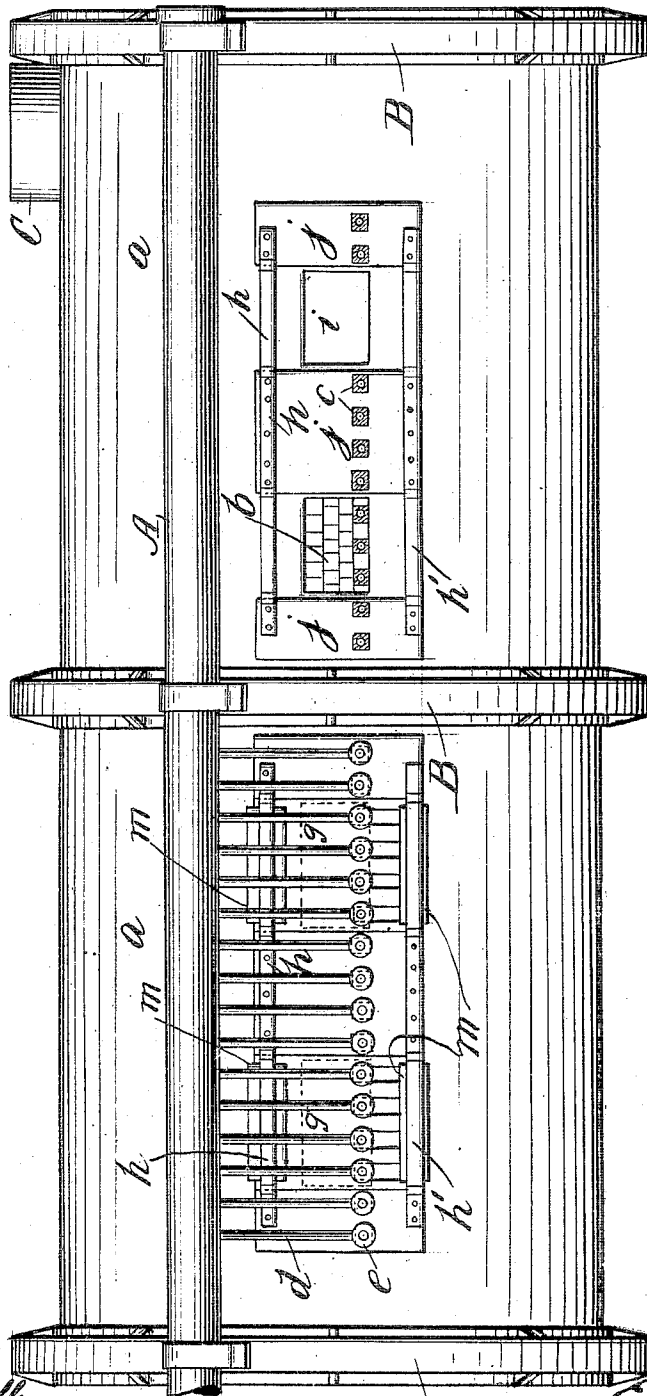


APPLICATION FILED AUG. 20, 1910.

1,044,587.

Patented Nov. 19, 1912.

2 SHEETS—SHEET 1.



WITNESSES:

Carolyn T. Cheffe
Josephine McQuinn

INVENTOR;

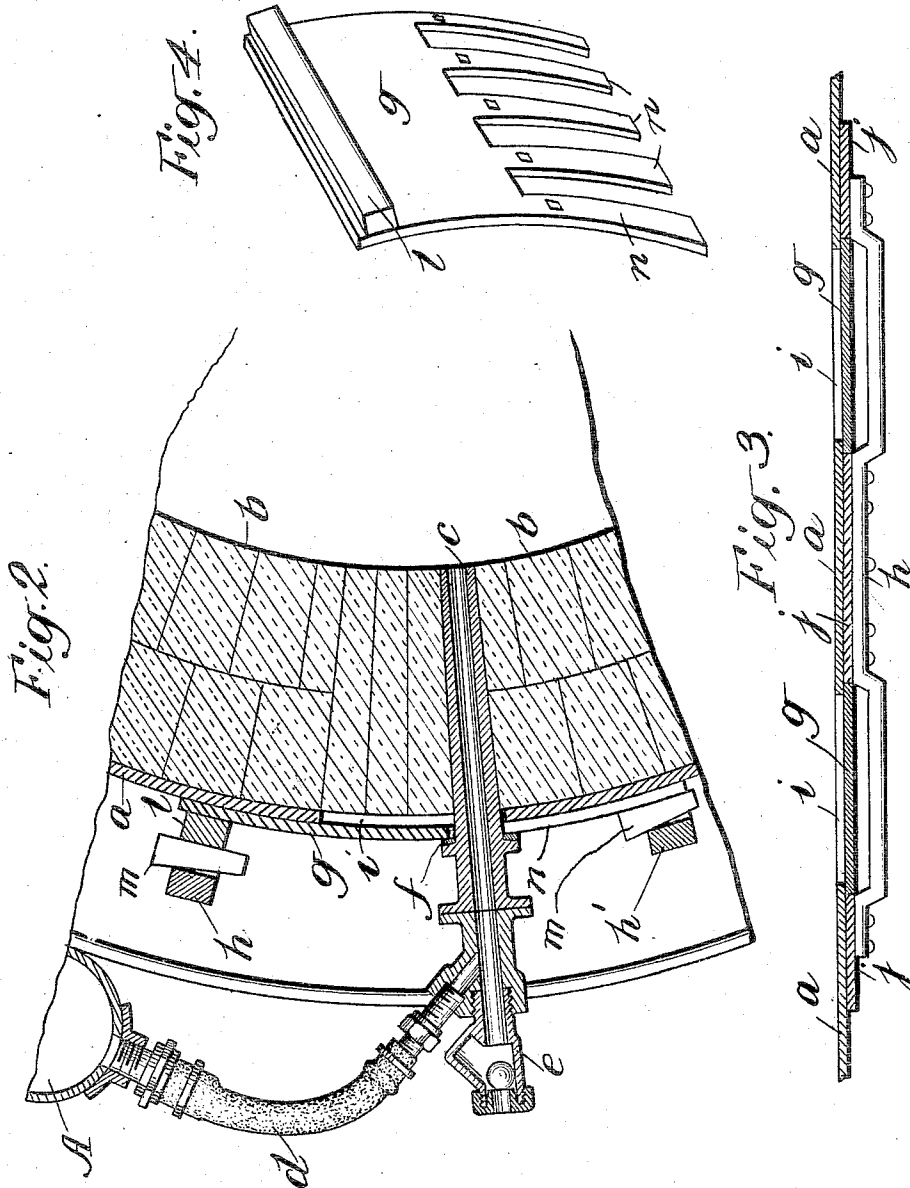
BY
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E. A. C. SMITH.
REPAIRING CONVERTERS.
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UNITED STATES PATENT OFFICE.

ELIAS ANTHON CAPPELEN SMITH, OF BALTIMORE, MARYLAND.

REPAIRING CONVERTERS.

1,044,587.

Specification of Letters Patent.

Patented Nov. 19, 1912.

Application filed August 20, 1910. Serial No. 578,136.

To all whom it may concern:

Be it known that I, ELIAS ANTHON CAPPELEN SMITH, a citizen of the United States, residing at city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Repairing Converters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In the bessemerizing of copper matte and the like, it is necessary from time to time to make substitutions and repairs in the converter principally along the line of the twyers. In converters of large size, it has heretofore been customary, in making these substitutions and repairs, to interrupt the furnace operation and to permit the interior of the furnace to cool sufficiently to permit the furnace mason to enter the converter and carry on his work from the inside. This has necessitated very considerable delays in the operation of the plant and is accompanied with corresponding inconvenience to the workman, who is thus obliged to operate in cramped quarters and in an atmosphere of such relatively high temperature as to seriously cut down his efficiency for any given period of time.

My present invention is designed to obviate these disadvantages by providing a structure wherein the twyers and the furnace lining along the twyer zone, are readily accessible from without, through the converter casing, so that while the converter is normally fully incased, when under blast, portions of that casing may, when desired, be readily disassembled or shifted, along the twyer zone, so as to lay bare corresponding portions of the lining and to permit the removal and replacement of defective bricks and twyers.

The arrangement is such that the portions of the casing which may thus be shifted in order to make accessible the corresponding portions of the lining behind them are so related to the permanent portions of the casing in extent and area that upon the removal of any two proximate removable or shiftable sections, the intermediate portions of the lining along the twyer zone and the intermediate twyers

may readily be reached from without by the workman, so that the removable sections permit the substitution and repair not only of the individual twyers and lining sections which they cover, but also the neighboring twyers and lining sections on both sides.

In actual practice, the use of my invention permits the effective repair and substitution of worn twyers and lining within a few hours, whereas, under the old practice the same repairs required on the average a loss of time of several days. The workman, operating from the exterior of the converter, undertakes and completes his substitutions and repairs, without inconvenience or discomfort, and without being obliged to wait until the furnace has cooled down to the low temperature which was essential for repairing from within.

In the accompanying drawings, Figure 1. represents, in side elevation, a copper matte converter, of a type suitable for the practice of my invention, certain of the parts being omitted, for the purpose of clearness of illustration of the remainder. Fig. 2. represents, on a larger scale, a detail sectional view of a portion of the converter along the twyer zone, at the region of one of the removable casing sections; Fig. 3. represents a longitudinal section through the casing upon a plane above two of the removable sections; and Fig. 4. represents, in perspective, one of the removable casing sections dissociated from the converter itself.

Similar letters of reference indicate similar parts throughout the several views.

The drawings illustrate the application of my invention to a copper matte converter having a metallic shell or casing *a* and a lining *b* of refractory bricks, of magnesite, chrome, bauxite, or the like.

a indicates the individual twyers, preferably of cast iron, of suitable cross section, said twyers, in the particular instance shown being individually connected by flexible pipes *d* with the longitudinal bustle pipe *A* supplying the converter blast. As is usual in copper matte converters, the twyers *c* may likewise be provided with the customary Dyblie valve-fitting *e*, for the admission of a punching rod, as is well understood in the art of copper matte conversion. The twyers are like-

wise adapted to shift upon the lead washer *f* as a center, so as to maintain their integrity in spite of the shifting of the lining due to its expansion and contraction under the heat conditions prevailing in the converter.

In copper matte converters, as has been hereinbefore indicated, the region of maximum wear is on the side of the converter where the twyers are located. On the opposite side of the converter the wear is relatively slight, and this is true also to a large extent for the parts of the lining below the range of twyers except perhaps in their immediate vicinity. More specifically stated, therefore, the maximum wear upon the lining is in the region immediately adjacent to, above and between the twyers, where the action of the slag upon the lining makes itself manifest to some degree even under the best attainable commercial conditions of practice and where it is especially aggravated whenever, through inadvertence or inattention, the temperature of the slag in the furnace is permitted to rise to too high a degree. Accordingly, in the practice of my invention, I arrange to render readily accessible this region of maximum wear or corrosion. To this end, as indicated in the drawings, I provide the casing *a* with a number of apertures *i*, preferably rectangular in outline, and whose lower margins serve as ledges upon which to rest the corresponding metallic twyers.

The converter, in the form illustrated in the drawings, is provided with the supporting rings *B*. Upon one side of the central ring are shown sixteen twyers, and upon the other side are shown fourteen twyers. To make readily accessible the entire twyer zone represented by these two series of twyers, each series is provided with two of the apertures *i*. The apertures for the series of sixteen twyers, each correspond in location to four twyers of that series, and the two apertures for the series of fourteen twyers, each correspond to three twyers of the series of fourteen. Consequently, when the apertures are uncovered for purposes of repair to the twyers or lining, the workman may readily gain access through any of the openings not only to the twyers which are thus uncovered, but also to the two twyers to the right and to the left of the opening, these adjacent twyers and the corresponding portions of the lining being within easy reach both for the removal and the replacing of the parts.

Above the apertures *i* is securely riveted to the shell or casing of the converter a bent wrought iron bar or strap *h*, the converter being preferably reinforced at the points of connection of the bar or strap by means of cheek pieces *j*, so as to afford a firm anchorage for the bar or strap. So also, a like bar or strap is provided below the twyers and

this bar or strap is likewise securely riveted to the casing and its cheek pieces. The upper bar or strap *h* is bowed out at those portions of its length corresponding to the apertures *i* and the lower bar or strap *h'* is similarly bowed out, these bowed-out portions projecting forwardly from the cylindrical plane of the main body portion *a* of the casing. There is thus afforded for each aperture *i*, a guide space for the reception of a removable plate section (shown in perspective, Fig. 4,) which is designed to cover the aperture and complete the casing after a repair or substitution has been made, and which normally covers the aperture when the converter is originally put into operation.

The removable plate section consists of a main body portion *g*, of metal, carrying at its upper portion a metal bar *l* and terminating at its lower edge in a series of prongs or yokes *n* with intervening rectangular recesses, so that the prongs or yokes straddle the rectangular twyers, and, in the lowermost or closed adjustment of the removable section, occupy the spaces intermediate of the twyers. When the removable sections are in place so as to cover the apertures *i*, they are forced into tight engagement with the main body portion *a* of the casing by means of wedges *m*, driven in for that purpose. This closed position of the removable sections is illustrated in Figs. 2 and 3 and at the left hand side of Fig. 1. On the right hand side of Fig. 1 the apertures *i* are shown as uncovered, and the aperture *i* farthest to the right is shown with its twyers and lining removed.

The mode of operation of the invention will be clearly apparent. The converter, in the first instance, is built up, in the usual manner, with its twyers and lining, and the removable sections are dropped into place, with their prongs or yokes straddling the twyers, whereupon they are securely wedged into close contact with the main body portion *a* of the shell or casing. When it is desired to repair the lining, at any point along the twyer zone, or to remove a defective or corroded twyer or twyers, the wedges *m* of the corresponding casing section are loosened, and the section is raised until the aperture is fully uncovered. This gives the workman access to the repair place, permits him to complete the substitution or repair, and thereafter to replace the removable section and again wedge it into contact with the main body portion of the casing, thereby reestablishing the converter. As indicated in Fig. 2, in order to permit the movement of the twyers to accommodate the shift in the lining due to expansion and contraction, there is left, in building up the furnace, a small space between the under surface of the twyers and the lower margins of the aper-

tures, and also a small space between the upper surface of the twyers and the main body portions of the closing plates.

Having thus described my invention, what

I claim is:

1. A converter, provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining, said converter being further provided with means for effecting substitutions and repairs along the twyer zone and from without, said means consisting of a removable casing section through which a corresponding portion of the twyers and lining are accessible; substantially as described.

2. A converter, provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining, said casing being provided at the twyer zone with an aperture, a closing plate for said aperture, and means for forcing the closing plate into close contact with the casing, so as to securely seal the aperture when the closing plate is in place; substantially as described.

3. A converter, provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining, said casing being provided at the twyer zone with an aperture, a closing plate for said aperture, said closing plate being provided with depending yoke fingers which straddle corresponding twyers, and means for forcing the closing plate into close contact with the casing; substantially as described.

4. A converter, provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining, said casing being provided at the twyer zone with a repair aperture, whose lower edge constitutes a supporting ledge for a corresponding number of twyers, a closing plate for said aperture, said closing plate being provided with depending yoke

fingers which straddle corresponding twyers, and means for forcing the closing plate into close contact with the casing; substantially as described.

5. A converter, provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining, said casing being provided at the twyer zone with an aperture, a closing plate for said aperture, a bar at the top and a bar at the bottom of said plate when in closing position, and wedges co-acting with the plate and said bars to force the plate into close contact with the casing; substantially as described.

6. A converter, provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining, said converter being provided at intervals along its twyer zone with apertures corresponding to portions only of the twyer zone but through which the lining of the converter immediately adjacent to the twyers is accessible from without for substitutions and repairs, and removable covers for said apertures; substantially as described.

7. In a converter provided with a metallic casing having a refractory lining and a series of twyers passing through the casing and lining and being further provided at the twyer zone with an aperture through which substitutions and repairs may be made, a cover plate for said aperture having a series of yoke fingers along its lower edge for straddling corresponding twyers, and having a bar along its upper edge; substantially as described.

In testimony whereof I affix my signature, in presence of two witnesses.

ELIAS ANTHON CAPPELEN SMITH.

Witnesses:

WILLIAM H. DAVIS,
JOHN C. PENNIE.