March 5, 1935. C. B. WISNER 1,993,199

CARBONIZING APPARATUS

Filed Nov. 24, 1930 4 Sheets-Sheet 1

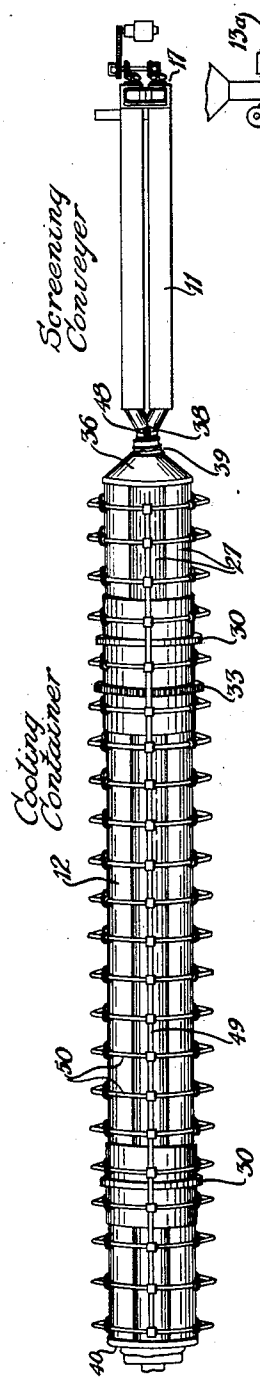


Fig. 1

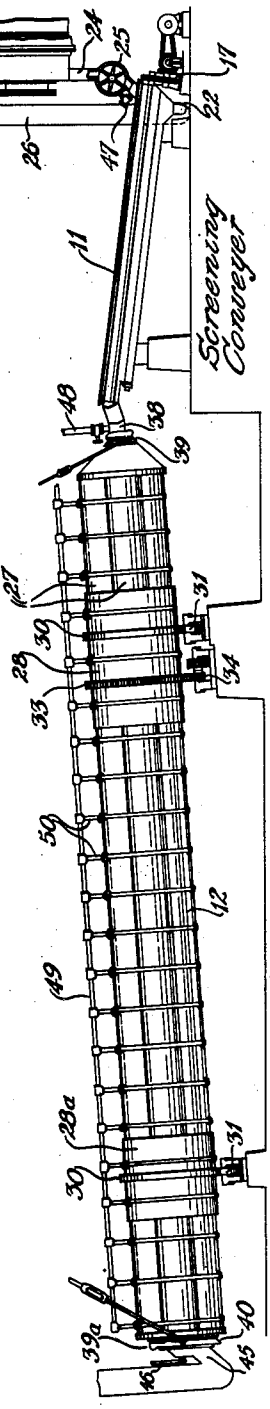


Fig. 2

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CARBONIZING APPARATUS

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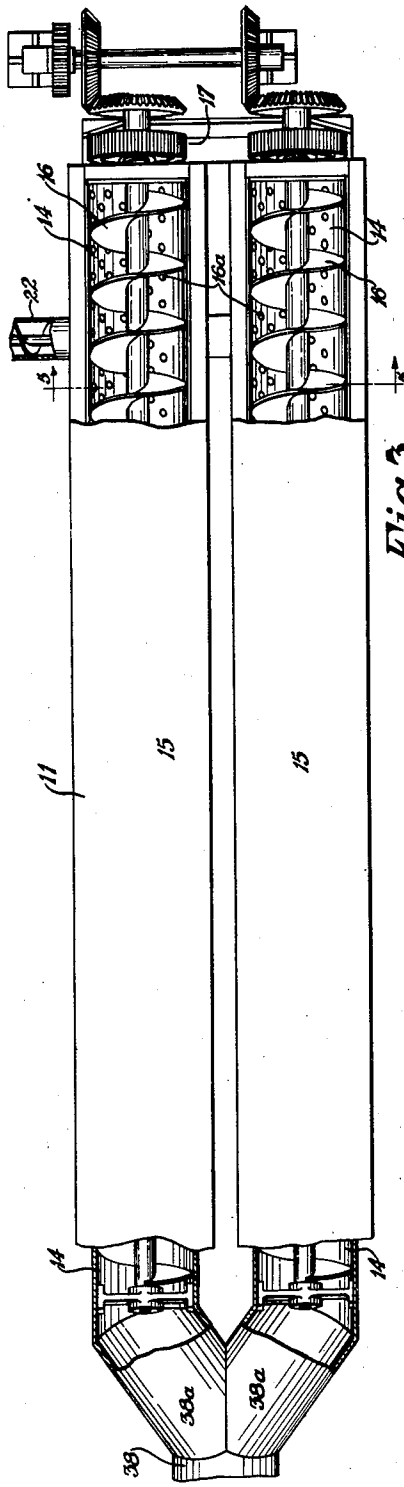


Fig. 3

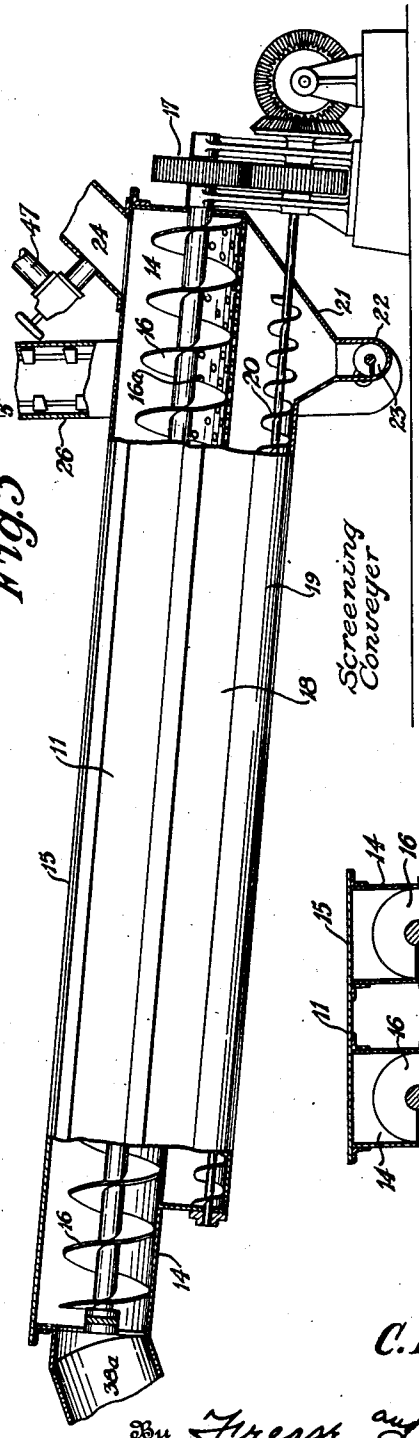


Fig. 4

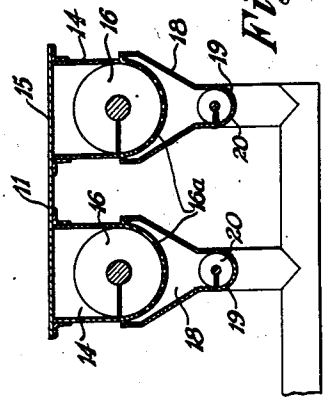


Fig. 5

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CARBONIZING APPARATUS

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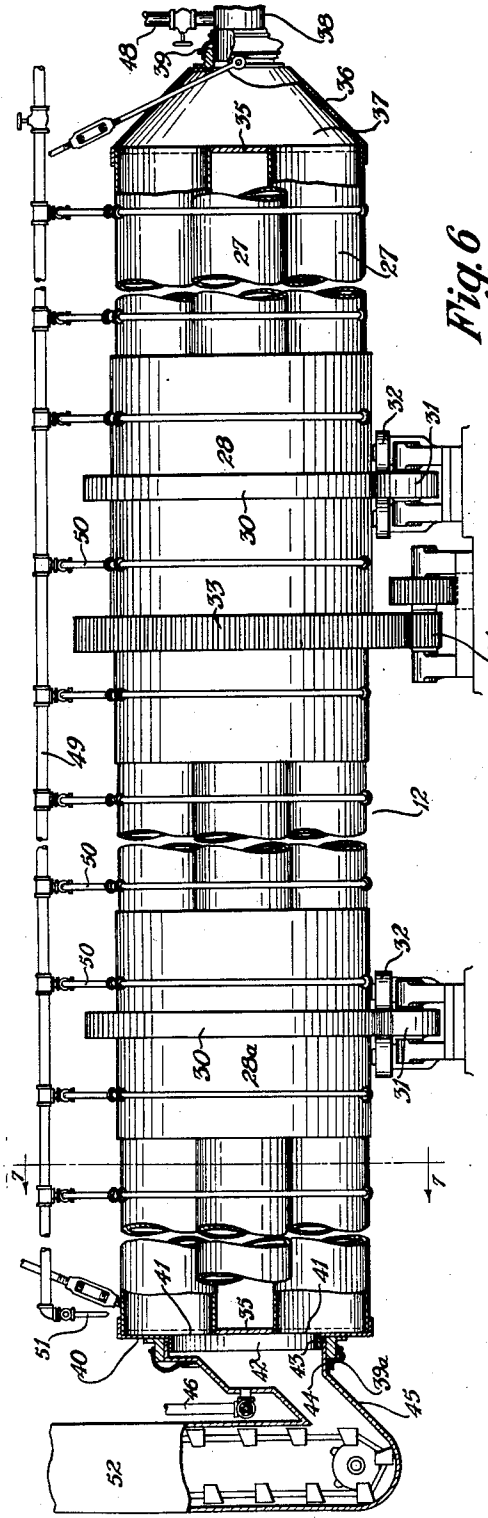


Fig. 6

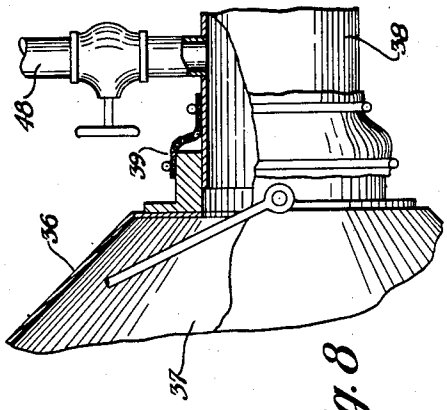


Fig. 8

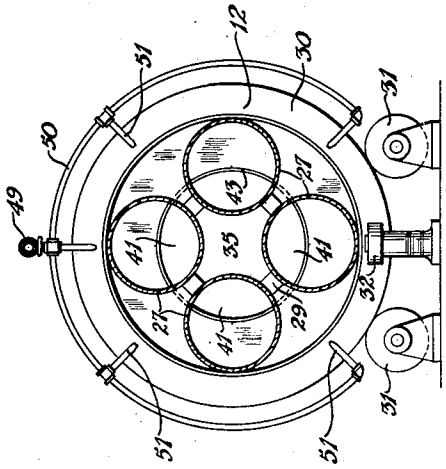


Fig. 7

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CARBONIZING APPARATUS

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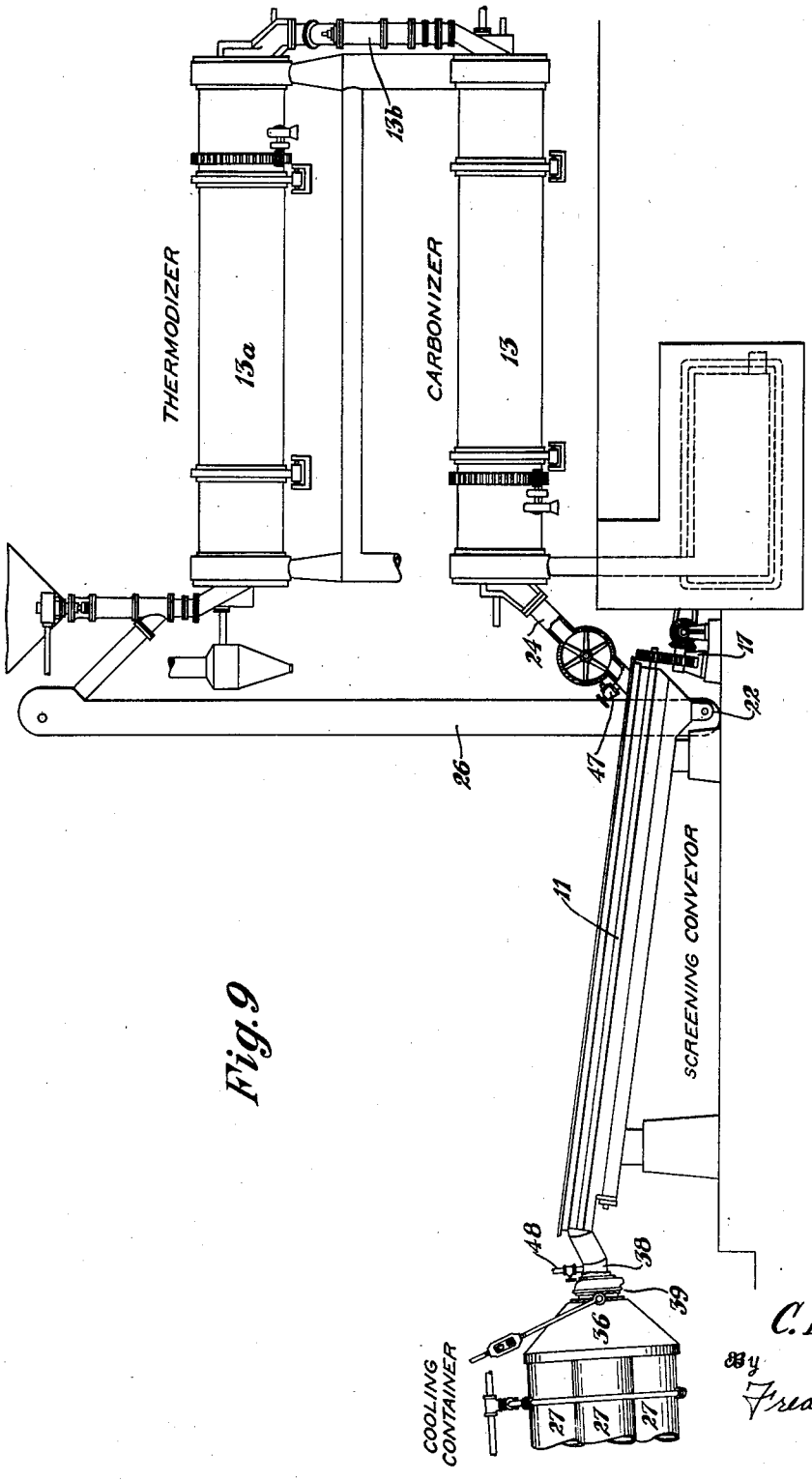


Fig. 9

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Patented Mar. 5, 1935 1,993,199

UNITED STATES PATENT OFFICE

1,993,199

CARBONIZING APPARATUS

Clarence B. Wisner, Orange, N. J., assignor to Coal Process Corporation, Dover, Del., a corporation of Delaware

Application November 24, 1930, Serial No. 497,829

3 Claims. (Cl. 202—150)

The invention relates to the proper cooling and aging of the coke products of low temperature carbonization of volatile coals, before releasing the same to the atmosphere; and particularly to the cooling and aging of carbonized coal balls made in accordance with the methods set forth in United States Letters Patent No. 1,490,357 of June 4, 1924, and No. 1,756,896 of April 29, 1930, in which the solid product is discharged in well rounded balls, with only a limited amount of fines.

It is well known that when semi-coke is dry cooled, even to atmospheric temperature, in an inert atmosphere, especially if it comes in contact with moisture when released to the air, it may, and often does absorb enough oxygen to raise the temperature in spots to cause autogenous combustion and the firing of the lot; and one of the objects of the present invention is to avoid the difficulty and the danger of autogenous combustion.

It has been found that the cooling of such products will be greatly facilitated by the preliminary segregation and removal of the fines from the larger balls or products; and that the danger of firing is reduced, if not entirely avoided, by continually moving and agitating the same in an externally cooled container, and at the same time, scavenging the hot gas and sensible heat of the semi-coke, as by causing a small volume of saturated steam to flow over and through the same, throughout the entire cooling period.

It is also well known that when carbon is heated in an inert atmosphere and later released to the air that it is in a nascent state with strong affinity for oxygen at whatever temperature released, but if oxygen is brought in contact with the carbon in minute volume insufficient to cause its temperature to rise while cooling it will become saturated at some temperature above atmospheric temperture, at which point it may be released to the air without fear of autogenous combustion, and for that reason it is advantageous to admit with the steam a small amount of air as the aging medium.

Accordingly, a further object of the present invention is to provide means for segregating and screening the fines from larger balls or products, during a continuous movement thereof; for separating a larger mass of coal balls into smaller masses, and for tumbling and moving the same continuously to more readily cool the balls by an indirect cooling medium; and at the same time scavenging the hot gases and reducing the sensible heat of the coal balls, to facilitate and complete a proper cooling and aging of the same without danger of firing when discharged into the atmosphere.

The present improvement may be embodied, and the proper cooling and aging of coal balls and the like may be carried out by the apparatus illustrated in the accompanying drawings forming part hereof, in which—

Figure 1 is a diagram plan of the apparatus;

Fig. 2, a diagram elevation of the same;

Fig. 3, an enlarged plant, partly in section, of a pair of screening conveyers;

Fig. 4, an elevation, partly in section, of the same;

Fig. 5, a cross section of the same as on lines 5—5, Figs. 3 and 4;

Fig. 6, a side elevation, partly in section, of the tubular cooling container;

Fig. 7, a cross section of the same as on line 7—7, Fig. 6;

Fig. 8, a fragmentary sectional end view of the intake head of the same; and

Fig. 9, a side elevation of the thermodizer and carbonizer retorts, the screening conveyer and a portion of the cooling container.

Similar numerals refer to similar parts throughout the drawings.

The apparatus may include a screw screening conveyer 11 and a tubular cooling container 12, arranged and connected so that carbonized coal balls and the like, received from a carbonizing retort 13, combined with a thermodizing retort 13*a* communicating through a conduit 13*b* with the carbonizing retort, may pass through the screening conveyer 11 for segregating and removing the fines, and thence through the cooling container 12 for cooling the larger coal balls and the like.

Each of the two screening conveyers illustrated in the drawings, may be in the form of a U-shaped trough 14 with a closing cover 15, in the round bottom of which is mounted a conveyer screw 16, driven by gearing 17 from a suitable source of power; and the bottom and one side of the U-trough are provided with series of perforations, say $\frac{7}{16}$ of an inch in diameter, to form a screen for the fines, of say under $\frac{3}{8}$ of an inch.

Depending from the sides of each screening trough is a longitudinal hopper 18, in the bottom of which is a smaller U-trough 19 having a conveyer screw 20 therein driven by the gearing 17 in the reverse direction from the screw 16 of the screen conveyer; and at the delivery end of the pendent conveyer thus formed, is a depending hopper 21 opening into a transverse U-trough

22 having a conveyer screw 23 operating therein, to form a transverse conveyer.

Carbonized coal balls, together with the fines, may be discharged from the carbonizing retort 13, and continuously delivered through a feed pipe 24 containing a gas-tight gate which may be a six star spider 25, into the intake end of the screening conveyer 16, which is preferably inclined upward from the intake end to the outlet end, so that the operation of the screw 16 will convey the coal balls from the one end to the other of the screen and permit the fines to segregate from the larger balls and then to pass through the apertures 16*a* in the bottom and side of the screen conveyer trough, downward into the smaller pendent conveyer trough; wherein the fines will be conveyed in the opposite direction and delivered into the hopper 21 and will thence be conveyed by the transverse conveyer trough 22 and delivered by a bucket elevator 26 into the raw coal being fed into the thermodizing retort 13*a*; thereby utilizing the sensible heat of the fines for initially warming the raw coal.

The tubular cooling container 12 may consist of a plurality of steel tubes 27, preferably four tubes of say 36 inches in diameter and 90 feet long, mounted within two or more cylindric reinforcing sleeves 28 and 28*a*, welded or riveted to the outer walls of the tubes, as in the periphery of an 8 foot cylinder; the tubes being separated by suitable spacers 29.

An annular track tire or rail 30 is secured around each reinforcing sleeve, and the rails are mounted and adapted to ride upon rollers 31 for supporting and rotating the container, suitable end thrust rollers 32 being provided for holding the rails upon the supporting rollers; and a girt gear 33 is secured on one of the reinforcing sleeves, which meshes with a driving pinion 34, suitably geared with a motive power (not shown), for rotating the tubular container.

A disk plate 35 is fitted around and welded with an air-tight joint to the four steel tubes, at each end thereof, to close the intervals between and around the same, while leaving the ends of the tubes open for receiving and discharging coal balls. These end plates may have a diameter of 8 feet, corresponding to the periphery of the tubes.

A conical head 36 is secured to the periphery of the disk plate at the intake end of the container, so as to form an intake compartment 37 for receiving coal balls through a Y-pipe 38 having branches 38*a* communicating with the discharge ends of the screening conveyers 11; a suitable sealing joint, indicated generally at 39 being provided between the stationary pipe 38 and the conical head 36, which joint may be of the character set forth in detail in my application for Rotary retorts, filed April 17, 1929, Serial No. 355,913.

A ring head 40 is secured to the peripheral portion of the disk plate at the discharge end of the cooling container, the ring being of such a width as to close the outer portion only of the opening in the end of each tube; thus leaving the inner portion 41 of said opening free to discharge through the central opening 42 of the ring head.

A cylindric flange 43 extends outward from the rim of the opening 42 of the ring plate, around which is telescoped a cylindric flange 44 on a stationary outlet chute 45, the joint between the rotatable ring head and the stationary outlet chute being provided with a suitable seal, indicated generally at 39*a* of the same character as the seal 39 at the intake end of the cooling container.

A valve controlled inlet pipe 46 is connected with the outlet chute of the cooling container, and a valve controlled inlet pipe 47 is connected with the feed pipe 24 at the intake end of the screening conveyer for admitting scavenging medium, such as a small volume of saturated steam; and a valve controlled outlet pipe 48 is connected with the intake pipe 38 of the cooling container, which constitutes a common outlet for the scavenging medium admitted through the inlet pipes 46 and 47; thereby causing it to flow through and over the cooling coal balls for scavenging the hot gases and reducing to some extent, the sensible heat of the carbonized coal balls; the screening conveyer and the tubes of the cooling container being otherwise closed against the admission of air or other gases.

A water main pipe 49 is longitudinally mounted over the rotating cooling container for its entire length, from which the branch pipes 50 extend outward and downward around the same and are provided with centrally directed spray nozzles 51, through which turbulent water is supplied in a continuous spray over all parts of the periphery of the rotating tubes for indirectly cooling the contents thereof.

In the operation of the apparatus, hot coal balls and fines are delivered from the carbonizing retort into the intake end of the screening conveyer, wherein the same are constantly agitated and moved forward to and discharged from the outlet end thereof, and at the same time the fines are segregated and screened from the larger balls and returned by the depending and transverse screw conveyers and the bucket elevator to the raw coal being fed into the thermodizing apparatus, so as to initially heat the same.

After the fines are thus screened from the coal balls, they are discharged from the screening conveyer and delivered to the intake compartment of the rotating cooling container, which is inclined downward towards the discharge end so that the coal balls will tumble and move forward within the respective tubes, and at the same time will be sufficiently cooled by the cold water impinging the side thereof and the scavenging medium drawn through and over them; whence they are discharged through the outlet chute 42 at the delivery end thereof.

The inclination of the conveyer and the rate of rotation thereof is so regulated that the coal balls will be sufficiently cooled when they are discharged therefrom; whence the cooled balls may be elevated by a vertical bucket elevator 52 to a trommel in which they may be sized, if desired, above a storage bin.

At the same time, a current of saturated steam or other scavenging and aging medium is caused to flow through the apparatus from the discharge end of the cooling container and the intake end of the screening conveyor to the intake end of the one and the discharge end of the other, so as to scavenge the hot gases from the coal balls and assist in removing the sensible heat therefrom.

When two or more screening conveyers are used, they may all receive coal balls from the same carbonizing retort, or they may severally receive coal balls from separate carbonizing retorts, and in any event, the speed of rotation of the conveyer screw may be varied to meet different conditions; so that by continuously agitating and moving the carbonized fuel, the fines will be readily screened and the hot gases

readily scavenged therefrom in what may be referred to as the initial cooling operation.

And when the stream of screened balls is discharged from one or more screening conveyers into the intake compartment of the cooling container, it is divided into a plurality of streams flowing into the several tubes, at a rate depending upon the inclination and rate of rotation of the container; wherein the reduced volume or mass is constantly agitated by tumbling and moving forward toward the discharge end thereof, which brings every ball or particle of the carbonized fuel into constantly recurring contact with the cooling wall of the tube and the scavenging medium, and more quickly and uniformly cools the separate streams than when a single stream of the entire mass or volume is moved through a single cylindric container, for the final cooling operation.

In this manner, the screening conveyers, the tubular container, and the scavenging medium all cooperate in a more or less inert atmosphere, for quickly and uniformly scavenging, aging, screening and cooling the carbonized fuel, so that upon the completion of the final cooling operation, the same may be discharged into the atmosphere without danger of autogenous combustion.

I claim:

1. The combination of a cooling container for carbonized fuel balls and the like, comprising a plurality of parallel tubes of substantial diameters with open ends provided with common headers and mounted for rotation on a longitudinal axis for the continuous flow therethrough of fuel balls to be cooled, communicating with a conveyor and means for screening fine carbonized fuel from fuel balls as they flow continuously through the apparatus.

2. A carbonizing apparatus including a thermodizing retort communicating with a carbonizing retort, a screening conveyer for continuously receiving carbonized fuel from the carbonizing apparatus, means for continuously passing a scavenging medium through the conveyer, and means for continuously returning the fines screened from the fuel to the thermodizing retort.

3. A carbonizing apparatus including a thermodizing retort, a screening conveyer for continuously receiving carbonized fuel from the carbonizing apparatus, and means for continuously returning the fines screened from the fuel to the thermodizing retort.

CLARENCE B. WISNER.