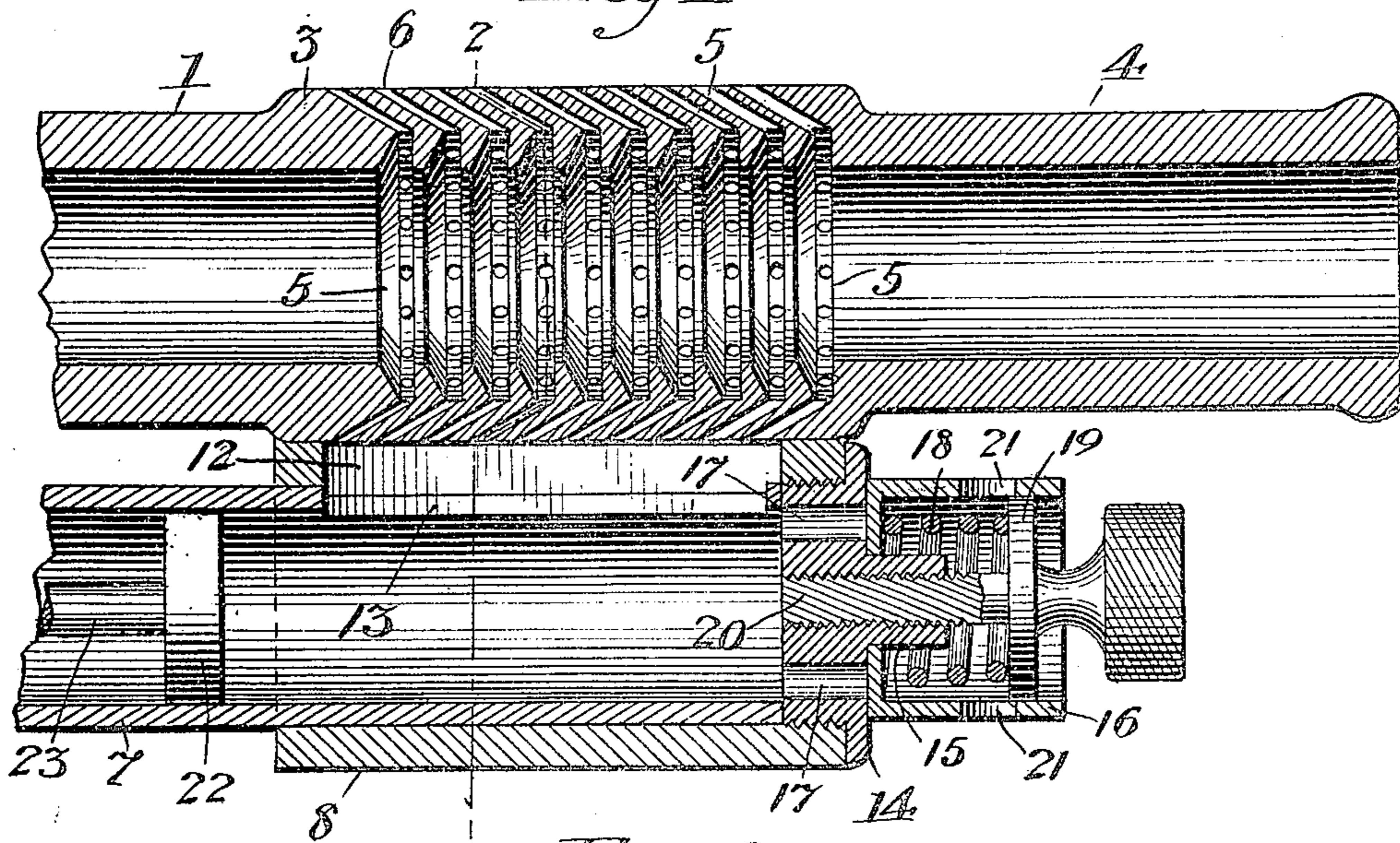


PATENTED MAR. 28, 1905.

Fig. 1.



*Fig. 2.*

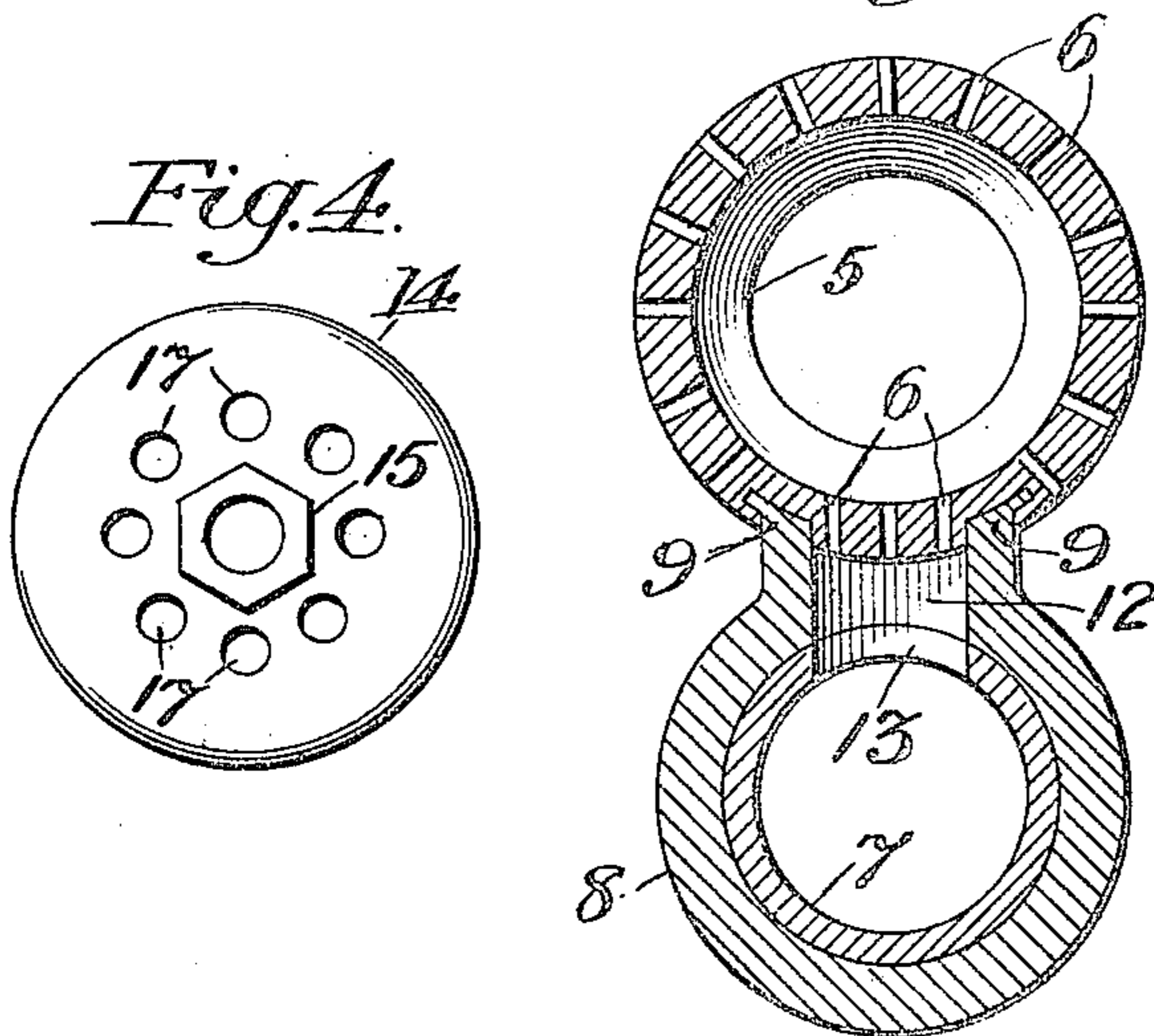
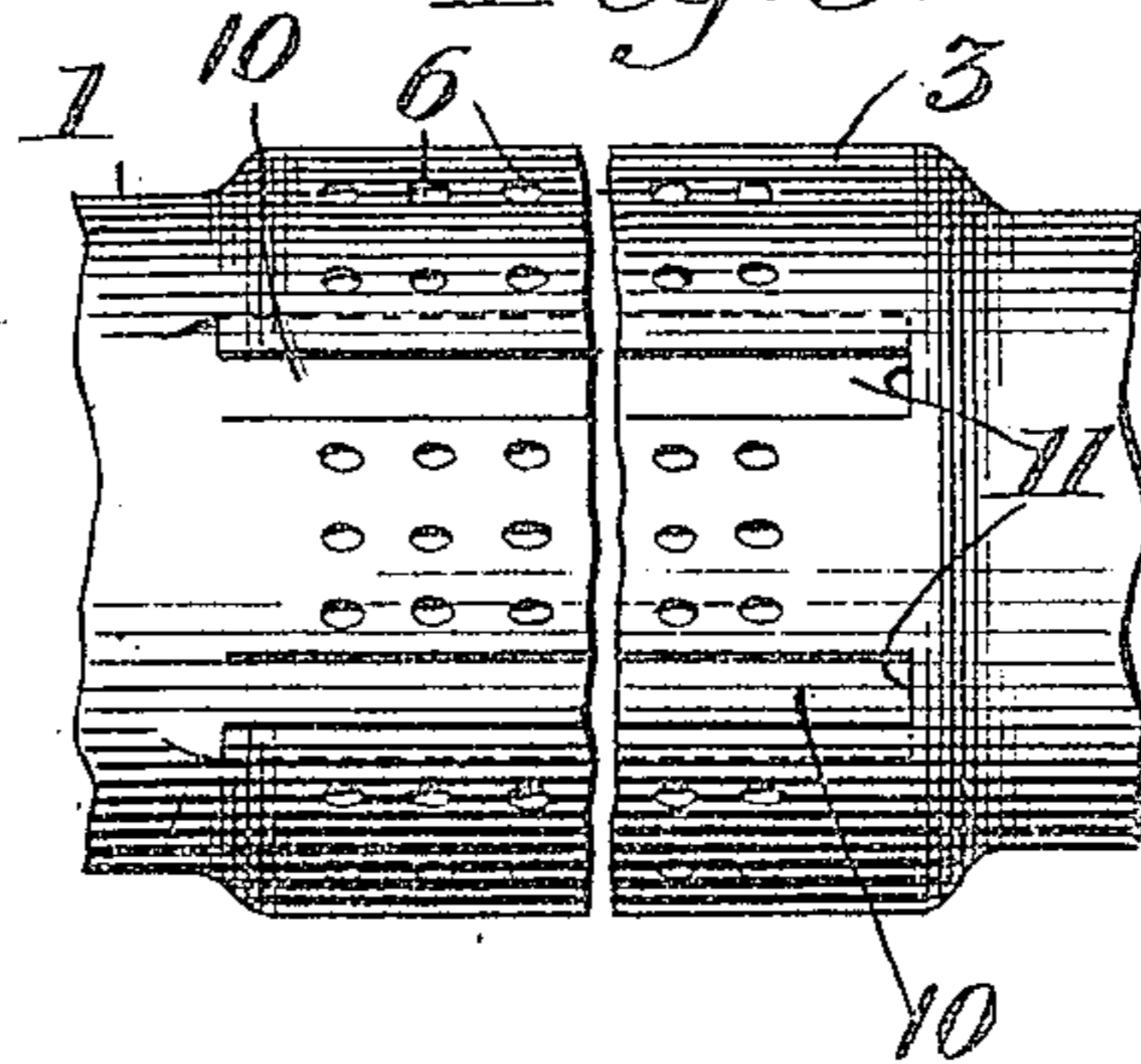


Fig. 3.



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## UNITED STATES PATENT OFFICE.

SAMUEL N. McCLEAN, OF CLEVELAND, OHIO.

## GAS-OPERATED GUN.

SPECIFICATION forming part of Letters Patent No. 785,974, dated March 28, 1905.

Application filed February 17, 1904. Serial No. 193,972.

*To all whom it may concern:*

Be it known that I, SAMUEL N. McCLEAN, a resident of Cleveland, Ohio, have invented a new and useful Improvement in Gas-Operated Guns, which invention is fully set forth in the following specification.

My invention relates to improvements in gas-operated firearms; and the object of the invention is to control and utilize the powder-gases for counteracting the recoil of the gun, reduce and control the injurious effects arising from the powder-blast at the muzzle of the gun, and control and utilize the powder-gas to operate the gun; also, to associate the recoil-controlling construction with a device for operating the gun in such manner as to control the action of the powder energies in the operation of the gun.

More specifically stated, the object of the invention is to provide a construction of gun-barrel having circumferential grooves associated with vents, part of which communicate with the action of the gun and part with the air, and to provide in connection therewith an auxiliary automatically-controlled valve for controlling the gas-pressures.

A further object is to provide in a gas-operated gun a construction of gun-barrel and gun-operating device which cooperate with each other to control the powder-gases and pressures for reducing the recoil, operating the gun, and controlling the effects of the powder-blast at the muzzle of the gun, also to prolong and control the operation of the powder-gas and to provide auxiliary means for controlling its pressures.

A more specific object is to combine a construction of gun-barrel for counteracting the recoil and controlling the powder-gases and utilizing the powder energies with a gun-operating device so connected to the barrel that it may be assembled and disassembled without tools, possess the required strength of parts, and be easily and cheaply manufactured.

With these objects in view the invention consists in a gas-cylinder provided with means for transmitting power to operate the gun, combined with means interrupting and deflecting a portion of the gas-current into the

cylinder and a portion into the atmosphere. The said interrupting and deflecting means preferably take the form of resistance-surfaces on the interior of the gun-barrel, against which the gases impinge and by which they are deflected into vent-ports passing through the walls of the gun and leading some to the atmosphere and some to the gas-cylinder. This construction of barrel, with the resistance-surfaces and associated vents, acts to reduce and resist the recoil and minimize the injurious effects of the blast at the gun's muzzle. In addition to this such construction serves to reduce the energy of the gases in the gun at a point near the muzzle, and by the present invention the gas is withdrawn from the barrel at the point where its energy has been thus reduced to the end that the violence of the gas within the cylinder may be reduced to a point where it will efficiently operate the gun without injury thereto. As a further or auxiliary means of controlling the energy of the gas within the cylinder vent-ports are provided in said cylinder, which ports are controlled by a valve automatically opening when the pressure within the cylinder exceeds a predetermined amount. The duration of the action of the gases upon the operating mechanism will be determined by the distance between the muzzle end of the barrel and the point where the gas from the barrel enters the gas-cylinder.

In addition to the features mentioned above the ready assemblage and disassemblage of the parts is provided for by forming grooves or ways in a thickened portion of the walls of the barrel near the muzzle, which grooves or ways receive corresponding flanges formed either directly on the front end of the cylinder or on a sleeve supporting the end of the cylinder. This forms an efficient and easily-machined construction for uniting the parts.

Various mechanical expressions may be given to the inventive idea involved, one of which for the purpose of illustration is shown in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of the muzzle end of a gun-barrel with my improvement applied thereto. Fig. 2 is a transverse vertical section on the line 2 2, Fig. 1.

Fig. 3 is a broken bottom plan of the barrel with the cylinder removed and showing the grooves for receiving the flanges on the cylinder-supporting sleeve, and Fig. 4 is a front elevation of the end closure of the gas-cylinder.

Referring to the drawings, in which like reference-numerals designate like parts, 1 indicates the forward or muzzle portion of a gun-barrel, whose walls are thickened for a short distance, as at 3, after which the extreme muzzle portion 4 is preferably reduced in thickness. Within the thickened portion 3 of the walls rearwardly-facing resistance-surfaces 15 are formed, upon which the gas-current impinges. These resistance-surfaces preferably are substantially normal to the gun-bore. One convenient way of obtaining such surfaces is by cutting grooves 5 on the interior of the barrel where the thickened walls 3 are located, said grooves preferably having a rearwardly-facing wall substantially normal to the gun's axis and another wall oblique thereto, as shown. Associated with some or all of said 25 resistance-surfaces are vent-ports 6, passing through the walls of the gun in any desired direction. As here shown, these vent-ports are located in planes radial to the gun and are rearwardly inclined in order that the vented 30 gases may be directed rearwardly and by their reaction on the surrounding atmosphere may oppose the recoil of the gun. Such rearward inclination of the vent-ports is not essential, however, as many of the advantages of the invention may be secured with vent-ports which 35 are not rearwardly inclined. For example, radial ports may be and sometimes are employed. Preferably these vent-ports 6 are arranged in symmetrical series around the gun-barrel in order that the gas may be vented evenly and uniformly, thereby avoiding any tendency of the vented gases to move the barrel from the line of aim.

A cylinder 7 is attached at its forward end 5 to the barrel in any suitable manner, preferably by inserting it into a sleeve 8, having dovetailed flanges 9 9, which take into corresponding grooves 10 10, formed in the under side of the thickened portion 3 of the barrel, 10 Figs. 2 and 3. Preferably these grooves 10 are open at their rear ends and closed at their forward ends, thereby affording stop-shoulders 11 11, against which the forward ends of the flanges 9 9 abut. The sleeve 8 has a slot 12 extending along a portion of its upper side, and this slot 12 is here shown as 15 of sufficient length and width to cover three rows of the vent-ports 6 through the entire length of said rows. It is manifest, however, that the dimensions of this slot may be varied to suit the requirements of particular gun and character of ammunition employed. A slot 13 is also formed in the cylinder 7, and when the cylinder is in place in the sleeve this slot 13 registers with the slot 12, so that gases im-

ping upon the resistance-surfaces of the grooves 5 and vented through those ports 6 which are opposite the slot 12 may pass into the cylinder 7. The forward ends of the cylinder 7 and sleeve 8 are closed by a screw- 70 plug 14 engaging screw-threads in the sleeve, the plug being provided with a projecting polygonal hub 15, which serves as a guide for a valve 16, controlling ports 17 through the plug. This valve 16 is retained yieldingly on 75 its seat by a spring 18 reacting between the valve and an annular shoulder 19 on a screw-plug 20, entering a socket in the hub 15. The valve 16 is in the form of a cylinder, which can reciprocate but not turn upon the hub 15, and 80 has two holes or openings 21 21 formed in its walls. A piston 22 is mounted in the cylinder 7 and has attached thereto or forming a part thereof a piston-rod 23, which may be connected to the breech mechanism or other oper- 85 ating parts of the gun.

The parts are readily assembled and disassembled. The flanges 9 9 on the sleeve 8 are slipped into the grooves 10 10 from the rear and are pushed forward until they abut 90 the shoulders 11 11, the plug 14 having been previously screwed into the front end of the sleeve by slipping the valve over the hub 15 and then inserting the screw 20 through the holes 21 21 in the valve and using said screw 95 as a lever for turning the valve and with it the plug 14. The plug 14 being screwed home, the spring 18 is placed in position and the screw 20 adjusted in the socket in the hub 15 till the desired tension is secured on the 100 valve 16. The cylinder 7 is inserted into the sleeve 8 from the rear and preferably with its front end abutting the screw-plug 14, and when the rear end of the cylinder is secured to the gun-frame in the usual or any suitable 105 way all the parts herein shown are firmly secured in position. It will be seen that no tools are required for the assemblage or disassemblage of the parts.

In operation the gases of discharge strike 110 upon the rearwardly-facing walls of the grooves 5 and are vented through the rearwardly-inclined vent-ports 6, some of which lead to the cylinder 7, but the most of which lead to the atmosphere. The gas thus first exerts its 115 energy in opposition to the recoil by its action on the resistance-surfaces and offers further resistance to the recoil by its reaction on the atmosphere as it escapes through the ports 6. By thus dissipating a portion of the gas 120 energy through the ports 6 the energy of the gas-current issuing from the muzzle is greatly decreased, thereby lessening the portion of the recoil due to the muzzle-blast and eliminating the other injurious effects of such blast. This 125 reduction of the energy of the gas in the barrel is also of great importance, since it affords a means whereby the action of the gas on the piston 22 in the cylinder 7 may be regulated and controlled. The dissipation of 130

the gas energy through those ports 6 which vent to the atmosphere materially reduces the energy of the gas entering the cylinder, and hence the violence of its action on the operating parts of the gun. In addition to the control of the gas energy in the cylinder thus obtained the vent-ports 17 and valve 16 afford auxiliary means for regulating such energy, since the valve will open when the pressure in the cylinder is greater than desired, and thereby reduce the pressure to the desired degree.

It will be understood that the action of the gases upon the piston in the cylinder will be prolonged during the passage of the projectile through the part 4 of the barrel, and by constructing this portion to suit the character of gun and ammunition used the duration of the gas action upon the piston may be entirely controlled.

It will be perceived that by thickening the walls of the barrel at the point where the groove and vent-ports occur provision is made against any undue weakening of the barrel at this point, as well as affording a ready means for securing the cylinder to the barrel.

What is claimed is—

1. In a gun, a gas-cylinder, a barrel having resistance-surfaces formed on its interior, vent-ports associated with said surfaces, some of said ports venting into the gas-cylinder and some of them to the atmosphere.

2. In a gun, a gas-cylinder, a barrel having resistance-surfaces formed on its interior, and rearwardly-inclined vent-ports formed in the walls of the barrel and associated with said surfaces and venting into said cylinder.

3. In a gun, a gas-cylinder, a barrel having resistance-surfaces formed in its interior, and vent-ports symmetrically arranged around the gun-barrel, some of said ports venting to the cylinder and some of them to the atmosphere.

4. In a gun, a gas-cylinder, a barrel having resistance-surfaces formed on its interior, and rearwardly-inclined vent-ports symmetrically arranged around the gun-barrel, some of said ports venting to the cylinder and some of them to the atmosphere.

5. In a gun, a barrel, a gas-cylinder, a piston therein, and means interrupting and deflecting a portion of the gas-current into said cylinder and a portion into the atmosphere.

6. In a gun, a barrel, a gas-cylinder, a piston therein, means interrupting and deflecting a portion of the gas-current into said cylinder and a portion into the atmosphere, and means limiting the pressure in said cylinder.

7. In a gun, a gas-cylinder, a barrel having interior circumferential grooves and rearwardly-inclined lateral vents extending through the walls of the barrel from said grooves to said cylinder.

8. In a gun, a gas-cylinder, a barrel having interior circumferential grooves and rearwardly-inclined lateral vents extending

through the walls of the barrel from said grooves to said cylinder, and other rearwardly-inclined lateral vents extending through the walls of the barrel from said grooves to the atmosphere.

9. In a gun, a gas-cylinder, a barrel having interior circumferential grooves and lateral vents extending through the walls of the gun-barrel from said grooves to said cylinder, and other lateral vents extending through the walls of the gun-barrel to the atmosphere.

10. In a gun, a gas-cylinder, a barrel having a plurality of rearwardly-facing surfaces on its interior, and a plurality of lateral vents in proximity to said surfaces and leading from the interior of said barrel to said cylinder, and a plurality of other lateral vents leading from the interior of the barrel in proximity to said surfaces to the atmosphere.

11. In a gun, a gas-cylinder, a barrel having a plurality of rearwardly-facing surfaces disposed on its interior in planes substantially normal to the axis of the barrel, and a plurality of rearwardly-inclined vents passing through the walls of the barrel in proximity to said surfaces, and leading from the interior of the barrel to the gas-cylinder.

12. In a gun, a gas-cylinder, a barrel having a plurality of rearwardly-facing surfaces disposed on its interior in planes substantially normal to the axis of the barrel, and a plurality of rearwardly-inclined vents in proximity to said surfaces, some of said vents leading from the interior of the barrel to the gas-cylinder and some of them leading from the interior of the barrel to the atmosphere.

13. In a gun, a gas-cylinder, and a barrel having several series of lateral vents formed in its walls, the vents of each series being arranged in a plane substantially at right angles to the axis of the barrel, some of the vents leading to the gas-cylinder and some of them to the atmosphere.

14. In a gun, a gas-cylinder, and a barrel having several series of rearwardly-inclined lateral vents formed in its walls, the vents of each series being symmetrically arranged in a plane substantially normal to the bore of the gun, some of said vents emptying to the atmosphere and some of them to said cylinder.

15. In a gun, a gas-cylinder, a barrel having its walls thickened near its muzzle, and a flange-and-groove connection between said thickened barrel portion and said gas-cylinder.

16. In a gun, a gas-cylinder, a barrel having a thickened portion near the muzzle with longitudinally-extending grooves formed therein, and means supporting said cylinder and having flanges engaging said grooves.

17. In a gun, a barrel having means reducing the gas energy within the barrel, a cylinder communicating with the bore of the barrel, and an automatic pressure-relief device connected to said cylinder.

18. In a gun, a barrel having its walls thick-

ened near the muzzle, interior grooves and  
vent-ports formed in said thickened portion,  
and a gas-cylinder secured to said thickened  
portion and communicating with the gun-  
5 bore.

19. In a gun, a barrel having its walls thick-  
ened near the muzzle, interior grooves and  
vent-ports formed in said thickened portion,  
the barrel being prolonged in front of said  
10 grooves and ports, and a gas-cylinder secured  
to said thickened portion and communicating  
with the gun-bore.

20. In a gun, a barrel having a thickened

portion near its muzzle, dovetailed grooves in  
said thickened portion open at their rear ends 15  
and having abutments at their front ends, a  
gas-cylinder, and cylinder-supporting means  
having flanges entering said grooves and bear-  
ing against said abutments.

In testimony whereof I have signed this 20  
specification in the presence of two subscrib-  
ing witnesses.

SAMUEL N. McCLEAN.

Witnesses:

S. T. CAMERON,  
REEVE LEWIS.