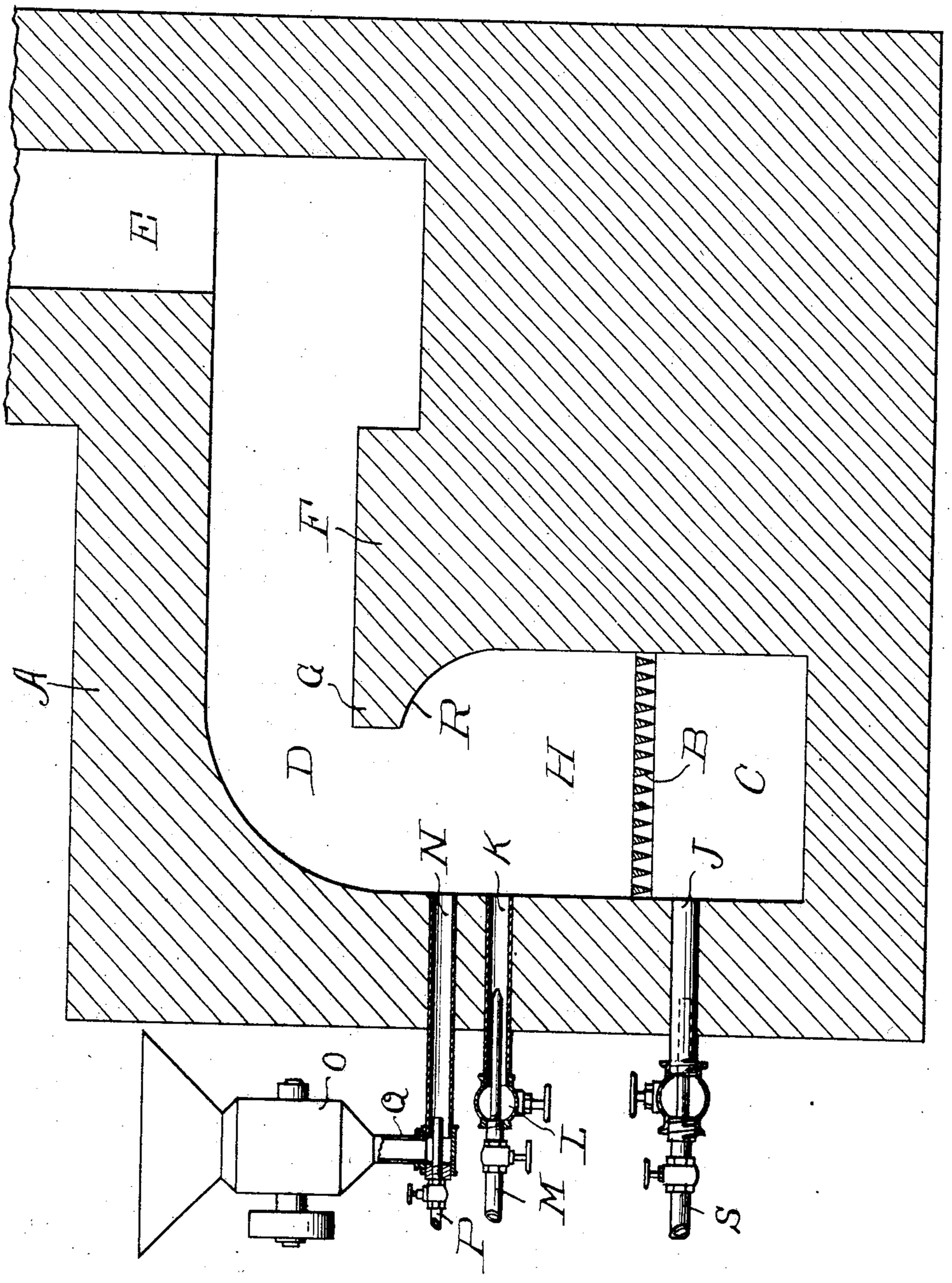
No. 785,990. PATENTED MAR. 28, 1905.

G. S. WELLES.

METHOD OF FIRING.

APPLICATION FILED JUNE 8, 1904.



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UNITED STATES PATENT OFFICE.

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METHOD OF FIRING.

SPECIFICATION forming part of Letters Patent No. 785,990, dated March 28, 1905.

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To all whom it may concern:

Be it known that I, GEORGE S. WELLES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods of Firing; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a novel method of firing in a furnace, the object being to produce high temperatures and perfect combustion at minimum cost; and it consists in the various steps hereinafter fully described and claimed.

The accompanying drawing shows a furnace in vertical section suitably constructed for carrying out my method.

My said method includes as an essential element the use of finely-granulated coal as distinguished from pulverized coal, and consists, essentially, in introducing such granulated coal, by means of compressed air, into a furnace which has been previously heated by suitable means to a temperature so high as to immediately act upon the coal particles to expel the volatile combustible constituents and ignite the latter and the resulting coke particles, the latter being deposited upon a suitable bed or grate and further supplied with oxygen from a suitable source to insure complete combustion thereof.

A further important feature of my method consists in concentrating the heat in the furnace by deflecting the jet of commingled coal particles and air downwardly toward the incandescent bed of coke resulting from the deposit of said coke particles, so that the heat produced by the latter and by the combustion of the volatile constituents or gases will be brought into close proximity and form substantially a single fire, the heat of which is very intense. The heat produced by the latter is sufficiently intense to maintain the walls of the furnace sufficiently hot to reignite the fuel in the event of a temporary break in the feed; but such breaks are practically entirely obviated by reason of the relative coarseness of the particles as compared with the substantially impalpable powder generally used, such coarser particles being more readily separated.

A further important step in the method consists in introducing a combustible fluid commingled with air below the grate or bed upon which the coke particles are deposited, the air introduced being so much in excess of the fluid as to leave a sufficient surplus of oxygen for the combustion of the coke, such, combustible fluid serving to heat the air before it reaches the coke and insure ignition of such coke in the event that the same should fail to be ignited by the heat of the furnace.

In order to heat the furnace to a high degree before introducing the granulated coal, I inject into the same a jet of commingled combustible fluid and air—as, for instance, carbureted air, gas and air, or atomized hydrocarbon and air.

The apparatus used in carrying out my method as shown in the accompanying drawing comprises the furnace A, having a grate B, ash-pit C, and flue D, leading to the chimney-flue E, the bridge F having a projection G overhanging the fire-chamber H above the grate. Compressed air is introduced into the ash-pit C through the valve-controlled pipe J, and the commingled gas and air, atomized oil, or carbureted air is introduced through pipe K, the latter being connected, by means of the pipe L, with the source of supply of compressed air and by means of the valve-controlled pipe M with the source of supply of hydrocarbon fluid. The granulated coal is fed through the pipe N, connected with the mill O or other source of supply, such coal being injected by means of compressed air introduced through the valve-controlled pipe P at a point forward of the point of admission of the coal-dust to said pipe N, there being openings Q in the coal-feed pipe entering said pipe N for the admission of further air, which is drawn in by the partial vacuum produced by the injection of compressed air and carries the coal-dust into the path of said compressed air. The said pipe J is also connected with the source of supply of combustible fluid, preferably car-

bureted air, by means of the valve-controlled pipe S, this connection being identical in construction with the connection of the pipe M with the pipe K.

The lower face of the projection G and the adjacent wall of the fire-chamber meet in a curve R, which forms a deflector, which is in substantially horizontal alinement with the pipe N and against which the jet of air and coal-dust impinges and is deflected downwardly, the curved surface serving to cause the gases to whirl in the fire-chamber and concentrating the heat therein.

The furnace herein shown and described is of a type particularly adapted for use in forge-shops, but may be varied in general shape to suit any desired purpose, as will be obvious.

In starting the fire I preferably place upon the grate B a quantity of waste or similar absorbent material soaked with oil and ignite the latter and then introduce the commingled combustible fluid and air both above and below the grate. Such fluid will obviously be ignited by the fire on the grate and will produce a flame which practically fills the entire fire-chamber H and will heat the walls of said chamber to a high temperature. As soon as the walls of said chamber H have attained the desired temperature the granulated coal is introduced by means of compressed air in a continuous stream, which is directed against the curved wall R. The intense heat of the furnace immediately decomposes the fine particles of coal by freeing the volatile constituents in gaseous form, the latter and the resulting coke particles being immediately ignited. The coke particles are deflected downwardly and fall upon the grate B or the fire thereon and by reason of the constant supply of compressed air through the pipe J serve to maintain a constant fire upon the grate, the heat from which is intense. At the beginning of the introduction of the granulated coal the supply of combustible fluid and air is preferably partially or entirely shut off. If partially shut off at such time, the supply is gradually further reduced until it is entirely shut off, when the supply of granulated coal and air has been properly adjusted by the operator to produce the best results, the object of partially maintaining the supply of such fluid after introducing the supply of coal being to prevent any reduction in temperature of the walls of the furnace, the heat of the latter being subsequently maintained by the combustion of the granulated coal introduced.

The supply of combustible fluid may be continued indefinitely if it is desired to maintain a maximum temperature in the furnace; but for average purposes the temperature produced by the granulated coal is amply sufficient.

The supply of compressed air and combustible fluid below the grate is preferably continued, the air being very much in excess of the amount necessary to the combustion of such fluid. The combustion of the latter serves to heat the excess air and, further, to ignite the coke particles should the latter fail to be ignited by the heat of the furnace. The introduction of hot air below the grate will obviously tend to intensify the heat produced by the coke.

The advantages resulting from the use of granulated coal as distinguished from finely-pulverized coal are many. The cost of grinding such coal is very much less and the coal retains a larger percentage of combustible matter, a part of which is always lost in grinding, the percentage lost increasing with the degree of fineness to which the coal is reduced. Finely-pulverized coal is held in suspension in the gases and is easily carried out of the furnace therewith and is thus scattered as to render it impossible to produce the best results. Granulated coal on account of its greater weight is not easily carried by the gases into the chimney-flue or boiler-flues, where the fine ash resulting from finely-pulverized coal is deposited. Such ashes when deposited in the boiler-flues obviously partially insulate the walls of the flues against absorption of heat from the gases.

By causing the granulated particles to strike the opposite wall of the furnace they are caused to rebound and are thus held in the heat center for a sufficient length of time to insure complete decomposition and ignition.

I claim as my invention—

1. The method of firing granulated fuel in a furnace, consisting in maintaining the combustion-chamber at a temperature to decompose the granulated fuel as injected therein, and to ignite the constituents thereof, injecting the fuel into the chamber under pressure and simultaneously supplying oxygen for its combustion, directing the solid constituents upon a grate and there providing oxygen for the complete combustion of such solid constituents.

2. The method of firing granulated fuel in a furnace, consisting in maintaining the combustion-chamber at a temperature to decompose the granulated fuel, as injected therein, and to ignite the constituents thereof, injecting the fuel into the chamber under pressure and simultaneously supplying oxygen for its combustion, directing the solid constituents upon a grate, maintaining a fire at said grate of a character such that the solid constituents projected thereon are completely burned.

3. The method of firing in a furnace which consists in first heating said furnace to a high temperature, then introducing into said furnace at one side a continuous jet of commingled granulated coal and compressed air,

the heat of said furnace being adapted to free the volatile constituents of the coal and ignite the same together with the resulting coke particles, directing said jet of coal and air against the opposite wall of the furnace and deflecting same downwardly to cause said coke particles to deposit in the lower portion of the furnace, and introducing compressed air below the bed of coke particles to maintain combustion thereof.

4. The method of firing in a furnace which consists in first building a fire therein and introducing compressed air below said fire to force combustion and produce a high temperature, then introducing above said fire a continuous supply of commingled combustible fluid and air, maintaining the said supply until the walls of said furnace have attained a high temperature, then introducing into said furnace above said fire a continuous jet of commingled granulated coal and air, the high temperature being adapted to free the volatile constituents of said coal and ignite the same and the resulting coke particles, and causing said coke particles to be deposited upon the fire to continuously feed the latter.

5. The method of firing in a furnace which consists in first heating said furnace to a high temperature, then introducing into said furnace a continuous jet of commingled granulated coal and air under pressure, the heat of the furnace serving to free the volatile constituents of the coal and ignite the same together with the resulting coke particles, causing said coke particles to be deposited on a grate or the like, and introducing below said grate or the like a constant supply of combustible fluid commingled with an excess of compressed air.

In testimony whereof I have signed my name in presence of two subscribing witnesses.

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