

L. SCHWITZER.
ENGINE.

APPLICATION FILED APR. 17, 1911.

1,064,095.

Patented June 10, 1913

3 SHEETS-SHEET 1.

Fig. 1.

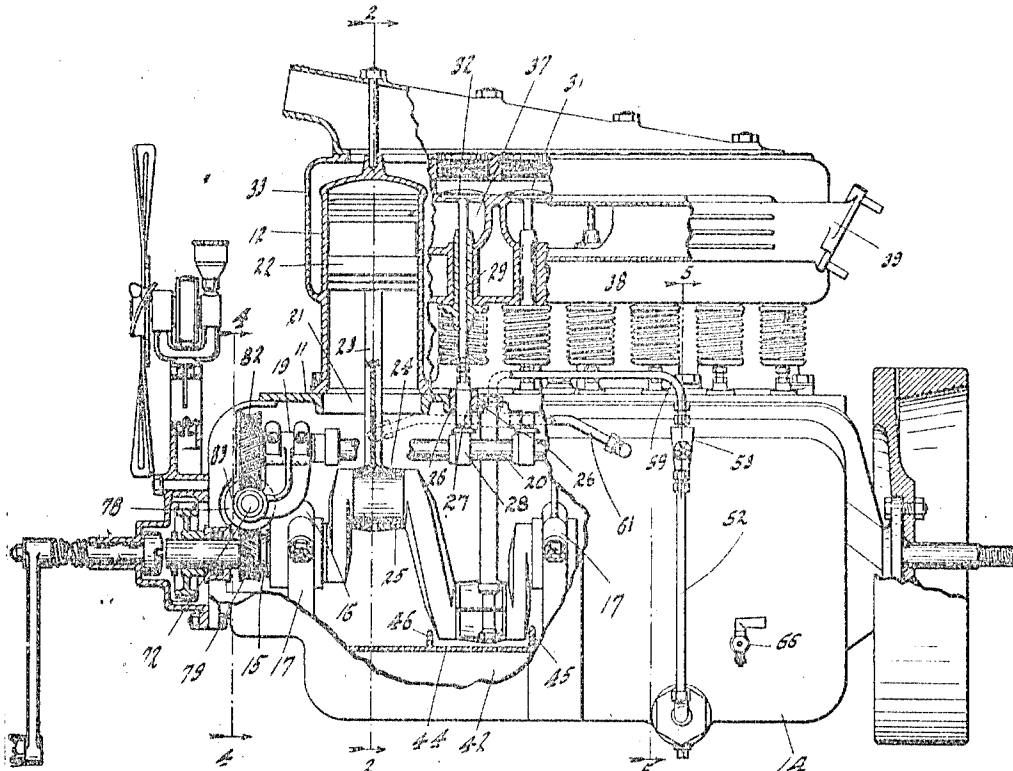


Fig. 6.

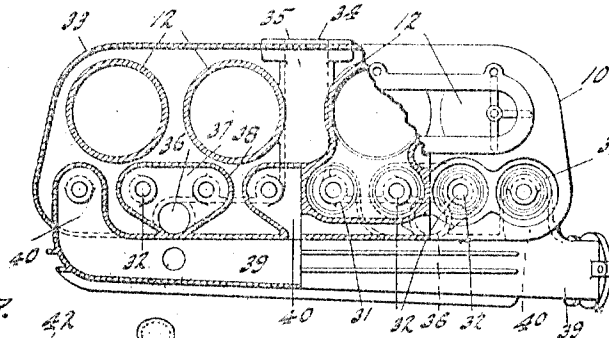
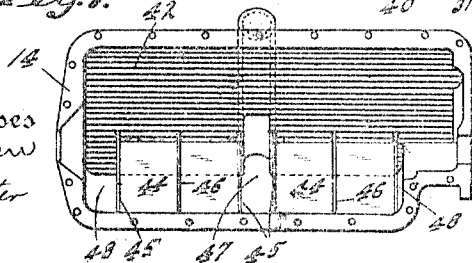


Fig. 7.



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3 SHEETS-SHEET 2.

Fig 2.

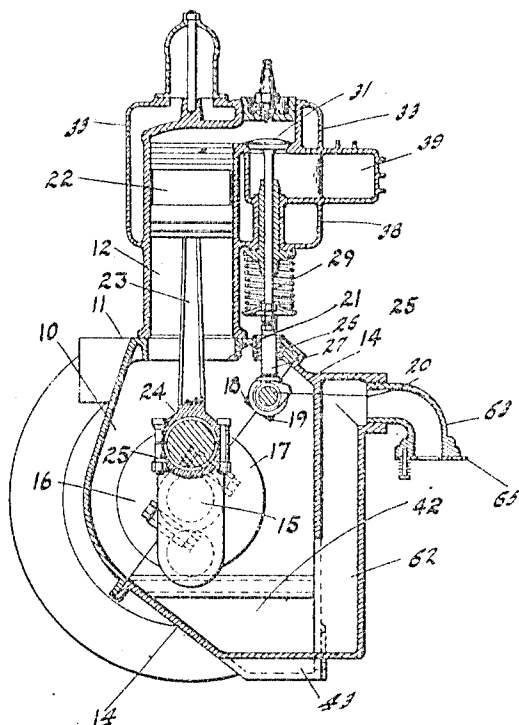
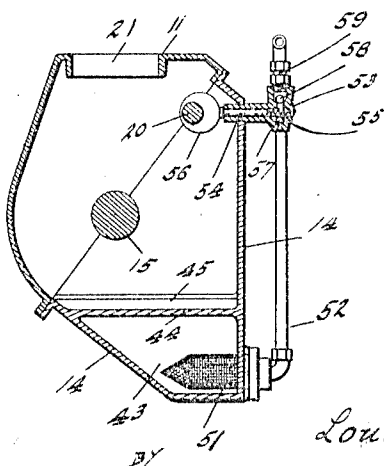


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 3.

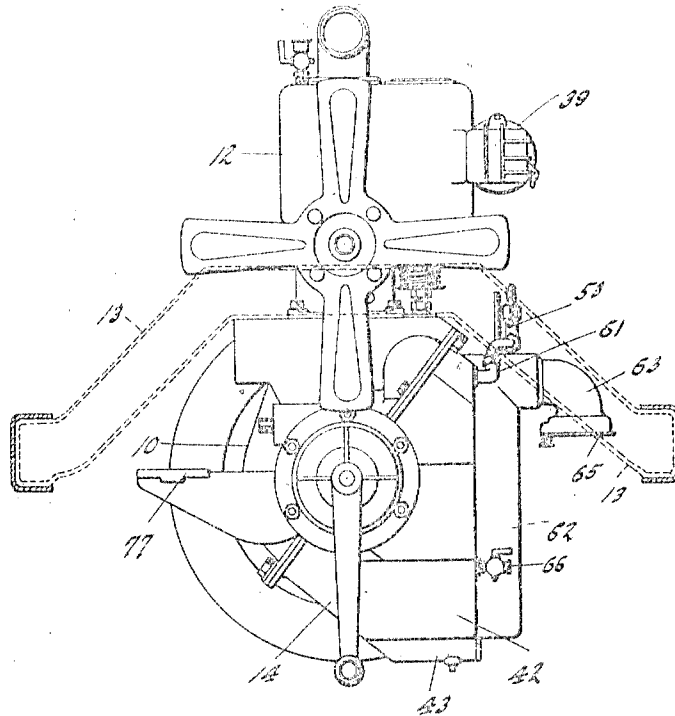
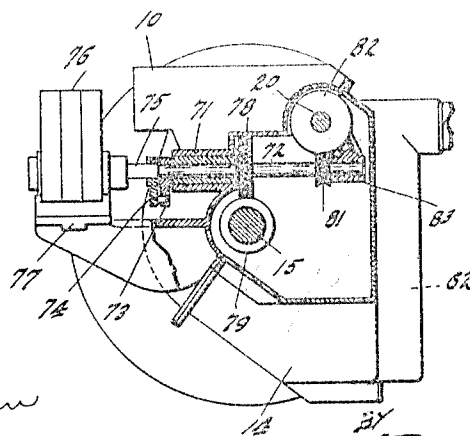


Fig. 4.



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UNITED STATES PATENT OFFICE.

LOUIS SCHWITZER, OF INDIANAPOLIS, INDIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO LYONS ATLAS COMPANY, OF INDIANAPOLIS, INDIANA, A CORPORATION OF INDIANA.

ENGINE.

1,064,095.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed April 17, 1911. Serial No. 621,652.

To all whom it may concern:

Be it known that I, LOUIS SCHWITZER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Engine, of which the following is a specification.

The object of my invention is to produce an engine structure of such compact form that its parts may be easily disassembled without the necessity of complete dismemberment, and as a part of said object there is the production of a crank-shaft casing so formed that one of its members may be readily detached from the other without separating said other member from the main supports; the detachable member forming a basin for oil for splash lubrication and also carrying the lubricant circulator and all of the lubricating piping so that separation of the crank casing into its two parts will not require dismemberment of any of the lubricating piping. As a result of this construction it becomes possible to provide a peculiar and very simple driving train for the spark generator, said driving train forming the connection between the crank shaft and cam shaft.

A further object of my invention is to produce a structure in which the cam shaft may be removed without dismemberment or displacement of the associated parts.

Further objects of my invention will appear from the specification, drawings and claims.

The accompanying drawings illustrate my invention.

Figure 1 is a side elevation in partial vertical section of an engine embodying my invention; Fig. 2 a section on line 2—2 of Fig. 1; Fig. 3 a front end elevation; Fig. 4 a section on line 4—4 of Fig. 1; Fig. 5 a section on line 5—5 of Fig. 1; Fig. 6 a plan in partial horizontal section, and Fig. 7 an elevation of the interior of the detachable casing member.

In the drawings, 10 indicates the main crank casing member, provided at one side with a perforated surface 11 formed for the reception of the cylinders 12 which are to be detachably secured to the main casing member. This main casing 10 is adapted for attachment to a suitable suspension member 13 by which the structure as a whole will be

supported. Cooperating with the main casing 10 is a detachable casing member 14.

Extending through the two casing members 10 and 14 is a crank shaft 15 which is supported in fixed bearings 16 which are preferably half bearings complemented by removable cap members 17, the members 16 being formed integral with or carried by the casing member 10. A cam shaft 20 is also arranged within the casing members and is supported in bearing members 18 which are carried by the casing member 10, and bearing caps 19 which complement, and are carried by, the bearings 18. Cam shaft 20 lies wholly within casing member 10 so that, when casing member 14 is withdrawn, said shaft may be readily transversely removed without disturbing the bearings of the crank shaft and without disturbing the associated parts.

The two casing members 10 and 14 are so formed that their mating planes will pass substantially through the axes of the crank shaft 15 and cam shaft 20 and the cam shaft is so arranged relative to the crank shaft and cylinders that when the member 14 is withdrawn, the member 10 is wide open from top to bottom, and from side to side, the crank shaft 15 being preferably so arranged that the mating plane between the two casing members is in the neighborhood of 45 degrees to the horizontal.

The crank shaft 15 and the cam shaft 20 are preferably so arranged, with relation to the cylinder openings 21 through surface 11, that a piston 22 may be withdrawn from its cylinder 12 downwardly into the casing 10 and from thence outwardly between crank shaft 15 and cam shaft 20. It will be understood that a piston 22 is mounted in each cylinder 12 and that each piston is connected by a pitman 23 with a proper crank of the crank shaft, this connection being by means of a half bearing 24 on the end of the pitman and a cooperating cap 25.

Bearing bushings 26 are extended through a surface 11 of casing member 10 and in each of these is mounted a valve plunger 27 arranged to be engaged by a cam 28 on the cam shaft 20. Each plunger 27 is so formed that it may be withdrawn downwardly into the casing and is, therefore, separable from the valve stem 29 which it operates.

The valve stems 29 are connected either to

exhaust valves 31 or inlet valves 32 which may be of any desired form. In the present construction I have shown a four-cylinder engine and all of the cylinders and valves are inclosed in a water jacket 33. The inlet valves 32 are grouped in two pairs which are separated from each other between adjacent cylinders. Leading through the water jacket from a surface 34, to which an inlet pipe or a carbureter may be attached, is a horizontal passage 35 which passes through the water jacket to the opposite side thereof and there diverges into a pair of laterals each of which ends in a short vertical riser 36 which delivers directly into a chamber 37 in which a pair of inlet valves 32 is arranged. The laterals from the fuel passage 35 are within a casing 38 which is preferably formed integral with the cylinder casting, and immediately above this portion 38 is a horizontal exhaust channel 39 which is connected to the several exhaust valve chambers 40.

By arranging the fuel supply passage 35 in the manner indicated, the fuel (*i. e.*, the carbureted air) is caused to pass through the water jacket and delivered to water-jacketed inlet chambers and is therefore continuously surrounded with the heated water of the water jacket. The temperature of this water is always such as to prevent condensation of the gasoline or other hydrocarbon but at the same time prevents the carbureted air from reaching a temperature of combustion before it enters a cylinder.

The detachable casing member 14 is provided in its bottom with an oil-retaining chamber 42, which at its middle is depressed at 43. Arranged above the oil chamber 42 are two horizontal shelves 44. Each of these shelves is flanked at its ends by vertical ribs or flanges 45 and at its middle is provided with a flange 46 which is slightly less in height than the flanges 45. The two shelves are separated at their adjacent ends so as to form a passage 47 communicating with the depressed portion 43 of the main chamber 42, and the shelves at their ends do not extend to the end of the casing, thus leaving openings 48, the arrangement being such that oil discharged upon the shelves 44 will be retained thereon at a depth equal to the height of flanges 45 and will flow over those flanges into the reservoir 42—43. Each of the shelves 44 is placed beneath a pair of cranks of the crank shaft, each crank dipping down into the space between flange 46 and one of the flanges 45.

Leading from the lowest point in the depression 43 is a strainer outlet 51 which discharges into a pipe 52 leading upwardly to a pump casing 33. This pump casing is substantially T-shaped, the stem of the T being threaded into the casing 14 and bored to receive a reciprocating pump plunger 54 nor-

mally urged outwardly by a light spring 55 within the casing and at its outer end engaging a cam 56 carried by the cam shaft 20. The head of the T is perforated from end to end and provided with an inlet valve 57 and an outlet valve 58 and leading from the outlet passage beyond valve 58 is a pipe 59 which is connected to a pair of divergent delivery pipes 61, the ends of which pass through casing 14 so as to discharge upon each shelf 44.

Communicating with chamber 42 is a vertical supply passage 62 in the upper end of which is rotatably mounted a filling neck or fitting 63, said neck being normally closed by a swinging perforated plate 65, the arrangement being such that air may have free flow into the crank casing through perforations of the plate but no dirt will enter owing to the fact that under running conditions the filling fitting is presented downwardly. In order to fill the casing with oil, the fitting 63 is turned upwardly and plate 65 swung to one side so that lubricating oil may pour freely into the casing until a desired level has been reached, indication of the level being secured by opening cock 66.

Formed in the main casing member 10 between the level of the crank shaft 15 and cam shaft 20 is a horizontally arranged bearing 71 in which is mounted an intermediate shaft 72. At its outer end shaft 72 carries a coupling member 73 adapted to detachably cooperate with a coupling member 74 carried by the shaft 75 of a magneto or other generator 76 mounted upon a projecting bracket 77 carried by or formed integral with casing member 10. Shaft 72 carries a spiral gear 78 which meshes with a spiral gear 79 on crank shaft 15 and also carries a spiral gear 81 which meshes with a spiral gear 82 carried by cam shaft 20. The two spiral gears 78 and 81 are preferably oppositely pitched so that the thrust of one will counterbalance the thrust of the other. The inner end of shaft 72 is supported in a bearing 83 carried by the adjacent cap bearing 19.

Shafts 15 and 20 may remain in place while shaft 72 may be removed or replaced. I claim as my invention.

1. In an engine, the combination of a main base casing member having a cylinder-opening in its upper side and having an open lower side diagonally arranged relative to the upper side and extending substantially from top to bottom and side to side of the casing and passing substantially through the axes of the crank shaft and cam shaft, a crank shaft and a cam shaft mounted in said main casing member and wholly supported thereby, a cylinder mounted over the cylinder-opening on the main casing member, a piston therein, connections between the piston and crank shaft, and a comple-

mentary casing member detachably coacting with the open lower face of the main casing member and forming an oil-retaining basin independent of the main member.

2. In an engine, the combination of a main base casing member having a cylinder-opening in its upper side and having an open lower side passing substantially through the axes of the crank shaft and cam shaft, a crank shaft and a cam shaft mounted in said main casing member and wholly supported thereby, a cylinder mounted over the cylinder-opening on the main casing member, a piston therein, connections between the piston and crank shaft, and a complementary casing member detachably coacting with the open lower face of the main casing member and forming an oil-retaining basin independent of the main member.

3. In an engine, the combination of a main base casing member having a cylinder opening in its upper side and having an open lower side diagonally arranged relative to the upper side and extending substantially from top to bottom and side to side of the casing and passing substantially through the axes of the crank shaft and cam shaft, a crank shaft and a cam shaft mounted in said main casing member and wholly supported thereby, a cylinder mounted over the cylinder-opening on the main casing member, a piston therein, connections between the piston and crank shaft, a complementary casing member detachably coacting with the open lower face of the main casing member and forming an oil-retaining basin independent of the main casing, oil-circulating pipes carried entirely by said complementary casing member, and an oil-circulating pump communicating with said pipes and carried entirely by said complementary casing member.

4. In an engine, the combination of a main base casing member having a cylinder-opening in its upper side and having an open lower side passing substantially through the axes of the crank shaft and cam shaft, a crank shaft and a cam shaft mounted in said main casing member and wholly supported thereby, a cylinder mounted over the cylinder-opening on the main casing member, a piston therein, connections between the piston and crank shaft, a complementary casing member detachably coacting with the open lower face of the main casing member and forming an oil-retaining basin independent of the main member, oil-circulating pipes carried entirely by said complementary casing member, and an oil-circulating pump communicating with said pipes and carried entirely by said complementary casing member.

5. In an engine, the combination, with a main base casing member, of a complementary base casing member forming an oil-re-

taining basin independent of the main casing member and detachably connected to the main casing member, an oil-retaining shelf arranged in said complementary member above the bottom thereof, oil-circulating piping carried by said complementary casing member and extending from a point below the shelf to a point above the shelf, and a pump carried by the complementary casing member and communicating with said piping.

6. In an engine, the combination, with an oil-retaining casing having a detachable member forming part of said casing, of a cam shaft journaled in the casing, oil-circulating piping carried by the detachable casing member, an oil pump also carried by said detachable casing member and communicating with the piping, said pump having a plunger detachably engaged by a portion of the cam shaft, whereby the detachable casing member may be removed without manipulation of the oil-circulating piping or pump.

7. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also journaled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft journaled in said intermediate shaft bearing and lying at an angle to the crank shaft and cam shaft, a pair of spiral gears connecting the crank shaft and intermediate shaft, a second pair of spiral gears connecting the intermediate shaft and cam shaft, the two spiral gears on the intermediate shaft being oppositely pitched to balance the thrusts, and a bearing cap forming a part of the support for the cam shaft and carrying a bearing for the intermediate shaft, the said cap being removable from its fellow cam shaft half bearing in the line of the intermediate shaft.

8. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also journaled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft journaled in said intermediate shaft bearing and lying at an angle to the crank shaft and cam shaft, a pair of spiral gears connecting the crank shaft and intermediate

shaft, a second pair of spiral gears connecting the intermediate shaft and cam shaft, and a bearing cap forming a part of the support for the cam shaft and carrying a bearing for the intermediate shaft, the said cap being removable from its fellow shaft half bearing in the line of the intermediate shaft.

9. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also journaled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member and meeting the latter in a plane passing through the axes of both said shafts, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft journaled in said intermediate shaft bearing and lying at an angle to the crank shaft and cam shaft, a pair of spiral gears connecting the crank shaft and intermediate shaft, and a second pair of spiral gears connecting the intermediate shaft and cam shaft.

10. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also journaled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft journaled in said intermediate shaft bearing and lying at an angle to the crank shaft and cam shaft, a pair of spiral gears connecting the crank shaft and intermediate shaft, a second pair of spiral gears connecting the intermediate shaft and cam shaft, the two spiral gears on the intermediate shaft being oppositely pitched to balance the thrusts, a bearing cap forming a part of the support for the cam shaft and carrying a bearing for the intermediate shaft, the said cap being removable from its fellow cam shaft half bearing in the line of the intermediate shaft, a generator support carried by the main casing member beyond the outer end of the intermediate shaft, an electric generator mounted thereon, and intermediate detachable driving connections between the outer end of the intermediate shaft and the generator.

11. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also jour-

naled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft journaled in said intermediate shaft bearing and lying at an angle to the crank shaft and cam shaft, a pair of spiral gears connecting the crank shaft and intermediate shaft, a second pair of spiral gears connecting the intermediate shaft and cam shaft, the two spiral gears on the intermediate shaft being oppositely pitched to balance the thrusts, a generator support carried by the main casing member beyond the outer end of the intermediate shaft, an electric generator mounted thereon, and intermediate detachable driving connections between the outer end of the intermediate shaft and the generator.

12. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also journaled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft journaled in said intermediate shaft bearing and lying at an angle to the crank shaft and cam shaft, a pair of spiral gears connecting the crank shaft and intermediate shaft, a second pair of spiral gears connecting the intermediate shaft and cam shaft, a bearing cap forming a part of the support for the cam shaft and carrying a bearing for the intermediate shaft, the said cap being removable from its fellow cam shaft half bearing in the line of the intermediate shaft, a generator support carried by the main casing member beyond the outer end of the intermediate shaft, an electric generator mounted thereon, and intermediate detachable driving connections between the outer end of the intermediate shaft and the generator.

13. In an internal combustion engine, the combination of a main base casing member, a crank shaft journaled therein and wholly supported thereby, a cam shaft also journaled in said main casing member and wholly supported thereby, a detachable casing member cooperating with the main casing member, which detachable casing member, when removed, gives access to the crank shaft and cam shaft, an intermediate shaft bearing arranged between the crank shaft and cam shaft and at an angle thereto, a shaft jour-

naled in said intermediate shaft bearing and
lying at an angle to the crank shaft and
cam shaft, a pair of spiral gears connecting
the crank shaft and intermediate shaft,
5 a second pair of spiral gears con-
necting the intermediate shaft and cam
shaft, a generator support carried by the
main casing member beyond the outer
end of the intermediate shaft, an electric
10 generator mounted thereon, and intermedi-
ate detachable driving connections between
the outer end of the intermediate shaft and
the generator.

14. In an internal combustion engine, the
15 combination with a cylinder-support, a
crank shaft journaled therein, a cylinder
carried by said support, a piston mounted
in the cylinder and connected with the crank
shaft, controlling valves associated with the
20 cylinder, cam shaft bearings carried by said
cylinder support, a cam shaft mounted in
said bearings and laterally withdrawable
therefrom, cams carried by said cam shaft
and arranged to operate upon the valves,
25 and intermediate driving connections be-
tween the crank shaft and cam shaft.

15. In an internal combustion engine, the
combination of a main casing member hav-
ing an open portion, a crank shaft sup-
30 ported by said casing member, a cylinder
carried by the casing member, a piston
mounted in the cylinder, connections be-
tween the piston and crank shaft, control-
ling valves associated with the cylinder, cam
35 shaft bearings carried by the casing mem-
ber, a cam shaft journaled in said bearings
and laterally removable therefrom inde-
pendent of the crank shaft, cams carried by
said cam shaft and arranged to operate upon
40 the valves, a driving connection between the
cam shaft and crank shaft, a cover member
complementing the open portion of the main
casing member said cover member forming

an oil basin, lubricant conduits carried en-
tirely by said cover member, a lubricant cir- 45
culator also carried by said cover member,
and means carried by the cam shaft for op-
erating said lubricant circulator.

16. In an internal combustion engine, the
combination of a main casing member hav- 50
ing an open portion, a crank shaft sup-
ported by said casing member, a cylinder
carried by the casing member, a piston
mounted in the cylinder, connections be-
tween the piston and crank shaft, control- 55
ling valves associated with the cylinder,
cam shaft bearings carried by the casing
member, a cam shaft journaled in said bear-
ings and laterally removable therefrom, in-
dependent of the crank shaft, cams carried 60
by said cam shaft and arranged to operate
upon the valves, a driving connection be-
tween the cam shaft and crank shaft, and
a cover member complementing the open
portion of the main casing member. 65

17. In an engine, the combination, with
an oil-retaining casing having a detachable
member forming part of said casing, of a
cam shaft journaled in the casing inde- 70
pendently of said detachable part, oil-cir-
culating piping carried by the detachable cas-
ing member, an oil pump also carried by
said detachable casing member and com-
municating with the piping, said pump hav-
ing a plunger detachably engaged by a por- 75
tion of the cam shaft, whereby the detach-
able casing member may be removed without
manipulation of the oil-circulating piping
or pump.

In witness whereof, I have hereunto set 80
my hand and seal at Indianapolis, Indiana.

LOUIS SCHWITZER. [L. S.]

Witnesses:

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FRANK A. FAHLE.