May 7, 1957 P. J. HOMAN 2,791,552

QUENCHING LIQUID SUMP SYSTEM

Filed Dec. 11, 1951 6 Sheets-Sheet 1

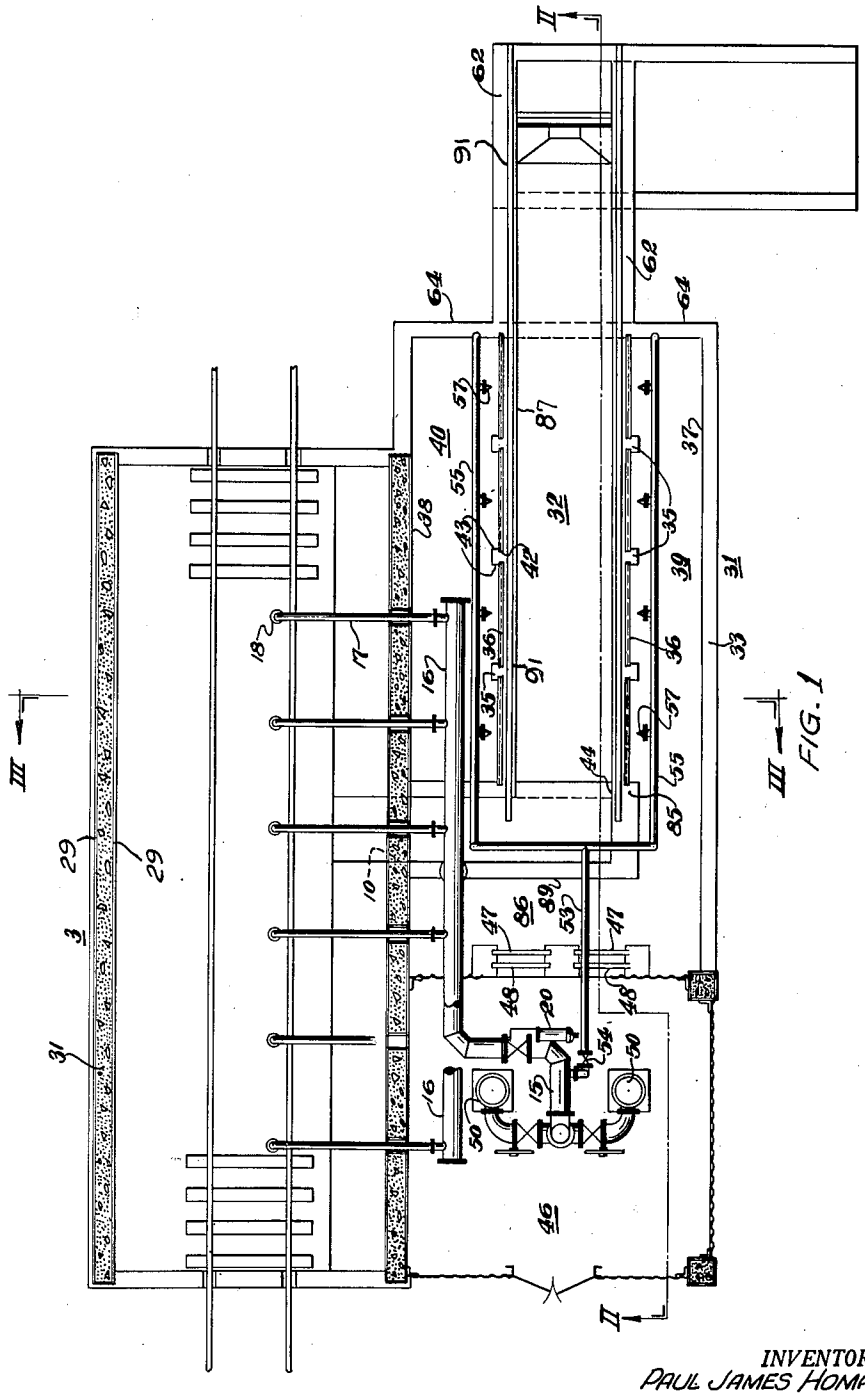


FIG. 1

INVENTOR.
PAUL JAMES HOMAN

BY
Samuel B Bronstein
his ATTORNEY.

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QUENCHING LIQUID SUMP SYSTEM

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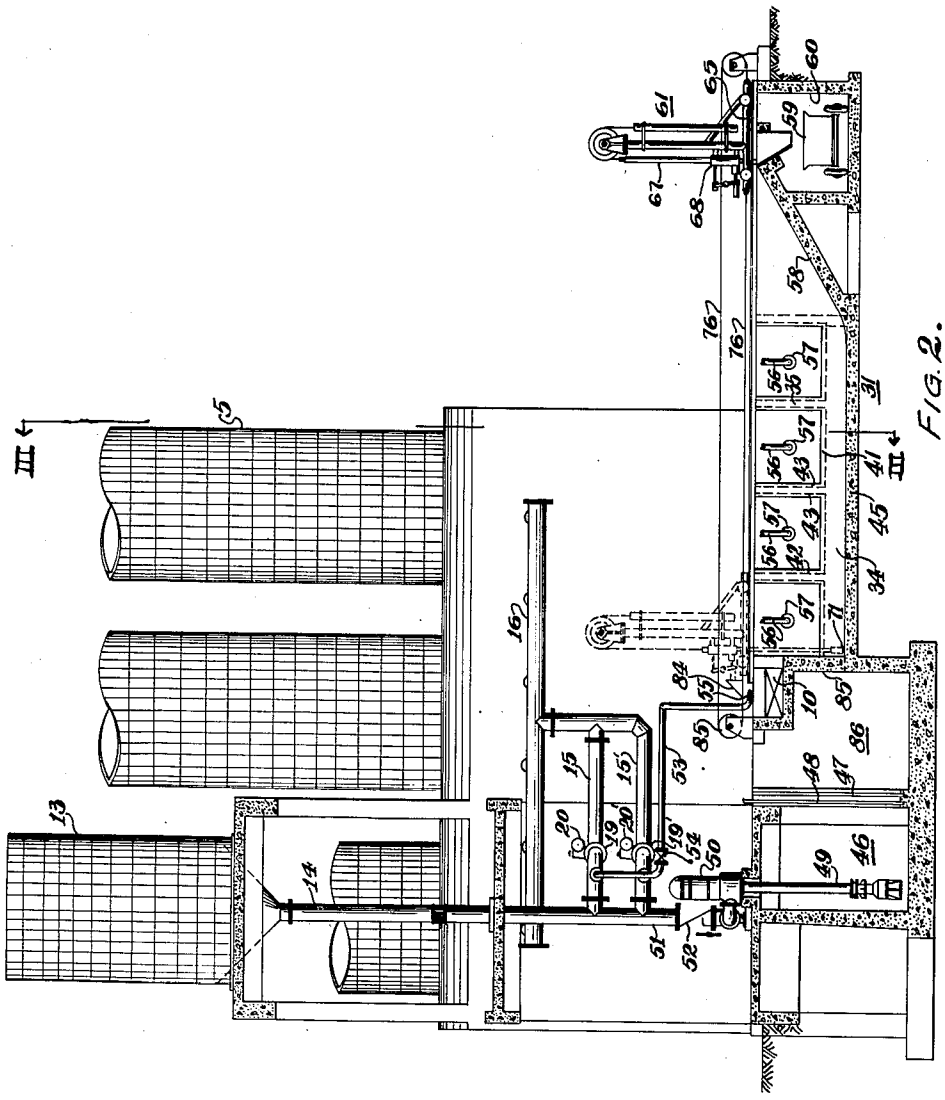


FIG. 2.

INVENTOR.
PAUL JAMES HOMAN
BY
Sewall P Bronstein
his ATTORNEY.

May 7, 1957 P. J. HOMAN 2,791,552

QUENCHING LIQUID SUMP SYSTEM

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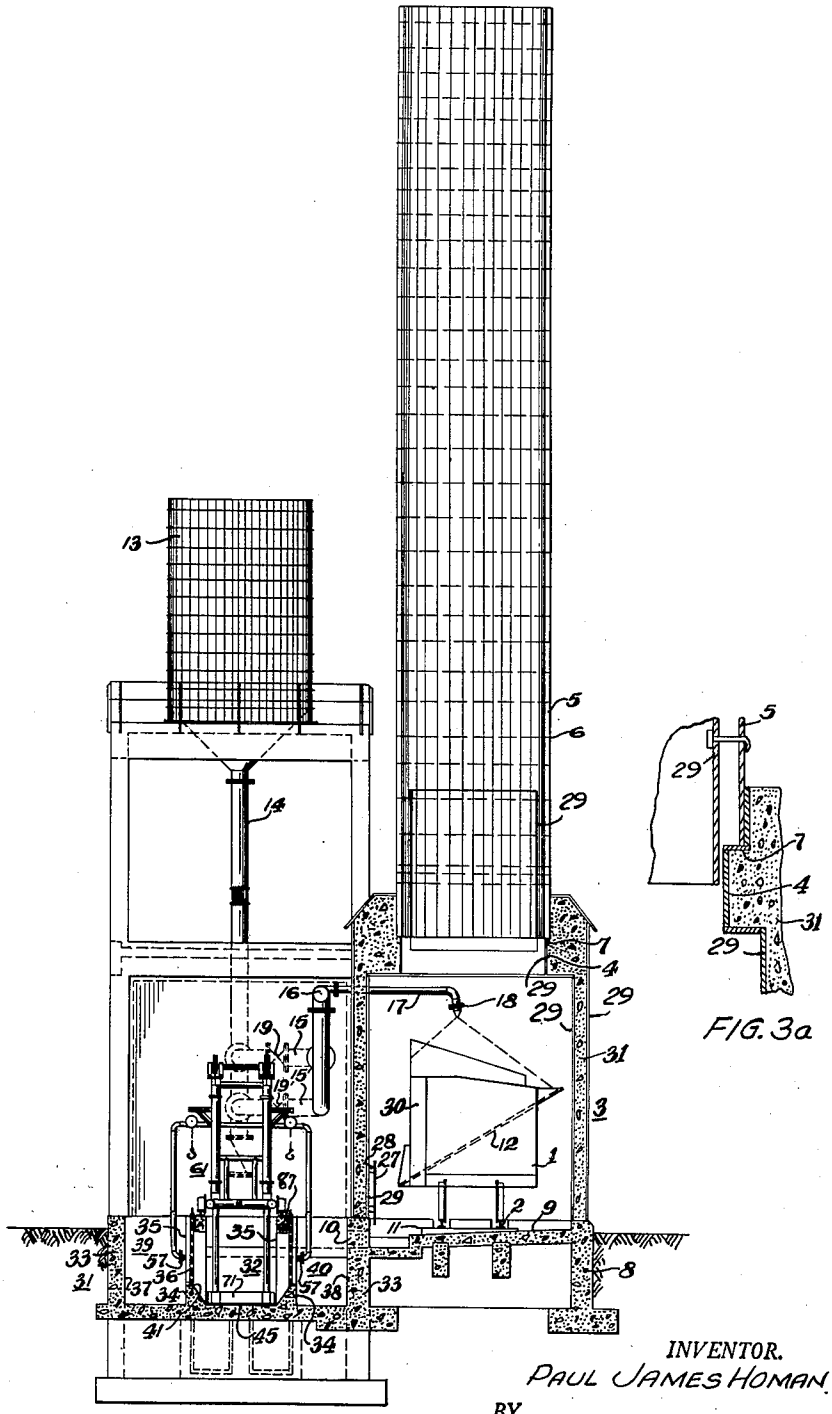


FIG. 3

FIG. 3a

INVENTOR.
PAUL JAMES HOMAN
BY
Harold B Bronstein
HIS ATTORNEY

May 7, 1957 P. J. HOMAN 2,791,552

QUENCHING LIQUID SUMP SYSTEM

Filed Dec. 11, 1951 6 Sheets-Sheet 4

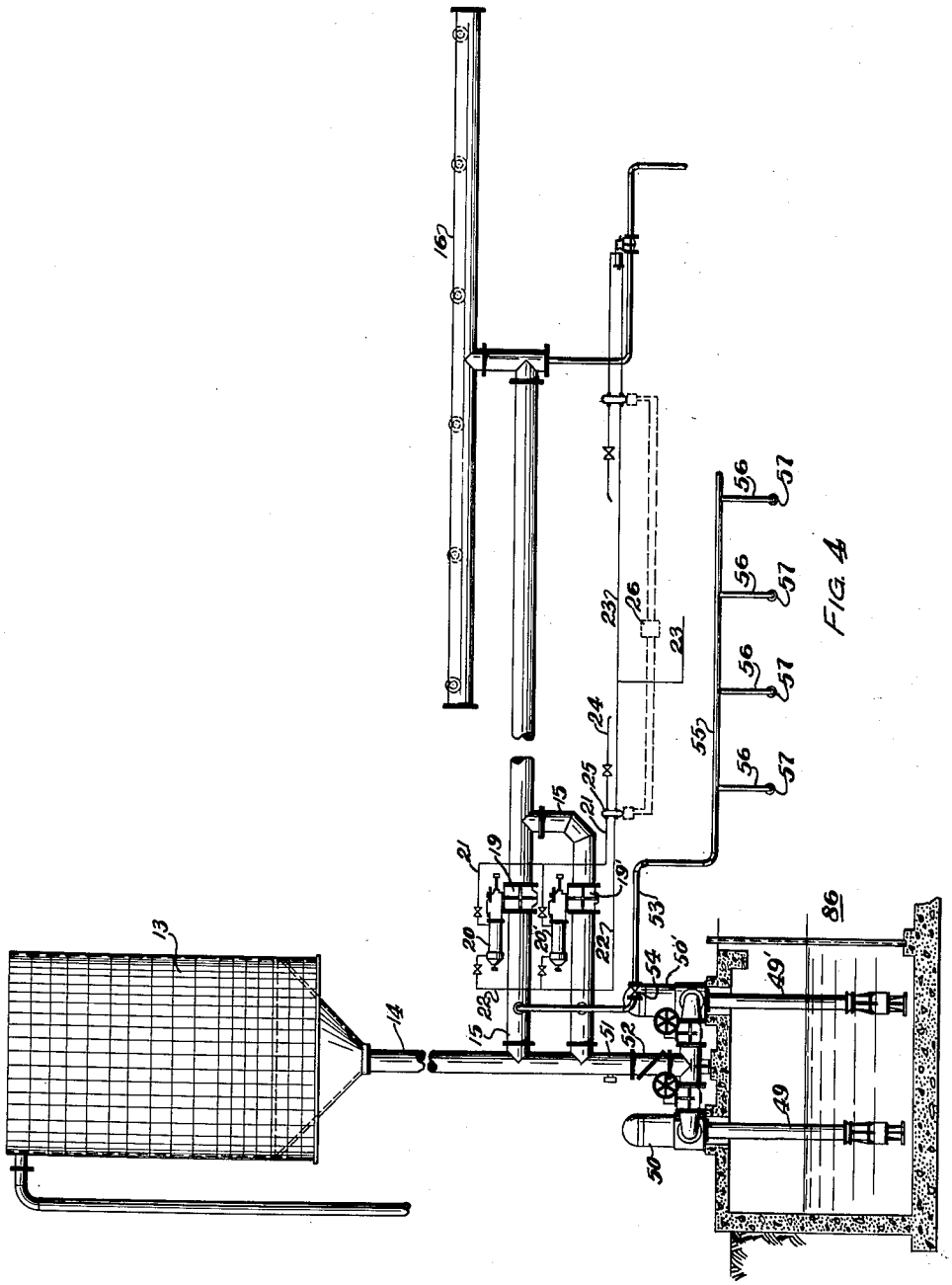


FIG. 4

INVENTOR.
PAUL JAMES HOMAN
BY
Harold B Bronstein
his ATTORNEY.

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QUENCHING LIQUID SUMP SYSTEM

Filed Dec. 11, 1951 6 Sheets-Sheet 5

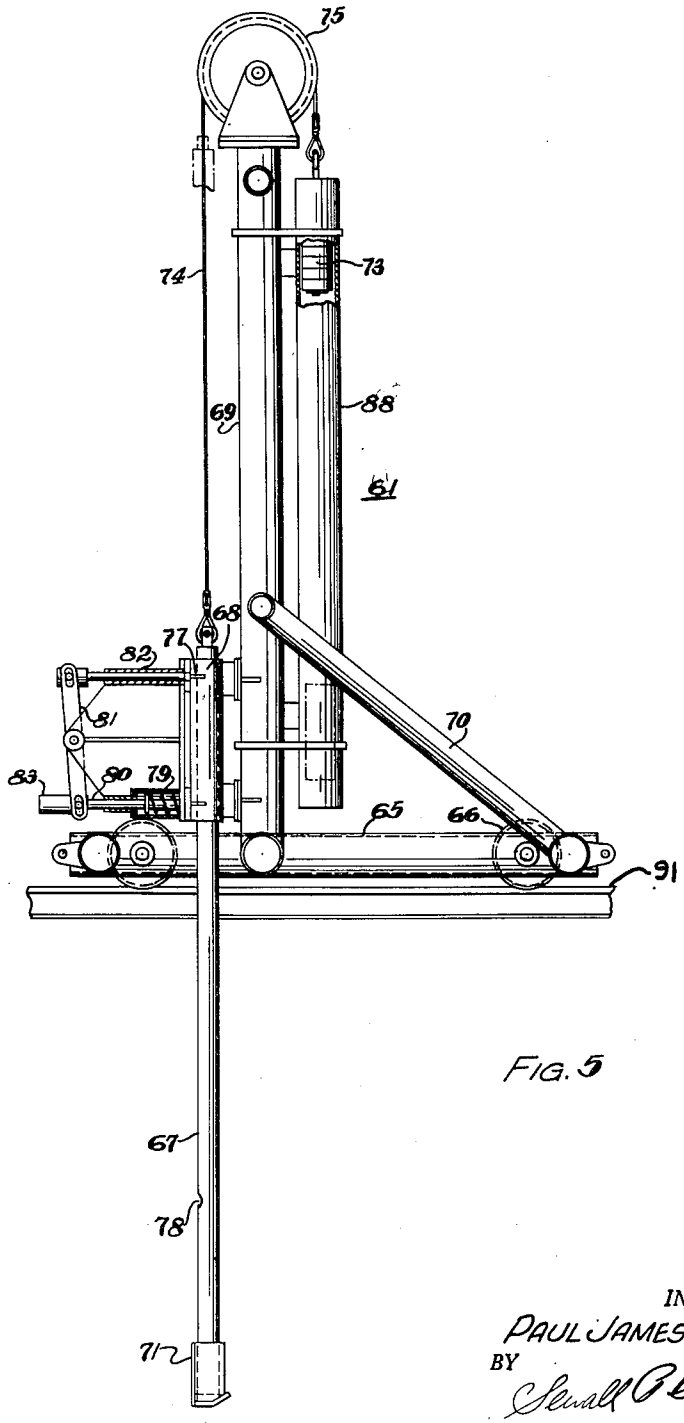


FIG. 5

INVENTOR.
PAUL JAMES HOMAN
BY
Sewall P. Bronstein
his ATTORNEY

May 7, 1957 P. J. HOMAN 2,791,552

QUENCHING LIQUID SUMP SYSTEM

Filed Dec. 11, 1951 6 Sheets-Sheet 6

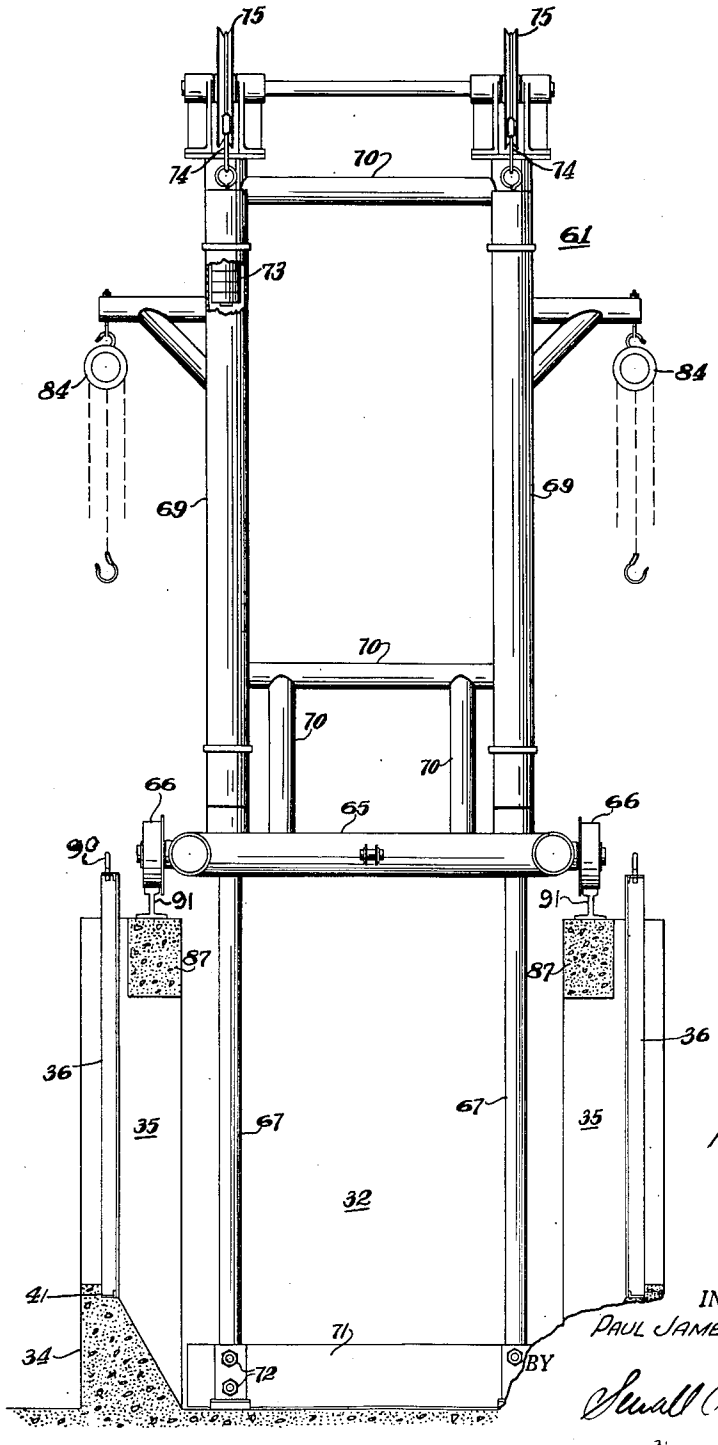


FIG. 6

INVENTOR.
PAUL JAMES HOMAN

Sewall P Bronstein

his ATTORNEY

United States Patent Office 2,791,552 Patented May 7, 1957

2,791,552

QUENCHING LIQUID SUMP SYSTEM

Paul J. Homan, Pittsburgh, Pa., assignor to Koppers Company, Inc., a corporation of Delaware

Application December 11, 1951, Serial No. 261,047

7 Claims. (Cl. 202—229)

This invention relates to the manufacture of coke and more particularly to an improved and economical apparatus for and process of wet quenching hot coke wherein the coke is quenched with a quenching liquid in an improved quenching hood vented through an improved stack structure to the atmosphere and the spent quenching liquid is collected in an improved sump system for separation and recovery of coke breeze and other solids therefrom by an improved separation and recovery system after which the solids-free quenching liquid is discarded as waste liquor or is recirculated by an improved recirculation system back to the quenching hood for quenching more coke.

A typical wet coke quenching station of the prior art comprises a quenching hood made from concrete and steel vented to the atmosphere through a brick stack or stacks. Cars of hot coke having sloped bottoms are rolled along tracks under the quenching hood and quenching liquid is sprayed thereupon for a predetermined interval of time. Steam and other gases generated during the quenching operation pass through the vents and stacks to the atmosphere. The spent quenching liquid containing coke breeze and other solid materials drains from the lower end of the sloped bottom of the car, usually flowing against a side wall of the quenching hood and thence to the floor of the hood from whence it drains to a deep sump below the level of the hood floor. Part of the coke breeze and other solids contained in the spent quenching liquid settle by gravity to the bottom of the sump. The spent quenching liquid, still containing large amounts of coke breeze and other solids, may then be disposed of as waste or it may be recirculated back to the quenching hood for quenching more coke. At intervals, quenching operations are stopped and the coke breeze and other solids collecting on the bottom of the sump are removed by hand or by clam shells attached to a lift. If the quenching liquid, containing large quantities of coke breeze and other solids, is recirculated, it is usually pumped from the pump through a conduit system to storage tanks located above the level of the quenching hood. The quenching liquid is withdrawn from these storage tanks intermittently as needed through motor or solenoid operated quenching valves to the quenching hood for quenching more coke. These solenoid or motor controlled quenching valves are turned on during quenching periods and off during non-quenching periods.

In both the once-through and recirculating prior art quenching stations, corrosion and resultant disintegration of the concrete hood, brick stack and metal tank structures, failure to adequately remove coke breeze and other solids from the spent quenching liquid and cumbersome methods of recovering settled coke breeze and other solids from the sump floor have led to difficulties from a maintenance, operational and initial cost standpoint.

The present invention overcomes these difficulties by providing a novel wet coke quenching system in which shallower sumps may be utilized than in any prior art quenching systems; in which the quenching liquid emerging from the sump system for either disposal or recirculation is substantially devoid of coke breeze and other solid materials, thereby resulting in a cleaner effluent when it is disposed, and a more economical recirculation system when it is recirculated than in any wet coke quenching system heretofore known; in which a purer and cleaner coke breeze is recovered from the sump system, without shutting down coke quenching operations, in greater quantities, at a more constant rate and at less cost than in any wet coke quenching system heretofore known; and in which, when the quenching liquid is recirculated, a more breeze-free coke is obtained than in any wet coke quenching system heretofore known.

The present invention further provides in a wet coke quenching station an improved and economical coke quenching hood structure, highly resistant to corrosion, moisture and high temperatures under coke quenching conditions, easily repairable and the use of which results in a cleaner coke breeze, a cleaner coke and a cleaner spent quenching liquid.

The present invention further provides in a wet coke quenching station, an improved non-corrosive, economical and easily replaceable vent stack or stacks for venting gases, during wet coke quenching, from the coke quenching hood thereof, to the atmosphere, the use of which improved stack or stacks prevents stack disintegration and therefore results in a cleaner coke breeze, a shallower sump system, a cleaner coke, a cleaner spent quenching liquid and makes possible a more economical hood structure on which the stacks rest.

The present invention further provides, in a wet coke quenching station, an improved apparatus for, and process of removing coke breeze and other solids from spent quenching liquid, the use of which results in a cleaner coke, a shallower sump system, a more economical spent quenching liquid recirculation system when the quenching liquid is recirculated or a cleaner effluent when the spent quenching liquid is discarded, and the recovery of coke breeze in larger quantities at greater rates and at less cost than in any other wet coke quenching system heretofore known.

The present invention further provides, in a wet coke quenching station, an improved economical apparatus for and method of automatically recovering coke breeze and other solids from the bottom of the coke quenching liquid sump system thereof as they are deposited thereon, without stopping quenching operations, the use of which results in the recovery of coke breeze at a faster and more constant rate, in greater quantities and at less cost than in any wet coke quenching system heretofore known.

The present invention further provides an economical apparatus for and method of scraping the bottom of settling or reactor chambers.

The present invention further provides, in a wet coke quenching station, an improved and economical apparatus for and method of recirculating spent quenching liquid from the coke quenching liquid sump system thereof to the quenching hood thereof.

The present invention provides all these by the utilization of a novel asbestos cement lined, wet coke quenching hood; novel, wooden, vapor vent stacks; novel, upwardly disposed filtering means located in the sump system which filters substantially all of the coke breeze and the solids from the spent quenching liquid, depositing them on the bottom of the sump system; a novel scraping arm extending downward into the sump, the bottom portion of which, in moving along the length of the sump on a carriage on which the scraping arm is mounted, scrapes solids out of the bottom of the sump system as they collect thereon, by scraping the sump floor along and up an upwardly inclined ramp end thereof; and vertical turbine pumps for pumping the filtered

quenching liquid back to the quenching hood via a wooden storage and surge tank.

The use of a corrosion-resistant, asbestos cement lining in the quenching hood prevents corrosion and resultant disintegration of the concrete quenching hood structure due to the action of steam and acidic gases generated during quenching.

This resistance to corrosion prevents the concrete from disintegrating into small pieces which fall into the spent quenching liquid, thereby adding to the solid content thereof, contaminating the coke breeze settling therefrom in the sumps, and contaminating the coke itself.

Also, the use of an asbestos cement lining increases the life of the quenching hood with resultant financial savings.

The use of prefabricated, wooden vapor vent stacks rather than the prior art brick stacks prevents corrosion of the brick with resultant disintegration and contamination of coke breeze, coke and quenching liquid, is very inexpensive, is easily replaceable, and does away with the necessity of a strongly built hood and hood foundation of structural steel and reinforced concrete which are necessary to support the great weight of prior art brick stacks.

The use of upwardly disposed filtering means insures substantially complete removal of coke breeze and other solids from the spent quenching liquid, thereby resulting in a clean effluent for waste disposal in a once-through quenching system and a clean quenching liquid for recycle or recirculation back to the quenching hood in a recycle or recirculatory system.

It is important in a once-through system that the effluent be clean in order to comply with civil laws forbidding the disposal of contaminated effluents into streams. The use of the filtering means of the present invention provides such a clean effluent.

It is important in a recirculatory system that the recirculating quenching liquid be clean and free from abrasive solids such as coke breeze in order to prevent excessive wear by abrasion of, and the plugging of valves, pipes, pumps (pump impellers), storage and surge tanks, and quenching sprays of the recirculation system. Furthermore, the presence of solids in the recirculation system causes greater loads upon and resultant burning out of pump motors and of solenoid-operated control valves utilized in the recirculation system. Also, if a large amount of coke breeze and other solids are recirculated in the quenching liquid, they tend to collect on the coke during the quenching period, resulting in a contaminated coke product. The use of the vertically disposed filtering means of the present invention provides a clean, coke breeze and solids-free recirculating quenching liquid.

Because the recirculating quenching liquid of the present invention is substantially free of solids, less expensive and smaller valves and pipes as well as smaller control solenoids and solenoid valves may be utilized than in prior art systems, resulting in substantial savings.

Furthermore, the use of filters does away with the necessity of deep sumps formerly necessary in order to aid in the gravitational separation of the coke breeze and other solids.

The vertically disposed filters of the present invention results in the recovery of greater quantities of coke breeze at faster and more constant rates and at less cost than in any coke quenching system heretofore known.

The filters must be upwardly (approximately vertically) disposed rather than horizontally disposed in order to prevent clogging.

The novel scraping device of the present invention offers a cheap method for coke removal from the bottom of the sump system without the necessity of halting quenching operations, by providing a scraper arm assembly which extends vertically downward into the sump system from a carriage on which it is mounted for movement upwardly and downwardly in relation thereto, the bottom portion of which scraper arm, when moved with the carriage along the length of and across the open top of the sump system, scrapes along the bottom thereof, scraping coke breeze and other solid materials along the bottom thereof up the ramp end thereof and finally out of the sump system, whereby the scraper arm assembly is moved upwardly in relation to the carriage to a raised position in which position it is locked while it moves with the carriage back across the length of the open top of the sump system, after which it is released from its locked, raised position and moves downwardly by its own weight until its bottom portion contacts the bottom of the sump system, whereupon the scraping and return cycles are repeated continuously.

This scraping arm provides a method of and apparatus for the recovery of coke breeze from the sump system at a greater and more constant rate and at less cost than in any other wet quenching liquid system known heretofore and removing solid materials from the sump before the vertically disposed filtering means of the present invention becomes plugged and rendered inoperative thereby.

Utilizing such a solids removal apparatus contributes in doing away with the need of deep sumps.

It contributes in conjunction with the filtering means, a means for obtaining a filtered clean quenching liquid for recirculation or waste disposal.

Since no moving parts of the scraping device are submerged beneath the liquid level of the quenching liquid in the sump, there is no problem of corrosion of moving parts with consequent jamming and repair.

The use of a vertical turbine pump in the quenching liquid recirculating system for pumping cleaned (filtered) quenching liquid from the sump system back to the quenching hood does away with the necessity of pump rooms containing pump motors at lower sump levels with resultant damp operating conditions and flood hazards.

The prefabricated, wooden quenching liquid surge and storage tank of the present invention does away with corrosion and resulting quenching liquid, coke and coke breeze contamination, is easily replaceable and is inexpensive.

In the accompanying drawings forming a part of the specification are shown for purposes of exemplification, a certain form and manner in which the present invention may be embodied and practiced but the claimed invention is not limited to such illustrative instance.

Fig. 1 is a plan view of the coke quenching station and system for the practice of the present invention.

Fig. 2 is a vertical front cross-sectional view taken along the line II—II of the coke quenching station of Fig. 1.

Fig. 3 is a vertical side cross-sectional view taken along the line III—III of Fig. 2.

Fig. 3*a* is an enlarged detailed cross-sectional view of the juncture of the top of the coke quenching hood and the vapor vent stacks.

Fig. 4 is a front view of the quenching liquid recirculation system of Fig. 1.

Fig. 5 is a front view of the scraping device of Figs. 2 and 3.

Fig. 6 is a side view of the scraping device of Fig. 5.

With reference to the accompanying drawings a preferred method of and apparatus for practicing the improved process of the present invention is now described.

Car **1**, filled with hot coke from a coke oven (not shown), is rolled along tracks **2** laid on level support **11** under quenching hood **3** having three vapor outlets **4** at a top portion thereof, over each of which is a prefabricated wooden stack **5** made up of wooden staves held together by a plurality of hoops **6**, each of which stacks rests in a recess **7** extending around the upper periphery of each vapor outlet. The coke quenching hood rests on a concrete foundation **8** and has a concrete floor **9** sloping

from rear to front and from both sides toward the center to form a trough or funnel for channeling spent quenching liquid to a spent quenching liquid outlet 10 in the concrete foundation 8.

Support members 11 resting on the sloped floor 9 serve to form a level support for tracks 2. The coke in car 1 rests on a sloped car bottom or apron 12.

Quenching liquid flows from a prefabricated wooden quenching liquid storage and surge tank 13 through a tank conduit 14, thence through a quenching liquid conduit 15 and quenching valve 19 or alternate quenching liquid conduit 15' and alternate quenching valve 19', and thereafter through quenching liquid distributor 16 where it is distributed through a plurality of pipes 17 to a plurality of sprays 18 from which it is sprayed over the hot coke.

Quenching valve 19 or 19' is opened for a predetermined time during a quenching period and closed during a non-quenching period while the car of quenched coke is removed from under the quenching hood and is replaced by a new car of hot coke. Each quenching valve may be operated by a hydraulic control system comprising a quenching valve actuator 20 and alternate quenching valve actuator 20' controlled by the flow of fluid into and out of the actuator 20 or 20' which is in turn controlled by a solenoid control valve 25 operated electrically by an electrical timer 26. The electrical timer 26 automatically actuates solenoid control valve 25 for a predetermined quenching period to allow fresh fluid under pressure from a fluid source (not shown) to flow from fluid supply line 23 through solenoid valve 25 to fluid line 21 into actuator 20 or 20' and exhaust fluid to flow from actuator 20 or 20' to fluid line 22 through solenoid valve 25 and hence to drainage through drainage line 24, whereby actuator 20 or 20' is actuated to open quenching valve 19 or 19' for a predetermined time during the quenching period.

After the quenching period, timer 26 automatically actuates solenoid control valve 25 for a predetermined non-quenching period allowing fresh fluid under pressure to flow from fluid supply line 23 through solenoid valve 25 to fluid line 22 into actuator 20 or 20' and simultaneously allowing exhaust fluid from actuator 20 or 20' to fluid line 21 through solenoid valve 25 and hence to drainage through drainage line 24, whereby actuator 20 or 20' is actuated to close quenching valve 19 or 19' for a predetermined non-quenching period.

The quenching hood 3 is made of reinforced concrete 31 having an inside and outside lining of flat asbestos cement sheet or board 29 made from asbestos fibers and cement. For example, a material commercially referred to as Transite can be used.

In constructing the quenching hood, asbestos cement sheet can be used in place of wooden forms for pouring the concrete and left in place, providing an economical construction method. The asbestos cement forms are bolted together with stainless steel bolts (not shown) passing through the concrete structure. Quenching liquid passing from sprays 18 flows over the coke and the spent quenching liquid drains from the sloped car bottom or apron 12 through suitable openings (not shown) at the bottom of the side 30 of coke car 1 against a wearing plate 27 attached to an inside wall of the quenching hood, onto floor 9 from which it is channeled by the force of gravity through outlet 10 and thence through passageway 39 to a breeze sump inlet 44 located at an inlet end 85 of a channular breeze sump 32 of a channular trough-like sump 31 below the level of quenching hood floor 9. Sump system 31 is made up of concrete walls 33 and a concrete floor 45. It is composed of a breeze sump 32 and a clean quenching liquid sump well system, which latter system is comprised of sump wells 39, 40 and 86 and pump well 46.

Steam and other gases formed during the quenching, escape through the vapor outlets 4 lined with asbestos cement board 29, and wooden stacks 5 to the atmosphere. The lower portion of wooden stacks 5 which are exposed to the greatest heat are lined with an asbestos cement lining 29.

Two removable, vertically disposed, screen walls 36 run parallel to the longitudinal sump system walls 33 along part of the longitudinal length of the sump system 31 from a middle portion thereof to an end thereof forming a channular breeze sump therebetween and two sump wells one of which 39 lies between one screen wall and one sump system wall 37, the other of which 40 lies between the other screen wall and the other sump system wall 38.

Each screen wall arises from and is supported on a concrete screen support 34, rising from the sump system floor 45, which screen support 34 has a plurality of parallel, upright, filter screen support columns 35 arising vertically therefrom and spaced longitudinally along the top thereof. Each screen wall is made up of a plurality of removable rectangular screens or perforated plates having filter cloth mounted over one or both faces thereof 36. The lower edge of each rectangular screen 36 lies in and is supported by a groove 41 on the top face of the concrete screen support 34 and the vertical side edges of each rectangular screen fit into and are supported by oppositely facing grooves 42 in oppositely facing longitudinal edges 43 of two screen support columns 35 located adjacent to each other on one of the screen supports 34.

Spent quenching liquid flows through quenching hood outlet 10, spent quenching liquid conduit 89 and breeze sump quenching liquid inlet 44 located at the end 85 of the channular breeze sump 32 and at the middle portion of the sump system 31, and hence through coke breeze filtering means or filter screen walls 36 into channular sump wells 39 and 40. The filter screen filters out the breeze and other solids contained in the spent quenching liquid, part of which coke breeze and solids settles to the bottom 45 of the breeze sump and part of which coke breeze and solids collects on the filter screen.

Channular sump wells 39 and 40 extend into a single sump well 86, the floor of which is at a lower level than the floors of sump wells 39 and 40 and the breeze sump 32.

A pump well portion 46 of the single sump well 86 is separated from the rest of the single sump well by vertically disposed pump filtering means or screens 47 and 48 both finer than the filter screens separating the breeze sump 32 from sump wells 39 and 40. Filter screens 47 and 48 have filter cloth covering one or both faces thereof, which filter cloth is finer than that of filter screens 36.

Cleaned quenching liquid flows from sump wells 39 and 40 into single sump well 86 by gravitational force through pump filter screens 47 and 48 into the pump well portion 46 of the single sump well 86, from whence it is pumped by one of two alternative vertical turbine pumps 49 or 49' driven by one of two alternative motors 40 and 50' located above the sump well, through a pump conduit pipe 51 and check valve 52 located therein.

When quenching valves 19 and 19' are closed during a non-quenching period, the quenching liquid is pumped from the conduit pipe 51 by pump 49 or 49' through tank conduit pipe 14 to prefabricated wooden storage and surge tank 13. When quenching valve 19 or 19' is open during a quenching period, quenching liquid is pumped by pump 49 or 49' from conduit pipe 51 either through quenching liquid conduit pipe 15 or 15' and quenching valve 19 or 19' hence to distributor 16, piges 17 and finally to sprays 18, or from conduit pipe 51 through tank conduit pipe 14 to storage tank 13.

Storage and surge tank 13 may be equipped with a pressure or float device which automatically cuts off pump 50 or 50' when a certain predetermined liquid level is reached in the tank, and automatically turns the pump on when the liquid in the tank falls below the predetermined level. The wooden storage tank is made up of wooden staves held together by hoops.

During a quenching period when either valve 19 or 19'

is open, quenching liquid flows from wooden tank 13 through tank conduit pipe 14, hence through quenching liquid conduit pipe 15 or 15', valve 19 or 19' and distributor 16 to pipes 17 and finally sprays 18 where it is then showered over the hot coke in car 1.

At the end of a non-quenching period when the sump system is comparatively empty of quenching liquid, valve 54 is opened and quenching liquid flows from quenching liquid conduit pipe 15 and/or 15' at a point located before quenching valve 19 or 19', through pipe 53 and valve 54 to two manifold pipes 55, and hence through a plurality of manifold offtake pipes 56 to a plurality of sprays 57 from whence it is sprayed with force against filter screens 36 in a direction opposite from the normal flow of quenching liquid through the filter screen, thereby cleaning the screens of coke breeze and other solids which have accumulated thereupon by washing such coke breeze and other solids from the screens to the floor 45 of the breeze sump 32. Valve 54 may be automatically controlled (not shown) to open for a predetermined period of time at the end of each non-quenching period but before the quenching period begins, or it may be controlled by hand directly or remotely. Valve 54 can be controlled by timer 26 so as to be opened at the proper time during the quenching and non-quenching cycle.

Breeze sump floor 45 is inclined upwardly at the end opposite from breeze sump quenching liquid inlet 44, forming an upwardly sloping ramp which forms one end 58 of the channular breeze sump.

The two longitudinal filter screen walls 36 and the longitudinal walls 37 and 38 of the sump system end where the breeze sump floor begins to incline upwardly. Thereafter the filter screen walls extend into solid concrete walls 62 which rise upwardly from the ramp floor 58, and end walls 64 connect the filter screen walls and the longitudinal sump system walls 37 and 38, forming sump well end walls 64.

The coke breeze and other solids collecting at the bottom of the breeze sump are scraped out of the breeze sump by a scraping device 61 mounted on a carriage 65 adapted to be rolled on wheels 66 to and fro over and across the open top of breeze sump 32 from and towards its upwardly inclined, ramp bottomed end along tracks 91 supported by and laid on the tops of walls 62 and beams 37 laid along upright filter screen support columns 35.

Carriage 65 has two long vertical scraper arms 67 with a scraper blade 71 attached to the lower ends thereof, each of which scraper arms passes through a vertically spaced guide member 68 which in turn is attached to an upright parallel support member 69 rising vertically from and above carriage 65. Support members 69 are braced in a vertical, upright position by braces 70. The scraper blade 71 is made from hard steel and extends across the width of the breeze sump. The lower ends of the two scraper arms fit into holes in the top of the scraper blade and are held therein by tightening bolts 72.

The weight of the two scraper arms and scraper blade are partially counterbalanced by two sets of counterbalance weights 73 slideably mounted in counterbalance guides 88 which counterbalance weights are attached to the ends of two cables 74, the other ends of which cables are attached to the upper ends of the two scraper arms. The cables pass over and are supported by sheaves 75 rotatably mounted on the tops of support members 69. Located on each of support members 69 is a fall and chain 84, which may be utilized to remove and replace filter screens 36 by means of an eye 90 attached to the top of each filter screen.

The slightly greater weight of the scraper arms and scraper blade over the counterbalance weights causes the scraper arms 67 and blade 71 to be normally in a position wherein the scraper blade rests against the bottom of the breeze sump floor, in scraping contact therewith.

When the carriage and scraper arm are in a starting position directly adjacent to the quenching liquid inlet side 85 and opposite from the ramp bottomed side 58 of the breeze sump 32, the scraper arms and blade are in a lowered position shown by dotted lines in Fig. 2.

Periodically the carriage, scraper arms and scraper blade are pulled, during a scraping cycle, along tracks 91 by cable 76 from the inlet side 85 of the breeze sump or starting position to the ramp-bottomed side 58 thereof or end position, during which scraping cycle the scraper blade 71 scrapes along the bottom of the breeze sump. As the scraper blade passes up ramp 58, the upward inclination of the ramp forces the scraper arms and blade vertically upward through guide members 68 until an end position at the end or top of the ramp is reached, at which point the scraper arm and blade are in a raised position as shown in full lines in Fig. 2. During the passage of the scraper blade over the bottom of the breeze sump in scraping relation therewith, coke-breeze and other solids are scraped along the bottom of the breeze sump up ramp 58 and finally out of the breeze sump 32 into a coke breeze car 59, located in coke breeze or chamber 60.

When the two scraper arms 67 reach the end or top of the ramp and the scraper arms are in a raised position, a pin 77 slideably mounted in each guide member 68 is forced by spring 79 pushing against plunger member 80, lever arm 81 and pin shaft 82, to enter a depression 78 in each scraper arm 67 thereby locking scraper arms 67 in a raised position.

After the carriage assembly has reached the top or end of the ramp and the scraper arms are locked in a raised position, the carriage is pulled, during a return, non-scraping cycle, in a reverse direction by cable 76, away from the ramp-bottomed end 58 of the breeze sump or end position until the quenching liquid inlet side 85 of the breeze sump or starting position is reached, at which point end portions 83 of plunger members 80 strike against a bumper or car stop 84, forcing plungers 80 to move against the force of springs 79, thereby releasing levers 81 which pull pins 71 out of depressions 78, thereby allowing the scraper arms to slide vertically downward by the force of gravity in guide members 68, until the scraper blade rests on the breeze sump floor in a lowered position. Thereafter the scraping cycle and return, non-scraping cycle are repeated continuously.

Cable 76 can be controlled by a servo or reversible motor attached thereto, which in turn, can be automatically controlled to cause the scraping device to make any number of scraping cycles per unit time. The movement of the scraping device may be controlled by an electric timer synchronized with the quenching and non-quenching cycles.

In no wise is the present invention limited to the above single illustrative instance.

Although the combination of the novel hood, novel sump system, novel scraping device and novel quenching liquid recirculating system all contribute in attaining a better and purer coke breeze more economically at a faster, more uniform rate and a cleaner effluent or recirculating liquor, the latter of which makes possible a more economical and longer lasting recirculating system and a purer coke product, each novel element of the combination contributes an independently unexpected and improved result.

For instance, the use of the asbestos cement lining and wooden stacks of the present invention in any wet coke quenching system having a quenching hood and quenching liquid sump system prevents coke breeze and coke contamination, reduces the solids to be filtered from the quenching liquid and increases the life of the quenching hood with resultant financial savings. Although the quenching hood lining may be of any asbestos cement (cement containing asbestos fibers), Transite is preferred.

The use of the replaceable, prefabricated wooden stacks

of the present invention in any wet coke quenching station does away with the necessity of a strongly built supporting hood and foundation, prevents coke breeze and coke contamination and reduces the amount of solids in the spent quenching liquid.

The stacks may be prefabricated at the manufacturing plant and be lifted into place over the quenching hood. They are not only very cheap to construct but are very easily removable. However any stacks made of wood may be utilized whether prefabricated or not.

The use of the asbestos cement wearing plate of the present invention in any quenching hood increases the life of the quenching hood wall against which a stream of spent quenching liquid is ordinarily directed, and prevents disintegration thereof with resultant coke breeze, quenching liquid and coke contamination. Although Transite is preferred as a wearing plate material, any asbestos cement material may be used. In fact, the wearing plate may be made from any suitable material. It may be attached to the quenching hood in any detachable manner.

The filtering means of the present invention may be placed in the quenching liquid sump system of any wet coke quenching station in such a manner that the quenching liquid is forced therethrough, thereby producing a clean effluent or a clean recirculating liquid, permitting a shallow sump system and increasing coke breeze yield at a faster rate and at less expense. The filtering means is composed of either screens or perforated plates having one or both faces covered with filter cloth or other suitable filtering medium. The screens or plates may be of any metal or composition.

The vertical turbine pumps of the present invention may be utilized in any coke quenching liquid recirculating system to permit pump motors to be installed above ground level where operating conditions are not damp and there are no flood hazards.

The replaceable, economical, prefabricated wooden surge and storage tanks of the present invention may be utilized in any coke quenching liquid recirculating system, to decrease original and maintenance costs and to prevent corrosion and resulting disintegration.

The scraper apparatus of the present invention may be utilized with any coke quenching liquid sump system, so long as the bottom of the sump system is constructed to form a ramp at one end. It provides an efficient and inexpensive method for handling breeze coke and results in the recovery thereof at a constant and fast rate. Quenching operations need not be halted in order to remove settled coke breeze. None of its moving parts are below the liquid level in the sump and therefore they are not exposed to corrosive quenching liquid.

The scraper apparatus of the present invention may be utilized to remove material from the bottom of any reactor or tank, such as the removal of tar in tar decanting.

Any number of scraper arms may be utilized. For instance, in addition to the use of two arms as previously shown, it is within the scope of the present invention to construct the scraping apparatus with only one arm or with more than two arms.

The scraper blade should be constructed of a hard metal but not necessarily.

The carriage may be constructed in any suitable manner.

The scraper arms and blade may be counterbalanced by any conventional means, although the use of counterweights attached to a rope passing over a sheave rotatably supported by upright support members rising from the carriage is preferable. For instance, a spring counterbalancing device would be satisfactory.

The particular support members rising upwardly from the carriage and the particular scraper arm mounting means may have other constructions or designs than shown herein.

The counterbalanced scraper arm may be mounted on the carriage in any conventional manner allowing upward and downward sliding movement in relation to the carriage.

The carriage may move either on undertracks as shown or it may be suspended from overhead tracks.

The scraper assembly should be built of all stainless steel or other corrosion-resistant material. It is particularly advantageous to build those parts of the scraper contacting the quenching liquid, from corrosion-resistant material such as stainless steel.

Any conventional means for locking the scraper arms in a raised position may be utilized, as well as any conventional lock release means for permitting the scraper arms to move to a lowered position. The lock may even be applied and/or released by hand.

The carriage may be pulled to and fro across the top of the sump system by any conventional means or by hand.

The movement of the carriage may be controlled automatically by an electrical timer synchronized with the quenching and non-quenching periods.

The solids may be removed from the screen as illustrated by flowing clean quenching liquid through the filters countercurrently to normal liquid flow, or a vibrator may be utilized to continuously vibrate the screens sufficiently to shake off solids collecting thereon.

Furthermore, clean quenching liquid nozzles may be so arranged at the top of the sump system that when the screens are raised by the chain-falls on the support members, a stream of clean quenching liquid is directed against them, thereby washing out solids adhering thereto.

Any type of fluid may be utilized in the solenoid valve control system, such as water, hydraulic fluid or air.

The most desirable material for the piping in the present invention in Monel or stainless steel since these metals are the least corrosive.

Although it has been attempted to describe the theoretical basis for the unexpected advantages of the present invention, it is by no means intended that the invention be limited by such theory.

It will be obvious to those skilled in the art that various modifications can be made in the several parts of the present apparatus and the several steps of the present process in addition to those enumerated hereinabove without departing from the spirit of the invention and it is intended to cover in the claims such modifications as are included within the scope thereof.

I claim:

1. A quenching liquid sump system for a coke quenching station comprising a breeze sump having a bottom inclined upwardly at one end to form an upwardly sloping, solids discharge ramp end thereof; a clean quenching liquid well system extending along a side of said breeze sump, a filtering means positioned between said breeze sump and said well system, means to direct quenching liquid into said sump, and scraping means for scraping the bottom of said sump toward and upwardly along the inclined ramp end thereof.

2. The apparatus of claim 1 and means for removing breeze from said filtering means into said sump.

3. The apparatus of claim 1 and a recycling means for recycling clean quenching liquid from said clean quenching liquid well system to the coke quenching station.

4. The apparatus of claim 3, said recycling means comprising a vertical turbine pump means submerged below the liquid level of said clean quenching liquid well system and driving means for said pump means located above the liquid level of said well system.

5. The apparatus of claim 4, said clean quenching liquid well system comprising a sump well and a pump well separated by a vertically disposed pump well filter which filters fine solid particles not filtered out previously, said pump means being disposed in said pump well.

6. A quenching liquid sump system for a coke quenching station comprising a breeze sump having a bottom

inclined upwardly at one end to form an upwardly sloping, solids discharge ramp end thereof, a clean quenching liquid well system extending along a side of said breeze sump, a filtering means positioned between said breeze sump and said well system, means to direct quenching liquid into said sump, and scraping means for scraping the bottom of said sump toward and upwardly along the inclined ramp end thereof, said scraping means including a carriage adapted to travel back and forth across the open top of said breeze sump and a vertical scraping member mounted thereon for travel therewith, said scraping member being vertically slidable relative said carriage to permit the scraping member end to follow along the bottom of said sump along the upwardly sloping solids discharge ramp end thereof.

7. The apparatus of claim 6 and automatic locking and release means on said carriage to lock said scraping member in locked position when it has reached the terminus of the discharge ramp end and before reverse travel, and to release said scraping member to a lower position when said carriage reaches a predetermined end position in its reverse travel.

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