W. L. DILLON.

EXPANSIBLE COLUMN.

APPLICATION FILED OCT. 26, 1909. RENEWED NOV. 11, 1910.

995,444. Patented June 20, 1911.

Fig. 1.

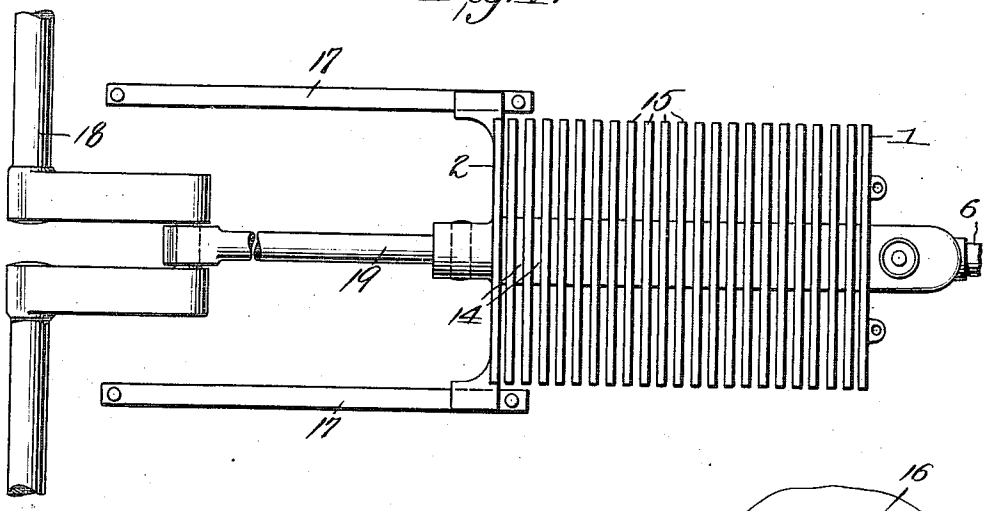
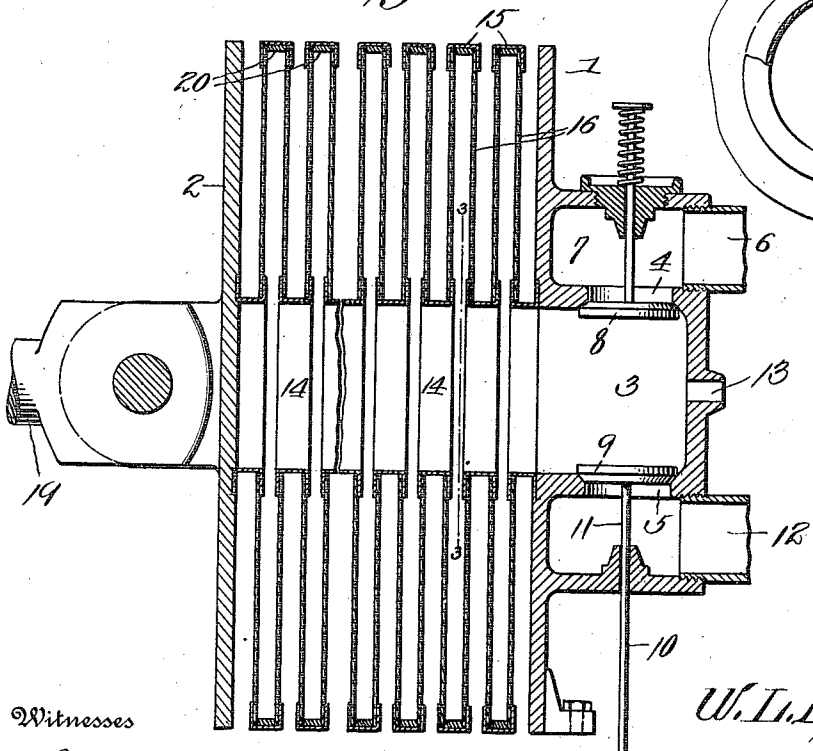


Fig. 2.



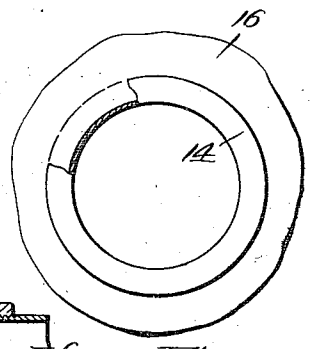


Fig. 3.

Witnesses

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EXPANSIBLE COLUMN.

995,444. Specification of Letters Patent. **Patented June 20, 1911.**

Application filed October 26, 1909, Serial No. 524,689. Renewed November 11, 1910. Serial No. 592,061.

To all whom it may concern:

Be it known that I, WILLIAM L. DILLON, a citizen of the United States, residing at Council Bluffs, in the county of Pottawattamie and State of Iowa, have invented a new and useful Improvement in Expansible Columns, of which the following is a specification.

This invention relates to an expansible column formed of communicating cylindrical sections, each section being adapted to expand in a direction along the longitudinal line of the column and the object of the invention is to secure longitudinal movement of said column, which movement may be employed either for the purpose of producing motion, as when one end of the column is fixed and the other is connected to a crank rod, or the column can be utilized as the equivalent of a spring, as a buffer, or as a shock absorber.

The invention consists of the novel features of construction, hereinafter fully described, pointed out in the claims and shown in the accompanying drawings, in which,

Figure 1 is a plan view of one of my columns shown in position for use in connection with an explosive fluid. Fig. 2 is an enlarged vertical longitudinal section through the column, the central portion being broken out, a valve casing being also shown in section. Fig. 3 is a detail section on the line 3—3 of Fig. 2.

In the drawings, I have illustrated one view of the invention, that is, as an air cooled, pistonless gas engine. In these drawings, 1 and 2 represent rigid end plates for the column. The end plate 1, in the device as used in connection with a gas engine, or in a compressed air motor, is provided with a centrally arranged chamber 3 provided upon one side with an inlet port 4, and upon the opposite side with an exhaust port 5. Employed as a gas engine a supply pipe 6 opens into a valve casing 7 with which the inlet port 4 communicates, said port being controlled by an inwardly opening suction valve 8. A valve 9 controls the exhaust said valve being provided with a stem 10, said stem to be positively actuated, as by a cam or other well known valve operating means and the port 5 leads into a casing 11 from which leads an exhaust pipe 12. An opening 13 is provided in the end of the chamber 3 through which an ignition device may project into the chamber. It will be understood that the end plate or head 1 is cut out centrally, said cut out portion having the same diameter as the chamber 3. Upon the inner face of the end plate 1 and surrounding the central cut out portion of the end plate is a channel ring 14. As a large number of these rings are employed in building up a column it may be stated that the rings 14 are all of the same size, the flanges carried by them extend outwardly, and similar rings 15 have a diameter much larger than the rings 14 and have their flanges extending inwardly. In forming the column a flange of the first ring 14 is secured to the end plate 1 and to the other flanges is brazed, welded or otherwise firmly secured a disk 16 of comparatively thin sheet metal, said disk being centrally cut out to receive the ring 14, and the outer marginal portion of the disk 16 is similarly secured within a flange of one of the rings 15. A second disk is secured to a flange of the second ring 14 and also to the other flange of the last mentioned ring 15. In this manner the column is built up and it will be noted that the disks 16 are arranged in pairs, the disks forming a pair being connected to the same ring 15 but to different rings 14. The result of this construction is that a central pipe is formed through the column consisting of a series of rings 14 all in alinement but spaced apart, around the central pipe portion thus formed there is also formed by the disks and the rings 15 a plurality of cylinders, said cylinders all opening into the central hollow portion, which for convenience I have referred to as a pipe, each of said cylinders being spaced from each other, a free circulation of air being permitted between each pair of disks and adjacent pairs. It will also be noted that in a construction of this kind the rings 14 and 15 are staggered with respect to each other.

When used as an engine the end plate 1 is fixed and the end plate 2 left free to slide along guide-rods 17. This end plate is connected to the crank portion of a crank shaft 18 by means of a connecting rod 19. In operation as a gas engine gas will be sucked through the port 4, will pass through the rings 14 into the spaces formed by the pairs of disks 16, and if said gas is exploded in the chamber 3 by means of any suitable igniting device it will exert its explosive powers within said cylinders, expanding the cylinders, especially along the central longitudi-

nal line of the column, and as a result of such expansion the length of the column will be increased thus driving the crank rod through one-half of a revolution. Upon the return stroke, due to momentum the products of combustion will escape through the port 5 the valve 9 being timed to open upon such return stroke. Upon the first half of the second revolution the column will again be expanded thus drawing in a new supply of gas, which supply will be compressed during the second half of the second stroke, the valve 9 remaining closed, ignition will then take place and the expanding gas will produce the first half of the third stroke, and a cycle as above described will continue.

In reference to the above description it will be noted from Fig. 1 that there are twenty-one rings 15 in the column shown, making forty-two disks. An expansion of one-eighth of an inch upon the part of each disk, or the spreading apart of the rings 14 so that the distance separating them normally will be increased by one-eighth of an inch will give a positive movement to the crank rod equal to the number of rings employed multiplied by the said increase. It will be readily seen therefore that a stroke of from four to six inches can be readily obtained with a very slight expansion upon the part of each cylinder forming the column. It will be further noted that the diameters of the cylinders are approximately about five times that of the rings 14, and the diameters of the cylinders are very much greater than their dimensions along the longitudinal line of the column the distance between the disks of a pair being very slight compared with the diameter. All of these disks therefore have practically their entire surface upon two faces exposed to the outside air, and the air cooling surface of an engine so constructed is very great.

In order to strengthen and brace the cylinders I may insert rings 20 within the flanges of the rings 15, said rings 20 spacing apart and bracing the outer marginal portions of the disks. The rings 20 however, are simply a preferred form of strengthening the cylinders and are not essential parts of the construction, and where an extremely light engine is desired, as for example in connection with aeroplanes these rings may be dispensed with and the rings 15 may be electrically welded to the disks.

I have described at length the construction and operation of the device when used as a part of a gas engine in order to more clearly bring out its construction. I do not desire, however to be limited to any particular use of the column, as it can be readily adapted for use in connection with steam by making the necessary changes in the valve construction, and if desired two of these columns may be connected in tandem one expanding as the other contracts.

A further and perhaps more universal use of the column is as a shock absorber, buffer or spring. When so used it is placed in any desired position, and either end may be the fixed end. Any suitable means would be provided for inflating the same with compressed air or other suitable fluid, as for example air could be forced through the pipe 6 under pressure, or any desired arrangement of check valves could be provided.

Manufactured of extremely thin disks and upon a much smaller scale than for the purpose above mentioned the device could be filled with some volatile gas, such as ether, and employed as a thermostat or regulating disk, such as are found in incubators, curing establishments and other places where a thermostatic alarm or regulator is desired.

What I claim is:—

1. A device of the kind described consisting of rigid end plates, flanged rings connected to said end plates, a series of similar rings arranged between the rings first mentioned, in alinement with them, and spaced from them, a plurality of disks arranged in pairs, said disks being centrally cut out and the disks of each pair being secured to different rings, and flanged rings to which the outer edges of said disks are secured, each pair of disks being connected to one of the last mentioned rings.

2. A column of the kind described consisting of a plurality of channel rings of a comparatively small diameter, said rings being in alinement with each other and spaced apart, of disks centrally cut out and arranged in pairs, said disks being mounted upon the said rings, the disks of each pair being secured to adjacent rings, respectively, and rigid channel rings of a much greater diameter than the rings first mentioned, the said second mentioned rings securing together disks of the same pair, as and for the purpose set forth.

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Witnesses:
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