H. E. STOVER.

STOKER.

APPLICATION FILED MAY 21, 1912.

1,048,756.

Patented Dec. 31, 1912.

3 SHEETS—SHEET 1.

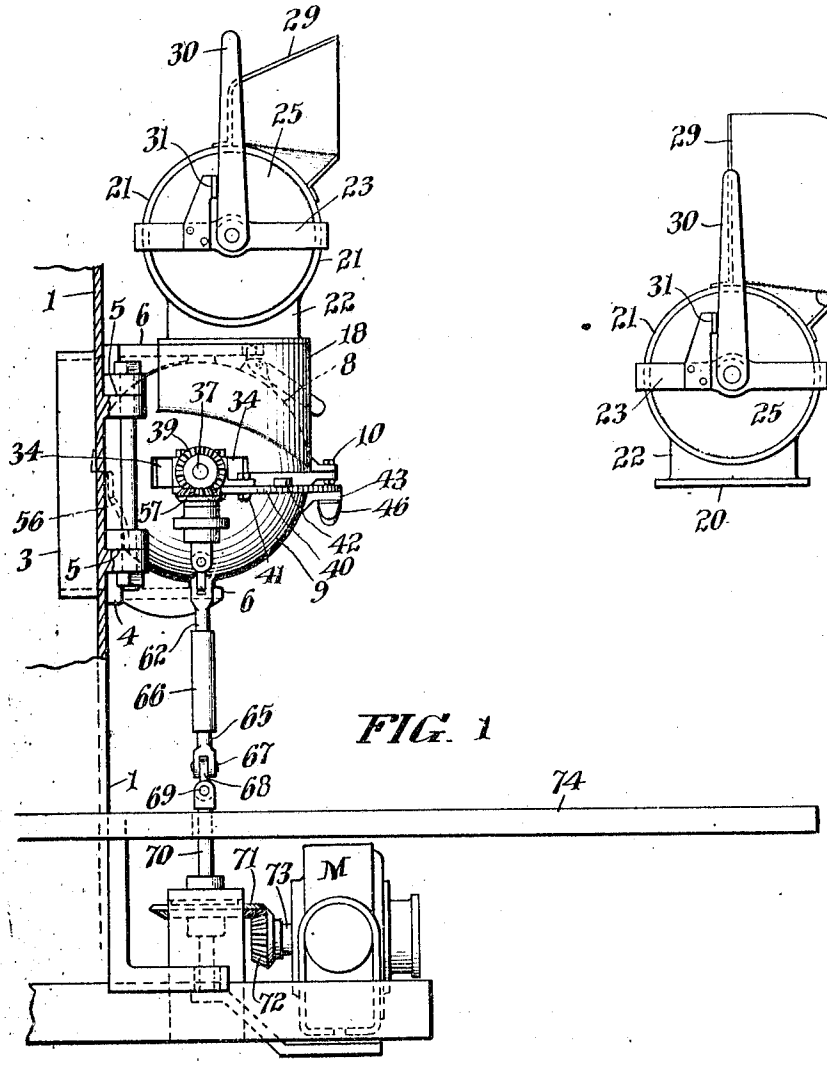

FIG. 1

FIG. 5

WITNESSES

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3 SHEETS—SHEET 2.

FIG. 2.

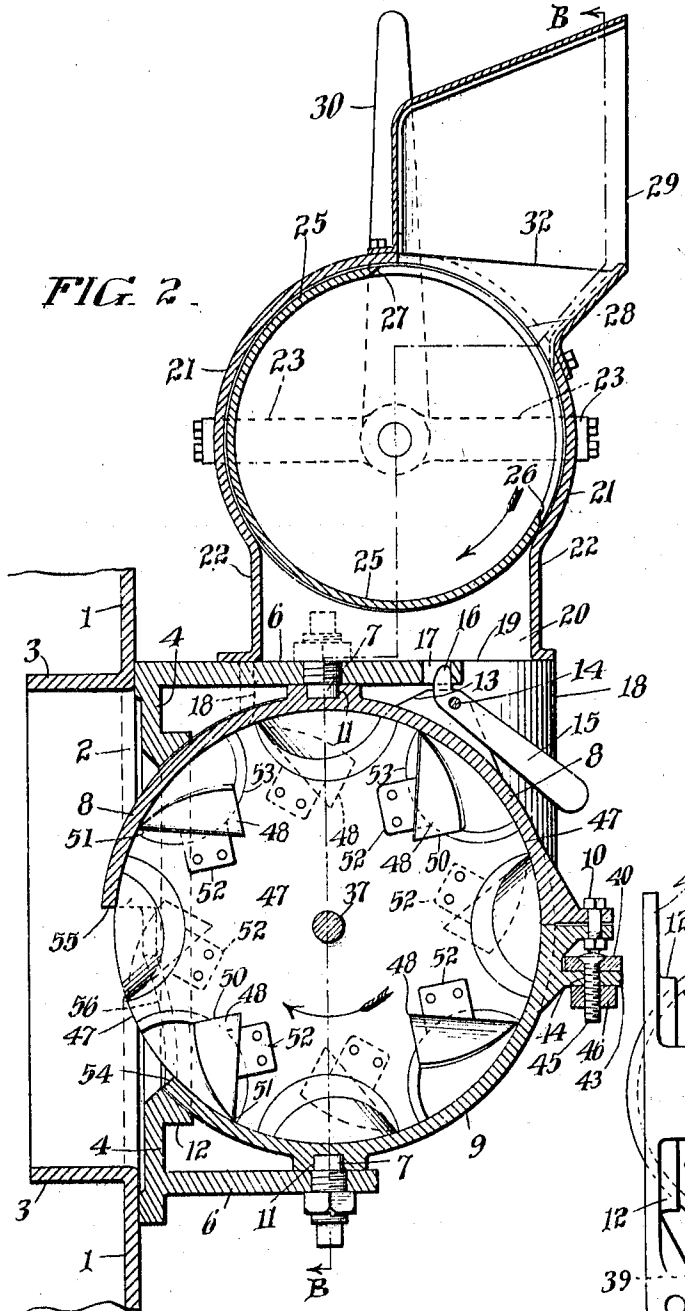
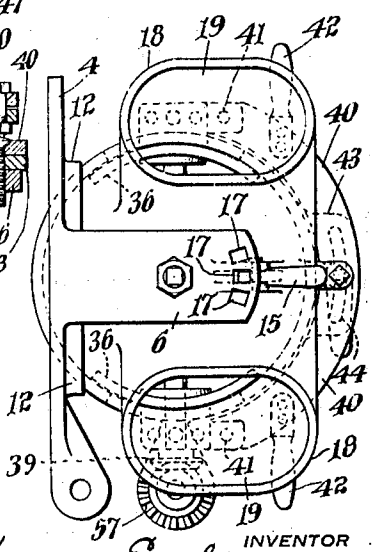


FIG. 4.



WITNESSES

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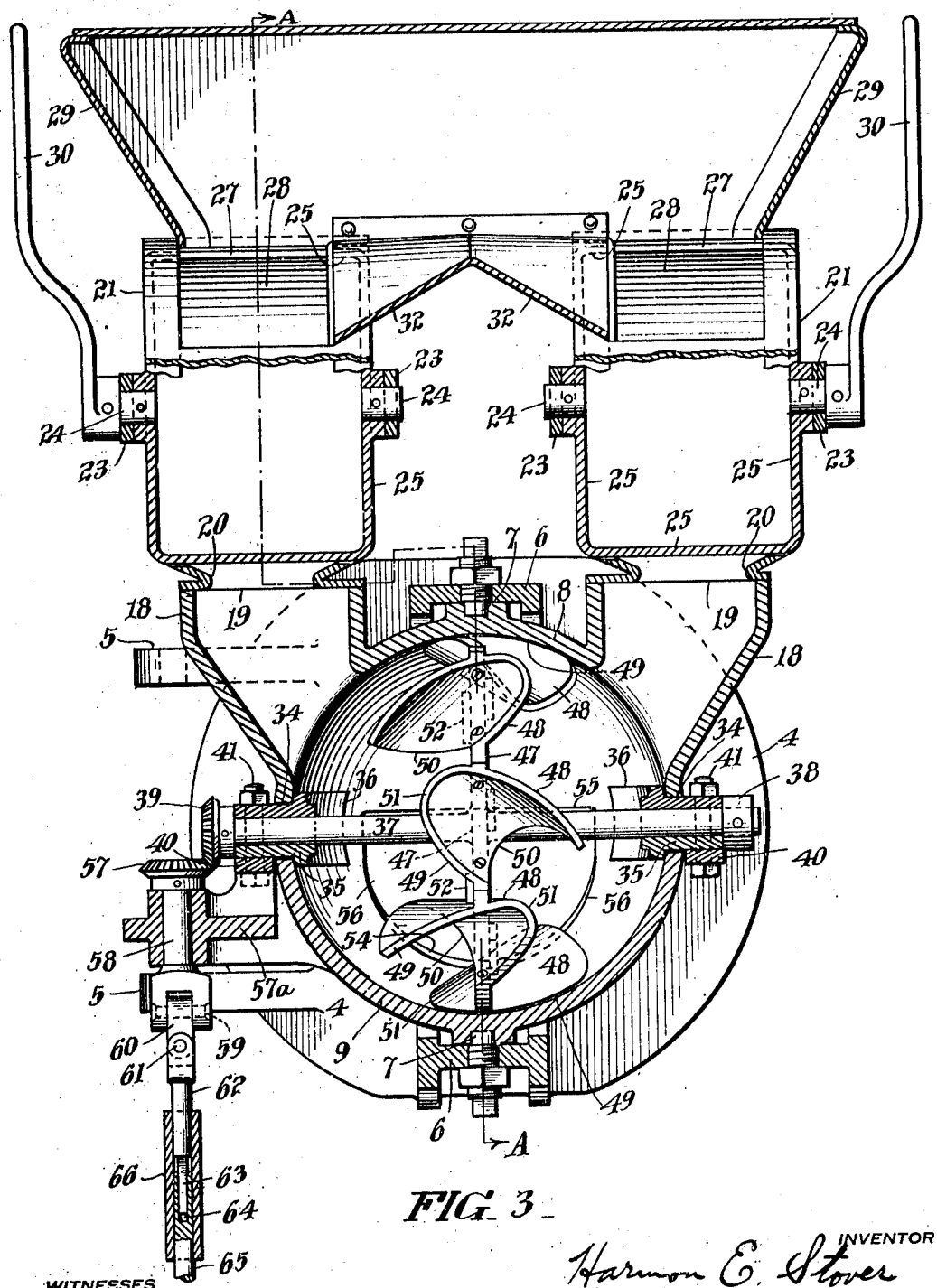

FIG. 3.

WITNESSES.

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UNITED STATES PATENT OFFICE.

HARMON E. STOVER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE BALDWIN LOCOMOTIVE WORKS, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

STOKER.

1,048,756. Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed May 21, 1912. Serial No. 698,680.

To all whom it may concern:

Be it known that I, HARMON E. STOVER, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Stoker, of which the following is a specification.

My invention relates to mechanical stokers for use for delivering fuel, such as coal, into a furnace or fire box of a locomotive or stationary boiler or, generally, to any combustion chamber.

It is the object of my invention to provide, in a mechanical stoker, means for efficiently delivering and directing the fuel to the points required; and it is a further object of my invention to provide a mechanical stoker which, considering the amount of fuel delivered therefrom, shall be operated with low power consumption and which shall be easy of manipulation and control.

My invention resides in mechanical stoking apparatus having the features hereinafter described and claimed.

For an illustration of one of the forms my invention may take reference is to be had to the accompanying drawings, in which:

Figure 1 is a side elevational view, partly in section, of one form of my stoking apparatus in operative position with respect to a fire box. Fig. 2 is a vertical sectional view, parts in elevation, to larger scale, taken on the line A—A of Fig. 3. Fig. 3 is a vertical sectional view, parts in elevation, taken on the line B—B Fig. 2. Fig. 4 is a top plan view, on a different scale, of the stoker shown in Fig. 1, the fuel supplying mechanism being omitted. Fig. 5 shows in side elevation a modified form of fuel supplying apparatus such as may be used when the fuel is supplied thereto by a conveyer or the like.

Referring to the drawings, the front face or wall 1 of the fire box of a locomotive boiler, or of any other fire box, furnace, or combustion chamber, is provided with the fire opening 2 having the flange 3 extending around its periphery and extending toward the combustion chamber. The fire door frame 4 is hinged to the face or wall plate 1 at 5, and is therefore adapted to be swung, like an ordinary door upon these hinges to and away from the fire opening 2. This door frame 4 carries the stoker proper which may accordingly be swung away from the position shown in Figs. 1 and 2 upon the aforementioned hinges. Integral with or secured to the door frame 4 are the top and bottom brackets 6 each carrying a pivot pin 7, these pivots being in vertical axial alinement. The stoker casing is substantially spherical in shape and comprises the upper and lower sections 8 and 9, respectively, held together by bolts 10. Each of the parts 8 and 9 has a socket 11 adapted to receive a pivot 7, upon which the parts 8 and 9, as a unit, are adapted to move or rotate about a vertical axis passing through said pivots 7. The door frame 4 has an outwardly projecting flange 12 surrounding a circular opening into which the stoker casing is adapted to partially enter. Upon a lug 13 upon the upper member 8 there is pivoted at 14 a hand lever 15 having a nose 16 adapted to enter into any one of a plurality of openings 17 in the upper bracket 6. By lifting the handle 15 the nose 16 is withdrawn from a hole 17 and then the casing 8, 9 may be rotated upon the pivots 7 through a desirable angle and locked in position by releasing the handle 15 and allowing the nose 16 to enter the adjacent opening 17. It is to be understood, however, that this rotative movement of the stoking casing may be dispensed with and the parts 8 and 9 suitably permanently secured to the upper and lower brackets 6 or otherwise to the door frame 4.

The upper member 8 is provided with chutes or passages 18 communicating with the interior of the stoker casing and opening at their upper ends 19. Registering with the upper opening of each of these passages or chutes 18 is the delivery orifice 20 of a horizontal cylindrical casing 21 secured by hollow pedestal 22 in fixed relation with respect to the chute 18 either upon the chute 18 or upon any other suitable part of the apparatus moving with the door frame 4. Each cylindrical casing 21 supports a yoke 23 girdling or passing around the casings 21. At each end of the casing 21 the yoke 23 carries a short shaft 24 upon which is secured within casing 21 the cylindrically shaped member 25, which, as seen in Fig. 2, is open at its circumference between the points 26 and 27 and which, as seen in Fig. 3, has closing end walls, forming mov-

ing end walls for the casings 21. The gap between the points 26 and 27 forms an opening adapted to register with the outlet 28 of the hopper 29 secured upon the casing 21. To one of each pair of shafts 24 is secured a handle 30 for rotating the member 25 from the position shown, in Fig. 2 for example, in which position the handle 30 is against the stop 31 upon the yoke 23, to a position where the edge 27 has completely transversed the opening 28 so as to entirely shut off the passage 28. When in this position the point 26 has advanced, in the direction of the arrow, to a place where the opening between points 26 and 27 registers with the passage 20 in the member 22. The edges 26 and 27 may be more or less sharp to facilitate cutting off flow of fuel.

As shown in Figs. 1, 2 and 3, the hopper 29 is open at its side, and into the opening coal is adapted to be delivered, preferably manually. Within the hopper 29 is a dividing member 32 sloping from the center toward both sides to facilitate the passage of fuel in the openings 28.

In the case where the fuel is to be delivered to the hopper by a conveyer, or other apparatus, the hopper may be made in the form shown in Fig. 5 where a conveyer 33 will deliver the fuel into the top of the hopper.

In the spherical casing 8, 9 there are provided at opposite ends of a diameter the short horizontal circumferential slots 3' through which extend the bearing members 35 having horizontally extending arc shaped extensions 36 on the inside of the casing member and covering the slots 34 in all positions of the shaft hereinafter referred to. In the members 34 the shaft 37 has bearings, the collar 38 secured on the shaft limiting the movement of the shaft toward the left, Fig. 3, while the beveled gear 39 secured on the other end of the shaft 37 limits the movement of the shaft 37 toward the right. In other words, the shaft 37 can rotate freely in its bearings 34 but has very little, if any, end play. A yoke 40 is secured by bolts 41 to the bearing members 34 outside of the casing 8, 9 and extends around in front of that casing from one bearing member to the other. Upon the yoke 40 are secured the handles 42 by which the shaft 37 and the parts attached thereto may be rotated or oscillated in a horizontal plane. A lug 43 upon the casing 9 is provided with a slot 44 through which extends bolt 45 carried by the yoke 40. Upon the bolt 45 having, preferably, left hand threads, is a hand lever 46 by rotating which the yoke 40 is clamped to the lug 43 in any of the positions of the shaft 37.

Within the casing 8, 9 there is a disk 47 integral with or secured upon the shaft 37 and rotated at high speed by the shaft 37 in the plane of the disk at right angles to the shaft 37. Secured upon the rim of the periphery of the disk 47 and set into and extending across the disk 47, is a plurality of scoops 48, half of them directed to one side of the disk 47 and the remainder directed toward the other side of the disk 47. the disk 47 dividing the spherical chamber into two compartments, each communicating with a chute 18, above described.

The outer edge 49 of each scoop conforms to a spherical surface so that the scoops may run close to the inner wall of the casing 8, 9. Each scoop slants across the disk 47, the open receiving end 50 of each scoop communicating with a compartment of one side of the disk 47, the scoop extending across the disk and having a tip 51 extending into the other compartment and closing, or substantially closing, against the inner wall of the casing 8, 9. Each scoop is provided with a lug 52 extending parallel to the face of a disk 47 and secured to the disk 47 by bolts, rivets or otherwise. And for each scoop the disk 47 has a depression 53 in its periphery into which the back of the scoop is fitted so that no part of the scoop projects beyond the periphery or circumference of the disk 47, each scoop being set in the periphery of the disk 47 and having its edge 49, as described, conforming to the inner wall of the casings 8, 9. The direction of the rotation of the shaft 37 and the scoops 48 is indicated by the arrow in Fig. 2. By such rotation the scoops are brought in succession to the opening in the casing 8, 9 between the points 54 and 55 opening into the combustion chamber or fire box, the dotted lines 56, Fig. 2, indicating the side edges of the opening in the casing 8, 9 which extends partially into the opening in flange 12. The opening in casing 8, 9 has its major extent in the lower casing member 9 and has its upper edge near the horizontal equator of the spherical casing. It is to be understood, however, that an opening of different shape and location and size may be employed and is within my invention.

Meshing with the gear 39 upon the shaft 37 is the gear 57 secured upon the short shaft 58, carried by bracket 57^a integral with 35 and pivoted at 59 to the member 60 pivoted at 61, at right angles to the pivot 59, to the shaft member 62 which terminates in a square shank 63 slidable longitudinally in the square socket 64 in the shaft member 65. A sleeve 66 surrounds the ends of the shafts 62 and 65 and the sliding coupling 63, 64. As seen in Fig. 1, the shaft 65 is pivoted at 67 to the member 68 which in turn is pivoted at 69, at right angles to pivot 67, to the upper end of the shaft 70 driven by the beveled gear 71 which in turn is driven by the bevel gear 72 on the shaft 73 of any suitable motor M, such as a rotary steam motor, or the like.

As shown the motor M is supported beneath the locomotive deck 74 and the shaft 70 extends freely through the deck 74. As well understood, the connection between the shaft 70 and the gear 57 is through shafting which permits movement of the gear 57 out of alinement with the shaft 70, the connection being what may be termed a universal coupling. Of course the motor M is supplied with suitable control means for starting and stopping at will.

The operation is as follows: The fuel, such as coal, is delivered either manually or by conveyer to the hopper 29 where it drops through the passages 28 into the interior of the member 25. Then by rotating either or both of the handles 30, in a clockwise direction as viewed in Fig. 1, and in the direction of the arrow, Fig. 2, the circumferential opening in the member 25 will come opposite the passage 20 in the member 22 allowing the coal or fuel to drop through the chute 18 into the casing 8, 9, the passage 28 being simultaneously closed by member 25. One chute 18 delivers fuel to one side of the disk 47 while the other delivers fuel in similar manner to the other side of the disk 47. The motor M having been started, the shaft 37 is rotated in the direction of the arrow indicated in Fig. 2 and in consequence the scoops having their receiving ends in the right hand compartment, Fig. 3, pick up the fuel, and in a measure reduce the sizes of its pieces, and carry it around in the direction of the arrow until the opening between the points 54, 55 is reached when the fuel is thrown off by each of the scoops from the front end of each scoop into the fire box. Similarly fuel delivered to the other compartment of the chamber 8, 9 is picked up and delivered into the fire box by the scoops having their receiving openings in that compartment. The shape of the scoops is such that little or no coal can escape from one compartment into the other, but must be carried around to the point of delivery into the fire box. The coal from one compartment of the casing 8, 9 is delivered principally to one side of the fire box while the coal from the other compartment is delivered principally to the other side of the fire box, the two sets of scoops delivering two streams of fuel crossing each other. To direct the streams of coal or fuel transversely or laterally across the fire box the operator grasps the handles 42 and rotates the yoke 40 and the shaft 37 and the disk 47 and scoops 48 in a horizontal plane while running, with the result that the fuel is delivered to all parts of the fire box, from front to rear and laterally. Upon return of the handles 30 to the positions shown, more coal will again be delivered into either or both of the chutes 18, as may be desired.

By my arrangement of the disk 47 and the scoops, as herein described, the size or the stoker, particularly in direction parallel with the shaft 37, is shorter than if the scoops or buckets did not extend across the disk 47. Furthermore since the scoops or buckets do extend across the disk 47, as described, the streams of fuel delivered by the two sets of scoops or buckets will overlap each other more or less, tending to more uniform distribution of fuel in the fire box. It is to be understood however that my invention is not limited to this structure except where so expressly stated.

Due to the flexible shafting or universal coupling arrangement between the shaft 70 and the gear 57, the gear 39 remains in mesh with the gear 57 and in consequence the shaft 37 and the scoops continue to be rotated by the motor M irrespective of the position to which the shaft 37 may have been shifted or rotated by handles 42. In fact the shaft 37 in such movement rotates about the geometric center of the spherical casing and in consequence, to whatever position the shaft 37 may be moved, the scoops 48 maintaining their relative position with respect to the stationary and inner wall of the spherical casing.

From the above description it is apparent that I have provided a stoker which will deliver fuel transversely to the fire box to any part thereof; that it will deliver to the rear or front end of the fire box as well as to the more remote portions thereof, without necessity of reversing or otherwise operating upon the rotating member, and that delivery laterally of the fire box is controlled by shifting the stoker while running. And it is further apparent that the stoker may be swung away from the furnace wall or plate or fire box upon the hinges 5 without disturbing the power connections or the coal feeding apparatus. And it is further apparent that when in position for stoking the stoker acts as a closed door to the fire box, there being no substantial passages to permit ingress of air through the fire door above the fire.

While I have herein shown the casing 8, 9 as spherical in shape, especially with respect to the interior thereof, it is to be understood that the chamber need not be completely spherical as shown, but may be more or less flattened or otherwise shaped, particularly at the ends of the diameter corresponding with the shaft axis. And it is to be further understood that my invention is not limited to a spherical shaped chamber or casing, except where so pointed out in the claims.

What I claim is:

1. In a stoker, the combination with a casing, of a member rotatable therein and having a circular periphery extending to the inner wall of said casing, and a plu-

rality of buckets or scoops set in the periphery of said member and transverse thereto.

2. In a stoker, a fuel propeller comprising a rotary member, a plurality of buckets or scoops carried thereby at the periphery thereof and each of them extending from one side of said member across said member to the other side thereof, whereby fuel is delivered from both sides of said member, and means for rotating said member in a plane extending in the direction of fuel propulsion.

3. In a stoker, a propeller comprising a rotary disk, a plurality of scoops or buckets carried thereby at the periphery thereof, each of said scoops extending from one side of said disk across said disk to the other side thereof, whereby fuel is delivered from both sides of said member, and a casing inclosing said disk, said disk extending to said casing between said scoops or buckets.

4. In a stoker, a propeller comprising a rotary disk, a plurality of scoops or buckets carried thereby at the periphery thereof, said scoops extending from one side of said disk across said disk to the other side thereof and slanting with respect to the plane of said disk, and a casing inclosing said disk, said disk and said scoops or buckets extending completely through said casing and dividing the same into compartments completely isolated from each other.

5. In a stoker, a rotary member, a plurality of buckets or scoops carried by said member at the periphery thereof, and a casing inclosing said member and buckets or scoops, said member dividing said casing into compartments, said scoops or buckets extending from one of said compartments into the other compartment, each scoop or bucket having a receiving opening in one compartment and closed with respect to the other compartment.

6. In a stoker, a rotary member, a plurality of buckets or scoops carried by said member at the periphery thereof, and a casing inclosing said member and buckets or scoops, said member dividing said casing into compartments, said scoops or buckets extending from one of said compartments into the other compartment, each scoop or bucket having a receiving opening in one compartment and closed with respect to the other compartment, part of said scoops or buckets having their receiving openings in one compartment and the remainder of said scoops or buckets having their receiving ends in the other compartment.

7. In a stoker, a casing, a rotatable member within the same, a plurality of scoops or buckets carried by said member at the periphery thereof, said scoops or buckets set in the periphery of said member, the periphery of said member and of said scoops or buckets having a running fit with said casing.

8. In a stoker, a casing, a rotatable member within the same, a plurality of scoops or buckets carried by said member at the periphery thereof, said scoops or buckets set in the periphery of said member, the periphery of said member and of said scoops having a running fit with said casing, said member dividing said casing into compartments, each scoop or bucket having a receiving end in one compartment and its other end closed to the other compartment.

9. In a stoker, a casing forming a spherical chamber, a member rotatable in said chamber, a plurality of scoops carried by said member at the periphery thereof, the periphery of said scoops having a running fit with the spherical wall of said chamber.

10. In a stoker, a casing forming a spherical chamber, a member rotatable in said chamber, a plurality of scoops carried by said member at the periphery thereof, the periphery of said scoops having a running fit with the spherical wall of said chamber, said rotatable member extending to the spherical wall of said chamber and with said scoops dividing said chamber into compartments isolated from each other.

11. The combination with a door frame having an aperture, a flange thereon surrounding said aperture and having a substantially spherically shaped seat, of a spherical casing supported on said door frame and projecting into said aperture and close to said seat, said casing having an aperture registering with said first named aperture, fuel propelling means rotatable within said casing, and means for shifting said fuel propelling means with respect to said casing.

12. In a stoker, a casing forming a chamber, a rotatable member therein, a plurality of buckets or scoops carried by said member at the periphery thereof, and means for shifting the plane of rotation of said buckets or scoops with respect to said casing, said buckets or scoops maintaining substantially the same clearance from said chamber for all positions to which they are shiftable.

13. In a stoker, a casing forming a chamber, a rotatable member therein, a plurality of buckets or scoops carried by said member at the periphery thereof, and means for shifting said member and scoops with respect to said casing to change the plane of rotation of said buckets or scoops, said member and said buckets or scoops having a running fit with said chamber for all planes in which they are rotatable.

14. In a stoker, a casing forming a substantially spherical chamber, a rotatable member in said chamber, a plurality of buckets or scoops carried by said member at the periphery thereof, the periphery of said

buckets or scoops conforming to the wall of said spherical chamber, and means for shifting the plane of rotation of said buckets or scoops.

15. In a stoker, a casing forming a substantially spherical chamber, a rotatable member in said chamber, a plurality of buckets or scoops carried by said member at the periphery thereof, the periphery of said buckets or scoops conforming to the wall of said spherical chamber, and means for shifting said buckets or scoops with respect to said casing for varying the plane of rotation of said buckets or scoops.

16. In a stoker, a casing forming a chamber, rotatable fuel propelling means in said chamber dividing the same into compartments, a fuel chute supported solely on said casing communicating with each compartment, fuel controlling means supported on each of said chutes, and a fuel receiving hopper common to said fuel controlling means supported on said fuel controlling means, said casing, chutes, fuel controlling means and hopper being movable as a unit, said fuel controlling means adapted to deliver fuel into said compartments independently of each other.

17. In a stoker, the combination with a casing, of rotatable fuel propelling means within said casing dividing the same into compartments, a fuel chute on said casing communicating with each compartment and a fuel controlling member for each chute supported on said casing and having an aperture communicating with said chute, said fuel controlling members being operable independently of each other.

18. In a stoker, the combination with a casing, of rotatable fuel propelling means within said casing dividing the same into compartments, a fuel chute on said casing communicating with each compartment, a fuel controlling member for each chute supported on said casing and having an aperture communicating with said chute, said fuel controlling members operable independently of each other, and a fuel receiving hopper having apertures for delivering fuel to said fuel controlling members, said hopper supported upon said casing.

19. In a stoker, a casing forming a chamber, fuel propelling means within said chamber, a stationary source of power, means connecting said fuel propelling means with said source of power, and means for shifting said fuel propelling means without interrupting connection with said source of power, said fuel propelling means maintaining a running fit with said chamber for all positions to which the same are shiftable.

20. In a stoker, a fire box, a casing forming a spherical chamber, a shaft extending horizontally through said chamber, fuel propelling means rotated by said shaft within said chamber, said chamber having an outlet aperture opening directly into said fire box, the upper edge of said aperture being substantially horizontal and at substantially the height of said shaft.

21. The combination with a fire door having an aperture, of a casing forming a spherical chamber, said casing having an outlet aperture registering with said aperture in said fire door, means for securing said casing in fixed relation with respect to said fire door, fuel propelling means within said casing, and means for shifting said fuel propelling means with respect to said casing.

22. The combination with a fire door having an aperture, of a spherically shaped casing partially embraced by said fire door and having an aperture registering with the aperture in said fire door, means supporting said casing in fixed relation with respect to said fire door, and fuel propelling means rotatable within said casing.

23. The combination with a fire door having an aperture, of a spherically shaped casing partially embraced by said fire door and having an aperture registering with the aperture in said fire door, means supporting said casing in fixed relation with respect to said fire door, fuel propelling means rotatable within said casing, and means for shifting said fuel propelling means with respect to said casing.

24. The combination with a fire door having an aperture, of a casing pivoted on a vertical pivot carried by said fire door, means for holding said casing in fixed relation with respect to said fire door, and fuel propelling means within said casing.

25. In a stoker, the combination with a hollow casing, of a shaft, fuel propelling means within said casing driven by said shaft, bearings for said shaft supported by said casing, and means permitting the shifting of said shaft bearings with respect to said casing, said fuel propelling means maintaining substantially the same clearance from said casing for all positions of said propelling means.

26. In a stoker, the combination with a hollow casing having slots, of fuel propelling means within said casing, a shaft driving said fuel propelling means, shaft bearings supported by said casing in said slots, said bearings being shiftable in said slots to shift the position of said fuel propelling means with respect to said casing.

27. In a stoker, the combination with a hollow casing having slots, of fuel propelling means within said casing, a shaft driving said fuel propelling means, shaft bearings supported by said casing in said slots, said bearings being shiftable in said slots to shift the position of said fuel propelling means with respect to said casing, and means

for covering said slots for all positions of said shaft bearings.

28. In a stoker the combination with a hollow casing, of fuel propelling means within said casing, a shaft driving said fuel propelling means, shaft bearings supported by and movable with respect to said casing, and a yoke connecting said shaft bearings outside of said casing.

29. In a stoker, the combination with a hollow casing, of fuel propelling means within said casing, a shaft driving said fuel propelling means, shaft bearings supported by and movable with respect to said casing, a yoke connecting said shaft bearings outside of said casing, and means for clamping said yoke.

30. In a stoker, a rotating disk, a plurality of fuel engaging hollowed scoops secured to said disk at the periphery thereof, said fuel engaging scoops having their axes disposed at angles with respect to the plane of rotation of said disk.

31. In a stoker, a rotary member, a plurality of fuel engaging members carried by said member at the periphery thereof, said fuel engaging members arranged in sets disposed at different angles with respect to said rotary members, whereby fuel is delivered in crossed streams.

32. In a stoker, a rotary disk, a plurality of hollowed buckets or scoops carried by said disk at the periphery thereof, said buckets or scoops divided into sets, the buckets or scoops of one set having their axes disposed at angles with respect to said disk differing from the angles of the axes of the scoops or buckets of another set, whereby fuel is delivered in crossed streams.

33. In a stoker, a rotary member, a plurality of fuel engaging members carried by said member at the periphery thereof, and a casing inclosing said member and said fuel engaging members, said member dividing said casing into compartments, said fuel engaging members extending from one compartment into the other compartment, each fuel engaging member having a receiving end in one compartment and a delivery end in the other compartment, the said fuel engaging members delivering fuel through an aperture in said casing in crossed streams.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

HARMON E. STOVER.

Witnesses:
BEATRICE WHITNEY,
ELEANOR T. MCCALL.