Patented Aug. 15, 1939

2,169,261

UNITED STATES PATENT OFFICE

2,169,261

PROCESS FOR PURIFYING SULPHUR

Clarence O. Lee and Homer A. Smith, Port Sulphur, La., assignors, by mesne assignments, to Freeport Sulphur Company, a corporation of Delaware

Application March 24, 1936, Serial No. 70,572
Renewed March 9, 1938

8 Claims. (Cl. 23—224)

This invention relates to a process of purifying sulphur, and has for its object generally to provide an improved procedure for purifying sulphur, whereby the process may be practiced in an efficient and economical manner.

More specifically, the invention relates to a process of purifying sulphur obtained from mining by underground fusion whereby hydrocarbons and other impurities that discolor and otherwise reduce the value of the mined sulphur are removed.

Another object is to practice the purification of a crude sulphur product by distillation without interference from the high viscosity ordinarily attendant in the heating of a body of molten sulphur to the temperature of vaporization.

Another object is to provide a resultant sulphur product substantially devoid of hydrogen sulphide and other adsorbed gaseous impurities.

A further object is to provide an improved procedure for removing carbon and other solid products resulting from the breakdown of hydrocarbons during the distillation of sulphur whereby there is recovered additional sulphur to augment the product obtained by distillation.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others thereof, which will be exemplified in the process hereinafter disclosed and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a view partly in section and partly in elevation showing an arrangement of apparatus adapted for the practice of the invention;

Fig. 2 is a similar view of a modified form of apparatus adapted for the practice of the invention;

Fig. 3 is a fragmentary view partly in section and partly in elevation showing an arrangement of apparatus for practicing an auxiliary purifying step in conjunction with the apparatus shown in Figs. 1 and 2; and

Fig. 4 is a fragmentary view showing a detail of the lower boiler drum employed in Fig. 2.

In the mining of sulphur from underground deposits by the method of underground fusion, the sulphur deposits are frequently near petroleum and other sources of hydrocarbons. The sulphur mined by underground fusion as a result contains impurities which operate to discolor the product, impair its burning characteristics, and otherwise detrimentally affect the value of the product.

Several methods of treating the sulphur mined by underground fusion with various reagents to remove the undesired impurity have been proposed. Such treatments, however, have invariably proved either insufficiently effective to remove the impurity to the desired extent or are too costly for commercial purposes. Mechanical removal of impurities of this character is, in general, impractical because of the intimate distribution of the impurities and the high viscosity of the molten sulphur.

By the present process, the product obtained by underground fusion is purified by distillation; the heating being performed in a manner which avoids the difficulties due to viscosity. The breakdown of the hydrocarbons, which takes place on account of heating, gives products which are separated and purified, yielding a final purified product of high commercial quality that has the characteristic brilliant yellow color of pure sulphur.

In the ordinary method of sulphur distillation, it is not possible to make a separation of the hydrocarbon impurities in the liquid sulphur, and the resulting product is a sulphur containing some volatile hydrocarbon oils and finely divided carbonaceous impurities caused by the reaction of the volatile oils and the sulphur in the vapor state. This produces a sulphur with a color varying from green to black. For this reason, it has been necessary to use a sulphur of less than .03% of hydrocarbon impurities when making flowers of sulphur by distillation in the usual retort. In the present invention, a process has been developed for distilling sulphur at high rates by means of tubular equipment which yields a brilliant yellow color and is substantially free from impurities, regardless of the amount of such impurities initially present.

The first step of the process involves relatively rapidly heating the sulphur containing the undesired impurity, in a liquid state, through the viscous temperature range by contacting the sulphur with sulphur vapors in a direct contact heater. This initial heating step is accomplished in any suitable manner, for example, by spraying the sulphur into an atmosphere of sulphur vapors, or by introducing the sulphur into pans which will distribute the sulphur uniformly in a container filled with sulphur vapors. It is pref-