was discussed, and the belief was expressed that a change from 1,853.248 meters to 1,852 meters would not affect nautical charts, the calibration of navigational instruments, or navigation. Because there seemed to be no sound reason why the International Nautical Mile should not be adopted in this country, the Departments of Commerce and Defense agreed to accept this value as of July 1, 1954, the announcement to be made by the National Bureau of Standards.

Identical directives, in the names of the two departments, have been mutually adopted. The Department of Commerce directive is as follows:

Adoption of International Nautical Mile

I. Purpose

To adopt the International Nautical Mile for use as a standard value within the Department of Commerce.

II. Implementation

After the effective date of this directive, the International Nautical Mile (1,852 meters, 6,076.10333 . . . feet), shall be used within the Department of Commerce as the standard length of the nautical mile.

III. Effective date

This directive is effective 1 July 1954.

It will be noted that in the forgoing announcement one of the equivalents of the international nautical mile is stated as 6,076.10333 . . . feet. The three dots following the last digit indicate a continuing repetition of the digit 3.

By reference to appendix 5, it will be found that the equivalent of the international nautical mile in feet is stated as approximately 6,076.11549 international feet; this latest value represents no change in the length of the nautical mile—1852 meters—but is merely a restatement of the equivalent in terms of the international foot which is shorter than the former United States foot by two parts in a million.

Appendix 5. The United States Yard and Pound

The following statement of the Department of Commerce concerning a refinement of values for the yard and the avoirdupois pound, approved June 25, 1959, is quoted from the Federal Register of July 1, 1959:

Refinement of Values for the Yard and the Pound

Background. The National Bureau of Standards, founded in 1901, is authorized by statute (U.S. Code, Title 15, Ch. 7, sec. 272) to undertake "The custody, maintenance, and development of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards. * * *" Under this authority the National Bureau of Standards has sought to refine and extend the standards to meet the continuing requirements of science and industry for increased accuracy and uniformity of measurement.

Since 1893 the National Bureau of Standards and its predecessor agency, the Office of Standard Weights and Measures of the Treasury Department, have derived the yard and the pound and the multiples and submultiples of these units from metric standards, namely the international meter and the international kilogram. The original announcement of this derivation, together with the numerical ratios upon which the derivations were based, is given in Bulletin 26, "Fundamental Standards of Length and Mass", of the U.S. Coast and Geodetic Survey, approved for publication April 5, 1893, by the Secretary of the Treasury. An amendment to the 1893 Bulletin was made in 1894 in which there was a small adjustment in the pound-kilogram ratio to bring it into closer agreement with the British Imperial pound.

In the latter half of the period since 1893 minor but troublesome discrepancies have developed among various groups, both in this country and abroad, that are concerned with very accurate measurements involving yard and pound units or their customary multiples and submultiples. As a result of study and negotiation, it has developed that most of the discrepancies can be resolved and a high degree of measurement uniformity obtained by small refinements of the ratios defined in the 1893–94 bulletins relating the yard and pound to the meter and kilogram. Accordingly, the following announcement is made:

Announcement. Effective July 1, 1959, all calibrations in the U.S. customary system of weights and measures carried out by the National Bureau of Standards will continue to be based upon metric measurement standards and except those for the U.S. Coast and Geodetic Survey as noted below, will be made in terms of the following exact equivalents and appropriate multiples and submultiples:

$$1 \text{ yard} = 0.914\,4 \text{ meter}$$
$$1 \text{ pound (avoirdupois)} = 0.453\,592\,37 \text{ kilogram}$$

Currently, the units defined by these same equivalents, which have been designated as the International Yard and the International Pound, respectively, will be used by the National Standards Laboratories of Australia, Canada, New Zealand, South Africa, and United Kingdom; thus there will be brought about international accord on the yard and pound by the English-speaking nations of the world, in precise measurements involving these basic units.

Any data expressed in feet derived from and published as a result of geodetic surveys within the United States will continue to bear the following relationship as defined in 1893:

$$1 \text{ foot} = \frac{1200}{3937} \text{ meter}$$

The foot unit defined by this equation shall be referred to as the U.S. Survey Foot and it shall continue to be used, for the purpose given herein, until such a time as it becomes desirable and expedient to readjust the basic geodetic survey networks in the United States, after which the ratio of a yard, equal to 0.914 4 meter shall apply.

Relation to Previously Defined Standards

In 1866 (U.S. Code 1952 Ed., Titles 15, Ch. 6, secs. 204 and 205) the Congress legalized the use of the metric system within the United States. The law also established approximate equivalents between customary and metric measures. The above ratios between the yard and pound and metric measures as well as those defined in the 1893–94 bulletins are consistent with the ratios established by Congress in 1866 within the limits of accuracy by which the latter are expressed.

Yard. In the 1893 Bulletin the yard was defined as:

$$1 \text{ yard} = \frac{3600}{3937} \text{ meter}$$

which results in the approximate relation:

$$1 \text{ yard} = 0.914\,401\,83 \text{ meter}$$

Thus the new value for the yard is smaller by 2 parts in one million than the 1893 yard. Numerical measures expressed in terms of the new unit will, therefore, be increased by 2 parts in one million.

Pound. The pound was defined in the 1893 Bulletin as:

$$1 \text{ pound (avoirdupois)} = \frac{1}{2.20462} \text{ kilogram}$$

The 1894 amendment based on a recent determination of the British Imperial pound, gave the ratio as:

$$1 \text{ pound (avoirdupois)} = \frac{1}{2.20462234} \text{ kilogram}$$

which results in the approximate relation:

$$1 \text{ pound (avoirdupois)} = 0.453\ 592\ 4277 \text{ kilogram}$$

Thus the new value for the pound is smaller by about 1 part in 10 million than the 1894 pound. Numerical measures expressed in terms of the new unit will, therefore, be increased by about 1 part in 10 million.

Changes concern science and precision tools. Such small changes are beyond the limits of accuracy by which many reference standards are now calibrated by the National Bureau of Standards, including the standards furnished to or calibrated for the State governments. Therefore, the refinements in the definitions of the yard and the pound will have no effect at all upon ordinary trade and commerce. The differences are significant, however, in a number of very precise metrological determinations such as are found in the precision machine tool and instrument industries and in certain scientific activities.

Standard inch. The value for the inch, derived from the value for the yard effective July 1, 1959, is exactly equivalent to 25.4 millimeters. It may be noted that this value was approved by the American Standards Association for "Inch-millimeter Conversion for Industrial Use" in 1933 (ASA Standard B48.1–1933), was adopted by the National Advisory Committee for Aeronautics in 1952, and has been adopted by many standardizing organizations in other countries.

Relation to grain. The new conversion factor for the pound is exactly divisable by 7 and results in the following exact value for the grain:

$$1 \text{ grain} = 0.064\ 798\ 91 \text{ gram}$$

The grain is the common unit of the avoirdupois, apothecary, and troy systems, there being 7000 grains in the avoirdupois pound and 5760 grains in the apothecary pound and in the troy pound.

Nautical mile. On July 1, 1954, it was announced that the Secretary of Commerce and the Secretary of Defense had agreed officially that the International Nautical Mile would henceforth be used within their respective departments. The International Nautical Mile is based on the meter and is equal to 1852 meters. Based on the yard-meter relationship then in use, the International Nautical Mile was shown as being equivalent to 6,076.10333 feet. Under the new conversion factor, the International Nautical Mile is equivalent to 6,076.11549 International feet approximately.

(For a detailed treatment of the Federal basis for weights and measures, see National Bureau of Standards Circular 593, The Federal Basis for Weights and Measures, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., price 30 cents.)

[SEAL]

A. V. ASTIN,
Director,
National Bureau of Standards.
H. ARNOLD KARO,
Rear Admiral,
Director, Coast and Geodetic Survey.

Approved: June 25, 1959.
F. H. MUELLER,
Under Secretary of Commerce.

[F.R. Doc. 59-5442; Filed, June 30, 1959; 8:45 a.m.]

Appendix 6. Adoption of the Wavelength Definition of the Meter

The following account concerning the adoption of the wavelength definition of the meter is quoted from the National Bureau of Standards Technical News Bulletin of December 1960:

Wavelength of Kr^{86} Light Becomes New International Standard of Length

On October 14, 1960 the world adopted a new international standard of length—a wavelength of light—replacing the meter bar which had served as the standard for over 70 years. The action was taken by the 11th General Conference on Weights and Measures, which met in Paris.

Dr. Allen V. Astin, NBS Director, headed the American delegation to the Conference. The delegation also included Louis Polk, President, Sheffield Corporation; Elmer Hutchisson, Director, American Institute of Physics; A. G. McNish, Chief, Metrology Division, NBS; T. H. Osgood, U.S. Scientific Attaché, London, and Marten Van Heuven and Benjamin Bock, U.S. State Department.

Other actions taken by the Conference included the establishment of a central facility at the International Bureau of Weights and Measures for international coordination of radiation measurements, confirmation of a new definition of the second of time, and adoption of refinements in the scales for temperature measurements.

The new definition of the meter as 1,650,763.73 wavelengths of the orange-red line of krypton 86 will replace the platinum-iridium meter bar which has been kept at Paris as an international standard for length since 1889 under the Treaty of the Meter.

These actions of the General Conference are of great importance to those engaged in precision measurements in science and industry. For many years the world has relied on a material standard of length—the distance between two engraved lines on the International Meter Bar kept at Paris Duplicates of the International Standard were maintained in the standards laboratories of other countries of the world. From time to time it was necessary to return these duplicates to Paris for recalibration, and occasionally discrepant results were obtained in these recalibrations. Also, there was doubt in the minds of some scientists regarding the stability of the International Meter Bar. The new definition of the meter relates it to a constant of nature, the wavelength of a specified kind of light, which