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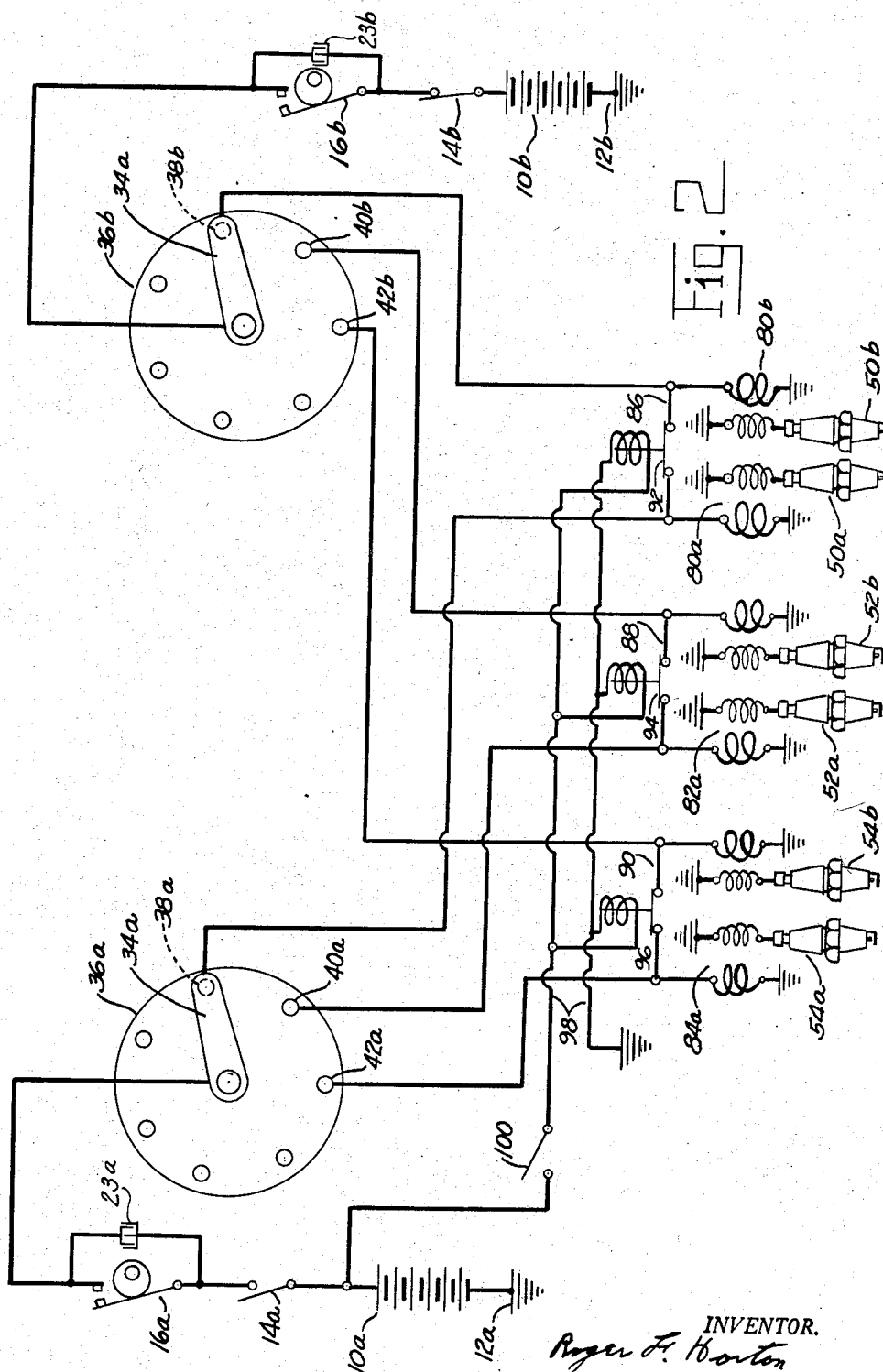
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2,367,023

DUAL IGNITION SYSTEM

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2 Sheets-Sheet 2



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DUAL IGNITION SYSTEM

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10 Claims. (Cl. 123-148)

My invention relates to ignition systems for internal combustion engines and more particularly to improvements in dual ignition systems.

It has long been recognized that, particularly in larger internal combustion engines, improved ignition of the fuel charge is obtained if two spark-plugs are employed in each cylinder. Both of these plugs may be supplied with current from the same ignition system, but in certain cases it has been found preferable to use separate systems, the chief advantage of which is that in the event of failure of one of the systems, the other will continue to function and hence at least one of the plugs in each cylinder will fire. Dual ignition systems of this type are used where reliability in the operation of the engine is of great importance, such as in aircraft engines.

However, with dual ignition systems of this type, it is difficult to properly time the two systems with respect to each other so that plugs in any one cylinder fire at the same instant. If one plug fires ahead of the other, there is little or no improvement in combustion over that obtained from a single spark-plug.

One of the objects of my invention is to provide a dual ignition system so interconnected that both of the spark-plugs fire in unison, even though the timers of the respective systems are not perfectly timed with respect to each other. Another advantage of my improved system is that, should one of the ignition systems fail, the other will supply current to both of the plugs, whereby both plugs will continue to fire in unison.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawings which form a part of this specification and of which;

Fig. 1 is a schematic wiring diagram of one embodiment of my invention; and

Fig. 2 is a similar wiring diagram of another embodiment of my invention.

In the following description and in the drawings only three pairs of spark-plugs have been shown and described for the sake of simplicity, inasmuch as it will be perfectly obvious how additional pairs would be connected in the systems. Like elements in the separate ignition systems making up the dual system of each embodiment have been given like reference characters, but with the suffixes "a" and "b," respectively.

Referring more particularly to Fig. 1, refer-

ence character 10a designates a suitable source of direct current, such as the usual three-cell, six-volt storage battery, one side of which is grounded at 12a. The other side of the storage battery is connected through an ignition switch 14a with a timer shown schematically and designated by reference character 16a. The timer includes a breaker arm 18a carrying a contact point 20a which is repeatedly open and closed with respect to a fixed contact point 22a by means of a cam 24a, there being a condenser 23a connected across the points. The cam is driven through suitable timing gears from the crankshaft of the internal combustion engine and is so timed or adjusted as to open the contacts whenever it is desired that any one of the plugs should fire. Contact 22a is connected to one terminal of the primary winding 26a of an induction coil 28a, the other terminal of the primary winding being grounded. The secondary winding 30a of the induction coil is connected by means of a conductor 32a with the rotatable contact point 34a of a distributor 36a. The distributor is provided with a fixed contact point for each cylinder of the engine. In Fig. 1 it is assumed that the system is to be used with a six-cylinder engine, and consequently six contacts 38a, 40a, 42a, 44a, 46a and 48a are provided.

Each cylinder of the internal combustion engine is provided with a pair of spark-plugs, and one plug of each pair is connected by a suitable conductor with a fixed contact of the distributor 36a. As above stated, for the sake of simplicity only three pairs of spark-plugs are illustrated, those connected to the distributor 36a being designated by reference characters 50a, 52a and 54a.

The contact point 34a of the distributor is rotated through suitable timing gears by the crankshaft of the engine and is so timed that it is in contact with one of the fixed points whenever a spark is desired at the plug which is connected to that fixed point. Moreover, the timer and distributor are so timed with respect to each other, that the point 34a is in contact with one of the fixed points whenever the circuit is broken through the timer 16a.

The spark-plugs 50b, 52b and 54b are connected to a similar ignition circuit including the distributor 36b and a timer 16b, both driven through suitable timing gears from the crankshaft. The two distributors and the two timers are so timed with respect to each other, as to operate in synchronism, insofar as this is possible. However, it is difficult to so adjust the timers

plug 50a. Inasmuch as the interconnection is between the low tension sides of the two ignition systems, the second timer to open determines the instant at which both plugs will fire, as was the case in Fig. 1.

Both plugs will continue to fire even though the battery, timer and/or distributor of one system fails. Inasmuch as there is a separate induction coil for each sparkplug, one or more of these could fail without seriously impairing the operation of the engine.

While I have shown and described several more or less specific improvements of my invention, it is to be understood that this has been done for purposes of illustration only and that the scope of my invention is not to be limited thereby, but is to be determined from the appended claims.

What is claimed is:

1. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an electric circuit for supplying high tension current to one spark-plug of each pair, a separate electric circuit for supplying high tension current to the other spark-plug of each pair, and conductor means for interconnecting said circuits so that each circuit may supply current to the spark-plugs of the other circuit.

2. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an electric circuit including a first timer for supplying timed high tension current impulses to one spark-plug of each pair, a separate electric circuit including a second timer for supplying timed high tension current impulses to the other spark-plug of each pair, and conductor means interconnecting said circuits at points between the timers and the spark-plugs of the respective circuits.

3. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an electric circuit including a timer, an induction coil and a distributor for supplying timed high tension current impulses to one spark-plug of each pair, a similar electric circuit for supplying timed high tension current impulses to the other plug of each pair, and a conductor interconnecting said circuits at points between the timers and induction coils of the respective circuits.

4. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an electric circuit including a timer, an induction coil and a distributor for supplying timed high tension current impulses to one spark-plug of each pair, a similar electric circuit for supplying timed high tension current impulses to the other plug of each pair, and means interconnecting the spark-plugs of each pair.

5. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an individual ignition circuit for supplying high tension current to the different plugs of said pairs, each circuit includ-

ing an induction coil dividing the circuit into a low tension portion and a high tension portion, and means for interconnecting the low tension portions of said circuits.

6. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an individual ignition circuit for supplying high tension current to the different plugs of said pairs, each circuit including a timer, a distributor connected to receive low tension current from said timer and a separate induction coil between each spark-plug and said distributor, and means interconnecting the circuits so that each circuit may supply current to the spark-plugs of the other circuit.

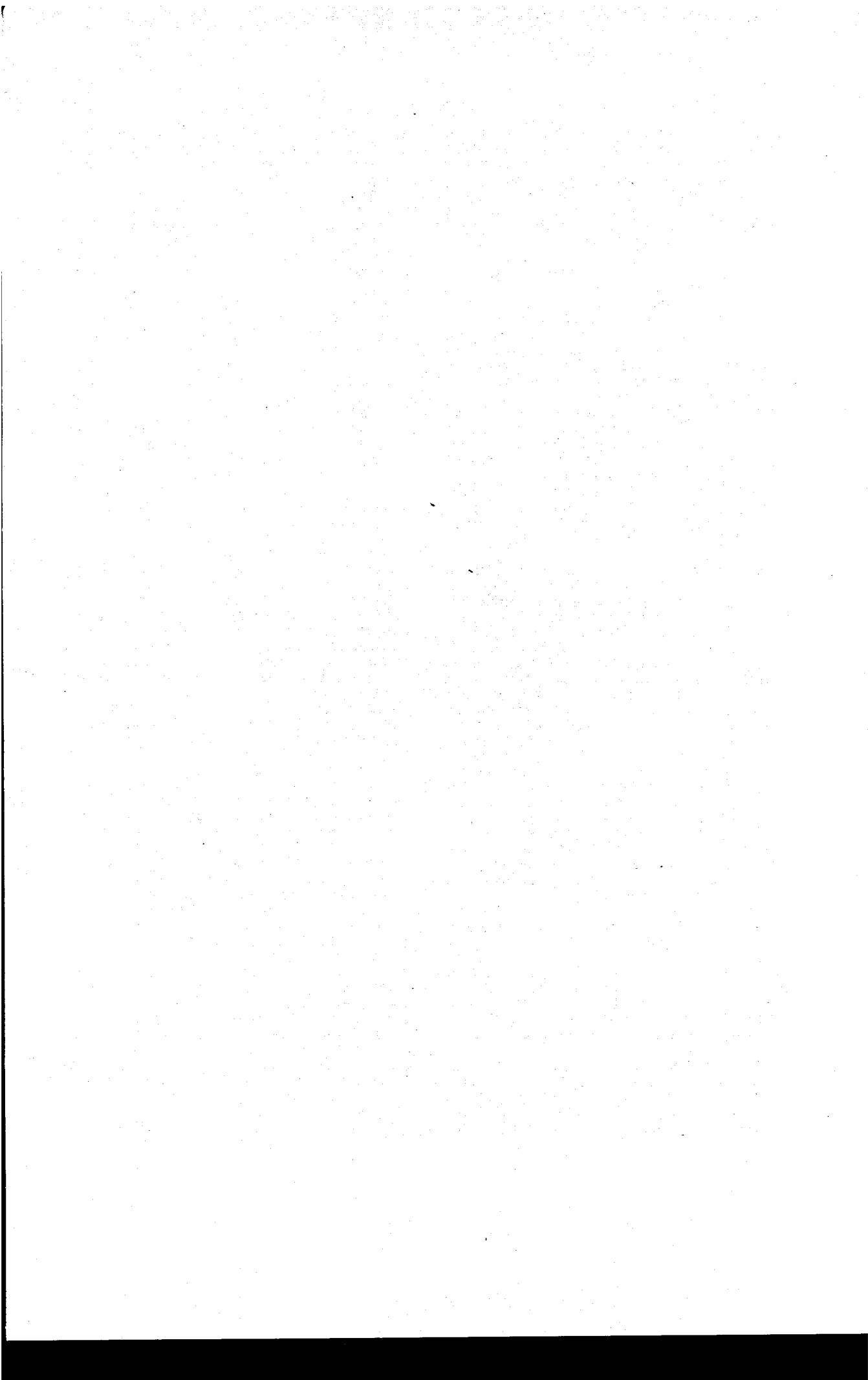
7. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an individual ignition circuit for supplying high tension current to the different plugs of said pairs, each circuit including a timer, a distributor connected to receive low tension current from said timer and a separate induction coil between each spark plug and said distributor, and means interconnecting said circuits at points between the timers and the spark-plugs of the respective circuits.

8. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an individual ignition circuit for supplying high tension current to the different plugs of said pairs, each circuit including a timer, a distributor connected to receive low tension current from said timer and a separate induction coil between each spark-plug and said distributor, and means interconnecting said circuits at points between the distributors and the spark-plugs of the respective circuits.

9. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an individual ignition circuit for supplying high tension current to the different plugs of said pairs, each circuit including a timer, a distributor connected to receive low tension current from said timer and a separate induction coil between each spark-plug and said distributor, and means interconnecting said circuits at points between the distributors and the induction coils of the respective circuits.

10. In a dual ignition system for an internal combustion engine, a pair of spark-plugs for each cylinder of said engine, an individual ignition circuit for supplying high tension current to the different plugs of said pairs, said circuit including a timer, a distributor connected to receive low tension current from said timer, an induction coil connected to each plug and a conductor connecting each coil to the distributor, conductor means connected between the conductors of the different circuits which supply current to the coils which are connected to the spark-plugs of said pairs, relay operated switches in said conductor means, and a manually controlled circuit for operating said relays in unison.

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UNITED STATES PATENT OFFICE

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CLEANING CREOSOTE

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No Drawing. Application July 10, 1942,
Serial No. 450,493

6 Claims. (Cl. 196—15)

This application relates to the cleaning of creosote and more particularly to an improvement in the art of cleaning creosote which includes the use of a depressant.

One of the difficulties which arises in the treatment of lumber with creosote is the development of impurities in the creosote which are not readily removable and which require, at the present time, discarding of the creosote after a period of use.

The most troublesome impurity is the increase in the so-called "coke residue" and matter insoluble in benzol. Most of the coke and benzol insolubles are forms of carbon, although a small amount may be dirt, wood fibre, resins, etc. The impurities are classified as insoluble A, insoluble B and insoluble C. They are due to the use of pressure, temperature, the presence of wood resins, moisture, oxygen, etc., encountered under normal impregnation schedules. The American Wood-preservers' Association specification and other treating standards limit the coke residue and benzol insoluble because these may interfere with good creosote treatment. For instance, the AWWPA specification for grade 1 creosote (Manual Standard 4f) states: "It shall not contain more than 0.5% of matter insoluble in benzol" but it carries the following footnote, "Samples of creosote taken from working tanks may show an increase in matter insoluble in benzol due to treating operations. Such increases provided they do not exceed by 1% the specification limits should not serve to cause rejection of the creosote for non-conformity with specifications if it can be shown that the original fresh oil was of specified quality." The foregoing evidences the change; however, once past the 1% tolerance it is necessary to clean the creosote.

The term "cleaning creosote" is used in the industry to mean the removal of carbon and other insolubles.

In general, more weight is given to the benzol insoluble test than the coke residue test.

Creosote is a distillate of coal-tar produced by high temperature carbonization of bituminous coal; it consists principally of liquid and solid aromatic hydrocarbons and contains appreciable quantities of tar acids and tar bases; it is heavier than water; and has a continuous boiling range of at least 125° C., beginning at about 200° C. It is not a single chemical, but a mixture containing a great number of compounds which may include phenols, cresols, xylenols, and naphthols, pyridines, acridines, benzene, toluene, xylene,

naphthalene, anthracene, and many others. It is evident that creosote is closely associated with carbon and other complex compounds.

At the present time the common methods to remove coke residue and benzol insoluble are by filter press or centrifuge.

The data in the AWWPA Proceedings show that creosote with a 1.35 per cent benzol may be filtered to a 0.81 per cent benzol insoluble or centrifuged to a 0.56 per cent benzol insoluble. It has been further shown that certain of the benzol insolubles are also water soluble and may or may not be fully removed by present cleaning methods.

Both the filter press and the centrifuge have certain disadvantages. The centrifuge handles only small volumes of creosote and must be attended almost constantly. The filter press is a very dirty operation and it requires practically a water-free creosote which is difficult to obtain. Both processes are comparatively expensive.

The fact is well known that part of the creosote fractions known as the benzol insoluble will settle if permitted to stand without agitation. This accounts for sludge in storage and working tank bottoms; however, this rarely accomplishes sufficient benzol insoluble removal to be considered as creosote cleaning.

It has now been discovered that materials used in the mining industry as depressants in connection with water solutions of ore may likewise be employed to produce more rapid and complete precipitation of carbon and other insolubles from creosote to such an extent that inexpensive and thoroughly satisfactory cleaning of the creosote may be accomplished with small percentages of the depressants.

The depressants used in the mining industry comprise a rather wide class including alkali metal cyanides or other soluble cyanides, zinc sulphate, sodium phosphite, starch and the alkali metal dichromates.

In the treatment of creosote these materials may be employed, but potassium permanganate, starch and potassium dichromate have been found particularly useful.

Starting with dirty creosote with a 3.00 per cent benzol insoluble, it was found that by the addition of 1 per cent potassium permanganate, or 1 per cent starch (by weight), the matter insoluble in benzol after settling for 1 week was 0.66 and 0.78 per cent, respectively, while the control settled to only 2.55 per cent.

A possible theoretical explanation for the greater amount of sludge that was found to be