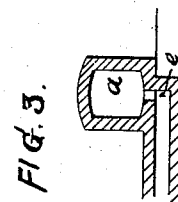
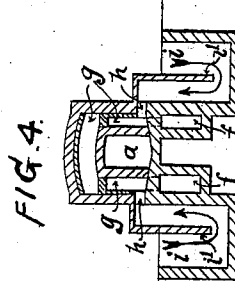
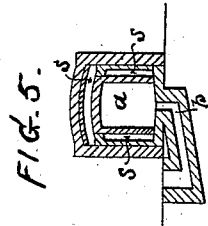
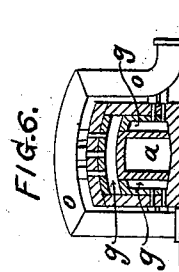
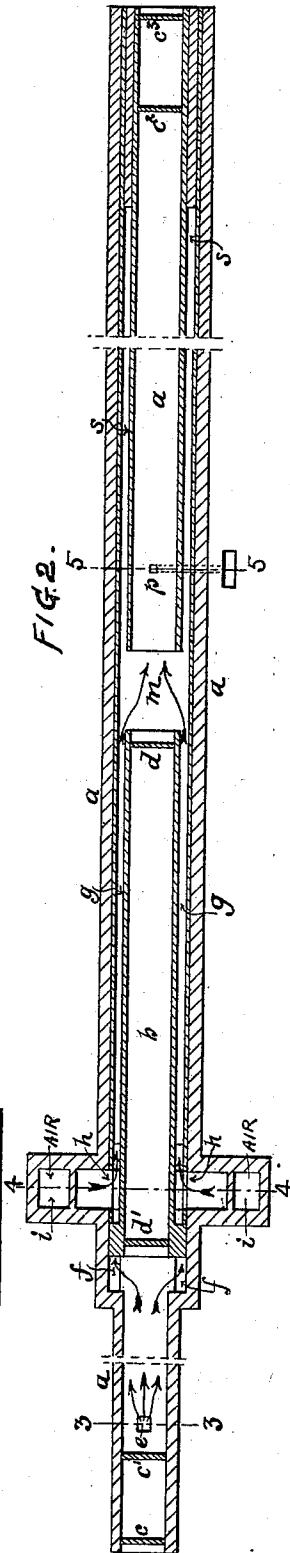
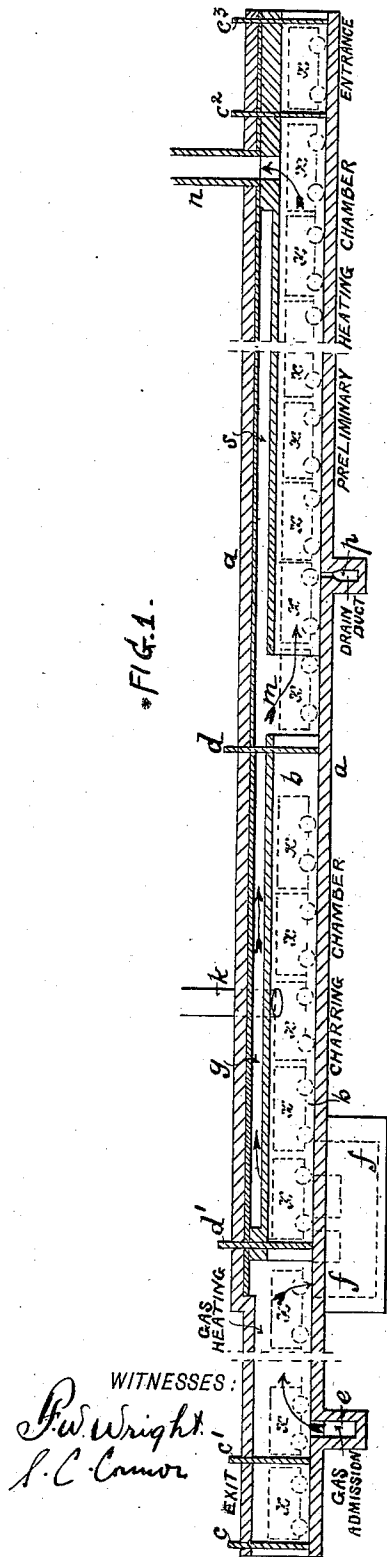


G. GRÖNDAL.
APPARATUS FOR CHARRING WOOD, &c.

(Application filed June 29, 1899.)

(No Model.)



WITNESSES:
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UNITED STATES PATENT OFFICE.

GUSTAF GRÖNDAL, OF PITKARANTA, RUSSIA.

APPARATUS FOR CHARRING WOOD, &c.

SPECIFICATION forming part of Letters Patent No. 687,304, dated November 26, 1901.

Application filed June 29, 1899. Serial No. 722,302. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF GRÖNDAL, a subject of the King of Sweden and Norway, and a resident of Pitkaranta, Finland, Russia, have invented a certain new and useful Improved Method of Charring Wood and other Fuels, of which the following is a specification.

According to the improved method of charring wood, &c., of this invention I provide means for advancing the wood to be charred throughout the length of a furnace. Near the outlet for the finished product I admit cool gas—that is, gas of ordinary temperature. After the process has been in operation for some time the wood at this end will have acquired a state of incandescence, as hereinafter described. The projection of the cool gas against this incandescent material serves to heat the gas to an advantageous temperature and at the same time to reduce the temperature of the incandescent charred material, which is afterward withdrawn from the furnace. It is important that a gas indifferent to red-hot coals be used—that is, one that will not chemically combine with them. This heated gas I next convey to passages surrounding a charring muffle or chamber; but I arrange air-ducts to draw or force air into these passages to be mixed with the heated gases. The gas is burned in these passages, and the wood in the muffle is charred by the heat. The burned gases from the passages are then directed to another chamber at the wood-charging end of the furnace, and they are passed through this chamber, giving up their heat to the wood therein prior to its admission to the muffle. From this preliminary wood-heating chamber the burned gases may be carried off by a chimney.

That my invention may be more readily understood, I have annexed the accompanying sheet of drawings, in which—

Figure 1 is a vertical section of a furnace adapted to carry out the process of my invention. Fig. 2 is a sectional plan of the same. Fig. 3 is a section on the line 3 3, Fig. 2. Fig. 4 is a section on the line 4 4, Fig. 2. Fig. 5 is a section on the line 5 5, Fig. 2; and Fig. 6 is a sectional view showing a modification of air-inlet.

The wood or the like to be charred is ad-

mitted at the right-hand end between doors $c^2 c^3$ and passed into the preliminary wood-heating chamber to the left, where it becomes heated by the burned gases passing through the chambers, as indicated by the arrows, and out at the chimney n . The wood is next introduced into the charring-muffle b , which is a long chamber having doors $d d'$ at either end and surrounded by passages $g g$. To these passages heated gas mixed with air is conducted and burned, heating the muffle and charring the wood therein. It is these burned gases that are afterward passed through the space m to the preliminary wood-heating chamber. To the muffle b I connect a chimney k to convey away such gases as may arise from the wood in process of charring. Instead of so conveying these gases away to be condensed and saved for future use I may simply leave the door d to the muffle open, thereby allowing the free exit of the gases from the muffle. The gases will in that case be consumed in the space m by combining with the burning gases from the combustion-passages $g g$ and will add their heat to the wood in the preliminary wood-heating chamber as they pass therethrough.

When the wood in the muffle has been sufficiently charred, the door d' is opened and the charred wood is placed in the gas-heating chamber. The wood has then been reduced to incandescent charcoal. The gas is admitted to this chamber through a gas-admission duct e and caused to come into contact with the red-hot coals of the charred wood. The wood becomes cooled through contact with the gas and is passed out a finished product through an exit end having two doors $c' c$.

The doors of the furnace may be of any well-known construction. I have shown them as slides movable vertically.

The gas, heated by contact with the live coals, passes down through a passage f , Figs. 1, 2, and 4, and up into the passages $g g$, surrounding the muffle. The heated gases being lighter than the air and having a tolerably free passage direct through the furnace to the chimney n , quite a draft is created in the furnace. I utilize this to feed air to the gas upon its admission to the combustion-passages $g g$, as shown in Fig. 4. The air-intake i on a level with the floor of the fur-

nace extends downwardly, where it is provided with baffle-plates *i*; thence it passes upwardly to the openings *h* into the chamber, where the air joins the onrushing heated gases, with which it unites, and combustion takes place in the passages *g g*. Instead of so admitting the air to the gas it may be found advantageous to admit air under pressure to the passages *g g* through a pipe *o*, surrounding the furnace *a*, as shown in Fig. 6.

In the bottom of the wood-heating chamber I prefer to place a drain-duct *p*, by which the products of distillation can be drained from the furnace. Heat-jackets may surround the wood-heating chamber by forming extra walls *s s*, as shown in Figs. 1 and 2.

The cars *x*, containing the wood, may be intermittently advanced through the furnace in much the same manner as are the coils of wire advanced in Koch's patent, No. 489,017, by forcing one car against another, and so on, or chain means quite similar to that shown in Daniel's patent, No. 385,247, may be employed. The cars may even be advanced by arranging the exit end at a lower level than the inlet end and at intervals allowing the cars to be fed forward by gravity upon opening the chamber-doors.

I claim as my invention—

30 1. The process herein described of continuously carbonizing or charring wood, &c.,

consisting of passing the wood through a furnace, causing a gas indifferent to red-hot coals, to enter the furnace at a point where the coals are incandescent, thereby heating the gas 35 and cooling the coals, passing said heated gas around a charring-muffle, but not in contact with the wood therein admitting air to the gas at this point to cause combustion to char the wood in the muffle, substantially as set forth. 40

2. The process herein described of continuously carbonizing or charring wood, &c., consisting of passing the wood through a furnace, causing a gas indifferent to red-hot coals, to enter the furnace at a point where 45 the coals are incandescent, thereby heating the gas and cooling the coals, passing said heated gas around a charring-muffle, but not in contact with the wood therein, admitting air to the gas at this point to cause combustion 50 to char the wood in the muffle, and causing the burned air and gas to heat the wood preliminary to its reception into the muffle, substantially as described.

In testimony whereof I have signed my 55 name to this specification in the presence of two subscribing witnesses.

GUSTAF GRÖNDAL.

Witnesses:

THILDE NEOVIUS HELSINGFORS,
AMA WINBERG, Jr.