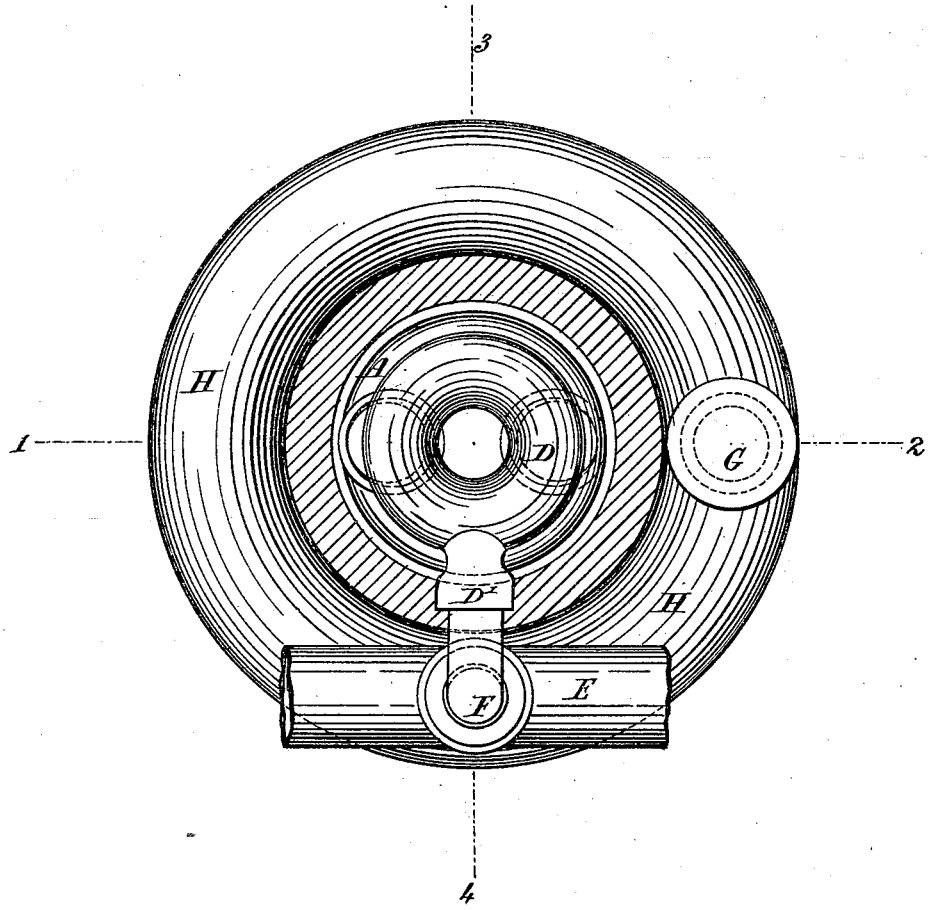
3 Sheets—Sheet 1.

A. WILSON.

COMBINED CUPOLA-FURNACE AND HOT-BLAST OVEN.

No. 191,213. Patented May 22, 1877.

Fig. 1.



Witnesses.
Michael Ryan
Fred. Haynes

Inventor.
Alex. N. Wilson,
by his Attorneys
Brown & Allen

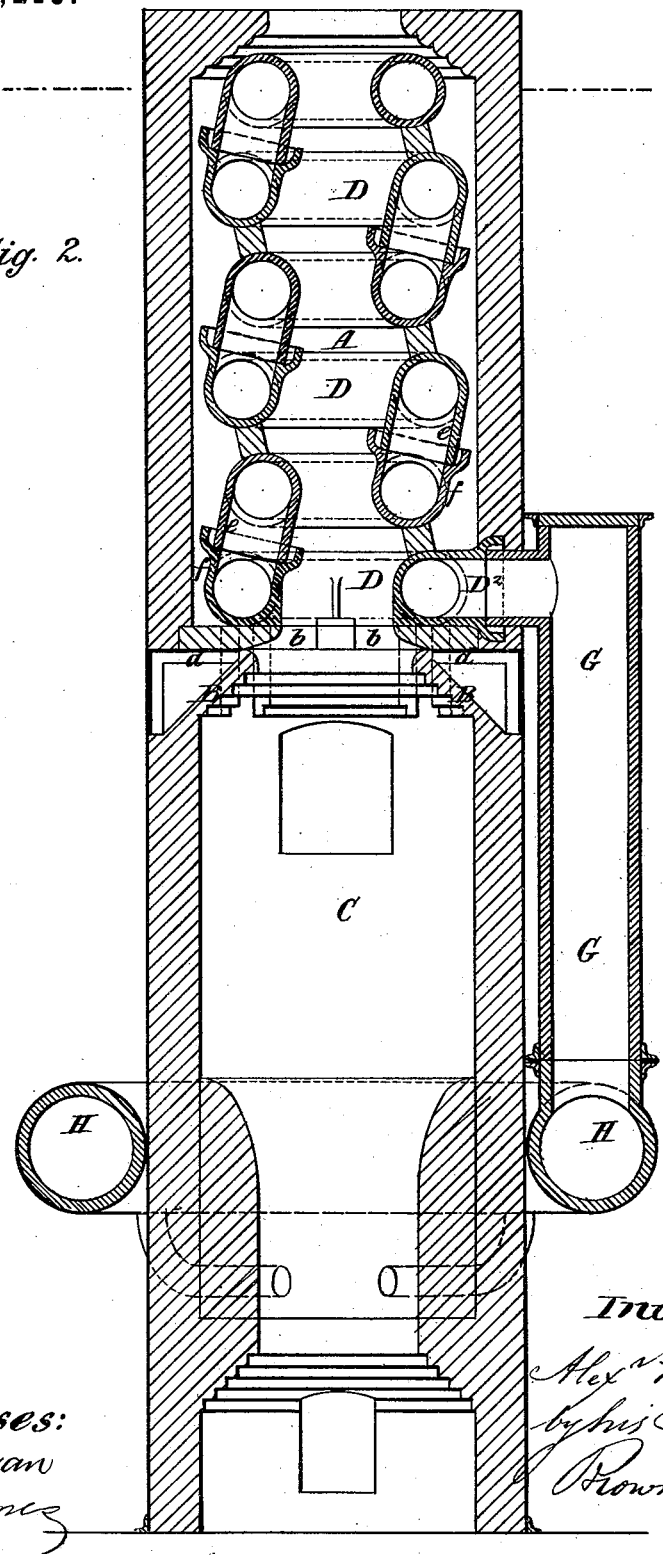
3 Sheets—Sheet 2.

A. WILSON.

COMBINED CUPOLA-FURNACE AND HOT-BLAST OVEN.

No. 191,213. Patented May 22, 1877.

Fig. 2.



Witnesses:
Michael Ryan
Geo. Haynes

Inventor
Alex. Wilson
by his Attorneys
Brown & Allen

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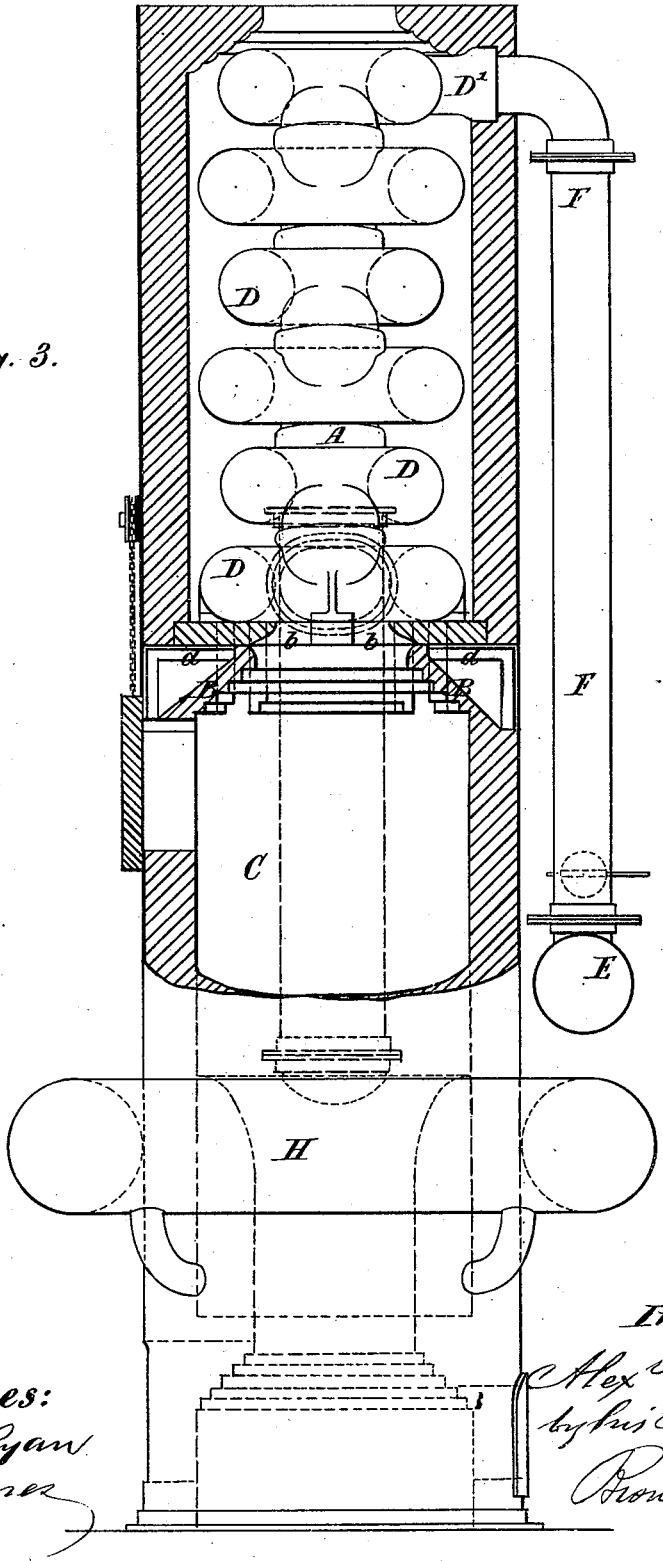
A. WILSON.

COMBINED CUPOLA-FURNACE AND HOT-BLAST OVEN.

No. 191,213. Patented May 22, 1877.

Fig. 3.



Witnesses:
Michael Ryan
Fred. Haynes

Inventor.
Alex Wilson
by his Attorneys
Brown & Allen

UNITED STATES PATENT OFFICE.

ALEXANDER WILSON, OF SHEFFIELD, ENGLAND.

IMPROVEMENT IN COMBINED CUPOLA-FURNACE AND HOT-BLAST OVENS.

Specification forming part of Letters Patent No. **191,213**, dated May 22, 1877; application filed December 27, 1876.

To all whom it may concern:

Be it known that I, ALEXANDER WILSON, of Sheffield, in the county of York, England, have invented certain Improvements in Combined Cupola-Furnace and Hot-Blast Ovens, of which the following is a specification:

This invention consists in the combination, with a cupola-furnace having an air-heating chamber above its mouth, of a series of horizontal detachable pipe-sections or annuli, arranged one above another within said chamber, of alternately-varying diameter, and secured together by suitable cup flange joints, the arrangement of parts being such that the air-blast of the furnace is circulated through the pipe-sections, and is heated by the escaping products of combustion prior to discharging the furnace at the tuyeres, as more fully hereinafter described.

In the accompanying drawing, which illustrates the application of the invention to a cupola-furnace, Figure 1 is a horizontal section of the furnace taken through the upper part of the heating-chamber. Fig. 2 is a vertical section of the same on the line 1 2 of Fig. 1; and Fig. 3 is another vertical section taken in the line 3 4 of Fig. 1.

A is the heating-chamber, formed by coving over the brick lining of the cupola C a short distance above the charging-hole, as at B, and, also, coving over the same at the top, a contracted opening, *b b*, being left between the said chamber and the part of the furnace below for the passage of the gases which are evolved from the fuel.

In the above-mentioned heating-chamber A I place a series of horizontal rings of cast-iron pipes, D, supported on brackets *d d*, which are fixed to the inside of the cupola-casing. Each ring of pipes D is made separate, and is provided with an inlet and an outlet branch, by which the whole series are connected. It will be seen that the inlet-branch *e* of the air-pipes D is inserted and rests in a flange, *f*, of the pipe immediately below it, so that should any one of the pipes or tubular rings D become defective or damaged it can be easily removed by first raising up the tubular rings or pipes D above it, and then a fresh or perfect ring or pipe can be inserted in the place of the defective one.

The said rings or annuli D D are of different diameters, and arranged so that a larger one and a smaller one are alternatel superposed.

It will be evident that the joints of the pipes D may be luted with sand, or otherwise, if desired, so as to prevent leakage of the air. The cold air is brought from the main air pipe E by an uptake-pipe, F, and is admitted into the inlet-branch of the top tubular ring D^1; from thence it passes through the whole series of rings of pipes D D, and out through the outlet-branch of the bottom ring of pipe D^2. The heated air-blast is then conveyed, by means of a brick-lined down-take-pipe, G, into an annular space or chamber, H, fixed round the outside of the cupola, and from this chamber it is distributed through the tuyeres into the cupola, in the usual manner.

By allowing a sufficient quantity of air to pass through the charging-hole, or through small apertures entering the combustion-chamber from the outside of the cupola in a line with the charging-door, which quantity can be regulated by a sliding door or flappets, such a mixture of air with the ascending gases will be obtained as to insure the combustion of the latter on their passage from the furnace. The temperature of the heating-chamber A can also be increased or regulated by the addition of small quantities of fuel to the "charge."

By this system of heating pipes and con-construction of the chamber a very effective, and, at the same time, very economical, heating of the air is obtained. The contracted construction of the heating-chamber A at the top and bottom causes it to collect, and, in some degree, retain the gases for heating the air-pipes, while the varying diameters of the rings D D cause the gases discharged from the furnace to play over and around the said rings in a zigzag or sinuous course, so that all parts of the said rings are exposed to the action of the said gases, and the said gases are very perfectly consumed.

Having now described my invention of improvements in the method of and apparatus for utilizing the waste heat of cupola and other furnaces, and having explained the manner of carrying the same into effect, what I claim as my invention is—

The combination, with a cupola-furnace

having an air-heating chamber situated above its mouth, of a series of horizontal detachable pipe-sections or annuli, arranged one above another within said chamber, of alternately-varying diameter, and secured together by suitable cup-flange joint, the arrangement of parts being such that the air-blast of the furnace circulates through the pipe-sections, and is preheated by the escaping combustion-products prior to discharge into the furnace at the tuyeres, substantially as herein shown and described.

Dated the 16th day of November, 1876.

ALEX. WILSON.

Witnesses:

WM. E. TATTERSHALL,
Notary Public, Sheffield.

ALFD. KENDALL,
Clerk to Messrs. Watson & Esam, Solicitors, Sheffield.