

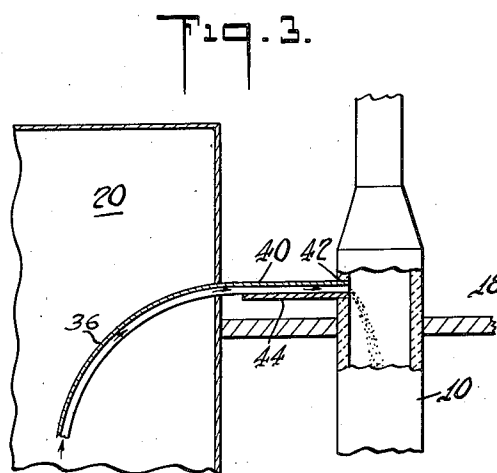
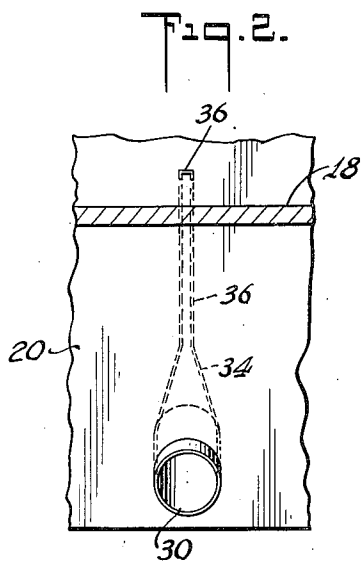
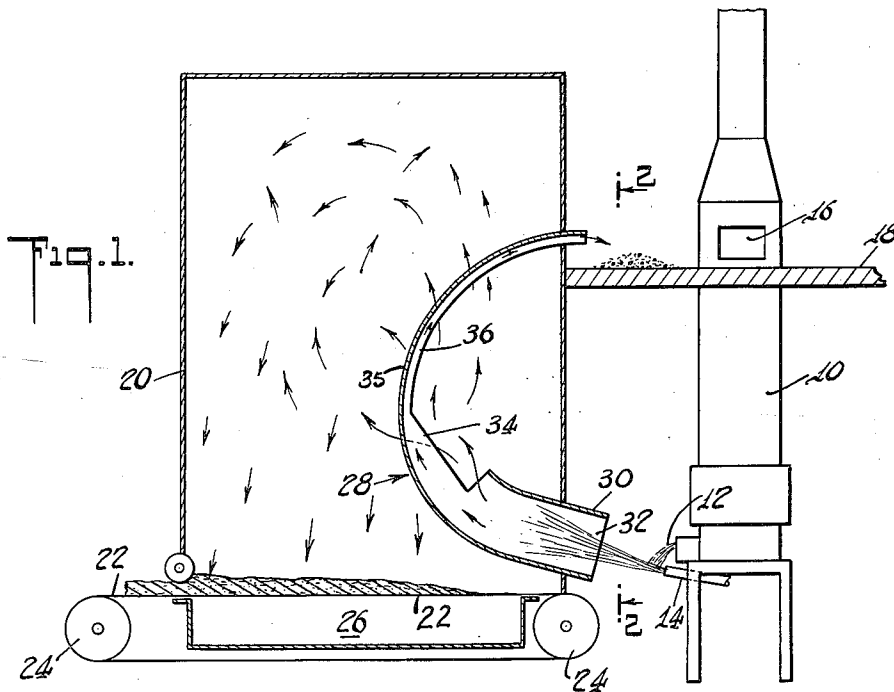
March 31, 1942.

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2,278,092

APPARATUS FOR THE MANUFACTURE OF MINERAL WOOL

Filed July 14, 1939



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UNITED STATES PATENT OFFICE

2,278,092

APPARATUS FOR THE MANUFACTURE OF
MINERAL WOOL

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Application July 14, 1939, Serial No. 284,439

8 Claims. (Cl. 83—91)

The present invention relates to an apparatus and method for the separation of fibres and unfiberized particles, particularly in the improved production of mineral wool, the term "mineral wool" being employed herein in a conventional sense to include wool or fibres of slag, rock, glass, and the like.

In the manufacture of mineral wool, it is now conventional to form first a melt of the selected raw material, such as a silicate composition derived largely from blast furnace slag or rock, the melting means usually comprising a furnace of the cupola type. The molten material is discharged from the cupola in a small stream at a temperature of about 2400° F. in front of a blast of steam at high pressure, with the result that the stream is shredded into a larger proportion of fibres and a lesser proportion of unfiberized particles. The fibres and unfiberized particles, the latter being referred to as "shot" are carried at a high velocity as a suspension in the gaseous stream, provided by the steam blast, into a settling chamber in which the fibres and shot are allowed to settle to the bottom of the chamber.

Heretofore it has been considered practically impossible to avoid the presence of shot commingled with the fibres in the felt formed by the standard type of equipment, briefly described above, notwithstanding the well recognized disadvantages of its inclusion. The instant invention has for its principal object the provision of means for effectively separating the desired fibrous material from the shot before the fibres are felted in the settling chamber.

Another object of the invention is the provision of means for separating the shot from the fibres, which includes a device for conveying the shot from the settling chamber preferably to, or adjacent to, the charging door of the cupola in which the raw material is melted.

A further object of the invention is the provision of a shot separating and deflecting means in the path of the suspension of fibres and shot to receive the shot and control its movement.

Briefly stated, my invention resides in the provision of means comprising a member so arranged and designed as to receive the gaseous suspension of shot and fibres, conduct it into the settling chamber, deflect the shot from the path of movement of the fibres, and direct the shot to a location outside the settling chamber. The particles of shot are of great mass relatively to their surface area, as compared to the fibres which, as far as present considerations are con-

cerned, have no appreciable mass, the difference in mass of the two being employed to effect the separation. Thus, the shot particles, of relatively great mass and initially discharged at a very high velocity by the steam blast, have a considerable momentum which will carry them for a substantial distance, irrespective of the movement of the gaseous stream. The fibres, on the other hand, are influenced in their travel substantially entirely by the gaseous stream. The shot separating means of the invention comprises a device located in the path of the suspension to receive the same, the device including a trough, into and along which the shot particles are carried by their momentum, the gaseous stream overflowing from the sides of the trough and carrying the fibres with it to settle from the suspension to the floor of the settling chamber.

My invention will be further understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description thereof which is to follow and to the accompanying drawing, in which

Fig. 1 is a diagrammatic view, partially in elevation and partially in section, of an apparatus embodying the preferred form of the instant invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; and

Fig. 3 is a detail view illustrating a modification of the construction of the instant invention.

Referring now to the drawing, and particularly to Figs. 1 and 2, there is illustrated an apparatus of generally conventional type for the manufacture of mineral wool. The apparatus comprises a melting furnace 10 of the cupola type. It will be understood, however, that any other suitable type of melting furnace may be employed. The cupola includes a discharge opening through which a stream 12 of molten mineral wool forming material is drawn from the furnace and falls into the path of a high velocity steam blast issuing from a jet 14, the steam blast shredding the stream 12 into fibres and shot, which are suspended in a moving stream of a fluid medium, as air and steam, set up by the blast. The cupola includes a suitable charging door 16 through which the raw material and fuel is fed into the furnace, the charging door being located adjacent a charging floor 18.

Adjacent the furnace 10 and in a position to receive the fluid gaseous stream in which the fibres and shot are suspended, is a settling chamber 20. Suitably, the chamber includes a floor 22 comprising a foraminous belt carried by

pulleys 24. A suction chamber 26 may be provided below the upper reach of the belt, if desired, the suction aiding in securing proper felt-ing of the fibres on the belt.

The shot separation means comprises a device 28 located primarily in the settling chamber. This device includes, in its preferred embodiment, a tubular portion 30 having a mouth 32 located directly in the path of the gaseous suspension of fibres and shot. Preferably, integrally connected to the tubular portion 30 is an open-sided reducing portion 34, which, in turn, connects with a narrow, shallow, trough-like portion 36. The portions 30, 34, and 36 together form a curved channel extending from a point outside the settling chamber adjacent the fiberizing means, through the chamber to a point again outside the settling chamber adjacent the charging floor 18.

In the operation of the device as thus far described, the suspension of fibres and particles or shot enters the mouth 32 of tubular portion 30 and is directed thereby into the settling chamber. The momentum of the shot particles carries the same directly ahead and into contact with the inner or back wall 35 of the device 28, centrifugal force holding them thereagainst as they are driven by their momentum through the portions 34 and 36 to be finally discharged upon the charging floor 18. Reduction of the width of the means 28 in the portion 34 serves to confine the shot particles in a narrow stream within the portion 36, and at the same time causes the overflow of the gaseous stream and the fibres carried thereby from the member 28 and into the settling chamber proper, where the fibres gradually settle on the floor 22. Thus, the fibres having little or no appreciable mass, considering their surface areas, are constrained to move with the gaseous stream, which floods over both sides of means 28 as it narrows down to form the trough 36, with the result that very few fibres are carried with the shot and removed from the settling chamber. The fibres settle to the bottom of the chamber 20 and are felted thereon, preferably under the action of suction, as previously referred to. The conveyor carries the felt from the settling chamber, the steam and air which has entered the chamber being drawn through the belt by the suction means.

By means of the apparatus and method described above, a substantial reduction in the shot content of the felt formed on the conveyor has been obtained with only a minor loss of fibres through the removal system. The actual advantages in the resulting felt are further increased by the fact that the shot removed are the larger shot particles which are particularly objectionable. Thus, the removed shot constitutes, for the greater part, particles of a size greater than would pass through a 100-mesh screen. Also, the fibres which are removed with the shot are, to a large extent, the harsh brittle fibres which are not desired in the final product.

Variations in the proportion of shot removed can be made by varying the contour and radius of curvature of the shot separating device. Thus, for example, by making the device 28 of constantly diminishing curvature radius, a greater proportion of the shot is removed, a greater proportion of the fibres, however, also being removed with the shot. Accordingly, it will be understood that the selection of the particular curvature of the device 28 will depend upon the

desired balance between economy of operation and freedom from shot in the felt.

The shot removed through the device 36 and deposited upon the charging floor 18, as shown in Fig. 1, is suitably reused by mixing the same with the fuel or raw material charged into the cupola 10 through the door 16. Prior to feeding the shot into the cupola, the fibres accompanying the shot may be removed and returned to the settling chamber, as by passing the shot and intermingled fibres through a fluff box or means of a similar type to separate the fibres from the shot.

In the form of the invention disclosed in Fig. 3, means are provided for discharging the shot and other particles removed by the device 28 directly into the cupola 10. Thus, the end of portion 36 may be extended, as at 40, to enter a suitable opening 42 formed in the cupola wall. In this form of the invention, the continuous stream of the rejected shot and fibres are fed into the cupola onto the conventional charge of raw material and coke. A plate 44 preferably covers the lower side of extension 40 to insure against the dropping of material, whose momentum is nearly spent, to the floor 18.

Although the invention has been described particularly in connection with the problem of shot removal in the manufacture of mineral wool, it will be understood that it may have other applications. Thus, the invention may be employed and the advantages thereof secured in similar cases where it is desired to separate fibers and unfiberized materials by conveying the mixture of fibers and unfiberized material in a high velocity stream of air or fluid medium into a shot separating means of the type herein disclosed.

Having thus described my invention in rather full detail, it will be understood that these details need not be strictly adhered to, but that various changes and modifications will suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What I claim is:

1. In an apparatus for the production of mineral wool having means for melting raw mineral wool forming material and converting the same into fibres and solid particles suspended in a stream of a fluid medium moving at a high velocity, a fibre settling chamber, and a device including a portion in alignment with said stream for receiving said stream and leading the same into said settling chamber and an open-sided trough portion connected thereto and directly in the path of said stream and crossing the same and arranged to receive said particles and lead the same from said fibre settling chamber.

2. In an apparatus for the production of mineral wool having means for melting raw mineral wool forming material and converting the same into fibres and solid particles suspended in a stream of a fluid medium moving at a high velocity, a fibre settling chamber, and a device including a tubular portion receiving said stream and directing the same into said settling chamber, and an open-sided, upwardly extending, trough-like portion including a closed bottom wall connected to said tubular portion with its open side facing said stream, said tubular portion and said open-sided trough-like member constituting a return bend leading into and out of said chamber, respectively.

3. In an apparatus for the production of mineral wool having means for melting raw mineral wool forming material and converting the same into fibres and solid particles suspended in a stream of a fluid medium moving at a high velocity, said means including a melting furnace having a charging door, a fibre settling chamber, and a device including a tubular portion receiving said stream and directing the same into said settling chamber, and an open-sided, upwardly extending trough-like portion including a closed bottom wall connected to said tubular portion with its open side facing said stream and arranged to receive said particles and conduct them to a point adjacent the charging door of said furnace.

4. In an apparatus for the production of mineral wool having means for melting raw mineral wool forming material and converting the same into fibres and solid particles suspended in a stream of a fluid medium moving at a high velocity, said means including a melting furnace, a fibre settling chamber, and a device including a tubular portion receiving said stream and directing the same into said settling chamber, and an upwardly extending portion connected to said tubular portion arranged to receive said particles and conduct them into said furnace.

5. In an apparatus for the production of mineral wool having means for melting raw mineral wool forming material and converting the same into fibres and solid particles suspended in a stream of a fluid medium moving at a high velocity, a fibre settling chamber including a fibre deposition zone, a tubular member arranged to receive said stream extending into said settling chamber, and an open-sided trough including a closed bottom wall connected to said tubular member and extending arcuately from said tubular member to cross said stream with its open side facing said stream, said trough terminating at a point removed from said deposition zone.

6. An apparatus comprising means for suspending fibres and unfiberized particles in a moving fluid stream, a fibre settling chamber in-

cluding a fibre deposition zone, a tubular member arranged to receive said stream extending into said settling chamber, and an open-sided trough including a closed bottom wall connected to said tubular member and extending arcuately from said tubular member to cross said stream with its open side facing said stream, said trough terminating at a point removed from said deposition zone.

7. In an apparatus for the production of mineral wool having means for melting raw mineral wool forming material and converting the same into fibres and solid particles suspended in a stream of a fluid medium moving at a high velocity, a fibre settling chamber including a fibre deposition zone, a tubular member arranged to receive said stream extending into said settling chamber, and an open-sided trough including a closed bottom wall connected to said tubular member and extending arcuately from said tubular member to cross said stream with its open side facing said stream, said trough including a section of tapered cross section with its larger end connected to said tubular member, said trough terminating at a point removed from said deposition zone.

8. An apparatus comprising means for suspending fibres and unfiberized particles in a moving fluid stream, a fibre receiving chamber including a fibre deposition zone, a device including a portion for receiving said stream and leading the same into said receiving chamber, and an upwardly extending, open-sided, trough-like portion disposed within said chamber in the path of said stream and substantially in advance of said deposition zone, said trough-like portion including a closed bottom wall and extending across said stream with its open side facing said stream, said trough-like portion terminating at a place removed from said deposition zone whereby said particles are received by said trough-like portion and carried to said removed place and said fibres are carried by said stream past said trough-like portion to said deposition zone.

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