

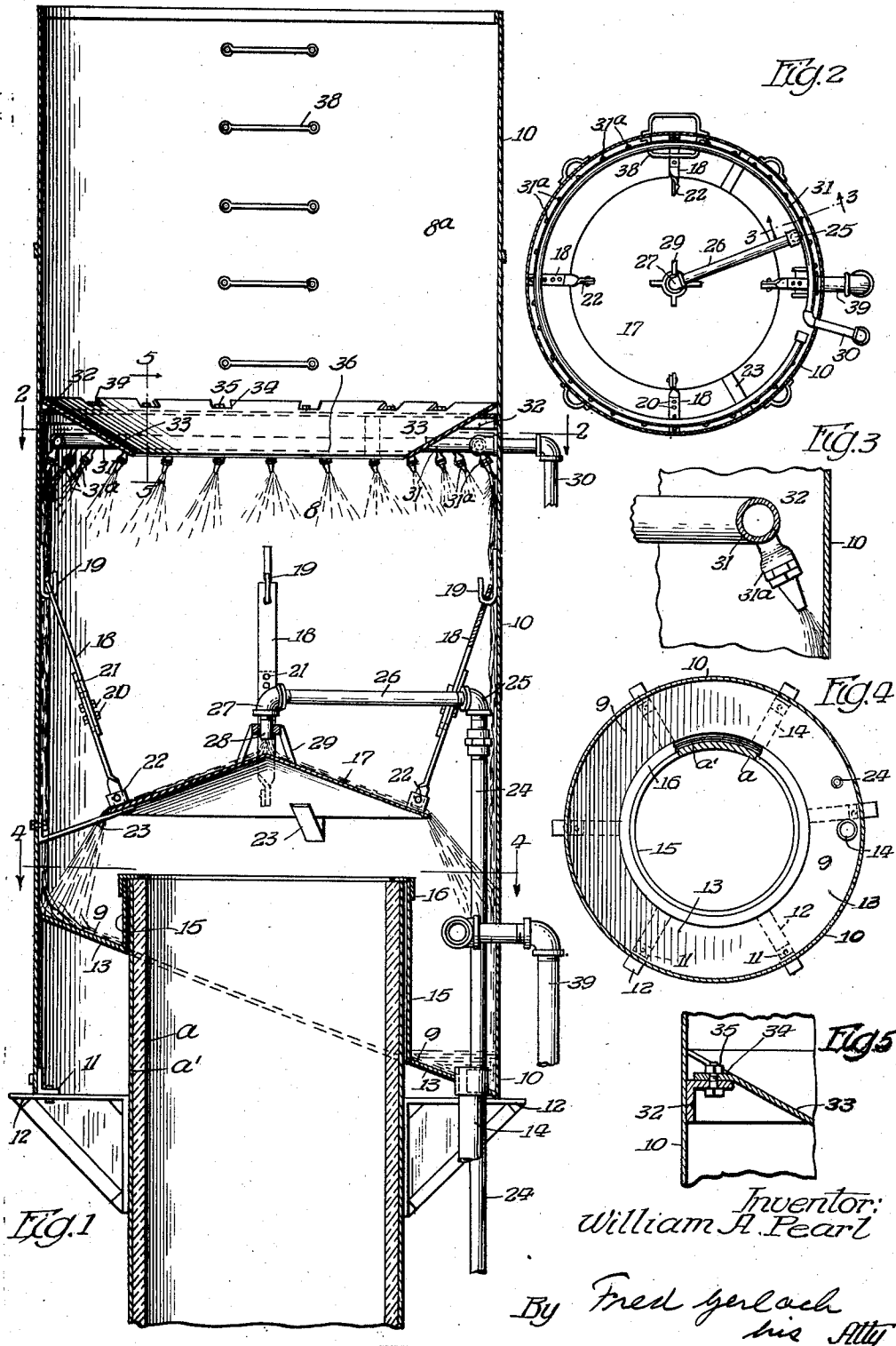
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APPARATUS FOR WASHING STACK GASES

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APPARATUS FOR WASHING STACK GASES

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The invention relates to apparatus for washing gases, and more particularly to the type used in connection with the stacks of cupolas and other furnaces to prevent objectionable carbon, cinders, fly-ash and other particles and odors in the gases produced in the furnace from escaping to the atmosphere around the stack.

One object of the invention is to provide an apparatus which is adapted to be mounted on the upper end of a stack and which is adapted for efficiently washing the gases passing through the stack.

Another object of the invention is to provide an apparatus of this type which is efficiently water cooled to prevent the destruction of the parts by gases which contact therewith.

Other objects of the invention will appear from the detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawing:

Fig. 1 is a vertical section of apparatus embodying the invention and the top portion of a stack to which it is applied.

Fig. 2 is a section taken on line 2-2 of Fig. 1.

Fig. 3 is a detail section taken on line 3-3 of Fig. 2 illustrating the jets for cooling the cylindrical wall which extends above the stack.

Fig. 4 is a section taken on line 4-4 of Fig. 1.

Fig. 5 is a detail illustrating the connection for construction supporting the conical baffle.

The invention is exemplified as applied to the stack *a* of a cupola or melting furnace. The improved apparatus comprises a cylindrical shell 10 which is of uniform diameter from top to bottom and of greater diameter than the stack and forms an enlarged extension through which the gases pass from the stack. The lower portion of shell 10 extends around and below the upper end of the stack to provide an annular chamber or trough 9 around the stack for receiving the water used to wash the gases and the material separated from the gases. The lower end of shell 10 has secured thereto angular lugs which are supported by right-angled and braced brackets 12 which are suitably secured to the metal lining *a*¹ of the stack. The shell 10 is also supported by an inner cylindrical sleeve 15, the outer end of which has welded thereto an angle iron reinforcing ring which overlaps the upper end of the stack. An inclined elliptical annular plate 13 forms the bottom of the trough 9 and has its outer edge secured to the shell 10 and its inner

edge to the sleeve 15. The plate 13 is flat and inclined from one side of the shell 10 to the other side so that the water used for washing the gases and the material separated therefrom will flow to an outlet pipe 14 at the lower side of the plate. This plate is preferably inclined from side to side of the shell so that the water discharged onto it will flush the material separated from the gases to the discharge pipe 14 so there will be no accumulation thereof in the trough 9. This exemplifies washing apparatus which comprises a shell of greater diameter than the stack and of uniform diameter from top to bottom with an annular trough having a bottom which is inclined from one side of the shell to the other.

The gases issuing from the upper end of the stack are deflected outwardly toward the cylindrical shell 10 by a conical baffle 17 which is concentric with the stack and is supported from above and in spaced relation from the stack. The diameter of the conical deflector 17 is somewhat greater than the diameter in the opening in the stack so that the gases issuing from the stack will be deflected outwardly and toward the shell 10 by said deflector. The gases deflected by the deflector 17 pass into the portion of the chamber 8 in the shell 10 above the baffle. By forming the shell 10 of substantially uniform diameter from top to bottom and of greater diameter than the stack, the area of chamber 8 is sufficient to produce a reduction of velocity of the gases in said chamber to cause turbulence for separating the ash, metal and solid particles from the gases while they are being washed, as hereinafter described. The conical deflector 17 is supported from a shell 10 by a series of hangers 18 which are suspended from hooks 19 which are welded to the shell 10. Each hanger is preferably formed of upper and lower sections which are adjustably connected by bolts 20 and holes 21, so that the conical deflector 17 will be installed in the desired spaced relation from the upper end of the stack. The upper section of each hanger 18 is provided with an opening through which one of the hooks 19 passes and the lower section is connected to a lug 22 which is welded to the upper face of deflector 17. The deflector is also supported by underlying bars 23 which have their outer ends bolted to the shell 10.

A pipe 24 for supplying water under pressure, extends upwardly through the inclined bottom wall 13 to an elbow 25 and has a horizontally extending section 26 which is connected to an elbow 27 to discharge the water through a downwardly extending pipe-section 28 onto the apex

of the cone so that the water under pressure will flow uniformly over the entire area of the upper face of the conical deflector 17 and be discharged downwardly and outwardly from the outer edge of the baffle to the shell 10. The water delivered to deflector 17 is sufficient to form a downwardly spreading curtain across the annular space between the outer edge of the deflector 17 and the shell 10 through which the gases from the stack pass. Pipe-section 28 extends through a saddle 29 which is fixedly secured to the top of the deflector so that the water will be uniformly discharged onto the apex of the deflector 17. The water cools the deflector 17 to prevent it from being burnt out. The water also provides a downwardly spreading curtain through which will pass the gases from the stack which are deflected by the deflector, and by which the gases are initially cooled and washed.

An annular header 31 is disposed above the deflector and at the top of chamber 8 and is connected to receive water under pressure from a supply-pipe 30. The header is provided with a series of nozzles 31^a for discharging an annular series of jets of water onto the inner face of the shell 10. These nozzles are directed downwardly and toward the shell 10 to spread the jets to produce a film of water flowing downwardly over substantially the entire inner periphery of shell 10. The gases spread by the deflector 17 will impinge against the downwardly flowing film of water on the shell 10 so that the gases will be again washed after they pass through the curtain of water from the deflector 17. This exemplifies means for flowing water over the inside of the straight cylindrical shell 10 for a sufficient distance to effect a second washing of the gases.

An upwardly and outwardly flared annular baffle 33 in the shape of an inverted frustum of a cone is supported in the shell above the header 31, by an angle iron ring 32, which is welded to the shell 10. Outstruck tongues 34 on the baffle 33 are secured by bolts 35 to the ring 32. The baffle 33 extends inwardly from shell 10 to deflect the gases inwardly toward the center of the shell and through the central opening 36 in the baffle. The reduction of velocity of the gases while in chamber 8 and their inward deflection by baffle 33 produces a turbulence which aids in the separation of the cinders, ash and water vapor from the gases which escape through opening 36 in the baffle. The baffle also functions to separate the water or vapor from the gases before they pass through the opening 36. This provision prevents likelihood of injury or damage by the escape of vapor or water with the gases to property which may be stored near or around the stack. The shell 10 extends above the baffle 33 to form a chamber 8^a through which the washed gases pass before finally escaping through its top to atmosphere.

The apparatus described exemplifies one which comprises a cylindrical shell of substantially uniform diameter supported around the upper end of the stack with an annular trough or chamber with an inclined bottom around the upper end of the stack; a conical deflector for directing the gases through a downward curtain of water and so they will impinge against the shell over which a film of water is flowing, while the gases are passed through a chamber of great area above the deflector, and a baffle for producing a turbulence in said chamber and for separating the water or vapor from the gases before they

pass into a continuation of the chamber above the baffle before their final escape. The turbulence in the chamber below the baffle also causes the fly-ash and heavier particles of material to be quickly separated from the gases so they will be deposited into the annular trough around the upper end of the stack. The bars 38 are secured inside and outside of the shell 10 to form a ladder for access to the washing apparatus in the shell. An overflow pipe 39 is connected to carry off water and materials washed from the gases in the event of an excess flow of water or accumulation of material washed from the gases.

The operation of the apparatus will be as follows: Assuming the water under pressure is being discharged through pipe-section 28 on the top of the cone, it will be uniformly flowed over the top face of the deflector 17 and will be discharged downwardly and spread across the annular space between the outer edge of the deflector 17 and the shell 10. The cone 17 will deflect the gases from the stack outwardly to pass through the curtain of water from the deflector 17 by which they will be initially washed and so they will impinge against the shell 10. The area of the annular space between the deflector 17 and the shell 10 being somewhat greater than the area of the shaft of the stack, the velocity of the gases above the deflector will be somewhat reduced which will result in turbulence in the chamber 8. The gases will travel upwardly along the shell 10 in chamber 8 and contact with the film of water from the nozzles 31 until they are deflected inwardly by the baffle 33. This baffling of the gases will cause separation of the water and the solid materials in the gases so that they will be arrested and fall downwardly into the annular trough on the bottom 13 of the shell, while the washed gases will be deflected around the inner edge of baffle 33 and pass through opening 36 and escape through the chamber 8^a in the upper end of the shell.

The invention exemplifies apparatus for washing stack gases which efficiently separates fly-ash, carbon, cinders, odors and the water used in washing, from the gases before they are discharged into the atmosphere above the stack. The water flowed along shell 10 and over deflector 17 also serves to cool them to prevent them from being burnt out. The apparatus is simple in construction and lends itself to installation on the upper end of stacks without change in the stack structure.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

What I regard as new and desire to claim by Letters Patent is:

1. Apparatus for cleaning combustion gases from a stack comprising a substantially straight cylindrical shell of diameter greater than the stack, having its upper end extending above and its lower end extending below the stack, an annular trough in the shell and around the stack and having an inclined bottom, means for supporting the shell from the stack, a conical deflector in the shell vertically spaced from the top of the stack, terminating inwardly from the shell to form an annular passage for the gases, means for delivering water under pressure to flow outwardly over the deflector and downwardly and across the gases passing through said an-

nular passage, an annular header above the deflector provided with a series of nozzles arranged to discharge jets of water downwardly and outwardly against, and to spread it into a curtain on the inner periphery of, the shell, means for supplying water to the header, a baffle above the header, and an outlet pipe for the water and material deposited in the trough said outlet pipe being connected to the shell at the lower side of the inclined plate so that solid material will be carried off by the water flowing over the plate.

2. Apparatus for cleaning combustion gases from a stack comprising a substantially straight cylindrical shell of diameter greater than the stack, having its upper end extending above and its lower end extending below the stack, an annular trough in the shell and around the stack and having an inclined bottom, means for supporting the shell from the stack, a conical deflector in the shell vertically spaced from the top of the stack, terminating inwardly from the shell to form an annular passage for the gases, means for delivering water under pressure to flow outwardly over the deflector and downwardly and across the gases passing through said annular passage, an annular header above the deflector provided with a series of nozzles arranged to discharge jets of water downwardly and outwardly against, and to spread it into a curtain on the inner periphery of, the shell, means for supplying water to the header, an upwardly divergent annular baffle in the shell and above the header, and an outlet pipe for the water and material deposited in the trough.

3. Apparatus for cleaning combustion gases from a stack comprising a substantially straight cylindrical shell of diameter greater than the stack, having its upper end extending above and its lower end extending below the stack, an annular trough in the shell and around the stack and having an inclined bottom, means for supporting the shell from the stack, a conical de-

flector in the shell vertically spaced from the top of the stack, terminating inwardly from the shell to form an annular passage for the gases, means for delivering water under pressure to flow outwardly over the deflector and downwardly and across the gases passing through said annular passage, an annular header above the deflector provided with a series of nozzles arranged to discharge jets of water downwardly and outwardly against, and to spread it into a curtain on the inner periphery of, the shell, means for supplying water to the header, an annular baffle in the shell and above the header, and an outlet pipe for the water and material deposited in the trough, the shell extending upwardly to form a substantially straight chamber above the baffle.

4. Apparatus for cleaning combustion gases from a stack comprising a substantially straight cylindrical shell of substantially uniform diameter greater than the stack, having its upper end extending above and its lower end extending below the stack, an annular trough in the shell and around the stack and having an inclined bottom, means for supporting the shell from the stack, a conical deflector in the shell vertically spaced from the top of the stack, terminating inwardly from the shell to form an annular passage for the gases, means for delivering water under pressure to flow outwardly over the deflector and downwardly and across the gases passing through said annular passage, an annular header above the deflector provided with a series of nozzles arranged to discharge jets of water downwardly and outwardly against, and to spread it into a curtain on the inner periphery of, the shell, means for supplying water to the header, an upwardly divergent annular baffle in the shell and above the header, and an outlet pipe for the water and material deposited in the trough, the shell extending above the baffle to form a substantially straight chamber above the baffle.

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