(No Model.) 2 Sheets—Sheet 1.

B. BRAZELLE.

STEAM ENGINE.

No. 271,781. Patented Feb. 6, 1883.

FIG. 1.

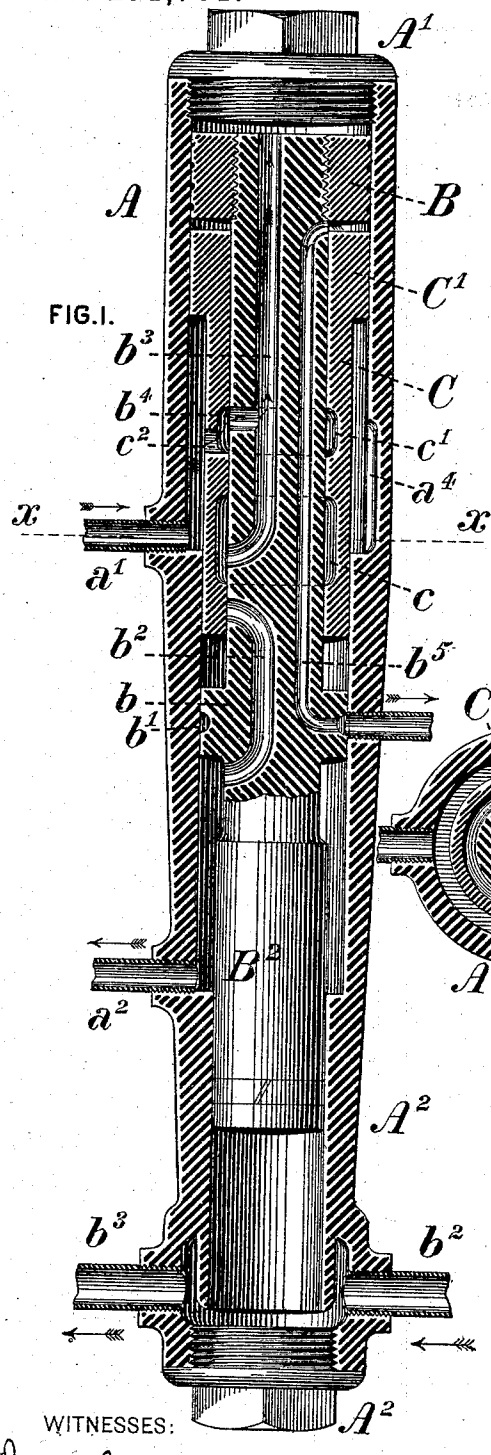


FIG. 2.

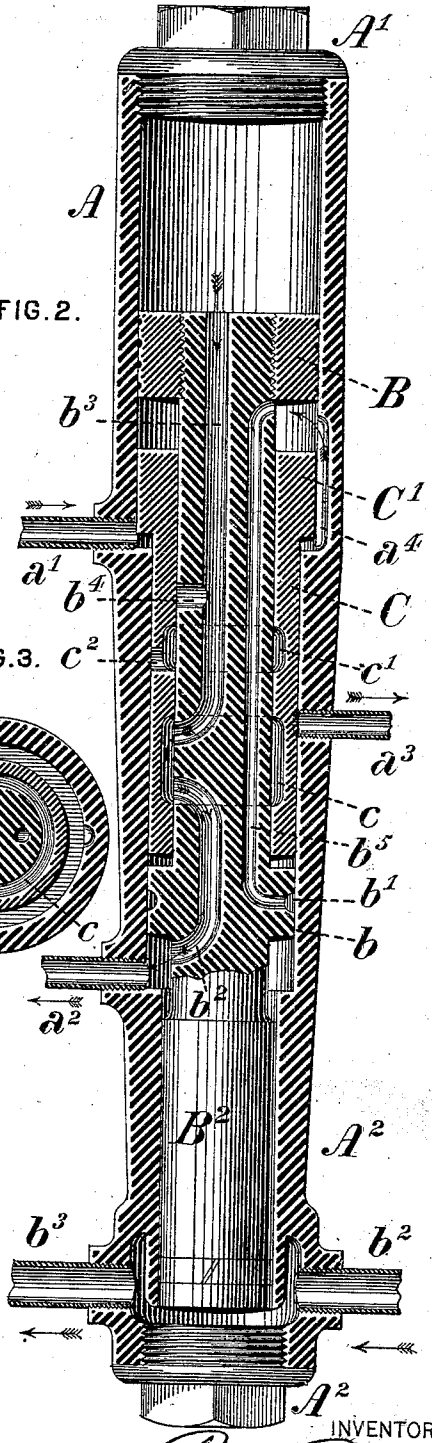
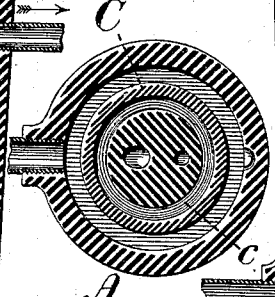


FIG. 3.



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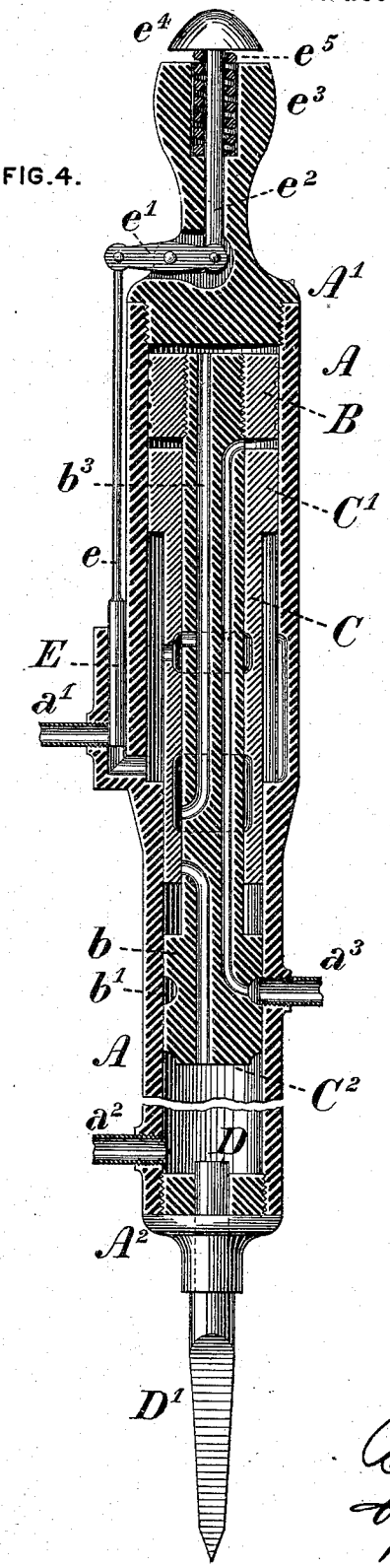
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FIG. 4.



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UNITED STATES PATENT OFFICE.

BENJAMIN BRAZELLE, OF ST. LOUIS, MISSOURI.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 271,781, dated February 6, 1883.

Application filed August 31, 1882. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN BRAZELLE, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Steam-Engines, of which improvements the following is a specification.

The object of my invention is to provide a direct-acting engine which shall embody the features of simplicity of construction, comparatively slight cost of manufacture, positive action under low as well as high pressures, and the capacities of using steam expansively, and of operating chipping, calking, riveting, and other analogous tools.

To this end my improvements consist in the combination of a cylinder bored out concentrically to two different diameters for different portions of its length, a piston-rod provided with a series of longitudinal ports, a piston and a collar fitting respectively the larger and smaller bores of the cylinder, and a tubular valve having supply and exhaust ports and fitted to reciprocate upon the rod of the main piston; also, in the combination of a cylinder, piston, piston-rod, and valve, as set forth, an anvil or abutment connected to said cylinder, said anvil carrying a cutting, punching, or other tool, and being adapted to receive the impact of the piston in operation, and a controlling-valve regulating the application of motive fluid to said piston.

The improvements claimed are hereinafter fully set forth.

In the accompanying drawings, Figures 1 and 2 are vertical longitudinal central sections through a direct-acting steam-pump embodying my invention, the pistons being shown at the upper and lower extremities of their stroke, respectively; Fig. 3, a transverse section through the same at the line *x x* of Fig. 1, and Fig. 4 a vertical longitudinal central section through a chipping or calking engine.

The cylinder A is bored out concentrically to two different diameters—from a point at or near its center to each of its ends, respectively—the larger diameter being suited to receive the piston B, and the smaller corresponding with that of a collar, *b*, on the piston-rod B′, and the ends are closed by screw-caps A′ A². A steam-pipe, *a*′, is connected to a flange or nozzle on the cylinder at the inner end of its larger bore, and an exhaust-pipe, a^2, leads from a nozzle on the cylinder at the outer end of its smaller bore. A supplementary exhaust-pipe, a^3, leads from the cylinder at a point between the steam and the main exhaust pipe, its purpose being hereinafter explained. The cylinder A and piston-rod B′ are in this instance each prolonged so as to form respectively a pump-barrel, A², provided with suitable connections, b^2 b^3, to suction and delivery valves, and a pump-plunger, B², working in said barrel; but in lieu thereof the piston-rod may be fitted with connections suitable to any special duty for which the engine is designed.

Steam is admitted to and exhausted from each side of the piston B by a tubular valve, C, the inner diameter of which corresponds with that of the piston-rod B′, and the outer with the smaller diameter of the cylinder A, so that an annular space is afforded between the larger diameter of the cylinder and the valve. A head or piston, C′, corresponding with the larger diameter of the cylinder, is formed upon the valve C at the end adjacent to the main piston B, and two annular recesses, *c c*′, are formed in the inner surface of the valve, the one, *c*, which constitutes an exhaust-passage, being located adjacent to its end farthest from the main piston B, and the other, *c*′, which serves as a steam-passage, being located between the recess *c* and the head C′, its distance from the latter being dependent upon the degree of expansion at which the engine is to be worked. A steam-port, c^2, extends from the recess *c*′ to the exterior of the valve, so as to establish communication between said recess and the space surrounding the valve. Inasmuch as the port c^2 will be closed as soon in the traverse of the valve as it passes the inner end of the larger bore of the cylinder, an early or late cut-off will be effected, according as said port is located farther from or nearer to the head C′, respectively.

A collar, *b*, fitting the smaller bore of the cylinder A, is formed upon the piston-rod B′ at such distance from its end as will permit the opening of the exhaust-pipe a^2 to be fully uncovered when the piston is at the inner or lower extremity of its stroke, and an exhaust-passage, b^5, extends longitudinally through the piston-rod B′

from a circumferential groove, b', in the collar b to a point in the periphery of the rod immediately adjoining the main piston B. An exhaust-passage, b^2, formed in the piston-rod, opens at one end, on the periphery thereof adjoining the collar b, at the side of said collar farthest from the main piston, and the opening of its opposite end is at such distance from the opposite side of the collar as will enable it to communicate fully with the exhaust-recess c when the valve is at the inner or lower extremity of its stroke, in which position communication is also established between said recess and the space on the opposite side of the main piston B by a passage, b^3, extending longitudinally through the piston, and serving alternately for conveying live and exhaust steam to and from the outer side thereof. A port, b^4, leading into the passage b^3, establishes communication between said passage and the steam-recess c' of the valve. A passage, a^4, in the larger bore of the cylinder A extends from the inner end of said bore for a distance greater than the thickness of the collar C′ of the valve, so as to allow steam to pass from the inner to the outer side of the latter when at the inner extremity of its stroke.

In operation, both the piston B and valve C being at the upper or outer extremity of their stroke, as in Fig. 1, the steam or other motive fluid admitted to the cylinder through the pipe a' passes through the ports c^2 and b^4 and passage b^3 to the upper side of the piston B, and effects the downward stroke of the piston and valve, the steam on the opposite side of the piston acting on the larger area of the valve-collar C′, and being exhausted through the passage b^5 and supplemental exhaust-pipe a^3. It will be seen that the supply of motive fluid will be cut off as soon as the valve-port c^2 passes the inner extremity of the larger bore of the cylinder, and the remainder of the stroke will be effected by expansion. The location of said port, therefore, determines the point of cut-off. To effect the upward stroke steam passes through the passage a^4 and acts upon the lower side of the piston B, the valve C being raised coincidently by the collar b of the piston-rod, and the steam admitted during the previous stroke being exhausted through the passage b^3, recess c, passage b^2, and exhaust-pipe a^2. A special advantage exists in the positive action of the valve, insured by the large area of its collar C′, as sufficient power to move the valve is thereby afforded under the lowest working pressure that may be employed. A steam-chest being dispensed with, the apparatus is rendered correspondingly more compact, and its manufacture is facilitated and economized by the fact that all the surfaces in working contact are cylindrical.

Fig. 4 illustrates my invention as adapted to the operation of a chipping or calking tool, or any analogous service in which a hammering or impacting action is required. A hammer-face, C^2, is formed upon the lower end of the piston-rod, and an anvil or abutment, D, is secured in the lower cap of the cylinder A, against which abutment said hammer strikes at the end of the downward traverse of the piston. The abutment D forms the stem of a chipping or calking tool or chisel, D′, which is operated by the blows of the hammer, and is guided by the operator, who holds the cylinder, steam, compressed air, or other operating-fluid being admitted through a flexible pipe to the supply-pipe a'. The supply is governed so as to effect and regulate the blows of the hammer, as required, by a controlling-valve, E, upon the end of a rod, e, fitted to reciprocate in a socket on the outside of the cylinder A, and connected to one end of a double-armed lever, e', the other end of which is connected to a stem, e^2, guided in a handle, e^3, upon the upper cap of the cylinder, and having a head or button, e^4, upon its outer end. A spring, e^5, bearing against the inner face of the head e^4, maintains the controlling-valve E in such position as to entirely shut off the supply of operating-fluid, except when the head is pressed down by the operator, when the valve is opened to a greater or less degree, as required, and immediately closed by the spring on the release of the head.

The apparatus is so small and light as to be conveniently portable and adjustable in any desired positions relatively to the work to be performed, and the operator is relieved from any labor beyond that of guiding the tool and regulating the force of the blows applied thereto.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, substantially as set forth, of a cylinder which is bored out concentrically to two different diameters for different portions of its length, a piston-rod adapted to reciprocate in said cylinder, said rod carrying a piston and a collar fitting respectively the larger and the smaller bores of the cylinder, and a tubular distribution-valve fitted to reciprocate upon said piston-rod between its piston and its collar, and having ports adapted to communicate with steam and exhaust passages in the piston-rod.

2. The combination, substantially as set forth, of a cylinder which is bored out concentrically to two different diameters for different portions of its length, a piston fitting the larger diameter of said cylinder, and secured upon a rod having internal steam and exhaust passages, and a tubular distribution-valve fitting freely upon said rod, said valve having a head fitting the larger diameter of the cylinder, and a lateral steam-port located so as to cut off the supply of steam from the piston by passing from the larger to the smaller bore of the cylinder in the traverse of the valve.

3. The combination, substantially as set forth, of a cylinder which is bored out concentrically to two different diameters for differ-

ent portions of its length, a piston fitting the larger diameter of said cylinder, a piston-rod secured at one end to said piston, and having at or near its other end a head or collar fitting the smaller diameter of said cylinder, a tubular distribution-valve adapted to move freely upon said piston-rod, and having a head fitting the larger diameter of the cylinder, and two internal recesses, one of which communicates with a lateral supply-port, a channel, or passage of greater length than the thickness of the valve-head, and formed in the inner surface of the cylinder adjacent to the junction of its larger and smaller bores, an exhaust-passage extending through the piston-rod from the piston to the collar, a supplemental exhaust-pipe opening into the smaller bore of the cylinder, and two longitudinal passages extending through the piston-rod and adapted to communicate with the recesses in the valve, and thence with a steam and an exhaust pipe connected to the cylinder.

4. The combination, substantially as set forth, of a cylinder, a piston and rod adapted to reciprocate therein, a tubular distribution-valve fitting freely and reciprocating upon the piston-rod, and governing the supply and exhaust of motive fluid to and from each side of the piston, a hammer formed on or secured to the piston-rod, an anvil or abutment secured to the cylinder and adapted to receive the blows of said hammer, a cutting or striking tool connected to said anvil, and a controlling-valve governing the supply of motive fluid to the distribution-valve.

5. The combination, substantially as set forth, of a cylinder, a piston and rod adapted to reciprocate therein, a tubular distribution-valve fitting freely and reciprocating upon the piston-rod, and governing the supply and exhaust of motive fluid to and from each side of the piston, an anvil or abutment secured to one end thereof, a handle secured to the other end, and a hand-lever fitting in said handle, and connected to the stem of a controlling-valve governing the supply of motive fluid to the distribution-valve.

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Witnesses:
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