2 Sheets--Sheet 1.

H. A. BROOKE & W. F. WRIGHT.

Coal-Tar Burner.

No. 167,873. Patented Sept. 21, 1875.

FIG. 2.

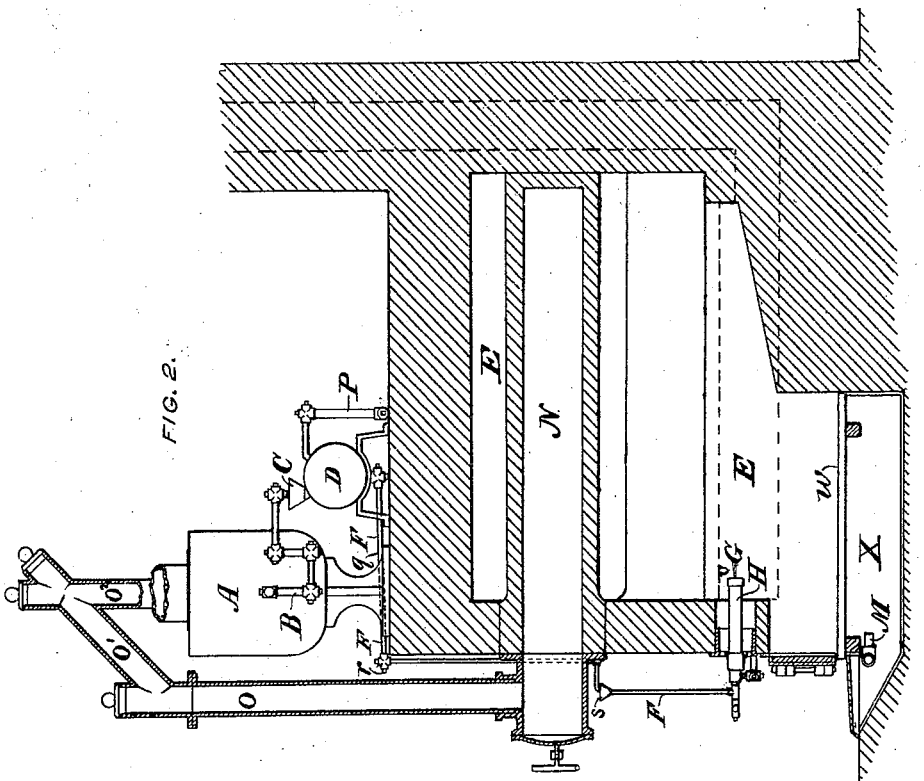
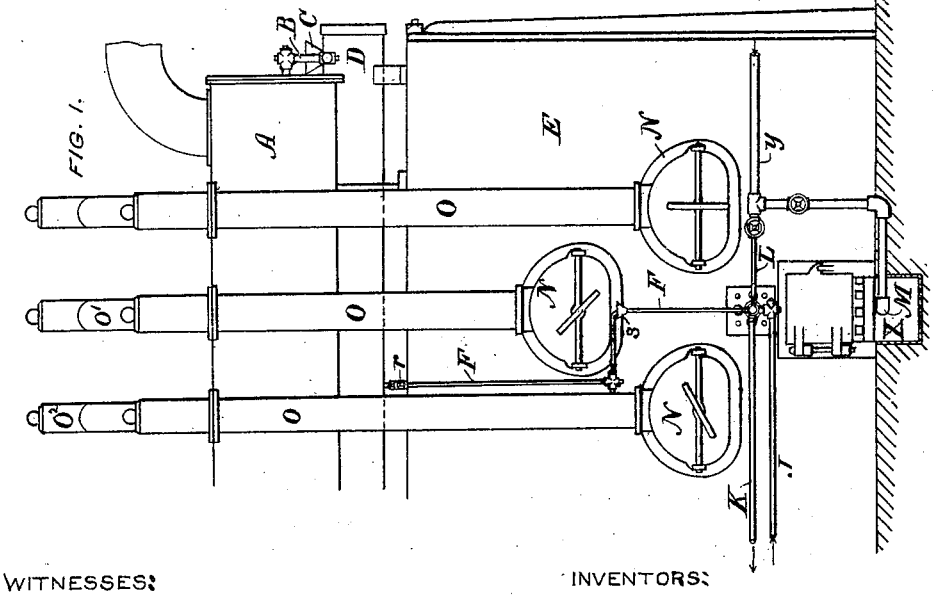


FIG. 1.



WITNESSES:

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James T. Goodfellow

INVENTORS:

Howard A. Brooke.

William F. Wright

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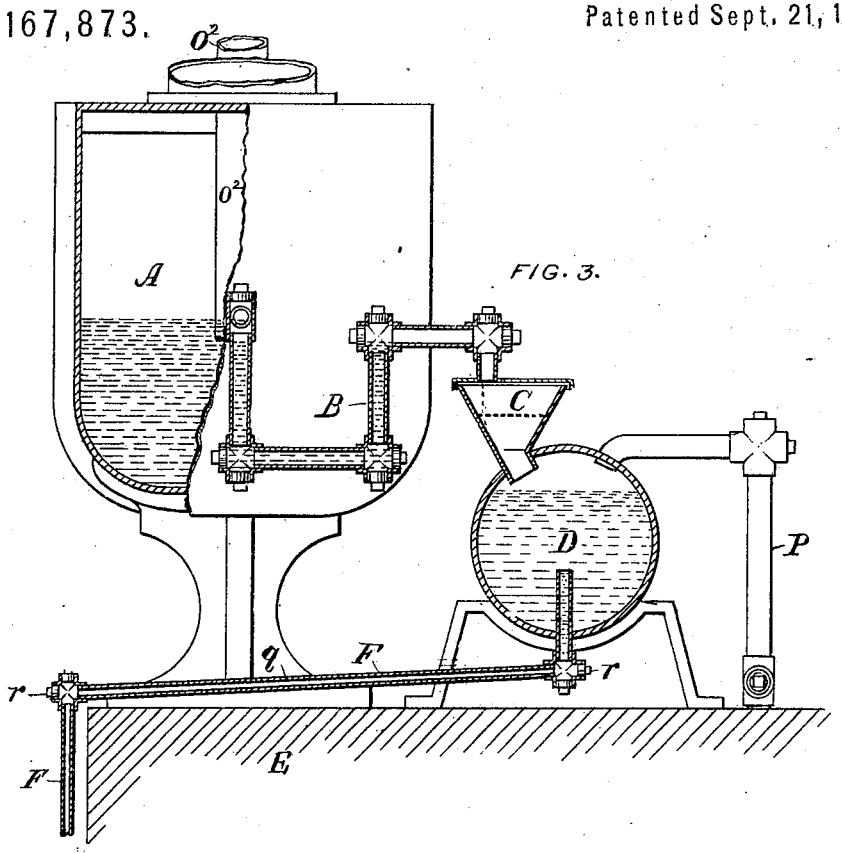

FIG. 3.

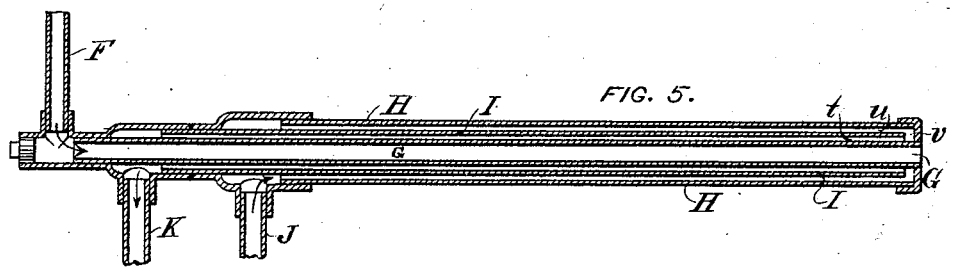

FIG. 5.

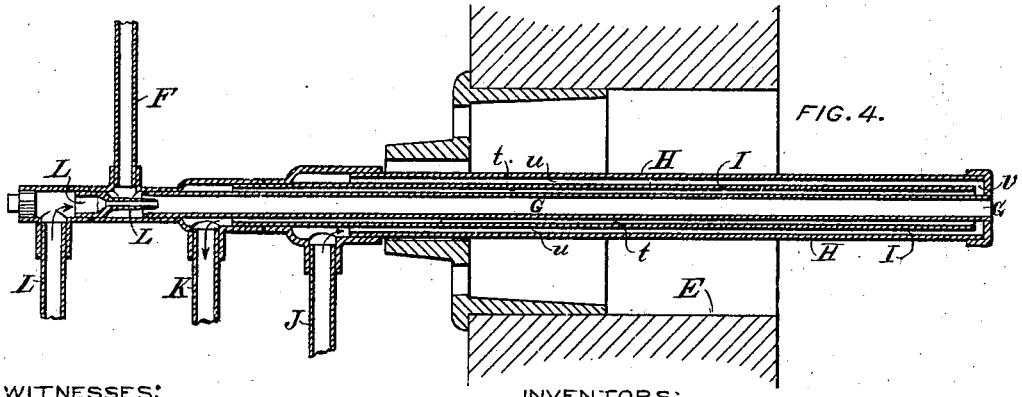

FIG. 4.

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UNITED STATES PATENT OFFICE.

HOWARD A. BROOKE AND WILLIAM F. WRIGHT, OF ALBANY, NEW YORK.

IMPROVEMENT IN COAL-TAR BURNERS.

Specification forming part of Letters Patent No. **167,873**, dated September 21, 1875; application filed August 7, 1875.

To all whom it may concern:

Be it known that we, HOWARD A. BROOKE and WILLIAM F. WRIGHT, both of the city of Albany, in the county of Albany and State of New York, have jointly invented certain new and useful Improvements in Coal-Tar Burners, of which the following is a specification, reference being had to the accompanying drawings.

The tar which is ordinarily deposited in the hydraulic mains of coal-gas works is generally of little commercial value, and various devices have been tried for burning it in connection with coke or solid fuel in gas-retort furnaces, but generally with unsatisfactory results.

Some of the difficulties which have attended the burning of such coal-tar in such furnaces have resulted from the presence of solid grains and tough, viscid, and jelly-like matters in the tar as commonly deposited in the hydraulic main and ordinarily discharged therefrom; from the almost constant watching and frequent readjusting of regulating-cocks in the pipes for conducting the tar to the burners; from the heating of the discharge-pipes of the burners so as to coke the coal-tar therein, and thereby stop up such discharge-pipes; from failure to keep the discharge-pipes clear and from being overheated, and to properly atomize and discharge the coal-tar into the furnace; and from the want of air positively introduced into the furnace through the burning fuel over which the coal-tar is introduced and burned.

To obviate or lessen such defects is the principal object of our present invention, of which one part consists in the combination, with the hydraulic main, of an inverted tar-discharging siphon, a strainer, and a tar-receiving vessel, so that the crude coal-tar will be drawn out of the hydraulic main through the inverted siphon without altering the pressure of the gas in the main, and without loss of gas, and will be passed through the strainer, and thereby separated from the larger solid grains and tough jelly-like matters, and, when thus purified, will be passed into and retained in the receiving-vessel, from which it can be conveniently drawn off to the burner or burners.

Another part of our invention consists in the combination, with a furnace, and a burner-pipe arranged to discharge coal-tar into the furnace, of a reservoir or vessel containing coal-tar, and located above such discharge-pipe, and connected with the latter by a supply-pipe, which is of such internal diameter and length that it will not be liable to be stopped by the solid, viscid, and jelly-like matters in the coal-tar, and will at the same time deliver only a proper uniform, or nearly uniform, quantity of coal-tar from the reservoir to the discharge-pipe of the burner, and the said supply-pipe being formed at its angle or angles with a removable cap or caps, or plug or plugs, for convenience in occasionally clearing the said supply-pipe of any deposits that may gradually accumulate therein.

Another part of our invention consists in the combination, with the discharge-pipe in communication with a supply of coal-tar, of pipes or passages surrounding the discharge-pipe and in communication with each other and with water-supply and discharge pipes, so that the portion of the discharge-pipe which is exposed to great heat shall be surrounded by a current or currents of water circulating through the said surrounding pipes or passages, and thereby prevented from becoming so hot as to coke the coal-tar therein.

Another part of our invention consists in the combination, with a furnace, of a coal-tar-discharge pipe, water-circulating pipes or passages around the discharge-pipe, a pipe supplying coal-tar to the discharge-pipe, and an air-blast injector, whereby the discharge-pipe is prevented from becoming unduly heated, and at the same time the coal-tar is forced through and out of the discharge-pipe and into the furnace, and in an atomized or diffused condition, and mixed with air, which will help support the combustion of the coal-tar in the furnace.

Another part of our invention consists in the combination, with a furnace, of a coal-tar-supply pipe, a coal-tar-discharge pipe, an air-blast injector applied to the discharge-pipe, and an air-blast-discharge pipe in a closed pit under the fuel-supporting grate of the furnace, whereby the coal-tar is forced through and out of the discharge-pipe in an atomized condition and mixed with air, and into the furnace over the burning solid fuel on the grate, while a blast of air under artificial pressure is blown

into the closed pit of the furnace, and thence through the burning fuel on the grate, so as to support the combustion of that fuel and insure, or assist in, the burning of the coal-tar above.

In the aforesaid drawing, Figure 1 is a front view, and Fig. 2 is a partial sectional elevation, of a portion of an ordinary coal-gas-retort furnace, showing a coal-tar burner combined therewith according to our present invention. Fig. 3 is a sectional elevation of a part of the same, on an enlarged scale; and Figs. 4 and 5 are sections, on a larger scale, of parts of the same burner.

A is the hydraulic main, mounted on the furnace E, in which are mounted the gas-generating retorts N, which are connected with the hydraulic main by the pipes O O^1 O^2, as usual. B is an inverted siphon-pipe, which taps the hydraulic main at or about the level at which the coal-tar is to be maintained, and which extends downward and upward far enough to form a liquid seal, which will prevent the gas from escaping from the hydraulic main through that pipe. The discharge end of the pipe B is below the level of the liquid in the hydraulic main, and is over a strainer, C, on a reservoir, D, so that the tar will run from the main A through the pipe B, and thence upon and through the strainer C and into the reservoir D. The strainer C is of such structure that it will permit the tar to run through it quite freely, but will retain the coarse grains and tough jelly-like matters from the tar.

The coal-tar thus purified will run through the feed and discharge pipes of the burner far more freely and uniformly than the crude coal-tar directly from the hydraulic main.

P is an overflow pipe to carry off the surplus coal-tar from the reservoir D.

In coal-tar burners heretofore made the supply of the tar to the burner has commonly been regulated by a cock in a large feed-pipe; but in such cases the regulating-passage through the cock has been so extremely short that it required to be so nearly closed to allow only the proper small quantity of the tar to pass to the burner that the very narrow passage through the cock was so liable to be stopped by the solid or thick matters in the tar that the burner required to be almost constantly watched and the cock very frequently opened wide and then skillfully readjusted to keep the burner properly supplied with the coal-tar. To obviate that difficulty, we dispense with any regulating-cock in the feed-pipe F, which conducts the coal-tar from the reservoir D to the discharge-pipe G, which delivers the coal-tar into the furnace E, and makes either the upper part *q*, or the main portion, of the pipe F of so large internal diameter that it will not be stopped by the ordinary solid or thick matters in the coal-tar, and at the same time so long and so small in diameter that the pipe will, by reason of the very considerable adhesion of the coal-tar to the interior surface of the pipe, allow only the required quantity of the tar to pass to the discharge-pipe G of the burner. We also make such graduating feed-pipe F with a detachable cap or plug, *r*, at its angle or angles, so that, by removing such cap or plug, any solid matters that may ever accumulate in that pipe can be readily removed by means of a suitable clearing-rod. The feed-pipe F may, preferably, be in two parts, slightly separated, as at *s* in Figs. 1 and 2, with a funnel on the lower part to receive the tar from the upper part and to permit inspection of the flow of the tar, and to allow the discharge portion of the burner to be conveniently removed from the furnace for repairs.

The pipe G, Figs. 4 and 5, by which the coal-tar is conducted from the feed-pipe F into the furnace, is surrounded by a pipe, I, so as to leave an intervening tubular passage, *t;* and the pipe I is surrounded by the pipe H, with an intermediate tubular space, *u*, which latter is in communication with a water-supply pipe, J, and also with the space *t* at the end *v;* and the space *t* is in communication with a water-discharge pipe, K, so that a current of water will pass from the pipe J first through the pipe H and passage *u*, and thence through the pipe I or passage *t*, and away through the pipe K, and will thereby prevent the pipe G from being heated in the furnace to a degree which would coke or vaporize the coal-tar in the latter pipe. With a like result the water may pass from the pipe K through the pipe I, and thence through the pipe H or passage *u*, and away by the pipe J; or, as regards this invention, any other equivalent arrangement of water-conducting pipes along the coal-tar discharge-pipe G may be adopted.

While the water-pipes H I J K keep the coal-tar from being vaporized or coked in the pipe G, the tar may be permitted to simply run out of the end *v* of the pipe G into the furnace, and there burned over the coke, coal, or other similar fuel burning on the grate *w*. We, however, commonly combine with the pipes F G and H I an injector-pipe, L, Fig. 4, which is in communication with a supply of air under artificial pressure, as from a fan or other suitable blower, (not shown in the drawings,) so that a blast of air shall be discharged from the injector-pipe L into and through the tar delivered into the pipe G by the pipe F, so as to mix with that tar and force it through and out of the pipe G and into the furnace in an atomized or diffused condition over the burning fuel on the grate, and there assist in supporting the combustion of such diffused coal-tar.

In the closed ash-pit X, Fig. 2, under the grate *w*, on which solid fuel is burned, is an air-blast discharge-pipe, M, which has communication by a pipe, *y*, Fig. 1, with a supply of air under artificial pressure, produced by a fan, bellows, or other suitable blower, (not shown in the drawing,) so that a current of air under artificial pressure shall be thereby introduced into the closed ash-pit X, and thence forced upward through the burning fuel on the grate, and thereby highly heated, so as to in-

flame and insure the combustion of the atomized coal-tar introduced into the furnace by the feed-pipe F, discharge-pipe G, and air-blast injector L.

We do not claim the straining of coal-tar; nor the passage of coal-tar through a pipe of a certain diameter and length; nor a furnace with a blast-pipe or injector therein surrounded by water-circulating pipes; nor the atomization and discharge of liquid fuel into a furnace by means of an air-blast injector; nor the introduction of a blast of air into the closed ash-pit of a furnace.

What we claim as our joint invention is—

1. The combination of the hydraulic main A, inverted discharge-siphon B, strainer C, and receiving-vessel D, substantially as set forth.

2. In combination with the furnace E, the coal-tar reservoir D, graduating feed-pipe F, having the removable angle part *r*, and the discharge-pipe G, substantially as set forth.

3. The combination of the discharge-pipe G, in communication with a supply of coal-tar, and the surrounding pipes H I, in communication with each other and with water supply and discharge pipes J K, substantially as described.

4. The combination of the discharge-pipe G, surrounding pipes H and I, communicating with each other and with water supply and discharge pipes J K, coal-tar-supply pipe F, and injecting air-blast pipe L, substantially as described.

5. In combination with the furnace E, having a closed ash-pit, X, under a fuel-supporting grate, *w*, the coal-tar-supply pipe F, discharge-pipe G, injecting air-blast pipe L, and blast-pipe M, discharging air under the fuel-grate of the furnace, substantially as described.

In testimony whereof we hereto sign our names this 14th day of July, 1875, in the presence of two subscribing witnesses.

HOWARD A. BROOKE.
WILLIAM F. WRIGHT.

Witnesses:
AUSTIN F. PARK,
JAMES T. GOODFELLOW.