K. STEINBECKER.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED NOV. 27, 1912.

1,086,793. Patented Feb. 10, 1914.

Fig. 1.

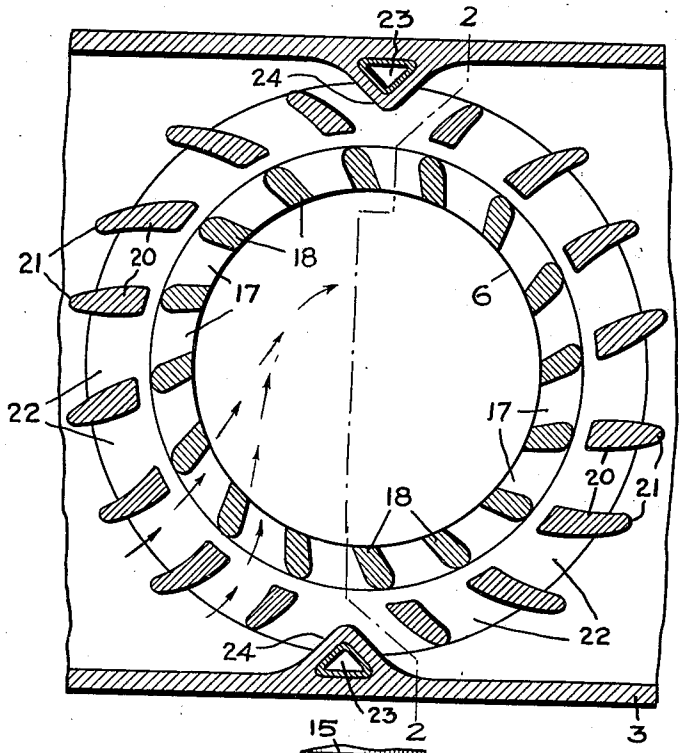
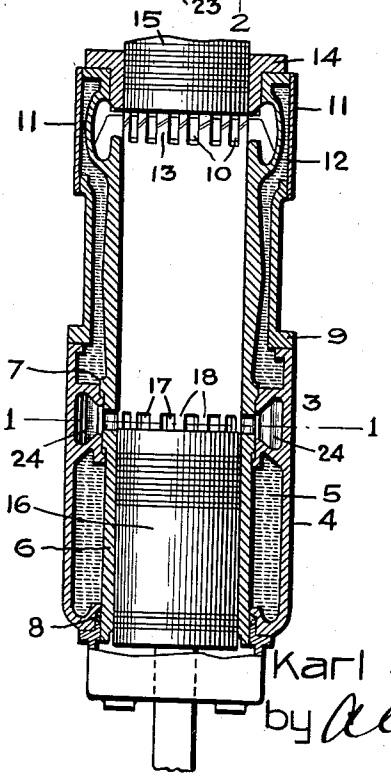


Fig. 2.



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UNITED STATES PATENT OFFICE.

KARL STEINBECKER, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

INTERNAL-COMBUSTION ENGINE.

1,086,793. Specification of Letters Patent. Patented Feb. 10, 1914.

Application filed November 27, 1912. Serial No. 733,794.

To all whom it may concern:

Be it known that I, KARL STEINBECKER, a subject of the King of Prussia, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

The present invention relates to internal combustion engines and has for its object to improve their construction, and particularly to improve the arrangement for introducing scavenging air into the cylinder.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and claims appended thereto.

In the accompanying drawing which is illustrative of my invention, Figure 1 is a cross section of a vertical cylinder engine, said section being taken on line 1—1 of Fig. 2, and Fig. 2 is an axial section of an engine taken on line 2—2 of Fig. 1.

3 indicates a receiver of rectangular form to which scavenging air is admitted from a suitable source, such as an air compressor for example. Formed integral with the top and bottom walls of the receiver or attached thereto are annular walls 4 that form the outer portions of the water chamber 5 of the cylinder. The top and bottom walls of the receiver are bored to receive all the cylinders 6 of the engine, said cylinders being provided with peripheral shoulders 7 that are seated on shoulders formed in the walls of the receiver.

The lower part of the water jacket is formed in one piece with the receiver and terminates in a flange through which the cylinder extends, a packing 8 being provided to maintain a water tight joint. The upper part of the water jacket is made separate from the lower and is preferably formed integral with the cylinder, there being a flange 9 that rests on the top of a flange formed on the rising wall 4, said parts being bolted together. This arrangement facilitates the casting operation as the core material forming the cooling chamber can readily be removed.

To decrease the distance across the water jacket at the upper end so as to decrease the length of the crank shaft and the cross-head connected to the upper piston, (the engine being of the opposed piston type with side connecting rods) the cast metal surrounding the exhaust ports 10 is cut away and thin flat pieces of metal 11 fastened thereto with water tight joints. It will be evident that if the outer wall of the jacket followed the contour of the wall 12 of the exhaust conduit and was separated by the same distance as the main portion of the jacket the diameter, taken in a horizontal plane passing through the centers of the exhaust ports, would be much greater. Inasmuch as the wall 12 forms a portion of a sphere it follows that while there is a slight restriction at the point of maximum diameter there is plenty of space for the water to circulate elsewhere.

The upper end of the cylinder proper is provided with saw-tooth projections 13 that register with similar projections formed on a removable flanged sleeve 14, the latter in effect forming a continuation of the cylinder and serving as a guide for the upper piston. Between the projections are exhaust ports which are controlled by the upper piston. The advantage of this construction resides in the fact that the ports can be more accurately and easily machined. Inside of the cylinder is an upper piston 15 and a lower piston 16, said pistons being connected to the main shaft by suitable connecting rods.

Referring now to Fig. 1 which is on an enlarged scale, 6 indicates a cylinder having scavenging ports 17 which are formed between bridge pieces 18 that unite the upper and lower parts of the cylinder. The shape and arrangement of these bridge pieces is important because they determine the shape of the scavenging ports and on the latter depends to a very large extent the effectiveness of the scavenging operation. The bridge pieces are similar in form with well rounded outer ends and each occupies the same angular position with respect to a radius passing through the center of the cylinder. The ports thus formed are slightly narrower at their discharge ends than at their receiving ends thereby increasing the

velocity of the air flowing through them. Owing to the tangential arrangement of the ports a whirling motion is given to the air, and as the air continues to flow into the cylinder it forms in effect an air piston of substantially the same diameter as the cylinder which drives before it the burned gases due to the preceding combustion stroke of the engine. This combined whirling and piston effect of the air thoroughly washes out the cylinder and prevents the pocketing of burned gases thereby increasing the efficiency of the engine.

At some time during the engine cycle, and usually during the working portion, air under pressure is being delivered to the receiver 3 from an air compressor driven by the engine or from a separate source of power, as desired. Now this air when the scavenging ports are uncovered by the piston tends to rush into the ports from all directions and as some of the ports are in a more favorable position to receive air than others there would be a tendency to irregular action, some of the ports getting more air and in a better direction than the others. To overcome this I provide directing vanes 20 which surround the bridge pieces 18. Since these vanes are carried by the receiver and occupy a larger circle where more space is available, they can be properly designed and arranged to direct the air currents into the ports. Since most of the air will come from the right and left hand sides of the receiver the outer ends of the vanes extend toward the incoming air and are curved to discharge it into the receiving ends of the scavenging ports. These vanes are provided with well rounded ends 21 to avoid eddy losses as far as possible. The passages 22 between the vanes are made slightly converging to somewhat increase the velocity of the air. The vanes should also be wide enough in the direction of flow to impart the proper direction to the air currents.

It is desirable in an engine of this class to tie the top and bottom walls of the receiver together for strength. I therefore utilize the vanes 20 for this purpose making them as integral part of the casting. In this manner the vanes serve two functions, *i. e.*, directing devices for the air and struts or braces for the receiver.

The water jacket of the cylinder is in effect divided into two parts, one located above, and the other below the receiver. These are connected by the triangular passages 23, and I utilize the outer walls 24 thereof to assist in directing the air currents into the scavenging ports.

It will be seen from the foregoing that my improved arrangement permits of the use of a relatively narrow receiver without loss in the scavenging operation. Reducing the size of the receiver has the effect of reducing the weight and means a smaller engine and one of reduced cost.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In an internal combustion engine, the combination of a cylinder, tangentially arranged scavenging ports therein, said ports converging from their outer to their inner ends whereby energy of pressure is converted into energy of velocity, a receiver, and vanes located in said receiver which receive air therefrom and direct it into the receiving ends of said ports.

2. In an internal combustion engine, the combination of a cylinder, tangentially arranged scavenging ports therein, a receiver, and vanes located in the receiver which receive air therefrom and direct it into the receiving ends of said ports.

3. In an internal combustion engine, the combination of a cylinder, tangentially arranged scavenging ports formed therein which converge toward the cylinder and act to impart velocity to the air and discharge it with a whirling motion into the cylinder, a receiver, and vanes located in the receiver which receive air currents from different portions thereof, impart direction thereto and deliver it to said scavenging ports.

4. In an internal combustion engine, the combination of a cylinder, an annular row of tangentially arranged scavenging ports, a receiver through which the cylinder extends and is supported thereby, and an annular row of vanes which receive air from the receiver, impart velocity and direction to it and discharge the same to the scavenging ports, said vanes also serving as means to unite the opposed walls of the receiver.

5. In an internal combustion engine, the combination of a receiver having annular walls that rise above and extend below it, and a cylinder whose lower end extends through the receiver and engages the end of the annular wall below the receiver, said cylinder having a surrounding wall formed integral therewith and forming a water jacket with the cylinder, the lower end of said surrounding wall resting on the wall rising from the receiver.

6. In an internal combustion engine, the combination of a cylinder, tangentially arranged scavenging ports therein, said ports all sloping around the cylinder in the same

direction, a receiver for supplying scavenging air to opposite sides of the cylinder, and directing vanes in the receiver on such opposite sides, which vanes are arranged at such angles to each other as to direct the scavenging air into said tangentially arranged scavenging ports.

In witness whereof, I have hereunto set my hand this first day of November, 1912.

KARL STEINBECKER.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.