

No. 827,502.

PATENTED JULY 31, 1906.

H. F. CAMPBELL, DEC'D.

J. L. CAMPBELL, EXECUTRIX.

APPARATUS FOR CONVEYING AND COOLING ORE.

APPLICATION FILED DEC. 14, 1905.

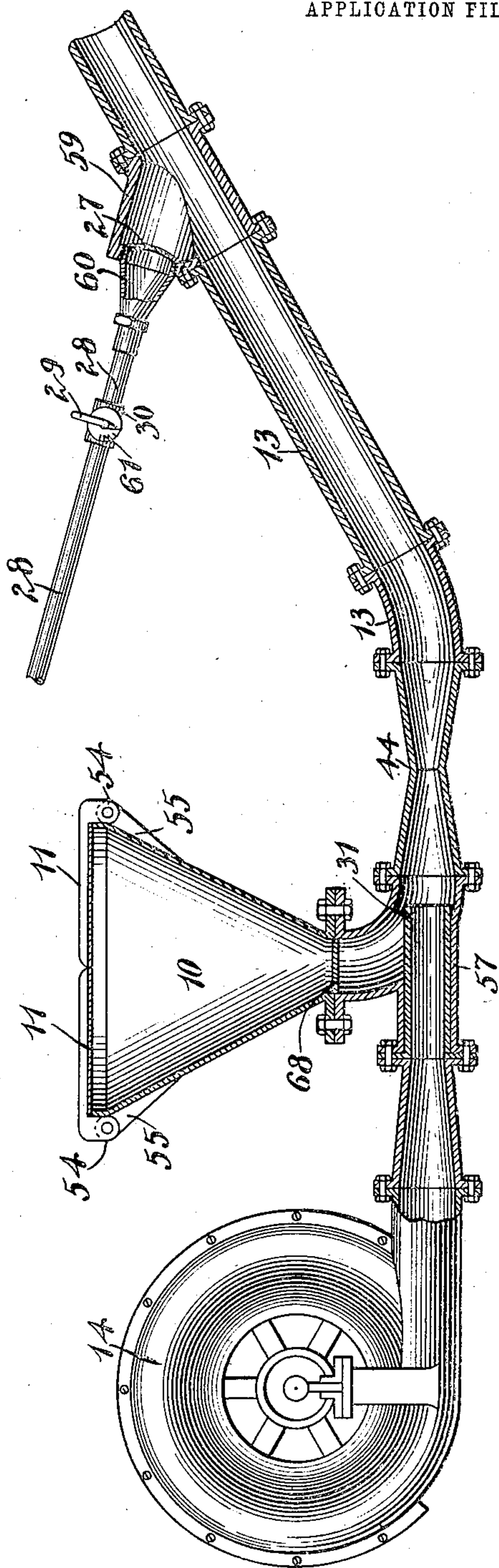


FIG-1-

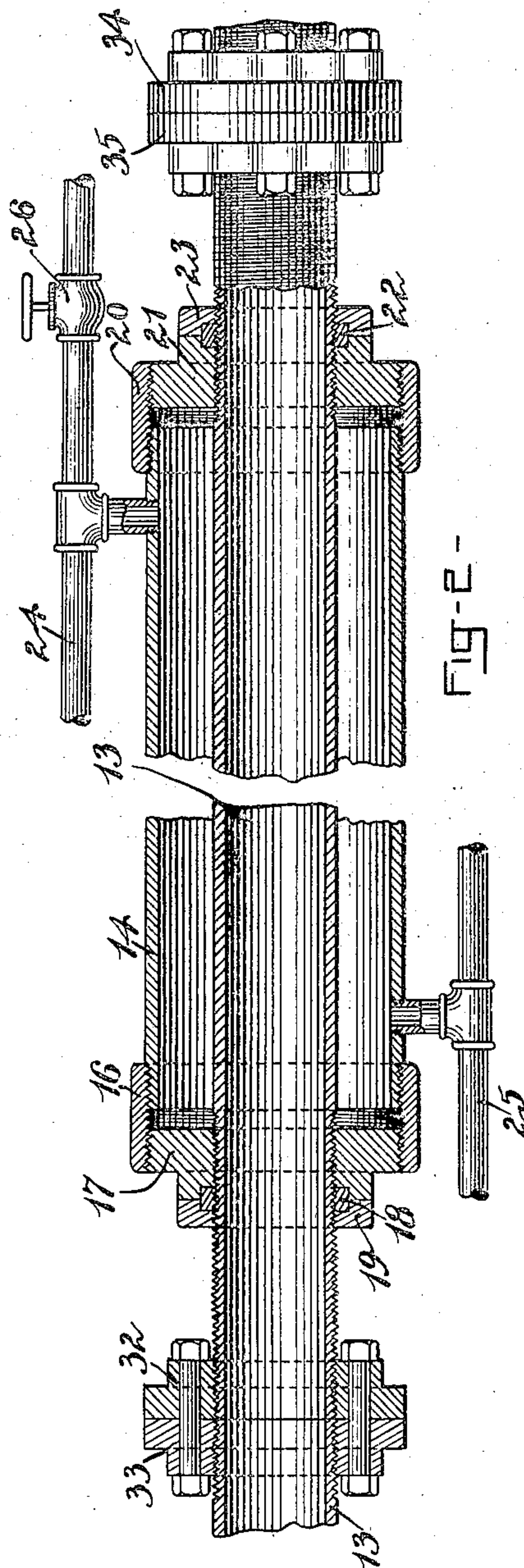


FIG-2-

WITNESSES =

Elmer H. Briggs  
Everett M. Curtis

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Jeannette L. Campbell  
Executrix of the will of Henry F. Campbell  
by Chas. F. Perkins her Attorney



# UNITED STATES PATENT OFFICE.

JEANNETTE L. CAMPBELL, OF MELROSE, MASSACHUSETTS, EXECUTRIX  
OF HENRY F. CAMPBELL, DECEASED.

## APPARATUS FOR CONVEYING AND COOLING ORE.

No. 827,502.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed December 14, 1905. Serial No. 291,723.

*To all whom it may concern:*

Be it known that HENRY F. CAMPBELL, deceased, late a citizen of the United States, and a resident of Melrose, in the county of Middlesex and State of Massachusetts, did invent new and useful Improvements in Apparatus for Conveying and Cooling Ore, of which the following is a specification.

The invention relates to an apparatus for pneumatically conveying and cooling comminuted ores and like materials; and the objects of the invention are to convey heated ferruginous ore and the like directly from the furnace to elevated bins and to cool the same to a predetermined degree while in transit, so that the ore may at the earliest possible moment be ready for treatment by a magnetic separator.

The invention consists, primarily, of a conductor and blower or fan which forces therein through a nozzle a current of air, the conductor having a contraction in its diameter less than the diameter of the said nozzle and located beyond the same.

The invention also consists in certain features of construction, which are more specifically hereinafter described and claimed.

The inventor and others have described a complete apparatus of similar character in an application filed December 11, 1903, Serial No. 184,846, reference to which is hereby made for a full description of the apparatus to which the invention relates, as in the drawings have been shown only such portions and modifications thereof as are necessary to illustrate the particular invention herein described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which like numerals indicate corresponding parts in both views.

Figure 1 is a view of the apparatus, showing the blower and connections partly in section and partly in elevation and the hopper, conductor, and spray-pipe in vertical section. Fig. 2 is an enlarged longitudinal section of a portion of the conductor and one of the water-jackets.

Referring to the drawings, 10 is a receiving-hopper of any convenient shape and of any suitable material.

11 represents metal covers hinged at 54 to the brackets 55, which are cast on the hopper.

At the throat of the hopper is an opening having a horizontal metal plate 68, fitted and adapted to slide therein to regulate the flow of the material from the hopper.

13 is a conductor consisting of a metal pipe of suitable diameter and composed of sections bolted together or secured in any well-known manner. The casting 57 of the conductor 13 may be the ordinary T-section, but preferably is a curved portion of pipe commonly called a "gooseneck" and has a branch cast integral therewith into which is inserted and tightly fits the nozzle 31 of the blower 14. This nozzle extends beyond the throat of the hopper 10 into the conductor 13, so as to avoid the tendency of the air-blast to cause the ore to be forced back out of the hopper. At the point 44 beyond the mouth of the nozzle 31 the conductor is contracted to a diameter less than the diameter of the nozzle, the conductor gradually expanding both before and after said contraction to the general diameter of the conductor and assuming the form of a double truncated cone. By decreasing the diameter of the conductor in this way the full effect of the air-blast is used in the best manner to produce a suction which overcomes any tendency of the dust and fumes of the ore by reaction to escape back through the hopper.

28 is a supply-pipe for cold water for the purpose of injecting water directly into the heated contents of the ore at 59.

60 is a nozzle having perforations 27 therein for the purpose of causing a spray of water to be discharged into the ore.

59 is a branch of the conductor 13 and is screw-threaded on the inside to receive the screw-threaded end of the nozzle 60.

The pipe 28 is provided with the cock 29, having an index-pointer and a scale 61 to indicate the degree of opening of the pipe 28.

In Fig. 2 is shown in detail one of the water-jackets, of which there may be any desired number and which surround and inclose portions of the conductor 13. 17 and 21 are nuts which constitute the heads of the water-jacket 14 and are fitted to the screw-thread upon the outside of the conductor 13. They are connected to the water-jacket 14 by means of the rings 16 and 20, which have internal screw-threads fitting the screw-threads upon the heads 17 21 and upon the ends of the water-jacket 14. 19 and 23 are



lock-nuts between which and the heads of the water-jacket are suitable packings 18 and 22, which serve to form water-tight joints. 24 is a supply-pipe, and 25 is a waste-pipe for the water-jacket 14. The water-cock 26 (shown in Fig. 2) is for the purpose of regulating the supply of water to the water-jacket.

32 and 33 are screw-threaded collars or nuts fitting the external screw-thread of the conductor 13. These nuts 32 and 33 serve the purpose of flanges upon the conductor for uniting two sections of the conductor. The said nuts are bolted together in the ordinary manner of joining the flanges of two sections of pipe. It is necessary to employ the said nuts instead of flanged ends of the pipe in order that they may be removed to allow the head 17 and the lock-nut 19 to be first applied to the conductor. 34 and 35 are similar screw-threaded collars or nuts used for the same purpose as 32 and 33.

The method of operation of the apparatus when used for conveying and cooling ore is as follows: The speed of the fan or blower 14 is regulated so as to create a blast of air of sufficient force to carry the ore through the conductor. Ordinarily a four-ounce current is sufficient. The covers 11 are opened so as to allow the admission of a stream of ore of sufficient volume to keep the hopper practically full. The ore in a pulverized and heated state is then delivered into the hopper from the furnace. The ore descends from the hopper and enters the conductor 13 in the path of the air-blast, by which it is carried to the dust chambers and bins or whatever receptacle is used at the upper or discharge end of the conductor. As the ore passes the point where the pipe 28 discharges into the conductor water in the form of a fine spray is mingled with the ore. The flow is regulated by the cock 29 and gage 30. It is unnecessary to employ a spray, as the water coming in contact with the hot ore is almost immediately converted into steam and is carried along with the ore particles, air, and gases through the conductor. The flow of water through the pipe 28 should be regulated so that the quantity is no greater than will be instantly converted into steam and will permit the particles of ore to enter the bin in a dry state and not adhering together.

While the invention has been described with special reference to ores, it is not to be understood that the invention is to be limited to this class of material; but there are also to be included all pulverized materials susceptible of being conducted and elevated in the manner described.

What is claimed, and desired to be secured by Letters Patent, is—

1. In an apparatus for conveying ore and like materials, the combination of a conductor, means for discharging an air-blast through a nozzle into said conductor, means

for discharging material into said conductor and into the path of said air-blast, said conductor having a contraction in the diameter less than the diameter of said nozzle and at a point beyond where the material is discharged into the same, and said conductor being expanded immediately beyond said contraction.

2. In an apparatus for conveying ore and like materials, the combination of a conductor, means for discharging an air-blast through a nozzle into said conductor, means for discharging the material into said conductor at a point beyond where the air-blast is admitted, said conductor having a contraction in its diameter less than the diameter of the said nozzle and at a point beyond where the material is discharged into said conductor, and said conductor being expanded immediately beyond said contraction.

3. In an apparatus for conveying ore and like materials, the combination of a conductor provided with a gooseneck at the receiving end, a hopper arranged to discharge therein, a nozzle entering said gooseneck, means for discharging an air-blast into said conductor through said nozzle, said conductor having a contraction in its diameter less than the diameter of said nozzle and at a point beyond where the air-blast is discharged therein, and said conductor being expanded immediately beyond said contraction.

4. In an apparatus for conveying and cooling ore, a conductor, means for discharging an air-blast through a nozzle into said conductor, means for discharging the material into said conductor at a point beyond where the air-blast is admitted, said conductor having a contraction in its diameter less than the diameter of said nozzle, and at a point beyond where the material is discharged into said conductor, and said conductor being expanded immediately beyond said contraction, combined with units each consisting of a central conductor, a jacket inclosing the same, means for causing a circulation of water through said jacket, said central conductor having its ends provided with couplings, and said jacket consisting of a cylinder and circular nuts forming heads thereof connected together by annular screw-threaded rings.

5. In an apparatus for conveying and cooling ore a conductor provided with a gooseneck at the receiving end, a hopper arranged to discharge therein, a nozzle entering said gooseneck, means for discharging an air-blast into said conductor through said nozzle, said conductor having a contraction in its diameter less than the diameter of said nozzle and at a point beyond where the air-blast is discharged therein, and said conductor being expanded immediately beyond said contraction, combined with units each consisting of a central conductor, a jacket inclosing the same, means for causing a circulation of



water through said jacket, said central conductor having its ends provided with couplings, and said jacket consisting of a cylinder and circular nuts forming heads thereof connected together by annular screw-threaded rings.

6. In an apparatus for conveying ore and like materials, the combination of a conductor, means for discharging an air-blast through a nozzle into said conductor, means for discharging material into said conductor and into the path of said air-blast, said conductor having a contraction in its diameter less than the diameter of said nozzle and at a point beyond where the material is discharged into the same, and said conductor being expanded immediately beyond said contraction, combined with a feed-pipe discharging water into said conductor and means for regulating and registering the supply of water therein.

7. In an apparatus for conveying ore and like materials, the combination of a conductor, means for discharging an air-blast through a nozzle into said conductor, means for discharging material into said conductor and into the path of said air-blast, said conductor having a contraction in its diameter less than the diameter of said nozzle and at a point beyond where the material is discharged into the same, and said conductor being expanded immediately beyond said contraction, combined with a feed-pipe discharging water into

said conductor, said feed-pipe being provided with a cock and gage for regulating and registering the flow of water through the same. 35

8. In an apparatus for conveying and cooling ore, a conductor, means for discharging an air-blast through a nozzle into said conductor, means for discharging the material into said conductor at a point beyond where the air-blast is admitted, said conductor having a contraction in its diameter less than the diameter of said nozzle, and at a point beyond where the material is discharged into said conductor, and said conductor being expanded immediately beyond said contraction, combined with a water-jacket surrounding said conductor, means for causing a circulation of water through said jacket, said jacket consisting of a cylinder and circular nuts forming the heads thereof connected together by annular screw-threaded rings; a feed-pipe discharging water into said conductor, and means for regulating and registering the supply of water therein. 40 45 50 55

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 13th day of December, 1905.

JEANNETTE L. CAMPBELL,  
*Executrix of Henry F. Campbell, deceased.*

Witnesses:

EVERETT N. CURTIS.  
ELMER L. BRIGGS.