W. SCHENKER.

SCAVENGING PUMP CONSTRUCTION.

APPLICATION FILED FEB. 6, 1912.

1,048,593.

Patented Dec. 31, 1912.

2 SHEETS—SHEET 1.

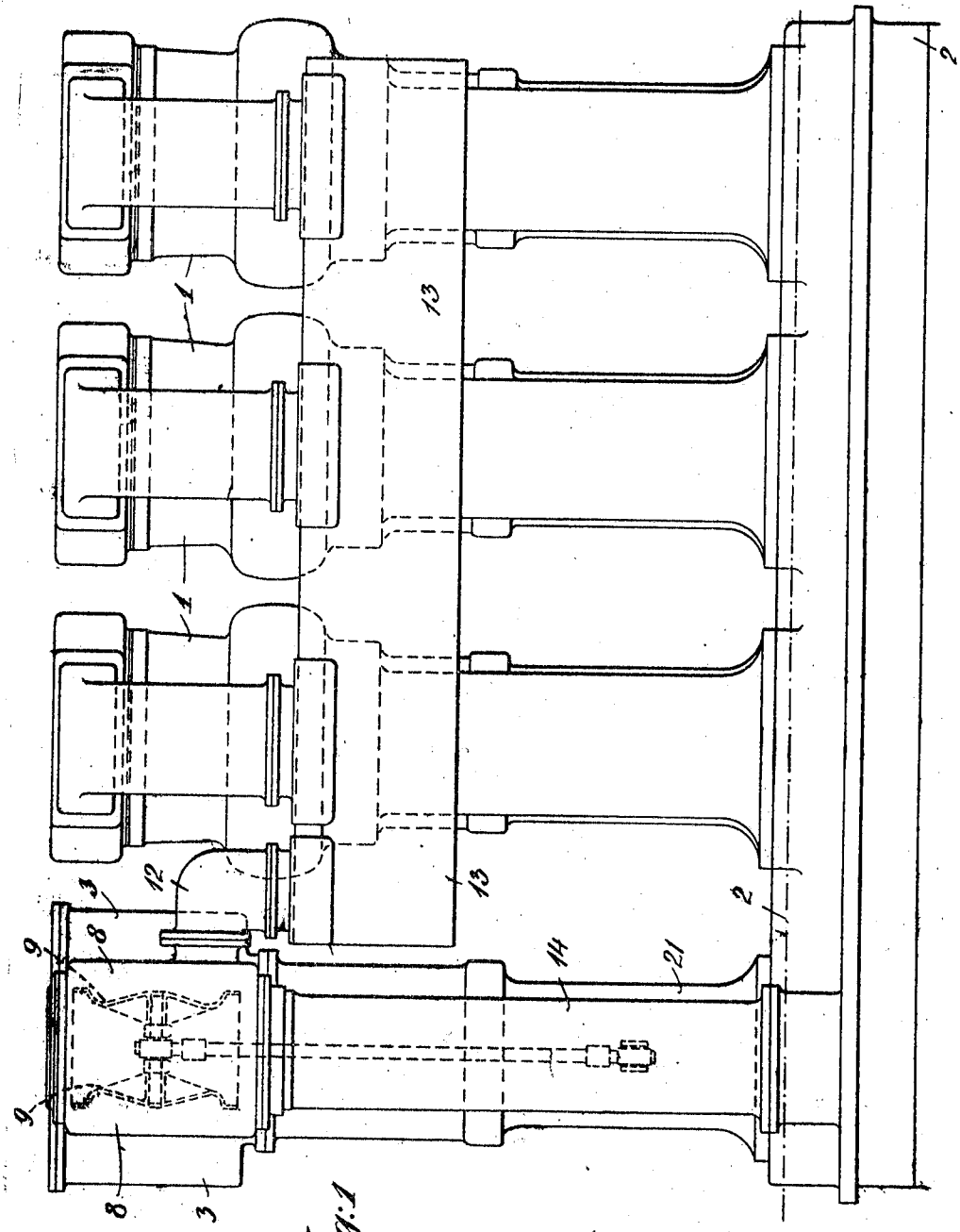

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

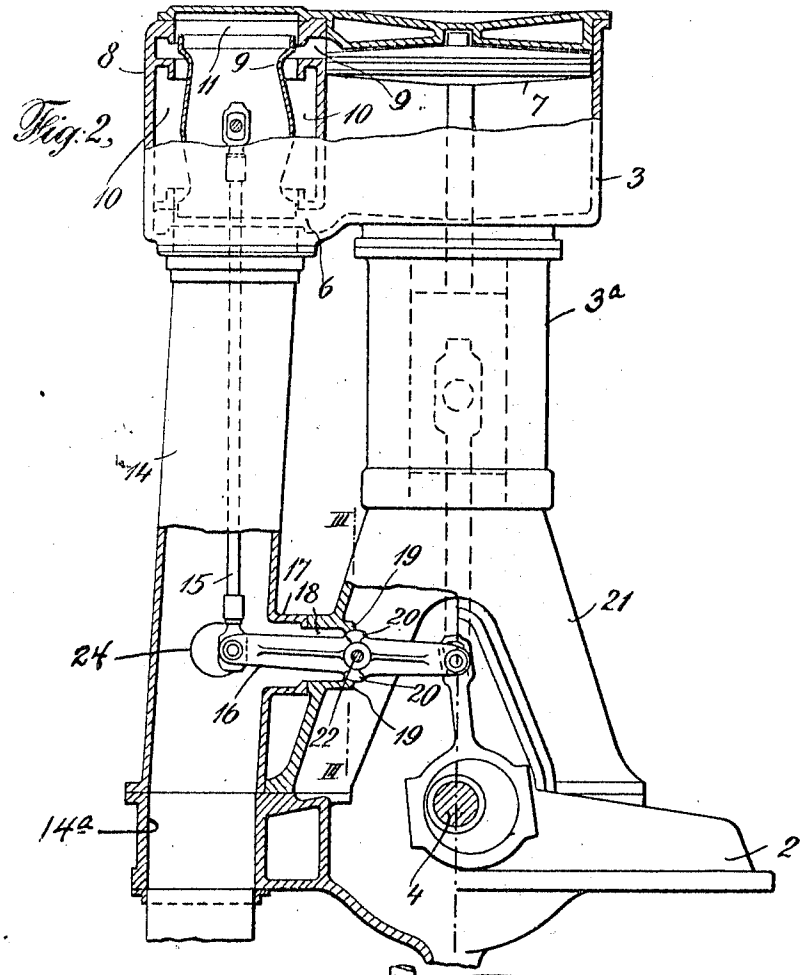
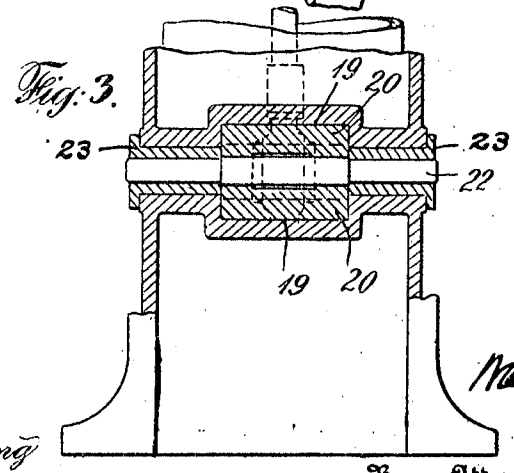


Fig. 3.



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UNITED STATES PATENT OFFICE.

WALTER SCHENKER, OF WINTERTHUR, SWITZERLAND, ASSIGNOR TO BUSCH-SULZER BROS.-DIESEL ENGINE COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

SCAVENGING-PUMP CONSTRUCTION.

1,048,593. Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed February 8, 1912. Serial No. 676,451.

To all whom it may concern:

Be it known that I, WALTER SCHENKER, a citizen of the Republic of Switzerland, residing at Winterthur, Switzerland, have invented the following-described new and useful Improvements in Scavenging-Pump Construction.

The invention is an improved and simplified means of valve operation in the scavenging pumps of combustion engines, or of other pumping apparatus, and consists in the relative arrangement and disposition of the several parts as hereinafter described and as exemplified in the drawings, whereby greater compactness and durability, as well as an improved appearance, are obtained.

In the drawings, Figure 1 represents in side elevation a three-cylinder two-cycle combustion engine provided with a scavenging pump equipped with this invention. Fig. 2 is an end elevation of such pump, with parts broken out to show the interior arrangement; and Fig. 3 is a section, substantially on the line III—III of Fig. 2, indicating the nature of the leak-tight closure, through which motion is imparted to the valve mechanism of the pump.

The three combustion cylinders, marked 1, are mounted on the common bed-plate 2, in line with each other and with their scavenging pump 3, which is mounted at one end of the same bed-plate and driven by a suitable crank connection with the engine crank-shaft 4, which latter shaft thus forms the pumping shaft of the pump. The several combustion cylinders are herein shown without any of the usual engine accessories, it being understood that they may be constructed according to any suitable principle of operation, for instance, they may be two-cycle engines of the Diesel type. The scavenging pump may also be built according to any suitable design and may consist of one or several cylinders arranged to compress scavenging air or other fluid in one or more stages as desired. As herein indicated and preferred for engines of the type referred to, the large pumping cylinder 3 is mounted on top of a smaller cylinder 3^a, which latter may form the pumping mechanism for compressing the air for fuel injection purposes. The plungers of both cylinders are intended to be operated by a single connecting rod and suitable crank connections, not indicated, with the engine shaft. The scavenger pump cylinder 3, is preferably double-acting, with ports 5 and 6 on both sides of its pumping plunger 7, communicating with a valve chest 8, which forms a part of the valve mechanism of that pump. Such valve mechanism includes also a hollow piston or slide-valve 9, which comprises suitable valve elements for each of the ports 5, 6, as will be observed in the drawings. The space 10, outside of the valve and within the valve chest forms one of the valve chambers adapted to be put in alternate communication with the ports 5 and 6, in the usual manner, while the space 11, at the ends of the valve chest and within the valve 9, forms the other valve chamber adapted for similar alternate communication with the ports, according to the motion imparted to the valve. One of these chambers forms the inlet and the other the outlet conduit for the pump and it is immaterial to the broadest aspect of this invention which of these chambers serves which purpose, except that in the type of engine illustrated the greatest convenience and compactness is obtained by making the chamber 11 the inlet and the chamber 10 the outlet, and arranging the valve-actuating gearing to act accordingly. The force-pipe 12 therefore leads laterally from the chamber 10, to the reservoir pipe 13, which, as usual, constitutes the direct supply of scavenging air for each of the combustion cylinders, and the intake pipe 14, leads to the other chamber, being connected by a suitable joint to the bottom of the valve chest 8, and extended downwardly therefrom toward the engine crank-shaft and alongside the casing or standard 21, which supports the pumping cylinder or cylinders. The said pipe or conduit 14, preferably extends through or past the bed-plate where it receives from below its supply of air. It is desirably stepped on the margins of an aperture 14^a in the bed-plate and being on one side of the crank-shaft it thus forms an effective strut support for the vertical pump, which is particularly effective in resisting the strains and vibration therein. The said pipe is of sufficient internal diameter to accommodate the volume of fluid designed to pass through it, and also the train of operating elements, by which appropriate motion is imparted to the valve

mechanism, from the crank-shaft. Such train includes a connecting valve rod 15, and a rock lever 16, which is connected to the crank-shaft by means of an eccentric, as shown, or in any suitable manner adapted to impart oscillatory movement to the lever. The valve rod is contained wholly within the pipe or conduit 14, being pivotally connected to the end of the rock lever therein and direct connected to the pump valve, that is without the intervention of stuffing box connections, so that it will thus work in and through the junction of the conduit and the valve chest. Various different types of pump valves may be employed in place of the particular type illustrated in the drawings, and in such case the connection with the valve rod may be varied accordingly, but the location of the rod within the conduit and within the junction of the conduit and valve chest avoids the necessity for the usual stuffing box in the latter, as well as certain other jointed connections which will be recognized by those familiar with this subject.

The rock lever 16 extends through the side of the conduit 14, to the interior of the casing or standard 21, without disturbing the isolation of the interior from the exterior of the conduit, and for this purpose is journaled or fulcrumed in a part which forms the wall of the conduit in the region adjacent to the lever. The conduit is preferably extended laterally toward the pump casing, as shown at 17, in order to meet a corresponding projecting seat formed on the pump casing, and the journal for the rock lever is disposed in the latter part. Such journal is formed by a pair of opposed bearing surfaces 19, each having a circular section concentric to the axis of the lever, and the latter is formed with opposite wing-like enlargements 20, with correspondingly curved faces engaging on the faces 19, so as to form a ball-and-socket type of journal for the lever, but as the bearing faces are preferably cylindrical, the oscillation of the lever is thereby maintained in a fixed plane. The said lever may be maintained on its bearing thus formed by the curvature of the bearings themselves, but a cross-shaft 22, is desirably added, such shaft being of course concentric to the opposite bearing faces and preferably held in sleeves 23, which give it the capacity of some lateral adjustment so that it may be set up as occasion demands to take up wear of the faces 19 and 20. The ends of the lateral projections 20, being least subject to wear, are found to maintain a substantially leak-tight joint with the ends of the bearings without providing gaskets or filling therefor although such addition can be made if found necessary. It will be observed that the tight fulcrum joint of the rock lever is so located that it is exposed to conditions in the crank case and may thus be automatically lubricated by the same system that lubricates the crank shaft.

From the foregoing it will be seen that the valve operating mechanism is entirely concealed from view and is extremely simple in construction and mode of operation, but that the interior joint of the valve rod and the fulcrum joint are both accessible for attention when needed, the former through the manhole 24, and the latter through the inside of the pump casing or standard 21, which may be inclosed with suitable cover plates, if desired.

Claims:

1. In an internal combustion engine, the combination with the scavenger or air service pump thereof comprising the engine shaft, a cylinder, a plunger therein, and a suitable valve, of an air conduit communicating with said valve and extending toward the crank shaft, a rock lever actuated by the crank shaft and extending through the side of said conduit and having a leak-tight fulcrum joint exposed to conditions in the region of the crank shaft, and a rod housed in the conduit and connecting the portion of said rock lever inside the conduit with the pump valve.

2. In an internal combustion engine, the combination with the engine crank shaft and an air pump driven thereby and having a suitable valve, of an air conduit communicating with said valve and extending alongside the pump toward the crank shaft, and means for actuating said valve from the crank shaft comprising a rock lever extending transversely from the region of the crank shaft through the side of said conduit, and an oscillating connecting rod housed in said conduit, being connected at one end to the end of said lever inside the conduit and at the other end direct connected to said valve.

3. In an internal combustion engine, the combination with the engine crank shaft and an air pump driven thereby and having a suitable valve, of an air conduit communicating with said valve and extending alongside the pump toward the crank shaft, a rock lever actuated by the crank shaft and extending transversely from the region thereof through the side of said conduit, an oscillating connecting rod housed in said conduit, being connected at one end to the end of said lever inside the conduit and at the other end direct connected to said valve, and means at the fulcrum of said lever sealing the interior of the conduit from the region of the crank shaft.

4. In an internal combustion engine, the combination with the scavenger or air service pump thereof comprising the engine shaft, a cylinder, a plunger therein, a suitable valve and a crank case, of an air con-

duit communicating with said valve and extending alongside of the crank case, and a train for operating said valve from the engine shaft housed entirely in the crank case and in said conduit.

5. In an internal combustion engine, the combination with the engine shaft, an air pump comprising a cylinder having a suitable valve and a plunger inside the cylinder operated by the engine shaft, a casing between the pump cylinder and the engine shaft, and an air conduit communicating with said valve and extending alongside said casing, of a rock lever actuated by the engine shaft and extending through said casing and the side of said conduit, and an oscillating connecting rod connected at its lower end to said lever within the conduit and at its upper end direct connected to said valve.

6. In an internal combustion engine, the combination with a vertical scavenger or air service pump comprising the engine crank shaft, a cylinder, a plunger therein, a suitable valve, and a crank case, of an intake air conduit communicating with said valve and extending downward below the engine bed, a lateral recess between said conduit and crank case, a rock lever actuated by the engine shaft extending from the interior of the crank case through said recess into the conduit and having means at its fulcrum closing said recess, and a rod housed in the conduit and connecting said lever with the valve.

7. In an internal combustion engine, the combination with a vertical scavenger or air service pump comprising the engine crank shaft, a cylinder, a plunger therein, a suitable valve, and a crank case, of an intake air conduit communicating with said valve and extending downward to and through the engine bed and a train for operating said valve from the crank shaft housed within the crank case and conduit.

In testimony whereof, I have signed this specification in the presence of two witnesses.

WALTER SCHENKER.

Witnesses:

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