No. 671,555. Patented Apr. 9, 1901.

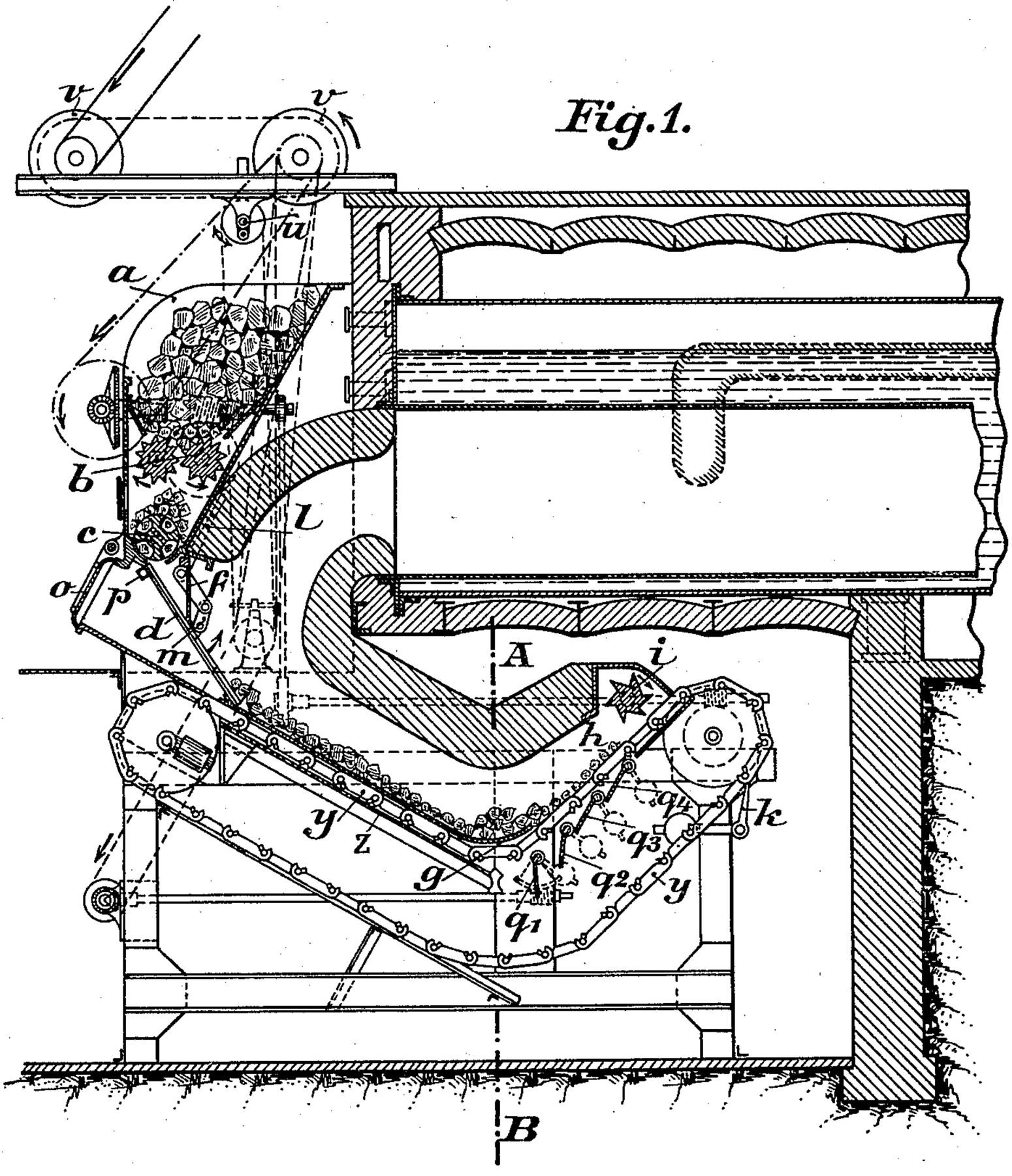
A. HOFMANN.

MECHANICAL STOKER.

(Application filed July 16, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



WITNESSES
E. Stuart Jr.
Harvey L. Hanson.

INVENTOR
Alfred Hofmann
By Charles A. Brown & Cragg
Attorneys.

No. 671,555. Patented Apr. 9, 1901.

A. HOFMANN.

MECHANICAL STOKER.

(Application filed July 16, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

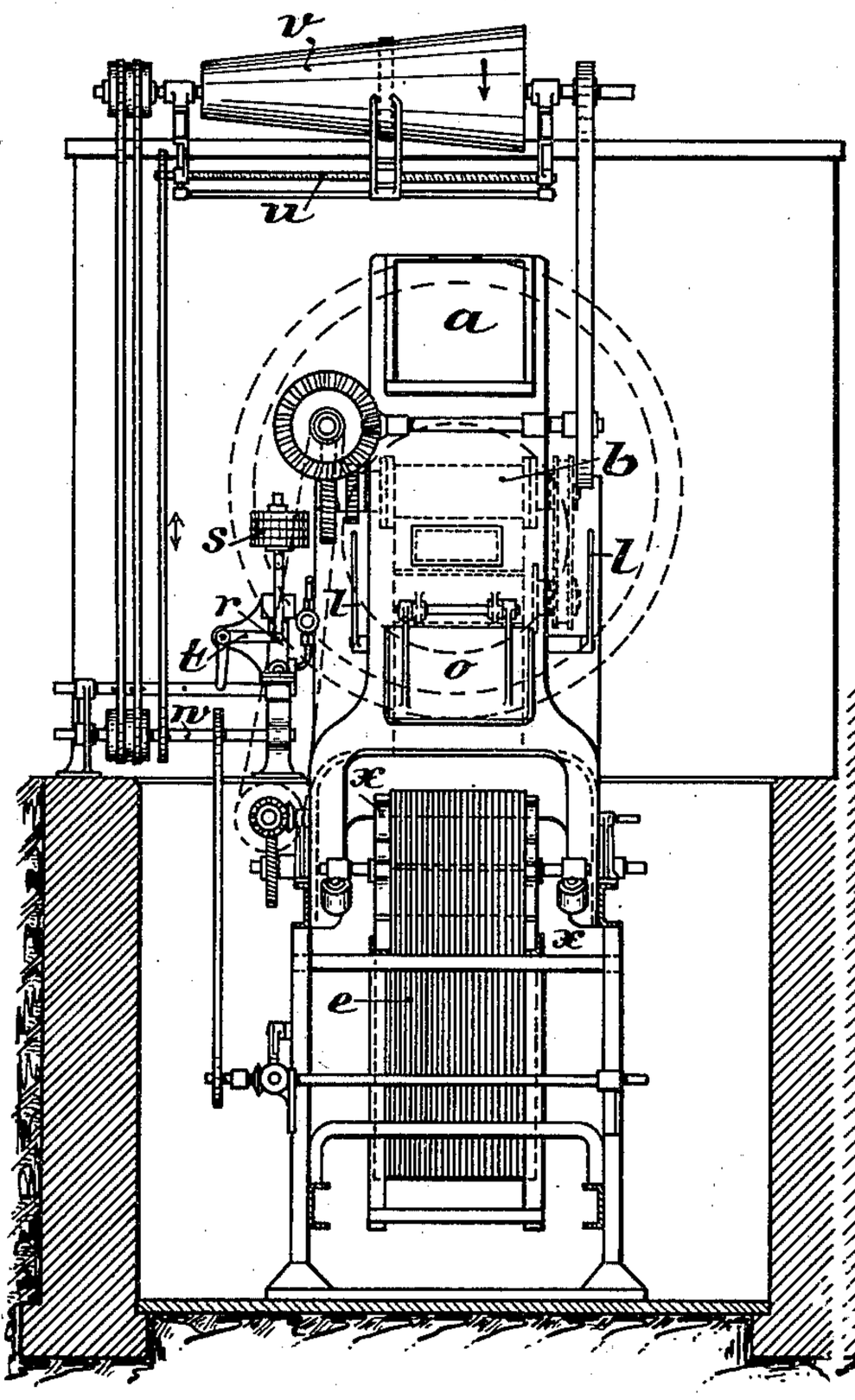
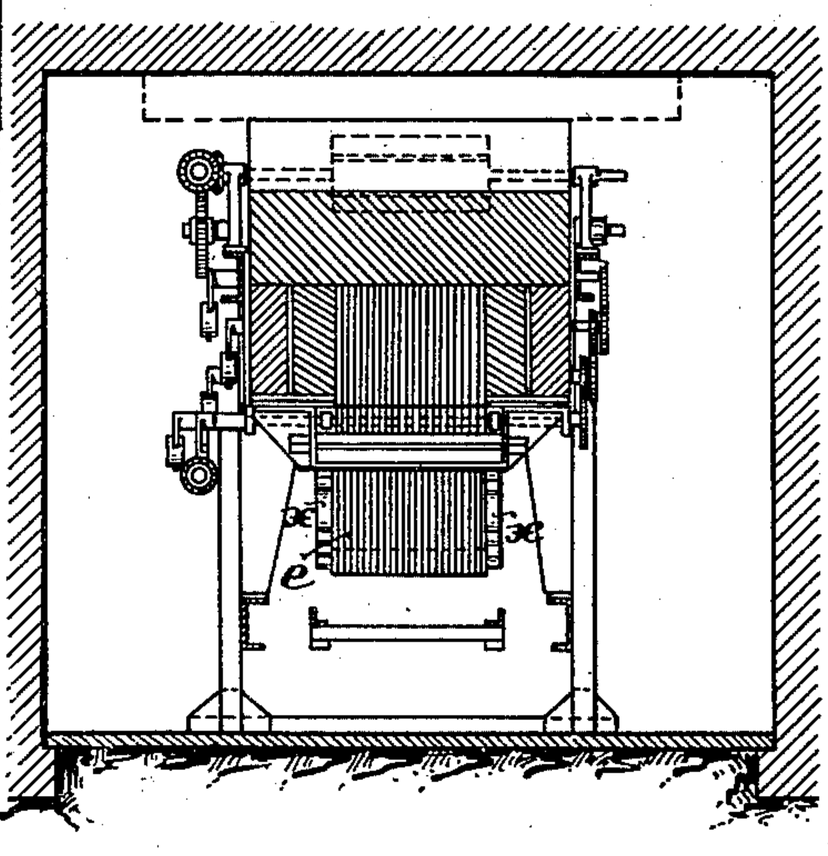


Fig. 3.



WITNESSES

C. E. Hubert.

Harvey L. Hanson.

INVENTOR

Alfred Hofmann

By Charles A. Brown & Cragg

Attorneys.

UNITED STATES PATENT OFFICE.

ALFRED HOFMANN, OF KEMPTTAL, SWITZERLAND.

MECHANICAL STOKER.

SPECIFICATION forming part of Letters Patent No. 671,555, dated April 9, 1901.

Application filed July 16, 1900. Serial No. 23,758. (No model.)

To all whom it may concern:

Be it known that I, ALFRED HOFMANN, engineer, a citizen of the Republic of Switzerland, residing at 376 Züricherstrasse, Kempttal, Switzerland, have invented a certain new and useful Improvement in Mechanical Stokers, (Case No. 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to mechanical stokers adapted for the continuous introduction of fuel by means of an inclined double-chain grating.

The invention has for its object to obtain a complete and almost smokeless consumption of the fuel without excess of air and with an automatic regulation of the feed of such fuel and air.

The improved stoker is adapted for steam-generators, cooking apparatus, and other apparatus for the generation of steam or other gases under pressure.

One form of construction is shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a steam-boiler provided with the improved stoker. Fig. 2 is a front elevation of the same, and Fig. 3 is a section taken on the line A B of Fig. 1.

The fuel in any convenient form is fed into the hopper *a*, where it is acted upon by the two toothed rollers *b*, which reduce the larger pieces into pieces of ordinary size. The reduced fuel falls automatically into the opening of the measuring-cylinder *c*, which delivers it onto the inclined plane *d*, down which it slides and is distributed upon the chain grate *e*. In order to prevent pieces of fuel from rebounding from the incline when falling from the measuring-cylinder *c*, a suspended hinged plate *f* is provided, which after the accumulation of a certain quantity of fuel on one side thereof opens and allows the latter to slide down to the grate *e*. When it reaches the grate, the fuel, without a supply of air, is conducted down the highly-inclined plane of the said grate to the lowest point *g* thereof, where it is supplied with air and ignited. The air is prevented from passing from below through the foremost part of the grate by means of a plate *z*, without air-holes, fixed below the grate and extending from the inlet to the point *g*. From the point *g* the grate ascends a sharp incline, and during the passage of the fuel from *g* to *h* combustion takes place. The incompletely-burned portions of the fuel are thrown back toward the point *g* by the toothed roller *i*, and the clinkers which are caked to fire-bars are loosened by the bending of the chain or grate and are completely detached by the scraper *k*. By means of this continuous feed of fuel, together with the arrangement of hearth at the rear side of the double inclined grate, the flame is obliged to pass over the fuel in a direction opposite to that of its travel, thereby gradually heating the same and at the same time consuming all the gases evolved. For this purpose a flue is arranged over the grate, which is formed at the top and at the sides by the walls of the fire-box, consisting of fireproof material, and at the under side by the grate itself. This flue begins at the rear end of the grate, passes back over the grate, and is then bent for leading into the boiler or other apparatus to be heated. If the mechanical stoker is to be applied to boilers of another type than that shown in the drawings, a part of the said flue may be formed by the boiler itself. In the case of tubular boilers, for instance, the top of the flue may be formed by the slanting tubes and the partitions.

To admit of firing by hand during the stopping of the transmission-shaft or during breakdowns, the sliding plane *d* is elevated by means of the levers *l* and *m* and the fuel is introduced in the usual manner for flat grates through an opening *o*.

By lifting the inclined plane or flap *d*, and thus causing it to swing around its fulcrum *p*, the sectional area of the fire-flue is reduced and the draft is reduced to the minimum, so that when opening the fire-door—*i. e.*, when stoking by hand—cold air is not drawn in.

The speed of travel of the fuel can be regulated within certain limits and can be so adjusted as to supply the quantity of fuel so as to confine the combustion to a portion only of the distance *g h* or to extend it over the whole length. At the same time with the alteration in the speed of travel of the fuel

the opening or closing of the air valves or flaps q' q^2 q^3 below the grate can be regulated. The number of flaps to be opened at one turn will be determined by the quantity of fuel to be consumed in a given time—for example, one flap only will be opened when it is desired to burn only a small quantity of fuel, while for the maximum consumption all the flaps will be opened or all will be closed when no steam is required. This enables a variable effective area of grate to be obtained to correspond to the direct consumption of fuel, while an excess of cold air, and consequent cooling of the gases and of the boiler, is prevented.

The apparatus for regulating the speed of the arrangement consists of a small steam-cylinder r, with piston, which latter is acted upon by the steam from the boiler at the lower side, and by a counterpoise s of slightly-less weight than the steam-pressure at the top. An increase of pressure in the boiler causes the piston with its counterpoise to ascend and to again descend by the action of the latter when the pressure falls. A bell-crank lever t transmits the motion of the piston to the belt-shifting fork, so as to bring into action either the open or the crossed belt upon the counter-shaft w, thereby revolving this latter either forward or backward. This counter-shaft drives the spindle u for shifting the fork upon the cone-pulley v, and thereby effects the reversing of the air-flaps q' q^2 q^3. By thus shifting the belt upon the cone-pulley v the speed of the entire system may be regulated. The forward-and-backward motion of the counter-shaft w communicating motion to the air-flaps q enables these latter to be operated alternately. They are so coupled one with another and also with the operating mechanism as to close the one after the other and also to open in the same manner.

The grate consists of two link chains x x, guided at the sides, which carry the whole grate upon distance-bars of round iron. The fire-bars y are hung onto these distance-bars one against the other, so as to form a grate of the required width. The heads of the fire-bars are formed with hook-shaped ears, the ends of which project only so far as to prevent the bars from slipping off in a horizontal position, but allowing the same to be removed at the bend of the chain during working. The movable parts are driven from a transmission-gear with adjustment by means of two cone pulleys and belts and worms or gear-wheels. The lowermost air-flap is furnished with a worm-sector, whereby the stroke of the flaps is limited.

The sides, roof, and arches for conducting the gases into the boiler are made of refractory material and the whole arrangement is mounted upon an iron frame, so as to allow of the same being pushed back when cleaning the boiler.

Having now particularly described and ascertained the nature of my said invention and the manner in which the same is to be performed, I declare that what I claim is—

1. In a mechanical stoker, the combination with a chain grate having two surfaces inclined in an opposite direction, the foremost of which is protected against air passing through it, of a flue leading from the rear end of the grate to the front end of the same, substantially as described.

2. In a mechanical stoker, the combination with a chain grate having two surfaces inclined in an opposite direction, the foremost of which is protected against air passing through it, of a flue leading from the rear end of the grate to the front end of the same, of air-flaps arranged below the rear part of the grate, and of means for automatically closing and opening said flaps, substantially as described.

3. In a mechanical stoker, the combination with a chain grate having two surfaces inclined in an opposite direction, the foremost of which is protected against air passing through it, of a flue leading from the rear end of the grate to the front end of the same, of air-flaps arranged below the rear part of the grate, and of a steam-accumulator provided with a counterpoise and operated by the variations of the pressure of a steam-generator fired by the said stoker in such a manner as to close more or less the said air-flaps and the inlet-passages for the fuel, substantially as described.

4. In a mechanical stoker, the combination with a chain grate having two surfaces inclined in an opposite direction, the foremost of which is protected against air passing through it, of a flue leading from the rear end of the grate to the front end of the same, and of fire-bars, the heads of which are formed in the shape of hooks, substantially as described.

In witness whereof I hereunto subscribe my name this 27th day of June, A. D. 1900.

ALFRED HOFMANN.

Witnesses:
A. M. LIEBERKNECHT,
JEAN GROSS.