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Title: TOPOGRAPHIC MAPPING IN HUNGARY

Source: Mitteilungen des Reichsamts fuer Landesaufnahme, No 2, 1932-1933, German periodical

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The Topography of Hungary

~~Contributed by the Imperial Hungarian State Cartographic Institute.~~ By Aurel Medvey, Director of the Imperial Hungarian State Cartographic Institute.

Historical Summary

The oldest recorded document of Hungarian cartography is the map, dating back to 1528, which was drawn by Lazarus and Tanstetter on a scale of approximately 1: 1,200,000. The circumstances of the origin of this map are, for the most part, unknown, although it ~~might~~ may be a copy of an older original by Lazurus. A striking peculiarity of this map is the erroneous (no ~~observation~~ notation to this effect on the map) and distorted orientation ~~of the northeast direction~~. In other respects, the ~~illustration~~ of the country has been successfully carried out, and the remarkable accuracy of the individual details points to exact knowledge of the country and to ~~XXXXXXXXXX~~ scrupulous examination and use of the material.

For almost two centuries, the excellent map ~~of~~ by Lazarus constituted at first the direct and later, through the less successful map of Lazius (1556), the indirect source of all maps of Hungary, of which there was, a rather large number, stimulated by the need which arose from the wars against the Turks. Although these maps underwent various enlargements in content, the accuracy of the original Lazarus map was lost. Well known is the error whereby the double bend of the Danube River (Donauknie) was stretched out almost in a straight line, ~~XXXXXXXXXXXX~~ resulting in the complete distortion of the representation of the country.

~~Only the military conquests, effected by the wars against the Turks, of individual fortresses, border regions and other similar installations constitute an important enlargement of the cartography in this epoch.~~ The most significant work in this respect is connected with the name of the Italian Count and Imperial ~~(Emperor's, kaiserliches)~~ General ~~of~~ Marsigli. His maps, ~~[illegible]~~

be the very famous Danube Map, are already based on astronomical position - finding. The precise contents and, above all, the strict, systematic use of data collected "on the spot" stamp his works as landmarks of the beginning of modern Hungarian cartography. Marsigli's assistant, J. Ch. Mueller from Nuernberg, also relied on these basic principles in his four-page map of Hungary which appeared in 1709 on a scale of 1: 550,000. Mueller's map was an excellent concentration of all reliable data known up to that time, and was, as the first modern map of Hungary, the best of those in general use throughout some 100 years. Richer in content but less valuable from a cartographic standpoint was the Lacy Map of 1769, intended solely for military purposes, on a scale of 1: 360,000.

Just as the aforementioned map, the First Military Land Survey (the Joseph Survey) did not yield material of general accessability and was, therefore, also of very little cartographic value. The survey of Hungary took place from 1766 to 1773 and from 1782 to 1785, was based on graphic triangulation, and consists of 1,451 original surveys on a scale of 1: 28,800. Unfortunately this superb survey, priceless in its intrinsic value as a masterpiece of eighteenth century cartography, was not made accessible for general use and for further work, (research - Auswertung). Only a few hand copies, destined for private uses, were made of these surveys. Of the Transylvanian papers, condensations in writing were made by Major Jeney on a scale of 1 : 96,500, and by the Hungarian Colonel Neu on a scale of 1: 115,200 and 1: 192,000. It might also be noted that the semi-official "Fallon" outline map which appeared in 1822, the first such map of the former monarchy, is also partially based on the First Military Land Survey.

Several decades before this First Land Survey, during the 1730's, the reformer of Hungarian cartography, Samuel Mikoviny, began his work. He was appointed by King Karl III (Emperor Karl VI) to furnish the map supplements for Matis Bel's great historical-geographical work "Notitia Hungariae.....". Mikoviny chose the meridian through Pozsony as the prime meridian and selected a base line in the

vicinity of this city; ~~proceeding on these hypotheses~~, he created an extensive triangular network ~~(Dreiecksnetz)~~ with several astronomically determined points. He proceeded as accurately as possible in the details of the surveys, so that his maps by far surpass in excellence those of most of his contemporaries and must be deemed an honor to the cartography of that time.

After the geodetic works of Mikoviny came the triangulation surveys of Liesganig in 1769, and the astronomical works of P. Maximilian Hell in 1776 and of Bogdanich in 1798-1800. Mikoviny's maps were succeeded by constantly increasing numbers of county maps, most of which were very well done by official county engineers, such as Balla, Kenedich and others. With these maps as the basis, the first county atlases came into being: Korabinszky's little "Atlas portatilis" in 1804 and Goeroeg's sixty-page atlas, ~~published~~ in 1793, ~~and remained unsurpassed series~~ until the middle of the last century.

In 1806 the excellent and very famous map of Lipszky, on a scale of 1: 469, 472, appeared as a synopsis of all these various valuable geodetic and astronomic works, ~~and of~~ more than 600 independent original surveys. Sydow comments as follows on this, perhaps most splendid work of unofficial ~~topographical~~ Hungarian cartography: "As the product of great diligence, it rightfully attracted much attention and became the source of all later maps of Hungary" (Petermann's Reports, 1857, page 62). The map by Franz Karacs, which was engraved on copper, was printed in several editions; later, in 1836, it was revised by Schedius and Blaschnek, particularly with regard to ~~the boundary regions~~, and it remained in this form as the best map of Hungary, and the one most in demand, for decades until the first official topographic maps were published.

In the meantime, after several interruptions, the monarchy's Second Topographical Land Survey, ~~having been~~ begun in 1806, was completed in 1869. This survey, which extended throughout the entire monarchy, as will be explained subsequently in greater detail, was based on eleven triangulation networks, each ~~considerably~~ independent of ~~one another~~ the others and not mutually ~~XXX-XXXXXX~~ consistent (almost every Kronland [crown district] had its own network); it was further based on a rather defective network of elevations ~~(II)~~ and, finally, partly on the results of the land-registry surveys which had been instituted simultaneously.

The original survey was made on a scale of 1: 28,800; it formed the basis for the special maps on a scale of 1: 144,000 and the general maps on a scale of 1: 288,000. The publication of these two types of maps was then accomplished gradually.

The geodetic work in the structure of these maps, particularly the continued troubles caused by separate parts of the publication was never finally completed - constituted factors which were very detrimental to the value of this otherwise excellently edited work.

In 1856 the famous Schedler General map, an unofficial map, achieved a unified coordination of this survey on a scale of 1: 576,000. Later this was extended throughout the whole of Central Europe and, on an enlarged scale of 1:300,000, served as the official map.

The work of the Second Topographical Land Survey was carried out by units of the permanent military authorities; the Trigonometric Bureau as of 1806, the Topographic-Lithographic Institute as of 1816, and finally, after the incorporation of these offices with the Lombardian Geographic Institute founded by Napoleon in Milano, by the Military-Geographic Institute in Vienna, as of 1839.

After the compromise with Austria in 1868, August Toth, on the occasion of a reorganization of the Vienna Military-Geographic Institute, initiated a proposal which aimed at the establishment of a separate Hungarian Topographic Institute. Unfortunately, the classic ideas of this pioneer of Hungarian topography were not realized; only a cartographic division of minor importance was set up in connection with the Ministry of Transportation. Later, after the resignation of Toth, under whose leadership the organization had performed very valuable work (also with regard to foreign countries), even this division was taken over by the state printing works.

In comparison with the above, the development of the Hungarian land-registry system was all the more gratifying and significant. The work of this organization - today known as the Official Imperial Hungarian State Land Survey Institute (Allami Foeldmeres) - was started in 1853 and consisted of the completion of the triangulation network, first to form the; in connection with the military network, and a detailed survey on a scale of 1: 2,880. The

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latter constituted an excellent foundation for the topographical survey.

From this time forward, the topographical survey remained a function of the Military-Geographic Institute. The most distinguished work of this world-famous institute was the topographical Land Survey, which was begun in 1869 and completed in the short, unprecedented period of eighteen years.

The basis for this survey was a standardized, consistent triangular network, which since 1862 was used for the Central European measurement of degrees and later for the international measurement of degrees. The resultant original survey, on a scale of 1: 25,000, constituted the foundation for the first complete topographic map on a large scale, namely the 746-page-board map which was produced during 1873 to 1889 on a scale of 1: 75,000. After these maps came the 305-page general (Generalkarte) of Central Europe on a scale of 1: 200,000, during the years 1887 to 1913, and the 54-page outline map of Central Europe, on a scale of 1: 750,000, during the years 1882 to 1886.

After the monarchy was dissolved following the World War of 1918, the Military-Geographic Institute, the basic work of the official topographic maps, the copyrighting and right of publication, was given over to be partitioned among the states which were granted the territory which was formerly German or Austrian. Hungary was thus awarded exclusive possession of the maps of its current terrority, on a scale of 1: 25,000 and 1: 75,000 (See p. 102, paragraph 3), and was also authorized publication of maps on the scales of 1: 200,000 and 1: 750,000. In order to continue the topographic projects, the Military Map Unit (Militärkartographische Abteilung) was set up in 1919 with the Hungarian members of the former Military-Geographical Institute, from which has originated the Imperial Hungarian State Cartographic Institute(Allami Terkepeszet) of today.

Since this time the large geodetic projects have been concentrated under the authority of the Imperial Hungarian Land Survey, that of the land-register (Kataster), the Imperial Hungarian Cartographic Institute takes over the geodetic groundwork from this office and supplements corrects it, if necessary, in accordance with its own requirements.

The Cartographic Institute, constituted, just as the State Land Sur-

vey, a department of the Imperial Hungarian Ministry of Finance; for a unified control of all surveying work, the State Surveying and Cartographic Commission was established in 1921.

The foundation material, as has been passed down in the maps of the Military-Geographic Institute, is, in general, completely obsolete. The survey papers (Aufnahmsblätter) on a scale of 1: 25,000 were not rectified, and their degree of accuracy no longer is adequate to the higher requirements of today. It is true that the used maps, on a scale of 1: 75,000, were permanently established for current use; nevertheless, because of the great number of changes, they require thorough improvement. This also applies to the maps, on a scale of 1: 200,000 and 1: 750,000. A general lack of all types of maps, since the foreign naming, the German legends for signs and abbreviations, and the very frequently recurring, awkward (sowal bonne) translations of the names of places are to their misrepresentation.

All these reasons compel us to instigate as necessary as quick and thorough improvement of the map material.

The basic material for the renovation of the maps is composed of the survey sections on a scale of 1: 25,000, which have been reconnoitered since 1920, or those which, since 1937, have been furnished by new topographical or aero-photogrammetrical surveys.

The resultant thorough revision of the maps of the country on a scale of 1: 75,000 finally constitutes the completion of the surveying work, whereas the current resumption of continued improvements involves difficulties (Laufendhaltung?, p. 103, para. 6).

The new maps of new versions, that is, the information gained in regard to the maps on a scale of 1: 25,000 and 1: 50,000 will be published in a completely new form, whereas those which have not been renewed, but suitably improved, will appear in the old Wiener Ausgabe (1). In accordance with the advancement of surveying, the maps on a scale of 1: 200,000 and 1: 750,000 will naturally also undergo revision.

The Geodetic Bases of Maps

Triangulation

Originally all astronomic-geodetic work, which constitutes the foundation for topographical work, was carried out by individual scholars whose work was subsidized by the state or by public corporations. In the case of the First Topographical Land Survey, the Joseph Survey, during the time of Emperor Joseph II, this work was combined with topography in the hands of the military.

As has already been mentioned in the preceding section, during the execution of the Second Topographical Land Survey from 1806 to 1869, all geodetic-topographic projects were assigned to permanently organized military authorities, and the land-register measurement, instituted in 1816, took over the entire results of the military triangulation.

The results of the land-register detailed surveys were then utilized in the topographical survey. At that time there were eleven different triangular networks, each network having its own starting point, so that almost each province had it's own independent system. Each of these systems was within itself a complete whole; the position of the points of a network in relation to each other was very readily determined for the requirements of that time. In the transition from one network to another, however, the greatest difficulties came to light, for not only was the reciprocal position of the coordinate elements (Koordinatenursprünge) unstable, but the networks were also disoriented with respect to each other.

This period, known as the "Old Main Network", lasted until 1863 in Hungary. This old main network formed into several subdivisions as follows:

1. The old main network, first to third order triangulation, west of the Danube River. This comprises, including the [illegible] line [illegible], all surveys of the Military-Geographic Institute up to 1848, and those of the Hungarian Land-registry from 1853 to 1856;

2. The Upper Hungarian old main network, first to third order triangulation, based on the former. In the case of both these networks, the coordinates were calculated without proper projection, according to a geometrical principle of equality of land surface (l. c. p. 104, paragraph 4) and the empirical

~~compensation~~ (Cassinian Projection). The [illegible] triangulation was executed, for the most part, graphically up to 1875, and the detailed [illegible] were made by plane table. The coordinate ~~source (Koordinatenursprung)~~ [illegible] was the east tower of the Budapest Observatory, the Ofen Observatory at [illegible] Gellertberg.

3. The Croatian-Slavonic old main network; point of origin is Ivanic Monastery, joined onto the network west of the Danube River.

4. The network of the Croatian-Slavonic military frontier, the military land-register, ~~(Militaerkataster)~~ comprises several systems which are independent of one another.

5. The old Transylvanian main network, based on the Nagyszeben (Hermannstadt) meridian.

The New Main Network

a. In Hungary proper.

Since unified development of the old network was no longer possible, in 1860 the Military-Geographic Institute decided to reorganize the entire Hungarian network, using the newer surveys of 1857.

The progress of the network development was as follows:

The starting point was the base line at Wienerneustadt, which was connected by a triangular chain with the base line of Szentanna near Arad, through Budapest. A triangular chain ran from Budapest in a northerly direction to the base line at Partin in Galicia. These triangular chains were then coordinated into a unit, using the method of the least squares; they comprised 71 points, 100 triangles and 154 conditional equations ~~(Bedingungsgleichungen)~~.

The second [illegible] was formed [illegible] of the base line of Partin with that of Radautz in Bukovina and the latter with Szentanna. It contains 75 points, 106 triangles and 165 conditional equations. This coordination project was one of the most extensive ever undertaken; the work required almost four years to complete (until 1864).

This very accurately adjusted new main network constitutes even

today the foundation of Hungarian land surveying and also of the topographical maps.

The remaining sections of the main network were covered by a first order triangulation network by the Hungarian Land Survey; the second and third order networks were superimposed on this network, and finally the fourth order (lowest order) network, which is used directly for making the maps, was superimposed on the latter. There is one triangulation point to approximately every 1.5 to 2 square kilometers.

After 1869, the stereographic principles of the Budapest system were established as the projection method for Hungary proper, with the exception of Croatia and Transylvania.

With this conformal projection the reduction is effected by means of the Marek-Hoffmann Tables in accordance with the Gaussian principle, from

First by Bessel's ellipsoid { a = 6,377,397 meters; b = 6,356,079 meters

to the Gaussian Sphere (Schmiegungskugel (Osculating Kugel)) { r = 6,378,513 meters; Norm parallel: 46° 32' 43",4104

and from this to the stereographic projection plane, which is tangent to the Gaussian sphere at the nadir of the east tower of the former Budapest (Ofen) Observatory on the Gellertberg.

The position of this coordinate origin, geodetically calculated by the Vienna Observatory (1874), is:

φ = 47° 29' 14", 93

λ = 36° 42' 51",69

The Gellertberg-Szechenyiberg Azimuth: α = 100° 47' 14", 34

The projection of the Budapest meridian on the stereographic plane forms the x-axis, and the line perpendicular to it the y-axis.

b. The new Transylvanian Main Network

This includes the network measured by the Military-Geographic Institute in the 1880's, between the new measured base line at Radautz, the base line at Brasso (Kronstadt), and the one at Szentanna, and was carefully coordinated into two groups.

The stereographic type of projection was used, with the origin of coordinate in Keszteljberg, and

a first order triangulation point near Marosvasarhely.

This system is known as the "Marosvasarhely System".

c. Finally, the Third Network, that for Croatia and Slavonia, was the "Ivanic System", for which the stereographic coordinate origin was the triangulation point at the Ivanic Monastery.

Since the distortions in length and in area were unfortunately rather large in these stereographic projections - in the case of the Budapest System, the longitude at the boundary near Orsova - the Survey Institute(land-register) felt it necessary in 1908 to introduce three oblique-axis cylindrical projections, whereby the distortion in remained under 1/10,000 . The Budapest meridian was retained as the x-axis; the for the northern system is a point with

φ = 46° 42'56", 3160
λ = 36° 42'53", 5733 east of Ferro

for the middle system

φ = 47° 08'46", 7267
λ = 36° 42'53", 5733 east of Ferro

for the southern system

φ = 45° 34'36", 5869
λ = 36° 42'53", 5733 east of Ferro.

The Gellertberg has the position:

φ = 47° 29'09", 6380
λ = 36° 42'53", 5733 east of Ferro

The Gellertberg-Szechenyiberg Azimuth of the year 1907 was

α = 100° 47'07", 90.

The tangentes of the cylinders with the Gaussian Sphere are the great circles which are perpendicular to the prime meridian at the points of origin.

This was the status of triangulation measurement in Hungary when the Military-Geographic Institute discontinued its activity following the collapse. The Hungarian Cartographic Institute, which was in the process of being organized, was confronted with the choice as to which geodetic bases its maps should be based on. Some of the factors which were of particular importance in the new arrangement (Neuordnung) were:

Circumstances prohibited important new geodetic projects on a large scale; the information already at hand had to be utilized. The Hungarian Land-Register already had a compact network of triangulation points, [illegible] for most of the country, whereas in the case of the [illegible] military triangulation, only [illegible] could be relied on as having been definitely established [illegible]. Therefore, the triangulation [illegible] of the Hungarian Land Survey was employed as the foundation of Hungary's topographic maps.

The idea of retaining the old polyconic projection was finally also dropped, for the basic [illegible] given in conformal plane coordinates, and those persons concerned were [illegible] not in favor of [illegible] of geographic positions.

The stereographic method of map projection was established with the Budapest (Gellertberg) coordinate [illegible] which is the same as the "Budapest System" [illegible] by the land-register, with the difference that the calculated position of the point of origin was [illegible] to be:

φ = 47° 29' 09",0380

λ = 36° 42' 53", 5733 east of Ferro,

as [illegible] deduced from the [illegible] astronomical observations. The Gellertberg-Nagyszal Azimuth of 1874 - α = 191° 28' 52", 19 - was left unchanged.

The advantage of the establishment of this system is that the whole of Hungary proper is represented in one system, [illegible]; moreover, figures of the new cylindrical projection can be converted easily and rapidly with the help of tables into those of the stereographic projection.

[illegible] The old page-arrangement [illegible] retained.

The difference between the corner points on the [illegible] and those of the old Vienna maps is [illegible] the fact that a new value has been [illegible] to the coordinate [illegible] the peculiarity of [illegible]. The stereographic corner points [illegible] are located on circles, [illegible] rectilineal joining is used to form the margin of the page, whereas the upper or lower [illegible] margins of the old maps appeared as tangents to the parallel of latitude. The coordinates taken from the Hungarian maps [illegible] on the kilometer network correspond ex-

actly with the ~~estimates of~~ the land-register.

Data on Elevations

All old maps of Hungary originated from the Third Land Survey of the Military-Geographic Institute which was conducted from 1869 to 1887. The military precision ~~leveling (directed counterclockwise)~~ was carried out from 1873 to 1898 by the Commission of International Geodesy. Consequently the elevation ~~estimates of~~ the old maps are still based mainly on the old trigonometric elevation network of the Institute.

After the dissolution of Austria-Hungary, the Hungarian Land Survey ~~XXXXX~~ took over the work of ~~Hungarian Precision Levelling~~. The old ~~Nivellements-~~ ~~sets (leveling networks)~~ are a distinguished piece of work of former times, still fulfills the demands of today for all practical purposes, but does not satisfy ideal requirements. In spite of the very slight difference in the two measurements $\mu = \pm 1.3$mm, the average error per kilometer ~~for the Hungarian Levelling~~ was frequently $m = \pm 5.0$mm. ~~(from Hungarian, author)~~

In 1920 the Hungarian Land-Register began the new measurement of the ~~Nivellementsnetzes~~. ~~Network Section I~~ is almost entirely finished, and ~~that of Section II~~ is being ~~XXXX~~ worked on. Retained as the starting point was the only original ~~point (Pomaner)~~ which remained on the territory of present-day Hungary, that is, the point "Nadap" of the ~~Militärprecisionsnivellementsnetzes~~ with its old absolute elevation ~~estimate (data)~~. Therefore, in the final analysis, all elevation ~~estimates of~~ this network refer to the elevation of ~~s~~ the Adriatic Sea at the fixed ~~tidal gauge of~~ Molo Sartorio in Trieste, which is the starting point of the old ~~Präzisionsnivellementsnetzes~~ of the Military-Geographic Institute. ~~(from page 107, paragraph)~~

The new and more exact ~~Nivellementsnetzes~~ of the Hungarian Land Survey ~~constitutes the foundation of~~ all Hungarian topographic elevation ~~estimates~~, whether the latter are derived directly from trigonometric altimetry or from ~~Nivellements Section~~ ~~found W of this~~ main network.

The Cartographic Institute takes over all points of the triangulation network, ~~first through fourth order~~, from the Hungarian Land Survey and supplements the network in accordance with its own requirements. The necessity of such

supplementation often occurs, since the land-register and the topographic surveying methods place different demands on triangulation measurements. Whereas the topographer requires that all prominent landmarks be provided with triangulation points, and obtains elevation framework only these points, the requirements of the land-registry engineer are those concerning horizontal surveying.

Because the elevations of the older triangulation network do not yet apply to the first order level of the new level net, section I, of the Land Survey, the Cartographic Institute itself measures the elevations of the triangulation points. This is done by trigonometry or by the inclusion of the triangulation points in the first order level lines. The latter method, measuring heights has frequently proved useful in the lowlands, for in this way, the time-consuming erection of signals on those triangulation points already known is avoided.

The Topographic Projects

The topographic projects of the Cartographic Institute consist of the new land survey on a scale of 1: 25,000, the map correction of the original land survey, and the topographic map, of the terrain on a scale of 1:25,000.

The method of survey on a scale of 1: 25,000 is adjusted according to the characteristics of the terrain and the basic material at hand. Nevertheless, the execution of the survey and the appraisal of its results is carried out in accordance with standard principles.

The basis for topographic surveying consists of the triangulation and elevation network, with the supplementary measurements, which appear to be necessary for the particular requirements of the topographic survey, and by the land-register surveys on a scale of 1: 2,880 and, in recent times, of 1: 2,000. After the kilometer network, the map margin, and the triangulation points have been drawn on the XXX land-register draft map, the reduced contents of this map are traced onto the draft sheet by means of a pantograph. The density of the triangulation network depends on the character of the terrain; in general, a there is a fixed point for every 1 - 2 square kilometers, depending upon the location and elevation.

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The topographer then reduces this network of points graphically to the dimensions required by the tachymetric detailed survey; for this, he uses the linear perspective, whereas he measures the detail points by dioptic means. For a tachymetric survey he uses a range finder-altimeter, [redacted] reading of 30". The distance is measured with rods, each 4 or 5 meters long. The contours of the terrain of a particular locale [redacted] by the topographer by means of contour lines, which he obtains [redacted] number of detail points, measured and calculated in the field, with the aid of relief and short contour lines. [redacted] the characteristics of the terrain, five to seventy such detail points are [redacted] each square kilometer. The main contour lines are spaced at intervals of 10 meters; however, in places where individual [redacted] are to be shown, auxiliary contour lines, each 5 or 2.5 meters high, can be used. Details of minor significance, which are not important enough to be represented by contour lines, such as small hills, undulations in the terrain, [redacted] and others, are indicated by hatching.

Surveying by aerial photography has already been used systematically for years, and was utilized in the new survey and also in gaining information for the map, [redacted] 1: 75,000. The manner and method of employment of aerial photographs is determined, on the one hand, by the purpose of the projects, and, on the other hand, by the terrain and the basic data available.

For new [redacted] on a scale of 1: 25,000, [redacted] for level land [redacted] in the following two ways:

1. If [redacted] land-register surveys are available, they are reduced to a scale of 1: 25,000 and their framework [redacted] with the aid of additional points by aerial photographs, [redacted] The aerial surveys are made with [redacted] f = 21 cm, at an altitude of 3,500 meters, having about [redacted] per cent overlap. The map, which has been prepared [redacted], is then completed by the topographer by the entry of elevation measurements, by drawing in the contour lines, and by denoting characteristics, [redacted] the land surface, names, and types of roads.

2. If the land-register survey is so outdated that it does not provide sufficient starting points for the transfer of the contents of the aerial photograph, a ~~photograph map is made by means of~~ on a scale of 1: 10,000, the topographer enters the characteristics of the terrain, as mentioned under (1) above, on a blueprint of 1: 25,000.

Aero-stereophotogrammetry is used for wooded, hilly or mountainous areas. The ~~XXXXXX~~ made with ~~the~~ f=21 cm, at an altitude of 2,100 meters. A Zeiss stereoplanigraph ~~serves~~ to evaluate the double plane ~~photograph~~ on a scale of 1: 10,000. A blueprint, ~~XXXXXXX~~ based on the results of the evaluation, is made, which is ~~XXXXXXXXXXXXXXX possibly supplemented XXXXXXXX XXXXXXXX~~ used for ~~perpetration and eventual supplementation of the terrain.~~

For all these ~~terrain~~ projects the topographer uses a ~~separate~~ key for the representation of the terrain, which ~~deviates~~ considerably from that of the published maps. The signs are selected so that they ~~on the one hand~~ give ~~the~~ accurate position and measurement proportionate to the scale, and ~~on the other hand~~ simplify the field work of the topographer. The final sketch is then made on a blueprint of the field work.

According to what has been stated above, the following methods of survey, ~~in conformity with~~ the type of terrain can be ~~XXXXXXXXXXXXXXXX~~ employed used:

1. The usual method of terrestrial surveying is ~~XXXXXXX~~ for open hilly and mountainous areas.

2. Stereo-photogrammetry is used for wooded hilly and mountainous areas.

3. ~~Simple~~ ~~photogrammetric(s)~~ is used for level areas.

The latter type of surveying has especial significance for Hungary, since about ~~XXX~~ sixty per cent of its total area is level.

The original ~~land survey on a scale of~~ 1: 25,000 map and the map on a scale of 1: 75,000 ~~are currently being~~ will, for the time being, be subjected to partial, or, if necessary, to complete revision. ~~XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX~~ ~~XXXXXXXXXXX~~ ~~Also incorporated with these adjustments will be the aerial survey the contents of which, because of the terrain perpetration, will be~~ results will be drawn in on the map by hand ... in the field. ~~XXXXXferred to XXX map XXX drawn on the map by hand (3 page 100, para 3).~~

The Atlases

The official topographic maps of Hungary are: the [redacted] map on a scale of 1: 25,000, the special map on a scale of 1: 75,000, the General Map on a scale of 1: 200,000, and the [redacted] Map on a scale of 1: 750,000.

The maps originated from the Third Land Survey, which was conducted from 1869 to 1887, of the former Austro-Hungarian Monarchy, and are being replaced by new maps in accordance with the new surveys now underway. The scale of the new maps, the arrangement of the pages, the key to the symbols, and, on the whole, their basic construction remain, in general, unaltered in comparison to those of the Vienna edition. More important innovations to be: the increased accuracy of the topographic base data; the use of a standard stereographic projection instead of the old polyconic projection; and, finally, the use of several colors in printing the maps, with the aid of contour lines. The maps are reproduced photomechanically by heliography or photolithography, and copies are made on offset presses; the map sections in the appendix show the method and style of execution (tables 2 to 7).

Various special maps are being published with the official maps as their bases; for example: the provincial maps on a scale of 1: 75,000; maps of the environs of larger cities; tourist maps; and maps for winter and aquatic sports, etc.

The map on a scale of 1: 25,000, comprises 414 sheets. The map has the largest scale of all the topographic maps and is a reproduction of the original survey. One page or section contains four ordnance-survey maps and represents one quarter part of the map; the degrees are 15' longitude from Ferro and 7'30" latitude. The average size of a sheet is 76 by 56 centimeters; one page covers about 260 square kilometers of ground surface.

The black-and-white copies of the 1:25,000 map are photolithographic copies of the original sheets of the Third Land Survey. The originals themselves are drawings done by hand in several colors, with hatched sketching of the terrain and 20-meter contour lines. They were originally not intended for publication but were to constitute the basic data for the maps on a scale of 1: 75,000, for which purpose they were also

entirely adequate. Their accuracy is limited; also, they were not kept up-to-date, which accounts for their obsolete contents. Under the pressure of circumstances, photolithographic copies in black-and-white were made from the originals and their technical execution is naturally also defective. Nevertheless, they are indispensable, because they are drawn on such a large scale, for which reason they must also remain in use until they are gradually replaced by the new maps on a scale of 1: 25,000.

The new map (see table 2) is the result of the of the old original survey, made from 1920 to 1936, and of the new survey begun in 1937. This map is the basis for all new maps. Of the 115 which have been published, the greater number, by far, consist of old original surveys which have been . The basic outline of these was completely re- on the basis of the land-register papers, whereas the representation of elevation was taken over from the old maps. Investigations as to the accuracy of both maps are still in progress.

As has already been mentioned, the entire country is represented by a stereographic plane, and the old observatory in Budapest(Gellertberg) is the point of origin of the coordinate system and of the kilometers recorded on the maps.

The map is a reproduction of the original map. The topographer makes the final on a blueprint of the original . One contains four survey maps or ordnance-survey maps, which are joined together with the aid of the kilometer network. The cartographer makes the final sketch of the aerophotogrammetric on a scale of 1: 25,000 and contains the kilometer network, triangulation points and the map margins. Within this framework the is accurately by means of a transparent . The blueprint is the reduction of the original from 1: 10,000 to 1: 25,000. The final of most of the were made in manner.

The final of the basic outline and of the XXX are made

separately. The basic outline includes all details which can be drawn to scale, 10-meter contour lines to represent the topography, and 5-meter and 2.5-meter auxiliary contour lines for individual formations, whereas those details which cannot be expressed by means of contour lines are represented by hatching.

From the final drawing, the offset plates of the basic plan or, the topographic features, are transferred by the photolithographic process to aluminum or zinc sheets; added to these are the wooded-area plate, and, in the case of the more important maps, a separate plate for bodies of water. The maps are reproduced in three or four colors as follows: black for the basic plan, cliffs and the legend; brown for the topographic features; green for woods and gardens; blue for bodies of water.

The degrees are marked on the corners of the page, and recorded on the margins are the subdivision into 1' and 5', the designation of the sheet, and the numbering of the kilometer network. Outside of the margin, the number and name of the map section is noted on the upper part of the page; on the lower part are noted the linear scale and relief scale, and also the dates of the survey, reconnaissance and publication.

The Special Map, comprises 122 sheets. The Special Map, the real objective of the Third Land Survey, was on a scale of 1: 75,000, larger than that of the other topographic maps of the Austro-Hungarian Monarchy. It was rightfully regarded as a masterpiece, and is worthy of being classed with the same type of large atlases of the previous century. Its consistent, clear construction, its compact structure and especially the very short period of time required to produce it (1873 to 1889), assured a position of unsurpassed value for this Special Map among others of its type.

The large scale of the map permits a great wealth of individual detail, along with greater legibility and more sharply defined means of representation. Its accuracy answers the demands which one is entitled to place on a map of this scale. The outline of the basic plan contains almost all details of the original map, whereas the representation of the topographic features are reproduced in a considerably condensed form, as though with vertical illumination, by the use of hatching and 100-meter contour lines, and occasionally also 50-meter con-

tour lines. The map is printed in one color. Contains individual sheets ~~[illegible] appeared in a second, improved~~ because additional data or corrections were received edition, ~~[illegible]~~

The representation was based on a polyconic projection. The map covers the area of four 1125,000 sheets and is equal to the eighth of the General Map on a scale of 1: 200,000, ~~[illegible]~~. The trapeziform sheets are bounded by the straight line representation of meridians or parallels of latitude, and longitude and latitude, ~~[illegible]~~ The dimensions of the sheets are, on the average, 50 x 37 cm; the surface covered is approximately 1,050 square kilometers.

The sheets for ~~[illegible]~~, which have been published, ~~[illegible]~~, in a revised second edition, are twenty to sixty years old. Since they were ~~[illegible]~~, the contents are ~~[illegible]~~ defective in many ways.

The old maps ~~[illegible]~~ gradually replaced by the new 1:75,000 maps; ~~[illegible]~~ the maps not revised will be published in reduced form on the basis of the revisions, but in the field and in the shop (Table 3). ~~[illegible]~~ The field work covers ~~[illegible]~~ all alterations of the basic plan and applies to the reinstatement of the Hungarian names; however, the partial adjustment, because of the extensive ~~[illegible]~~ keeping the maps up to date covers only the most important changes. The corrections are made on the original plate by means of copperplate engraving; only if the use of copperplate engraving were impracticable because of the large number of changes, would a new sketch be made in the format of the new 1:75,000 maps, ~~[illegible]~~.

The new 1:75,000 map (Table 4) ~~[illegible]~~ with the new 1:25,000 map ~~[illegible]~~ as its basis. The arrangement of the map and the amount of surface covered is the same as that of the old map, so that the old and new sheets for ~~[illegible]~~ joined together; moreover, the old margin was retained, whereas the entire contents of the map are represented by stereographic projection.

The drawing of the map, with separate outline plate and topographic plate, is done on a scale of 1: 60,000, using a reduction of the 1:25,000 map as a basis. The transparent overlays ~~[illegible]~~ the ~~[illegible]~~ section

network a
the kilometer XXXXX as basis, are inserted and copied exactly, using. The basic
is suitably reduced, unimportant material is deleted, and important de-
tails are emphasized.

Special care is devoted to the selection and placing of names and
of the elevation contours. The topographic plate consists of the occasionally
generalized contour lines, with 10-meter contour lines,
In addition, the concentrated hatching, characteristic shapes of the
terrain, is added. Original copperplates are made of the basic outline and
contour lines by heliogravure, whereas the hatching is directly trans-
ferred to the offset plates by means of photoengraving. The outline plate
is then supplemented by a plate for wooded areas, and a plate for bodies of
water which is engraved on copper.

The map is published by offset printing in five colors; script,
XXX basic outline and cliffs in black; wooded areas in green; bodies of water
in blue; contour lines in brown; hatching in gray-brown. The geographic
latitude and longitude, the kilometer lines and the distances
they represent, and the designation of the adjoining sheets are specified on the margins of the map page. Outside of the border the
number and XXXXX title are noted on the upper section of the map, and the
information as to the survey, revision, publication, and the linear scale
and relief.

Up to the present time, 12 new sheets have appeared on a scale of 1: 75,000;
an additional 18 sheets are being worked on.

The General Map on a scale of 1: 200,000; 61 sheets are allotted to
historical Hungary.

"The General Map of Central Europe on a Scale of 1: 200,000", of the
years 1887 to 1913, was actually intended as a military map for the former
Austro-Hungarian Monarchy. However, it fulfilled this purpose only partially;
because of its small scale, this map was not longer
suited for lower echelon tactics. Nevertheless, the clear topographic summary
which it offered guaranteed its suitability for varied scientific and
practical uses.

Each trapezoid formed by the parallels of latitude and the longitudinal meridians is represent-

ed by polyconic projection on the map. The full degrees run through the center of the sheet. The surface covered by one sheet amounts, on the average, to 8,500 square kilometers; the size of the sheet is about 38 by 56 centimeters. The special 1:75,000 map, and similar maps of the surrounding states served as the basic data; in the latter case, the material is of limited value, for example, in the Balkans. The basic outline presents a comparatively detailed and very distinct picture of the roads and settlements. The topographic features are represented in pen-and-pencil drawing without contour lines by means of very sharply defined hatching. A copperplate print was made of both the basic outline and the topographic features by means of heliogravure, and the sketches of bodies of water were put on stone in accordance with the water. lithographic process. The map was reproduced using four colors: black for script and basic outline; blue for bodies of water; brown for topographic features; green for the wooded areas, which helps to bring out the topographic features. the appearance of the terrain. (8)

The historical development of Hungary is represented on 61 sheets, the contents of which are being improved using the topographic features projects and the subdivisions (1) as the basis (Table 5). In cases where, as a result of the excessive number of changes, correcting the plates does not appear to be expedient, a new sketch of the page, with the exception of the topographic features of the terrain, will be made. Up to the present time, two sheets have been re-drawn, and an additional eight sheets are in the process of revision.

The survey map on a scale of 1: 750,000; 10 sheets are allotted to historical Hungary.

The survey map of Central Europe, on a scale of 1: 750,000, was made and published from 1881 to 1886, using the Bonne projection, and was based on the old general map on a scale of 1: 300,000. The sheet arrangement is independent of the network of parallels and meridians; the sheets are divided by coordinate lines into rectangular sheets of equal size, 33 by 39 centimeters; the area covered is 72,400 square kilometers. The map was printed with the use of four colors: black for basic outline; red for highways; blue for water; red-brown hatching for topographic features.

The historical developments Hungary comprises 10 sheets, all of which are being published in a revised form. The basic plan which, for the most part, is obsolete, is being re-drawn, whereas the terrain, without the exception of minor improvements, is being retained in unaltered form, except for

The new drawing is being made on a scale of 1: 600,000; the reduced copies of the new basic plan, drawn on the blueprints of the map, scale of 1: 75,000, serve as the basis. Particular attention is devoted to the accurate reproduction of the road network and of the housing settlements, as well as XXXX to the correct and efficient selection of the names of regions (Schreibweise). The plates are produced by the heliographic process.

Up to now, the new sheet for one page has been completed, and two sheets are being worked on. The map is published in the two following forms:

a. With the wooded areas printed in green; otherwise in the style of the old Vienna Edition (Wiener Ausgabe) (Table 6).

b. With color gradations for the general geographic elevations and contours color for the wooded areas. The hatching is done in gray, whereas the elevation levels of 150, 300, 500, 1,300 and 2,000-meters are denoted by five, brown contour lines. The elevation contour lines are rendered in five shades, beginning with the pale yellow-brown of the hilly land to the deep brown of the high mountain chains. Altitudes over 2,000 meters are rendered in red, the Miocene (Brown zone) areas above the forest region in white, and the level areas and valley basins in green.

The Most Important of the Special Maps

The map on a scale of 1: 75,000, with provincial boundaries (Verwaltungsgrenzen). This is the official map with provincial borders and offices printed in red. The maps are kept up-to-date by the recording of changes.

Area maps of the surrounding areas: These are condensations of official maps which show wooded areas, (Waldmarkierung), the recreation areas, roads, bodies of water, and vineyards, are also printed in color. With the exception of the environs of larger cities, these maps are issued on a scale of 1: 75,000 and 1: 200,000, for Balaton (Plattensee) and for various mountainous regions.

Tourist maps: They are published on the basis of the new map on a scale of 1:75,000

~~plans supplemental [illegible] indicating data obtained from~~ ~~1:25,000 and the expanded area perforation with the usage of tourist~~ tourist organizations ~~information.~~ They are generally issued on a scale of 1: 50,000 (see Table 7). The ~~[illegible]~~ basic ~~plan~~ is simplified, ~~where~~ and all information important from the tourist's standpoint is included. The legend is copious. The representation of the ~~terrain~~ topography is based on the map, ~~on a scale of 1: 25,000, and is effected by the use of~~ 10-meter contour lines and hatching. The maps are printed in several colors. Special editions are the winter sport maps, showing skiing and tobogganing areas.

Aquatic sport maps: ~~Rowing (Boating) maps~~ Charts of the Danube, Theiss and other rivers, maps are printed in several colors, on a scale of 1: 25,000, and they show the river bed and its environs, depth lines and other information important for boat travel.

~~Outline~~ map of the Central and Lower Danube Basin, on a ~~scale of~~ 1: 1,600,000: (one ~~sheet~~ 85 by 83 centimeters .) A military-geographic survey of the ~~Danubian principalities (Central Dobrudja)~~, the map is printed in several colors with ~~two special~~ representation of the orographic ~~characteristics~~ of the area.