

(No Model.)

G. A. CLARK.

FURNACE.

No. 333,995.

Patented Jan. 12, 1886.

Fig:1.

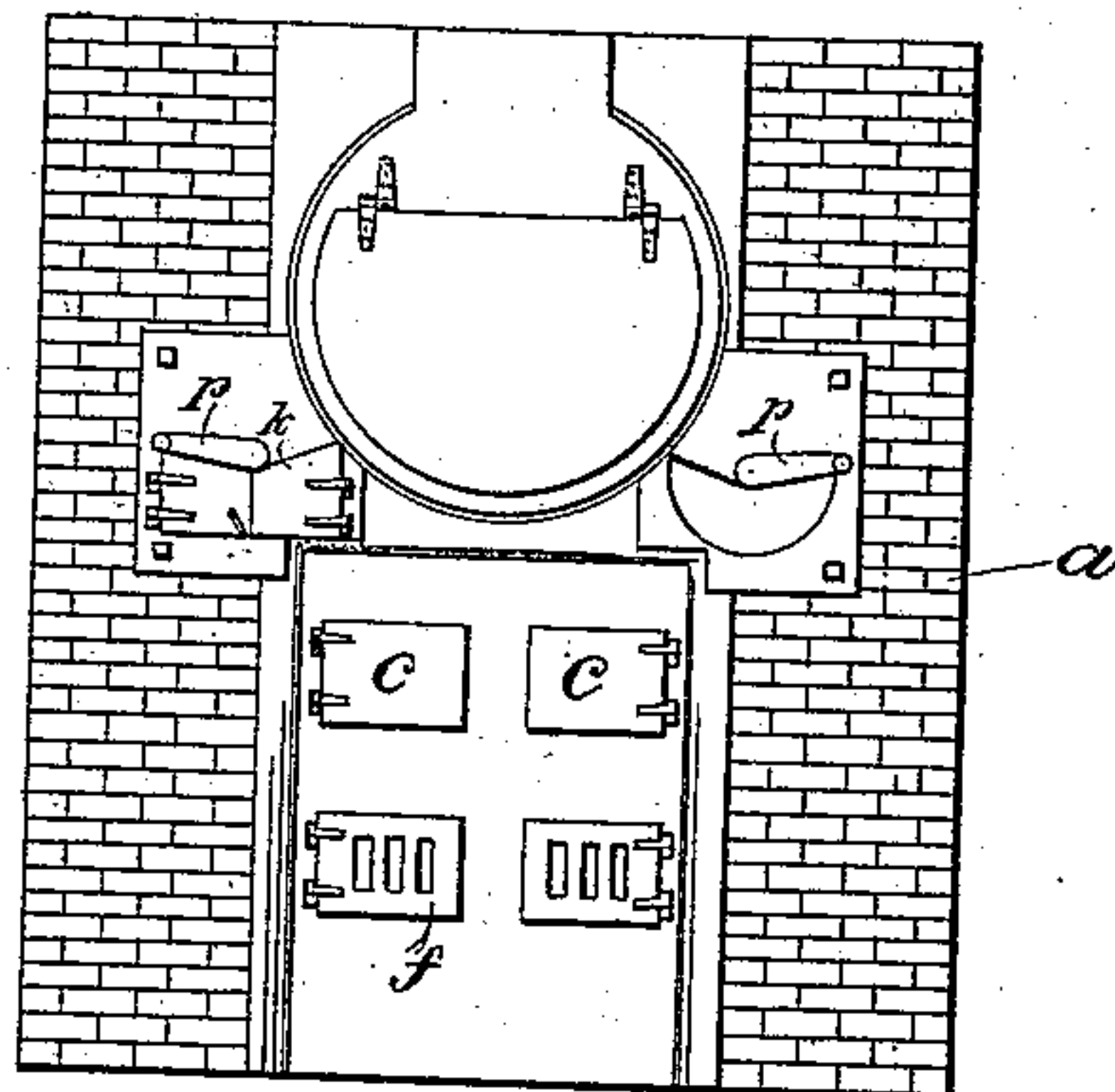
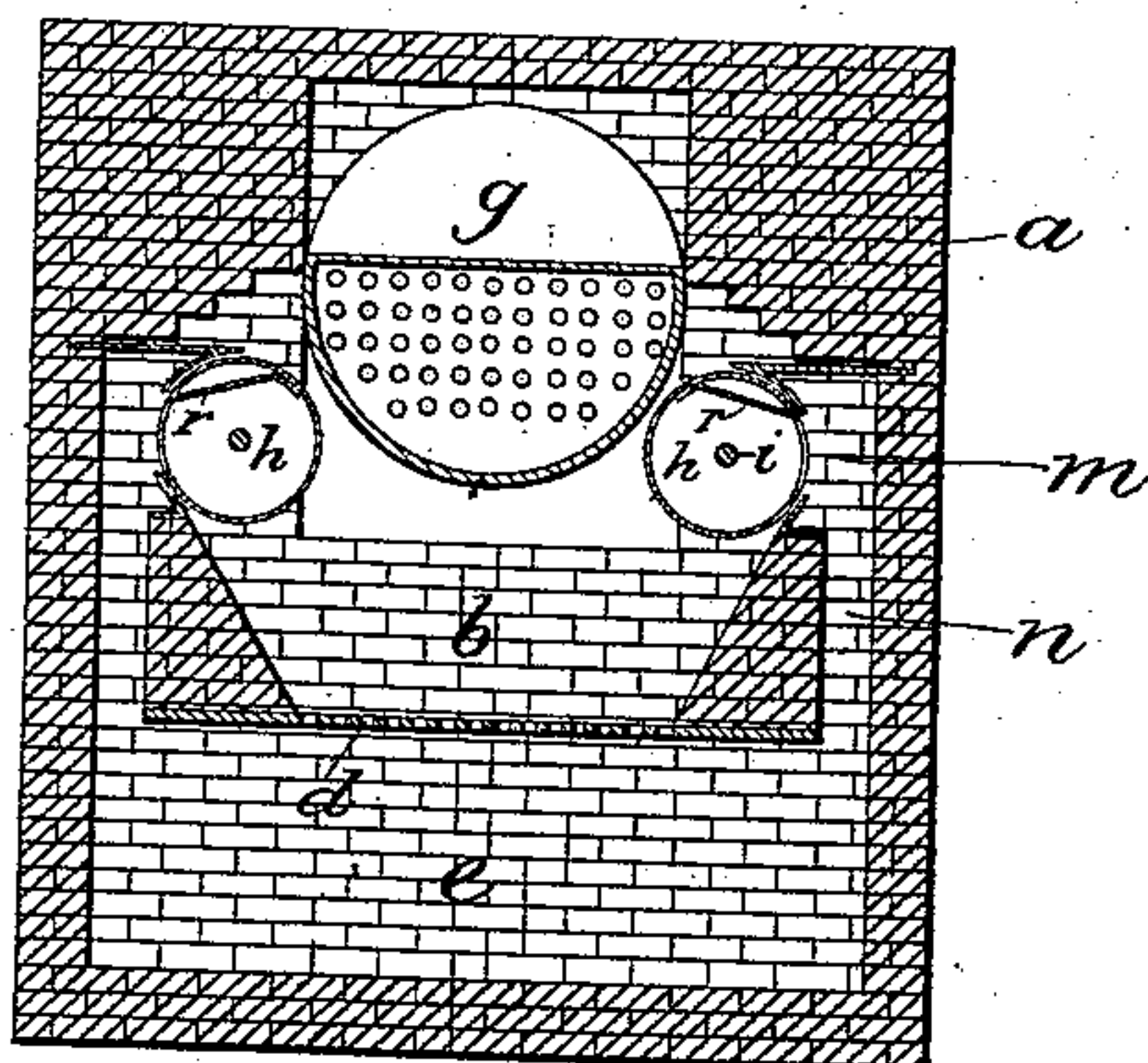


Fig:2.



Witnesses.

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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 333,995, dated January 12, 1886.

Application filed February 24, 1885. Serial No. 156,888. (No model.)

To all whom it may concern:

Be it known that I, GATES ARNOLD CLARK, of Rochester, county of Monroe, State of New York, have invented an Improvement in Furnaces, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The main object of my invention relating to furnaces is to insure the more complete combustion of fuel and afford a greater amount of heat from a given amount of fuel than has been heretofore attained, the invention being especially applicable to furnaces using bituminous coal or other fuel having a large proportion of volatile or gaseous matter which by the ordinary methods is not usually completely consumed, but is delivered from the furnace in the form of smoke or unconsumed gases, not only wasting the heat which might be derived from the said smoke, if properly consumed, but also vitiating the surrounding atmosphere.

My invention is embodied in a furnace having, in addition to the usual fire-chamber, in which the solid fuel burns on a suitable grate, combining with air introduced through the said grate from below, auxiliary chambers, ovens, or retorts normally having no direct communication with the fire-chamber above the grate, but communicating with flues or passages leading to the space below the grate, where the air is introduced to combine with the fuel burning on the grate. These ovens are provided with doors or openings, into which the solid fuel—such, for example, as bituminous coal or wood—is introduced, and the ovens are exposed to the heat of the fire, so that the fuel contained therein is roasted and the more volatile products, consisting of water or steam and various combustible gases, are conveyed by the flues before mentioned to the space below the grate, where they mingle with the air and pass through the grate, and are thus thoroughly consumed in connection with the solid fuel, thereby greatly increasing the heat in the fire-chamber. Means are provided for placing the ovens or retorts in direct communication with the fire-chambers, and after the volatile portions have been removed from the fuel in the ovens and consumed, as previously described, communication is estab-

lished between the retorts and the fire-chamber, permitting the solid portion of the fuel remaining in the retorts to be discharged therefrom into the fire-chamber or upon the grate, the said fuel delivered from the ovens approaching more or less the condition of coke. The retorts or ovens are preferably cylindrical, and are capable of rotary movement, the fuel being introduced at the end of the cylinder, which has a lateral passage or opening that may be placed in communication with the flue for discharging the volatile portion of the fuel or in communication with the fire-chamber for discharging the solid portion of the fuel onto the grate.

Figure 1 is a front elevation of a furnace embodying this invention, shown as employed for the generation of steam in a boiler; and Figure 2 is a vertical section thereof on a plane parallel with the front end of the furnace, passing through the fire-chamber and ovens or retorts.

The main portion *a* of the furnace, and the fire-chamber *b* therein, accessible by doors *c* in the furnace-front, and the grate *d* and ash-pit *e*, below the same, and doors *f*, affording access to the said ash-pit, and admitting air to support combustion of the fuel, may be of any suitable or usual construction, the body of the furnace being shown as of masonry and supporting a boiler or steam-generator, *g*, to be heated by the fire burning on the grate *d*, and the products of combustion derived therefrom.

The furnace is provided with one or more chambers, ovens, or retorts, *h*, shown as cylindrical in shape, and mounted on a shaft, *i*, the said chambers being accessible from the front of the furnace by doors *k*, through which the fuel is introduced to the said chambers. These fuel-chambers, ovens, or retorts are provided with openings *m*, which normally communicate with flues or passages *n* in the furnace, leading to the space below the grate *d*, and the said chambers are placed within the fire-chamber *b* and exposed to the heat of the fire burning on the grate *d*, so that the fuel introduced to the chamber *h* is roasted, causing the more volatile portion, consisting largely of water and combustible gases, to be driven off from the said fuel, the said volatile portions escaping through the openings *m*,

and passing through the flue *n* into the space below the grate, and, passing through the fuel on the grate, are consumed, thus adding to the heat derived from the said fuel that is burning on the grate. After the fuel in the chamber *h* is exposed a sufficient length of time to the heat of the fire to thus drive off and consume the greater part of the volatile constituents of the fuel, reducing it more or less nearly to the condition of coke, the said fuel is discharged into the fire-chamber and burns on the grate *d* in the usual manner. In order to thus discharge the fuel from the chambers *h* into the grate, the said chambers are provided with cranks, as handles *p*, (see Fig. 1,) by which they may be turned on their journals, so as to bring the openings *m* of the said chambers into the chamber *b* in position to discharge the fuel from the said chambers *h*, which are shown as provided with flat partitions or floors *r*, extending to the edge of the opening *m*, from which floors the fuel will slide onto the grate *d*. After the solid fuel has been thus discharged into the furnace from the chambers *h* the latter are restored to their normal position, (shown in Fig. 2,) and fresh fuel is introduced through the doors *k*, and permitted to roast and become heated, as before described, before being discharged into the fire-chamber or furnace proper; and it will be seen that the fuel is introduced to the furnace without opening a door or providing a direct passage to the space above the grate, as usually occurs when the fresh fuel is introduced through the doors *c*, as usually practiced.

When fresh fuel is thrown directly upon the fire already burning in a furnace, as usually practiced, the fresh fuel cools that which is already burning, and before becoming thoroughly ignited will have its volatile products roasted or driven out, and such products, being above the fire, and not being provided with sufficient oxygen for proper combustion, will pass off through the chimney in the form of smoke or vapor, thus not only wasting the heat which might be derived from their combustion, but also vitiating the surrounding atmosphere to a needless extent.

In the herein-described furnace, on the other hand, the volatile portions of the fuel before arriving at the chimney have to pass through the highly-heated fuel burning on the grate, in connection with sufficient air to insure perfect combustion, so that the maximum amount of heat is derived from the fuel passing through the fire-chamber without giving out smoke or unconsumed gases, and, furthermore, the solid fuel, when finally discharged upon the grate, is highly heated, and will thus become ignited at once without materially lowering the temperature of the fuel that is already burning.

The invention is not limited to the particular construction of the ovens herein shown, nor to the means provided for discharging the fuel from the said ovens into the fire-chamber,

the essential feature of this part of the invention being that the ovens have no direct communication with the fire-chamber while the fuel is being introduced into the said ovens and roasted therein. If desired, the doors *k* may be provided with openings or left open to admit air to the chamber *h*, which air will mingle with the gases before they pass through the flues *n* to the fire-chamber or to the ash-pit or air-inlet chamber below the grate.

Another leading feature of the invention is that the fuel may be introduced from the fuel-chambers into the fire-chamber without establishing communication between the fire-chamber and the external air.

The furnace is herein shown as provided with two fuel-chambers, one at each side; but it is obvious that it might have but one, if that were of sufficient capacity to supply the fuel needed for the furnace.

It is not essential that the gases driven off from the fuel in the ovens should be led to the fire-chamber through the ash-pit, as they might be introduced to the fire-chamber at some other point; but the said gases will be exposed to a fire in a state of complete incandescence, and will be introduced to the said fire in connection with sufficient air to insure the perfect combustion of the said gases.

I claim—

1. In a furnace provided with a fire-chamber for burning solid fuel, a rotary fuel-chamber, oven, or retort exposed to the fire, and a flue leading from the said fuel-chamber to the fire-chamber, the fuel-chamber normally communicating with the fire-chamber only through the said flue, substantially as described.

2. A furnace provided with a fire-chamber combined with a rotary fuel-chamber exposed to the fire, but normally without direct communication with the said fire-chamber, a flue leading from the said fuel-chamber, and means for establishing direct communication between the fuel-chamber and fire-chamber, for discharging the fuel from the former into the latter, substantially as described.

3. In a furnace, a grate and a fire-chamber above it, and an ash-pit or air-inlet chamber below the same, combined with a rotatable fuel-chamber or retort exposed to the fire in the said fire-chamber, and a flue leading from the said fuel-chamber to the ash-pit, substantially as and for the purpose described.

4. In a furnace provided with a fire-chamber, a fuel-chamber, oven, or retort capable of rotation upon a longitudinal axis, normally without direct communication with the fire-chamber, and having an opening or door to receive fuel from the outside of the furnace, combined with a flue leading from the said fuel-chamber to the fire-chamber, and means for discharging fuel from the fuel-chamber into the fire-chamber, substantially as described.

5. In a furnace provided with a fire-chamber, a rotarily-movable fuel-chamber and a flue leading therefrom, the said fuel-chamber having an opening, which may by its move-

ment be placed in communication with the said flue or with the fire-chamber, substantially as and for the purpose described.

5 6. A furnace having a fire-chamber, combined with a cylindrical fuel-chamber capable of rotation about its axis and a flue leading from said fuel chamber to the fire, the said fuel-chamber being placed by its rotary movement in communication with the said flue or

with the fire-chamber, substantially as and for the purpose described.

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

GATES ARNOLD CLARK.

Witnesses:

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LEMUEL J. HATCH.