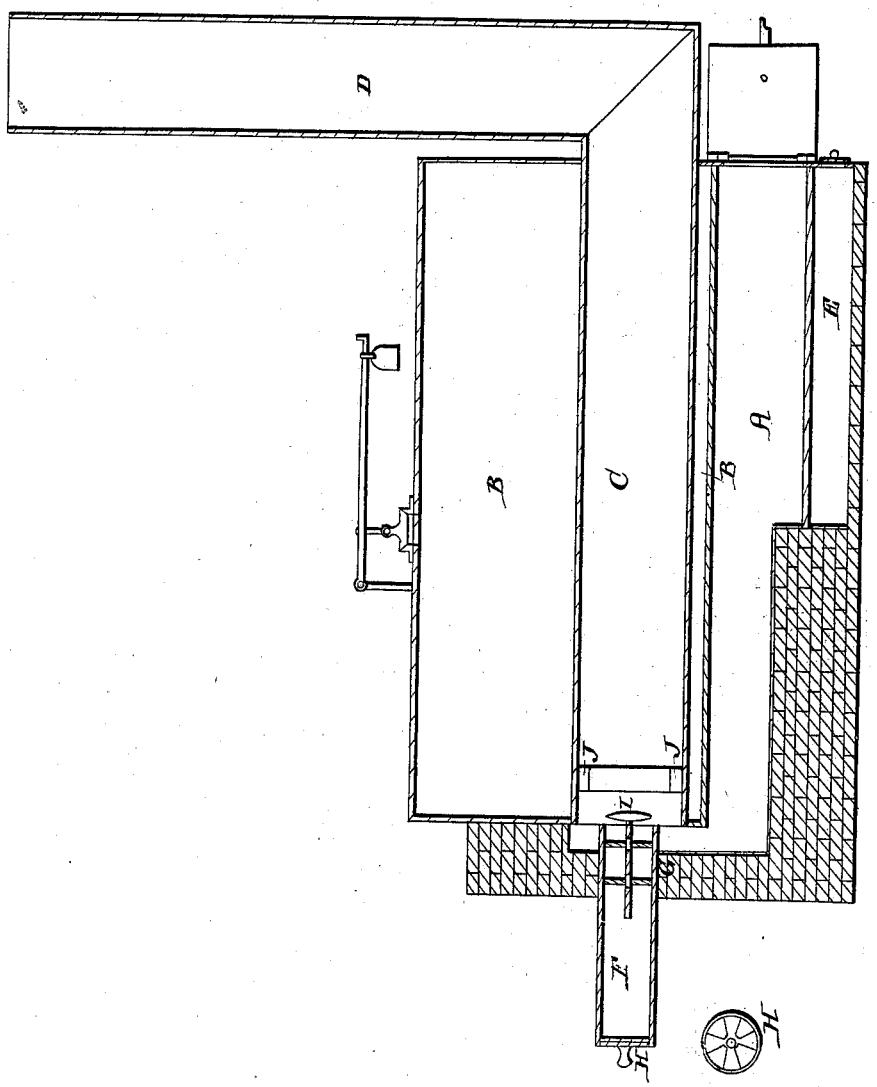
P. Robinson,

Steam-Boiler Furnace,

No. 3,555. Patented Apr. 20, 1844.



UNITED STATES PATENT OFFICE.

P. ROBINSON, OF WATERLOO, NEW YORK.

MANNER OF SUPPLYING AIR TO CONSUME THE COMBUSTIBLE GASES, &c., THAT ESCAPE FROM THE FURNACES OF STEAM-ENGINE AND OTHER BOILERS.

Specification of Letters Patent No. 3,555, dated April 20, 1844.

To all whom it may concern:

Be it known that I, PETER ROBINSON, of Waterloo, in the county of Seneca and State of New York, have invented a new and useful improvement in the manner of consuming the combustible gases and smoke which escape from the furnaces of steam-engine or other boilers and which are usually lost by passing out from the chimney either in a state of combustion or otherwise; and I do hereby declare that the following is a full and exact description thereof.

It is a well known fact that a large quantity of gaseous, combustible matter, in the form of oxid of carbon, and of carbureted hydrogen, is generated in the combustion of fuel in the furnaces of steam-engines, as well as in those of other kinds, and that such gas, accompanied sometimes by large quantities of smoke, escapes into the atmosphere in an unconsumed state, producing thereby a great waste of fuel. I am well aware that means have been taken to effect the combustion of this gaseous and fulginous fuel, by admitting currents of atmospheric air to flow into the fire chambers of steam-boiler furnaces, above the fuel, and that these means have been promotive of economy. I have, however, devised an apparatus to be applied to the flues of the boilers of steam-engines in such manner as to cause this combustion to be effected more advantageously than heretofore; and which apparatus may be applied, not only to boilers hereafter to be built, but may be added to those now in use.

By means of my improved apparatus I admit atmospheric air into the flue, or flues, of a steam-engine boiler, just above the fire chamber, at, or within, the mouth of the flue, instead of admitting it into said chamber, as heretofore done; and I thus effect the combustion of the gases, and smoke, at a point immediately in the vicinity of the interior of the flues, in which situation the atmospheric air, so admitted, is brought into more direct contact, and more immediately commingles with the gases and smoke to be burnt than is possible when it is admitted into the fire chamber itself. For this purpose, I carry an air-tube, or air-tubes, through the wall, or other material, which is usually situated at the rear end, but under some constructions at the fore end, of the boiler, immediately opposite to the flue, or flues, that pass through the boiler, allowing the center of such tube, or tubes, to coincide with the center, or centers, of said flue, or flues, or nearly so. On the outer end of the tube, so inserted, I place a register by which the quantity of atmospheric air admitted may be regulated at pleasure; and the inner end of said air-tube is usually furnished with a disk of metal so placed as to cause the atmospheric air to be discharged therefrom through an annular opening formed by such disk, and air-tube. Instead of introducing my supply of atmospheric air at the ordinary temperature, I sometimes introduce it in a highly heated state; in which case I connect the outer end of the supply tube with a pipe, or with pipes, which have been allowed to pass through, or so near to, the fire, or other source of heat, as shall elevate the temperature of the contained air to three, or four, hundred, or more, degrees of heat; although this heating of the atmospheric air may not be essential, it will be found to be a very advantageous mode of procedure.

The accompanying drawing represents a section of a boiler and furnace in a vertical plane, along their centers, from front to back.

A, is the furnace; B, the boiler, and C, a flue running through it in the ordinary manner.

D, is the chimney, and E, the ash-pit.

F, is the tube for supplying atmospheric air, which is shown as passing through the brick work G, at the back of the boiler, so as to enter the opening of the flue, C. The air-tube may be furnished with a revolving register, at H, to regulate the quantity of air admitted; this, however, may be governed by means of a throttle valve, or otherwise.

I, is a disk, at the inner end of the air-tube, to force the atmospheric air to commingle at once with the combustible gases and smoke escaping from the furnace; or this may be effected by closing the end of this tube, and making a number of perforations around it, close to its inner end; but the disk is preferred, as it may readily be made to slide in and out, so as to regulate the aperture at this end of the apparatus. The tube F, also, may be made to slide in and out, so as to regulate the distance to which its inner end shall enter the flue.

If there is sufficient supply of atmospheric air there will be no difficulty whatever in the igniting of the gases, as this ignition frequently takes place when they are escaping from the top of the chimney, which is at a great distance from the fire. It is important, however, that the quantity of atmospheric air admitted should be no greater than is actually necessary to insure the complete combustion of the smoke and inflammable gases; and as this will differ at different times, according to the nature of the fuel used, and other circumstances, the adjustments above designated are matters of much importance. Where there is little variation in the fuel, or in the other conditions of the use of the apparatus, it may, of course, be made stationary, in that situation which experience may point out as the best; the means of regulating the quantity of air admitted, always remaining.

I intend, sometimes, to contract the flue, so as to lessen its diameter to the amount of two, or three, inches, more or less, at a short distance from the opening of the air-tube into it, as shown at J, J. Such contraction will have the effect of more completely mixing the air and gases, and will not, as I verily believe, injuriously affect the draft, as the combustion of the smoke and gases will tend to accelerate it in a greater degree than the contraction will retard it.

It may be found useful to make the tube F, double, so as to form a water chamber and prevent its being burnt out. When the tube is stationary it may obtain its supply of water from the boiler, or it may be made to derive it from any other convenient source.

The advantages proposed by my improvement are, 1st, By the movable pipe or tube which is about half the size of the boiler flue, I have the means of contracting it at pleasure, which not only brings the gaseous matter in contact with the air, in a thin sheet, and in the proportions best suited to produce ignition, but by giving the column of gaseous matter this shape, while its volume is diminished, I increase its velocity, and impel it against the surface of the boiler flue. 2d. The sheet of gaseous matter as it enters the flue is converted into flame, which is thrown in a sheet upon the whole surface of the flue, thus exposing almost double the surface, to the action of this intense heat, which like that produced by the blow pipe, is rendered most intense, at the point where it is most available, instead of having the heated air pass through the flue in a mass, a small portion of which only is brought by radiation to act upon the surface of the flue. 3d. The annular opening formed by the disk, mentioned above, and in connection with the contraction of the flue, by means of the air tube, secures the effect above set forth, bringing the heat upon, and in contact with, the surface of the flue, instead of having it pass through in a mass. 4th. This apparatus also by sending the air through the thin sheet of gaseous matter, and coupled with the contraction of the boiler flue itself, produces a perfect commingling of the gascous matter, with the air, thus obviating the difficulty experienced by others, that in proportion to the amount of air introduced to effect this object more perfectly, the heat in the furnace is diminished. 5th. This sheet of flame so directed against, and brought in contact with, the surface of the boiler flue, entirely prevents the incrustation which would otherwise take place in it, from smoke and other matter, lodging upon it, and which being a non-conductor of heat, prevents the full action of the heated air passing through it, and so operates as a great drawback upon the production of steam in the boiler. 6th. Whatever heat is generated by my invention, is so much gained upon all past improvements, inasmuch as the carbonaceous matter is taken for use at a point in its progress to the smoke chimney, beyond which these improvements have sought to make any use of it.

Having thus fully described the nature of my improvement, in the manner of consuming the smoke and combustible gases that escape from the furnaces of steam engine or other boilers, what I claim therein as new, and desire to secure by Letters Patent, is—

The introducing of atmospheric air either at its ordinary temperature, or after it has been duly heated, into the end of the flues of such boilers, where the gaseous matter enters through a tube, furnished with a register or other means of regulating the quantity admitted, said tube being situated, arranged, and operating substantially in the manner herein set forth.

P. ROBINSON.

In presence of—
CHARLES S. SWIFT,
D. W. FORMAN.