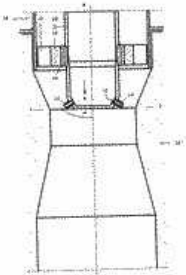
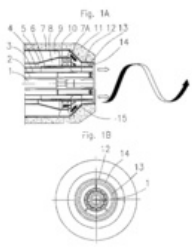
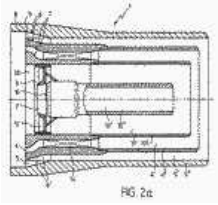
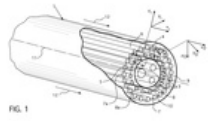
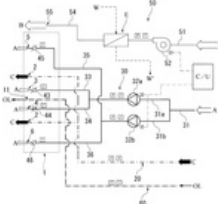
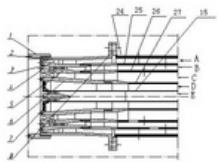
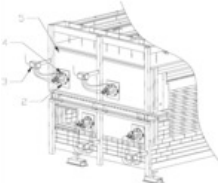
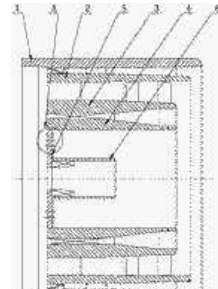
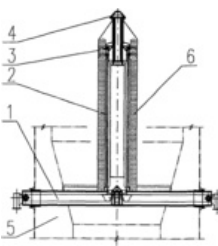
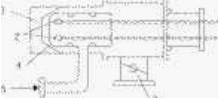
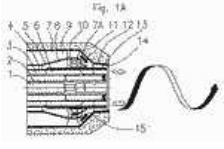
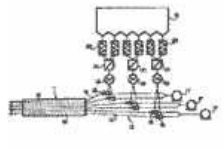
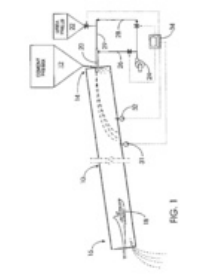
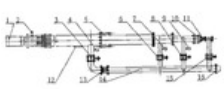
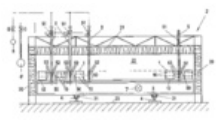
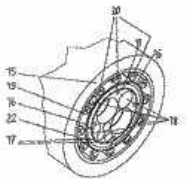
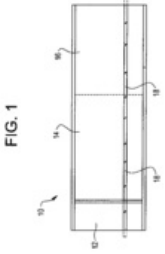
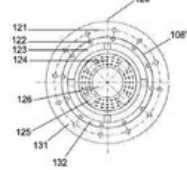
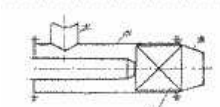


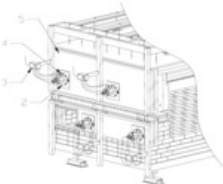
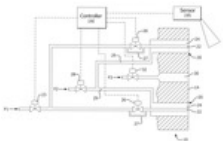
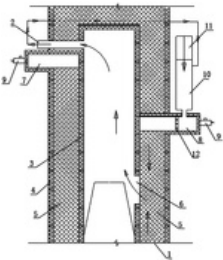
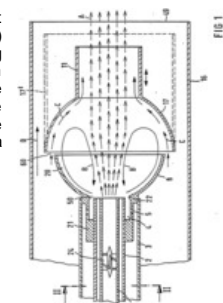
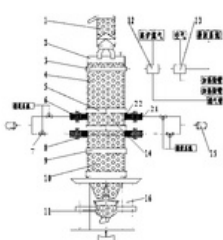
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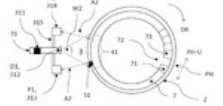
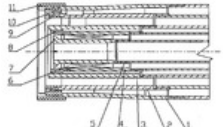
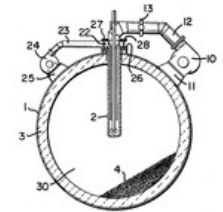
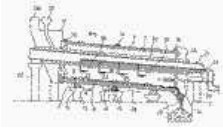
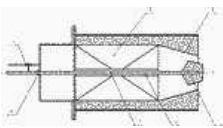
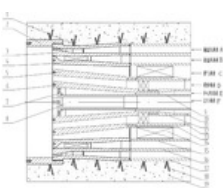
#	  Title	Publication number	Publ. date	Applicant/Assignee	
1.	Gas burner for incineration furnaces and installations.	FR2700830	1994-07-29	 RIEDHAMMER	
The invention relates to a gas burner for furnaces and kilns, having a central gas feed pipe (10), a burner pipe (18) extending around the gas feed pipe (10) with clearance therefrom, and a disc (16), extending radial to the gas feed pipe (10), disposed in the annular gap (20) formed between the gas feed pipe (10) and the burner pipe (18) in order to supply combustion air. The disc (16) has a plurality of through-ways (22, 24) in the flow direction of the combustion air, the cross-sectional area of these through-ways (22, 24) is at least 50% of the cross-sectional area of the disc (16), and the gas outlet end of the gas feed pipe (10) is so formed that the gas discharged via a plurality of gas outlet apertures (12, 14) is fed direct into the combustion air stream. In this furnace a substantial optimisation of the efficiency of the burner and significantly improved reliability are achievable. The through-ways may be arranged at an angle of between 1 - 30 degrees to the flow direction of the combustion air. The disc may be axially displaceable and along with the end of the gas feed pipe may be made of ceramic. <IMAGE> (From DE4301840 A1)					
2.	Method of mixing high temperature gases in mineral processing kilns	EP1888990	2008-02-20	 ASH GROVE CEMENT  CADENCE ENVIRONMENT ENERGY  CADENCE CHEMICAL RESOURCES  CADENCE ENVIRONMENTAL ENERGY  CADENCE ENVIRONMENTAL ENERGY	
A method is described for reducing NOx emissions and improving energy efficiency during mineral processing in a rotary kiln (10). The method comprises injection of air with high velocity/high kinetic energy into the kiln (10) to reduce or eliminate stratification of kiln gases. The method can be applied to mix gases in a rotary kiln vessel (12) or in a preheater/precalciner vessel.					
3.	Method and burner for introducing fuel to a kiln	EP0965019	1999-12-22	 FLSMIDTH F L HAND FL SMIDT EHND KO VÅ=LLER SMYRNE	
A method as well as a burner are provided for introducing solid, liquid or gaseous fuel into the burning zone of a kiln, such as a rotary kiln for manufacturing cement clinker or similar products, where fuel is conducted through substantially concentric ducts (1, 6) and where primary air is conducted through two likewise concentric and annular ducts (8, 9) arranged around the fuel ducts, where the air in one of these air ducts (9) is made up of axially flowing air, whereas the air in the second air duct (8) comprises air which is caused to rotate about the centre axis of the burner, and where the portions of primary air can be independently controlled. The peculiar feature of the burner is that the primary airstreams are mixed at a relatively low velocity in a collecting duct (15) into a primary airstream which is subsequently accelerated up to a desired, relatively high velocity prior to being injected into the kiln via an annular nozzle (14). There is thus obtained effective mixing of fuel and air in an operationally reliable manner with a minimum loss of pressure, and the flame shape can be adapted to the optimum desired.					
4.	Process for operating a burner and burners for rotary drum furnace	EP0421903	1991-04-10	 PILLARD CHAUFFAGE  PILLARD FEUERUNGEN	
In a corresponding process, fuels and primary combustion air are introduced concentrically and the burner comprises a burner nozzle (1) which comprises concentric supply pipes for the fuel (10') and for the primary combustion air in the form of axial air (5') and swirling air (4'). In order to provide a process and a burner which can function with a lower proportion of primary air and a wider adjustment range, a dead zone is provided at the centre of the flame directly around a central fuel pipe and inside an annular fuel supply pipe, into which a very low proportion of fuel is sent.					
5.	Rotary kiln burner capable of replacing fuels by solid wastes	CN203010622	2013-06-19	 NANJING NBE SCIENTIFIC & TECHNOLOGY	
The utility model discloses a rotary kiln burner capable of replacing fuels by solid wastes. The rotary kiln burner comprises a burner casing (1), a burner spray head (2), an axial flow air passage (3), an external tangential air passage (4), a coal powder passage (5), an internal tangential air passage (6), a center air passage (7), a solid waste passage (8) and an oil gun passage (9), wherein the axial flow air passage (3) is positioned in the burner casing (1). The rotary kiln burner has the advantages that the structure design is reasonable, the environment protection performance is high, various kinds of coal can be used as fuels, meanwhile, solids such as refuse derived fuels (RDFs), rice hulls and sawdust can be used as alternative fuels, the resource utilization of the wastes can be realized, the environment pollution is reduced, the energy is saved, the consumption is reduced, the cost is lowered, in addition, the emission of nitric oxides can be reduced, and obvious economic effects and social effects are realized.					
6.	A method and a burner for introducing fuel into a burning zone of a kiln	WO2013/091634	2013-06-27	 FLSMIDTH	
A description is made of a method as well as a burner for introducing solid, liquid or gaseous fuel into a burning zone of a kiln, such as a rotary kiln for manufacturing cement clinker or similar products, by which method fuel is conducted through a number of ducts (3) to a discharge end (4) of a burner (1) having a centreline (11) and portions of primary air is conducted through ducts (5, 6; 14, 15) being arranged outside the fuel ducts (3) also to the discharge end (4) of the burner (1), and where the portions of primary air can be independently controlled. The peculiar feature of the method and burner is that the primary air is discharged from the discharge end (4) of the burner (1) in at least an inner an and outer set of air streams, where the air streams in at least one of the sets are discharged through each their nozzle (7a, 8a), where at least some of the air streams discharged from the nozzles (7a) in the outer set (9) have an axial velocity component (X0) and a radial velocity component (Y0) in the direction towards the centreline (11), where at least some of the air streams discharged from the nozzles (8a) in the inner set (10) have an axial velocity component (Xi) and a radial velocity component (Y i) in the direction away from the centreline (11), and whereat least some of the air streams in a set collide with a neighbouring air stream. Hereby is obtained a method as well as a burner by means of which severe ignitable and slow burning fuels in a more effective way may be used for the firing into a kiln. This is mainly because the fuels by the method and burner according to the invention may be ignited relatively close to the burner and therefore in most cases have sufficient of the time to burn out completely before they fall into the material filling in the kiln.					

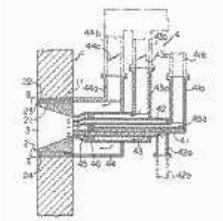
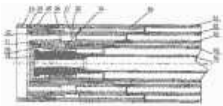
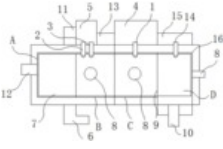
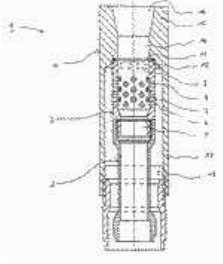
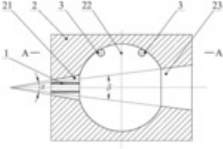
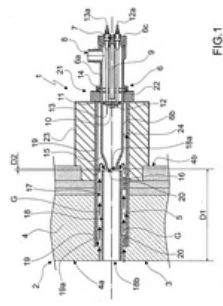
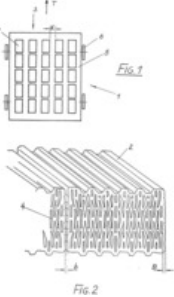
7.	Spiral-flow type four-channel pulverized coal burner for rotary kiln	CN201964401	2011-09-07	XIANGFAN DALI ELECTROMECHANICAL TECHNOLOGY	
The utility model relates to a spiral-flow type four-channel pulverized coal burner for a rotary kiln in which pulverized coal and combustion air can be burned fully in the rotary kiln. The spiral-flow type four-channel pulverized coal burner for the rotary kiln mainly solves the problems that known double-air duct and three-air duct pulverized coal burners can only burn high-quality coal and have poor flame adjustment performances. The spiral-flow type four-channel pulverized coal burner for the rotary kiln is characterized in that an axial flow air channel A, a spiral flow air channel B, a coal air channel C, a central air channel D and an ignition channel E are sequentially arranged at the head of a nozzle of the burner from outside to inside, an axial flow outlet section area adjustment device, a spiral flow outlet section area adjustment device and a coal air outlet section adjustment device at the head of the nozzle are arranged on a burner body, and adjusting valves for adjusting air quantity are respectively arranged on air purifying pipes connected with an axial flow air pipe, a spiral flow air pipe and a central air pipe. By using the spiral-flow type four-channel pulverized coal burner, the combustion is full, the flame is stable and regular, the flame temperature is uniformly and reasonable distributed, and the section area of the outlet air channels can be adjusted, so that the speed, shape and intensity of flame can be adjusted.					
8.	Burner device for a rotary kiln	JP3213113	2017-10-19	NIPPON FURNACE	
PROBLEM TO BE SOLVED: In a rotary kiln burner apparatus, and improve the controllability of the flame, or lean pulverized coal is used as a main fuel a solid powder mixed combustion in operation, reduced fuel costs and increasing the rate of the mixed combustion or the cost. SOLUTION: The swirl air injection port (4,6), to form a swirl air flow and air flow deflection means, the fuel supply port (2), a fuel flow injection to form the straight (C). The straight air injection port (3) and within the flow of the air injection port (4) is in flow turning, the first 1 air pumping device is interposed the flaming (32a) of the air supply system is connected with flow paths (31a). Co-fuel to a combustion reaction (OL) takes in the air flow path downstream of the combustion supporting air injection (A) is supplied to the inlet (3,4). The straight-flow air injection port (5) and the outer flow turning out of the air injection port is provided (6), first 2 air pumping device is interposed in the main (32b) of the air supply system is connected with flow paths (31b). The primary air flow is formed on the relatively fast (A) the combustion air flow path downstream of the outside air supplied to the injection port (5,6). SELECTED DRAWING: Fig. 7					
9.	Spiral-flow type four-channel gas burner used for rotary kiln	CN201954551	2011-08-31	XIANGFAN DALI ELECTROMECHANICAL TECHNOLOGY	
The utility model provides a spiral-flow type four-channel gas burner used for a rotary kiln, and relates to a four-channel gas burner capable of enabling gas fuel to be burned completely. The utility model mainly solves the problems that the double-channel and three-channel gas burners used for the rotary kiln of the prior art cannot fully mix and burn gas fuel and combustion air, the burning speed is low, the flame is diffuse and powerless, and the shape is irregular. The spiral-flow type four-channel gas burner adopts the structure as follows: an axial-flow channel A, a spiral-flow channel B, a coal gas channel C, a center wind channel D and an ignition channel E are sequentially arranged from outside to inside at the head of a nozzle of the burner; an axial-flow wind discharge area adjusting device and a spiral-flow discharge area adjusting device of the nozzle head are arranged on a burner body; and clean wind pipes connected with axial-flow, spiral-flow and center wind pipes are equipped with adjusting valves respectively for adjusting wind volumes. The spiral-flow type four-channel gas burner has the advantages that the combustion is full, the flame is stable, the flame temperature distribution is even and reasonable, and each discharge duct area can be adjusted on line, that is, the flame speed, the shape and the power can be adjusted.					
10.	Alarm device for monitoring partial overtemperature of kiln nozzle	CN104990424	2015-10-21	GUANGDONG MODENA TECHNOLOGY	
The invention relates to a kiln auxiliary alarm device, in particular to an alarm device for monitoring partial overtemperature of a kiln nozzle. The alarm device comprises a nozzle, a nozzle flange, a nozzle controller and a temperature sensing element. The nozzle is provided with an ignition electrode and a monitoring electrode. The nozzle flange is arranged on a kiln and attached to the outer wall of a combustion chamber. A nozzle combustion chamber is arranged around the nozzle and composed of a pipe sleeve made of a silicon carbide material. A high-aluminum protection cover is further arranged outside the pipe sleeve which is made of the silicon carbide material and is located in an insulated layer of the kiln. The temperature sensing element is a touch type temperature sensing element located on the nozzle flange and transmits temperature signals to the nozzle controller. The temperature of the area around the nozzle is detected through the temperature sensing element, when the temperature exceeds a normal range, the nozzle controller sends out an alarm signal to remind an operator to check the nozzle in time, the condition that the kiln and equipment are damaged when the temperature is ultrahigh is prevented, and therefore maintenance difficulty and cost are effectively reduced.					
11.	Crossed-jetting-type low-nitrogen energy-saving pulverized coal burner for rotary kiln	CN202792007	2013-03-13	YANGZHOU YINYAN MACHINES PLANT	
The utility model discloses a crossed-jetting-type low-nitrogen energy-saving pulverized coal burner for a rotary kiln in the field of burners. The crossed-jetting-type low-nitrogen energy-saving pulverized coal burner comprises an adjustable whirlcone, a coal nozzle, an axial-flow air nozzle and an axial-flow air jacket, wherein an axial-flow air flue is formed between the axial-flow air jacket and the axial-flow air nozzle; a coal air flue is formed between the axial-flow air nozzle and the coal nozzle; a whirl air flue is formed between the coal nozzle and the adjustable whirlcone; a honeycomb rotary-cutting nozzle is coaxially arranged inside the adjustable whirlcone; an ignition channel is connected with the center of the honeycomb rotary-cutting nozzle; and an inclined surface is processing on the inner side, close to the outlet end surface of the whirl air nozzle, inside the axial-flow air jacket. According to the crossed-jetting-type low-nitrogen energy-saving pulverized coal burner provided by the utility model, the coal air flue is arranged between the axial-flow air flue and the whirl air flue, and the combustion characteristics of pulverized coal are utilized to improve pulverized coal conveying concentration, improve the jetting condition of combustion air after the pulverized coal dust is sprayed out, and reduce energy consumption and generation of NOX, so that the coal burner can be used for pulverized coal combustion of the rotary kiln.					
12.	Lime shaft kiln with central burning nozzle	CN101117277	2008-02-06	ACRE COKING & REFRACTORY ENGINEERING CONSULTING	
The invention relates to a large-sized lime shaft kiln with a central burner tip. The invention is characterized in that: the shaft kiln is provided with the central burner tip which is arranged on the lower part of the kiln and provided with refractory lining bricks all round; the central burner tip is divided into a central top burner tip and a central side burner tip according to the difference in burning area coverage; a central post supported by a support beam is respectively arranged on the lower part of the central top burner tip and the central side burner tip; and the central post and the support beam are still taken as channels to convey gas and air. The invention solves the problem of insufficient heat supply to materials in the center of the kiln when the large-sized lime shaft kiln adopts a circumferential gas burner tip, thereby the quality and quantity of products are improved and the lime shaft kiln is made to develop towards large scale.					
13.	Cooling device of high temperature short kiln burner	CN202993196	2013-06-12	SHENYANG RESEARCH INSTITUTE OF NONFERROUS METALS	
The utility model relates to a cooling device of a high temperature short kiln burner. The cooling device of the high temperature short kiln burner comprises an air guide sleeve, wherein a fuel nozzle and an air inlet channel are arranged in the air guide sleeve. The cooling device of the high temperature short kiln burner is characterized in that a cooling sleeve which encircles the fuel nozzle is arranged in front of the fuel nozzle in the air guide sleeve, and a cooling air channel which is communicated with an external fan is arranged at the lower portion of the cooling sleeve. According to the cooling device of the high temperature short kiln burner, the fuel nozzle of the burner is cooled by means of a cold air blowing-in mode, due to the fact the contacting area of air is large, the air can fully contact with the fuel nozzle, the temperature of the fuel nozzle is reduced, and the problem that the fuel nozzle is burned due to overheating can be solved.					

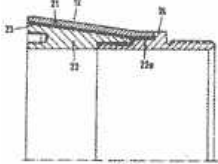
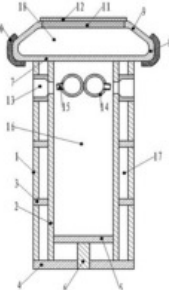
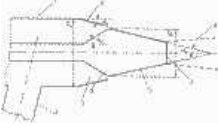
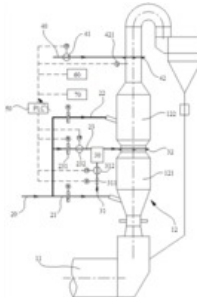
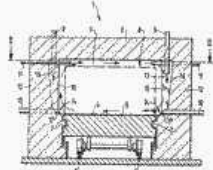
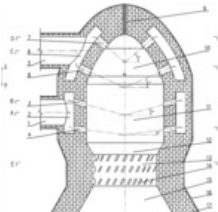
14.	A method and a burner for introducing solid, liquid or gaseous fuel into a burning zone of a kiln	IN2961/CHE/1997	2006-10-13	FLSMIDTH
A method and apparatus for introducing solid, liquid or gaseous burning zone of a rotary kiln for manufacturing cement fuel into a conducted through a duct or ducts and primary air is conducted clinker. Fuel is two annular ducts arranged concentrically with, and around, conducted through at least portion of air in one of the air ducts flowing axially, the fuel duct(s), the in the second of the air ducts comprises air which - whereas the portion of air the center axis of the burner, and wherein has a rotary component about the amount of primary air in the two portions is independently controlled, such that the two portions of pri are mixed at a lower velocity in a collecting duct into a single ri ary mixed ed airstream having a desired axial/rotary flow characteristic and y mixed airstream is subsequently accelerated up to a desired, higher discharge this velocity. 				
15.	Device for supplying pulverized coal to burner of rotary kiln	JP10101384	1998-04-21	MITSUBISHI MATERIALS
PROBLEM TO BE SOLVED: To stabilize the combustion in heating and to prevent the wear of brick due to initial slapping by making the supply of pulverized coal to a burner constant and eliminating the deposition of coating, channeling of pulverized coal in an air duct, clogging of the burner with pulverized coal and nonuniform delivery at the tip. SOLUTION: Pulverized coal is continuously and uniformly extruded from a hopper 12 by a measuring screw conveyor 20. The pulverized coal pressure is made constant by the uniform discharge. The pulverized coal is weighed by an impact line 21, mixed with air by an ejector 16 through a rotary valve 16 and supplied to a burner 11 from six coal feed pipes 15. The pulverized coal is circumferentially supplied into a rotary kiln from twelve spouts of the burner 11 in a uniform amt. (uniform concn.) to form a combustion flame. The pulverized coal is uniformly discharged and centrifugally supplied into the kiln in a uniform concn. in this way, and hence the combustion is improved and stabilized in the kiln. COPYRIGHT: (C)1998,JPO 				
16.	Reduction of no x emissions from rotary cement kilns by selective noncatalytic reduction	EP0934112	1999-08-11	FUEL TECH NALCO
The use of urea injection SNCR is enabled for rotary kilns of the type used to produce cement clinker. Rotary kilns (10) are long cylinders that rotate about an inclined axis, with cement premix fed in at one end (14) and a burner (18) for heat at the other end (16). The geometry of the kilns and temperatures at the ends make introduction of ammonia or urea solutions ineffective or totally impractical. Urea prills can be injected at an initial velocity of a least 25, typically greater than 100 meters per second (20) to reach into the kiln where a suitable temperature window for NOx reduction can be found. 				
17.	Burner for a kiln	US4373900	1983-02-15	PILLARD
A burner for pulverized coal such as in a rotary kiln includes three concentric cylindrical ducts. The outer duct carries an air supply which is directed in a generally axial direction into the kiln. The next innermost duct carries the pulverized coal-carrier gas mixture and is also generally directed in an axial direction. The next innermost duct carries air which is directed in a divergent radial direction in the kiln and includes a rotational air component. By controlling the quantities of air in the ducts which flank the coal duct, the resulting flame form can be controlled in the kiln without restoring to variations in the velocity or direction of the coal carrier gas stream. By eliminating such variations in regard to the coal carrier gas stream, the abrasive action of the pulverized coal is kept to a minimum. 				
18.	Rotary kiln five-duct coal burner	CN2529083	2003-01-01	WANG SHUSEN
The utility model provides a rotary kiln five-duct coal burner, and is characterized in that the utility model consists of five coaxially distributed steel pipes, corresponding outlet nozzles and a valve used for regulation of air flow and air speed etc. The utility model has different ducts consisting of different gaps between each sleeve pipes, which are respectively known as: an outer axial flow air duct, a coal air duct, an inner axial flow air duct, an inner cyclone air duct and a central air duct. Front ends of each air pipes are respectively provided with a correspondingly heat-resistant steel outlet nozzle or a cyclone. The utility model has high efficiency of combustion, high burnout rate of the coal and wide regulating ranges of the flame shape and temperature, can significantly reduce one-time air flow entry into the kiln, the fuel consumption and the environmental pollution, in particular has high adaptation for the fluctuation of quality of the coal, not only has the burning of high-quality bituminous coal but also has the burning of anthracite and low-quality coal as well flammable industrial and domestic refuse. The nozzle of each air duct positioned at a head of the burner is respectively connected with the corresponding head of the air duct and the steel pipe by adopting thread or a bayonet, thereby having rapid and convenient replacement of spare parts. 				
19.	Tunnel kiln, and burner for use in a tunnel kiln	US20020136998	2002-09-26	WIENERBERGER ZIEGLINDUSTRIE
A tunnel kiln useful for burning vertically perforated green bricks, includes a furnace chamber; a plurality of tubular burners for heating the furnace chamber, with the burners defined by longitudinal axes which extend essentially in a vertical direction; and a transport device for so transporting green bricks in raster-like spaced-apart relationship in a travel direction through the furnace chamber that the perforations of the green bricks are oriented in a common direction. Each of the burners has a nozzle body formed with orifices for combustion gases, with the orifices defined by longitudinal axes which extend substantially in a direction of the perforations, wherein the nozzle body is positioned within a spacing between confronting end faces of neighboring green bricks. 				
20.	Oxygen-rich partial oxygenation jet-flow combustion-supporting energy-saving emission-reducing system for rotary kiln	CN103411420	2013-11-27	WEI BOQING
An oxygen-rich partial oxygenation jet-flow combustion-supporting energy-saving emission-reducing system for a rotary kiln comprises a set of oxygen-rich nozzle inside a combustor, multiple sets of oxygen-rich nozzles outside the combustor, an oxygen-rich conveying system directly conveying part of oxygen-enriched gas in a kiln tail decomposing furnace, an enriched oxygen generating device and an enriched oxygen preheating device. The oxygen-rich partial oxygenation jet-flow combustion-supporting energy-saving emission-reducing system for the rotary kiln is characterized in that the largest included angle of the inclined face of the spraying mouth of the oxygen-rich nozzle inside the combustor and the vertical face of the middle axis of the oxygen-rich nozzle is 1 degrees to 15 degrees, and the inclined face exactly faces the lower portion of the combustor; the oxygen-rich nozzles outside the combustor are mainly distributed on the lower half portion of the combustor, for the contrarotating rotary kiln, N oxygen-rich nozzles are evenly distributed on the cover wall of a kiln head cover at the position of one fourth of the lower left portion of the combustor, M oxygen-rich nozzles are evenly distributed on the cover wall of the kiln head cover at the position of one fourth of the lower right portion of the combustor, 1<=M<=5, N<=M, an oxygen-rich nozzle on the upper right side of the combustor is arranged on the upper side of the cover wall of the kiln head cover at the position of one fourth of the lower right portion of the combustor. 				
21.	Method and apparatus for controlling a flame in a kiln	IN1267/MUM/2012	2012-06-01	SANGHAVI ENGINEERING
The present disclosure provides an apparatus and a method for controlling flame geometry of a burner for a rotary kiln comprising at least one first hollow member positioned axially to the burner adapted to transport fuel. At least one second hollow member concentric to the at least one first hollow member configured to supply a draft of cold air through a first conduit. At least one third hollow member configured to supply a main solid fuel through a second conduit. At least one fourth hollow member adapted to be retractable in axial direction to the burner through a positioning assembly and further adapted to supply an independently controlled air having a swirl motion about the burner axis positioned concentrically around the at least one third hollow member. At least one fifth hollow member defining a fourth conduit adapted to supply air having an axial direction of flow to the burner.				

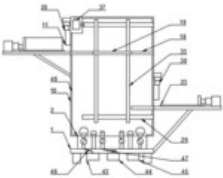
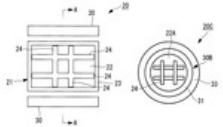
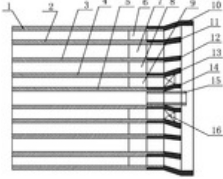
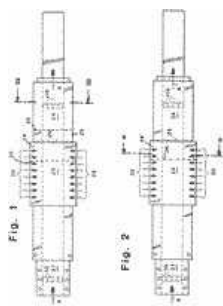
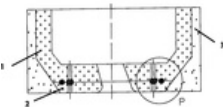
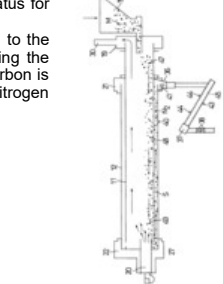
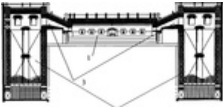
22.	Rotary furnace burner	EP1957867	2008-08-20	KHD HUMBOLDT WEDAG	
In order to create a rotary furnace burner, particularly for fine-grained solid fuels such as coal dust with jet air nozzles, which can be adjusted easily and in an effective manner during operation of the rotary furnace for the purpose of changing the divergence angle of the high-speed air jets in order to modify the shape of the flame and for optimizing the burning, the invention provides that the jet air nozzles (20) are fastened to the nozzle openings, which diverge with regard to the burner axis, at the end of jet air tubes (21), and these are to be arranged in an axially parallel and distributed manner around the burner axis, and the air jet tubes (21) are to be placed inside a cooling air ring duct (22) that delimits the coal dust duct (16) in an annularly surrounding manner outside the burner support tube (19) and to mount in a manner that enables them to rotate about the jet air tube axes so that, when the jet air tubes (21) rotate, at the cold end of the burner lance, the divergence of the high-speed air jets and thus the angle of the air jet flow cone can be changed and set in comparison to the coal dust cone.					
23.	Method for firing ceramic honeycomb bodies in a tunnel kiln	EP1042640	2000-10-11	CORNING	
A tunnel kiln (10) for firing ceramic honeycomb structural body comprising a vestibule region (12), a carbonaceous material release region (14) located downstream of the vestibule region and a sintering region (16) located downstream of the carbonaceous material release region and having a multiplicity of kiln cars (18) adapted to convey materials to be fired through the kiln. A gas distribution system (20) is provided which includes a series of conduits (22, 24, 26, 28, 30) each which operatively communicates with an injection site which operatively communicates with the interior of the release region for introducing a gas into the carbonaceous release region. The injection sites include a combustion burner located site (38), a vestibule located site (32), an undercar located site (34), a rooftop located site (36), and a sidewall located site (40) or combinations thereof.					
24.	Method to enhance burner efficiency and burner	EP3455554	2019-03-20	DYNAMIS ENGENHARIA E COMÉRCIO DYNAMIS ENGENHARIA E COMÉRCIO	
There is described a burner barrel (102) comprising a concentric multi-tubular structure, formed by pipes (111-115) and wherein at the end downstream the said burner barrel (102) is provided a burner tip (120) in which various nozzles to inject fuel and primary air (Ap) are perforated. Said burner tip (120) comprises at least one series of nozzles (121) intended to inject an external air flow; a second series of nozzles (122) intended to inject tangential air flow; a third series of apertures (123) intended to inject the fuel and transport air. The ends downstream the first (111) and second (112) burner pipes are joined and define a continuous external annular surface (131) of the burner tip (120), and wherein said nozzles (121) arranged within an inscribed area (141), being the dimension of the nozzles (121) limited by a rate between the open area A of the nozzles (121) and the complementary closed area A.					
25.	Horizontal flame unit kiln structure adopting thermal storage combustion technique	CN102494533	2012-06-13	LIAONING TIANHE TECHNOLOGY	
The patent refers to the field of 'furnaces, kilns, ovens, or retorts and open sintering or like apparatus'. The invention relates to a horizontal flame unit kiln structure adopting the thermal storage combustion technique. In the invention, independent thermal storage chambers are arranged on the left and the right sides of a kiln; fire spraying nozzles are arranged below a combustion-supporting air spout of the kiln; and the flame of the burners is horizontally arranged. When the kiln operates, combustion at time intervals is adopted, that is, when the burner on the right side operates, the thermal storage chamber on the left side stores heat, and when the thermal storage requirement is met, the burner on the left side starts to operate, and the burner on the right side stops operating; and combustion airflow blown from a blower flows through the thermal storage chambers to absorb heat inside the thermal storage chambers, therefore, the burners on the left and the right sides perform reversing combustion at time intervals, and the thermal storage chambers on the right and the left sides store heat at time intervals at the same time, so as to form the thermal storage combustion type horizontal flame unit kiln structure. The structure can improve the uniformity of the internal temperature field of the kiln, and improve the production quality of metallurgical auxiliary material; and at the same time, the structure can effectively utilize the flue gas residual heat after the combustion of the kiln, thereby saving energy.					
26.	Kiln for continuous fiber production of basalt	CN202543025	2012-11-21	SHANXI BASAI AOTE SCIENCE & TECHNOLOGY	
The utility model relates to a kiln for the continuous fiber production of basalt. The inside of a kiln body (16) is sequentially divided into a preheating area, a high temperature area, a settling area and an operation area, wherein a flue (11) is arranged above the preheating area; a charging hole (12) is formed in the kiln body (16) on a side surface of the preheating area; the top of the kiln body (16) comprises a high arch and a lower arch; the flue (11) is connected with a high arch (5) and a lower arch (13) in the high temperature area, a high arch (4) in the settling area and a low arch (15) in the operation area sequentially; two rows of high temperature area nozzles (2) and (3) are arranged on the high arch (5) in the high temperature area; a nozzle (1) in the settling area is arranged on the high arch (4) in the settling area; a nozzle (14) in the operation area is arranged on the low arch (15) in the operation area; a channel (7) is arranged between the bottom and the top of the kiln body (16); a catching table (6) is arranged where the bottom of the kiln body (16) corresponds to the flue; the bottom of the kiln body (16) in the operation is lower than those in the settling area and the high temperature area; a discharge hole (10) is formed in the bottom of the kiln body (16) in the operation area; and temperature detection holes (8) are formed in the side surface of the kiln body (16) in the operation area and the front surfaces of the kiln body (16) in the settling area and the high temperature area. The kiln has the advantages that the temperature in each area can be controlled precisely; and high-quality stable basalt fusan can be produced.					
27.	Cement kiln local oxygen-enriched combustor	CN203703959	2014-07-09	NANJING KISEN INTERNATIONAL ENGINEERING	
The utility model relates to a cement kiln local oxygen-enriched combustor. An oxygen-enriched air channel is arranged outside a combustor axial-flow air channel, and nozzles are disposed at an outlet of the oxygen-enriched air channel. The nozzles are distributed below the outer circumference of axial-flow air nozzles and are close to clinker, so that the local concentration oxygen of a contact side between the lower portion of the combustor and the oxygen-enriched air channel is increased and the combustion speed of fuel is increased to directly lead to local heat aggregation. With the progress of oxygen diffusion, heat transfer and heat radiation, adjacent fuel starts combusting, therefore, the temperature of a contact side between rotary kiln clinker or similar matters and the oxygen-enriched air channel obviously rises to cope with raw material quality fluctuation caused by ingredients. In addition, a central angle corresponding to a distribution area of the nozzles in a circumferential direction is set to be smaller than or equal to 270 degrees and can fully cover an area between fuel and cement clinker or similar matters that rotate along with a rotary kiln, such that oxygen-enriched air is guaranteed to be utilized precisely and saved.					
28.	Heating apparatus and process	US3427010	1969-02-11	STRATEGIC MATERIALS STRATEGIC PARTNERS	
1,161,327. Rotary furnaces. STRATEGIC PATENTS Ltd. 18 Oct., 1966 [19 Oct., 1965]. No. 46574/66. Heading F4B. In a rotary furnace 40 for the reduction of ore with a carbonaceous reactant having a burner 48 at the discharge end, air injection pipes 10 with associated fans 28 are disposed at intervals with nozzles pointing centrally and axially of the kiln. Scoops 50 pick up coal from troughs 52 and deposit it in the furnace near the pipes 10. The nozzles may have a reduced orifice (Fig. 3) which may be associated with a flared baffle narrowing in the downstream direction (Fig. 5). Another nozzle assembly is of assymetric T-section (Fig. 4), the delivery nozzle being disposed short of the entry pipe end to form an air cushion. (From GB1161327 A)					
29.	Energy-saving premix gas burner	CN2088200	1991-11-06	SHANGHAI MACHINERY COLLEGE SHANGHAI NO 3 IRON & STEEL PLANT	
The utility model discloses an energy-saving premix gas burner nozzle, which is a gas-burner used for industrial kilns. The utility model is characterized in that a straight furcation eight-channel two-channel mixer (3) is arranged at the spout end (5) of a burner nozzle, a premixed flame is formed by that gas and air are mixed fully before combustion by the mixer; the temperature of the premixed flame is high, the flame length can be adjusted, and the combustion is complete and stable. The utility model has the advantages that the hearth temperature is uniform, the flow resistance of the airflow is small, the phenomenon of coke tar can not occur, the work pieces can be quickly heated, the heating quality is reduced, the fuel is saved, and the goal of energy saving is achieved.					

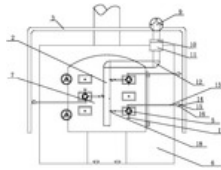
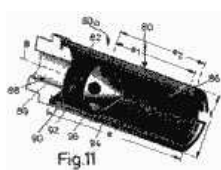
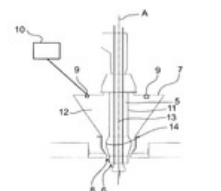
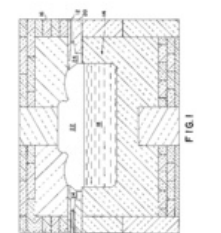
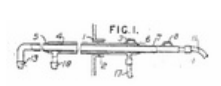
30.	Local over -temperature alarm device of monitoring kiln nozzle	CN204757722	2015-11-11	GUANGDONG MODENA TECHNOLOGY	
The utility model relates to an alarm device, especially a local over -temperature alarm device of monitoring kiln nozzle are assisted to the kiln. Including a nozzle, nozzle flange, nozzle controller, temperature -sensing element, wherein, the nozzle has ignitor electrode and monitoring electrode, and nozzle flange mounting is on the kiln and hug closely outer wall of the combustion chamber, is equipped with the nozzle combustion chamber around the nozzle, and the nozzle combustion chamber comprises the pipe box of carborundum material, still is equipped with the adiabatic intraformational high alumina quality guarantee sheath of installing in the kiln outside the pipe box of carborundum material, the temperature -sensing element is for installing the contact temperature -sensing element on the nozzle flange to pass to the nozzle controller with temperature signal. The utility model discloses a temperature -sensing element detects the temperature of nozzle peripheral region, and when the temperature exceeded normal range, the nozzle controller sent alarm signal, reminded operating personnel in time to inspect, prevents that it personally experiences sth. Part of the body and equipment to damage the kiln after the temperature superelevation to the degree of difficulty and cost are maintained to effectual the reduction.					
31.	Device for spraying ammonia to decrease nitric oxide emission on kiln head of cement kiln and rotary cement kiln	CN202638266	2013-01-02	CHINA BUILDING MATERIALS ACADEMY	
The utility model relates to a device for spraying ammonia to decrease nitric oxide emission on a kiln head of a cement kiln and a rotary cement kiln. The device comprises an ammonia water pipeline and a compressed air pipeline. One end of the ammonia water pipeline is connected with an ammonia water storage tank, a booster pump, a pressure gauge and a spray element in sequence. One end of the compressed air pipeline is connected with a compressed air pipe network, a booster pump, a pressure gauge and the spray element in sequence. The spray element comprises a spray gun and a spray nozzle. The spray nozzle is arranged horizontally. The number of the spray guns and the spray nozzles can be selected according to the diameters of different rotary cement kilns. The device for spraying ammonia to decrease the nitric oxide emission on the kiln head of the cement kiln is independent in system and convenient to operate, decreases the nitric oxide emission without restriction of cement production process, can decrease the nitric oxide emission by 90%, and reduces pollution to the environment.					
32.	Rotary furnace and method of operating a rotary furnace	EP3098512	2016-11-30	AIR PRODUCTS & CHEMICALS	
A selective oxy-fuel burner (10) for mounting in a charge door of a rotary furnace, including at least two burner elements (20) each oriented to fire into different portions of the furnace, each burner element including a selective distribution nozzle (22) configured to flow a first reactant; and a proportional distribution nozzle (24) configured to flow a second reactant; at least one sensor to detect one or more process parameters related to furnace operation; and a controller programmed to independently control the first reactant flow to each selective distribution nozzle (22) based on the detected process parameters such that at least one burner element is active and at least one burner element is passive; wherein the second reactant is substantially proportionally distributed to the proportional distribution nozzles (24); and wherein the first reactant is one of a fuel and an oxidant and wherein the second reactant is the other of a fuel and an oxidant.					
33.	Method utilizing low caloric value gas for calcination in annular sleeve shaft kiln	CN102914143	2013-02-06	GAO JINGTAO	
The invention relates to a method utilizing low caloric value gas to calcine massive bulk cargos in a shaft kiln, and specifically relates to a method utilizing low caloric value gas for calcination in an annular sleeve shaft kiln. The method solves the problem that the existing calcination process cannot utilize the low caloric value gas to calcine materials. The method comprises the following steps of: feeding the materials into an annular furnace chamber of the sleeve shaft kiln, feeding fuels into a lower combustion chamber from a nozzle outside the lower combustion chamber, injecting waste gas out of the kiln from a smoke outlet to a mixing section of an ejector by high-pressure gas ejected from an ejecting section of the ejector, mixing the high-pressure gas and the waste gas out of the kiln in the mixing section of the ejector, feeding the two gasses into the lower combustion chamber, feeding cooling air into the annular furnace chamber from an air inlet, and heating the cooling air by the materials wh					
34.	Waste gas processing and recycling device of decorating firing kiln	CN102809300	2012-12-05	KEFA THERMAL TECHNOLOGY EQUIPMENTS	
The invention discloses a waste gas processing and recycling device of a decorating firing kiln, which comprises a kiln, wherein a muffle board is arranged inside the kiln, the kiln comprises a smoke exhaust area, a preheat area, a firing area and a cooling area, a nozzle is arranged inside the firing area, the smoke exhaust area is arranged in a stained paper waste gas production area on the front end of the kiln, the lower end of the smoke exhaust area is provided with a plurality of smoke exhaust outlets, the upper end of the smoke exhaust area is provided with a plurality of waste gas discharging outlets, and the smoke of the smoke exhaust outlets is exhausted through a smoke exhaust pipeline after being concentrated; waste gas of the waste gas exhaust outlets enters a waste gas exhaust pipeline and then enters the nozzle of the firing area through a combustion-supporting fan after being concentrated; on the premise of guaranteeing the firing quality of the kiln, a dehumidifying structure and the waste gas exhaust structure of the kiln are separated, the waste gas is pumped into the combustion-supporting fan to be conveyed into the kiln so as to be burned; the waste exhaust odor can be eliminated, and environmental protection can be achieved; and the temperature of the recycled exhausted waste gas is about 130 DEG C which is 100 DEG C higher than the normal temperature, so that the energy can be saved, the cost can be reduced, and economy can be achieved.					
35.	Burner for pulverulent, gaseous and/or liquid fuels	EP0101462	1984-02-29	KORTING HANNOVER KOERTING HANNOVER 3000 HANNOVER KORUTENGU HANOBAA KÖRTING HANNOVER	
The burner for pulverulent, gaseous and/or liquid fuels has an ignition chamber (20) with a wall (8) which opens out and having the rotation symmetry, as well as an exhaust pipe (17, 17') connected thereto. At the center of the chamber wall, there is arranged the inlet of a pipe (1) for the admission of a fuel jet (A) as well as an air supply (50) surrounding said inlet, for the admission of a vortex of combustion air which produces inside the ignition chamber a hot recirculation stream (B) mixing the fuel jet and heating the latter at the ignition temperature. The air quantity of the vortex supplied to the ignition chamber is only a portion of the total combustion air required. In the area between the chamber wall and the exhaust pipe there is provided a second air admission pipe (60) through which another portion of the combustion air (C) may be introduced in the ignition chamber, said portion being totally or partially mixed with the fuel jet. The sum of the combustion air portions participating within the ignition chamber to the mixture with the fuel jet (and hence to the ignition and initiation of the combustion) is adjusted so as not to exceed 50 % of the total combustion air required. By conjugating all those measures, there is provided a burner particularly appropriate for the production of heat for industrial process and further having at intermediary and variable power rates a stable ignition producing a flame with an elongate and thin form in the combustion chamber and thus with a low radial deflection of particles.					
36.	Air heat accumulation lime kiln	CN203144298	2013-08-21	SHIJIAZHUANG XINHUA ENERGY ENVIRONMENTAL TECHNOLOGY	
The utility model relates to an air heat accumulation lime kiln, comprising a kiln body, heat-accumulation burners, a feeding system, a discharge system, an air supply system, a control system and an exhaust system, wherein a feeding hole, a pre-heating zone, a burning zone, a cooling zone and a discharge hole are formed inside the kiln body; 1-5 upper pumping beams are arranged in the pre-heating zone; two layers of beam bodies are arranged inside the burning zone; each layer of beam body comprises 1-5 beam bodies; 1-5 lower pumping beams are arranged in the cooling zone; the regenerative nozzles are arranged at the lower parts at two ends of each beam body; the heat-accumulation burners are divided into left and right parts, or upper and lower parts; gas tubes are arranged in the middles of the two parts; a heating burner, an air inlet and a jet nozzle are respectively formed in the two parts of each heat-accumulation burner; the inside of each part of each heat-accumulation burner is divided into a heat storage zone and a seal zone; a heat accumulator is arranged inside each heat storage zone; each seal zone is divided into three segments; the middle segment of each seal zone is provided with a small ball; and cellular bodies are arranged at the two side segments of each seal zone. The burning temperature of a low-calorific value fuel is improved by heating combustion air through the heat-accumulation burners; the burning effect is optimized; and a resource of the low-calorific value fuel is fully utilized.					

37.	Cooling system for rotary kilns	EP2947409	2015-11-25	KIMA ECHTZEITSYSTEME VEREIN DEUTSCHER ZEMENTWERKE E V VER DEUTSCHER ZEMENTWERKE & V	
The invention relates to a cooling system (3) for rotary furnaces (1), and also to a method for operating such a cooling system (3). The cooling system (3) comprises for this purpose an arrangement of one or more cooling modules (31, 31', 31''), which are arranged in the portion (21) to be cooled of the furnace shell (2), at least along the axis of rotation (R) of the furnace shell (2), wherein each cooling module (31) comprises an activatable switching valve (311) and a fan nozzle (312) for issuing a pulsed fan-shaped cooling liquid jet (4) and, when there are a number of cooling modules, the neighbouring cooling modules (31, 31', 31'') are arranged in relation to one another at a distance (A1) parallel to the axis of rotation (R) of the furnace shell (2). Each cooling module (31, 31', 31'') comprises at least one first heat sensor (313), connected to a cooling system control (32), for measuring a first local temperature (T1) of the furnace shell (2) ahead of the area of impingement (41) as seen in the direction of rotation (DR) of the furnace shell (2). (From US2017097191 A1)					
38.	Datachable head of multi-duct powdered coal burner	CN2530162	2003-01-08	WANG SHUSEN	
The utility model relates to a detachable head for a multi-duct pulverized coal burner used in rotary cement kilns, characterized in that: the coal air duct head 2 is positioned inside the outer axial-flow air duct head 1 to form an outer axial-flow air channel; the inner axial-flow air duct head 3 is installed in the coal air duct head 2 to form a coal air channel; the inner swirl air duct head 4 is installed in the inner axial-flow air duct head 3 to form an inner axial-flow air channel; the central air duct head 5 is installed in the inner swirl air duct head 4 to form an inner swirl air channel; the central air duct head 5 forms a central air channel; the outer axial-flow air nozzle 10 is buckled on the outer axial-flow air duct head 1; the coal air nozzle 9 is connected to the coal air duct head 2; the inner axial-flow air nozzle 8 is connected to the inner swirl air duct head 4; the cyclone 6 is connected to the central air duct head 5. The utility model can perform excellently with a longer service life, and the spare parts and fittings can be replaced in a flexible and convenient way. When the head portion, which projects into the high-temperature area inside the rotary kiln, malfunctions due to incorrect operation, attrition wear or deformation etc, the utility model can be put back to use only by replacing the disabled components in thread or buckle connection, and the repair cost is low.					
39.	Cooling of rotary furnace shell burner pipes and method	US3861859	1975-01-21	SHERWOOD MEDICAL INDUSTRIES LYON SHERWOOD SHERWOOD W L SHERWOOD WILLIAM L	
Overheating of rotary kiln shell burner pipes has resulted in serious deterioration and severely limited service life in a number of operating furnace installations. Various measures have been applied in attempts to solve this problem, but with only limited success. This invention provides a positive solution by use of forced cooling employing an array of high-velocity air jets directed to impinge directly on the inner burner pipe walls. The apparatus includes an assembly of internal cooling header ducting within the burner pipe in an annular configuration, supplied with air under pressure, and equipped with an array of spaced jet nozzle openings through which cooling air jets are directed to impinge on the inner pipe surface, thereby effecting accelerated and continuous cooling of the burner pipe as it operates in the hot furnace atmosphere.					
40.	Rotary kiln and method of using such a kiln	US4462793	1984-07-31	KAWASAKI HEAVY INDUSTRIES KAWASAKI JUKUGYO	
This disclosure relates to a rotary kiln for heating and calcining lime, waste, etc. and to a method of direct reduction of metal oxide using such a kiln. A cylindrical outer shell is mounted for rotation on its axis, and a stationary inner tube extends into the interior of the shell. Fuel and/or combustion air flow passages extend within the tube, and burner nozzles are supported by the tube and are connected to the passages. The tube is concentrically or eccentrically mounted adjacent the upper side of the space within the shell, thereby positioning the burner nozzles at the optimum positions.					
41.	Heat accumulating type burner with changeable sectional area of nozzle orifice	CN202101244	2012-01-04	ANSTEEL ENGINEERING TECHNOLOGY	
The utility model relates to a heat accumulating type burner with a changeable sectional area of a nozzle orifice, which comprises a burner brick, a connecting rod and a cone body. A heat accumulating chamber is arranged in the middle of the burner brick, the connecting rod is arranged at the center of the heat accumulating chamber, and the cone body is arranged at the front end of the connecting rod. The cone body is in a wedge-shaped three-dimensional structure which is matched with an inner hole of the front end of the burner brick, and the connecting rod can drive the cone body to move in straight-line mode along the direction of a center line of the burner brick. The tail end of the connecting rod is provided with a stroke controller and a sealing device, the outer diameter of the connecting rod is provided with a slide groove, and the cone body is made of fireproof materials. Compared with the prior art, the heat accumulating type burner with the changeable sectional area of the nozzle orifice has the advantages of being simple in structure and convenient to operate, effectively resolving the problem of insufficient smoke-discharging capability, flexibly controlling flow rate and flow quantity of circulation media including air, gas, smoke and the like according to actual requirements and flexibly adjusting furnace pressure.					
42.	Low-nitrogen-oxide calcium carbide furnace gas burner	CN203464279	2014-03-05	XIANGYANG ZHONGHE M & TECHNOLOGY	
The utility model relates to a low-NOX burner applied on a rotary kiln and using calcium carbide furnace gas, discloses a low-nitrogen-oxide calcium carbide furnace gas burner and mainly solves the problem that the calcium carbide furnace gas is low in pressure, fluctuant in heat value, large in dust content and difficulty in inflaming. The low-nitrogen-oxide calcium carbide furnace gas burner is characterized in that an axial flow air passage A, a rotational flow air passage B, a gas passage C, a coal air passage D, a central air passage E and an ignition passage are sequentially arranged on a burner nozzle head portion from outside to inside, an axial flow air outlet section area adjusting device, a rotational flow air outlet section area adjusting device or a coal air outlet section area adjusting device of the nozzle head portion are arranged on a burner body, adjusting valves for adjusting air quantity and a flame holding cover connected on an axial flow air outer barrel of the axial flow air passage A in a threaded manner are mounted on a clean air side pipe connected with axial flow air, rotational flow air and central air pipelines respectively, and axial length of the inner side of a flame holding end of the flame holding cover is 80-100cm. The calcium carbide furnace gas is used on the burner of the rotary kiln, so that the low-nitrogen-oxide calcium carbide furnace gas burner is energy saving, reliable in performance and convenient to use.					
43.	Method and apparatus for treating contaminated soil.	EP0457889	1991-11-27	RYAN MURPHY KEY BANK	
A vehicle-mounted system for removing hydrocarbon contaminants from the soil has an inclined rotary kiln (10) which is rotated about a substantially horizontal axis of rotation, a burner assembly (18) at the discharge end of the kiln and a hopper (11) for loading soil into the inlet end to advance through the kiln and be directly heated by the burner assembly. The exhaust stream created in the kiln is drawn through a baghouse (24) for removal of fines, then through a catalytic incinerator (32) to burn any unburned constituents in the exhaust stream. The temperature of the exhaust stream is monitored prior to its passage into the incinerator and at the discharge end of the incinerator as well; and the concentration of hydrocarbon constituents in the exhaust stream is regulated either by introduction of air into the exhaust stream as it is discharged from the kiln or by recirculating a portion of the exhaust stream, after filtration, into the kiln.					
44.	Process for producing foam glass by using natural gas as fuel and roller kiln used by same	CN102617020	2012-08-01	ZHEJIANG ZHENSHEN COLD INSULATION TECHNOLOGY	
The invention provides a large production foam process of foam glass, which uses natural gas as fuel, and utilizes a variable frequency motor to drive a roller shaft to convey foam moulds. The effective inner width of a kiln body reaches 2.3 meters, three-row materials can be performed simultaneously, the whole kiln body is divided into ten independent areas, and the areas are mutually separated by using fire stopping walls and fire stopping curtains. A cold air pipe is installed on the side face of the ninth area, a smoke discharging fan is installed at the top of the ninth area, and an air inlet pipe, the smoke discharging fan and a pressure transmitter are integrally controlled through a programmable logic controller (plc) so as to guarantee that stable kiln pressure in a foam kiln meets requirements of foaming. Fire nozzles are vertically arranged on the other 9 areas, the vertically-arranged fire nozzles at each area have independent control modules, piping and instrument diagram (PID) self stabilization is utilized, temperature of the fire nozzles are guaranteed, burning atmosphere is changed through regulation of flow-limiting valves and ratio valves on an air pipe and a gas pipe, and stable atmosphere is guaranteed.					

45.	Powdery coal burner	US4523530	1985-06-18	SUMITOMO METAL INDUSTRIES	A powdery coal burner is disclosed, which comprises a burner nozzle having an opening at the end of the burner body, through which a combustion-assisting gaseous medium is injected into a combustion area, means of providing a swirling motion to said combustion-assisting gaseous medium which is injected through said burner nozzle to said combustion area in a swirled state, an injection nozzle having an opening surrounding said burner nozzle opening, through which coal is injected toward said combustion area, and a primary air outlet nozzle having an opening surrounding said opening of said injection nozzle for the powdery coal, through which a primary combustion air is forwardly injected. 
46.	Bispin five-duct fine coal burner for rotary furnace	CN2577124	2003-10-01	WANG SHUSEN	The utility model relates to a double rotation coal powder burner with five wind channels for a rotary kiln, which is characterized in that the utility model is composed of five steel pipes which are arranged in the same shaft, outlet nozzles which are corresponding to the steel pipes, and a valve which is used for adjusting wind quantity and wind speed. An outer rotational flow wind channel is composed of an outer wind groove of an outer rotational flow wind pipe, an inner wind groove of the outer rotational flow wind pipe and a sleeve of the outer wind groove, wherein, the outer rotational flow wind channel is communicated with the channel of the outer rotational flow wind pipe. An inner rotational flow wind channel is composed of a swirl nozzle and the head part of an inner rotational flow wind pipe, and the inner rotational flow wind channel is communicated with the channel of the inner rotational flow wind pipe. The angle range of the helical angle of the inner wind groove and the outer wind groove of the outer rotational flow wind channel is 1-35 DEG, and the angle range of the helical angle of the swirl nozzle of the inner rotational flow wind channel is 15-45 DEG. The utility model has the advantages of high combustion efficiency, high sufficient combustion efficiency of the coal powder, and wide adjustable range of flame shape and temperature; wind quantity which enters the kiln by one time can be largely reduced, fuel consumption can be reduced, and environmental pollution can be reduced; especially, the adaptability for variation and fluctuation of coal quality is strong. The utility model not only can be used for burning high grade coal but also can be used for burning smokeless coal, inferior coal, combustible industrial refuse and domestic refuse. 
47.	Continuous basalt fiber of hot subregion produces stove	CN205856304	2017-01-04	ZHU HONGMO	The utility model discloses a continuous basalt fiber of hot subregion produces stove, refining region nozzle, first high -temperature region nozzle, second high -temperature region nozzle, refining region encircle that arch, high -temperature region highly encircle the arch, connect the material platform, melt the passageway, the temperature detects mouth, operation passageway, discharge gate, flue, charge door, depressed arch arch, operation area nozzle, operation area depressed arch arch, stove furnace body, preheating zone, high -temperature region, refining region and operation area including being high. The beneficial effects of the utility model are that: the high hunch arch of adoption, depressed arch arch and the structural design that the flat top combined together effectively restrain the mutual interference of interior each operation interval of stove when regulation and controlled temperature, have guaranteed the accurate control of each interval temperature, effectively restrain " go here and there and anger " phenomenon, install at the stove top with the flat -flame burner, messenger's gas can fully be burnt, is favorable to very much controlling the mistake surplus of interior gas of kiln and combustion -supporting gas, guarantees that the interior burning atmosphere of kiln internal pressure and kiln satisfies the requirement of basalt fuse -element. 
48.	Method for atomizing and burning fuels by means of oxygen, and burner used in said method	EP1407187	2004-04-14	MESSER CUTTING & WELDING	Liquid and/or solid fuels are conventionally burnt, especially in cement rotary kilns, using oxygen lances and external mixing-type burners in which oxygen is added to the fuel upstream of the actual nozzle to burn.A disadvantage of such burners is their high oxygen requirement.According to the inventive method, an internal mixing-type burner is operated with oxygen.The method is further characterized in that the fuel is atomized with oxygen in a mixing chamber and is thoroughly mixed.A high ejection speed of the highly combustible fuel-oxygen mixture prevents the burner from being damaged.Combustion proceeds in a substantially more efficient manner than according to known methods.Especially, the burner of a cement rotary kiln can be operated with a substantially increased share in waste oil. 
49.	Rotational flow and return flow combined type oil atomization burner	CN105605570	2016-05-25	CENTRAL SOUTH UNIVERSITY	A rotational flow and return flow combined type oil atomization burner comprises a fuel pipe, a burner brick and compressed air pipes.Air channels are arranged in the burner brick, and comprise the left channel in the shape of a circular truncated cone, the spherical middle channel and the right channel in the shape of a circular truncated cone.The right channel, the middle channel and the left channel are sequentially communicated, the generatrix of the left channel and the generatrix of the right channel extend to intersect at the same point, and the taper angle of the right channel is 10-20 degrees smaller than that of the left channel.The fuel pipe coaxial with the left channel is sleeved with the left channel, the compressed air pipes are arranged in parallel, the outer circumference of the end face of an outlet of each compressed air pipe is internally tangent to the circumference of the vertical middle section of the middle channel, and the flowing directions of compressed air in the compressed air pipes are identical.The rotational flow and return flow combined type oil atomization burner can be used for high-temperature kilns combusting liquid fuel hard to atomize.The rotational flow and return flow combined type oil atomization burner can combust heavy oil or coal tar or biodiesel fuel, carbon deposition blocking is avoided, the combustion efficiency is 98%, the energy saving rate ranges from 5% to 10%, and smoke pollutants meet the requirement of the integrated emission standard GB16297-1996 of air pollutants. 
50.	Industrial furnace provided with a burner	EP3155320	2017-04-19	SITI B & T	A burner for industrial furnace, which can be installed in a furnace (2) comprising at least one firing chamber (3), the burner comprises a main tubular body (6) provided with at least one first port (7) for the inlet of a fuel, with at least one second port (8) for the inlet of combustible agent, and with an end nozzle (15) provided with an outlet mouth (16) facing towards the firing chamber (3), and elements (12) for triggering combustion of the fuel - combustible agent mixture. The burner also comprises at least one duct (17) adapted to pick up a portion of the gases present within the firing chamber (3) and to convey them at the outlet mouth (16) of the end nozzle (15). 
51.	Process and facility for drying and/or baking raw bricks	EP0707530	1996-04-24	WIENERBERGER ZIEGELINDUSTRIE	A process is disclosed for drying and/or baking raw bricks. Each raw brick (2) is arranged per se on a transport means for drying (12) and/or baking (20) at such a distance from the other raw bricks that all raw bricks react as individual bricks during drying and/or baking. 

52.	Rotary furnace burner using finely granulated solid fuel	EP0619458	1994-10-12	DEUTZ	To provide a rotary furnace burner using solid fuels such as finely granulated coal dust, having a coal dust annular-gap nozzle (12) which is wear-resistant and guarantees a long service life of the burner, it is proposed according to the invention that the solid-fuel duct (10) has in the region of its annular-gap nozzle (12) which lets out the solid-fuel/transporting-air suspension, on at least one of the boundary walls of the annular-gap nozzle, a wear protection consisting of an inherently rigid sleeve-like ceramic body (21) which is detachably and exchangeably fixed on a metallic carrying body (22) via an interposed flexible ceramic-fibre layer (23).  FIG. 2
53.	Vertical couple of roof beam kiln burning roof beam spray nozzle device	CN208765497	2019-04-19	ORDOS SHUANGXIN CHEMICAL INDUSTRIAL	The utility model discloses a vertical couple of roof beam kiln burning roof beam spray nozzle device, including the roof beam body, the roof beam body is including liang ticeqiang, roof beam body diqiang and roof beam body crown wall, liang ticeqiang includes the external section of thick bamboo of roof beam and the internal section of thick bamboo of roof beam, roof beam body end wall includes roof beam body diapire and the internal diapire of roof beam, roof beam body crown wall includes roof beam body roof, curved side panels, connecting plate, sealed piece and fixed block, be equipped with the internal section of thick bamboo of roof beam in the external section of thick bamboo of roof beam, form a conduction oil cavity between external section of thick bamboo inner wall of roof beam and the internal section of thick bamboo outer wall of roof beam. The utility model discloses this kind of vertical couple of roof beam kiln burning roof beam spray nozzle device through adjustment flame spray angle, avoids flame and kiln body direct contact, make flame not with the roof beam physical contact, only with the building stones contact, extension burning roof beam life to having reduced and having stopped the kiln time, stabilized original improvement of lime quality, the safety and stability of production run is more guaranteed, reduces the oil leak of burning roof beam, and the pollution abatement reduces the conduction oil loss. 
54.	The gas burner for the rotary furnaces	RU58660	2006-11-27	KOPTSEV VALERIY VLADIMIROVICH (RU)	Utility model relates to the burner devices of thermo-technical aggregates and can be used in the metallurgical industry, namely for the rotary furnaces of the kilning of cement clinker, keramzit, lime. The Declared construction of the gas burner for the rotary furnaces forms steady long torch without the flameout, ensures the effective combustion of fuel due to an increase in the intensity of agitation and speed of the flow of gas. The gas burner for the rotary furnaces, which contains housing with the branch pipe of gas supply with the central nozzle orifice, situated in its conical end output part, established along the axis of housing by mobile choke with the partial output for the edge of the nozzle orifice of burner housing with the formation with it of radial clearance, according to utility model choke is executed in the form reverse- biconical central body, in this case the angle of taper of the end output part of the housing is equal to the angle of taper of central body in the direction from the exit side from the burner and composes 15°-21°, the angle of taper of central body in the direction from the entry side into the nozzle of burner composes 35°-50°, furthermore the maximum value of the diameter of central body at junction of reverse cones coincides with the end section of exit nozzle and composes 0,8-0,9 values of the inside diameter housing. 
55.	Flue gas denitrification system used for dry-process cement kiln	CN105080315	2015-11-25	FUJIAN LONGKING	The invention discloses a flue gas denitrification system used for a dry-process cement kiln. The flue gas denitrification system comprises a decomposing furnace, an SNCR denitrification device, a natural gas combustor and a controller, wherein the natural gas combustor is used for supplying CO into the decomposing furnace, and the controller is used for turning on the natural gas combustor when judging that the denitrification parameter of the SNCR denitrification device exceeds the standard and controlling natural gas to combust incompletely in the natural gas combustor to generate the CO. When a coal type is changed or the working condition of the kiln is adjusted, the denitrification effect of the system can be guaranteed, and it is ensured that NOx emission and ammonia escape at the kiln tail meet the emission standard. 
56.	Kiln for firing ceramic workpieces	US4368036	1983-01-11	LUDWIG RIEDHAMMER	In a kiln for firing ceramic workpieces, which kiln is composed of two opposed side walls and a top wall enclosing an elongate kiln chamber, and elements for introducing jets of heating or cooling gases into the kiln chamber at locations spaced along the length of the kiln, the elements are located for directing the jets produced thereby vertically in the region of the side walls of the kiln, and deflector stones are disposed at a distance from the elements for deflecting the jets and gases within the chamber transversely of the length of the kiln. 
57.	Three-dimensional vortex burner	CN108662581	2018-10-16	JIANG FENGSHAN	The invention relates to a three-dimensional vortex burner and belongs to the technical field of thermal power engineering. The three-dimensional vortex burner is primarily characterized by being provided with an air inlet and a coal gas inlet entering tangentially, a catenary convoluted rectifying room, a primary air nozzle and a secondary air nozzle which are arranged in layers and different indirection and a diversion trench reinforcing throat, so that air is supplied to form conical spiral vortexes to inject the coal gas to fit an extremely low coal gas pressure and staged burning and thick and light burning are achieved to reduce emission of nitric oxide. The three-dimensional vortex burner is full in burning and small in resistance loss, and is particularly suitable for various industrial kilns which are high in power, low in coal gas calorific value, low in coal gas pressure, great in pressure fluctuation and high in demand on emission of nitric oxide. Energy conservation and emission reduction are achieved. 
58.	Direct reduction process in a rotary kiln	US4268304	1981-05-19	METALLGESELLSCHAFT	An improved process for the direct reduction of iron oxide-containing materials to form sponge iron which takes place in a rotary kiln by treatment with a solid carbonaceous reducing agent having a high content of volatile combustible constituents is disclosed. The charge is moved through the rotary kiln opposite to the direction of flow of the kiln atmosphere. Oxygen-containing gases are blown at controlled rates through nozzle blocks into the charge disposed over the nozzle blocks in the heating-up zone in that region thereof defined by the occurrence of ignitable particles of the solid reducing agent and ending before the reduction zone. Oxygen-containing gases are blown in at controlled rates through shell tubes into the free kiln space at least in that region. In accordance with the invention, at least a part of the solid carbonaceous reducing agent comprises disintegrated waste rubber. Preferably more than 80% of the solid carbonaceous reducing agent comprises waste rubber.

59.	Continuous sintering type efficient energy-saving kiln	CN108302939	2018-07-20	HUANGGANG HUAYAO ZHONGXIANG KILN EQUIPMENT	
The invention discloses a continuous sintering type efficient energy-saving kiln. The continuous sintering type efficient energy-saving kiln comprises a kiln base. The kiln base is fixedly installed on the ground. A combustion device is arranged above the kiln base. A kiln shell is arranged above the combustion device. An outlet device is arranged below the surface of the right side of the kiln shell. The outlet device is composed of an outlet, an outlet platform, an outlet hydraulic cylinder, a square electromagnet, second limiting plates and a second supporting plate together, wherein the outlet is formed in the middle of the lower part of the surface of the right side of the kiln shell, the outlet platform is located on the right side of the outlet and fixedly connected with the surface of the right side of the kiln shell, the outlet hydraulic cylinder is located above the outlet platform and is fixedly connected with the middle of the upper surface of the outlet platform, the square electromagnet is located on the left side of the outlet hydraulic cylinder and fixedly connected with the surface of the left side of the cylinder rod of the outlet hydraulic cylinder, the second limiting plates are located on the left side of the square electromagnet and fixedly connected with the upper surface of the outlet platform, and the second supporting plate is located in the kiln shell and fixedly connected with the front surface and the rear surface of the inner side of the kiln shell. The continuous sintering type efficient energy-saving kiln has the beneficial effects of being simple in structure and high in practicability.					
60.	Solid-fuel-fired burner and solid-fuel-fired boiler	EP2623862	2013-08-07	MITSUBISHI HEAVY INDUSTRIES	
' A solid-fuel-fired burner that suppresses a high-temperature oxygen remaining region formed at the outer circumference of a flame and that can decrease the amount of NOx eventually produced is provided. A solid-fuel-fired burner (20) that is used in a burner section of a solid-fuel-fired boiler for performing low-NOx combustion separately in the burner section and in an additional-air injection section and that injects powdered solid-fuel and air into a furnace includes a fuel burner (21) having internal flame stabilization and a secondary-air injection port (30) that does not perform flame stabilization.					
61.	A detachable nozzle of a five-air-channel pulverized coal burner	CN203431856	2014-02-12	ZHENGZHOU AOTON THERMAL ENGINEERING	
The utility model relates to a pulverized coal burner for a kiln in the cement industry. The utility model provides a detachable nozzle of a five-air-channel pulverized coal burner and solves the problems that the head of a conventional pulverized coal burner cannot be replaced and the maintenance cost of the burner is high. The detachable nozzle comprises an outer axial air channel, a coal air channel, an inner axial air channel, an inner whirlwind channel and a central air channel; the outer axial air channel is formed by connecting a coal air pipe and an outer axial air pipe through a fixing ring; the coal air channel is formed by connecting an inner axial air pipe with the coal air pipe through a fixing ring; the inner axial air channel is formed by connecting an inner whirlwind pipe and the inner axial air pipe through a fixing ring; the inner whirlwind channel is formed by connecting a central air pipe and the inner whirlwind pipe through a fixing ring; and the central air channel is formed by the central air pipe. The detachable nozzle of the five-air-channel pulverized coal burner is long in service life and the replacement of the head of the burner is more flexible and convenient.					
62.	Method of producing a range of colours during the firing of flat ceramic ware	EP0059849	1982-09-15	BUCHTAL BUCHTAL 8472 SCHWARZENFELD BUCHTAL KERAMISCHE BETRIEBE	
PCT No. PCT/DE82/00028 Sec. 371 Date Sep. 17, 1982 Sec. 102(e) Date Sep. 17, 1982 PCT Filed Feb. 11, 1982 PCT Pub. No. WO82/03072 PCT Pub. Date Sep. 16, 1982. For producing uneven coloring on firing plate-like ceramic material such as tiles or flags in a kiln, more specially a roller kiln, made up of preheating, firing and cooling zones, and through whose oxidizing atmosphere in the firing zone the material to be fired is moved in a single layer without burning tools for supporting it, in or at the end of the firing zone, in a screened-off part of the kiln, the material to be fired is acted upon by a partly reducing atmosphere. In this respect the material to be fired may be passed at this position through a reducing zone and then through a pulsating oxidation zone. It is however possible as well for the material to be fired to be moved through a reducing zone and then purposefully acted upon by blowing with a strongly oxidizing gas. A further possible way of undertaking the process is such that in or at the end of the firing zone the material to be fired is moved in a pulsating reducing zone. It is furthermore possible for the material to be fired to be acted upon by blowing against it with a reducing gas in or at the end of the firing zone. (From US4488871 A)					
63.	Device for improving smoke discharge capability of heat-accumulation-type stove kiln	CN102269528	2011-12-07	ANGANG STEEL	
The patent refers to the field of 'details or accessories of furnace'. The invention provides an apparatus for improving the furnace exhaust fume ability of heat accumulating type, it features the burner brick of heat accumulating type is divided into upper half, the latter half and overcoat, fix the upper half of the burner brick, the latter half together by the overcoat, set up the unidirectional auxiliary path where the axis corresponded to in upper half and the latter half of the burner brick, the cross section of the upper half channel of burner brick is oval, the cross section of the latter half channel of burner brick is round, have the spherical space in the burner brick upper half in the auxiliary path and point of connection of the latter half of burner brick, spherical space account for burner brick upper half and half the burner brick the latter half all, put the refractory ball in the spherical space. The invention is under guaranteeing normal throat area and condition invariable in flow rate of the flue gas of pulverizing jet, increase the area of exhaust fume, improve the exhaust fume ability, increase the exhaust gas volume past heat sponge chamber, and guarantee the furnace pressure is steady, recovery and utilization efficiency to raise sensible heat of flue gas. Solve and use the air-introduced machine oversize at the same time, waste the question of the electrical energy.					
64.	Continuous carbonating method and apparatus	JP2005350329	2005-12-22	SK TEC SKETEC SKTEC	
PROBLEM TO BE SOLVED: To produce activated carbon through a process for surely carrying out the extinguishment of a carbonized material in a method and an apparatus for continuously carbonizing wood chips. SOLUTION: The carbonized material is obtained by repeating processes of moving a raw material M along a nearly fixed route from one side end of an inside cylinder 11 to the outside through an outside cylinder 12 in a rotary furnace having a double cylinder structure, igniting the raw material at another end side of the inside cylinder 11 during the movement and after continuing the combustion, stopping the supply of air to the space S between the inside cylinder and the outside cylinder to extinguish. The activated carbon is produced by carrying out an activating process on the carbonized material with the supply of water and the burning of the carbonized material is extinguished by gaseous nitrogen N(sub 2). COPYRIGHT: (C)2006,JPO&NCIPI					
65.	Transverse flame unit kiln structure utilizing heat-storage combustion technique	CN202329072	2012-07-11	LIAONING TIANHE TECHNOLOGY	
The utility model relates to a transverse flame unit kiln structure by utilizing a heat-storage combustion technique. An independent heat storage chamber is respectively arranged at each of the left side and the right side of a kiln, a flame nozzle is arranged below a combustion-supporting air nozzle of the kiln, and a flame of a combustor is transversely arranged. The kiln runs to utilize interval combustion, and a left-side heat storage chamber is used for storing heat when a right-side combustor runs, a left-side combustor starts running and the right-side combustor stops running when heat storage requirements are realized, and the combustion-supporting air blown from an air blower flows through the heat storage chamber to absorb heat in the heat storage chamber, thus the left-side combustor and the right-side combustor are combusted reversely at an interval; simultaneously, the right-side heat storage chamber and the left-side heat storage chamber store heat at an interval so that a heat-storage combustion type transverse flame unit kiln structure. The transverse flame unit kiln structure can improve uniformity of an internal temperature field of a kiln and production quality of metallurgy auxiliary materials; and the transverse flame unit kiln structure can effectively utilize waste heat of combusted fume of the kiln so as to save energy.					

66.	Shuttle kiln firing device	CN203478928	2014-03-12	SHANDONG NARI ENVIRO TECHNOLOGY	The utility model relates to a combustion device, in particular to shuttle kiln firing device, and belongs to the technical field of firing of ceramics. The shuttle kiln firing device comprises a kiln (6), and a wicket (7), a kiln tail (8), an air blower (1), a combustion-supporting air pipeline (2) and a fuel pipeline (3). The air blower is connected with the combustion-supporting air pipeline. The combustion-supporting air pipeline and the fuel pipeline are connected with firing nozzles (5) respectively. The firing nozzles are connected with automatic igniters (17) and arranged at the centers of four corners or vertical sides of the wicket (7) and the kiln tail (8) respectively. The firing nozzles (5) arranged on the wicket and the kiln tail are in triangular cross arrangement. Through triangular cross arrangement of the firing nozzles, namely high-speed isothermal nozzles or impulse nozzles, speed of flames in the kiln is increased, the whole shuttle kiln hearth is full of a high-temperature flame turbulence region, uniformity of the temperature of the kiln hearth is improved greatly, and accordingly, product roasting temperatures are uniform. 
67.	Burner nozzle, system, furnace and installation	EP1843093	2007-10-10	KARAMAHMUT YILDIRIM	A burner nozzle (80a) comprises a burner sleeve (80) which protrudes over the nozzle head (88) to form a zone for producing a twist in the flow mixture downstream behind the nozzle insert (90) having channels (96). Units are provided for producing the twist. Independent claims are also included for the following: (1) a system comprising a number of burner nozzles; (2) an oven arrangement with the above burner nozzle; (3) an installation for treating continuously cast strands; and (4) a heating installation comprising the above oven arrangement or system of nozzles. 
68.	Method and arrangement for monitoring performance of a burner of a suspension smelting furnace	EP3129736	2017-02-15	OUTOTEC	The invention relates to a method and to an arrangement for monitoring performance of a burner (1) of a suspension smelting furnace (2). The burner (1) is arranged at the top structure (3) of a reaction shaft (4) of the suspension smelting furnace (2). The burner (1) has a solids feeding channel (5) that has a solids outlet (6) opening up into the reaction shaft (4), and a reaction gas channel (12) comprising a reaction gas outlet (8) opening up into the reaction shaft (4). The arrangement comprises at least one imaging means (9) for producing images representing the cross-section of the reaction gas channel (12), and a processing means (10) for receiving images of the cross-section of the reaction gas channel (12) from the imaging means (9). The invention relates also to uses of the method and of the arrangement. 
69.	Air/coal gas double pre-heating lime kiln	CN203144293	2013-08-21	SHIJIAZHANG XINHUA ENERGY ENVIRONMENTAL TECHNOLOGY	The utility model relates to an air/coal gas double pre-heating lime kiln. The kiln consists of a kiln body, a feed system, a discharge system, an air supply system, a control system and an exhaust discharge system. A combustion beam consists of a gas channel and an air channel. The gas channel is communicated with a gas nozzle, and the air channel is communicated with an air nozzle. The lime kiln is provided with an air heat accumulator and a gas heat accumulator. The air heat accumulator or the gas heat accumulator respectively consists of upper and lower parts. Each part is provided with a combustion chamber, a heat storage body and a sealed area. The air heat accumulator is connected with a Roots blower and the discharge system through a three-way valve, the gas heat accumulator is connected with a gas pipeline and the discharge system through the three-way valve. The air heat accumulator is connected to the air channel of the combustion beam through an air inlet, and the gas heat accumulator is connected to the gas channel of the combustion beam through a gas inlet. According to the kiln provided by the utility model, combustion air and gas are pre-heated through the air accumulator and the gas accumulator, so that the combustion temperature of low-heat value fuel is improved, and the low-heat value fuel sources are adequately utilized. 
70.	Oxygen-gas fuel burner	EP0789191	1997-08-13	BH F BOC	An oxygen-gas fuel burner (12) for use in a refractory burner block (20) of glass distribution and conditioning channels (14) for thermally treating glass (18). The oxygen-gas fuel burner (12) includes a gas fuel conduit (26) extending to a central fuel outlet (28); a plurality of oxygen conduits (30) circumferentially spaced about the fuel conduit (26) and converging radially to oxygen outlets (32) circumferentially spaced about and concentric with the central fuel outlet (28); and a burner housing (34) including an outer nozzle (38). The outer nozzle (38) surrounds the fuel outlet (28) and the oxygen outlets (32) to provide a burner tip chamber (40) for mixing and combustion of oxygen and gas fuel to produce a flame within the burner tip chamber and extending outward from the burner tip chamber. 
71.	Improvements relating to the burning of materials in rotary kilns	GB891451	1962-03-14	FLSMIDTH	891,451. Cooling cement clinker. SMIDTH & CO. A.S., F. L. Sept. 27, 1960, No. 33163/60. Class 51 (2). In apparatus for reducing and cooling material, particularly cement clinker, before discharge from a rotary kiln, reducing and cooling agents are supplied as conical sprays on to the surface of the material in the kiln, the reducing process preceding the cooling process. The reducing agent is supplied via a hose 11, pipe 7, and nozzle 13, and the cooling agent via a hose 17, pipe 4, and nozzle 18. The pipe 4 is coaxial with the pipe 7 and its ends are provided with seals 5 and 6. Handles 3 and 8 enable the pipes to be turned and moved longitudinally in a sleeve 2 of the furnace end casing 1. The arrangement is adjusted so that the clinker surface areas struck by reducing and cooling agents are close together but do not touch. In a modification, Fig. 3 (not shown), the pipe 4 is provided with two nozzles giving overlapping cooling sprays. The reducing agent may be an oil and the cooling agent water; and the pipes 4 and 7 may be provided with refractory linings. Specification 406,530 is referred to. 
72.	Stehender ofen und verfahren zur herstellung kalzinierter produkte	DE1433865	1969-01-09	ONODA CEMENT	1,038,957. Shaft kilns. ONODA CEMENT CO. Ltd. March 6, 1964 [March 6, 1963; June 11, 1963; Sept. 16, 1963], No. 9732/64. Heading F4B. A shaft kiln for calcining limestone, dolomite, clay or raw cement mixture comprises one or more water-cooled nozzle casings 8 extending across the shaft and blowing fluid fuel from nozzles 15 through ports 9 in the bottom wall to be burnt in the charge interstices, recycled exhaust gases or a mixture thereof with air or oxygen being supplied by fan 18 to the casings and escaping through the ports 9 around the nozzles. The fluid fuel may be crude petroleum, or petroleum distillate or heavy oil and is supplied through pipe 11, distributor 13 and pipes 14 to the nozzles 15. Air supplied by a fan 35 and pipe 6 ascends through the charge cooling it and mixes with the vaporized fuels in spaces 16 below the casings 8. Heat resistant plates 10 are spaced from and disposed below the casings 8 to inhibit deposition of soot and tar thereupon, and shutters 22 inside the casings may be used to close the ports 9 when the fuel is shut off. In this case air may be supplied by pipe 23 controlled by valve 24 to blow residual oil out through the nozzles. The oxidizing or inert gas supplied may be spread sideways by a device, Fig. 3 (not shown), in which a sleeve seated on an O-ring 26 around the nozzle 15 has one or more tangential ports 27 opening into the inner space of the casing 8. In a modification, Fig. 5 (not shown), the sleeve opens into a pipe supplying the gas and the nozzle has a spiral guide disposed around it. Another modification, Fig. 8 (not shown), has a plate around the nozzle formed with outwardly inclined gas jets, and another, Fig. 10 (not shown), has a trumpet-shaped sleeve. A final modification, Fig. 12 (not shown), has concentric sleeves, the inner one supplying gas around the nozzle 15 and the outer one having a spiral supply as in Fig. 3. (From GB1038957 A) 