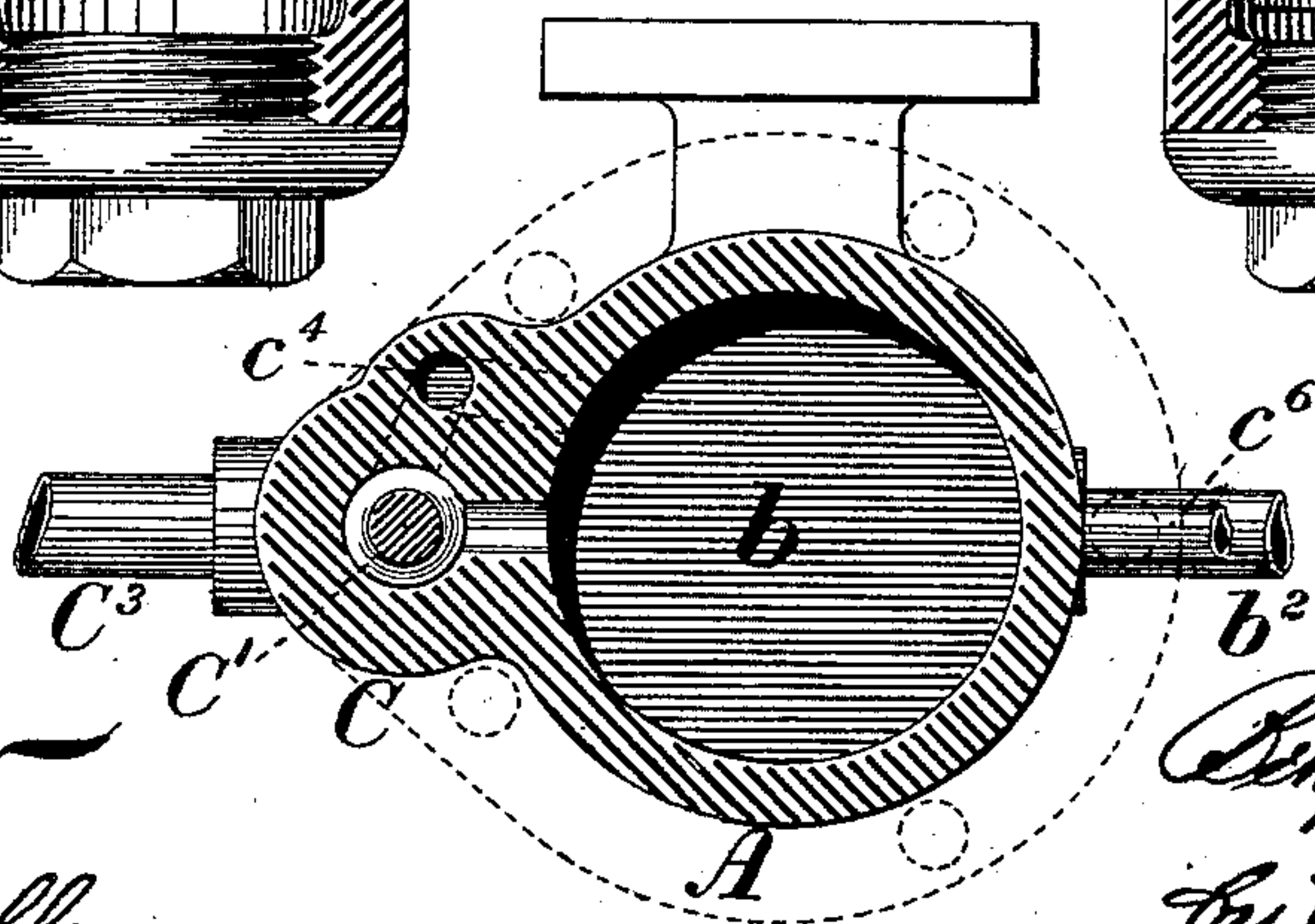
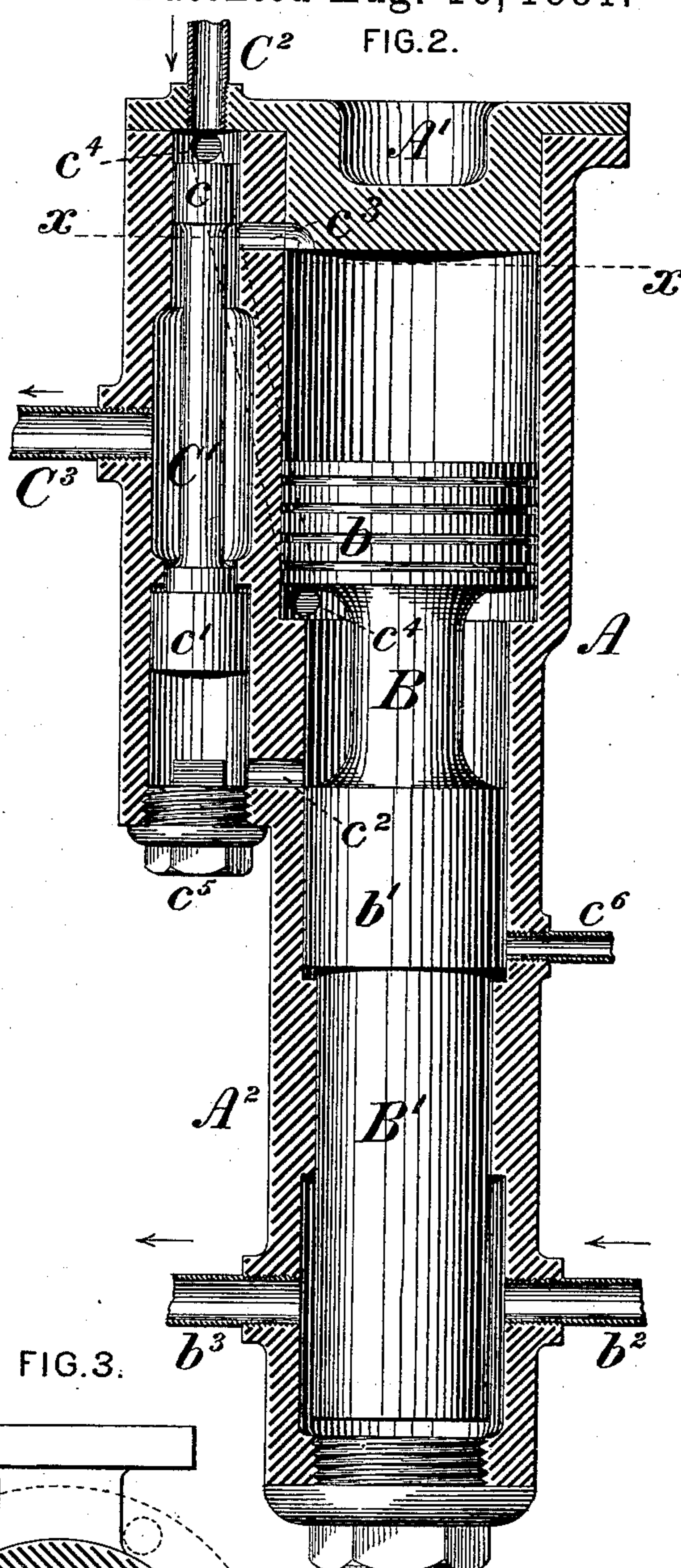


B. BRAZELLE.
STEAM PUMPING ENGINE.

Patented Aug. 16, 1881.



WITNESSES:
Geo. B. Leckie
George T. Kelly.

INVENTOR
Benⁿ Brazzelle,
by Collier & Bell,
attys

UNITED STATES PATENT OFFICE.

BENJAMIN BRAZELLE, OF ST. LOUIS, MISSOURI.

STEAM PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 245,777, dated August 16, 1881.

Application filed May 7, 1881. (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 simple, compact, and inexpensive direct-acting engine adapted for application to pumping water, feeding boilers, compressing air, operating steam hammers or stamps, rock-drills, and analogous uses, and specially suited for operation under high pressures and at high speeds; to which end my improvements consist in a certain novel construction and combination of a steam-cylinder and differential piston and a steam-chest and steam-operated valve, as hereinafter more fully set forth.

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

To carry out my invention I provide a steam-cylinder, A, which is bored out truly to receive a differential piston, B, consisting of two cylindrical heads, $b b'$, of larger and smaller diameters, respectively, united by a central stem, each head fitting accurately and moving in a portion of the cylinder of corresponding diameter. A steam-chest, C, is formed upon or secured to the cylinder A, and is provided with a differential piston-valve, C', consisting of a smaller cylindrical piston-head, c , and a larger head, c' , united by a stem, and fitting respectively in correspondingly-bored portions of the steam-chest, the smaller piston, c , being so located as to alternately establish communication through a port, c^3 , between the space in the cylinder A above the larger area of the head b of the main piston and the steam-pipe C², which communicates with the steam-chest above the head c and between said space and the exhaust-pipe C³, which is connected to the steam-chest at a point between the heads c and c' of the valve. The smaller bore of the cylinder and the larger bore of the steam-chest are

connected by a port, c^2 , opening into the steam-chest below the larger head, c' , and the larger bore of the cylinder and smaller bore of the steam-chest by the port c^3 , before referred to. A port, c^4 , extends from the steam-chest above the smaller head, c , to a point in the cylinder at or adjacent to the inner end of its larger bore, said port being continuously open to the steam-pipe C², and consequently supplying live steam to the space in the cylinder between the heads b and b' of the piston uninterruptedly during the operation of the engine. A port with which a supplemental exhaust-pipe, c^6 , is connected is formed in the cylinder A at or adjacent to the outer end of its smaller bore, and the outer end of its larger bore is closed, as is the adjacent end of the steam-chest, by a head, A'. The opposite end of the steam-chest is fitted with a removable bonnet, c^5 , to admit of the insertion and removal of the valve, and a transverse partition or seat, c^7 , is formed in the valve-chest to act as a stop for the valve on its upward traverse, said partition having a central opening fitting a collar, c^8 , on the valve-stem. In the instance shown the cylinder A and piston B are each prolonged, so as to form respectively a pump-barrel, A', provided with suitable connections, $b^2 b^3$, to suction and delivery valves, and a pump-plunger, B', working with suitable clearance in said barrel; but it will be obvious that in lieu thereof an ordinary piston-rod, provided with connections suitable for any special duty to which the engine is designed, may be provided and actuated by the means hereinbefore described.

In the operation of my improvements, the piston B being at the upper and the valve C' at the lower extremity of its stroke, as in Fig. 1, the steam from the boiler, which is admitted to the steam-chest by the steam-pipe C², passes therefrom through the port c^3 into the cylinder above the larger head, b , of the piston B, and also passes through the port c^4 to the space between the heads b and b' , acting thereby upon both sides of the head b , but with an excess of downward pressure due to the difference in area between its upper and lower surfaces, such preponderance of pressure effecting the downward stroke. At the termination thereof, the smaller head, b' , of the piston having passed the lower port, c^2 , the steam sup-

plied through the port c^4 to the space between the heads passes therefrom through the port c^2 to the steam-chest and raises the valve C' by its pressure upon the larger head, c' , simultaneously opening the upper port, c^3 , to the exhaust, for the discharge of the steam which has effected the downward stroke, and effecting the upward stroke by its pressure upon the lower surface of the larger head, b . At the termination of the upward stroke, communication being established between the lower port, c^2 , and the supplemental exhaust-pipe c^6 , the steam which has raised the valve C' escapes through the pipe c^6 , and the pressure upon the upper head, c , throws down the valve, thereby opening the port c^3 to the steam-pipe and effecting the succeeding downward stroke, as above described. The provision of the collar c^8 above the lower head, c' , of the valve effects the cushioning of the valve on its upward stroke by the compression of air between the head c' and seat c^7 .

My improvements effect a material simplification in construction and consequent reduction in cost, all valve-operating mechanism being dispensed with, and but two moving members—to wit, the piston and valve—being required. An additional economy in construction is effected by reason of the fact that lathe-work only is required in the finishing of the apparatus, and the absence of joints and reduction in the number of wearing-surfaces is of special advantage in its application to use under high pressure and at high speed.

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

1. In a steam-engine, the combination, substantially as set forth, of a steam-cylinder, a differential piston fitting therein, and a differential-piston distribution-valve.

2. In a steam-engine, the combination, substantially as set forth, of a steam-cylinder, a steam-chest, and a piston-valve having two heads of different diameters, said valve being adapted for reciprocation within the chest by the application respectively of steam-pressure to the smaller head directly from the steam-pipe and to the larger intermedially through the cylinder.

3. In a steam-engine, the combination, substantially as set forth, of a steam-cylinder bored to two different diameters for different portions of its length, a differential piston formed of two heads of diameters corresponding respectively to those of the cylinder, and connected by a stem, and a reciprocating valve, by which a preponderance of steam-pressure is alternately applied to the outer and the inner faces of the larger piston-head.

4. In a steam-engine, the combination, substantially as set forth, of a steam-cylinder and a steam-chest, each bored to two different diameters for different portions of its length, a differential piston and a differential-piston valve, fitted respectively to the cylinder and to the steam-chest, a steam-supply and a steam-exhaust opening, each communicating with the steam-chest, two ports, which respectively connect the larger bore of the cylinder with the smaller bore of the steam-chest, and vice versa, a port connecting the steam-supply opening with the larger bore of the cylinder at the end opposite that at which the port leading to the steam-chest is located, and a supplemental exhaust-port located in the smaller bore of the cylinder.

B. BRAZELLE.

Witnesses:

J. SNOWDEN BELL,
CHAS. A. SAFFORD.