

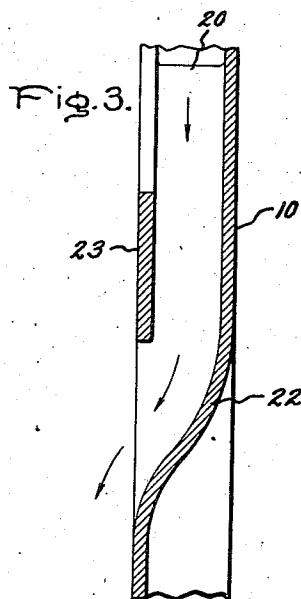
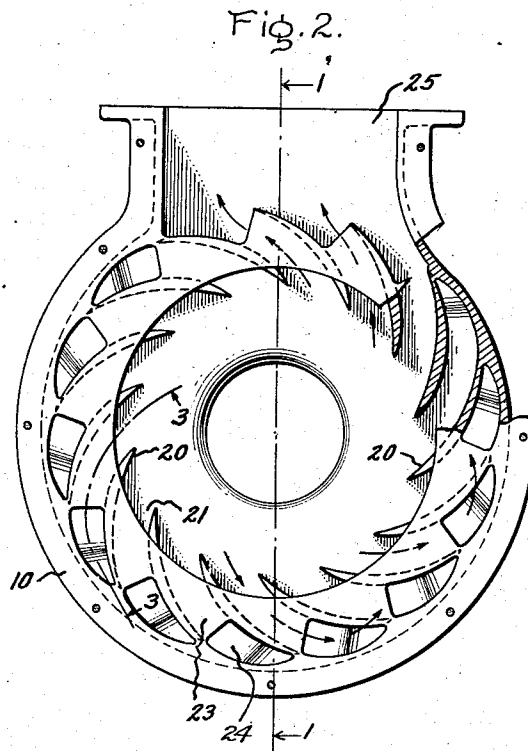
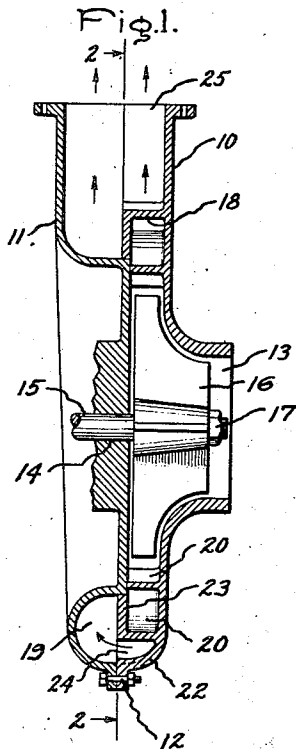
July 7, 1942.

C. H. AUGER ET AL
CENTRIFUGAL COMPRESSOR

2,289,231

Filed Jan. 18, 1940

2 Sheets-Sheet 1



Inventors:
Claude H. Auger,
Wayne H. Allen,
by *Harry C. Dunham*
Their Attorney.

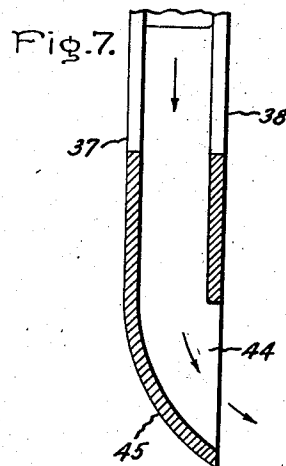
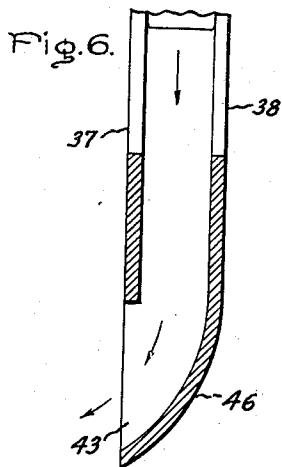
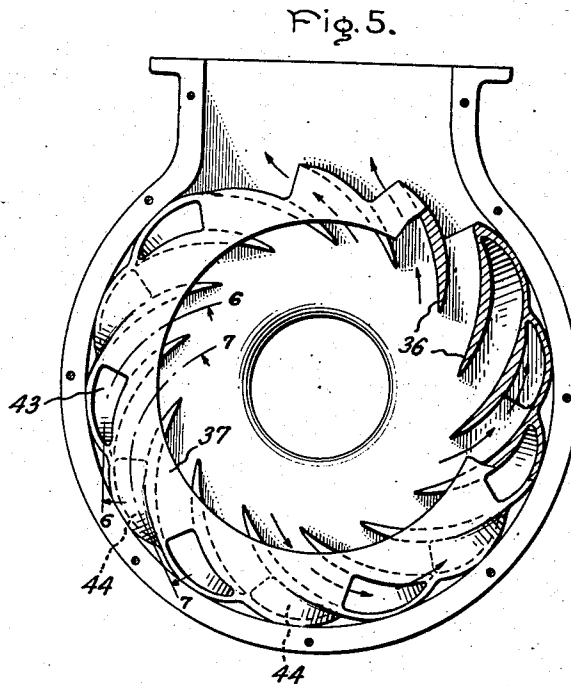
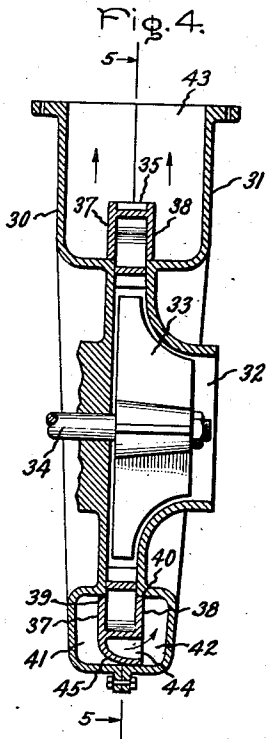
July 7, 1942.

C. H. AUGER ET AL
CENTRIFUGAL COMPRESSOR

2,289,231

Filed Jan. 18, 1940

2 Sheets-Sheet 2



Inventors:
Claude H. Auger,
Wayne H. Allen,
by *Harry E. Smith*
Their Attorney.

UNITED STATES PATENT OFFICE

2,289,231

CENTRIFUGAL COMPRESSOR

Claude H. Auger, Saugus, and Wayne H. Allen,
Lynn, Mass., assignors to General Electric Com-
pany, a corporation of New York

Application January 18, 1940, Serial No. 314,466

7 Claims. (Cl. 230—127)

The present invention relates to centrifugal compressors or blowers such as are used for supercharging internal combustion engines. Such compressors comprise an impeller disposed in an impeller chamber for impelling a compressible medium such as air and forcing it into a collector passage or discharge scroll. Ordinarily a diffuser is interposed between the impeller chamber and the collector passage for converting velocity energy of the medium impelled by the impeller into pressure energy. In many cases, especially where such superchargers are used in connection with aircraft, it is desirable to keep their radial dimensions at a minimum.

The object of our invention is to provide an improved construction and arrangement of centrifugal compressors whereby the radial dimension thereof may be considerably reduced.

Heretofore it has been customary to provide a collector passage surrounding the diffuser and extending in radial direction considerably beyond the diffuser. According to our invention the collector passage is arranged laterally adjacent the diffuser. In one embodiment the discharge scroll is entirely on one side of the diffuser while the diffuser vanes extend radially to the outer periphery of the casing. In order to effect smooth discharge from such diffuser into the collector passage, the outer portion of one diffuser side wall has openings adjacent the collector passage and the other side wall of the diffuser is smoothly curved towards the collector passage.

For a better understanding of what we believe to be novel and our invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawings.

In the drawings, Fig. 1 illustrates a sectional view of a centrifugal compressor in accordance with our invention; Fig. 2 is a view partly broken away, along line 2—2 of Fig. 1; the right-hand part of Fig. 1 is a section along line 1—1 of Fig. 2; Fig. 3 is an enlarged sectional view along the curved line 3—3 of Fig. 2; Fig. 4 illustrates a sectional view of a modification of a compressor embodying our invention; Fig. 5 is a view, partly broken away, along line 5—5 of Fig. 4; Fig. 6 is an enlarged sectional view along the curved line 6—6 of Fig. 5; and Fig. 7 is an enlarged sectional view along the curved line 7—7 of Fig. 5.

The arrangement comprises a casing having two halves 10 and 11 flanged together by bolts 12. The casing half 10 forms an inlet opening 13

for air or other medium to be compressed. The casing half 11 forms a bearing 14 for an impeller shaft 15, which latter has an overhung portion carrying an impeller 16 located in an impeller chamber formed by the casing and secured to the shaft by means including a nut 17. The shaft 15 with the impeller 16 is driven by a suitable power agency, not shown. During operation the compressible medium is drawn into the inlet 13 and forced outward by the impeller at considerable velocity. The velocity energy of the medium thus impelled is partly converted into pressure energy by a diffuser 18 concentrically surrounding the impeller 16 and in the present instance integrally formed with the casing half 10. The compressed medium is discharged from the diffuser into a collector passage or scroll 19 which in the present instance is formed by the casing half 11 and arranged substantially entirely laterally adjacent the diffuser.

The diffuser has a plurality of vanes 20 forming diffuser passages 21 between them. One side wall of the diffuser facing away from the collector passage is formed by the casing half 10 and has an outer portion 22 curved towards the collector passage 19 to effect smooth discharge of compressed medium. Another side wall 23 of the diffuser adjacent the collector passage 19 has an outer portion with openings 24 through which compressed medium is discharged from the diffuser passages into the collector passage 19. The side wall 23 is seated on a shoulder formed by the casing half 11. From another viewpoint, it will be noted that the collector passage is defined between an outer portion of the casing half 11 and the side wall 23 of the diffuser, and the outer diameter of the collector passage is about equal to the outer diameter of the diffuser. Portions of the two casing halves 10 and 11 form a flanged opening 25. The portion of the side wall 23 beyond the outer tips of the diffuser vanes 20 is completely removed within the flanged opening 25 so that the side wall in this opening assumes a saw-tooth shape similar to the arrangement described in the Patent No. 2,042,550 to S. R. Puffer and assigned to the same assignee as the present application.

In the arrangement shown in Figs. 1 to 3 the discharge scroll is located substantially entirely on one side of the diffuser. In the modification shown in Figs. 4 to 7 the discharge scroll is located laterally adjacent both sides of the diffuser. The compressor of Figs. 4 to 7 comprises a casing having two flanged halves 30 to 31 bolted

together. The casing half 31 forms an inlet 32 to an impeller chamber formed by the casing and containing an impeller 33 secured to a shaft 34, the latter being supported by a bearing on the casing half 30.

Compressed medium forced outward by the action of the impeller 33 is passed through a diffuser 35 which surrounds the impeller and extends radially outward to the inner surface of the casing. The diffuser has a plurality of circumferentially spaced vanes 36 secured to, in the present instance integrally formed with, side walls 37 and 38. The side walls are seated on shoulders 39, 40 formed by the casing. The vanes project outwardly into proximity of the outer ends of the side walls and inwardly beyond the inner ends of the side walls, that is, beyond the shoulders 39, 40. These inner ends are engaged side-wise by the inner surfaces of the casing halves 30, 31.

Compressed medium passed through the diffuser is discharged into a discharge scroll formed by the casing. More specifically, the discharge scroll includes two channels or passages, a channel 41 defined between the side wall 37 and an outer portion of the casing half 30 and a passage or channel 42 formed between the side wall 38 and an outer portion of the casing half 31. The two channels or discharge passages 41, 42 merge into a flanged outlet 43 formed by the casing. Here, as in the arrangement described above in connection with Figs. 1 and 3, the outer diameter of the discharge passages 41, 42 is about equal to the outer diameter of the diffuser. The diffuser discharges into the channels 41, 42 through two sets of sidewall openings 43 and 44, connecting alternate diffuser passages with the channels 41 and 42 respectively, that is, alternate passages formed by the diffuser vanes are connected by openings 44 in the side wall 38 with the channel 42 and the other passages formed between the vanes are connected by openings 43 in the side wall 37 with the channel 41. Hence, the diffuser passages formed on opposite sides of each vane discharge through openings in the opposite side walls 37, 38 into the channels 41, 42 respectively. The side wall 37 has outer portions 45 opposite to and curved towards the openings 44 in the side wall 38 to effect smooth lateral discharge from the diffuser into the channel 42. Likewise, the side wall 38 has outer portions 46 opposite to and curved towards the openings 43 in the side wall 37 to effect smooth discharge of compressed medium from the diffuser into the channel 41.

Having described the method of operation of our invention, together with the apparatus which we now consider to represent the best embodiment thereof, we desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

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

1. Centrifugal supercharger comprising a casing forming an impeller chamber, an impeller disposed in the chamber, a diffuser surrounding the impeller and having side walls with a plurality of vanes between them, outer portions of one side wall forming openings and outer portions of the other side wall being curved towards said openings, and a collector passage for receiving compressed medium from the diffuser through said openings, said entire passage being arranged laterally adjacent the diffuser and having outer

radial dimensions substantially equal to those of the diffuser.

2. Centrifugal supercharger comprising two casing halves flanged together, a diffuser having side walls and being secured to an outer portion of one casing half, and a collector passage laterally adjacent the diffuser and formed by the side wall of the diffuser and a casing half, the outer dimension of the diffuser and the collector passage being substantially equal and the outer portion of one side wall forming openings for conducting compressed fluid from the diffuser to the collector passage and outer portions of the other side wall being curved towards said openings to effect smooth discharge of fluid.

3. Centrifugal compressor comprising a casing forming an impeller chamber, a diffuser with a row of vanes concentrically surrounding the impeller chamber and partly formed by the casing, a collector passage formed partly by the casing and the diffuser and located laterally adjacent the diffuser, the diffuser having a side wall adjacent the collector passage with openings in the outer portion only of the wall through which compressed medium is discharged from the diffuser into the collector passage and another side wall facing away from the collector passage with an outer portion curved towards the passage in the direction of fluid flow to effect smooth discharge of compressed medium, said diffuser vanes extending radially to the inner surface of the curved side wall portion.

4. Centrifugal compressor comprising a casing forming an impeller chamber, an impeller disposed in the chamber, a diffuser surrounding the impeller and having side walls and a plurality of circumferentially spaced vanes extending to the outer wall of the casing, and a scroll for receiving compressed medium from the diffuser, said scroll being formed by two channels on opposite sides of the diffuser and having outer radial dimensions substantially equal to those of the diffuser, and means for smoothly conducting fluid from the passages into the scroll comprising axially curved walls forming continuations of the side walls and enclosing outer portions of the passages and openings formed in the outer portion only of a side wall of each passage.

5. Centrifugal compressor comprising a casing forming an impeller chamber, an impeller disposed in the chamber, a diffuser surrounding the impeller and having side walls supported on the casing and a plurality of vanes formed on the side walls and defining diffuser passages therewith, outer portions of each side wall having openings and a discharge scroll for receiving compressed medium from the compressor comprising two channels, a first channel formed between one side wall and one casing half, a second channel between the other side wall and the other casing half, said channels communicating through the openings in the side walls with different diffuser passages, and an outer wall forming continuations of the side walls and substantially closing the outer ends of the diffuser passages and having axially curved portions smoothly to direct fluid through the openings into the channels.

6. A diffuser for centrifugal type compressors comprising a plurality of circumferentially spaced vanes, and side walls secured to opposite ends of the vanes and definitely secured to opposite ends of the vanes and defining diffuser passages therewith, outer portions of one side wall having openings for discharging compressed medium from

alternate diffuser passages, the other side wall having an outer portion with openings for discharging compressed medium from the other passages, and each side wall having outer portions substantially closing the ends of alternate passages and curved towards the openings in the other side wall to effect smooth lateral discharge from said alternate diffuser passages.

7. Centrifugal compressor comprising a casing forming an impeller chamber, an impeller disposed in the chamber, a diffuser concentrically spaced with the impeller and comprising a plurality of circumferentially spaced vanes and side walls secured to opposite ends of the vanes and defining diffuser passages therewith, outer portions of one side wall having openings for discharging compressed medium from alternate dif-

5 fuser passages only, the other side wall having an outer portion with openings for discharging compressed medium from the other passages only, each side wall having outer portions curved towards the openings in the other side wall to effect smooth lateral discharge from the diffuser passages, and a discharge scroll for receiving compressed medium discharged from said openings comprising two channels, a first channel formed between one side wall and an outer portion of the casing and a second channel formed between the other side wall and another outer portion of the casing, the outer dimensions of the discharge being about equal to those of the outer dimensions of the diffuser.

15
CLAUDE H. AUGER.
WAYNE H. ALLEN.