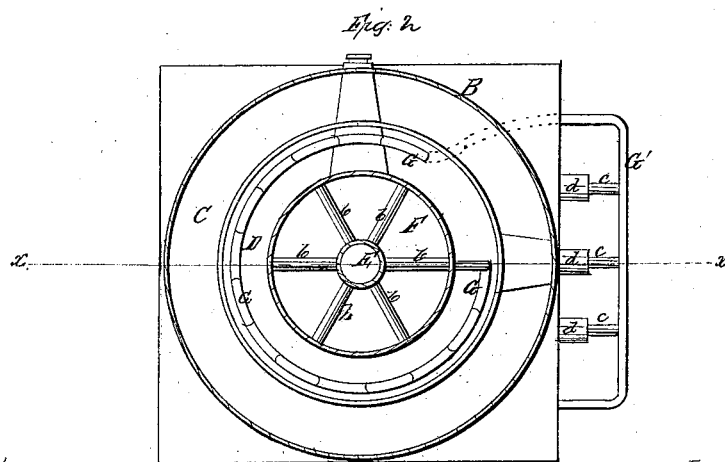
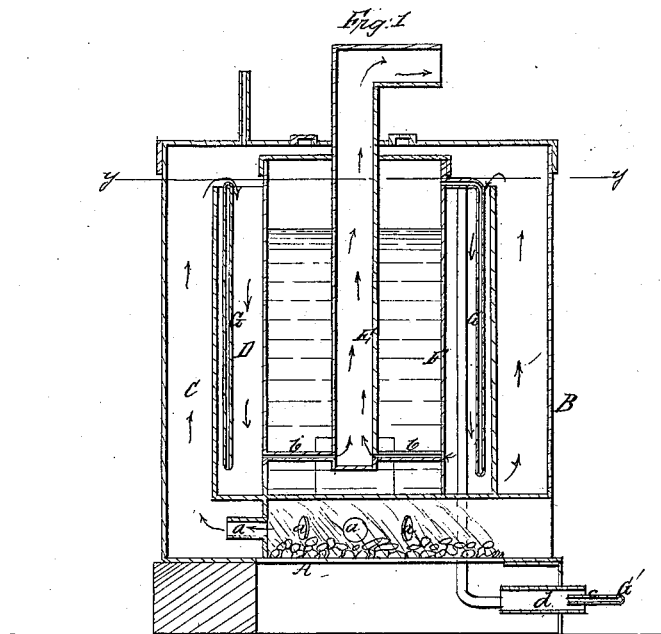


Bassett & Norfolk,
Steam-Boiler Furnace.
N^o 46,624. Patented Mar. 7, 1865.



Witnesses:
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UNITED STATES PATENT OFFICE.

J. A. BASSETT AND E. L. NORFOLK, OF SALEM, MASSACHUSETTS.

IMPROVED SYSTEM OF SUPPORTING COMBUSTION.

Specification forming part of Letters Patent No. 46,624, dated March 7, 1865.

To all whom it may concern:

Be it known that we, J. A. BASSETT and E. L. NORFOLK, of Salem, in the county of Essex and State of Massachusetts, have invented a new and Improved System of Supporting Combustion; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a vertical central section of a steam-boiler constructed according to this invention, the line *x x*, Fig. 2, indicating the plane of section. Fig. 2 is a horizontal section of the same, the plane of section being indicated by the line *y y*, Fig. 1.

Similar letters of reference indicate like parts.

This invention consists in supporting or effecting the combustion of carbonaceous fuel in furnaces or stoves by the introduction of superheated steam mixed with atmospheric air below the incandescent fuel, by which an instantaneous decomposition of the steam takes place into hydrogen and carbonic oxide, both of which are combustible and burn as gas above the layer of fuel, and this decomposition is more or less energetic, as the steam is more or less heated.

The object of our invention may thus be stated: It is to drive through the strata of fuel in a furnace a volume of highly-heated, highly-expanded steam made as hot as possible by continued superheating, which in its course through the incandescent fuel shall become decomposed, and by the change into a gaseous form transfers it where it may be of most service and perform most work.

When wet or comparatively cold steam from the boiler is brought in contact with the incandescent fuel, it will absorb as much heat from said fuel as the result of the decomposition will give out, and consequently no advantage will be derived from the use of steam not superheated. In fact, by bringing wet steam in contact with heated coal the temperature is soon lowered, so as to render the continued decomposition practically impossible; but when highly-heated steam is used the process is continuous and practicable, and the change into hydrogen and carbonic oxide goes

on continuously. If desired, heated air may be introduced in conjunction with superheated steam, which will be of importance in glass and other furnaces.

The means which can be used to carry out our invention are represented in the accompanying drawings.

A represents the furnace of a steam-boiler, B. The heated gases and products of combustion pass through channels *a* into the outside jacket, C, thence down through the inner jacket, D, and through pipes *b* to the smoke-stack E. The pipes *b* pass through the water-space F of the boiler, which, being surrounded by the jacket C, is exposed to a considerable heat.

Situated in the jacket C is a serpentine pipe, G, the upper end of which communicates with the steam-space of the boiler, whereas its lower end, G*, passes down below the grate H and out in front of the furnace, as clearly shown in the drawings. The pipe G* is provided with three (more or less) outlets, *c*. The steam, while passing through the serpentine pipe G, is superheated, and jets of superheated steam are introduced through the outlets *c* under the grate into the incandescent fuel. The outlets *c* may be made to pass into large pipes *d*, inserted in the front wall of the ash-pit, as shown in the drawings, so that by the currents of superheated steam passing through these pipes a certain quantity of air is sucked in, and the draft of the fire is thereby materially increased. The use of atmospheric air is, however, not necessary under all circumstances; or, if it is to be used, it can be introduced by different means from those above described.

We regard it as being important to use for this purpose very highly-heated steam; and we distinguish our invention from others which have been made in this line by this peculiarity. In the drawings a very large amount of heating-surface is shown and the steam is heated nearly red hot. The action of highly-heated steam upon the incandescent fuel is very different from the action of ordinary steam. Superheated steam is thoroughly expanded, and there is a less proportion of water present, bulk for bulk, than when ordinary steam is used, so that the steam is in the best possible condition to be decomposed. In the use of common steam a large portion of it is con-

densed and the remainder is little better than fog, and the decomposition is very slow. But there is a powerful elastic force in heated steam which drives its way through the fuel, increasing the combustion and making a vigorous decomposition.

We do not propose to introduce the steam above the grate-bars, as indicated in the patents of Hagen, Mason, and others. We have found that when the steam is introduced above the grate, not having the entire strata of fuel to pass through, a large portion of it escapes decomposition. Neither can the steam be so thoroughly and evenly distributed to the fuel as when used below the grate.

It is desirable in the use of fuel for various heating purposes to convey the gaseous products of combustion to parts of the furnace or heating apparatus not readily reached by the direct action of the strata of fuel. This arrangement facilitates this transfer of heat where it will be of most service and do most work.

The quantity of air being injected with the steam depends (other things being equal) upon the pressure of the steam, and for melting purposes, forges, &c., a very high pressure will be required—say, from eighty to one hundred pounds.

In applying our invention to a cupola-fur-

nace we prefer to place the jets all round the same at or near the place where the air is admitted now. The superheating-pipes may be placed over the mouth of the cupola and receive the waste heat from the escaping gases. This arrangement may also be used with glass-furnaces.

We also find that our invention is applied with better advantage to thick fires having strata of fuel at least six to eight inches deep, and for some purposes from ten to eighteen inches. A considerable saving in fuel can thereby be effected, and inferior fuel can be used with great advantage.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

Supporting or effecting combustion in furnaces, stoves, &c., by the introduction of superheated steam with or without air, substantially as herein described.

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