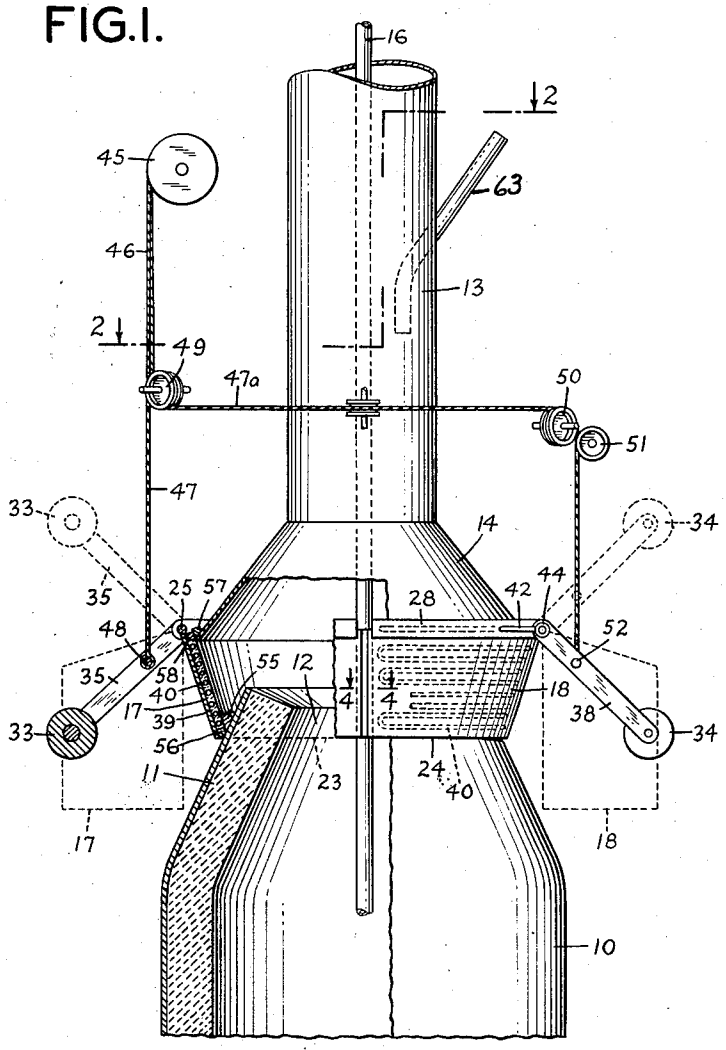
Oct. 7, 1958 W. KÖNIG 2,855,194

SYSTEM FOR SEALING A CONVERTER

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FIG.I.



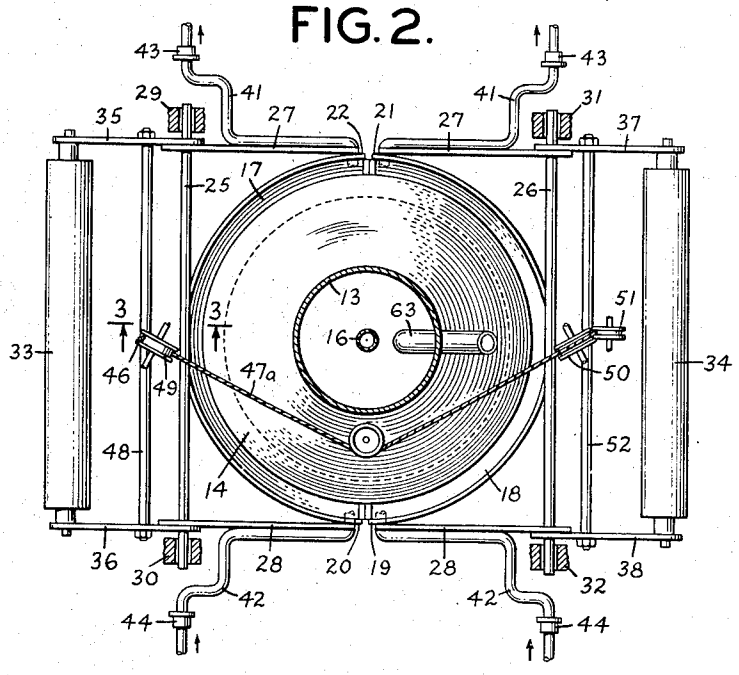
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FIG. 2.



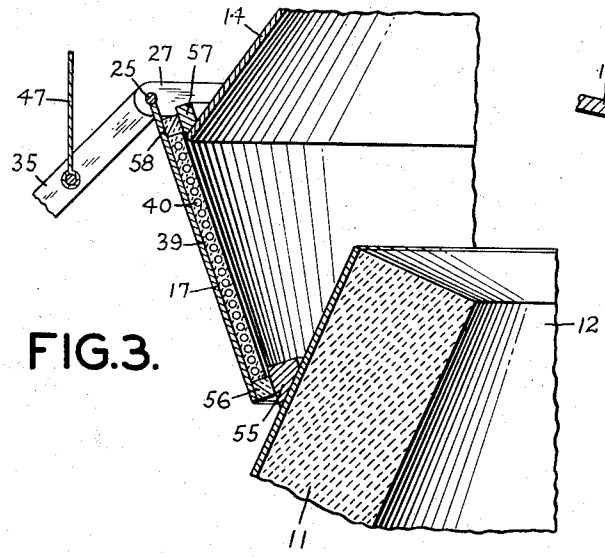


FIG. 3.

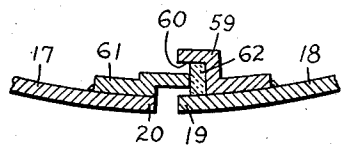


FIG. 4.

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SYSTEM FOR SEALING A CONVERTER

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Application July 15, 1955, Serial No. 522,343

Claims priority, application Austria July 21, 1954

8 Claims. (Cl. 266—35)

This invention relates to improvements in converters for the refining of pig iron and the like to produce steel and for similar refining operations, and it relates more particularly to a system for facilitating the recovery of valuable waste gas developed during the converting operation and for recovering dust and iron oxides and the like from the converter.

Waste gas is developed during refining of metals in a converter. This gas escapes mainly into the atmosphere. When pig iron is converted to steel by blowing it with pure oxygen from above, large quantities of waste gas are created which, being principally carbon monoxide, burn at the mouth of the converter. The waste gas also carries finely divided oxide with them, thereby creating a nuisance as well as constituting a waste of a valuable product.

In order to minimize the loss of carbon monoxide oxides or other dust, it is necessary to keep the volume of gas issuing from the converter as small as possible and to collect the gas in an unburned state at the mouth of the converter. If the gas could be accumulated or collected without substantial dilution or burning, its volume and B. t. u. value could be maintained at such a level that the gas could be handled in suitable dust collectors and the like to enable the separation of the metal oxide powder from the gas and the gas burned to fire boilers or the like or for other useful purposes.

If the gas is allowed to mix with air, it will burn with the result that nearly ten times as much gas will be produced as that initially issuing from the converter. The gas thereby produced is of little value and its volume is so great that it cannot be handled economically to recover metallic oxides therefrom.

The problem of providing a closed circuit through which the gas is discharged is not a simple one because the converter must be mounted for tilting movement between a position for charging and blowing the converter and a pouring position. Means usually is provided in the installation for drawing off the smoke and gas such as the smoke pipe of a conventional converter installation. The smoke pipe must be arranged to cover or be opposed to the mouth of the converter and thereby receive the gas therefrom. However, the smoke pipe cannot very well be arranged to drop over the mouth of the converter because it must be insulated by fire brick or the like and thus would be very heavy and woud require a great amount of power equipment to move it up and down to open and close the mouth of the converter and provide enough clearance to enable the converter to be tilted from its blowing to its pouring position. Moreover, because of the large extent of the hood and warping due to changing temperatures, it is very difficult to provide an effective seal between the hood and the mouth of the converter.

The above problem is solved in accordance with the present invention by providing a collar member made up of a plurality of sections which can be moved into and out of substantially sealing engagement with the edges

of the hood and the shell of the converter around the mouth thereof to exclude air and direct the gas from the converter into the smoke pipe without substantial dilution. The shell section can be formed of sheet steel or the like and may be appropriately lined with brick or other heat resisting material and may have cooling coils or the like therein to enable the collar to withstand the temperatures at the mouth of the converter. However, inasmuch as they close a relatively narrow gap between the mouth of the converter and the hood on the smoke pipe, they are not excessively heavy and can be counter balanced to facilitate their movement. The collar sections are mechanically or otherwise moved out of the way to enable the converter to be tilted and moved into engagement with the hood, converter and each other to form a closed collar or sleeve closing the gap between the converter and the smoke pipe. With this arrangement of elements, substantial dilution of the carbon monoxide with air and burning thereof at the mouth of the converter is avoided so that dilution of the converter gas can be kept to a minimum and it can be cooled and subjected to dust removal to separate out of the dust-like metal oxides or the like. The cleaned gas can then be burned or utilized in any other suitable way.

Existing installations can be equipped with the sealing collars without substantial reconstruction so that the cost of installation can be kept at a minimum.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

Figure 1 is a view partly in vertical section and partly in front elevation of a portion of a converter and a hood and smoke pipe together with a typical sealing collar embodying the present invention;

Figure 2 is a top plan view of the sealing collar shown in conjunction with the smoke pipe and taken on line 2—2 of Figure 1;

Figure 3 is a somewhat enlarged sectional view taken on line 3—3 of Figure 1, and

Figure 4 is an enlarged view in section taken on line 4—4 of Figure 1.

The invention will be described with reference to a converter of the type which is adapted to be blown from the top with substantially pure oxygen. Such a converter includes a generally cylindrical shell **10** formed of sheet steel containing a brick liner of any suitable composition, the shell being mounted for pivotal movement around a horizontal axis and having a tapered nose portion **11** provided with a filling and pouring opening or mouth **12**. The installation also includes a smoke pipe **13** substantially in alignment with the vertical axis of the converter **10** when the latter is in blowing position, the smoke pipe having a flared hood **14** at its lower end overlying the mouth of the converter but spaced therefrom to enable the converter to be tilted for charging, blowing and pouring.

Extending downwardly through at about the center of the smoke pipe is an adjustable pipe or lance **16** through which oxygen is introduced into the converter against the surface of the charge therein. The pipe or lance **16** is movable up and down by means of a hoist (not shown) or in any other suitable way to allow it to be withdrawn from the converter when the latter is to be tilted and to allow the lance to be moved into the proper spatial relation to the charge in the furnace.

Due to the gap between the mouth of the converter and the lower edge of the hood **14**, as shown in Figure 1, large quantities of air can come into contact with the waste gas issuing from the mouth of the air converter and will combine with this gas to produce combustion and flame. Due to the very great increase in the volume of the products of combustion as compared with the volume of gas issuing

from the converter, it is very difficult to handle the gas or to recover anything of value from it.

The present invention provides a mechanism for sealing the gap between the mouth of the converter and the lower edge of the hood 14. As best shown in Figures 1 and 2, the sealing mechanism includes two or more arcuate collar sections 17 and 18 which are essentially identical and which together form a complete collar capable of encircling and engaging the edge of the hood 14 and the shell adjacent to the mouth of the converter. The collar sections 17 and 18 are circular in cross section and are tapered downwardly rendering the collar frusto-conical in shape. The dimensions of the shell sections 17 and 18 are such that when their vertical edges 19 and 20 and 21 and 22 are in substantial engagement, the lower edges 23 and 24 of the sections are in contact with the shell of the converter 10. Also, the upper portions of the collar sections are substantially in sealing engagement with the peripherial edge of the hood 14. When in the positions shown in Figure 1, the sections 17 and 18 close the gap between the lower edge of the hood and the converter shell and thereby prevent substantial entry of air into the gas stream flowing from the mouth of the converter into the smoke pipe 13.

Inasmuch as provision must be made for relative movement between the converter 10 and the smoke pipe during movement of the converter between charging, blowing and pouring positions the collar sections 17 and 18 must be mounted for movement out of the path of the converter. The sections 17 and 18 can be mounted for linear movement toward and away from the hood into and out of sealing position but preferably as shown in Figure 1, they are mounted on pivot shafts 25 and 26 at their outer edges which extend between the frame pieces 27 and 28 mounted at opposite sides of the sections 17 and 18. Suitable bearings 29, 30, 31 and 32 are provided for the pivot shafts 25 and 26 on a frame above the hood as shown in Figure 2. In order to facilitate movement of the collar sections 17 and 18, they may be provided with counterbalances 33 and 34 which are mounted between parallel arms 35, 36 and 37 and 38 which are fixed to the pivot shafts 25 and 26 and move with the collar sections 17 and 18. By providing appropriate counter weights, the collar sections can be counterbalanced for easy movement even if they are lined with fire brick 39 or the like as shown in Figure 3 and provided with suitable cooling coils 40 behind or in the lining in the shells. As shown in Figures 3 and 4, such cooling coils can be provided for the sections and mounted in them without the use of flexible connections. By extending the ends 41 and 42 of the coils outwardly in alignment with the pivot shafts 25, for example, their ends can be connected by means of rotatable couplings 43 and 44 to water supply and discharge lines.

Movement of the collar sections 17 and 18 can be accomplished in any suitable way, for example, by means of a winch or motor driven drum 45 about which is wound a cable 46 having one portion 47 extending down and connected to a cross bar 48 between the counterbalance arms of the section 17, and a second portion 47*a* passing around the pulleys 49, 50 and 51 and fastened to a cross bar 52 between the counter balance arms of the section 18. When the cable 46 is wound up on the drum 45, the counter balance arms are lifted upwardly and the collar sections 17 and 18 are swung downwardly and outwardly away from the shell of the converter. When the drum is reversed to allow the cable 46 to unwind, the counter balances swing the collar sections 17 and 18 downwardly into contact with the edge of the hood 14 and the shell of the converter 10.

A somewhat more effective sealing action between the collar sections and the hood and converter is obtained by providing suitable sealing surfaces thereon. Thus, for example, the converter 10 can be provided with a sealing ring 55 on the surface thereof spaced from the mouth out of the path of discharge of metal or slag and having a surface which can be engaged by a packing of asbestos or the like 56 on the lower edge of each of the collar sections 17 and 18. A similar sealing ring 57 is mounted on the hood adjacent its lower edge for engagement with a packing or collar 58 near the upper edge of each collar section. The rings 57 and 55 have the additional advantage of bracing the shell and the hood against distortion so that warpage thereof due to heating and cooling is substantially reduced and a better seal is assured.

Effective sealing of the zones of contact of the opposed edges 19 and 20, 21 and 22 of the sections 17 and 18 can be obtained in the manner shown in Figure 4. Thus, the collar section 17 may be provided with a Z-shaped flange 59 providing a channel 60 for receiving an asbestos packing or the like. A flange 61 can be mounted on the edge 20 of the section 18 for sealing engagement with about the mid-portion of the packing 62 when the sections 17 and 18 are in engagement with the hood and converter. Inasmuch as the collar sections 17 and 18 seal the gap between the mouth of the converter and the hood, it is not possible to observe directly the flame at the converter mouth. In order to overcome this difficulty, the smoke pipe 14 may be provided with a viewing tube 63 through which the interior of the furnace may be viewed.

Mechanisms of the type described above are easily installed because they can be tailored to existing installations without substantial modification of such installations. The collar sections can be made of any desired size or shape whether symmetrical or unsymmetrical and circular or non-circular, depending upon the requirements. The use of the counter-balancing mechanism for the sections of the sealing collar enables an appropriate cooling means to be provided in the collar sections without overburdening the hood and at the same time greatly facilitating the movement of the sections. The collar prevents dilution of the gas by air and combustion enables the products of gaseous and solid natures to be drawn off through the smoke pipe and in such concentration that dust recovery is economically feasible. The cleaned and cooled gas has sufficient B. t. u. value to enable it to be used for firing boilers or supplying heat thereby constituting a valuable by-product which otherwise is wasted.

It will be understood that the mechanism described herein is susceptible to considerable modification and that the sealing collars may be designed to fit existing structures and that they may be moved into and out of engagement in other ways and by other means than those shown herein without departing from the invention.

Accordingly, the form of the invention described above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. A device for conducting away gas from a converter having a shell and a mouth at the one end of the shell, said shell being mounted for tilting to dispose said mouth upwardly during blowing and to one side during pouring, comprising a smoke pipe above and having a hood above and spaced from the mouth of the converter during blowing of the latter to form a gap therebetween, a collar having a plurality of relatively movable sections, means spaced angularly around the periphery of said hood for supporting each of said sections for upward and inward pivoting movement thereof for engagement with said hood, with said shell around said mouth, and with each other to close and seal the gap between said shell and said hood, and means for so moving said sections, said laterally spaced-apart supporting means being remote from the high temperature area immediately adjacent the mouth of the converter, and said sections being movable downwardly and outwardly out of engagement with said shell to permit said converter to tilt for pouring.

2. The device set forth in claim 1 in which said hood is of greater diameter than the mouth of said converter,

and said collar is frusto-conical having its greatest diameter adjacent to said hood and its smallest diameter adjacent to said converter.

3. The device set forth in claim 1 in which the means supporting said sections comprise pivotal connections between said hood and said sections, said pivotal connections being adjacent to the upper edges of said sections and adjacent the lower edges of said hood.

4. The device set forth in claim 3, comprising cooling coils mounted on said sections and connections for supplying cooling fluid to said coils said fluid supplying connections being substantially coaxial with said pivotal connections.

5. A device for conducting gas away from a converter having a shell and a mouth in said shell, said shell being mounted for tilting to dispose said mouth upwardly during blowing and downwardly for pouring, comprising a smoke pipe above and having a hood at its lower end spaced from the mouth of the converter during blowing and forming a gap therebetween, a plurality of arcuate collar sections mounted around the periphery of said hood for upward and inward pivoting movement thereof into engagement with said hood and the shell of said converter around the mouth thereof during blowing to close and seal the gap between the hood and the shell, said sections being movable downwardly and outwardly out of engagement with said shell to permit said converter to tilt for pouring, and means for so moving said sections.

6. The device set forth in claim 5 in which said collar sections are pivotally connected at their upper edge portions to said hood for said movement into and out of engagement with said hood and shell, and comprising means connected to said sections for counter-balancing them.

7. The device set forth in claim 5 comprising heat-resistant packings mounted at the edges of said sections for sealing them together and sealing surfaces on said hood and said shell for engaging edges of said sections.

8. The device set forth in claim 5 comprising heat-resistant linings in said sections and cooling coils mounted in and movable with said sections.

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