No. 750,901. PATENTED FEB. 2, 1904.

F. A. SEITZ.

INTERNAL COMBUSTION OR EXPLOSIVE ENGINE.

APPLICATION FILED FEB. 19, 1903.

NO MODEL.

Fig. 2.

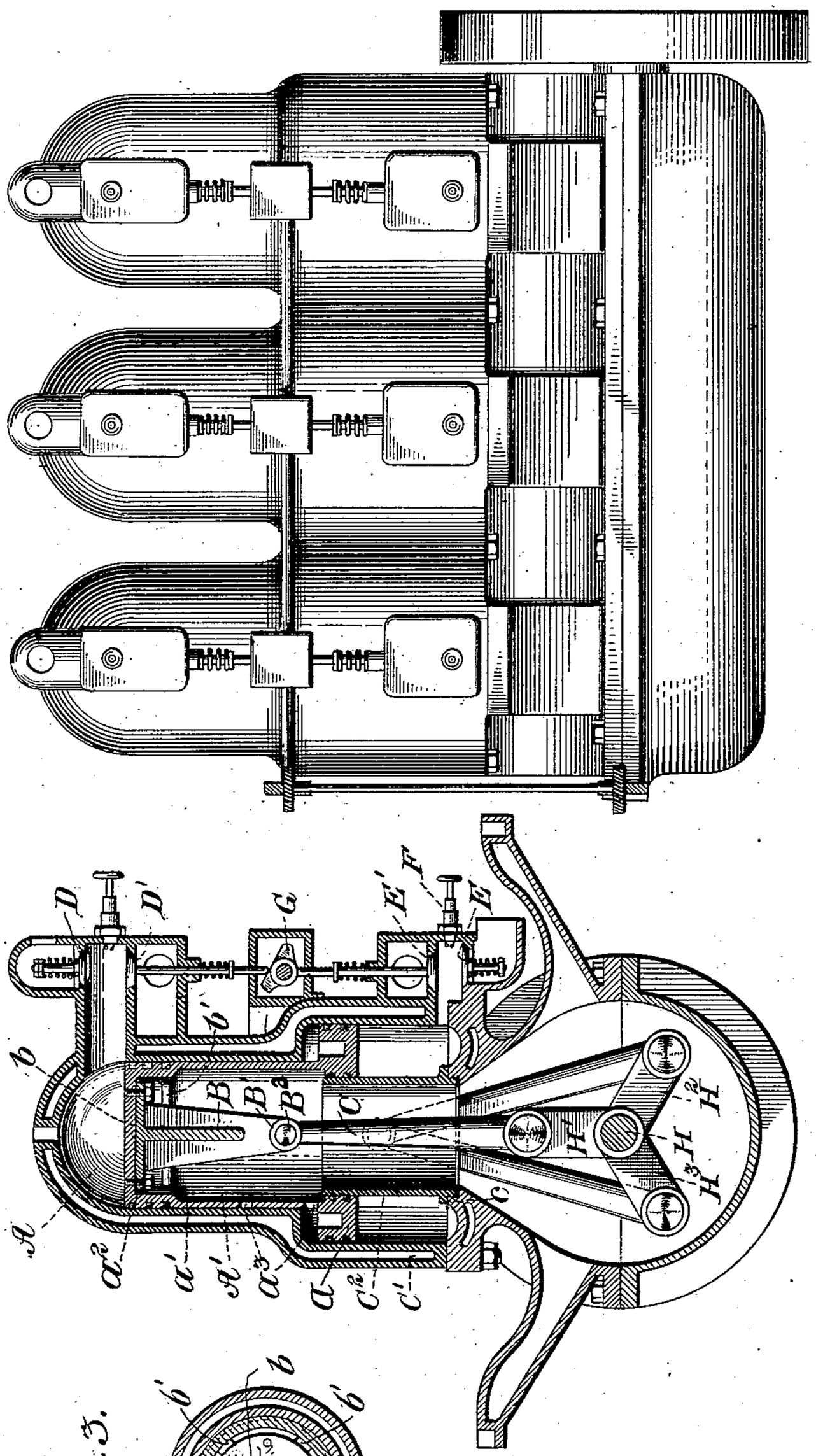
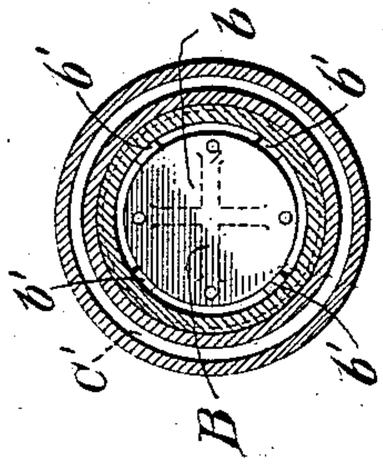


Fig. 1.

Fig. 3.



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No. 750,901. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

FREDERICK A. SEITZ, OF NEWARK, NEW JERSEY.

INTERNAL-COMBUSTION OR EXPLOSIVE ENGINE.

SPECIFICATION forming part of Letters Patent No. 750,901, dated February 2, 1904.

Application filed February 19, 1903. Serial No. 144,076. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK A. SEITZ, residing in the city of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Internal-Combustion or Explosive Engines, of which the following is a specification.

My invention in internal-combustion motors relates particularly to that class known as explosive-engines of the "four-cycle" type; and the object of my invention is to construct a four-cycle explosive-engine which will receive an impulse of its working piston both on the outward and inward strokes, thereby increasing the horse-power capacity of motors of the character to which my invention belongs for a greater amount of power and a less amount of material employed in their construction in a more simple and effective manner than any of the other constructions with which I am familiar.

The different features of the invention whereby I carry out the object stated are illustrated in the drawings which form part of this specification and are clearly described in the subsequent detailed explanation and fully pointed out in the claims.

In the drawings I have illustrated the invention as being applied to a three-cylinder four-cycle water-cooled double-acting explosive engine designed in this instance for motor-vehicles, the manner of suspension for this purpose being illustrated in the vertical longitudinal sectional view, Figure 1, and the general appearance of the motor presenting the three cylinders is illustrated by the side elevational view, Fig. 2. Fig. 3 is a detail view of the bracket to which the piston-rod is attached.

In the several figures similar characters of reference refer to the same parts.

The engine is shown as arranged vertically, so that the downward stroke of each piston corresponds with the outward stroke thereof and the upward with the inner stroke of the same. Contained within the combustion chamber or cylinder A is a piston A′, having an enlarged piston-head *a* cast integral with the trunk portion *a′*, and secured to the piston-head a^2 is a bracket B, said bracket being secured in any suitable manner, but preferably by threaded bolts, as shown. At the lower extremity of the bracket B is a wrist-pin bearing B′. The function of the bracket B at its base, where it is shown bolted to the piston-head a^2, is to adapt the trunked piston comprising the body *a′*, head a^2, and head *a* to be more freely constructed and the boring of the same made simpler, consistent with strength, than would be the case were the same constructed upon the principles in vogue previous to my invention.

The bracket B, being composed of angle-iron, which may be of a tougher material than that of which the piston is composed, is of the extended vertical character indicated in Fig. 1, and at the end opposite to that having the bearing B′ the bracket has integrally the flat plate *b*, which is bolted against the inner side of the end of the smaller piston a^2. This bracket is furthermore provided at a short distance from the plate with a series of radial fingers *b′*, which bear against the inner sides of the piston and serve to brace the bracket more rigidly relative thereto. To facilitate the introduction and securement of the bracket within the piston, the fingers *b′* alternate with respect to the position of the bracket-securing bolts, so that access may be readily had to the latter in attaching or detaching the bracket.

The connecting-rod C is secured to the bracket B at the wrist-pin bearings B′ by a wrist-pin B^2, which is fitted to the parts in operable relation, as is customary. The combustion chamber or cylinder A has a water-jacket C′, preferably cast integral with the cylinder A, or the three cylinders illustrated in Fig. 2 may be cast integral with said water-jacket.

In order to obtain an impulse during the upward stroke of the piston, I provide an inner or reëntrant cylinder C^2 in gas-tight connection with the cylinder-head *a* by means of the usual packing-rings, as illustrated in Fig. 1. I prefer, however, to mount the inner

cylinder C^2 upon the crank-case *c* and construct this of a separate piece of metal independently of the cylinder A, the inner cylinder C^2 being secured to the crank-case *c* by bolts or by thread engagement within a suitable recess in the crank-case to secure a gas-tight connection. This cylinder C^2 forms a fixed bearing-cylinder, upon which the large piston-head works.

It will be observed that the disposition of the two piston-heads *a* and a^2 is such as to comprise, in effect, a double-cylinder four-cycle explosive-engine with but one crank and connecting rod. It will also be obvious by studying the drawings that a double set of intake and exhaust valves D D′ E E′ are disposed in a similar manner to that of a double-cylinder motor of the type aforesaid. The ignition-plugs F, intake-valves, exhaust-valves, and cam mechanism G therefore are sufficiently illustrated to require no further description and specifically form no part of the present invention. Their functions will be well understood by those skilled in the art of combustion-motor designing and building. It will also be observed, however, by the arrangements of the valve mechanism stated that upon the upward or compression stroke of the piston-head a^2 the enlarged piston *a* will be making an inhalation stroke, and upon maximum compression and ignition due to the piston-head a^2 and the concomitants thereof the same will be returned by the kinetic energy of the ignited gases in the combustion-chamber A. The downward stroke will result in the consequent compression of the inhaled ingredients by the larger piston-head *a* as it is descending until its maximum compression-stroke, depending uponthe load, has been reached, when ignition will follow, as aforesaid, and the piston-head a^2 will be returned by the working stroke of the piston-head *a* and expel the products of combustion from the upper part of the combustion-chamber A into the upper exhaust-outlet.

I prefer to construct the piston-heads a^2 and *a* of such diameters that their pressure areas will be practically equal. The trunk connecting the pistons heads is provided contiguous to the larger piston-heads *a* with small ports a^3 to admit air in cushioning the upward stroke of said piston.

It will be observed that while the engine is operating in the manner aforesaid and the reciprocating movement of the piston is being translated by the crank and connecting-rod into a rotary one, as is customary, the impulses during four strokes will be two consecutive impulses and two consecutive exhausting strokes intervening; but two impulses will be obtained in every four strokes or an equivalent of an impulse in each revolution, and in consequence thereof I am enabled to operate my four-cycle explosive-engine under more variable mean effective pressures than those constructions wherein an impulse is obtained but once in every four strokes of the piston.

In embodying my invention in a triple-cylinder arrangement, as exemplified in the drawings, the cranks H′ H^2 H^3 are so equidistantly secured on the driving-shaft H at angles of one hundred and twenty degrees apart that the impulse stroke of each piston will overlap that of the preceding piston, so that the total effect of the three pistons will be to secure a practically uniform rotation of the crank-shaft, resulting in an increase of torque and the avoidance of the manifestation of the explosions so noticeable in this class of engines.

I am aware that previous to my invention double-acting combustion-motors have been constructed, and I therefore do not broadly claim the same; but

What I do claim, and desire to secure by Letters Patent, is—

1. An internal-combustion motor comprising a cylinder having bores of different diameters, connected piston-heads disposed in said bores, and a fixed bearing-cylinder upon which the larger piston-head works.

2. An internal-combustion motor comprising a cylinder having bores of different diameters, connected piston-heads disposed in said bores, a fixed bearing-cylinder upon which the larger piston-head works, an inwardly-projecting bracket carried by the smaller piston-head, and a connecting-rod pivotally attached to the bracket, extending through the bearing-cylinder and in operative relation with a crank-shaft.

3. An internal-combustion motor comprising a crank-casing and a cylinder having bores of different diameters, the larger bore being contiguous to the crank-casing, connected piston-heads disposed in said portions, a fixed bearing-cylinder secured to the crank-casing and upon which bearing-cylinder the larger piston-head works, and a crank-rod pivotally attached to the smaller piston-head, extending through the bearing-cylinder and in operative relation with a crank-shaft in the casing.

4. An internal-combustion motor comprising a cylinder having bores of different diameters, piston-heads disposed in said bores, a trunk connecting said piston-heads and provided with ports a^3, for cushioning the larger head, and a fixed bearing-cylinder upon which the larger head works.

5. In an internal-combustion motor, the combination with a plurality of cylinders, each having bores of different diameters, a crank-casing common to and connected with the larger bores of the cylinders, a crank-shaft mounted

in the casing, connected piston-heads disposed in both bores of each cylinder, bearing-cylinders upon which the larger piston-heads work, and connecting-rods pivotally connected with the smaller piston-heads, extending through the bearing-cylinders and connected with the crank-shaft.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FREDERICK A. SEITZ.

Witnesses:

WILLIAM PAXTON,

HELEN E. MAHER.