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R. J. SCHLOMING.

TURBINE ENGINE.

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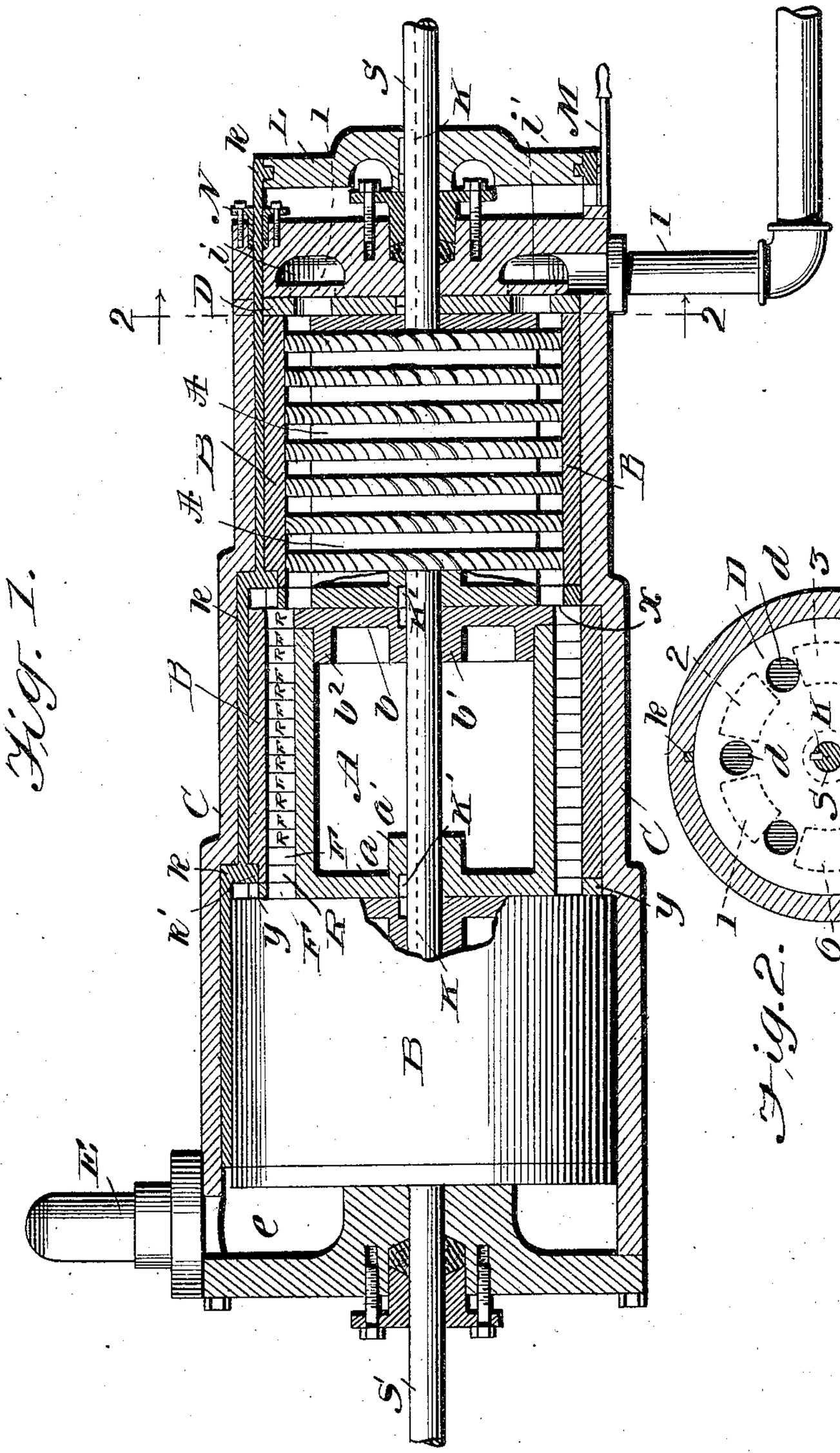

Fig. 1.

Fig. 2.

WITNESSES

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TURBINE-ENGINE.

No. 877,237. Specification of Letters Patent. Patented Jan. 21, 1908.

Application filed April 29, 1907. Serial No. 370,849.

To all whom it may concern:

Be it known that I, RICHARD J. SCHLOMING, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and useful Improvement in Turbine-Engines, of which the following is a specification.

This invention relates to turbine engines, and has for its object to provide means for reversing a single shaft turbine directly, without changing the direction of flow of the steam or other propelling fluid, and without altering the relative position, pitch or angle of the blades, and without the use of additional casings or rotary parts or disks with reversed blades, and without the duplication or addition of any of the parts of the ordinary direct acting turbine.

The invention is applicable to various kinds or makes of turbines, with slight modification, and consists, broadly speaking, in providing means whereby either set of buckets or blades may be fixed, and the other revolved, the revolving set being in either instance coupled to the shaft and the other fixed to the casing, so as to drive the shaft either way, accordingly.

The invention is illustrated in the accompanying drawings as embodied in a single shaft triple expansion turbine.

Figure 1 is a longitudinal section of the casing, the respective drums or units being shown in different sectional aspects, except the low pressure drum which is in elevation, partly broken away. Fig. 2 is a section on the line 2—2 of Fig. 1.

I employ, in each unit, two drums, one within the other and both within the casing. Either of these drums is revoluble with the shaft, and they carry blades set in opposite directions, and accordingly the direction of rotation varies according to the drum coupled to the shaft.

The casing is indicated at C, with admission pipe I and annular recess *i* in the high pressure end, and exhaust recess *e* and pipe E in opposite end. S is the shaft passing through suitable glands in the heads. The inlet of steam to the drums is controlled by the rotary valve disk D.

Each unit or section of the turbine consists of two rotary concentric drums or cylinders A and B, placed one inside the other, and the "forward" or "go ahead" blades F are (in the embodiment shown) carried by the inner drum A, and the "reverse" or "astern" blades R by the outer drum B, and these blades occupy and work across each other in the annular space between the drums, and the annular spaces of the respective sections lap at *x* to permit the flow or expansion from the high pressure to the low pressure sections. Each drum has a head, at opposite ends respectively, that of the drum A being indicated at *a* and that of the drum B at *b*, and these heads are formed with cuffs *a'* and *b'*, respectively forming bearings around the shaft S. In addition, the head *b* has an annular bearing flange b^2 for the open end of the drum A.

The shaft S has a long keyway, extending through all the sections, in which there is a slidable key K having projections K' adapted to enter a notch in either head *a* or head *b*, these heads being located beside each other in the successive sections, so that by shifting the key the projections pass from one notch to the other consequently couple or fix either drum A of one section, or drum B of the next section, to the shaft. Similarly the casing C has a long keyway in the inner side thereof, within which is a long key *k* slidable, and this key is stepped up from one section to the next. This key carries projections *k'* adapted to enter notches in the periphery of either drums A or B, the head of the drums A being extended or flanged beside the open end of the drums B, as indicated at *y*, and the notches being in these flanges and in the adjacent end of said drums. Accordingly, by shifting the key *k* one drum or the other is fixed to the casing, and the arrangement is such that when the drums A are keyed to the shaft the drums B are keyed to the casing, and vice versa, and necessarily the direction of rotation of the shaft will change accordingly, since either the drums *a* or the drums B are free to rotate with the shaft and become the driven member. At the inner end of the turbine the keys K and *k* are fixed to a yoke L which is shiftable in or out, to the extent necessary to shift the keys, by means of the reversing lever M.

The invention is not limited to the specific means shown for alternately fixing either of the drums to the shaft or casing, as friction or other devices may be used instead of the keys shown. The shaft key K is packed by

the shaft gland where it extends through the head, and the casing key *k* is packed by a gland at N in the head.

The mechanism shown makes possible the instantaneous reversal of a turbine of any number of sections, since it may be duplicated and extended to the extent desired. No more space is required than with a single acting machine of the same capacity, and the engine is of substantially equal efficiency or power when run in either direction. The direction of flow of the motive fluid is not changed, nor is the relative position or inclination of the blades.

The rotary disk D closes the steam supply automatically at the instant of reversal and thus facilitates an efficient exhaust. Said disk has a series of ports *d*, and the inlet recess *i* has a series of openings 1, 2, 3, 4, 5 and 6 which register or not with the ports as the disk is rotated. The keyways are set at such position that shift of the keys is permitted only at the instant or position when the inlet openings from the recess *i* and the ports *d* do not register, as shown in Fig. 2, and consequently the steam is shut off at that instant.

I claim

1. In a reversible turbine, the combination with a shaft and a casing having multiple expansion sections, the shaft and casing each having a long keyway extending through the sections, of a pair of rotatable members on the shaft in each section of the casing, having coöperating opposite blades, and also having notches which may be registered with said keyways, and long keys slidable in the keyways through all the sections and into the respective notches of opposite members of each pair, to couple simultaneously one set of said members to the shaft and the other to the casing a yoke mounted slidably on the shaft and connected with the said keys, and a reversing lever for operating the yoke, as shown and described.

2. In a reversible turbine, in combination, a casing having a keyway therein, a shaft extending through the casing and having a keyway, a pair of cylindrical drums extending around the shaft within the casing, the drums being located one within the other and having heads at respectively opposite ends, the heads having notched cuffs around the shaft and the head of the inner drum having a notched flange projecting around the end of the outer drum, said end having a corresponding notch, and keys slidable in the keyways and engageable in the notches to fix either drum to the casing and the other to the shaft.

3. In a reversible turbine, in combination, a casing and a shaft therethrough, an inlet head to the casing, having an annular inlet recess and a series of openings therefrom into the casing, a rotary disk valve beside said head and having ports which register or not with said openings as the disk is rotated, and means to reverse the direction of rotation of the shaft, said means being operative only when the ports are not registered with the openings.

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