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ART OF PREPARING COAL FOR MARKET

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My invention refers to preparation of coal, more particularly to facilitating the individual operations involved in preparing coal, to reducing cost of such operations and to improving the coal output.

Coal as mined is an unassorted aggregate consisting of all sizes, from the largest pieces that one man can lift to finest dust. Within this aggregate is pure coal along with natural impurities which must be removed. These impurities occur interbedded in the coal veins and, within the mine, cannot be advantageously removed.

Near the mine mouth a surface plant is normally provided wherein the coal as mined is prepared for market. In the preparation plant, the mass of mixed material is first usually assorted into size class classifications such as will best allow application of the various means available for separating marketable coal from impurity. The natural impurities associated with coal are chiefly slate and "bone", pieces of interlaminated slate and coal.

The means most frequently employed in removal of impurities are: (1) Hand picking, applicable to larger sizes and pieces, (2) jigging, adapted to sizes and pieces, ponderable, but too small for successful hand picking, (3) air cleaning, adapted to all sizes smaller than can be hand picked and (4) wet concentration, adapted to segregations of small particles. These treatments, and indeed any normal handling of coal in its progress from the mine to the consumer, involve agitation or tumbling of a coal mass containing assorted coal sizes.

As at present marketed, well sized coal is in greatest demand, and, in general, larger sizes command a higher price than small sizes, which latter are known in the trade as "slack" and will pass through a screen having 1¼ inches or smaller mesh. Profitable production depends upon a minimum of degradation of larger into smaller sizes.

In coal preparation plants, necessary chuting and sliding arrangements are often such as to impede proper flowage of coal, either because of insufficient slope or corrosion of sliding surfaces. Also, often coal is passed through spouts or gates too restricted to allow at all times free delivery. Whatever facilitates chuting and spouting speeds production.

Cost of operating a coal preparation plant is a function of capacity. Increasing plant capacity correspondingly increases realization.

My invention improves coal preparation by affording better screening, jigging, dry cleaning, wet concentration and facilitating hand picking. It lowers cost of plant operation both by increasing output and eliminating dust. It allows flatter chuting and freer spouting. It increases coal salability. It increases realization by raising the proportion of larger sizes.

My invention consists in applying to an aggregate of intermixed coal and impurity composed predominantly of pieces larger than slack and which is to be subsequently treated in order to separate the commercial coal from associated impurity, or to clean coal still in process, a dosage of oil slightly in excess of that required to form, throughout the mass, a dust-laying film upon the coal. By oil, I mean any substance of an oily character fluid at 200 degrees Fahrenheit. Oil alone is effective in obtaining practical results. However, I prefer to apply the oil as an oil-in-water emulsion and use, normally, a soap formed emulsion, as the presence of soap lowers surface tension and, in itself, is a lubricating agent.

In the appended claims the term "an oily liquid" is used to designate and to include both oil and oil emulsions or like liquids containing oil.

The oil, having an affinity for coal, attaches itself to the coal element of the mass and, in hand picking, serves to emphasize the difference in appearance between rock, bone, and coal, thereby facilitating this operation.

In screening, the beneficial effect of oiling is particularly noticeable in small sizes, especially where the coal as mined is wet. Lubricated pieces, sufficiently small to pass through screen openings, do so readily, while those which enter screen openings but are unable to pass through, free themselves instead of remaining to be sheared or broken by the passage of unenmeshed material as occurs when unoiled coal is screened. Thus, due to oiling, screen capacity is increased and degradation reduced.

In jigging, the surface lubricated coal frees itself more readily and stratifies more quickly than will coal unoiled.

In dry cleaning, oiling increases uniformity of air passage and speeds separation of coal from impurity. Also, the riffles which are provided for guiding the impurities do not impede coal travel, surface lubrication allowing the coal to slide over the riffles. The lubricated coal particles free themselves from the aggregate more readily than would the same particles unoiled. The presence of a slight excess of oil keeps the riffles polished and the air permeable deck from becoming choked with dust.

In wet concentration, separation of coal from impurity occurs quickly and completely where coal particles are surface lubricated. Also, the oil coated particles slide freely over the riffling.

In chuting, surface lubrication allows flatter angles than is possible where coal is unoiled. Also, the slight excess of oil reduces corrosion and keeps metal surfaces in good condition. In passing oiled coal through restricted openings, arching, the chief cause of stoppage, does not readily occur.

The coal surfaces, immediately upon their becoming filmed with oil, accumulate a thin, permanent layer of dust, appreciably increasing weight of larger, higher realization sizes, and removing from the small sizes very fine dust the presence of which is not desirable. This dust layer, apparent under a microscope, on the oil-coated surfaces of the larger coal sizes, results not only in recovery in the most valuable size classification of combustible coal dust heretofore lost, but forms a protective coating on the larger coal pieces which reduces breakage of these pieces from impacts to which they are subjected in the coal preparation process. At the same time, the removal of this dust from the smaller or slack size coal results in a superior slack which burns with a higher combustion rate because of minimizing of dust pockets and air-channeling. This result of my treatment is not accomplished by treatment of slack with oil subsequent to its preparation, as such treatment merely lays the dust without transferring it from the slack to the larger size classifications. The terms "size" or "size classification" are to be understood as referring to commercial size classifications such as lump, slack, etc., and these terms do not merely mean that coal is present in particles of differing size but substantially all in the same commercial size classification.

In prevention of escape into the air of dust from the aggregate in process of treatment, best effects are obtained where the dosage of oil is applied early in the treatment, normally at the point where the mined material is delivered into the preparation plant. Also, by applying at this point, maximum opportunity is afforded for the oil to spread throughout the mass and dust elimination is complete. However, I do not confine the applicability of my invention to the entire aggregate as mined. My invention applies to oil dosage of the mined aggregate as a whole or to any subdivision of the mined aggregate ahead of any department of preparation or to cleaned coal in process, as for instance, in re-screening, chuting or spouting cleaned coal.

Having described my invention and its application, I claim:—

1. In a process for treating coal, the steps which comprise applying a dosage of an oily liquid to a run-of-mine coal containing predominantly sizes larger than slack, and subsequently removing impurities and assorting it into commercial sizes with adhering fine elements.

2. In a process for treating coal, the steps which comprise applying a dosage of an oily liquid to a subdivision of a run-of-mine coal aggregate containing predominantly sizes larger than slack, and subsequently removing impurities and assorting it into commercial sizes with adhering fine elements.

3. In a process for treating coal, the steps which comprise applying a dosage of an oily liquid to a run-of-mine coal aggregate containing predominantly pieces larger than slack and causing thereby fine elements within the aggregate to adhere to oiled surfaces of larger pieces and particles and subsequently removing impurities.

4. In a process for treating coal, the steps which comprise applying a dosage of an oily liquid to a subdivision of a run-of-mine coal aggregate containing predominantly pieces larger than slack and causing thereby fine elements within the aggregate to adhere to oiled surfaces of larger pieces and particles and subsequently removing impurities.

5. In a process for treating coal, the steps which comprise applying a dosage of an oily liquid to a run-of-mine coal aggregate containing predominantly sizes larger than slack and subsequently assorting it into size classifications with adhering fine elements.

6. In a process for treating coal, the steps which comprise applying a dosage of an oily liquid to a subdivision of a run-of-mine coal aggregate containing predominantly sizes larger than slack and subsequently assorting it into size classifications with adhering fine elements.

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