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C. A. PARSONS.

PROPELLING VESSELS BY STEAM TURBINES.

(Application filed Jan. 26, 1897.)

(No Model.)

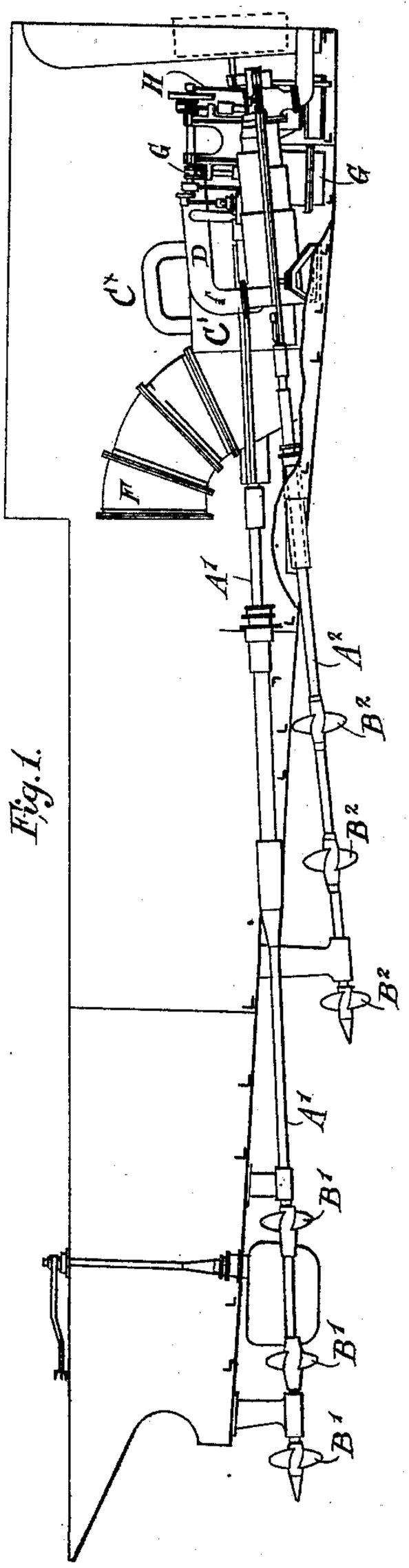

Fig. 1.

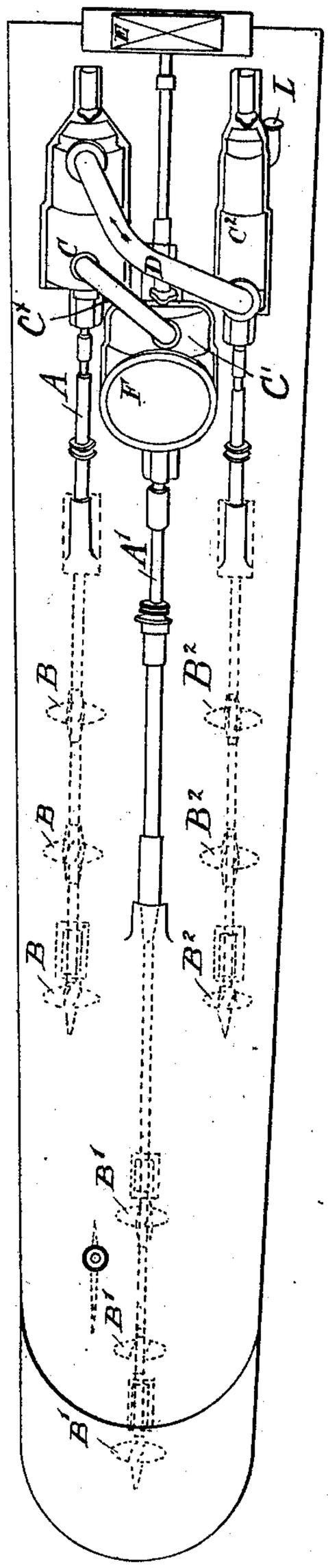

Fig. 2.

WITNESS:

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UNITED STATES PATENT OFFICE.

CHARLES ALGERNON PARSONS, OF NEWCASTLE-UPON-TYNE, ENGLAND.

PROPELLING VESSELS BY STEAM-TURBINES.

SPECIFICATION forming part of Letters Patent No. 716,468, dated December 23, 1902.

Application filed January 26, 1897. Serial No. 620,719. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ALGERNON PARSONS, engineer, a citizen of Great Britain, residing at Heaton Works, Newcastle-upon-Tyne, in the county of Northumberland, England, have invented certain new and useful Improvements in Propelling Vessels by Steam-Turbines, of which the following is a specification.

My invention relates to vessels propelled by steam-turbines; and my object is to obviate certain difficulties which I have experienced in applying steam-turbines to marine purposes.

I have found that when a steam-turbine constructed according to any of my well-known types is applied to working a screw-propeller directly the high speed of the turbine necessitates a diameter of screw-propeller which is rather too small to provide sufficient blade area to absorb the power of the engine in propelling the vessel with a high efficiency and that sometimes under such condition the efficiency is reduced by the formation of vacuum behind the blades of the propeller.

I arrange two or more screw-propeller shafts, to each of which I couple a steam-turbine, which turbines are coupled by pipes and valves, so as to cause the steam to pass through them in series or in multiple series. By this arrangement the steam passes from turbine to turbine and its expansion is completed in the series. I thus divide the total power available among two or three or even more screw-propeller shafts and use a compound turbine, which has a distinct advantage over one large motor in that its members or turbines are severally more rigid in construction than the one large motor. They permit of greater refinements of construction, and lower angular speeds may also be adopted without affecting the economical consumption of the steam.

I do not wish to limit myself to coupling each turbine separately to a screw-shaft.

The turbines I adopt may be of any known type; but I prefer my well-known turbins with or without steam-balancing arrangements for the screw thrust. The turbines may be fitted with reversing-gear, if desired. Superheaters or steam-driers in the main steam-pipe or in the connecting-pipes between the motors may also be used. I may also fit between the motors suitable by-passes and valves to secure their joint or independent working.

Referring to the accompanying sheet of drawings, illustrating one method of carrying my invention into effect, Figure 1 is a longitudinal section through part of a steam vessel, showing my turbine as applied to multiple propeller-shafts; and Fig. 2 is the corresponding plan.

In the embodiment of my invention shown I use three turbines, through which the steam passes in series, the three turbines being coupled to three propeller-shafts. The high-pressure steam is admitted to the high-pressure turbine C^2 by the steam-inlet pipe L. After passing through the turbine C^2 it is conducted by the pipe D to the intermediate turbine C, whence it passes to the low-pressure turbine C through any suitable pipe, as that shown at $C^\times$, and then the steam passes to the surface condenser by the large pipe F. The turbine C is coupled to the propeller-shaft A, which shaft carries three propellers B. The turbine C′ is coupled to the shaft A′, which carries three propellers B′, and the turbine C^2 is coupled to the shaft A^2, which carries three propellers B^2. The furnace-forced draft-fan E is also driven from the low-pressure turbine. A reciprocating air-pump G, Fig. 1, is adopted for the condenser, and it is operated by the small reciprocating steam-engine H.

I have found that at the high speed necessary to obtain economy in steam consumption from a turbine and propellers on a single shaft the propellers formed an almost continuous vacuum behind the blade, and thus led to an enormous waste of power. Recognizing this, I sought to reduce the speed of the turbine-spindle by arranging in a vessel a steam-turbine divided into three portions, each portion rotating a separate shaft having thereon a propeller. By this arrangement larger discharge areas are secured, smaller drop of steam-pressure between each set of blades, and thus are secured, also, smaller peripheral velocities for the turbine-blades. In this way I obtain three shafts operated by economical turbines and yet each running

at a lower speed than was otherwise possible. By combining with these three shafts screw-propellers in sufficient numbers of small diameter and yet in their sum of great blade area I obtained economical propulsion and an absence of vacuum loss. By my invention I am enabled to run the three shafts at a lower speed than can be done with one shaft. Further, it is practically impossible to greatly reduce speed by increasing the number of rows of blades upon one shaft. If the motor is lengthened, so as to interpose, say, two or three times the number of rows of blades between the steam entry and exhaust, so as to get a slower velocity of steam and permit of a slower rate of rotation consistent with good steam economy, it is found that the lengthening of the shaft causes so much spring as to require greatly-increased clearance between the edges of the blades and the casing and the edges of the fixed and moving blades. The economy obtained in this way is lost by the increased clearance required because of the extra spring of the shaft.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

In combination with the vessel, a plurality of steam-turbines, a propeller connected to each turbine whereby the required blade area is obtained and a steam-supply, the said turbines being connected thereto in series whereby the steam passes through the turbines in series and the whole expansive force is utilized and distributed to the several propellers, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CHARLES ALGERNON PARSONS.

Witnesses:
THOMAS JAMESON,
THOMAS RODHAM HUTCHINSON.