many combinations and forms in which these elements exist in the various crude petroleums recovered from the earth present a wide range of problems for the chemist and the practical refiner. This statement has become particularly true in the past few years because, in spite of the enormous increase in the production of crude petroleum, not alone in the United States, but in the entire world, consumption has kept pace with supply and is continually threatening to outstrip it. Notwithstanding the jump in production in the United States from 2,000 to nearly 300,000,000 barrels of crude petroleum a year in the short space of 55 years (1859 to 1914), the diversified uses to which the many readily recoverable products have been put has called for ever-increasing supplies. The stocks of crude oil in storage above ground, notwithstanding the tremendous floods of oil that such fields as the Cushing pool, with a past maximum production of over 300,000 barrels a day, and the famous Maricopa field have produced, have remained practically constant for several years past at approximately 120,000,000 barrels. Large as this supply may seem, it represents less than six months' consumption by refineries.[a]

Evidently the race between production and consumption is of such a character that consumption will inevitably overtake production, because of the depletion of our known reservoirs of oil and the limited extent of prospective oil lands in this country.

DRAINS ON PETROLEUM OF THE UNITED STATES.

The demand for petroleum products, having been created, must continue to be supplied, and the United States, with its production of approximately 65 per cent of the world's supply, is to be drawn on in increasing measure by other countries that have learned the value and usefulness of these products and have come to be dependent on them. The world's demands must be supplied by relatively few fields, as, notwithstanding the fact that oil is found in almost every quarter of the globe, three countries—the United States, Russia, and Mexico—produce nearly 90 per cent of the world's output.

The period of 55 years that has witnessed the great increase in output of crude oils in the United States has seen also an equally great change in the relative desirability of various petroleum products. Beginning with the discovery of Prof. Benjamin Silliman, jr., of Yale University, that a satisfactory burning or illuminating oil could be obtained from crude petroleum, early efforts were devoted to the production of increasing quantities of this product. Enormous outputs were sold in the United States, and the markets were extended to foreign countries. During the year 1913, over 1,000,000,000 gal-

[a] Day, D. T., The production of petroleum in 1913: Mineral Resources U. S. for 1913, U. S. Geol. Survey, 1914, p. 946.

lons of burning oils was exported, representing a value, in round figures, of $72,000,000. In the same year nearly $150,000,000 worth of other petroleum products was shipped to foreign lands.[a]

PRESENT DEMAND FOR GASOLINE COMPARED WITH THAT FOR BURNING OILS.

The demand for motor fuel is outstripping that for illuminating oils in this country, and the increasing number of motor vehicles in operation, both at home and abroad, has brought about a need which, if it continues to increase at the present rate, will soon far exceed present production by ordinary means. So serious does this situation appear that recently the International Association of Recognized Automobile Clubs offered a prize of $100,000 for a gasoline substitute to cost less than gasoline. The acuteness of the need responsible for an offer of this nature becomes all the more evident when it is realized that a large proportion of the world's output of crude petroleum is of such a character as to produce by ordinary refining comparatively little gasoline and naphtha. Mexican oils are of this class. The result is that the demand for gasoline and naphtha must be supplied by the types of crude petroleums generally known as "refinable crudes." Even refinable crude petroleums are capable of yielding, by the usual refinery methods of distillation, only fractions of their total volumes as gasolines and naphthas. For example, a high-grade, refinable crude yields only between 15 and 25 per cent of refined naphthas and gasoline.

BURDEN OF SUPPLYING WORLD-WIDE DEMAND FOR GASOLINE FALLS ON UNITED STATES.

Although the United States now produces approximately 65 per cent of the world's supply of crude oils, it produces a much higher percentage of the total world output of refinable crudes. The result is that, unless efficient cracking processes are developed, the greater part of the burden of supplying the quantities of motor fuel demanded throughout the world must fall on the United States, as its chief competitors in the producing field, Russia and Mexico, furnish only relatively small quantities of such fuel.

The extent to which this demand is being met can be realized from a consideration of the exports of naphthas and gasolines during the past few years. In the period from 1910 to 1915 these exports more than trebled. During the fiscal year 1910, 77,650,923 gallons was exported; in 1911, 111,998,260 gallons; in 1912, 171,040,150 gallons; in 1914, 192,452,267 gallons,[b] and during the fiscal year ended June 30, 1915, 244,546,872 gallons.[c]

[a] Day, D. T., Op. cit., pp. 1084–1085.
[b] Foreign commerce and navigation of United States, 1914: U. S. Bureau of Foreign and Domestic Commerce, 1915, pp. 605–607.
[c] Monthly summaries of foreign commerce of United States, January and June, 1915: U. S. Bureau of Foreign and Domestic Commerce, 1915.