

**Zeitschrift:** Regio Basiliensis : Basler Zeitschrift für Geographie  
**Herausgeber:** Geographisch-Ethnologische Gesellschaft Basel ; Geographisches Institut der Universität Basel  
**Band:** 22 (1981)  
**Heft:** 2-3

**Artikel:** The internal boundaries of the United States and their relations to its road pattern  
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**DOI:** <https://doi.org/10.5169/seals-1088864>

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# The Internal Boundaries of the United States and their Relations to its Road Pattern

MAURICE E. PERRET

Flying over the central part of the United States, a traveller is surprised to see the uniformity of the land divisions. The country is divided into squares or rectangles with their sides oriented north-south and east-west and most roads are straight lines following the topography of the lots. One may think that this is due to the topographic conditions as this region is part of the vast plain between the Appalachian Mountains and the Western Ranges, but this situation is unique and only exists in part of the United States. Across the border in Canada, in Kentucky and Tennessee in the central part, and in Louisiana and Texas in the South, under the same conditions, the pattern is no longer regular. This pattern is the result of the surveying system of the land, called the United States Land Survey and it is found only in those areas that had not been surveyed before the American Revolution or before their acquisition by the United States.

Surveying the land goes back to very early times. An ancient Assyrian clay tablet has on its face a map of land surveyed well over five thousand years ago, and many times in the Bible references are made to land surveys. The Romans had a cadaster, signs of which are still traceable in parts of the Roman Empire. In Switzerland, the Roman cadaster could be retraced in the region of Aventicum (Avenches). The concept of land ownership and the need for boundaries between lots remained through the middle ages up to the present. The English system of surveying, called the «Metes and Bounds System» consists of marking the several corners or angles of a tract of land by monuments, stones or trees, when available using streams or shorelines as limits. This is the traditional system used in most countries (see Fig. 1). British used this system in their colonies. Spaniards, followed by Mexicans, made land grants surveyed on the same system. On the other hand French colonists started a new system of surveying. As they were penetrating the land by waterways, the shores of the streams that served as transportation routes were divided in equal parts and the lots extended at right angles away from the streams (see Fig. 2).

After the Revolution, Americans wanted to abandon English traditions and they decided to start a new system of surveying, on a rational plan proposed by Thomas Jefferson. In 1785, Congress authorized a survey of the territory

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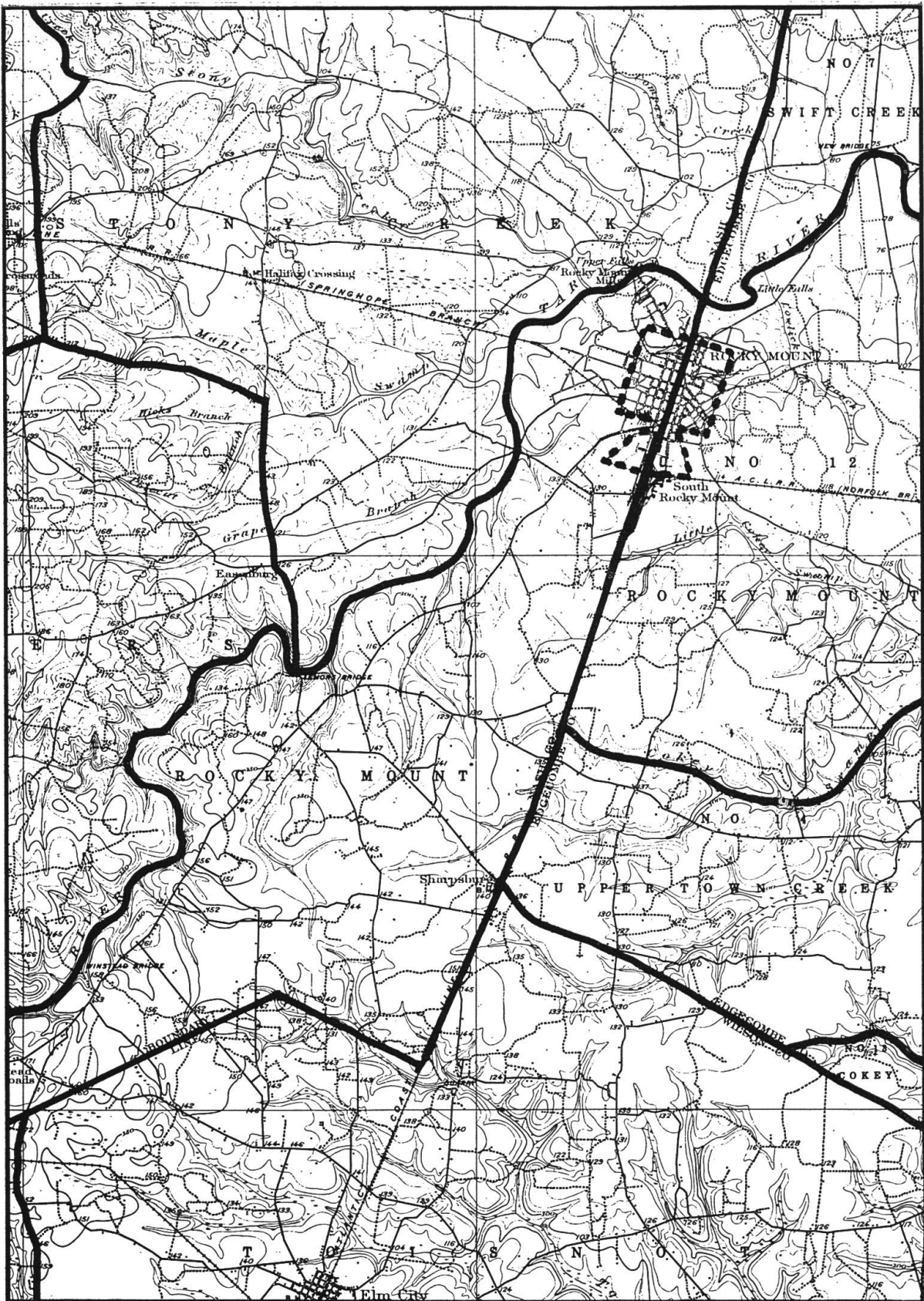


Fig.1 Irregular road pattern resulting from the «Metes and Bounds» Survey system, used in the former British colonies, map of Rocky Mountain, North Carolina (Based on topographical maps from U.S. Geological Survey)



Fig. 2 The Mississippi River used as a base for the French survey system («Long Lots»), the U.S. Land Survey used in areas away from the waterway, map of Donaldsonville, Louisiana (Based on topographical maps from U.S. Geological Survey)

lying north and west of the Ohio River, based on this new method that became known as the United States Land Survey System. There was no questions to resurvey the land that was already settled. Consequently, the thirteen former British colonies and the territories that they claimed (for instance the eastern part of Ohio and the present states of Kentucky and Tennessee) kept the Metes and Bounds system; the settled regions of Louisiana and some small areas such as Green Bay in Wisconsin and a few places along the Mississippi River kept the French system (also called the «Long Lots System»); Texas and the Spanish and Mexican land grants in California were not included in the new system.

According to the United States Land Survey System, the land is divided in six mile squares called congressional townships. The grid of townships is based upon parallels called base lines, the boundaries of the townships east and west are meridians. The work began in 1786 already. With regard to the size of the country and the existing divisions (states, territories, Indian reservations, land grants), several base lines and several meridians were used and named. When Washington became the capital, the meridian passing through it was called the Prime Meridian of the United States, but the principal meridians were established without consideration for prime meridians. There are 35 principal meridians and they do not correspond to even numbers of degrees from the Greenwich meridian and are not regularly spaced. The fourth principal meridian is at  $90^{\circ} 28' 45''$  from the Greenwich Meridian, the fifth at  $91^{\circ} 03' 42''$ , the sixth at  $97^{\circ} 23' 00''$ . Most of the base lines (there are 32 of them) are at even degrees of latitude. In addition to the numbered principal meridians, others have names, for instance the Navajo Meridian, the Salt Lake Meridian, the San Bernardino Meridian, the Mt. Diablo Meridian. Principal meridians and their corresponding base lines are used in areas varying in size, a small territory, one or several states. Of all the systems, the one based on the fifth principal meridian covers the largest area, in all it has an east-west spread covering 726 miles, a north-south extent of 1122 miles and is used in six states (see Fig. 3).

Congressional townships are numbered in relation to the base line and the principal meridian of the region. For instance, one congressional township may be indicated as Range 17 West of the 4th Principal Meridian, Township 6 North. Congressional townships are further divided into sections of one mile square containing 640 acres. They are identified by a numbering system that starts with section 1 in the northeastern corner of the township and ends with section 36 in the southeastern corner. The section can be further subdivided into quarter sections of 160 acres. Each quarter can be divided into halves or quarters. Thus a property may be described as occupying the SE  $\frac{1}{4}$  of the NW  $\frac{1}{4}$  of Section 17, Township 4 North, Range 6 East.

By definition, one congressional township has an area of 36 square miles, but as meridians are not parallels but converge toward the Pole, townships are not exact squares but trapeziums and their areas decrease from south to north. In order to avoid great differences, new parallels have been chosen as new base lines from which townships are again at six-mile intervals. These are called standard parallels or correction lines. As the survey was made mostly during

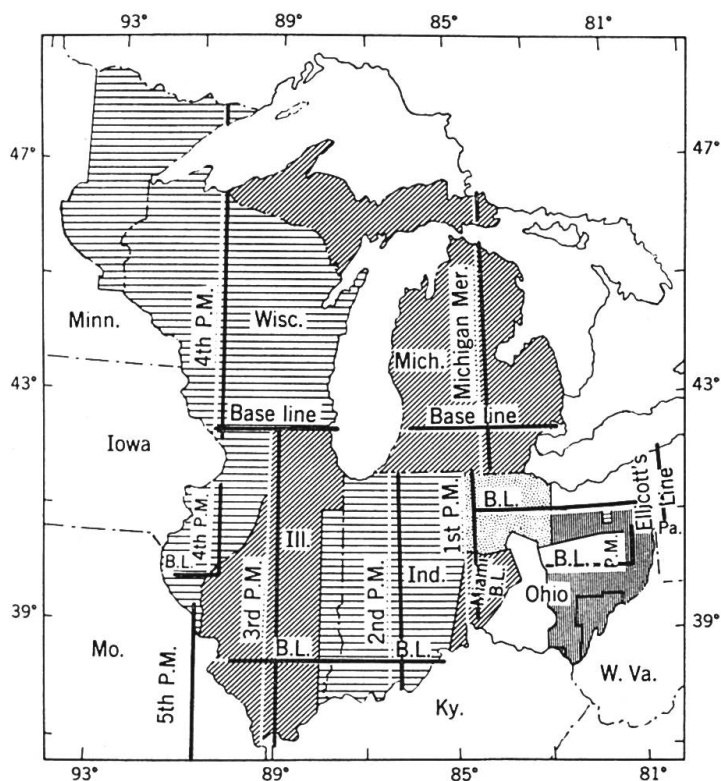


Fig. 3 Base lines and principal meridians representative of the U.S. Land Survey (After U.S. Dept. Interior, General Office Map of the United States, 1937)

the first part of last century, it is not perfect as some surveyors were not competent, or used poor equipment, or were hampered by some topographical features (lakes, swamps, hills, mountains). As a result, sections that should have an area of about 640 acres may only have 100 acres or as much as one thousand; instead of being squares some are rectangles; sides may be at an angle from true meridians and parallels (see Fig. 4).

Based on the U.S. Land Survey, many political boundaries have been set: states, counties, towns. For instance, when the Dakota Territory was divided into two states, the boundary was placed on the 7th principal parallel from the base line of the 5th principal meridian in preference to the 46th parallel of latitude which lies four miles to the north of it, because the former line was already in use as a boundary between townships. The base line of the 4th principal meridian is the boundary between the states of Illinois and Wisconsin. Many congressional townships became political towns or political townships (Gemeinden, communes), or served as a base when counties were divided into political towns or townships, some of them occupying several townships.

The area covered by the U.S. Land Survey consisted generally of public lands and they were sold to new settlers. The quarter of a section, 160 acres, became the basic unit used by the Public Land Office under the Homestead Act of 1862 dealing with public lands acquired by settlers from the government. Among the new settlers were Americans coming from the East and in quest of better land, but many were immigrants from various European countries who came in groups and settled in the same region forming ethnic colonies which have subsisted

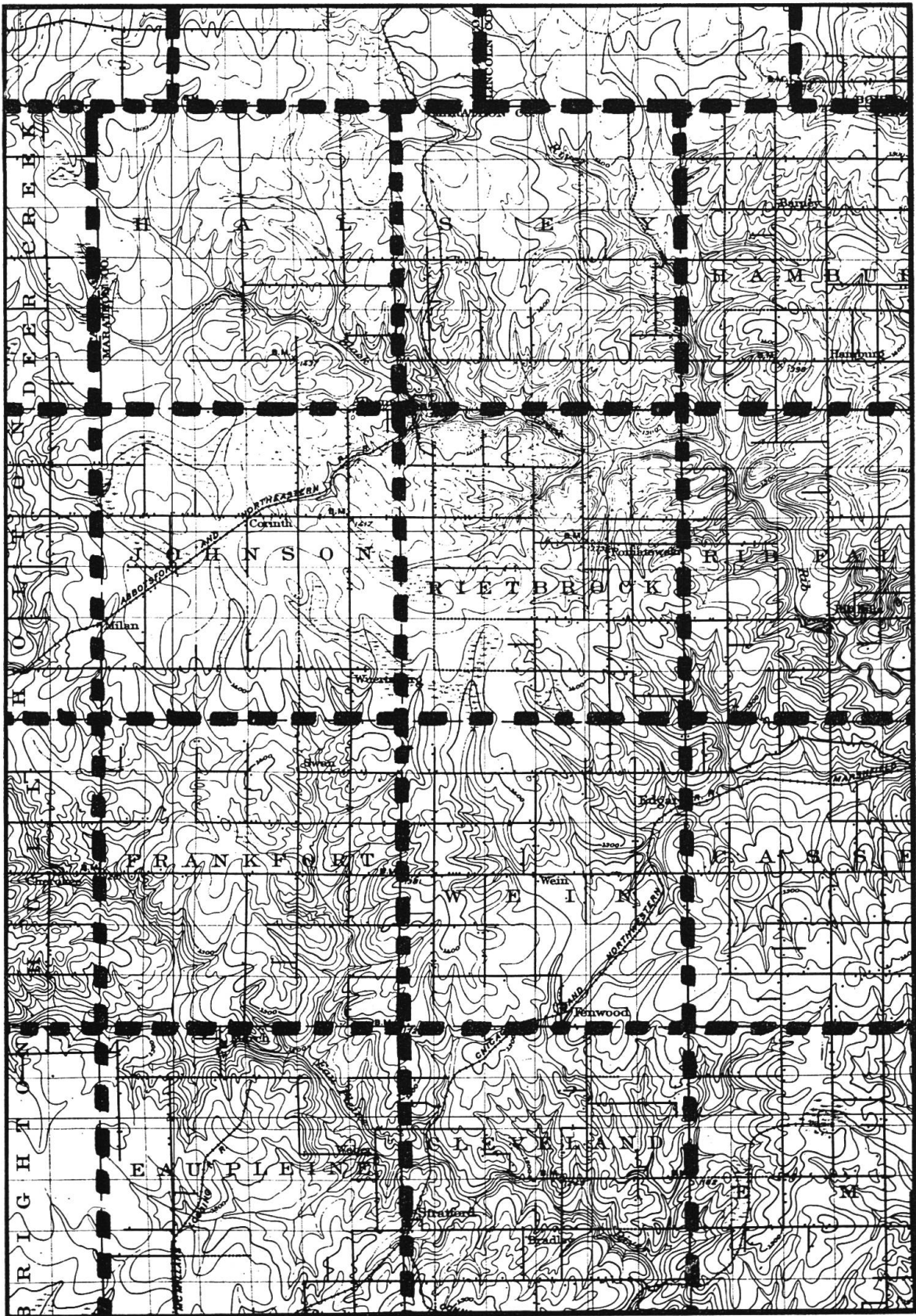


Fig. 4 Regular east-west and north-south road pattern resulting from the U.S. Land Survey dividing the line in congressional townships, with an example of a correction line, map of Marathon, Wisconsin (Based on topographical maps from U.S. Geological Survey)

until today. Although most of the European pioneers have passed away, their descendants, born in the United States and speaking only English, still form German, Polish, Norwegian, Swedish, Irish, Dutch and Swiss colonies.

Central places are developed, starting at crossroads as market places. They followed the pattern that Christaller recognized and presented in his theory about central places. The roads leading from the farms to the central places were built along property lines and consequently ran straight east-west and north-south. Some of the central places became cities and in this case some roads were built converging towards them and departing from the checkerboard pattern. Nevertheless, most of the local roads in the plains are straight lines and some may extend from one end of the state to the other, with jogs at the correction lines on the north-south roads. Where there is an obstacle (a lake, a swamp, a hill), or to avoid a steep slope on both sides of the valley of a stream, there may be a slight detour; but even in undulating topographies and even in some mountainous regions, the roads remain straight with ups and downs, what the French call «montagnes russes». Even, when the road is laid in the valley of a stream, it does not follow the river but is set in steps at right angles. As most roads are straight, motorists do not expect curves, consequently each curve is preceded by a road sign which indicates the direction and generally the speed at which the turn should be made, as little as 10 miles (16 km) per hour when the road is narrow and turns at a right angle, or 20, 30, 50 miles per hour when the road is wider and the curve not so sharp. Road crossings at right angle are dangerous and may cause collisions. Consequently, at each crossing, there are stop signs on the less important roads and when there are roads of equal importance, there are stop signs at all four corners, with the indication 4-way stops, meaning that the first car to stop has the right to start first. In area of dense traffic, there are light signals.

When the railroads were introduced, they were considered as a very important factor for the development of the country and consequently were given land or were granted the right to buy the land that they needed to build lines connecting cities and regions by direct routes. In this way, they were able to set their tracks regardless of the orientation of the U.S. Land Survey system. Railroad stations were established, often in the middle of farm land, and they were at the origin of many new towns and cities, where, instead of tracing a plan based on the land survey, the streets were traced parallel to the railroad tracks, although the land around the place is in the checkerboard pattern.

When the federal government organized the network of national highways instead of starting from the capital or from important cities as New York, Chicago, New Orleans or San Francisco, it created highways running north-south and east-west. They were numbered: even numbers for roads running east-west and odd numbers for north-south highways.

Nr. 2 starts at the line between Canada and the United States, runs through the states of Maine, New Hampshire and Vermont, then it is interrupted through Canada and starts again at Sault-Ste-Marie in the state of Michigan, at the border of Canada and then runs westwards to the Pacific Coast, north of the



city of Seattle. Nr. 98 is a short highway across Southern Florida. Nr. 1 follows the east coast, from Canada to Florida, Nr. 51 runs from Lake Superior to the Gulf of Mexico, almost as a straight meridian, Nr. 101 follows the Pacific Coast. With the introduction of freeways (Autobahnen, autoroutes), the government departed from the traditional pattern and the network was designed to connect all the states between them. The numbering still kept odd numbers for the freeways running more or less from north to south and even numbers for freeways in an east-west direction, but the numbering is the opposite of the federal highways. Interstate highway Nr. 4 runs across Florida from Tampa to Daytona Beach, Nr. 90 from Boston to Seattle passing through Albany (capital of the state of New York), Buffalo, Cleveland, Chicago, Madison (capital of the state of Wisconsin), Butte (Montana). The freeways were traced without consideration of the land surveys as they were intended to offer the shortest and fastest roads to connect regions and large cities. Most of the principal network is now completed and is contributing to a regular flow of traffic and a reduction of travel time by cars and trucks, but the checkerboard pattern of national, state, county, town and farm roads remains as the base for the local traffic wherever the U.S. Land Survey has been used.

The U.S. Land Survey is based on measurements of the customary British system. The regulation stipulates that «The chain (20.1168 meters) is the unit of linear measurement for the survey of public lands as prescribed by law. The chain is equal to 100 links or 66 feet. One mile is equal to 80 chains or 5280 feet. For the area measurements, the acre (0.4047 hectares) equal to 10 square chains or 43 560 square feet, or the square mile (259 hectares) are used.» These land measurements are one of the major obstacles that prevented, until now, the United States from adopting the metric system and even when the country officially adopts the metric system, the land will continue to be measured in miles and acres.

#### FRONTIÈRES INTERNES ET SYSTÈMES DES ROUTES DANS LES ÉTATS-UNIS

Aux Etats-Unis, la plupart des frontières (non seulement celles des Etats, mais encore celles de parcs nationaux et de forêts, de «counties», de «townships», de villes et même de simples propriétés) sont des lignes droites qui suivent les méridiens et les parallèles. Ceci est dû au système d'arpentage étatsunien, établi après l'accès à l'indépendance. Ce système divise le pays en carrés, les «townships», divisés eux-mêmes en trente-six sections d'une «square mile» (2,59 km<sup>2</sup>) chacune. La plupart des routes suivent les lignes des townships ou des sections et, par conséquent, filent tout droit en direction nord-sud ou est-ouest, sauf dans les régions montagneuses où elles sont partiellement adaptées à la configuration du terrain. Afin de raccourcir les distances entre des localités non sises sur le même méridien ou parallèle, certaines routes suivent des lignes obliques rayonnant à partir de centres tels que les capitales d'Etat, les «county seats» ou les villes industrielles.

Le réseau d'autoroutes établi récemment, renonçant au dessin routier régulier, relie les capitales et les grandes villes par les trajets les plus courts. Les régions peuplées avant l'indépendance se servent toujours des anciennes mesures: les «Metes and Bounds» des Britanniques dans les Etats de l'ouest, les «Long lots» français en Louisiane et dans certaines régions isolées, les

«Land grants» espagnols en Californie. Dans ces régions, les counties, les townships («parishes» = paroisses, en Louisiane) et les propriétés privées ont parfois des formes irrégulières, et par conséquent, le tracé des routes y est irrégulier.

#### BINNENGRENZEN UND STRASSENNETZ IN DEN USA

Zahlreiche Grenzen in den USA (nicht nur politische und Verwaltungsgrenzen, sondern auch solche von Nationalparks, Wäldern, Städten und sogar Besitzparzellen) verlaufen in geraden Linien, entlang Meridianen und Breitenkreisen. Dieser schematische Verlauf geht auf die Landvermessung zurück, die nach der Unabhängigkeit vorgenommen wurde. Das Land ist in Quadrate eingeteilt, die «townships», diese in jeweils 36 «sections», die je 2,56 km<sup>2</sup> Fläche (1 Quadratmeile) umfassen. Die meisten Strassen folgen den Grenzen von «townships» oder «sections», d. h. gradlinig N–S bzw. W–E. Nur in bergigem Terrain sind sie etwas an die Topographie angepasst. Um bedeutende Orte, die nicht auf dem gleichen Meridian oder Breitenkreis liegen, möglichst direkt zu verbinden, schneiden gewisse Strassen dieses Schema diagonal durch; sie strahlen sternförmig von bedeutenden Zentren aus (Hauptstadt, Industriezentrum).

Das neue Autobahnnetz («freeways») hält sich nicht an das reguläre Muster, sondern stellt die kürzeste Verbindung zwischen Hauptstädten und Grossstädten her. In den Gebieten, die bereits vor der Unabhängigkeit besiedelt waren, haben sich die alten Formen der Landeinteilung (englisch, französisch, spanisch) erhalten. Die «townships» etc. haben deshalb unregelmässige Formen, und die Strassen zeigen einen entsprechenden Verlauf.

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