No. 880,479. PATENTED FEB. 25, 1908.

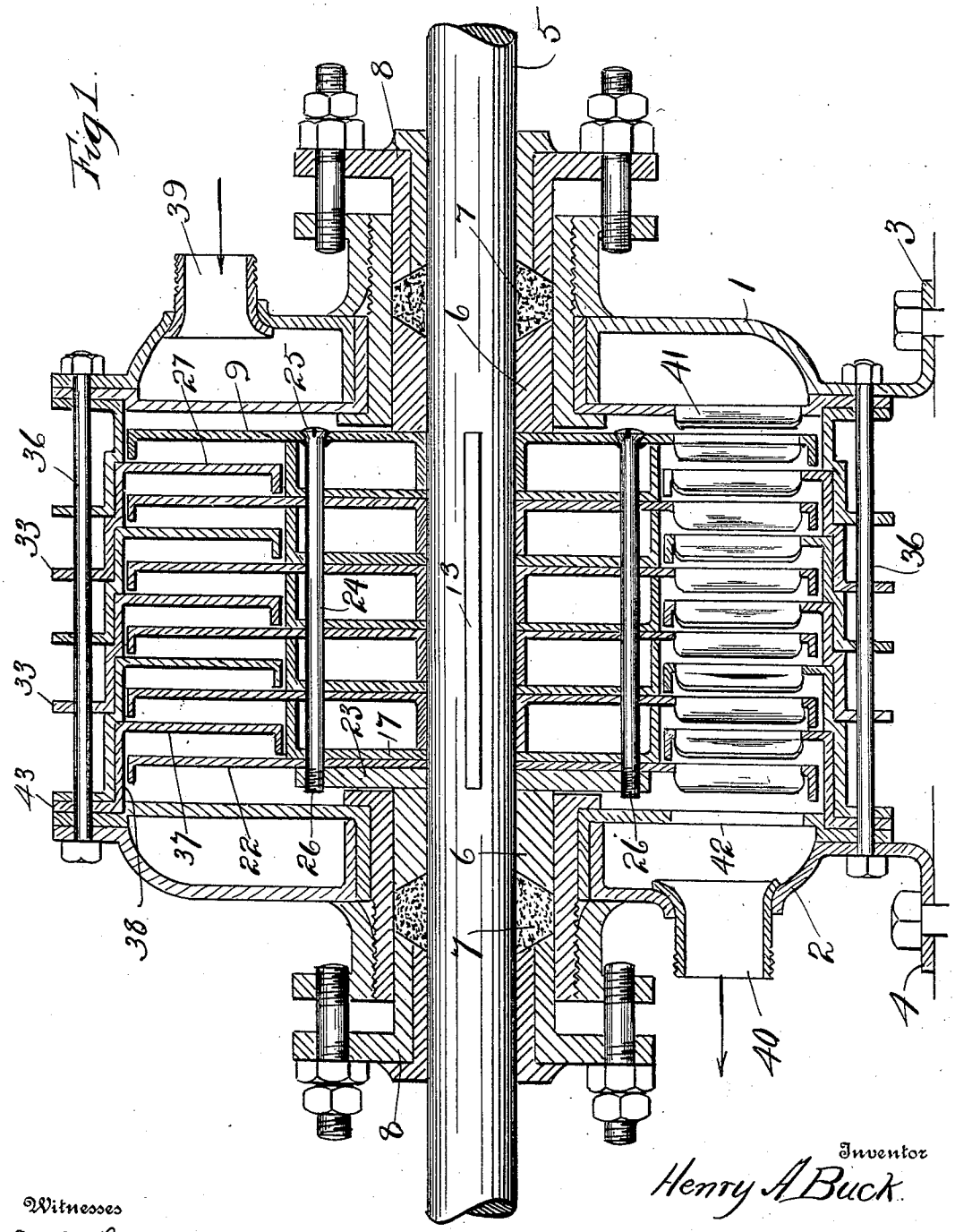
H. A. BUCK.

TURBINE ENGINE.

APPLICATION FILED MAR. 15, 1907.

3 SHEETS—SHEET 1.

Fig 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

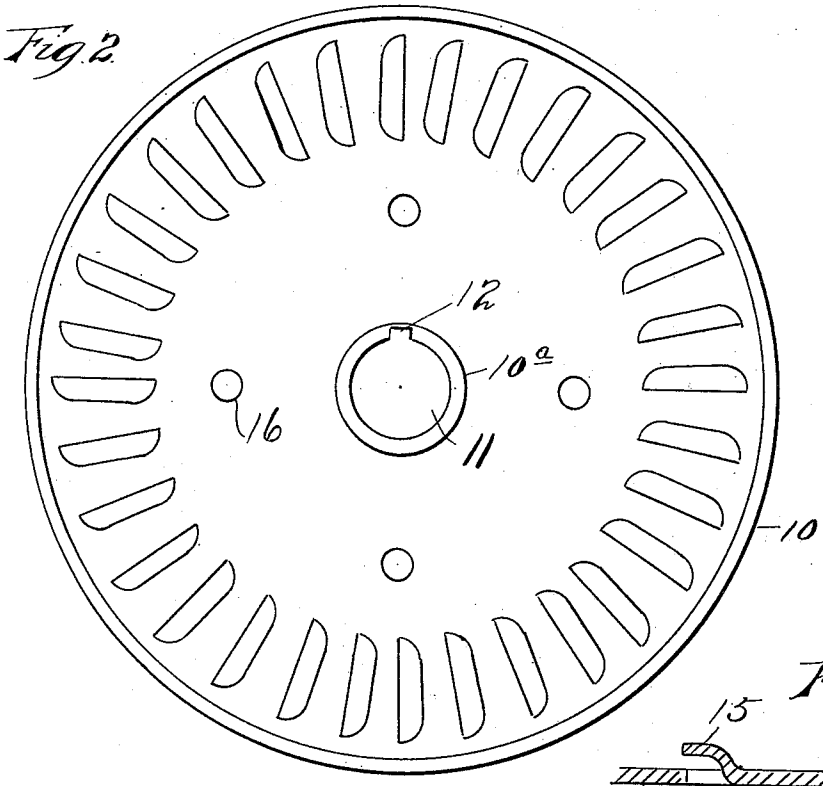


Fig. 4

Fig. 3.

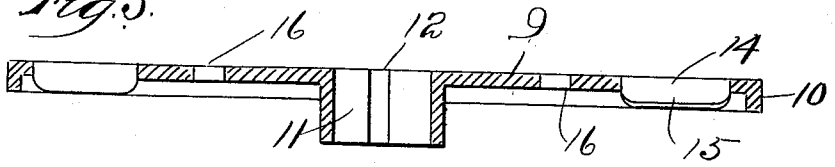


Fig. 5.

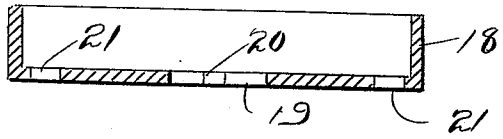
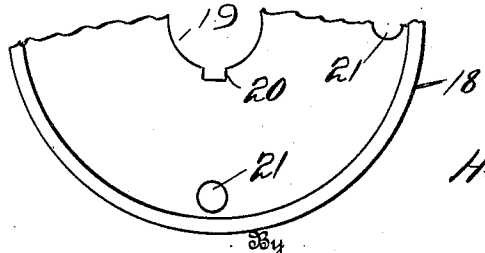


Fig. 6.



Witnesses

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3 SHEETS—SHEET 3.

Fig. 7.

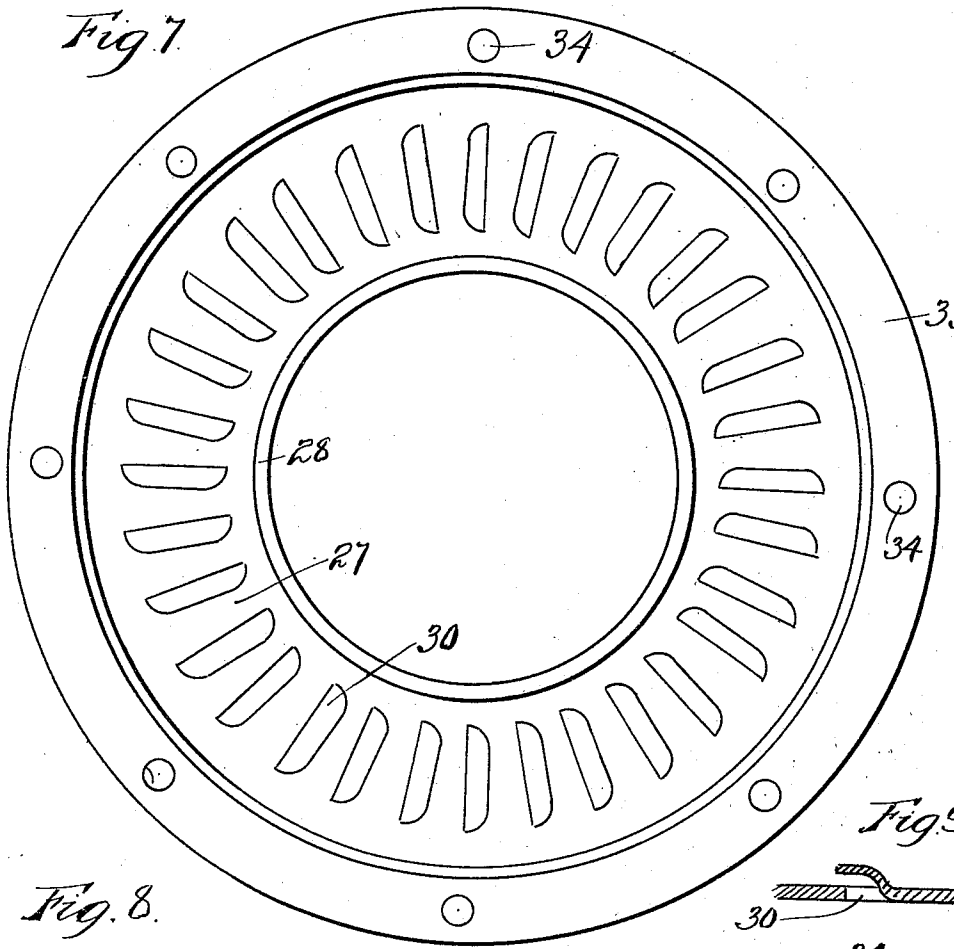


Fig. 9.

Fig. 8.

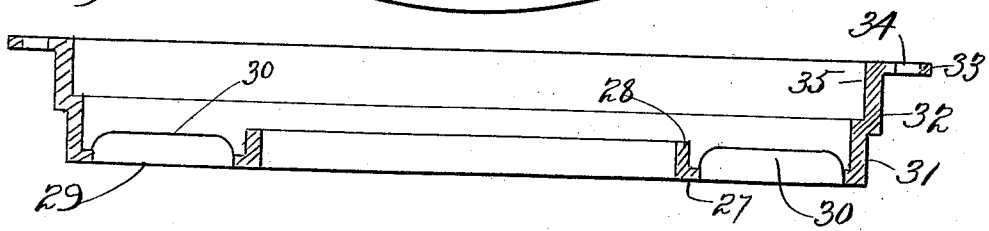
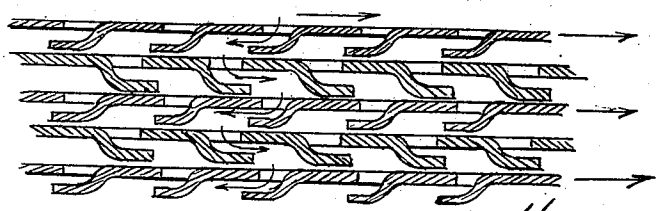


Fig. 10.



Witnesses

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UNITED STATES PATENT OFFICE.

HENRY A. BUCK, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO CHARLES D. WAINWRIGHT, OF MARBLEHEAD, MASSACHUSETTS.

TURBINE-ENGINE.

No. 880,479. Specification of Letters Patent. Patented Feb. 25, 1908.

Application filed March 15, 1907. Serial No. 362,478.

To all whom it may concern:

Be it known that I, HENRY A. BUCK, a citizen of the United States, residing at the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Turbine-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in the construction of turbine engines and has for its object to provide an engine made up of parts that are stamped, pressed or swaged from sheet or plate material into the desired form. These parts are secured together to form a complete engine that will produce the highest degree of efficiency and develop the maximum power for an engine of its weight and cubic inches of space occupied, the form of construction being most simple, practical and inexpensive.

The ordinary steam turbine engine is constructed of cast metal and must of necessity be of great weight in order to withstand the centrifugal force of the rapidly revolving disks and to provide sufficient strength to transmit the power developed. Again, the many thousands of steam ports through both the revolving and stationary disks must be formed by coring or made of independent blades fixed to the disks by suitable means. When the ports are cored the direction of the steam therethrough cannot be accurately controlled and when separate and independent blades are fixed to the disks the expense of construction is greatly increased, the blades often becoming disengaged and much damage may be done before the engine can be stopped. Then again, both the revolving and stationary disks in the ordinary engine must of necessity be of considerable thickness so that when the ports are cored therethrough they will be of sufficient length to impart the proper direction to the steam and when separate blades are used the disks must be of sufficient thickness to receive permanent fastenings for the same.

In my improved construction the above difficulties of forming the parts is entirely obviated and a great many practical and essential advantages obtained. On account of the toughness of the material used the plates may be made very thin thereby taking up little space and the ports may be formed in each of the blades by raising a deflecting lip from the stock on one side thereof which lip is bent to direct the steam at right angles to the axis of the plate, thereby obtaining the greatest efficiency from the steam used. Again, the plates being of thin material a larger number may be arranged in a short space, whereby the action of the steam may be reversed a greater number of times within a given number of inches, and consequently obtain a higher degree of efficiency from the steam used and a greater number of horse-power per pound of material. By the use of these thin plates it will also be seen that the clearance through the same is reduced to a minimum. A further advantage in this construction is that by directing the steam at right angles to the axis of the plates a greater number of lineal inches are utilized for the expansion of the same in a circular direction around the disk thereby utilizing this frictional action of the steam to assist in the rotation of the plates, again obtaining an increased efficiency from the same diameter of engine.

Another object of this invention is to draw the outer edge of the stationary plates up into a dish-form so that a part of one plate will set tightly within the other, thereby forming a steam tight body or casing for the engine from the edges of the stationary plates themselves and at the same time accurately space and securely hold these plates within this sectional casing, but I do not confine myself to this manner of construction of the shell or casing.

An engine of my improved construction has many advantages among others being, first the increased strength which is, to say the least, over three times that of any form or kind of cast metal; second, great saving in weight; third, great increase in elasticity, the possibility of breakage being reduced to a minimum; fourth, economy in the cost of construction, as an engine of my improved construction can be completed at a cost much less than that of unfinished castings for an engine capable of producing an equal horse power, without considering the expenses of finishing the same; fifth, economy in time of manufacture. The various stampings or plates can be produced, finished and assembled in less than the time required in the molding and casting of one of the parts of an ordinary old-style engine. Then again, when the parts are constructed by die

work they are all perfectly true and may be accurately duplicated, all the parts being thus rendered interchangeable. The quality of the material and the manner in which the engine is constructed renders the same practically indestructible, the wearing parts are very few and may be readily replaced at small expense.

A turbine engine constructed of my improved form, to be run either by the pressure of liquids or gases, will produce the greatest power for its size or weight of any other machine of its character now on the market. This fact renders the engine particularly advantageous for use in such vehicles as air-ships, automobiles, torpedo boats or the like, and also on account of its inexpensive construction and durability it is well adapted for all purposes for which a driving engine may be required.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification in which similar characters of reference indicate corresponding parts in all the views.

In the accompanying drawings: Figure 1— shows a sectional view of a turbine engine, the same being constructed of sheet metal parts, and ports and deflecting lips being illustrated for convenience through the lower part only of both the rotatable and stationary plates. Fig. 2— is a plan view of one of the rotatable plates. Fig. 3— is a sectional edge view of said plate illustrating the central inwardly turned flange collar, also the inwardly turned flange around the outer edge of the plates and the ports and deflecting lips through the face of said plate. Fig. 4— is an edge view of this plate sectioned through the port showing the deflecting lip as raised from the surface of the plate. Fig. 5— is a sectional view of the spacing plate drawn up into a cup-shape, the same being arranged to reinforce the center portion of the rotatable plates and at the same time accurately space the distance between them. Fig. 6— is a plan view showing a portion of the spacer plate illustrated in Fig. 4. Fig. 7— is a plan view of one of the stationary plates showing its shape and arrangement of ports. Fig. 8— is an edge view of said stationary plate in section, illustrating the dish-like form in which the outer edge of the plate is drawn for the purpose of fitting one within the other to space the same and also form a steam tight casing for inclosing the working parts of the engine. Fig. 9— is an edge view of the plate sectioned through the port showing the deflecting lip raised from the surface of the plate. Fig. 10— is an edge view showing a series of both the fixed and rotatable plates alternately arranged, sectioned through their ports, to illustrate the direction and action of the steam in passing through the same.

Referring to the drawings at 1 and 2 are cylinder heads which may be of any suitable construction, but are preferably of the form and construction shown and described in another of my patent applications pending in the Patent Office. The inner plate of each of these heads, as shown in Fig. 1, is provided with ports as shown at 41 and 42 which serve the same purpose as any of the other ported stationary plates. The hollow portion of the head, between the inner and outer plates, forms a natural steam chest or chamber for receiving the live steam at one end of the engine and the exhaust steam at the opposite end thereof. On these heads may be formed or secured the supporting feet 3 and 4 which may be of any desired number or shape to properly support the engine on any suitable base. The main shaft 5 is supported in the bearings 6—6 in the heads 1 and 2 at either end of the machine, the steam being prevented from leaking out by means of the packing 7—7 which is retained in position by the usual packing glands 8—8. Mounted on this center shaft 5 are the rotatable plates 9—9 which plates are preferably constructed of sheet or plate metal and in the form best shown in Fig. 3. The annular flange 10 on the outer edge of this plate is turned back to increase its strength and stability. The center portion at 11 is also turned back forming an annular collar or flange to stiffen the center portion and provide a longer bearing on the shaft. This center collar is provided with a key-way 12 to engage the long key 13 in the shaft. A plurality of port holes 14 are formed through the face of this plate by punching, swaging or forcing the metal through and raising the deflecting lip 15 to the position best shown in Fig. 4. A suitable number of bolt holes 16 are also punched through the plates. All of these holes, flanges, ports and lips may be formed by one operation on the thinner plates if desired. A spacing plate 17, is drawn up into a cup form having an outer annular flange 18, the same being employed to separate and position the rotatable plates holding them the proper distance apart and at the same time support them well outward from the center and near the point where the pressure is applied. These spacers are also provided with a central bore 19 having a key-way 20 to slide over the key 13 in the shaft. Bolt holes 21—21 are also formed through which the binding bolts pass.

The last rotatable plate 22 of the series is formed without the central collar 10^a and is backed up by a stiffening washer 23. In order to securely bind all of these rotatable plates together a suitable number of binding bolts 24—24 are passed through all of the plates and spacers, the first plate 9 being countersunk to receive the head 25 while the opposite end of the bolts are threaded at 26

into the washer 23, thus securely holding all of the rotatable plates in their relative positions and forming a large hollow center drum secured by the key 13 to the shaft. Located between these rotatable plates are the stationary plates 27, which latter plates have their central portions punched out and a narrow annular flange 28 formed around the opening for stiffening the center of the plate, which flanged portion is just large enough to clear and not come in contact with the outer surface 18 of the spacers. The face of each of these fixed plates, like the rotatable plates, is provided with a corresponding or suitable number of port holes 29 formed by punching or swaging the lip 30 inward from the face of the plate. The outer edge of the plate is drawn up into the form of a dish, the wall being provided with two different diameters 31 and 32, the outer edge being turned off at right angles to form an annular flange 33 pierced at intervals with bolt holes 34. The smaller diameter 31 of the outer wall of each of these dish-shaped plates is arranged to fit closely into the internal diameter 35 of the adjacent plate for a portion of its length, as illustrated in Fig. 1, thereby forming a stiff outer shell or casing of a double thickness of material. The heads 1 and 2 are fastened to this body at each end thereof by means of the stay bolts 36—36 which passes through the hole 34 in each of the flanges and through flanges of the cylinder heads at each end of the casing thus firmly securing the whole together forming a complete engine of very few parts all of which are struck from sheet material.

In assembling the parts the head 2 with the shaft 5 located therein is set on end, the tapped washer 23 is then dropped in position followed by the rotatable plate 22, then a spacer 17, and a fixed plate 37 with an inwardly turned annular body portion 38 and a flange 43, after the second rotatable plate a fixed plate is forced up into position over the said body portion of plate 37, a rotatable plate and a fixed plate then follow each other alternately until the machine is built up to the required length. The dishing portion of the fixed plates fit tightly and are forced one within the other forming a rigid and steam tight shell or casing of a double thickness of material. The bolts 24—24 are inserted through the bolt holes in the rotatable plates and spacers and are screwed into the thick washer 23 at the opposite end of the series of plates to secure the whole together, the bolt head being countersunk, as at 25, into the first plate 9 if desired. The cylinder head 1 is then placed in position and the whole is secured together by means of the stay bolts 36—36 and the engine is completed. When the steam is turned on it enters through the inlet 39 and passes through the various ports in the manner best illustrated in Fig. 10, and out through the exhaust port 40 in the opposite end of the machine.

The engine may be as readily taken apart as assembled, by reversing the operation.

My invention is not restricted to the construction and arrangement of the various parts as shown and described as the shell or casing of the engine may be made in any suitable manner, either sectional or in one piece, and entirely separate and independent from the stationary plates if desired. An engine constructed in any form of sheet or plate material having ports in its stationary and rotatable plates, each port being provided with a lip which overhangs the same would come within the spirit and scope of my invention, one practical embodiment of which has been herein illustrated and described without attempting to show all the various forms and modifications in which my invention might be embodied.

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

1. A turbine engine comprising a casing, a series of stationary and rotatable plates alternately arranged within said casing, a shaft, said rotatable plates mounted on said shaft, each of said plates being provided with a plurality of ports, and a lip integral with its plate projecting over each port whereby the driving medium may be deflected substantially parallel with the face of the plate.

2. In a turbine engine, a casing, a head at either end thereof, a series of alternate stationary and rotatable plates within said casing, a shaft, said rotatable plates mounted on said shaft, means for retaining the stationary plates, each of said plates being provided with a plurality of ports, and lips formed integral with the plates overhanging said ports whereby the driving medium is deflected as it passes through the ports.

3. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, each of said plates being provided with a plurality of ports, and a lip raised from the stock in the plate to overhang each port whereby the driving medium is deflected as it passes through the ports.

4. A turbine engine comprising a casing, a series of alternate stationary and rotatable plates within said casing all cut or stamped from sheet or plate material, a shaft, said rotatable plates mounted on said shaft, each of said plates being provided with a plurality of ports, and a lip over each port formed from the stock punched out to form said port.

5. A turbine engine comprising a casing, a series of alternate stationary and rotatable plates within said casing all cut or stamped from sheet or plate material, a shaft, said

rotatable plates mounted on said shaft, each of said plates being provided with a plurality of ports, and a lip projecting over each port the same being formed from the stock raised from the body of the plate in forming the port whereby the driving medium may be deflected in a plane with the face of the plate as it passes through the ports.

6. In a turbine engine, a casing, a series of stationary and rotatable plates alternately arranged within said casing, said plates being stamped from sheet or plate material, means for retaining the stationary plates, means whereby the rotatable plates may be permitted to rotate, each of said plates being provided with a plurality of suitable ports, and means formed in said plates to prevent them from springing when under pressure of the driving medium.

7. In a turbine engine, a casing, a series of stationary and rotatable plates alternately arranged within said casing, said plates being stamped from sheet or plate material, means for retaining the stationary plates, means whereby the rotatable plates may be permitted to rotate, each of said plates being provided with a plurality of ports, and a lip raised from the stock in its plate to overhang each port whereby the driving medium may be deflected in a plane with the face of the plate as it passes through the ports.

8. A turbine engine comprising a casing, a series of stationary and rotatable plates alternately arranged within said casing, a shaft, said rotatable plates mounted on said shaft, each of said plates being provided with a plurality of ports, a lip integral with its plate projecting over each port whereby the driving medium may be deflected substantially parallel with the face of the plate, and means for stiffening said plates.

9. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a stiffening flange formed on said plates by turning the outer edges of the same, a series of stationary plates arranged alternately with said rotatable plates, each of said plates being provided with a plurality of ports, and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through the ports.

10. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a flange swaged from the stock on the outer edge of said plates to stiffen the same, means for supporting and stiffening the center portion of said plates, a series of stationary plates arranged alternately with said rotatable plates, each of said plates being provided with a plurality of ports, and a lip raised from the stock in the plate to project over each port whereby the driving medium may be deflected at right angles to the axis of the plate as it passes through the ports.

11. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a flange swaged from the stock on the outer edge of said plate to stiffen the same, members placed between said plates to space support and stiffen the same at their center portion, a series of stationary plates arranged alternately with said rotatable plates, said rotary and stationary plates being provided with a plurality of ports, and a lip raised from the stock in the plate to project over each port.

12. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a flange swaged from the stock on the outer edge of said plate to stiffen the same, members placed between said plates to space support and stiffen the same at their center portion, means for securing all of said plates and spacers rigidly together, a series of stationary plates arranged alternately with said rotatable plates, said rotary and stationary plates being provided each with a plurality of ports, and a lip raised from the stock in the plate to project over each port.

13. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a flange swaged from the stock on the outer edge of said plate to stiffen the same, a cup-shaped spacing member placed between said plates to hold the same apart, said spacers arranged to engage and support said plates near the inner ends of their ports, means for securing all of said plates and spacers rigidly together, a series of stationary plates arranged alternately with said rotatable plates, said rotary and stationary plates being provided each with a plurality of ports, and a lip raised from the stock in the plate to project over each port.

14. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, said latter plates being provided with a central aperture, a stiffening flange formed about said aperture by turning the edge of the plate, each of said plates being provided with a plurality of ports, and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through the ports.

15. A turbine engine comprising a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, a stiffening flange swaged on the outer edge of said plates, each of said plates being pro-

vided with a plurality of ports and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through said ports.

16. A turbine engine comprising a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, said latter plates being provided with a central aperture, a stiffening flange formed about said aperture by turning the edge of the plate, a stiffening flange swaged on the outer edge of said plates, each set of said plates being provided with a plurality of ports and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through said ports.

17. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, a stiffening flange formed on the outer edge of said plates, said flange being also arranged to serve as a spacer for said plates, both said rotatable and fixed plates being provided with a plurality of ports and the lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through said ports.

18. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, said latter plates being provided with a central aperture, a stiffening flange formed about said apertures by turning the edge of the plate, a stiffening flange formed on the outer edge of said plates, said flange also being arranged to serve as a spacer for said plates, both said rotatable and fixed plates being provided with a plurality of ports and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through said ports.

19. In a turbine engine, a casing formed in sections, a series of stationary and rotatable plates alternately arranged within said casing, a shaft, said rotatable plates mounted on said shaft, each of said plates being provided with a plurality of ports, a lip integral with its plate projecting over each port whereby the driving medium may be deflected substantially parallel with the face of the plate and means for stiffening said plates.

20. A turbine engine comprising a casing formed of a plurality of sections, a shaft in said casing, a series of rotatable plates mounted on said shaft each plate being constructed of sheet metal and provided with ports through its face, means for preventing said plates from springing, a series of stationary plates arranged alternately with said rotatable plates, each of said stationary plates being provided with a plurality of ports, and a lip integral with its plate projecting over each port, said stationary plates being drawn or swaged up into a dish-shape to form the sections of said casing, each section being adapted to fit and be forced over the body of the next adjacent section.

21. In a turbine engine, a casing formed of a plurality of sheet metal sections, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates, each of said stationary plates being provided with a plurality of ports, and a lip integral with its plate projecting over each port, said stationary plates being drawn or swaged up to form the sections of said casing each being adapted to fit one within the other, the outer edge of each section being turned outward to form a stiffening flange, said plates being provided with a central aperture, and a stiffening flange also formed about said aperture by turning the edge of the plate, each set of said plates being provided with a plurality of suitable ports.

22. A turbine engine of sheet metal construction comprising the combination of a casing formed of a plurality of sections, a series of alternate stationary and rotatable plates having flanges formed on their peripheries to stiffen the same, each of said plates being provided with a plurality of ports punched through their faces, and a lip integral with its plate projecting over each port, a hollow head at either end of said casing, and means for securing the whole together.

23. A turbine engine of sheet metal construction comprising the combination of a casing formed of a plurality of sections, each section being adapted to fit closely and be forced one within the other to form a steam tight shell, a series of alternate stationary and rotatable plates having flanges formed on their peripheries to stiffen the same, each of said plates being provided with a plurality of ports punched through their faces, and a lip integral with its plate projecting over each port, a head at each end of said casing, and means for securing the heads and sections together.

24. A turbine engine of sheet metal construction comprising the combination of a casing formed of a plurality of sections, each section being adapted to fit closely and be forced one within the other to form a steam-tight shell, a series of alternate stationary and rotatable plates having flanges formed on their peripheries to stiffen the same, each of said plates being provided with a plurality of ports punched through their faces, and a lip integral with its plate projecting over each port, a hollow cylinder head at each end of

said casing, each head being constructed of a plurality of sheet metal plates, said plates being bent to engage and support each other at a plurality of points.

25. In a turbine engine the combination of a shell or casing formed of sheet metal, a flange swaged on each end thereof, a hollow head at each end of said casing, one or both of said heads being constructed of a plurality of plates providing a receiving chamber between said plates, and means for securing the heads to the casing.

26. In a turbine engine, a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a stiffening flange formed on said plates by turning the outer edges of the same, a series of stationary plates arranged alternately with said rotatable plates, said latter plates being provided with a central aperture, a stiffening flange formed about said aperture by turning the edge of the plate, each of said plates being provided with a plurality of ports, and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through the ports.

27. A turbine engine, comprising a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a stiffening flange swaged on the outer edge of said plates, a series of stationary plates arranged alternately with said rotatable plates, a stiffening flange swaged on the outer edge of said fixed plates, said flange also serving as a spacer for the plates, both said rotatable and fixed plates being provided with a plurality of suitable ports, and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through said ports.

28. A turbine engine comprising a casing, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a stiffening flange swaged on the outer edge of said plates, a cup-shaped spacing member placed between said plates to hold the same apart, said spacers arranged to engage and support said plates near the inner end of their ports, a series of stationary plates arranged alternately with said rotatable plates, a stiffening flange swaged on the outer edge of said fixed plates said flange also serving as a spacer for the plates, both said rotatable and fixed plates being provided with a plurality of suitable ports.

29. In a turbine engine, a casing formed of a plurality of sections, a shaft in said casing, a series of rotatable plates mounted on said shaft, a cup-shaped spacing member placed between said plates to hold the same apart said spacers arranged to engage and support said plates near the inner end of their ports, a series of stationary plates arranged alternately with said rotatable plates the outer edges of said stationary plates being drawn up to form the sections of said casing each being adapted to fit one within the other, said plates being also provided with a central aperture, a stiffening flange formed about said aperture by turning the edge of the plate, each set of said plates being provided with a plurality of ports and a lip raised from the stock in the plate to project over each port whereby the driving meduim is deflected as it passes through said ports.

30. In a turbine engine, a casing formed of a plurality of sections, a head at either end thereof, a shaft in said casing, a series of rotatable plates mounted on said shaft, a series of stationary plates arranged alternately with said rotatable plates each of said stationary plates being formed integral with the sections of said casing, said plates being provided with a plurality of ports, and a lip raised from the stock in the plate to project over each port whereby the driving medium is deflected as it passes through said ports.

31. In a turbine engine, a casing formed of sheet metal of a plurality of sections, each section being drawn up and adapted to fit closely and be forced one within the other to form a steam-tight shell, a series of stationary plates integral with each section of the casing, a series of alternate rotatable plates between said stationary plates, and ports in said plates adapted to deflect the driving medium as it passes through the same.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY A. BUCK.

Witnesses:
HOWARD E. BARLOW,
E. I. OGDEN.