

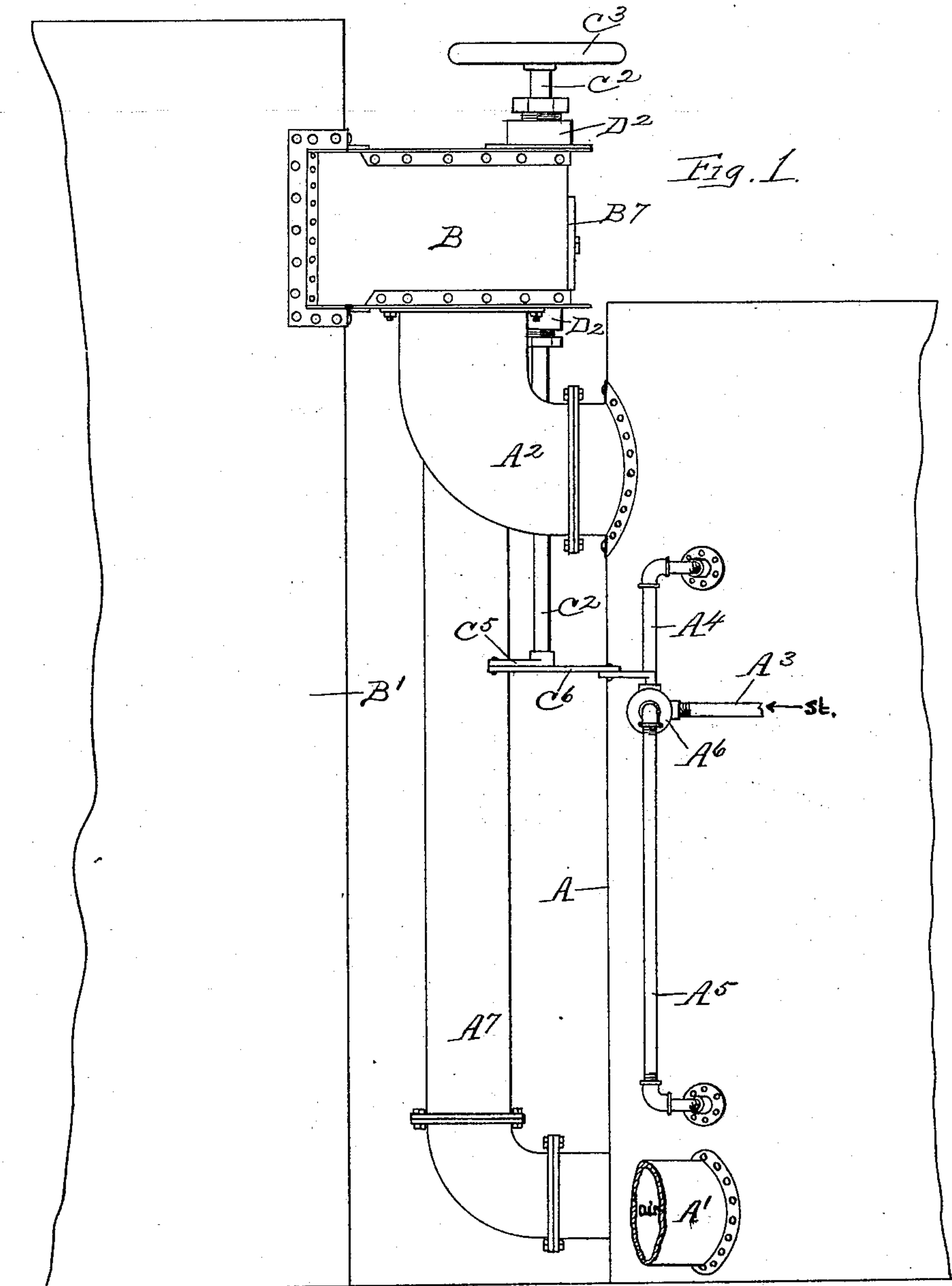
(No Model.)

2 Sheets—Sheet 1.

H. C. SHIELDS.  
APPARATUS FOR MANUFACTURING GAS.

No. 604,427.

Patented May 24, 1898.



Witnesses:  
C. H. Curtis  
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Inventor:  
Henry C. Shields  
By Mosher & Curtis  
Attys.

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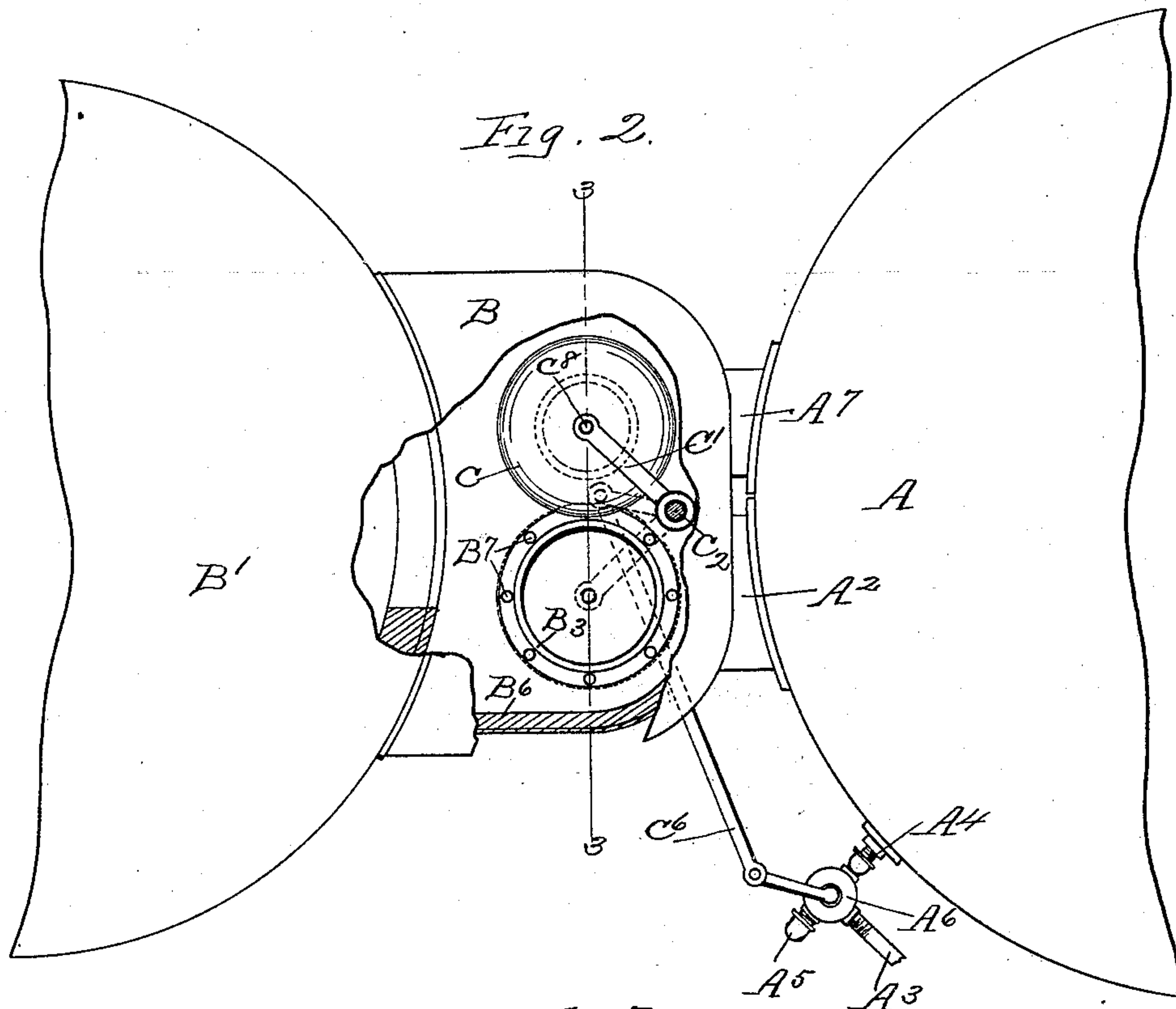


Fig. 3.

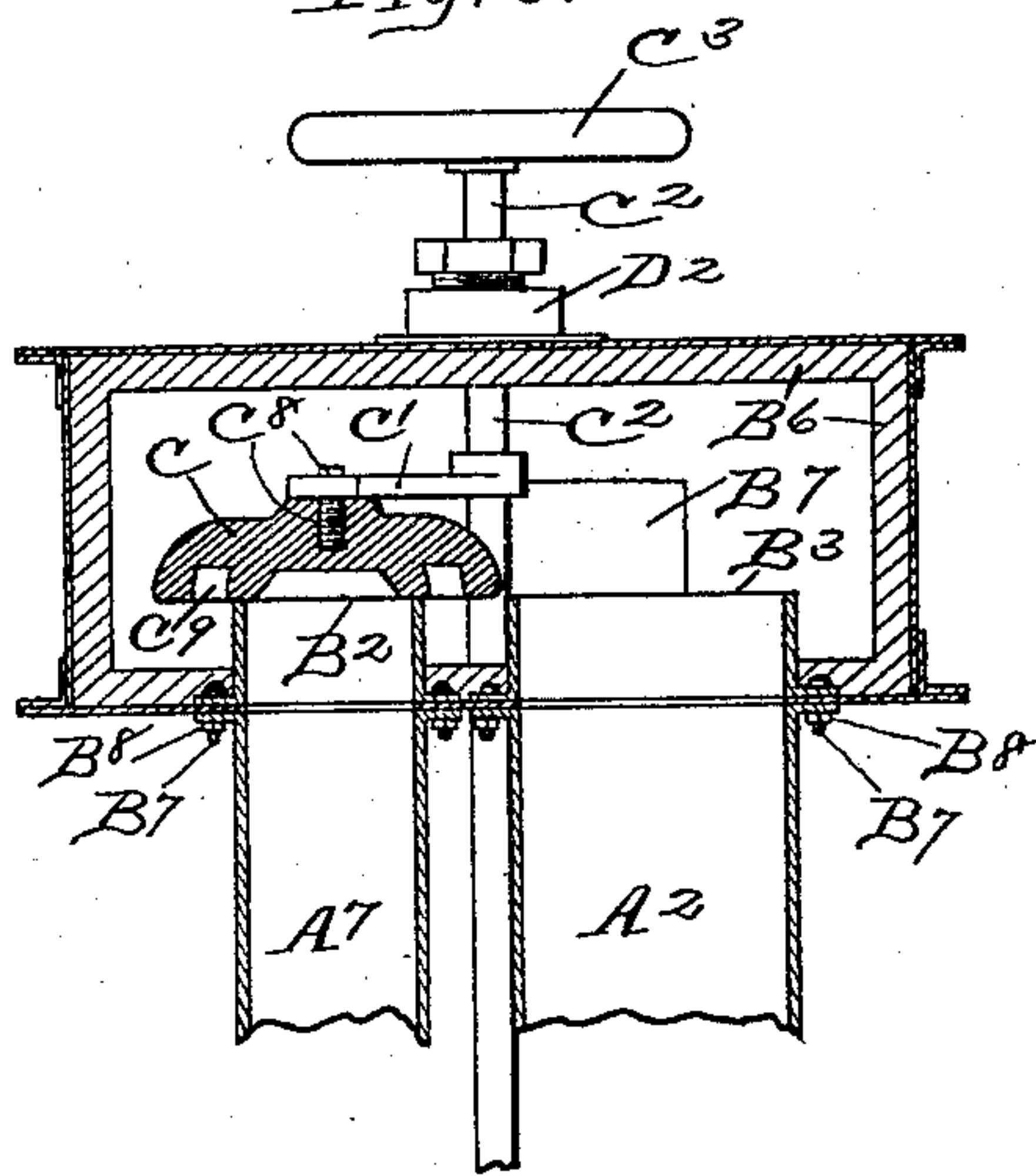


Fig. 4.

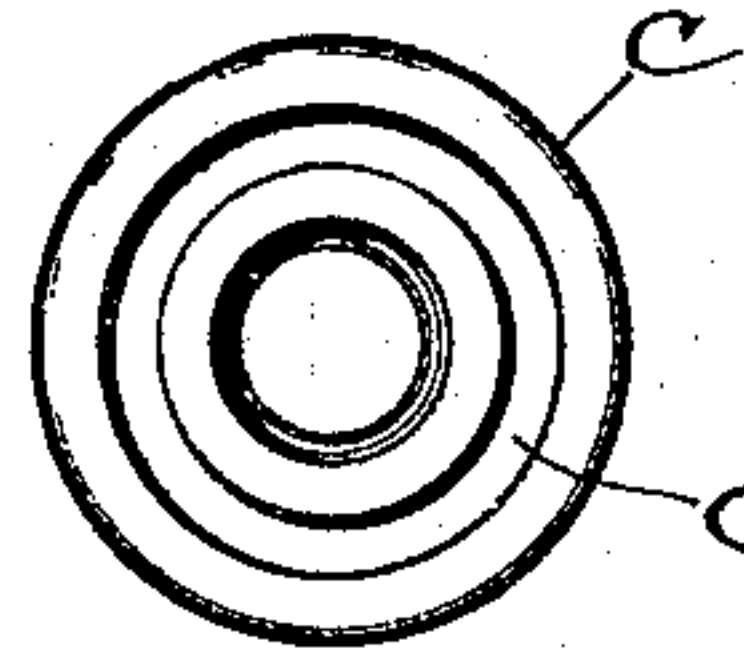
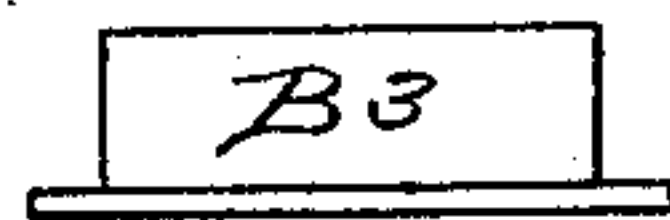


Fig. 5.



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# UNITED STATES PATENT OFFICE.

HENRY C. SHIELDS, OF TROY, NEW YORK.

## APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 604,427, dated May 24, 1898.

Application filed December 27, 1895. Serial No. 573,463. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY C. SHIELDS, a citizen of the United States, residing at Troy, county of Rensselaer, and State of New York, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas, of which the following is a specification.

The invention relates to such improvements; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings, and the letters and numerals of reference marked thereon, which form a part of this specification.

Similar letters and numerals refer to similar parts in the several figures therein.

Figure 1 of the drawings is a view in side elevation of portions of a gas-generator and fixing-chamber, showing pipe connections, valve-case, and valve-operating mechanism. Fig. 2 is a top plan view of the same. Fig. 3 is a vertical section of the main-valve case, taken on the broken line 3 3 in Fig. 2. Fig. 4 is a face view of the main valve detached. Fig. 5 is a side elevation of one of the removable valve-seats detached.

The principal object of my invention is to provide a main valve that will be durable and that can be easily and quickly operated to form one of the steps necessary to reverse the currents in a gas-generator to produce "up and down runs."

I have shown the gas-generator A provided with the usual blast-pipe A' at the lower end, the upper exit-pipe A<sup>2</sup> for taking off the products of combustion and gases, the steam-pipe A<sup>3</sup>, leading from a steam-boiler to an upper branch A<sup>3</sup>, entering the upper end of the generator, and a lower branch A<sup>5</sup>, entering the lower end of the generator. A three-way cock A<sup>6</sup> is adapted to alternately deliver the steam to the upper and lower branches. The generator is also provided with a gas-pipe A<sup>7</sup>, leading outwardly from the lower end of the generator.

The two pipes A<sup>2</sup> and A<sup>7</sup> lead to the valve-case B, which is shown attached to and opening into the upper end of the fixing-chamber B'.

When an up run is to be made, steam is ad-

mitted through the lower branch to the lower end of the generator, and the gas or decomposed steam leaves the upper end of the generator through pipe A<sup>2</sup> and passing through the valve-case enters the fixing-chamber, the pipe A<sup>7</sup> being closed.

To make a down run, the steam is admitted through the upper branch into the upper end of the generator, and the decomposed steam passes from the lower end of the generator through the pipe A<sup>7</sup> and thence through the valve-case into the fixing-chamber, the pipe A<sup>2</sup> being closed.

As a means for alternately closing and opening the pipes A<sup>2</sup> and A<sup>7</sup>, I provide the valve-disk C, which is centrally pivoted upon one end of the crank-arm C', the other end of the arm being fixed interiorly of the valve-case upon the operating crank-shaft C<sup>2</sup>, rotatively movable in bearings in the shell of the valve-case and provided with an operating handle or lever C<sup>3</sup>, fixed upon a part projecting exteriorly of the valve-case.

At the upper ends of the pipes A<sup>2</sup> and A<sup>7</sup> I provide valve-seats B<sup>2</sup> and B<sup>3</sup>, located within and attached to the case and projecting a short distance above the bottom of the case. The seats terminate in approximately the same horizontal plane in close proximity to each other, so that a rocking movement imparted to the shaft C<sup>2</sup> will swing the valve from one seat to the other seat in such a manner that the operation of closing one pipe opens the other pipe.

By connecting the valve-operating shaft with the three-way steam-cock A<sup>6</sup>, as by lever C<sup>5</sup> and link C<sup>6</sup>, the rotative movement of the shaft which operates the valve also acts to operate the steam-cock, whereby steam is admitted to the upper end of the generator when the pipe A<sup>2</sup> is closed and to the lower end of the generator when the pipe A<sup>7</sup> is closed and pipe A<sup>2</sup> opened. Such arrangement and connection of the respective valves renders it impossible to accidentally admit steam into the lower end of the generator when the pipe A<sup>7</sup> is closed, thereby obviating accidents, which would materially retard the useful operation of the apparatus, and at the same time facilitating convenience in successful operation.

Heretofore slide gate-valves have been extensively used, one for each of the pipes A<sup>2</sup>



and A<sup>7</sup>; but the intense heat to which the seats of such valves, as well as the valves themselves, are subjected cause large expansion, and the variation of expansion due to  
 5 variation of heat when the valves are opened and closed renders it difficult to produce a tight joint. The wearing away of the parts due to the contact of cinders and ashes carried through the pipes by the strong currents  
 10 of air and gases soon causes such valves to leak, thereby materially impairing the successful operation of the apparatus.

In my improved form of valve the seats are attached to the bottom of the valve-case over  
 15 the connecting-pipes and project above it to allow space for ashes and cinders to lodge without interfering with the operation of the valve. The valve itself is preferably a heavy piece of metal having a smooth plane face  
 20 which slides across the seats. A pin C<sup>8</sup> is tapped into the center of the valve, being passed loosely through an enlarged aperture in the end of the crank-arm. The valve is held to its seat by gravity, its weight being  
 25 sufficient to tightly close the opening through the valve-seat. As the valve when operated is caused to slide back and forth from one pipe-seat to the other its action is to grind the seats and the face of the valve smooth,  
 30 thereby automatically maintaining a perfect tight-fitting joint, greatly enhancing the durability of the parts and insuring perfect action.

The pin C<sup>8</sup>, passing loosely through the  
 35 crank-arm, forms a swivel connection between the disk and arm, which permits the disk to rotate upon an axis central to the pin as the disk is forced to slide from one seat to the other. Such rotary movements cause differ-  
 40 ent surfaces on the disk to engage the seats when the slide movements take place, thereby maintaining a uniformly polished and plane surface on the disk instead of a grooved or uneven surface, which would result from  
 45 the slide movements if the disk were non-rotatively supported and moved by the arm. The construction is such that the valve rests upon one or both pipes and moves on them in an approximately horizontal plane. The  
 50 loose pivot 68 allows variations in the plane of the movement. This insures the proper operation of the valve in case either pipe is bent or warped from its normal position, as is liable to happen owing to the high tempera-  
 55 ture to which they are subjected, and particularly the larger pipe.

The valve-case is lined with refractory material B<sup>6</sup> and is provided with a door B<sup>7</sup> on the side, affording easy access to all the working  
 60 parts of the valve.

When one of the pipes, as A<sup>2</sup>, is larger in diameter than the other pipe, as A<sup>7</sup>, the valve common to both is made of sufficient size to close the larger pipe and allowed to overlap  
 65 the seat of the smaller pipe, as shown in Fig. 3.

When desired, the face of the valve may be provided with an annular groove C<sup>9</sup> larger in

diameter than the diameter of the smaller pipe and smaller than that of the larger pipe. Such groove tends to prevent the warping of  
 70 a larger valve and maintains a plane surface on its face.

By making the valve-seats B<sup>2</sup> and B<sup>3</sup> of separate detachable pipes or nipples or thimbles, which are secured in place by bolts B<sup>7</sup> and  
 75 nuts B<sup>8</sup>, I am able to renew or repair the seats without disturbing the relative positions of the case and pipes. This is a very important feature of my invention for the reason that the pipes are very large and rigid and the  
 80 valve-case very heavy and practically immovable, and if these parts should be disconnected after having been subjected to the intense heat required in operating the apparatus it would be a very long and difficult operation  
 85 to reunite the case and pipes, so as to produce a tight joint.

By making the bottom of the case of sheet metal I am able to secure a tight joint between the pipes, the seats, and the sheet metal  
 90 by means of the nuts and bolts, which joint will not be injured by the slight variation due to heat expansion of the several pipes and other parts, and the bolts will be protected by the refractory lining, as shown. Sheet  
 95 metal not only provides for more readily making tight joints, but such joints are less liable to be opened by expansion due to heat, and the metal about the joints is less liable to be cracked for the reason that sheet metal has  
 100 flexibility, and though this results in small variations in the level of the mouths of the pipes the valve by its wearing action, and more particularly by its loose pivot, is adapted to accommodate itself to such variations.  
 105

By providing the valve-case with a door B<sup>7</sup> on the side of the case I am able to obtain easy access to the interior parts for the purpose of renewal or repairs. The door may be secured in any well-known manner.  
 110

The valve-case is provided with a packing-box D<sup>2</sup> of any well-known form to produce a tight joint with the valve-operating crank-shaft C<sup>2</sup> wherever the same passes through the shell of the valve-case. Since the shaft  
 115 has no slide or endwise movement like the stem of a slide gate-valve, that portion which is contained in the packing-boxes never comes in contact with the confined gases, and a tight joint is easily maintained.  
 120

In constructions where the valve-stem slides through a packing-box into a gas-chamber the action of the hot gases upon the stem roughens it, so that the roughened stem soon  
 125 tears and wears the packing sufficiently to cause a leak through the box.

I am aware that two alternately-used gas-conduits have been combined with a valve sliding in ways endwise of itself across said conduits, a part of the operating mechanism being situated in one of the conduits, and such device is not of my invention. My  
 130 improvement is characterized by a case having an area larger than the combined trans-



verse area of the gas-pipes, said pipes extending into the case above its bottom and adapted to be covered alternately by a valve moving loosely on and over the pipe-mouths about a point situated outside said pipes, none of the operating mechanism being situated within either pipe. The case is adapted to receive and hold the ashes swept by the valve from the valve-seat. The valve is uniformly worn on its bottom. It readily follows moderate variations of the level of the pipe-mouths and its operating devices are not of a kind to be easily affected by heat and are also removed from the direct path of the hot gases, and, further, the case is improved, as elsewhere herein pointed out.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a valve, the combination of the valve-case, pipes situated side by side and extending above the floor of the case, a pair of valve-seats on the ends of said pipes in approximately the same horizontal plane, a perpendicular crank-shaft approximately equidistant from such seats and extending from the interior through the case-wall, a crank-arm secured to such shaft interiorly of the case, a slide-disk movable on and along the seats, a swivel connection between the disk and crank-arm, the pin of said connection being

the center of the motion of the valve, and means located exteriorly of the case for communicating rocking movements to the shaft, substantially as described.

2. In combination a valve-case, pipes extending through its bottom and above the same, the valve pivoted at a point outside the circumference of the pipes to swing on and across their mouths in an approximately horizontal plane, a shaft supported in the case-wall and fixed against endwise motion, and devices intermediate the valve and shaft whereby the rotation of the latter alternately covers and uncovers each pipe-mouth, substantially as described.

3. In a valve, the combination with the valve-case, said case having a sheet-metal side with a pair of openings, pipes extending through said openings, the valve-disk, and means for operating the disk, of a detachable nipple-seat registering with each case-opening, and means for detachably securing the nipple-seats to the sheet-metal wall of the case, substantially as described.

In testimony whereof I have hereunto set my hand this 16th day of December, 1895.

HENRY C. SHIELDS.

Witnesses:

GEO. A. MOSHER,

FRANK C. CURTIS.