T. FULSHAW.

BOILER FUELING RECORDER.

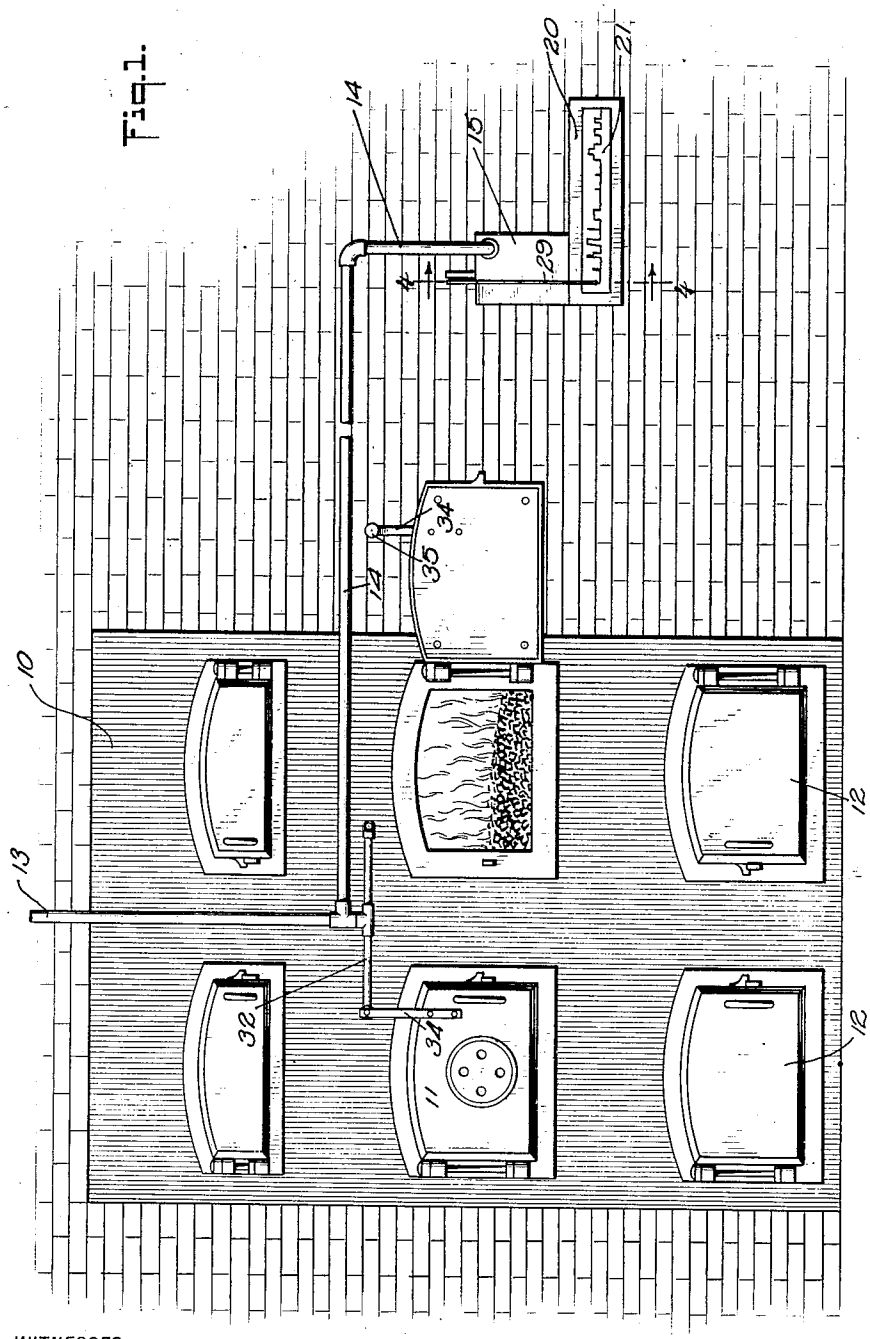
APPLICATION FILED JUNE 23, 1915.

1,175,628.

Patented Mar. 14, 1916.

2 SHEETS—SHEET 1.

Fig. 1.




WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

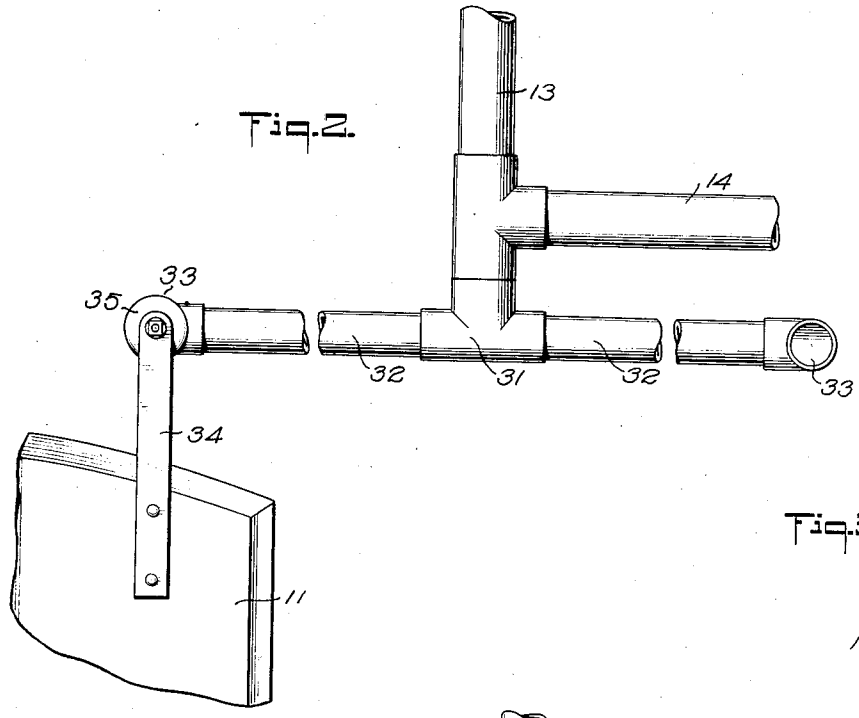
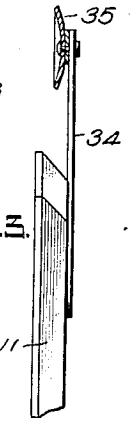



Fig. 3.



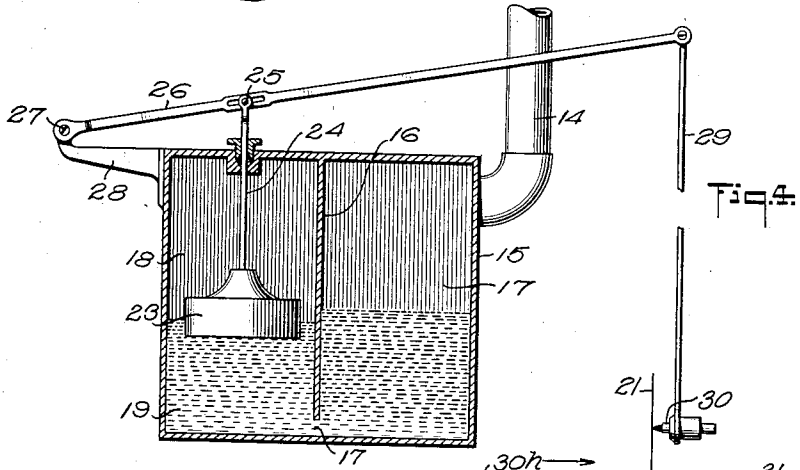




Fig. 4.



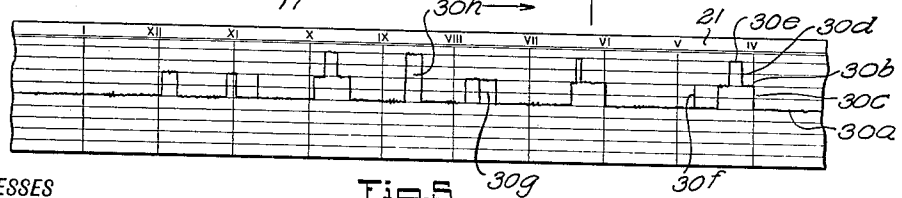




Fig. 5.

WITNESSES

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# UNITED STATES PATENT OFFICE.

THOMAS FULSHAW, OF BAYONNE, NEW JERSEY.

## BOILER-FUELING RECORDER.

1,175,628. Specification of Letters Patent. Patented Mar. 14, 1916.

Application filed June 23, 1915. Serial No. 35,791.

*To all whom it may concern:*

Be it known that I, THOMAS FULSHAW, a citizen of the United States, and a resident of Bayonne, in the county of Hudson and State of New Jersey, have invented a new and Improved Boiler-Fueling Recorder, of which the following is a full, clear, and exact description.

This invention relates to stoves and furnaces and has particular reference to indicating and recording means whereby a permanent record is made of the times when the furnace doors are opened and a record is made of the length of time the doors are left open.

Among the objects of the invention is to provide an automatic recording attachment for steam boiler or other furnaces which will show to the superintendent of the works or other person the amount of fuel being used, the amount of fuel being determined by the amount of time the furnace doors are left oven.

With the foregoing and other objects in view, the invention consists in the arrangement and combination of parts hereinafter described and claimed, and while the invention is not restricted to the exact details of construction disclosed herein, still for the purpose of illustrating a practical embodiment thereof reference is had to the accompanying drawings in which like reference characters designate the same parts in the several views, and in which—

Figure 1 is a front elevation of a steam boiler furnace with my improvement attached thereto; Fig. 2 is a front elevation of a part of the devices shown in Fig. 1 but on a larger scale; Fig. 3 is an edge view, partly in section, of one of the furnace doors and valve carried thereby; Fig. 4 is a vertical sectional view of the automatic recording mechanism on the line 4—4 of Fig. 1; and Fig. 5 is a fragment of a record sheet indicating the character of the record made thereon.

Referring more particularly to the drawings, I show the front of a steam boiler furnace 10 including fuel doors 11 and ash doors 12.

At 13 is shown a standpipe secured in any suitable manner in fixed position with respect to the furnace and communicating with the interior of the chimney or stack (not shown). By reason of the location of the pipe 13, it is always subjected to the suction due to the upper draft in the flue or chimney. Therefore, a certain pull is always exerted upwardly through such pipe. To the lower end of the pipe 13 is connected a branch pipe 14 which leads in any suitable direction or desired distance to a casing 15 secured in any suitable manner to an out-of-the-way portion of the structure. The casing is substantially closed on all sides and bottom and is provided with a middle partition 16 having an opening 17 through its lower end so as to bring the two chambers 17 and 18 into communication with each other. The casing 15 is partially filled with a body of liquid 19 which, when undisturbed, seeks its level in both of the chambers.

At 20 is a casing including clockwork of common and well known nature, and hence not specifically shown, adapted to operate a time sheet 21 having time graduations thereon as indicated in hours on Fig. 5. It will be understood, therefore, that the time sheet will be driven at a uniform rate of speed in the direction of the arrow in Fig. 5.

At 23 I show a float supported upon the surface of the liquid in the chamber 18 and having a stem 24 extending freely upwardly through the top of the casing and connected at 25 to a lever 26 pivoted at a fixed point at 27 upon a bracket 28. The free end of the lever 26 carries a pen rod 29 having a pen 30 at its lower end coöperating with the time sheet 21.

The term pen as used herein will be understood as covering any sort of marking device suitable for the purpose indicated. The pen 30 having constant contact with the time sheet will make a continuous mark on the sheet as the latter is moved forwardly by the clockwork above described, the form of the mark or curve depending upon the vertical fluctuations of the pen while the sheet is moved continuously in a uniform manner horizontally. Under normal conditions the suction created by the stack draft acting through the pipes 13 and 14 and the casing 15 will cause the level of the fluid in the chamber 17 to stand higher than in the chember 18, the disparity of levers in the two chambers representing the force of the suction. The float, therefore, will carry the pen 30 at a substantially low level indicated by the horizontal line $30^a$. This line is shown somewhat of a wavy or ragged nature which results from the normal pulsations or

fluctuations of the stack draft although the mean force of such draft is practically constant.

The description made thus far referring to the recording mechanism pre-supposes that the furnace doors are both shut. When, however, the normal substantially steady upward draft through the pipe 13 is disturbed through any opening outside of the casing 15, the suction in the chamber 17 is correspondingly diminished, allowing the surface of the liquid therein to drop proportionately. I therefore connect to the lower end of the pipe 13 a T 31 from which extend pipe arms 32 having open mouths 33 adjacent the furnace doors 11. Each door, however, is fitted with a bracket 34 carrying at its upper end a flexible valve or cup 35 which, when such door is closed, seals the adjacent mouth 33. The sealing furthermore is naturally made more effective due to the upward suction in the pipe 13. It will now be understood that if either furnace door is opened for any purpose, the valve 35 carried thereby will pass from the mouth 33 of each pipe 32 and hence the upward suction in the pipe 13 will be operative through the then open arm 32. The caliber of the arms 32 may obviously be as small as necessary to provide the required variation in vertical operation of the recording mechanism. In other words, the opening of a single pipe arm 32 will have the result of lowering the liquid level in the chamber 17 approximately only half way between the normal level therein and the condition in which the level is the same in both chambers. In other words, the opening of a single furnace door will cause the float 23 to be partially lifted with a corresponding elevation of the pen 30 so as to mark the curve on the chart at about the level indicated at $30^b$. So long, therefore, as a single door is open, the curve will be traced on the chart substantially horizontally at the level $30^b$. The vertical line $30^c$ indicates the opening of a door and the time when such action is taking place. The right hand end of Fig. 5 indicates that at the hour of four, one of the furnace doors was opened and remained open alone for approximately ten minutes, and then the second door was opened as indicated by the line $30^d$, the pen then forming the curve $30^e$ and continuing for about twelve minutes, during which time both doors were open. At the end of this period one of the doors was closed as indicated by the continuation of the line $30^b$, the other door remaining open for a period of eight or nine minutes, and then the door closed, restoring the pen to the line $30^a$. At $30^f$ is a line indicating that one of the doors was opened momentarily, probably for inspection of the fire, and immediately thereafter closed again, the pen retracing its mark on the chart. At $30^g$, between the hours of seven and eight, is an indication that a single stoker coaled the furnace through the two doors successively, the second door being opened immediately after the first one was closed, the length of the time of break in the line $30^a$ indicating the period of time the doors were open. At $30^h$ is an indication that both doors were opened simultaneously, showing that two stokers were busy for the same length of time, and then both doors were closed at the same time. It will be understood in this connection that when both furnace doors are open and hence both pipe arms 32 are open at 33 to the atmosphere, the suction through the pipe 14 and casing 15 is practically all released and the liquid stands at the same level in both the chambers.

Since it is well understood that an experienced stoker shovels coal at a practical uniform rate of speed known to the superintendent of the works, the superintendent or overseer, upon reading the chart and applying thereto his calipers to determine the interval of time during which the furnace doors were open, it is possible within very accurate limits to determine, not only the amount of coal being shoveled by each individual stoker, but also the amount of service being had from any particular furnace among a large number of furnaces which may be connected up to the same power plant.

I claim:

1. In an automatic recording device for furnaces, the combination with a furnace and a main standpipe connected therewith, of a vacuum recording device connected to the end of said standpipe, an auxiliary pipe arm connected to the standpipe, and means carried by the furnace door serving normally to close said auxiliary pipe arm but causing the same to be opened to the atmosphere when the furnace door is open, whereby a variation in the recording mechanism incident to the opening of the door results.

2. In an automatic recording device for furnaces, the combination with a furnace including a fuel door and a main suction standpipe associated with the furnace, of vacuum controlled recording mechanism connected to the end of said pipe, an auxiliary pipe arm communicating with said standpipe and having an open end adjacent the furnace door, and a valve carried by the furnace door and serving to normally close said pipe arm when said door is closed, substantially as set forth.

3. In a device of the character set forth, the combination with a furnace having a pair of independent fuel doors, of a single time recording mechanism associated with both furnace doors, and means connected

with the individual furnace doors serving to cause a variable record to be made indicating the time when either one or both furnace doors are opened and the length of time either or both of the doors remain open.

4. The combination of a furnace having a pair of independent fuel doors, a main suction standpipe associated with the furnace, an auxiliary pipe arm communicating with the main stand pipe and extending to a point adjacent each of the fuel doors, vacuum controlled recording mechanism connected to the end of the main suction stand pipe, and means carried by each of the fuel doors serving to close the auxiliary pipe arm when the doors are shut, said recording mechanism including a chart movable by clockwork, and means to make a mark transversely thereon to indicate when either door is opened and the length of time that either door is open alone or in connection with the other door.

THOMAS FULSHAW.

Witnesses:
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FLORENCE FULSHAW.