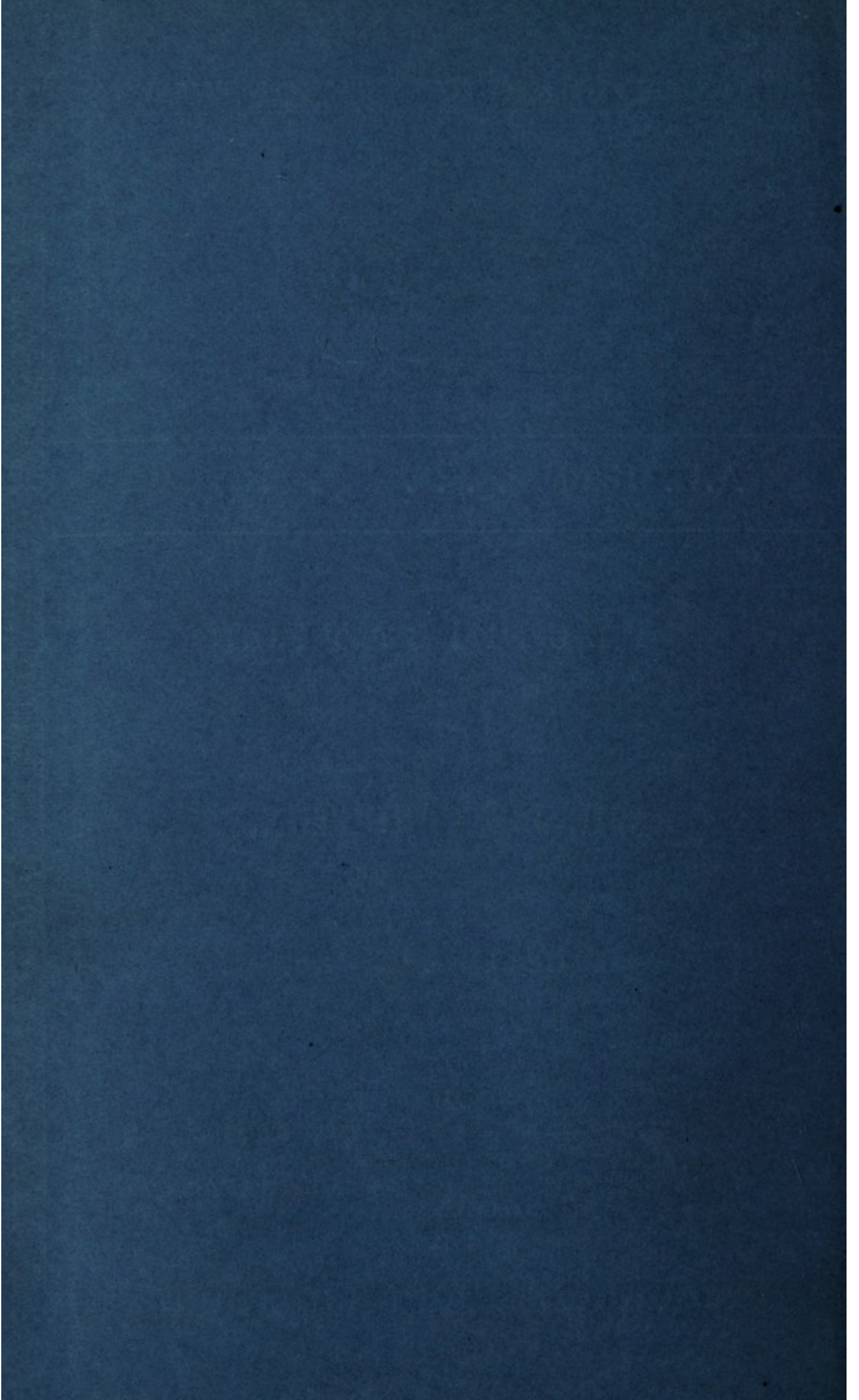
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A.D. 1820 N^o 4449.

Fire Grates, &c.

BRUNTON'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, WILLIAM BRUNTON, of Birmingham, Engineer, send greeting.

WHEREAS His most Excellent Majesty King George the Fourth, did, by His Letters Patent under the Great Seal of that part of the United Kingdom
5 of Great Britain and Ireland called England, bearing date at Westminster, the Nineteenth day of April, in the first year of His reign, give and grant unto me, the said William Brunton, my exors, adñors, and assigns, His especial licence, full power, sole privilege and authority, that I, the said William Brunton, my exors, adñors, and assigns, during the term of years therein
10 mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, my Invention of "CERTAIN IMPROVEMENTS ON AND ADDITIONS TO FIRE GRATES, WHICH I INTEND TO DENOMINATE **ECONOMICAL FIRE GRATES;**" in which said Letters Patent there is contained a proviso, that if I, the said William Brunton, shall not particularly
15 describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be inrolled in His Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said Letters Patent, that then the said Letters Patent, and all liberties
20 and advantages whatsoever thereby granted, shall utterly cease, determine, and become void, as in and by the same, relation being thereunto had, will more fully and at large appear.

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NOW KNOW YE, that in compliance with the said proviso, I, the said William Brunton, do hereby declare that the nature of my said improvements on and additions to fire grates, and the manner in which the same are performed, are particularly described and ascertained in the following description thereof (that is to say):—

My said improvement consists in, 1st, the introducing the coal and distributing the same in an equal and uniform manner over the surface of the fire, without opening what is usually called the fire door; 2nd, in maintaining the heat of the fire at nearly an uniform temperature; 3^d, in obtaining a more perfect combustion of the coal than is procured by fire grates of the common construction; 4th, in producing a sudden and temporary diminution of the effect of the fire where the nature of the process to which it is applied may require it. My said improved fire grates are applicable to the coppers for brewing stills, reverberatory furnaces, for melting or refining iron, copper, and lead, and also to furnaces for heating retorts, and to the furnaces of stoves or ovens for annealing glass or cast iron, and are effected by means and combinations herein described. The fire grate I make of a circular form, and it is ultimately supported by a vertical shaft (which I call the grate shaft) moveable round its axis, the lower end of which shaft stands in the ash pit, and the upper end whereof is supported by a strong bar built into the brickwork of the ash pit. (This shaft is similar to that described in the Patent granted to me on Twenty-ninth day of June, One thousand eight hundred and nineteen, for (certain improvements in steam engines and the furnaces of steam engines, by which a saving in the consumption of fuel is effected, and the combustion of the smoke is more completely attained; and so far it and its accompaniments are not considered as new in the Invention which I am now describing; but the support of its lower end and the means employed for lowering the shaft vertically, which is the mechanical means employed when I wish suddenly to diminish the effect of the fire on the boiler or still, are new to fire grates of this construction; and the way of feeding the fire by means of a shovel in the manner to be hereafter described is also new.) The said shaft is kept in its vertical position by one or more bearers of cast iron, built into the brickwork of the ash pit, through which bearer or bearers the said grate shaft may be moved perpendicularly, and the lower end of the said shaft is supported on a bearer, which is moveable perpendicularly between guides or side supporters. To this last-mentioned bearer I attach a rack and pinion, or sometimes a beam or lever, by which the said grate shaft may be elevated or depressed at pleasure; from the upper end of the said grate shaft, above the upper supporting bar, are extended two or more arms, carrying a strong cast iron ring

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(which I call the grate ring), concentric with the said grate shaft, and having its plane at right angles thereto; upon this grate ring I lay the grate bars, which are similar to those in common use, but of different lengths, suited to the places which they respectively occupy in the plane of the said ring when
5 placed parallel to its diameter and each other. To the exterior edge of the said grate ring, and about three inches below its upper surface, is attached another cast iron ring (which I call the brick ring): the plane of this ring, which is also at right angles to the said grate shaft, and about six inches broad, terminates at its exterior diameter in a vertical rim, rising from eight
10 to fourteen inches, according to the required thickness of the fire, thus forming with the said plane and the above three inches of the grate ring a circular case for a circle of fire bricks all round the grate, which fire bricks should be of such a height as to stand from six to fourteen inches above the grate (as the case may require) for the lateral support of the fire. To the
15 under side of the said grate ring is fixed a rim or cylinder (which I call the air ring, made of strong sheet iron, projecting downwards about four inches into a circular trough of suitable diameter, made of cast iron, which trough is built into the brickwork of the ash pit, and concentric with the said grate shaft; the said air ring is not suffered to touch the bottom of the said trough, but
20 moves in sand with which the trough is filled; the use of the said air ring is to prevent the passage of air between the said grate ring and the said trough. The inside of the furnace or brickwork surrounding the said grate is made circular and concentric with the fire grate, and about three inches more in diameter than the outside of the brick ring; the wall rises off this diameter from the
25 level of the bottom of the said trough to serve as a receptacle for any dust or ashes which may accidentally fall over the edge of the grate through the insterstice of one inch and half left all round the said brick ring by the greater diameter of the furnace. Into the said cavity I make two or more openings at convenient places through the brickwork, with doors upon the
30 same, to be kept open or shut at pleasure, for the double purpose of cleaning out the ashes and of permitting a current of atmospheric air to have access through the said insterstice of one inch and half to the top of the fire to ignite the smoke if necessary. In cases where the grate is to be moved vertically, I attach a sand trough to the under side of the grate ring by
35 a cylinder of cast or wrought iron, the length of which cylinder I make about six inches more than the intended range of the vertical motion of the grate, and I fix the air ring by a flanch, to which it is joined into the brickwork of the ash pit concentric with the grate shaft and said trough, in such a position that when the said trough is filled with sand and elevated to

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its greatest height, the air ring projecting downwards will enter the sand sufficiently to prevent the admission of air between the air ring and the said sand trough; when the grate is lowered the sand trough leaves the air ring, and the grate descends into a circular chamber of fire brick formed by a wall which is built perpendicularly from the level of the air ring upwards, having an 5
insterstice round the brick ring of one inch and half. I at the same time retard the combustion of the coal upon the grate by closing the opening of the ash pit by doors attached thereto, and thus prevent the free admission of atmospheric air. In that part of the furnace which is above the level of the brick ring, I fix a fire door of the usual construction, for the purpose of cleaning and 10
lighting the fire, and also at a convenient place near to the said door, and in the direction of a tangent of a radius of nine inches from the centre of the grate, an opening is formed through the brickwork of the side of the furnace, of suitable dimensions for the introduction of the coal, as hereafter described. Connected with the said opening and extending in the same direction beyond 15
the brickwork of the furnace, I fix an oblong close box or case of wrought or cast iron (which I call the shovel box), of sufficient dimensions to receive the shovel with its wheels (as hereafter described), and having suitable openings with doors thereon in its sides for the purpose of examining or oiling the wheels of the shovel. In the top of the said shovel box and in the direction of its 20
length, I make a hole or opening, the length of which is equal to half the diameter of the grate, and its width about five inches (this I call the feeding hole); over the said feeding hole is placed a box, which I call the fire feeder, or for brevity, the feeder, which is made large enough to contain a supply of coal sufficient for one or more hours; this fire feeder is in shape similar to the 25
hopper of a corn mill, excepting that the bottom is made oblong, its length being equal to half the diameter of the grate, and its width about nine inches; the aperture through which the coal passes from the fire feeder is on one of its sides and close to the bottom, and this aperture is adjusted to the size of the pieces of coal used by means of a sliding shutter, raised or lowered as occasion 30
may require, say, varying from two to five inches. The bottom of the fire feeder is an iron plate, about twelve inches wider than the lower orifice thereof, and inclines downward about one in six towards the side on which is the aperture for discharging the coal and in the same direction; it has a reciprocating motion upon a pivot fixed at that end of the bottom of the fire feeder which is next 35
the grate (that is, the pivot is nearly or directly over the end of the feeding hole next the grate), by which reciprocating motion the coal resting upon the bottom of the fire feeder, that (is on the said iron plate which has the said reciprocating motion) is passed through the aforesaid opening in the side of the

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said feeder, and precipitated over the lower edge of the said plate through the said feeding hole. In order to prevent any air from entering the furnace through the said feeding hole, I connect the said feeder to the top of the shovel box by a case which incloses the lower part of the said feeder with its moveable
5 bottom plate, making a hole through the side of the said case of sufficient size to allow a rod to pass through to communicate the said reciprocating motion (obtained by connecting the same with an engine or other convenient power), and upon the upper edge or mouth of the fire feeder I form a horizontal channel or gutter to hold water or sand, into which a rim projecting down-
10 wards from the under side of the cover of the said feeder is received, and thereby I prevent all passage of air downwards through the interstices among the pieces of coal. The said cover is suspended so as to be easily removed or lifted upwards when the feeder is to be supplied with coal. For the purpose of conveying the coal to the grate and distributing the same thereon in an
15 equal and uniform manner, I construct a plate of wrought iron (which I call the shovel), and I cause it to move horizontally between the grate and the feeding hole, alternately through the said opening in the brickwork and within the said shovel box, by power obtained from an engine or other convenient source, connected to the said shovel by a rod or chain passing through a small hole in
20 the end of the said shovel box. The said shovel I make as long as the half diameter of the grate and about twelve inches wide, having a margin about two inches high at each end and along the back or side edge over which it does not discharge, and when the said shovel is at the extremity of its range from the grate it is perpendicularly under the said feeding hole, so as to receive the
25 charge of coal from the fire feeder, and when it is at the opposite extremity of its range, one end of it is over or against the centre of the grate, the other end is over its periphery; the longitudinal motion of the shovel, that is, its motion between the said feeding hole and the grate, is in the same direction with the aforesaid opening left in the brickwork, and in the line of a tangent
30 of radius of nine inches, as already noticed, in order that the shovel in discharging the coal from from the side nearest the centre of the grate, may fall upon its radii, or nearly so. To the end of the shovel I attach a bar, extending in the same plane and in a direction parallel to its side edges; the bar, with the shovel thus attached, I support upon four wheels, the axles of
35 which are placed upright angles to the said bar, and the said wheels run upon two rails, parallel to each other, and so fixed within the said opening and shovel box as to conduct or guide the shovel between the feed hole, from which it receives the charge of coal, and the grate where it is to be discharged upon the fire; to the end of the bar opposite to that to which the shovel is

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attached, I fix a weight sufficient to counterpoise the shovel and to equalize the pressure upon the four wheels; the bar of the shovel, while it is supported by the axles longitudinally, is moveable on its own axis, and the coal is discharged from the shovel by its cross section turning by the said bar to about sixty degrees from level, which position I induce it to take by making 5 the said shovel heavier on that side from which I intend it shall discharge; and to restore the said shovel to a level position preparatory to its receiving a supply of coal, I fix upon and at right angles to the said shovel bar a lever, about fourteen or sixteen inches long, the end of which I cause to bear upon a curved guide, fixed so as to be equidistant through through its whole length from 10 the centre of the shovel bar, and forming an angle of thirty degrees with the rails on which the shovel moves longitudinally; as the shovel retires from the grate it is restored to a level position by the said lever sliding upon the said curved guide, which terminates against another guide which is fixed parallel to the said rails (which I call the parallel guide), against which the said lever con- 15 tinues to slide, and thereby supports the shovel in a level position till it reaches the feeding hole, through which receiving a supply of coal it is returned toward the grate, the lever still bearing upon the said parallel guide; but to prevent the lever in its progress towards the grate from following the curved guide, I apply a tongue similar to that of a turnout waggon rail, which 20 forms a continuation of the parallel guide, moveable upon a round stud or pin at its extremity, on which its other end being fitted to the curved guide and held thereto by a weight or spring, presents a continuity of the parallel guide upon which the said lever slides, and it supports the shovel loaded with coal until it has reached the end of its range towards the grate, where the lever 25 passing off at the end of the tongue falls against the curved guide, and the coal is thereby discharged; and the grate being made to revolve by power obtained from an engine or other convenient source, the fuel, as noticed above, is distributed equally and uniformly over the whole surface or area of the fire grate, whilst the coal introduced upon the fire at short intervals, say 30 of fifteen or twenty seconds, the heat of the fire is maintained at an uniform temperature; and also by the revolving of the grate the pieces of coal thereon are exposed successively on all their sides to the current of the fire passing constantly in one direction towards the chimney or flew; the combustion of the coal is thereby rendered more complete, and by lowering the grate into 35 the chamber, as before noticed, and shutting the said doors of the ash-pit, the effect of the fire upon the boiler or still will be thereby greatly diminished and the combustion of the coal retarded. No competent engineer will find any difficulty in connecting the said grate shaft with a steam engine or other

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convenient power, so as to make it revolve on its axis and give the required motion to the fire grate (the velocity at which I prefer the grate to move in one revolution in about six minutes for a grate of five feet diameter, and so in proportion to any other diameter), nor will any engineer find difficulty in
5 borrowing from any convenient power what may be necessary to give the reciprocating motion to the inclined moveable bottom of the fire feeder, or the horizontal motion to the shovel, but I shall describe a method for doing so which may be easily understood. Upon the grate shaft, at any convenient height above its lower end, fix a spur wheel, nearly as large as the grate, to be
10 driven by a pinion upon another vertical shaft turned by an engine or other convenient power, (introducing, if necessary, another wheel or wheels between the said spur wheel and the said pinion, and proportioning the number of their teeth to the velocity wanted); when the grate is intended to be moved vertically, the wheel or pinion into which the spur wheel upon the grate shaft
15 works must be of sufficient depth to permit the said spur wheel to move the whole distance of its vertical range, without getting out of the teeth of the said wheel or pinion. Upon the above-mentioned vertical shaft, having the pinion and being driven by the engine, fix a cam or excentric curve, including ninety degrees, which being brought round by the revolutions of the said shaft, may
20 act against a lever connected with the sliding bottom plate of the fire feeder, and moved in one direction, at the same time raising a weight connected with and sufficiently heavy to move the said plate back again in the opposite direction whenever the cam ceases its action upon the said lever. In order to regulate the quantity of coal introduced by each movement of the said sliding
25 bottom plate, cause the said lever to act against or fall upon a wedge, which, by moving longitudinally, will increase or diminish the space through which the said sliding bottom plate moves. Upon the before-mentioned vertical shaft and at a convenient height above the aforesaid cam, fix a bevil wheel, which, turning another bevil wheel of equal dimensions fixed upon a horizontal
30 shaft, upon which fix another cam or excentric, which I call the shovel cam), including about one hundred and twenty degrees, and of such excentricity as when turned round by the said horizontal shaft will move the end of a lever suspended over and bearing (by a roller) upon the said cam, through a space equal to that through which the shovel moves horizontally; to the said end of
35 this lever (the other being stationary) fix a chain, which passing under a pulley fixed to the outside of the end of the shovel box and passing in a horizontal direction through the said end and round another pulley fixed so near to the grate and between the aforesaid rails as the chain when passed round it and attached to the shovel is drawn out by the elevation of the said

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lever; the shovel will be thereby moved to the extremity of its range toward the grate, whilst another chain, attached also to the shovel, and passing directly through the said end of the shovel box, and over a pulley fixed on the outside thereof, raises a weight sufficiently heavy to draw the shovel back again from grate to the feed hole, whenever the cam has ceased to act upon the said 5 lever. That the respective movements of the sliding bottom plate (by which the coal is discharged from the feeder), and of the shovel (by which the coal is conveyed towards the grate horizontally, may correspond with each other in feeding the fire, it is necessary that the cam operating upon the sliding bottom plate shall cease to act on its lever, and the coal be discharged thereby 10 before the action of the shovel cam commences; and as the first-mentioned cam includes ninety degrees and the shovel cam one hundred and twenty degrees, the action of both may be accomplished in about two thirds of the revolutions of the said vertical and horizontal shafts upon which the said cams are respectively fixed, leaving a period of time equal to one third of the said 15 revolution for the operation of withdrawing the shovel from the grate to the feeding hole, preparatory to receiving the next charge. Upon the said grate shaft above and resting upon the said spur wheel I fix a circular plate of iron somewhat larger than the fire grate; upon this plate the ashes fall, and are by the motion of the plate urging them against an excentric bar of iron, 20 which bar is fixed to the side of the ash-pit, swept from the surface of the plate into the lower part of the ash-pit. With my said improved grate and its appendages the smallest coal may be used, but pieces larger than would pass through in every direction a ring four inches diameter, must be broken previously to their being put into the fire feeder. I have already intimated, 25 and I wish it to be clearly understood, that the said improvements which form the subject of the present Specification, do not consist in the invention or construction of the said revolving grate and fire feeder, these having been already described in my Specification of the Invention for which I obtained His Majesty's Royal Letters Patent, dated the Twenty-ninth day of June, in 30 the year One thousand eight hundred and nineteen, for certain improvements in steam engines and the furnaces of steam engines, by which a saving in the consumption of fuel is effected, and the combustion of the smoke is more completely attained, though I have thought it adviseable for the sake of perspecuity to repeat here many part of the description given in the Specifica- 35 tion just alluded to. The said improvements which form the subject of the present Specification consist in the means which I now employ and have before described), to apply the said circular grate and fire feeder to coppers for brewing, to stills, to reverberatory furnaces for melting or refining metals, to

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furnace for heating retorts, to the furnaces of stoves for annealing glass or cast iron, or to any other furnaces to which the said circular grate and fire feeder may be applicable, namely, the moveable support and side guides of the lower end of the upright shaft and the power of vertical movement now given
 5 to the said shaft, and the shovel now combined with the said fire feeder, as above described, it being by these means that the said revolving circular grate and fire feeder are rendered applicable to furnaces on which it would be either inconvenient or impracticable to introduce coal through the roof of the furnace.

10 In witness whereof, I, the said William Brunton, have hereunto set my hand and seal, this Seventeenth day of October, in the year of our Lord One thousand eight hundred and twenty.

WILLIAM (L.S.) BRUNTON.

AND BE IT REMEMBERED, that on the Seventeenth day of October,
 15 in the year of our Lord 1820, the aforesaid William Brunton came before our said Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stampt according to the tenor of the Statute made for that purpose.

20 Inrolled the Eighteenth day of October, in the year of our Lord One thousand eight hundred and twenty.

WHATELEY, Extra.

LONDON:

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

Witness's Deposition in the Cause of

James for having recourse to the furnace of gases for ascending the
or part of it, or to any other furnace in which the said cylinder gases and the
factor may be applied, except the movable support and side guide of the
lower end of the upright shaft and the power of vertical movement now given
to the said shaft, and the other new conditions with the said cylinder gases
above described, it being by these means that the said revolving cylinder gases
and the factor are rendered applicable to furnaces in which it would be
either inconvenient or impracticable to introduce coal through the neck of the
furnace.

In witness whereof, I the said William James have hereunto set my
hand and seal, this seventeenth day of October, in the year of our
said One thousand eight hundred and twenty.

WILLIAM JAMES (A.S.)

AND BE IT REMEMBERED that on the seventeenth day of October,
18 in the year of our said One thousand eight hundred and twenty,
said James the King in His Chancery, and acknowledged the said
affidavit, and all and every thing therein contained and specified, in form above
written. And also the said Specification of Invention was signed according to the
tenor of the Statute made for that purpose.

In witness whereof, I the said William James have hereunto set my
hand and seal, this seventeenth day of October, in the year of our said One
thousand eight hundred and twenty.

WILLIAM JAMES

LONDON:
Printed by George Kearsley and William Storer, Stationers,
Printers to the Queen's most Excellent Majesty, 1830.