L. L. GRIFFITHS.

OIL BURNER.

APPLICATION FILED JAN. 22, 1909.

1,033,068. Patented July 16, 1912.

4 SHEETS—SHEET 1.

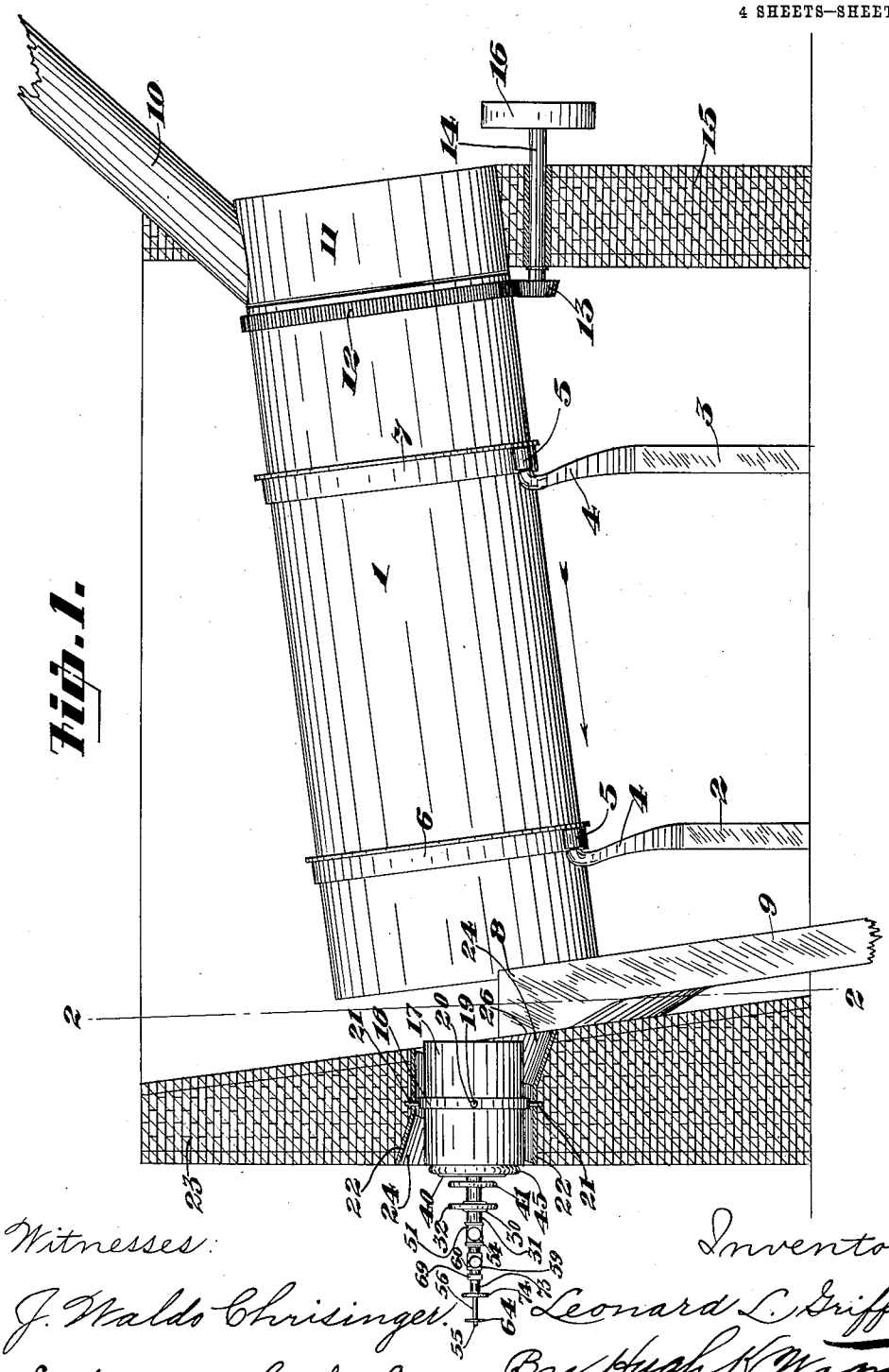

Fig. 1.

Witnesses:

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Inventor:

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By Hugh K. Wagner,

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4 SHEETS—SHEET 2.

Fig. 2.

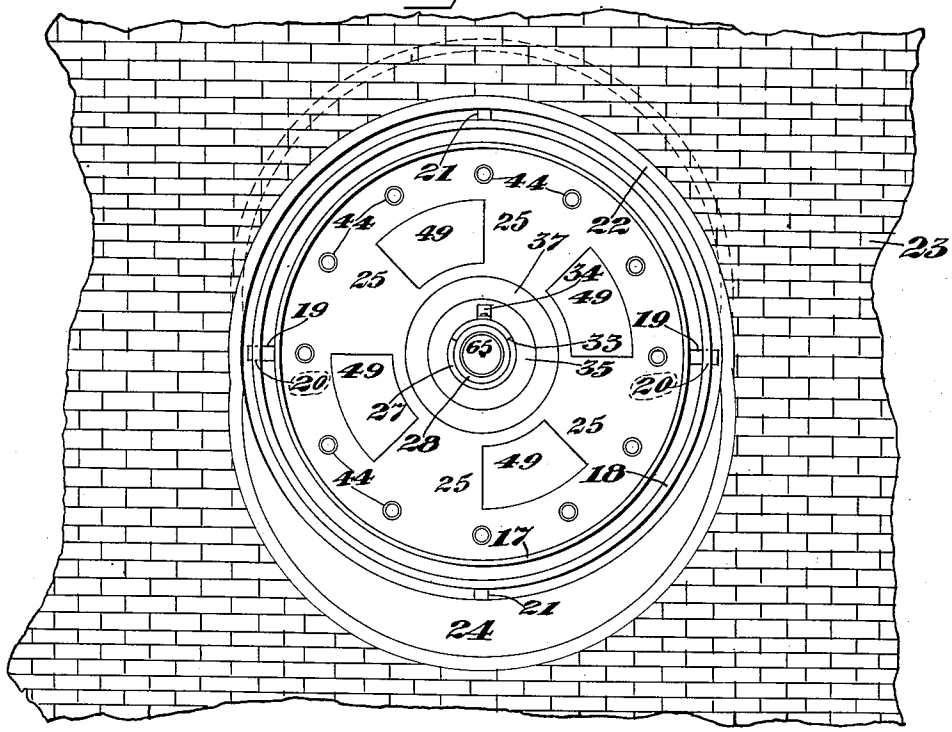


Fig. 4.

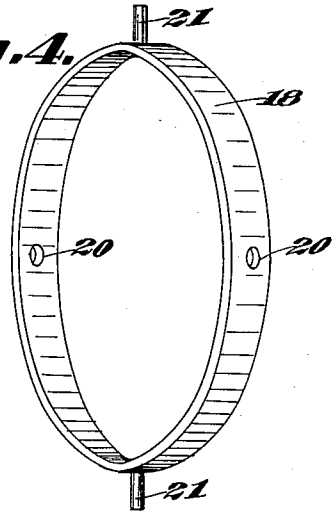
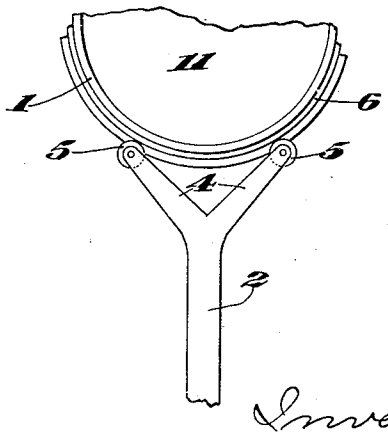


Fig. 3.



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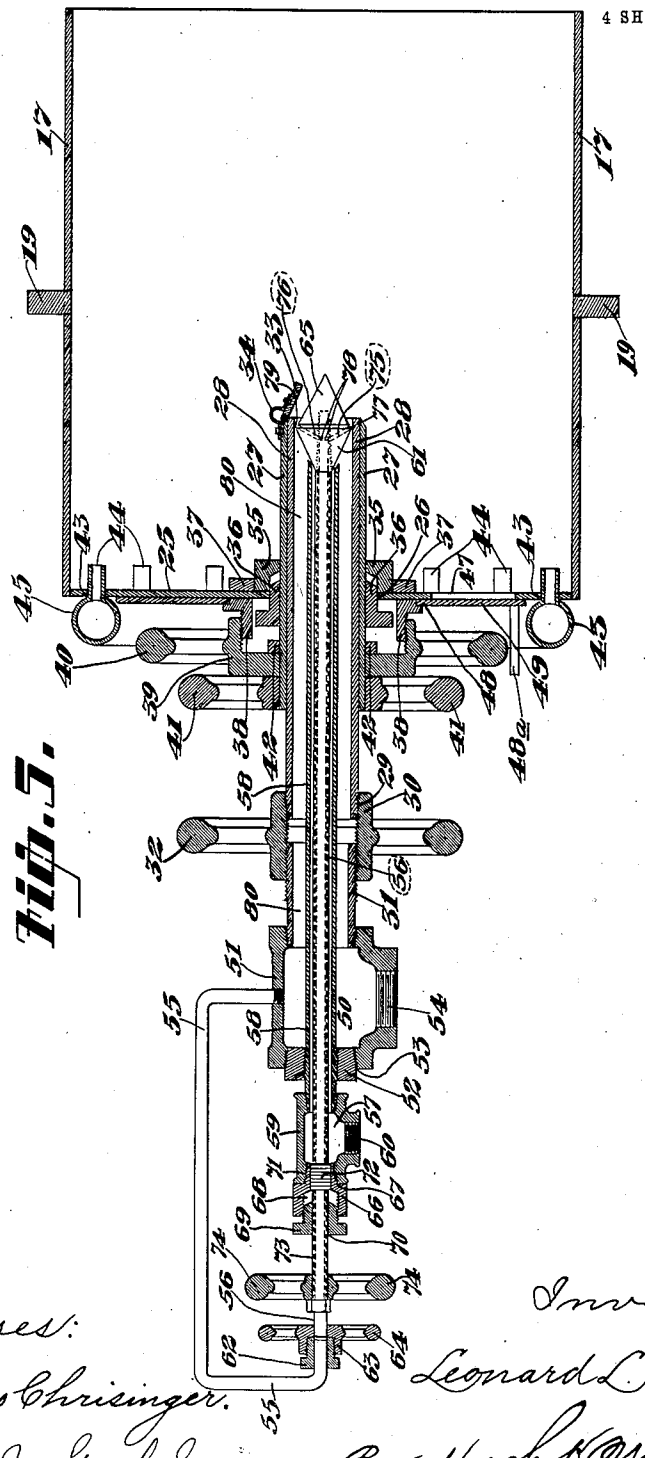

Fig. 3.

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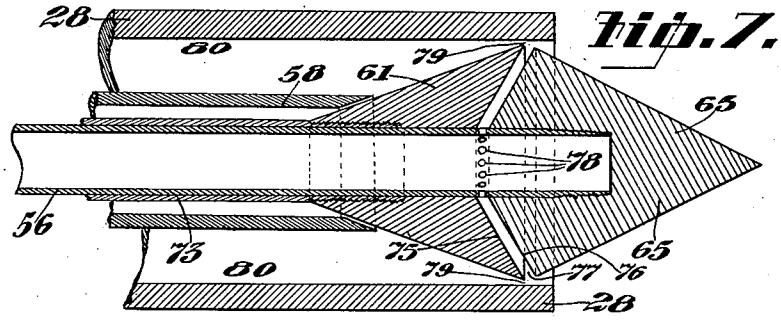
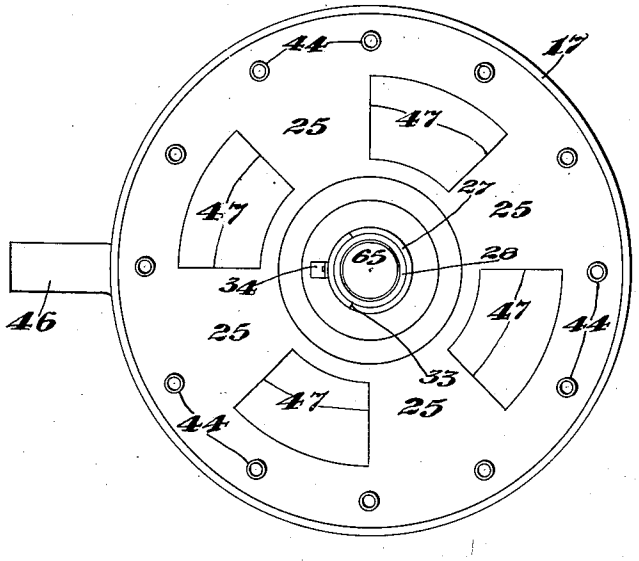


Fig. 7.

Fig. 6.



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UNITED STATES PATENT OFFICE.

LEONARD L. GRIFFITHS, OF DALLAS, TEXAS, ASSIGNOR TO TEXAS PORTLAND CEMENT COMPANY, OF DALLAS, TEXAS, A CORPORATION OF WEST VIRGINIA.

OIL-BURNER.

1,033,068. Specification of Letters Patent. Patented July 16, 1912.

Application filed January 22, 1909. Serial No. 473,641.

To all whom it may concern:

Be it known that I, LEONARD L. GRIFFITHS, a citizen of the United States, residing at the city of Dallas, in the county of Dallas and State of Texas, have invented certain new and useful Improvements in Oil-Burners, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a new and useful improvement in oil burners designed particularly for use in connection with cement kilns.

The object of my invention is to provide a structure whereby a thorough admixture of the air and combustible gases is insured, one in which it is possible to adjust the parts to vary the flame according to the treatment it is desired to give the materials or object being acted upon by the flame.

In the accompanying drawings: Figure 1 is a sectional view through the front wall of the furnace and a side elevation of the rotating, reverberatory chamber; Fig. 2 is a sectional view on the line 2—2, Fig. 1, looking to the left; Fig. 3 is a detailed view to show the supports for the rotatable cylinder; Fig. 4 is a perspective view of the burner supporter; Fig. 5 is a sectional view of the burner, same being on a greatly enlarged scale as compared to the previous figures; Fig. 6 is an end view of the burner, looking from the interior of the furnace; and Fig. 7 is a detailed view of the tip of the burner and adjacent parts.

The material to be converted into cement is introduced into hollow cylinder 1, which is supported by the forked standards 2 and 3, the arms 4 of said standards bearing the rollers 5, on which said cylinder is adapted to rotate. Flanged rings 6 and 7 encircle cylinder 1, and serve as tracks for rollers 4 and 5, respectively. The rear standard 3 is higher than standard 2, and thus supports cylinder 1 on an incline, thus giving the material contained therein an inclination to move in the direction indicated by the arrow in Fig. 1 from the initial end of said cylinder to the exit end thereof, where hopper 8 catches same, after which it is conveyed away by chute 9. The material is introduced into cylinder 1 through chute 10, which opens into a stationary end cap 11 for cylinder 1. A rack 12 on cylinder 1 is engaged by pinion 13 mounted on shaft 14 journaled in wall 15 and driven by pulley 16, and, by this means, a continuous rotation is imparted to cylinder 1, by reason whereof, conjoined with the incline of cylinder 1 (heretofore mentioned), the material contained in said cylinder is given a constant travel toward hopper 8. If, for any reason, such, for instance, as the nature of the particular material being treated, it were desirable to change the continuous rotary movement of said cylinder 1 into an intermittent rotary, or rotary reciprocatory movement, or into a movement variably continuous, such changes in the character of motion of said cylinder 1 can be readily effected by substituting other driving means for rack 12 and pinion 13.

Other cement furnaces more or less resembling in general characteristics the one that has been herein described have been found unsatisfactory, due to the fact that the entire mass of material therein contained would become fused, or that result would appear in an undue mass thereof, whereas, the best product is produced by, first, thoroughly calcining the material, and, thereafter, fusing same. This undue fusing of the material has been caused by the fact that the flame from the burner has penetrated too far to the rear in cylinder 1, and has subjected all parts of the contents thereof, or approximately all parts of the contents thereof, to the fusing temperature, which is higher than the preparatory calcining temperature. In the present apparatus, the burner employed is of such construction and so arranged that its flame can be regulated to any desired length, and, also, projected in any desired direction. Thus, instead of being projected clear to the rear of cylinder 1 (approximately 70 feet), it may, if desired, be injected a distance of only 10 or 15 or 20 feet into said cylinder 1. In this event, it would supply a suitable calcining temperature for the rear portion of cylinder 1, but its greatest heat, accompanied by fusing of the material, would be limited to that part of cylinder 1 lying in proximity to hopper 8. Thus, two distinct results would be produced by the same flame, and in the proper order to produce the best quality of product. It will be understood that the flame of said burner is not necessarily limited to 20 feet, but may be regulated to any desired greater or less length. Its length,

and, also, the specific application of its efficiency, depend, also, upon the angle at which said flame is directed, as hereinafter described, its penetration into cylinder 1 being greater when the burner is tilted into one position than when it occupies a different one, the exact degree of adjustment of the angle of inclination of said burner, and, therefore, of the angle at which its flame will strike the material in cylinder 1, being optional and governed by the kind of material to be treated. Said material preferably does not completely fill cylinder 1, but occupies a space of several inches depth, more or less, along the lower wall of said cylinder, which wall rotates past same, while the material travels lengthwise of said cylinder and toward hopper 8.

The particular construction and arrangement of the burner used in this furnace in connection with the above-described cylinder makes possible the above-mentioned better control or regulation of the flame, as well as the direction in which same is projected.

The flame of the burner is emitted, first, into cylinder 17 forming a combustion chamber. Said cylinder is supported in ring 18 by lugs 19, which seat in perforations 20 in said ring. Pins 21, projecting from ring 18, find bearings in lining 22 located in an opening through wall 23. By this double swiveling of cylinder 17, it is possible to direct the flame issuing therefrom either to the right or the left in cylinder 1, or to direct it up or down therein, that is to say, to cause same to impinge upon the material lying along the lower part of cylinder 1 at an angle of about 30 degrees, or more, or at an angle of much less than 30 degrees, or at an angle approximating 180 degrees, or at any other angle. When said cylinder 17 is tilted into one position, the flame issuing therefrom will be projected a considerable degree farther into cylinder 1 than when same is tilted into a position to form a more abrupt angle to the lower part of cylinder 1. When the flame issues out of the combustion chamber formed by cylinder 17 at an abrupt angle to the material in cylinder 1, it does not penetrate so far into cylinder 1 as when it enters thereinto at a less abrupt angle, with the result that intense heat is provided at that end of cylinder 1 adjacent to cylinder 17, while mere calcining heat will be found in the other part, or rear portion, of cylinder 1. The angle to the ground or floor at which cylinder 1 is arranged is, also, a factor in determining the degree at which cylinder 17 shall be tilted for the direction of the flame. It will, however, be obvious that, by reason of the pivoting of cylinder 17, the flame can be caused to strike the material in only the forward part of cylinder 1, and thus to expose same to great heat, while the heat farther back in the chamber formed by cylinder 1 will not be equally intense. It will, also, be obvious that, by means of this arrangement, the heat can be directed as required by the nature of the particular material under treatment, the exact tilt of cylinder 17 being governed to produce the best results with each kind of material or mixture. The central part of lining 22 is smaller in diameter of cross-section than the ends thereof, which are flared at 24, either as shown in the drawings, or otherwise, to allow for the tilting of cylinder 17 either up or down or to the right or left.

Cylinder 17 is open at the end adjacent cylinder 1, and is provided with a head 25 at the other end thereof, there being an opening 26 in said head in which is supported the pipe 27. Pipe 28 telescopes, and is supported by, said pipe 27, said pipe 28 being threaded at 29 for connection, by means of an internally-threaded sleeve 30, with pipe 31. A hand-wheel 32 is borne by said sleeve 30, and when said wheel is rotated in one direction pipe 28 moves forward in pipe 27, and when said wheel is rotated in the opposite direction said pipe 28 moves backward in said pipe 27, the threads on pipe 28 within sleeve 30 and the threads on pipe 31 being right and left hand threads relative to each other. A deflector 33 is attached by a spring 34 to pipe 27, which spring normally tends to cause said deflector partially to cover the opening out of pipe 28, but the degree of such opening depends upon the location of pipe 28 relative to the end of pipe 27. If within same, deflector 33 will hang like a shutter over the opening from pipe 28. If pipe 28 be advanced by hand-wheel 32 a short distance beyond the end of pipe 27, or pipe 27 moved back so that its end is a short distance beyond the end of pipe 28, deflector 33 will be raised into the position shown in Fig. 5. Further advance of pipe 28, or retraction of pipe 27, would additionally raise deflector 33.

Pipe 27 is mounted in opening 26 by means of the stuffing-box 35 and gland 36, stuffing-box 35 being held in place by ring 37 attached to head 25.

A threaded collar 38 is attached to the exterior of head 25, threads on the interior of the hub 39 of wheel 40 engaging the threads on collar 38. Wheel 41 is tight upon pipe 27, and engages hub 39 of wheel 40 in fixed relation thereto on one side of same, while stop 42 engages same upon the other side. Thus, rotation of wheel 40 will, by reason of the coöperation of the threads of its hub with the threads on collar 38, produce longitudinal movement of pipe 27, which serves as the primary means of adjustment of same and of deflector 33 relative to pipe 28, although movement of pipe 28, as hereinabove

mentioned, will also affect same. The movement of pipe 28 is, however, principally intended and utilized for the regulation of the thickness, rather than the direction, of the flame. Wheel 41 is used to rotate pipe 27 any desired distance for the purpose of changing the position of deflector 33, so as to afford a means for determining the direction of the projection of the flame of the burner or in thus assisting the other means (such as the tilting of cylinder 1, change of position of the burner on the universal joint, and movement of pipe 28) of governing the direction of the flame hereinbefore described.

Head 25 is pierced with a plurality of openings 43, which receive branches 44 from air-pipe 45. Air is driven through said pipe and said openings under pressure, and blows the flame emitted by the burner a considerable distance beyond the end of cylinder 17, port 46 for the admission of air into pipe 45 being located at any convenient point. A plurality of openings 47 in head 25 allow for the suction of additional outside air into cylinder 17, by reason of the draft created by the air forced therethrough under pressure from pipe 45. A shutter or damper 48, operated by handle 48ª, can be used either partially or wholly to close the openings 47, each wing 49 being adapted to register with an opening 47 to close same, or partly to overlie same in order partially to close same, or to register with the solid parts of head 25 between the openings 47 when it is desired that said openings 47 shall stand open to their fullest extent. It will thus be observed that provision is made for full control of the amount of air that is to be drawn into cylinder 17.

An air-chamber 50 is contained in box 51, screwed or otherwise secured upon pipe 31, one end of said air-chamber opening into the interior of said pipe, and the other end thereof being closed by a plug 52, either threaded or otherwise secured in opening 53 in box 51. Air under pressure is admitted into said air-chamber 50 by means of port 54, and, in part, is driven into pipe 31 and, in part, into pipe 55, which pipe 55 either circuitously or directly leads to the mouth of the burner. Admission of air through port 54 may be controlled in any desired manner.

In one form of arrangement, pipe 55, after leaving chamber 50, connects with pipe 56, which passes through oil-chamber 57, air-chamber 50, pipe 31, and oil-duct 58 located within pipe 28, said oil-duct 58 incasing said pipe 56 within pipe 28, pipe 31 and air-chamber 50 and said oil-duct 58 also communicating with oil-chamber 57, being threaded or otherwise secured in an opening in box 59 containing said oil-chamber 57. Oil is admitted into said chamber through port 60, and flows thereout through the entire length of duct 58 to the conical spreader 61 located adjacent to the mouth of the burner. Nut 62 is stationarily mounted on pipe 55, the exterior of its head being threaded into ring 63 adapted to move with wheel 64 stationarily mounted on pipe 56. Thus, by rotation of wheel 64, pipe 56 will be turned in either direction and caused to travel longitudinally within oil-duct 58, being thus adapted to move tip 65 forward or backward relative to the opening of pipe 28, one end of pipe 56 being screwed into, or otherwise secured to, said tip and supporting and carrying same.

A plug 66 closes an opening 67 from oil-chamber 57, said plug itself containing a recess 68 closed by a threaded gland 69. A perforation 70 extends through said gland, and a threaded perforation 71 passes through said plug 66. A threaded nut 72 is fixed to tube 73, which encircles and supports pipe 56. Said nut 72 engages the threads within the perforation through plug 66, and, by reason of same, when wheel 74, fixed to tube 73, is rotated, said tube 73 moves longitudinally either forward or backward, dependent upon the direction of rotation of wheel 74. Spreader 61 is fixed to the forward end of said tube 73, the forward face of said spreader being dished at 75 to receive the convex projection 76 from tip 65. Thus, a passage 77 is formed between said convexity 76 and the dish 75, openings 78 out of pipe 56 allowing air under pressure to escape into said passage 77, and thus to mingle with the oil emitted from duct 58.

Oil, preferably under pressure, is admitted into chamber 57, and flows through duct 58 in the narrow passage surrounding tube 73 to the end of said duct adjacent to spreader 61, at which point the oil exudes from duct 58 over the surface of conical spreader 61, thereby forming of the oil a hollow cone or film spread over the surface of said spreader 61, the presence of tube 73 within duct 58 having already formed the oil into a hollow cylinder preparatory for filming over said spreader 61. The advantage of this arrangement is that it is much easier to atomize the oil and to mix same with the air when the oil has been first mechanically reduced to the thickness of a film than if left as a solid column, such as would be ejected from an ordinary jet, such as has heretofore been used in oil and gas burners. When the oil is admitted, as just described, air is also forced into chamber 50, and travels through pipe 28 surrounding duct 58 to the point where the air under pressure strikes the film of oil covering the surface of spreader 61, which impact results in the atomization of the oil and thorough mixture therewith of the air, said mixture escaping through a

narrow passage 79 surrounding said spreader 61 and lying between same and the interior of pipe 28. Since oil duct 58 is located within pipe 28, a passage 80 is formed within pipe 28, and surrounding duct 58, said passage terminating in a tapered part, due to the tapering or conical shape of spreader 61. Usually, passage 79 will be located slightly inside the mouth of pipe 28, and, in any event, same will be so located that the air blown through openings 78 from pipe 56 and emitted by passage 77 will strike the mixture of oil and air escaping from passage 79, and at an angle adapted to force same farther forward, thus increasing the atomization of the oil and continuing the agitation which keeps same thoroughly mixed with the air. By means of the thorough atomization of the oil in the tapered end of passage 80, due to the contact there of air under pressure with a film of oil, and the mixture of the atomized oil with the air at that point, and the further atomization and mixture due to movement through the restricted passage 79, and assisted, furthermore, by the additional atomization and mixture caused by the blast of air issuing from passage 77, superior combustion is obtained, and a flame is produced of maximum calorific intensity. After emission from passage 79 in its atomized state, the combustion fluid is lighted by any appropriate means, and the flame thus produced is shunted in any desired direction by the use of deflector 33 and the tilting of cylinder 17.

While the burner hereinbefore described is principally intended to burn oil, yet it is obvious that gas or natural gas might, also, be used.

It will, furthermore, be obvious that cranks or handles may be substituted for the various wheels shown in the drawings and herein described, and that many other ordinary changes in various parts may be made without departing from the nature or spirit of the invention.

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

1. The combination of a wall having an opening, a burner, a cylinder supporting the burner, and means for supporting the cylinder in the wall opening for universal movement therein comprising wall-engaging and cylinder-engaging members.

2. The combination of a wall having an opening, a burner, a cylinder supporting the burner, means for supporting the cylinder in the wall opening for universal movement therein, comprising a ring pivotally mounted in the burner wall, and a pivotal connection between the cylinder and said ring.

3. The combination of a wall having an opening, a burner, a cylinder open at its front end, having a head at its rear end, the burner being mounted in said head, and means for supporting the cylinder in the wall opening for universal movement therein.

4. A burner comprising a combustion chamber, an oil duct communicating therewith, an interior air pipe arranged within said oil duct, an exterior pipe encircling said oil duct, and a spreader located at the mouth of said oil duct and nearly closing the exit from said exterior pipe, said spreader being supported concentrically with relation to the interior pipe.

5. A burner comprising a combustion chamber, an oil duct communicating therewith, an interior air pipe contained within said oil duct, an exterior air pipe encircling said oil duct and a conical spreader located at the mouth of said oil duct and nearly closing the exit from the exterior air pipe, said spreader being supported concentrically with relation to said interior air pipe and forming a tapering passage for the oil and air adjacent to the mouth of said exterior air pipe.

6. A burner comprising a combustion chamber, an oil duct communicating therewith, an inferior air pipe contained within said oil duct, an exterior air pipe encircling the oil duct, a spreader located at the mouth of said oil duct and nearly closing the exit from the exterior air pipe, said spreader being supported concentrically with relation to said interior air pipe, a tip spaced from said spreader and forming therewith a passage for the escape of air from said interior air pipe.

7. A burner comprising a combustion chamber, an air pipe opening thereinto, an oil duct concentrically arranged within said air pipe, an additional air pipe encircled by said oil duct whereby the oil is emitted in the shape of a hollow cylinder or film, and a spreader having an outwardly flaring surface adapted to restrict the opening from said first-mentioned air pipe and to shape said film like a hollow cone at the point of contact with the air passing through said first-mentioned air pipe.

8. A burner comprising a combustion chamber, an air pipe opening thereinto, an oil duct concentrically arranged within said air pipe, an additional air pipe encircled by said oil duct whereby the oil is emitted in the shape of a hollow cylinder or film, a spreader adapted to restrict the opening from said first-mentioned air pipe and to shape said film like a hollow cone at the point of contact with the air passing through said first-mentioned air pipe, and a tip spaced away from said spreader so as to form a passage therebetween, there being openings in said second-mentioned air pipe adapted to allow air to escape therefrom into said passage.

9. A burner comprising a combustion

chamber, an air pipe leading thereto, an oil pipe arranged within the air pipe, a second air pipe provided with outlet openings arranged within the oil pipe, an adjustable spreader in the form of a plug extending partially in the end of the oil pipe and forming a surface for directing the oil across the mouth of the first mentioned air pipe, the adjustment of said spreader also serving to control the outlet openings from the second mentioned air pipe, and a tip for directing the air from the second mentioned air pipe across the restricted outlet formed by the spreader and the first mentioned air pipe.

10. A burner comprising a combustion chamber, an air pipe leading thereto, an oil pipe arranged therein, a second air pipe arranged within the oil pipe and extending beyond the end of the first mentioned air pipe, a tip having a flaring surface arranged on the end of said second air pipe to close the same, said second air pipe having perforations for discharging air adjacent to the flaring surface of said tip, and a conical spreader encircling the second air pipe for coöperating with the end of the oil pipe and forming a restricted annular space between the end of said spreader and the first mentioned air pipe, said spreader also having a flaring wall adjacent the perforations in the second air pipe.

11. A burner comprising a cylinder having a head, a plurality of pipes mounted in said head and projecting into said cylinder a distance less than its length, a deflector pivotally mounted on one of said pipes and actuatable by movement of said pipe, and means mounted on said pipe for producing movement thereof.

12. A burner comprising a cylinder having a head, a plurality of pipes mounted in said head and projecting into said cylinder a distance less than its length, a deflector pivotally mounted on one of said pipes and actuatable by movement of said pipe, and means on said pipe for producing longitudinal movement thereof.

13. A burner comprising a cylinder having a head, a plurality of pipes mounted in said head and projecting into said cylinder a distance less than its length, a deflector pivotally mounted on one of said pipes and actuatable by movement of said pipe, and means on said pipe for producing rotary movement thereof.

14. In a burner, the combination of a cylinder having a head, a ring attached to said head, said ring being screw-threaded, an internally screw-threaded wheel, a pipe mounted in said head, and means for attaching said pipe to said wheel so that said wheel and said pipe will be adapted to travel longitudinally together.

15. In a burner, the combination of a cylinder having a head, a pipe mounted in said head bearing a pair of wheels, one adapted to impart longitudinal movement thereto and the other rotary movement, a pipe mounted in and supported by said first mentioned pipe and bearing a wheel adapted to impart longitudinal movement thereto, an oil pipe mounted within said last-mentioned pipe, and an air pipe located within said oil pipe and bearing a wheel adapted to impart longitudinal movement thereto.

16. In a burner, the combination of a cylinder having a head, an oil pipe mounted in said head and entering said cylinder, a spreader at the end thereof, an air pipe surrounding said oil pipe, an additional air pipe encircled by said oil pipe, an oil chamber adapted to supply oil to said oil pipe, a single air chamber adapted to supply air to both said air pipes directly connected to the air pipe around the oil pipe, and a pipe connecting said air chamber and the air pipe within the oil pipe.

17. In a burner, the combination of a cylinder having a head, a deflector-carrying pipe bearing a pair of wheels, one adapted to impart longitudinal motion to said pipe and the other being adapted to impart rotary motion thereto, an air-pipe within said first-mentioned pipe bearing a wheel adapted to impart longitudinal motion thereto, an oil pipe within said last-mentioned pipe, a second spreader-carrying pipe within said oil pipe bearing a wheel adapted to impart longitudinal movement thereto, and a third tip-carrying pipe within said last-mentioned pipe, and bearing a wheel adapted to impart longitudinal movement thereto.

18. In a burner, the combination of a cylinder having a head, means supporting the cylinder for universal movement, pipes mounted in said head and penetrating said cylinder, and means in connection with said pipes for adjusting same relative to each other.

19. In a burner, the combination of a cylinder having a head, and an air pipe leading thereto, a tip on the end of said air pipe, a tube encircling said air pipe, a spreader connected to said tube, an oil pipe the end of which is controlled by said spreader, means coöperating with the tube for adjusting the spreader relative to the oil pipe, and means for adjusting the tip relative to the spreader.

20. In a burner, the combination of a cylinder having a head, a pair of air pipes mounted in said head, an air chamber adapted to supply air under pressure to both said pipes, an oil duct surrounding one of said pipes and located within the other, and a spreader controlling the exit of oil and air movable to different positions relative to the pipe ends.

21. In a burner, the combination of a combustion chamber, an outer air pipe penetrating said chamber, an oil pipe within said outer air pipe, an inner air pipe within said oil pipe, a tube encircling said inner air pipe, a spreader mounted upon said tube and coöperating with the outlet of said oil pipe and of said outer air pipe, a tip mounted on said inner air pipe and forming a passage with the spreader, an air chamber communicating with said air pipes, and an oil chamber communicating with said oil pipe supported by said tube.

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

LEONARD L. GRIFFITHS.

Witnesses:
J. W. De Fever,
R. N. Miers.