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**JAN-N-412A**

30 JUNE 1948

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**SUPERSEDING**  
**JAN-N-412**  
**24 OCTOBER 1946**
**NATIONAL MILITARY ESTABLISHMENT SPECIFICATION**  
**NICKEL, POWDERED (FOR USE IN AMMUNITION)**

This specification was approved by the Departments of the Army, the Navy, and the Air Force for use of procurement services of the respective Departments.

**A. APPLICABLE SPECIFICATIONS**

A-1. The following specifications, of the issue in effect on date of invitation for bids, form a part of this specification:

**U. S. ARMY SPECIFICATIONS**

- 50-0-1—General Specifications for Ammunition except Small Arms Ammunition.<sup>1</sup>  
 100-2 —Standard Specification for Marking Shipments by Contractors.<sup>1</sup>

**NAVY DEPARTMENT SPECIFICATION**

General Specifications for Inspection of Material.<sup>2</sup>

**FEDERAL SPECIFICATION**

RR-S-366—Sieves; Standard, Testing.

**B. GRADE**

B-1. This specification covers one grade of powdered nickel as hereinafter specified.

**C. MATERIAL AND WORKMANSHIP**

C-1. See section E.

**D. GENERAL REQUIREMENTS**

D-1. See section E.

**E. DETAIL REQUIREMENTS**

- E-1. *Free metallic nickel*.—95.0 percent, minimum.  
 E-2. *Mercury*.—2.0 percent, maximum.  
 E-3. *Moisture*.—0.2 percent, maximum.  
 E-4. *Granulation*.—Unless otherwise specified in the contract or order, the granulation shall be as follows:  
 E-4a. Through No. 100 U. S. Standard sieve, 100 percent minimum.  
 E-4b. Average particle diameter,  $1.5 \pm 0.5$  microns.

**F. METHODS OF SAMPLING, INSPECTION, AND TESTS**

- F-1. *Size of lots*.—Maximum, 1000 pounds.  
 F-2. *Sampling*.—A minimum of 10-percent of the containers in the lot shall be selected by the inspector in such a manner as to

<sup>1</sup> Applicable only to Army purchases.

<sup>2</sup> Applicable only to Navy purchases.

be representative of the lot. When lots comprise less than 10 containers, all containers in the lot shall be selected. From each of these containers, remove enough of the material to form a composite sample of approximately 8 ounces. Mix these portions thoroughly to form a homogeneous composite sample. Place this composite sample in a suitable container, seal and label so as to show the name of the material, manufacturer, plant, purchase order, and number of pounds in the lot, and lot number. All acceptance tests shall be made on the composite sample representative of the lot.

**F-3. Inspection.—**

**F-3a. Army.**—Inspection shall be made in accordance with the requirements of U. S. Army Specification 50-0-1, and shall be made at the point of delivery unless otherwise specified in the contract or order.

**F-3b. Navy.**—Unless otherwise specified in the contract or order, inspection shall be made at the point of delivery.

**F-4. Tests.**—The laboratory tests shall be made in accordance with the following paragraphs. For Navy purchases, the tests shall be made at a Government laboratory unless otherwise specified in the contract or order.

**F-4a. Free metallic nickel.**—Accurately weigh a sample of approximately 1 gram of nickel powder into a previously ignited and tared crucible. Carefully spread the sample in a thin layer on the bottom of the crucible. Apply a Bunsen flame to the bottom of crucible until the powder ignites. Allow visible oxidation to proceed without the aid of further heat. After visible oxidation ceases, place the crucible at a 45° angle on a triangle and apply the full flame of a Meker burner for 1½ hours (or ignite in a muffle furnace for an equal time). Cool the crucible in a desiccator and weigh.

$$\text{Percent free metallic nickel} = \frac{(A + B + C) 366.8}{W}$$

where

- A = gm. gain in weight of sample.
- B = gm. of mercury in sample (see par. F-4b)
- C = gm. of moisture in sample (see par. F-4c)
- W = gm. of sample.

**F-4b. Mercury.**—Weigh accurately a sample of nickel powder of approximately 1 gram. Place in an Erlenmeyer flask and dissolve the sample in 10 ml. of 1:1 nitric acid. Heat on hot plate until nitrogen dioxide fumes are no longer evolved. Heat almost to dryness to eliminate most of the nitric acid. Avoid heating to dryness as mercury may be lost as vapor. Dilute to approximately 75 ml. with water. Add 1 to 3 drops of a saturated solution of potassium permanganate. Then carefully add 1 ml. of concentrated sulfuric acid. Add enough ferrous ammonium sulfate to clear the solution to previous green color. Add approximately 5 ml. of a saturated solution of ferric nitrate. Titrate

{JAN-N-611A}

with a solution of potassium thiocyanate which has been standardized against pure mercury, using the above procedure.

$$\text{Percent mercury} = \frac{100 VF}{W}$$

where

V = ml. KCNS used in titration  
 F = gm. mercury equivalent to 1.00 ml. of KCNS solution (from standardization)  
 W = gm. of sample.

**F-4c. Moisture.**—Place 2 gm. of the sample in a shallow receptacle, spread evenly over the surface of the receptacle, and dry in a vacuum desiccator containing a porous type of granular anhydrous calcium sulfate for 24 hours at laboratory temperature (approx. 20°C.). Calculate the loss of weight as percent moisture.

**F-4d. Granulation.**—

**F-4d(1).** Attach a bottom pan to a U. S. Standard No. 100 sieve conforming to the requirements of Federal Specification RR-S-366. Place a 100 gm. portion of the sample on the sieve, cover, and shake for 5 minutes by hand or mechanically by means of a shaker geared to produce  $300 \pm 15$  gyrations and  $150 \pm 10$  taps of the striker per minute. Weigh any material remaining on the sieve and calculate the percent passing through the sieve.

**F-4d(2). Determination of average particle diameter.**—Determine the average particle diameter by means of a sub-sieve sizer based on the air permeability principle described below.

**F-4d(2)a. Apparatus.**—The sub-sieve sizer (see figs. 1 and 2 and par. H-3) is composed of an air pump, an air pressure regulator, a precision-bore sample tube and a double-range air flowmeter (capillaries and manometer) with water as the manometer liquid, along with accessory equipment necessary to correlate these parts into a unit. The air pump builds up pressure to a constant head in the pressure regulator. The air, under this pressure head, is conducted through the packed powder sample contained in the sample tube. The flow of air through this packed bed of powder is measured by means of the manometer of the flowmeter, the level of the water in the manometer being used to calculate the average particle diameter of the sample.

**F-4d(2)b. Calibration of sub-sieve sizer.**—Adjust the water level in the pressure regulator so that the height from the bottom of the regulator to the water level is  $50.0 \pm .1$  cm. when air is bubbling from the inner tube of the regulator. Place a calibrated flowmeter with a measuring range of 0-60 ml. per minute in place of the sample tube. By means of the air regulator adjust the air flow so that air bubbles from the inner tube of the pressure regulator at a rate of 3-5 bubbles per second. Adjust the first capillary resistance by moving the wire in or out of the capillary until it shows a conductance of 11 to 12 ml. per minute when calculated as follows:

$$C = \frac{A \times 50}{B}$$

[JAN-N-412A]

where

- C = conductance of the capillary resistance  
 A = rate of flow indicated on the calibrated flowmeter  
 B = pressure in cm. of water indicated on the manometer.

Adjust the second capillary resistance so that the total conductance of both capillaries when connected in parallel is exactly 4 times that of the first capillary specified above. The first capillary resistance should be used when testing samples having an average particle diameter of 0-20 microns and the two capillary resistances should be used when testing samples having an average particle diameter of 20 to 50 microns.

**F-4d(2)c. Determination of average particle diameter.**—Screw one of the porous plugs on the plug manipulator. (See fig. 2.) Lay a filter paper disc ( $\frac{3}{8}$  inch diameter and made of paper of a medium-rapid retentive qualitative type) over one end of the sample tube and push the plug into the sample tube a distance of approximately 0.5 inch with the perforated surface of the plug against the surface of the paper disc. Force the paper to crimp around the edges and precede the plug into the sample tube. Place the sample tube in a vertical position with the paper side of the plug up. Weigh out 8.00 gm. of dry sample and transfer to the sample tube with the aid of a small funnel. Tap the side of the tube to settle the powder. Lay a second paper disc over the top of the sample tube, attach the second porous plug to the plug manipulator, and force the plug and paper disc down into the sample tube. Tap the tube to settle the powder and firmly press the plug down on the sample. Remove the manipulator. Place the sample tube in the sample height gage and measure the height of the sample in the tube. Record this value as L. Attach the sample tube to the apparatus and start the air pump. Adjust the air flow so that air bubbles from the inner tube of the pressure regulator at a rate of 3 to 5 bubbles per second. Allow the water level to rise in the manometer until it reaches a maximum. Measure the difference in height between the two arms of the manometer and record this value as F. Calculate the average particle diameter using the following formula and report the average of two determinations.

$$d_m = 1.064L \sqrt{\frac{CF}{(1.28L-1)^2 (50-F)}}$$

where

- $d_m$  = average particle diameter of sample in microns  
 L = height of sample in sample tube in cm.  
 C = conductance of the flowmeter in ml. per minute for a pressure difference of 50 gm. per cm.<sup>2</sup>  
 F = difference in height of liquid in arms of manometer in cm.

**F-5. Resubmission.**—If the composite sample representative of the lot fails to pass the inspection tests, the manufacturer shall have the option of having analysis of each primary sample made without expense to the Government. The manufacturer

[JAN-N-4.2A]

(3)

5

may then remove or replace defective portions of the lot represented by the primary samples which fail to meet the requirements, and submit the lot for acceptance, provided that the markings on the container are such that complete removal or replacement of defective portions of the lot can be made to the satisfaction of the inspector.

#### G. PACKAGING, PACKING, AND MARKING FOR SHIPMENT

G-1. *Packing.*—Nickel powder shall be packed and shipped in such a manner as to insure acceptance by common or other carrier for safe transportation at the lowest rate to the point of delivery.

#### G-2. *Marking.*—

G-2a. *Army.*—In addition to any special marking required by the contract or order, shipments for the Army shall be marked in accordance with the requirements of U. S. Army Specification 100-2.

G-2b. *Navy.*—Shipping containers for Navy purchases shall be marked with the name of the material, the specification number, the quantity contained therein as specified in the contract or order, the name of the contractor, the name of the manufacturer, the number of the contract or order, and the gross weight.

#### H. NOTES

H-1. *Use.*—Powdered nickel covered by this specification is intended for use in the manufacture of nongaseous fuze powder.

H-2. Requests, requisitions, schedules, and contracts or orders should specify the title, number, and date of the specification.

H-3. The Fischer Sub-Sieve Sizer, Catalogue 90, No. 14-312 manufactured by the Fischer Scientific Company, Pittsburgh, Pa., complies with the requirements of the instrument described herein.

H-4. Copies of National Military Establishment, Joint Army-Navy, and Federal specifications (required for Army and Air Force purchases) and U. S. Army specifications may be obtained as indicated in the "Index of United States Army, Joint Army-Navy, and Federal Specifications and Standards." Copies of this Index may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Agencies within the Departments of the Army and the Department of the Air Force will obtain copies of Joint Army-Navy, U. S. Army, and Federal specifications through established departmental channels. Both the title and identifying symbol number should be stipulated when requesting copies of specifications.

H-5. Copies of National Military Establishment, Joint Army-Navy, and Federal specifications (required for Navy purchases), and Navy Department specifications may be obtained upon application to the Bureau of Supplies and Accounts, Navy Department, Washington 25, D. C., except that Naval activities should make application to the Supply Officer in Command, Naval Supply Center, Norfolk 11, Va. Both the title and identifying symbol number should be stipulated when requesting copies of specifications.

[JAN-N-412A]

H-6. Copies of this National Military Establishment specification (required for Department of Army purchases) may be obtained from the Office, Chief of Ordnance, Department of the Army, Washington 25, D. C.

Notice.—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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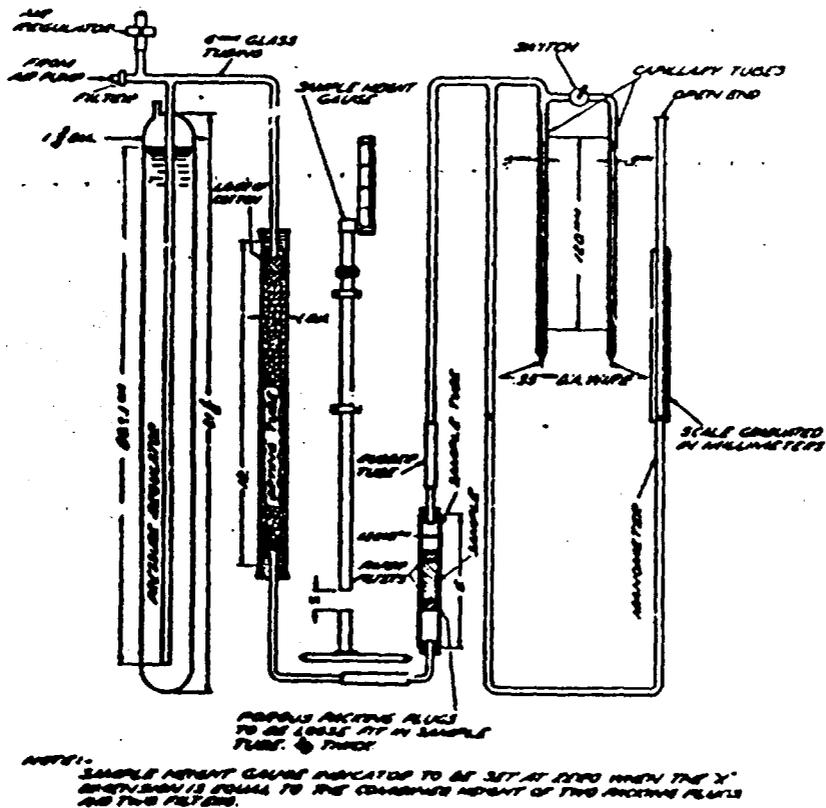


FIGURE 1.—Sub-sieve sizer.

[JAN-N-412A]

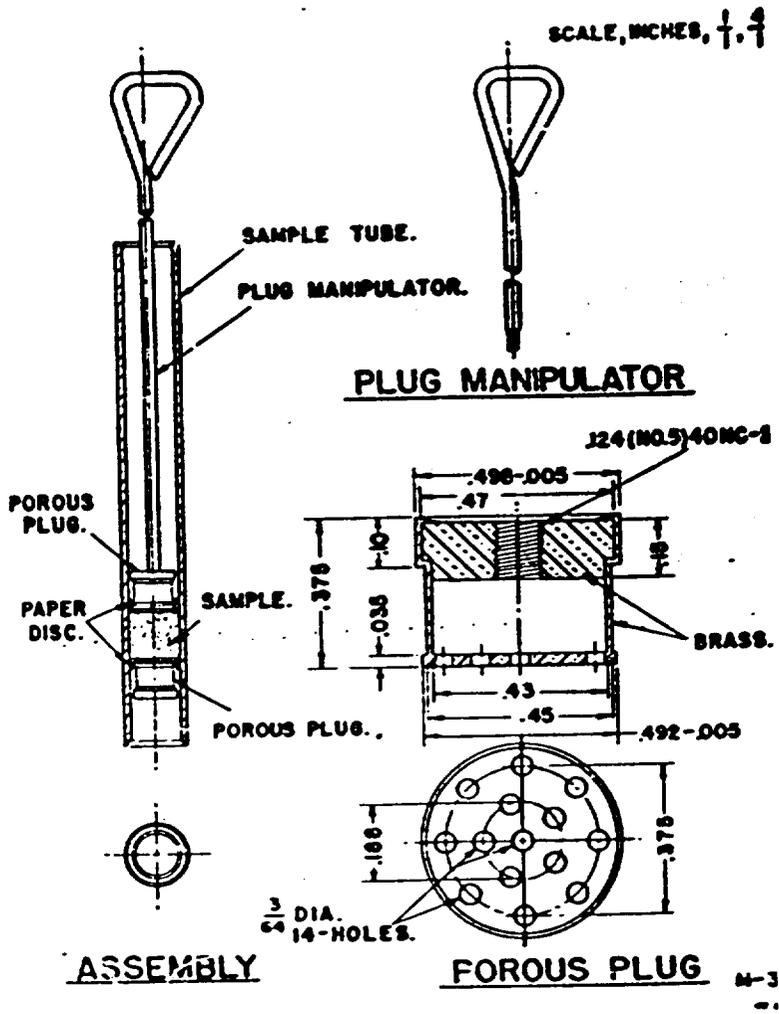


FIGURE 2.—Sub-sieve sizer—details.

[JAN-N-412A]