J. Easton, Jr. & F. Thiry. Sheet 1. 4 Sheets.

Pulp Engine.

No. 52,941. Patented Feb. 27, 1866.

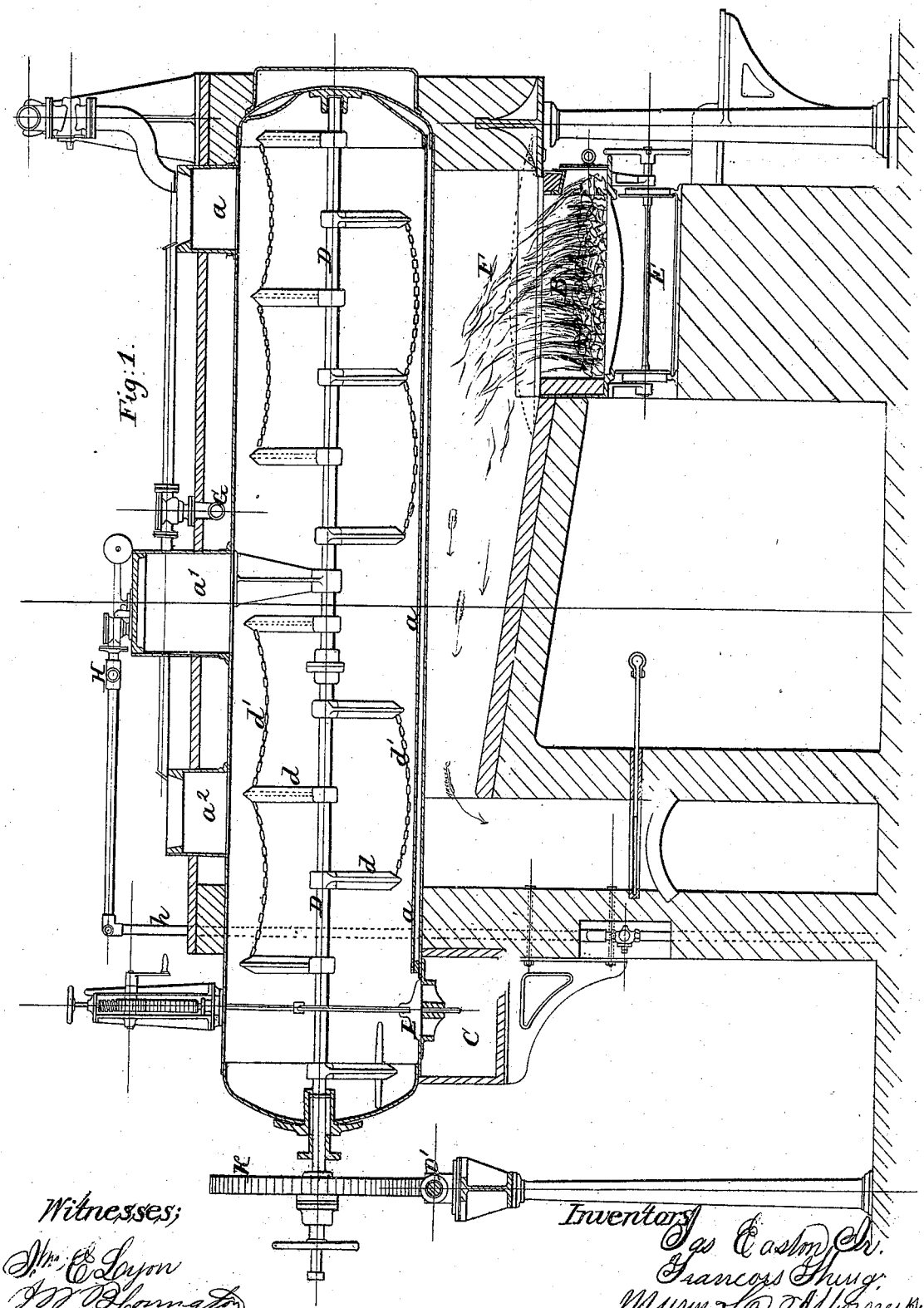



Fig: 1.

Witnesses;

Wm. E. Layton

J. W. Harrington.

Inventors;

Jas Easton Jr.

Francois Thiry.

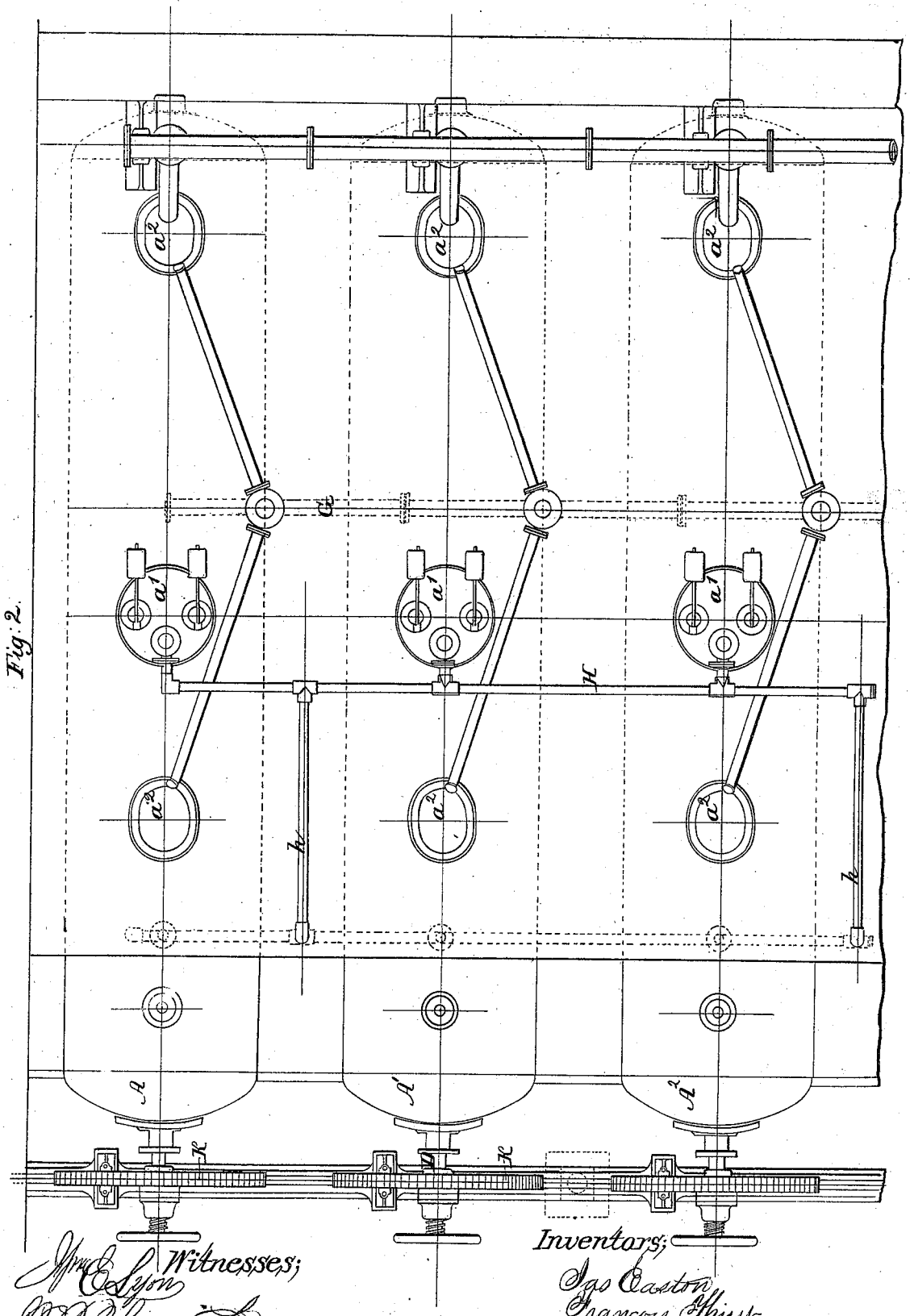
Munn & Attorneys

J. Easton, Jr. & F. Thiry. Sheet 2. 4 Sheets.

Pulp Engine

No. 52,941. Patented Feb. 27, 1866.

Fig. 2.




Witnesses;

Jno. E. Lyon

Jno. A. Emmerich

Inventors;

Jas Easton

Francois Thiry

Munn & Co Attorneys

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Pulp Engine.

No. 52,941. Patented Feb. 27, 1866.

Fig. 3.

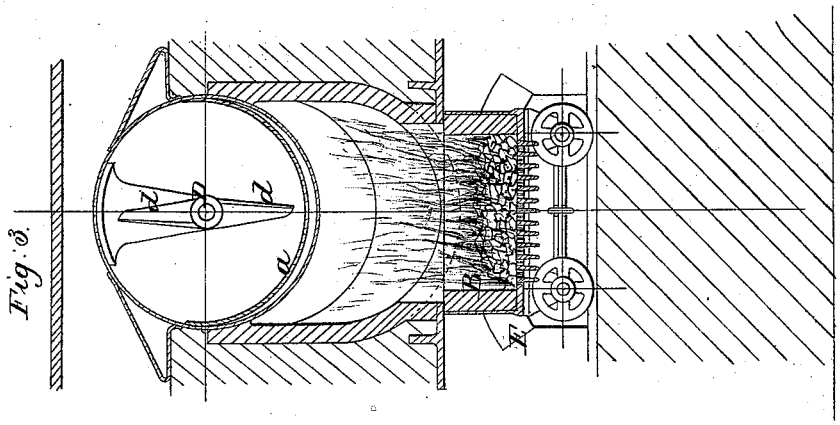
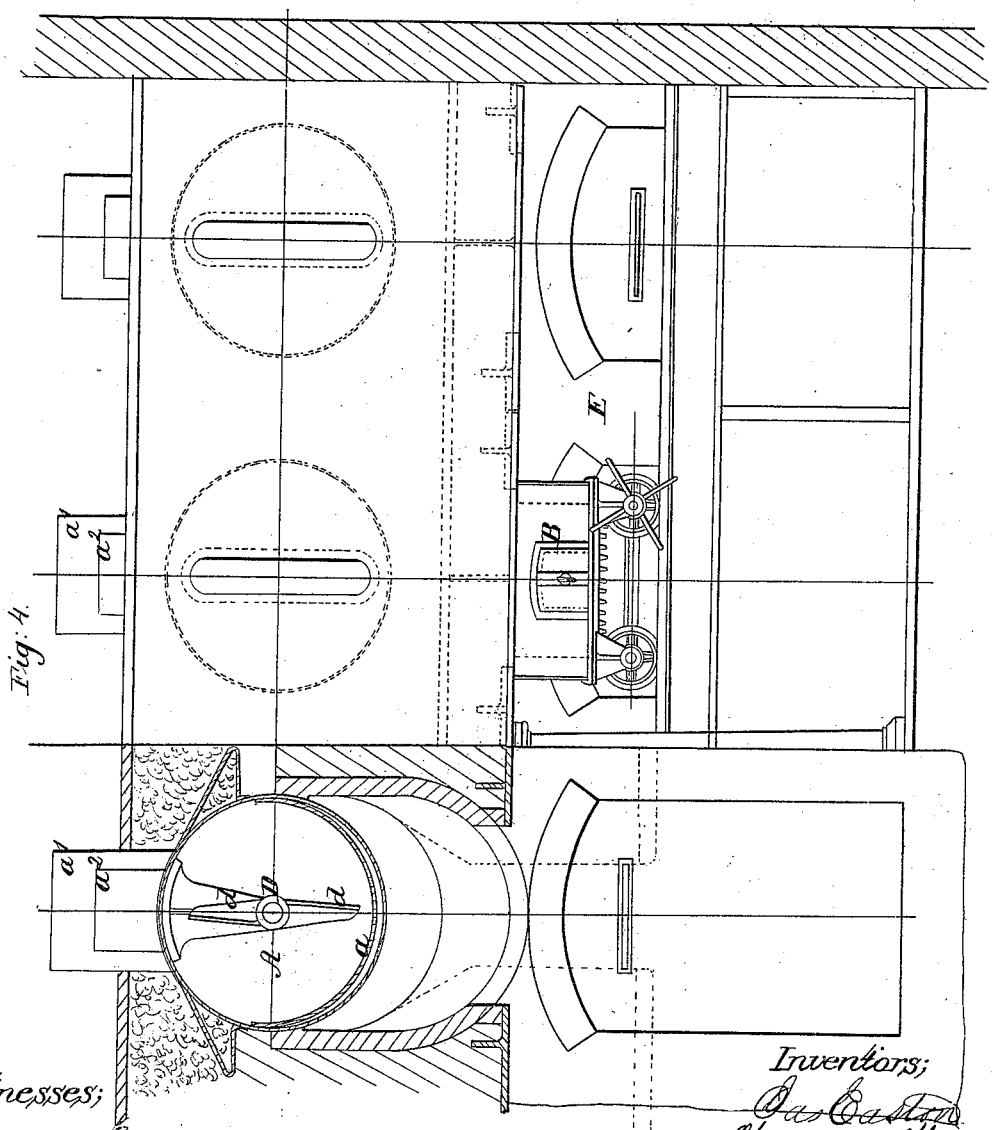



Fig. 4.




Witnesses;

Jas. E. Lyon

J. R. Livingston

Inventors;

Jas. Easton

Frazcois Thiry

Munn & Co.

Attorneys.

J. Easton, Jr. & F. Thiry. Sheet 4, 4 Sheets.

Pulp Engine.

No. 52,941. Patented Feb. 27, 1866.

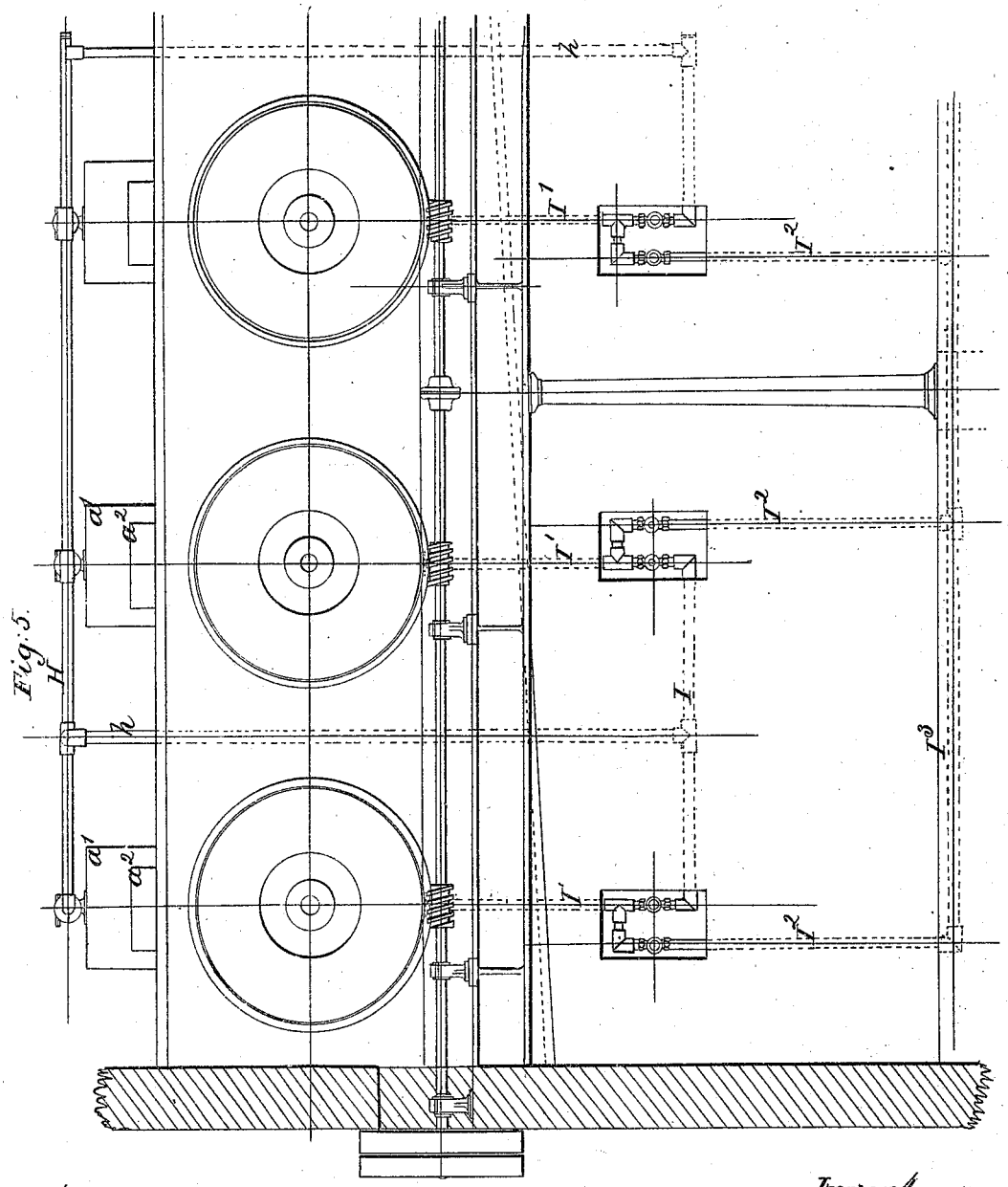



Fig. 5.

Witnesses;

Jno. E. Lynn

W. W. Thompson

Inventors;

Jas Easton

Frances Thiry

Munn & Co

Attorneys

# UNITED STATES PATENT OFFICE.

JAMES EASTON, JR., OF GROVE SOUTHWARK, ENGLAND, AND FRANÇOIS THIRY, OF HUY, BELGIUM.

## IMPROVED APPARATUS FOR THE MANUFACTURE OF PAPER-PULP.

Specification forming part of Letters Patent No. **52,941**, dated February 27, 1866.

*To all whom it may concern:*

Be it known that we, JAMES EASTON, Jr., of the Grove Southwark, in the county of Surrey, England, engineer, and FRANÇOIS THIRY, of Huy, in the Kingdom of Belgium, have invented Improved Apparatus for the Manufacture of Paper-Pulp; and we do hereby declare that the following is a description of our said invention.

This invention relates to a novel arrangement of apparatus for reducing straw to half-stuff for the manufacture of paper. The straw, having been cut up into short lengths, is immersed in an alkaline solution and subjected to steam-pressure in steam-boilers of peculiar construction, after which it is washed and discharged from the boilers by the aid of a copious stream of water supplied thereto. It is for the purpose of effecting these operations in an efficient and economical manner that the novel apparatus shown in the accompanying drawings was designed.

Figure 1 is a longitudinal vertical section of the improved apparatus. Fig. 2 is a plan view of the same. Fig. 3 is a partial transverse section taken in the line 1 2 of Fig. 1. Fig. 4 is a front view, partly in section; and Fig. 5 is a back elevation.

In these views three steam-boilers of like construction and mounted in brick-work side by side are shown, that number being preferred, as they economize time in the working by being used in succession and heated. These boilers are shown at A A′ A², and they are heated by traversing fires contained in fire-boxes and carriages B. The boilers are horizontal cylinders fitted at their lower halves with a false bottom *a*, segment-shaped in cross-section, pierced with holes to allow of the free circulation of liquor through them. The hinder ends of the boilers project beyond the brick-work which carries them, to permit of a discharge-opening closed by a valve overlying an open trough, C, which is intended to receive and convey away the contents of the boilers when the operation is completed. Safety-valves are provided in the steam-chambers *a′*, which are situate at about the middle of the length of the boilers, and at either end there are man-holes *a²*, through which the boilers are charged with cut straw and liquor. A horizontal rotating shaft, D, carrying radial arms *d*, is provided in each boiler, and from there arms chains *d′* are pendent for the purpose of turning over the stuff or cut straw contained in the boiler, and thus presenting every portion thereof to the action of the alkaline liquor. At the same time these chains scrape or clear the perforated bottom *a*. Below the boilers A A′ A², near the front ends thereof, a passage, E, is formed in the brick-work, running transversely thereto, and in this passage a railway is laid to receive, say, two fire-boxes B, which are mounted on wheels. This passage E communicates with the flues F that run under the boilers in the direction of their length, as shown at Fig. 1. The fire-boxes B are fitted at bottom with fire-bars of the usual construction, and they are lined with fire-brick to protect the metal sides and back end from the injurious action of the fire. The front end is furnished with a door and hearth like an ordinary furnace. These fire-boxes are intended to transport the fire from one boiler to another as soon as the operation in one boiler is completed and another has been charged and made ready for getting up steam, and thus removing the necessity for drawing the fire to cool down a boiler and relighting when the operation is to be repeated. It is to allow of this transfer of the fire that the transverse passage E is made under the boiler-flues and brought into connection therewith. The fire-boxes, when brought under the boilers to be heated, fit closely against the flues F, to which they are respectively applied, and in which the boilers to be heated are mounted, so that little or no cold air is allowed to enter the flues.

By this arrangement it will be understood that the fire acts directly upon the boiler; but by reason of the clearing action of the chains and the use of the perforated false bottom, which sustains the material under treatment, and allows of the circulation of the liquor below it, the bottom of the boiler will be covered with liquor, and thus the material will not be liable to be burned nor the boiler injured by the direct action of the fire.

Instead of having a transverse passage for the transfer of the fire-box from boiler to boiler, the box may be drawn out endwise and shifted

into a line with the next boiler to be fired and then pushed under that boiler.

The supply of alkaline liquor is brought to the boilers by a horizontal main pipe, G, which leads from the vessel in which the mixture is prepared. From this main extend branch pipes *g g*, Fig. 2, which lead, respectively, to the several man-holes $a^2$ $a^2$ of the group of boilers. The supply to these branch pipes is governed by cocks, so that either set is, at pleasure, brought into communication with the main supply-pipe.

The steam-chambers *a'* of the several boilers are connected together by a horizontal steam pipe, H, from which branch pipes *h h* lead down to horizontal pipes, I, below the boilers. (See Fig. 5.) These pipes I connect with pendent pipes I', leading from the bottoms of the several boilers, and stop-cocks are fitted to these pendent pipes below their junction with the horizontal pipes I. Above this junction a hand-pipe, $I^2$, is connected with each pendent pipe I', and these branch pipes are connected with a horizontal discharge-pipe, $I^3$, sunk in the ground. They are also provided with stop-cocks for cutting off connection with the discharge-pipe. This arrangement is for the purpose of discharging the steam out of one boiler, after the completion of the operation, into another boiler, and for discharging the spent alkaline liquor from the apparatus.

A slow rotary motion is given to the shafts D, carrying the radial arms *d* and chains *d'*, by means of a worm-shaft, D'. This shaft, it will be seen, is supported in bearings on a transverse girder, carried by cast-iron pillars a little in the rear of the boilers. The worms on this shaft gear into and drive worm-wheels K, mounted on the ends of the shafts D, and thereby impart a slow rotary motion to the radial arms. Supposing, now, the apparatus to be in working order, the first boiler of the series A having been properly charged with cut straw and alkaline liquor and the man-holes closed, and the fire is lighted in the fire-box below the boiler, and a suitable internal pressure of steam is maintained until the silicious matter is dissolved out of the straw with which the boiler was charged. The fire-box under the boiler is shifted to the boiler next to be set at work—say A', or No. 2—and the alkaline liquor is blown from No. 1 boiler into boiler No. 2. A free supply of water is now to be admitted into boiler No. 1 through one of the man-holes, which is opened for the purpose. The discharge-valve K, Fig. 1, is then raised to open a passage to the trough C below. The continuous rotary motion of the arms will cause the contents of the boiler to be discharged into that transverse trough in the form of half-stuff, whence the half-stuff will be conveyed away to undergo the further treatment common to that material before being converted into paper. The boiler No. 1 is thus emptied into them ready to be recharged, and when this operation is completed the boiler No. 2, the third of the series, being by this time ready to be discharged, steam is blown from that boiler into No. 1 boiler. The spent liquor is then run off and the half-stuff is run into the trough, as before described. The fire-box is then shifted from under boiler No. 3 to boiler No. 1, and the operation is repeated.

Having now explained the nature of the invention, we wish it to be understood that we claim—

1. The passage E and movable fire-boxes or cars B, in combination with two or more boilers, A A' $A^2$, constructed and operating substantially as and for the purpose set forth.

2. The radial arms *d* and chains *d'*, in combination with the boilers A A' $A^2$, and with suitable gear intended to give the shaft from which the arms *d* extend a revolving motion, substantially as and for the purpose described.

In witness whereof we, the said JAMES EASTON, Jr., and FRANÇOIS THIRY, have hereunto set our hands and seals this 17th day of March, 1865.

JAMES EASTON, JR.
F. THIRY.

Witnesses to the signature of James Easton:
WM. SCORER,
24 *Royal Exchange*,
FRED. WALKDEN.
66 *Chancery Lane, London.*
Witnesses to the signature of F. Thiry:
J. PONCIN,
J. GORJON.