

No. 690,795.

Patented Jan. 7, 1902.

B. H. THWAITE.

APPARATUS FOR COOLING AND CLEANSING BLAST FURNACE GASES.

(Application filed Sept. 12, 1901.)

(No Model.)

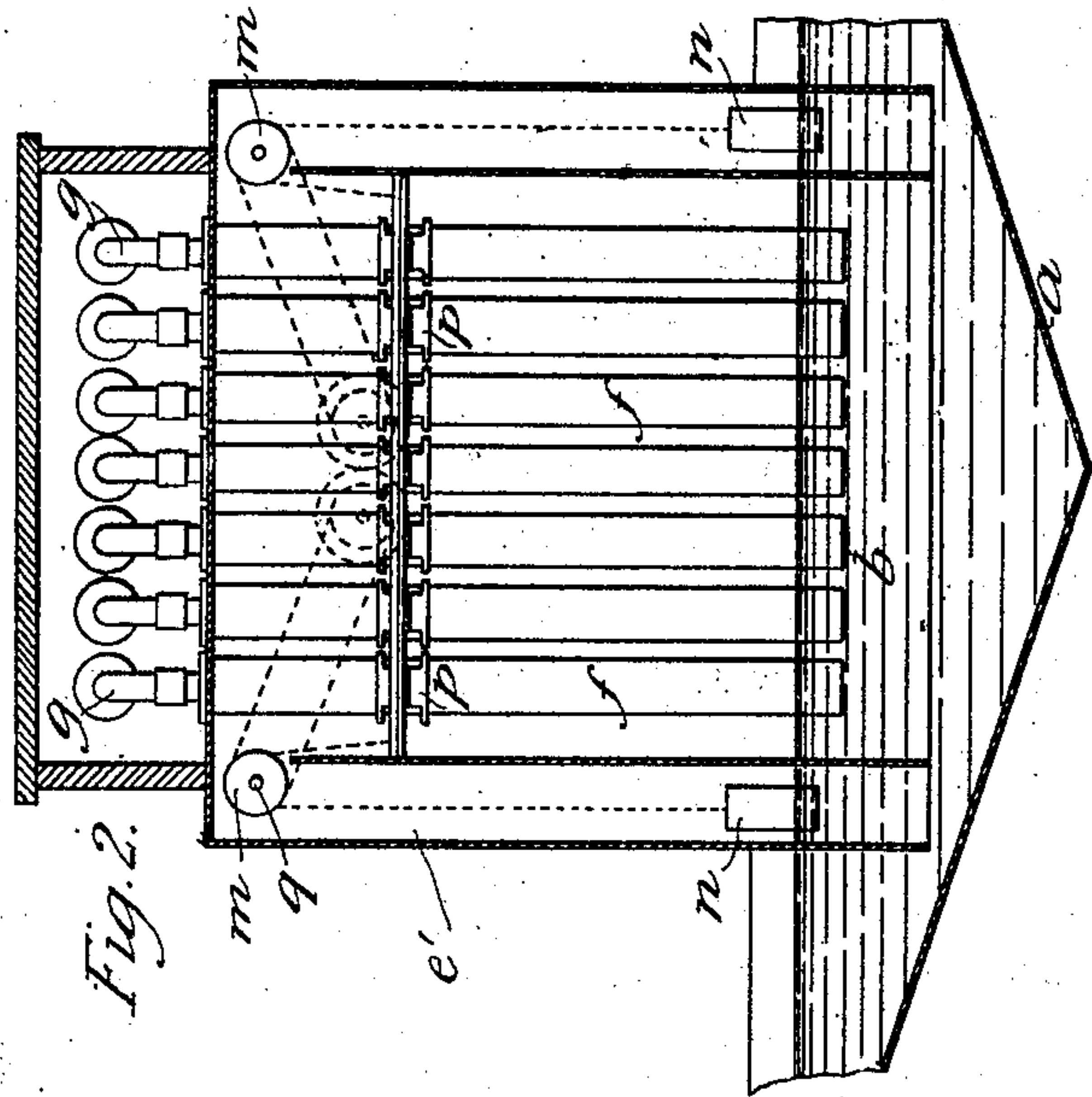


Fig. 2.

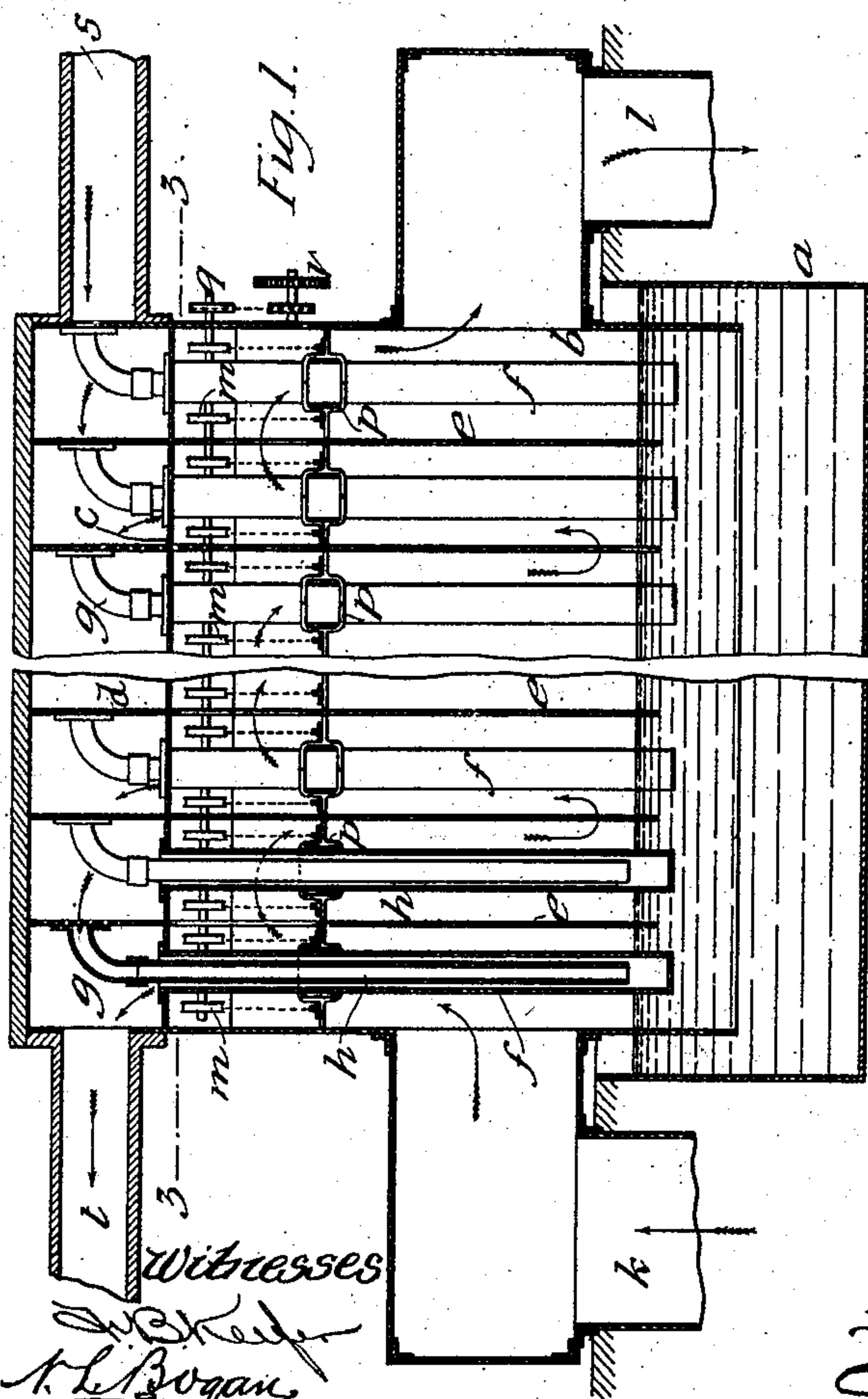


Fig. 1.

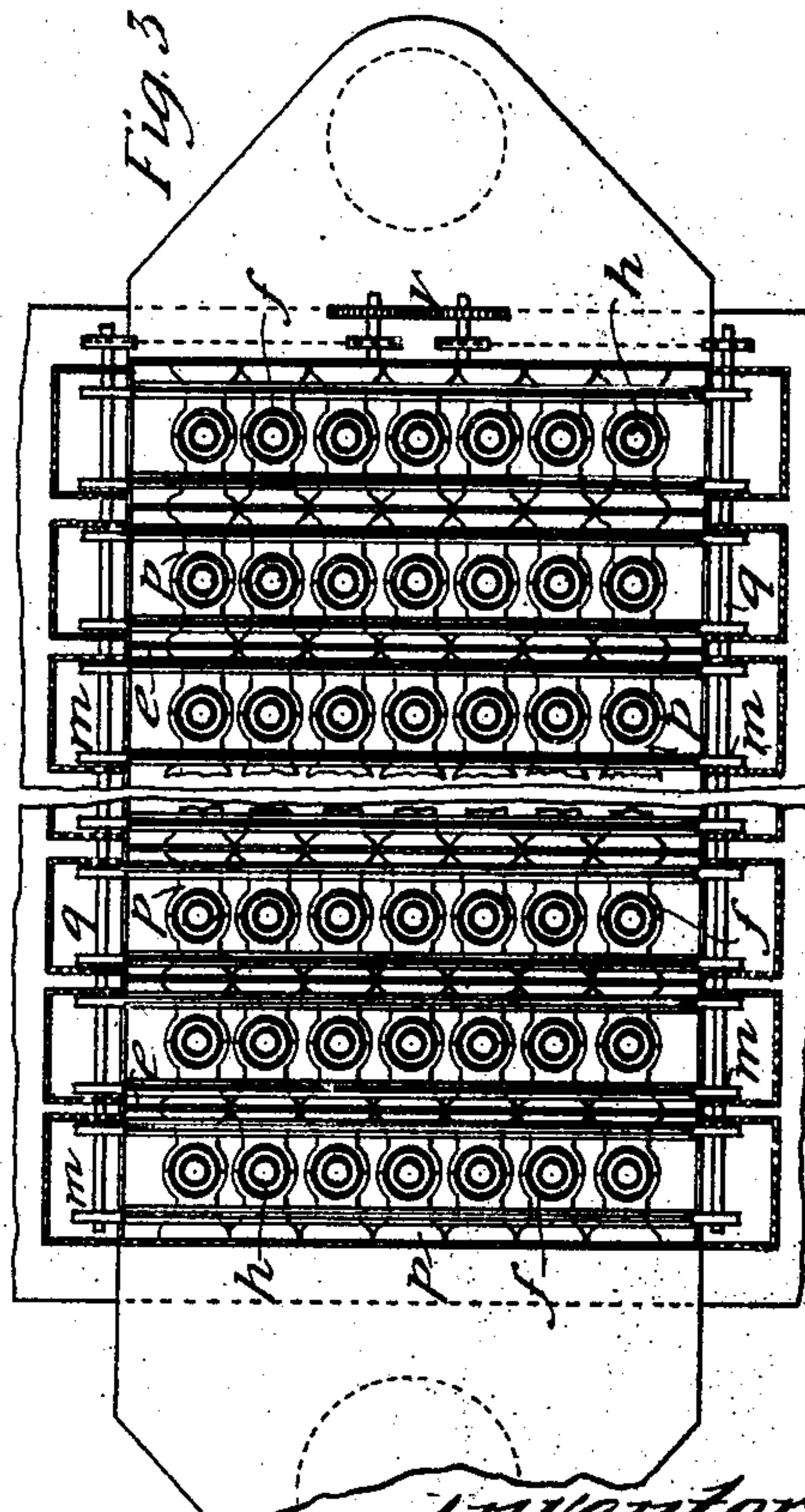


Fig. 3.

Witnesses  
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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR COOLING AND CLEANSING BLAST-FURNACE GASES.

SPECIFICATION forming part of Letters Patent No. 690,795, dated January 7, 1902.

Application filed September 12, 1901. Serial No. 75,220. (No model.)

*To all whom it may concern:*

Be it known that I, BENJAMIN HOWARTH THWAITE, a citizen of England, residing at 29 Great George street, Westminster, in the county of London, England, have invented a certain new and useful Apparatus for Cooling and Cleansing Blast-Furnace Gases, (for which I have applied for a patent in Great Britain, dated August 1, 1901, No. 15,595,) of which the following is a specification.

My invention relates to apparatus for cooling and cleansing the combustible gases which issue from a blast-furnace, so that they may be rendered available for operating in an internal-combustion engine, the apparatus being so designed that the heat abstracted from the gases is imparted to air to be employed for hot blast or to support the combustion of producer or other gas burned in stoves for heating the blast.

Figure 1 of the accompanying drawings is a longitudinal section, Fig. 2 is a transverse section, and Fig. 3 is a sectional plan on the line 3 3 of Fig. 1, of apparatus according to my invention.

Over a trough *a*, containing water and made with an inclined bottom, so that deposited mud can be raked out at either side, is supported a casing *b*, made in two compartments separated by a horizontal partition *c*. The upper compartment is also divided into a number of subsidiary compartments separated by vertical partitions *d*. In the lower compartment there are a number of vertical partitions *e* in line with the upper partitions *d*; but the first, third, and other odd partitions *e* have large passages through their upper parts, while the second, fourth, and other even partitions *e* have large passages through their lower parts. Through the horizontal partition *c* are rows of holes in which are fitted in an air-tight manner tubes *f*, closed at their bottoms, which dip into the water, there being a row of these tubes between each pair of the partitions *e*. Through each of the upper partitions *d* there are rows of holes fitted in an air-tight manner with bends *g* of tubes *h*, which extend down, one in each of the tubes *f*, to nearly its bottom, *h* being itself open at the bottom. At one end of the vessel is an inlet *k* for blast-furnace gases, and

at the other end there is an outlet *l* for them.

There is also an inlet *s* and an outlet *t* for air.

At each side of the vessel are formed laterally-projecting recesses *l'*, in each of which are accommodated a pair of pulleys *m* and weights *n*, suspended by chains which pass over the pulleys, the other ends of these chains being attached to scrapers *p*, which are metal plates so shaped that they embrace the tubes *f* and bear against the faces of the partitions *e*. The pulleys *m* are fixed on shafts *q*, driven by chains from gear-wheels *r*, which are caused by any suitable motor to make a number of turns in the one direction and a number in the opposite direction alternately.

The apparatus is operated as follows: Blast-furnace gases entering by the inlet *k* are caused by the partitions *e* to pass in a zigzag course through the vessel in contact with the tubes *f* to the outlet *l*. At the same time air blown or drawn by a fan or otherwise is caused to enter by the inlet *s*, to pass from the first subsidiary compartment down the tubes *h* of the first row, to ascend the annular spaces between the tubes *f* and *g* to the next upper compartment, and so on through row after row of the tubes to the outlet *t*. The blast-furnace gases are thus cooled and the air is heated. Also the gases deposit on the surface of the tubes *g* and of the partitions *e* much of the dust carried by them. By the alternating up-and-down movements of the scrapers *p*, due to the reciprocations of the shafts *q*, the matters deposited on the tubes *g* and the partitions *e* are scraped off their surfaces and drop into the water below, forming a mud, which from time to time can be removed.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. An apparatus for cooling and cleansing blast-furnace gases comprising a vessel placed over a water-trough and having a suitable inlet and outlet for the gases, partitions in said casing provided with openings for the passage of the gases therethrough, an upper compartment in the said vessel having a suitable air inlet and outlet and divided into subsidiary compartments, tubes depending from each of said subsidiary compartments to the water and provided with closed bottoms, and

a tube extending in each of the said depending tubes, having an open bottom and connected at the top to one of the subsidiary compartments, substantially as and for the  
5 purpose set forth.

2. In combination in an apparatus for cooling and cleansing blast-furnace gases, vertically-extending tubes and partitions over which the gases are caused to pass, scrapers  
10 adapted to be moved alternately up and down

along the surfaces of the said tubes and partitions, and means for so moving them, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses. 15

B. H. THWAITE.

Witnesses:

WALTER E. ROCHE,  
HORACE ALLEN.