

No. 819,806.

PATENTED MAY 8, 1906.

F. ROBINSON.
EXHAUST FOR LOCOMOTIVES.
APPLICATION FILED FEB. 1, 1905.

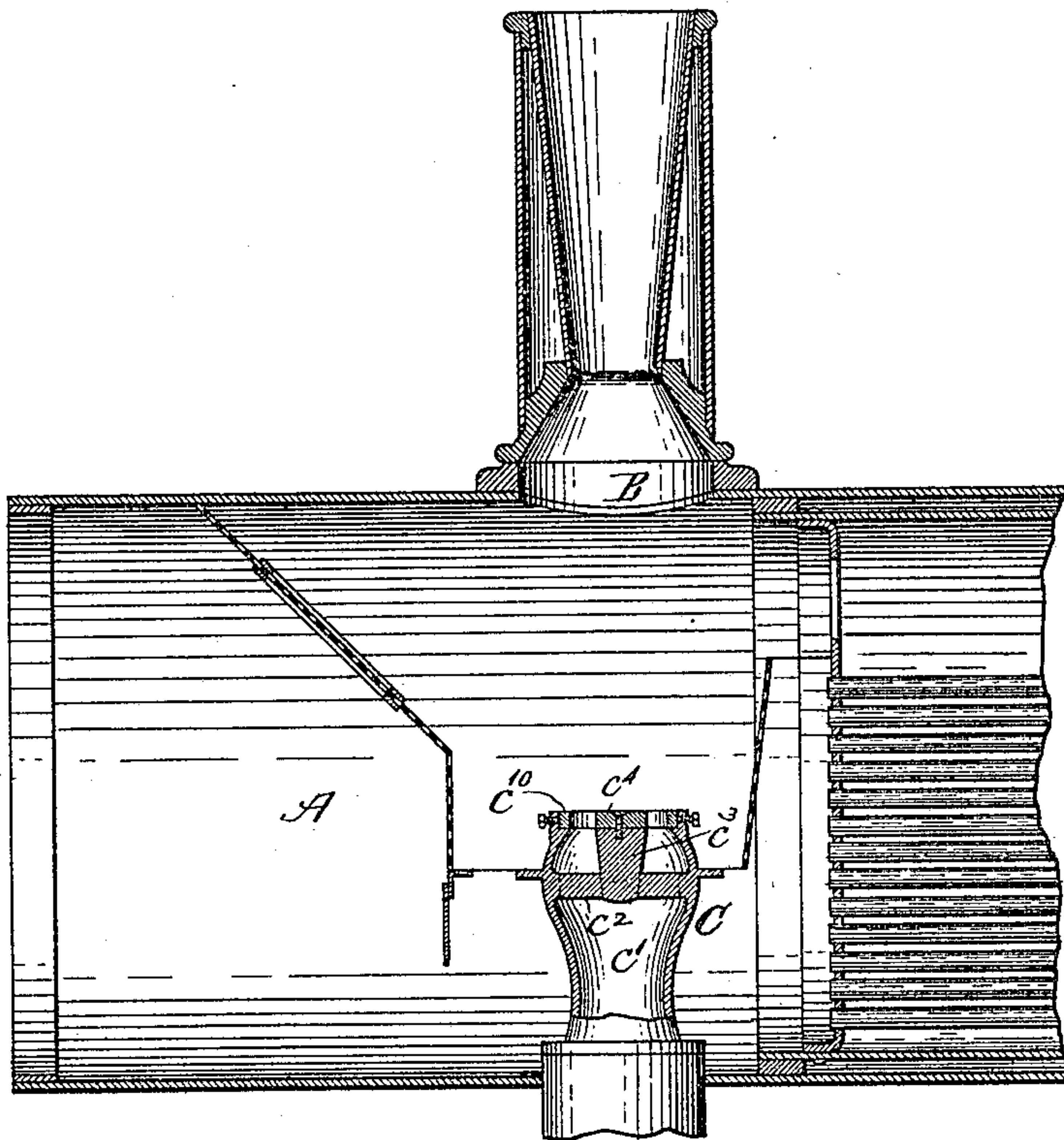


FIG. 1.

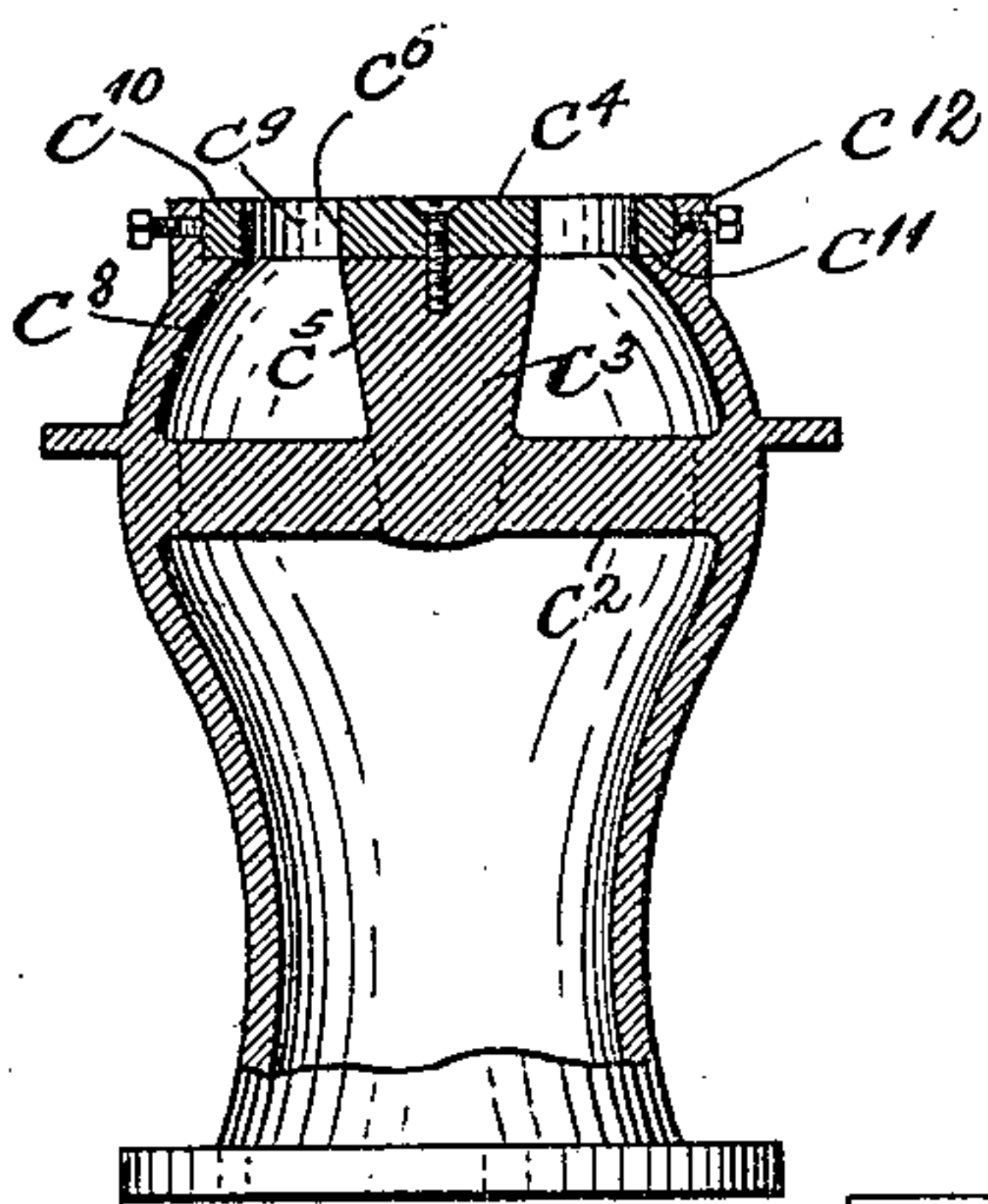


FIG. 2.

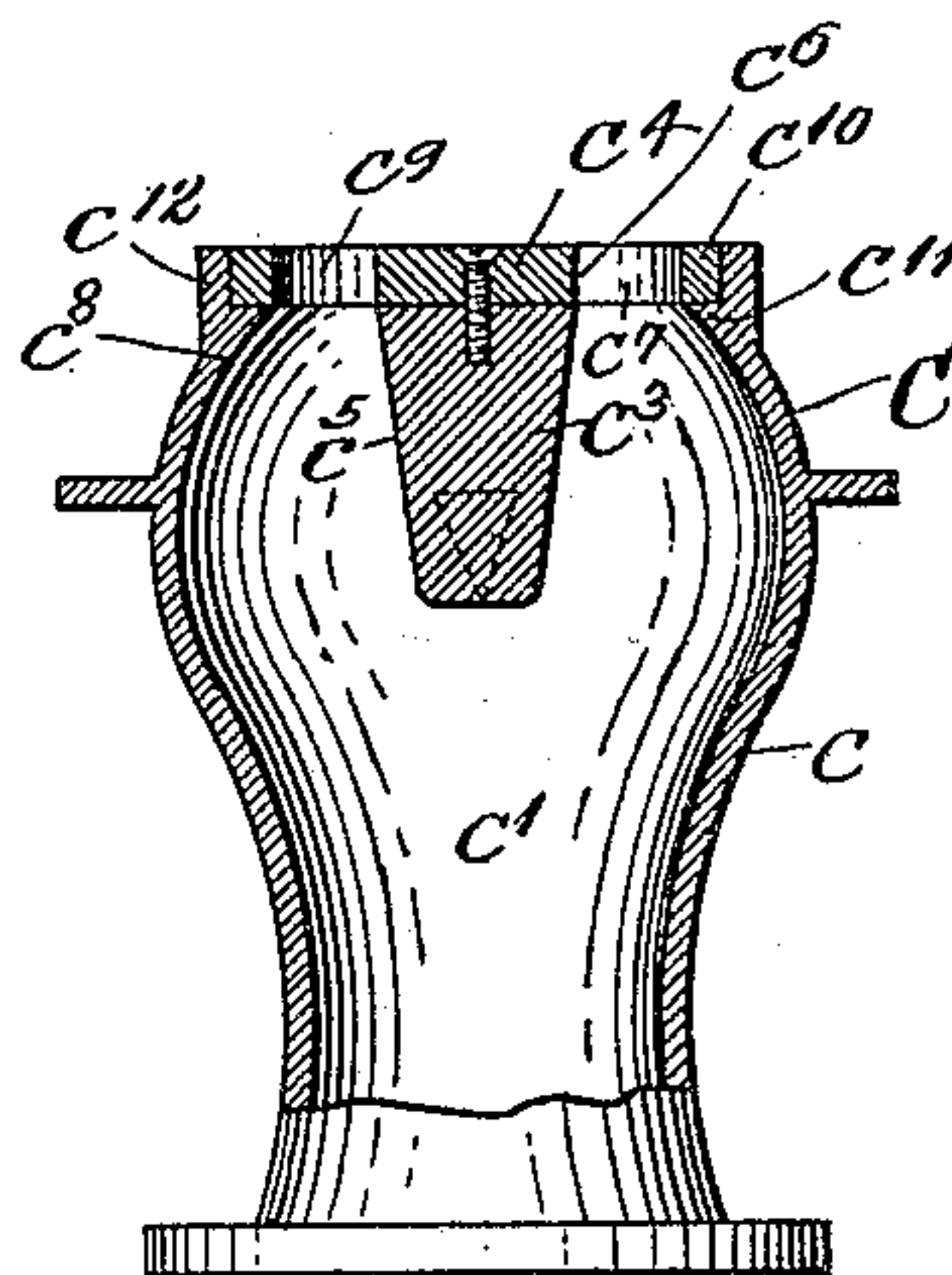


FIG. 3.

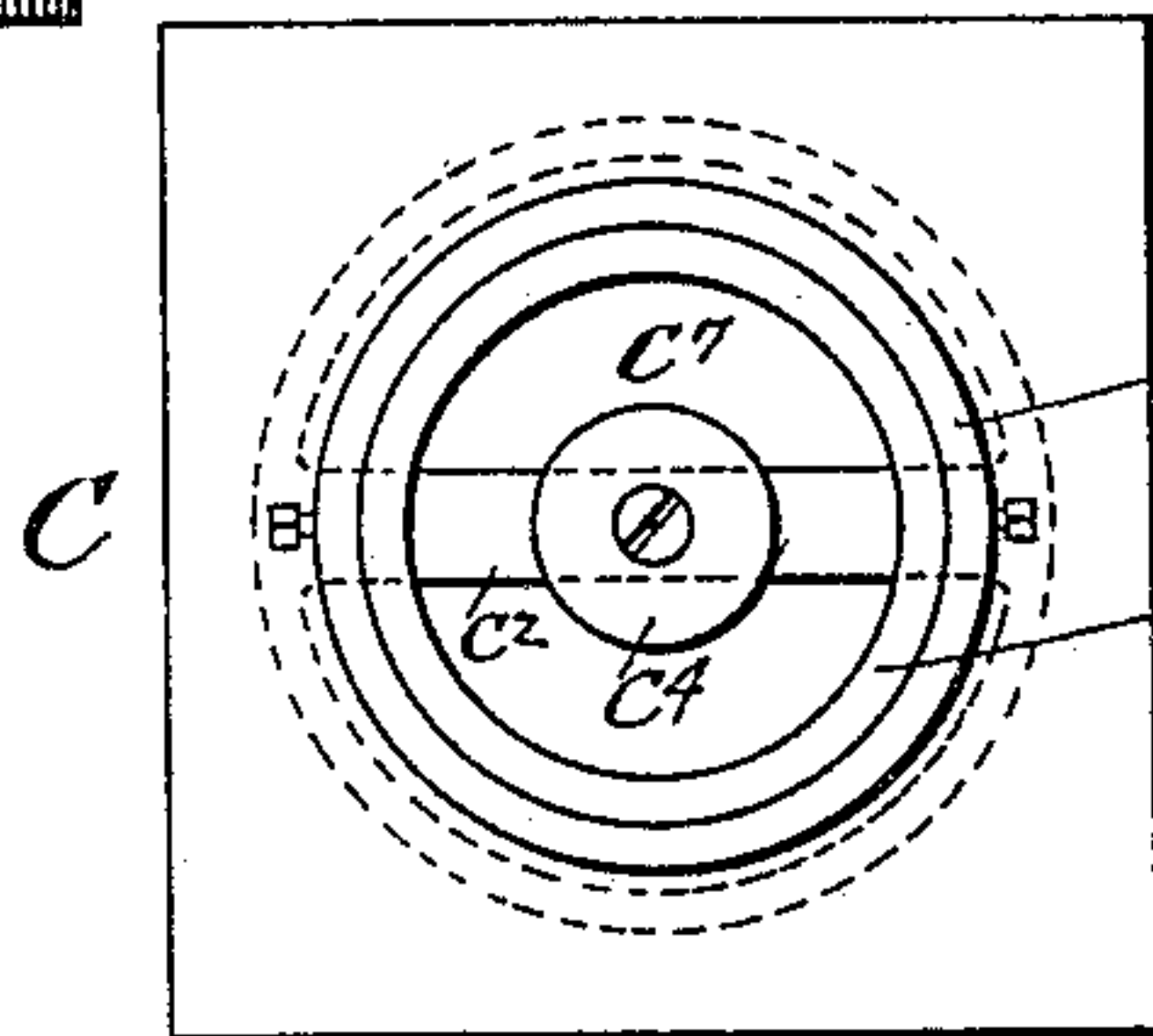


FIG. 4.

WITNESSES.

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EXHAUST FOR LOCOMOTIVES.

No. 819,806.

Specification of Letters Patent.

Patented May 8, 1906.

Application filed February 1, 1905. Serial No. 243,605.

To all whom it may concern:

Be it known that I, FRANK ROBINSON, a citizen of the United States, residing at New York, in the county and State of New York, have invented a new and useful Improvement in Exhausts for Locomotives, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention is an improvement upon that described in my Patent No. 715,873, dated December 10, 1902; and it consists in certain improvements whereby the back pressure in the cylinders is decreased, while the draft effectiveness of the exhaust is increased.

I will now describe the invention in conjunction with the drawings forming a part of this specification, wherein—

Figure 1 is a view in vertical section of the forward end of a locomotive, showing the application of my invention. Figs. 2 and 3 are enlarged sectional views of the nozzle, one at a right angle to the other; and Fig. 4 is an enlarged view in plan thereof.

A continuous exhaust instead of an intermittent one is desirable for the reasons stated in my said patent, and while the device described therein provides for a continuous exhaust as distinguished from an intermittent one the device was so formed that the escape of steam from the exhaust-chamber was more retarded than is desirable. This was largely due to the position of the discharge-opening with respect to the holding-chamber, to its diameter, and to the shape of the interior surfaces of the reservoir which direct the steam to the discharge-outlet, and I have now ascertained that by making an outlet having the same area as that of the patented device for cylinders of the same steam capacity, but of less diameter, whereby the outlet is broadened, while it is shortened in circular length, and by making the directing-surfaces of the holding-chamber to be but slightly inclined to the outlet the steam is still held in the holding-chamber sufficiently to provide for the escape of steam therefrom in a continuous column, but in a more direct and compact form of column and with less friction and greater speed, so that the back pressure upon the cylinders of the engine is very materially reduced. On the other hand, the use of a swifter-moving and thicker cylindrical

column of steam provides a higher, better, and more certain vacuum for establishing the draft, so that my invention works an improvement in the draft as well.

Referring to the drawings, A represents the vacuum-chamber at the end of the boiler, into which the boiler-tubes extending from the furnace open and which a continuous exhaust-column of cylinder-steam from the exhaust apparatus traverses to and through the smoke-stack passage B.

The smoke-stack passage preferably, though not essentially, is of the type known as the "choke-passage," in that it is reduced in size at a point sufficiently remote from the outlet of the exhaust to be somewhat smaller than the diameter of the column of passing steam at that point. This insures the formation of the vacuum in the vacuum-chamber, as it seals the chamber from communication with the outer air, and the character of the exhaust-column which my invention forms is such that it especially well combines with the choke-passage, the steam column being cylindrical in form and moving at a uniform velocity throughout and having greater density throughout than a solid column of steam of the same diameter under the same conditions would have. Moreover, as the movement of the cylindrical column is continuous instead of being intermittent, as is the case with the solid column, the vacuum seal is at no time broken.

C is the improved exhaust apparatus. It comprises the shell c , forming the steam-holding chamber c' , into which the steam-cylinders discharge their exhaust and in which the exhausts are combined. Across the chamber, near its upper end, is a narrow horizontal bar or support c^2 , the sides of which preferably taper from its lower edge outward to the upper surface to form surfaces of least resistance to the passage of the steam. To this bar is fastened or with it is integral the central support c^3 for the cylindrical head c^4 . This support has the conical wall c^5 of relatively slight pitch extending from its lower end upward to the surface c^6 of the head, which forms a straight wall to the steam-passage c^7 . The surface c^8 of the shell opposite the conical surface c^5 is inclined slightly inward to the inner wall c^9 of the ring c^{10} , which is held in the upper end of the shell, to be removable by a shoulder c^{11} and an embracing-flange c^{12} . The wall c^9 forms

the outer wall of the steam-escape passage c^7 and is parallel with the wall c^6 of the head c^4 . The head c^4 is smaller than the head of my patented device, and the annular ring c^{10} is likewise smaller in the diameter of its opening, but is not reduced relatively so much as is the head, the idea being not to reduce the area of the outlet of the exhaust apparatus with regard to the capacity of the steam-holding chamber, but to so shape it that the escape-passage shall be wider than that of the patented device, as by so doing and in conjunction with the surfaces of the cone and chamber-wall leading to the opening the steam is allowed to escape from the holding-chamber with less friction upon it and with greater freedom from return throttling-currents at the outlets, while at the same time the circular column of steam passing through the vacuum-chamber is reduced in diameter, but its wall thickened and its speed increased and its shape maintained until its exterior comes into contact with the choke of the smoke-stack, or, in other words, the outlet of the exhausting-chamber has been so changed in position and shape and the surfaces within the holding-chamber have been so shaped and combined with it that the steam flows from the chamber in a faster, smaller, thicker-walled, and straighter column than the steam column of my patented device. This result is accomplished without converting the action of the exhaust into an intermittent one, the flow of the steam still being continuous, while at the same time the friction has been so reduced and the relief has been so heightened that while a sufficient throttling is still maintained to hold steam enough in the holding-chamber to permit this result to be accomplished the back pressure of the steam in the cylinders has been very materially reduced and, as I have above stated, the vacuum in the vacuum-chamber and its constancy have been increased, thereby insuring a uniformity to the draft, which is very desirable and which I think has never before been attained by this class of exhaust apparatus. Of course this means better consumption of fuel and a saving in the amount of fuel used as well as a material diminution in the number of cinders ejected from the smoke-stack, all of which are material advantages.

The head c^4 preferably is made separate from the support c^3 and is secured thereto by a bolt or in any other desired way.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. An apparatus of the character specified having a steam expanding and holding chamber, walls forming an annular outlet to said chamber, which walls forming the outlet are so separated and the area of said outlet so

proportioned that the exhaust intermittently discharging into said chamber may be held and allowed to commingle and expand therein, and walls inclined to form a gradually-narrowing approach from said chamber to said outlet, whereby the exhaust may issue therefrom in a freely-moving, unbroken column.

2. An apparatus of the character specified having a steam expanding and holding chamber, walls forming an annular outlet to said chamber, which walls are so arranged that said annular outlet will be of relatively small diameter but large area, so proportioned, however, that the exhaust intermittently discharging into said chamber may not issue directly therefrom through said outlet, but may be held to commingle and expand therein, and walls inclined to form a gradually-narrowing approach from said chamber to said outlet, whereby the exhaust may issue therefrom in a freely-moving, unbroken column.

3. An apparatus of the character specified having a steam expanding and holding chamber, walls forming an annular, straight-walled escape opening or outlet to said chamber, which walls forming the annular outlet are so separated and the area of said outlet so proportioned that the exhaust intermittently discharging into said chamber may not escape directly therefrom through said outlet, but may be held to commingle and expand therein, and walls forming slightly-inclined guiding-surfaces extending to the walls of said outlet, whereby a gradually-narrowing approach is made to said outlet and the exhaust controlled to exit therethrough in a freely-moving, unbroken column.

4. In an exhaust apparatus, the combination of a globular steam-expanding chamber, the upper portion of said chamber having a straight-walled opening, a V-shaped cross-bar located at the larger diameter of said chamber, an inverted cone mounted on said cross-bar having a cylindrical base adapted to form with the opening in the chamber a straight-walled annular exhaust-passage as shown.

5. The combination of a steam-expanding chamber, comprising a curved conical upper portion, an opening at the top of said chamber, a recess around said opening, a removable annular ring in said recess, forming one wall of a straight annular discharge-passage, the inner wall of said passage comprising an inverted cone suspended within said chamber, having a removable disk mounted thereon as shown.

FRANK ROBINSON.

In presence of—

JAMES COX,
MICHAEL RYAN.