Sept. 15, 1931. F. C. GEILER 1,823,858

COMPRESSOR CONDENSER UNIT

Filed July 18, 1927 2 Sheets-Sheet 1

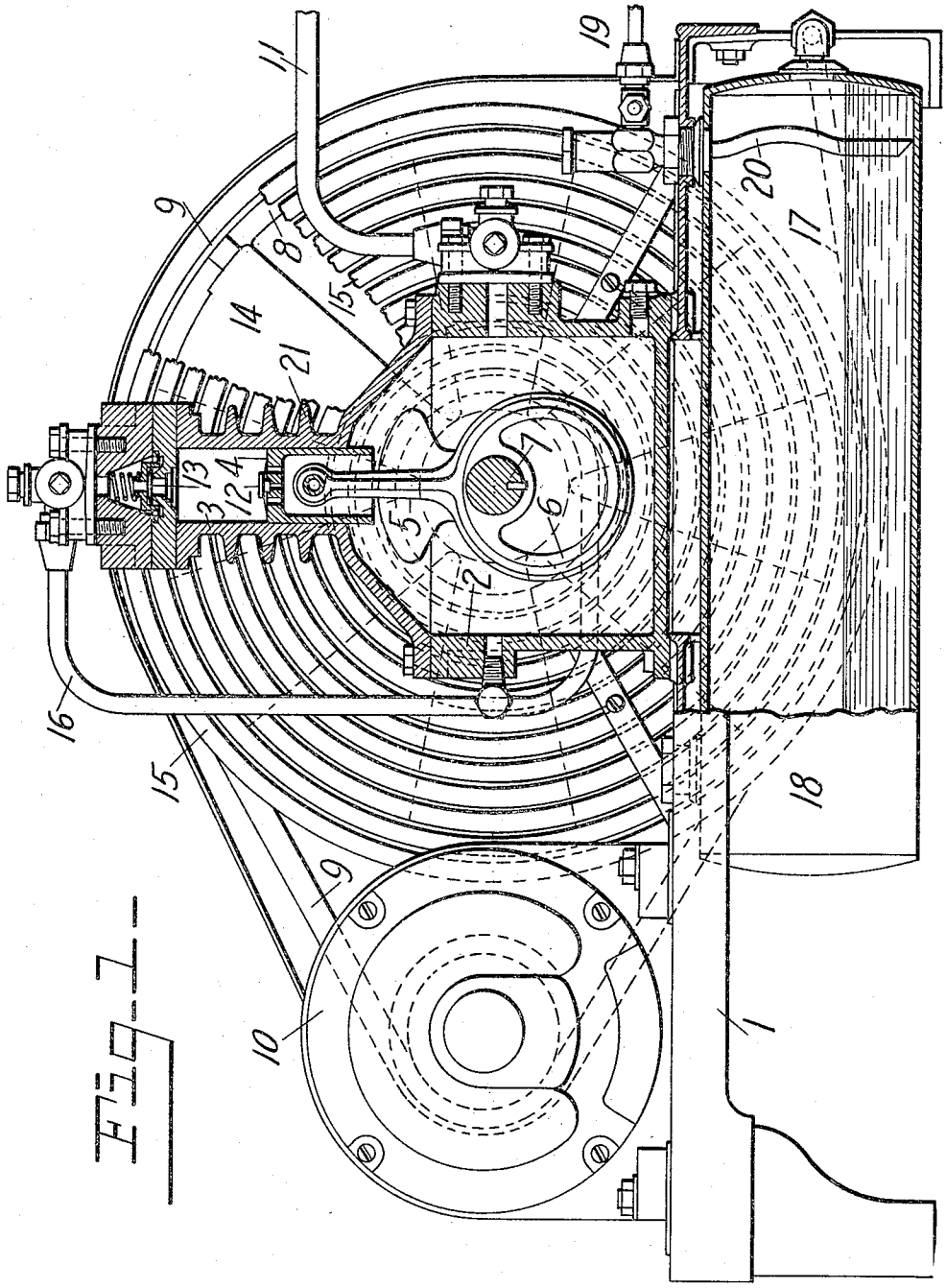


Fig. 1

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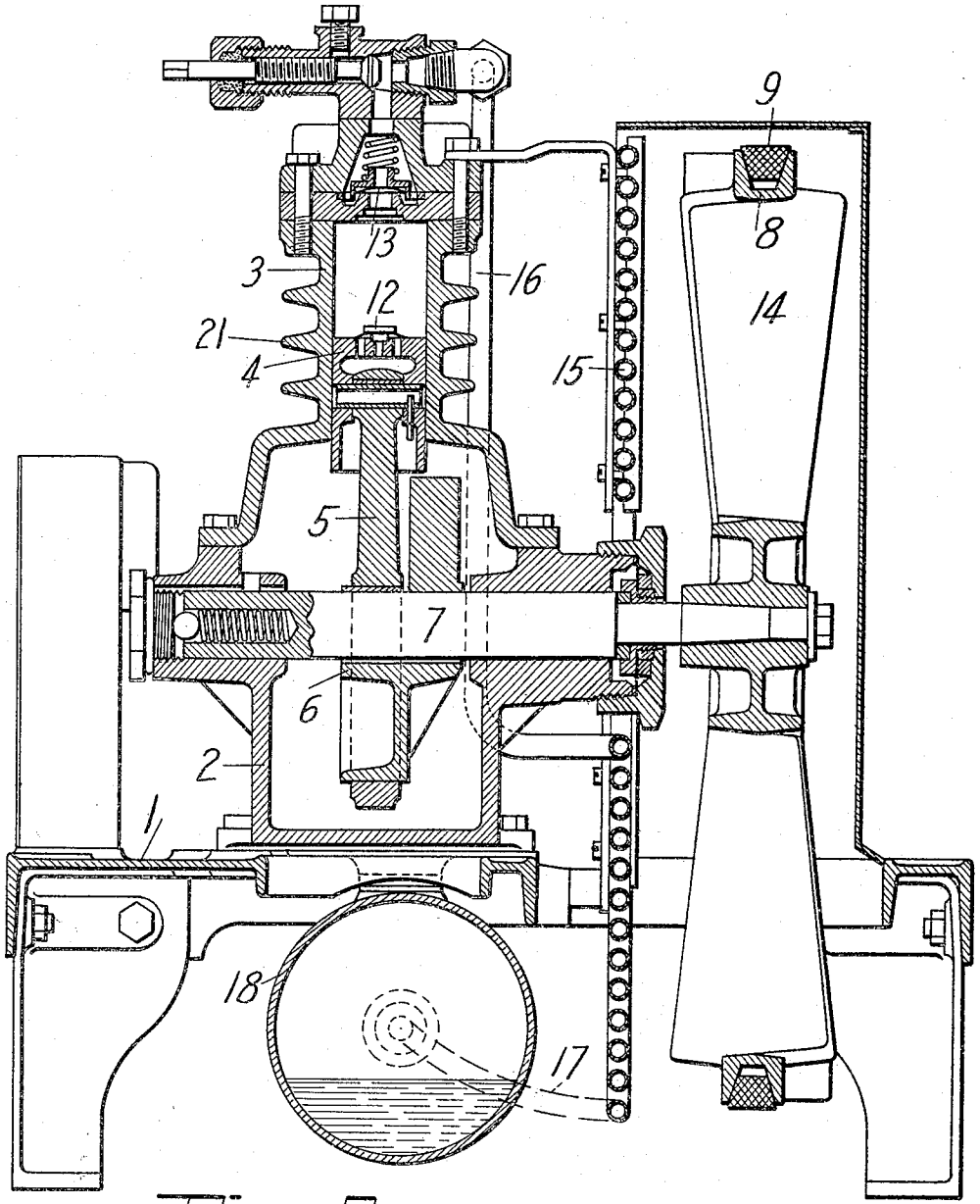


Fig. 2.

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Patented Sept. 15, 1931 1,823,858

UNITED STATES PATENT OFFICE

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COMPRESSOR-CONDENSER UNIT

Application filed July 18, 1927. Serial No. 206,534.

My invention relates to an air cooled condenser for gaseous fluid, and more particularly to a construction wherein the successive convolutions of the condenser coil are uniformly subjected to the cooling air current.

The condenser structure herein described is especially adaptable to refrigeration apparatus for domestic use, wherein it forms a part of a self-contained compressor-condenser unit for condensation of the compressed refrigerant.

In the usual cycle of operation of a refrigeration apparatus the expanded gas drawn from an expansion coil or cooling unit of the refrigeration system is passed through a compressor by which the refrigerant is placed under sufficient pressure to return it to liquid form. In order to dissipate the heat the compressed gas is circulated through a condenser, the usual form of which is a succession of coils of copper tubing, or the like, subjected to external cooling influence of water, air or other medium. It has been more or less the common practice to mount such a condenser unit in close proximity to the compressor and to simultaneously subject the condenser coils and the compressor cylinder to the cooling influence of an air current induced by fan blades carried by the fly wheel of the compressor. Such condenser units have ordinarily been of vertical helical formation, sometimes of rectangular or oval formation, but including nevertheless, a continuously descending circuitous conduit, different portions of which are spaced various distances from the fan and hence the condenser coils are not uniformly subjected to the cooling influence of the air currents.

To overcome the un-uniformity of the cooling action and to utilize the affinity of the compressed gas for moisture, the condenser coil has, in the present instance, been embodied in a spiral, or evolute formation, wherein the successive turns lie in a common plane, parallel with and also concentric with the air circulating fan. Therefore all portions of the condenser coils are uniformly subjected to the influence of the cooling air current. The uncompressed gases under pressure have a great affinity for moisture. It has been found that the compressed gas condenses much more rapidly in the presence of a body of liquid condensation and in coils, the interior surfaces of which are maintained in a moistened or wet state than when such coils are dry throughout. This "pancake" form of coil has the advantage of presenting every portion of the condenser conduit in unobstructed uniform relation with the fan. While obviously the present spiral or evolute condenser coil may be arranged in a horizontal plane, it is preferably arranged in a vertical plane so that each turn or convolution of the coil will form a trap to temporarily retain a small quantity of liquid condensation. Such small quantities of the condensation collected in the lower portions of the succeeding turns of the condenser coils are carried forward from coil to coil by the pressure of succeeding charges of gas admited to the condenser from the compressor. However, the circulation of such liquid portions of the refrigerant keep the interior of the coils moist and hence in condition to attract the further condensation of compressed gases passing through the coil. Moreover, the compressed gas prior to such condensation is caused to bubble through such collected bodies of liquid in the turns of the condenser coil further facilitating its condensation by the inherent affinity of the liquid and gaseous portions.

The object of the invention is to simplify the means and mode of operation of condenser units for gaseous fluids whereby they will not only be cheapened in construction, but will be more efficient in use and effect more rapid condensation of the gaseous product circulated therethrough and unlikely to get out of repair.

A further object of the invention is to provide a condenser unit wherein the succeeding turns or convolutions are uniformly subjected to the influence of the cooling medium.

A further object of the invention is to provide a condenser unit wherein may be

utilized to best advantage the inherent affinity of a gaseous and liquid portions of the fluid.

A further object of the invention is to provide a compressor-condenser unit suitable for domestic refrigeration purposes wherein the condenser coil is interposed intermediate the air circulation fan and the compressor cylinder.

A further object of the invention is to provide an improved compressor-condenser unit wherein the action of the cooling fan will be equalized.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the accompanying drawings is shown the preferred, but obviously not necessarily the only form of embodiment of the invention, Fig. 1 is a side elevation of the compressor-condenser unit, the compressor being shown in vertical section and the condenser coil being broken away to show the relative position of the circulating fan. Fig. 2 is a vertical transverse sectional view of the assembled compressor-condenser unit.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the accompanying drawings, 1 is a bench or table upon which are mounted the compressor-condenser unit forming the subject matter hereof and the actuating motor. In the present instance the compressor is shown as comprising a crank case or housing 2 above which is supported in vertical position the compression cylinder 3. Within the cylinder 3 operates a reciprocatory piston 4 connected by a piston rod or pitman 5 with an eccentric 6 upon the compressor shaft 7. The compressor shaft 7 extends laterally beyond the crank case or housing 2 and carries a combined pulley and fly wheel 8 connected by a driving belt 9 with an electric motor 10. This motor 10 is supported upon the table or bench 1 and serves to operate the compressor to draw expanded gas from the expansion coil or cooling unit of the refrigeration system through the intake or return conduit 11 which discharges into the crank case or housing 2. Upon the down stroke of the piston 4 this gas is admitted through valved ports 12 in the piston head into the interior of the cylinder 3. Upon the return or upstroke of the piston 4 such charge of gas is compressed within the cylinder 3 and delivered thence through the outlet valve 13. The particular construction of the compressor per se forms no part of the present invention, and, as at present advised, will be described and claimed in a companion application.

The pulley and fly wheel 8 embodies, instead of spokes, a series of fan blades 14. These fan blades are preferably so contoured or possess such varying pitch that the discharge of air is substantially uniform from the central portion to the rim of the fan wheel. The fan blades 14 discharge air toward the compressor.

Located intermediate the fan wheel 8 and the compressor unit, the condenser 15 comprising a continuous conduit of heat conductive material such as copper, or the like, wound in spiral or evolute formation with its successive turns or convolutions arranged in a substantially vertical plane and spaced equidistant from the plane of the fan wheel 8. A discharge or high pressure conduit 16 leads from the head of the compressor cylinder 3 to the central or innermost turn of the evolute condenser unit. The gas under pressure entering the condenser unit adjacent to its center is carried progressively through the succeeding coils or turns, each of increasing diameter and is finally discharged from the outermost or peripheral turn of the condenser unit through the extension conduit 17 into a reservoir or receiver tank 18 located beneath the bench or table 1. From this reservoir or receiver 18 the liquid refrigerant is carried back to the expansion coil or cooling unit of the system through the conduit 19 which communicates with the bottom of the reservoir 18 through the down pipe 20. As the gas under pressure liquefies within the coil or condenser 15 such liquid portions tend to collect at the bottoms of the succeeding turns or convolutions. Such collected bodies of liquefied refrigerant are carried upwardly and around through the succeeding turns by the force of the successive charges of compressed gas discharged from the compressor cylinder 3. The flow of liquefied refrigerant through the succeeding turns of the coils keeps the interior walls of the coils moist and facilitates further condensation of the compressed gas due to the inherent affinity of the gaseous and liquid portions.

Being arranged in a plane parallel with that of the fan wheel the turns or convolutions of the condenser coil are thus equally exposed to the circulation of air. Not only are the different coils subjected to like cooling influence but such influence is equalized throughout the entire circle of each coil. However, inasmuch as each succeeding turn of the coil is of greater length than the preceding turn or convolution, the refrigerant is subjected to the cooling influence through longer periods of time while traversing successive turns. The air passing between and beyond the convolutions of the condenser

coil circulates about the compressor, the cylinder 3 of which is provided with external fins 21 for the radiation of heat.

From the above description it will be apparent that there is thus provided a construction of the character described, which possesses the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportion and detail construction without departing from the principle involved nor sacrificing any of its advantages.

While the invention is described in language more or less specific as to structural details it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein shown comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A unitary structure including a compressor pump, a supporting stand for the pump, a receiver tank located beneath the supporting stand, a drive shaft for said pump, a fan wheel mounted on said drive shaft, and a condenser coil of evolute form stationarily arranged in a vertical plane intermediate the fan wheel and the compressor pump and substantially concentric with the drive shaft, the inner end of the evolute condenser coil being connected with the compressor and the outer end thereof being connected with the receiver.

2. A unitary structure comprising in combination a compressor pump, a drive shaft therefor, a fan wheel mounted upon the drive shaft and discharging toward the compressor pump, a peripheral belt engaging surface on the fan wheel for engagement of a drive belt actuating the compressor and a stationary condenser coil of evolute formation, the evolutions of which are disposed in a vertical plane intermediate the fan wheel and the compressor pump, the inner end of which is connected with the discharge outlet of the compressor, and a receiver with which the outer end of such coil communicates.

In testimony whereof, I have hereunto set my hand this 10th day of July A. D. 1927.

FREDERICK CARL GEILER.