J. E. THORNYCROFT.

PROPULSION OF VESSELS.

APPLICATION FILED MAY 8, 1911.

1,053,243.

Patented Feb. 18, 1913

8 SHEETS—SHEET 1.

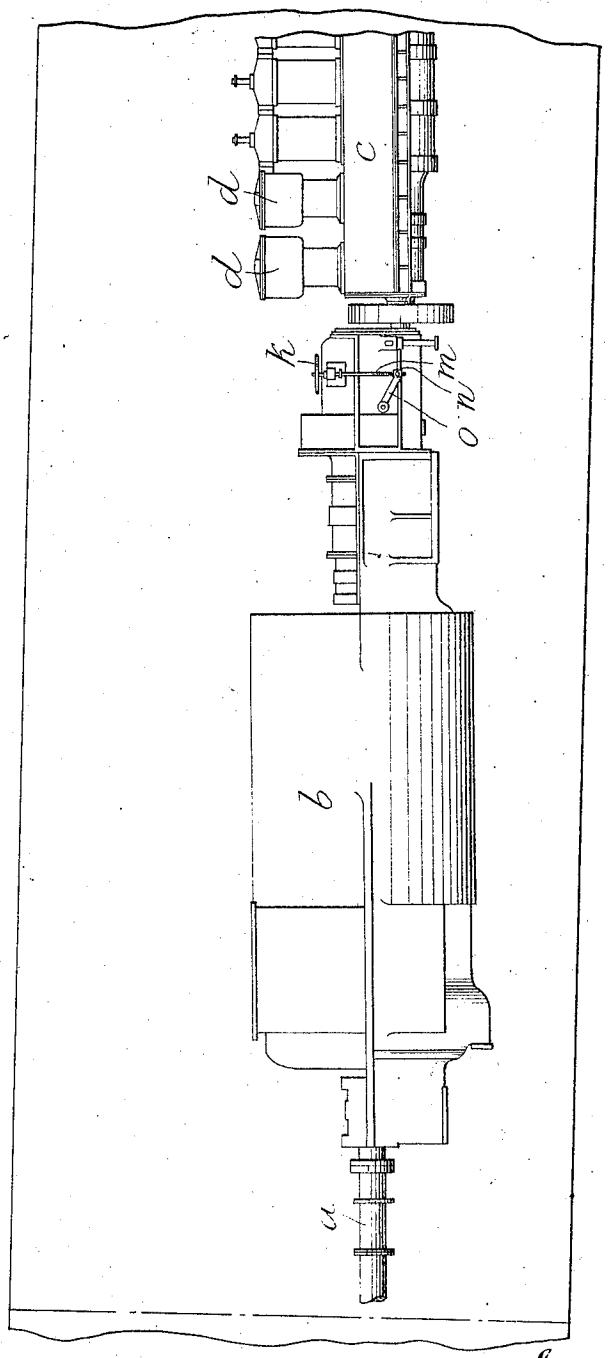

Fig. 1.

Witnesses
L. L. Bunker.
H. A. Pattison

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By A. S. Pattison
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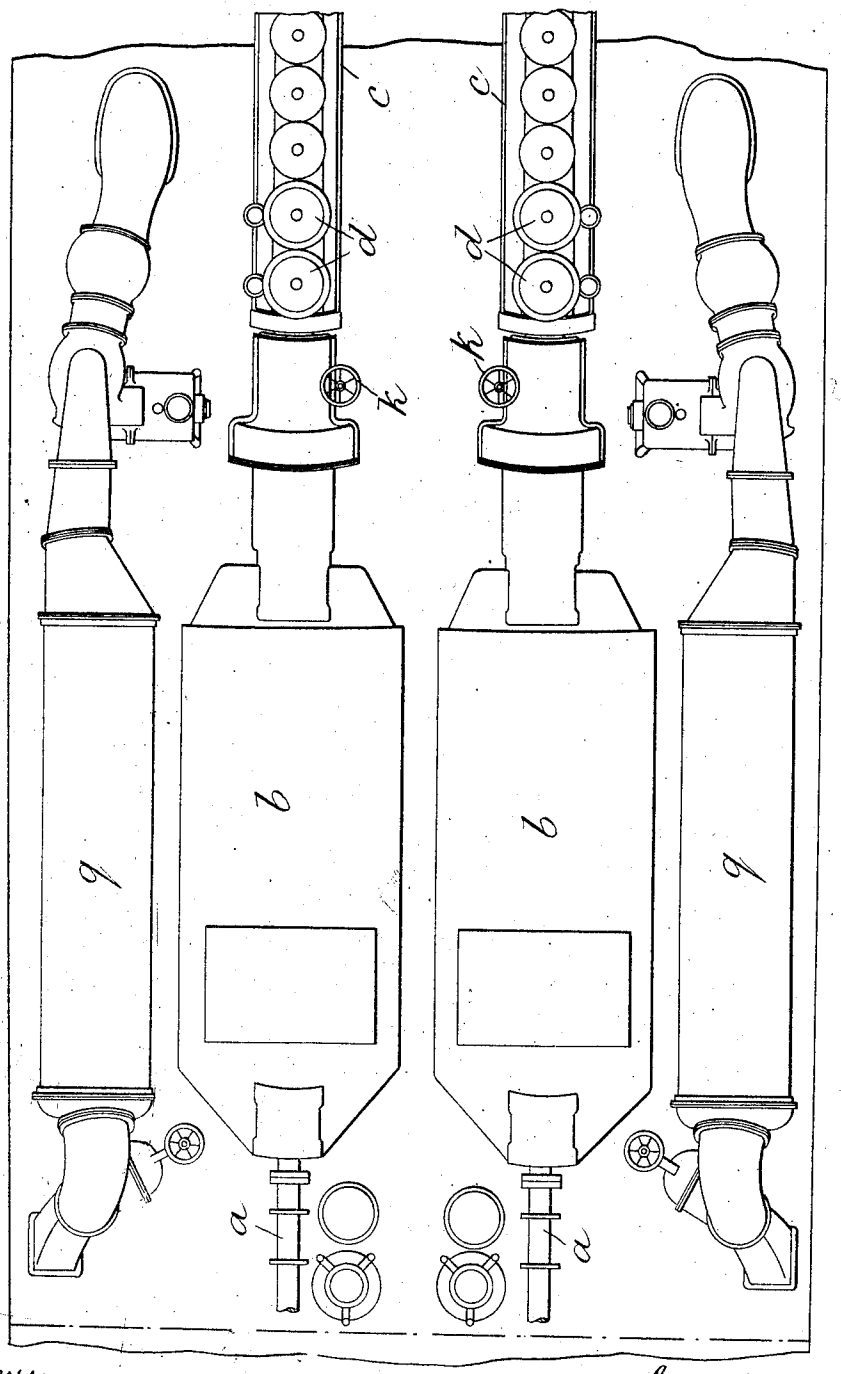

Fig. 2.

Witnesses
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H. A. Pattison.

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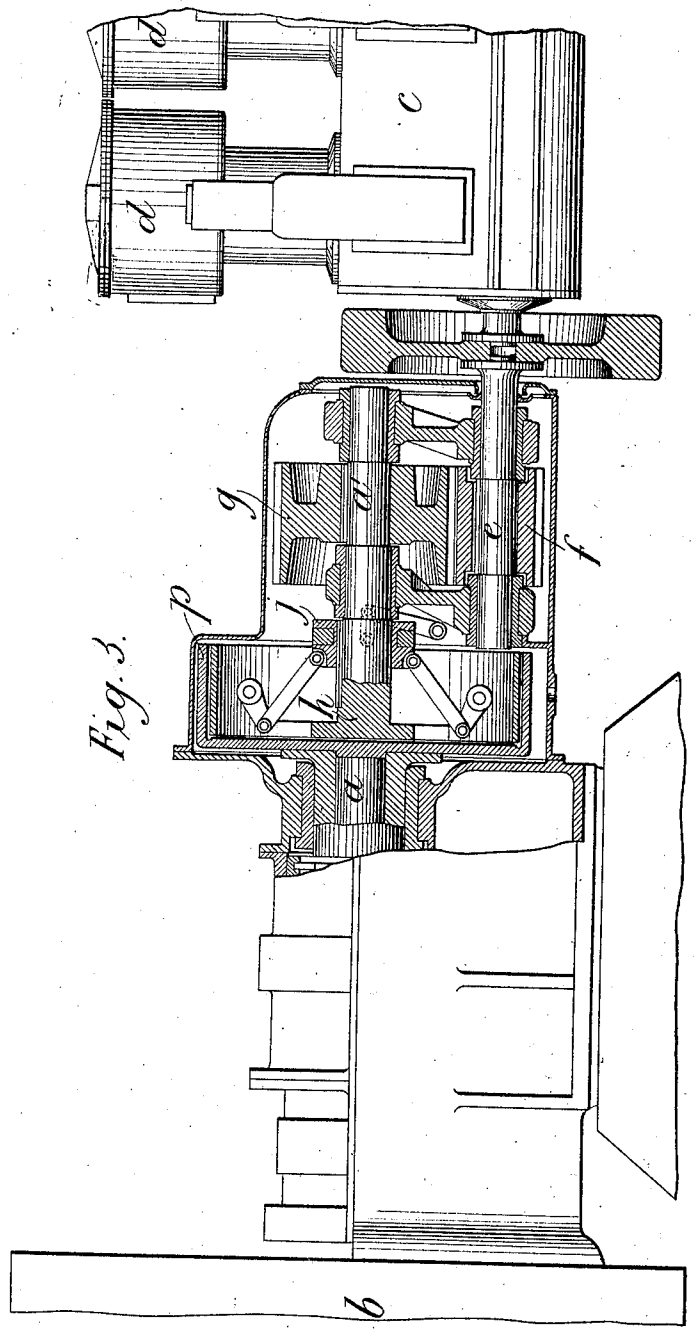

Fig. 3.

Witnesses.
L. L. Bucket.
H. A. Pattison.

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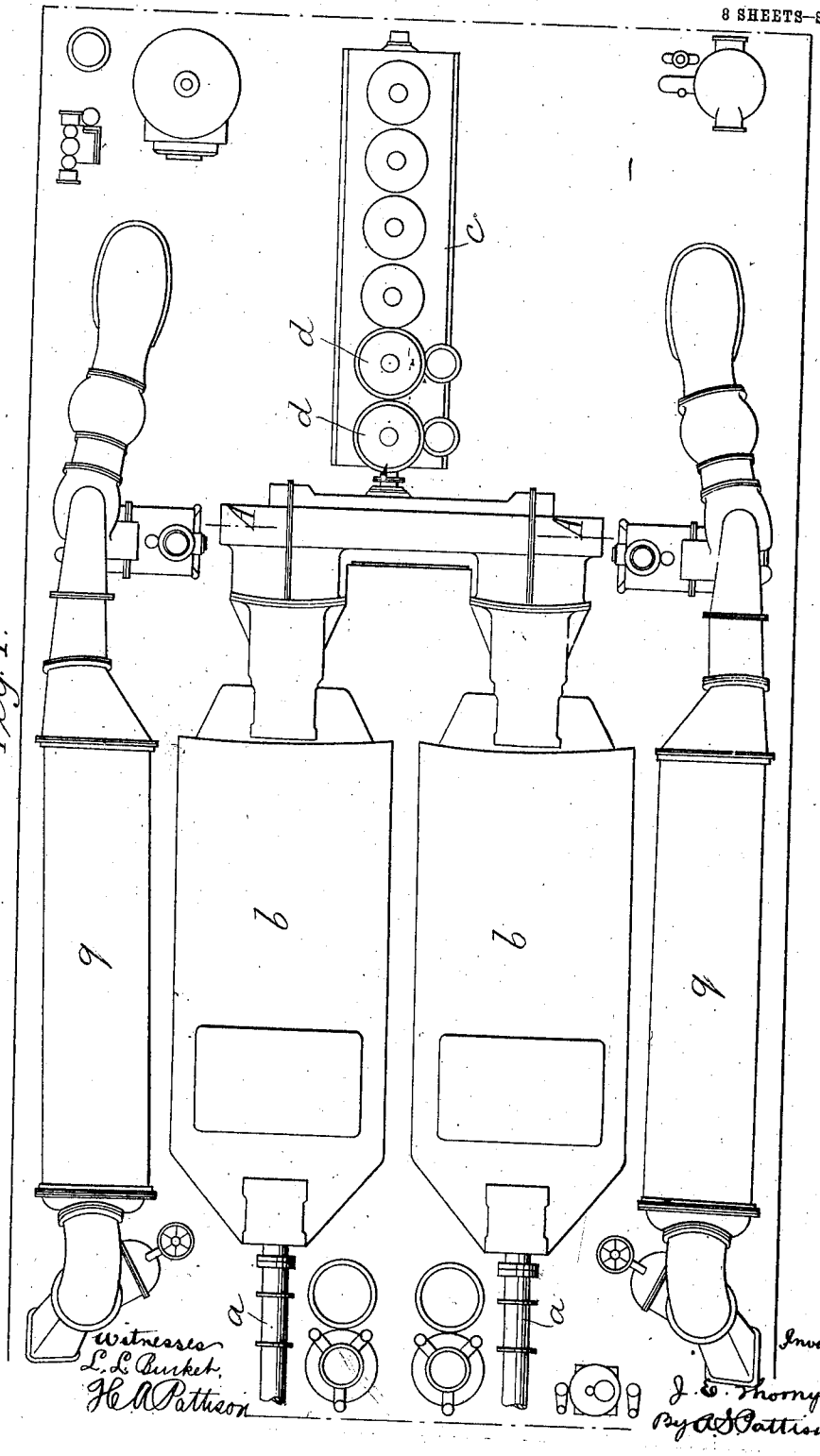
8 SHEETS—SHEET 4.

Fig. 4.



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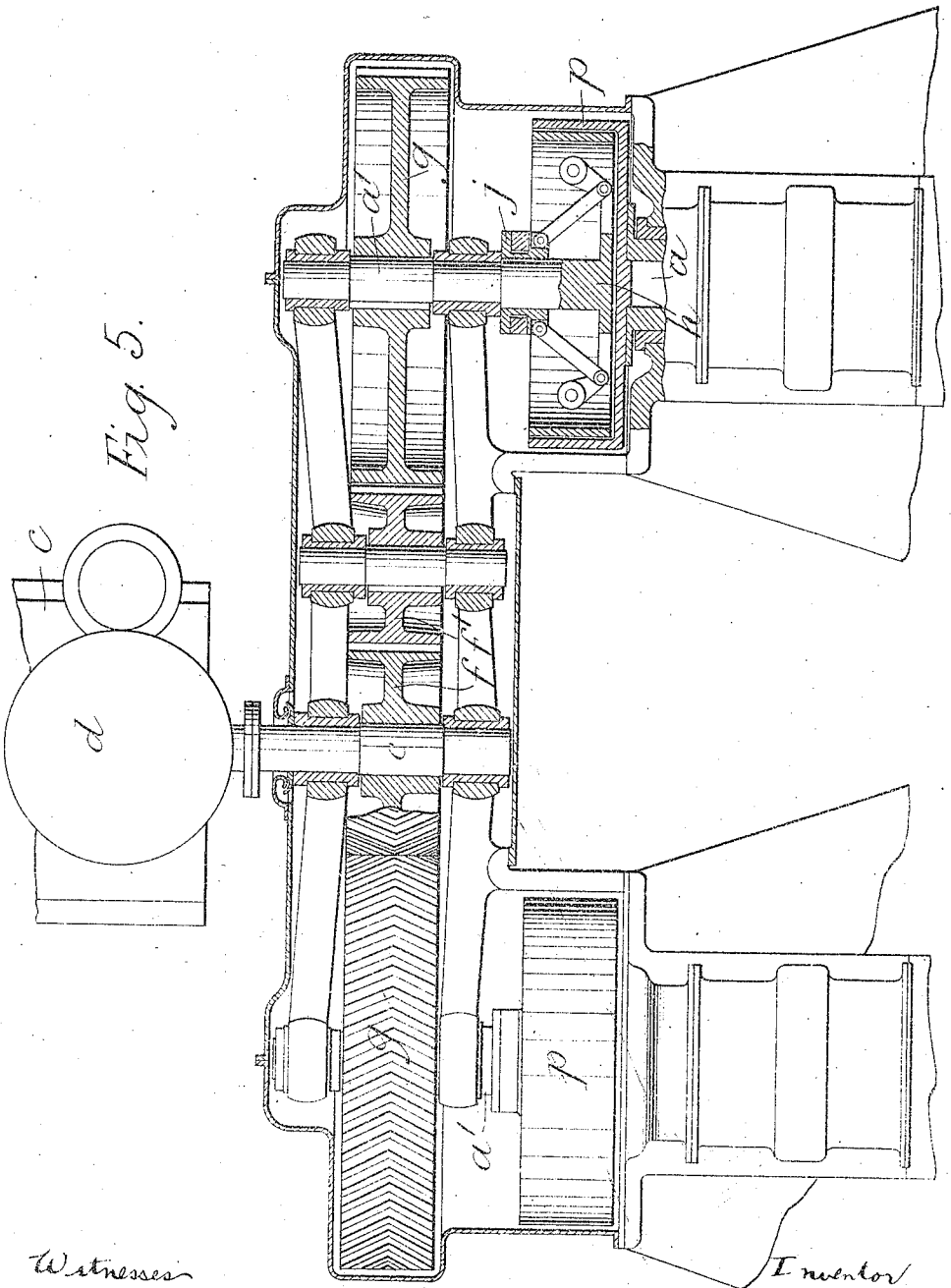
8 SHEETS—SHEET 5.

Fig. 5.



Witnesses
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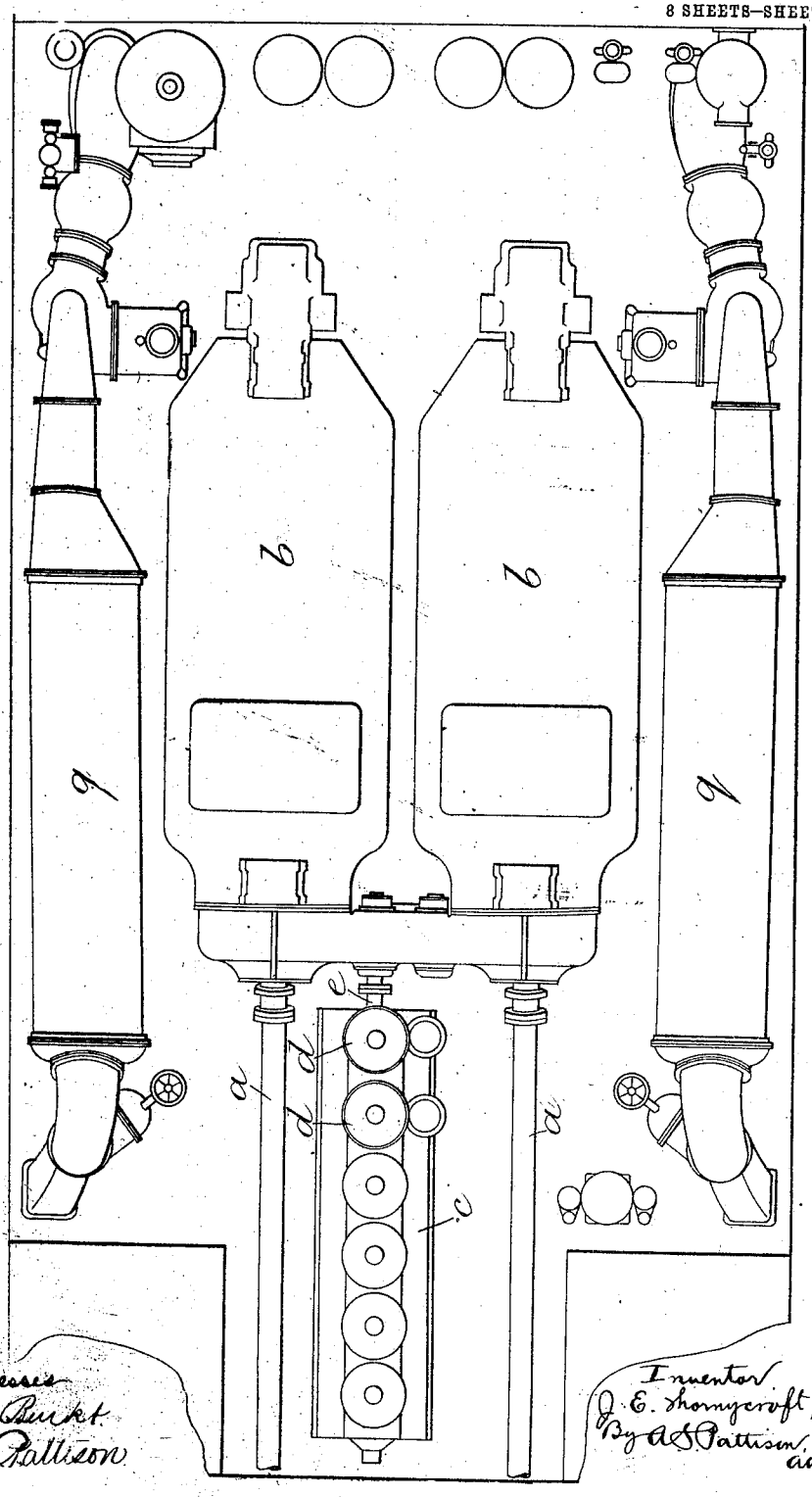
8 SHEETS—SHEET 6.

Fig. 6.



Witnesses
L. L. Burkt
H. C. Pattison

Inventor
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By A. J. Pattison
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J. E. THORNYCROFT.

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8 SHEETS—SHEET 7.

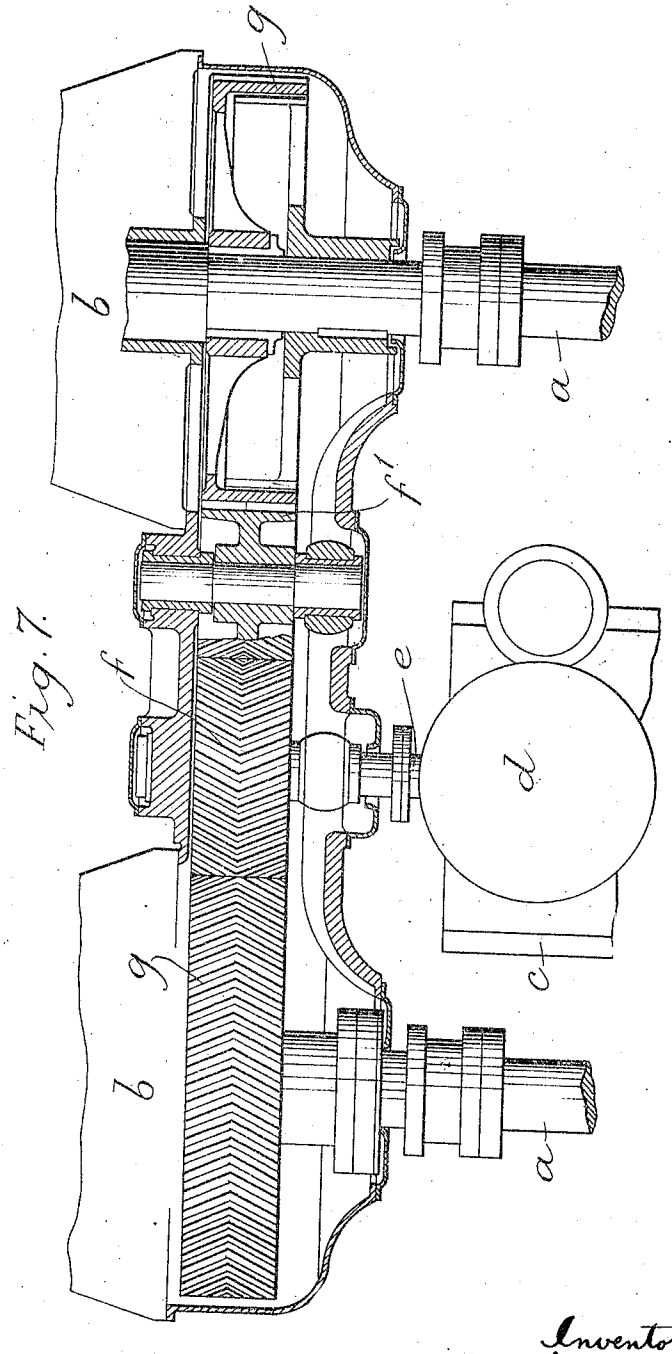

Fig. 7.

Witnesses.
L. L. Tucker.
H. A. Pattison.

Inventor.
J. E. Thornycroft.
By A. S. Pattison,
Atty.

J. E. THORNYCROFT.

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8 SHEETS—SHEET 8.

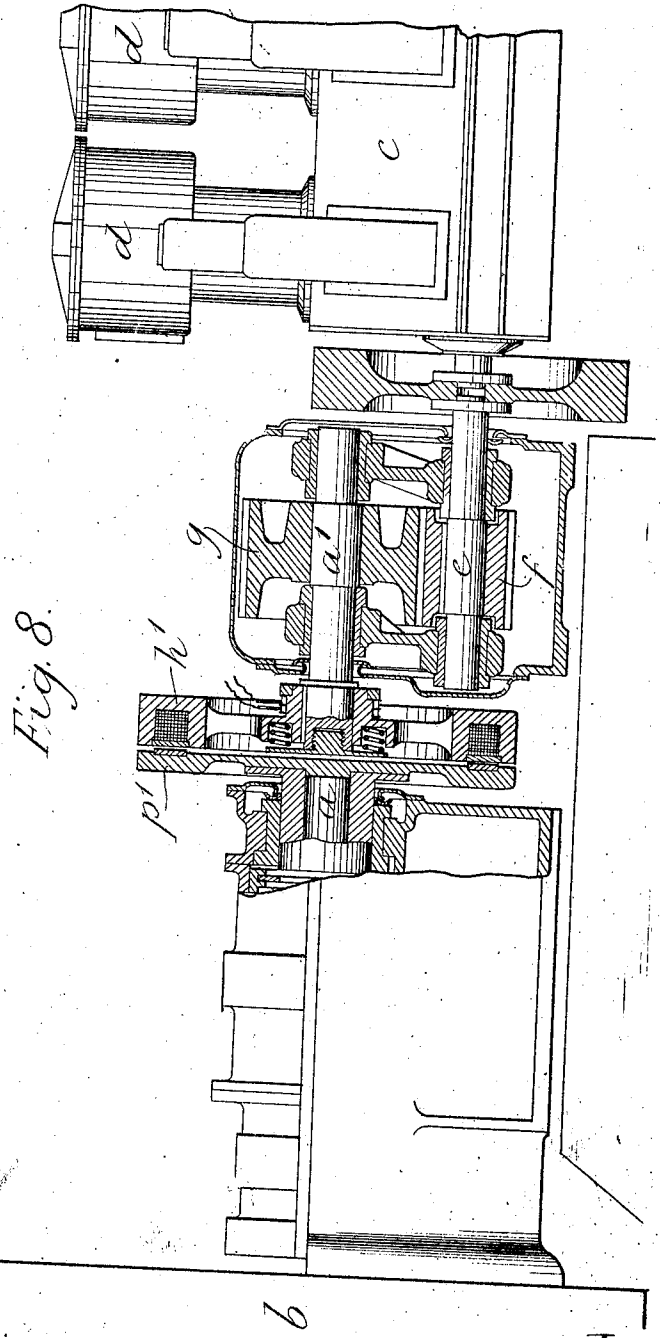

Fig. 8.

Witnesses.
L. L. Sinclair.
H. A. Pattison.

Inventor.
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By A. S. Pattison
Atty

UNITED STATES PATENT OFFICE.

JOHN EDWARD THORNYCROFT, OF WOOLSTON, ENGLAND.

PROPULSION OF VESSELS.

1,053,243. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed May 8, 1911. Serial No. 625,377.

To all whom it may concern:

Be it known that I, JOHN EDWARD THORNYCROFT, a subject of the King of Great Britain and Ireland, residing at Woolston, in the county of Hants, England, have invented Improvements Relating to the Propulsion of Vessels, of which the following is a specification.

This invention relates to the propulsion of vessels, such as high speed warships, which at times require the development of very considerable power but frequently cruise at low speeds when the power required is only a small fraction of the maximum that must be provided for.

The primary object of the invention is to provide for this purpose improved installations comprising turbines and internal combustion engines, with means for bringing the said turbines and internal combustion engines into use alternatively.

With this and other objects in view, the invention consists in the arrangements and combinations of parts hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation, Fig. 2 a plan and Fig. 3 a sectional elevation, to a larger scale, of part of Fig. 1, illustrative of one arrangement according to the invention. Fig. 4 a plan of a modified arrangement. Fig. 5 is a sectional plan drawn to a larger scale, of part of the arrangement shown in Fig. 4. Figs. 6 and 7 are views corresponding respectively to Figs. 4 and 5, of a further modified arrangement. Fig. 8 is a sectional elevation of a still further modification.

The arrangement shown in Figs. 1, 2 and 3 is assumed to be for a torpedo boat destroyer requiring say 15000 H. P. when driven at full speed but approximately only 1200 H. P. to obtain a cruising speed of say 15 knots. *a*, *a* represent two propeller shafts each provided with a turbine *b* of 7500 H. P. so that when used together they aggregate 15000 H. P. for full speed propulsion. *c*, *c* represent oil engines, which may be reversible, of say the Diesel type, each of 600 H. P. so that when used together in lieu of the turbines the required cruising speed can be obtained. The oil engines are assumed to be of two stroke cycle type, *d*, *d* being the air pumps therefor. Each engine *c* is disposed forward of the turbine *b* and its shaft *e* is capable of being, through speed reducing and clutch gear, coupled to and uncoupled from the corresponding propeller shaft whereon is secured the rotor of the turbine. As shown more particularly in Fig. 3, the shaft *e* is provided with a pinion *f*, preferably formed with double helical teeth, engaging a similarly toothed wheel *g* on a short shaft a^1. This shaft a^1 is provided with a friction clutch element *h* adapted to be expanded by axial movement of a clutch sleeve *j* operated through a hand wheel *k*, screw *m*, nut *n* and lever connections *o*. The companion clutch member *p* is secured directly upon the corresponding propeller shaft *a*. The arrangement is such that when it is desired to cruise, the clutch of each shaft *a* is operated to connect the oil engines *c* to the said shafts and cause them to drive the latter, the turbines *b* being connected, if desired, to condensers *q*. When the turbines are to be used, the clutches are operated to disconnect the oil engines from the shafts *a*.

The use of oil engines is advantageous in permitting the economical employment of oil fired steam generators which may be of a capacity to supply the turbines as well as the auxiliaries of the vessel. The turbines can be rotated by the internal combustion engine or engines during warming up of the former, thereby effecting a saving of time at starting and enabling the warming up to be done more satisfactorily.

In the modified arrangement shown in Figs. 4 and 5, the whole of the power required for cruising purposes is derived from a single internal combustion engine *c* arranged forward of the turbines *b*, *b* and adapted to be geared to both of the propeller shafts, the pinion *f* on the engine shaft *e* directly meshing with the wheel *g* pertaining to the clutch of one of the propeller shafts *a* and indirectly driving the wheel *g* pertaining to the clutch of the other propeller shaft *a* through an intermediate wheel f^1.

The arrangement according to Figs. 6 and 7 differs from the arrangement just described in that the oil engine *c* is disposed aft of the turbines *b*, *b* and the clutches are arranged on the propeller shafts *a*.

Although friction clutches have been specifically illustrated in the foregoing figures

other forms of clutch may be employed, Fig. 8 illustrating elements h^1 p^1 of an electromagnetic clutch of any suitable type.

What I claim is:—

1. In a vessel, propeller shafts, steam turbines on such shafts, an internal combustion engine plant, speed reduction gearing comprising a wheel in axial alinement with each propeller shaft and driven from the combustion engine plant, a clutch member rotatable with each such wheel and companion clutch members severally rotatable with the propeller shafts and adapted to place each propeller shaft independently in and out of driving connection with its companion gear wheel.

2. In a vessel, propeller shafts, a turbine on each shaft, an internal combustion engine of a power less than the total power of the turbines and having a shaft parallel to but out of alinement with the propeller shafts, a gear wheel on the engine shaft, a larger gear wheel in alinement with each propeller shaft and adapted to transmit the power of the engine to the propeller shafts with a reduction in speed, a clutch member rotatable with each such larger gear wheel, and companion clutch members severally rotatable with the propeller shafts and adapted to place each propeller shaft independently in and out of driving connection with its companion gear wheel.

3. In a vessel, twin propeller shafts, a turbine on each shaft, an internal combustion engine of a power less than the total power of the turbines arranged with its shaft parallel to but out of alinement with the propeller shafts, a gear wheel on the engine shaft, a larger gear wheel in alinement with each propeller shaft, one such gear wheel being in direct mesh with the engine gear wheel, a reversing gear wheel between the latter and the gear wheel associated with the other propeller shaft, clutch members severally rotatable with the larger gear wheels and companion clutch members severally rotatable with the propeller shafts and adapted to place each propeller shaft independently in and out of driving connection with its companion gear wheel.

4. In a vessel, twin propeller shafts, a turbine on each shaft, an internal combustion engine of a power less than the total power of the turbines, arranged with its shaft parallel to but out of alinement with the propeller shafts, a combined toothed gear wheel and clutch member loosely mounted on each propeller shaft, a toothed pinion on the engine shaft directly engaging one of said toothed wheels, an intermediate pinion engaging the engine shaft pinion and the other toothed wheel, and clutch members rotating with but axially movable along the propeller shafts adapted to be operated independently to engage the said combined gear wheel and clutch members.

5. In a vessel, twin propeller shafts, a turbine on each shaft, an oil engine of a power less than the total power of the turbines arranged aft of the turbines and with its shaft parallel to and between the propeller shafts, a combined toothed gear wheel and clutch member loosely mounted on each propeller shaft, a toothed pinion on the engine shaft directly engaging one of said toothed wheels, an intermediate pinion engaging the engine shaft pinion and the other toothed wheel, and clutch members rotating with but axially movable along the propeller shafts adapted to be operated independently to engage the said combined gear wheel and clutch members.

Signed at London, England, this 27th day of April, 1911.

JOHN EDWARD THORNYCROFT.

Witnesses:

C. P. LIDDON,

R. F. WILLIAMS.