

No. 861,047.

PATENTED JULY 23, 1907.

P. F. ODDIE.
POWER MACHINE.
APPLICATION FILED MAY 7, 1907.

Fig. 2.

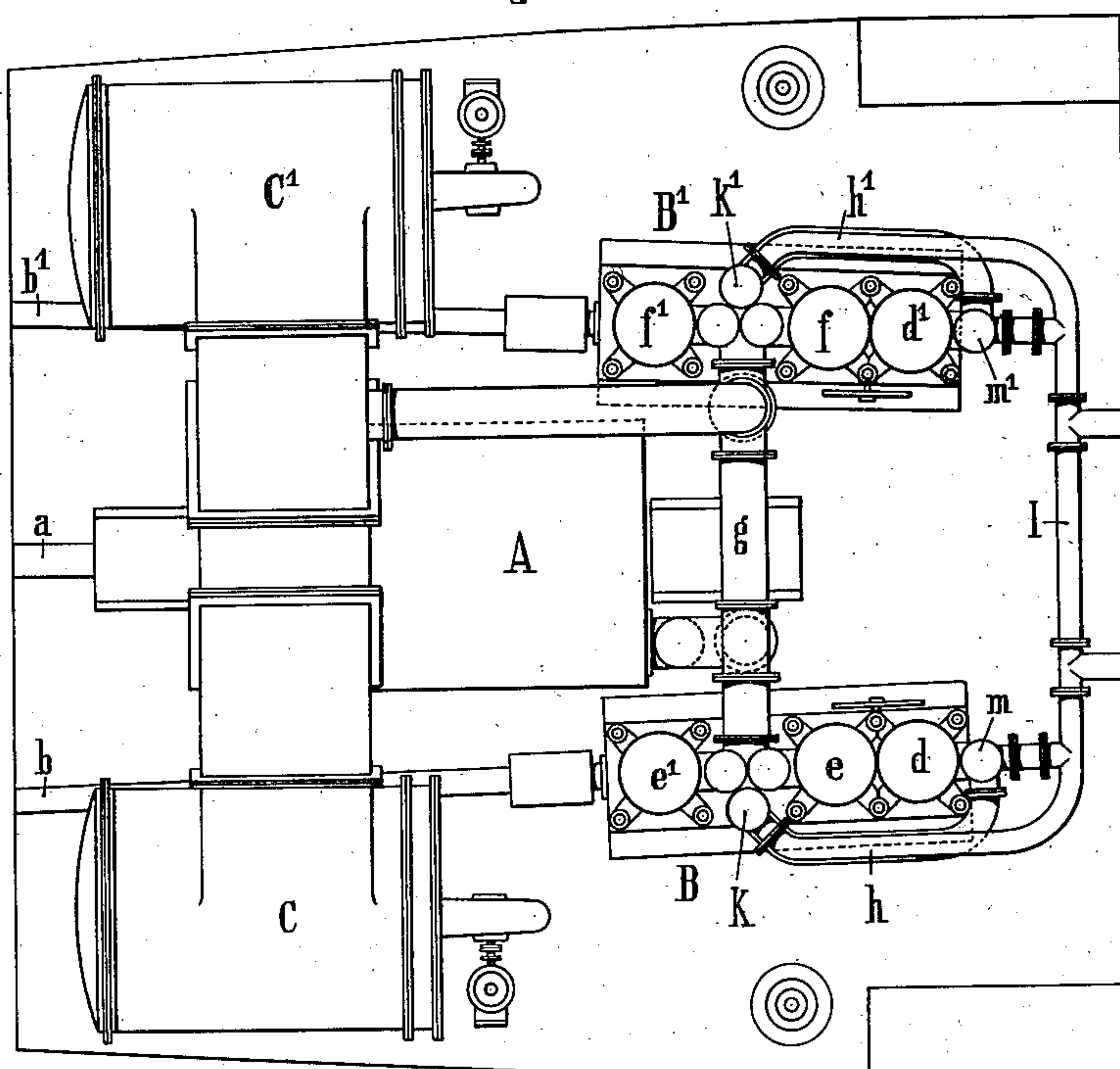
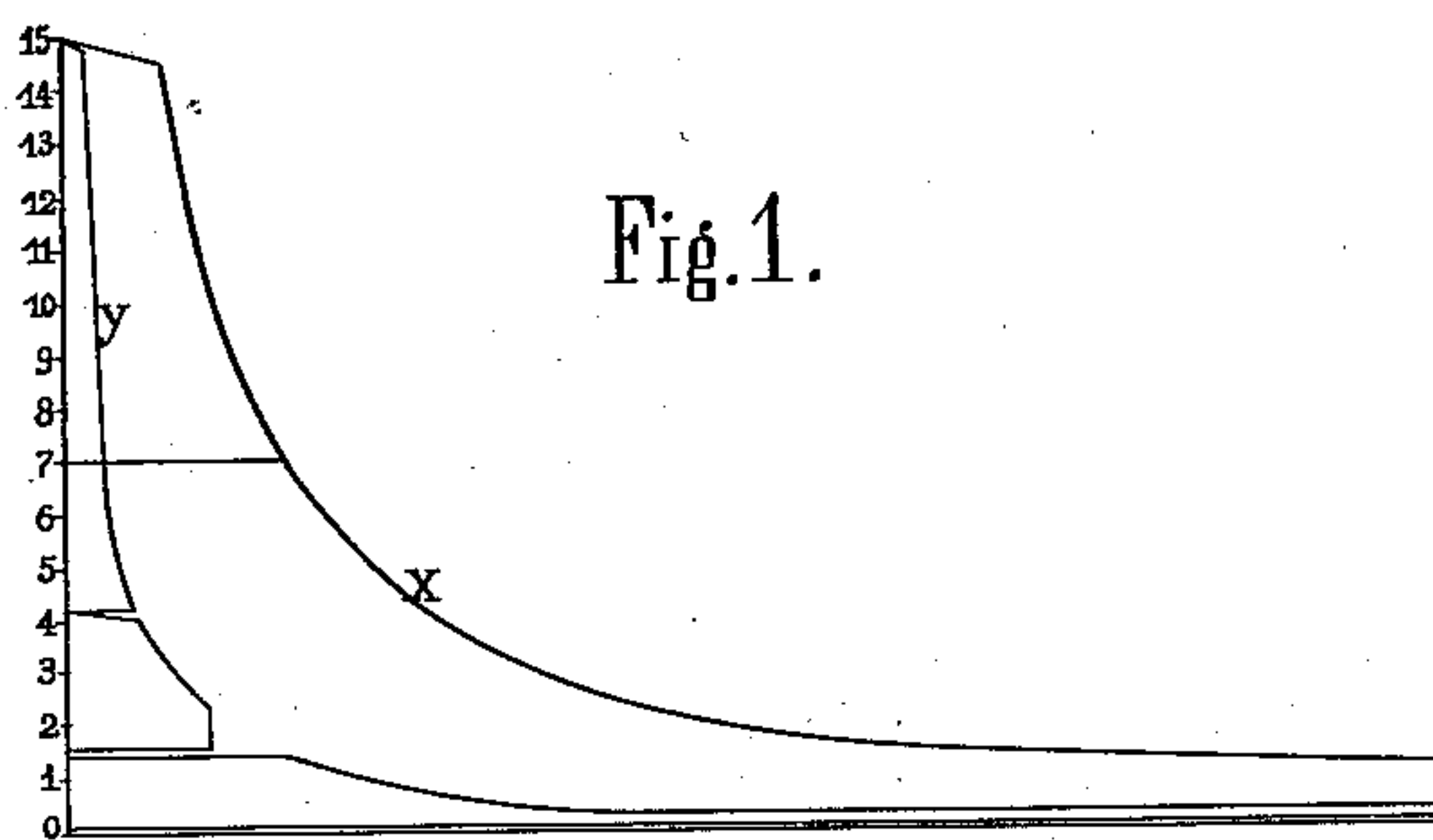


Fig. 1.



Witnesses:

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UNITED STATES PATENT OFFICE.

PHILIP FRANCIS ODDIE, OF WIMBLEDON, NEAR LONDON, ENGLAND.

POWER-MACHINE.

No. 861,047.

Specification of Letters Patent.

Patented July 23, 1907.

Application filed May 7, 1907. Serial No. 372,414.

To all whom it may concern:

Be it known that I, PHILIP FRANCIS ODDIE, engineer, a subject of the King of Great Britain and Ireland, and a resident of Wimbledon, near London, England, have
5 invented new and useful Improvements in Power-Machines, of which the following is a specification.

The following invention relates to a new arrangement for the development of power by means of a combination of a reciprocating machine or machines
10 with turbines in which the steam passes first through three or more cylinders of the reciprocating machine before being used in the turbine. The cylinders of the reciprocating machine are approximately of the same size but arranged in a convenient manner so that
15 it is possible that the steam shall pass through all cylinders either parallel or in series; that is to say that the cylinders can work either all as high pressure cylinders or two as high pressure cylinders and the rest as middle pressure cylinders and the turbine as low
20 pressure cylinder. It is well known that high pressure steam can be more economically used in the reciprocating engines than in turbines. On the other hand the turbine works more economically with low pressure steam than the reciprocating engines. By this invention it is possible to vary the power and speed within
25 very large limits without throttling the steam while the volume and pressure of the same passing to the turbine will always be approximately suited to the power and speed required to be developed by the same. Hitherto where steam is first allowed to pass
30 through an ordinary compound engine, this distribution of the steam was not possible, since the capacity of the high pressure cylinder remained constant and consequently by reduced powers the steam had to be
35 throttled and the turbine run altogether or partly empty. By this new arrangement it is possible in every case to run the combination of the reciprocating engines and turbines with the highest efficiency. This is particularly important when the arrangement is used
40 on cruisers or torpedoboat destroyers; for example a torpedoboat destroyer running at 28 knots per hour will develop say 8000 horse power. Such speeds, however, are only required by about 10% of the time that the ship is in use. For the rest of the time only small
45 speeds such as say 12 knots per hour are required, corresponding to about 300 horse power.

In Figure 1 the diagram line *x* shows an indicated horse power of 8000 all cylinders working as high
50 pressure cylinders and allowing the exhaust to pass at a comparatively high pressure into the turbine. *y* is a diagram showing an indicated horse power of 300 in which the boiler pressure steam is only allowed to enter to the first cylinder in each reciprocating machine the other cylinders receiving the exhaust from
55 the first cylinder. These cylinders working as mid-

dle pressure cylinders further expand the steam, while the turbine receiving the steam from these two cylinders acts as a low pressure cylinder and expands the steam to the pressure of the condenser. It will be seen from this that not only for the development of 60 8000 horse power but also for the development of the smallest power namely 300 horse power the full boiler pressure is used. At both these powers the reciprocating machine as well as the turbine is used, and neither in one or the other case is the turbine or the 65 reciprocating machine disconnected.

Fig. 2 shows in plane the arrangement of the invention for a triple screw machine. *a* is the center shaft, *b* one of the side shafts. *A* is the turbine, *B* is one of the reciprocating machines and *B/1* the other. Each 70 reciprocating machine possesses 3 cylinders of approximately equal diameter. *C* and *C/1* are condensers. Each reciprocating engine drives a shaft *b*, *b/1*, respectively, while the turbine drives the middle shaft *a*. These shafts working all independently of 75 another. Steam enters by the pipe *l* and passes the valves *m* *m/1* of the cylinders *d* *d/1*. At cruising speeds the exhaust from the high pressure cylinders *d* *d/1* by means of the pipe *h* *h/1* passes into the middle pressure cylinders *e* *e/1*, *f* *f/1*, while the exhaust from 80 these middle pressure cylinders passes into a common pipe *g* and into the turbine *A*. From the turbine *A* it passes in the usual way into the condensers *C* *C/1*. *k* *k/1* are valves which allows fresh steam from the admission pipe *l* to pass into the cylinders *e* *e/1* and *f* 85 *f/1*, while at the same time allowing the exhaust from the cylinders *d* *d/1* to pass directly into the common pipe *g*. For full powers fresh high pressure steam is let into all the cylinders with the comparatively long admission. The steam passes through all the cylin- 90 ders parallel and then exhausting into the common pipe *g* directly into the turbine *A*. If it is required to reduce the speed one can give less admission to all the cylinders. The exhaust pressure from the cylinders will be then lower, and the initial commencing 95 pressure of the turbine will also be lower, the speed of the ship, however, will be reduced so that the speed of the turbine will suit the reduced pressure of the steam. By maneuvering one can cut out the turbines altogether using only the reciprocating engines 100 and allowing the steam from these to pass directly into the condenser. In reversing one can either use reciprocating engines alone all as high pressure cylinders or in series as high pressure and low pressure, or by the introduction of the reversing turbine one can work in 105 the same way as in going ahead, letting the steam pass through the reciprocating cylinders either in series or parallel and exhausting into the reversing turbine.

Having now particularly described and ascertained 110

the nature of the said invention and in what manner the same is to be performed I declare that what I claim is:—

1. A power-machine, consisting of a combination of
5 reciprocating engines consisting of three or more cylinders, all approximately of the same diameter, in which the steam can pass through either all cylinders working parallel and then exhaust at a comparatively high pressure into the turbine or turbines to finish its expansion, or
10 in which the steam can pass through the reciprocating engines in series working as compound, and then exhaust at a comparatively low pressure into the turbine and there finish its expansion substantially as described.

2. A power machine, consisting of a combination of
15 reciprocating engines and turbines, the reciprocating engines consisting of three or more cylinders, all approxi-

mately of the same diameter, in which the steam can pass through either all cylinders working parallel and then exhaust at a comparatively high pressure into the turbine or turbines to finish its expansion, or in which
20 the steam can pass through the reciprocating engines in series working as compound, and then exhaust at a comparatively low pressure into the turbine and there finish its expansion the turbine acting on a main shaft arranged between the shafts of two reciprocating engines, substantially as described. 25

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 22nd day of April, 1907.

PHILIP FRANCIS ODDIE.

Witnesses:

HERMANN HOPPE,
HERMANN FORSFREUTER.