PATENT SPECIFICATION

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Complete Accepted: Aug. 12, 1926.

COMPLETE SPECIFICATION.

A Method of and Means for Driving Power Operated Vehicles, particularly Gliders and Aircraft.

I, ALOIS HELFENSTEIN, Swiss citizen, of Bastiengasse 50, Wien XVIII, Austria, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to means utilising the repellent action of compressed air or gases for the upward propulsion or raising, steering, stabilisation and the like of vehicles particularly aircraft gliding boats, and hydroplanes and the like, thereby avoiding the use for that purpose of mechanical devices such as steering and lifting planes, screw propellers, or of gases which are lighter than air. To produce the repellent pressure required, compressed air is generated on the vehicle itself in piston or turbo compressors and compressed under the cover of a compression chamber from which it expands into pressure pipes connected thereto. These pipes are open at one side and for the propulsion of the vehicle are approximately horizontal, while those used for raising it are arranged vertically. They may be telescopically extensible and form together with the chambers, the principal supporting elements of the machine. The compressed air generated is conducted into the compression chambers and compressed against the covers of the chambers, produces pressure against the walls of the chambers, generates eddies and heat and then expands in the pipes whereby according to the direction (i.e. the position of the pipes) a powerful upward or forward driving pressure or both is produced. The compression chambers are placed at such a height that their tops lie considerably above the centre of gravity of the vehicle so as to allow the upward driving force of the compressed air to act above the centre of gravity even under severe fluctuations or deviations of the vehicle from the normal whereby the stabilisation of the vehicle vertically is assisted and the pipes may be of such a length that they will afford the compressed air sufficient guidance for the favourable working of the expansion.

In order to increase the action of the pressure, fuel may be mixed with the compressed air in a suitable manner and the mixture may be caused to explode by ignition or non-explosive combustion may be induced by high pressure.

The reduction of the velocity of expansion of the compressed air is of the greatest importance for reasons of economy in compressed air and power. The velocity depends on the pressure in the compression chambers, on the resistance of the walls of the chambers and pipes and on the resistance offered by the outer air situated beneath the pipes. It is therefore important above all things to reduce the velocity of expansion so far as the consumption of compressed air is concerned. This retardation of expansion can be obtained by the use of vertical division walls in the pipes, which simultaneously serve to stiffen them, also by the increase of the speed of travel whereby the counter action of the outer air on emergence is increased or by flying low or gliding, which likewise produces an increase in the repulsion on emergence by the proximity of the ground. The velocity of the expansion of the air may also however be reduced by compressed air or the pressure of the expansion, that is to say by the counter force, or back pressure. For this purpose an annular nozzle a ring of nozzles or both are pro-

[Price 1/-]

vided in the compression chambers through which compressed air, or burnt gas is blown radially or transversely of the cover. The retarding devices may be placed both in the chamber and in the pipes connected thereto.

For the upward propulsion or raising of the vehicle the compressed air is introduced into the compression chamber through an annular nozzle, a ring of nozzles or both arranged underneath the cover. The nozzles may also be arranged tangentially and in order to retard the expansion they may be directed obliquely upwards. By the mutual impact of the currents of compressed air which enter through the flat compressed air nozzles, repulsion combined with the formation of eddies is produced, which leads to heating and increase of the pressure at the cover. In a long pipe a number of such stages of rings of nozzles may be provided. The tangentially directed nozzles induce a one-sided formation of eddies, whereby a strong braking action is exerted on the expansion.

The upward propulsion or raising of the vehicle is produced mainly by a difference in pressure from the pressure against the cover of the compression chamber as compared with the pressure above the vehicle and by the actions of the vis viva of the air (or gases) their expansion and emergence from the chambers and pipes respectively and consequently by the pressure against the ground or the surface of the water in the case of gliding boats and against the outer air situated in rear of the vehicle in the case of air craft.

The compressed air rotors are arranged in pairs and in opposite directions in order to avoid one-sided horizontal forces.

The propulsion forwards is obtained likewise by means of compressed air or a mixture of compressed air and fuel in approximately horizontal chambers and compressed air pipes connected thereto.

To ensure stability the heavy motors and compressed air compressors also the material for driving them are placed in the lower part of the machine, thus keeping the centre of gravity low. The compressors may be constructed as vertical rotors, so as to assist in maintaining the stability of the machine by their gyroscopic action. The suction pipes of the compressors lead vertically through the machine as chimneys to the outer air or horizontally to the front end of the machine so as to use the suctional pressure for upward or forward propulsion.

To ensure that the compressors shall work without shock the vehicles are provided with compressed air reservoirs which act as buffers and which are made of such dimensions that should the generation of compressed air fail there shall be a sufficient reserve of compressed air to enable landing to be effected quietly.

The outlet end of the vertical pipe may be provided with a telescopic hose, a jacket or the like of dense flexible material such as fabric, leather, rubber or the like, which when starting trails over the lower surface and thereby enables the machine to rise rapidly and without shock from the ground or surface of the water, without a great expenditure of power and also allows when descending within a few metres of the ground, a sufficient brake pressure thus ensuring a slow landing without shock.

The jacket also enables air-craft and surface water craft to convey greater loads and renders possible the driving of power sledges with a small expenditure of compressed air.

In order to assist the stabilisation of the vehicle rigid gas cells filled with gas lighter than air or the like or inflatable balloon envelopes may be arranged at the upper end of the machine which are blown up as may be needed with compressed air and the use of which can assist the stability by increasing the resistance of the air. During flight they act as supporting surfaces which effect an increase in the capacity of the vehicle, but may also be provided with high pressure nozzles, in such a manner that they will produce ascent and forward motion and at the same time act as stabilisers.

Maintenance of the stability may also be effectively assisted by arranging the vertical pressure pipes in pairs and inclined slightly relatively to each other.

The normal steering of the vehicle may likewise be effected by compressed air. For this purpose the pressure pipes or the suction pipes of the compressors are provided with branchings and means for shutting off provided with valves or the like in such a way that lateral steering and also vertical steering and the maintenance of the stabilisation under sharp squalls can be effected by blowing out or drawing air at suitable points. It is obvious of course that steering planes may also be provided as an assistance or a reserve.

In the accompanying drawing is shown an example of an arrangement for carrying out the method according to the invention on an aircraft.

Figure 1 shows a portion of the air craft in side elevation, partially in longitudinal section.

Figure 2 is a section on the line A—A of Figure 1.

Figure 3 is a vertical section of a compression chamber with the pressure pipe attached and the arrangement of nozzles.

Figure 4 shows the same partly in plan and in section on the lines B—B, B^1—B^1 and B^2—B^2 in Figure 3.

Figure 5 is a modified form of the nozzle with the explosion chamber and

Figure 6 is a longitudinal section of the arrangement of horizontal suction and pressure pipes with operating devices for travelling forwards and backwards.

In the drawing *a* a^1 denotes the motors, *b* b^1 the two turbo compressors driven by the motors, *c* the suction pipe *d* the parallel pressure pipe for forward movement, *e* the compression chambers for the pressure pipes, *f* the pressure pipes leading from the compressors for upward propulsion, *g* the horizontal distributing pipes therefor, *h* the compression chambers for upward propulsion, *i* the upward propulsion pressure pipes some of which (see Figure 2 and i^1 Figure 1) are set obliquely, *k* k^1 are the horizontally projecting compressed air chambers which are open underneath and provided with high pressure nozzles, *l* l^1 are the horizontal pressure pipes for controlling direction and for stabilising, *m* the inflatable balloon envelopes ready for inflation and *n* the telescopic jacket projecting beyond the mouth of the pressure pipe and *z* are the compressed air reservoirs.

In Figures 3 and 4 *o* denotes the compression space of the compression chamber *h*, *p* p^1 the compressed air supply pipes to the compression chamber, *q* the upper annular jet, *r* the lower ring of nozzles with the nozzle slots pointing tangentially upwards, *s* is the division wall in the pressure pipes.

Figure 5 shows a modified compression chamber wherein an annular explosion chamber *t* communicating by a ring of orifices with the pressure pipe and fitted with sparking plugs *u* is provided to enable a mixture of fuel and air to be burned and the gases of combustion to be used for propulsion.

Finally as shown in Figure 6 cut off devices *v* v^1 are provided on the air inlets *p* p^1 of the chambers, and on the suction and pressure pipes *c*, *d*, branch connections c^1, d^1, the said branch connections leading to the compressors and the branch connection d^1 being adapted to be connected according to requirements with the suction side of the compressors.

The apparatus according to the present invention may be applied to air-craft surface water craft, sledges, or wheeled vehicles. In the case of air craft the pressure pipes may also serve as landing supports while for craft descending on the surface of the water a water tight bottom or float may also be provided.

Mechanical driving devices may be provided on the machine as addition or reserve devices and additional gyroscopes may be provided for stabilising purposes.

The cooling of the circulating water for compressors and the like is suitably effected by a refrigerating machine.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Means for driving vehicles especially surface water craft and air craft, by the repellant action of compressed air or gases in compression chambers and expansion pipes attached thereto, characterised by the fact that an annular nozzle, a ring of nozzles or both is arranged beneath the covers of each of the compression chambers.

2. Means according to Claim 1, characterised by the fact that the nozzles (*r*) are arranged tangentially and if necessary inclined upwards on the chamber or pipe jackets so as to prolong the expansion by the formation of eddies.

3. Means according to Claim 2, characterised by the fact, that the compression chambers have adjacent their nozzles combustion or explosion chambers (*t*) in which the mixture of compressed air and fuel is brought prior to its admission to the compression chambers for explosion or high pressure combustion.

4. Means according to Claims 1, 2 or 3 characterised by the fact that the compressors provided on the vehicle for the generation of the compressed air, are arranged in opposed pairs and are constructed as vertical turbo compressors so as to assist the gyroscopic action of the rotors in maintaining stability.

5. Means according to Claim 4, characterised by the fact that horizontal suction pipes (*c*) of the compressors (*b* b^1) and the horizontal pressure pipes (*d*) which together run the whole length of the machine are divided into suction and pressure sides and which can be so put into communication with the compressors that the normal suction side acts as the pressure sides and the pressure side as the suction side so that the vehicles can be rapidly braked without reversing the motor or be set for running forwards or backwards as may be required.

6. Means according to Claim 1, characterised by the fact that for the purpose of controlling direction and stabilisation the suction and pressure pipes are provided with lateral branches (l, l^1) which can effect both lateral steering, as well as upward and downward steering by drawing in air or blowing out compressed air.

7. Means according to Claim 1 characterised by the fact that there are mounted laterally on the vehicle projecting compressed air chambers (k, k^1) which are open underneath and provided with high pressure nozzles.

8. Means according to Claim 1, characterised by the fact that some of the pressure pipes i i^1 for upward propulsion are arranged in pairs relatively to each other and arranged obliquely.

9. Means according to Claim 1, characterised by the fact that the outlets of the pressure pipes i are each provided with telescopic jackets (hoses) or the like (n).

Dated this 12th day of May, 1925.

WHEATLEY & MACKENZIE,
40, Chancery Lane, London, W.C. 2,
Agents.

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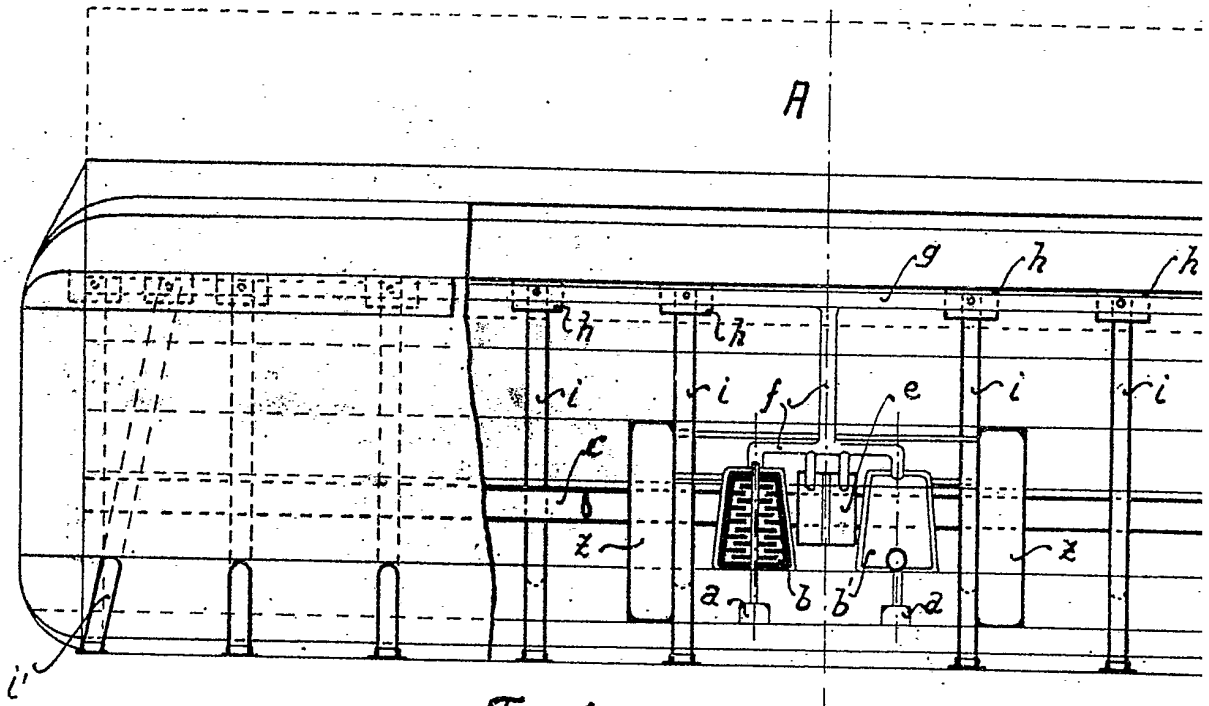


Fig. 1

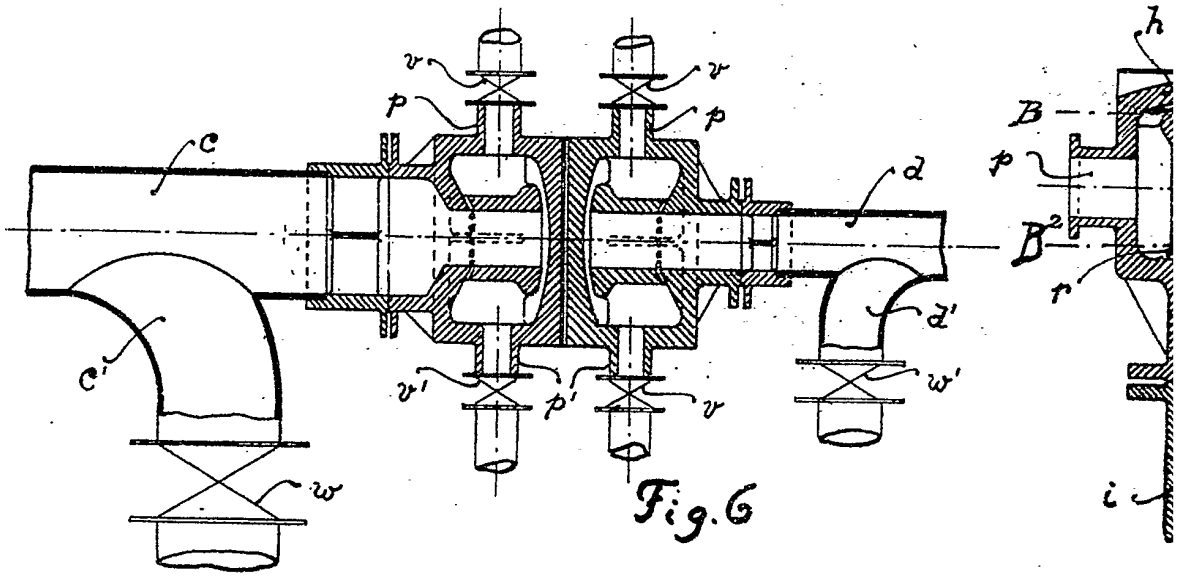
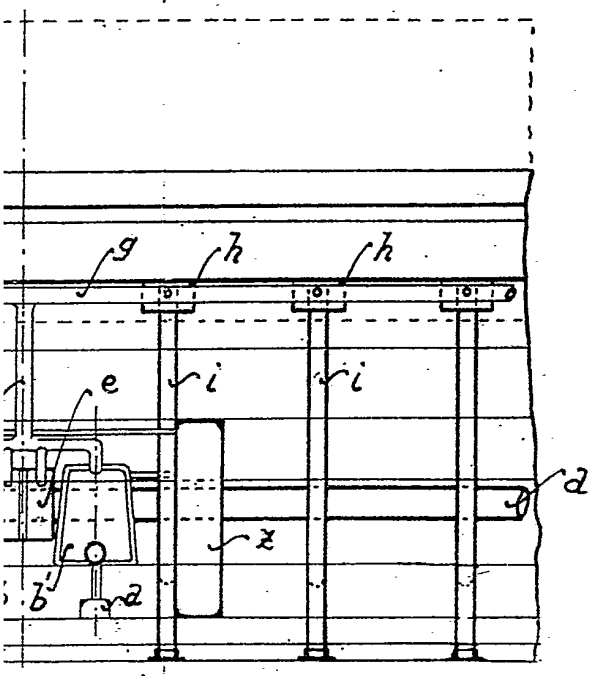


Fig. 6



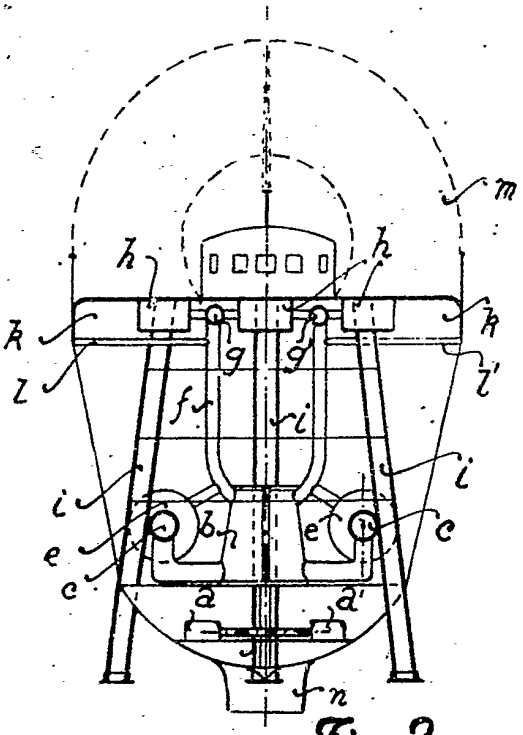
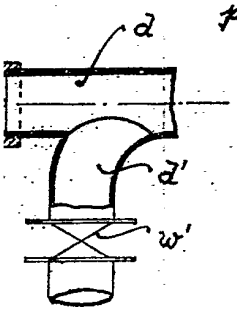
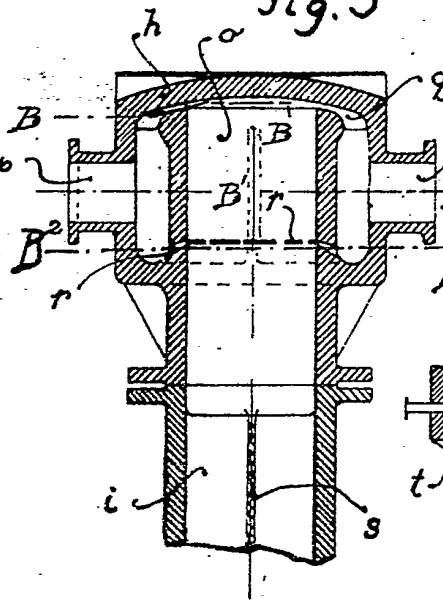


Fig. 2

Fig. 3





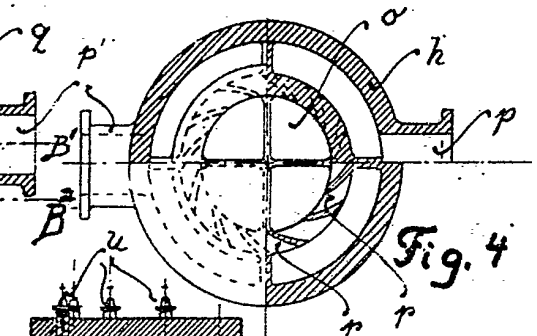


Fig. 4

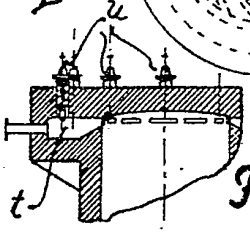


Fig. 5

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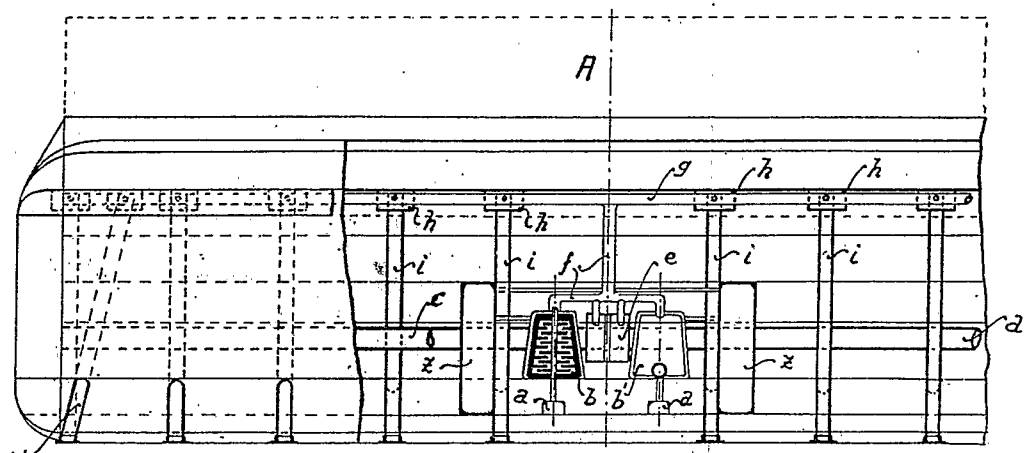

Fig. 1

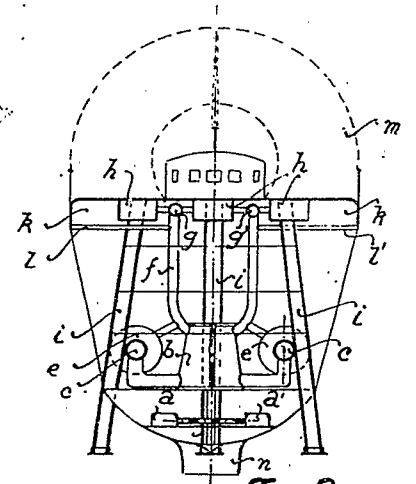

Fig. 2

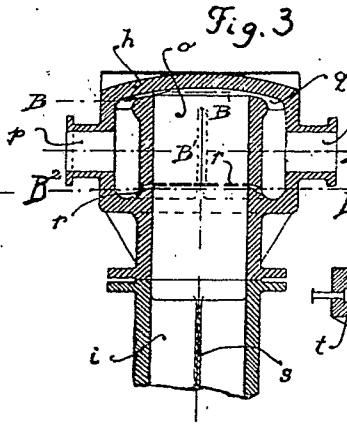

Fig. 3

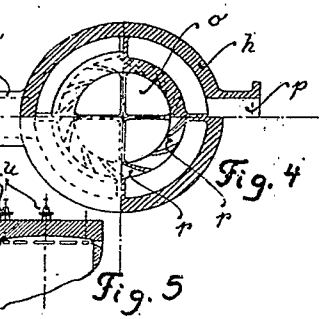

Fig. 4

Fig. 5

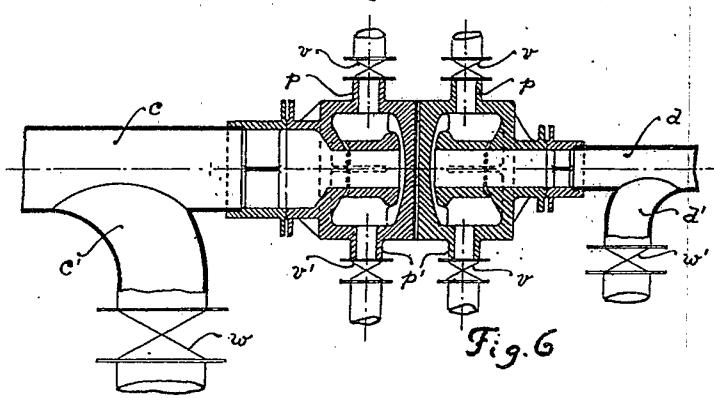

Fig. 6

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