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SUBJECT: Directions for Sampling Coal

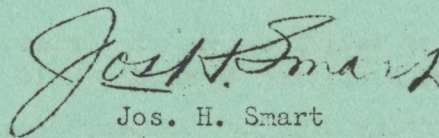
Your attention is called to Technical Paper No. 133 (attached hereto) and the Photostatic Plate No. 1 accompanying same.

This paper outlines the correct procedure for sampling all coal purchases made by the Government and explains that a thorough and carefully made sample of each mine run is to be provided before final payment can be made on coal contracts.

It should be the responsibility of the Project Engineer to digest these instructions and provide ways and means for prompt sampling and forwarding of samples to the Bureau of Mines at Pittsburg, Pennsylvania.

We cannot emphasize too strongly the necessity for studying and absorbing all details in Technical Paper No. 133. Please note that provision will have to be made for weighing scales at unloading docks and a small dustproof concrete floor shed be erected for crushing samples.

For your convenience, the Quartermaster has provided a few notes headed, "Notes for Coal Sampling and Preparing, Receiving, and Inspection Report". These will serve as a check list for the engineer or project supervisor in processing samples.



Jos. H. Smart  
Regional Director

Attachment

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Distribution: All manuals; project directors and staff; procurement; transportation and supply; warehouse personnel and engineers.

8/28/42

(Sheet 1)



INSTRUCTIONS FOR COAL SAMPLING AND PREPARING,  
RECEIVING, AND INSPECTION REPORT

1. Take sample of every mine shipment or not to exceed 20 cars on any one day.
  - a. For example: Take sample from one car from mine. If 8 cars are received in one day from one mine, one sample is sufficient. If 8 cars are received in one day from 8 different mines, 8 samples are necessary.
2. Be sure sample is properly identified against its proper contract. Show car numbers. Refer to your copy of QM Purchase Order covering each mine contract for your identification.
3. Do not attempt to take sample from pile which represents more than one coal.
4. Prepare in accordance with Technical Paper No. 133, Bureau of Mines, copy attached, together with Photostat of each operation.
5. If coal upon visual inspection is acceptable as to size, same should be accepted subject to analyses of coal sample forwarded.
6. Show on receiving report: Form QM #430 "Sample has been taken".
7. Hold two cans of each sample, retain and do not forward unless specifically authorized to do so. Forward two samples as instructed in attached mimeographed pamphlet to U. S. Bureau of Mines, Pittsburgh, Pennsylvania.
8. Be sure and wrap samples in heavy paper as Post Office will not accept same otherwise.
9. Franked wrappers and Form #220 have been ordered from the Bureau of Mines, together with supply of cans for forwarding samples.
10. At time of taking sample the following certificate should be signed by Receiving Agent and held in his files until called for:

"I certify that the samples of coal represented by this analysis were taken and prepared in strict accordance with Technical Paper No. 133, Bureau of Mines.
11. Be sure and show car numbers on Form #220 and also receiving report forms.
12. Please acknowledge receipt.

\_\_\_\_\_  
Receiving Agent"



# DIRECTIONS FOR SAMPLING COAL FOR SHIPMENT

## OR DELIVERY<sup>1</sup>

By George S. Pope;<sup>2</sup> revised by N. E. Snyder<sup>3</sup>

### INTRODUCTION

Approximately 3,000,000 tons of coal are purchased annually for the use of the Federal Government. Virtually all contracts are awarded on the basis of the Government's analysis records of coals offered; on most large contracts the coal is purchased on a guaranteed-analysis basis requiring continuous or periodical sampling and analysis. The importance of proper sampling and analysis in the Government scheme of coal purchases is therefore obvious.

Every sample must be collected and prepared carefully and conscientiously in strict accordance with the methods described herein, as it has been demonstrated both theoretically and by experiment that only by so doing can reliable and representative results be obtained. Gross samples of the quantities designated herein must be taken whether the coal to be sampled consists of a few tons or several hundred tons, and the samples must be crushed, mixed, and reduced to laboratory size according to the methods described.

The method of sampling described herein is essentially the same as the standard method adopted by the American Society for Testing Materials and approved as an American Tentative Standard by the American Standards Association. The following differences should be noted: (1) The American Tentative Standard method requires that "a gross sample shall be taken for each 500 tons or fraction thereof, or in case of larger tonnages, for such quantities as may be agreed upon." The Government method requires that a sample be collected for each 1,000 tons or fraction thereof, except that in ship or barge sampling where the tonnages are large a single sample may represent up to 2,000 tons provided the coal is known to be reasonably uniform in character. (2) The American Tentative Standard method requires that "the 30-pound quantity (fig. 29, pl. 1) shall be crushed to 3/16-inch size or to pass a 4,760 micron (no. 4) sieve, mixed, coned, flattened, and quartered. The laboratory sample shall include all of one of the quarters, or all of two opposite quarters (fig. 34, pl. 1), as may be required." This indicates a sample of  $7\frac{1}{2}$  or 15 pounds is to be forwarded to the laboratory. The Government method requires that the coal be successively crushed, mixed, coned, flattened, and quartered to approximately 10 pounds and one half or approximately 5 pounds of the final sample forwarded to the laboratory.

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<sup>1</sup> Work on manuscript completed March 1933.

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This paper has been prepared primarily for the use of Government employees charged with the duty of sampling coal purchased by the Government. The various steps necessary, particularly with reference to collecting representative samples, are described in considerably more detail than the corresponding steps given in the American Tentative Standard method to aid in establishing at each point of sampling a systematic method of collecting the samples. Competent officials should study the method of unloading, conveying, and storing coal at their particular locations and select the point at which samples should be collected, the weight and frequency of the increments to be collected, and suitable places for accumulating, storing, and preparing samples. Responsible employees should be detailed to do the sampling, and the officials should witness the process from time to time to insure proper collection and preparation. If desired the sampler may be required to certify as to the method of collecting and preparing samples. The purpose of such certificate is to make the employee realize the importance of doing the work conscientiously and to fix the responsibility for proper sampling.

The long-pile method (figs. 1 to 10, pl. 1) in many instances has been found to be impracticable owing to lack of space. Paragraph 33 describes a modified method of handling the gross sample, which gives equally satisfactory results and may be used when desired. Mechanical crushing, mixing, and reducing samples as described in paragraphs 34, 35, and 36 save labor and time and tend to produce more accurate results.

#### TIME OF SAMPLING

1. Collect the sample when the coal is being loaded into or unloaded from railroad cars, ships, barges, or wagons, or is being discharged from supply bins, industrial-railway cars, grab buckets, or coal conveyors. In case the coal is crushed at the place of sampling, the sample should be collected, if possible, after the coal has passed through the crusher. Do not collect samples entirely from the surface of coal in piles or bins, or in cars, ships, or barges as samples so collected are unreliable. A reliable and representative gross sample can be collected only by taking portions of coal from different parts of the mass, and such opportunity is afforded only when the coal is being transferred from one carrier to another--mine cars to railroad car, railroad car to barge, or wagon to bin, etc.

#### COLLECTION OF GROSS SAMPLE

2. Use a shovel for taking equal portions or increments to make up the gross sample. For slack or small sizes of anthracite, increments as small as 5 to 10 pounds may be taken, but for run-of-mine or lump coal the increments should be at least 10 to 30 pounds, depending on the size and weight of the pieces of coal and impurities being sampled.

3. Collect the increments regularly and systematically, so that the entire quantity of coal sampled will be represented proportionately in the gross sample, and collect them at such intervals that the gross sample will be of the required size. The gross sample should contain the same proportion of lump coal, fine coal, and impurities as the coal sampled. When coal is extremely



lumpy, making difficult the collection of representative increments by shovel, break a quantity of the lumps and collect portions, as required, from the broken coal.

#### SIZE OF GROSS SAMPLE

4. For run-of-mine or lump coal the gross sample must not be less than 1,000 pounds. If the coal contains an unusual amount of impurities in pieces of considerable size, the gross sample should be about 1,500 pounds. For slack coal and small sizes of anthracite in which the impurities are in not abnormal quantities, or are not in pieces larger than three quarters inch, a gross sample of approximately 500 pounds is sufficient. Whether the quantity of coal sampled consists of 1 ton, 500 tons, or more, the need of the gross sample being of the sizes stated is the same.

#### QUANTITY REPRESENTED BY A GROSS SAMPLE

5. A gross sample shall be taken for each 1,000 tons or fraction thereof, except that in ship or barge sampling where the tonnages are large a single sample may represent up to 2,000 tons provided the coal is known to be reasonably uniform in character.

6. The number of tons, within the above limits, represented by a single sample will vary for each consignment or shipment, and each case must be considered individually. For example, a shipment of 1,000 tons, 20 railroad cars of 50 tons each, may be represented by 1 gross sample of approximately 1,000 pounds, if properly collected; but if the shipment consists of coal from several mines and a separate gross sample from 4 cars that will represent the coal produced by 1 mine is desired, or if for some other reason a sample from 4 of the cars is desired, then a gross sample of 1,000 pounds should be collected by taking approximately 250 pounds from each car. If, for example, another sample from 8 of the cars is required, then approximately 125 pounds should be taken from each car. The sampler will, presumably, be instructed as to the number of gross samples desired, or the number of cars, or the coal each sample is to represent.

#### STORAGE OF GROSS SAMPLE

7. As the shovelfuls or increments that make up a gross sample are taken, deposit them on a clean, tight, smooth floor if the sample is to be prepared immediately or place them in clean barrels, boxes, or other receptacles if the gross sample is to be accumulated over a period of time. Protect the sample from rain, snow, wind, and beating sun. Do not let cinders, sand, chippings from floor, or any other foreign matter get into the sample. Inspect boxes, barrels, buckets, or other receptacles each time before using to insure that they are clean.

#### WAGONLOAD SAMPLING

8. Collect shovelfuls of coal from each wagon, or every second or third wagon, as the coal is being loaded into or unloaded from the wagons, the number



of shovelfuls and the number of wagonloads sampled depending on the number of loads that the gross sample is to represent. If the coal is unloaded by shovel, take shovelfuls from different parts of the wagon or wagons; but do not take all shovelfuls from similar points, as from the surface or the ends of loads or from the very last coal remaining in the wagons. If dump wagons are used, take shovelfuls as the coal flows from the wagon, observing care, however, not to take shovelfuls from the very first or last coal running.

#### CARLOAD SAMPLING

9. Collect the number of shovelfuls or increments of coal required to make up the gross sample from different points in the car or cars, from top to bottom and from end to end, while the coal is being loaded or unloaded.

10. In sampling a shipment of coal at the mine take the shovelfuls or increments systematically and regularly as the coal is loaded into the railroad cars, so that the gross sample will represent the entire quantity sampled. The frequency of collecting the increments will depend on the number of cars of coal to be represented by the gross sample. If only one railroad car is to be sampled, collect from each mine car dumped the number of shovelfuls required to obtain a gross sample of the required size. If two or more cars of coal are to be represented by one sample, the gross sample should be collected by taking a shovelful of the coal dumped from each mine car or from every second, third, or fourth, etc., mine car, in order to have a gross sample of proper size, so that representative portions of coal will be taken in equal quantities from each car. If the railroad cars differ in size the quantities taken from each car should be in proportion to the capacities of the cars. When coal is dumped from mine cars into railroad cars, the lumps usually roll to the bottom; hence shovelfuls should not be collected entirely from the bottom of the car, but should be taken systematically over the surface of the coal. If a sample covering the average output of the mine is desired, the increments should be collected throughout a day's run or should be collected so that coal from every working place in the mine is represented proportionally in the sample.

11. Sample the coal after it has been prepared for market. If the coal is washed or is passed over picking tables or if pickers are employed on the car to remove impurities, the sample should not be taken until the coal has had its final preparation. If the coal is picked after it is dumped into the car, the sample must be collected from within the car as the coal is being loaded and after the pickers have gone over it. If no pickers are employed on the car, the sampling may be done at some advantageous place on the tippie before the coal reaches the car.

12. In sampling coal being unloaded by hand from cars, the shovelfuls that make up the gross sample should be taken at regular intervals. Workmen unloading coal usually begin at one end of a car and shovel the coal out to the bottom to facilitate shoveling from the floor. As a result the load is exposed from top to bottom and an excellent opportunity is afforded for taking shovelfuls for the sample from different places in the face exposed as unloading progresses, and it is easy to obtain a final sample composed of shovelfuls from all parts of the load, from top to bottom and from end to end.



13. In sampling coal from dump cars, shovelfuls may be taken from the stream of coal being discharged, observing care not to collect portions of the first or last coal spilling from the car. Because of the suddenness with which coal may dump out of a railroad car and because of the momentum of the rapidly falling lumps, the collection of a satisfactory sample by attempting to catch shovelfuls may be impossible. In such event it may be necessary to collect shovelfuls of coal that has overflowed on the pier or the trestle deck or the sides of pockets. If beams 10 to 12 inches wide span the pockets immediately underneath the car, a fairly satisfactory sample can often be collected in shovelfuls from the coal lodging on the beams.

#### SHIP OR BARGE SAMPLING

14. In sampling a ship or barge, as in sampling a car, portions of coal should be taken in equal quantities and at frequent and regular intervals while the coal is being loaded or unloaded, so as to represent proportionate parts of the whole consignment. If the coal is unloaded by grab buckets or into barrows or coal-conveying equipment, shovelfuls usually can be advantageously collected at regular intervals from the buckets, barrows, or equipment.

#### PREPARATION OF GROSS SAMPLE

##### Crushing

15. After the gross sample has been collected it shall be systematically crushed, mixed, and reduced to convenient size for transmittal to the laboratory. The crushing may be done with a tamper or a sledge. If a suitable iron tamper or sledge is not available, a satisfactory tamper can be made from a piece of 6 by 6 inch timber, 12 to 15 inches long, by boring a suitable hole in one end and inserting a handle about 3 feet long and  $1\frac{1}{2}$  to 2 inches in diameter, and by screwing an iron plate on the other end. The handle should fit the hole snugly. By splitting the end to be inserted and loosely placing a wooden wedge therein the handle will be firmly held in place when it is driven home.

16. Crush the sample on a smooth, clean, sheet-iron plate of suitable dimensions or on a solid floor. If a suitable plate or floor is not available, the crushing may be done on a heavy canvas. In crushing the sample take care that no pieces of impurities fly out of it and that no cinders, sand, chippings from the floor, or any other foreign substances get into it. Crush samples of the weight indicated in the accompanying table so that no pieces of coal and impurities will be greater in any dimension, as judged by the eye, than specified for the sample before division into two approximately equal parts:

Largest sizes of coal or impurities allowable in samples before division

Weight of sample to be divided:	Inch
1000 pounds or more.....	1
500 pounds.....	$\frac{3}{4}$
250 pounds.....	$\frac{1}{2}$
125 pounds.....	$\frac{3}{8}$
60 pounds.....	$\frac{1}{4}$
30 pounds.....	$\frac{3}{16}$ (4-mesh screen)



17. The method of reducing by hand the quantity of coal in a gross sample shall be carried out as prescribed below, even though the initial size of the coal or of any impurities be less than is specified in the table.

18. The progressive reduction in the weight of the sample to the quantities indicated in the table shall be done by the following methods; which are shown in plate 1.

#### HALVING

19. The alternate-shovel method of reducing the gross sample shall be repeated until the sample is reduced to approximately 250 pounds. Before each reduction in quantity the sample shall be crushed to the fineness prescribed in the table.

20. The crushed coal shall be shoveled into a conical pile (figs. 2 and 7) by depositing each shovelful of coal on top of the preceding one, the sampler walking around the cone and systematically depositing shovelfuls on the apex of the cone from every side so that the center of the cone shall not be displaced. A long pile shall then be formed in the following manner:

21. The sampler shall fill his shovel from the base of the cone, walking around the cone for succeeding shovelfuls, thus systematically removing the coal from the base of the cone. The shovelful of coal from the conical pile shall be spread out in a straight line (figs. 3, A, and 8, A) having a width equal to the width of the shovel and a length of 5 to 10 feet. The next shovelful shall be spread directly over the top of the first shovelful, but in the opposite direction, and so on back and forth, the pile being occasionally flattened until all the coal has been formed into one long pile (figs. 3, B and 8, B).

22. Half the pile thus formed shall be discarded in the following manner:

23. Beginning on one side of the pile, at either end, and shoveling from the bottom, the sampler shall take one shovelful (shovelful 1, figs. 4 and 9) and set it aside; advancing along the side of the pile a distance equal to the width of the shovel, he shall take a second shovelful (shovelful 2, figs. 4 and 9) and discard it; again advancing in the same direction one shovel width, he shall take a third shovelful (shovelful 3, figs. 4 and 9) and add it to the first. Shovelful 4 (figs. 4 and 9) shall be taken in a like manner and discarded, the fifth shovelful (5, figs. 4 and 9) retained, and so on; the sampler advancing always in the same direction around the pile, so that its size will be reduced gradually and uniformly. When the pile is removed about half of the original quantity of coal should be contained in the new pile formed by the retained shovelfuls (figs. 5, A and 10, A, show the retained halves; and 5, B and 10, B, the rejected halves.)

#### QUARTERING

24. After the gross sample has been reduced by the above method to approximately 250 pounds, further reduction in quantity shall be by the quartering method. Before each quartering the sample shall be crushed to the fineness prescribed in the table.



25. Quantities of 125 to [redacted] pounds shall be thoroughly mixed by coning and re-coning (figs. 12 and 13); quantities less than 125 pounds shall be placed on a suitable cloth, measuring about 6 by 8 feet, thoroughly mixed by raising first one end of the cloth and then the other (figs. 18, 24, and 30), so as to roll the coal back and forth, and then formed into a conical pile by gathering together the four corners of the cloth (figs. 19, 25, and 31). The conical pile shall be quartered as follows:

26. The cone shall be flattened by pressing its apex vertically down with the back of a shovel, at the same time giving the shovel a rotary motion, so that when the pile is quartered each quarter will contain the material originally in it. The flattened mass, which shall be of uniform thickness and diameter, shall then be marked into quarters (figs. 14, 20, 26, and 32) by two lines that intersect at right angles directly under a point corresponding to the apex of the original cone. The diagonally opposite quarters (B, B, figs. 16, 22, and 28) shall then be shoveled away and discarded and the space that they occupied brushed clean. The coal remaining shall be successively crushed, mixed, coned, flattened, and quartered until two opposite quarters shall equal approximately 10 pounds of 3/16-inch or 4-mesh size.

27. The 10-pound quantity shall be thoroughly mixed by rolling back and forth on the cloth, coned, flattened, and quartered; two samples shall be taken, each consisting of all the coal of diagonally opposite quarters (A, A, and B, B, fig. 34). One of these samples shall be marked "original" and the other "duplicate," and the original shall be forwarded to the laboratory and the duplicate retained for forwarding if the original is lost or damaged in transit. If it is not convenient for the sampler to retain the duplicate sample, as when he is traveling from place to place, then the duplicate sample also should be forwarded to the laboratory.

28. If a crusher that will break the coal to 3/16-inch or 4-mesh size and a riffle are available for mechanically crushing and reducing the sample, they should be used instead of the hand method, as their use greatly facilitates the preparation of samples and tends to eliminate possible error by the sampler.

#### SEALING AND MAILING

29. The metal containers furnished by the Bureau of Mines<sup>4</sup> hold  $2\frac{1}{2}$  to 3 pounds; 2 are therefore required for the original 5-pound sample and 2 for the duplicate.

30. As soon as the samples are prepared place them in the containers and seal the containers. The screw cap of the container has a rubber washer, but to insure tightness the cap, when in place and screwed down, should be wrapped carefully with several layers of adhesive (electrician's) tape, the first layer being pressed down with thumb and forefinger so that it completely covers the joint between the lower edge of the cap and the neck of the can.

31. Fill in forms for furnishing data concerning the sample and place (do not paste) the form around the container. When two containers are used each form

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4. Containers furnished only to Federal institutions.



should show the number of the can that carries the other half of the sample. As a safeguard against containers opening in transit and coal damaging the contents of a mail sack, wrap each can with several thicknesses of heavy manila paper and paste on or tie around the wrapped can the addressed franked mailing wrapper. The containers are then ready for mailing.

32. Write a letter to the laboratory stating that the sample or samples, giving container numbers, have been forwarded.

#### MODIFIED METHOD OF CRUSHING AND QUARTERING

33. If desired, the entire gross sample may be crushed to  $\frac{1}{2}$ -inch size and the crushed coal shoveled into four conical piles of approximately 250 pounds each. Each pile shall be reconded and quartered and one half discarded (figs. 12-16, pl. 1). Two new piles of approximately 250 pounds each shall then be formed by combining two of the remaining 125-pound portions. Each pile shall be reconded and quartered and one half discarded (figs. 12-16, pl. 1); the remaining 125-pound portions shall be combined into one pile, and the final 250-pound pile shall then be prepared in accordance with plate 1, figures 12 to 34.

#### MECHANICAL CRUSHING AND QUARTERING

34. Mechanical crushers that will break the coal to 3/16-inch or 4-mesh size and riffle buckets for reducing samples should be installed when possible. Their use saves labor and time and tends to eliminate possible errors by the sampler, thus producing more accurate results.

35. Virtually any type of crusher that will break coal to the desired size is satisfactory for use in coal sampling. A number of crushers designed especially for coal sampling are on the market.

36. Satisfactory riffle buckets for reducing samples may be made of galvanized iron. Blueprints of such buckets will be furnished by the Bureau of Mines upon request. The buckets are used in pairs, the coal from one bucket being poured over the riffles of the companion bucket, thus eliminating half the quantity poured and retaining the other half.



OFFER TO SELL BY VENDOR

To: War Relocation Authority  
Denver, Colorado

I hereby offer to sell to the United States Government - War Relocation Authority, for \$\_\_\_\_\_, personal property as listed hereon and according to the attached specifications: \*

This offer to sell is entirely voluntary on my part and I am satisfied with the above sales price. I also certify that I have clear title to the above described property, free and clear of all liens and encumbrances. I further certify that I have resided only in the continental United States at all times on and since June 17, 1940.

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Vendor or his Attorney

(If signed by owner's agent or attorney, this letter must be accompanied by two certified copies of the power of attorney or other instrument authorizing such agent or attorney to make all of the above representations including that regarding residence in the United States.

\* Attach addendum if necessary



AFFIDAVIT AND AGREEMENT

STATE OF \_\_\_\_\_ )  
COUNTY OF \_\_\_\_\_ ) SS.

I hereby solemnly swear (or affirm) that I am the sole owner of and have clear title to the following described property, free of all liens and encumbrances:

I further declare and agree that if I am given a purchase order for all or any of the above listed equipment I will furnish a certified bill of sale and any documents that may be required to effect a complete transfer of the legal title to the Purchaser.

I further solemnly swear (or affirm) that I am not a blocked national subject to the provisions of Executive Order No. 8389, as amended.

\_\_\_\_\_  
SUBSCRIBED AND SWORN to  
before me this \_\_\_\_\_  
day of \_\_\_\_\_  
A.D., 1942.







SUBJECT: Ticks and Spotted Fever

The United States Public Health Service, Washington, D. C. has prepared a series of informative questions and answers pertaining to spotted fever and the ticks that transmit the disease. This information is given below for the guidance of the project personnel.

Since about 1930, Rocky Mountain spotted fever has been recognized along the eastern coast and has now been diagnosed as far north as Massachusetts and as far south as Georgia. The increasing number of cases each year reported to the Public Health Service probably does not represent a spread but an increasing recognition.

Spotted fever is acquired by man from the bite of an infected tick. This tick in the east has been given the name Dermacentor variabilis, more commonly known as the 'dog tick'. The history of spotted fever both in the east and in the west reveals that there are certain areas more heavily infected than others. It can be truthfully said that where ever there is this kind of tick, then spotted fever is potentially present.

Each spring and summer, the National Institute of Health in Washington is deluged with questions concerning the proper handling of ticks, the advisability of vaccination, prophylactic measures to be instituted in infected areas, etc. In order that this information may be more widely disseminated and by so doing decrease the number of cases, the Public Health Service has prepared a list of the more common inquiries with the proper answers.

- Q. - I have just removed a tick from my child; where and how can I determine if this tick is infected?
- A. - If the tick is infected with spotted fever (in the most severely infected areas such as Montana, only about one tick in three hundred is capable of infecting man) and has bitten a person, that individual will contract spotted fever before the laboratory procedures can be completed. Therefore, it is of no value to attempt laboratory tests to see whether a given tick is infected, as far as the individual is concerned.
- Q. - Is there any way that one can tell by looking at a tick whether it is capable of infecting man or not?
- A. - It is not possible to tell by simple observation whether any given tick is infected. However, the tick can be classified as to species by trained personnel, but for practical purposes, it is better to consider every tick as dangerous and to remove it from the body as soon as possible.

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Distribution: All manuals, Project Directors, and Staff



3. Q. - I have just removed a tick from my body; is there any danger of acquiring spotted fever?
- A. - If the tick has fed for a considerable period (six to eight hours or more) and is infected, there is danger of acquiring spotted fever. However, if the tick is removed before attachment or very soon after feeding (two to four hours), then the danger of infection is greatly reduced. For this reason, it is advised that persons exposed to ticks (campers, fishermen, picnickers, children playing in upcleared land, etc.) be examined carefully at least once a day for ticks. In doing this, it is recommended that all the clothing be removed and a careful search for ticks be instituted. Ticks are more commonly found in the hairy parts such as the back of the neck and under the arms. It is believed that a careful search for ticks and their prompt removal is one of the most practical and effective means of prophylaxis against spotted fever.
4. Q. - How should ticks be removed?
- A. - Ticks can be removed with the fingers, but a safer method is with forceps, or a small piece of cotton, paper, etc. If the ticks have fed and are full of blood, this blood may be infectious as is the excreta, so care should be taken not to crush the tick. The site of the tick bite should be painted with an antiseptic such as iodine, and the fingers or forceps dipped in alcohol or at least washed thoroughly with water.
5. Q. - I live in . . . . . There have been several cases of spotted fever near here. Should I sell my house and move to another district?
- A. - Ticks are very widespread and where ever there are ticks, it is possible to acquire the disease. Therefore, it would probably be of little benefit to move from any given area.
6. Q. - Is it safe to have a dog?
- A. - Since the disease is contracted from ticks, the only danger in the possession of a dog lies in the fact that it may carry ticks around the home. Ticks should be removed from the dog with forceps. The Department of Agriculture has advised Derris powder, either in powder form or as a dip, as an effective method of controlling ticks on small domestic animals.
7. Q. - I have been bitten by a tick. When and how will I know if I am contracting spotted fever?
- A. - After the tick bite, there is a lapse of usually four to twelve days. Then a rather sudden onset often with a chill, rapid rise in temperature, severe headache. One should immediately go to bed and call a doctor. About three to four days after the fever begins, there is seen an eruption, flat pinkish in color, small and distinct, noted usually first and most prominent on the arms and legs, later perhaps over the body including the



face, soles of the feet and palms of the hands. The treatment of spotted fever is limited to non-specific therapy with nursing care as an important factor. In the east, the case fatality may run as high as one death out of every five cases.

3. Q. - Is there any serum or vaccine that one can take to prevent spotted fever?

A. - The Public Health Service has discovered and developed a vaccine which following years of use, particularly in Montana, has proven to be of value. This vaccine is particularly advantageous in reducing the number of deaths and it is probable that the number of cases may also be reduced.

4. Q. - Should I take the vaccine?

A. - No broad generalization can be made on this point. Many circumstances must be taken into account before this advice can be given. It is absolutely impractical to attempt widespread vaccination on a disease that infects so few of the general population. Vaccination must be limited to known infected areas and to those with the greatest exposure to ticks.

5. Q. - What reactions are commonly seen after the vaccine?

A. - A general reaction is commonly seen somewhat similar to that of typhoid vaccine. More severe reactions are occasionally noticed, however, but there have been fatalities.

6. Q. - Is the vaccine of value after the tick has bitten?

A. - The vaccine is probably of no value after the tick has fed. It should be administered about ten days before expected exposure to ticks.

7. Q. - How often must the vaccine be given?

A. - It is recommended that the vaccine be given once a year just before or early (April and May) in the tick season.

8. Q. - Where can the vaccine be procured?

A. - The vaccine can be secured from one's family physician, or local health officer, through the National Institute of Health in Washington, D. C., or from the Public Health Service at Hamilton, Montana. There is no charge for the vaccine to the private physician.

*Jos. H. Smart*

Jos. H. Smart  
Regional Director

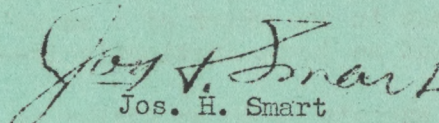


War Relocation Authority  
Central Region  
Denver, Colorado

BULLETIN NO. 5

SUBJECT: Treatment of Rattlesnake Bite

A considerable infestation of rattlesnakes in the area surrounding the Heart Mountain and Granada relocation centers makes advisable a reliable knowledge of the habits of the reptile and methods of treating its bite. The article which follows has been written by one of America's foremost authorities on the subject of snake bites.

  
Jos. H. Smart  
Regional Director

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Distribution: All Regional Office manuals and all project personnel members

9/5/42

(Sheet 1)



## THE MANAGEMENT OF SNAKE-BITE

By Dudley Jackson, M. D.

Fear of the rattlesnake is so great in many people that constant apprehension prevents their enjoyment of an outing, and I have known persons who refused to make any camping or woods trip for this reason. They are depriving themselves unnecessarily of some of the greatest pleasures life has to offer. I say unnecessarily, because when all the facts of our painfully-acquired knowledge of the rattlesnake and his bite are spread before us and studied, our panic disappears and we do not hesitate to walk through a rattlesnake paradise if necessity or desire takes us there.

This peace of mind is worth much and is possible to everybody. I shall tell you how to acquire it. First dismiss from your mind any stories you may have heard in the past of odd, unusual, or bizarre antics of snakes. Snakes are reasonable creatures, having dispositions much like those of people; some good, some bad, some vicious, and some almost angelic. There died recently in the snake garden at the Witte Museum in San Antonio "Pan-nical Pete", a gentlemanly old rattlesnake who in a long and kindly career had won the affectionate regard of all the employees. His favorite trick was to open his mouth in a prolonged and frightening yawn of boredom when tourists admired him over-long or too closely. His passing was sincerely mourned. There have been others, in the same garden, that were as trustworthy as the modern bandit.

The rattlesnake rarely strikes without warning, and this is only common sense. He is comfortable and does not wish to be disturbed. When you heed his warning and move on, he does not pursue you. There is an evil and vicious threat in the whirr of a snake's rattle that is sensed by the greenest dude, and he jumps instinctively--in the opposite direction.

The length of a snake's reach or strike is seldom more than a third the length of his body. Thus he strikes below the knee, usually at the foot or ankle; and often the lightest protection--khaki pants or canvas shoes--will catch enough of the venom to prevent the bite from being serious. Leather shoes and leggings insure that no fangs can touch flesh.

If he makes a glancing strike leaving only one fang mark, or hangs on only half a second or so, the chances are that the bite will not be serious. If, however, as rarely happens, he hangs on long enough to contract the muscles around the poison sacs several times, he empties a full load of the poison into your clothes or you. It takes two weeks to replenish the venom in his poison sacs, so if he has struck recently there is small danger to you even in a firm bite.

(Sheet 1 - reverse)



The sooner after the bite that suction is applied, the more highly toxic the venom removed, and the greater the good accomplished. So do not be discouraged at the few innocent looking drops of serum first withdrawn; they contain almost pure snake venom. Gentle suction is best, and any device that causes drastic painful pressure should not be used.

After an hour or so a great outpouring of serum around the bite causes swelling and a dilution of the venom. Now you are encouraged by being able to withdraw larger amounts of blood-tinged fluid. This dilution of the venom is necessary before any of it can be absorbed into the body, and it is necessary for you to follow the spread of the swelling with your cuts. Thus at the end of an hour or so, if a physician has not been reached, make a circle of cross cuts around the wound, about like



and, having done so, continue suction from these incisions as well as from the two original ones. If in making these cuts a small vein is opened, or you get blood instead of bloody serum, plug the small wound with a bit of cotton, and make another cut nearby. After the first two hours apply suction for only twenty minutes out of each hour, continuing this for the next fifteen hours. While the wound is resting, the whole limb is kept wrapped in heavy towels kept hot and very wet from a strong solution of epsom salt, or failing that, table salt, to help the outflow of serum.

4. Treat the pain. Intense pain is a symptom always present in the bite of a poisonous snake, the undilute venom being a violent irritant, much too violent in fact to be absorbed as it is. As venom is sucked out the pain lessens to some extent, but it should have some relief at once. It is better to give a narcotic such as morphine or codeine by hypodermic or by mouth. If these drugs are not at hand give fairly heavy doses of a sedative, such as aspirin, amytal, or any headache medicine.

5. Do not give whiskey, brandy, coffee, or any other stimulant as early as this. They may do actual harm. The gathering of serum at the site of the bite serves to dilute the venom and makes it more quickly absorbable. This serum is taken from the blood, and thus if circulation is increased the venom is more quickly diluted and more quickly absorbed. Do not allow the patient to walk if it can be avoided. Do not allow kerosene or potassium permanganate to touch the wound. All these and many other often-used remedies have been found to be not only of no benefit, but some of them, especially potassium permanganate, are actually harmful.



6. Hospital service is always best. Most patients do fairly well following snakebite for the first fifteen to twenty-four hours. When deaths do occur they come usually in from twenty-four to forty-eight hours after the accident, and collapse is likely to be sudden. Therefore, secure hospital service and a competent surgeon; and here is his procedure:

Without loss of time several relatives and friends should be typed for possible blood transfusion. Those matching the patient should be kept on call, preferably in the hospital so as to be ready in case collapse is threatened. Extra cuts are made above the wound as the swelling spreads, always following the edge of the swelling, and suction is kept up from all the incisions for fifteen or twenty minutes out of every hour. Every hour, colonic irrigations of hot salt and soda solutions are given, and if symptoms of shock begin to appear, blood transfusions are in order, these to be repeated at the doctor's discretion.

These transfusions have been known to turn the tide on several occasions, and save a life. Each snake-bite confers some immunity on the victim, and if it is possible to obtain blood from a person who has recovered from one or two bites, so much the better. Such persons often can be found around carnivals or snake gardens. Intravenous glucose solutions may be given, and if the heart needs stimulation, hypodermics of digitalis or adronalin.

These directions, as you see, presuppose a vicious and malignant bite. The average one required less treatment. However, since it is often difficult to tell in less than fifteen hours how severe the wound really is, it is in order to be prepared for the worst. And if these orders seem pre-emptory, they have been arrived at by long and careful experimentation on animals, and painstaking and anxious care of human victims, for many years in a snake-infested country. Probably our most interesting experiment was one wherein a dog was injected with ten times a fatal dose of venom. Using suction, the accumulated serum was withdrawn, divided, and then injected into four other dogs. All four of these dogs died with all the symptoms and autopsy findings of typical snake-bite poisoning, while the original dog recovered.

We have seen the death-rate from rattlesnake bite lowered from fifteen out of a hundred, under the old methods of treatment, to a possible one per cent or less. But the snake-bite patient cannot be neglected. He must have constant, conscientious, and back-breaking care for forty-eight hours. He must not be attended by a lazy, indifferent, overoptimistic, or ignorant doctor or nurse. His doctor must be within a few minutes' call for forty-eight hours, and his nurse must be alert and almost constantly at work. I have never seen a case over-treated, but am convinced that under-treatment has been the cause of death in several instances.

If, as often happens, your physician has had little experience in the treatment of snake-bite, it is not out of order to call his attention to these directions, as the day when the doctor stood on his dignity went



out with the frock coat and high hat. It is the habit of the medicine man of today to put progress and efficiency above all other considerations.

If the rattlesnake has been in mind throughout this article it is because practically all of our work has been with the diamond-back rattler of southwest Texas, and his victims. The same procedure is in order following the bite of any of the three other poisonous snakes of America--the cotton-mouth moccasin, the copperhead, and the coral snake. The coral snake, though deadly, probably bites less often, due to the two facts that his bright color advertises his presence and his jaws do not open at the same wide angle as the others. Thus he usually requires a finger or a toe as the object of his strike.

We have found by repeated experiments that anti-venine, unless given in much larger quantities than those recommended by the manufacturers, is of small value. One ampule alone is of no clinical value. Snake venom kills by body weight, a lethal dose requiring one mg. of venom per pound of the victim. The average Texas diamond-back rattler is capable of discharging 250 mg. in a good firm bite. (We have known one to discharge 600 mg. when forced to bite several times through a rubber dam over a glass container.) One ampule, or ten cc., of anti-venine neutralizes less than thirty mg. of venom in a glass tube, and a much less quantity (less than ten mg.) in the body. Thus is seen the futility of relying on one or two ampules of anti-venine. When used at all, as many as five ampules should be injected in and around the site of the wound, and left for an hour before suction is again used. In severe cases five or ten more ampules should be used, and always of course as an adjunct to the above treatment.

Often even the experienced woodsman cannot collect his wits in the face of an unusual accident; but this accident should never find us at a loss, it is so easily prepared for. It is good insurance to carry narcotics, razor-blades, and suction cups along on hunting trips. Type the outline of this treatment and keep it at hand, pasted in some kit or bag, and walk the woods with the assurance that in case of this accident you will know at once what to do.



SUBJECT: Some General Suggestions for Home Safety

I. Read and Remember.

The housing unit in which you live is your home. Although it may not be as spacious as the home which you previously occupied, it has been made available by the Federal Government so that you might have a place to live near to your work. The relatively close quarters in which you live may expose you to an increased number of accident hazards. In order that accidents may be prevented and that you and members of your family may not suffer as a result of carelessness or negligence, the following suggestions, if adhered to, will make the housing unit in which you live a relatively safe place of abode.

The following suggestions, if followed, will decrease if not completely eliminate home accidents and will increase the operating efficiency of the equipment in the housing units.

Electrical Equipment

1. See that plugs and cords are in good repair.
2. Never break a circuit by pulling the plug from the socket by the cord; take the plug firmly in your hand and pull it from the socket.
3. Do not use any electrical equipment not permitted by the Management. The electrical circuits in the housing unit which you occupy are designed to carry a specified load and any additional load may result in damaging the entire circuit and cause a fire.
4. Be sure that all electrical appliances are disconnected before the last occupant leaves the unit. Failure to disconnect electrical appliances may result in a fire which may either damage or destroy yours and other houses. It is even possible that loss of human lives may be involved.

Stoves

1. Never use gasoline, kerosene, or distillate to start or quicken the fire in the stove.
2. To avoid escape of smoke into the room, always close bottom drafts BEFORE closing top draft, or BEFORE removing stove lid.
3. See that fire is out or nearly out and that all drafts are closed before leaving the unit unoccupied.

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4. DO NOT BUILD TOO HOT A FIRE IN STOVE. If the stove begins to overheat because too much fuel has been added, close bottom drafts tightly, open top damper, and lift lids from stove to check draft.
5. Be careful to avoid the chance of being smothered or overcome by carbon monoxide gas at night. Always close the bottom drafts tightly, but LEAVE THE TOP DAMPER SLIGHTLY OPEN when you go to bed.

## II. Some General Suggestions

1. Be Careful! Stop - Think - Act Wisely!
2. Familiarize yourself with the exact location of and the method of operating the fire extinguisher which is a part of the standard equipment of the community.
3. Be careful in smoking. Do not permit burning matches, cigarettes, cigars or the contents of a pipe to fall on the floor.
4. Do not smoke in bed.
5. See that grass, trash and other solids which might cause fire or injury to an individual are not permitted to clutter the area near your unit.
6. Never leave matches where children may reach them.
7. Gasoline or kerosene must not be used for any purpose or stored in your unit.
8. For your health and the health of others do not permit garbage pails to overflow. See that the bucket is emptied before it becomes completely filled; and see that it is kept clean at all times.
9. Garbage cans have been provided at convenient points for both wet garbage and dry trash; please use them for the purpose for which they are provided.
10. Do not drive in excess of the established speed limit on community roads. Children playing around the community may run into the roadway and an automobile driven at an excessive rate of speed cannot be stopped quickly enough to prevent an accident.
11. When equipment fails to operate satisfactorily, notify the project office so that necessary repairs may be made by a trained repairman. Do not attempt to repair equipment with which you are not familiar.
12. In case of an emergency, notify the Project Director immediately.

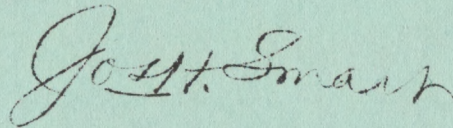


13. Have all injuries treated promptly at the clinic. A slight injury untreated today may become a serious infection by tomorrow.

14. Talk over these and other safety measures with your family or other persons with whom you live.

III. Observing the simple safety suggestions outlined above will result in reducing greatly, if not eliminating many accidents which would otherwise occur. Accidents are costly, not only in dollars and cents but in human suffering as well. You and those who occupy the housing units with you are members of a community, and, as such, we are sure that you wish to contribute your part towards making the community a desirable one in which to live. In addition, the prevention of accidents is a significant contribution to the war effort since it insures the uninterrupted continuance of services of individuals who are sorely needed in producing food and fibre and other items essential to the successful prosecution of the war.

Be Alert! Be Safety Minded!



Jos. H. Smart  
Regional Director



SUBJECT: SAFETY IN THE USE OF ELECTRICITY

I. Partial List of Suggestions for Eliminating Accident and  
Fire Hazards Due to Electricity

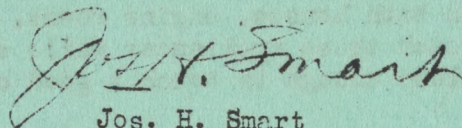
1. All switchboards and panelboards operated at over 150 volts to ground should be suitably enclosed in locked cabinets unless they are located in rooms or other enclosures to make them inaccessible to other than authorized operators.
2. Large switches and motors or generators that are liable to arc during operating should be well protected. Complete enclosures provide the most satisfactory protection. Where enclosures are not feasible, efficient barrier guards should be erected.
3. Combustible materials should be kept at a safe distance from transformers or other equipment which are likely to become hot.
4. Electric outlets and switches should be placed--especially in bath houses, engine rooms, etc.--so that persons cannot reach these appliances while standing on a wet surface or close enough to touch a good conductor such as a water pipe.
5. Be careful not to overload circuits. Use only fuses of the correct amperage and don't allow the fuse or fuse box to be tampered with. NEVER use pennies or pieces of wire back of the burned out fuse. A fuse is a safety valve. Accordingly, a penny or wire inserted in back of the fuse permits the overload to heat the wire in the line until it becomes white hot and a fire is ignited.
6. Don't handle electrical cords or other electrical equipment with wet hands. Also be especially careful in using any electrical device in damp locations unless special precautions have been taken.
7. No one should be allowed to tap or splice live wires. If it becomes necessary to do any repair work or install additional wiring always pull the main switch. When working around an electrical apparatus, whether alive or dead, precautions should always be observed as though all parts were alive.
8. Consider all wires as bare wires whether insulated or not. Insulation on wire is not to be trusted implicitly. It should never be depended upon in high voltage circuits and at times it may not give full protection on low voltage circuits.

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9. Don't use makeshift temporary extensions in place of permanent wiring. Electrical equipment must be properly installed to be safe. Only experienced electricians should be allowed to repair or extend wiring.
  10. Use only rubber sheathed extension cords for outdoor use or in damp locations. When flexible cords show wear to the extent that insulation is impaired, have them replaced. Replacement of damaged or worn-out cords will greatly reduce accident and fire hazards from wiring insulations otherwise in good condition.
  11. Make frequent inspections of electrical utilization equipment of all kinds. It is a sign of trouble when sockets hiss or lamps flutter, when plugs are loose in wall outlets, when wall switches fail to function, when the insulation on wires is injured, when it is possible to get a shock from an appliance, or when the appliance fails to operate or causes a blown fuse. Before any such failure can grow into a hazard, it is advisable to have the trouble remedied.
- II. Remember that electricity plays no favorite with those who disregard safety precautions. It is common knowledge that electricity is perfectly safe when used properly. If misused, it may cause disastrous fires, burns, shocks, or even electrocution.



Jos. H. Smart  
Regional Director



SUBJECT: Some Suggestions for Safe Tractor Operation

1. Be sure the gear shift lever is in neutral before cranking the engine.
2. Always engage the clutch gently, especially when going up a hill or pulling out of a ditch.
3. When driving on highways, or to and from fields, be sure that both wheels are braked simultaneously when making an emergency stop.
4. Always ride on seat or stand on platform of tractor. Never ride on drawbar of tractor or drawn implement.
5. When tractor is hitched to a stump or heavy load, always hitch to drawbar and never take up the slack of chain with a jerk.
6. Be extra careful when working on hillsides. Watch out for holes or ditches into which a wheel may drop and cause tractor to overturn.
7. Always keep tractor in gear when going down steep hills or grades.
8. Always drive tractor at speeds slow enough to insure safety, especially over rough ground or near ditches.
9. Reduce speed before making a turn or applying brakes. The hazard of overturning the tractor increases four times when speed is doubled.
10. Always stop power take-off before dismounting from tractor.
11. Never dismount from tractor when it is in motion. Wait until it stops.
12. Never permit persons other than the driver to ride on tractor when it is in operation.
13. Never stand between tractor and drawn implement when hitching. Use an iron hook to handle drawbar.
14. Do not put on or remove belt from belt pulley while the pulley is in motion.

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(Sheet 1)



15. Should motor overheat, be careful when refilling radiator.
16. Never refuel tractor while motor is running or extremely hot.
17. When tractor is attached to a power implement be sure that all power line shielding is in place.
18. Tractors rarely hurt anyone if he hasn't first placed himself in a position to get hurt.

IT'S NOT ONLY THE KNOWLEDGE OF SAFETY BUT THE PRACTICE THAT COUNTS.

*Jos. H. Smart*

Jos. H. Smart  
Regional Director



SUBJECT: Conservation of Motor Oil

The following Circular No. 399, and accompanying statement from the Bureau of the Budget, have just been received:

" In line with the national program of conserving rubber, gasoline, and oil, the Bureau of the Budget has recently completed a survey of the practices of Federal agencies, as well as large, private motor vehicle fleet operators, in changing crankcase oil. As a result of this survey the conclusion has been reached that a considerable saving in motor oil consumption can be effected by the Federal Government through the adoption of uniform oil changing practices for all automotive equipment, except for that used for heavy construction work, for diesel-powered equipment, or for military purposes.

The following practices are recommended for adoption by all Federal agencies:

- (1) Change oil in light equipment only semi-annually -- in the Spring and Fall of the year
- (2) Change oil in heavy equipment only every 6,000 miles, or semi-annually
- (3) When each change is made drain crankcase while engine is still hot and flush crankcase with a flushing oil
- (4) Do not fill crankcase higher than  $\frac{1}{4}$ " below the full mark on the dipstick
- (5) Use a replaceable element oil filter
- (6) Have motor checked when increases in oil consumption and rapid filter clogging are observed
- (7) Check operation of cooling system at least every Spring and Fall and use radiator covers in cold weather

There is attached to this Circular a statement which amplifies and explains the basis for recommending the above uniform practices. It is hoped that this data will be helpful in furnishing appropriate educational information and instructions to supervisors and operators of motor equipment used by each agency. It should be particularly pointed out that the recommendation of the above uniform practices is made possible largely through the improvements in lubricants, engines, and filters during the last few years. "

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(Sheet 1)



In the interest of conserving motor oil, it is requested that each Federal agency review its present practice in lubricating automotive equipment and adopt the practices recommended herein where indicated.

## CONSERVATION OF MOTOR OIL

Budget Circular No. 399 presents, in outline form, uniform practices governing the conservation of motor oil. The uniform practices as recommended are based on a survey of practices of Federal agencies and large, private motor vehicle fleets operating throughout the nation, the results of laboratory experiments, and the advice of fleet operators and research technicians. This attachment to that Circular covers the various points more fully and gives additional detailed information. It is suggested that a copy of this attachment be given each fleet operator or supervisor of motor equipment.

### I. Crankcase Oil

It is recommended that the following standards for changing crankcase oil be adopted. These provisions are not intended to apply to heavy construction equipment, to diesel engines, and to motor vehicles in use under extreme operating conditions. Extreme conditions would include very low or very high temperature, heavy loads over extended periods, excessively dusty regions, or other abnormal conditions which would adversely affect the operating efficiency of the motor. In such cases the general recommendations are to be modified by the operator to conform to the practices which experience has shown necessary to protect the life of the motor.

#### A. For Motor Vehicles Equipped with Oil Filters

1. Light equipment -- light equipment shall include passenger cars, station wagons, panel delivery trucks, pick-up trucks of  $1\frac{1}{2}$  tons or less, and motorcycles.

For the breaking-in period change oil at the 1,000, 2,000, 5,000, and 10,000 mile speedometer readings and seasonally thereafter, i.e., every Spring and Fall. Drain crankcase while motor is still hot and flush crankcase with flushing oil. Check oil level and condition every 500 miles.

The manufacturer's specifications may be followed insofar as oil viscosity is concerned, but, it is generally agreed by most fleet operators and laboratory technicians that an oil one grade lighter than specified usually gives better all round operating efficiency and economy.



For the Spring change-oils of the 3,000 series, Navy contract, with viscosity ratings of 20W or S. A. E. 30 have been found particularly satisfactory. Under most conditions the 20W oil will serve, but under sustained heavy load or high temperatures the 30 oil may be needed.

For the Fall change oils of the 3,000 series, Navy contract, with viscosity ratings of 10W or 20W have been found particularly satisfactory. Here again the 20W oil will usually prove satisfactory but extreme cold or areas where prolonged cold weather is the rule may necessitate the use of 10W oil.

2. Heavy equipment -- heavy equipment shall include all equipment of  $1\frac{1}{2}$  tons or more, exclusive of heavy construction equipment or diesel engine powered equipment.

For breaking-in period change oil every 1,000 miles for the first 5,000 miles and thereafter every 6,000 miles or seasonally, i.e. Spring and Fall, in the event the vehicles travel less than 6,000 miles semi-annually. Drain crankcase while motor is still hot and flush with flushing oil. Check oil level and condition every 500 miles.

The manufacturer's specifications may be followed insofar as oil viscosity is concerned but it is generally agreed by most fleet operators and laboratory technicians that an oil one grade lighter than specified usually gives better all round operating efficiency and economy.



For the Spring change oils of the 1,000 or 3,000 series, Navy contract, with viscosity ratings of 20W, S.A.E. 30, 40, or 50, depending upon the equipment and the operating conditions, have been found very satisfactory. It is difficult to specify the exact viscosity that should be used but in general the larger the engine, the higher the outside temperature, and the older the engine, the heavier the oil should be. The rate of oil consumption provides a rough rule of thumb check on adequacy of weight. A high rate of oil consumption might be caused by using an oil that is too light. Do not try to "eliminate" oil consumption by using a very heavy oil because increased gasoline consumption and wear on the battery will more than offset the saving in oil. Unless some oil is being used the engine is not being properly lubricated.

For the Fall change, oils of the 1,000 or 3,000 series, Navy contract, with viscosity ratings of 10W, 20W, or S. A.E. 30, depending upon the equipment and the operating conditions, have been found very satisfactory. The same general rule of selecting the oil viscosity on the basis of using the lowest that will protect the engine under the particular operating conditions should be followed.

- B. For Motor Vehicles not Equipped with Oil Filters: Although oil filters should be installed on every motor vehicle, emergency conditions may necessitate operating without a filter for a short period. In such cases the following regulations are recommended:
1. Light equipment -- for the breaking-in period change oil at the 500, 1,000, 2,000 and 3,000 mile speedometer readings and thereafter every 3,000 miles.
  2. Heavy equipment -- for the breaking-in period change oil at the 500, 1,000, and 2,000 mile speedometer readings and thereafter every 2,500 miles.
- C. Heavy Construction Equipment, Military Equipment, and Diesel Engines: For heavy construction equipment, military equipment, and diesel engines it is recommended that the manufacturer's specifications be followed, or the specifications developed for the particular equipment.
- D. Oil Level: Do not fill the crankcase higher than  $\frac{1}{4}$ " below the full mark on the dipstick. Check oil level when motor is cold or has been turned off for at least five minutes. Too much oil is not only wasteful but also can be harmful.

## II. Filters

A very important factor in motor lubrication is efficient filters. A proper filter will increase the life of the engine and



the oil and will reduce repair costs by trapping dirt, dust, metal particles and other harmful abrasives.

- A. Oil Filters: Generally speaking, the large, heavy duty, replaceable cartridge element type of oil filter is the best and all motor vehicles should be equipped with such a filter. On vehicles having a non-replaceable element-type filter, a replaceable element type should be substituted for the non-replaceable element type when it becomes clogged. Cotton waste replaceable cartridge elements are for most purposes very economical and satisfactory. Such elements can be used in most types of replaceable element filters. Change filter element at least every time crankcase oil is changed. Replaceable cartridge element-type filters should be purchased from the Procurement Division contracts, when such contracts are available. It is suggested that special attention be paid to the filter ratings as established by the Bureau of Standards in their "Report on the Investigation of Oil Filters."

Color of Crankcase Oil: The filter element should be changed when the oil becomes black. The determination as to whether the oil has darkened sufficiently to require the changing of the filter element calls for the exercise of judgment on the part of the personnel responsible for the maintenance of the vehicle. The necessary skill to make this determination can be acquired only by repeated observation of used oil as compared with new oil of the same grade and quality. Several observations of new and used oil should enable responsible personnel to arrive at a fair conclusion as to the condition of the filter element. The blotter test in which a drop of oil from the dipstick is placed, after every 500 miles of driving, on a white blotter of sufficient size for at least a year's record is a very helpful device in determining the necessity for changing the filter element. Such a test should be made immediately after the vehicle has been running, not when the engine is cold. This test is of little value when detergent oil is used. The dipstick test is also a very good basis for judging the condition of the element. In either case the sign of a clogged filter element is when the oil starts to become inky black, not dark brown. In view of the tendency of the 1,000 series oils to become black quite rapidly without a corresponding contamination of the oil this fact should not be overlooked when color is used as a guide to the condition of the 1,000 series oils. Regardless of the type of test used, the filter element should be inspected every 1,000 miles.



- B. Air Filter: Clean the air filter periodically, as specified by the manufacturer. Unless this is done dirt and grit will enter the motor and may cause serious damage.

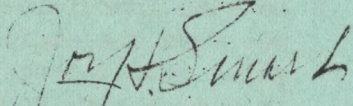
### III. Motor Condition

Perhaps the most important single factor in the life of oil and of motors is the proper adjustment of the motor. Dilution, carbonaceous deposits, sludge, metal particles, and acidity all accumulate in relation to the adjustment and operation of the motor. For this reason, it is particularly urged that careful attention be paid to the booklet published by the Office of Defense Transportation outlining a preventive maintenance program. Whenever high oil consumption and rapid clogging of the filter element are observed the motor should be checked and if necessary overhauled to correct the trouble.

### IV. Cooling System

Extreme variations in motor temperature increase both engine wear and oil dilution. At least seasonal checks of the condition of the cooling system should be made. The operating temperature of the thermostats should also be checked at the same time. Clogged cooling systems or improperly operating thermostats can cause overheating or underheating. In cold weather radiator covers should be used where necessary to maintain the proper operating temperature.

Regional and Project employees responsible for looking after WRA equipment will be guided in their care of equipment in accordance with the above.

  
Jos. H. Smart  
Regional Director



SUBJECT: USE AND MAINTENANCE OF SODA-ACID, CARBON TETRACHLORIDE  
AND FOAM FIRE EXTINGUISHERS

Putting out a fire with the least damage depends upon early discovery and rapid action. Portable extinguishers that contain a small quantity of water or other extinguishing agent are highly useful for this purpose. But they are intended only for the control of incipient fires, that is, fires in their early stages.

For convenience fires have been classified according to the way in which they can best be extinguished in their early stages: Class A, fires in ordinary combustibles, like wood, paper, textiles, and rubbish; class B, fires in small quantities of flammable liquids, oils, and greases; and class C, fires in electrical equipment. Fires are commonly put out in two ways: (1) By cooling (quenching) the burning material below its burning temperature, and (2) by smothering the fire and depriving it of the air (oxygen) necessary to support combustion. Class A fires are best put out by cooling with water or water solutions, and class B fires by smothering with a gas or foam. Class C fires introduce a third condition--that the stream applied be a nonconductor of electricity so as not to cause electrical shock or injury to the user.

Water is ordinarily not effective in fighting fires in flammable liquids. In fact, its use may spread the burning liquid over a larger area and make control of the fire more difficult. Water also is a conductor of electricity and its application on fires in electrical equipment may result in shock or injury.

There are several types of effective extinguishers suitable for use. They are briefly described here. Unfortunately there is no extinguisher on the market today which is equally effective on all three classes of fires.

Soda-Acid Type

The 2½-gallon soda-acid extinguisher is the most common size. It is so made that it can be hung on a wall in any convenient place. Turning the extinguisher upside down from the position in which it hangs causes the soda solution and acid to mix, resulting in the formation of carbon-dioxide gas, the pressure from which expels the solution through the hose. The extinguisher value of the soda-acid stream, which has force to carry a distance of 30 to 40 feet, with the flow continuing about 1 minute, is practically the same as an equal quantity of water.

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Distribution: All Regional and project staff members.



Larger soda-acid extinguishers, the most common sizes being 20 and 40 gallons, are available on wheels. They are wheeled to the fire. They discharge streams up to a distance of about 50 feet, the stream lasting about 3 minutes. The wheeled type of extinguisher should prove worth while on larger farms for operation in and around the barns or other main buildings.

Soda-acid extinguishers must be recharged each year, as well as immediately after use. In winter they must be placed where the temperature remains above freezing. Salt or other antifreezing ingredients should not be added to the soda-acid type of extinguishers as this will interfere with the operation.

Soda-acid extinguishers are effective on incipient fires in wood, paper, textiles, rubbish, and other ordinary combustible materials.

#### Vaporizing Liquid (Carbon Tetrachloride Base) Pump-Gun Type

The type of extinguisher known as the vaporizing liquid pump-gun type, of which the most common sizes are of 1-quart and 1½ quart capacity, uses carbon tetrachloride which has been specially treated to lower the freezing point to -50°F.; and to prevent corrosion. The liquid is forced out by working the pump with one hand while holding the extinguisher with the other. The stream can be thrown a distance of 20 to 25 feet, and the liquid can be expelled at the rate of a quart in 40 seconds, with average operation.

Under the heat of the fire the carbon tetrachloride mixture vaporizes very rapidly. The vapor, formed as soon as the liquid hits the fire, is heavy and noncombustible, and in effect smothers the fire by shutting off the air (oxygen) necessary to support combustion. As the extinguishing value of carbon tetrachloride depends on the smothering effect of the gas, these extinguishers are of little value where there is a wind or other air current which will carry the gas away from the fire. A fire in freely-burning material, such as wood or paper, quickly creates a strong draft of air inward and upward, and such fires are difficult to extinguish with carbon tetrachloride except when they are very small. This type of extinguisher is useful however for reaching fires in partitions, and other concealed spaces. In using these extinguishers, especially in unventilated places like small rooms, closets, or confined spaces, precautions should be taken to avoid the effects that may be caused by breathing vapors or gases produced.

This type of extinguisher should be partially discharged and refilled each year. No liquid except that furnished by the manufacturer should be used. Ordinary chemical carbon tetrachloride will not serve, as its freezing point has not been depressed and it corrodes the mechanism of the extinguisher.

The vaporizing-liquid extinguisher is effective on incipient or early fires in small quantities of flammable liquids, oils, and greases, and on incipient fires in electrical equipment, where the use of a non conducting extinguishing agent is of first importance.

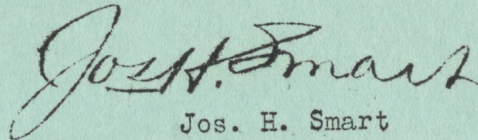


### Foam Type

The foam extinguisher is another type of chemical fire-fighting equipment. The most common size has a capacity of  $2\frac{1}{2}$  gallons. Turning the extinguisher upside down from the position in which it hangs causes two separately contained solutions to mix. Carbon dioxide gas is formed, the pressure of which expels from the extinguisher a foam of countless small bubbles filled with carbon dioxide gas. The foam can be discharged a distance of 30 to 40 feet for about 1 minute. It smothers the fire by clinging to the burning materials and excluding the air (oxygen) necessary to support combustion. As it contains a liberal quantity of water, the foam also has considerable cooling effect.

This type of extinguisher should be charged yearly as well as immediately after use, with chemicals supplied by the manufacturer. It must be protected against freezing, but antifreezing ingredients should not be added to depress the freezing point of the solutions.

Foam extinguishers are effective not only in incipient fires in wood, paper, textiles, rubbish, and other ordinary combustible materials, but also in small quantities of flammable liquids, oils, and greases.



Jos. H. Smart  
Regional Director



WAR RELOCATION AUTHORITY  
CENTRAL REGION  
DENVER, COLORADO

BULLETIN NO. 10  
SUPPLEMENT NO. 1

FIRE EXTINGUISHERS WILL BE PROVIDED IN ALL BUILDINGS HOUSING EVACUEES AND EMPLOYEES, ALSO IN BUILDINGS IN WHICH ANY GOVERNMENT PROPERTY IS STORED.

FIRE EXTINGUISHER CHART

CHARACTERISTICS			FOAM	SODA-ACID	ANTI-FREEZING	VAPORIZING LIQUID	CARBON DIOXIDE
CHEMICAL USED (OBTAIN CHARGES FROM EXTINGUISHER MANUFACTURERS)			SOLUTIONS OF ALUMINUM SULPHATE, BICARBONATE OF SODA WITH FOAM AGENT	BICARBONATE OF SODA SOLUTION AND SULPHURIC ACID	CALCIUM CHLORIDE AND SPECIAL SOLUTIONS WITH CARTRIDGE OR ACID	CARBON TETRACHLORIDE WITH IMPORTANT COMPONENTS	PURE LIQUID CARBON DIOXIDE FREE FROM MOISTURE
OPERATING METHOD			INVERT	INVERT	INVERT OR INVERT & PUMP	PUMP OR OPEN VALVE	OPEN VALVE
EXTINGUISHING EFFECT			BLANKETING AND QUENCHING	COOLING AND QUENCHING	COOLING AND QUENCHING	BLANKETING	BLANKETING
PROTECT FROM FREEZING			YES	YES	NO	NO	NO
SUITABLE FOR CLASS OF FIRES AS INDICATED	CLASS "A" FIRES	WOOD RUBBISH TEXTILES ETC.	YES	YES	YES	NO (LITTLE QUENCHING EFFECT)	NO
	CLASS "B" FIRES	OILS GREASES	YES	NO	NO	YES (SMALL FIRES)	YES
	CLASS "C" FIRES	ELECTRICAL EQUIPMENT (LIVE)	NO	NO	NO	YES	YES

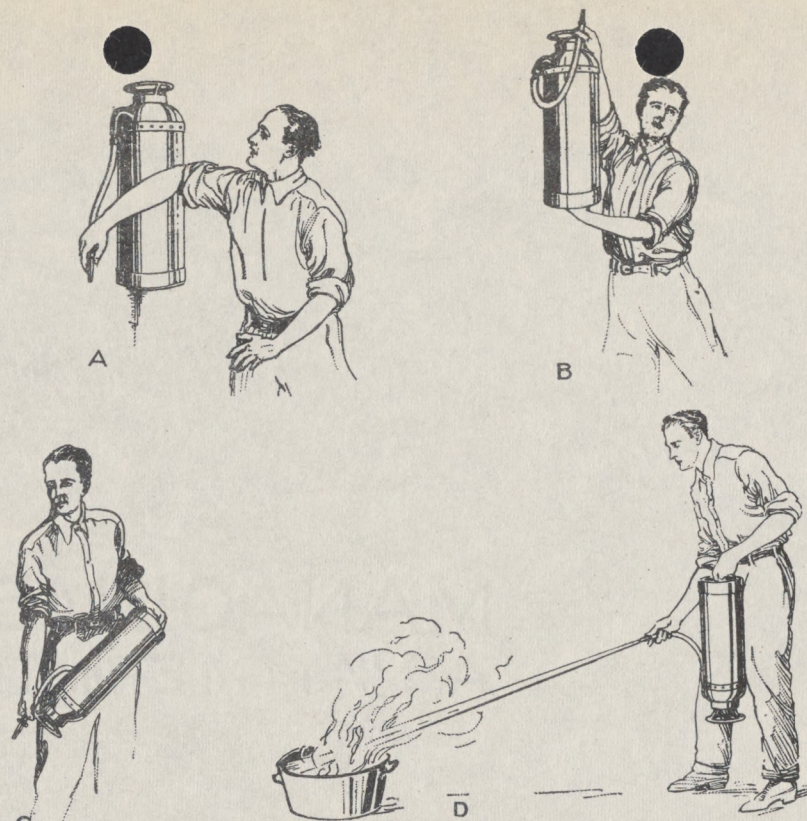
TO OPERATE A SODA-ACID FIRE EXTINGUISHER

1. CARRY THE EXTINGUISHER TO THE FIRE IN AN UPRIGHT POSITION.
2. GRASP THE NOZZLE IN LEFT HAND AND AIM IT AWAY FROM YOU.
3. GRASP THE TOP RING WITH THE RIGHT HAND AND TURN IT OVER ON THE FLOOR.
4. GRASP THE BOTTOM HANDLE WITH THE RIGHT HAND AND TURN THE EXTINGUISHER UPSIDE DOWN, KEEPING A TIGHT GRIP ON THE NOZZLE. DIRECT THE STREAM AT THE BASE OF THE FIRE.
5. THE EXTINGUISHER WILL DISCHARGE ABOUT ONE MINUTE WITH ONE CHARGING.
6. WARNING - DO NOT USE THIS TYPE OF EXTINGUISHER TO FIGHT ELECTRIC OR OIL FIRES.

TO OPERATE A ONE-QUART PUMP TYPE FIRE EXTINGUISHER

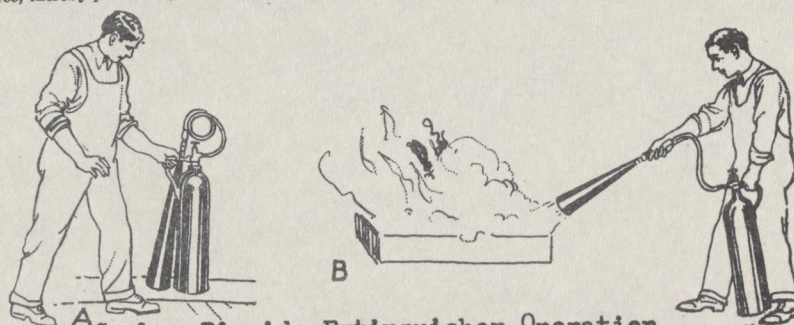
1. CARRY IT TO THE FIRE.
2. GIVE THE PUMP HANDLE A QUARTER TURN TO UNLOCK IT.
3. AIM THE EXTINGUISHER AT THE BASE OF THE FIRE, GRASPING THE EXTINGUISHER IN ONE HAND AND THE PUMP HANDLE IN THE OTHER.
4. OPERATE THE PUMP HANDLE AS YOU WOULD A TIRE PUMP.





### Foam Extinguisher Operation

FIGURE 1.—A, It is important that the hose be held between the thumb and the index finger of the right hand when bringing the extinguisher into use. B, Grasp the ring top with the fingers of the right hand and the bottom with the left hand, then lift the extinguisher off the hanger hook and carry it to the fire. C, The extinguisher can now be easily inverted by grasping the bottom handle with the left hand. When the extinguisher is approximately in the position shown, the fingers of the right hand should release the ring top, but should continue to hold the hose. The extinguisher, upside down, the left hand holding the bottom handle, is now in full operation. D, The stream should be directed against the inside of the opposite wall of the tank, above the level of the burning liquid. The operator should walk around the fire if possible, and if the fire is on the floor he should stand back and allow the foam to fall on the fire without much force, thereby preventing the spread of the flames.



### Carbon Dioxide Extinguisher Operation.

FIGURE 2.—A, The extinguisher is removed by grasping the handle with the left hand. It should be carried to the fire by means of the handle. To release the gas the valve is opened by turning it counterclockwise. B, Direct the discharge as close to the fire as possible, applying it first at the edge and bottom of the fire and progressing forward and upward, moving the discharge horn slowly from side to side. Continue the discharge even after the fire has been extinguished in order to cool the liquid and prevent possible reflash.



### Vaporizing Liquid Pump Gun Operation.

FIGURE 3.—A, Remove the extinguisher from the wall bracket by grasping the handle and pulling outward. B, On the way to the fire unlock the handle by turning. If the device is of the air-pump type, hold a finger over the nozzle and pump up the pressure. C, Direct the stream at the base of the flames and work around the fire rapidly. If the fire is in an open container or tank, direct the stream against the inside of the opposite wall above the level of the burning liquid.