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DUMITRU ȚEICU

WATERMILL IN THE BANAT

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DUMITRU ȚEICU

WATERMILL IN THE BANAT

ARCHAEOLOGICAL AND ETHNOLOGIC HERITAGE OF THE BANAT

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CONTENT

1.

AN APPROACH FOR THE PROVINCE CULTURAL HERITAGE

A research on the history and ethnology of the Banat enrolled as such, although it may seem a strange one at first sight, for my anterior scientific concerns, it certainly reflects my affinity for a particular field of ethnology as well as for the historical monuments. In fact, in my previous researches on medieval history and archeology I have sometimes called for ethnological sources in order to find solutions and suggestions in understanding of some material forms of the past that I have been investigating. I approached passing the history of medieval mill from the Banat when I talked about medieval economy of the Mountain Banat. Archaeological investigation of the Banat area from the Danube and up to the Mureş brought me into direct contact with the historical monuments of the province. I included from the very beginning the watermill among the significant witnesses of the Banat historical heritage. My archaeological note books from 1984-1985 prove on my first entries concerning the watermill and its terminology. Pictures of dismantled parts from the mills from Socolari and Ilidia, made in 1985, find today a natural place in this approach, as becoming meanwhile important historical witnesses.

The opportunity of a comprehensive approach at the province level occurred in 2009 when we won a cross boarder grant with the project "The Caraş Valley and the Nera Valley, thoroughfares of communication and pathways of civilization" under the IPA programme.

Official partner of the Reşiţa Museum was again Vršac City Museum, with which otherwise we had carried out also the project "Patrimonium Banaticum", in 2007. The project team was consisted of archaeologists (Adriana Radu, Dacian Rancu, Dragan Jovanović) and ethnologists (Mircea Taban, Vesna Stancov) who approached the two cultural corridors of the Caraş and the Nera through that area specific archaeology and ethnology. Evaluation of some technical monuments is not possible without the contribution and talent of an architect. We benefited by architect Dragoş Zipfl's passion for monuments and professionalism within this project too, to whom a long and fruitful collaboration binds us.

Suggestions, documentaries we have received from friends and specialized institutions from Romania. That is why we ought to address thanks and gratitude to Mrs. Dr. Paula Popoiu, CEO of Village Museum from Bucharest, who kindly provided us documentation on the Banat mills from the Museum. Same thoughts for Mrs. Mirela Creţu, scientific director of the Museum "Astra" Sibiu, as well as for our younger colleague, Mr. Ştefan Păucean from the same museum. Our gratitude also goes to Professor Ioan Godea from Oradea, who overwhelmed us, as always, with information about monuments. Our documentation could not avoid the Transylvania Ethnographic Museum from Cluj, where a mill got more than half a century ago. Our approaches have enjoyed the director of the Transylvanian Ethnographic Museum, Mr. Tudor Sălăgean's solicitude. A thought of gratitude turns to Mr. Paul Sever Smadu, a fond connoisseur of the Cerna Valley wonderful area. Our documentation about watermill from Serbia wouldn't have been possible without the kindness of our colleague Vesna Stancov from Vršac, who we ensure here too of our appreciation.

The balance moment of a project, completed each time with a work, is one of joy because a stage of work ends, and in the same time it is a joy and a thrill to watch the work impact within the scientific world.

You cannot write the history of the Banat watermill and make a repertoire of monuments without knowing the villages and people who take care of them. We passed again through villages from the Banat, as we did when we took in charge of medieval churches, or of cities, and we experienced a feeling of hopelessness and helplessness in the face of the fragile, vulnerable and threatened by rapid extinction monuments. Sense of loss of a defining heritage for the Banat province past can cause but grief. This feeling of despair is reinforced at the thought that the options to change the destiny of the watermills disappearance in the Banat, of their conservation in the environment are so few and should immediately be applied. Once they lose their economic position in the village life, that gave meaning to their existence, watermills, these ancient and brilliant hydrotechnical machines, seem to have a sealed fate. Watermill life was tied to that one of the rural world. The Banat village from mountain area of the province is a failed community, with an aging world and decreasing in number, which failed to find its sense in a world that hurries up to melt with the vast crucible of a Europe that wishes to be united. Disintegration of the Banat village, with its ancient institutions, with traditions and peasant industrial monuments began more than six decades ago, when the socialist collectivization of agriculture and forced industrialization of the province started up.

Ethnological historiography noticed still in the 80's of last century, namely in the height of the socialist era, that phenomenon of industrial facilities disintegration within the village life. The published statistics always showed an increased extinction till an alarming rate, of the watermill from Romania, but they did not render anyone then, as well as do now[1]. Watermill with a complicated legal situation marked by the group ownership, among failed local communities still waits a rescue solution to come from the local and central authorities, from the scientific academic communities, and from cultural institutions; or from anywhere a life expectancy can come.

European world towards which we tend to integrate, unfortunately anonymous and relinquished, created long time ago institutions dealing with conservation of the preserved watermills, with their restoring, with study of them and dissemination of information in special journals devoted to mill[2].

[1] Ruşdea, 1981, p. 209-230; Dăncuş, 1981, p. 235-238.

[2] Federations des moulins de France; Federations Française des Associations de sauvegarde de Moulins; Revista *Moulin de France*.

2.

HYDROPOWER OF THE BANAT. RIVERS AND RIVULETS

A debate on the water mill in the Banat, a power plant that uses the water energy, cannot avoid the subject of the Banat area hydrography. Hydrography, as defined by the literature in the field, would include waters course description, with complex references to their characteristics and fitting in a well-defined geographical landscape[3].

The Danube, from the Tisza flowing into, from Pancevo until Orsova, limits the southern boundary of the province. In the Banat sector of the Danube at Bazias, there is the boundary between the middle flow of the river, which begins in Bratislava and ends at Bazias, and the Lower Danube, from Bazias to its flow into the sea[4]. The river stream on the eastern Pannonian sector has gentle power and an average speed of about 0.9-1.5 m/s which allowed the arrangement of floating mills recorded in documents of the eighteenth century. Lower Western Danube in the sector Baziaş - Gura Văii, on a length of 136 km, crosses the Carpathian mountain relief of the Iron Gates through which it sawed the most spectacular European Gorge[5]. The Danube drains in this sector waters gathered in the catchment area of the Caraş, Nera, Bârzava and Timiş, capturing in the same time courses of some smaller rivers from Locva Mountains, Almaj and Mehedinţi Mountains.

The river of Radimna originates in Locva Mountains and crosses them from east to west on a course of 24 km, bypassing a wide loop to south through the village Radimna to the confluence with the river[6]. A number of 6 abandoned horizontal-wheeled watermills with bucket (mills with *bucket* water wheel and also with a sluice box wooden head, in a shape of little *bucket*/ little *pail* or *ring,* called *"ciutura"* as the bucket wheel is) one operational at Radimna and other two at Şuşca were mapped there in 1967[7]. The rivulet of Boşneag collects waters of the Baron and Valea Mare and afterwards it crosses the Depression of Moldova Veche. In the above cited period there were six mills on the Boşneag. East of the Danube Gorge from Pescari – Alibeg, the southern peaks of Locvei Mountains are fragmented by the Liborajdia Valley along which there were six operational and 14 abandoned mills.

Liubcova Depression is delimited between the two gorge areas of the river, Drencova-Cozla Gorge in the east, and Pescari Gorge in the west[8]. This depression unit is crossed by the Liborajdia Valley,the Sichieviţa Valley that drains water streams of the brooks of Cameniţa, Ravensca and Gramesca, Valley of streams Oravita and Berzasca. Within this basin of 82 km², on the waters of Cameniţa, Ravensca and Gramesca still horizontal-wheeled watermills with bucket whose number in the late nineteenth century was impressive, are preserved nowadays[9]. The Berzasca stream has its source in Almaj Mountains, south of Rudăria and collects in a basin of 228 km² waters of the Comoroşniţa and stream Dragosela. There were horizontal horizontal-wheeled watermills with bucket until recent years on the lower course of the river Berzasca and on its tributary, the Dragosela. The Sirinea rivulet, only 16 km long, which closed the depression basin of Liubcova in the east, had also mills arrangements.

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[3] Ujvári, 1959, p. 7.

[4] *Ibidem*, p. 41-43.

[5] *Ibidem*, p. 43; *Geografia Dunării*, p. 285-286.

[6] Sencu, Băcănaru, 1976, p. 72; *Geografia Dunării*, p. 279.

[7] *Atlasul Porţile de Fier*, p. 112, Pl. XCIV.

[8] *Geografia Dunării*, p. 283.

[9] Taban, 2008, p. 151-155.

Clisura Mountains, part of the massive Almaj Mountains, close the Danube course from Berzasca to the Jebeniţa Valley. Small depressions break up the Danube corridor at Sviniţa and Dubova [10]. Dubova Depression was formed in a break of the fault area that the Danube cuts there, between Cazanele Mari and Cazanele Mici. On this western Lower Danube sector, the valleys of Plavişeviţa, Liubotina, Iuţi, Tisoviţa and Mraconia break up the peaks of Clisura Mountains which descend sometimes to the river bed. The above invoked mapping from 1967 marked a number of two mills on the Mraconia, other four at Dubova, three mills at Tisoviţa and other eight abandoned mills, in a state of ruin, on the Tisoviţa, at Dubova. Depression Ogradena-Orşova is delimited between two gorge areas of the river. The Cerna confluence with the Danube represents the major landmark of the Danube hydrography in this sector of the river[11].

The Banat Mountains occupy about 65% of the southern surface of the province, while the Timiş Plain and the Torontal Plain occupy 6700 km², namely 77% of the northern area of the province that has now folded to Timiş County[12]. The orohydrography of the entire province is determined by the disposition of the mountain relief. The rivers of Nera, Bârzava, Pogăniş and Timiş originate in the Semenic Mountains, each one forming large river basins, with a dense network of rivulets. The Nera comes down from the Semenic Mountains and enters the Almaj Depression at Pătaş, crosses the depression from north to south, sawing its stream between Şopotu Nou and Sasca through a gorge area, to cross later the Caraş Plain until its flow into the Danube. Within the Almaj Depression it receives the rivulets of Miniş, Lăpuşnicel, Moceriş that drain waters from the southern slopes of Anina Mountains and from the southern shore, the rivulets of Prigor, Rudăria, Bănia, Şopotu Nou and Putna[13]. On the lower courses of these waters, in the Almaj Depression was arranged perhaps the most impressive and dense network of horizontal-wheeled watermills with bucket, preserved, in part, today. The Rudăria originates in Svinecea Mare, crossing 22 km to the confluence with the Nera. Horizontal-wheeled watermills with bucket were built on the river even from the Rudăria Gorges area, south of the village, and up to the meadow of it, in the northern border of the village Rudăria. The rivulets of Bănia, Gârbova and Şopot have short courses which don't exceed 10 km, which drain low waters from the northern slopes of the Semenic Mountains. The lower courses, inside the villages which took the names of those rivers, present horizontal-wheeled watermills with bucket arrangements, many currently functional during our research. The Miniş, the main tributary in the northern bank of the Nera, which comes on a length of 24 km from Anina Mountains, was used for fitting mills in Bozovici Depression. The hydrographic potential of the Nera for construction of grinding installation was also exploited on the lower river flow, from Naidăş to Socol.

The Caraş comes from the east of Anina Mountains, having a course facing north to change it after a loop towards east and southeast, making his way through a very spectacular gorge area. Once leaving the gorge, the river crosses Caraşova basin, where it registers another narrowing, and then exits in Oraviţa Hills area[14]. Along the 85 km long, it develops a catchment's area of about 1118 km² in which receives many tributaries. Thus, downstream of Caraşova, it receives waters of the Lupac, Dognecea, Bărcăş and Ciornovăţ that have their origin in Dognecea Mountains, on the right bank, while on the left bank it collects water of the rivulets Gârlişte, Lişava, Oraviţa and Vicinic which come down from Anina Mountains. The Caraş and its tributaries hydropower set in motion an impressive chain of horizontal-wheeled watermills with bucket. Tributaries of the Caraş from the left bank are flowing through the valleys which fragment the piedmont area of Oraviţa Hills with altitudes

[10] Cucu, 1980, p. 19.

[11] *Geografia Dunării*, p. 91; Cucu, 1980, p. 58.

[12] Ardelean, Zăvoianu, 1979, p. 23; Sencu, Băcănaru, 1976, p. 14; Munteanu, 1998, p. 9.

[13] Sencu, Băcănaru, 1976, p. 64-65.

[14] Sencu, Băcănaru, 1976, p. 68-70.

between 400-500m, gradually descending to 150m towards the Caraş Plain[15]. Oblong ridges of Oraviţa Hills that descend from Anina Hills to west or the high fields from the Caraş Plain delimit the courses of the Vicinic, Oraviţa and Lişava.

The Pogăniş pervades the entire spectrum of the province relief[16] during its flow of 100 km from Semenic ridges until the Banat Plain. Its lower course, in the plain, of about 30 km, is meandered and scattered, thus hard to use for arranging mills, but on the middle course, at Ersig, for example, the documents recorded mills since the medieval times.

The Bârzava originates under the Semenic Mountains peaks, through which it carved a deep valley till Reşiţa. A narrow path looking like a gorge marks the Bârzava course through Dognecea Mountains, on about 30 km, between Câlnic and Bocşa. Downstream of Şoşdea it enters the Moraviţa Plain[17]. River course in the 30 km through plane until the confluence with the Timiş is meandered and scattered. Office documents recorded a large number of mills on the middle course of the river in the fourteenth and fifteenth centuries. Mills were built in recent times also on the Birdeanca, an old abandoned course of the river formed at Gătaia, that overflows in the river in the south-west of Deta City[18].

The Timiş, with a course of 241 km long and a catchment's area of about 5300 km^2, is a significant actor of the province hydrography. It descends from the Semenic Mountains, enters, through Teregova basin, the Depression of Caransebeş where makes a loop and goes to north entering the Banat Plain at Jena[19]. The Sebes River, 23 km long, which connects its waters with those of the Timiş at Caransebeş, represents also the Timiş most important tributary within the mountain area. At the same mountain area the Timiş receives the rivulets Slatina, Goleţ, Bucoşniţa and Petroşniţa descending on the eastern slopes of the Semenic Mountains and from Ţarcu Mountains, beside the Sebeş, rivers Armeniş, Ilova, Bolvaşniţa come down. Medieval documents and also from the beginning of the modern era witnessed the construction of mills on the Timiş and on its tributaries.

The Bistra River, a tributary of the Timiş, gathers its waters from a basin of 900 km^2 in Poiana Rusca and Ţarcu Mountains. Certified in office documents or modern ethnographic researches, horizontal-wheeled watermills with bucket worked on course of the Bistra river or its tributaries, the Bistra Mărului, Glimboca, Rusca. The Nădrag River, with a length of 33 km, collects waters from the western slopes of the Poiana Ruscă Mountains[20].

The Cerna, with a basin of 1500 km^2, drains waters from the slopes of the Cerna Mountains. It runs through a tectonic valley until Pecinişca where changes its direction suddenly to the south until the confluence with the Danube. Small flow tributaries of the Cerna, like the Iauna, Prisăcina or Ţăsna located on the upper river course had been exploited for the improvement of horizontal-wheeled watermills with bucket. The Belareca, the most important tributary of the Cerna, has its origin in the Cerna Mountains. In the basin of Cornereva, it drains the waters of some rivulets as the Camăna, Strudena and Ramna whose energy is used today too for horizontal-wheeled watermills with bucket and fulling mills. The Belareca, at the gorge sector exit from Globurău, enters Mehadica Depression where collects the waters of tributaries descending from the Semenic and Cerna Mountains. The rivulets of Liubiana or Bolvaşniţa come down from Arjana peak. The Mehadica rivulet, with a length of 42 km, drains waters from the eastern slope of the Semenic Mountains. Some other waters with short courses, ranging from 10-30 km, such as those of the Glob, Cerna, Apa Satului at Cănicea, Luncaviţa, Craiova have set in motion the wheels of some water mills in the modern and recent time.

[15] Mihăilescu, 1978, p. 24.
[16] Ardelean, Zăvoianu, 1979, p. 51.
[17] Sencu, Băcănaru, 1976, p. 62; Munteanu, 1998, p. 35.
[18] Ardeleanu, Zăvoianu, 1979, p. 52.
[19] Sencu, Băcănaru, 1976, p. 59.
[20] Ardelean, Zăvoianu, 1979, p. 50.

The Bega collects waters from the north-east space and the plain of the Banat, on an area of 2241 km^2. Waters of the tributaries from the upper course, from the north-western Piedmont area of the province, the Gladna, Valea Mare, Miniş, Cladova were exploited for mills building. The Bega riverbed was adjusted in the modern era by changing its former route. The original route of the river, downstream of Timişoara, called the Bega Veche, drains the waters of the Torontal Plain[21].

The Mures along the lower course, on a length of 150 km, delimits the northern frontier of the Banat. The river represented since the ancient times an important thoroughfare that connected Transylvania with the Pannonian plain area. Writings of the early Middle Age witnessed on the ports arranged on the lower river corridor until Szeged and the intense trade with salt brought by ships on the Mureş[22]. Once leaving its defile, the Mureş crossed the Western Plain, where it had numerous meanders and branches until its regularization in the modern age[23].

If discussing the problem of the Banat hydrography, which represents the support on which the all types of mills have developed in the space of the province, it is not without interest to invoke here the essential findings regarding density of the hydrographic network in the Banat[24]. The network density is expressed as the result of a fraction in which the length of the river measured in km is divided by basin area, expressed in km^2. The mountain area rivers of the Banat, namely the Caraş, Nera, Cerna and Timiş, which are directly tributary to the Danube, were included in the first order basins, the other two great rivers of the province, the Bega and Mureş have a second category basins. Maps with densities of the rivers for the basins of order I, II and those for basins of orders III-IV are very suggestive[25]. They show for the southern Banat, with Clisura area, densities of 0.70 to 0.80 km. The Timiş[26], which has a basin of 5702 km,^{2} notes down for Caraş-Severin area densities of 0.56 to 0.67 km. The Nera[27] with a basin of 1452 km^2 notes down densities of 0.75 km in Bozovici Depression which diminishes later on the lower course, to 0.60. The Cerna River [28], with a basin of 1511 km^2, has a density with values calculated on various sectors of a rate between 0.50 and 0.60 km. The Danube from Baziaş to the confluence with the Cerna has a basin of 1381 km^2, for which a density of the river was calculated at levels between 0.70 and 0.84 km per one km^2.

Discussion regarding the hydrographic network we have raised here considering only the facilities for mills building shows that the massive relief, the nature of soil, vegetation and even anthropogenic factors influenced the density of the hydrographic network[29]. The number of 500 mills listed in the records of the National Committee of the Waters in Romania in 1957 and their arrangement in the space of the Banat province are closely related to the density of the hydrographic network in the Banat.

[21] Muntean, 1989, p. 34; Ardelean, Zăvoianu, 1979, p. 53.

[22] Kovách, 1980, p. 193-196.

[23] Ujvari, 1972, p. 299.

[24] Moraru, Savu, 1954, p. 59.

[25] *Ibidem*, p. 58-59.

[26] *Ibidem*, p. 85.

[27] *Ibidem*, p. 85.

[28] *Ibidem*, p. 85.

[29] *Ibidem*, p. 64-69.

3.

HISTORY AND ETHNOLOGY. HISTORICAL SOURCES AND HISTORIOGRAPHY

Reconstruction of the water mills past in the province area can be approached through recourse to written sources, on one hand, and, depending on how have survived and become conclusive witnesses, the call for field monuments may complete the scientific documentation. Viewed in the long perspective of the history, the historical written sources represent major support on which the history of water mill in the Banat may be reconstructed. The witnesses reported by ethnology belong to recent modern era or period. The Banat, a historical borderland, suffered massive losses in the historical monuments area, especially the medieval and modern ecclesiastical architecture, be it in wall or wood. The mills of medieval and modern eras were only modest wooden buildings, so that they could not survive the pressure of time and people. Medieval archeology, which could provide information on this regard, has not enrolled, for this European area, a research direction on settlements in which the medieval mill be one of the researching targets. This field of the archaeological investigation on watermill is relatively recent even within the European research, accumulating, however, spectacular results[30].

Recourse to written historical sources allows a stakeout of the road of watermill in the space of the Banat province. It is certainly recorded in the documents of the middle of the 13th century. In fact, office documents indicate watermills only in two cases, on the rivers of Timiş and Bârzava. The watermill presence in chancery documents of the 14th-15th c. is more consistent once having been imposed the rules of the Hungarian Angevin Kingdom in the province of the Banat. Diplomatic sources remain the unique information source on the watermill history also for the 16th and 17th centuries. Surely, the Banat received benefits in this regard by a systematic publishing of diplomatic sources regarding counties of Caraş, Timiş and Banat of Severin, still during the second half of the 19th century, thanks to scholars Pesty Friges and Ortvay Tivadar[31]. Completion was brought nowadays by Costin Feneşan's investigations[32].

Medieval diplomatic documents provide benchmarks for a statistics of the Banat water mill, for its dispersal in the area of the province and for its legal regime. Data regarding water mill in the 18th century come from the Austrian sources. The Austrian government made up solid archives both at the level of the local administration of the province and the central institutions where we can find information regarding agriculture, economy and finances of the province of the Banat, few researched so far[33]. In the same period of the 18th century, cartography of the Banat villages was made, where information regarding the watermills, the regulation of some rivers from the Banat Plain can be also found.

Documents from recent years have kept watermill plans, plans of the supply system, collecting from rivers, which usually accompany the mill building permits.

Horizontal-wheeled mills built at the gates of Timişoara appear in engravings of the 17th century, sometimes resumed until the 18th century[34]. The city, with different sequences of the urban world, dominates editorial production imaging, and the engravings from the seventeenth and eighteenth centuries. Floating mill from the Banat is

[30] Bloch, 1959, p. 85-87; Ryne, 1989, p. 2-4.

[31] Pesty, *Krassó*, III-IV, 1882-1883; Ortvay, 1896.

[32] Feneşan, *Documente*, 1978.

[33] Feneşan, 1997; Barótti, I, 1893, II, 1900-1904.

[34] Vârtaciu, pl. 2-10.

better known thanks to few photographic images from the early twentieth century.

Mill became a study subject for ethnographers later, in the second half of the last century, when it actually began gradually to disappear from the landscape of the province of the Banat. Thus, the floating mill, for example, was known and evaluated from the stored photographic images[35]. We found an entirely similar situation in the case of the vertical-wheeled mill, despite the higher number of samples that are still operating in 1957. Consequently, there were published only graphical documentation for one mill from the Bega Basin and another for a mill from Kovin[36]. The horizontal-wheeled mill from the Mountainous Banat enjoyed the earnest attention of ethnological research in the last three decades marked by significant accumulation in historical writing. Despite these earnest inclinations to, we do not find a proper documentation within the historiography field, with architectural plans and surveys, to accompany and support the historical speech. An older approach from 1908 of Cs. Sebestyen Karoly on Caraşova mills was based on a study of mill architecture[37]. Architectural documentation regarding mills from Rudăria and those from Topleţ was achieved through a study of a specialized institute from Bucharest in 1971, and was the basis of some published studies on this topic. A report on the Banat watermill statistics, in 1957 when there were 509 horizontal-wheeled and 74 vertical-wheeled mills, shows that a small percentage of them had been subject of a systematic research knitted on an architectural documentation and topography of the Banat mills. In this respect our approach to research watermill from the Banat was punctually accompanied by an architectural documentation for a number of 67 mills.

Historiography of watermill brings to light within the historical writing various approaches coming from historians, ethnologists, linguists, archaeologists and engineers. The issue of watermill in a restricted area of the Banat province, for instance, or in a general historic approach, was presented in different perspectives. Punctual concerns built on archives sources can be found in writings from the first half of the last century[38]. Interest in this matter was coagulated hardly in the second half of that century. A study from 1947 belonging to the geographer Marius Bizerea opened the series of some punctual concerns[39]. He proposed a discussion on the mill with turbine, namely horizontal-wheeled mills, from an ethnological perspective in the overall Romanian province, where he pursued and tried to provide answers on the origin, age and diffusion of this class of water mills[40].

The watermill became a concern of the historical research at the beginning of the seventh decade, which is obvious in historical writing, on the one hand, and occurred in the same time through field research of monuments in the Banat in 1965-1970. Two major national events gave impetus to scientific research: the major works for the hydro-electric plant at Porţile de Fier (the Iron Gates), on the one hand, and the decision to arrange a National Folk Technique History Museum in Sibiu, on the other one. They supported logistically and financially the ethnological research. Watermills from the Danube Clisura and those from neighboring areas of the Mehedinţi Plateau and Valley Tismana from Gorj were investigated by Monica Budiş and Gheorghe Dinuţă, and one of the plants from Plavişeviţa arrived in the Village Museum in Bucharest[41]. The field research was used in studies published between 1968-1975 by Monica Budiş[42], Natalia Marcu[43] and Gheorghe Dinuţă[44].

The other area of temporary preoccupation with the water mill from the Banat occurred in Sibiu after the 1963 decision for a national museum of technique history

[35] Demşea, Zănescu, 1972, fig. 1-2; 8.

[36] Ţăranu, 1979, p. 125-130; Djekić, 1990, p. 87-90.

[37] Sebestyen, 1908, fig. 1-3.

[38] Pamfilie, 1910, p. 177, 180-187; Iorga, 1927, p. 16-28.

[39] Bizerea, 1947, p. 1-12.

[40] *Ibidem*, p. 3-5.

[41] Dinuţă, 1971, p. 67-69.

[42] Budiş, 1968, p. 217-223.

[43] Marcu, 1971, p. 64-65.

[44] Dinuţă, 1971, p. 47-48.

establishing, which otherwise remains one of the most remarkable museological achievements in recent years. Field research in 1965-1967 provided Cornel Bucur, Hedwiga Ruşdea and Herbert Hoffmann with studying opportunities. The studies published between 1968-1981 focused on technical problems, architecture and organization of the horizontal-wheeled mill which dominates the mountain landscape of the Banat. Herbert Hoffmann has expressed its concern over the characteristic features of inlet system through the wooden sluice box [local name: *butoni*] at the horizontal-wheeled watermills with bucket [local name: *mori cu ciutură*] in the Banat and the floating mill[45]. Very concerned about the problem of ship-mill, he tried to establish its existence in the Banat beginning with the 15th century and even later. Austrian archival records regarding the Banat of the 18th century were always invoked in Hoffmann's speech on the ship-mill. The field research from the proximity of the Banat, conducted by Hedwig Ruşdea, had the merit to be brought significant wholeness on the horizontal wheel mill knowledge in the south and south-west area of Romania, on the one hand, and, at the same time, noticed and written then, in 1981, on the full implementation of the "process of disintegration of peasant industrial facilities within contemporary village life"[46]. The case study on the mills from village Podeni, Mehedinţi County, actually affected by the disintegration of contemporary Romanian village, remains exemplary in this regard. The work of Cornel Bucur, proceeding from the same research center in Sibiu, was a complex and lasting one. It remains outstanding his involvement in scientific publishing on the Molinologic Reservation from Rudăria and its lately restoring. Water mill approach proposed by Cornel Bucur developed on two levels, one concerning the watermill ethnology and the other aimed the history of this hydraulic machinery in the Romanian space. The discussion on watermill focused exclusively on the horizontal-wheeled watermills with bucket from the Banat, whose good field knowledge allowed full substantive conclusion on their management and operation[47]. The other level of his speech, regarding historical perspective on the water mill, which we do not share, remains a shaky historiography improvisation, without documentary support[48].

Tendency of the Romanian historiography to research watermill in the eighth decade was also felt in the province of the Banat, where we can quantify some approaches of this theme. Concerns of ethnologists Eutimiu Lăpăduş and Nicolae Ţăranu[49] from Timişoara, fall into this direction. But, it was an unsubstantial approach concerning only the mills from Topleţ and the vertical-wheeled mill from Poeni, which represents little, very little if we consider the impressive number of over 500 horizontal-wheeled mills still operating and the 74 mills with vertical wheel from the Banat. We may remark in Nicolae Ţăranu's study the endeavor to include the mills from Topleţ in an original architecture framework that defines and differentiates them. Influences coming from the Central European world, but also from the old kingdom, obvious in the rural area architecture, were reflected also in the planimetry of mills from the Bigăr Valley.

Floating mills on the Mures, already disappeared from the area landscape, but with a long history, benefit by two historiographic refunds proposed by Doru Demşea[50] and Erich Lammert[51]. Lammert's study, written from the perspective of Swabian ethnology from the Banat, proves to be very well informed and with links to accumulation of the European historiography on the watermill evolution in general and on ship-mills in particular. He invokes the Cistercian and Benedictine monasteries role in diffusion of watermill within this area, supported by accumulation coming from the French historiography on the work in Catholic monasteries rule. In the same period the unpublished

[45] Hoffmann, 1981, p. 125-158; Idem, 1968, p. 275-280.

[46] Ruşdea, 1978, p. 199-219; idem, 1981, p. 209-230.

[47] Bucur, 1981, p. 201-218.

[48] Bucur, 1968, p. 195-210; idem, 1974, p. 49-66.

[49] Ţăranu, 1979a, p. 125-131.

[50] Demşea, Zănescu, 1972, p. 214-224.

[51] Lammert, 1975, p. 9-27.

historiographic construction of Karol Lupşiasca may be taken as a remarkable one[52]. He scored a well-structured view on the horizontal-wheeled mill, a hydraulic machine, coming from a technical mind of a hydrotechnician engineer. His speech with technical elements and a reversion at many historical and linguistic arguments are part of a tradition in the history of Romanian science opened by Professor Engineer Dorin Pavel[53].

Mircea Taban's researches are far detached in the Banat historiography concerns upon the watermill. He made his researches on systematic field studies in the Banat large rivers basins. The approach he proposed for the mills from Sichieviţa, Mehadia, Mehadica, Topleţ, Rusca Teregova and Feneş have the merit to establish within the historical writings a number of monuments, many vanished now, and to offer in his speech reflections on the economic system of the mill, on the architecture and their recent history[54]. The Banat watermill history in the Middle Age rendering was recently made by O. Răuţ[55].

The multicultural historiography of the province reflects approaches on the subject coming from the Hungarian and Serbian ethnology. Floating mills from Szeged represented a punctual approach in Antal Juhász's[56] study. General approaches of the mill history, or of its ethnology, in which issues on the history of the Banat are also to be found, were proposed in the historical writings of Zs. Vajkai[57], T. Sabyán[58] and G. Oszváth[59]. Watermills from the Serbian Banat have been the subject of an integrative study for Milan Milošev[60], or only sequential for a certain class of mills[61]. Serbian ethnologists' studies accompanied by graphic and archive documents complete the documentation on the water mill in the Banat.

52 Lupşiasca, 1984, p. 157-189; idem, 1995, p. 267-298.

53 Pavel, 1954, p. 21-30.

54 Taban, 1986, p. 53-65; idem, 1988, p. 15-22, idem, 2010, p. 121-137.

55 Răuţ,

56 Juhász, 2006, p. 127-141.

57 Vajkai, 1978-1980, p. 351-369.

58 Sabyán, 2003, p. 242-250.

59 Oszváth, 2002, p. p. 69-103.

60 Milošev, 1954, p. 147-168.

61 Radović, 1953, p. 78-85; Djekić, 1990, p. 87-90.

4.

WATERMILL – A HYDRAULIC MACHINE

Watermill problem lies in technical speech on hydraulic machines and hydraulic engines, in the latest information on the subject. There was a language and conceptual translation from the technical approach toward the historical and ethnological one. Proffesor Dorin Pavel, an outstanding thinker in the field of hydraulic turbines, approached also the watermill problem in his work on *Hydraulic engines*[62]. The question was resumed afterwards in an approach on the hydraulic motors[63]. The watermill invoking in the evolution of hydraulic machines is commonly found in the European technical literature[64].

The debate we open here is a matter of principle, of going over history writing and technical opinions on this topic. It does not cover special technical issues related to math calculation specific to hydraulic engineering, as we found these approaches in some ethnological writings[65]. Certainly there is an entire science, with mathematical and physical formulas that calculate a hydropower of a water source, mechanical energy resulting from hydraulic energy conversion, power and other concepts[66] that we do not discuss because we do not have necessary competence, on one hand, and on the other hand, we do not believe that it would find a place in a historical and ethnological speech. Our choice for terminology used by hydraulic machine or hydraulic motors considers their definition. Machine is defined as the technical system consisting of parts with determinative movement, which transforms a form of energy into another form of energy or in a mechanical work[67], and engine is defined as a power machine that converts a certain form of energy into mechanical energy[68]. The hydraulic motors are classified into two major classes: hydraulic wheels and hydraulic turbines. Mill with vertical wheel is part of the class of hydraulic wheels, while mill with vertical axis and horizontal wheel belong to hydraulic turbines class being considered a prototype of turbine with action. Wheel-turbine found in the bucket-wheeled watermills from Romania is taken for "the oldest turbine"[69] in Professor Dorin Pavel's writings.

Mill with horizontal axis and vertical wheel and floating mill, which belongs to the same mill class, are hydraulic machines that can be included in the class of hydraulic wheels. They have all the technical features included between the parameters that define the functioning of a hydraulic wheel[70]. Hydro technical system of a mill with horizontal axis consists of a large wheel mounted on a horizontal axis which takes the kinetic energy as a hydraulic shock. Hydraulic wheels are classified as current wheels and inlet wheels[71]. The current wheel found at the floating mills works with kinetic energy of water through push on the paddles of the large wheel. The wheel was constructed of two discs connected by large wooden paddles. Horizontal shaft on which the wheel was fixed converts the hydraulic energy through gear fixed on the shaft and coupled to the grinding installation, into mechanical work. The overshot and the undershot water wheels are documented in written documents, in these forms in the fourteenth and

[62] Pavel, 1954, p. 21-26.
[63] Pavel, Voia, 1981, p. 21-22.
[64] Anastasi, 1956, p. 145-148.
[65] Hoffmann, 1981, p. 132-136.
[66] Pavel, 1954, p. 106; Pavel, Voia, 1981, p. 14-20.
[67] DEX, ediţia a II-a, 1998, s.v. *maşină*.
[68] DEX, ediţia a II-a, 1998, s.v. *motor*.
[69] Pavel, 1954, p. 106.
[70] Pavel, Voia, 1981, p. 21.
[71] Pavel, Voia, 1981, p. 23.

fifteenth centuries[72]. Wheels with upper intake are built for large water drops, while the hydraulic wheel with lower inlet is used for high flows but with reduced falls[73]. These types of hydraulic mills wheels used water position power, unlike the wheels with current and thus had a higher efficiency that reached up to 60% compared to that of wheel with current[74].

Mill with vertical axle and horizontal wheel are included in hydraulic machines in the class of hydraulic turbines. From technical point of view the turbine is a "motor composed of a rotor (attached to a shaft) and a stator, which converts the potential energy of a fluid into mechanical energy of solid body"[75]. Mill with horizontal wheel and vertical axle is put between prototypes of turbine of equal pressure. What defines the operation of a turbine of equal pressure is the hydraulic flow with equal pressure in the stator and rotor. Kinetic energy coming by dropping in the stator is converted into mechanical energy in the rotor[76]. At the horizontal-wheeled mills, according to Professor Dorin Pavel, structurally all elements of a turbine of equal pressure are meeting in a primitive shape. The stator is produced in the mill by the trough, the inlet knob or sluice box, and the rotor is represented by wheel with spoon shaped blades or bails whose hub is mounted on a vertical shaft connected to the runner stone. Admission is done through a single injector existing there hydrodynamic flow[77]. This theoretical approach of Professor Dorin Pavel is accompanied by graphical reconstruction and math calculation meant to bolster enrollment of mill with horizontal wheel between the hydraulic turbines of equal pressure prototypes [78]. We found in the cited above technical discourse the prototype of a rustic vertical turbine with vertical wheel with spoons[79] (Fig. 128/1). The stator has the shape of a forced pipe, 14-20 m long, arranged vertically. The rotor is a thick hub with diameter of 0.5 to 0.8 m in which are fixed wooden spoons. Water inlet is made in this case through a single injector on tangential direction, which finalizes it from the turbine prototype of equal pressure.

Watermill with horizontal wheel and vertical axle has the same structure of a hydro technical arrangement. Water, whose energy is used in mills, is captured from a source, be it water from a river or a mountain stream. Water intake is achieved by a high dam across the watercourse. Form and structure of the dam were adapted to the size of river bed and its flow. Archival documents preserved from the years 1905-1906 regarding the horizontal-wheeled mills from Lăpuşnicu Mare and Gârlişte, for instance, and those regarding the mill with vertical wheel on the river Timiş, from Armeniş, had covered this issue of dam through the mill building permit[80]. From the start the technical conditions about the dam height and construction materials were imposed in an attempt not to create major obstacles on the river, which could lead to flooding of the area. Raising the dam on the river for water collection should not affect mills arranged downstream. Regulations from recent acts specify punctual this thing. Authorization act of mill construction from Armeniş in 1906 includes this requirement for the mill manufacturer[81]. Medieval documents from the early fifteenth century, on mills from the Bârzava Valley, reflect a state of conflict always lit between two major properties, one from Remetea, belonging to the noble family Himfy, and the one from Gherteniş. Ponds built on the Bârzava in 1408 by the Gherteniş family left without water the 22 mills of nobles on the Remetea estate[82]. The problem of the same water

[72] Pesty, *Krassó*, III, p. 147. Zichy, *Ocl.* 1895, VIII p. 150-152, la Jebel „unum molendinum trium rotarum desubtus pellens super fluvio Themes". For other areas in the Hungarian kingdom under Sigismund, see: Malyus, II, 1, p. 51-54 la 1400, called „molendinum duarum rotarum que in pulsu aquarum a parte inferiori pelluntur"; *Ibidem*, p. 108 „...ac quartam parte eiusdem mollendini desuper pellentis...".

[73] Pavel, Voia, 1981, p. 41, 44.

[74] Pavel, 1954, p. 25.

[75] DEX, ediţia a II-a, 1998,p. 1120, s.v.

[76] Pavel, 1954, p. 105-106; Lupşiasca, 1984, p. 158.

[77] Pavel, 1954, p. 106-107, fig. 101.

[78] Pavel, 1954, p. 106, fig. 101.

[79] Pavel, 1954, p. 107, fig. 102.

[80] AST, fond, Prefectura Severin, Dosar 3605/1906.

[81] AST, fond. Prefectura Severin, Dosar 353/1906. Gârlişte.

[82] Ortvay, *Temes*, p. 396.

source fairly solving by all mills owners on the river flow, regardless of class of the built mills, is as old as the water mill. Solving the water issue was done by common low throughout the long history, and by legal written regulations in recent years.

Water inlet was done from the capture place through the dam, called pond, and up to mill by a parallel dug canal to the water flow. That mill supplying channel was adapted to the area conditions. Its shape and dimensions were determined by the volume of the brought water, by its flow and the inclination level, and the slope of the ground. Supply channel for the mills of Cornereva highlands, from the Bogâltin, which collects water from the streams Ciumerna, Topla, Ramna and even the Belareca is a modest improvement, a shallow one, not exceeding two feet in width. An identical situation can be seen at the pool [local name: *ieruga*] of the so-called *the twice mills mills* at Ilidia, which is about 0.25 m deep and 0.40 m wide, but with a constant flow. The mills supplying channels in the lowlands from Răcăşdia or Vrăniuţ, for example, is far wider reaching to 1.50 - 2 m wide. Storage tank is, usually, at the end of the supply channel, arranged before the inlet system. The pool was widened, the banks were equipped with dry stone walls or beams, in its wall were foreseen two obstacle openings, one for intake chute/pipe, the other one for refuge channel of water when the mill was stopped. Supply channel length was between 30 m and 1500 m, at Ilidia, for example.

Usually, the *inlet* was made in an open system trough a trough, or in a closed system or by plugs. Intake chute had a semicircular section and was made from a hollowed wood, from a cut metal pipe or, more recently, from concrete. Sometimes it had a quadrilateral section open on one side and was made of the same mentioned above materials. Usually, the section was broad and narrow at the end fixed in the mouth of the supply channel, and at the opposite end, near the wheel, had a narrow and high section to increase the injection power.

Intake in a closed system, equally old, was accomplished through a drilled tree trunk. A metal pipe or concrete pipe replaced now the trunk. The drain section in the case of closed intake was adjusted by an ingenious system of drilled wood plugs, in the shape of a truncated cone, mounted in the intake pipe mouth. The Banat dialect called that closed wooden sluice box *butoni* [barrel]. The holey wooden plug shut control at the mouth of the sluice box was called *găleţea* [little bucket/ pail] (Fig. 78).

Admission, in the case of mills with vertical wheel and horizontal axel, is made by a trough, and according to the water fall, it was an undershot one, or from above, an overshot one. Mill from Armeniş, for which the documentation was kept, shows a lower intake. Summary documentation does not allow conclusion on intake at vertical-wheeled water mills in the Banat.

The water drainage or the tailrace from the hydrotechnical facility shows some standardized solutions, based on local tradition and influences from neighborhoods. The horizontal-wheeled mill usually has a hydrotechnical installation, arranged in an underground space, a deep hole up to 2 m and coated with dry wall without binder. Underground chamber has an opening through which water (tailrace) is discharged into a channel with the same shape and dimensions of the supply channel (headrace), which leads the water flow back into the riverbed. Water drainage from the supply channel, when the mill is not working, is made through a smaller channel, in a shape of loop between storage tank and discharge duct. The mill pond is provided with two valves through which water is directed to the intake system, and if the mill does not work, it is opened the obstacle from the discharge duct leading the fluid in the mills pool. This system with *by pas* we meet at the mills from Ilidia, from Răcăşdia, from Almaj, and from the hamlets of Cornereva. Orască mill from Mehadica, mill from mouth of the Osoina at Pârvova, the one from Vrăniuţ have arranged at the end of the supply channel two parallel troughs entering the underground room of the mill. One of the troughs is the water intake (headrace) at the hydrotechnical system; the other is a water drain channel when the mill is stopped. These run galleries are made of wood or recently of iron sheet. Directing the flow of water is done in the same way through the two valves arranged in the storage pool points. In this regard the mill Ghitera from Vrăniuț reveals a special situation, with special arrangements. There is a system of pulleys in mill building, to handle the closing and opening of the two valves from the two troughs, as one directs the water inlet, and the other is a run gallery. I have met rarely, indeed, at Gârnic for instance, mills on the Gramensca, but also at Răcăşdia, such a rudimentary more dangerous system to handle the flow. The intake trough from Răcăşdia or the sluice box with shut at Gârnic are used as refuge for water system too, the hydrotechnical installation being blocked by the bridge tree on one side, but also by a thrust into the wheel blades pole stuck. Mill with vertical axle put into practice an ancient model of antiquity that used human or animal power, "following the idea of using for this purpose the hydropower, simply a hydraulic wheel must be added at the end of the vertical shaft, reducing the entire facility to a high simplicity of an undiminished mechanical elegance"[83]. Grinding plant is on the same plane as the horizontal wheel is. Vertical axel of water wheel was fixed in the hub of the wheel, and at the upper end was set in runner stone through the driver [local name: *părpăriță*], a metal blade with two sharp peaks set in underside of the runner stone. The kinetic energy of water is transformed into mechanical energy[84]. Vertical axis of the water wheel, meaning the motor shaft, plays at the same time the role of driving shaft acting on the runner stone. Motor shaft is both a water wheel driving shaft and a transmission shaft to the runner stone. It occurs this way a simple, direct transmission, through which the kinetic energy is converted into mechanical work. Calculations and technical discussions on the subject, for which we here certainly make the necessary references[85], exceed the discussion that we try to promote.

The vertical wheeled mill with horizontal axis shows a more complicated situation regarding conversion of hydraulic energy into mechanical energy. Mechanical grinding plant with the two stones is arranged horizontally while the hydraulic wheel is vertical. Between the motor shaft, placed horizontally, and the vertical axis of the mechanical system, a transmission mechanism is interposed. This unit is composed of a toothed wheel, fixed to the motor shaft, and a drum-pinion of rods fixed on the vertical axis of the grinding plant. The tooth gear, which is about 2/3 of the hydraulic wheel diameter, has wooden teeth on its inner circumference, which combine with drum-pinion, causing thus a circular motion of the millstones. Mathematical calculations made by H. Hoffmann in a case study on the vertical-wheeled mill, efficiency of these grinding installations provides benchmarks for comparison with floating mills and horizontal wheeled ones[86].

Our approach in this context of the relationship mill-hydraulic machine followed a highlight of accumulation on the subject, restricting the discussion on the historical and ethnological speech as much as possible. I deliberately avoided the recourse to demonstrations with math and physical formulas, frequently encountered in some ethnographers' construction, because our approach is addressing not to a technical target group, but to a wide spectrum with humanistic opening.

[83] Anastasi, 1956, p. 145-146.

[84] Lupşiasca, 1984, p. 158.

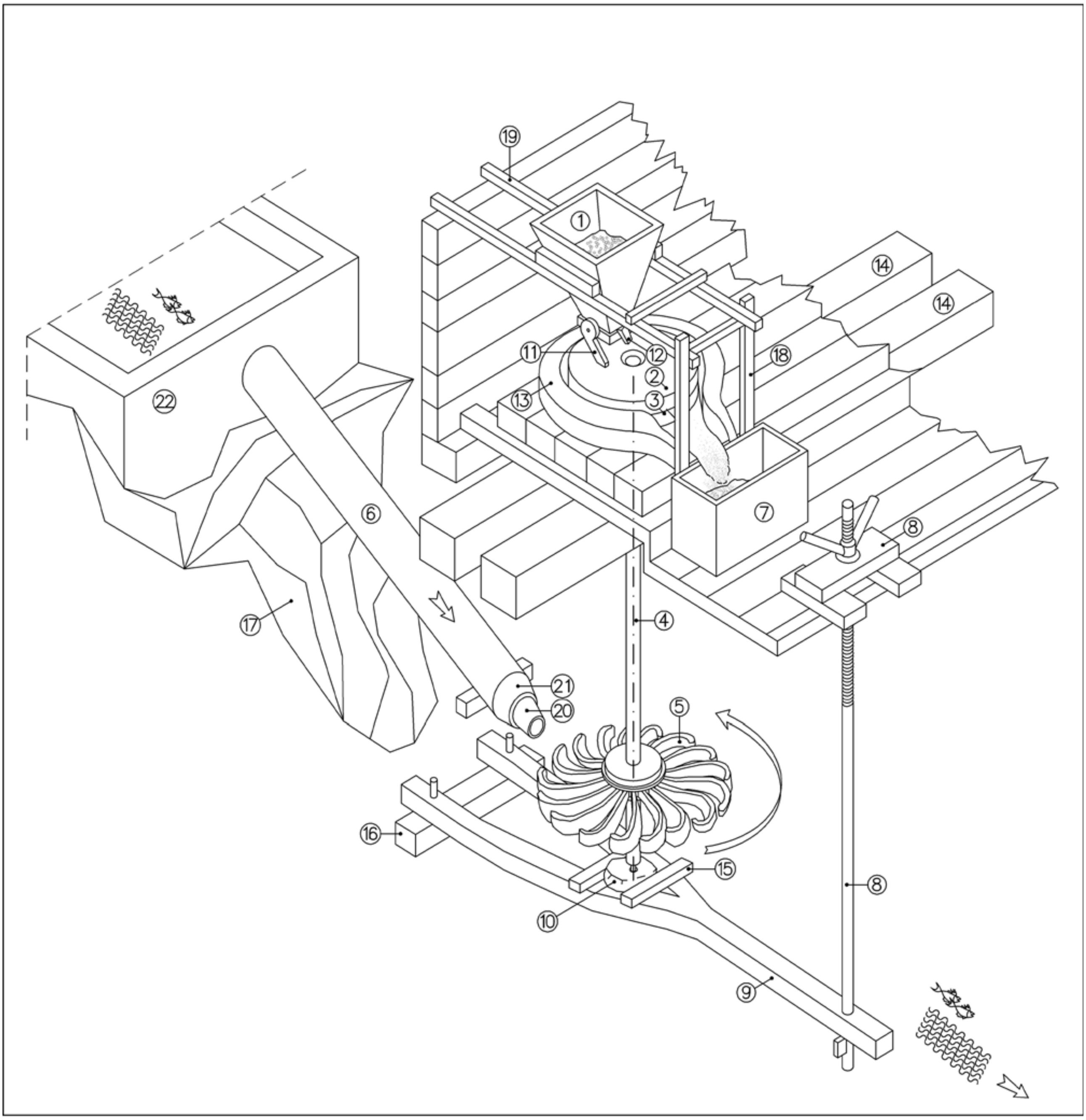
[85] Hoffmann, 1981, p. 135; Pavel, 1954, p. 106.

[86] Hoffmann, 1981, p. 135.

LEGEND

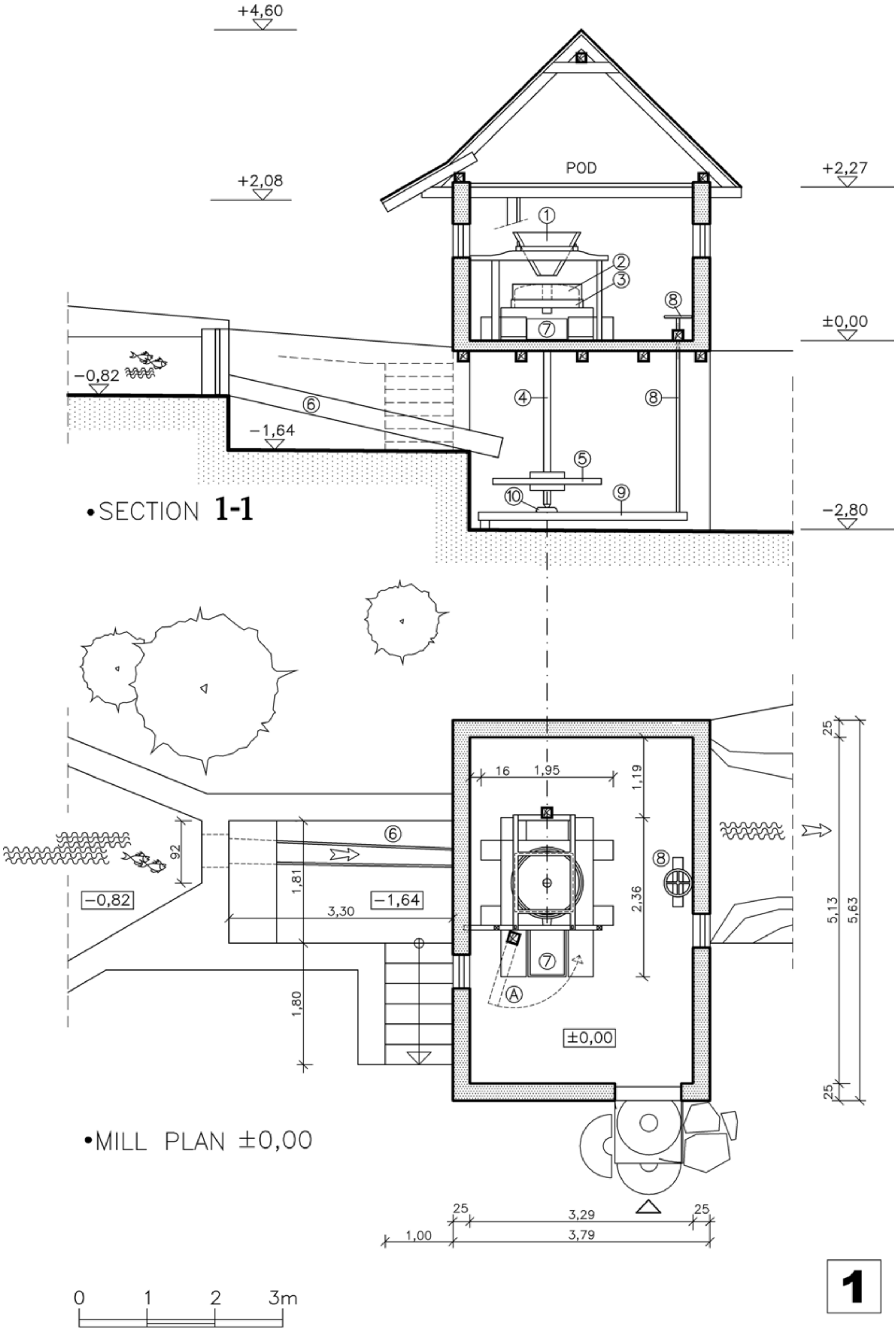
1. HOOPER/ GRAIN WOODEN CASE / BASKET [local name: *coș*]
2. RUNNER STONE [local name: *piatra alergătoare*]
3. BED STONE [local name: *piatra stătătoare*]
4. WHEEL SPINDLE/ SHAFT [local name: *fusul morii*]
5. HORIZONTAL BUCKET WATER WHEEL [local name: (roata cu) *ciutură*]
6. SLUICE BOX/ FLUME/ LADE [local name: *butoni*]
7. FLOUR COLLECTING BOX
8. BRIDGE TREE [local name: *ridicător*]
9. FORK/HUSK FRAME – A TREE TRUNK IN A SHAPE OF FORK [local name: *furcă*]
10. FROG - A HOLLOW STONE, ON WHICH THE WHEEL SPINDLE ROTATES [local name: *broască*]
11. SPINNING TOP [local name: *titirez*]
12. FEED SHOE/ DRIVER TO GUIDE GRAIN INTO THE EYE OF THE RUNNER STONE [local name: *postăviță*]
13. STONE CASE – CIRCULAR (WOOD/METAL) ENCLOSURE AROUND MILLSTONES [local name: *ocol*]
14. WOODEN BEAMS TO SUPPORT GEAR
15. PERCHES TO FIX THE LOCK
16. WOODEN TRAVERSE FOR FORK STIFFENING AND FIXING
17. SLUICE BOX ELEVATION (EARTH, HEAVY STONES, CONCRETE BLOCK) FOR SLUICE BOX LINING
18. PILLAR TO SUPPORT HOOPER
19. PERCH TO SUPPORT HOOPER
20. WOOD RING/ WOODEN LITTLE BUCKET [local name: *ciutura*]
21. SHUT/CONTROL GATE [local name: *gălețea/ găleţică* = (little) bucket]

HORIZONTAL BUCKET—WHEELED WATER MILL SCHEME OF FUNCTIONS

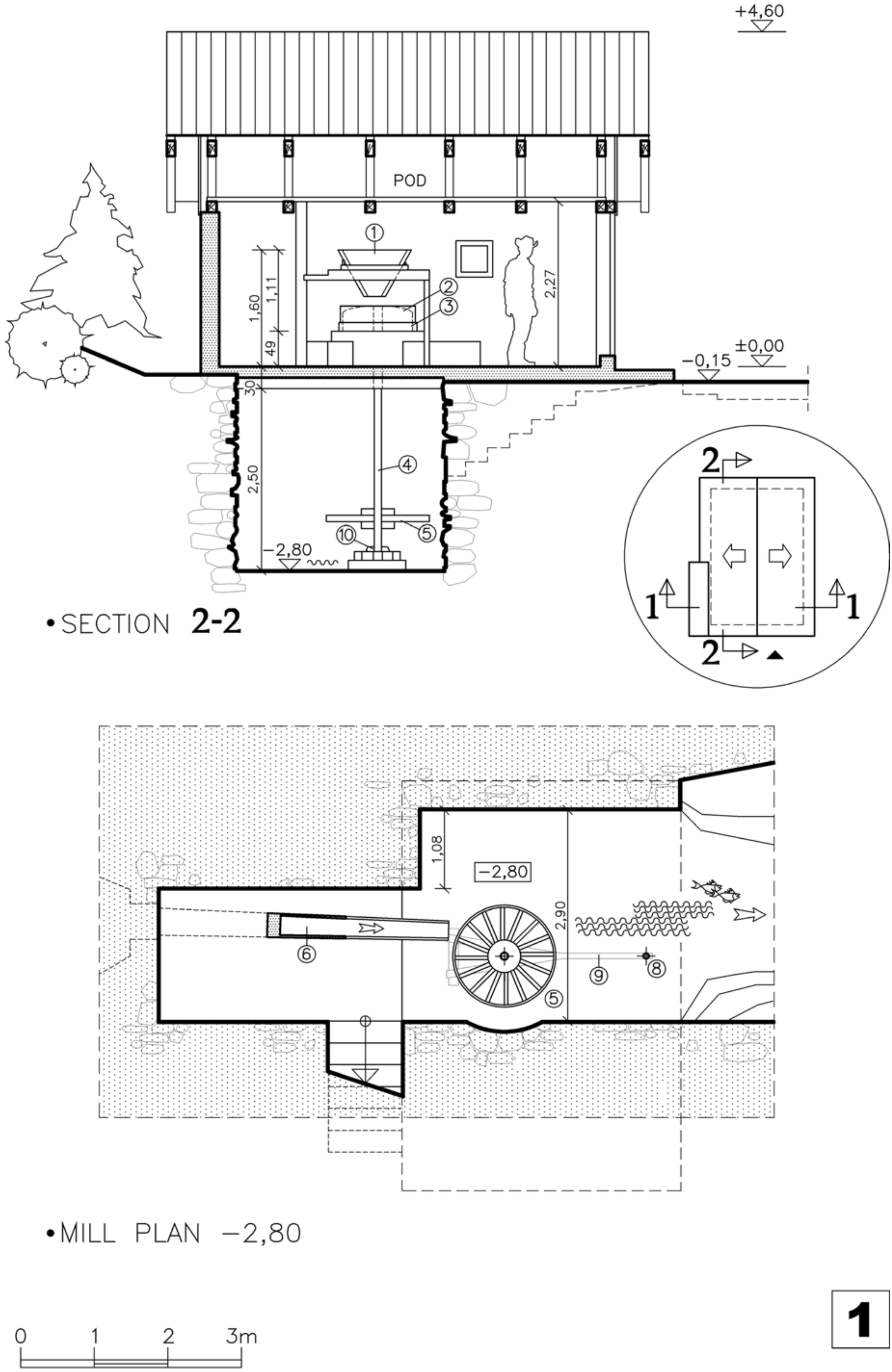


LEGEND

① HOOPER/ GRAIN WOODEN CASE
② RUNNER STONE
③ BED STONE
④ WHEEL SPINDLE
⑤ HORIZONTAL BUCKET WATER WHEEL
⑥ FLUME/ SLUICE BOX/ LADE
⑦ FLOUR COLLECTING BOX
⑧ BRIDGE TREE, A DEVICE–LEVER TO MODIFY THE FLOUR GRANULATION
⑨ FORK/ HUSK FRAME–A TREE TRUNK IN A SHAPE OF FORK
⑩ FROG– A HOLLOW STONE, ON WHICH THE WHEEL SPINDLE ROTATES
⑪ SPINNING TOP
⑫ FEED SHOE TO GUIDE GRAIN INTO THE EYE OF THE RUNNER STONE [local name: ***postăviță***]
⑬ STONE CASE—CIRCULAR WOODEN ENCLOSURE AROUND MILLSTONES [local name: ***ocol***]
⑭ WOODEN BEAMS TO SUPPORT GEAR
⑮ PERCHES TO FIX THE FROG
⑯ WOODEN TRAVERSE FOR FORK STIFFENING AND FIXING
⑰ SLUICE BOX ELEVATION (EARTH, HEAVY STONES, CONCRETE BLOCK) FOR SLUICE BOX LINING
⑱ PILLAR TO SUPPORT HOOPER
⑲ PERCH TO SUPPORT HOOPER
⑳ SHUT/ CONTROL GATE [local name: ***găleţea***]
㉑ WOOD RING [local name: ***ciutură***]
㉒ MILL POND



Pl. 1. Răcăşdia. ***Village Mill***



Pl. 2. Răcăşdia. ***Village Mill***

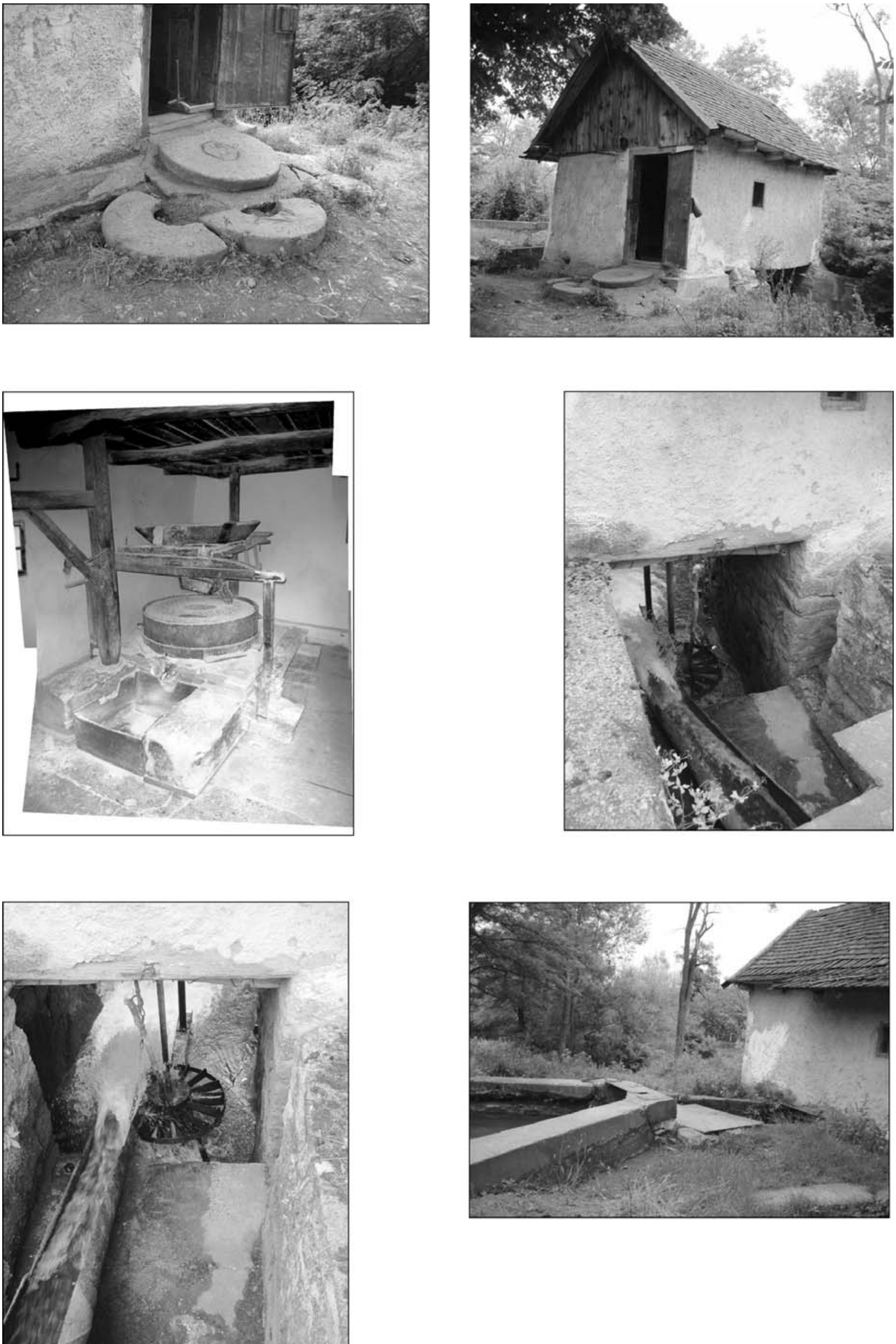
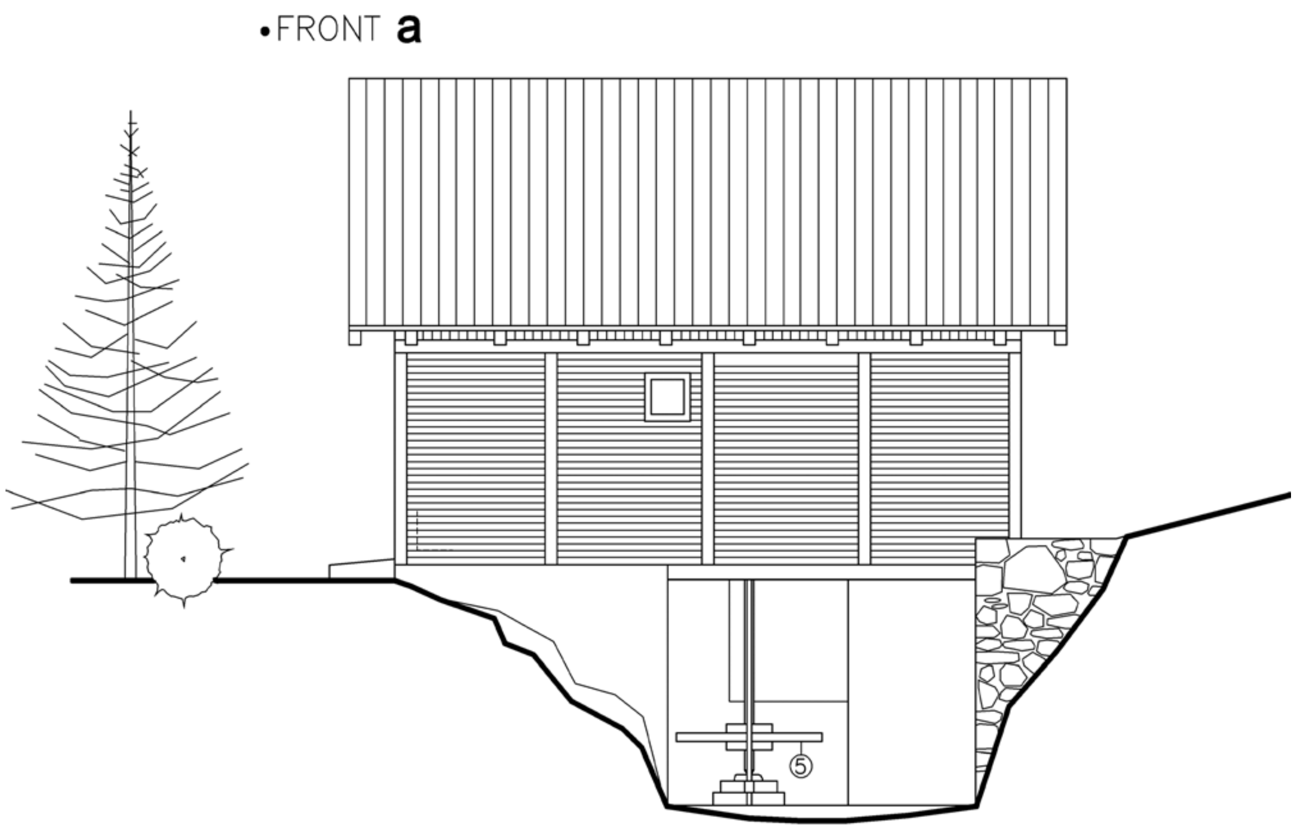
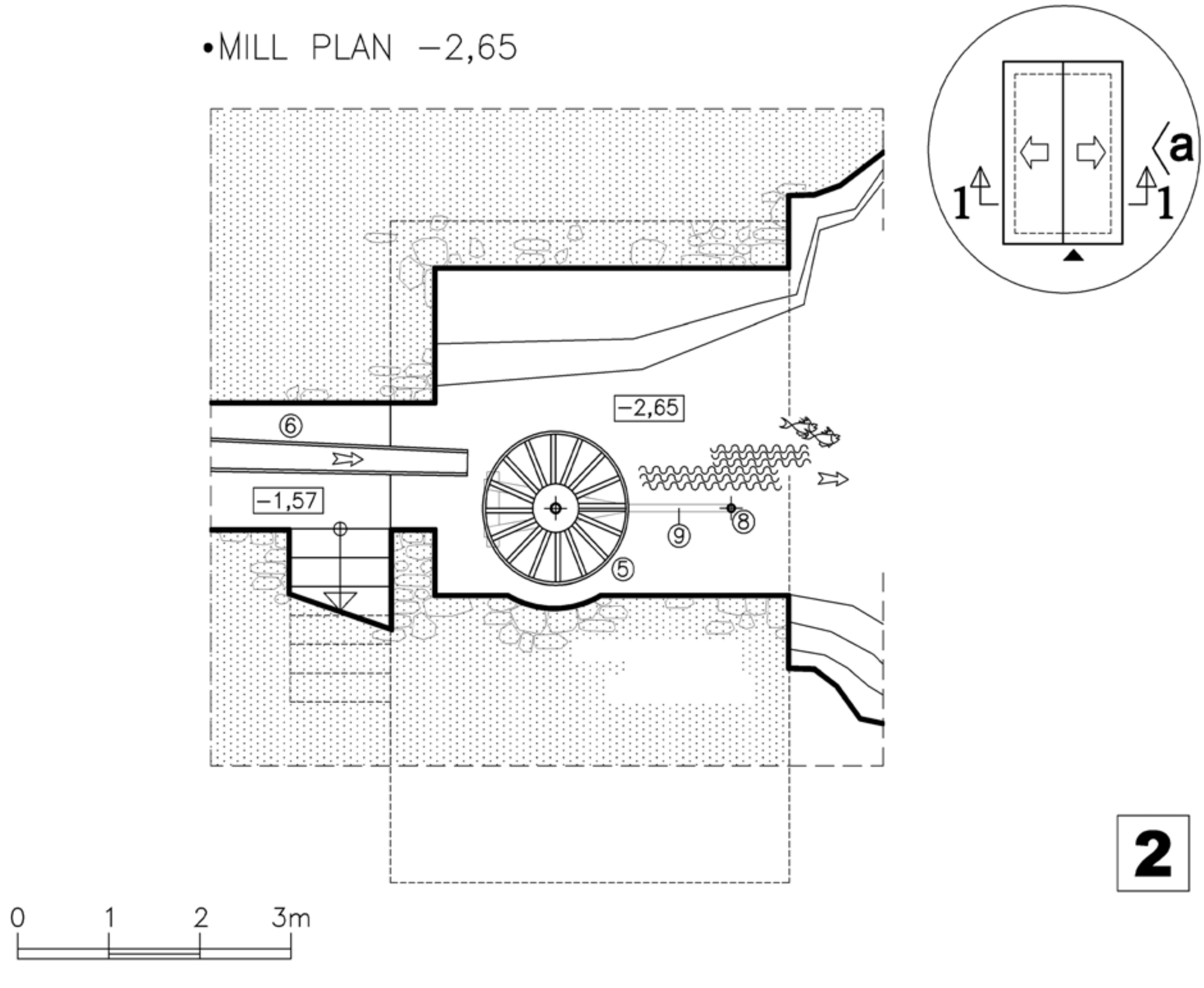
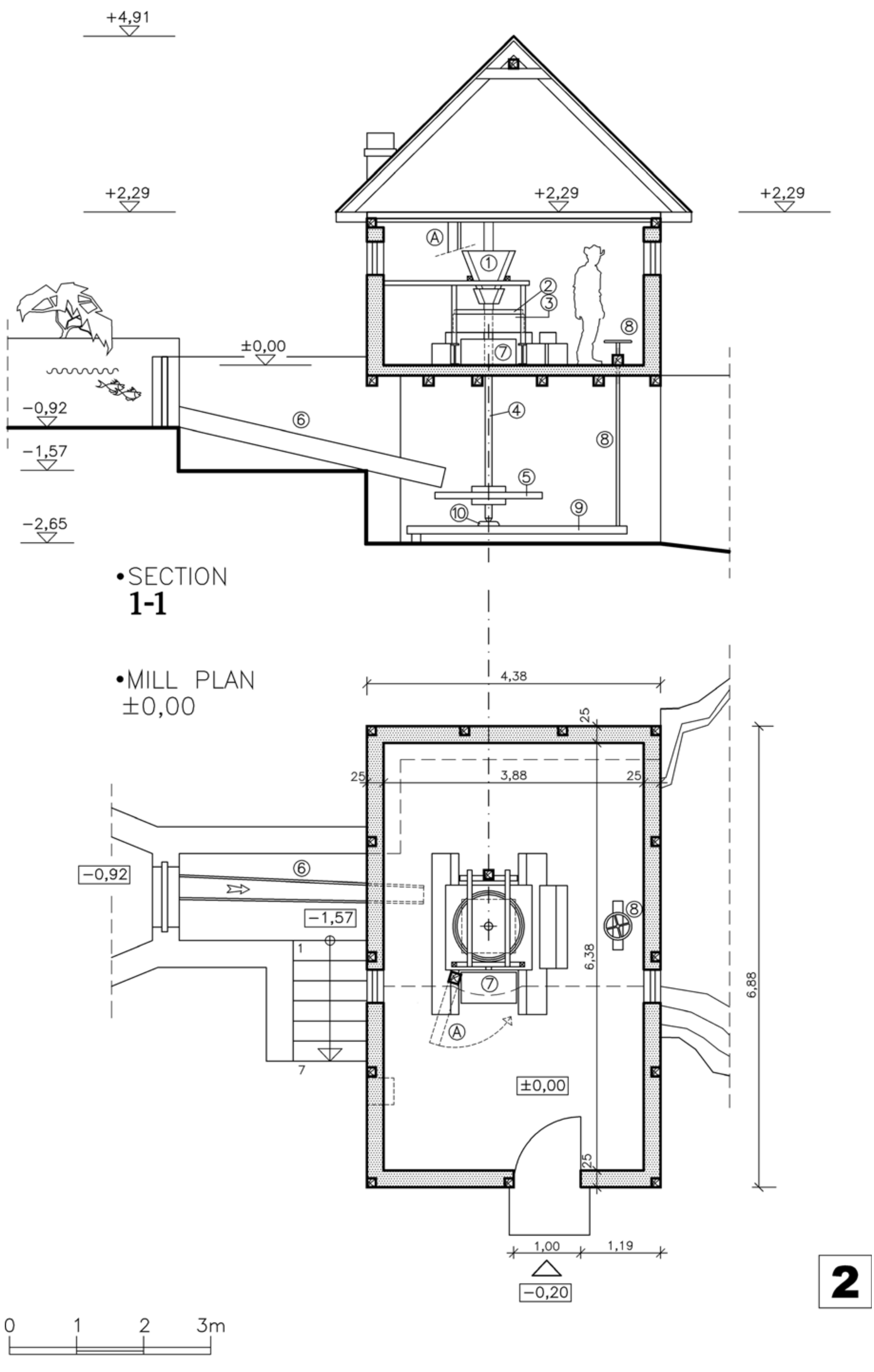


Fig. 1. Răcăjdia. ***Village Mill***





Pl. 3. Răcăşdia. ***Mill from Vârtop***



Pl. 4. Răcăşdia. ***Mill from Vârtop***

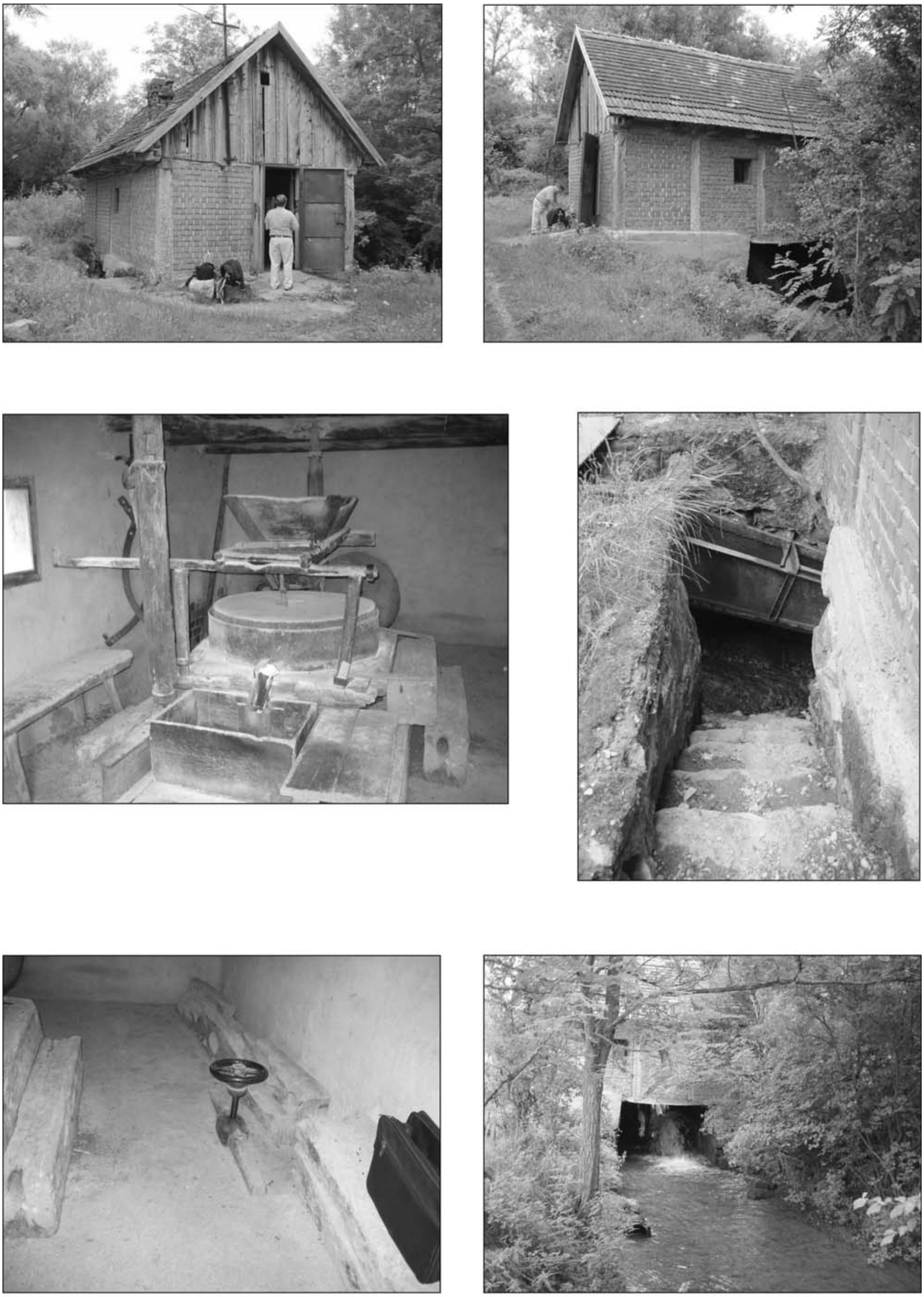
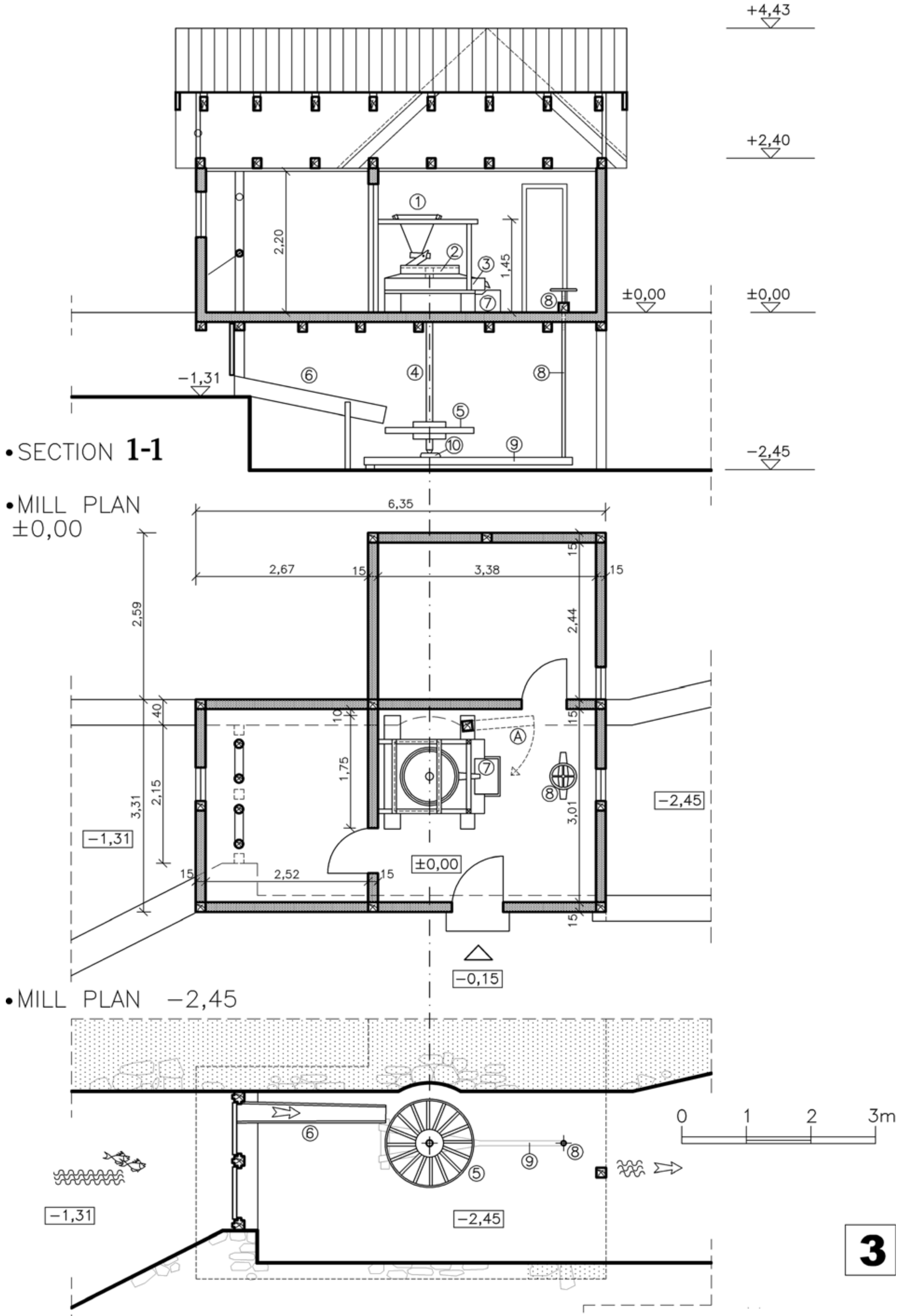
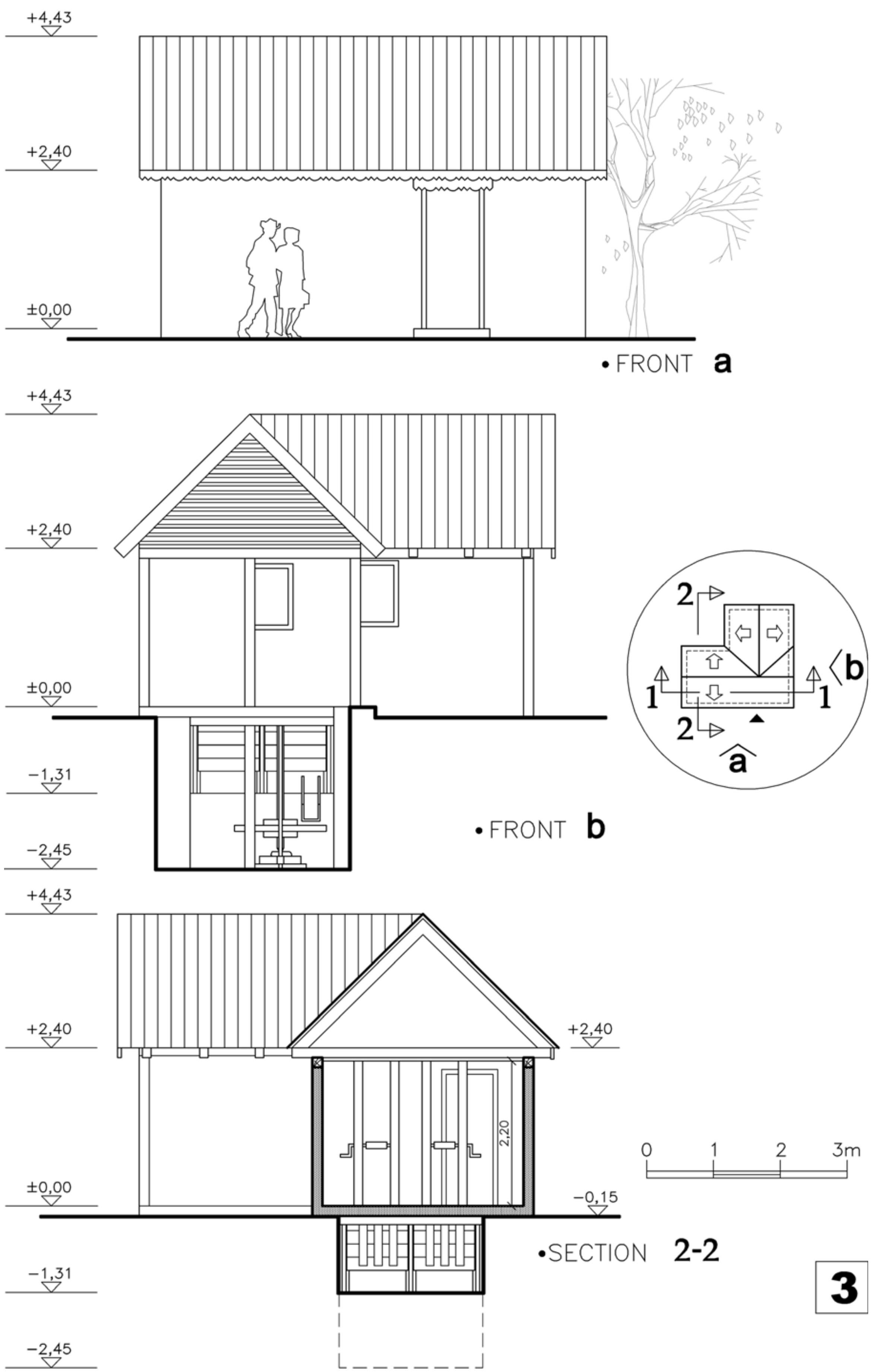


Fig. 2. Răcăjdia. ***Mill from Vârtop***

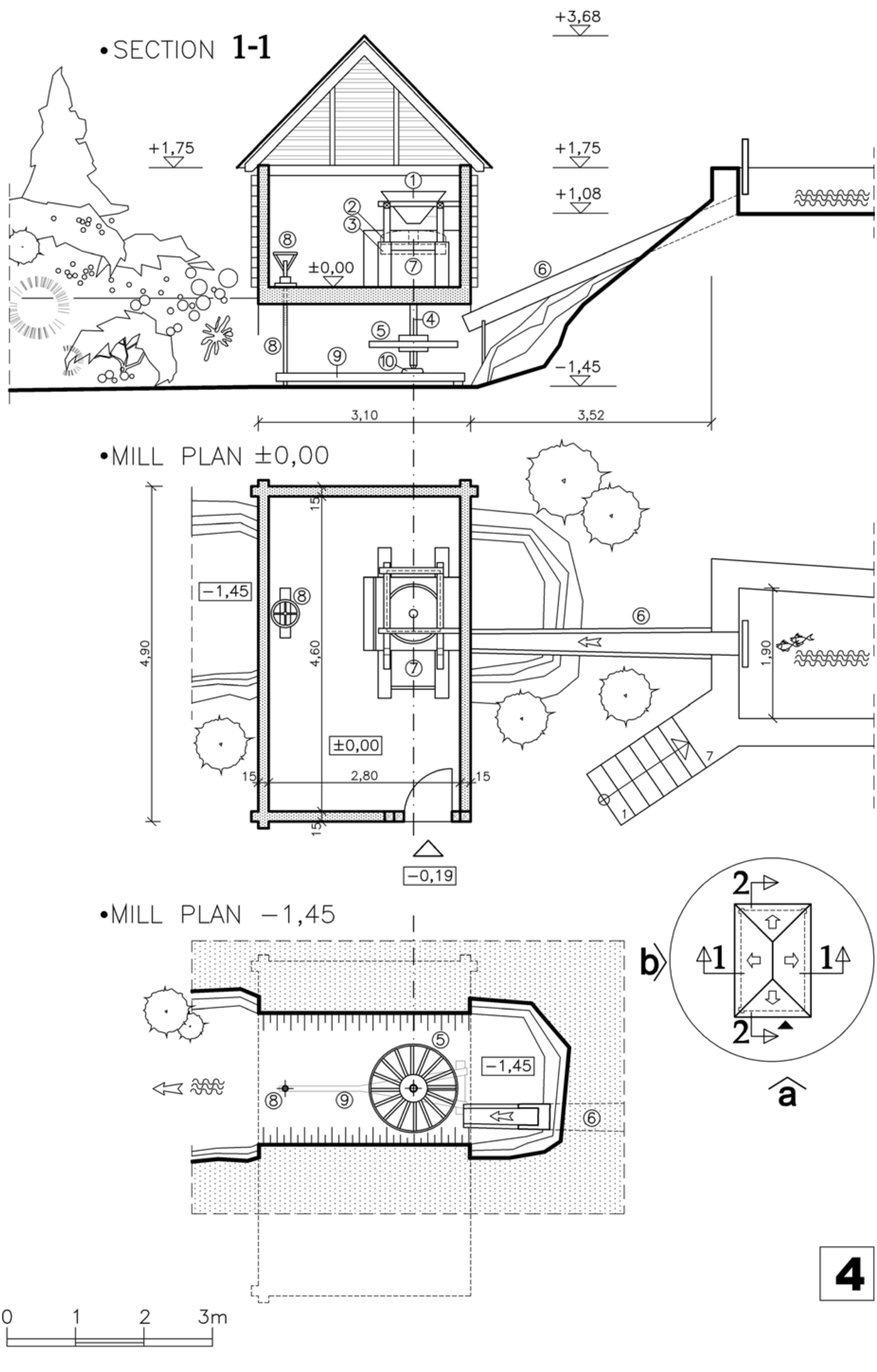


Pl. 5. Vrăniuț. ***Ghitera Mill***

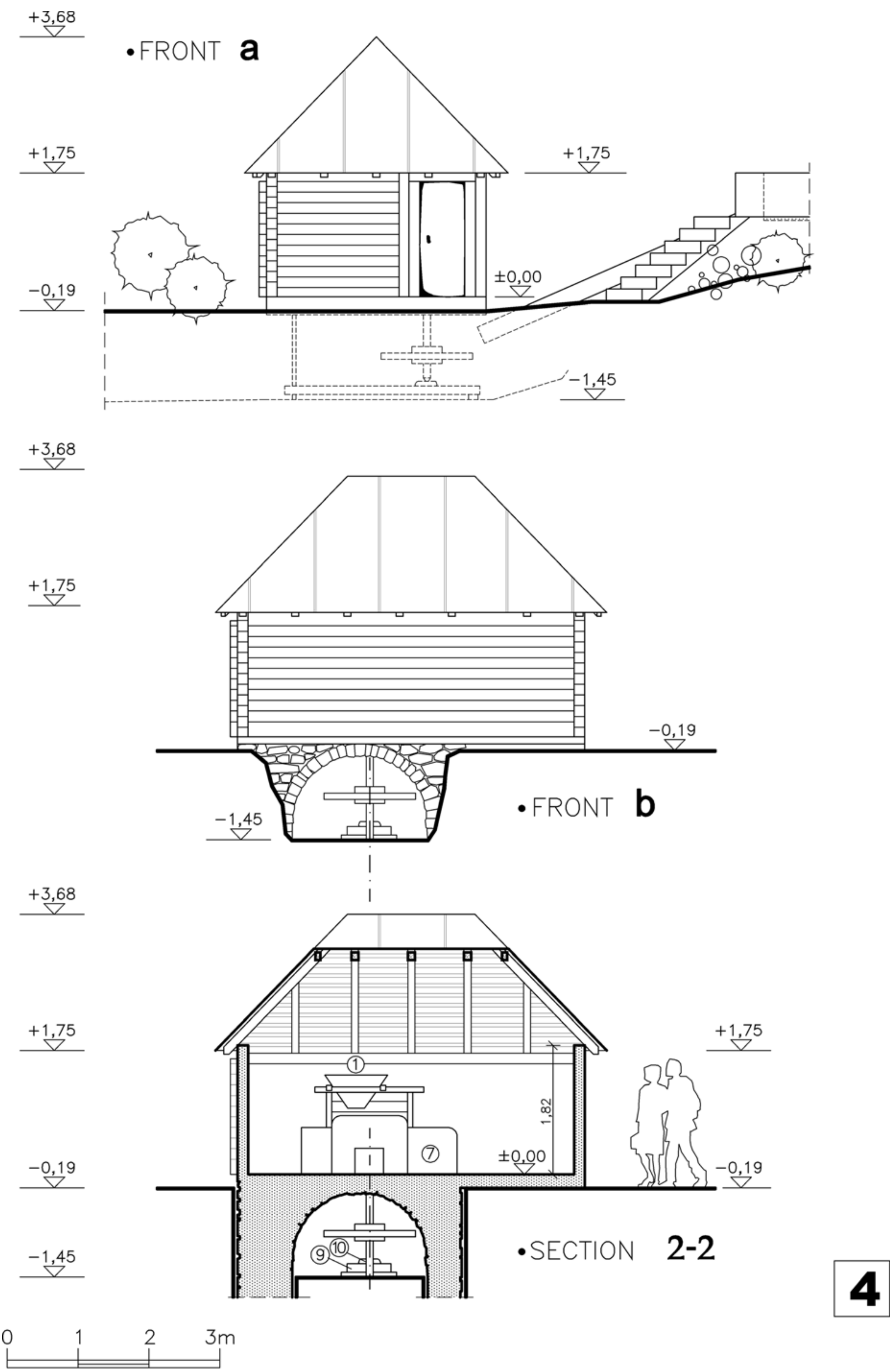


Pl. 6. Vrăniuț. ***Ghitera Mill***

Fig. 3. Vrăniuț. ***Ghitera Mill***

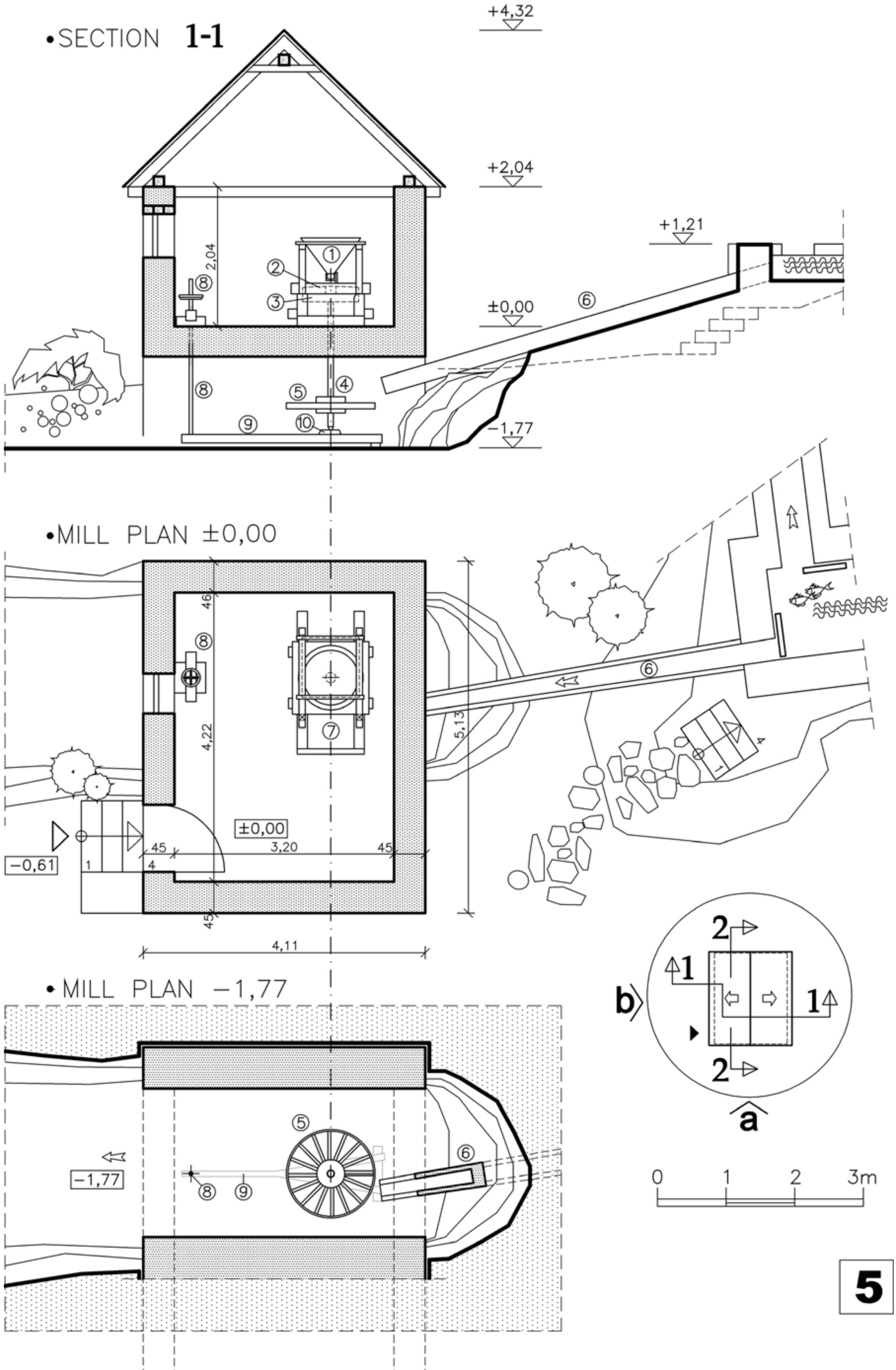


Pl. 7. Ilidia. *Mill from Pit*

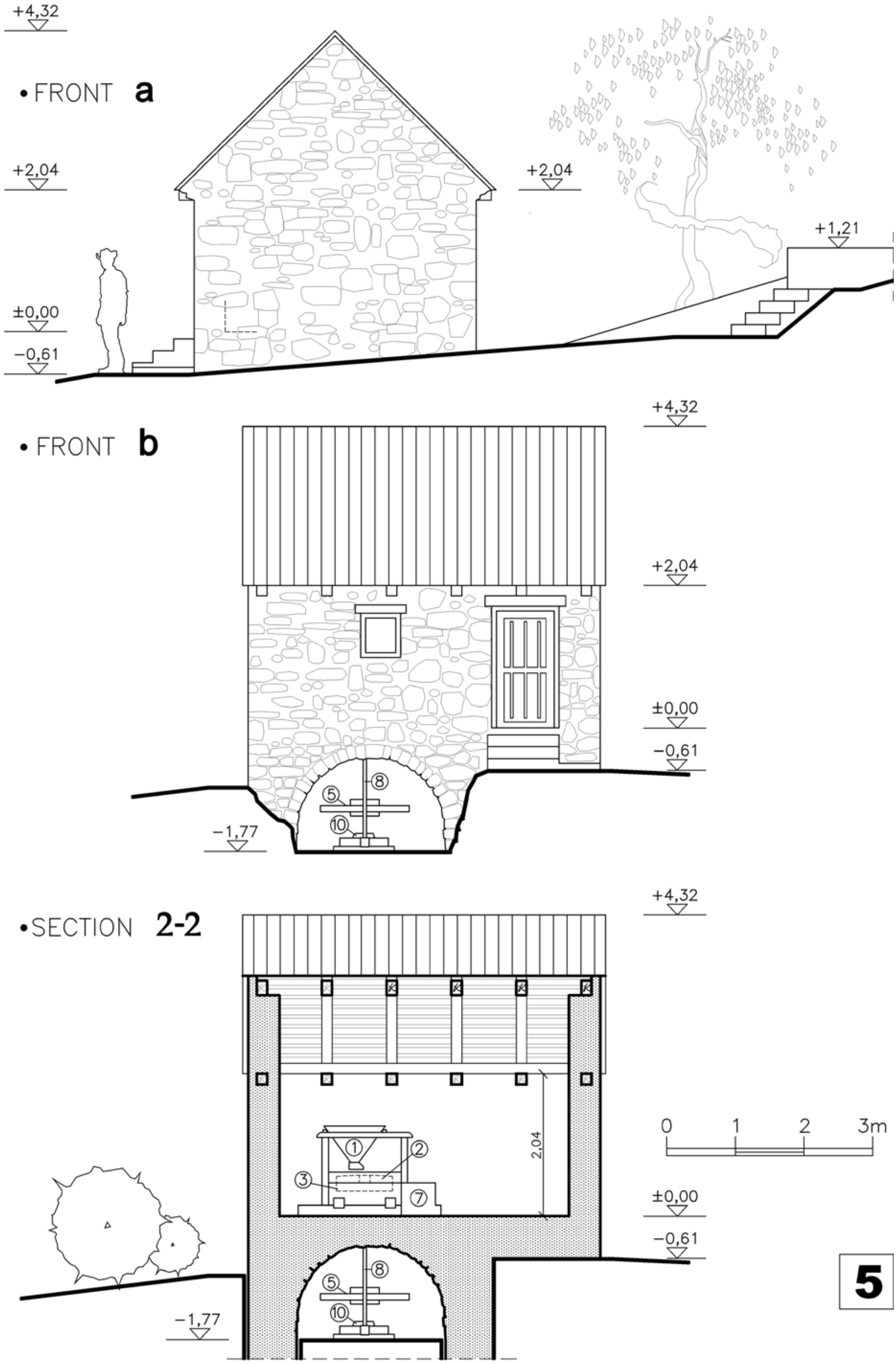


Pl. 8. Ilidia. ***Mill from Pit***

Fig. 4. Ilidia. ***Mill from Pit***



Pl. 9. Ilidia. *The two mills* – Lower Mill, from stone -



Pl. 10. Ilidia. ***The two mills*** **– Lower Mill, from stone -**

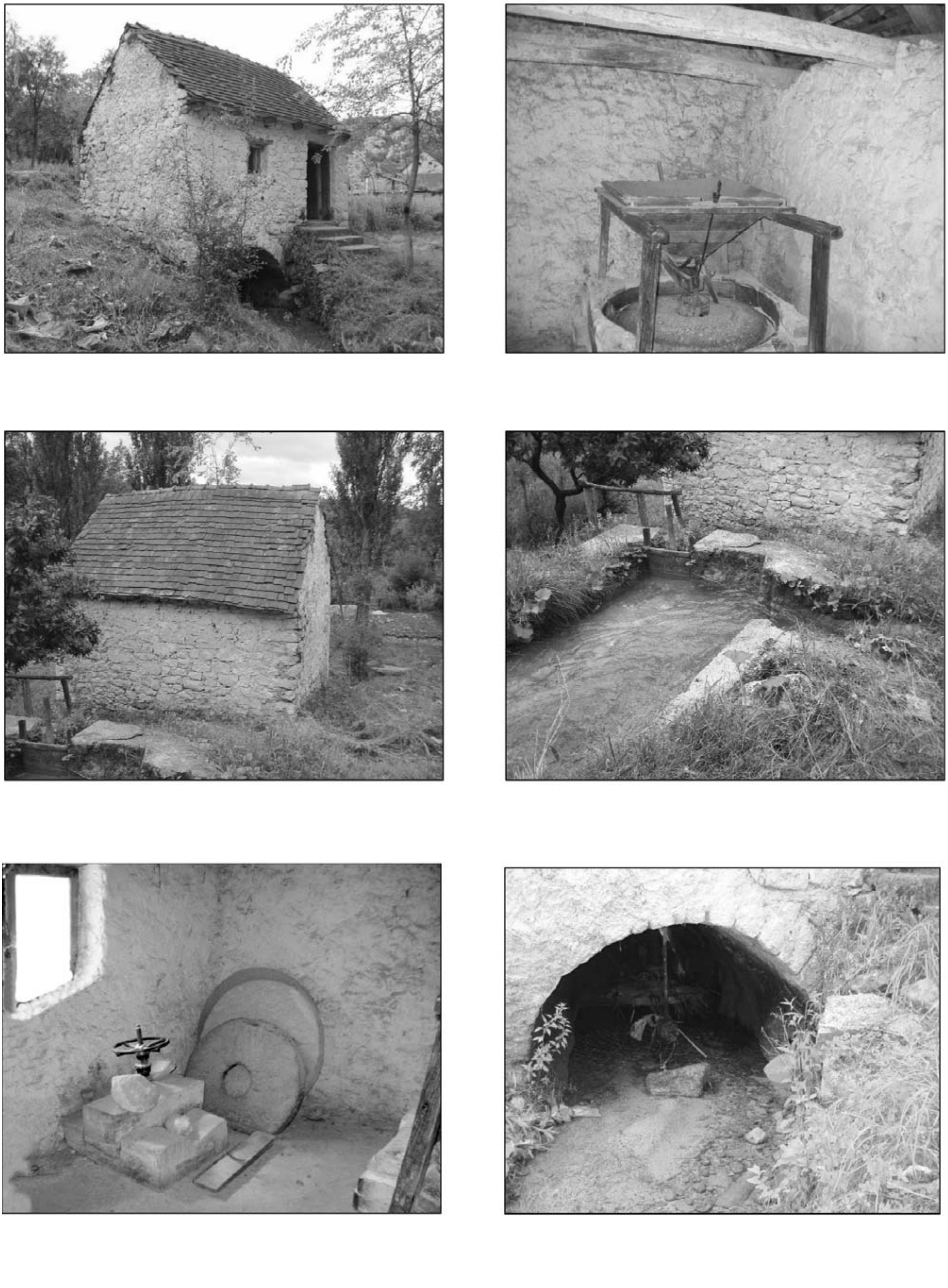
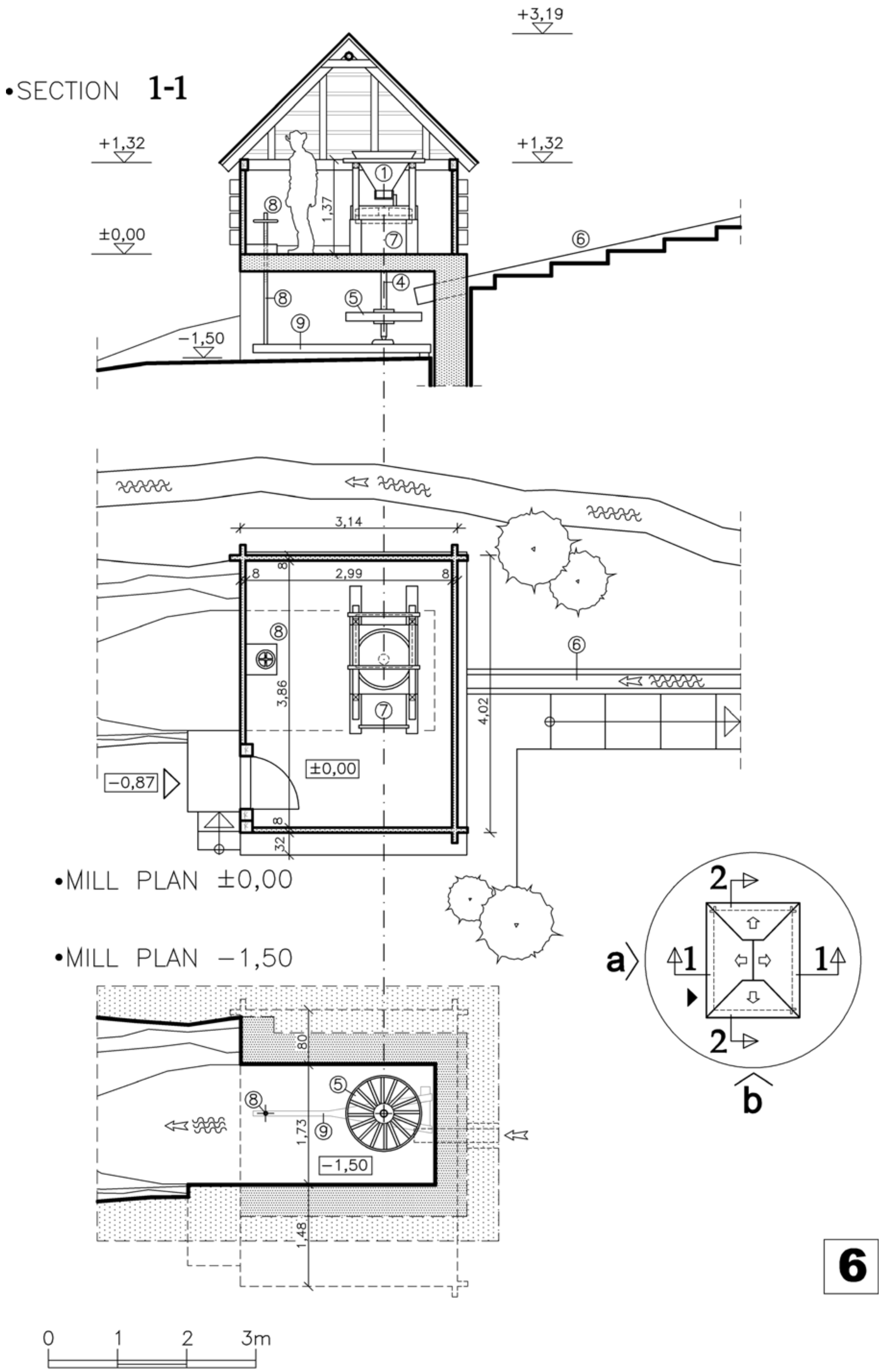
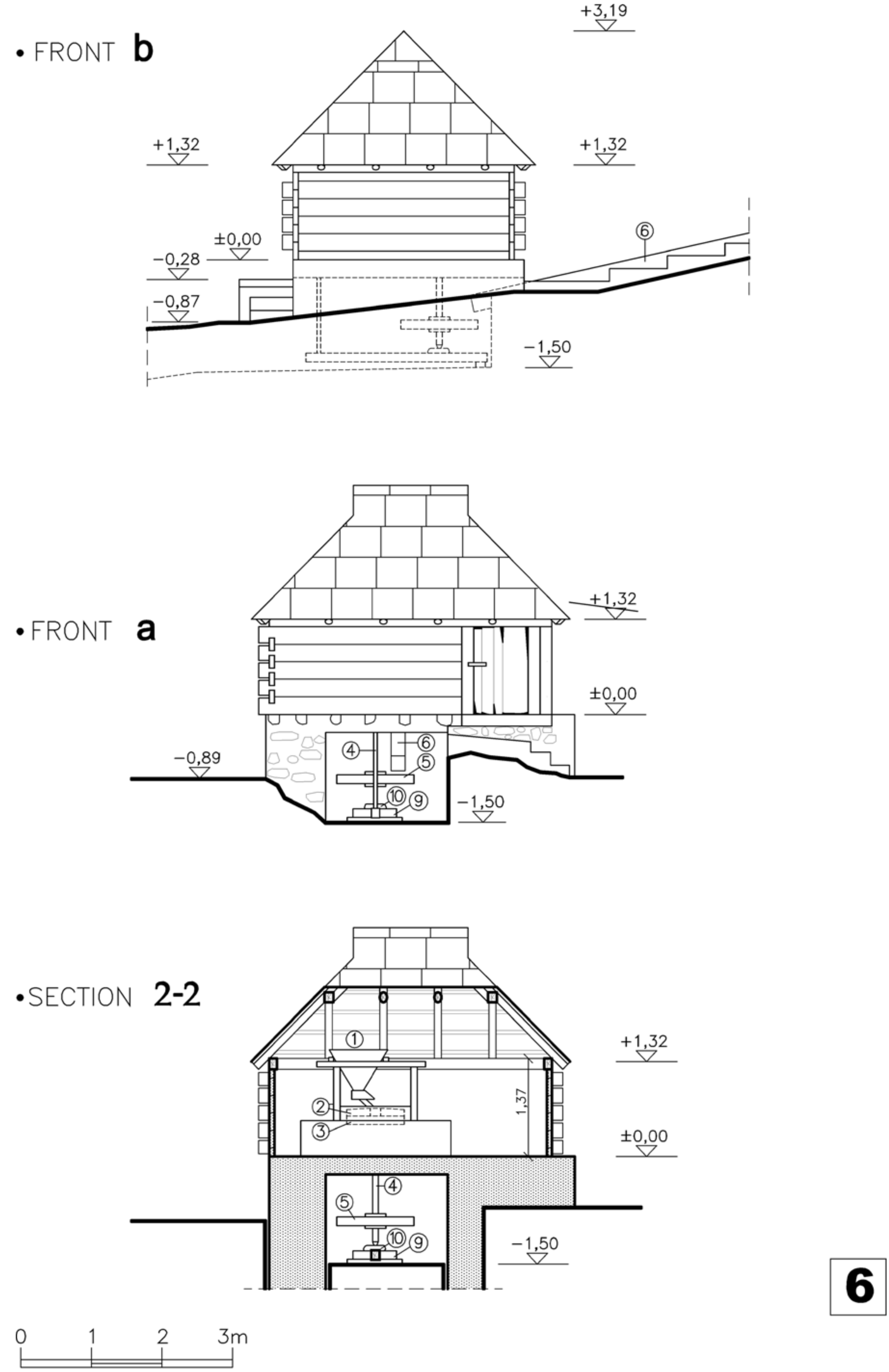


Fig. 5. Ilidia. ***The two mills***

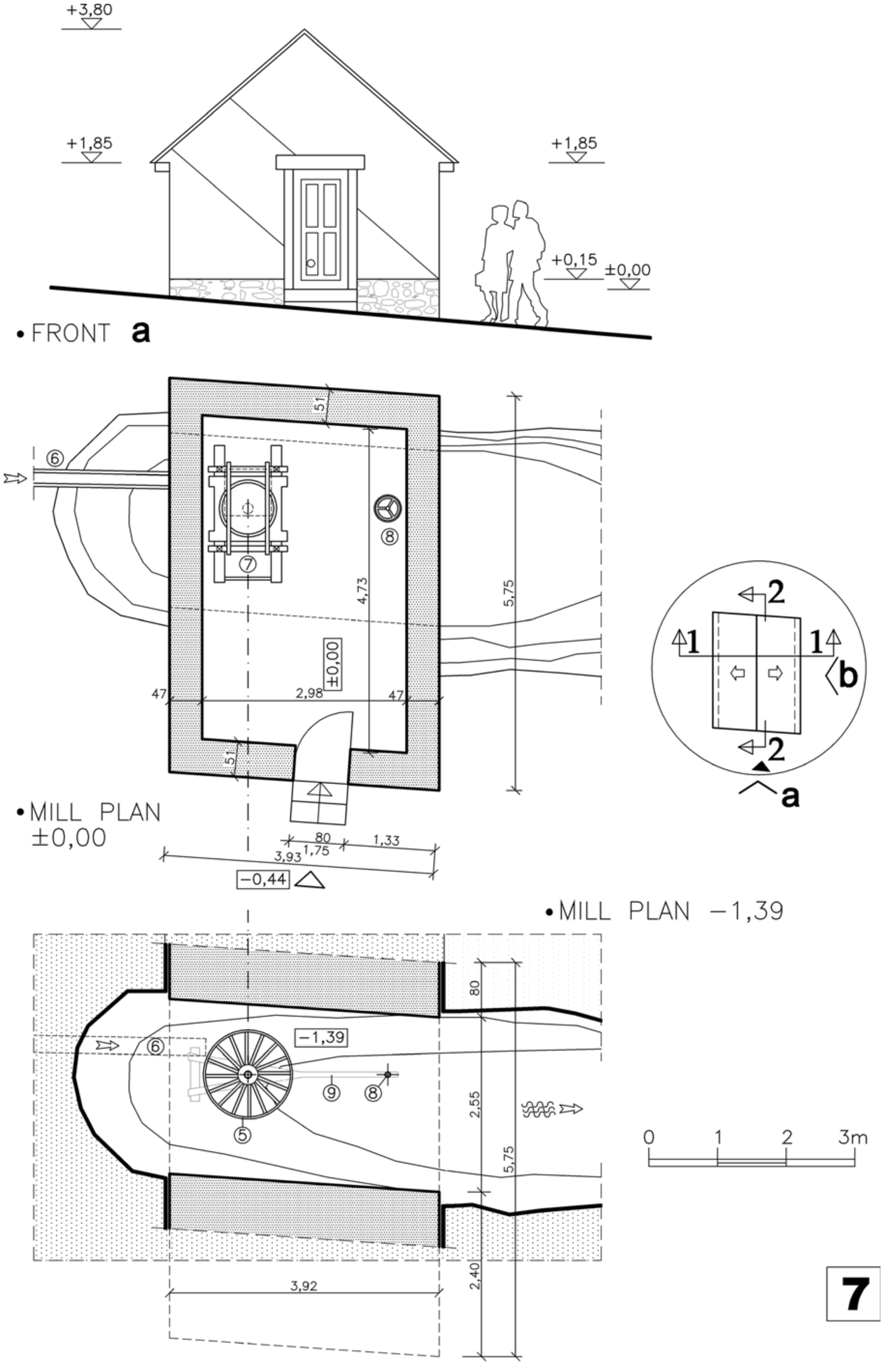


Pl. 11. Ilidia. ***The two mills*** **- Upper Mill, from wood -**

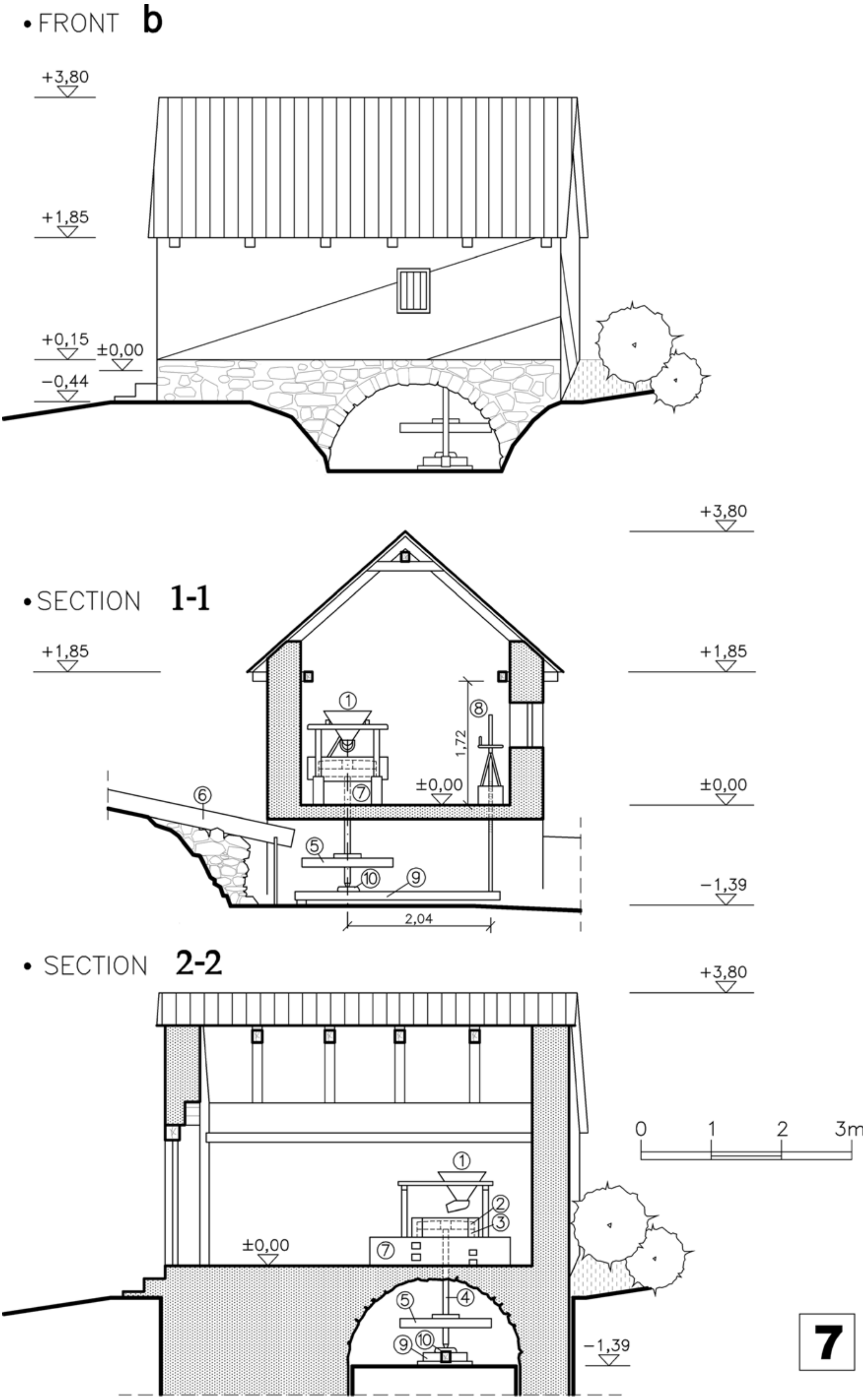


Pl. 12. Ilidia. *The two mills* – Upper Mill, from wood -

Fig. 6. Ilidia. ***The two mills***

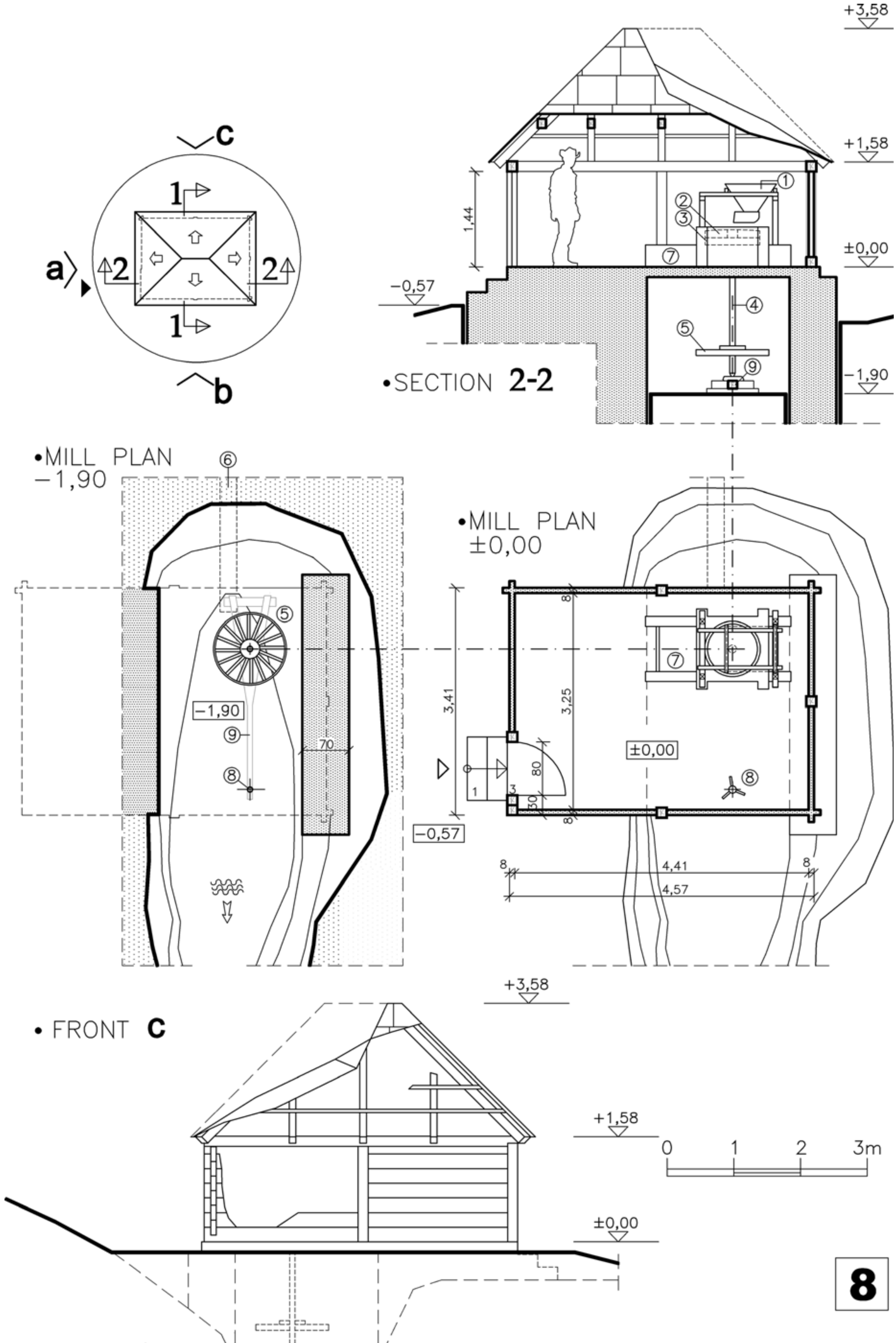


Pl. 13. Ilidia. *Balani's Mill*

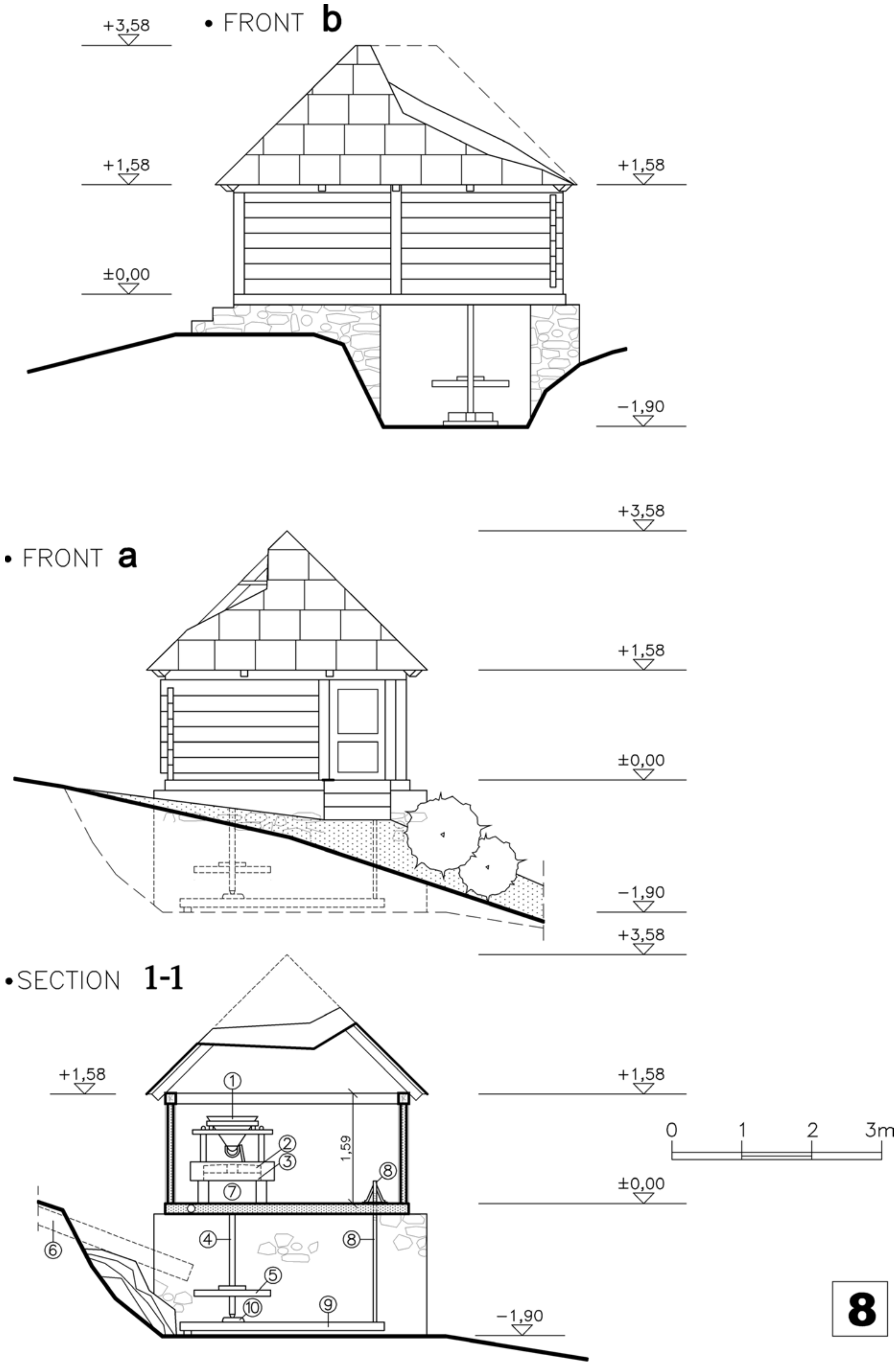


Pl. 14. Ilidia. *Balani's Mill*

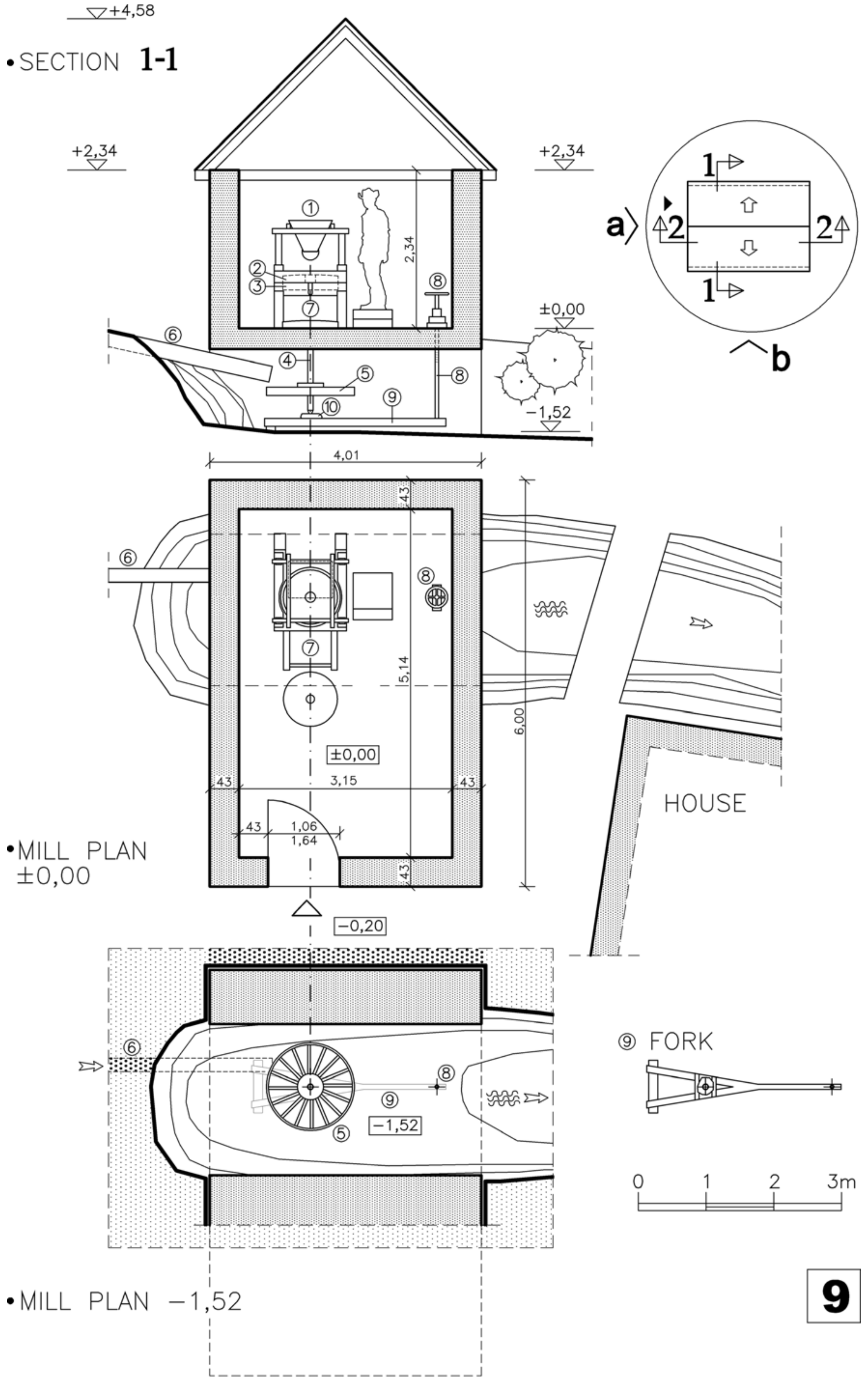
Fig. 7. Ilidia. *Bălani's Mill*



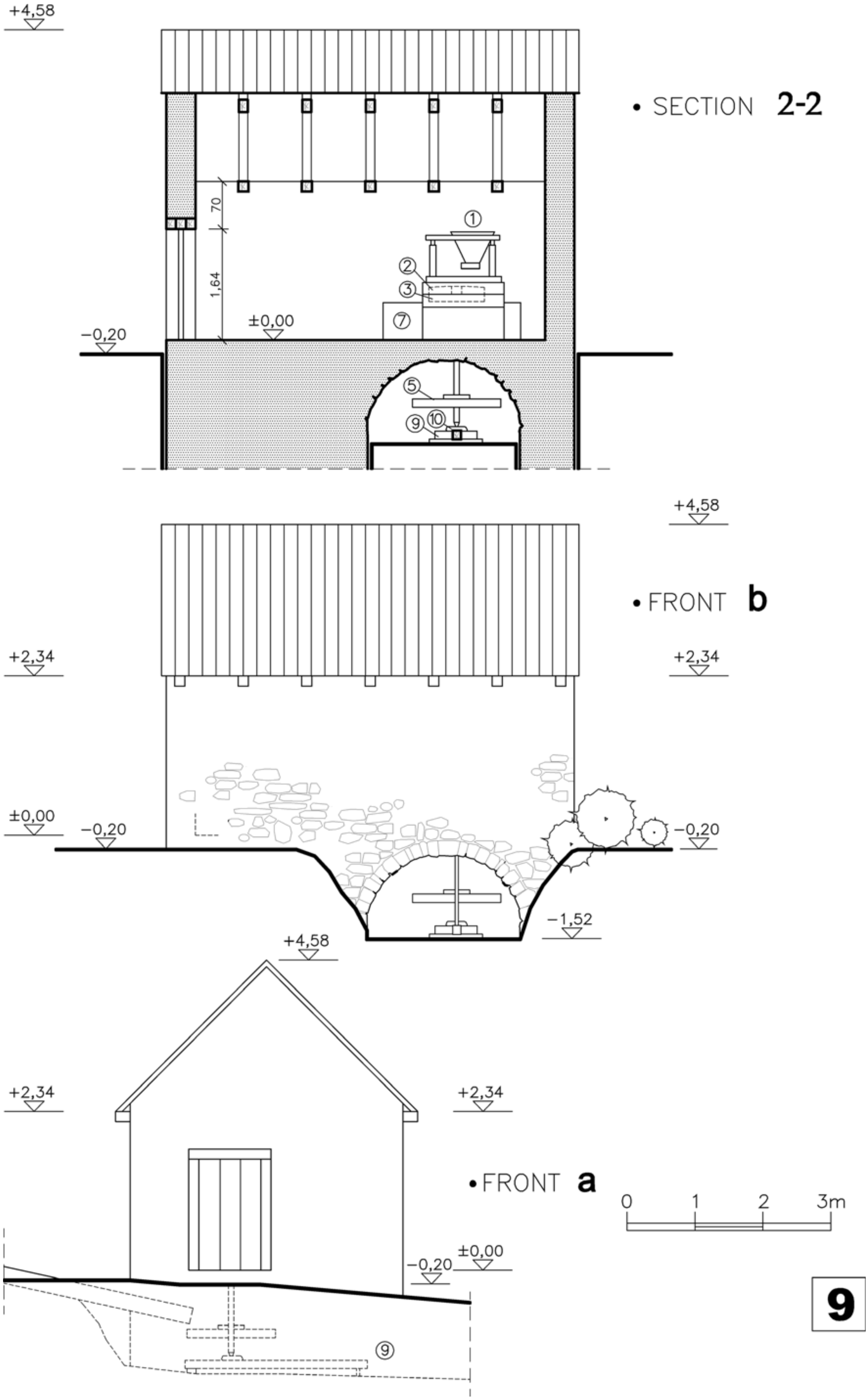
Pl. 15. Ilidia. ***Mill from Muican***



Pl. 16. Ilidia. ***Mill from Muican***

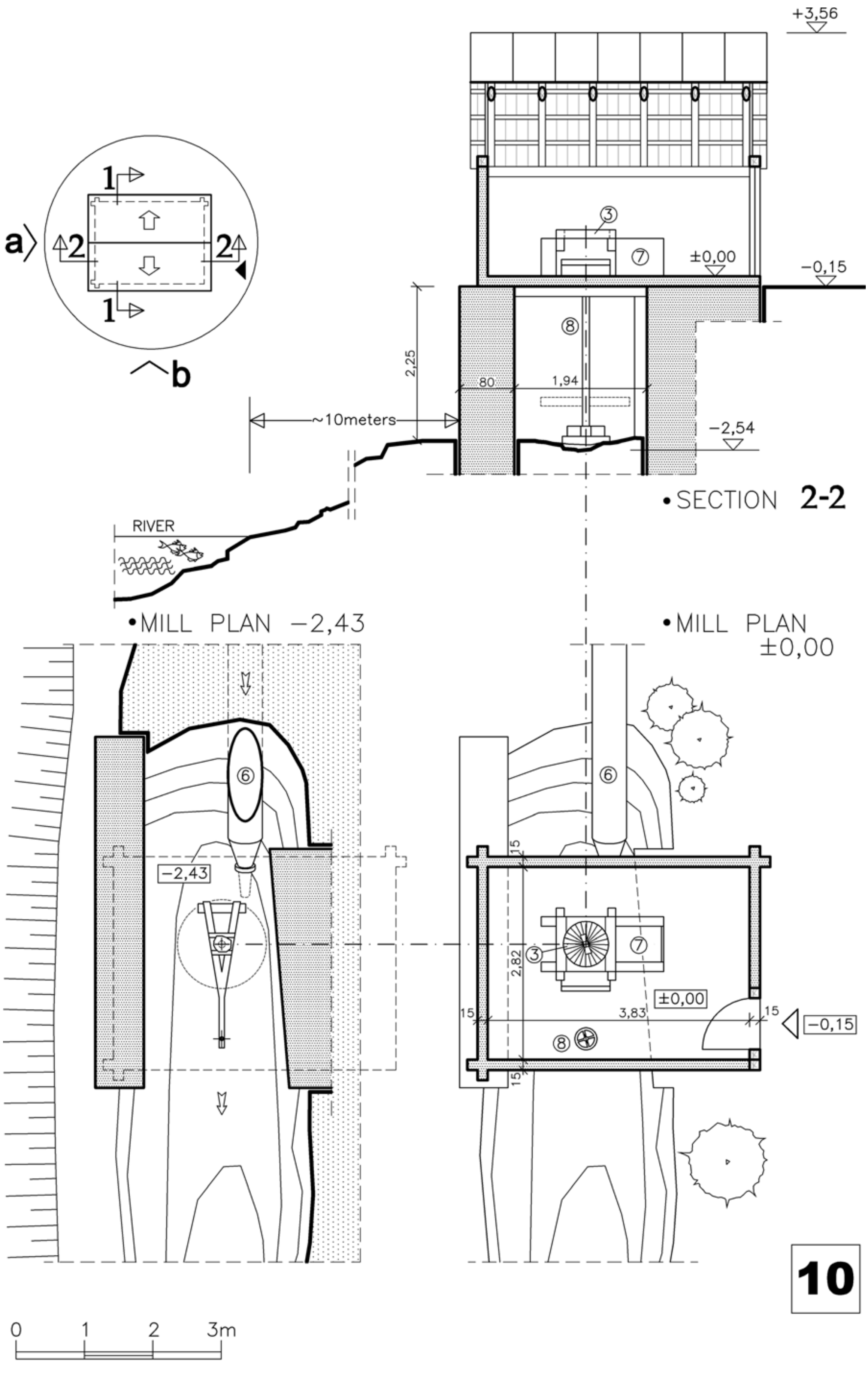


Pl. 17. Ilidia. ***The Small Mill***

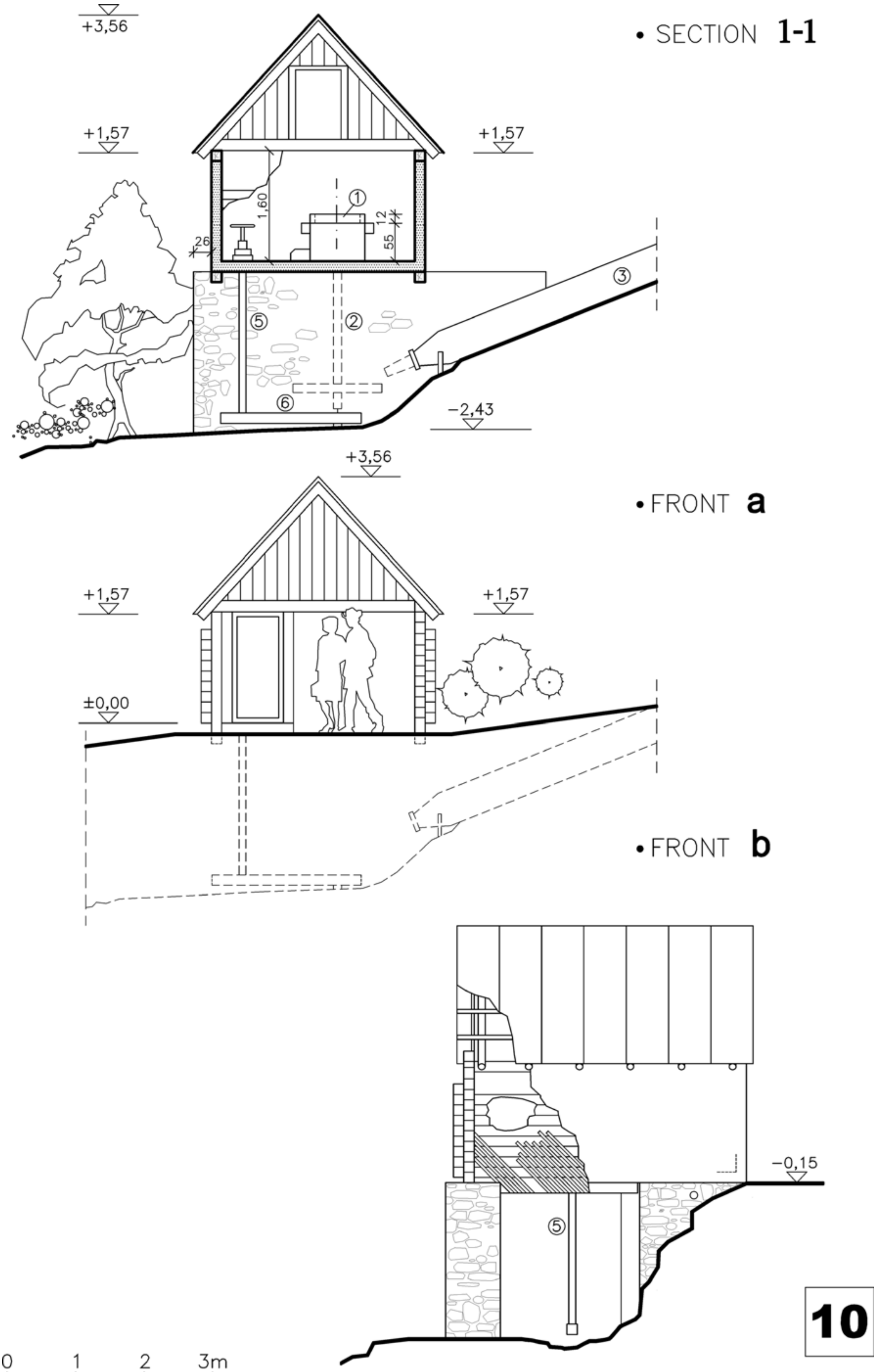


Pl. 18. Ilidia. ***The Small Mill***

Fig. 8. Ilidia. ***The Small Mill***



Pl. 19. Socolari. ***Mill from Sultana***



Pl. 20. Socolari. ***Mill from Sultana***

5.

MILL WITH VERTICAL WHEEL AND HORIZONTAL AXLE

We start from a long ago accepted in historical and technical writing finding which enrolls the mill among hydraulic machines. The principle used in classification of modern hydraulic machines, turbines or wheels represents the shaft position, which may be vertical or horizontal. Vertical-wheeled water mill has a horizontal axis position. We adopted this presentation with exact specification of the axle and wheel positions, otherwise found in historical writing. Office documents recorded vertical-wheeled mills in the fourteenth century. Estate Voia on the Lower Caras course came in 1377 in possession of Himfy nobles and so did the mill with lower intake[87]. Jebel estate had in 1424 a mill with three wheels with lower intake. We have in the two cases relied upon here certain benchmarks of vertical-wheeled mill in the area of the Banat Plain. More likely that documents of the thirteenth century mentioning mills, without specifying intake type, relate to the mill with vertical wheel, having in mind that they worked on major rivers from the low Banat Plain. Nobles from Cenad family had, in 1256, sites for mill and mill with two wheels on the Timiş, in the village Ciavoş. A document from 1270 confirms the operation of a mill on the Bârzava, in the low plain near Gătaia. The mills of the Banat Plain in the thirteenth century, invoked before, were likely vertical-wheeled mills, but in the absence of some specifications, the two documentary testimonies remain only circumstantial evidence.

The always invoked statistics, since 1957, registered a total of 3450 vertical-wheeled watermills in Romania, at a national level. The Banat, unlike the other historical provinces, had at that time a number of 74 vertical-wheeled watermills. It was a small number of such plants, if we consider Transylvania where there were 740 such mills in southern Transylvania and 2047 in the north of the province. Oltenia and Wallachia had 272 such mills. In the Banat, 41 of the 74 vertical-wheeled watermills and horizontal axis were on the Timiş, 12 were on the Bega, 5 operated on the Bârzava, by 6s mills were in operation on each of rivers Caraş and Cerna, and only 4 ones on the Nera[88]. The vertical-wheeled watermills in the Banat represented 2.1% of the total number of plants of this type operating in Romania. The massive share of mill with vertical wheel was in Transylvania, with a rate of 73%. The vertical-wheeled watermill is found in a very few approaches of historical and ethnological writings. We usually find timely presentation of some plants from Transylvania and the Banat, but never a zonal or a general monograph devoted to the mill with horizontal axis and vertical wheel[89]. Seen in light of ethnological heritage of the province of the Banat, the mill vertical-wheeled watermills totally disappeared from the Banat villages and even from the Open-air Museum of the Banat Village from Timişoara. Therefore, the Banat vertical-wheeled watermill remains a lost historical heritage.

Few historical and ethnological studies have focused their interest on this category of mills from the Banat. In the absence of field relicts or some preserved vertical-wheeled watermills in open air museums, the appeal to monuments from the upper Bega flow presented by Nicolae Ţăranu[90] and the ones from Kuvin area discussed by Milan Miloševʼ[91] represent few sources of discus-

[87] Răuţ, 1993, p. 26-28.

[88] Irimie, 1968, p. 423, 485.

[89] Lungescu, Godea, 1973, p. 127-134; Popescu, 1973, p. 135-154.

[90] Ţăranu, 1979 a, p. 125-131.

[91] Miloševʼ, 1954, p. 155-159, pl. I-II.

sion. Archival documents from the beginning of the past century provide information on the vertical-wheeled watermills on the Timiş River, at Armeniş[92].

Structurally, the vertical-wheeled watermill and horizontal axis has the same hydrotechnical arrangements as the horizontal-wheeled watermills. Differences between the two mill classes are done by of water intake and transmission.

Water pond is arranged through a dam over the river bed. Inlet is achieved by a parallel with the riverbed dig *channel*. Document cited before from the year 1905 noted following data: Paul Simescu's mill from Armenis no. 50 uses the flume of the right bank of the river Timiş, on which was also the mill of Mihai Grigorovici[93]. For the water–catchment a dam of 1.90 m high was built (Fig. 80). Supply channel has a total length of 270 m. from the dam up to the mouth of the river Timiş The distance from the dam and up to Simescu's mill is of 76 m, and from Simescu's mill up to Grigorovici's mill is of 106 m. Upstream of the dam is arranged another mill that belonged to Nicolae Veto from Armenis no. 6. Distance from Simescu's mill dam and up to the supply channel mouth for Nicolae Veto's mill was of 156 m. The document from March 25, 1905 also indicated data on the water flow designed for these mills. Drop of water at Simescu's mill was of 1.40 m. Supply channel's arrangement and raising dams to capture water should not cause damage to neighboring mills or to riverside owners of lands[94]. Water admission at mill with vertical wheel was usually done through a wooden trough. Written documentation about mills on the upper Bega flow, about those from village Poieni provides information in this regard. Horizontal-wheeled watermills in Făget area, from Poieni, Luncani and Fărăşeşti had a lower intake system[95].

Hydrotechnical system consisted of a vertical wheel mounted on a horizontal axis. Wheel of Poieni village mill had a diameter of 3.20 m. As a construction, it was made of two parallel disks with a distance of 0.70 m between. Each rim was supported by four spokes. A number of 25 simple board blades were fixed between the two disks of the wheel. Wheel rims were called in the area "coils" and bonded blades were called "shovel"[96]. Wheel axle was made of elm wood with a square or octagonal section. It measured 3.50 meters long, and the section sides were 0.40 m. The wheel shaft had two steel axles built in ends, which rotated in the wooden camps (Fig. 123). Parallel with the vertical water wheel a wooden wheel was fixed on the same shaft, in which were stuck wooden nails. These nails were placed circular underside of the wheel called because of the structure "wheel with large teeth". Gearwheel diameter was of 1.35 m. Wooden nails were made of hardwood, usually from hornbeam or horn[97].resistant to abrasion. The gearwheel interposed on the sprocket drum mounted on the vertical axis of the mechanical grinding machinery. Thus the shaft on which the "wheel with large teeth" was fixed transmitted the rotation movement in a horizontal plane to the runner stone, through the pair gearwheel – sprocket drum. Pinion shaft was fixed at the upper end in agitation attached to the underside of runner stone, and the lower extremity is sprocket drum in contact with the gearwheel (Fig. 123). Mechanical system axis fixed in agitation, and the lower end rested in a camp called "frog", a common terminology with that used in horizontal bucket-wheeled watermill, with vertical axis. Transmission gear, drum-shafts is called *crig* [lever], a terminology close to that found in Transylvania where it is called *crâng*, or *felinar* [lantern][98]. Grinding installation handling, the distance between the static and runner stone adjusting are done after the same technology found at the horizontal bucket-wheeled watermill. Vertical

[92] AST, fond Prefectura Severin, Dosar 3605/1906.

[93] AST fond Prefectura Severin, Dosar 3605/1906. Armenis Hydro Permit.

[94] AST, fond Prefectura Severin, Dosar 3605/1906. Armeniş.

[95] Ţăranu, 1979 b, p. 129; Blaj, Grigorescu, 1985, p. 73, fig. 11.

[96] *Ibidem*, p. 127.

[97] *Ibidem*, p. 127.

[98] Bucur, 1977, p. 127.

axis of the grinding plant on which the lever is, rests on a beam of oak. Parallel to the vertical axis of the grinding plant is a linkage arm, both being attached to the beam, called *puntea crigului* [lever deck][99]. Linkage arm forms together with the lever deck a lever handles in this way the distance between the stones, and well as starting and or stopping the plant, by coupling and decoupling of a cogwheel from the lantern. We may remark at a device for mill stones lifter location, called *granic* at the mill from Poieni. Similar devices were met at Topleţ and Răcăşdia horizontal bucket-wheeled watermills, and at the vertical-wheeled mills in Beiuş depression[100]. A similar device had the vertical-wheeled mills from Serbia and that one in Kovin, published by M. Miloševb[101]. Those technical inventions occurred most likely in the late nineteenth century under the impulses coming from the industrial environment. Mill from Țrna Bara, near Kovin, was an arrangement that measured 14 m / 6.5 m, with two rooms for the miller[102]. Vertical wheel mounted on horizontal shaft had a diameter of 4.20 m and 0.94 m wide. Stone lifting mechanism called *granic* suggests a loan from the Serbian language for the mechanisms common for the Banat mills. Mill architecture proves technical facilities transposition within a rural house structures. In fact, vertical wheel mills with a larger grain processing capacity, compared with bucket-wheeled mills, had also arranged one or two chambers for miller.

Mill from Poieni had linked beams by uprights drop in the base and the crown walls. The beams/logs were joined at the corners in the loops, and in the stanchions were joined by tongue and groove system (Fig. 123). A rustic summary furnished architecture is also seen at the vertical-wheeled mills in the western Banat.

The vertical wheeled mills disappearance from the Banat area landscape marks a loss of technical and cultural heritage of a province, of a defining segment of this heritage, which makes it poorest and culturally less attractive. Archival sources can provide new information on the age of this watermill group, its diffusion in the area of the province, but it will never set off a cultural loss, a more closely kept and preserved technical heritage in other European areas.

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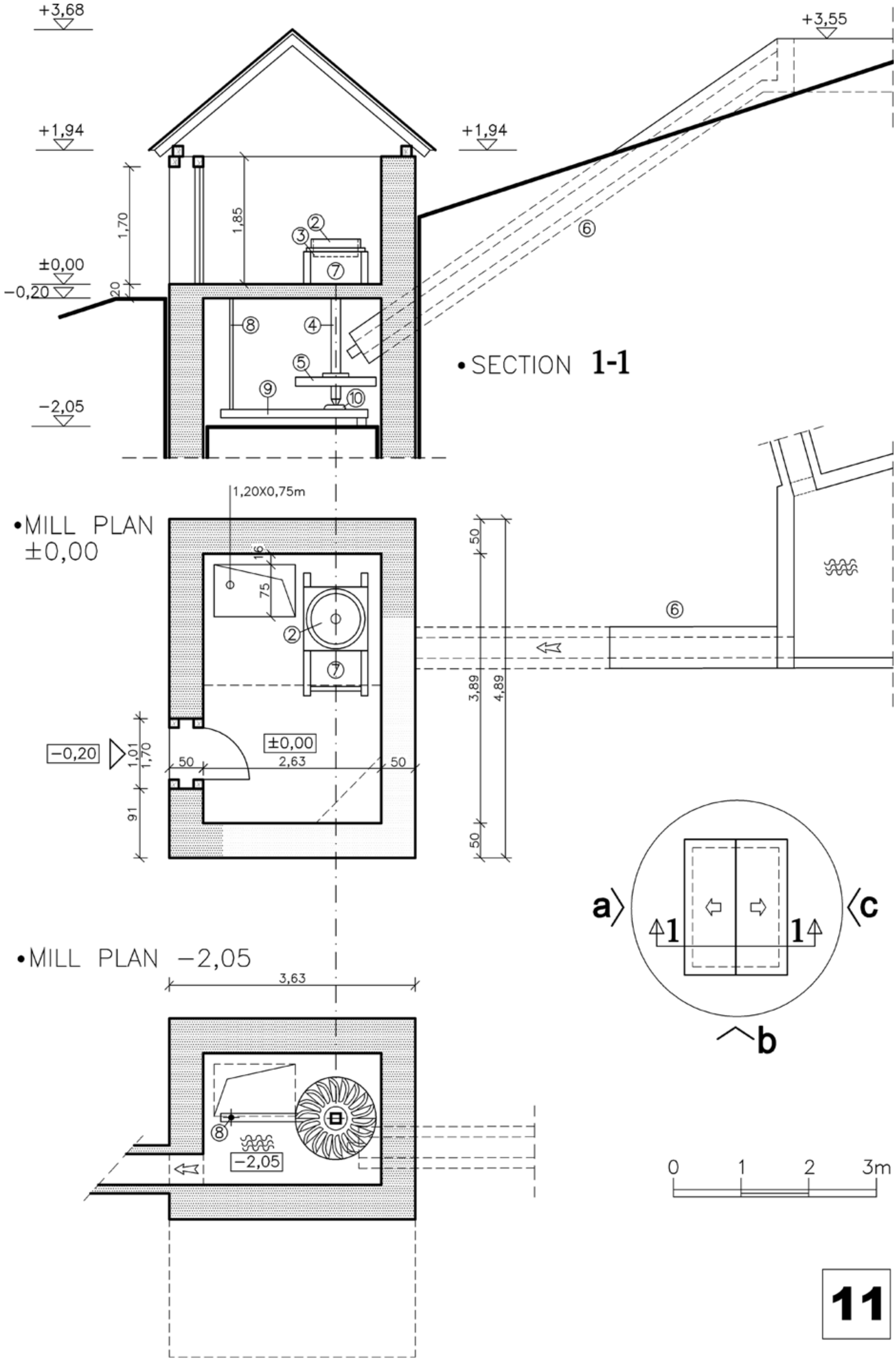
99 Ţăranu, 1979, p. 127..

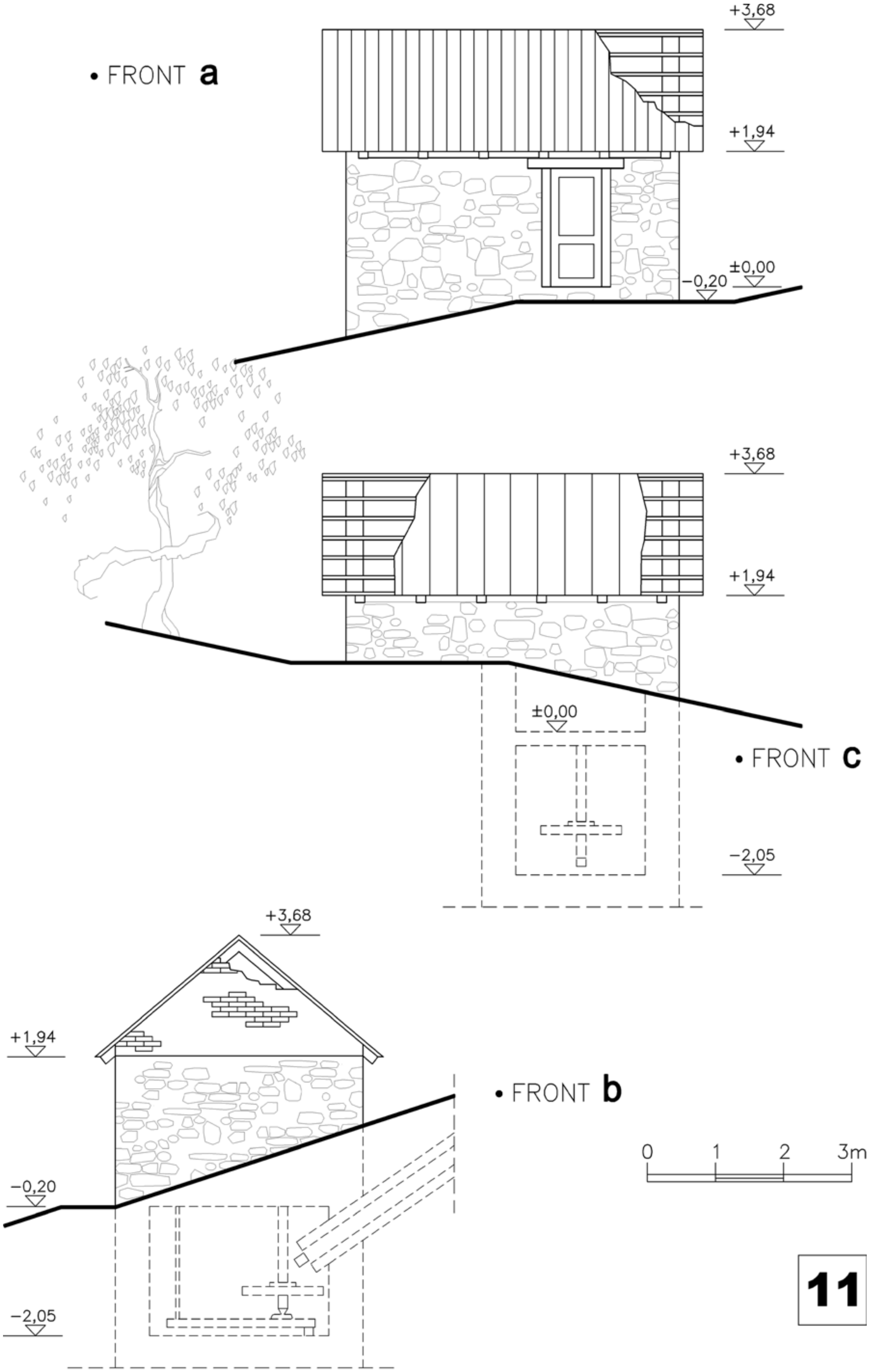
100 Lungescu, Godea, 1973, p. 133, fig. 7; Popescu, 1973, p. 150.

101 Miloševb, 1954, p. 159, fig. 5.

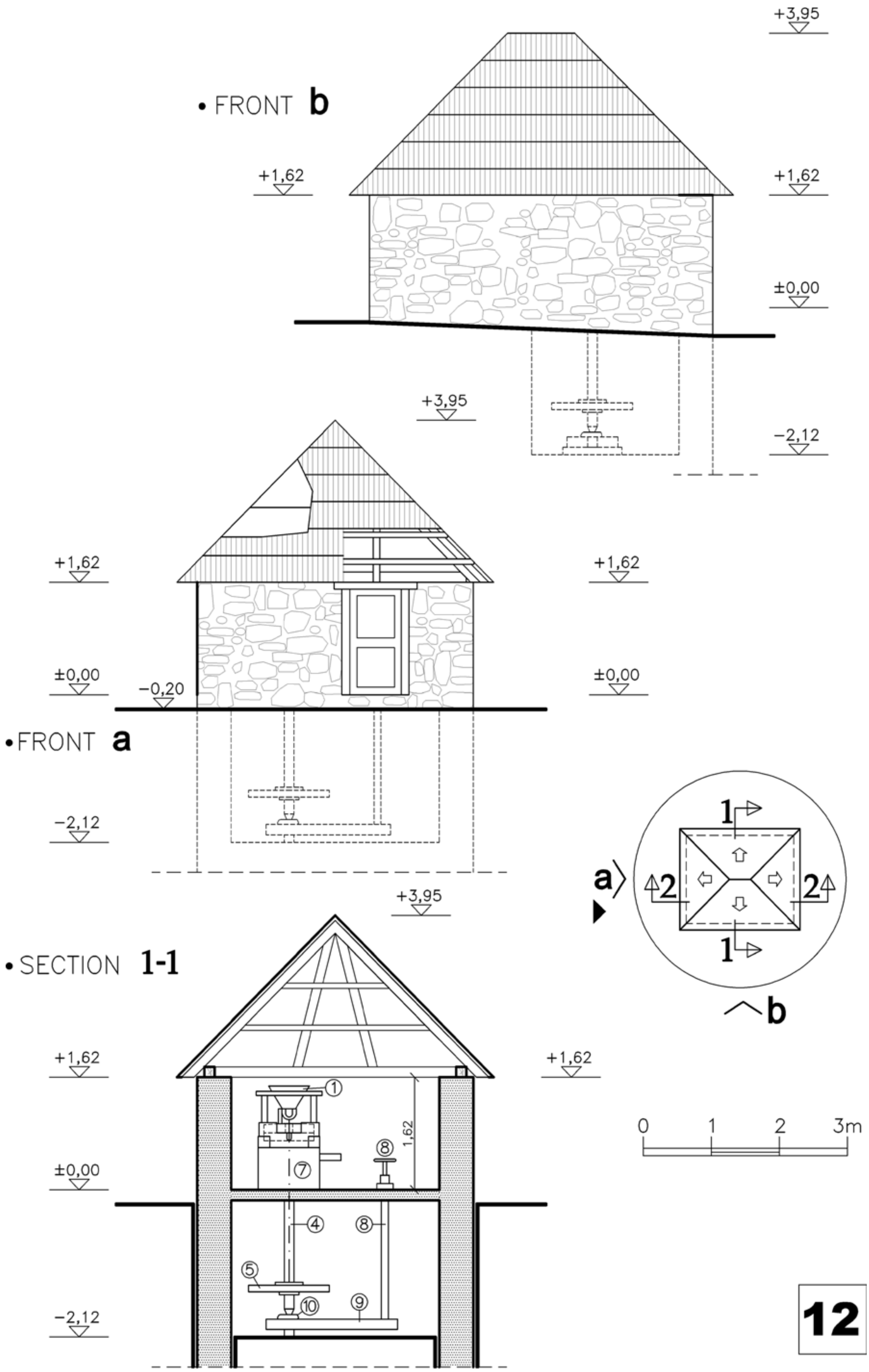
102 Miloševb, 1954, p. 155-159, fig. 4-5.



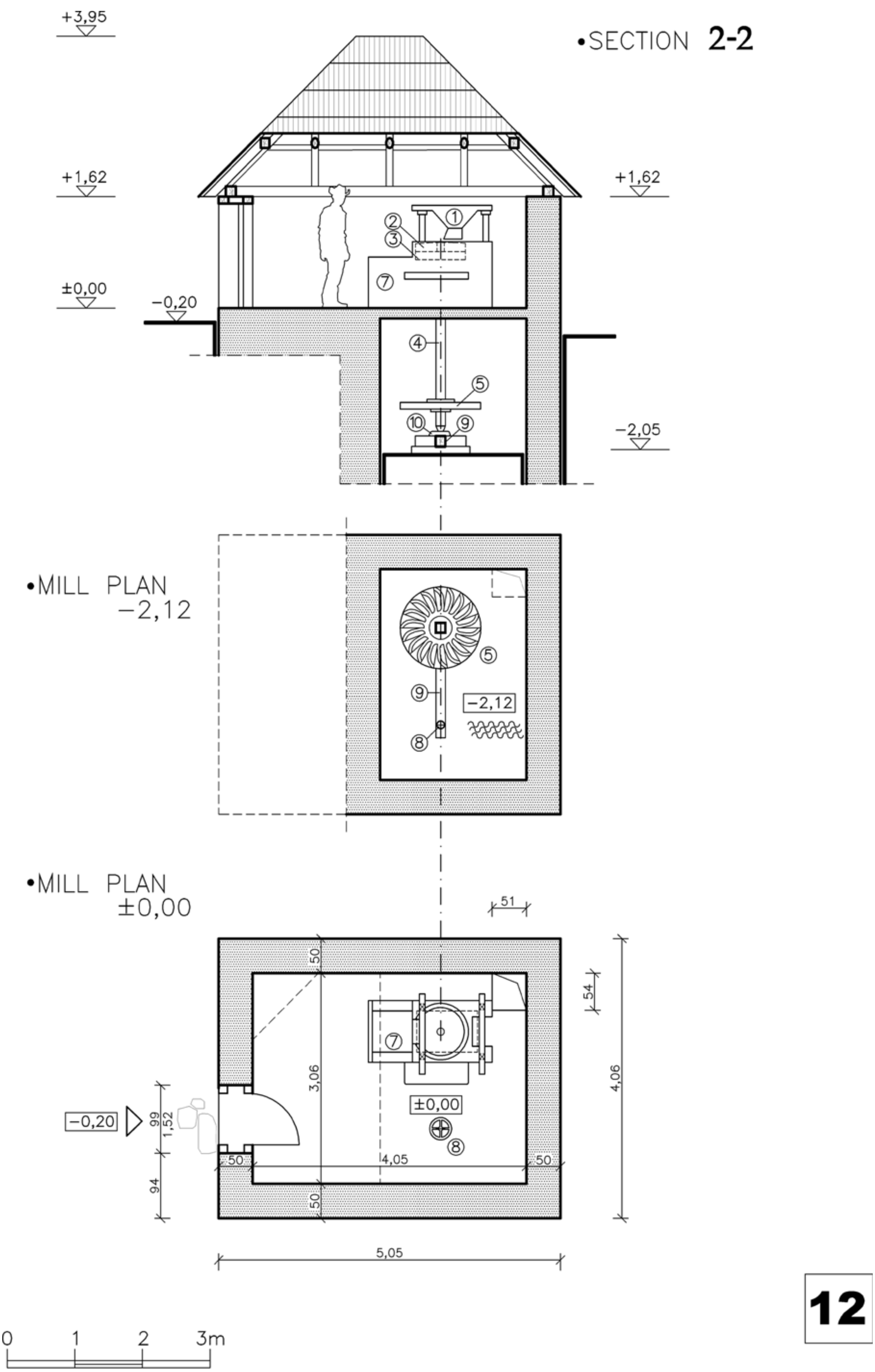
Pl. 21. Şopotu Vechi. ***Ursulița Mill***



Pl. 22. Şopotu Vechi. ***Ursuliţa Mill***



Pl. 23. Şopotu Vechi. ***Stone Mill***



Pl. 24. Şopotu Vechi. *Mill From Rocks*

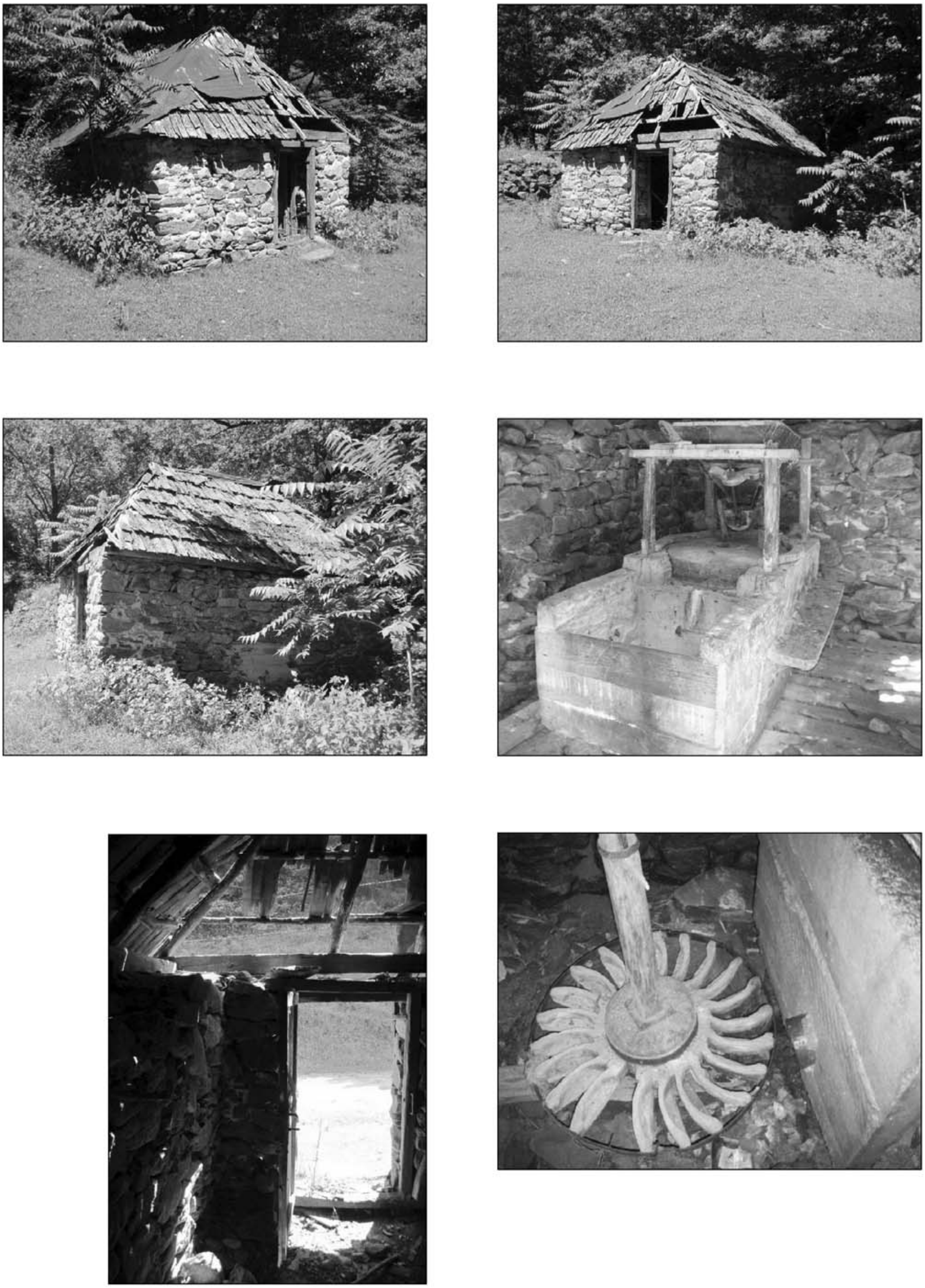
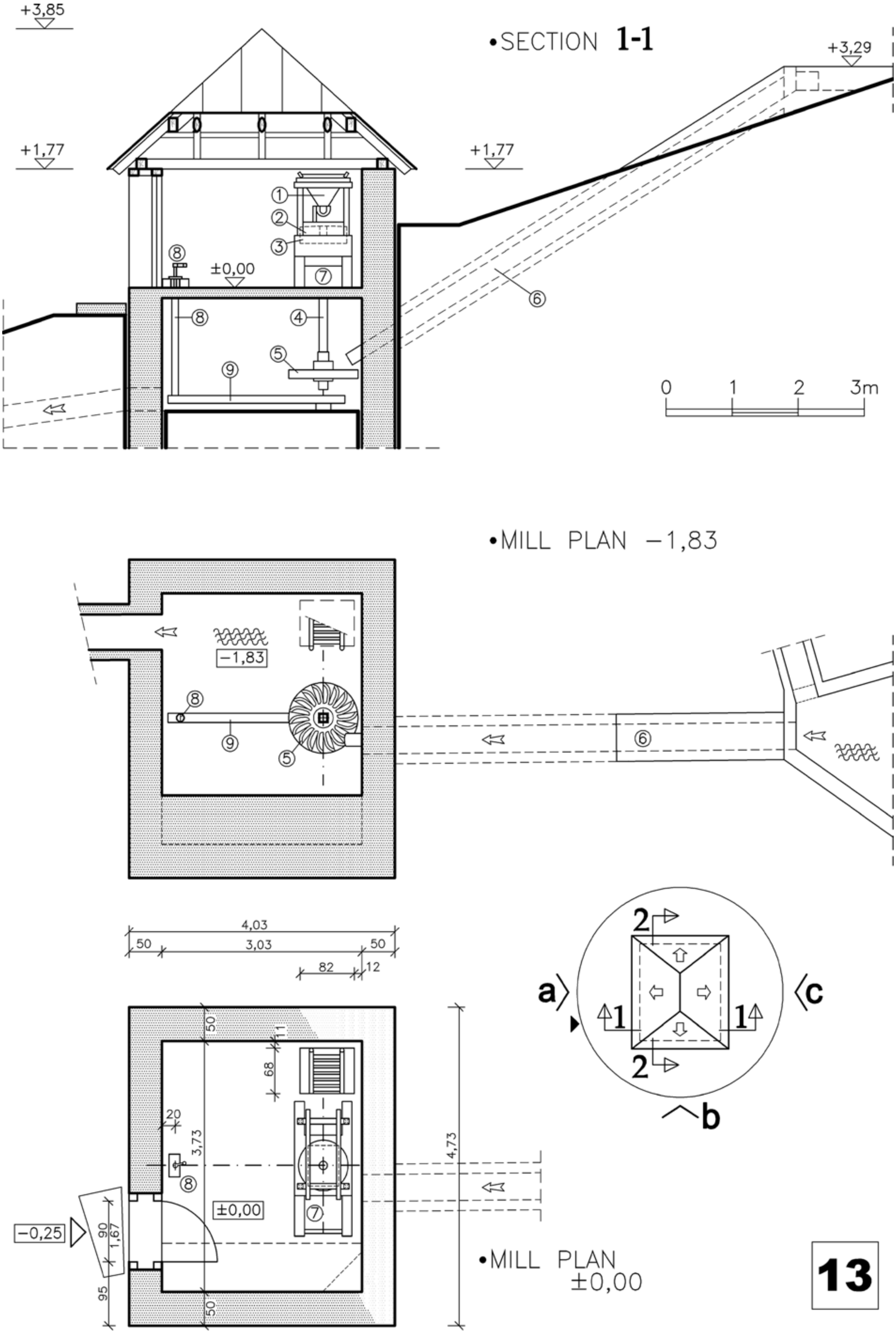
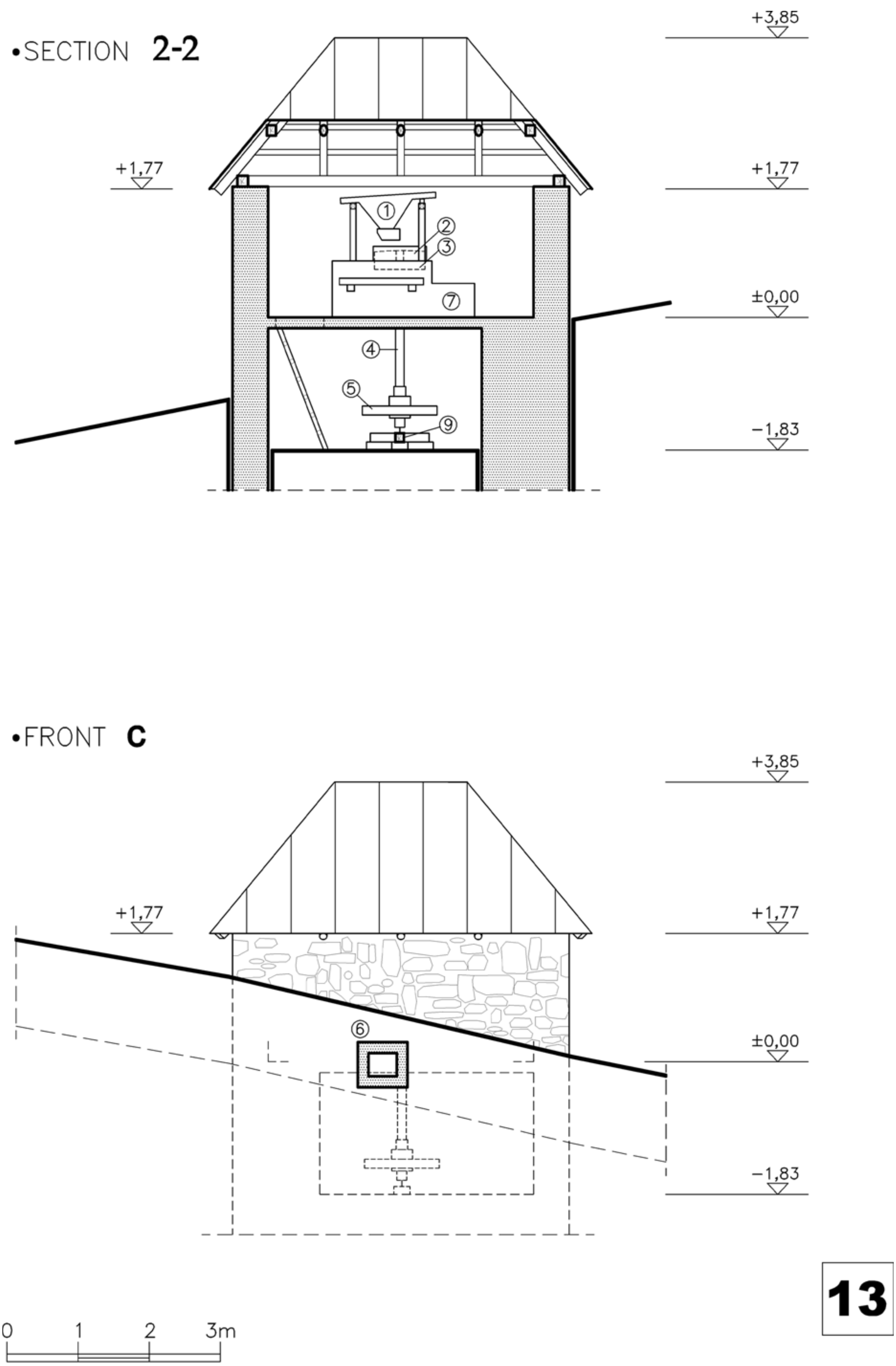


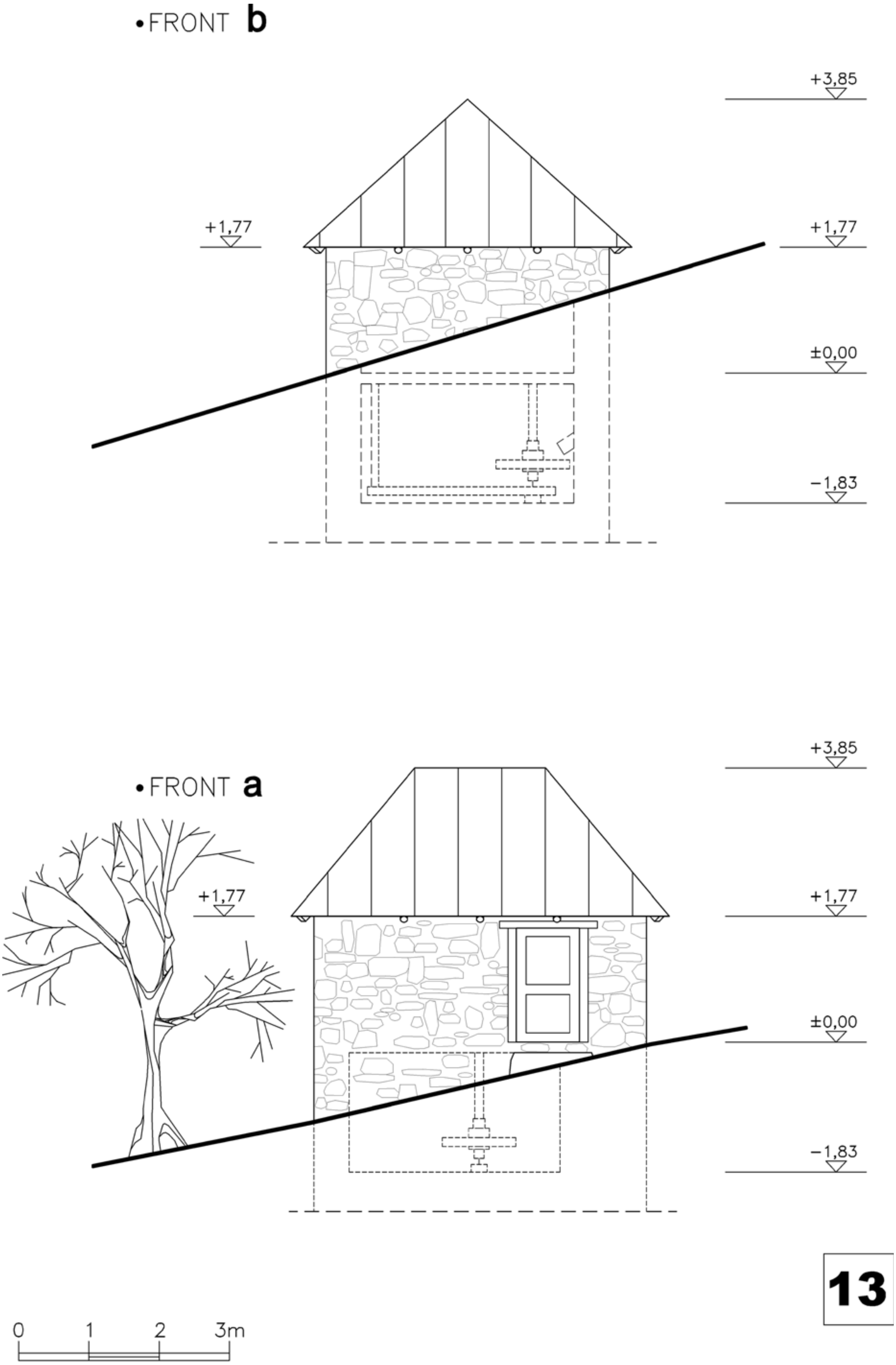
Fig. 9. Şopotu Vechi. ***Mill From Rocks***



Pl. 25. Şopotu Vechi. ***Gipsy Mill***



Pl. 26. Şopotu Vechi. ***Gipsy Mill***



Pl. 27. Şopotu Vechi. ***Gipsy Mill***

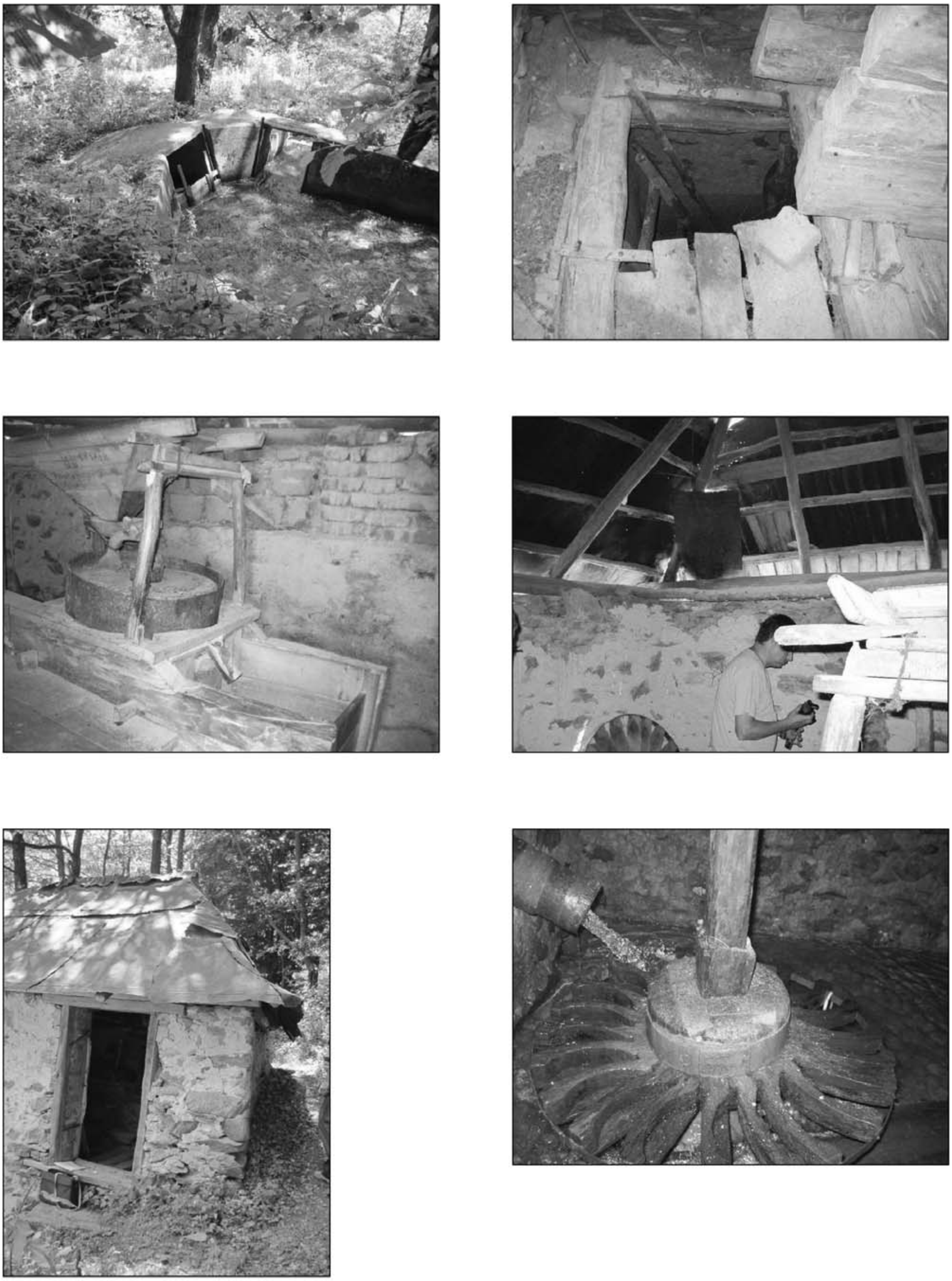
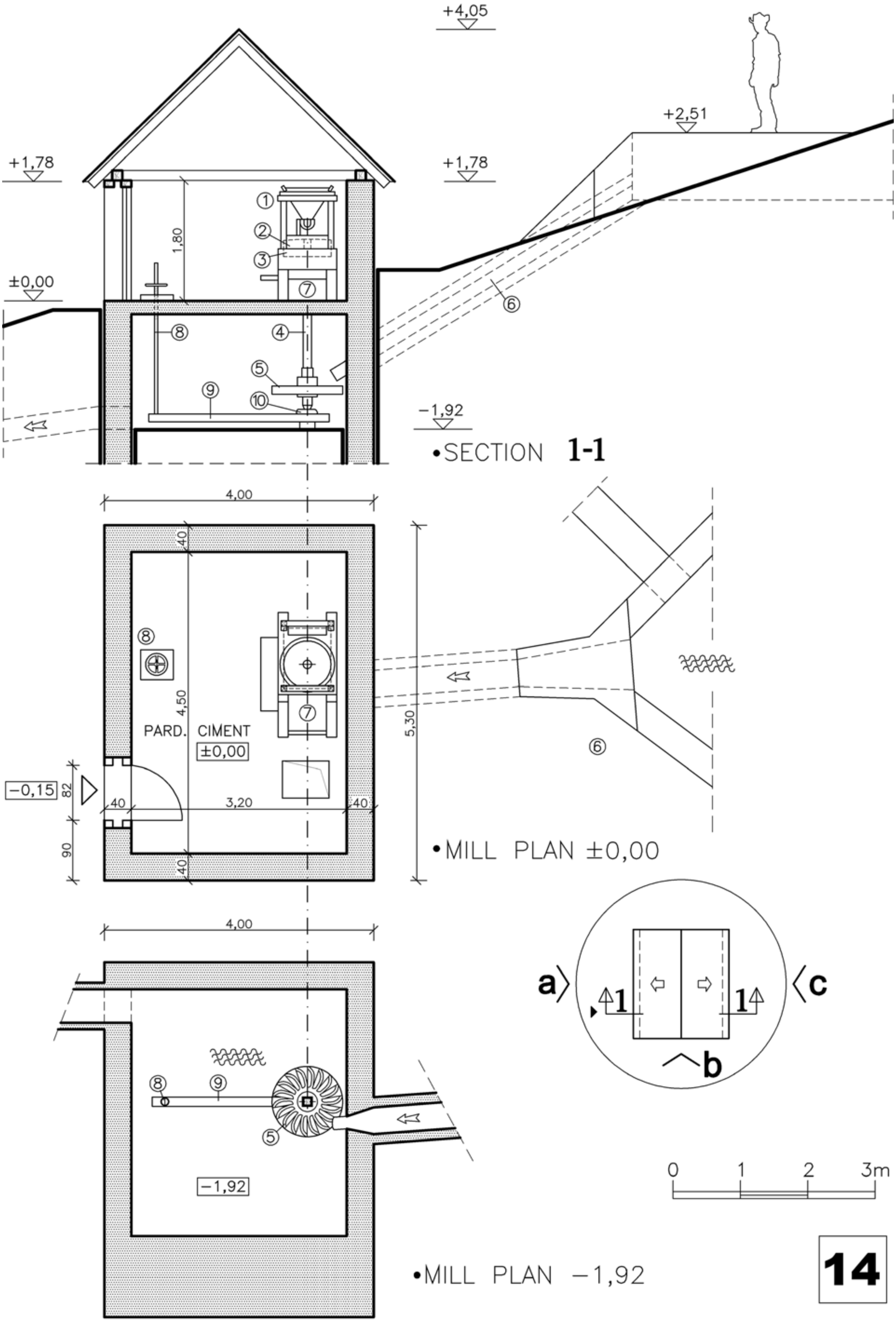
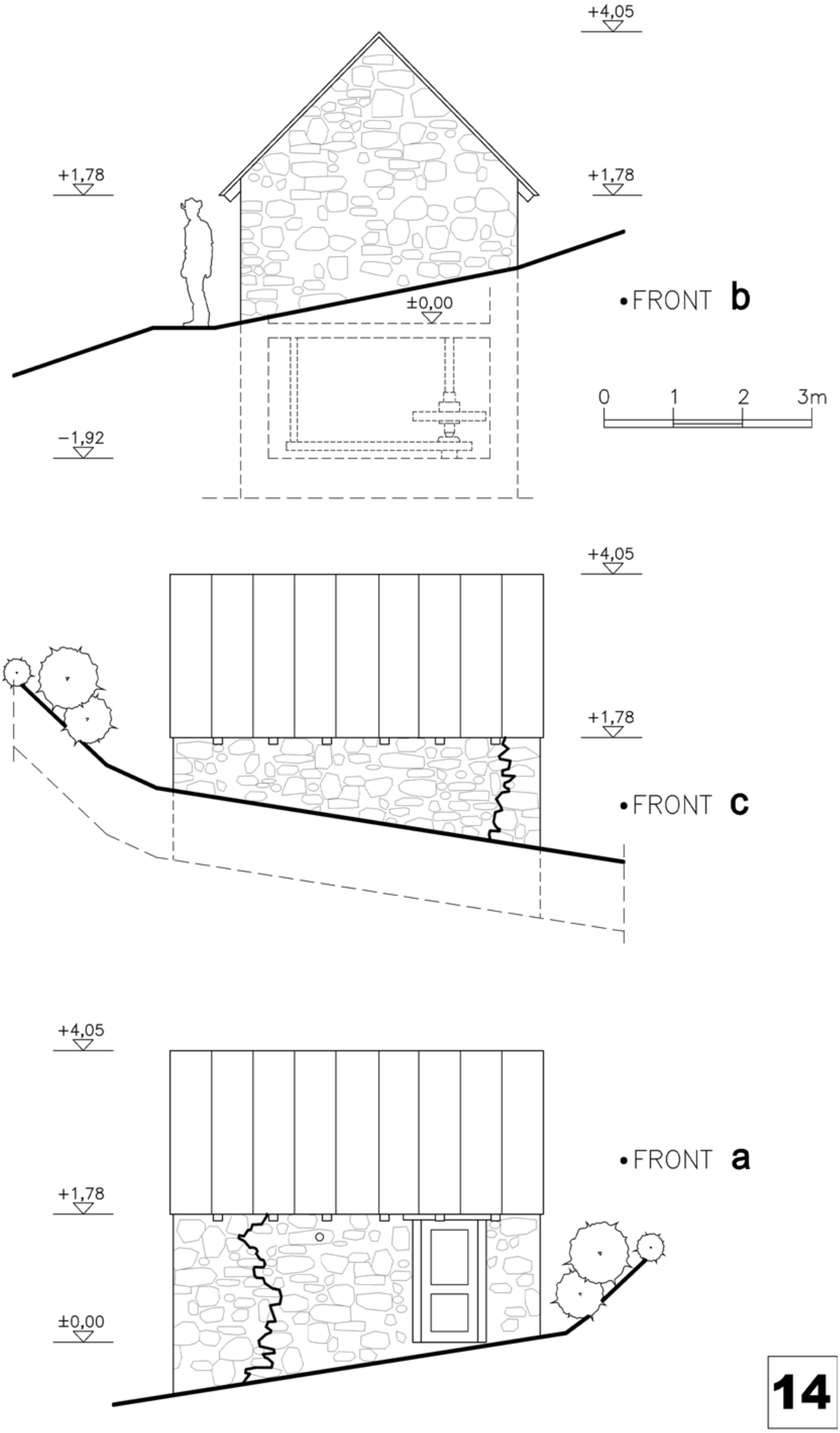


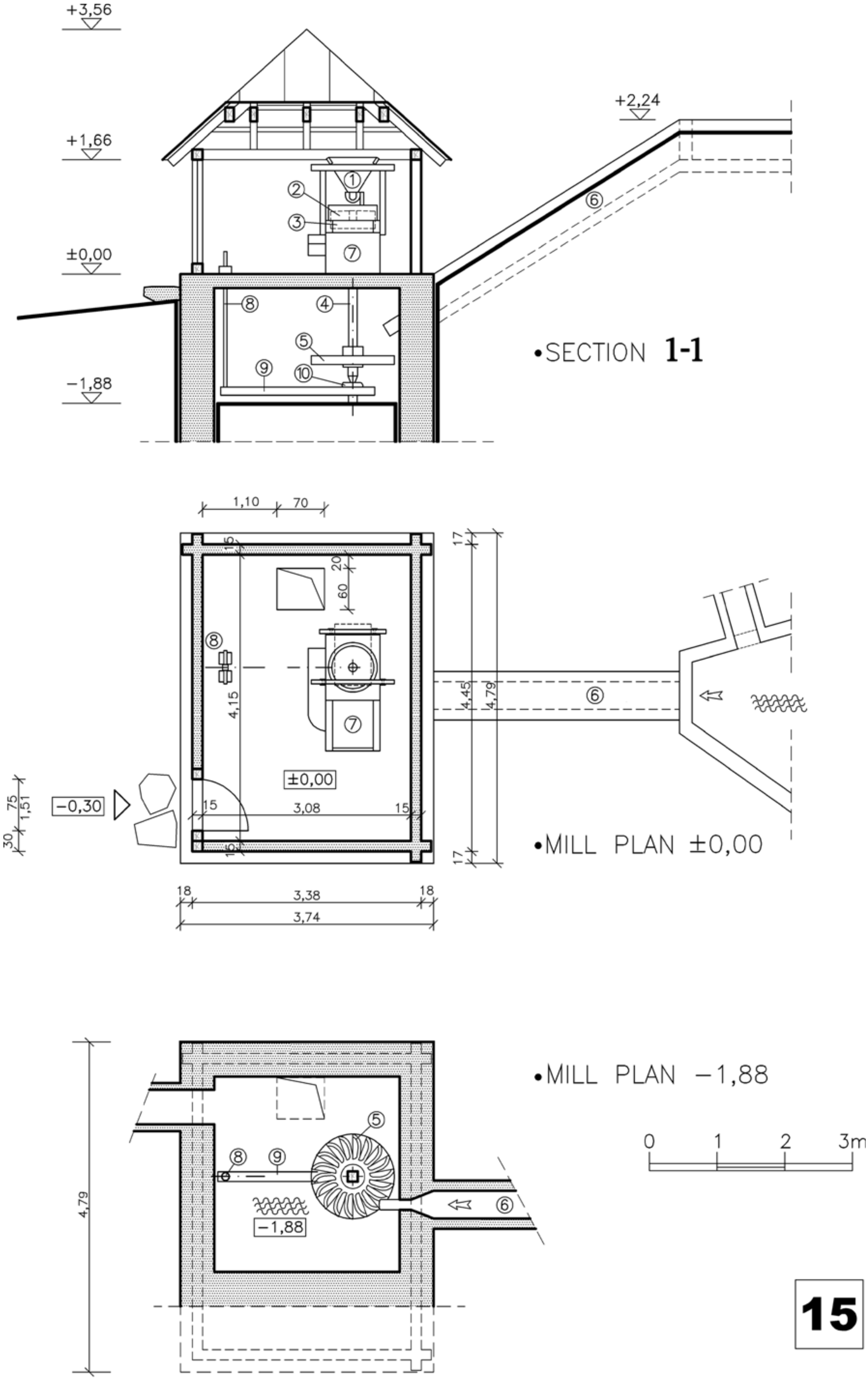
Fig. 10. Şopotu Vechi. ***Gipsy Mill***



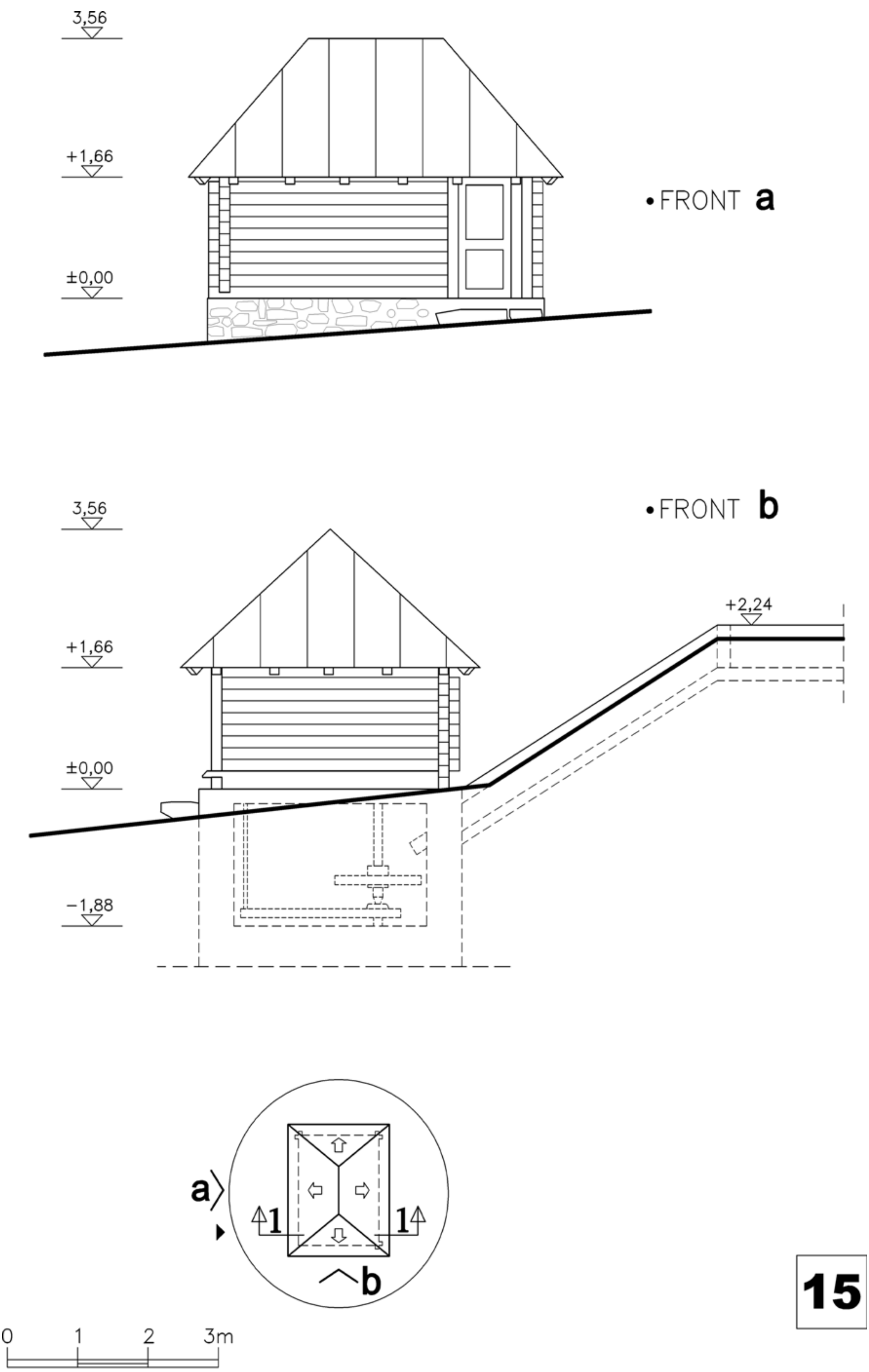
Pl. 28. Şopotu Vechi. ***The New Mill***



Pl. 29. Şopotu Vechi. ***The New Mill***

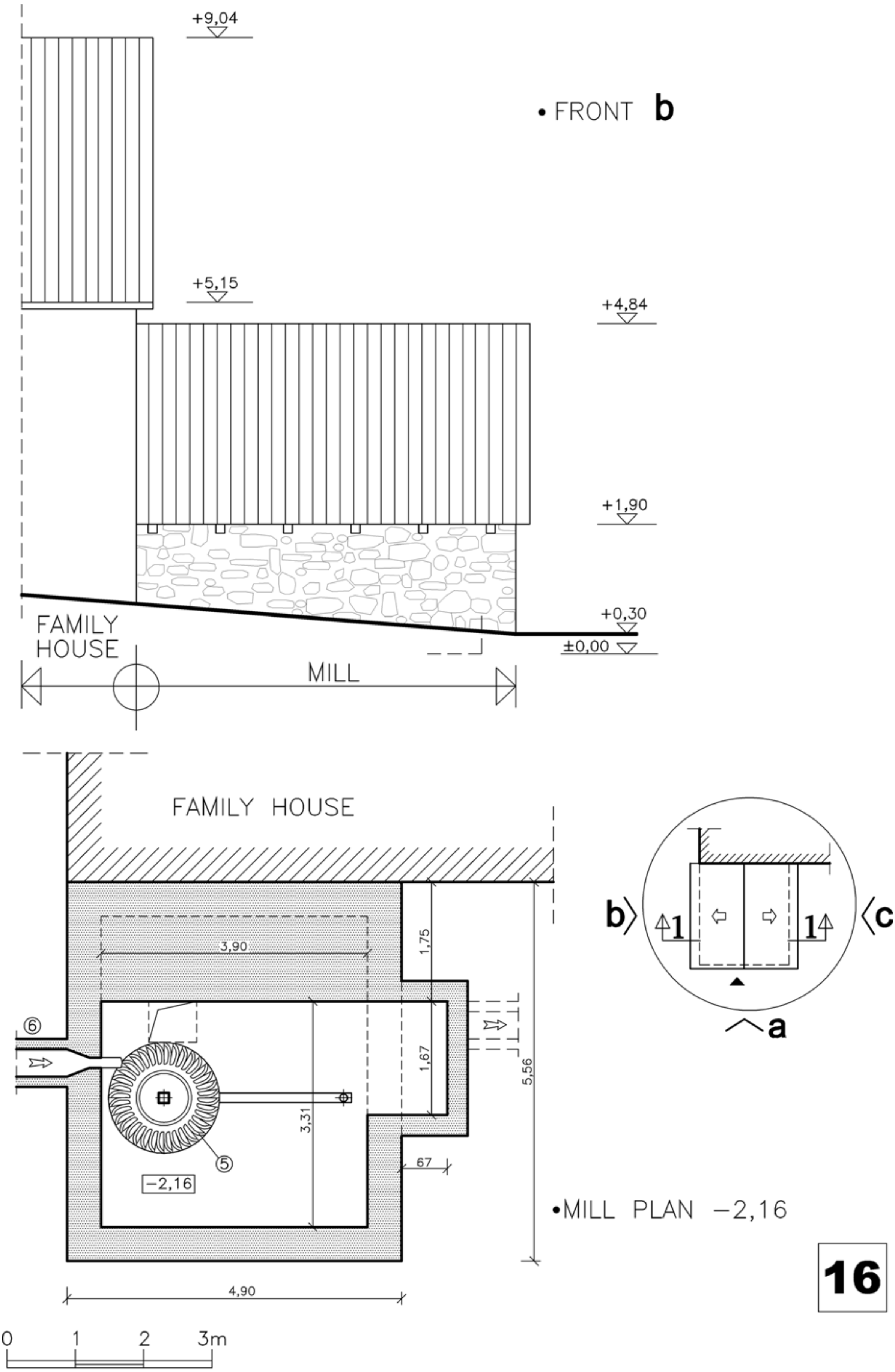


Pl. 30. Şopotu Vechi. ***Ghetera Mill***

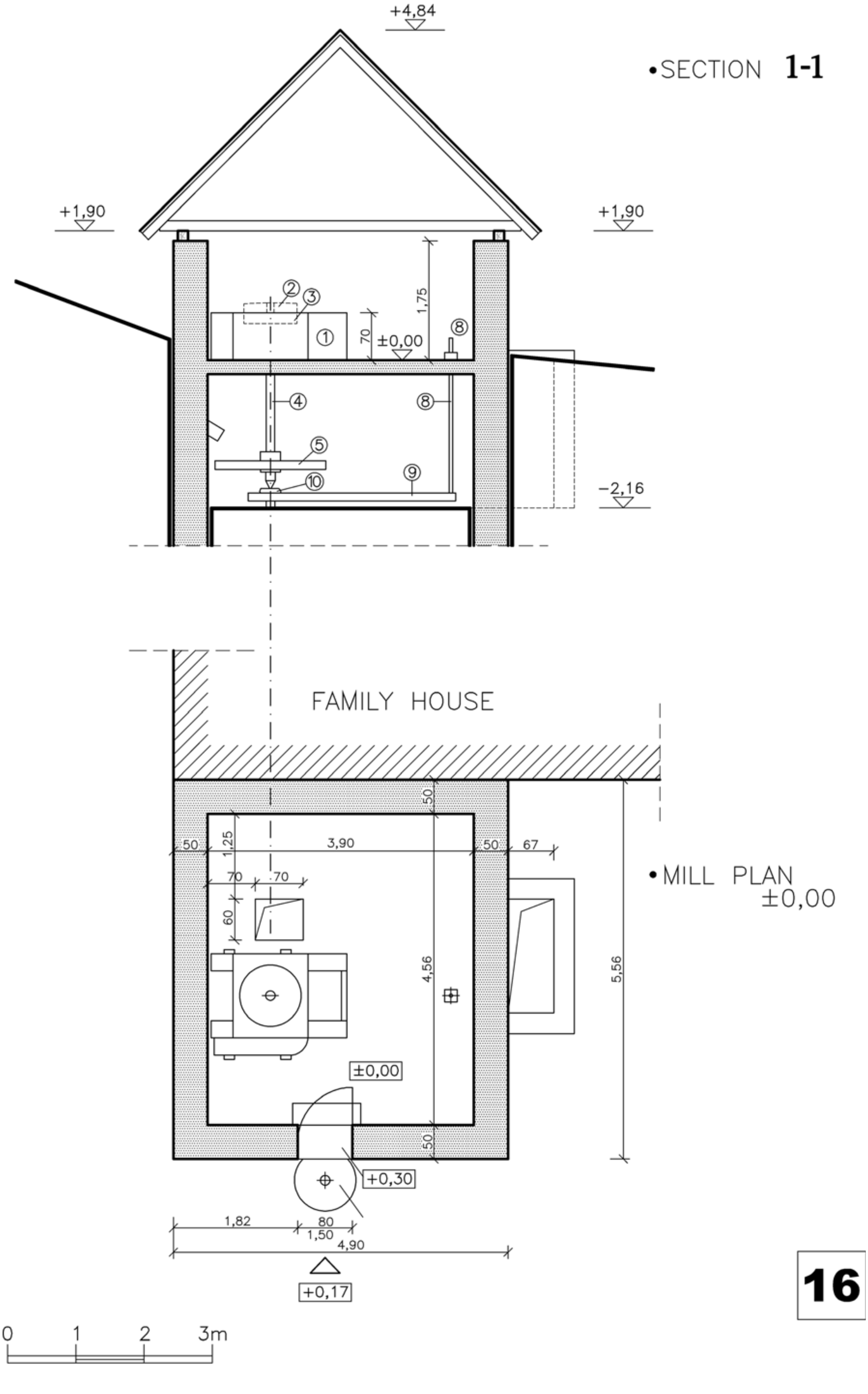


Pl. 31. Şopotu Vechi. ***Ghetera Mill***

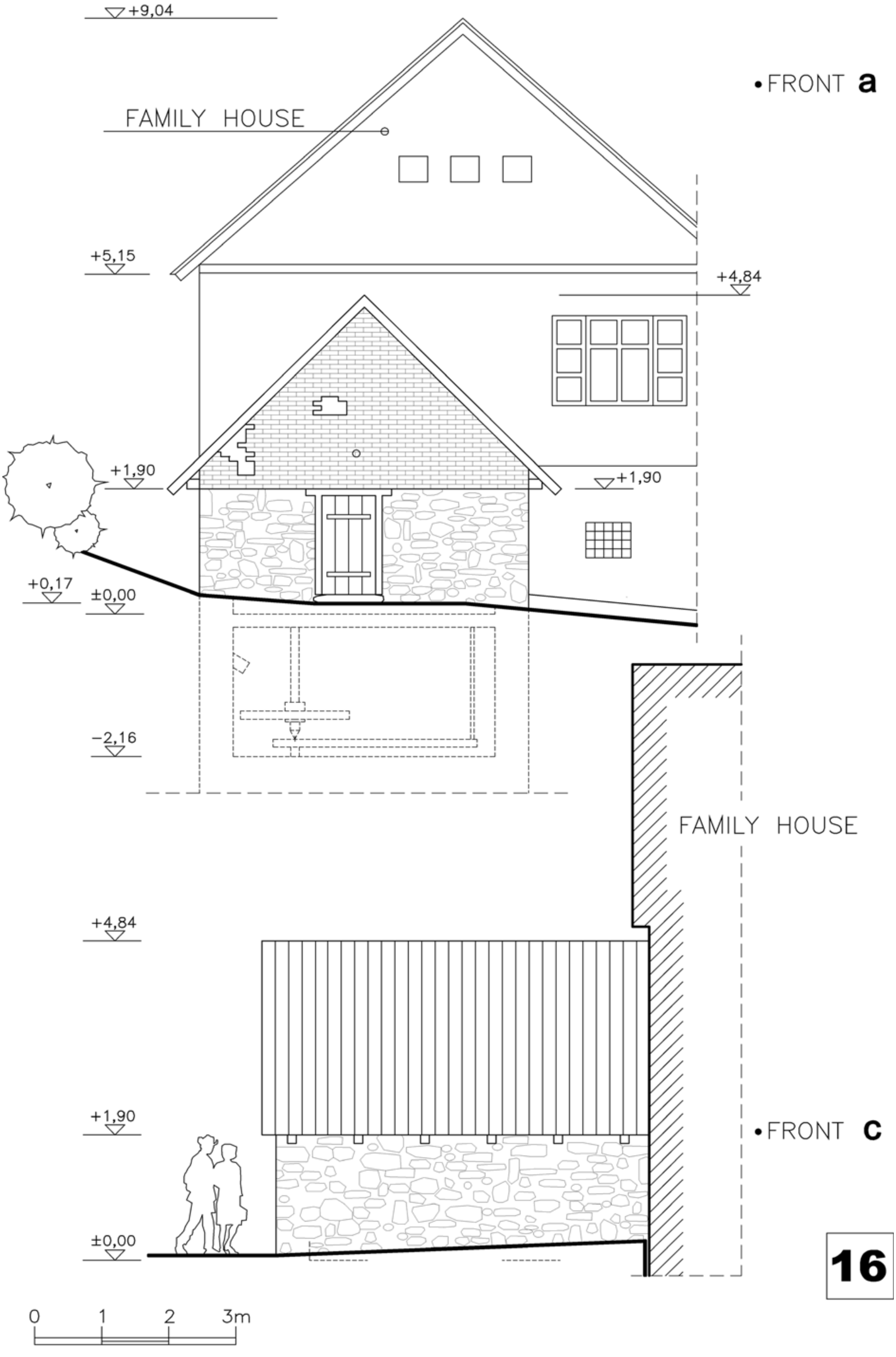
Fig. 11. Şopotu Vechi. ***Ghetera Mill***



Pl. 32. Şopotu Vechi. ***Bădească Mill***



Pl. 33. Şopotu Vechi. ***Bădească Mill***



Pl. 34. Şopotu Vechi. ***Bădească Mill***

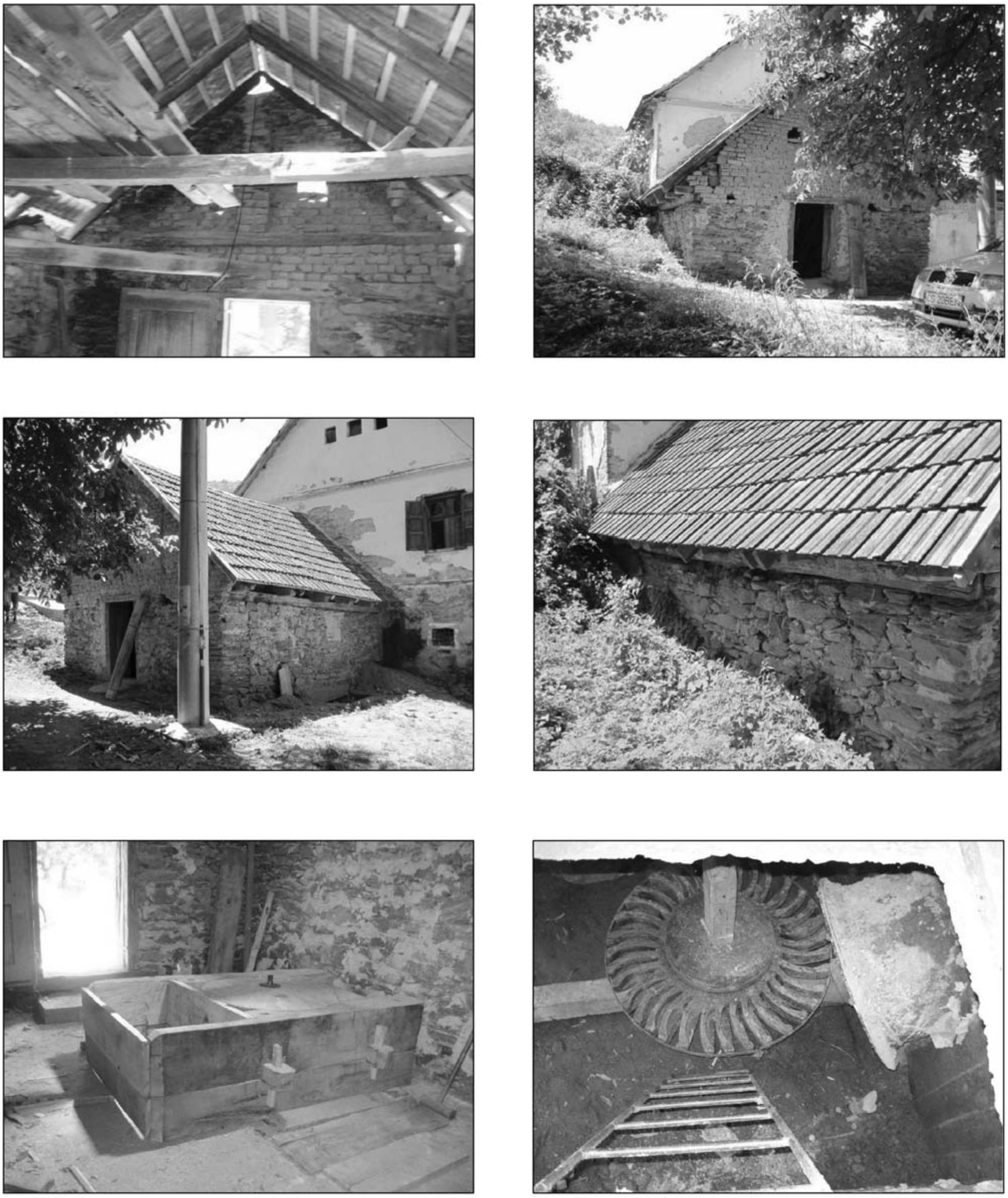
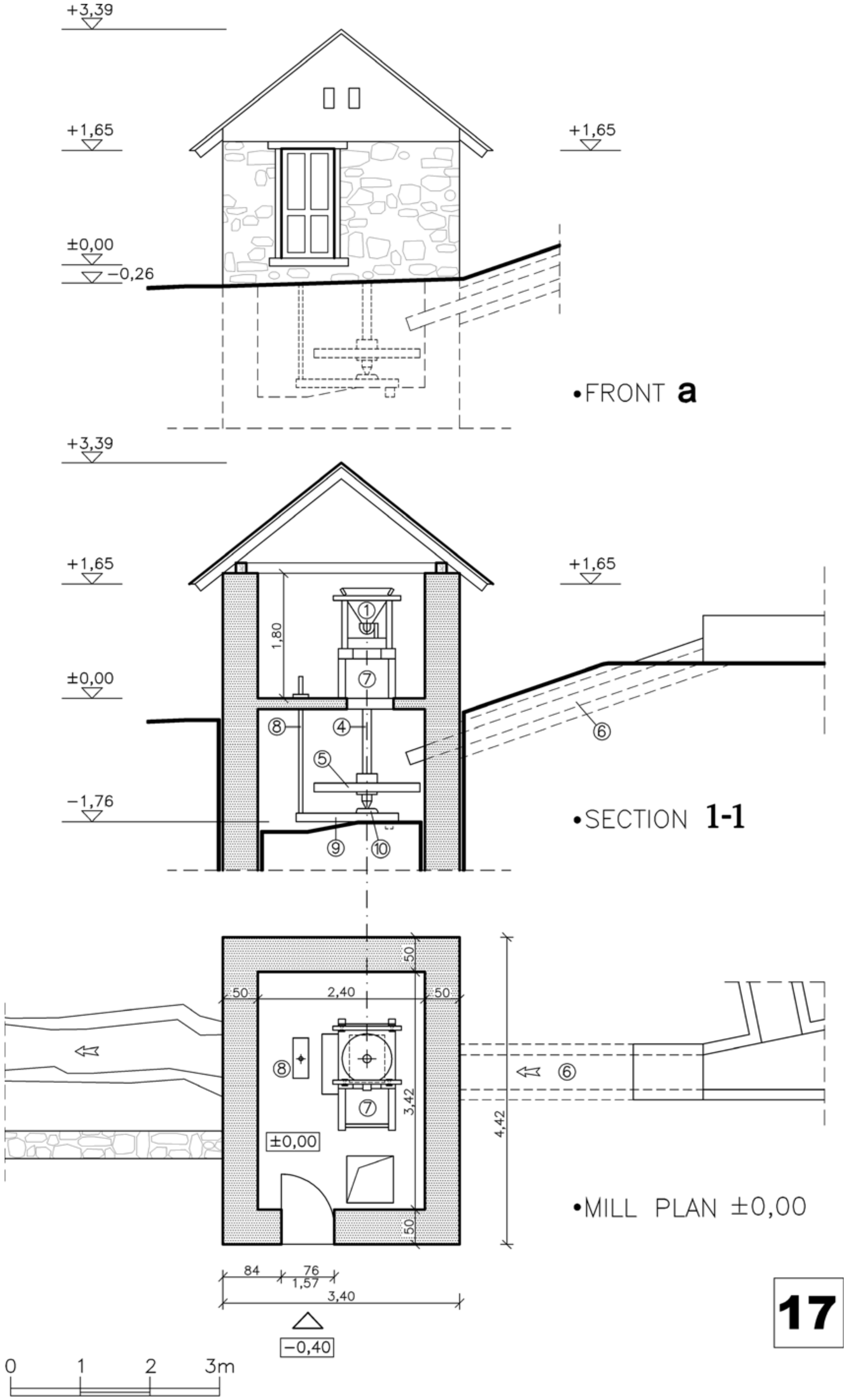
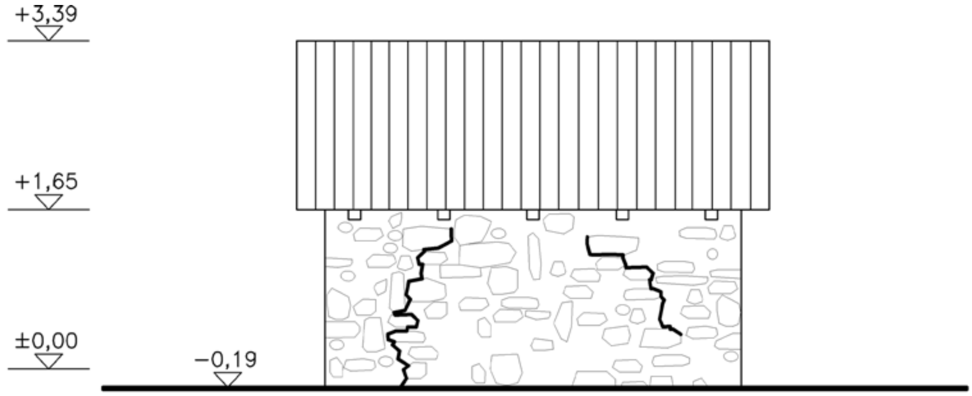


Fig. 12. Şopotu Vechi. ***Bădească Mill***



Pl. 35. Şopotu Vechi. ***Băltoniţa Mill***



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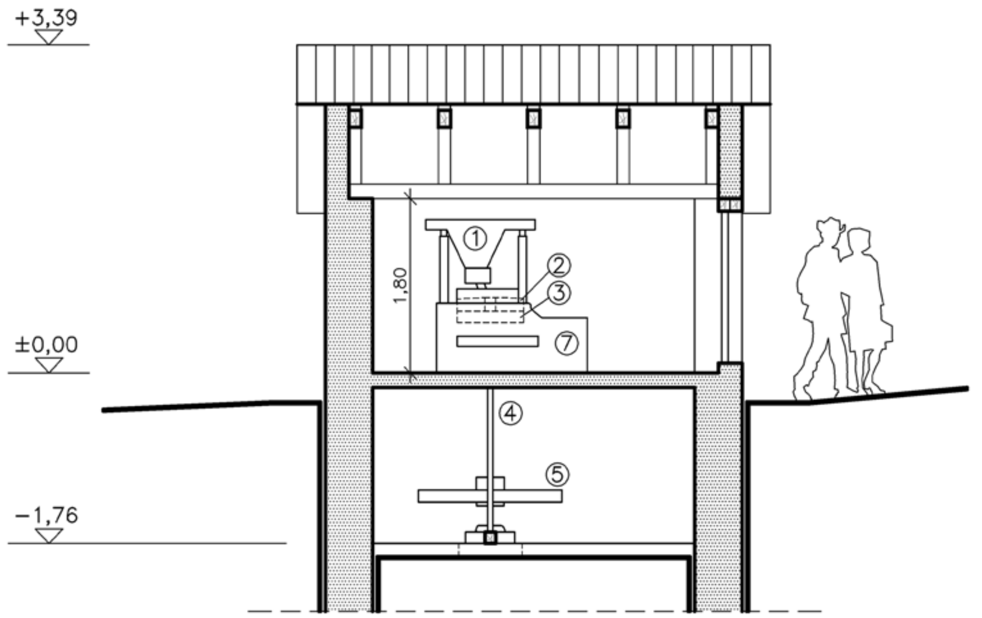
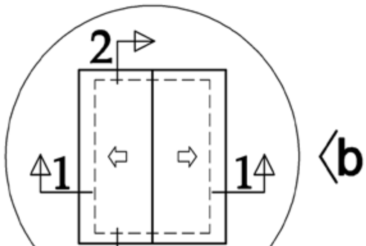


•SECTION **2-2**



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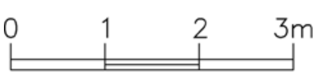
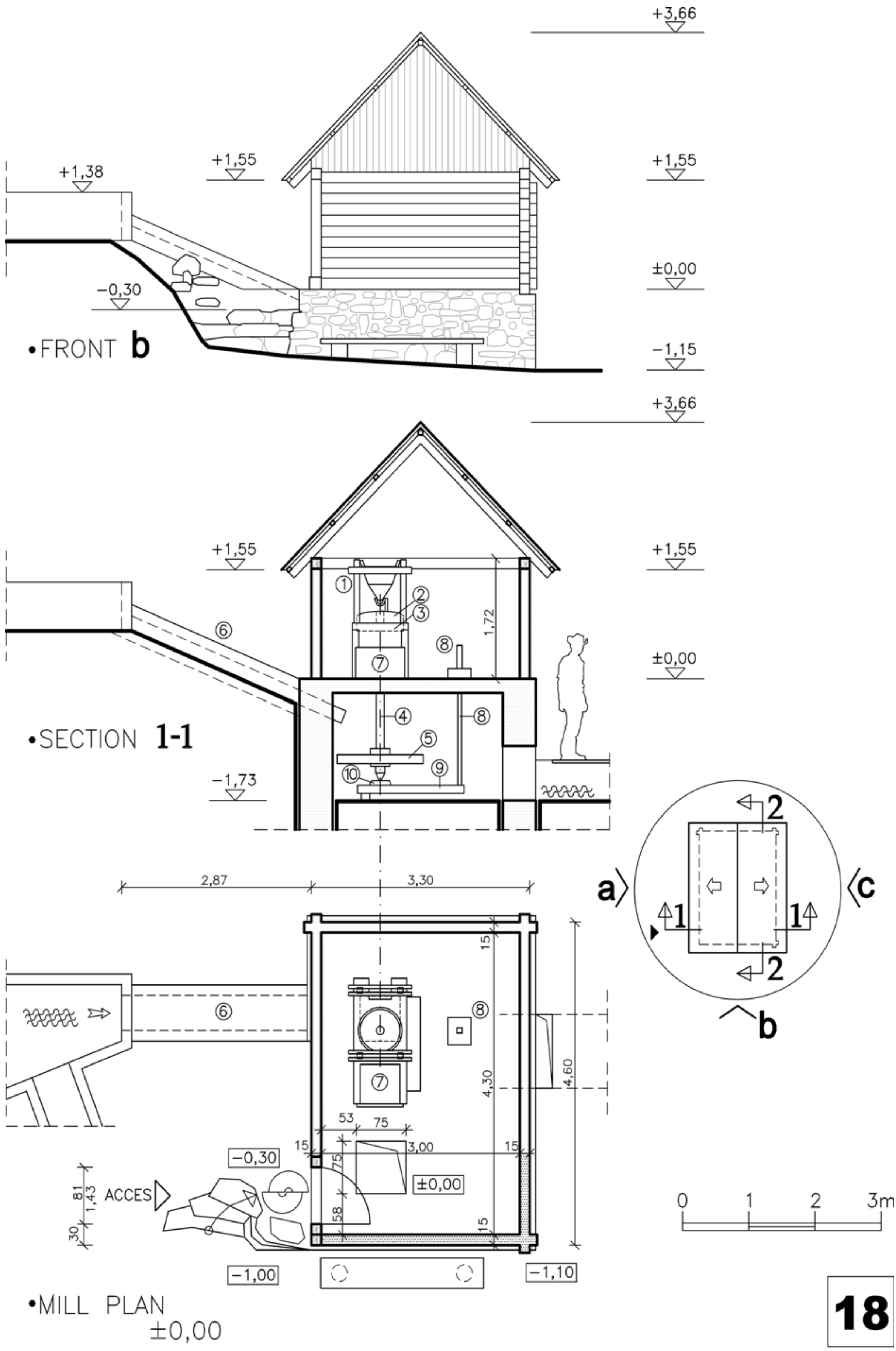
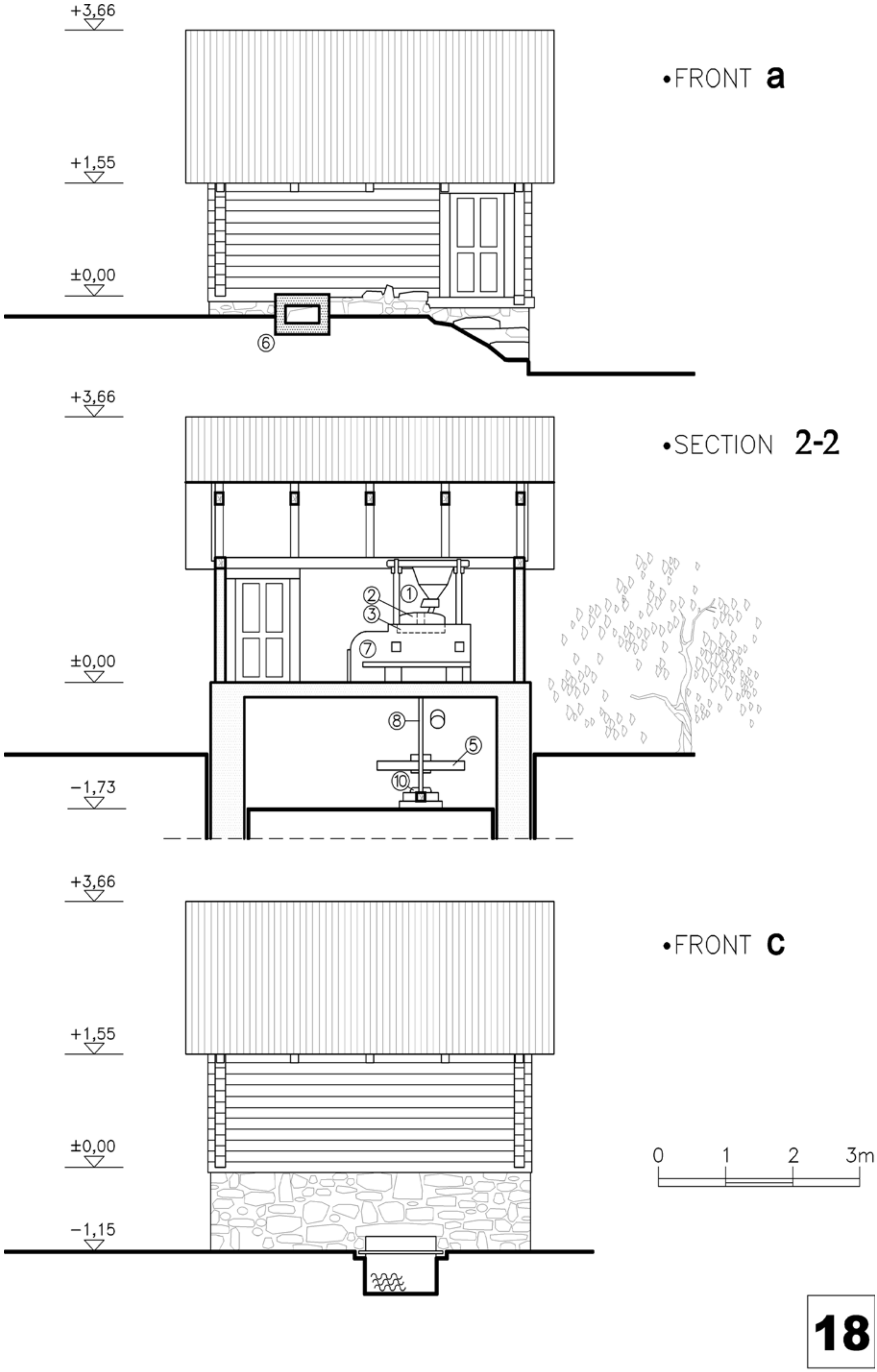


Pl. 36. Şopotu Vechi. *Băltonița Mill*

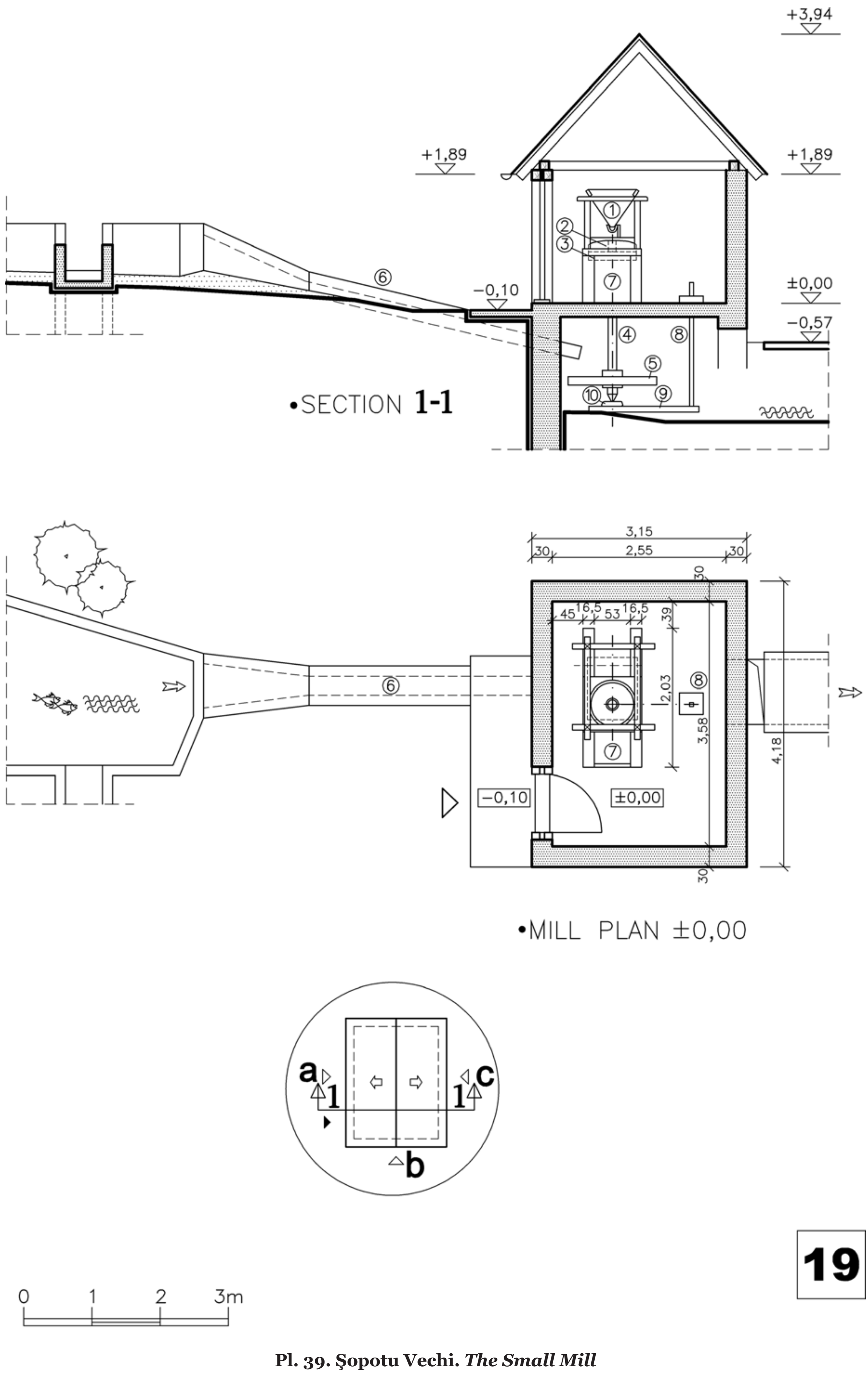


Pl. 37. Şopotu Vechi. ***Pleşoanea Mill***

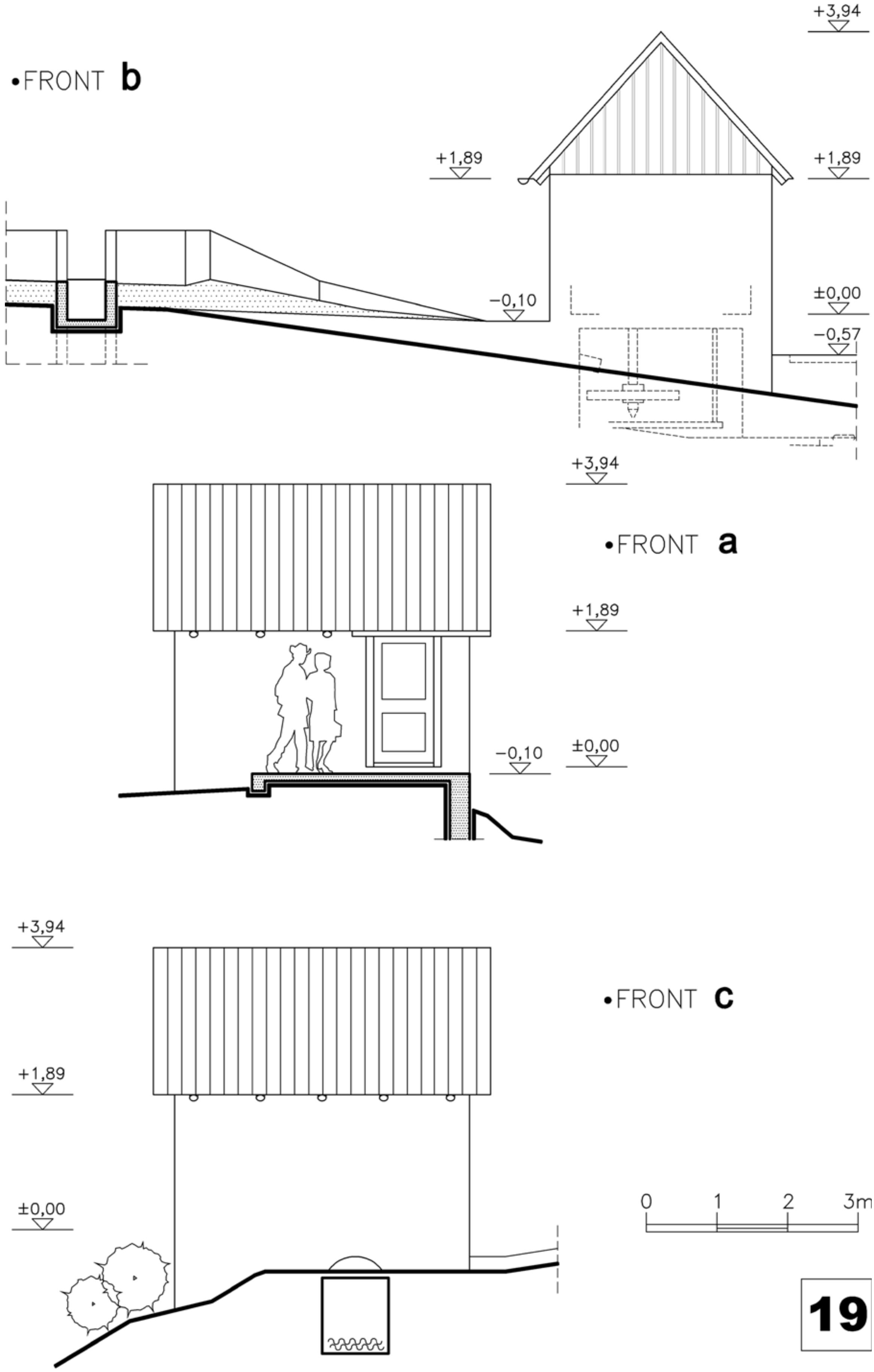


Pl. 38. Şopotu Vechi. ***Pleşoanea Mill***

Fig. 13. Şopotu Vechi. ***Pleşoanea Mill***



Pl. 39. Şopotu Vechi. ***The Small Mill***



Pl. 40. Şopotu Vechi. ***The Small Mill***

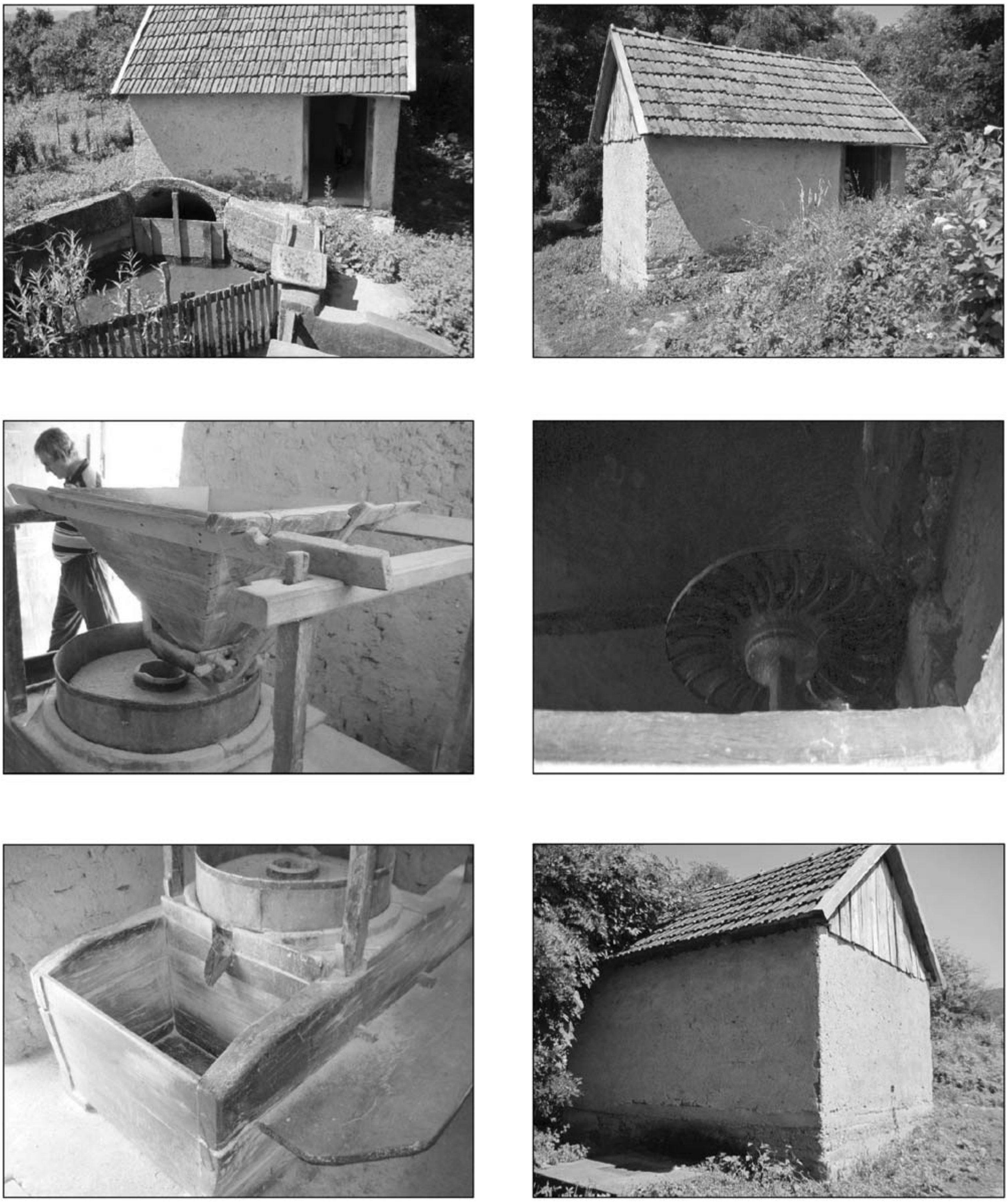
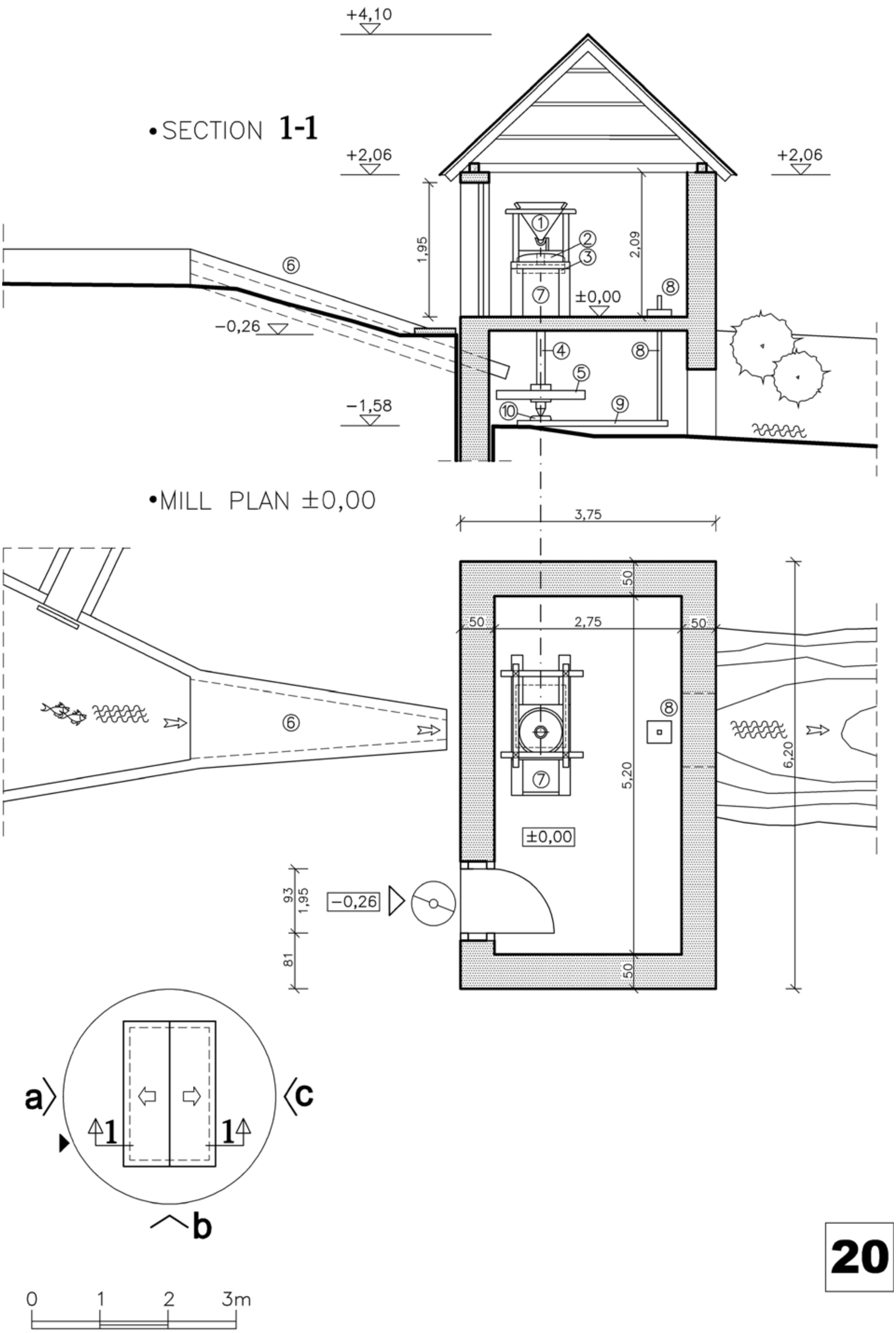
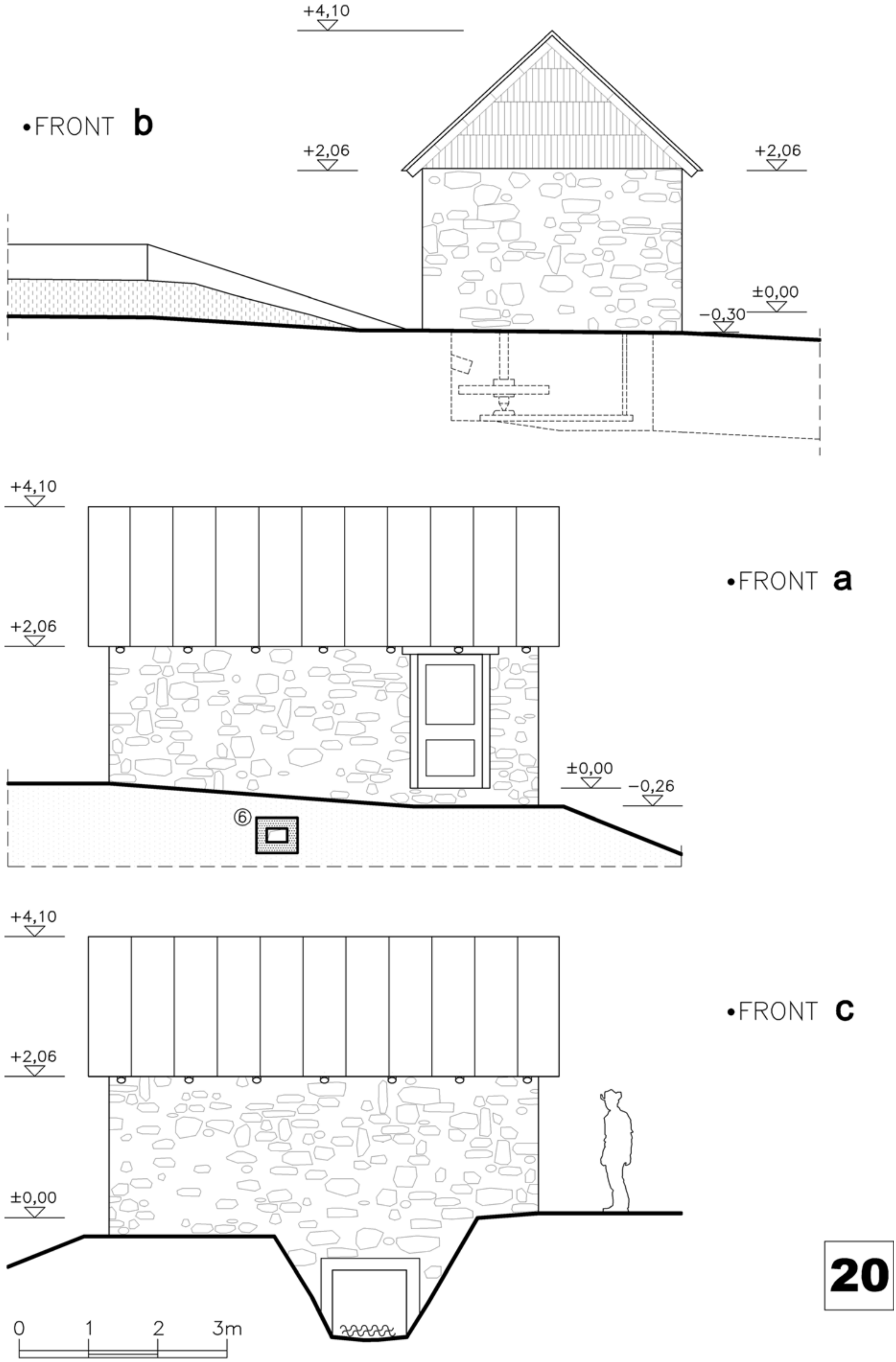


Fig. 14. Şopotu Vechi. ***The Small Mill***

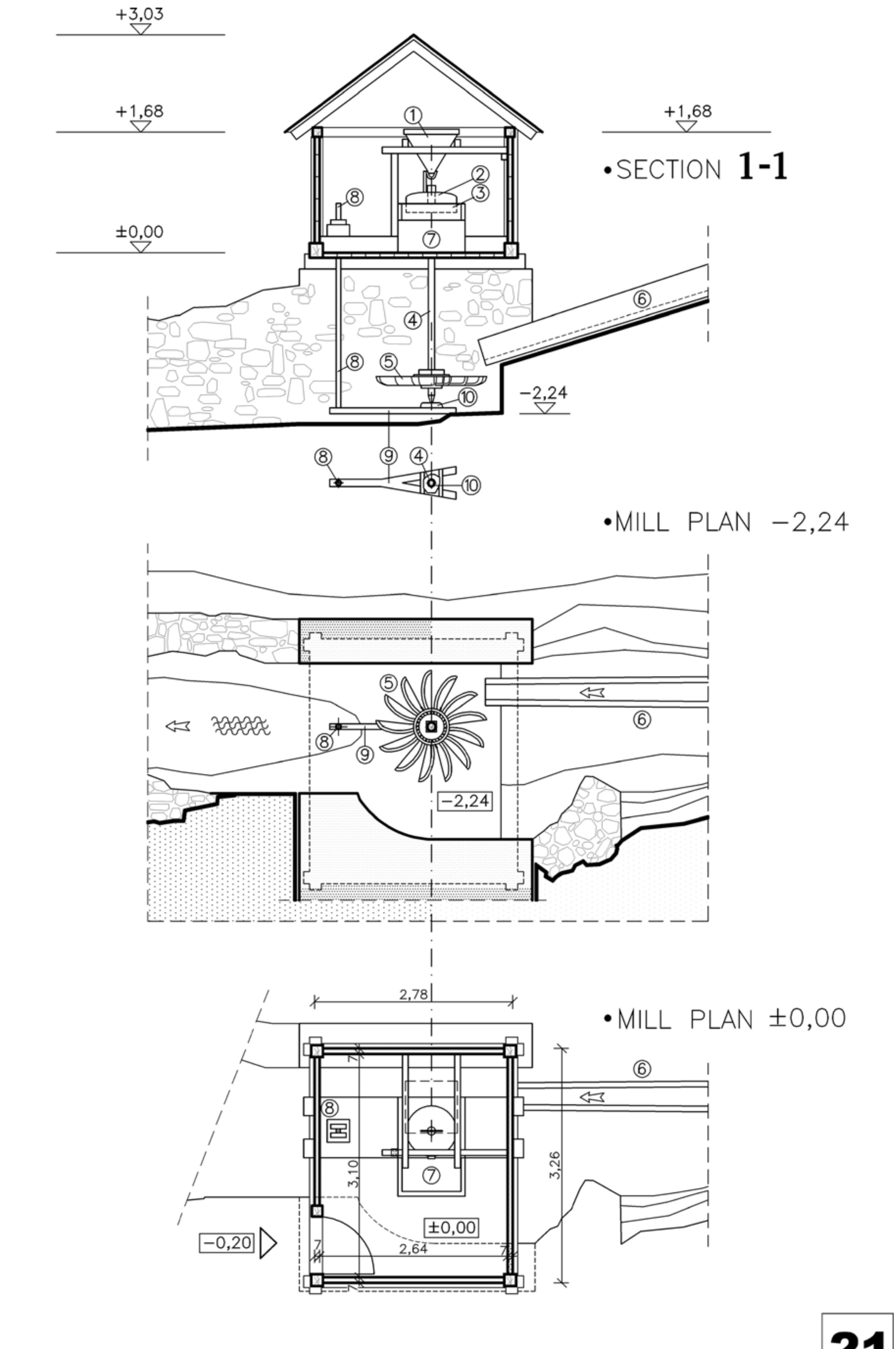


Pl. 41. Şopotu Vechi. ***Glimeica Mill***

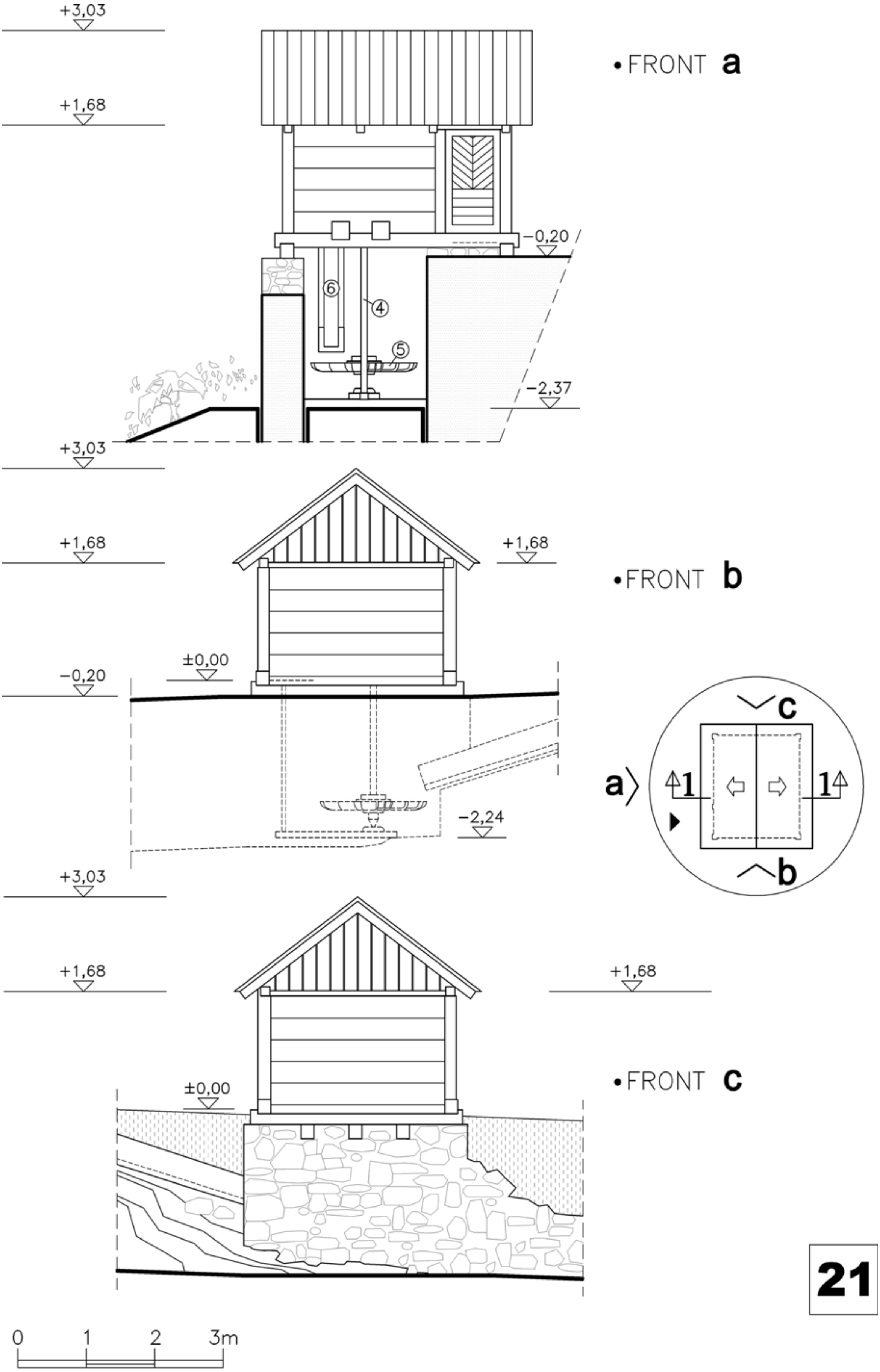


Pl. 42. Şopotu Vechi. ***Glimeica Mill***

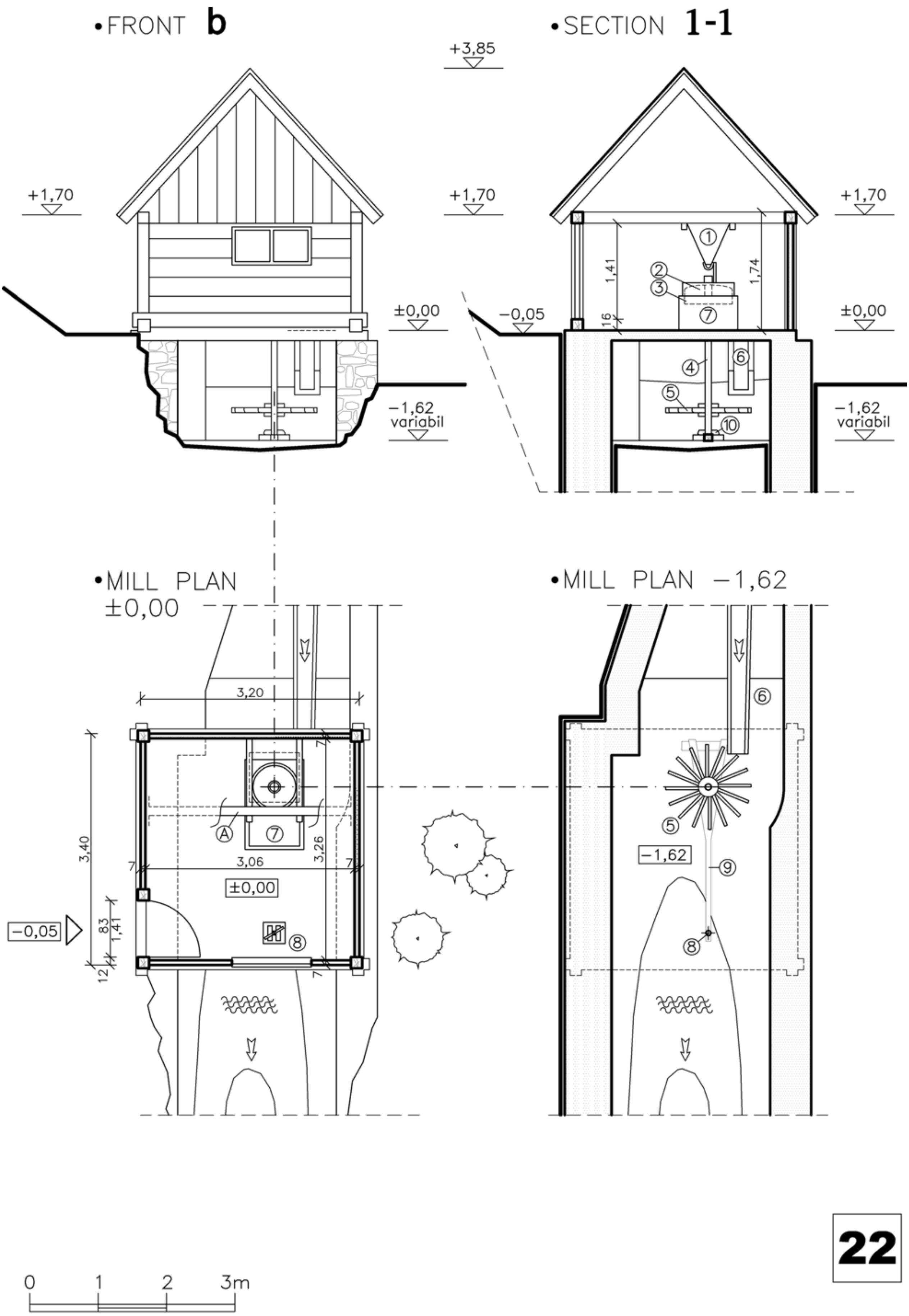
Fig. 15. Şopotu Vechi. ***Glimeica Mill***



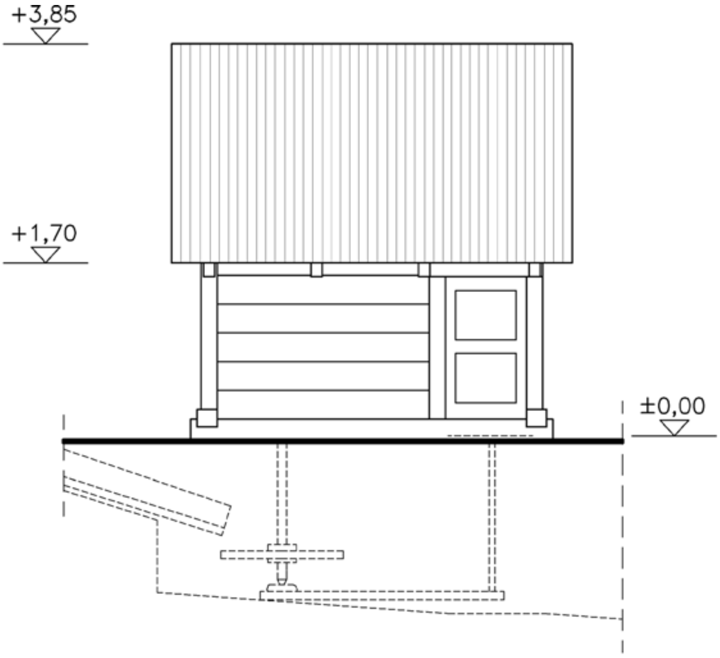
Pl. 43. Cornereva. ***Popeşti's Mill***



Pl. 44. Cornereva. ***Popeşti's Mill***



Pl. 45. Cornereva. ***Dărăban's Mill***



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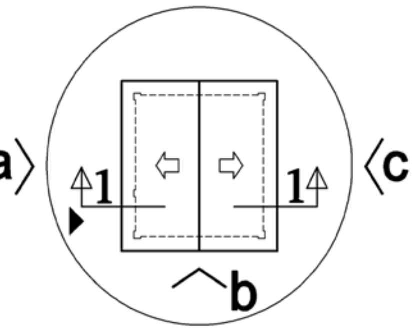
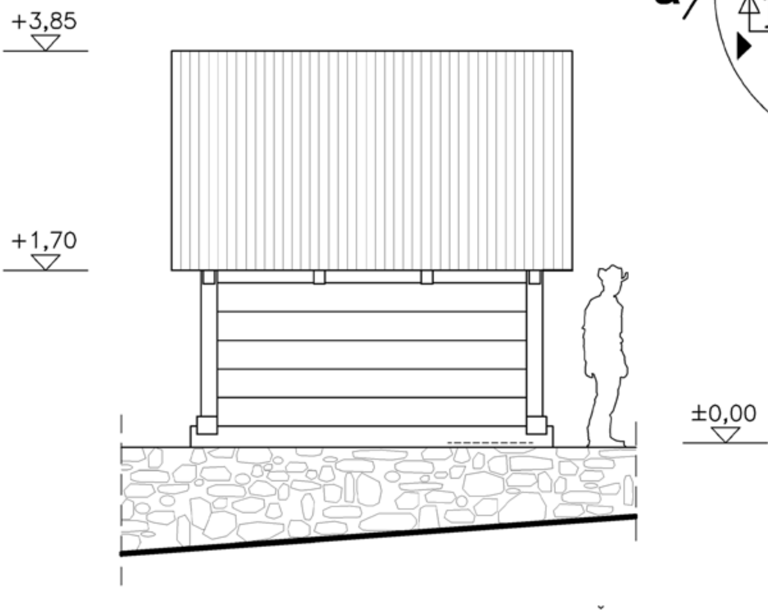
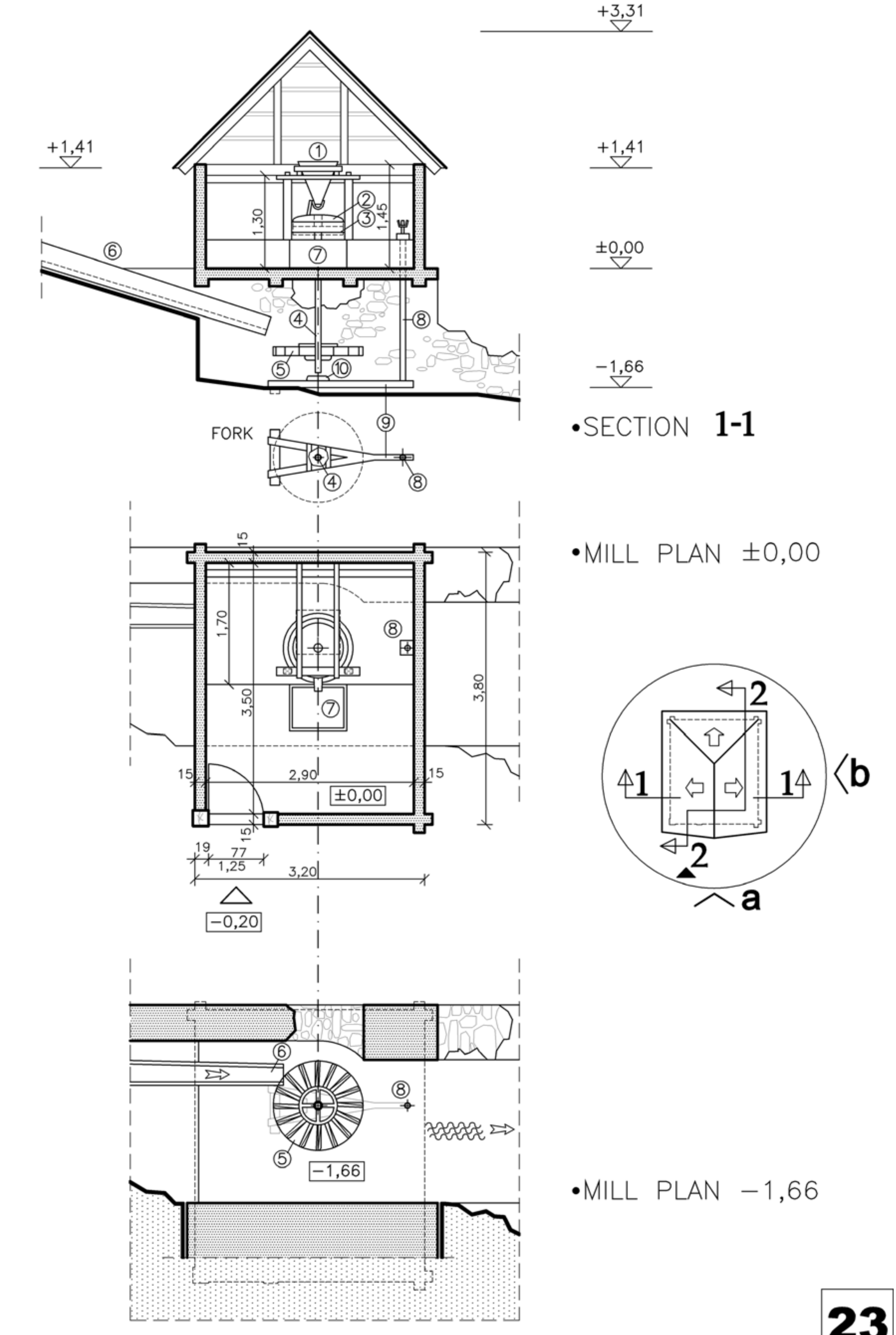




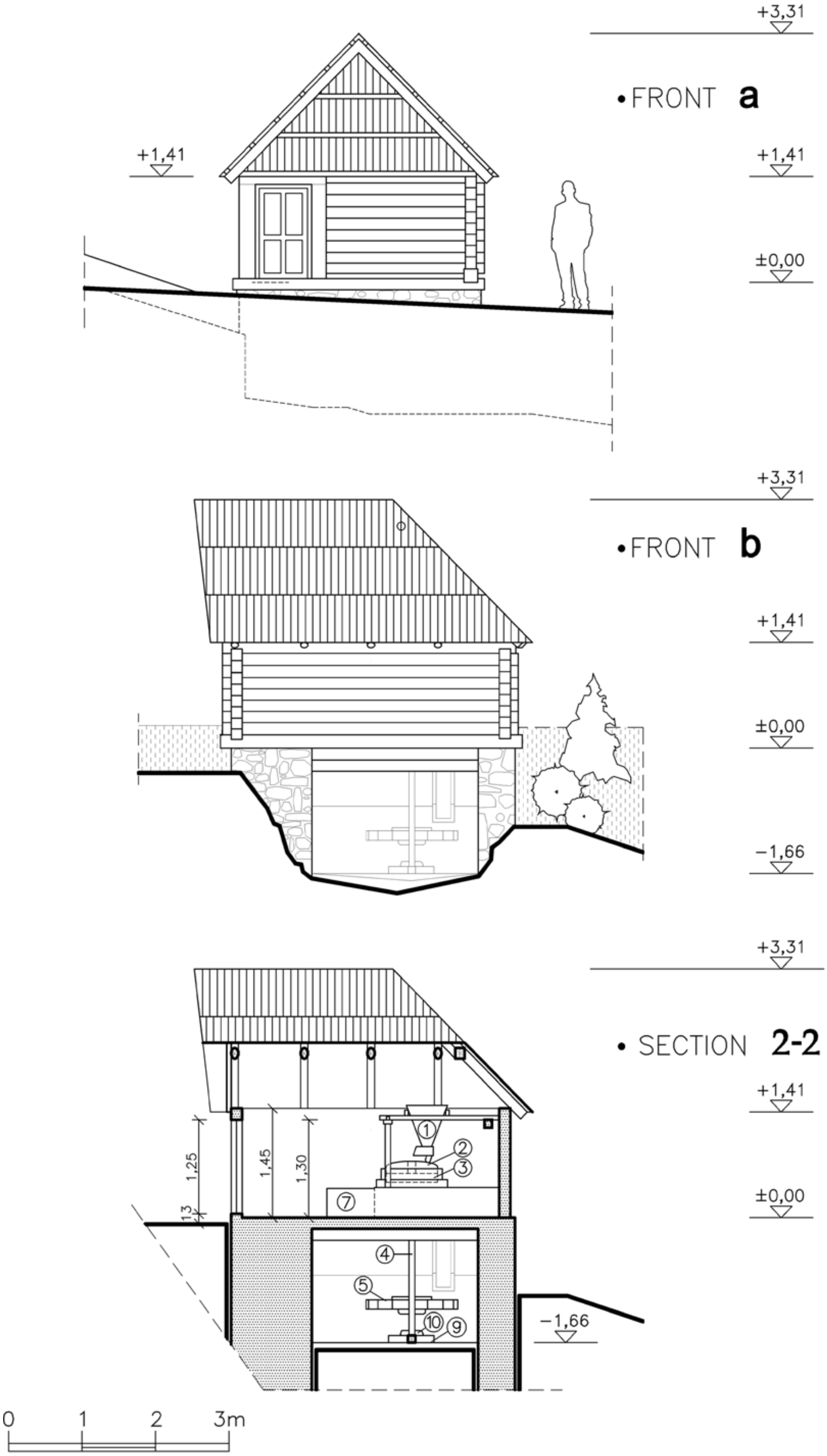
•FRONT **c**

22

Pl. 46. Cornereva. ***Dărăban's Mill***



Pl. 47. Dolina. ***Andrei's Mill***



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Pl. 48. Dolina. ***Andrei's Mill***

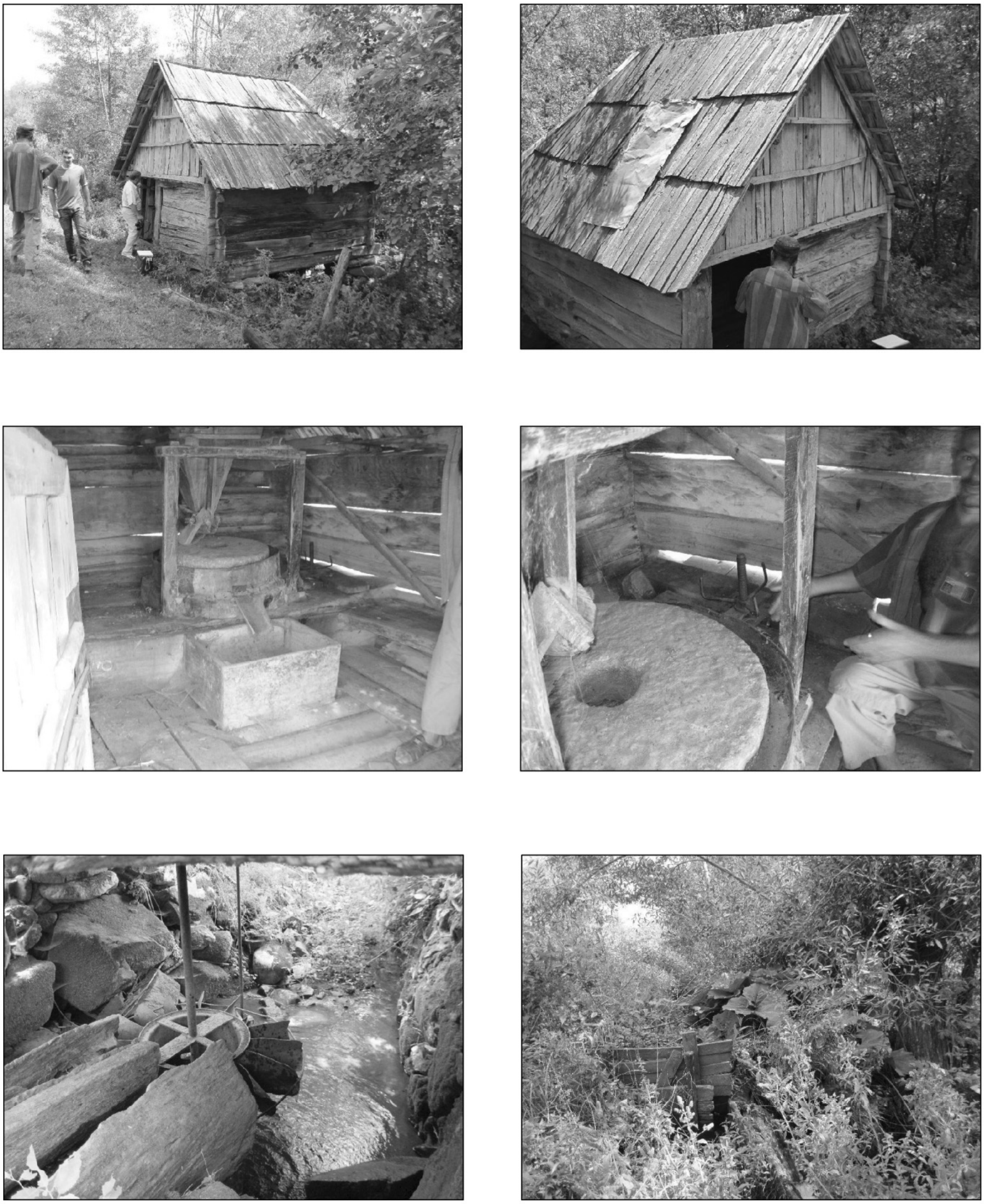


Fig. 16. Dolina. ***Andrei's Mill***

6.

FLOATING MILL IN THE BANAT

History of floating mill from the Banat is connected to waters of the Mureş and Tisa, that otherwise mark the northern and western borders of the province, and only in a small part to those of the Danube. The mills statistics from 1957 did not include floating mills from the Banat, although some were still in operation. The outstanding hydrographic network of the Banat province favored some floating mills functioning only on the big rivers, the Mureş, the Tisa, the Timiş and the Bega, in the northern area of the Banat Plain.

The floating mill history concerns both historians and ethnologists, who have later approached the issue, at those mills extinct moment. The historiography discourse was built by calling on written sources from the 18th century, on cartographic evidence from the same time or slightly early, and on the photographic images from the 20th one. Erich Lammert opened the subject in 1975 within a larger approach at the province level regarding the Banat Swabians ethnology[103]. Demşa's and Zănescu's study regarding floating mills from the Mureş, the river sector from Arad, brings new elements concerning modern hydrotechnical arrangements on the river course and on the impact of this operation in floating mills functioning[104]. The problem of watermill from the Banat is found as inserted in Daniela Graf's global approach of the theme, at the level of European continent[105]. Provincial government documents from the 18th century, with references to floating mills from the Mureş, gave substance in Herbert Hoffmann's speech on floating mill in Transylvania and the Banat[106]. Hungarian historical writing expressed its concern over the issue of floating mill in the medieval Hungarian kingdom or in punctually approaches[107]. Sabjan's studies or those of Juhász[108] discussed the floating mill problem in the context of water management in the Middle Age, or insisted punctually on grinding plant built on the Tisa. Floating mills in western Lower Danube, between Kovin and Tétel, made special topic of Mirjana Djekić's speech on watermill from Vojvodina[109].

The beginnings of ship-milling in the large rivers of the continent are formally established in the middle of the 6th century. Testimony of Procopius from Cesareea on the siege of Rome by Goths in 537, where they found a description of floating mills arranged by General Belizarie on the Tiber River, sets a milestone in the history of floating mills[110].

Daniela Gräf, who had special concerns on this problem, mapped 700 locations about with floating mills, in a long history period, from early Middle Ages until recent times. She relies on there findings and certifications from written sources, from the eighth century near Mainz, other from the ninth and tenth centuries on the Rhine, the Sade, the Seine, the Garonne and the Loire, which show a diffusion of ship-milling technology along the great rivers of Europe in the early Middle Age[111]. Beginning with the 12th century floating mills spread together with the Catholic abbeys in the Central

[103] Lammert, 1975, p. 9-20.
[104] Demşa, Zănescu, 1972, p. 213-229.
[105] Gräf, 2009, p. 467 şi urm.
[106] Hoffmann, 1981, p. 125-156.
[107] Takacs, 1907 b, p. 144-150; Vajka, 1983, p. 351-360.
[108] Juhász, 1960, p. 127-140; Sabján, 2003 ?, p. 242-140.
[109] Djekić, 1990, p. 87-91.
[110] Lammert, 1975, p. 11.
[111] Gräf, 2009, p. 467-468.

European space, as office documents in the thirteenth century mark their presence the Eastern European Christendom border. Floating mills were working in the 13th century on the middle Danube in the area of Arpád dynasty Hungarian kingdom[112].

The history of this class of mills built on floating vessels is better known in the Central and Eastern European area beginning with the 18th century. Demographic explosion and landed arrangement works, which increased the cultivated surface, had consequences in terms of increasing the number of mills. Information on the floating mill from the Banat became very relevant with the eighteenth century, when the province was integrated to the administrative and economic exploitation system of the Habsburg Empire[113]. Graphic and photographic documentation of the nineteenth century and early next century offers an image of floating mill from the lower Western Danube[114]. In fact, mapping with the diffusion of ship-mills on the Danube and its tributaries, the Tisa and the Mureş, proposed by Daniela Gräf, marks their certain presence beginning with the eighteenth century and a peak of accumulation in the nineteenth century[115].

Discussion on floating mills from the Banat is bearing only on written historic sources and images, not very many, from the last century, with those mills from Arad, Periam, Lugoj, and Timişoara (Fig. 79). The moment of the floating mill appearance in the Banat concerned historians and ethnologists who stuck on this issue. We have shown before that, for a researcher with a European vision on the issue, namely Daniela Gräf, the floating mill is used with certainty only from the 18th century. It is perceptible however in historical discourse an attempt to settle up the presence of floating mills on the banks of the Mures since the twelfth century[116]. There were invoked in that approach indirect historical evidences, circumstantial testimonies. The existence of a port on the Mureş, at Sâmbăteni[117] in 1138, the presence of the salt deposit brought on the Mureş to Szeged, certified in 1222, ships of various types that brought salt from Transylvania[118] that time suggest, undoubtedly, the importance of the Mures as a communication artery, but does not certify any way the existence of ship-mills in the twelfth and thirteenth centuries on the Mureş. The *Molinari* estate[119], recorded in an act of June 15, 1428, in the vicinity of Bizere Abbey, undoubtedly indicates a colony of millers on the bank of the Mureş, which could serve both to mills with vertical wheel or those arranged on ships.

Documents coming from the late Middle Age, since 1522 and those ones from 1604 and 1606 mark the existence of floating mills in Szeged and on the lower Mureş[120]. The eighteenth century, which represented a peak moment in broadcasting the ship-mill in Europe, integrated also the Banat area around the Mureş in dissemination of this technology.

The written information from the eighteenth century truly brings the ship- mill from the Banat within historical knowledge light. The Banat, after the Peace from Passarovitz in 1718, is integrated with the Habsburg Empire, having an administration directly subordinated to the imperial Court. German colonization in the eighteenth century did not remain without consequences in the field of ship-mills. Documents show the German floating mills functioning in the eighteenth century. There are issued regulations for operation and anchoring of mills[121]. German mill and German masters conquer the market of the Hungarian kingdom since

[112] Gräf, 2009, p. 468; Sabján, 2003, p. 242.
[113] Jordan, 1967, p. 29-38; Feneşan, 1997, p. 9-36.
[114] Sabján, 2003, p. 2426-248, fig. 12-14; Djekić, 1990, p. 88, fig. 1, 2; Demşea, Zănescu, 1972, p. 220-223, fig. 1-9.
[115] Gräf, 2009, p. 475, fig. 10-12.
[116] Demşea, Zănescu, 1972, p. 214; Lammert, 1975, p. 15.
[117] DIR, C, I, p. 2-3.
[118] DIR, C, I, p. 335.
[119] Juhász, 1927, p. 253-254.
[120] Juhász, 1960, p. 127; Lammert, 1975, p. 15.
[121] Takats, 1907 b, p. 148; Hoffmann, 1981, p. 130.

the first half of the sixteenth century, as suggests a document from 1527[122]. A statistics of ship-mills in Szeged, during the eighteenth century, published some time ago by Juhász, is highly suggestive regarding the rate of diffusion of this class of mills in the Banat[123]. A number of 22 ship-mills worked in Szeged in 1750, in 1768 there were 36 floating mills, to reach at 47 mills in 1777, and at their peak time, 71 floating mills worked[124].

Documents dating from the eighteenth century from Austrian sources, on which otherwise those who approached the floating mill issue have built their historiographical discourse, offer a diverse range of information, show a concern of local government, but also of those of the central one from Vienna, to regulate the problem of ships and floating mills on the Mureş, and the rivers inside the province. Salt Directorate from Presburg (Bratislava) asked, in 1743, the dams for mills elimination[125]. A circular to the Banat Districts Administration, of July 24, 1744, specifies the prohibition to build mills, and the reparation of old ones could be done only with a prior approval[126]. Documents coming from the Hungarian Court Government, in 1747, solicited measures to cleanse the banks of the Mures on the one hand, and on the other hand, a strict demarcation of the mill places[127]. In this way is intended to streamline the movement of ships with salt in Transylvania. An act of September 23, 1750, from the Hungarian Court Administration, resumed the problem of mills on the Mureş and of the mills dams that endangered the movement of ships[128]. An official responsible for salt transport submitted, in September 8, 1750, a report requesting the removal of two mills from the bed of the Mureş, which belonged to oberknez Ioan from Chesiuț and to Cristian Bicaler[129]. Similar actions took place also on the inner rivers of the province, where were functioning floating mills and causing damages to the riverside residents. A document from 1727 reveals the government effort to evacuate the mills from the Bega[130]. Floating mill, despite these impediments, has seen the upward diffusion in the nineteenth century. Growth of cultivated areas and demographic support were some of the auspicious factors. Diffusion peak of this ship-milling technology was achieved at the mid nineteenth century. The phenomenon decline is found with the second half of the nineteenth century, and will run slowly until the middle of the twentieth century. Steam power, in full swing in the second half of the nineteenth century, affected the ship-milling. A statistics of 1860 scored a total of 300 floating mills on the Mureş, and the number would decrease to 131 in 1884 and to only 67 in 1910[131]. It was the beginning of the water mill end within the European space. We meet an identical situation on the Tisza, in Szeged, which was a major manufacturing centre of floating mills as early as the 18th century. Here, in Szeged, appears in 1876 the first steam-mill, and the ship-mills production ceased with 1870. At the end of the century, in 1900, only 10 mills functioned in Szeged, and only one left by 1918[132]. The 1957 statistics scored only 35 floating mills in Romania, 12 of which on the Olt and 17 on the Someş, in Transylvania[133]. Photographic documents show the journey of floating mill at the beginning of the twentieth century in Timişoara, on the Bega, in Lugoj, on the Timiş, and at Kovin. Energy of river waters was not used there, in the Banat region, for floating mills. In fact, an act of Imperial Shipping Authority from Orsova, dated February 5, 1906, shows that, on the lower Danube, sector Moldova Veche -

[122] Takats, 1907 b, p. 147.
[123] Juhász, 1960, p. 128.
[124] *Ibidem*, p. 128.
[125] Hoffmann, 1981, p. 139
[126] Barotti I-IV, p. 196.
[127] Barotti VI-VII, p. 439-4440.
[128] Barotti, VI-VII, p. 441.
[129] Barotti, VIII-IX (XXI), p. 567.
[130] Barotti I-IV, p. 455-456.
[131] Demşea, Zănescu, 1972, p. 220; 230.
[132] Juhász, 1960, p. 130.
[133] Hoffmann, 1981, p. 137-138.

Orşova, the floating mills did not work. The decline of the Banat floating mill happened in the middle of the past century. Year 1944 marked the extinction of mills from Periam, the years 1946 and 1947 included the disappearance of mills from Chelmac, Căprioara and Igriş along the Mureş Valley landscape. Ususău mill maintained until 1954. Last relic of rural heritage on water – Belotin mill - was destroyed in 1963, marking the total floating mill disappearance in the Banat[134]. Thus, here in the Banat, a chapter of the European history of over a millennium and a half came to its end. Here on the eastern border of Europe, floating mill, which had seen, the last two centuries, a thriving and prosperous period, ended its European adventure without leaving witnesses in the cultural landscape of the province.

Floating mill or ship-mill or even boat mill has a complex structure consisting of a ship on which the milling structure is located, and a smaller one, the pontoon, which supports the horizontal axis of the hydraulic wheel. So the ship-mill is a mill with vertical wheel and horizontal axis mounted on the two floating bodies. We should specify from the beginning that our limited researches in the State Archives from Timişoara didn't identify plans of floating mills from the Banat, so that the discussion on their structure is reduced to observations from the kept photographic documentation. In fact, neither further documents regarding mills on the Mureş and the Tisa were accompanied by graphic documents of the floating mills in the 19/20th centuries. H. Hoffmann's study on floating mill has focused its documentation on floating mills from Transylvania and Oltenia[135]. Museum of Technical Civilization Sibiu, of a European extension, houses two floating mills.

Ship-mill was a solid construction, capable to uphold the structure of a house, of a house with two rooms. The photographic documents reveal a vintage elongated cottage, with wooden walls, the roof in two waters, with roof-cover from shingle or iron plate. The structure consisted of two rooms, one for the milling machinery and the animal housing, the other providing shelter, rest and heat for the boat miller[136]. The main hull with mill house and mechanical plant was called *ladie* or *ladic*[137]. The auxiliary boat, namely the small and uncovered pontoon, was meant to support the horizontal axis of the hydraulic wheel. The two vessels were connected with beams to ensure stiffness and transmission performance from the engine axle to the mechanical plant. The horizontal axle of mill with the hydraulic wheel had the gearwheel mounted at one end, in the ship mill. The gearwheel has hardwood nails set on the underside, arranged circularly, interacting with a drum-pinion fixed on the vertical axis of the runner stone. This simple, archaic mechanism of motion transmission from vertical to horizontal plan of the grinding stone works at the floating mills after the same principle found at the vertical wheeled mills. Floating mill uses exclusively vertical wheel with lower intake. From the inlet perspective the undershot wheel, using only the stream force, has a lower efficiency compared to hydraulic overshot or breastshot wheels. Studies on the floating mill from Transylvania noted problems with the location of floating mills, especially those ones arising from the special arrangements of some dams on river flows for those mills[138].

Historical research was concerned with floating mills production centers in the Banat area. There were identified regional centers in Arad and Szeged, but also regional workshops worked, where ships were assembled so that be later equipped with mills. Periam, port on the Mures, was

[134] Demşea, Zănescu, 1972, p. 222.

[135] Hoffmann, 1981, p. 133; Vojka, 1983, p. 360.

[136] Lammert, 1975, p. 19; Demşea, Zănescu, 1972, p. 223-225; Vojka, 1983, p. 353;Takats, 1907 b, p. 144.

[137] Demşea, Zănescu, 1972, p. 223-225.

[138] Hoffmann, 1981, p. 133; Takats, 1907 b, p. 147-148; Vojka, 1983, p. 355.

also a local manufacturing centre of floating mills[139]. Millers from the Mureş Valley set up their associations, their guilds. Documents show millers' guilds[140] in the early 19th century in Timişoara and the Mureş area.

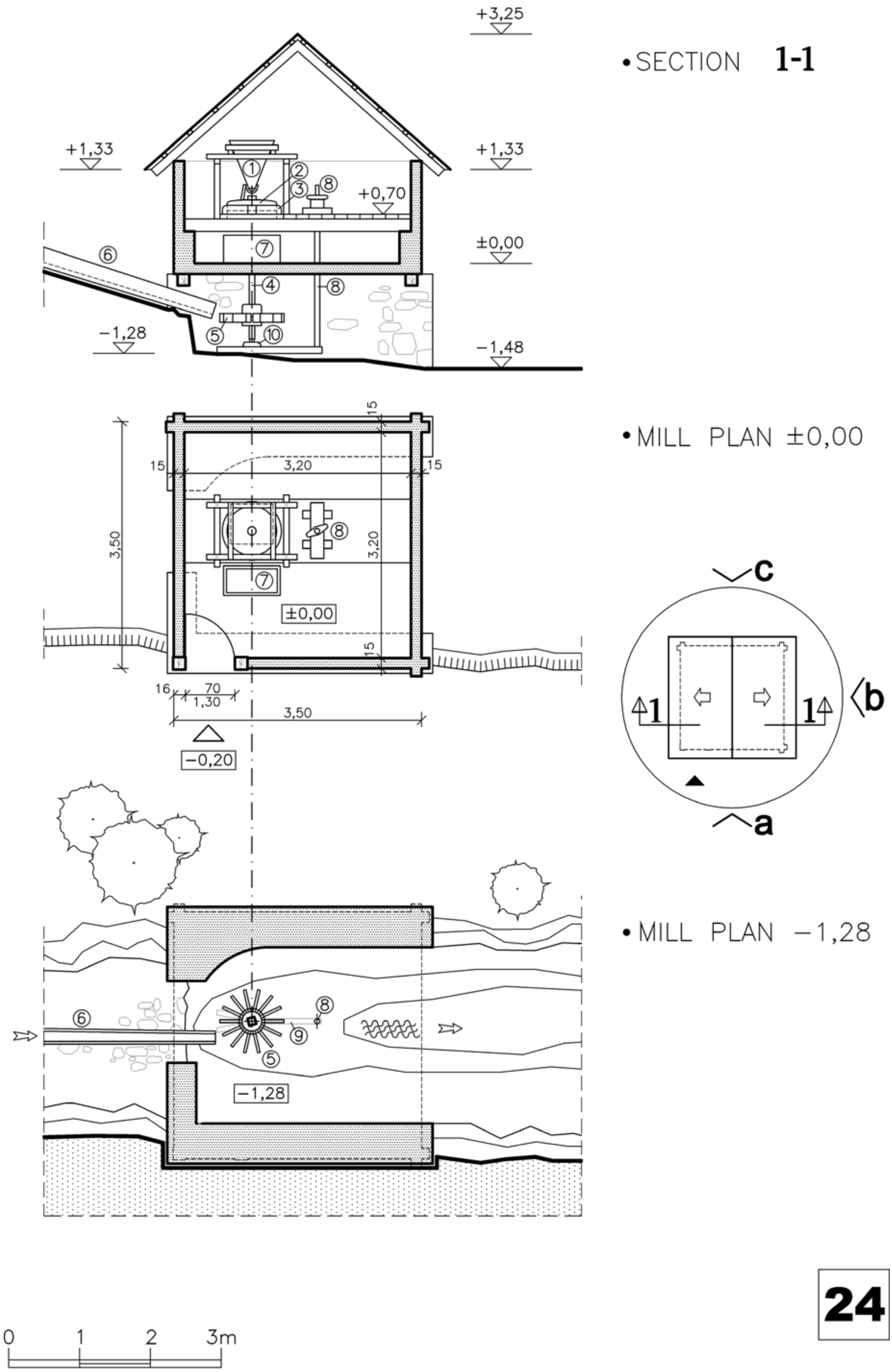
The millstones for floating mills were originally brought from Caraşova, then from Transylvania and Hungary stone masons. A case analysis, built on archive information from 1860, shows marks regarding the productivity of these installations. Mills from Arad, in a number of 17, grinded 980 kg daily, and six mills worked in the same period at Micălacă, grinding 740 kg grain a day [141].

Our approach on the Banat floating mill has intended to place these mills division within the overall cultural landscape of watermills history and ethnology in the Banat.

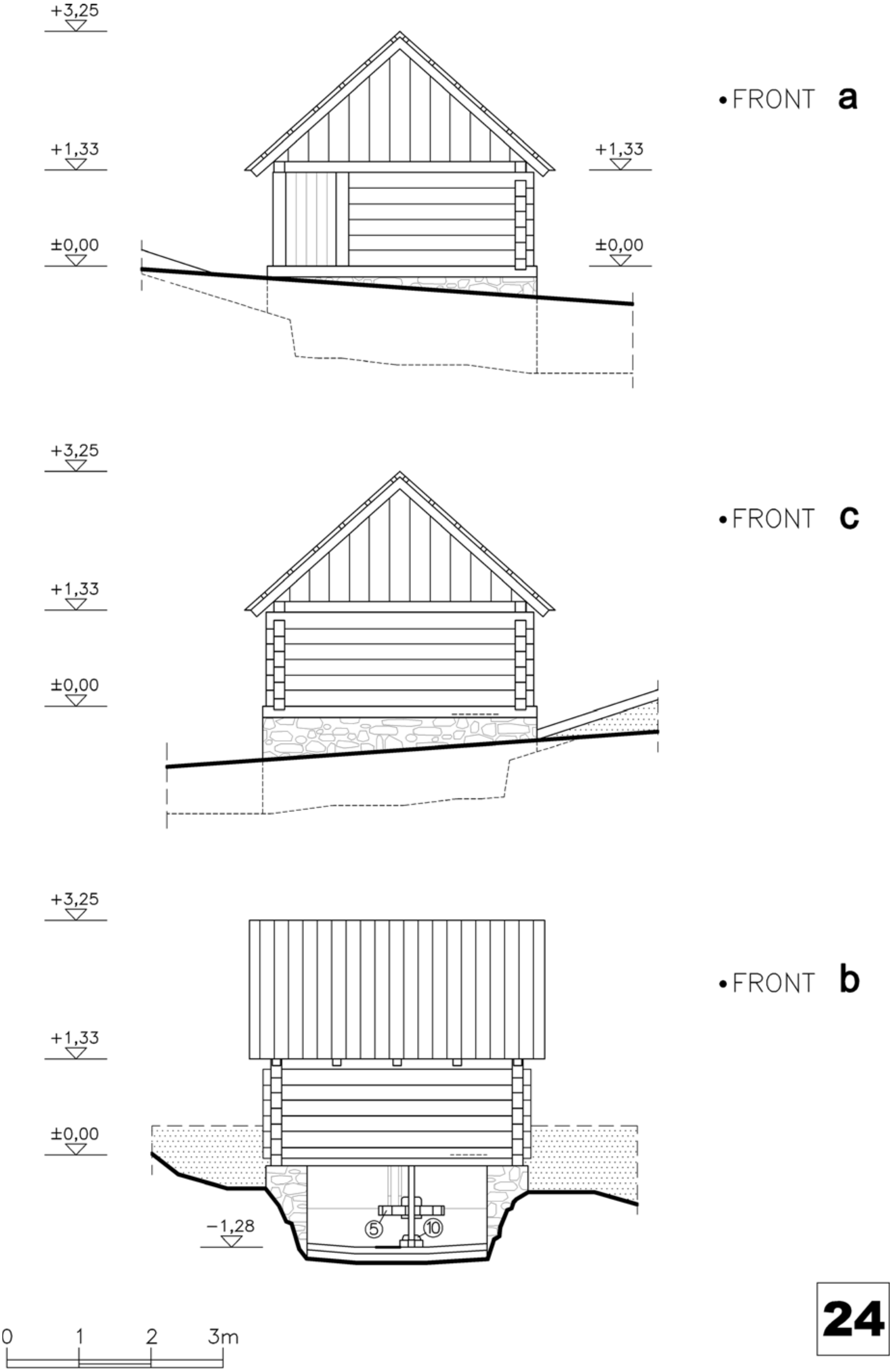
[139] Lammert, 1975, p. 19; Juhász, 1960, p. 129.

[140] Kakucs, 2008, p. 223, 224.

[141] Demşea, Zănescu, 1972, p. 226.

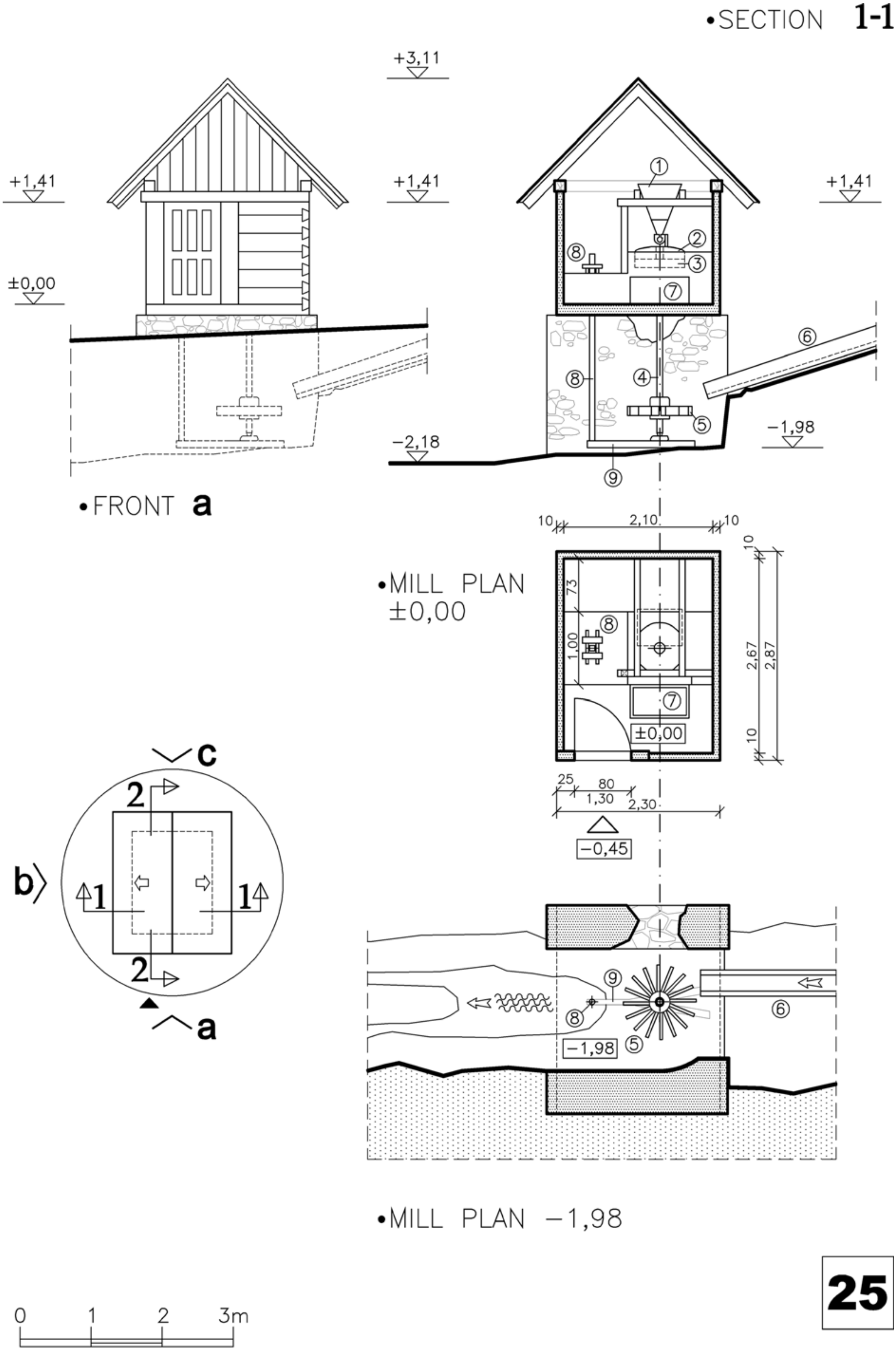


Pl. 49. Topla. ***Vâlculeşti's Mill***



Pl. 50. Topla. ***Vâlculeşti's Mill***

Fig. 17. Topla. ***Vâlculeşti's Mill***



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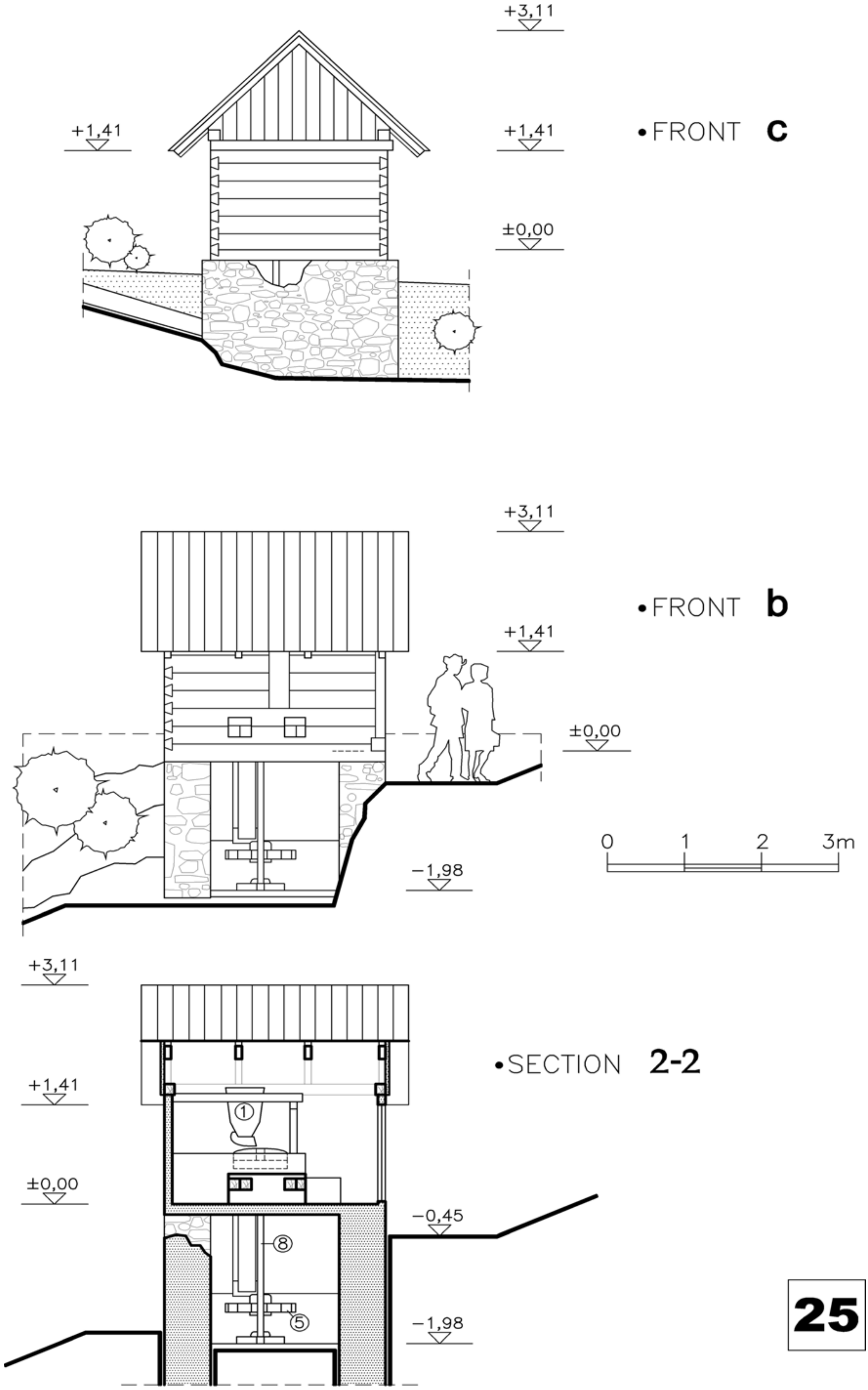
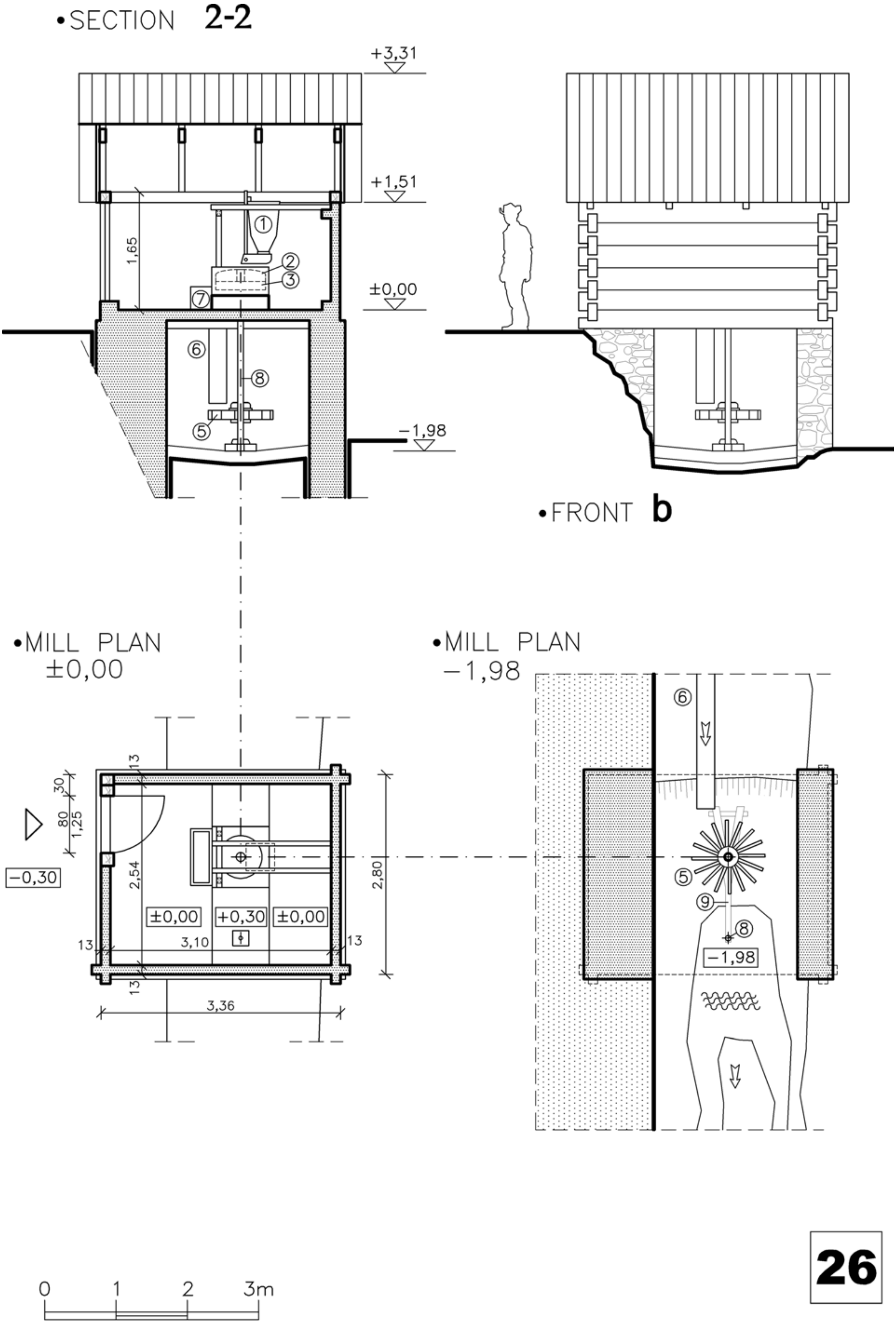
Pl. 51. Topla. *Boască's Mill*

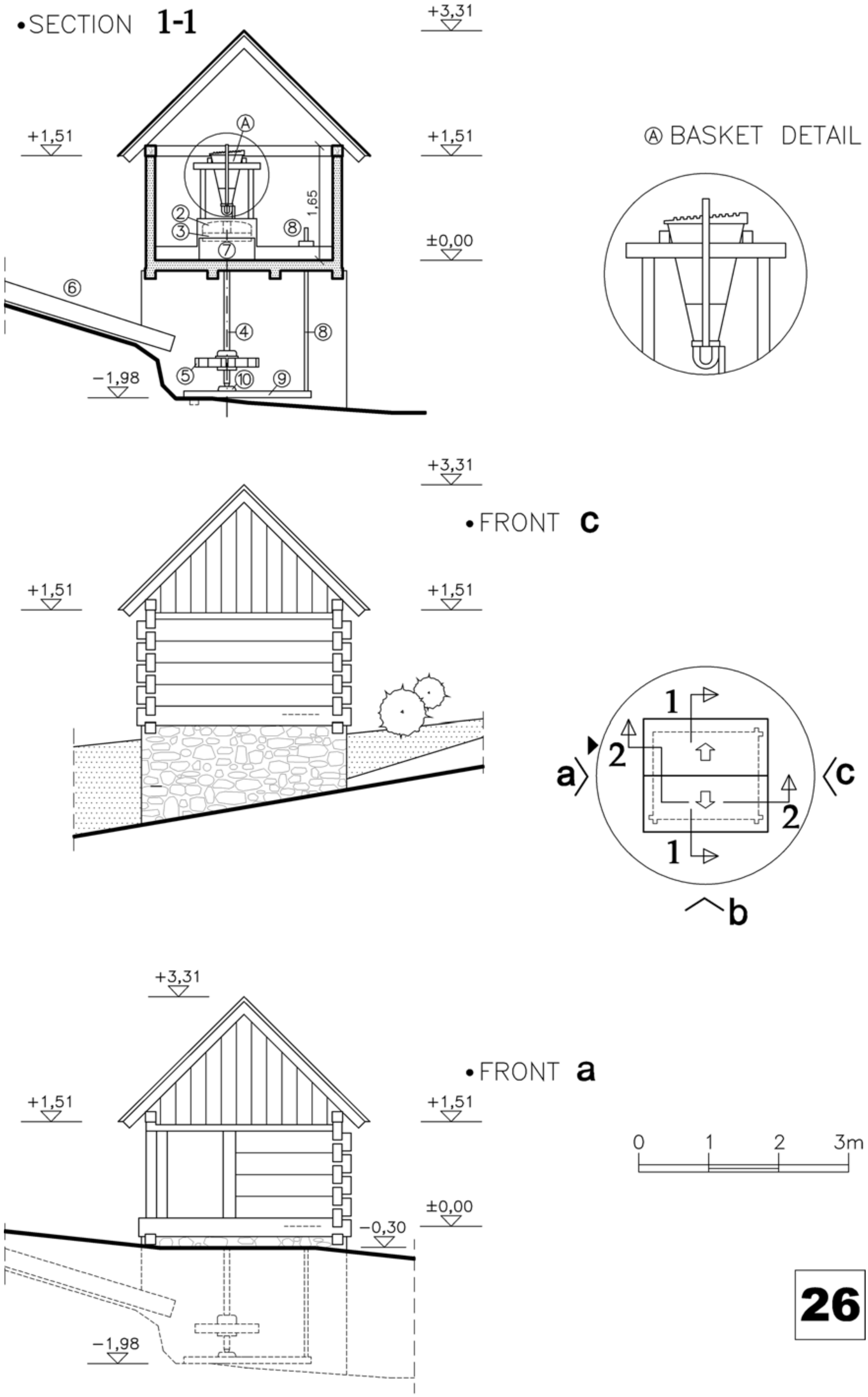


Pl. 52. Topla. *Boască's Mill*

Fig. 18. Topla. ***Boască's Mill***



Pl. 53. Topla. ***Ion Adam's Mill***



Pl. 54. Topla. ***Ion Adam's Mill***

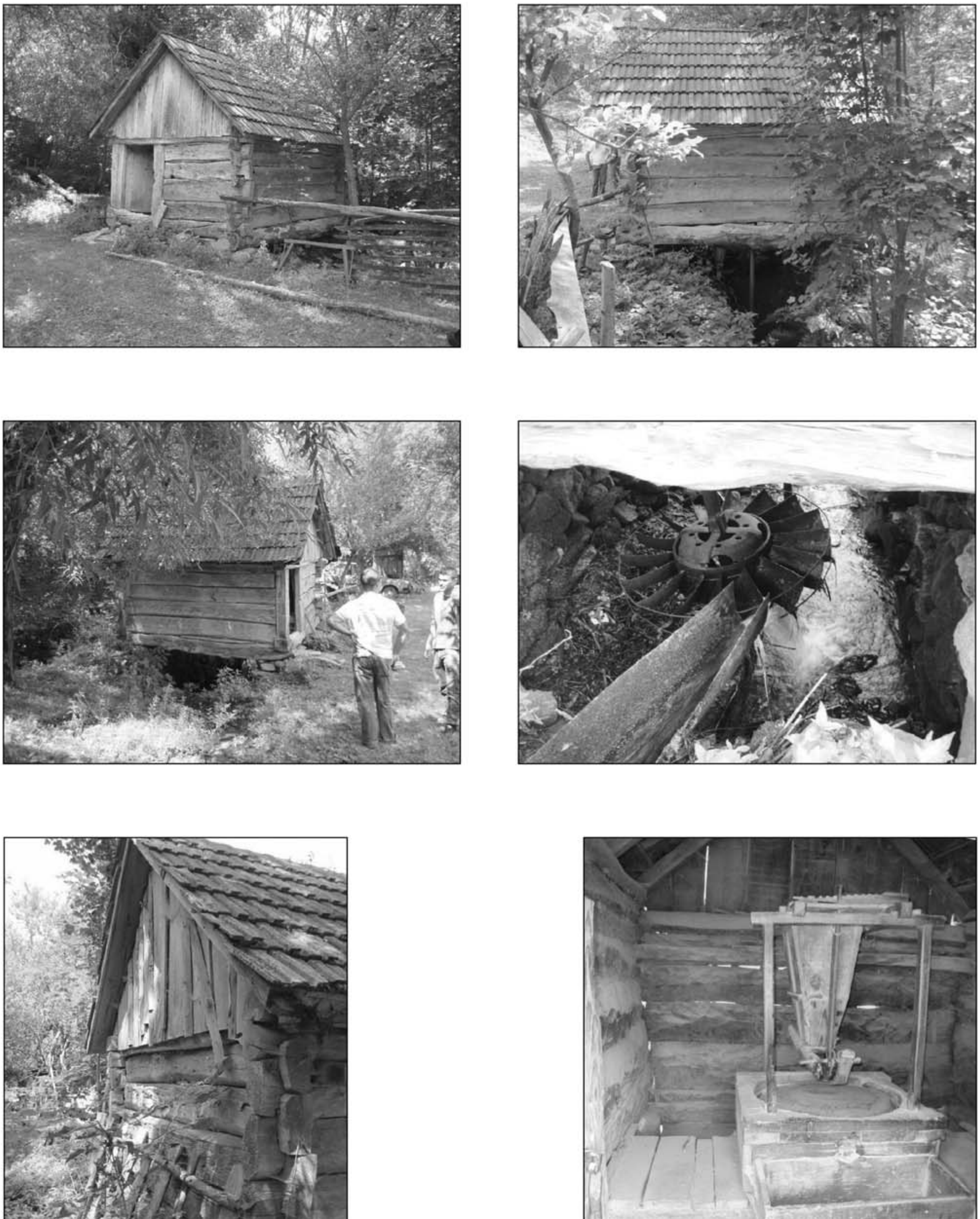
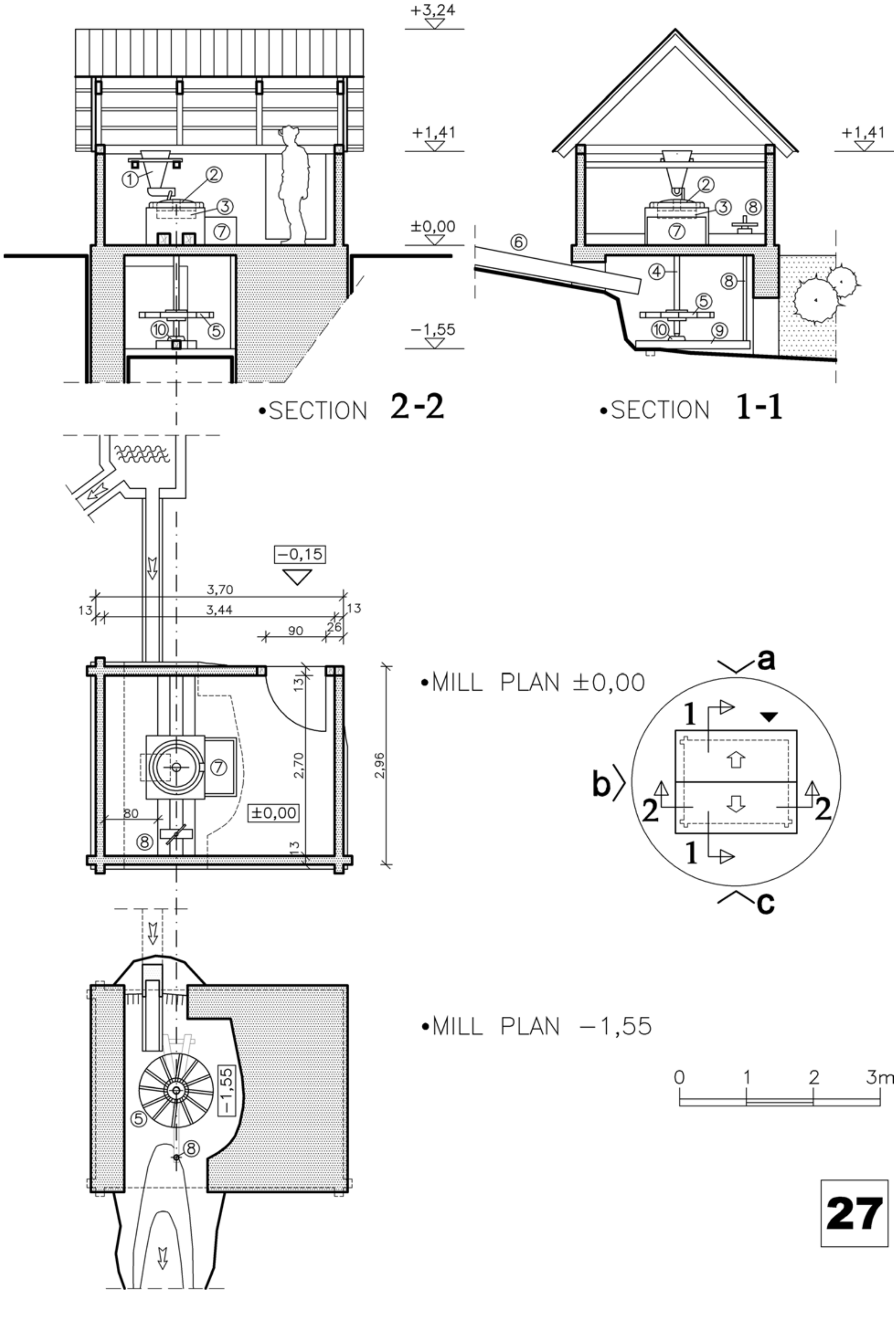
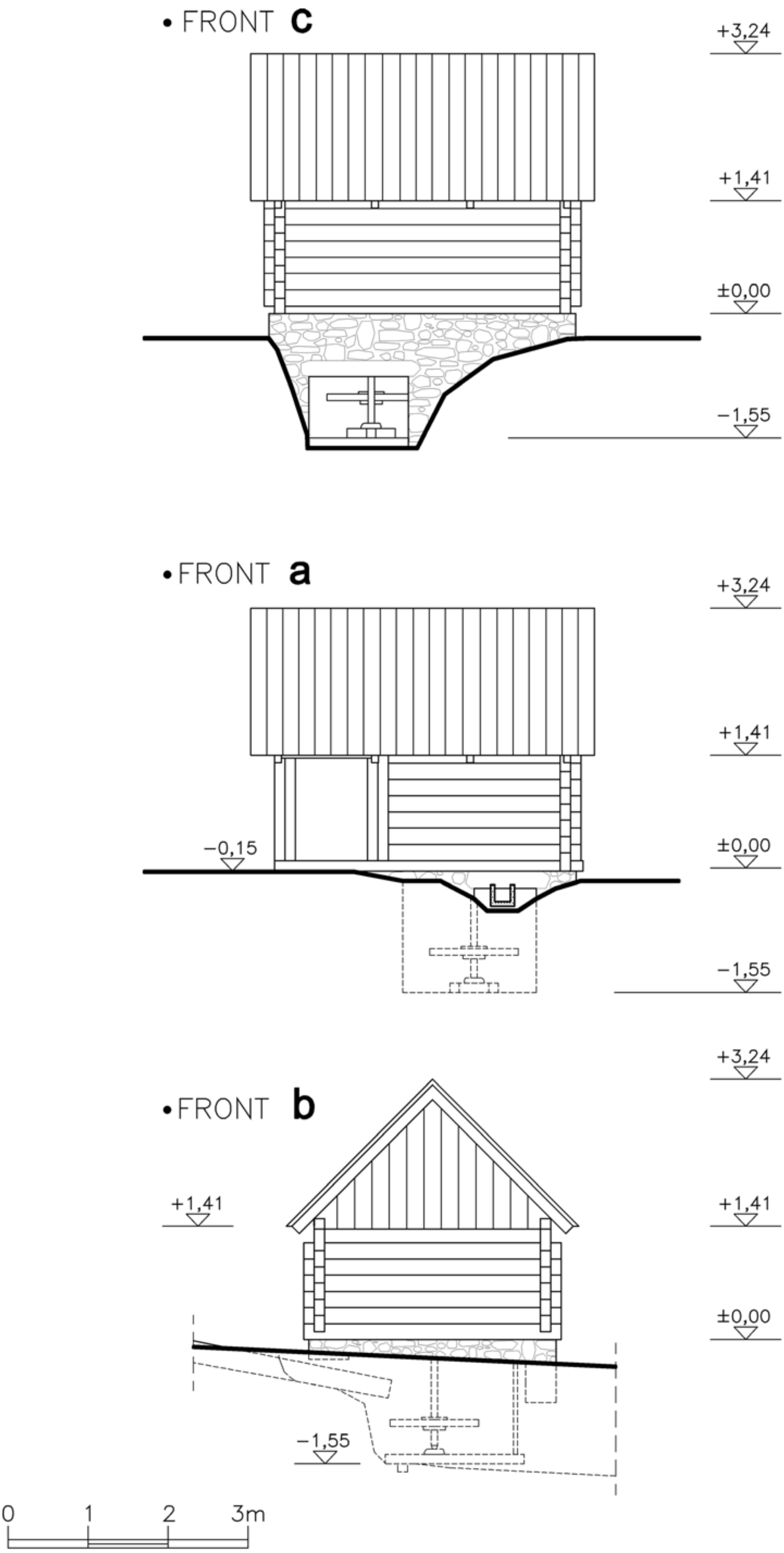


Fig. 19. Topla. ***Adămeşti's Mill***



Pl. 55. Topla. ***Drimească Mill***



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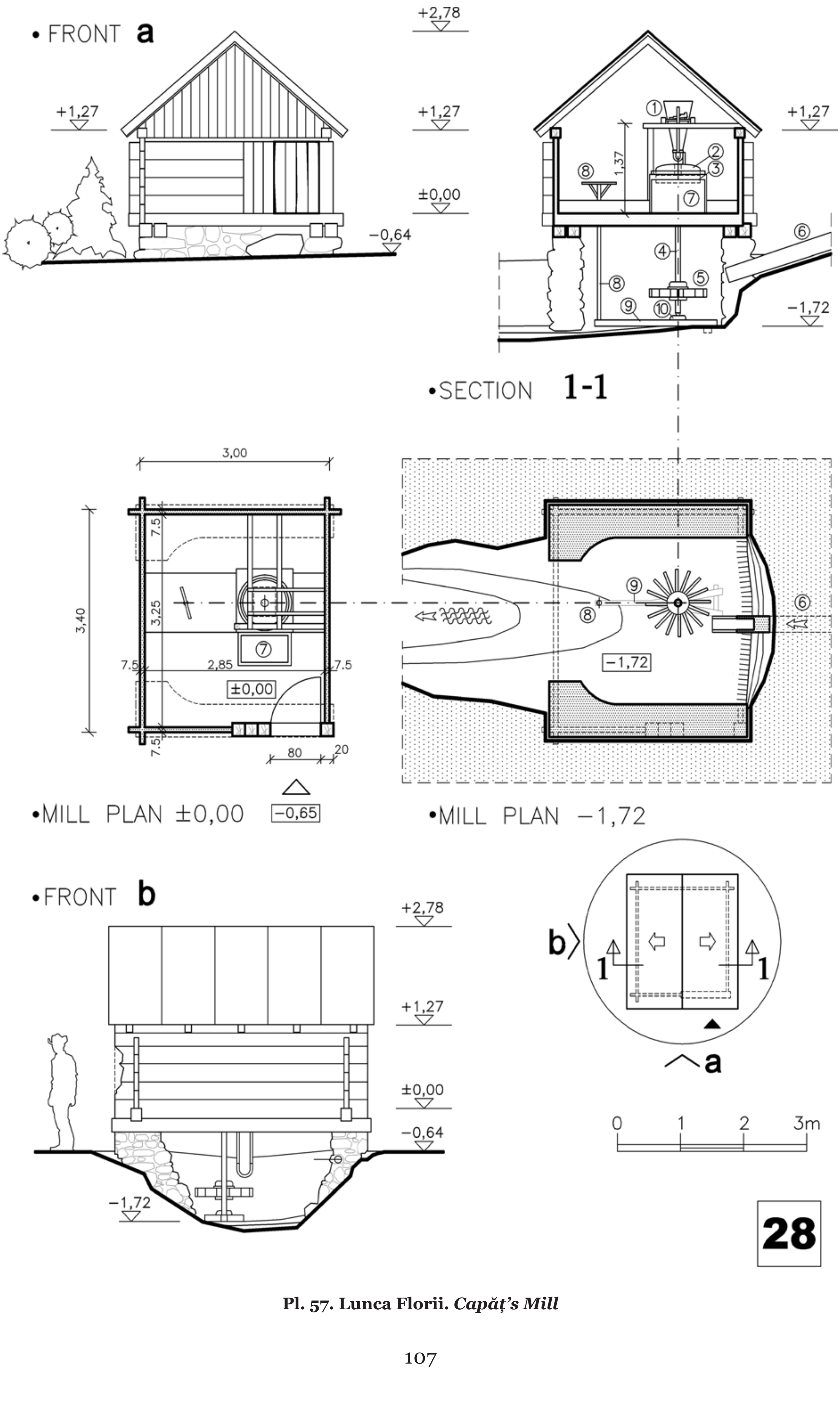
Pl. 56. Topla. ***Drimească Mill***

Fig. 20. Topla. *Drimească Mill*



Pl. 57. Lunca Florii. ***Capăț's Mill***

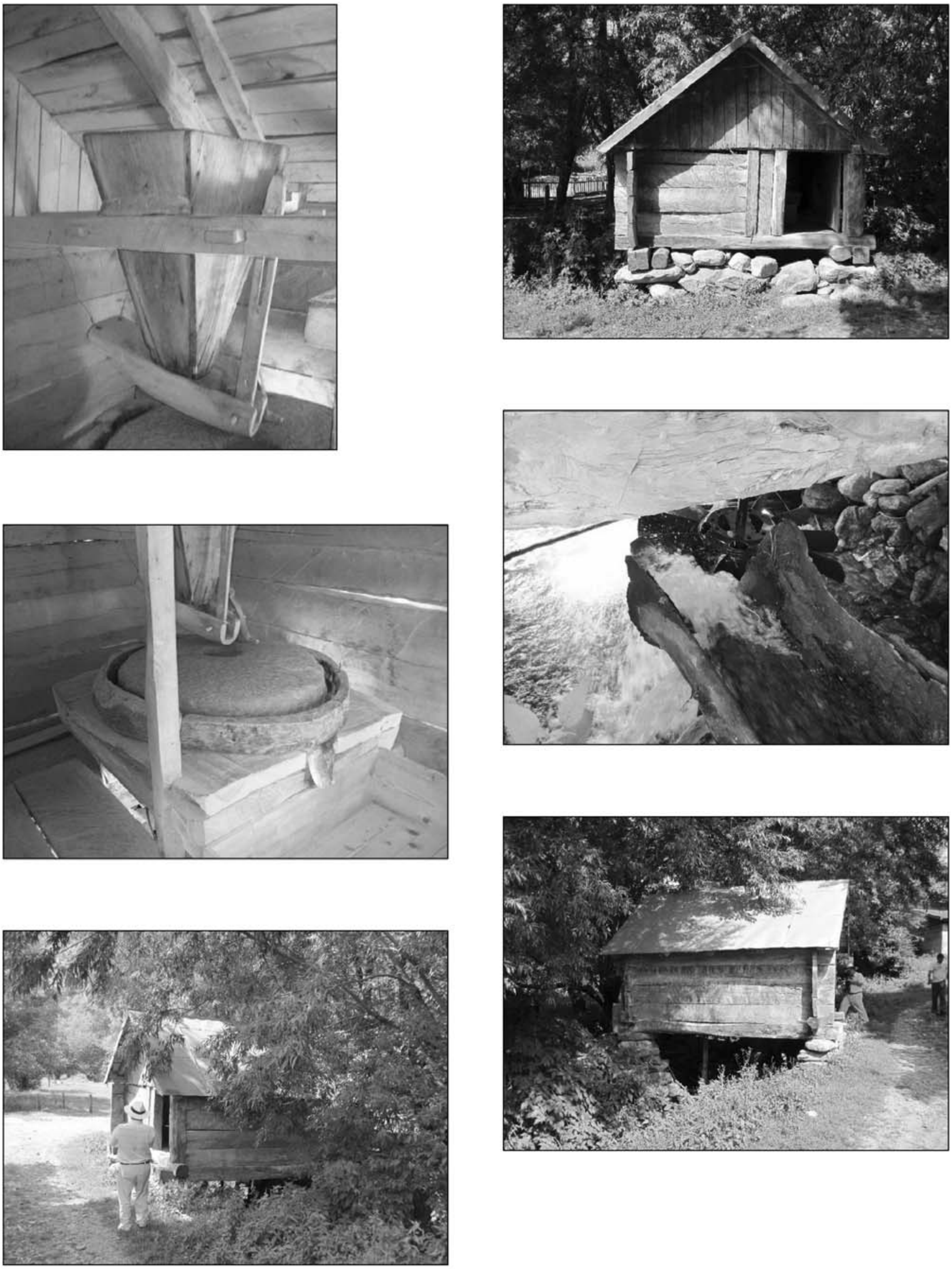
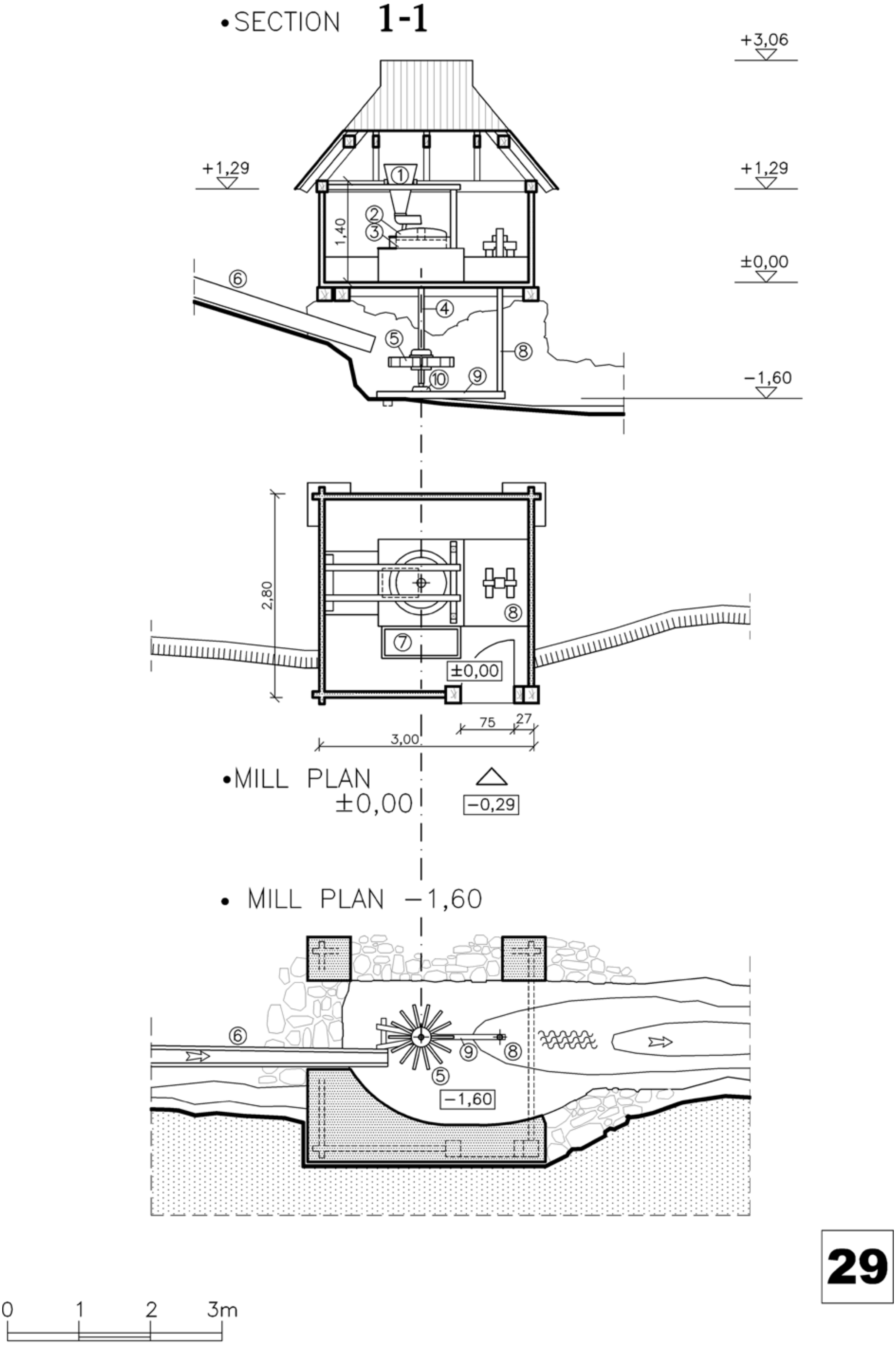
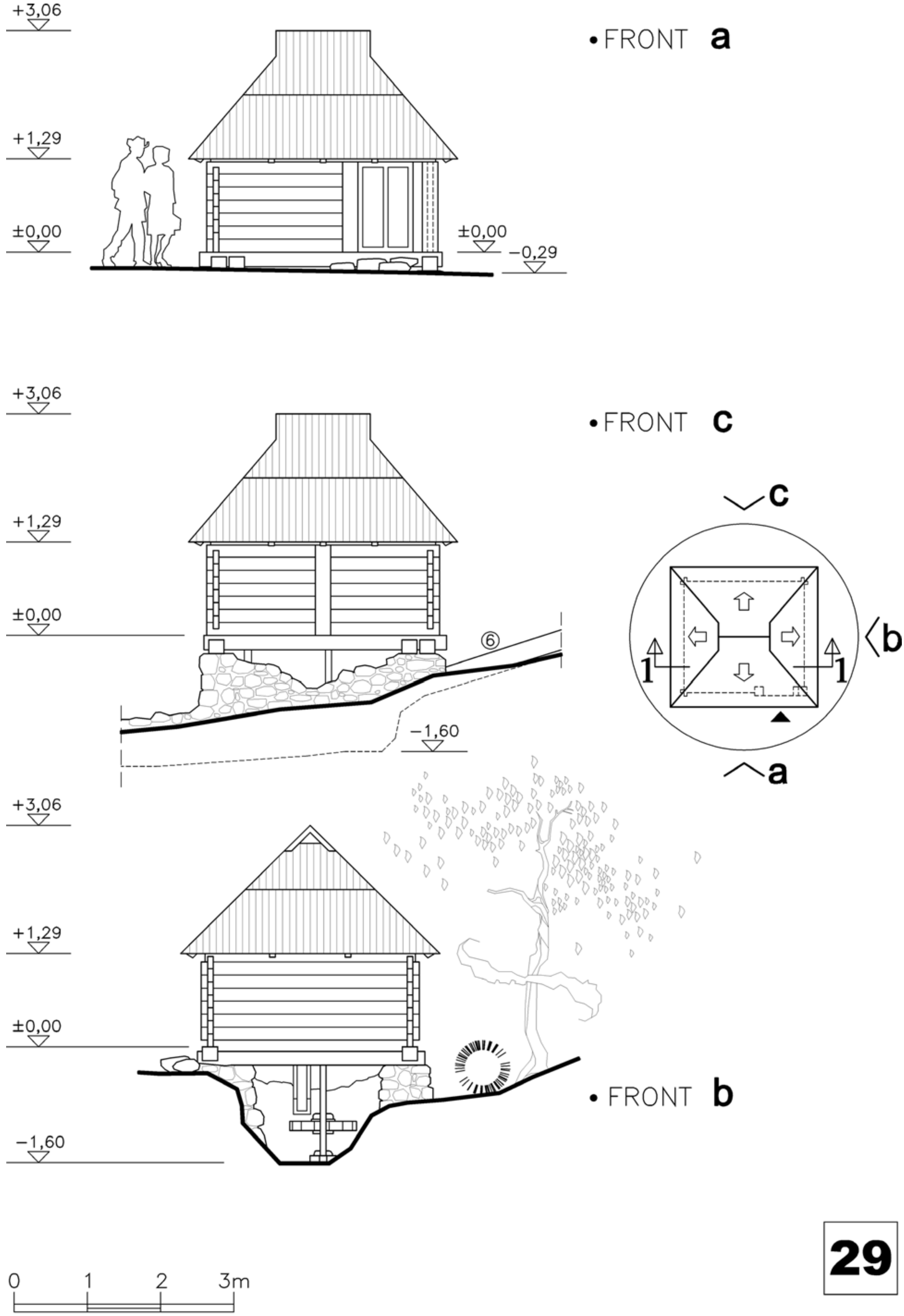


Fig. 21. Lunca Florii. *Căpăț's Mill*

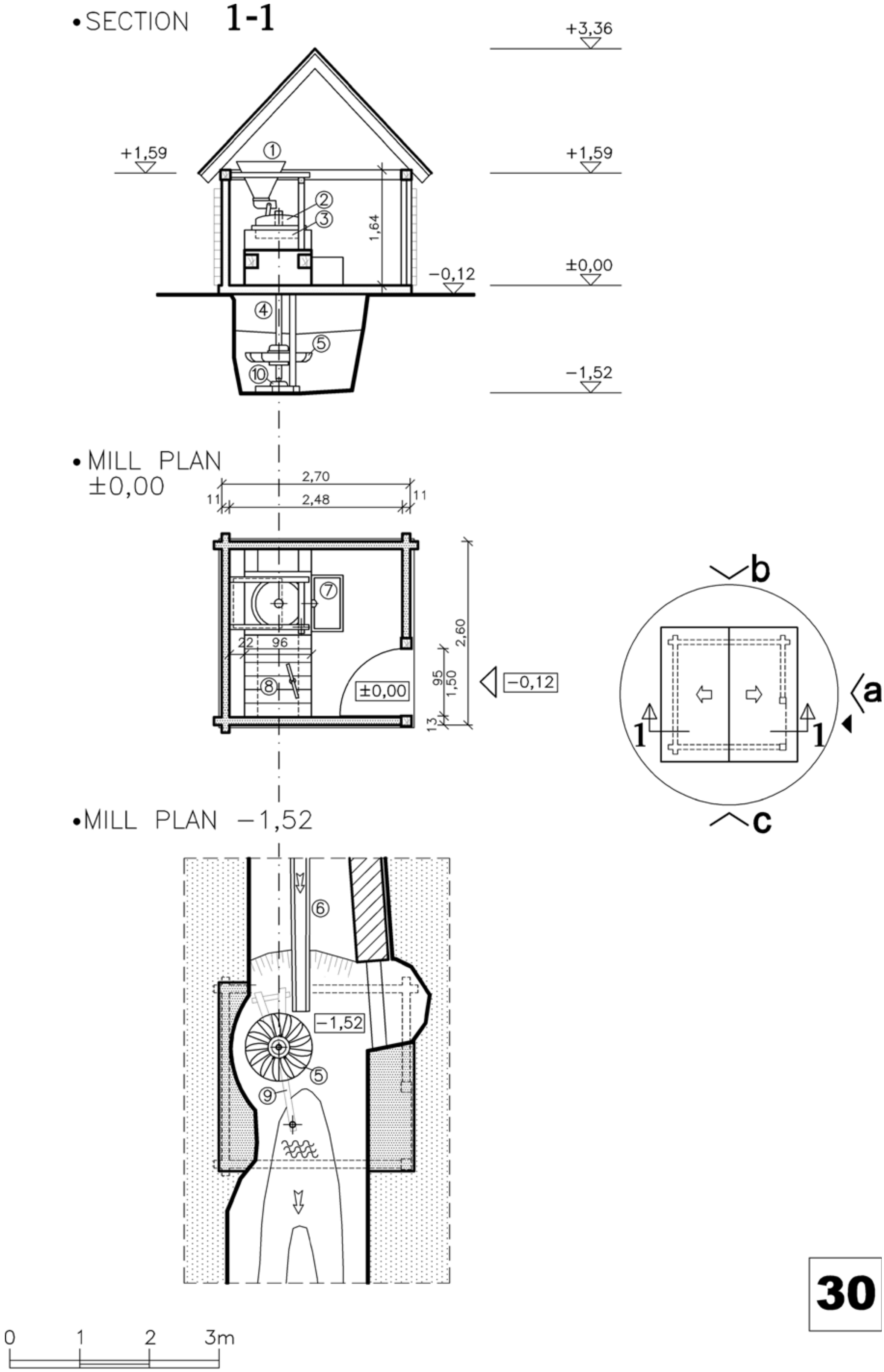


Pl. 58. Lunca Zaicii. ***Vulpeş's Mill***

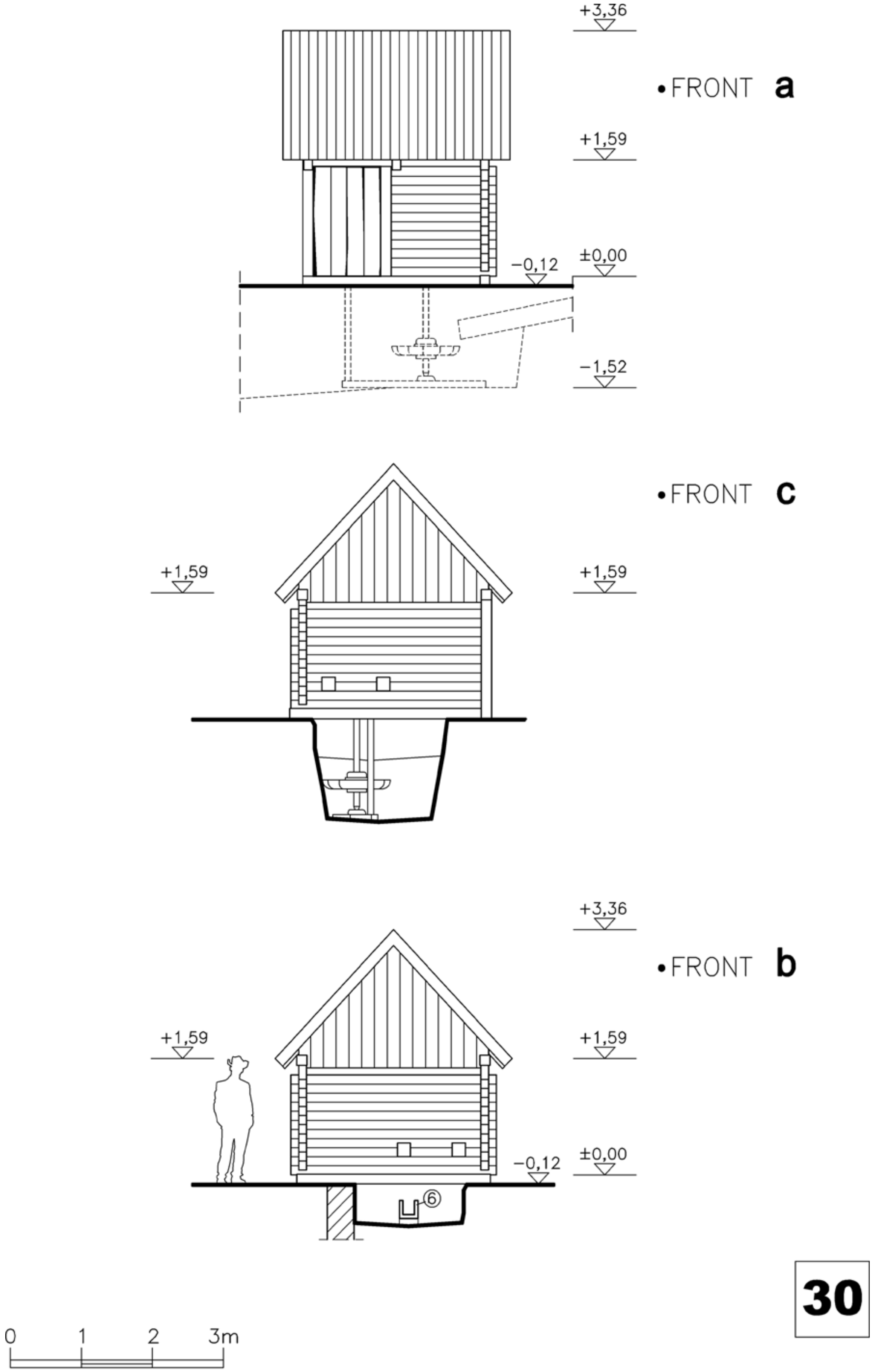


Pl. 59. Lunca Zaicii. ***Vulpeş's Mill***

Fig. 22. Lunca Zaicii. *Vulpeş's Mill*

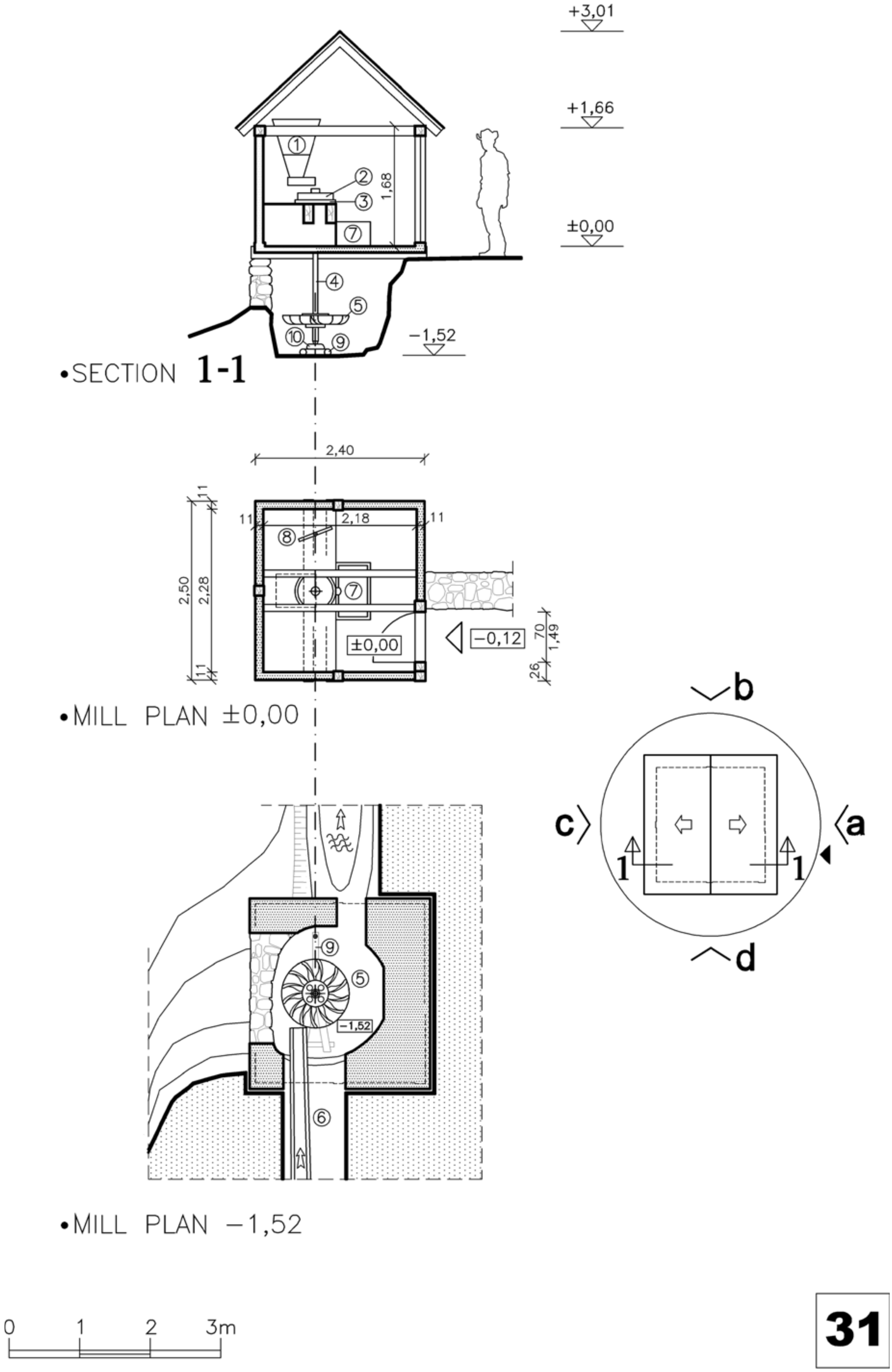


Pl. 60. Bogâltin. ***Bădâni's Mill***

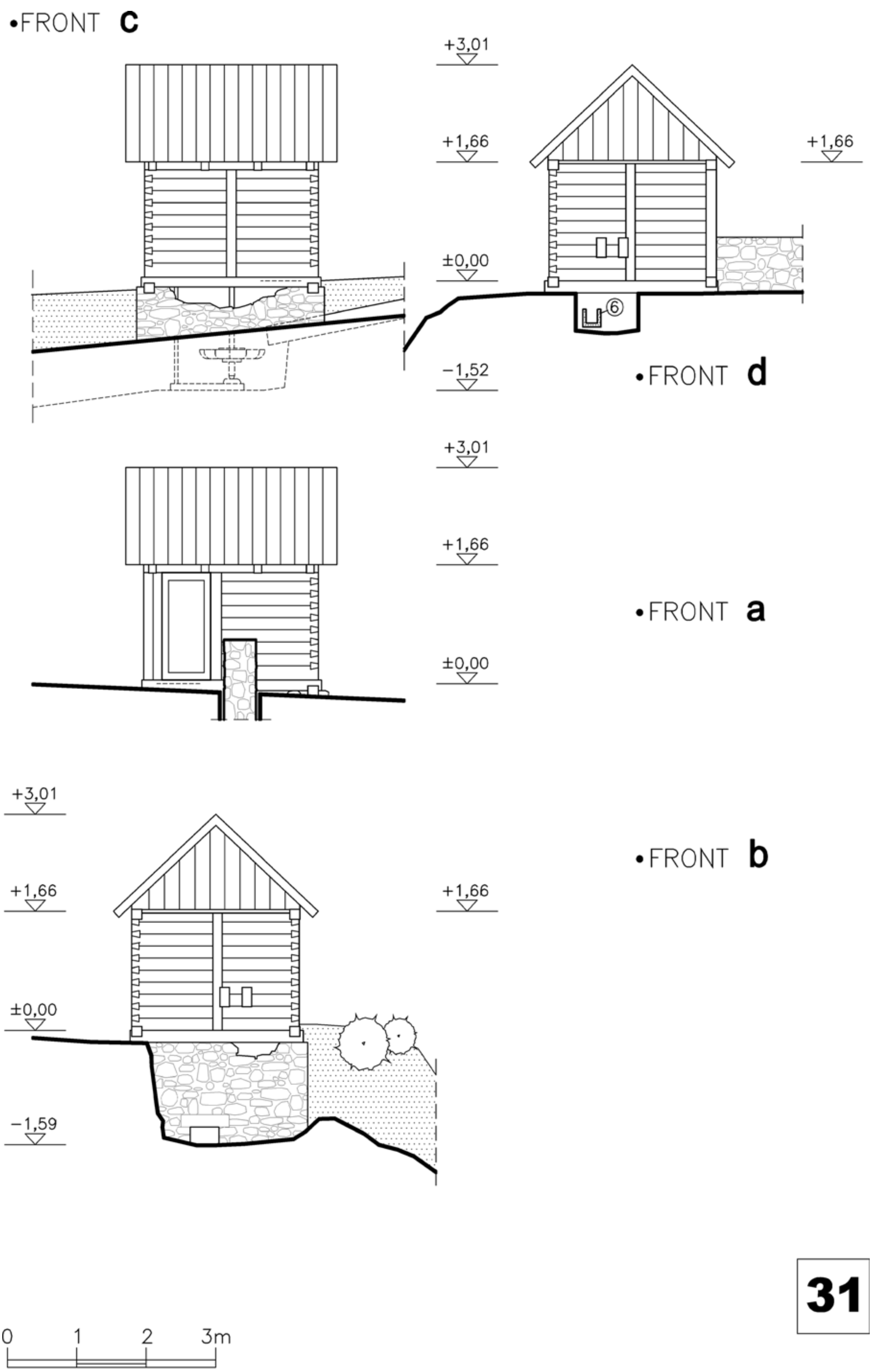


Pl. 61. Bogâltin. ***Bădâni's Mill***

Fig. 23. Bogâltin. ***Bădâni's Mill***



Pl. 62. Bogâltin. ***Milă Pălean's Mill***



Pl. 63. Bogâltin. ***Mild Pălean's Mill***

7.

MILL WITH HORIZONTAL WHEEL

A. MILL WITH HORIZONTAL WHEEL AND VERTICAL AXLE. STRUCTURES. TERMINOLOGY

Mill with horizontal wheel and vertical axle is a hydraulic machine. Mill structure has two major components: hydrotechnical installation and mechanical grinding installation. Water whose energy sets in motion the mill has an inlet system and admission system which make from mill a hydraulic machine. The terminology of the mill structures equally concerned historians, ethnologists, engineers, all preoccupied with the origin of this hydraulic machinery, its diffusion centers in European and Romanian space and who looked for arguments in the mill's linguistics, for promoting ideas they supported. Beginnings of investigation concerns on terminology and structure come from geographers. Marius Bizerea categorized this class of watermill as a mill with turbine[142]. His approach in 1947 aimed the entire Romanian space. The mill itself has a personalized name in each settlement after its position in the village, mill from hill, from valley, from pits, for example, after the owner's name, as we meet at Cornereva, after the group of families who built it, after the wheel rotation sense, at Rudăria we meet names as Îndărătnica [The Obstinate][143]. Horizontal type of wheel with specific appellation in different parts of the Romanian space caused the name of the horizontal-wheeled mill. It is not unimportant for watermill history that horizontal-wheel mill in the Banat, at Topleţ, for instance, but also in Mehedinţi is still called grinder. Typological similarity with the ancient hand grinder remains striking. It is called *moara cu ciutură* [horizontal-wheeled watermill with bucket], in the Banat, Oltenia and Haţeg[144]. The name of *moara cu făcău* [mill with spoon] – probably from the Hungarian: *fakanál* = wooden spoon, or "the spindle on which the millstone rotates" afterwards, and later "the spindle together with the millstone", *apud* Ioniţă, 2004, p. 24-25 – can be found in the sub-Carpathian areas, in Buzău, Prahova, Muscel[145]. *Moară cu titirez* [mill with (spinning) top] is a name known in Vrancea and Mehedinţi[146].

The wheel with axle engine and the inlet trough represent the hydraulic engine essential elements. These structural elements of mill are recorded in the Banat horizontal-wheeled mill investigations[147], and in the neighboring areas of Mehedinţi[148], Gorj[149] and Haţeg[150]. The wheel has a wooden hub with embedded hollow wood blades. The term *ciutura* for the wheel with blades in a shape of spoons or buckets is the consecrated name in the area of Mehedinţi, in the Bahna Basin, for example, in Gorj area and in the Banat.

Historiography consecrated the term "ciutura" for the horizontal-wheeled mill with spoons. Our recent findings come to confirm former, neglected observations on the name "ciutura" [bucket] for the wooden ring set at the sluice box mouth.

Etymology of the term *ciutura,* its translation and meanings mutation still mark the opinions of the involved ones in this discus-

[142] Bizerea, 1947, p. 2.

[143] Lupşiasca, 1995, p.267.

[144] Bizerea, 1947, p. 2; Lupşiasca, 1995, p. 269.

[145] Ibidem, p.2.

[146] Ibidem, p.2.

[147] Toşa, 1984, p. 6; Novacovici, 1923, p.22.

[148] Budiş, 1986, p. 219.

[149] Cărăbiş, 2002, p. 36-37; Cărăbiş, 1968, p.235.

[150] Lupşiasca, 1995, p. 270-273.

sion[151]. I think we ought to mention the opinion that we have met at Sicheviţa concerning the term *ciutura*, otherwise less in use today in the villages with mills: "the barrel [*recte* the sluice box] has in mouth a *ciutură* in which the little bucket/ little pail (local name: *găleţeaua*) [*recte* the shut/control gate] is introduced ". Dinuţă, in his field researches from the Danube Clisura recorded a similar finding: "at the lower end, in the barrel mouth is *a ring of wood*, 20 cm wide, called *ciutură* by the natives, and a wooden holed plug is inserted in – *găleţică* [*recte* the shut/control gate] – through which the water stream ... "[152]. O note on the Măidan mill, a village at the Anina Mountain feet, belonging to the local institutor (1895) is extremely relevant in our opinion when speaking about *ciutura*: "from the pond the water is conducted through the sluice box (a great trunk of 4 – 6m long) the (low) end of which a [*ciutura*] enters with a tube inside, and they are obliquely put there so that the water strike forcedly the wheel spoons."

The blades around the hub of the wheel, namely the buckets, have different names in the Banat: *wings, ladles, spoons*[153].

Vertical axis of the wheel that transmits motion to the grinding machinery is called spindle [*fus*]. Vertical shaft engine has at the lower end a peak of metal, called spindle heel [*călcâniul fusului*] and in the upper part of the spindle a metal rod called *stăniu* is introduced. This one is set in the driver [*părpăriţă*], on an iron slide underside the runner stone[154]. The spindle heel rotates in a middle hollowed rock called *frog*. The entire hydrotechnic facility with spindle, wheel and frog is placed on a beam, or a tree trunk in a shape of fork. This beam which is continuously in water is called crotch [local name: *cobilă*] at Măidan and Teregova, or mill sole [local name: *tălpoanea morii*][155]. We encounter a similar terminology in the neighboring area of Oltenia[156].

Mechanical grinding plant has its two stone bordered by the stone case [*ocoli* ≈ detours], usually of wood, the grain case or basket, a small box in which grain flow called *postăviţă* [shoe/driver], placed under the basket, a piece of wood, which through the vibrations with the shoe throws grain between stones, called *ciocat* [beak], *titirez* [spinning top], or with a dialectal form *chichirezi*, and the wooden perches supporting the basket called *hands*[157].

Supply system has a water outlet called pond and the head race called *ierugă*[158]. Storage pool created on the head race with walls clad in boards is called *ships*[159] at Răcăşdia, due to its shape. This primitive system with poles and boards can still be found in Almaj Depression, at Prigor and on the Belareca River. Admission is made on an open trough called *vălău* or *jgheab*[160]. Water conveying in a closed system is made through a wood or metal sluice box called *butoni* [barrel].[161]

It should be noted the use of archaisms specific to the Banat dialect that gave the names of the mill with horizontal wheel structural parts. There were perpetuated here archaic forms, as: *călcâni* (standard Romanian: *călcâi*), *cuni* (standard Romanian: *cui*), *tălpoane* (standard Romanian: *talpă*), *butoni* (standard Romanian: *butoi*) which were taken as distorted words in many ethnological approaches, causing corrupt meanings of those ancient terms. We invoke in this respect the defining intake element for water mill from the Banat, called *butoni*.

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[151] DEX, 1998, S. V. *Ciutură* = wooden hollow or made from staves bucket or pail, to lade water; Lupşiasca, 1995, p. 269-270. Up to Ioniţă, 2004, p. 202-203, there are many other meanings of the word, as: head, skull, and so on; *ciutura* [it. cytola = fulling mill or grinder used in a fulling mill]; "the Romanian shepherds, as moving their flocks, had got the word abroad all over the neighboring countries and peoples (Bulgarian, Serbian, Hungarian, Ukrainian, and even Libyan, Slovenian and Turkish ones); *ciutura* also means gourd in Transylvania and the Banat; and a part of a mill too; there are *mori cu ciutura* [mill with ...] where *ciutura* is the ladle or the bucket of the mill."

[152] Dinuţă, 1971, p. 69.

[153] Bizerea, 1947, p. 3; Lupşiasca, 1995, p. 277.

[154] Toşa, 1984, p.10; Ţăranu, 1977, p. 66.

[155] Toşa, 1984, p.10; Lupşiasca, 1995, p. 277.

[156] Cărăbiş, 1968, p. 236.

[157] Toşa, 1984, p. 10; Novacovici, 1923, p. 23; Budiş, 1968, p. 221-224; Cărăbiş, 1968, p. 238.

[158] Novacoviciu, 1923, p. 92; Bizerea, 1947, p. 2.

[159] Novacoviciu, 1923, p. 22.

[160] Bizerea, 1947, p. 2;

[161] Lupşiasca, 1995, p. 280; Ţăranu, 1977, p.67.

Originally it was made of a long wood hollow in the middle, which was replaced with a metal pipe or tube of concrete. Herbert Hoffmann's study devoted to the mill intake "A device to improve the mill intake the "<button>" introduces into scientific circulation, since 1968, a serious inconsistency in terminology of mill with horizontal wheel. The semantic confusion between *butoni* (the mill inlet device) and *button* (a knob, a small device to be pressed, e.g. to start machinery working, or an electric bell – *English Larousse Dictionnary, 1968*) perpetuated later in catalogs or scientific studies[162]. Collection and perpetuation of some wrong terminologies of rural industries as well as in the case of some complete toponyms take us away from understanding etymologies. Terminology of water mill from the Banat shows on the one hand the specific province language and the Banat dialect, and on the other hand, reflects the influences coming from the Slavic world, natural in a border area and of neighborhoods as the Banat is positioned.

B. MATERIALS AND CONSTRUCTION TECHNIQUES

Wood continued to be used also when the mill architecture adopted less perishable materials and mills with horizontal wheel were built from brick and stone. Discussion on the mill building materials targets, in our approach, only those constructions in operation, or in a state of ruin, as historical research has not yet signed into its preoccupation the identification and archeological investigation of medieval mills. Written documents of the medieval and modern age didn't preserve notes in this regard.

The wood has remained the main building material that has retained a special status all over the time. Easy accesses to this resource in the mountain area of the Banat, its lightly processing without recourses to specialized craftsmen are only two of the reasons that explain the perpetuation of its use for a very long time. The earliest preserved wooden buildings, some of them preserving even inscriptions belong to the mid-nineteenth century.

The Mill from hole from Ilidia, a wooden monument sitting on a foundation with a wall vault, bears inscriptions from that time on the door. The statistical argument invoking shows the absolute weight of timber in the architecture of the Banat mills. Thus, from about 100 preserved mills with horizontal wheel, only a quarter are buildings from wall, the overwhelming majority belonging to wood architecture. In fact, also at the wall constructions, the wood continues to be used for framing, at the grinding plant and, sometimes, at the floors and hydro technical installation.

Call to local resources of materials, to local craftsmen and experiences in the housing construction techniques are obvious, and the historical discourse on the subject emphasized the specific of the Banat province in the wood architecture area. Wood architecture in civil ad ecclesiastical buildings entirely covered the Banat space since the Middle Age twilight until recent years. Census of the eighteenth century, we invoke here the one from 1757 for instance, from Caransebeş Diocese, and later statistics in the second half of the nineteenth century, provide a comprehensive picture of a rural world absolutely dominated by wooden constructions of houses and churches[163]. Local resources led to choosing wood essences for construction of different segments of the overall of a mill, being obviously preferred the strong essences and durable against moisture like oak, evergreen oak and acacia, and some softer for interior construction of the grinding plant and mill roof. Transfer of rural civil architecture experience in the field was clearly in this case too[164]. The wooden mill was placed on large wooden logs, summarily processed, sometimes neatly, into four faces, to constitute the sole of construction. Woods were joined at ends in cuts with rectangular or semicircular cross sections, technique usually known

[162] Hoffmann, 1968, p. 275-276, *Civilizație românească*, 1995, p. 112; Bucur, 1981, p. 212.

[163] Suciu, Constantinescu, 1980, I, p. 274-284; Țeicu, 2007, p. 43; Săcară, 1987, p. 50-51.

[164] Săcară, 1987, p. 51.

under the name of *cheotori* [joinders]. The solid wood, usually hardwood, with sections of up to 0.40 / 0.40 m is called in the Banat area with a Slavic term “bulvan”[165] [log]. The walls of horizontal beams crowns stood over the mill sole closed at the corners with the same joinders system. Local name we met at Cornereva and also at Sicheviţa, in the Danube Clisura, for this connecting system is “în ţopi”. That joining system was preferred for small buildings, of no more than 4/5 m. For the mill access door, always fixed in one of the corners, the mill manufacturers resorted to two vertical pillars mounted in the sole and the ceiling large beam, the “rope” [dialectal name: *coardă*]. The side walls of the mill were tied to the two pillars through the *nut şi feder* [tongue-and-groove joint] system. The two pillars had grooves in the middle, in which the prominent notches made in the walls beams joined exactly. Instead of beams, the later constructions adopted board from 0.30 to 0.40 m wide, joined with the same technique. Traditional beams arranged in crowns were briefly cut on two sides, and sometimes four sides. Only Valley Mill from Putna kept round log walls in section. The round beam cut for joining from Putna, made by axe, has a semicircular section (Fig. 74; 95; 130).

Recent constructions of mills, dating from the last half century, have replaced the board beam with mechanically cut boards. Use of boards, in fact of a wide and thick board, led to the use of walls joining in vertical pillars, mounted in the sole and the ceiling large beam. The system cited previously is also called “în căţei”. Larger buildings, with walls of 6-8 m long, as we meet at the mills on the Cameniţa stream, from Sicheviţa, to those of Gârnic and the one from Bogodinţ, on the Nera, used that method since the nineteenth century. This connecting system of beam protruding part into the groove made along the vertical pillars, known as the tongued-and-grooved joint, has a more common name: *nut şi feder* (from the German *Nut-Feder-Verbindung*) in the territory of the Banat, and a long tradition within the wood civil architecture [166].

[165] Săcară, 1987, p. 55; Popescu, 1990, p. 27.

[166] Vuia, 1975, p. 412; Marcu, 1992, p. 112; Godea, 1996, p. 52.

Wood was used for mills framework, which has most often a simple form, only from rafters and slats. The stone mill had a system of beams resting on the walls, on which the framework was sit. Usually, the rafters were made from round wood, called *horns* in the territory of the Banat, and were put directly on a string or crown, as the top beam of the horizontal beams crown is called there[167].

The grinding installation was made only from wood. Solid wood trunks, processed as a parallelepiped, formed the grinding plant bed, sometimes sitting on two massive beams inside the mill. The grain bin and the stone cave were usually made from lighter materials the craftsmen had at their disposal. Hydrotechnical facility, with the sluice box, wheel, its axle and the bridge tree were made of water resistant hardwood.

Stone

The use of stone in building a mill gives it durability over time and visibility within the geographical landscape where it was built. Appeal to this building material is directly dependent on the local resources, on the one hand, and on the local traditions in the matter of brick architecture. The absence of a tradition of brick architecture, which spreads from urban centers to rural world, leaves local resources unused.

Hydrotechnical installation, with wheel and its vertical axis, was usually located in an underground space, a dug in the sloped ground hole. River rock walls, without binders lined like a fountain, the walls of the underground space. Bed of rivers and streams was, therefore, the most important quarry for the use of stone in mills building. Stone wall without binder had a long tradition, being raised to delimit properties, yards and gardens. Such dry walls can be seen now at Globurău, for example, near the two mills, to delimit the gardens and the households. We met during our preventive archeology research in the Cerna Mountains, at Cornereva, dry walls without binders sheepfolds built at 1000 m altitude. That technique of walls without glue, from rolled

[167] Săcară, 1987, p. 59; Popescu, 1990, p. 28.

stone, was used in all wood and brick mills for underground room arrangement. The carved stone quarry, was used in the construction of mills from Ilidia, Feneş, Gârlişte, Şopotu Vechi, Moceriş and Bozovici. Local limestone resources and tradition of a brick architecture imposed since the mid 19th century also spread to the construction of brick mills with horizontal wheel. Limestone and travertine limestone quarries, or *soft stone* as it was called in the area of Ilidia, played a decisive role in rural brick architecture flowering, at Ilidia, Ciclova Română, Socolari, villages located on the foothills of Anina Mountains. Lime kilns that exploited local limestone resources from Ilidia, area of the Valea Mare, stimulated brick architecture in this area of the Banat villages beginning with the second half of the nineteenth century.

Brick and tile

Brick production in the early Middle Age, the 12th century is documented by few and sporadic discoveries, at Ilidia, for example; beginning with the 13th – 14th centuries it will be used in military and civil constructions. The brick utilization for rural houses in the Banat developed just at the beginning of the 19th century. Mills with brick walls, from Topleţ, *Haşcă's Mill* from Moceriş, these from Bârz and Feneş are late buildings from the late nineteenth century and early twentieth century. Roof tiles for roof gets late, in early twentieth century in the rural architecture[168].

C. ARCHITECTURE OF MILL WITH HORIZONTAL WHEEL FROM THE BANAT

Preserved monuments have unitary structures, despite of a planimetric variety and of the building materials. Wood mill has a simple, archaic architecture, resumed with the same pattern until recent times. The mills usually have a rectangular plan, limited to a space of strictly utility; an elongated rectangular plan is rarely adopted, so that a beam or a floor for bags with grist and an open fireplace have their own place. Wood mills from the Belareca basin have a square plan of 2.60 m / 2.70 m and 2.40 / 2.50 m at Bogãltin, 2.70 m / 2.80 m at the mill from Globurău and even 2.30 m / 2.10 m at the mill from Pogara de Sus. Those ones from Topleț had a quadrangular structure of 3/3 m, at Chige's Mill. Adoption of a rectangular plan, with expanded space, was the solution adopted at Ilidia, where mills are of 6/4 m, 4.90 / 3.10 m; at Şopotu Nou they measured 4 m/3m and at Şopotu Vechi had 4.79 m / 3.74 m at Ghetera Mill and 4.60 m/3.30m at Pleşoanea Mill. Integration of an additional space in the wood mill architecture, for horses' shelter and feeding during milling, imposed the plan elongation. Mills from Gârnic and those from Clisura, from hamlets around Sichevița adopted such a plan. The mill from Liborajdea had an advanced plan that unitary included the mill of 3.30 / 3.00 m and the barn of 3.00 / 3.00 m[169].

Wooden mill building had at the base a tree trunk sole cut in quadrangular section. The mill sole was located partly on the dry wall which protected the underground room, and partly on the ground. There where the plane land did not allow an underground chamber building, the mill was placed on wooden pillars or on brick cells that actually replace the wooden pillars, as the monuments from Topleţ prove. The sole in this case was placed on pillars with fork or simple pillars that had a notch cut in the end. We meet this settlement system of the mill sole at the mills from Eftimie Murgu, Şopotu Nou and Putna (Pl. 61, 99, 100; Fig. 63; 74; 96).

The mill walls are built in horizontal beams crowns joined at the ends with notches. This system of the walls lifting, so-called *Blockbau* technique, is known during the long history and on vast spaces of the timber regions of Europe[170]. Round log walls were met in a small number of monuments. *Valey Mill* from Putna keeps round beams in the walls structure (Fig.74). The beams were usually processed on four sides. Recent buildings have replaced the beams with mechanically processed board plans, which

[168] Toşa, 1982, p. 91; Petrescu, 1963, p. 165; Stahl, 1963, p. 124.

[169] Popescu, 1990, p. 77.

[170] Petrescu, 1963, p. 155; Vuia, 1975, p. 411-412.

were jointed in the same old "joinders" system. Notches for connecting beams were semi-rounded, straight and rarely in acute angle. This wall joinders system is called in the Banat area "în țopi".

The wood mills with a rectangular planimetry usually are found on the Sichevița Valley, the Gramensca Valley, at Gârnic, and on the Caraş Valley from Răcăşdia and Vrăniuț. Manufacturers adopted for such a planimetry the technique of connecting walls short beams in the tongue-and-groove joint system. The short beams of the walls had cut a prominence called tongue, which joined with the grooves of vertical pillars, embedded in the sole and in the string. Short log walls joined in the vertical upright beams (local name: *căței*) are found in those areas with limited resources or where the raw materials of a good quality was lacking. The walls height is of 1.41 m at Dolina, 1.68 m at Cornereva, 1.72 m at Putna and of 2.40 m at Vrăniuț. Wood mills on the Rudăria river have a height of about 1.50 m. The wooden mill from Ilidia, from the group of the two ones there, has walls of only 1.32 m height. Mills have a simple unicellular volumetry developed on the simple and adapted to a strict utility plan. The two elements involved here, the planimetry and the volumetry of a mill were naturally dependent on practical and economic position of the mill. Few cases of field investigated monuments present deviations from the unicellular space rule by joining of two and rarely three cell nuclei. Mills from Gârnic and the hamlets from Sichevița have a structure with two functional cores, one for the economic activities and the other for animals sheltering. These spaces with two cells were sometimes separated by a wooden wall. This volumetric change was determined by the great distance from the village, and the need for animals housing during long milling time. An exceptional case regarding volumetries is this of Ghitera Mill from Vrăniuț, which has two slots for mill operation and one for the rest of the servant who served the mill.

The roof has in its structure a framework or the strength structure and the roof covering. All the wood construction adopted the rafters framing, which represent a roof system of an ancient tradition and a large diffusion in wooded areas. The pairs of rafters, joined at the top through tongue-and-groove system were directly fixed on the crown and the laths were stuck on this structure to fix the outer layer. The wall constructions at the Ilidia mills, for example, have the roof on fasten rafters in the cross beams of the mill walls.

The gabled roof had rates ranging from 3.40 m, at Eftimie Murgu, Mill Firizoanea, of 3.68 m in Ilidia, The Mill from Hole, and 3.97 m at Prigor. The mill from Vrăniuț had the ridge share of 4.43 m.

The roof of the monuments preserved from the nineteenth and twentieth century reflects the various solutions adopted by the builders, also encountered in fact in the time architecture. Most wooden monuments have adopted the gabled roof. Usually, the tympanum, called *fundoane* in the Banat area, was built with vertical plank attached to the rafters and rope. The framework was made usually of rounded logs, or scantily processed wood.

The square hipped roof is an old traditional solution in wood architecture[171]. The roof of this type was preserved at the wood ruins from Ilidia, at the one from Lunca Florii, Lunca Zaicii, at some of the mills from Eftimie Murgu. We meet at the monuments from Dolina – Andrew's Mill, at The Obstinate from the wall, at Viloanea, Trăiloane, Bătolea, Pătoanea on the water of Rudăria, the solution of a roof in triangular shaped slopes. (Pl. 92, 93).

Roof covering is a sensitive question especially in the case of wood mills with no ceiling. The shingle covering was the solution of an old and long tradition. Monuments from Gârnic, from the Gramensca Valley and most mills from the water of Rudăria have shingle roofs. Usually it was replaced with tile or metal. Sheets of asbestos were used frequently, with approximately three or four decades ago, as an economical solution for mills coverings. The same solu-

[171] Antonescu, 1992, p. 90-92; Vuia, 1938, p.80; Stahl, 1963, p. 133; Toşa, 1982, p. 82-85.

tions for roofs and covers are used also at the mill with stone or brick walls.

Mills built partly of wall and partly of wood, a common solution since medieval ecclesiastical architecture, can still be seen at Ilidia and Gârnic. The Mill from Pit from Ilidia has a high foundation made of shaped stone, covered with a semi-cylindrical vault, upon which sat the wooden mill building. Mills from Gârnic, from the Gramensca Valley are placed in a karst area. The soft stone, as travertine is called in local dialect of the Banat, was easily exploited and processed to raise the walls of the room for horses housing, in the back of wooden mill building. To separate the rooms of the mill there were usually beams scantily processed, mounted directly on the mills sole.

Stone architecture in the rural world of the Banat changes the appearance of settlements starting from the mid 19th century. There were previous experiences in rural environment. Since the end of the 18th century and the beginning of the next one, they built there stone and brick ecclesiastical monuments, schools and secular and military government buildings. The second half of the nineteenth century was the period of a wide diffusion of the wall architecture, especially in the mountain area with stone and binder resources and where the impulse came from urban and industrial centers, formed by the Austrian government in Oravița, Anina, Caransebeş, Băile Herculane[172].

We meet stone or brick mill at Feneş, Şopotu Vechi, Bârz, Moceriş, Lăpuşnic, at Borlovenii Vechi, Gârlişte and Ilidia, the last one still preserving four of the ten stone mills that had been built there. If we follow the layout of the invoked above wall mill zones on the map, we find on one hand that they are in a much smaller number compared to the ones built of wood, and on the other hand, that they are found in villages systematized at the beginning of twentieth century, where a tradition of wall architecture existed. There was a transfer of influence from rural house architecture, during the nineteenth century, to the mills architecture. Statistics of craftsmen from the rural world of the Banat in the second half of the 20th century reveals an impressive number of bricklayers. Village Măidan near Oravița had at the early twentieth century a number of 200 masons and stone carvers[173]. The German architectural tradition of the wall, brought by settlers in the Banat, was reflected on the structure of the Romanian households and rural architecture of the Banat village. Stone craftsmen brought by the Austrian government in the mid nineteenth century for things of public utility, citing here only Anina-Oravița-Baziaş railway construction, with an impressive number of bridges, tunnels and viaducts, had created a tradition in the rural Romanian world.

Ilidia, a Romanian village near Oravița, placed as Socolari, Ciclova, Măidan between low hills with heights not exceeding 200-300 m, illustrate the rural wall architecture as it developed during the second half of the nineteenth century, where mills found a natural integration in the structure of a systematized village. Wall houses from Ilidia have a high ground built over a cellar covered with a vault of limestone. Some of them keep inscriptions on stone or on wall dating from 1856 or 1922 for example, so marking the evolution of architecture of this village. High ground stone houses with cellars covered with semicircular arches are also met at Socolari, Gârlişte, Ciclova Română, Topleț, Mehadia and on the Bistra Valley.

Semicylindrical vault of limestone commonly used in hoses building was taken also in the mill with horizontal wheel architecture. The case of the wall mills from Ilidia, often invoked here, seems exemplary from this point of view. The preserved wall mills, Small Mill, Bălani's Mill, the Two Mills are simple unicellular constructions, built over a high semi-cylindrical vault. Mill from Pit, in the south-eastern extremity of Ilidia village, was built of wood over a high foundation wrapped in a stone semi-cylindrical vault. Supply channel, built for four mills from Ilidia, has a length of 1500 m and passes

[172] Țăranu, 1975, p. 103; Săcară, 1987, p. 63; Petrescu, 1963, p. 164-165.

[173] Liuba, Iana, 1895, p. 129.

through ten yards, under houses and barns to the mouth of the Vicinic. The wall houses have arranged arches above the supply channel, and such a fact proves that the channel had been there before the moment the wall households construction were lined up the street. The Ilidia village organization in the second half of the nineteenth century kept the mills and their topography, and integrated all of them within the whole urban settlement. Two of the monuments, the Small Mill and Bălani's Mill were built of stone wall, like the general architecture of Ilidia.

Mills from Fenes, on the Timiş corridor, were built of brick wall over a semi-cylindrical limestone vault. Mills from Şopotu Vechi, Lăpuşnicu Mare and Bozovici have brick wall architecture. The two openings in the underground room, for water entry and refuge from the hydrotechnical installation, are covered with a beam at mills from Almaj. Planimetry of wall constructions was adapted to simple shapes, usually a regular quadrilateral or a rectangle, and only when the mill plan must be integrated into a built set, at Topleţ, at Haşcă's Mill, and for example, we met an irregular plan. Dimensions of planimetry fall at Ilidia in rates of 4.11 m / 2.17 m and 5.75 m / 3.92 m, at the mills from Feneş are 3.50 m / 3.50 m and 4.35 m / 4.25 m, at Plavişeviţa were 4 m / 3 m, at Bârz are 4.36 m / 3.41 m, 4.43 m / 3.29 m. Roof structure, with tile or iron plates covering is usually placed, in the case of such walls constructions on beams.

The porch is a new, unique element, found in the architecture of Topleţ and Eftimie Murgu mills. We meet this open gallery, with a banister, arranged along the long wall of the mill at Jărgea's Mill from Topleţ and at Brusoanea and Micloşoanea Mill from Eftimie Murgu. Porch arranged at the floor level, by the outer extending of floor beams, was set at mills raised on wooden pillars or piles of masonry. Access to the porch located at 1 m above the ground is made on a wooden staircase (Fig.40; Pl. 70). Bruşoanea Mill has in this respect a particular architecture, one of the most beautiful and spectacular monuments of the Banat mills, in my opinion. The gallery is bound through a board walkway to the Bruşoanea Mill pond. A wooden staircase facilitates in the same time the direct access to the porch of the mill (Fig. 41; Pl. 100).

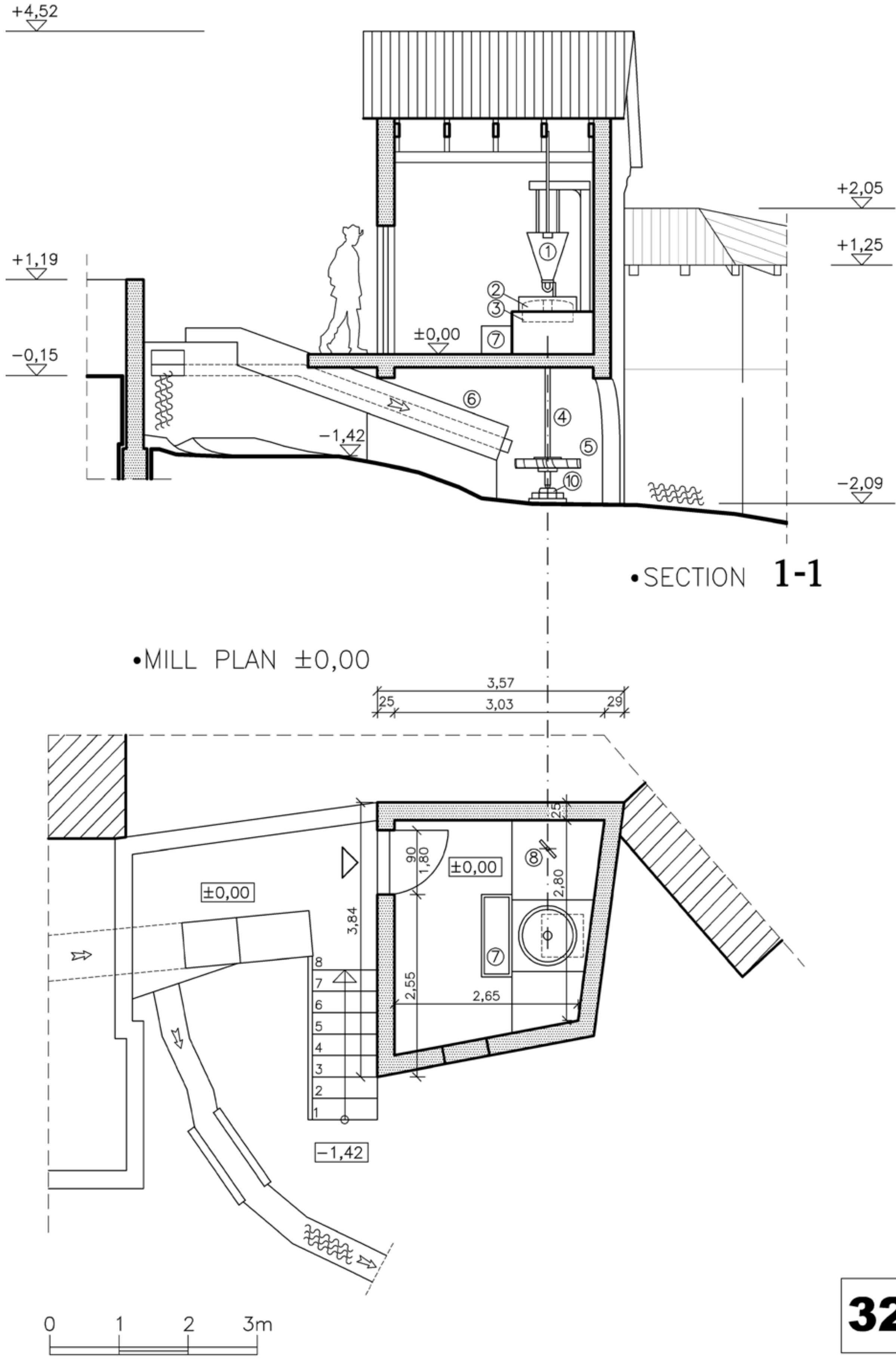
Open porch arranged over the high ground floor of wall houses is called "cindă" up to the Banat dialect, and that means an open vestibule. Wall houses from Ilidia, for example, built in the second half of the nineteenth century have „cinda", this open porch, arranged along the house.

There are several aspects of local traditions to make the wood mills architecture a distinctive one, together with those coming from interferences with neighboring areas of the Banat, the hilly area of Mehedinţi and Gorj, but also the are of Haţeg.

The extremely spectacular architecture of mills on pillars focuses on monuments preserved on the Rudăria Valley, but there can still be seen monuments built on pillars at Putna and Şopotu Nou. Appeal to the pillar construction from Rudăria was made also for the monuments raised in the Rudăria Gorge, in an area where rock dominates the landscape. We believe that the Mill from Tunnel illustrates exemplary this thing. The lower level of the mill, which houses the hydrotechnical plant, was set in a dug in the rock semi oval pit, open to the river bed; in there two parallel rows of wooden pillars were fixed on edges, on which sat the mill base (Fig. 29, Pl. 88). For mills Viloanea and Roşoanea, located on the river bed downstream, was adopted a similar system, part of the bank was terraced and supported the mill, and part of the pushing were taken by pillar beams attached under the mill. Wooden pillars are sometimes associated with dry masonry piles without binder. Mills The Obstinate from the Wall and The Obstinate between the Rivers illustrate these spectacular simple solutions, with local materials, as so they were used by builders of mills on the Rudăria River. Up to me, Micloşoanea Mill and Brusoanea Mill represent the most spectacular and representative monuments for wooden architecture on pillars. Association of a covered porch with an extended eave gives the defining architectural element of these wooden mills.

Architecture of mills on wooden pillars from Şopotu Nou and Putna is restricted to the essential use, with simple arrangements of round or hewn beams. Mills from Gârnic and Sicheviţa, partly supported by wooden pillars, fall into this category. Mills on wooden pillars are also known in Hateg, at Ponoarele and River of Mills, and in Gorj at Arcani and Găleşoaia, for instance.

The dry wall piles without binder or those from mortar wall, from Topleţ make the defining aspect of the wooden architecture of the mills in the Banat. Mill assembly from Topleţ, on the Bigăr, are defined as a distinct group of wooden mill architecture placed on wall piles, within the Banat architecture. Evolution from pillars to wall piles in the case of mills from Topleţ, is marked by relics of pillars, still preserved in some monuments after the wall piles construction. Over-raised porch at the pile level, on which the mill is placed, with access on wooden stairs, gives distinction to this monument from Topleţ (Fig. 26). Appeal to dry wall without binder is much more common in wooden mill architecture from the mountain area of the Banat. The lower level of mill with the hydrotechnical installation is usually underground. The pit above which mill rises had two openings, a smaller one through which water was brought from the pool on a gutter, and a bigger one for the tailrace flowing back in the pool to the mouth of the river. A dry wall without glue covers the underground level of the mill to protect it from water erosion. Water supply channel, especially the refuge, was coated on the edges with stone wall without glue. Typologically, the underground has many forms, circular, oval, semi oval or open, as determined each time by the nature of soil or rock in which the fitting was made. Planning for the underground wall without glue is often raised above the stepping level to provide horizontal platform, on the sloping land where the mills are built. Popeşti's Mill from Cornereva has stone walls without mortar designed for 2.40 m. Muican Mill from Ilidia presents structures of dry wall of 1.90 m, organically overtaken later also for the running channel and the water refuge (Fig. 113). Adam's Mill from Topla has the lower room covered with dry wall, on a height of 1.98 m. Ingenious technical solutions are found at the lower level arrangement of Drimeşti's Mill from Topla. Underground room, arranged as a quadrilateral, is dovetailed by the dry wall, which was raised on two of the sides of the quadrangle, it measuring from the floor level -1.55 m (Fig. 20; Pl. 55). The wall is carefully worked from local processed rock. A long slab of 1.45 m was placed over the mouth of refuge channel; it takes pushing of dry wall raised above it like a lintel (Fig. 20; Pl. 56). The same solution, but with a smaller slab, was used for the parallel mill wall where the state trough which brings water to wheel is settled (Fig. 20; Pl. 56). Milă Pălean's Mill on the water of Ciumerna from Bogâltin calls our attention for how solving the site through dry walls without glue. The monument with a quadrilateral plan (2,50 / 2,40 m) is located on an uneven ground in large slope where leveling problem was solved by fitting a truncated pyramid of stone without binder, above which was located the wooden mill (Fig. 54; Pl. 61). Construction of dry wall, without mortar, measures 1.60 m. The flow of water, entering through the mill gutter, gets out under the wall construction through a very small opening. A slab of local rock, about 0.65 m long, located at the base of the building, above the refuge canal, takes over the pressure of the wall (Fig. 54; Pl. 61). Such a solution as this one of a stone lintel beams from the mill from Băgâltin reflects ingenuity of local craftsmen in solving technical problems raised by the nature of the soil, solution that was required also in the up invoked case of the mill from Topla. Mortarless stone wall bounding the garden near the mill on the Ciumerna and the monument itself create the image of a rural architecture where stone, wood and water are harmoniously integrated. Mills from Prisăcina Gorge, located on large bumps have a similar architecture, where dry walls, without mortar, masonry piles mounted in the same way solved the questions raised in front of the rural builders.



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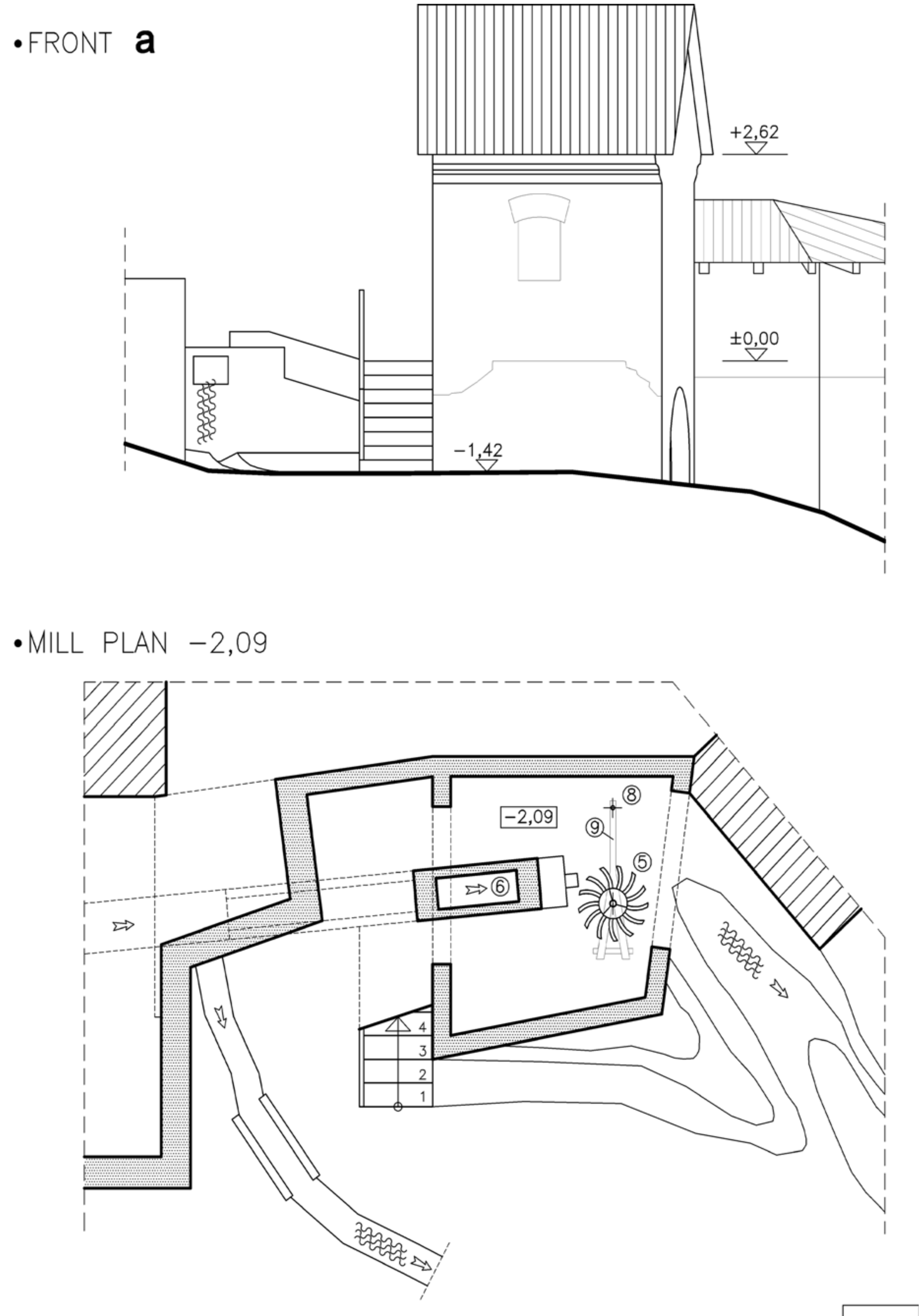
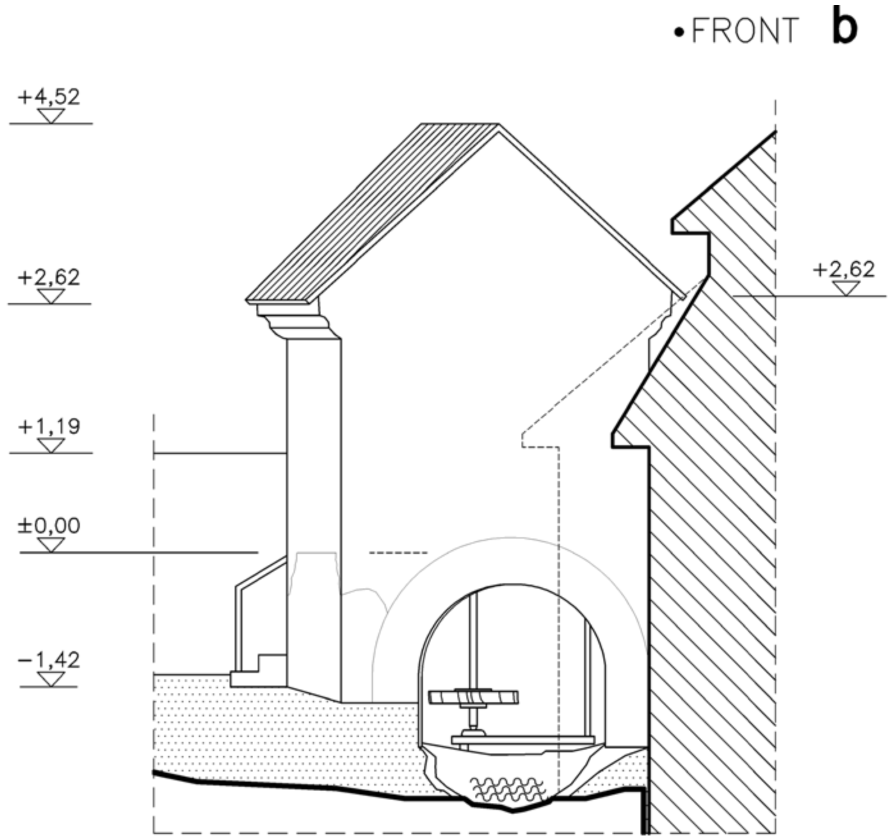
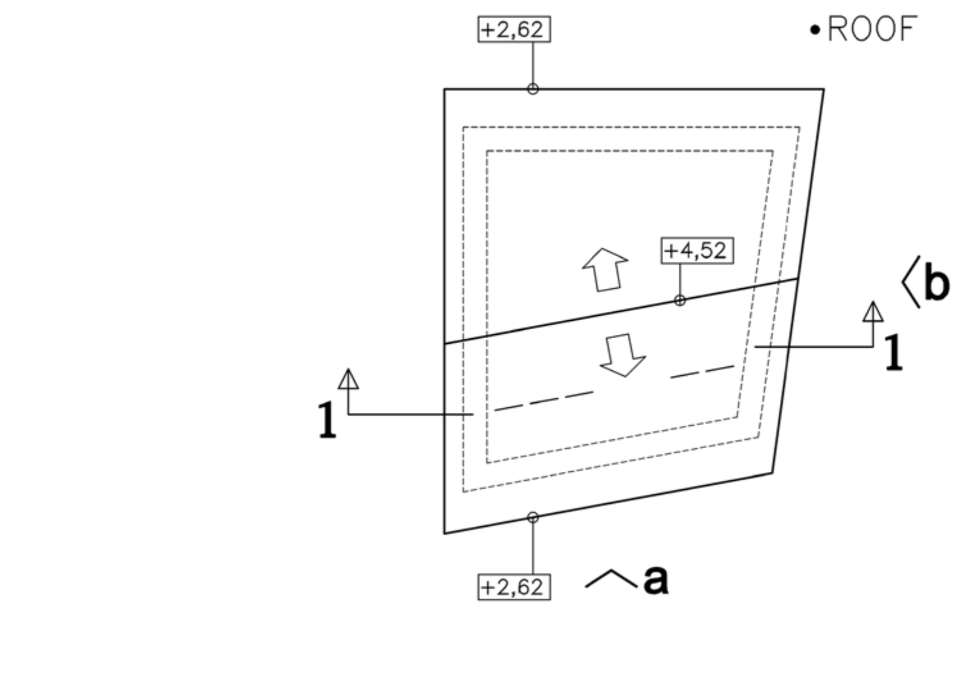
Pl. 64. Topleț. ***Haşcă's Mill***



Pl. 65. Topleț. ***Haşcă's Mill***





Pl. 66. Topleţ. ***Haşcă's Mill***

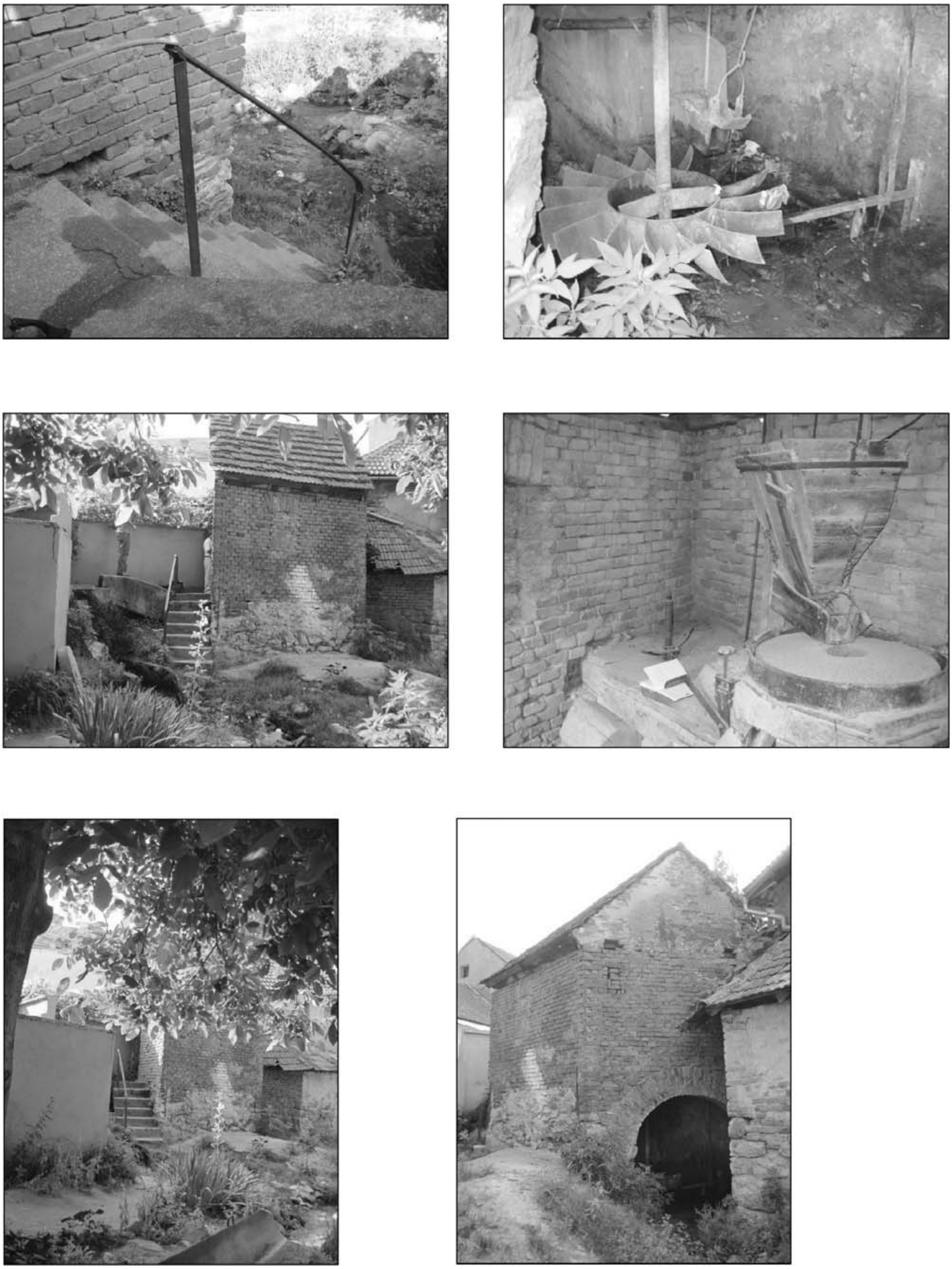
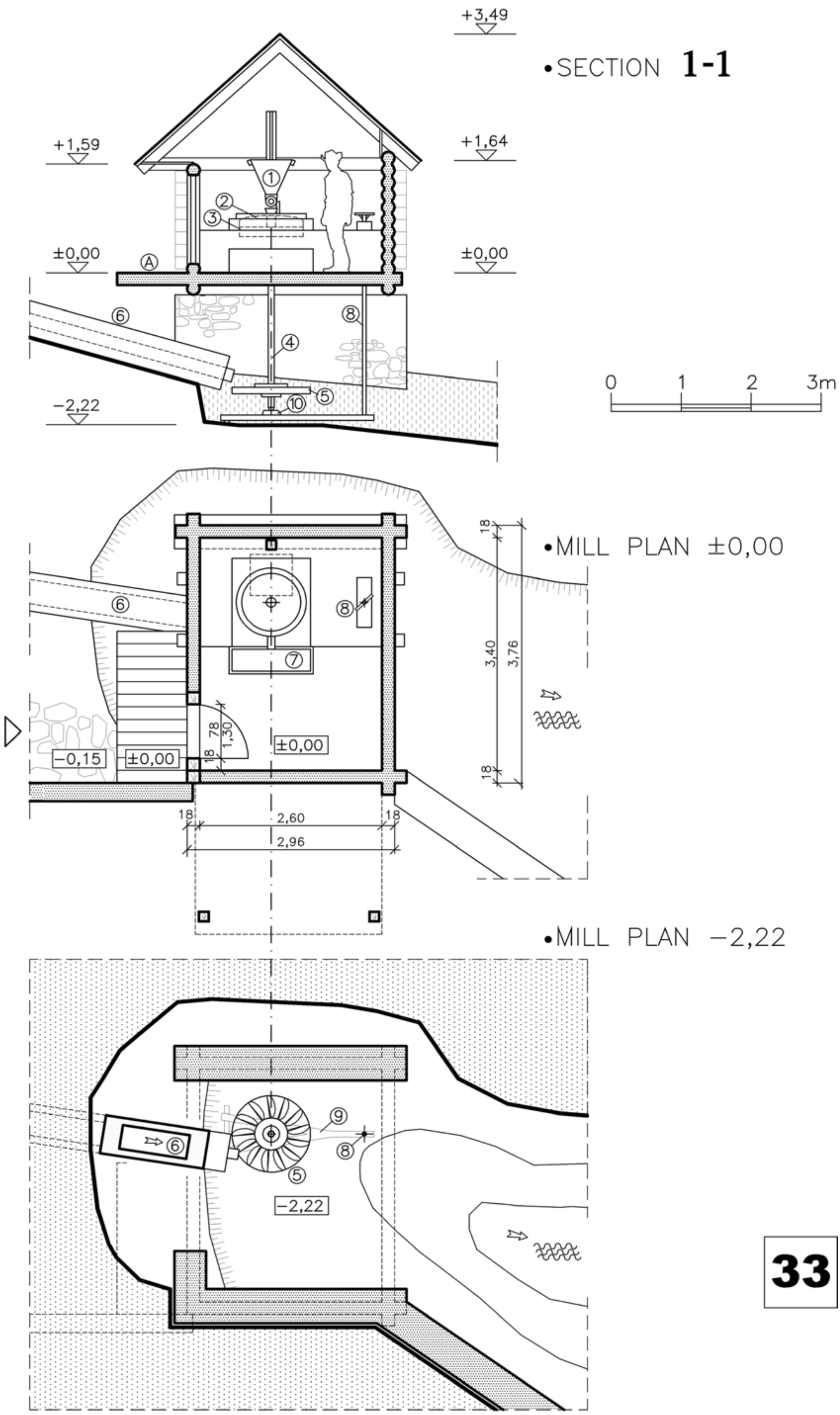
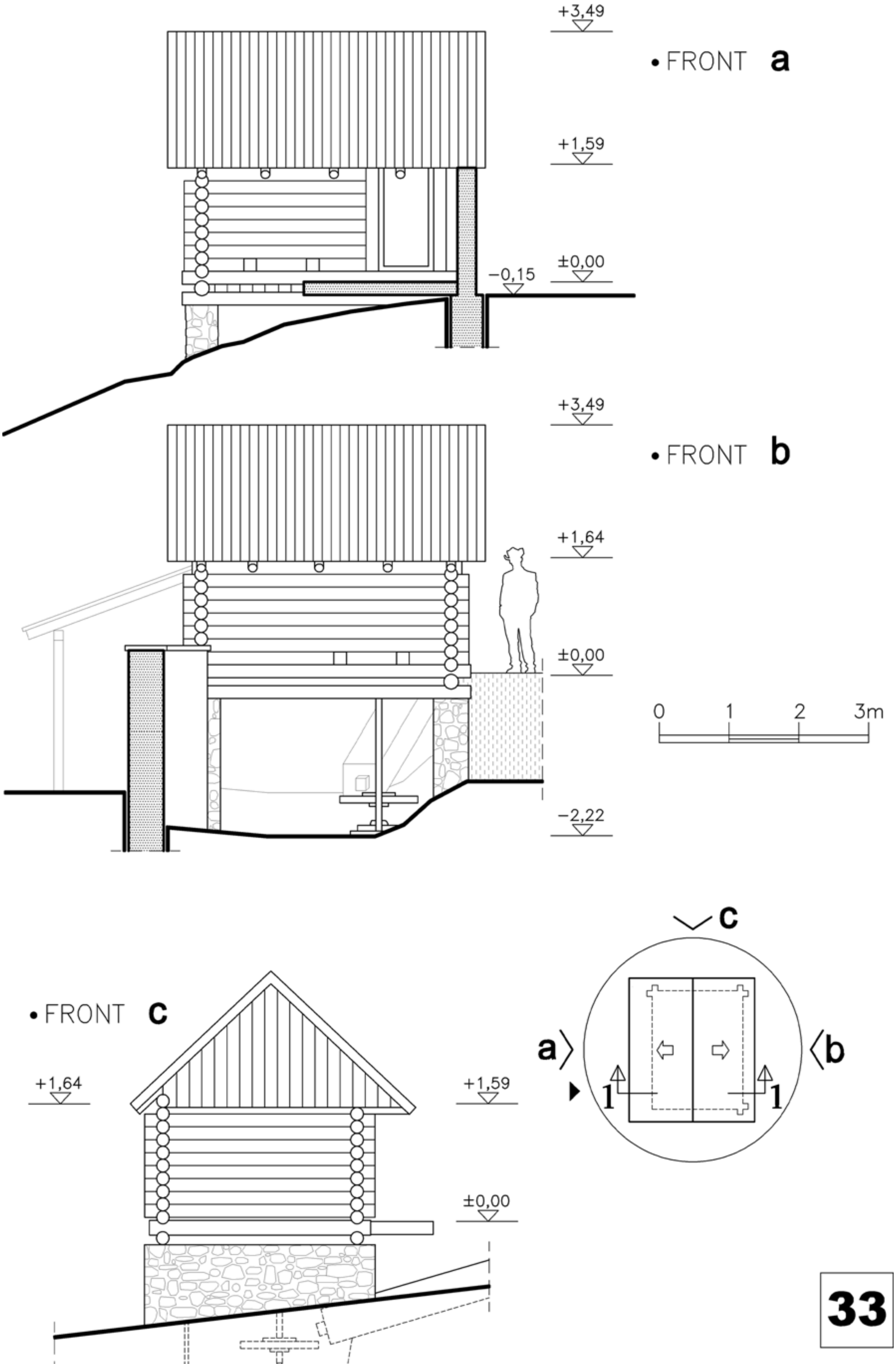


Fig. 24. Topleţ. *Haşcă's Mill*



Pl. 67. Topleț. *Şandru's Mill*



Pl. 68. Topleţ. *Şandru's Mill*

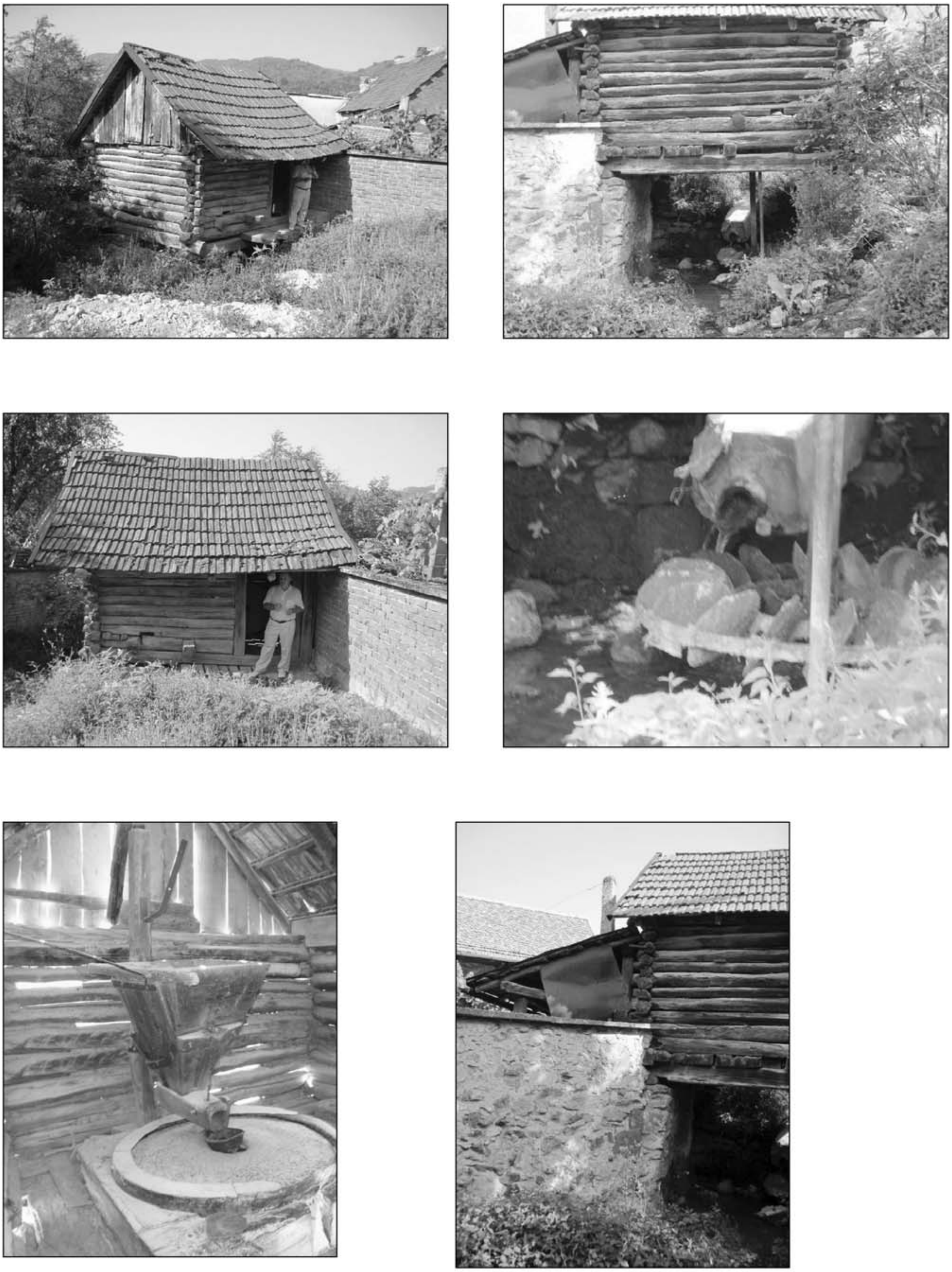
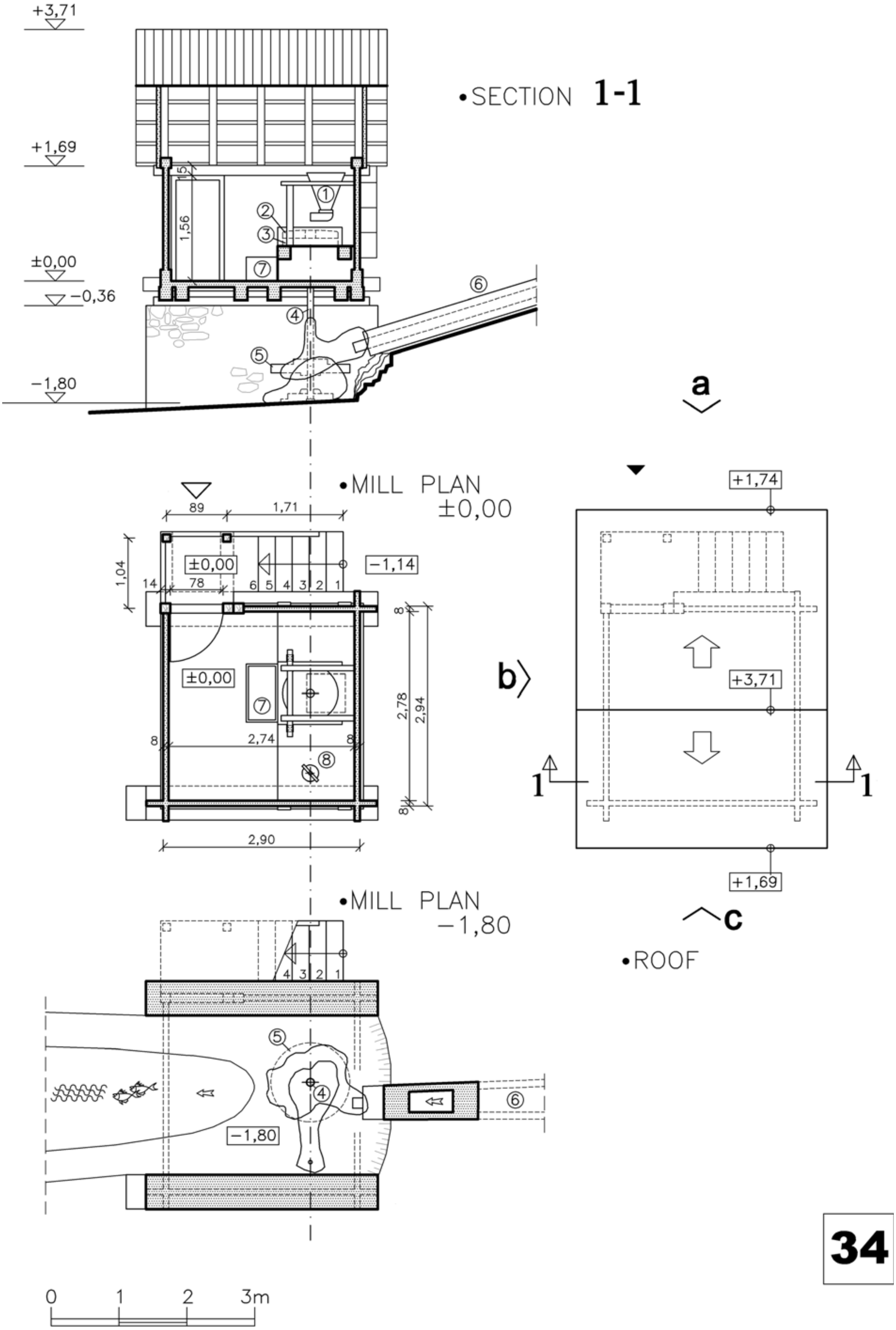
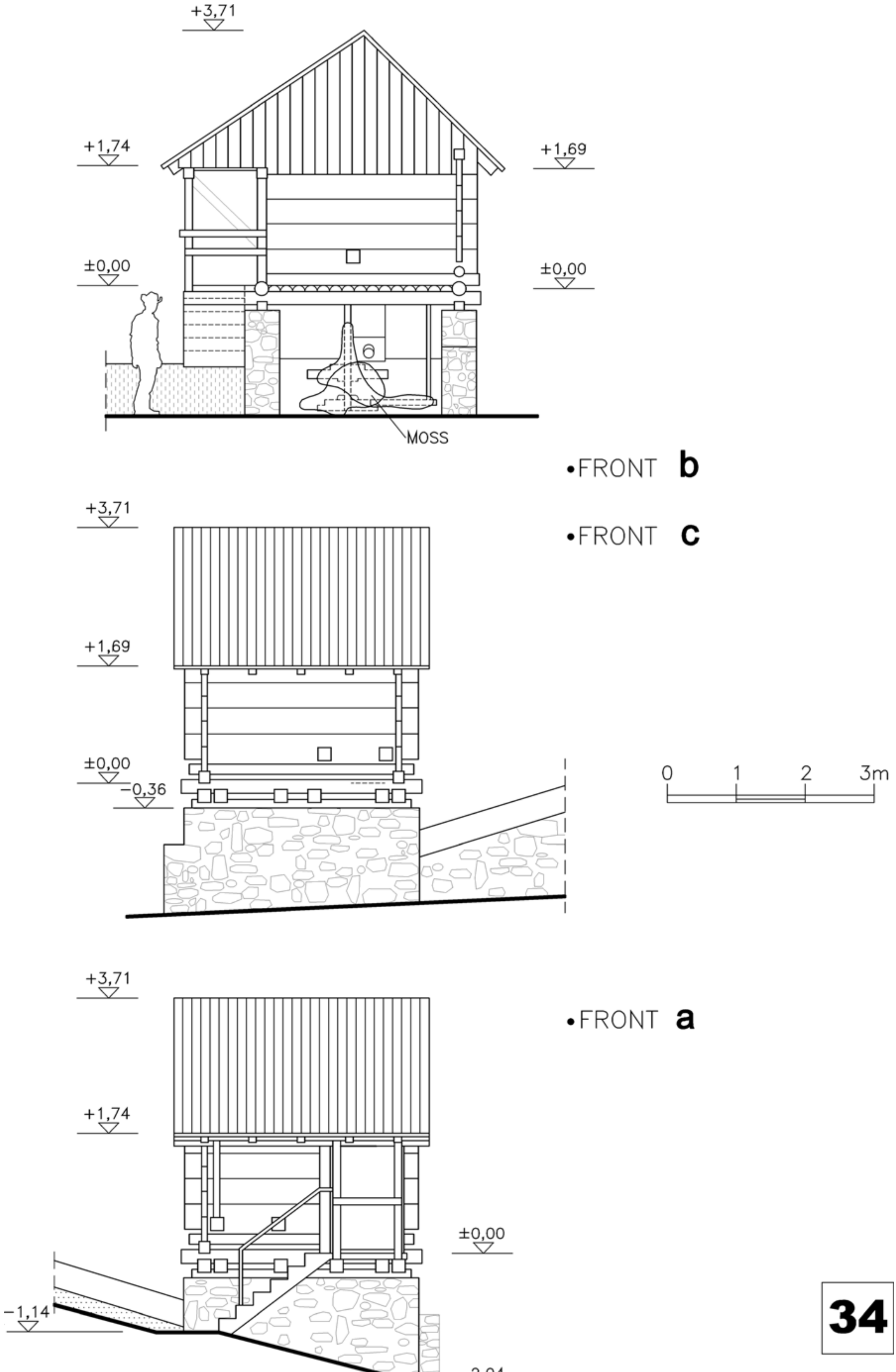


Fig. 25. Topleț. ***Şăndreşti's Mill***



Pl. 69. Topleţ. ***Jărgea's Mill***



Pl. 70. Topleţ. *Jărgea's Mill*

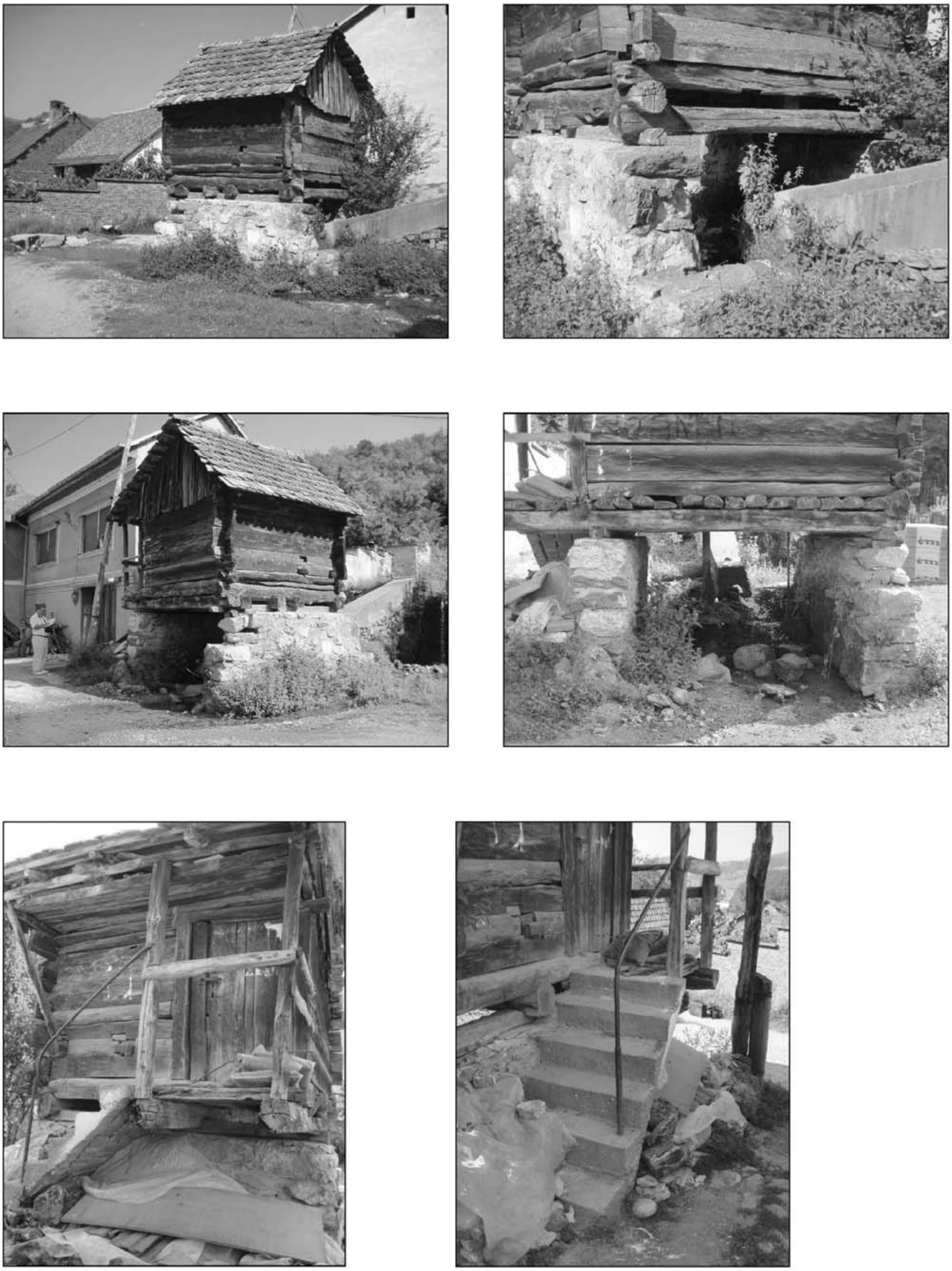
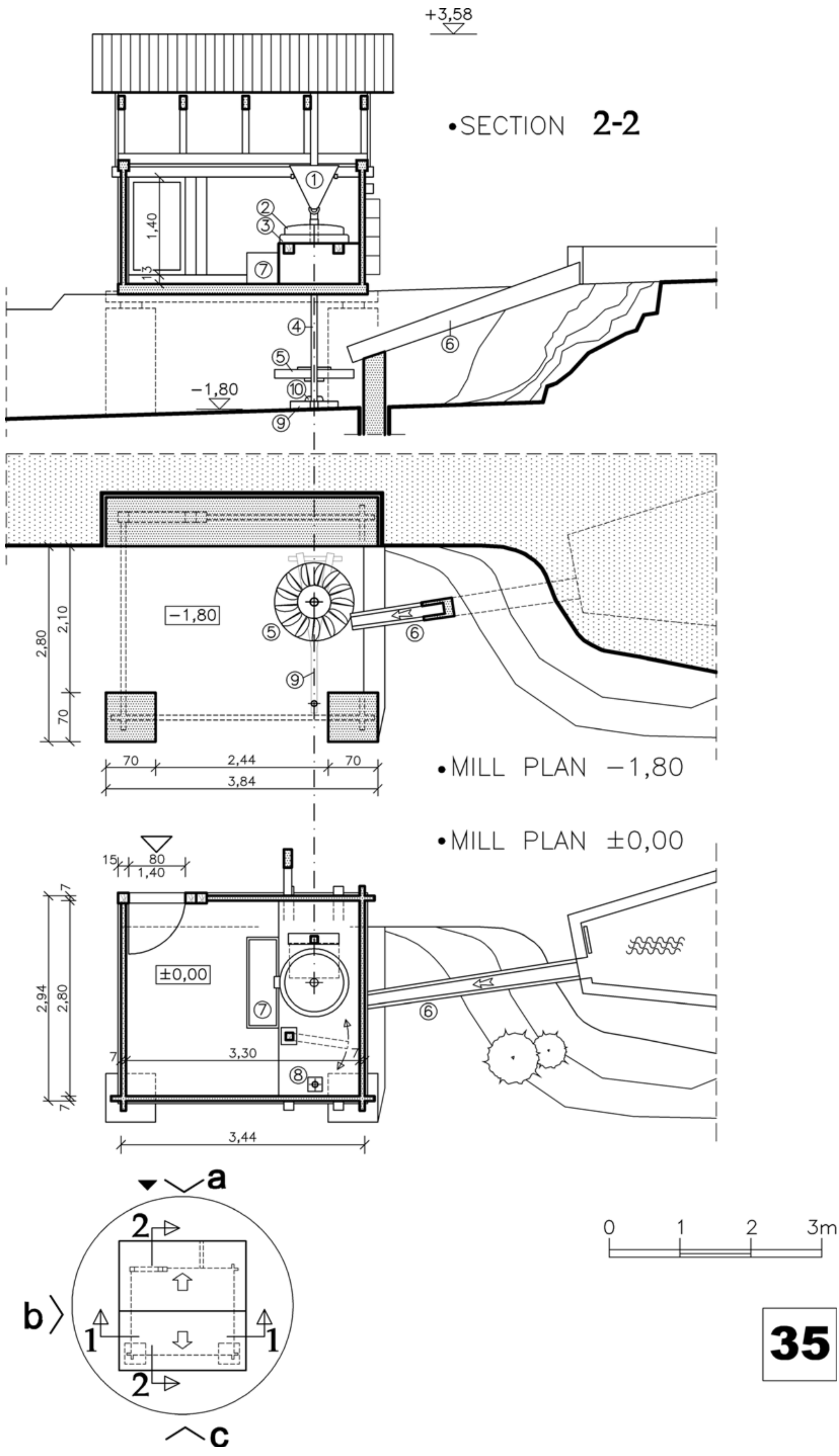
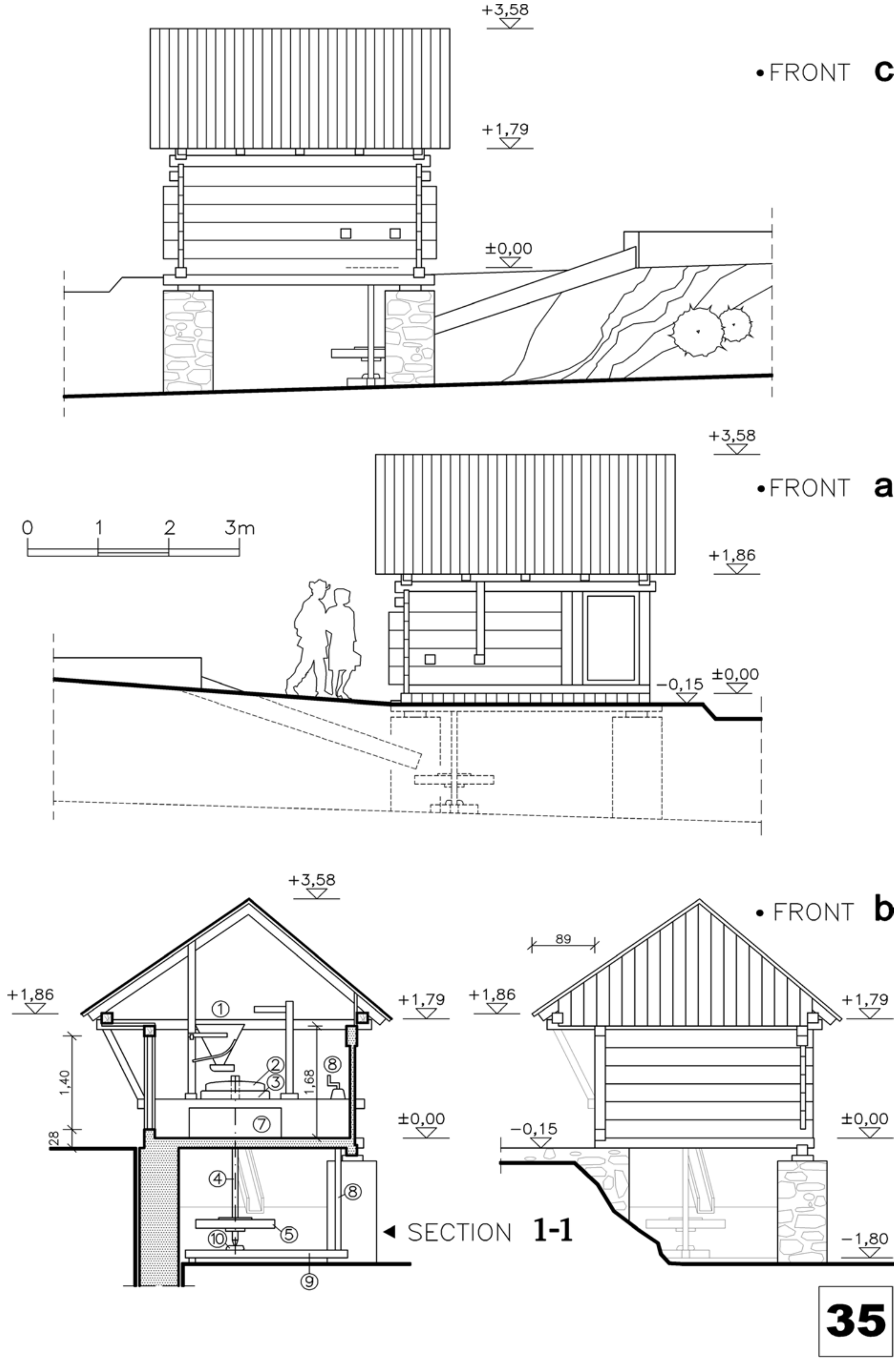


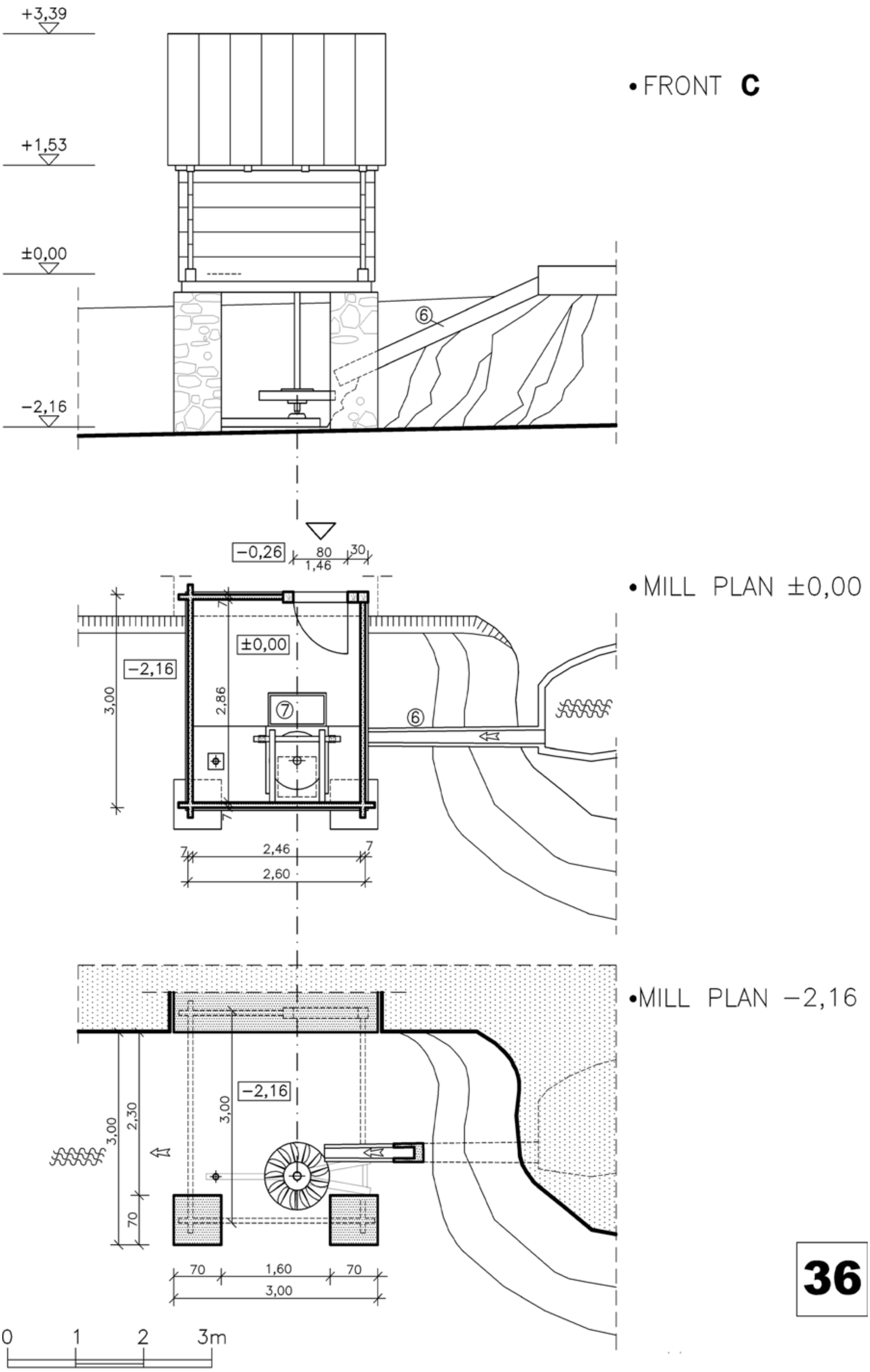
Fig. 26. Topleț. ***Jărgea's Mill***



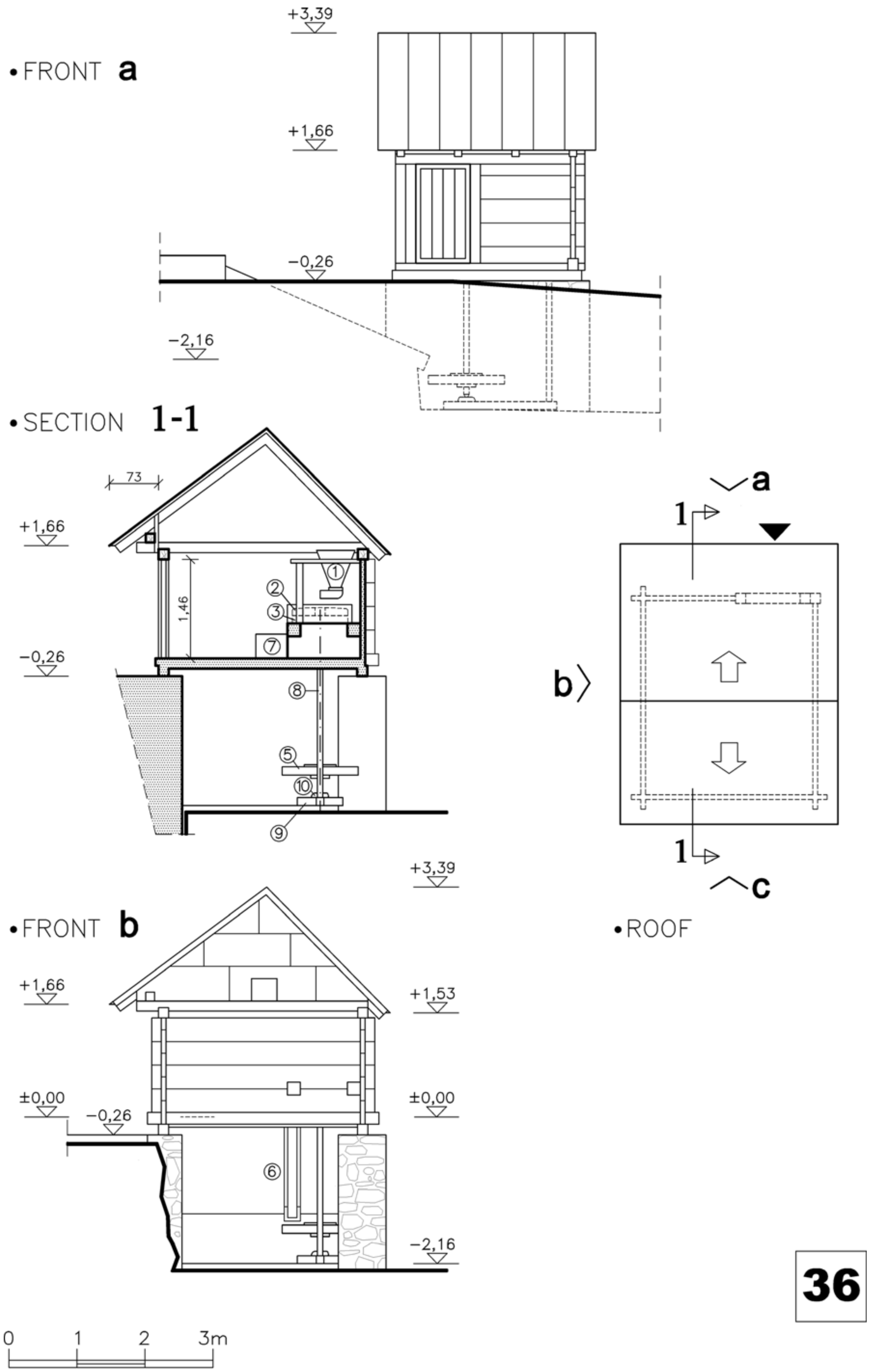
Pl. 71. Topleț. ***Chige's Mill***



Pl. 72. Topleț. ***Chige's Mill***



Pl. 73. Topleț. *Cunicel's Milll*



Pl. 74. Topleț. *Cunicel's Mill*





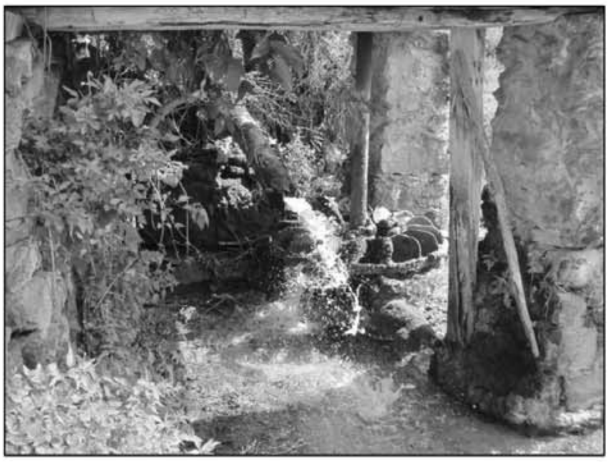
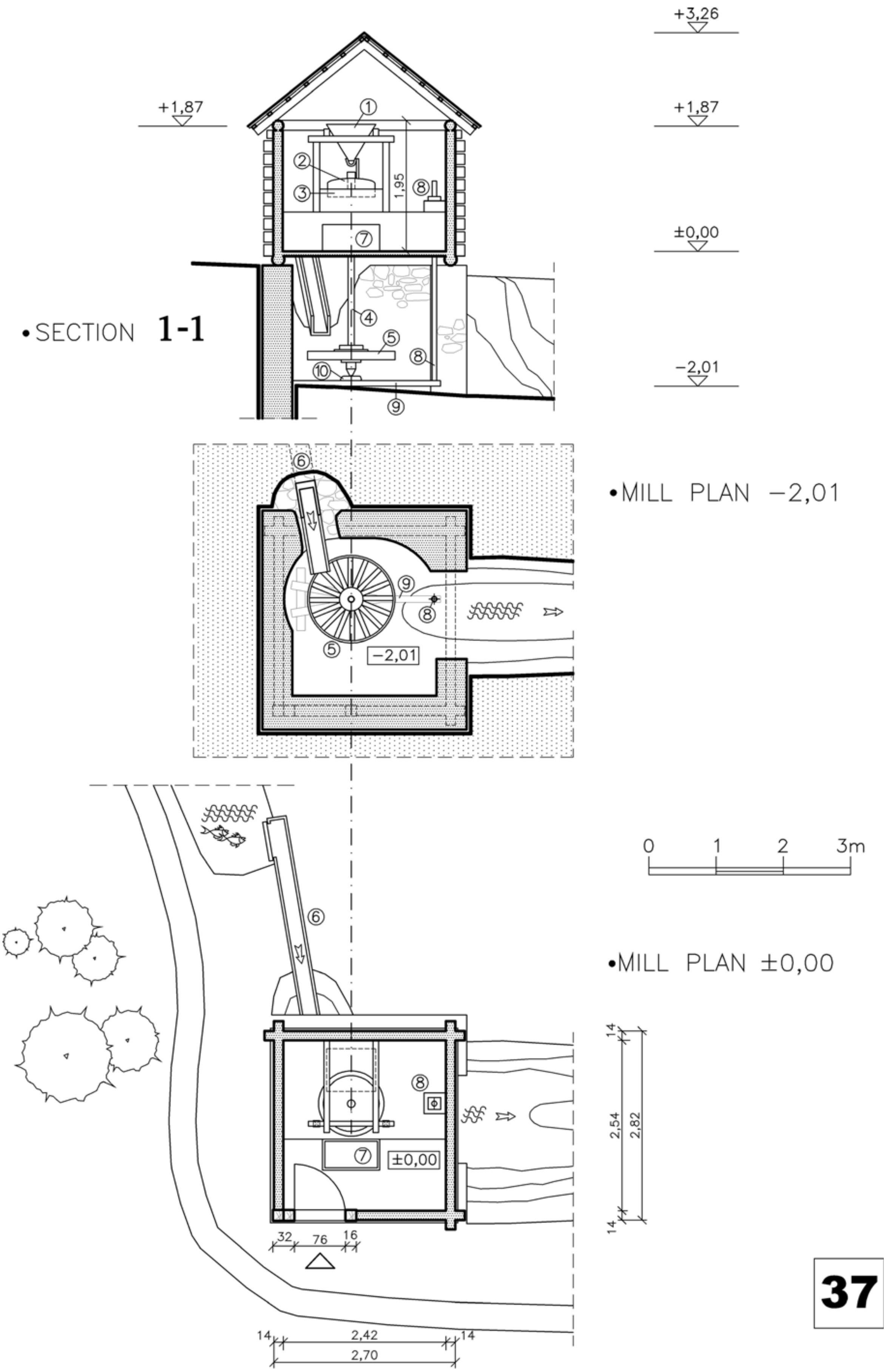
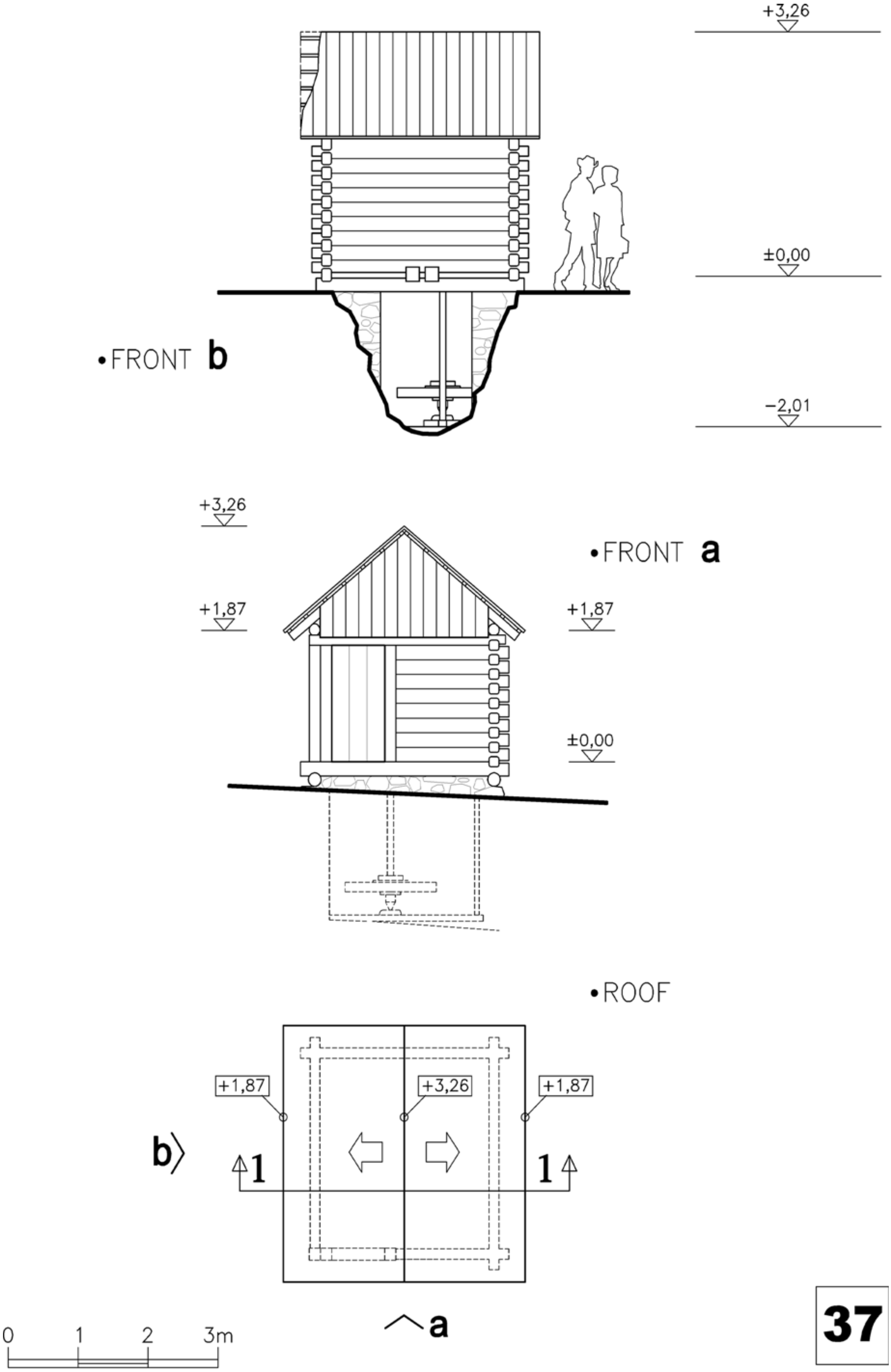



Fig. 27. Topleț. ***Cunicel's Mill***

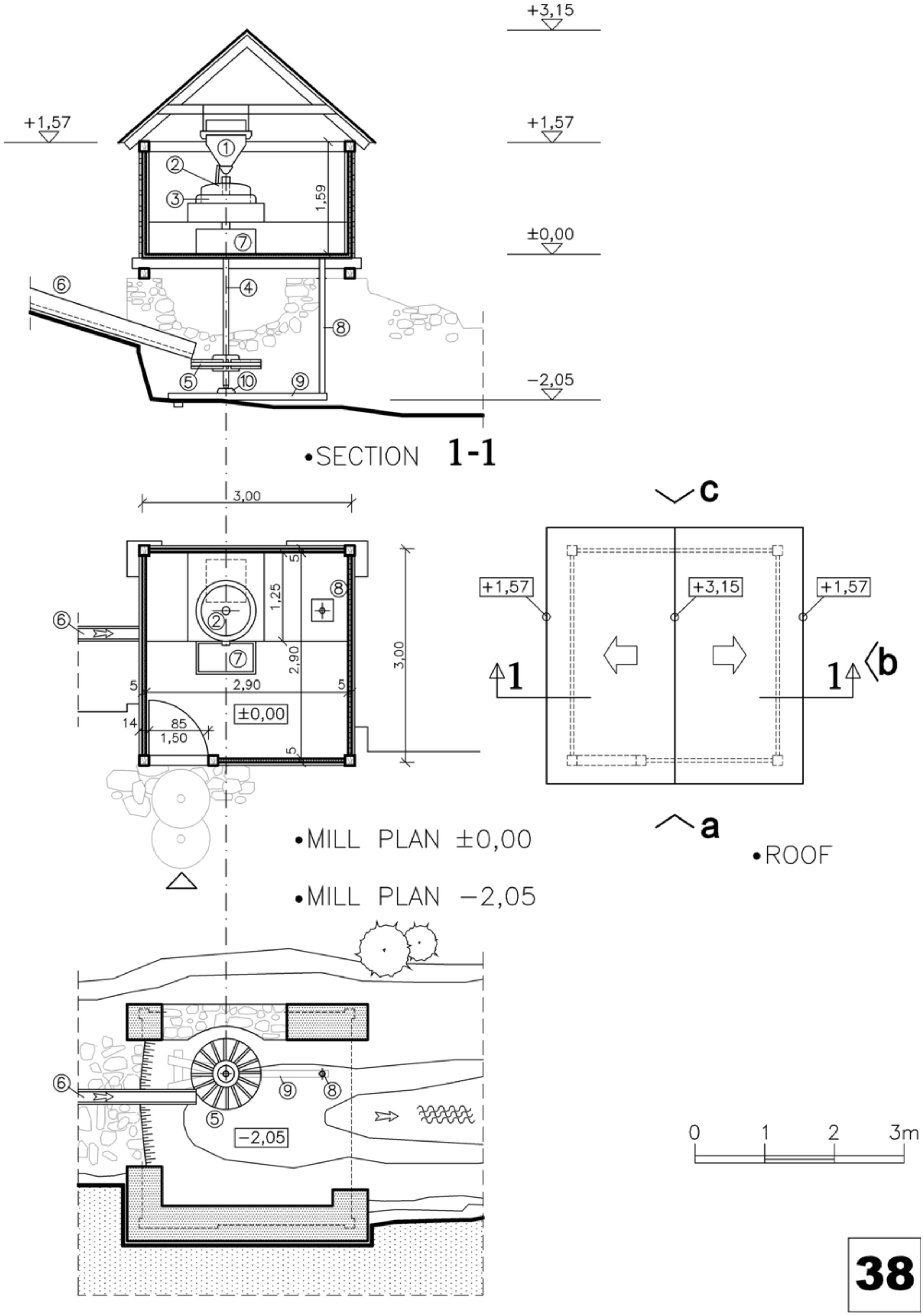


Pl. 75. Globurău. ***Mill 1***

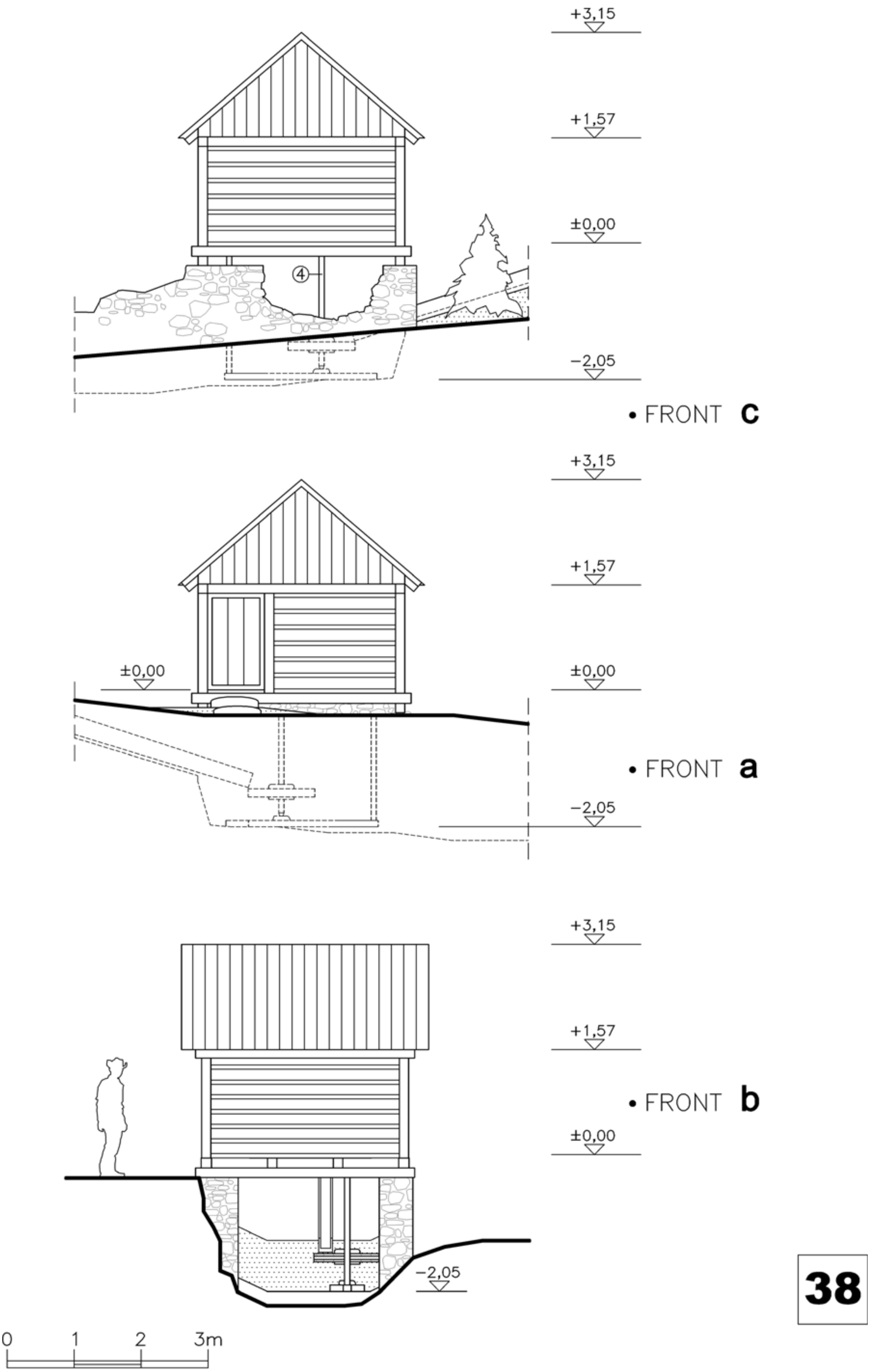


Pl. 76. Globurău. ***Mill 1***

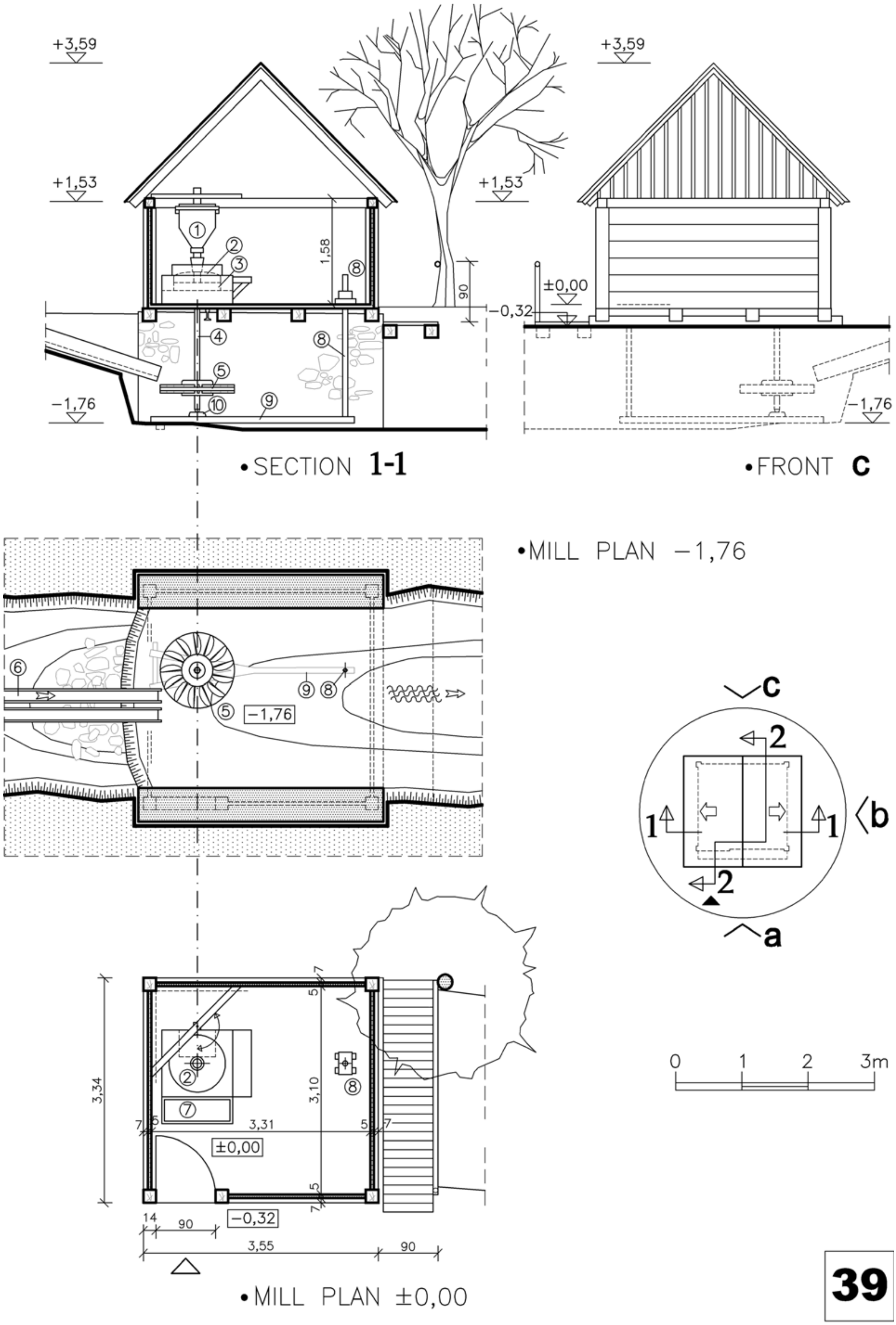
Fig. 28. Globurău. ***Village Mill***



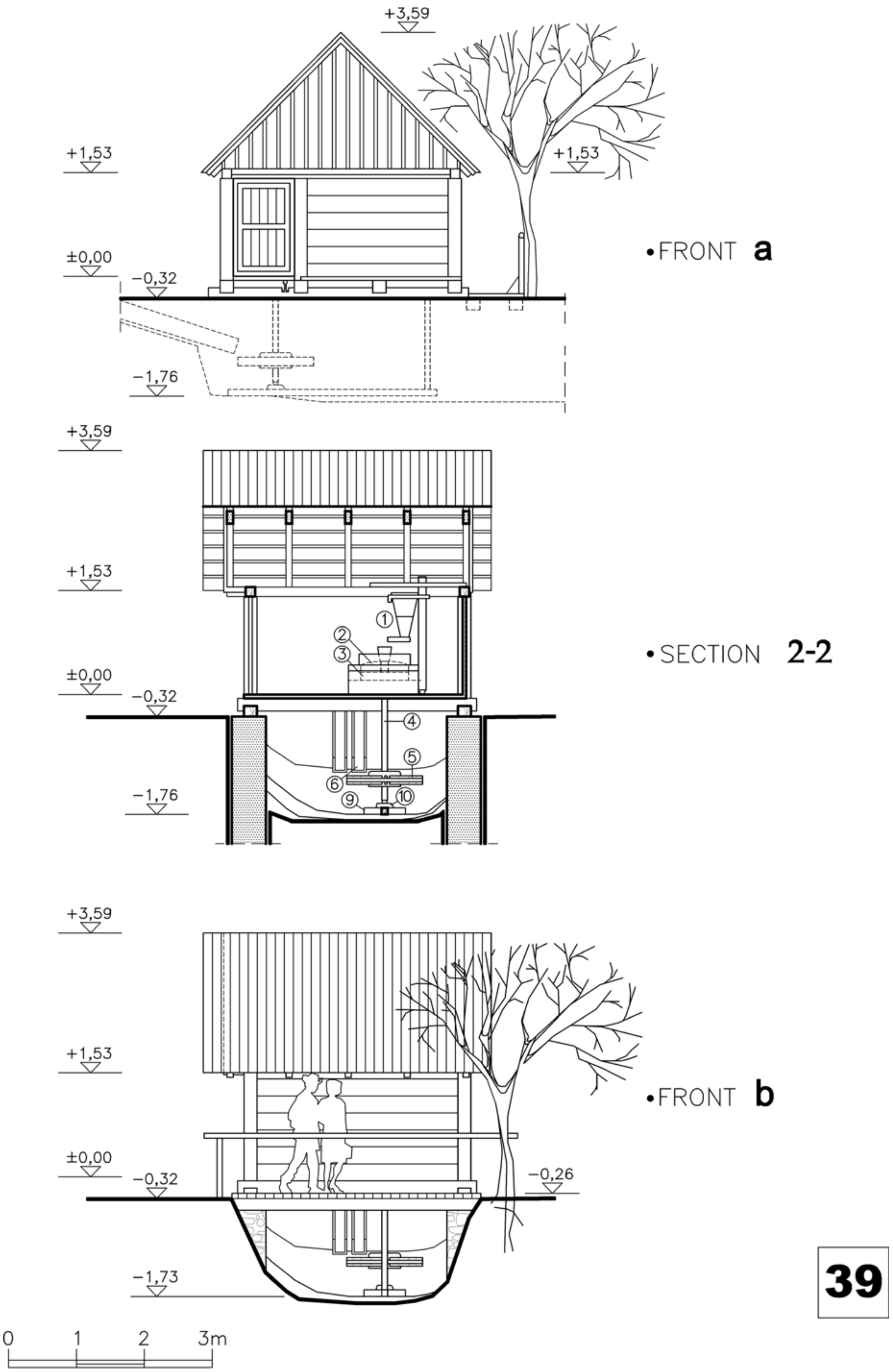
Pl. 77. Globurău. ***Mill 2***



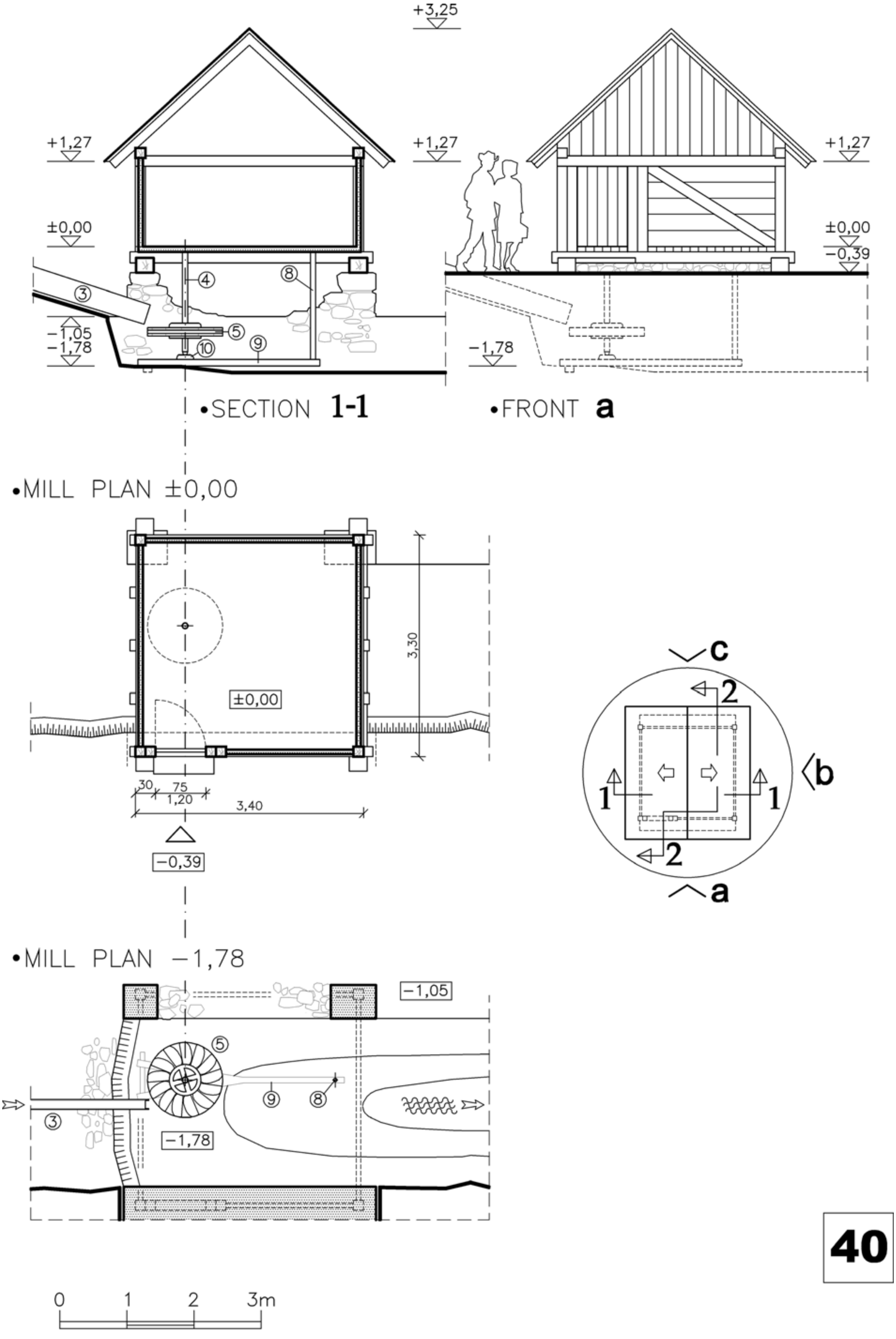
Pl. 78. Globurău. ***Mill 2***



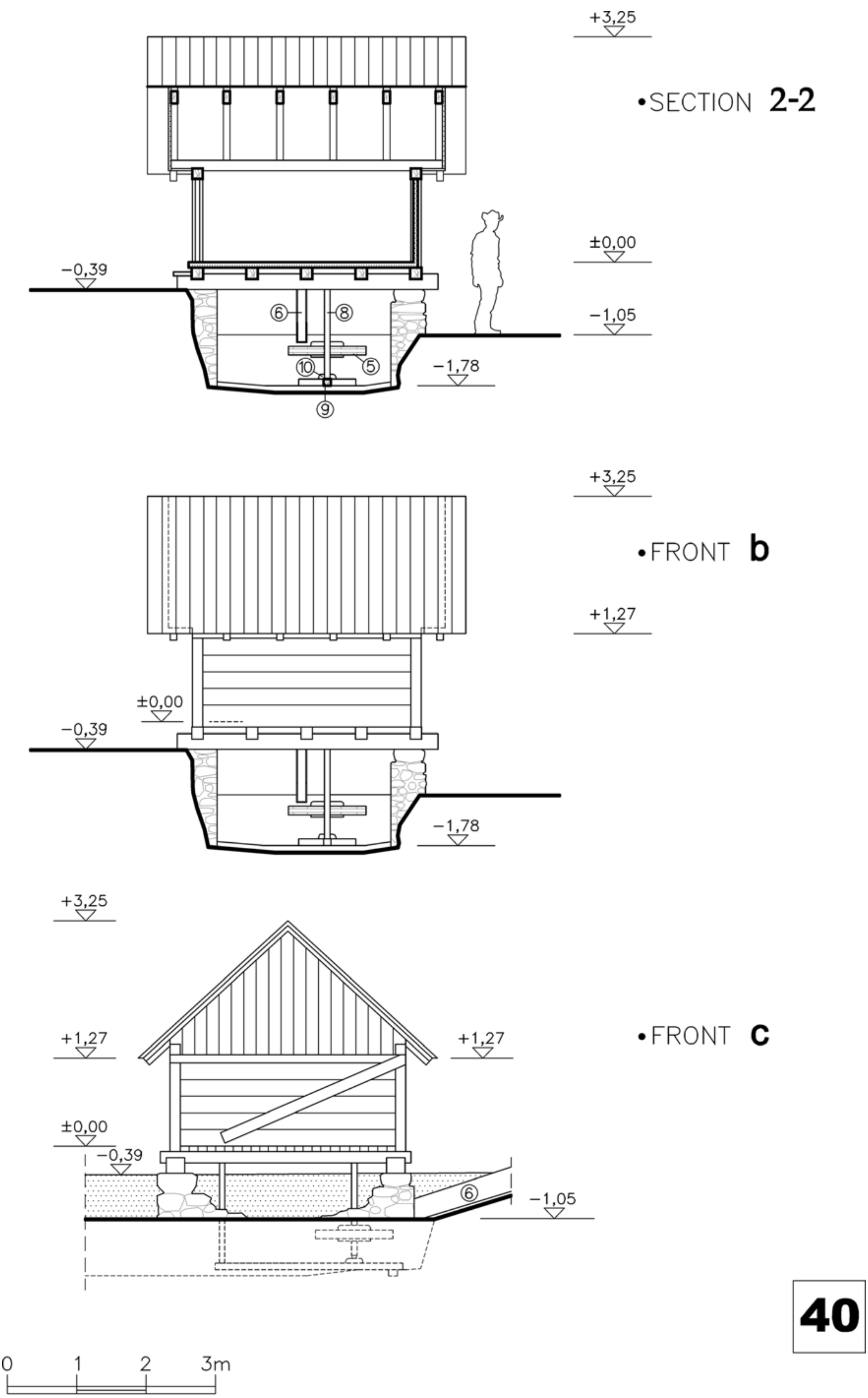
Pl. 79. Mehadica. *Orească Mill*



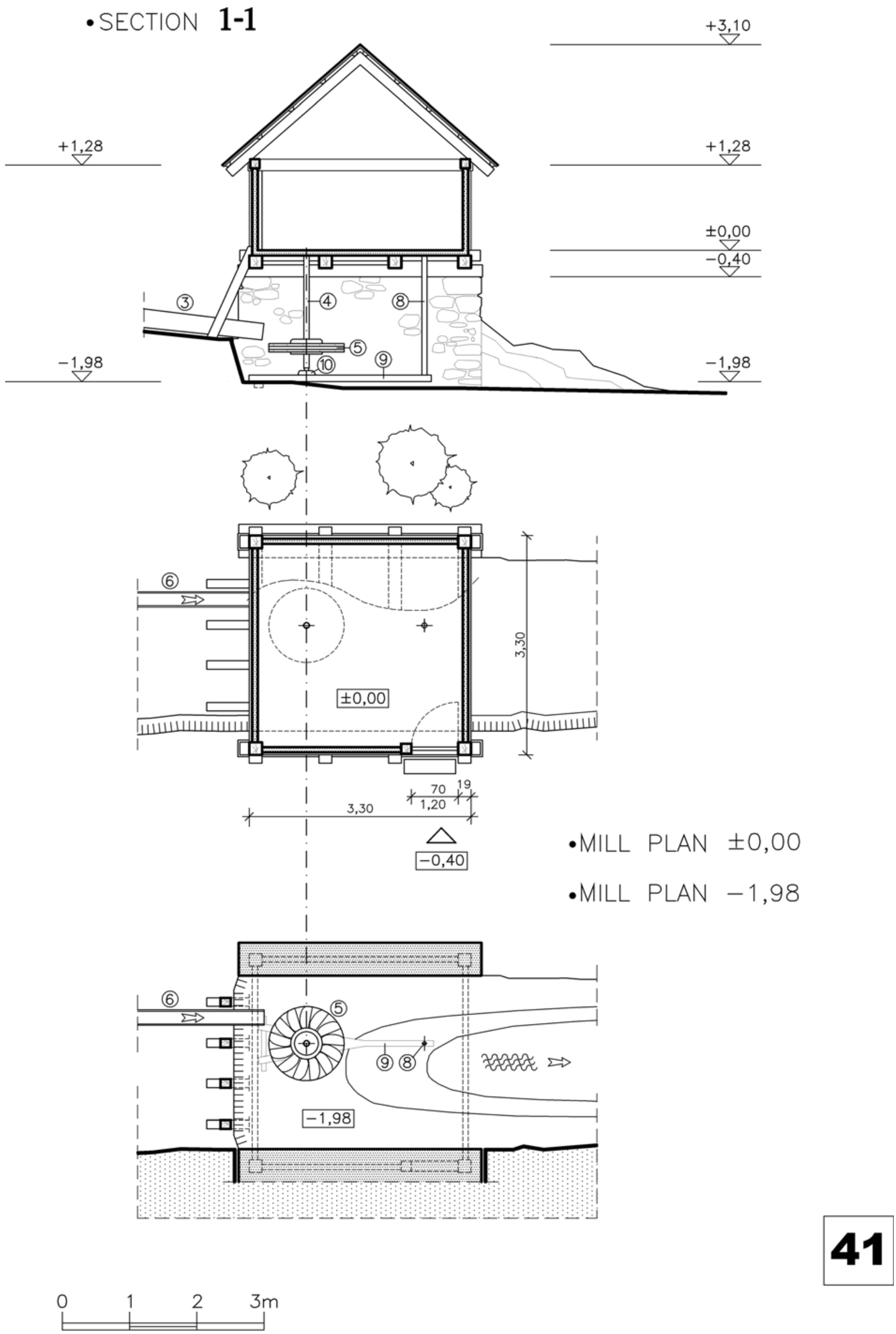
Pl. 80. Mehadica. *Orească Mill*



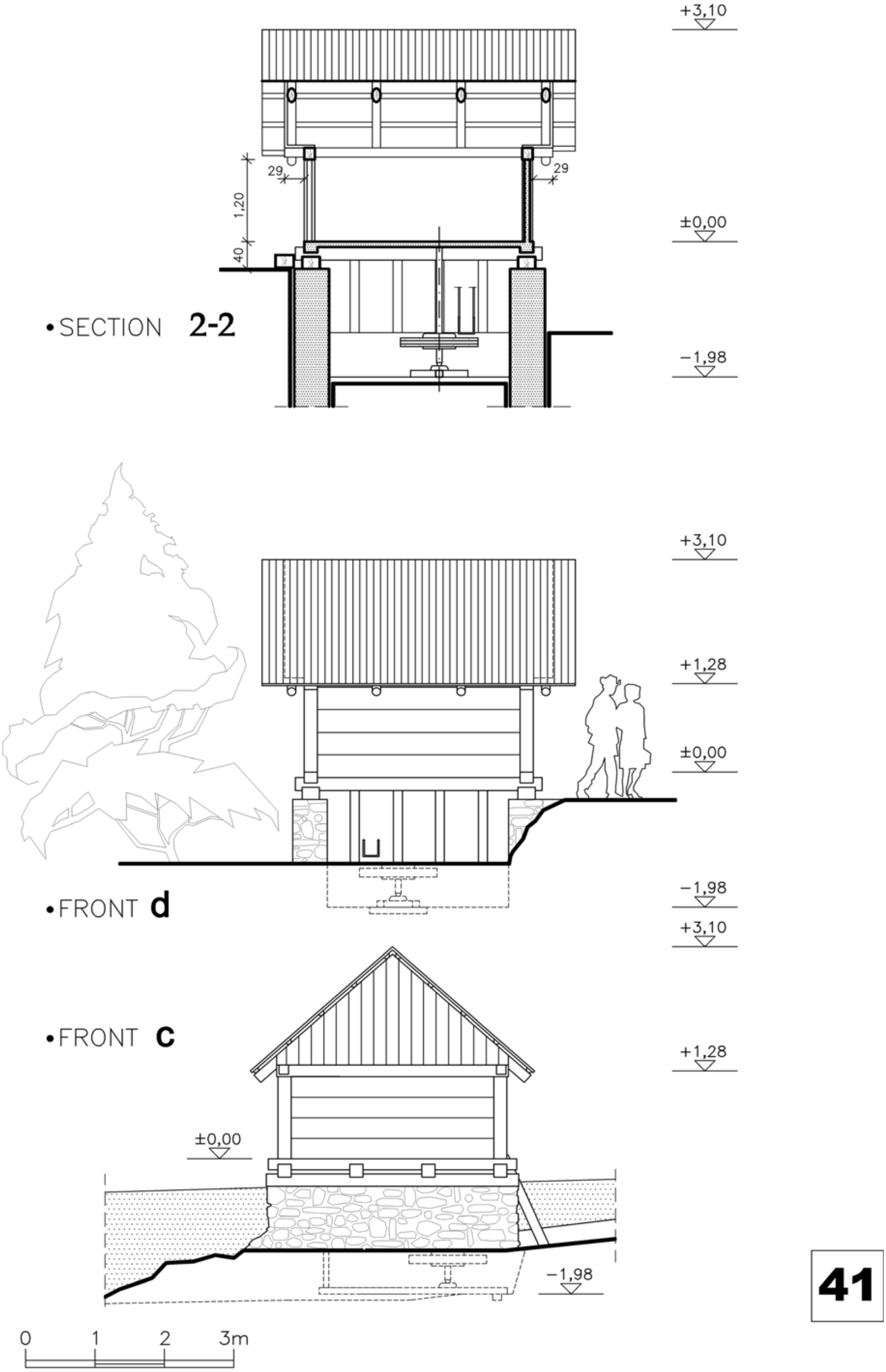
Pl. 81. Mehadica. ***Stone Mill***



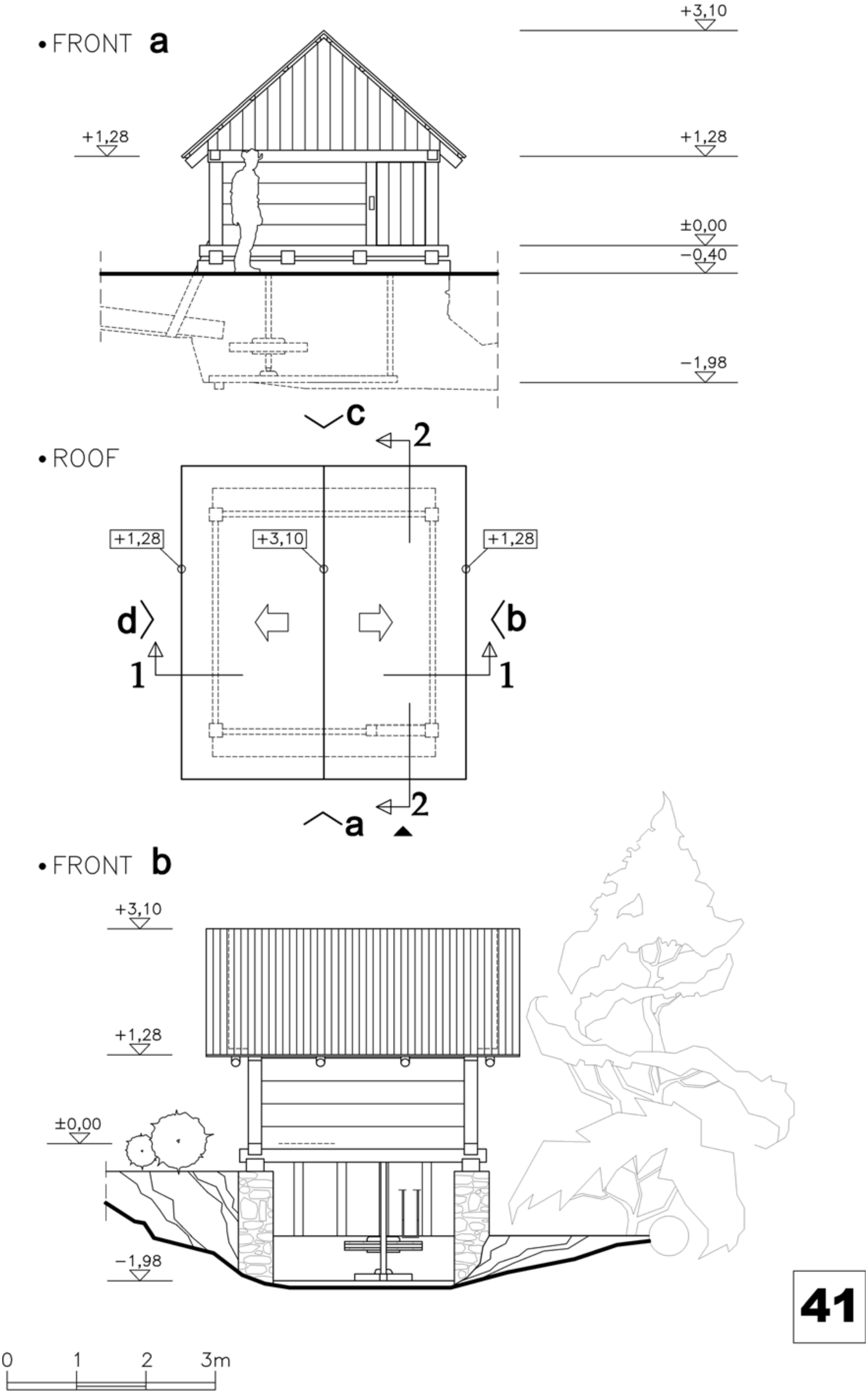
Pl. 82. Mehadica. ***Stone Mill***



Pl. 83. Mehadica. ***Gherghinească Mill***



Pl. 84. Mehadica. ***Gherghinească Mill***



Pl. 85. Mehadica. ***Gherghinească Mill***

D. HYDROTECHNICAL INSTALLATION OF MILL WITH HORIZONTAL WHEEL

Water management for mills built along the river was a matter always invoked in the written documents, since the medieval period and regulated in modern and recent time by the province's local government. Medieval documents of donation from the fourteenth and fifteenth centuries record mills and places for mill. Destruction of the Bârzava ponds and water supply channels had always been an object of conflict and processes between the Himfy noble family from Remetea, in the northern border of Berzovia, and their neighbors of the Gherteniş and Halimba estates. Documents from the years 1408 invoke such actions to divert the water flow, so that 24 mills had been left without water[174].

The mill building and, at the same time the management of water collecting from the river was strictly regulated in the nineteenth century and the next period. Permits to build mills from 1906 for Obeşterescu Nicolae from Lăpuşnicul Mare, for Simescu Pavel from Armeniş and Duda Adam from Gârlişte stipulated the conditions the mills and supply channels could be built, and the way how water outlet might be settled. The act number 14790 for mill from Lăpuşnic, stated that authorized construction allowed a bottom dam raising in the Lăpuşnic riverbed according to the place and at the rates listed in the site plan, and also a mill channel digging on the left bank of the stream Lăpuşnic, which might go according to the approved plan, and after reaching the mill, water flows back into the rivulet of Lăpuşnic[175]. (Pl. 124). A fulling mil [local name: *văială*] building permit at Gârlişte registers the same obligations as in the case of a mill, regarding the technical arrangements on the Gârlişte stream. Bottom dam built on the water of Gârlişte would have 0.50 m height, the supply channel must respect the characteristics required in the case plan (Fig. 80). The owner obligations, listed in the alleged act, were to maintain in good conditions the bed of stream Gârlişte, on a distance of 100 m upstream of the dam and 40 m downstream of the built plant. Documents of July 17, 1905 issued in Lugoj for Simescu Pavel from Armenis referred to a mill with a vertical wheel and horizontal axis building, and they provide useful technical information regarding the arrangement on the Timiş River. The supply channel had a length of 270 meters from the water outlet to the mill built by Simescu. Mill location didn't cause damages to other two mills, located on the same supply channel and neither to the neighboring landowners.

Water collecting

The water collecting stated legal and technical issues. The researches along the mountain Banat revealed in this regard the adoption of solutions adapted to local specific conditions, on each stream where mills were built. Streams with very low flow like the Apa Satului from Socolari or of smaller tributaries of the river Belareca, for example the Ciumerna, the Topla or those of the Studena, those from the Bigar at Topleţ didn't require special works for water collecting. The preserved ponds on the Belareca at Cornereva, on the Vicinic, at Ilidia or those on the Rudăria offered the opportunities to research such facilities.

Mills from Ilidia in number of eight were within the built-up area of the village, and other four were on the Vicinic meadow. Three ponds were arranged for the mills within the built-up area. One of the ponds supplied through the supply channel "the Two Mills" in the eastern end of the village, another one built near Adam Voica' household supplied four mills, the dam built near Traian Murgu brought water for a mill, and the one built near Peter Lascu's house brought water from the river for the three mills on the Sălişte. Other two ponds stopped the river water for the two mills on

[174] Ortvay, *Temes*, p. 395.

[175] AST, fond Prefectura Severin, Dosar 364/1906. Lăpuşnic Hydrotechnic Permit.

the Valea Mare from the eastern end of the village. Two of the ponds from Ilidia had a stone wall base, above which long tree trunks, called *bulvani* were placed.

The ponds dams from the Rudăria stream are built of horizontal crowns of *bulvani*, placed across the water flow. A parapet of short stumps with lengths of 2-2.5 meters was placed above the dam, similarly to an eave ready to prevent erosion of the riverbed at the base of dam (Fig. 93). This arrangement for water collection is called pond. The Belareca water, at Cornereva, for "Popeasca Mill" has an upstream pond built from long wooden logs, creating a level difference of over 1.50 m, from which the water is brought through the channel to the mill and the laundering installation mill [local name: *vâltoare*] located in its vicinity (Fig. 93; 107).

The dams on the Camena from Lunca Florilor, once studied by Eutimiu Lăpăduş, were built with the same technique. Locust beams of 6 m long were placed in horizontal crowns of 4-5 woods. Thick pillars of the same essence were stuck in the riverbed, at two meters distance, to support the built along the river dam[176]. Dam protection against erosion was provided by bundles of twigs stuck between beams and pointing out.

Emilian Novacoviciu, in a monograph of Răcăşdia village, described the setting technique of the pond and the supply channel at mills built near Ciclova stream. The dam was built of poles stuck in the riverbed, with wattle between, and after there were fixed together soil, straw and stems[177]. Such a pond planning technique with a low wood consumption was specific to a flat space.

The ponds built on the Belareca, Vicinic, Rudăria had a level difference of 1.50 to 2.50 m to create a lake, from where the water was conducted by a canal to the mill.

The supply channel is called *ierugă* in the Banat space. The supply channel characteristics were given by the land configuration and the nature of the soil. Archival documents invoked earlier, belonging to 1905 and 1906, for facilities on the Gârlişte, the Lăpuşnic and the one on the Timiş had previous established technical data through the approved plans. Thus, in Lăpuşnic, Obeşterescu's mill had a pond of 13 m long, which had to be built of river stone that could be easily dismantled, and the supply channel was of 142 m long (Fig. 80).

Along a supply channel were built more mills, every one with a "vâltoare" mill nearby at Cornereva, on the Belareca, for example. What is locally called „vâltoare" is a simple laundering arrangement of narrow boards, with space between them connected in a shape of funnel, a truncated cone placed upside down. Water flow brought through a gutter cleaned and washed there the wool fabrics as in a whirlpool. Next to the mills and the laundering installations, along the same supply channel the fulling mills also worked to process wool fabric [the process local name: *văiegărit*]. Archival documents keep the plan of the fulling mill from Gârlişte (1905). In the case of mills and wool processing facilities from Lunca Florii on the Camăna stream, the supply channel was of 430 m long, arranged parallel to the Camăna at 75-80 m from its riverbed[178]. Supply channels from the Nera for the two mills, The Old Boldurească and The New Boldurească at Borlovenii Vechi have a length of 70 m.

The mills on the Rudăria case is significant also for the water supply channel from the pond to mills, because the plants are strung in the rocky area of the river gorge and up to the meadow area with soft ground and a water fall in a very slow slope. The Mill from the Tunnel, as the name suggests, has a dug in the mountain rock supply channel. The dug in the rock tunnel has a height of 1.60 m and a width at the base of 1.10 m. From this perspective of planning and architecture it is one of the most spectacular wooden mills from the Banat area. The mills from the narrow area of the river, Trăiloanea, Viloanea, Roşoanea and the two mills The

[176] Lăpăduş, 1975, p. 140-141.

[177] Novacoviciu, 1923, p. 22.

[178] Lăpăduş, 1975, p. 141, schiţa 1.

Obstinate, each one with a pond along the river, not far from them, needed a very short supply channel. Installations from the meadow area of the river are placed on a long channel, with slow water flow, which, moreover, determined their raising on poles. The Bigar stream, with a flow less consistent, has simple ponds from several limestone runs, and the channel is a short one. Analysis of the channels from Ilidia reveals their local particularities determined by the topography of the area and even had an impact on the architecture of the houses located along the route of the channel. Length of the supply channel, which starts from the water outlet of Adam Voica's pond, is of about 1600 m, along of which the four mills had been built. The channel route is located on high slope of a valley that the Vicinic crosses.

The mills on the Gramesca from Gârnic are situated in a limestone area, where the river hasn't got a too large and constant flow. The ponds, in this case too, are simple aggregations of rock and sand, from where starts a fragile channel. Due to the single water flow the mills were located on the pillars, and the forced pipe leading water to the wheel was fitted with a bucket. It was arranged there at Gramesca a gutter on pillars that collects the stream waters, which is scattered among several vein through the limestone cliffs.

Storage tank

Supply channel is slightly expanded at its terminal and has summary facilities in order to accumulate a larger and continuous amount of water at the mouth of the forced pipe, no matter of the form in which it was made. The amount of water that comes through the channel and the flow invariability determine the proportion of the pool created at the channel terminal. The mill storage tank fitting at the Răcăşdia mills was described by Emilian Novacoviciu as follows: "in front of the mill are closed more wood planks, lined with planks on edges and down on the bottom, called "ships", because they look like that, due to their construction. Ships at the mill end are narrow, and in the opposite side are much larger, forming a breast, to collect water in there. From the narrow end of ships begins a gutter [local name: *vălău*] made of boards, or a mid-carved acacia[179].

Water supply simple, primitive arrangements of the kind of that described above we have met, now in 2011, in few situations on the field just because they were replaced with recent materials of stone and concrete. Vâlculeştilor Mill from Topla has such primitive arrangement. The pool is covered with planks on bottom and sides. It has two mouths, one towards the sluice box, and the other towards the refuge channel, which can be closed by a single folding small wood door. In fact, this mill entire system is made of wood, the wheel as well as the water inlet gutter. An absolutely identical basin with boards we have met at the corncobs mill from Prigor, at Gura Ibâlcinei. Facilities on the Camăna stream had basins lined with wooden planks[180]. Storage tanks were usually covered in dry wall without glue. The mills from Ilidia had their pool at the end of the channel arranged in this way. They had two mouths for water, one to supply the sluice box, the other to evacuate water in a detour canal, the refuge one.

Modern materials have replaced at almost all mills the old wooden or dry wall facilities. Now we meet at Răcăşdia, Bogodinț up to Cornereva, Eftimie Murgu, Topleț, Sichevița and Gârnic only concrete walls for the storage tanks.

We also meet this technical model of lining storage tanks with wood planks in some neighboring areas of the Bahna basin from Mehedinți County. Storage tanks from the mills on the Bahna covered with boards were called the mill bridge[181]. Similarly basin planning, 4-5 m wide and narrowed at 1.25 m in the pipe forced area, plated with boards we meet at the mills from Gorj on the Jaleş River, also called mill bridge[182].

[179] Novacoviciu, 1923, p. 22.
[180] Lăpăduş, 1975, p. 143.
[181] Budiş, Itu, 1998, p. 221.
[182] Cărăbiş, 1968, p. 235.

Water intake system

The intake system is an essential element of the hydrotechnical plant of the mill. It has a length of 5-8 m, measured from the limit of the pool up to the horizontal wheel. Structurally it is presented in two forms, one open as a trough, the other closed as a pipe[183]. If we start from the premise accepted in hydrotechnical engineering, that the mill with horizontal wheel is a prototype of the technique of equal pressure, than the intake system at the mill is in fact a forced pipe[184]. Often during our exposure we have used the term of forced pipe, for one or other of the shapes found at mills. In fact, also in approaches of the mill history from the world of hydrotechnical engineers we meet the same forced pipe terminology as invoked before.

Wood was the material originally used for the intake system, only in the recent period it was replaced with metal or concrete. Wood was used both for open form of the inlet system, and for the closed form, that one of a pipe. Intake system in open form is called gutter [Romanian: *jgheab*] in the area of Cornereva and in Almăj, at Rudăria for instance. We found, however, the name of *vălău* for this form in Răcăşdia, for example[185].

Intake system as a closed form of a sluice box is called *butoni* [a *local name for barrel*]. We found this specific name of the Banat dialect at Ilidia, in the Depression of Oravita, at Lăpuşnic, in Almăj area, at Sicheviţa and Topleţ. The sluice box was a tree trunk 5-6 m long, empty inside. Structurally it has the function of a forced pipe. Wooden pipe was the primary form of the inlet system at mill with horizontal wheel. The trunk was holed in the middle, controlled with fire, thus achieving a wooden pipe. The drain section of the sluice box was controlled by wood plugs with tapered section, which were inserted in the sluice box, above the wheel[186]. These fits of wood, with thin walls, these smaller diameters than the pipe diameter increased the spurt pressure at the mouth of the forced pipe. Wood plug of various diameters, mounted in the sluice box head is called (little) bucket [local name: *găleţea*]. The sluice box with bucket was used in the karst areas where waters have low and variable flow. Power of flow injected into the wheel from the sluice box through the bucket was much increased, thus increasing the milling plant efficiency.

Wheel was originally made only of wood. It was gradually replaced, under the impact of modern civilization, with wheels made of metal. Structure of a horizontal wheel consists of a hub in which usually are fixed a number of 14-16 carved wood blades. Our observations made on mills at Ilidia and Socolari, many years ago, and the recent ones on mills investigated in Almăj or on the Belareca recorded some details. The hub has a height of 40 cm and a diameter of 26 cm at the ends, at mill from Sultana at Socolari. Longitudinally is cut in the middle with a quadrilateral section of 12 cm. The wheel axle, which is the engine axle, passes through the hub, one end of the shaft being placed in the frog and the other one in the runner stone.

Dimensions of the wheel hub from Cernescu's mill from Pogara are similar to those mentioned before. It has a height of 35 cm and a diameter of 30 cm.

In the middle of hub are cut slots with rectangular section, of 10/3 cm in which are fixed the spoons. Cernescu's mill wheel from Pogara had a diameter of 1.10 m. Wheels measured at mills from Lăpuşnic had diameter of 1.20 m, value similar to 1.18 m we met in Topleţ. Wheel with bigger diameter of about 1.40 m are met at the mills from Ilidia, Răcăjdia and Bogodinţ. The small milling plants on the Ciumerna from Bogâltin, or the ones on the Topla and the Cămana have a wheel of around 1.10 m diameter.

The wheel blades were of carved wood, in a shape of spoon or bucket. On the basis of this similarity they took also the names met at the mills from Ilidia and at the mill

[183] Pavel, 1954, p.27.

[184] Lupşiasca, 1995, p. 280.

[185] Novacovici, 1923, p. 22.

[186] Hoffman, 1968, p. 276-277 with the wrong name: *button* for the sluice box.

from Socolari, two very representative installations for the mill with horizontal wheel structure. They have a hydrodynamic shape through which take the energy from the injected water coming through the sluice box. The Mill from Pit and Bălani's Mill (Ilidia) blades are of 50 cm length, and their width does not exceed 12 cm. Water hits a convex space measuring on the axles 34.4 cm/10, 5 cm. It is stiffened in the hub through a tail with rectangular section, measuring 7.4 cm / 2.6 cm. Blade thicknesses did not exceed 7-8 cm. Metal wheel took the same shape sometimes simplifying them. The hub is a metal ring in which two metal bars were welded in cross, on which is fixed the motor shaft. Blades made of steel are welded on this ring.

The wheel axle was originally made of wood, cut in square section and introduced in the wheel hub by wooden or metal nails, piercing both the wheel hub and the axle. Pogara mill had a shaft of 1.40 m length. Sultana Mill from Socolari had motor shaft of 2.60 m long with a square section of 10 m. Mills from Ilidia had motor shafts with lengths between 1.90 - 2.10 m. The calculated motor shafts dimensions, at mills on the Rudăria River have values between 2.40 and 2.70 meters long. We may note that the shafts of Răcăjdia mills have values of 3.05-3.20 meters. The two tips of the shaft have metal ends. In the lower tip of the spindle is a nail or a metal point, which rotates in the frog. Upper end of the spindle is provided with a round metal bar, introduced in spindle and which is fixed through the driver on the underside of the runner stone. This metal bar is called *stăniu* at Topleţ, but also in other areas of the Banat and Oltenia. The mill wheel and the runner stone are parallel centered through the vertical shaft, thus this one becomes a motor shaft, and a transmission one. It transmits the movement from torque to the mechanical grinding plant.

Frog has this name because it is always in water. The term designates a river stone, an oval one, with a hole in the middle, in which the spindle heel spins. It is mounted on a wood, on the bottom of the mill underground room, usually found in water.

Wood on which is fixed the frog and which supports the entire hydraulic system of the mill is called fork, crotch or mill sole. It is usually made from hardwood, to withstand the water action. Mills from Ilidia have sole in the form of beams, with square section fixed at one end in dry masonry of the mill underground room (Fig. 113; 115). Mills from Sicheviţa preserve the archaic form of the sole from acacia wood on a shape of fork, set with the two arms in the underground pit. The two samples brought to Reşiţa museum from Sicheviţa have a length of 2.11 m, respectively, of 1.88 meters, and the two arms of the fork measure 0.60 m. The sole shape imposed them the name within mill terminology: fork or crotch (Fig 126; Pl. 129; 126). The impact of industrial civilization on water mills from the Banat brought changes in this regard too. Wood was replaced by a metal beam with a rectangular section at Bogodinţ, or a quadrilateral and a round one at the mills from Topleţ and Rudaria, for example

E. MECHANICAL GRINDING PLANT

Mechanical installation provides an indispensable mill utility for daily life through grain processing and their conversion into flour. The main parts of the mechanical installation are the two stones, a static one and a mobile one. Other components of mechanical system, grain basket, bin for gathering flour, mechanisms regulating the distance between the stones, the control of grains flow to the two stones were adaptations and improvements made over time. Viewed through the prism of grinding installation the mill is, of course with a different scale, the ancient grinder. Human or animal power for operation was subsumed in this case by hydropower. The two stones are centered on the vertical axis of the paddle wheel that is both a motor shaft and transmission one. Millstones are placed on a solid wood construction, set, usually, on the beams floor of the mill. At Ilidia, the bed on which the stones are set was made of wood trunks of a parallelepiped shape, about 2 m long, 0.50 m high and 0.35 cm wide. Another two short planks sit on them and on this table were fixed the stones. Measured overall this arrangement for mechanical installation had, at Ilidia, dimensions of 2,13 m / 0,95 m at one of the mills; 2.08 / 0.98 m at another one, for example (Pl. 11-16). Where solid wood with circumference from 0.60 to 0.90 m, was missing, these beds for grinding installation were arranged in two pieces. Another solution for millstones location consists of fixing in the side walls of two massive beams above which sit rectangular bed mill, made of massive beams. Such a situation is encountered for example at Bogâltin, at Cornereva and Gârnic. A variant of this solution was elevation of a floor of about 0.40-0.60 m between the two walls of the mill house. Mechanical grinding plant was placed on one side of the paved area occupying nearly half of the inside of the mill. It was the solution at Dolina, at *Andrew's Mill,* at Topla at *Vâlculeşti's Mill*, at Bogâltin, Topleţ, Globurău and Putna.

The bed stone, called lying stone [*zăcătoare*], is a static one. The mobile stone above it was called walking or running stone. The two stones transposed to other dimensions and with other energy the ancient grinder system composed of *meta* and *catilus*. The runner stone was coupled to the rotor shaft of the hydraulic system through a mechanical piece called driver [*părpăriţă*]. It was made from a metal slide stuck in the runner stone and fixed in the same time in the metal rod of the motor shaft. The two stones were traditionally buried in a square wooden frame cut circular inside. This wooden stone case, recently replaced with metal, was called *ocoli* or *colaci* and it was meant to gather flour sticking under the wheels (Pl. 127).

Size and quality of stone finishing is extremely diverse at the researched mills from the Banat. Runner stone usually had diameters ranging from 0.70 to 0.90. We met runner stones with diameter of 0.90 m and 0.95 m at Topleţ, at Şopotu Vechi, Bădeasca Mill, at Lunca Florii, Feneş and Globurău. Mills from Ilidia, Şopotu Vechi, Topleţ, Dolina, Gârnic had stones with a diameter between 0.70 and 0.80 m. But there were plants that used smaller runner stones of 0.55, at Şopotu Nou, of 0.60 at Topla, Şopotu Vechi, Plavişeviţa. Rejected millstones, with diameter from 0.45 to 0.55 m, we met at Plugova at a local craftsman who processed millstones. Certainly an important question that historical research should answer is this of millstones production centers, on the one hand and on the other hand the occurrence of processed rocks. The answer we can give is partially, built on land survey that we undertook. The exact determination of the rocks can be done only by a petrographic analysis made by a geologist, a gap in the current state of research. Mills from Almăj, Prigor and Rudăria used local rock, and local tradition preserved the memory of a stone cutter, master Nichifor M. A similar situation we find at the mills from Plugova, where stones were processed by a local stone master, who was also a stone carver. Milă Bucur's shop from Brănici shelter, on the Belareca Valley preserves traces of the stone cutter master in the courtyard. We found during the researches from 2011, 5-6 rejected stones thrown into the courtyard, or used to access stairs. Mills from Cornereva were supplied with millstones by the local craftsmen. Occurrence of the rock was obviously in the Cerna Mountains, which dominated the basin of the Belareca. The same local situation was adopted for the mills from the Nera Valley from Borlovenii Vechi. Burcea, a stone hewer from Borlovenii Vechi, processed local rock for millstones. A stone hewers' center worked in the Danube Clisura at Jupalnic, which supplied the mills from Topleţ inclusively. They exploited and processed rock from Dubova-Sicheviţa area. A center for mill stone processing worked in the north-east of the Banat, at Pietroasa[187]. The stone masons from Pietroasa exploited local resources, with different processing for different types of flour. An investigation of Nicolae Țăranu recorded interesting data on the processing of mill stones, the duration and cost of a millstone[188]. Production time for a millstone was of a month at least, and a master processed on average 5-6 millstones yearly. It was assessed and sold during the inter-war period at of 2500-3000 lei amount.

The very well cared look, which shows millstones careful processing and finishing on the Caraş Valley, from Ilidia, Răcăjdia, Caraşova suggests the existence of specialized centers in this area, which operated at Caraşova and Surducu Mare, but possibly also in other areas, at Maidan, for example. Generous local resources from Anina Mountains feet had been heavily exploited since the mid nineteenth century, when ample public works developed there to which were brought stone hewers from Ilidia, who generated the appearance of some local stone hewers' centers. Processing mill stones better known due to the ethnographic investigation from Pietroasa shows this process developing under the same parameters known for the of stone masons centers from Transylvania, from Ciceu, for instance, but also from neighboring areas[189]. An important element of the mechanical system of the mill is the bridge tree. It sets the distance between the bed stone and the runner stone and assures mill starting. Structurally it was composed of a wooden bar attached by sewing or clamps in the head of the mill sole, namely from the beam or husk in the water, which supported hydraulic installation. The bridge axle, originally only of wood, was vertical, meaning parallel with the mill spindle and pierced a little the mill floor. Thus a lever is formed, with one of the arms made of driving axle which connected runner stone with water wheel, and the other arm consisted of beams from water on which stood wheel and spindle, frog represented a fixed point, of lever support. Raise or lower of the runner stone is made through levers. Simple archaic mechanisms operated with wooden plan which moved elevator shaft. This archaic system with wedges still works at Cornereva, Dolina, Borlovenii Vechi, Şopotu Nou and Sicheviţa. A lifting mechanism with screw is met at the most preserved mills. We note in such cirmstances the wooden mechanism, fixed on the inner floor of the mill on the Topla, at Vâlculeştilor mill.

[187] Țăranu, 1979, p. 155-158.
[188] *Ibidem*, p. 155-158.
[189] Kos, 1963, p.94-102; Vajkai, 1983, p.351.

F. HORIZONTAL-WHEELED WATER-MILLS IN THE BANAT. REPERTORY

BÂRZ

Bârz village belongs to the commune of Dalboşeţ being located on the northern frame of Almaj Depression. The Bârz rivulet is a small tributary on the left bank of the Nera.

1. MARINEASCĂ MILL
[*Moara Marinească*]

The mill has a structure of brick plastered wall, with a gabled roof and iron sheet covering. Building has a rectangular plan of 4.36 / 3.41 m (Pl. 119; Fig. 81). An inscription on the building gable indicates the mill name, the initials of some owners and builders, as well as the year 1959. It may be the year of construction or reparation. The floor to separate the two levels of the mill was poured from concrete over a beams floor. A concrete intervention seems to have been applied to the lower chamber level, as the outer appearance suggests (Fig. 81). Underground chamber with hydrotechnical facility was originally built on two sides, the side with the supply gutter and the refuge channel remaining open (Fig. 81). The forced pipeline is from a metal pipe with a diameter of 0.60 m, and a fall of 3.2 m. Hydraulic system, with its wooden wheel and axle, and the wooden (little) bucket [*gălețeau*] preserved a watermill older model. The grain case sits on a wooden frame fixed in the wall. The driver [*postăvița*] is characterized by perfectly round mouth cut from a piece of processed beam.

2. THE SMALL MILL [*Moara mică*]

It calls our attention by some archaic forms and structures combining with elements from modern concrete building (Pl. 120; Fig. 82). The lower mill level was rebuilt from concrete in a recent period. Pit over which the mill building stood was covered with a concrete wall. The same material was used for the pool settlement at the end of the supply channel. Concrete wall of the lower chamber was made with a light superelevation from the ground level, the mill house being placed over it. Building has a rectangular plan of 4.43 / 3.29 m. Walls are from crowns of horizontal beam, fixed with joinders in a shape of dovetail (Fig. 82). The very sharp gabled roof has an asbestos tiles covering. The gables were closed with boards. The milling plant preserves in a good measure the former structures. The yoke that supports the basket set in a necklace on the ground of grinding plant and on one of the mill walls, together with the chest for flour show recent replacements (Fig. 82). We note also here, at The Small Mill the same typological construction of the driver as at Marinească Mill (Fig. 82). Hydraulic plant preserves archaic wood forms. The sluice box [*butoni*], from a metal pipe with a diameter of 0.60 m, is equipped with a wooden (little) bucket. Wooden wheel has 16 blades on the hub, strengthened by a metalic hoop. The wheel spindle, the fork on which it is placed and the bridge tree are also made of wood.

BORLOVENII VECHI

The village lies on the north-eastern frame of Almaj Depression where the Nera River, which descends from Semenic enters the depression space.

The two mills are located on the banks of the Nera, about 2 km far from the village, on the place called Leu, where a prehistoric fort had been set up on the promontory hill (Pl. 116).

1. THE NEW BOLDEASCA MILL
[*Moara Boldeasca Nouă*]

Rectangular building of local rock, filled with brick (Fig. 53). Quadrilateral sides of 4.10 / 4.20 mm, and quadrangle height of 4.16 m (Pl. 116; Fig. 87). The square hipped roof has a tin covering, carelessly caught, which replaced of course the shingle. The mill is abandoned with the water system mostly destroyed. The wheel with vertical axle is missing, only the fork and the metal shaft of the bridge tree being preserved. Lower house architecture is very interesting, being unitary made with the mill walls (Fig. 87). Place arranged in the basement for the hydraulic plant was of 2.89 / 3.70 m. Water refuge channel, 1.20 m wide and 1.20 m deep, has brick side walls (Fig. 53). Lintel placed over the run channel was of wood (Fig. 87). The sluice box, in an advanced state of degradation, was made from an empty in the middle tree trunk. A floor of wide boards, laid on beams, separates the two levels of the mill (Fig. 87). The pool had two water channels, one to supply the wheel, the other, sitting nearby, to overflow all the water in the basement room when the mill was not working. We meet an identical system at Pârvova, at the Mill from Gura Osoinei.

2. THE OLD BOLDEASCA MILL
[*Moara Boldeasca Bătrână*]

It was built with an identical plan and similar volumetry (Fig. 52; 88; Pl. 116). The mill plan is a quadrilateral with sides of 4.80 / 4.00 m (Pl. 109). The walls were built of local rock and river stone briefly processed. They have a height of 1.66 m. The square hipped roof has a galvanized flat sheet covering (Fig. 52; Pl. 109). We remarked there the vertical pillars, set in rafters and beams, on which was hangt the milling plant grain case (Pl. 109). The lower chamber has a regular geometric shape, arranged until

-1.85 m rate (Fig. 88). The dry wall technique was also used in that case. A semi-cylindrical vault supports the wall over the refuge channel.

BOZOVICI

The commune of Bozovici is situated in the intramountane Almaj Depression, at the junction of the Nera with the Miniş. This tributary of the Nera sawed its riverbed through the high limestone walls of Anina Mountains. Two mills were located on Miniş, at the northern border of Bozovici.

1. THE SMALL MILL [*Moara Mică*]

Mill construction was made of plastered brick wall. It has a square plan of 4/6 m. The gabled roof has a tile covering (Fig. 55). The ceiling of mill house with the grinding plant is placed on beams. Floor that separates the mechanical plant from the hydraulic one is placed on massive beams. Underground room with hydraulic plant is built of bricks with mortar. It measures 3.80 / 3.20 m and descends to of -2 m rate. Mouth of water refuge channel has a width of 2.30 m. It has a brick vault (Fig. 89). Wheel water gutter [*jgheab*] was made of concrete. Mill wheel and its axle are made of metal (Fig. 89).

The mill is located near Bozovici-Anina road at about 3 km north of Bozovici. This site determined the groom to settle a wooden animal shelter directly near the road.

2. NEAMȚU'S MILL [*Moara Neamțului*]

Mill is found on the Miniş Valley upstream of The Small Mill. It is a large construction of wall, of 10.5 / 6.5 m. The gabled roof, with a ridge height of 2.94 m, has a tile covering (Fig. 56; 90). The plant, now abandoned, had two wheels, being among the very few mills with two buckets wheels in the Banat. The two wheels trained two grinding plants, one of them, without basket, to grind corn cobs for animal middlings, the other one, with basket, to process grain. Installation for the corn cobs had the stone runner of 1.06 m diameter, and the other one had a runner stone of 0.86 m diameter. The inner space had compartment for animals housing. They entred the mill through the door and had an area of 4/3.50 m, with a manger where they were binded.

Hydrotechnical facility was arranged in an underground room dug up to -1.70 m, of 4.40 / 3.50 m. One of the mill wheels was of wood and had a diameter of 1.40 m, the other wheel was of metal with the same diameter of 1.40 m (Fig. 56; 90).

BĂUȚAR

The village is located in the north-east of the mountain Banat, on the road linking Banat to Hațeg. A horizontal-wheeled wter-mill with bucket from this area was purchased around 1960 by Valer Mureşan and Valer Butură and transferred to the Ethnographic Museum of Transylvania (Butură, 1968, p 33).

Mill has a rectangular plan, of small dimensions. Walls of horizontal beam crowns were closed in joinders system. The gabled roof had a shingle covering. Grinding plant was placed on a pedestal of beams set into the lateral walls. Hydrotechnical plant was entirely made of wood. The lower level of the mill, with hydrotechnical plant is in a pit with no glue brickwork (Pl. 114a).

BOGODINȚ

1. MILL FROM VALLEY
[*Moara din Vale*]

The village lies in the Nera Valley between localities Naidăş, in west and Slatina Nera in north-east. Mill is located at about 1 km west outside built-over area of Bogodinț. Water intake was on the right bank of the river, and the supply channel has about two hundred meters. Mill was refurbished in a period prior to 1985, being preserved the old wooden structure which was placed, again, over a concrete foundation; the wheel and water inlet gutter are new metal constructions (Fig. 51). Mill has a rectangular plan, of 10.09 / 3.95 m, 1.35 m, a high gabled roof, with a tile covering. The two gables are of plank fastened on rafters and rope, neamely the large ceiling beam. Mill walls of of 1.90 m height are made of boards with corners joinders, only on the long sides were used short fixed in pillars boards (Fig. 86). The same system with pillars fixed in sole and crown is used at the mill acces door (Fig. 86). Grinding installation preserved its archaic form. Basket is mounted in a carved log frame, fixed in one of the long mill walls and on beams supporting the roof rafters (Fig. 86). Massive grinding stones with a diameter of 1.00 m were placed on a low bed, carved from a single tree trunk. We noted, also in the case of Bogodinț Mill, the stone lifting system with two metal arms attached to a screw, system met also at Răcăşdia and Vrăniuţ, in the neighbourhood. It is possible that this system of lifting stones by a massive screw with mounted on a pole two claws to have been adopted in 1991, as suggests an inscription on this crane arm. The beams floor to separate the two rooms was placed over a massive beam structure. The entire structure of the mill was placed on two massive piles of masonry, now replaced with two concrete piles (Fig. 86). The entire hydraulic plant is made of metal now. Mill spindle, wheel, bridge tree, support sole, gutter and intake are of sheet iron and metal pipe (Fig. 86). Inlet gutter is fixed in a concrete structure equipped with three mouths directing water to operation and stop the mill. It has a length of 4.60 m.

BOGÂLTIN

Village Bogâltin belongs to the very large administrative structure of the commune of Cornereva. The Ciumerna rivulet is a small tributary on the left bank of the Belareca, descending from the Cerna Mountains and passing through the village Bogãltin from east to west. Two mills work within the village area, namely Bădâni's Mill and Milă Pălean's Mill.

1. BĂDÂNI'S MILL [*Moara lui Bădâni*]

It is located within Gheorghe Bădâni's the extended household. Construction of small dimensions, of 2.70 / 2.60 m, was built of wood with a tile gabled roof. Walls are of beams crowns completed in joinders, only at the corner with the acces door upright beams with grooves were used, in which the beams ends are introduced (Fig. 23). Two square beams in section, which pierce the walls, support grinding installation. Stones are placed on a bed of two massive carved trunks (Fig.85; Pl. 60). Basket measuring 50/40cm at his mouth is set in a corner of the mill, supported by a pillar and the lateral walls (Fig. 85). Massive stone has a diameter of 70 cm. A scaffolding of 80 cm high occupies half of the inside space, on which the grinding stones sit, and the other part is for bags of grist (Fig. 84; Pl. 60). Recourse to this technical solution was required by the land configuration, which did not provide the necessary space for placing the hydraulic system under the the mill floor. Builders dug in the stream bed, a sloping ground, a pit of -1.50 m depth to place there the hydraulic system, the wheel and spindle (Pl. 61; Fig. 84). Pit was dressed in dry wall. Wheel, spindle and bridge tree were made of metal (Fig. 84). Current intake gutter was made of concrete.

2. MILĂ PĂLEAN'S MILL [*Moara lui Milă Pălean*]

It is located in the village limits on the same course of the Ciumerna stream, in a narrow bordered place, on one side by a dry wall fence of a household, and the Ciumerna river bed on the other. Mill is a modest wooden arrangement, of 2.40 / 2.50 m, with a height of 3 m (Pl. 62). Walls were built from short beams of about 1 m, joined in pillars in the middle and one of side ends, while at the other end were collected in joinders (Fig. 54; Pl. 63). The gabled roof has a tile covering. Milling installations as well as the inner space structure with a high floor are completely similar to those ones of Bădâni's Mill (Fig. 83; Pl. 63).

We may note here the compact dry wall of the lower chamber with spindle and mill wheel arrangement, like a pyramid trunk (Fig.54). It has just a narrow openning for water running channel. Water inlet is made on a boards gutter. Spindle and wheel are from metal. The mill supply channel is small and primitive. The monument proportions and its architecture, part of wood, part of dry wall, give its originality.

CARAŞOVA

Caraşova village, with a Catholic Slav population is situated in a valley at the river exit out of a spectacular canyon sector.

A study of ethnologist Cs. Károly Sebestyén from 1908 records a total of 14 mills with horizontal wheel on the Caraş and the Caraşova (Sebestyen, 1908, p 50-51). Molinologic settlement from Caraşova, with the exact description of mill type is encountered extremely loyal shown in this study (Sebestyen, 1908, p 51-58, fig. 1-6).

The studied mill, with plans and architecture study from 1908, has survived to date, and it is one of the few preserved plants from Caraşova; that one was part of a group of three mills located under the bridge at the entrance of the Caraş Gorge. It has suffered changes at the milling plant and the transmission system. The written and graphic architecture from 1908 were entirely preserved. It has an elongated quadrilateral plan, with log walls ended in joinders (Pl. 113). The gabled roof has a shingle covering. There is an extension of the roof that protects the mill access space. Water inlet is made through a boards gutter. Wooden wheel had a diameter of 1.20 m and 16 wooden buckets fixed in the hub (Sebestyen, 1908, p 57). Wheel blades have a length of 50 cm and are 20 cm wide, being identical typologically and dimensionally to those seen at Ilidia and Socolari, for example (Pl. 113).

CORNEREVA

Cornereva is the administrative center of one of the largest communes in the Banat, grouping around it a number of 42 scattered hamlets in the depression of the Cerna Mountains'foot. These settlements, some ones smaller other ones larger, are aligned on the valleys of the Ramna, the Camăna, the Topla, the Ohaba, the Studena, all of them tributaries of the Belareca River, which drain waters from the slopes of the Cerna Mountains.

1. POPEŞTI'S MILL [*Moara Popeştilor*]

It lies on the south-eastern side of the village between the left bank of the Belareca and the road to Dolina village. As a unicellular construction it has a simple quadrangular planimetry, of 3.26 / 2.78 m (Fig. 57; Pl. 43-44). Board trimmed walls, 1.68 m high were placed on beam sole. The four fitted in base and crown upright beams ensure the closing of board walls through the tongue-and-groove joint system (Pl. 43; Fig. 57). The gabled roof, with a tiled covering, is supported by a structure of four rafters. The gables were closed with plank (Fig. 91; Pl. 44). Grinding plant was placed on two massive beams, which pierce the lateral walls of the mill, just above the sole (Fig. 57; 91). Runner stone has a diameter of 0.70 m. Water inlet is done through a supply channel of about 200 m long, parallel to the Belareca flow. Hydraulic system is located under the mill building into a deep pit of -2.37 m, measured at a rate of ± 0.00. The pit is bounded to the riverbed by a pile of masonry without bonding and by the high opposite bank. Wood was used to carry out entire hydraulic plant. The supply channel [*ieruga*] in front of the mill is closed in planks fixed on poles, and provided with openings for water flowing (Fig. 57). Water gutter, wheel and its spindle were made of wood (Fig. 57). Accumulation of water created in the end of the supply channel had three mouths with water weirs through which water was conducted: one for the intake gutter which can set in motion the mill wheel, another one directed to a run channel in the riverbed when the installation was not working and the third inlet gutter was used for a loundering installation which worked near the mill (Fig. 57). Inlet gutter was carved from a thick tree trunk.

2. DĂRĂBAN'S MILL
[*Moara lui Dărăban*]

It is on the right bank of the Belareca, near Dărăban family household. The loundering installation next to mill, supplied from the same water accumulation, is among the few facilities of this kind which have survived. Mill planimetry has a simple, archaic structure, with quadrilateral plan of 3.29 / 3.40 m (Pl. 45). Mill and loundering installation have the same structure as that found at *Popesti's Mill*. Mill construction is based on a high bank of the river and a wall pile without glue in the water bed bank (Fig. 58; Pl. 45). Area below the water system was arranged in the vicinity of the river and protected by stonework without mortar. Wheel and spindle are recent metalic constructions, as well as the bridge tree that replaced the old wooden facility. Upgrades have to be noted also to the accumulation from the supply channel end which supplied the mill and the loundering installation. A concrete wall provided with three openings to control water, each one with a dam replaced the old facilities with plank boards. One of the openings served the pipe supplying mill plant, the other served the loundering installation, and the third one was in front of a run channel to the Belareca river bed, for the moment when nor mill neither the loundering installation worked (Fig. 58). In fact, we find here the same technical solution of arrangement that we found at Popeşti Mill. The lower level of the mill with the same rectangular plan, open at one end for water retreat, with a depth of -1.75 m, is bounded by a wall on which mill house sit. The last one has a height of 3.85 m, from which the walls measure just 1.70 m. The gabled roof has a cement tiles covering, and the gables were closed with vertical boards (Fig. 58; Pl. 45; 46). Mill house sole was modeled in four rudimentary cut tree trunks, over which was placed a floor of planks to separate the two mill levels. Walls of wood were built over that wooden floor. Perimeter structure of the mill house is made of five planks, ended at corners in vertical pillars set in the base and crown (Fig. 92; Pl. 45). A cross beam, relying on rafters, has the role to support the grinding plant basket (Fig. 92; Pl. 45). Wooden basket, in a shape of upside down pyramid, measures at base 72/73 cm. Runner stone has a diameter of 0.75 m (Fig. 92). The stone case is made of iron sheet.

DOLINA

Dolina hamlet is part of the administrative structure of Cornereva. It is located north-east of Cornereva, on the Camăna Valley, on the same boundary with the hamlets of Topla and Zoina.

1. ANDREI'S MILL [*Moara lui Andrei*]

The plant was installed on the Camăna stream, near the hamlet school. Monument planimetry is simple, with one room of 3.20 / 3.80 m. Lower level has a depth of -1.66, while the mill height does not exceed 3.31 m. Walls are of 1.41 m height and are placed on sole. A crown of wide boards, closed in joinders, forms the perimeter strucute of the mill house. Access is made through a door located in the north-east corner, where two corner upright beams [local name: *căţei*] were used (Fig. 16; Pl. 47). Roof in triangular shaped slopes has a shingle covering (Fig. 16; Pl. 48). Hydrotechnical facility is located in a pit whose sides were plated with dry wall, carved stones blocks and mixed with tiny stones from the area. The structure of this plant is a heterogeneous mixture of traditional and modern. The inlet gutter is of a hollowed inside tree trunk, the wheel and spindle are made of metal. A jeep rim was used around which were welded wings from thin sheet. A thick wire was welded around the wings, like at the wooden wheels, with the obvious purpose to increase the wheel resistance against water force. The bridge tree is from a metal pipe as the wheel axle is (Fig. 16; Pl. 48). Grinding facility is located on a high floor of about 0.70 m, entirely occupying a part of the mill house interior (Fig. 16). Runner stone has a diameter of 0.75 m.

EFTIMIE MURGU

Eftimie Murgu commune, formerly known as Rudăria, is settled on the south-eastern frame of Almaj Depression. The Rudăria Creek, on which is the largest concentration of preserved mills in the Banat descends from the Almaj Mountains, under Svinecea Mare (1224 m). Along a route of 22 km, to the mouth of the Nera, it crosses a deep and savage valley; out of mountain it cut a spectacular gorge sector (Sencu, 1976, p 66).

1. MILL FROM TUNNEL [*Moara de la Tunel*]

It is situated at Rudăria Gorge entrance; channel to supply water from the Rudăria stream was dug in crystalline schist rock, hence the name of Mill from Tunnel. Channel of 1.10 m wide and of 1.60 m height, has a loop trail from the water outlet to the river mouth, and again in the water of the Rudăria. At the mouth of this loop, in the rocky slope of the Rudăria Valley, a pit was dug above which was placed the Mill from-Tunnel. Seen from the perspective of human effort to break through the mountain wall, even on a short distance, to dig a large bucket in the same rock for mill location, I might say that it is one of the most beautiful and spectacular molinological arrangements in the Banat. Now abandoned and in state of ruine, the Mill from Tunnel causes admiration and sadness like all ruined historical monuments.

Wooden building had a quadrilateral plan of 3.78 / 3.50 m (Pl. 87; Fig. 29). Board walls of planks, 1.70 m high are dressed outside with a shingles covering. This way of wall protection, which can also provide a thermal comfort, is frequently found in dwellings of Rudăria boundaries, but also in household wooden buildings located within the built up village area. The two frontons of the gabled roof were closed with shingle wall (Fig. 29; Pl. 86, 87). A floor of laid on beams planks separates the two levels (Fig. 29; Pl. 86). Mill house was placed with the sole on four embedded in the rock wooden pillars, on which beams supporting the floor were fixed.

Hydrotechnical facility suffered modifications under the impact of the modern civilization. The wooden fork on which sat the stone frog was preserved. Wheel and its vertical axle are of metal (Fig. 29). Grinding plant was partially dismantled. Runner stone has a diameter of 1.00 m. Stones thickness is remarkable, the bed stone being of 18 cm thickness, and the runner one of 15 cm. Mill had a bridge tree similar to those encountered at Răcăşdia and Vrăniuţ, for example.

2. ROŞOANEA MILL [*Moara Roşoanea*]

Construction was made in the same gorge sector, being located downstream the Tunnel Mill, under the road that crosses Rudăria Gorge. The arrangement of mill location was made on the left side of the valley, which was slightly terraced, so that the mill was easily placed on the embankment of rocky wall in part and in part on two massive acacia stuck in the riverbed pillars. The two pillars are placed asymmetric in the river bank (Fig. 30; Pl. 89). Mill planimetry shows a quadrilateral of 3.00 / 3.10 m. Mill walls placed on sole are made of very wide machanically processed boards. The square hipped roof has a shingle covering (Fig. 30; Pl. 89). Roof ridge that reaches at the rate of 3.41 m is barely visible from the road through the gorges, under which is located the mill. A pond of tree trunks was arranged upstream, very close to the mill (Fig. 30). Intake gutter, from a cut metal pipe, takes the water from the pond edge. Wheel and its axle are of metal, but placed on a wooden base. Bridge tree introduced in the hook is a thin metal pipe.

3. VILOANEA MILL [*Moara Viloanea*]

It is between the way through gorges and the river bed, having a similar topography to Roşoanea Mill. Concrete structures in the lower chamber have changed the initial state of the monument (Fig. 31; 107; Pl. 90).

Mill house has walls high of 1.89 m, from crowns of horizontal beams ended in joinders. The roof in triangular shaped slopes gets up to rate of 3.85 m. Shingle was the covering solution. Mill was located at a rate of +2.28 m from the riverbed, and for this the building solution was a site on the slope land and wooden pillars (Fig. 107; Pl. 90). Pond was built of tree logs in horizontal crowns over which was raised a parapet of short beams to prevent erosion at the dam base as eaves do. Water inlet gutter to the wheel is of sheet with open rectangular section (Pl. 90; Fig. 31; 107).

4. THE OBSTINATE BETWEEN RIVERS MILL [*Moara Îndărătnica dintre râuri*]

Mill site between two branches of the river and the counterclockwise rotation of the wheel explain the name of this mill, *The Obstinate between Rivers* Mill. The plan is a quadrilateral of 4.00 / 3.10 m (Pl. 91). The walls of horizontal beams crowns, of 1.49 m height are placed on the sole (Fig. 32). The roof in triangular shaped slopes has a shingle covering. The floor separating the two levels was made of beams, half of it being placed on a sole, the other half being elevated over a beam (Fig. 99; 0Pl. 91). The walls are closing in joinders; there were used stanchions embedded in sole and rope only at the door, placed in one of the corners. Mill house is +2.04 m rate from the water level, being built on wooden pillars and a pile of dry masonry in one of the corners (Fig. 99; Pl. 91). One of the set initially wooden pillars was replaced with a metal pipe. Hydrotechnical installation is made of metal in a great measure. Wheel and its vertical axle are of pipe and sheet. Gutter bringing water from storage tank was made of tin. Grinding installation is a simple one and directly placed on the beams floor. Mill grain basket set on a wooden frame that was placed on four arms attached with metal clamp collars on mill bed.

5. THE OBSTINATE FROM THE WALL MILL [*Moara Îndărătnica de la perete*]

It is on the Rudăria riverbed left bank; it is abandoned and the hydrotechnical installation was laid waste. Mill was built of crowns of horizontal beams ended in joinders. The walls have height of 1.56 m. The roof in triangular shaped slopes has a shingle covering (Fig. 33; Pl. 92). The whole construction is supporting on the rocky wall of the valley and two double set in the riverbed wood pillars. Pond was destroyed entailing that mill abandonment. Gutter which brought water to the wheel was made of three thick planks. The fork and stone frog are still preserved. Metal wheel with the vertical axle fell down (Pl. 92; Fig. 100). Quadrilateral plan of the building was of 3.50 / 2.90 m. Grinding plant was located on the easy raised mill floor. Solutions for the mounted on four arms basket, driver and flour chest were like those from the neighbouring mills.

6. TRĂILOANEA MILL [*Moara Trăiloanea*]

Mill has a quadrilateral plan of 3.00 / 3.60 m. Walls in beams crowns are isolated outside with a layer of shingles. Roof in triangular shaped slopes and the two timpana have shingles covering (Pl. 93; Fig. 34; 94). Wall height is of 1.62 m, and the roof reaches +3.45 m rate. Recent interventions are seen as having been aggressively used concrete to strengthen the bank valley, under which the mill is located, at mill foundation and gutter (Fig. 93; 94; Pl. 93). Initially mill building was set on wood pillars and on rocky bank of the Rudăria. In a later stage a pile of concrete masonry has been poured, near the wooden pillars (Fig. 34; 94; Pl. 93). Wheel with its vertical axle are of metal.

7. BĂȚOLEA MILL [*Moara Bățolea*]

Mill has a simple quadrilateral planimetry, of 2.70 / 3.40 m. Walls were built from crowns of horizontal round wooden beams, fixed with joinders (Fig. 35; 95; Pl. 94). Roof in triangular shaped slopes has a shingle covering. Shingle was used for mill house outer insulation, up to the local tradition of timbered construction. Mill walls were of 1.75 m height, roof ridge reaching to +3.50 m rate. Roof was placed on beams fixed on the crown, creating at the entrance and margins wide eaves (Fig. 35; 95). We may remark the use of round beams in walls construction; for the floor that separates the two mill levels summary processed thicker beams were used. The floor beams were set on mill house sole, over which were built later perimeter walls (Fig. 95; Pl. 94). The whole construction of the mill was set on massive wooden pillars, on which the sole was placed. The underground level was in a shape of opened oval hole; it was on its turn dressed in a dry wall with no binder. It is notable that some of the three pillars on which sole was set were placed in structure of dry wall of underground mill room, which went down to rate of -1.80 m (Pl. 94; Fig. 95, 96).

8. PĂȚOANEA MILL [*Moara Pățoanea*]

Mill is placed in the Rudăria wider valley under the access road toward the village (Fig. 36; Pl. 95). Mill house, entirely of wood, was made of shaped well fixed beams. Planimetric, it is on a shape of quadrilateral, of 3.80 / 3.00 m. Walls are high up to +2.06 m rate, and the roof in triangular shaped slopes reaches a rate of +4.11 m (Pl. 95). The roof covering in made of shingles. Structurally, the building of Mill Pățoanea is very close to the upstream one, namely Bățolea Mill. The shaped beams floor is placed on the mill house sole. The whole construction was placed on three massive wooden pillars and on one of the Rudăria Valley wall side (Pl. 95). The oval wide open pit, carved into the river bank, was plated with dry wall.

Hydrotechnical facility reflects the influence of modern industrial civilization, extensively using iron and concrete. Wheel with vertical axle is of metal, and the supply gutter is of concrete. We find out the same appeal to recent materials, from tin and concrete, also in the case of grinding installation.

9. MILL FROM FIRIZ
[*Moara de la Firiz*]

The entire facility underwent substantial rebuilding in 1993, supply channel, gutter, hydrotechnical installation being reconstructed from concrete and metal. Mill house is made of mechanically preocessed logs, joined by cuts in a shape of “swallow tail” (Fig. 37; 105; 106). Walls are covered in shingle. Rectangular plan dimensions are 3.30 / 3.60 m. The gabled roof has tile covering (Pl. 96; Fig.105; 106).

10. HĂMBĂROANEA MILL
[*Moara Hămbăroanea*]

Hămbăroanea mill is built within the built-up village area, on a concrete curbs supply channel on the Rudăria rivulet (Fig. 38; 103). It has a neat construction of the beams with joinders system; its square hipped roof has shingles covering. Rectangular plan, of 3.20 / 3.20 m, straddles an extended supply channel. The walls were elevated up to 1.58 m, and roof does not exceed +3.26 m high (Pl. 97; Fig.103). A ceiling of planks laid on beams separates the inner mill house. The floor separating the two levels of mill is slightly raised over the space occupied by grinding installation. Call for metal materials, in ground basket, at the arms that support it, are evident in the mill inner architecture. Moreover, it is visible at hydrotechnical facility, where the wheel with vertical axle of the linkage is also of metal. The ground level preserves original appearance of a dug into the soil pit down to -1.69 m, with dry wall without binder (Pl. 97; Fig. 38; 103).

11. FIRIZOANEA MILL
[*Moara Firizoanea*]

Mill should be looked for in the built-up village perimeter, on the same supply channel. The building was recently renovated, as the outer mill appearance shows. It has a quadrilateral plan of 3.40 / 3.10 m (Pl. 98; Fig.39; 101). Walls 1.51 m high were tired in shingles, a traditional technique in the area, found also at sheds, barns, pigsties of rural households' construction in the area.

Firizoanea mill is a construction placed entirely on wooden pillars (Pl. 98; Fig.101; 102). Sole is set in the four pillars, on which the floor of beams processed on two sides sat. The square hipped roof reaches to +3.40 m rate. The solution of placing mill on pillars was imposed by the plan land from the Rudăria river meadow (Fig. 102).

12. MICLOŞOANEA MILL
[*Moara Micloşoanea*]

It is identified on a supply channel made on the other side of the stream Rudăria. It has a special wooden architecture, in my opinion, which gives a spectacular look to the monument (Pl. 99; Fig.40; 104). Low meadow ground, imposed in this case too a building supported by pillars. It has a porch and a wooden walkway which give personality to the monument (Fig. 40; 104; Pl. 99). Mill plan is a square of 2.90 m. The porch along the side of the mill access door is of 0.80 m wide. Wall beams closes, this porch extremity. Walkway mentioned before with the same width as that one of the porch continues until the pool (Pl. 99). The gabled roof with shingles covering is up the porch too (Fig. 40; Pl. 99). Hydrotechnical installation, with wheel and drive shaft of metal, and sheet inlet pipe, shows the impact of current industrial civilization.

13. BRUSOANEA MILL
[*Moara Brusoanea*]

The monument has an identical architecture with that of Micloşoanea Mill, whose neighbourhood, moreover, it is on the same supply channel.

Quadrilateral plan of the building has dimensions of 3.26 / 3.06 m. Walls are of carved beams concluded with joiders, called there "în ţopi" too. Wall height is of 1.60 m (Pl. 100; Fig. 41). A porch with no rails is arranged along the side with the acces door. This covered porch is of 1 m in width. The square hipped roof rolls over the mill porch too (Fig. 98). The whole construction is placed on wooden pillars. A beams sole was fixed on massive pillars, above which a floor of planks processed on two sides was caught on (Fig. 98; Pl. 100). Hydrotechnical facility was built from metal tube and sheet.

14. MILL FROM THE FIELD
[*Moara din Ţarină*]

Wooden building with rectangular plan of 3.86 / 3.76 m. Walls of hewn beams are 1.80 m height. Wall joining technique is the usual one in the area, namely in joinders (Pl. 100; Fig. 42). The gabled roof has shingle covering. Hydrotechnical facility entirely built of sheet iron and metal pipes, is located in an underground room. It was dug a quadrilateral pit in the land of meadow deep -1.72 m (Pl. 101; Fig. 42). It was clad with dry stone wall, without binders.

FENEŞ

The Feneş rivulet is a tributary of the Timiş with which joins waters near Armeniş. Together with its tributary, the Pârâul Alb, gathers its waters from the western slopes of the Ţarcu Mountains, on a length of 24 km (Sencu, 1976, p 60). Formerly in an impressive number, the mills of Feneş, only three in a state of ruin nowadays, exploited hydropower potential of those waters.

1. BOEREŞTI'S MILL
[*Moara Boereştilor*]

Mill was built of wall having at base a quadrilateral of 4.35 / 4.25 m. Plaster walls have height of 1.74 m. The gabled roof, with the ridge of 3.90 m, has a tiled covering. A concreted floor separates the two mill structures. Grinding plant was placed on a tree trunk bed of a prismatic plan in section. It measures 1.47 m / 1.10 m. Runner stone diameter is of 0.90 m. Heating installation, as a fireplace with brick chimney, was placed in a corner of the mill. Hydrotechnical installation is completely destroyed, so that no judgment could launch on it. The mill being abandoned almost two decades ago the supply channel and the lower chamber are strongly silted up.

2. LĂZĂREŞTI'S MILL
[*Moara Lăzăreştilor*]

Mill built of wall with a quadrilateral plan of 4/4 m. Walls are of 1.64 m height, and roof ridge reaches at the rate of 3.47 m, measured from the inside stepping level. Superior room with grinding facility measures inside 3.50 / 3.50 m. Bed on which the ground facility was fixed was built of manufactured from a single piece of a tree trunk beams. It is of 1.44 / 1.16 m. Runner stone diameter is of 0.90 m. The supply channel was dug on the left bank of the Feneş stream. The mill was abandoned more than a decade ago, due to the water supply channel from the Feneş outlet silting. Wooden hydraulic system rotted and disappeared.

GÂRLIŞTE

The village of Gârlişte is situated in the Caraş Valley, at Caraşova and Goruia boundaries. It belongs to the commune of Goruia administrative structure. The Gârlişte stream, originated in Anina Mountains, flows through a route oriented southeast-northwest to the confluence with the Caraş. The ensemble of eight mills, located at the south-eastern extremity of the village, until the the gorge entrance, are yet today, in 2012, registered in the official list of Romania Historic Monuments, although they disappeared years ago. Only one mill in a state of ruin near the houses from the village edge is preserved. Brani's Mill was also modified and transformed, connected to electricity, but we thought fit to point it out only from the perspective of the monument architecture. Mills missing but recorded in the List of Romania Historic Monuments are:

1. BRANI'S MILL [*Moara Branilor*]

It was a simple construction, yet elegant, following rural architecture style from the mountain Banat or rather that one of the late nineteenth century in the Caraş Valley. The walls were of plastered stone, the gabled roof had tile covering. The whole construction was placed on a semi-cylindrical vault of stone under which the hydrotechnical facility was set. (Fig. 108).

Planimetrically the monument is included in a rectangular plan. A stone of an older mill was laid as an entrance step (Fig. 108). Underground architecture looks like a room of wall, supported on the long sides by two semi-cylindrical stone vaults. Hydraulic plant was modified being introduced a metal wheel with vertical axle of pipe (Fig. 108).

GÂRNIC

Gârnic, a village of Czechs, is situated in the karst area at about 20 km north-east from Moldova Nouă. The Camenița Valley along which villages of Sichievița and Gornea are also settled originates in this area. From this restless limestone area starts too the Gramesca Valley towards south-east. A number of six mills are still preserved at Gârnic, some running, two of them being placed in the built-up village area.

1. ȚILINDAR MILL [*Moara Țilindar*]

It is located in a very picturesque area on the Gramesca Valley where a complex of four very beautiful and interesting mills was arranged in cascade. Being located at about 5 km far from Gârnic, access is difficult, only by waggon or car. Remoteness from the village otherwise determined also the mills constructive structure, each one having a small compartment, in fact an animals stable. That attached stable was built of limestone rock with a small mangle inside. Limestone tuff construction provides an increased thermal comfort in winter and summer. The mill itself was made of wood, with a heating system in its turn.

Țilindar Mill is a rectangular building with two compartments, one for the mill, the other one for animals sheltering; mill itself measured 3.72 / 4,02 m (Pl. 110). The gabled roof has cement tiles covering. Stable in the back of the mill was built from limestone tuff and has only a manger inward for horses feeding (Fig. 62; 110; Pl. 110). The mill was built of wood, from horizontal beams crowns ended in joinders system. A log wall separates mill from the stable, therefore one of the long sides of the wooden building was equipped with two doors, one for access in the mill, the other for animals' access behind the mill (Fig. 49; Pl. 110). Only the mill acces door is fixed between the two upright beams (fig. 49). Mill had a fireplace and therefore a stovepipe was built through the cover (Fig. 62).

Grinding facility is located on a platform of thick planks built throughout the entire room (Fig. 110; Pl. 110). Grinding basket rests on one of the mill walls and on one yoke fixed in the wall and in mill bed (Fig. 110). Very high stone case is made of sheet iron. Runner stone had a diameter of 0.90 m. The door has an entirely of wood with an ingenious locking system. Hydraulic system is within an underground space, a deep pit of -2.12 m that was introduced in carved stone masonry (Fig. 49; PL. 110). Wheel and its vertical axle are of metal, only the bridge tree and fork on which the wheel is placed are still of wood (Fig. 62; 110). The forced pipeline is of metal pipe with a (little) bucket mounted in its mouth (Fig. 78). Bridge tree has a leverage system with wedges (Fig. 110).

2. COTÂRLAICA MILL
[*Moara Cotârlaica*]

Mill is located downstream the slender thread of water flowing through limestone and very steep valley. Structurally entire system is identical to that one of Țilindăr Mill. Here too, we meet two compartments in mill construction (Fig. 62; 50; Pl. 111). Limestone walls of secundary room are of 1.20 m height and those ones of wood are of 1.61 m height. The gabled roof has shingles covering (Fig. 50; Pl. 111). A shingle stovepipe crowns the mill roof to indicate otherwise a limestone fireplace down. Wooden walls are set in the door frames through tongue-and-groove system (Fig. 63). Grinding installation in this case is placed on a beams platform. The two compartments of mill are separated by a log slab placed on a sole. Hydrotechnical facility was located in semioval dug into the limestone wall pit. Sole supporting wooden construction is based on solid ground around the underground room, and one of the building corners rests on a massive wooden fork (Fig. 111). Hudraulic system has identical characteristics to the wheel, to its shaft and forced pipe with the (little) bucket (Fig. 50; 63; Pl. 111).

3. BERANA MILL [*Moara Berana*]

Its location is downstream Cotârlaica Mill. It is built on the hill slope and therefore the limestone wall of mill stable was barely raised above the ground (Fig. 61; 109). The plan is a rectangle with two compartments measuring on the sides 6.70 / 3.70 m, of which stable has 3.70 m / 3.10 m (Fig. 61). The gabled roof has shingles covering. A shingle stovepipe rises above the ridge. Log walls end in joinders system. We may note the wall with two entrance doors for mill and stable, with tongue-and-groove system between the two doors. A wall from beams wreaths separates the two rooms. Wooden manger draws attention through the simple binding system by nails. Grinding installation in this case is placed on a platform raised about 0.70 m. Basket is supported by two fixed in the wall and mill bed parallel yokes (Fig. 109). Hydrotechnical facility has wheel and the vertical axle of metal. The forced pipeline has a (little) bucket too. Everything is located in the dug into the limestone wall pit to a depth of -2 m. Entire mill wooden building is proped up on the limestone wall of the underground room and two wooden pillars.

4. MAŞTALIC MILL [*Moara Maştalic*]

Mill has a rectangular plan with two compartments, of 6.50 / 3.70 m sides. The back limestone tuff room was the horses' shelter. The gabled roof of 2.80 m in height has a corrugated asbestos cement covering. The walls of mill are of 1.70 m finished in dovetail joinders system. The whole building was abandoned and is in a state of ruin. Sheet stone case that began to rust emphasizes such a state of ruin of the mill. Hydrotechnical facility located in the underground level of the mill has the same technical features as those ones invoked for the other mills.

5. VILLAGE MILL (1)
[*Moara din Sat* (1)]

A small wooden facility was placed under the road that winds through the village (Fig. 59). Rectangular plan has on sides 3/2.30 m. Walls from crowns of bars, 1.60 m tall, ending in joinders system. The gabled roof, 3.20 m high, has a tiled covering. A beam sole square section supports the small development from Gârnic built-up area. Hydrotechnical facility was located in a pit of -1.70 m depth, dressed in a wall dry for protection. Mill building sits on two wooden pillars and the dry wall. Wheel with vertical axle were made of metal. Supply gutter from a round concrete pipe, has a wooden hole stopper, a rudimentary (little) bucket fitted at its end. Lifting installation preserved archaic forms with wooden wedges lever (Fig. 59).

6. VILLAGE MILL (2)
[*Moara din Sat* (2)]

Mill is placed at the down village valley edge, within the built-up village area. We find here the same modest wooden structure that measures 3.30 / 3.30 m (Fig. 60). Wooden walls, ended in joinders system are of +1.80 m height (Fig. 60). The gabled roof has tile covering. Gables are of vertical hammered planks. The door was mounted on the narrow side of the mill between two set in the base and crown upright beams (Fig. 60). Underground chamber with hydraulic system has is of -1.90 m depth. Hydraulic system has the same characteristics of concrete and metal to wheel and axle, as noted at the Village Mill 1 (Fig. 60). The underground chamber architecture is to be noted in this case, lined in wall bounded with concrete.

GLOBURĂU

Globurău Village is situated on the Belareca river flow, at its exit from the gorge narrowing, bordered by peaks of the Cerna Mountains. Only two mills of the five operational ones along the Belareca are preserved now, of which one is disabled and abandoned.

1. MILL 1 [*Moara 1*]

Planning is based on a quadrilateral plan, of 2.70 / 2.82 m and height does not exceed 3.26 m height (Pl. 76-77). Construction was made of horizontal beams wreaths placed on a thicker sole. The walls are of 1.87 m height, being ended in joinders system. The beams are still wearing the marks of incision lines made by manufacturers (Fig. 28). The gabled roof has a tile covering. Two beams that pierce the lateral walls support grinding plant (Pl. 76; Fig. 28).

Builders dug a round pit deep -2 m, which houses the hydraulic system (Pl. 76). Limestone, abundant in the area, was used to cover underground walls with a dry wall without binders. Water run channel is protected in the same way by a wall of boulders without binders. Wheel and spindle are from massive carved wood (Fig. 28). Hub has flat, extremely primitive wooden pallets (Fig. 28).

2. MILL 2 [*Moara 2*]

Abandoned, in a state of degradation, the mill is a more recent building. It is on the same supply channel that takes over the water from the Belareca, being located at 200 m from Mill 1 (Pl. 77-78). The sole is of beams over which machanically processed planks walls were built (Pl. 78). Building has a quadrilateral plan of 3.00 / 3.00 m. Walls height reaches +1.50 m, and roof ridge is of +3.15 m (Pl. 78). The underground level of mill has a quadrilateral plan that goes down to -2.00 m. A river rock wall without binders separates this underground mill space (Pl. 78). The walls are mounted on edges in upright beams secured at the base and crown. The gabled has tile covering. The floor separating the two facilities is of beams. Two beams that pierce the lateral walls support grinding plant. Its arrangement has a sloppy look (Fig. 112). Runner stone, with diameter of 0.70 m, is massive (Fig. 112). Hydraulic system is in a pit of -1.76 m depth, protected by a dry stone river wall, without a binder (Pl. 78; Fig. 112). Placed on a wooden crotch spindle and wheel were made of metal (Fig. 112).

ILIDIA

The village lies at the foot of Anina Mountains, between the long ridges that go down to Oravița Depression (alt. 400-500m). The Vicinic stream has its source between limestone edges at about 4 km east of the village, where runs through a spectacular gorges sector. Throughout its course at Ilidia, Macovişte, Ciuchici, Nicolinț and Rusca an important number of mills with horizontal wheel worked using that river energy.

1. THE TWO MILLS
[*Morile ale Două/ Morile de două*]

At the eastern extremity of the village, on the right bank of the Vicinic stream, or Valea Mare as it is called by the inhabitants, the Two Mills are near a stray group of houses. The Two Mills are known in local toponymy also as “the twice mills”. Access to them is made over a stone arch bridge. One of the two mills was built of stone wall and the other of wood. The pond was made at about 300 m east to take water from the Valea Mare riverbed; water is brought up to the curve level through a supply channel.

2. WALL MILL [*Moara din zid*]

It was located on the sloping land, under wood mill, towards the stream bed. Construction, like a village house, was made entirely of limestone which is abundant in the area. The gabled roof has tile covering. It has a rectangular plan of 4.11 / 5.13 m. Access to gently sloping land is made in two stages. The walls are of limestone carved stone, the same stone being used also to close the two gables. Hydraulic system is housed in the built room, covered with a semi-cylindrical vault from carved limestone rock (Pl. 10). Wheel, spindle and bridge tree fixed on the sole to support whole hydraulic installation are of wood. Water brought by the channel stops in a pool, from where it is directed through the wooden gutter to hydraulic wheel. The pool is provided with lateral a slit to direct water into a diversion channel, when the mill doesn’t work. The two valves of the pool are open by a wooden obstacle. Grinding facility is located on two massive carved beams, over which the other two shorter beams were placed. The entire occupied area is of 2/1 m. Runner stone has a diameter of 0.80 m. Wooden basket, in a shape of truncated pyramid has on base 84/87 cm; it is set in a framework of four set in the mill bed upright beams (Fig.5; Pl. 9).

3. WOOD MILL [*Moara din lemn*]

We called conventionally this mill that was worked entirely of wide beams in joinders system. Rectangular plan measures 4.02 / 3.14 m (Pl. 11). The gabled roof, sitting on rafters, has now a sheet covering that replaced the old shingle covering. Short access door of only 1.32 m in height is set between two vertical pillars (Pl. 12; Fig. 114; 115). The lateral walls in this access corner are set in the groove practiced in the two pillars which double the jambs. The current concrete floor, separating the mechanical installation of the hydraulic is poured over beams floor. Grinding plant has the same construction structure, from a massive bed, wooden basket supported by a frame of four pillars, which we meet at every Ilidia mill.

Room housing the hydraulic system is underground, dug into the sloping land and was stiffened by a wall (Fig. 6; 114; 115). A carved beam, standing in water, on which frog was placed supports the wheel and spindle (Fig. 6; 114; 115; Pl. 12). The spindle, wheel and bridge tree are from metal.

4. MILL FROM MUICAN
[*Moara de la Muican*]

It is located 150 m about from Bălani's Mill, with the front towards the main street. It was a timber mill, originally covered with shingles, which is now degraded (Pl. 15, 16; Fig. 118). It was located on the same supply channel with Bălani's Mill. Base plan of the building had a rectangular shape of 4.60 / 3.41 m (Pl. 117). Building was placed on a sole over which wide boards walls were built, with joinders system the corners and upright beams on the short side, where the acces door was mounted. Short boards of about 2.50 m were used, so the manufacturer was required to use, for the long sides, embedded in the sole and string upright beams; then wooden boards were fixed in through the tongue-and-groove system (Fig. 113; Pl. 16). The square hipped roof had had shingles covering, over which an unfortunate sheet cover was placed (Fig. 118).

The mill location on a hilly ground shows a bump in the slope in which the pit deep about -2 m was dug, to place there the hydrotechnical installation. A carved stone wall without binder wrapped the pit and a part of the channel (Fig. 113; Pl. 15). Wheel with hub and wooden spindle were placed on a wooden beam fixed in the water; it had at one end a frog in which spindle heel was placed, and the bridge tree with wooden wedges at other end. Supply channel closed with a dam foreseen with two openings, one for the sluice box, the other for water refuge channel, when the mill was not working. The sluice box was from a carved tree trunk.

5. BĂLANI'S MILL [*Moara Bălanilor*]

The mill is located within the built-up village limits and therefore has a neat look integrated to Ilidia village architecture, where houses were made of stone wall since the mid nineteenth century. Construction with rectangular plan, of 5.75 / 3.92 m, was made of carved limestone (Pl. 118; Fig. 7; 116). Carved stone walls are plastered. The gabled roof has a tile covering. Lower chamber with water wheel is covered with a semi-cylindrical vault of 1.39 m in hight (Pl. 13, 14). A concrete floor separates the two mill chambers. Mechanical installation is structurally and in terms of solid wood materials identical with those described previously at Ilidia mills (Fig. 7; 116). Runner stone has a diameter of 0.75 m. The hollowed from a piece of wood driver is placed under the basket mouth; year 1941 is carved on it.

What calls our attention is the supply channel along which there were four mills, whose route was under houses through yards and gardens of some households. It is previous to village systematization that gave the current houses form with fronts toward street, dating back before the mid nineteenth century.

6. THE SMALL MILL [*Moara Mică*]

It is within the built-up village limits just in the center of Ilidia; it was built on the same supply channel with Bălani's Mill, Mill from Muican and another disappeared mill under the hill Cucuiova. Water inlet for supply channel is arranged across the river, near Adam Voica's house and crossed the village paralel to the main road, to return to the Vicinic riverbed after the *Small Mill*. Typologically it is identical with Bălani's mill being built of limestone with closed with wall gables. The gabled roof has a tile covering. The plan is mono-celular of 6/4 m (Pl. 17-18). The lower chamber with hydraulic system is covered with semi-cylindrical vault (Fig. 8; PL. 18). Supply channel had a pool with two openings, one for the sluice box, the other for diverting water flow on refuge channel when the mill was stopped. We may remark therefore at all Ilidia mills the use of a standard plan of arrangement of the hydraulic system with tree trunk or boards sluice box, and a water refuge channel which makes a loop around the mill, for situations when mill is stopped. Grinding plant from the Small Mill had the same typological features that we have described at other mills from Ilidia, the difference being given only by sizes. Runner stone had a diameter of 0.80 m, identical those of the Mill from Pit and The two Mills.

7. MILL FROM PIT [*Moara din Grop*]

Mill is located at the western extremity of the village, under Oblița hill. Water was brought by a channel to collect water from the Vicinic in the neighborhood of Gheorghe Roşianu's house; it meandered through the houses, and then suddenly made a detour to south up to mill. Mill construction is of wood, but placed on a stone foundation. It has a rectangular plan of 4.90 / 3.10 m (Pl. 7; Fig. 4; 117). Walls were built from carved beams placed in crowns up to a hight of 1.70 m. Beams were joined at corners with joinders system. Access in mill was made through a made of one piece door located in the northeastern corner of the mill. Two pairs of fixed in sole and rope upright beams solved the door location and, on the other hand, tied beams placed in crowns on this corner of the mill. The square hipped roof has a recent sheet covering placed directly on the framework. Carved door inscriptions, with years 1865 and 1871 suggest some history marks of that Mill from Pit. A placed over the old wooden structure cement floor separates the two compartments of the mill. Grinding installation preserves entirely its original wooden structure, only the sheet iron basket and the bridge tree with screw are recent upgrades. We may remark also in this case the massive carved beams of the mill bed, over which two shorter beams were seated to place there the two stones (Fig. 4). Water from storage tank, located at about 1 m higher than the rate ± 0.00 comes through gutter to mill wheel, located at the rate of -1.45 m on its turn (Pl. 7).

Hydraulic system was placed in a pit of a rectangular shape; it was dug in the slope ground, dressed in wall and covered with a semi-cylindrical vault (Pl. 8; Fig. 113, 117). Refuge channel was dug as deep as the hydraulic system location pit. It continues, in this case, on a length of several hundred meters to another now abandoned mill, located in meadow from Sălişte.

LĂPUŞNICU MARE

Village Lăpuşnicu Mare is in Almăj Depression at the border with Moceriş and Bozovici. The Lăpuşnic creek, a tributary on the right bank of the Nera, originates in Almăj Mountains and crosses the village from north to south, like an axis.

1. LUCHII MILL [*Moara Luchii*]

It is built within the built-up village area on the left bank of the Lăpuşnic stream. It is a quadrilater brick construction of 4.40 / 3.70 m. The gabled roof with tile covering reaches to rate +4.20 m (Fig. 64, 119). A concrete floor separates the two rooms of the mill. Grinding plant was placed on a cement bed fixed together with cement floor. Modernizations also affected hydrotechnical facility. Storage pool has concrete perimeter walls. Forced pipe that leaves the storage tank is a metal pipe, with a (little) bucket in its mouth. Wheel with vertical axle is from metal. Mill has a stopping system on a scale descending from the grinding chamber to the wheel (Fig. 119). The lower chamber with hydrotechnical installation has a rectangular shape of concrete wall of 3.60 / 2.80 m. Refuge channel 1.70 m wide is dressed in wall on both sides (Fig. 64, 119).

2. BĂLĂCENI'S MILL
[*Moara Bălăcenilor*]

It is located along the same supply channel on which Luchii Mill also lies. It is a brick wall construction with quadrilateral planimetry, of 3.90 / 4.20 m. Wood door is of 1.60 / 0.80 m (Fig. 65). The square hipped roof has an iron sheet covering (Fig. 65). The inlet system and hydrotechnical facility show the same modernization interferences and use of latest construction materials. Storage pool has concrete structures with two openings, one for the forced pipeline, other for the refuge channel when the mill is stopped. Forced pipe, meaning the sluice box, was cast in concrete with a (little) bucket at its lower end. Wheel and its spindle are of iron (Fig. 119). The lower chamber is of 3.10 / 2.60 m being completely built, with two openings for the sluice box and the water refuge channel of 1.40 m wide. A brick vault of 1.80 m in hight separates the lower chamber of the mill access. The (little) bucket mounted in the sluice box mouth has a diameter of 0.15 m (Fig. 64). Metal wheel diameter is of 1.20 m.

3. GHERMĂNEŞTI'S MILL
[*Moara Ghermăneştilor*]

It is located downstream Bălăceni's Mill, on the same supply channel with outlet in water of the Lăpusnicul, beyond Luchii Mill. Construction of brick wall has a simple rectangular planimetry of 4.20 / 3.90 m. Mill house has ceiling, with a gabled roof and tile covering. Recent technical upgrades have affected the grinding plant and hydraulic system. Thus, wheel and axle were made of metal, traditional wooden sluice box [*butoni*] was replaced with a metal pipe. A concrete floor separates the two mill levels. Grinding facility is placed on a concrete construction.

LUNCA FLORII

Lunca Florii is part of the administrative structure of the commune Cornereva, being one of the 42 hamlets scattered in the short but deep valleys, which crosses the Cerna Mountains. It is located north of the hamlet Dolina, on the Camăna stream valley. The Camăna has its origin under the Cozia peak (1450 m) having a course from north-west to south-east. The villages Cornereva, Zmogotin, Zănogi, Lunca Zaicii and Lunca Florii lay along of it. Village Lunca Florii is located in south-eastern end of the Camăna Valley.

1. CĂPĂŢ'S MILL [*Moara lui Căpăţ*]

Mill was recently restored from wide beech boards placed over a beam with a quadrilateral section (Fig. 21). Planimetric is part of a quadrilateral coordinates of 3.40 / 3 m (Pl. 57). Walls are completed in joinders system, only the side positioned door was set in two upright beams. The gabled roof has galvanized sheet covering. The walls have a height of 1.27 m, and the roof at ridge reaches of +2.78 m. Mill basket, above grinding plant, rests on a fixed in the wall perch and on a fixed in mill bed one. Runner stone has a diameter of 0.90 m (Fig. 21, 120, Pl. 57).

Hydrotechnical facility was placed in a not too deep pit, of -1.72 m (Fig. 21, Pl. 57). A dry wall, slightly rising above the soil, protects the pit edges from water erosion. Mill house rests, in fact, on this river rock dry wall. Mill wheel was made from an auto rim on which steel blades were welded. Spindle and bridge tree are from a metal pipe. Storage tank, at the end of the supply channel, is summary arranged from some river rocks, longer slabs and a poles fence (Fig. 21). Water inlet gutter was made of a thick hollowed in the middle tree trunk.

LUNCA ZAICII

Hamlet Lunca Zaicii is part of the structure of Cornereva commune, being located north of Lunca Florii. The Camăna stream flows along this village with houses scattered on both sides of the valley.

1. VULPEŞ' MILL [*Moara lui Vulpeş*]

Construction has a simple planimetry, a quadrilateral one of 3.00 / 2.80 m (Fig. 22, Pl. 58). Mill preserves its archaic nature, where everything was made of wood. Mill walls, of 1.29 m in height, are made from horizontal beams crowns connected in joinders system. The quarter hipped roof has a shingle covering (Fig. 22, 121, Pl. 58). A rudimentary floor of beams separates the lower mill level from grinding installation.

Hydrotechnical installation from Vulpeş' Mill is entirely of wood, with an archaic structure and shape. Wheel spindle, bridge tree, mill sole under mill heel, are all of wood. Intake gutter was made of a hollow tree. Wheel, called bucket [*ciutura*] in the area, has wooden wings. There is a phenomenon of retardation in mill maintenance. The old wheel wings are shaped like carved spoons, the latest, that replaced the damaged ones, are simple summary processed plank pieces embedded in the wheel hub (Fig. 22, 121). Bridge tree, to adjust the distance between the two stones is entirely of wood, and is driven by means of wooden wedges. A dry wall protects the lower mill level.

MEHADICA

Mehadica village is located within Mehadica Depression, part of the Caransebeş - Mehadica Depression, a well defined intramontane depression (Sencu, 1976, p 44). The Mehadica stream, having a length of 42 km, gathers its water from the Semenic slopes, from where it receives two tributaries, the Verendin and the Globul. River hydropower potential was exploited on the lower river flow; there were a great number of mills both at Mehadica and Cuptoare. Only 4 mills from a total of 12 there are still preserved at Mehadica, while those ones from Cuptoare were abandoned and destroyed.

1. ORASCĂ MILL [*Moara Orască*]

It is located within the built-up village area, on the right bank of the Mehadica. It has a supply channel parallel to the river flow along one of the village streets. Mill planimetry is a shape of a quadrilateral of 3.55 / 3.35 m (Pl. 79, 80). Walls are from wide shaped boards, mounted in vertical upright beams fixed at corners in sole and crown. Wall height reaches at the rate of 1.53 m, and of the ridge area to +3.59 m (Pl. 80). The gabled roof has tile covering. Along the wall mill has a porch (Fig. 68, Pl. 79). Grinding plant is remarkeable due to two specific elements. Basket is fixed on a pole that rotates, thus making it mobile. The stone case is made from iron sheet (Fig. 68, Pl. 80).

Hydrotechnical installation is on lower level, in a dug in the ground pit of -1.76 m rate; the pit walls are clad in stone wall without glue. The impact of modern civilization is evident at this mill too, where wheel and driving axle are from metal. The pool with concrete weir has two sheet troughs, one serves as a refuge channel when the mill is not working, the other, obviously, serves as intake pipe that leads water to hydraulic wheel (Fig. 68).

2. MILL FROM STONE
[*Moara de la Piatră*]

Facility is located on the same right bank of the Mehadica, just outside the village. Mill building is made entirely of wood, with a quadrilateral planimetry of 3.40 / 3.30 m (Pl. 81, 82). Sole was modeled of large square in section beams, above which rose by 1.27 m high the wide trimmed boards' walls. Joining walls at the corners was done in "upright beams" system (Fig. 66, Pl. 81). The gabled roof, with a ridge of +3.25 m in height, has a tile covering. The whole mill construction is based on the hydrotechnical plant pit dry wall. It was gentlely raised on the four corners with river rocks (Fig. 66). Hydrotechnical installation, placed at -1.73 m, reflects the impact of modern technical adaptations. Metal wheel is a simple construction with hardened on a circle steel blades (Fig. 66). Wheel axle as well as the water inlet gutter is from metal.

3. GHERGHINEASCĂ MILL
[*Moara Gherghinească*]

It is located upstream the Stone Mill, on the right bank of the Mehadica stream. Monument planimetry and volumetry are entirely similar to those described above (Pl. 83, 84). The building was placed on a sole of a massive processed in section beam. Quadrilateral plan is of 3.30 / 3.30 m. Wall of the beam rises up to the level of 1.28 m.

Hydrotechnical installation is located in a dug to -1.98 m pit (Pl. 83). The dry wall technique to cover the pit walls was adopted there too. (Pl. 84). The gabled roof has a corrugated asbestos cement slabs covering (Fig. 67). Gables are from boards. The impact of modern civilization may be noted also in this case, which led to metal wheel with pipe axle introduction; inlet gutter to wheel is also from metal (Fig. 67).

MOCERIŞ

Moceriş village is part of the administrative structure of the Lapusnicu Mare commune from Almaj Depression. The Moceriş stream, a tributary of the Nera River, originates in Almaj Mountains, with a course oriented north-south. Along the Moceriş stream four mills stil work nowdays.

1. ZĂBOANE MILL [*Moara Zăboane*]

It is a cubic stone wall construction, with a square hipped roof and sheet covering. Basic quadrilateral is of 4.41 / 3.56 m (Pl. 121). The mill is located at about 1.5 km from Moceriş village, on the stream with same name. Water is brought to the mill through a narrow channel from the upstream pool (Pl. 121). A concrete floor separates the two mill levels. Hydrotechnical installation is in a room of bricks placed in the hill slope whose height reaches 1.5 m. Storage pool has small sizes, because the flow of water brought on the supply channel has sufficient and constant values. Concrete wall protects a portion of the supply channel. The sluice box is from concrete in case of this mill. Grinding installation preserves the original forms. The stone case from a metal circle and the driver in a shape of very marked round mouth may be noted there.

2. STONE MILL [*Moara din Piatră*]

It is placed in the northern border of the village Moceriş, at the village stream entrance. Typologically it is entirely similar to Zăboane Mill, with the same cubic look (Fig. 122). Construction was made of stone wall without plaster; the square hipped roof has a tin covering. Recent interventions have changed, in part, the appearance of the lower room, as it was renovated with concrete (Fig. 122). Lower house of unplastered wall descends to -1.70 m from the floor level. Hydrotechnical installation is in a completely of wall space provided with openings for refuge channel and forced pipe. It has a storage pool expanded and upgraded with concrete wall (Fig. 122). In fact, the mill wheel was built from metal, only the bridge tree and the fork are made of wood (Fig. 122). Grinding plant is fully identical to those previously described at mills in the area.

PÂRVOVA

Pârvova village is part of Craina, countryside as the name suggests, linking Almaj Depression to the corridor of the Cerna-Timiş. Formerly 12 mills worked at Pârvova; only three remained there today (Ţunea, 2009, p 29, p 132, fig. 7.8).

1. CHEIA MILL [*Moara Cheia*]

It is built on a rectangular plan of 3.30 / 3.30 m, with wide board walls. The gabled roof has cement tiles covering (Pl. 102, Fig. 123). Gables were closed with vertically boards. Walls of 1.33 m in hight are placed on a base that straddles the lower house of mill. The entire building is completed in square section pillarss which were embedded in the sole and crown (Pl. 102, Fig. 123). Underground mill architecture is part of a built space that descends to -1.71 m. There in that space with stone roughly squared walls, a beam was mounted on which the frog, the bearing supporting metal wheel and the bridge tree were placed,. Linkage shaft and wheel axle are from metal pipe. Water inlet gutter at the wheel was made of metal sheet (Pl. 102, Fig. 123). Modern metal wheel has a simple architecture: the wheel blades were fixed between two concentric circles. Vertical motor shaft is mounted on a crossways rod that enteres the small circle of the wheel (Fig. 123).

2. MILL FROM GURA OSOINEI
[*Moara de la Gura Osoinei*]

It is located near Cheia Mill, similar to identity with Cheia Mill architecture and functional structure (Pl. 103, Fig. 124). It has the same rectangular plan of 4/3, 10 m. The wooden board walls finished in tongue-and-grooved joint are of 1.53 m in height (Fig. 124). The gabled roof has sheet covering. The mill has an underground architecture identical to that described in other mill from Pârvova. Storage tank is provided here with two metal gutters, one to lead water to the mill wheel, the other one serving as the water refuge gutter when the mill is stopped. Both gutters discharge into underground mill chamber, from where water goes through the walled without glue run channel (Fig. 124, Pl. 103).

PLAVIŞEVIŢA

Plavişeviţa settlement was in the Cazane area of the Danube. Limestone area of Almaj Mountains, which limits the Danube Valley, is fragmented by numerous valleys (Cucu, 1980, p 19). Ethnological researches in the years 1968-1970, made by Gheorghe Dinuţă from the Village Museum in Bucharest, have counted 11 mills with bucket at Tisoviţa, Plavişeviţa and Dubova (Dinuţă, 1971, p 67). One of the four mills from Plavişeviţa is now in the Village Museum Bucharest.

1. MILL FROM PEAR TREE
[*Moara de la Păr*]

This was the local name of the mill from Plavişeviţa which was moved to Museum in Bucharest. It was located at about 1 km from the village extremity.

Mill construction was simple, archaic from stone wall, with a gabled roof and shingle covering (Fig. 69/1, 127/1). Quadrilateral plan of unicellular building was of 4/3 m. Wall of bricks was lifted to a height of 1.80 m (Dinuţă, 1971, p 68). Grinding plant was placed on a massive tree trunks bed, a system known within the entire territory of the Banat. Bed stone had a diameter of 0.66 m and thickness of 0.26 m, and runner stone had diameter of 0.65 m and thickness of 0.10 m. The stone case was of wood. Wood tied to the driver was called beak [*ciocat* or *ciocăt*] in the area.

Water system was entirely of wood. Wheel with 14 spoons or shovels, the vertical axle and the bridge tree were made of wood. Water inlet from weir was done through a tree trunk long 5.60 m, which had opening of 0.50 m at one end and 0.40 at the exit. That sluice box was called *butoni*. Reduced water flow required the use of a drilled cap called (little) bucket [*găleţea*] to increase the power flow of the injected water (Dinuţă, 1971, p 69).

PLUGOVA

Plugova village is located on the lower flow of the Belareca, at the south-eastern extremity of Mehadica Depression. In the low area of the Belareca meadow ponds for the eight mills that once worked were arranged; now only one works, Alexe's Mill [*Moara lui Alexe*].

Alexe's Mill is completely rebuilt from concrete blocks, with a gabled roof and sheet covering. Hydrotechnical facility has undergone numerous transformations, lately being completely replaced with a metal one.

Millstones were carved in village by a stone mason, Milă Bucur. He exploited the local rock which he processed in cold weather, when there was no construction work in the area. He had had in a place called Brănici from the Belareca meadow a shelter for livestock, which also had served him as a winter workshop to process local rock for mill stones. Our field researches, in the fall of 2011, identified the shelter of Milă Bucur, the remaining millstones being used to access stairs, some rejects being in the shelter structure.

The preserved millstones in shelter have the following sizes: diameter 0.45 m, width 0.18 m; diameter 0.52 m, width 0.20 m; diameter 0.48 m, width 0.18 m.

POGARA DE SUS

Hamlet Pogara de Sus is located north of Cornereva, the administrative structure which otherwise it belongs to. It is on the border with villages Zbegu, Izvor and Cireşul, all located in the Ohaba valley.

1. CERNESCU'S MILL
[*Moara lui Cernescu*]

Wooden construction with a quadrilateral plan of 2.30 / 2.10 m. Summary carved beams walls, in horizontal crowns, of 1.38 m in height. Gabled roof has tile covering. Roof ridge is of +2.50 m in height. Grinding facility sits on a bed of carved beams, measuring on sides 0.80 / 0.65 m (Fig. 128).

Hydraulic system was placed in a covered with a dry wall pit. Dimensions on axes of the lower chamber are 2.28 / 1.50 m. Wheel is of wood, with wings in a shape of carved bailer. Spindle and bridge tree are also made from wood. Wheel hub is of 0.30 m in diameter, while the wheel has a diameter of 1.10 m (Fig. 128).

PRIGOR

Settlement Prigor is in Almaj Depression, in its eastern edge, where it communicates with the land of Craina. The Iablacina Creek has its origin in the southern foothills of Semenic Mountains. It has a course oriented north-south. Downstream Borlovenii Vechi it receives waters of the Şumiţa stream and the Putna stream near Prigor. Two mills were built in this area called Iablacina Mouth [*Gura Iablacinei*]. Hydropower of river was used in a very mills chain which was built on its lower course; nowadays only four mills are preserved, some completely modernized and restored.

1. MILLS FROM IABLACINA MOUTH
[*Morile de la Gura Iablacinii*]

1. Mill with rectangular plan that measure on sides 3.90 / 3.20 m. Walls are from crowns of horizontal beams, closed in joinders system, of 1.75 m in height (Pl. 104, Fig. 45). The gabled roof has tile covering. Gables are closed with rudimentary vertical boards. Roof ridge height reaches at +3.97 m (Pl. 104, Fig. 45). The entire building sits on a sole of a massive beam with vertical section, which straddles the mill lower room with hydrotechnical installation. Two masonry piles of 1.97 m in hight, placed on both sides of the water wire, separate underground space in which the horizontal wheel was installed. The underground space descends to -1.97 m (Pl. 104, Fig. 45). The whole hydrotechnical plant suffered influence of modern technology. Storage pool has concrete walls. The forced pipeline was also built from concrete (Fig. 45). Wheel and the motor shaft were made of metal. Sole on which is located hydrotechnical facility is a metal rail. The bridge tree axle is made of metal too. Grinding installation, carrying inscriptions from the middle of the last century has preserved traditional wooden forms (Fig. 45). The mill had a brick chimney and a fireplace in one corner.

2. MILL FOR CORN COBS
[*Moara pentru cocenii de porumb*]

It is built in the immediate vicinity. Typologically it is an identical construction with the mill shown above. The walls are from wreaths of beams, gabled roof and tile covering (Fig. 129, Pl. 105). Planimetric dimensions are: walls height 1.43, length and width of 3.80 / 3.10, the ridge roof height +3.22 m (Pl. 105). Underground room which shelters hydrotechnical installation was of dry stone wall. Storage pool was dressed in board (Fig. 129). Water inlet gutter at the wheel was from board. Around it a refuge channel, dressed partly in board was created. Wheel also in this case was made from metal with vertical axle from pipe (Fig. 129).

Grinding installation is apart in this case due to the absence of grain basket and massive grinding stones (Pl. 105, Fig. 129). Whole cobs were introduced and crushed between the two stones.

PRISĂCINA

Prisăcina hamlet lies in the administrative structure of Cornereva commune, along with other 42 villages and hamlets. The Prisăcina Creek is a minor tributary of the Cerna River that has its origin in the Cerna Mountains, in an area of limestone with spectacular forms of gorges. Two mills watched over Prisăcina Gorges.

1. Mill from Locul Golului is located at the canyon of Prisăcina gorges exit. Built entirely of wood it has a simple quadrilateral plan, with walls from short mechanically processsed boards. Walls, sitting on a massive base, were joined at the corners in joinders and upright beams (Fig. 79). The upright beams are placed on the long sides and door. The gabled roof has a sheet covering. Grinding facility is located on two set in the lateral walls of the mill house massive beams. The two gables were closed with vertical boards.

The lower chamber of the mill, with hydraulic system, was installed on the hill slope with walls of dry wall with no binders. Local processed in hewn blocks rock provides a neat appearance of wall paraments (Fig. 79). Hydrotechnical installation as well as the bridge tree is from wood.

2. Mill at the Prisăcina Gorge entrance has a planimetry entirely similar to the Locul Golului mill, both guarding the Prisăcina gorges. The same technique of combining wood walls in joinders system and upright beams was used there (Fig. 70). Lower chamber with wooden hydrotechnical plant is housed between high walls on the sloping land. The walls of massive limestone blocks have a less tidy appearance.

PUTNA

It is the village with such a famous name of the same Slavic etymology. Putna from Almaj must be looked for in the eastern eextemity of Almăj Depression, near Prigor. There are still preserved two mills on the Putna River, within the built-up village area.

1. MILL FROM VALLEY
[*Moara din Vale*]

A modest but well proportioned construction entirely made of beams (Fig. 47, Pl. 106). Rectangular plan of 3.80 / 3.00 m. Walls were raised to a height of +1.72 m from crowns of round beams joined in joinders system (Fig. 130). The gabled roof has a tile covering. The tympanum is covered with plank. Grinding plant was made from parts of massive wood. We may remark here also the special form of the driver with round mouth (Fig. 47). Mill house rests wholly on four wooden notched at end pillars, on which sole was placed (Fig. 47, Pl. 106). Underground space was protected by a dry wall, otherwise traditional in area. Storage tank and wheel underwent impact of modernization. The pool is bordered with a concrete wall, and the wheel was made of metal, with the vertical axle from pipe. The bridge tree was made of a metallic rod with a screw in the end (Fig. 130, Pl. 106). The sluice box was worked from a tree trunk.

2. MILL FROM HILL [*Moara din Deal*]

The mill is located in the upper extremity of the village of Putna. Planning of mill has identical shapes and structures to those ones of the Mill from valley. Rectangular plan measures 3.00 / 4.00 m. Walls from crowns of logs have a height of +1.57 m (Pl. 107). Floor of beams separates the two mill levels. Bridge tree has the same characteristics described above. Mill from Hill is placed over a dressed in dry wall pit (Fig. 71, Pl. 107). This layout was determined by the place geography of its site. Pool and wheel were undergone to same contamination of recent technique, being made of concrete and metal (Fig. 71, Pl. 107).

RĂCĂŞDIA

Răcăşdia is located in Oravita Depression, between low hills connecting the Caraş Plain to Anina Mountains. The two existing mills are located on water of the Ciclova River. The Ciclova stream oiginates in the the north-east of the village Ciclova Montană limestone area and crosses the west-east oriented high fields, and makes a loop at Răcăşdia changing direction toward west and north-west. A pond on the river course diverts water on a channel of a few hundred meters long to mill. Channel is parallel to the Ciclova stream course. It is located on the northern frame of the built-up area of Răcăşdia village.

1. VILLAGE MILL [*Moara din Sat*]

Mill is a unicellular construction, with rectangular plan, measuring externally 3.79 / 5.63 m. Walls were built from beams, which are now plastered both inside and outside. Sole from a carved beam supports mill walls and roof. Floor separating grinding installation from mill hydro plant was originally from hewn beams, over which a layer of cement was poured. The whole mill construction is located on five wooden beams fixed to an end on earth, and at the other on a pile of masonry. The gabled roof has tile covering. The ceiling is placed on the beams. The two gables which close the bridge were struck with boards (Pl. 1, Fig. 131).

Grinding facility sits on a bed of four massive tree trunks to support the weight of stones, of grist basket and, also, to provide stability to runner stone vibrations and shocks of (Fig. 132). The whole grinding plant is of 1.60 m in height. Wooden basket in a shape of a truncated pyramid, with the base above, was mounted on a wooden frame which is proped up on mill bed by four pillars. Grinding plant has a device for lifting stones. This bridge tree has a vertical pole between mill bed and the ceiling, set in a bearing to allow rotation around its own axis. A short arm of wood ended with two metal claws is fixed on this pole; the runner stone is cought by the claws to be lowered from the plant (Fig. 131). It is also notable the zoomorphic look of the wood that moves the driver (Fig. 132).

Hydrotechnical installation of the mill is fitted in a dug in the slopped ground pit of -2.50 m deepth from the current ground level (Pl. 2, Fig. 131). It is of a regular form, and, on three of the four sides the pit walls were plated with stone wall, so that the whole underground room have stability and not be exposed to water erosion. Wooden vertical shaft was replaced with a metal pipe, and the wheel was also made of metal. A cut metal pipe replaced the wooden gutter. The low volume of water and gentle slope of the terrain made the manufacturers to equip an expanded storage pool of about 5/6 m, with a side of only 0.92 m in front of the inlet pipe (Pl. 2; Fig. 131).

2. MILL FROM VÂRTOP [*Moara din Vârtop*]

Mill is located on the right bank of the Ciclova stream, north of the Village mill. Water inlet is made through a supply channel [*ierugă*] that takes water from the Ciclova stream. Elements of modernization have occurred at this mill, originally made entirely from wood. It has a rectangular plan of 6.88 / 4.38 m. Builders used initially short beams joined in upright beams by tongue-and-groove system to raise the walls. It was an appropriate technique given the great length, of almost 7 m of mill walls. Later, in recent times, only mill skeleton was preserved on upright beams, and gaps were filled with brickwork. At the same restoring time the beams floor was dismantled, being replaced with cast concrete floor. The ceiling of boards, placed at share of +2.19 on beams was kept. Grinding facility has the archaic original wood structure. We find there too a stone lifting system with the help of two metal arms mounted on a rotating pole, rigidly fixed in ceiling beam and mill bed (Fig. 133). The gabled roof has tile covering, the two gables being closed with board. Bed on which grinding facility is placed was worked in two large carved rectangular trunks. Runner stone has a diameter of 0.90 m, being closed by a wooden stone case. Hydrotechnical installation is arranged in a pit deep to -2.65; it is of a rectangular shape of 3/3.65 m (Pl. 4, Fig. 133). Remakes with metal and concrete were made at this section of the mill. A metal gutter replaced the wooden sluice box. Spindle and mill wheel are made of metal. Water storage tank was set in stone and concrete. The stopping system consists of a pole that blocks mill wheel, after water stopping in the pole gutter at the mouth of water inlet gutter. Steps built on one of the long sides are to facilitate access to hydro plant, at the time of its shutdown. Pit that houses the wheel, spindle and bridge tree was dressed in stone and cement wall (Fig. 133).

SICHEVIȚA

1. MILL FROM HILL [*Moara din Deal*]

It is built on the Camenița River in the hamlet with the same name being part of Sichevița commune. Supply channel remained without water and the mill was abandoned. It was built on the hill slope, with the long sides placed along the hillside (Fig. 72). Rectangular plan has dimensions of 6.80 / 3 m. The gabled roof has a tile covering (Fig. 72). Mill sole worked from a thick carved log with square section rests on the hillside and on a bed of massive boulders (Fig. 72). Made from horizontal beams the high walls of 1.90 are set on the long sides in fixed in the base and crown upright beams (Fig. 72). The walls are joined at corners in joinders system and in upright beams by tongue-and-groove joint system. The unusually high length of the building is due to the fact that half the space 2.50 / 3 m were used as a shelter for horses. A simple manger was mounted along the short wall of the mill. The animals went over beams floor and were tied to the manger. Grinding plant is partly desintegrated; the tin stone cave is rusty. Water inlet channel was of concrete pipe that had mounted a (little) bucket at the lower end (Fig. 72). Wheel and its vertical axle are from metal at -1.80 m. The bridge tree is still of wood being handled with wedges.

2. RAIA MILL [*Moara Raia*]

It is placed near the Mill from Hill but arranged close to the Camenița riverbed. Planimetrically and typologically it is similar to the Mill from Hill. Rectangular plan of the building has dimensions of 3.40 / 6.12 m (Pl. 112, Fig. 136). Walls 1.61 m in hight are of beams, fixed to the tongue-and-groove technique on the long sides and in joinders at the corners. The gabled roof, 4.12 m in hight, has shingle covering. A shingles stovepipe was built on one side of the roof (Fig. 136). Moreover, at the interior, where it is an open fireplace, the stovepipe has an arrangement, of weaved twigs; it is placed on a wooden frame (Pl. 112). Very big length of construction is explained by housing animals during winter. A shed, supported in forks and in a mill wall, offers the solution of housing carts (Fig. 136). Supply channel is parallel to the Camenița stream, from the water inlet up to the mill. Sluice box was set in a concrete pipe that had a plug hole, a (little) bucket in the end (Fig. 136). Wheel with its vertical spindle are made of metal, only the fork on which stone frog is set, has remained of wood (Fig. 136). The entire hydrotechnical facility was arranged in the underground mill chamber at -1.80 m, covered with dry stone wall. Construction sole was supported in that perimeter by two wooden poles (Fig. 136).

3. MILL FROM APIARY [*Moara de la Stupă*]

It was recently rebuilt with old reconditioned materials and new ones, up to the original plan and shapes (Fig. 73, 135). Construction has the same long, rectangular plan of 7.60 / 3.50 m (Fig. 73). Half the space, about 3.40 / 3.50 m, was intended as shelter for animals, with a manger mounted at ground level (Fig. 73). Log walls of 2.20 m in height, with a gabled roof and corrugated asbestos cement sheets covering. Mill was built in slope, due to its long walls. Hydrotechnical facility is located in the underground clad in masonry room of the mill, a rectangular pit of 2.50 / 1.90 m, 1.90 m deep. Wall was binded with concrete when restoring the mill. In fact, concrete materials were used at the storage tank too, and also the forced pipeline is a concrete pipe. Only the wood drilled plug at the sluice box end was preserved.

Wheel with its vertical axle is made from metal. The fork on which wheel and bridge tree with wedges was placed are still from wood (Fig. 135).

4. MILL FROM BOTU CRACULUI
[*Moara de la Botu Cracului*]

It is partly a restored and modernized mill, in what concerning the hydrotechnical installation. The whole molinologic arrangement, in this case, consists of two distinct bodies: the first one for the mill, the second one in the immediate vicinity for a closed shelter and shed for animals' housing (Fig. 134). Distance of about 3 km from the village required the construction of this shelter for animals and people, which, in another form, we find at all situated at some distance from the village mills at Sicheviţa and Gârnic. Mill has the same rectangular plan, being built with the same slope technique we met at the other mills in the area. The gabled roof has tile covering. Animals' shelter was made with the same technique used to build the mill (Fig. 134). The lower chamber of the mill and mill floors were rebuilt in concrete. Wheel, wheel axle and bridge tree with screw are made of metal (Fig. 134). The concrete pipe for the former sluice box uses the ancient technological adaptation of the (little) bucket (Fig. 134).

SOCOLARI

1. MILL FROM SULTANA
[*Moara de la Sultana*]

The village is located on the hills slopes which close Oraviţa Depression and border Anina Mountains'foot too. A narrow valley crossed from east to west by a water thread houses the village. Mill from Sultana is located on this low speed water thread with called Socolari Water [*Apa Socolariului*], a tributary on the left bank of the Vicinic stream.

A less consistent vein of water crosses from one end to another the village of Socolari, placed on a limestone terrain. Two mills were on the Socolari Water, one of them being preserved in ruins. It is the Mill from Sultana. It is located in the built-up village area, the front towards the street that descends on the sloped ground. Building has a rectangular plan of 4.13 / 3.10 m. Walls of planks, 1.57 m high, were covered with plaster (Pl. 19, 20). The gabled roof has sheet covering. Mechanical plant is largely destroyed or depleted (Fig. 137). Mill bed was kept; it was worked from two massive logs trunks, over which stones with wooden stone case were placed (Fig. 137, Pl. 19). This segment of grinding plant is of 0.67 m in height. The bed stone and driver are also preserved, while the runner stone was depleted (Fig. 137). Beams floor separated once the two compartments of the mill. The whole construction was placed on a masonry pile and a wall flanking the valley bank (Pl. 20, Fig. 137). Pile of limestone wall binded with mortar was of 2.25 m in height and 0.80 m wide. Inconsistent water flow imposed the arrangement of a water catchment basin, to provide the mill operation on a determined period. This water flow inconvenience caused also adaptation of compensatory technical solutions to hydrotechnical installation. Originally Mill from Sultana had a wooden sluice box with a (little) bucket in its extremity (Fig. 1). It was replaced with a metal pipe having lower terminal in a shape of truncated cone to increase water spurt power (Fig. 137, Pl. 20). It is applied the same principle of water drain section regulation, originally a rudimentary wood shape, more efficient now with metal pipes. Wooden wheel is not preserved. Wooden spindle and sole on which it was placed are still preserved. Wooden spindle and wooden beam with camp spinning heel are kept in a state of ruin (Fig. 137).

SVINIȚA

The former village was located on the Danube corridor from where it was moved above on the high terraces. One of the mills that operated there on a water thread was transferred in 1967 at Folk Technology Museum in Sibiu. *Novana* Mill was rebuilt there, within the Museum (Bucur, 2007, p 143).

1. NOVANA MILL [*Moara Novana*]

Building has a rectangular plan of of 72.6 / 3.48. The walls were built of carved local rock and had a height of 3.96 (Pl. 115/2, Fig. 76). Gabled roof has shingle covering. Grinding facility is located on a processed tree trunk podium. Mill had several runner stones, of different thicknesses, which were changed depending on water flow (Bucur, 2007, p 144). Hydrotechnical installation was made of wood. Sluice box was made from a holey tree trunk. Mill keeps several (liitle) buckets, namely wooden drilled plugs, with different diameter to be used up to water flow. Hydrotechnical installation was sat in a dry wall underground chamber. A floor of planks separated the two compartments of the mill.

ŞOPOTU NOU

Village Şopotu Nou is situated in the south-west extremity of Almaj Depression. The Nera, which goes as an axis through the intramontane depression of Almaj, makes here a sudden return to the west, from where enters the gorge sector until towards Sasca Montană. The Buceaua Creek is a frail tributary of the Nera [local usual name for (the) Nera: (the) *Nergăn*]. On the Buceaua stream course, there were two mills in the built-up village area.

1. THE UPPER MILL [*Moara de Sus*]

A wooden building placed on a foundation of concrete masonry gives it a lonely look. It has a plan of a rectangle of 4/3 m. Walls of 1.80 m in height are from wreaths of horizontal beams crowns concluded in joinders system. A carved beam sole with quadrilateral section supports the walls. A floor of wide planks is directly laid on the building sole, over which beams crowns were then placed. The gabled roof has tile covering (Fig. 75). Roof ridge height reaches a rate of +3.00 m. An abandoned millstone is use as the mill entry step. The tympanum is made from boards (Fig. 75). Wooden grinding installation is simple and archaic (Fig. 75). Basket is sat on a wood yoke and mill wall. Primitive-looking stone case is also made from wood (Fig. 75). Runner stone has a diameter of 0.55 m.

Hydrotechnical facility is within the stone and concrete room built up to+1.70 m from ground level. Lower level building, on a sloping land, was raised to this rate to ensure the wheel vertical axle assemblying. Storage tank arranged at the end of the supply channel has concrete lateral walls and dam. Forced water pipeline leading water to wheel was made of concrete pipes. It has a fitted in the lower end (little) bucket (Fig. 75). Wheel and its shaft are made of metal. Bridge tree kept the archaic form with wooden wedges (Fig. 75). It stands up in the interior construction grinding installation and linkage with wedges assembling on two massive beams placed over mill floor.

2. THE LOWER MILL [*Moara de Jos*]

It is Located on the Buceaua rivulet just in the village center. Mill building is sat on wooden forks and pillars (Fig. 74, 138). Mill outer dimensions are of 4/3 m. Mill has walls from round beams arranged in horizontal crowns. The walls are closing in joinders system. The building was raised on forks and massive wooden pillars, upon which a summary carved beam sole was placed (Fig. 138). The gabled roof has tile covering. Log walls are coated externally with two rows of shingles (Fig. 74). Roof ridge is of +3 m in height. Walls are of 1.80 m in hight. Wheel with vertical shaft are made of metal. Sluice box was made of a metal pipe with diameter at storage tank of 0.60 m and 0.40 m at the lower end. A wooden plug with a small opening is mounted to increase the force of water flow. Storage pool has cement fittings (Fig. 74, 138). Grinding facility is located in a corner of the upper mill room. Basket is supported on a gutter attached to the wall and bed mill (Fig. 74, 138). Stone case is made from metal. Runner stone has a diameter of 0.55 m. Bridge tree with wooden wedges preserves the original shapes (Fig. 74).

ŞOPOTU VECHI

The village lies on the northern frame of Almaj Depression on border with Dalboşeţ and Gârbovăţ villages. The Şopot Creek, a tributary from the left bank of the Nera, has a north-south oriented course. There are still preserved nowadays ten mills along the river, some in an advanced state of ruin (Rancu, 1996, p 4-5).

1. URSULIŢA MILL [*Moara Ursuliţa*]

It is a stone wall construction with a rectangular plan of 4.89 m / 3.63 m (Pl. 21.22). The gabled roof with tile covering is largely degraded. Wall height does not exceed 1.94 m. A concrete floor separates the two rooms of the mill, having in it an opening of 1.20 / 0.75 m through which you can go on a staircase down to wheel to change or mount the (little) bucket (Pl. 21). Grinding facility is largely destroyed, having collapsed basket. Facility bed was made of massive carved wood trunks. Stone case around grinding stones was made of tin. Runner stone has a diameter of 0.73 m. Mill lower chamber with hydrotechnical installation had carved stone walls. Depth of lower mill level was of -2.05 m (Pl. 22). The entire hydrotechnicall facility was made of wood. Fork on which the frog sat, bridge tree and the vertical axle were made from wood. Wood wheel with carved spoons had a metal hoop, similar to this one of a cart, which gave the wheel greater stability and resistance to the water stream tasks.

2. MILL FROM ROCKS [*Moara din Pietre*]

Facility is abandoned and in the state of ruin (Fig. 9, 139). It was built of hewn rock with mortar. The squared hipped roof had shingles covering. Rectangular plan of the mill measures 5.05 / 4.05 m (Pl. 23, 24). Walls did not exceed 1.62 m in height, while the roof ridge height was of +3.95 m. A log floor separated the two mill levels. Grinding plant was worked from a massive trunk. Basket is sat on four pillars mounted in grinding facility bed (Pl. 23, Fig. 139). Stone case was also made from wood. Runner stone diameter is of 0.70 m. Hydrotechnical installation is entirely of wood. Underground rate of this mill descends to -2.05 m (Pl. 24). Bridge tree is an archaic one and was made of wooden wedges.

3. GIPSY MILL [*Moara Ţigănească*]

It is a stone wall construction with a square hipped roof (Pl. 25-27). Perimeter walls come to 1.77 m rate, and the roof at 3.85 m. Roof covering is from tin (Fig. 10). The floor separating the two rooms is made from logs. A trap of 0.50 / 0.70 m, placed behind the grinding installation, assures the descent into the lower chamber (Fig. 10, 142). Basket is set on two frames fixed in the bed of grinding plant. Stone case is from tin. Runner stone has a diameter of 0.75 m (Pl. 25). Underground rectangular chamber with hydrotechnical installation is made from stone wall. Wooden wheel with carved and gathered in a hoop blades, sits on a wooden fork. Bridge tree with wedges keeps an archaic shape (Pl. 25). Supply channel and the storage tank are built of concrete (Fig. 10, 142). Pool floodgate is provided with two openings, one for the forced pipe, the other one for the refuge channel when the installation does not work (Pl. 27, Fig. 10, 142). Runner stone diameter is of 0.75 m.

4. THE NEW MILL [*Moara Nouă*]

Mill has a stone wall construction. Quadrilateral plan is of 5.30 / 4.00 m (Pl. 28, 29). The walls were raised to a height of 1.78 m. Gabled roof has a sheet covering. The same typology and characteristics as those described for the Şopotu Vechi mills are met to the New Mill grinding facility. Storage tank was made of concrete. Wheel and its vertical axle are of wood. Bridge tree has been upgraded being provided now with a screw (Pl. 28). Runner stone has a diameter of 0.70 m.

5. GHETERA MILL [*Moara Ghetera*]

It is a unicellular construction of wood sat on a dry wall foundation. Rectangular plan is of 4.79 / 3.74 m (Pl. 30, 31, Fig. 11, 140). The walls are from horizontal beams crowns ended in joinders system (Pl. 31). Sqaure hipped roof was raised to +3.56 m. Its covering is from flat sheet. Hydrotechnical facility preserves in part its archaic character with its wooden wheel, shaft, fork and bridge tree with wooden levers (Fig. 11, 140, Pl. 30). Storage pool and are forced pipe are made from concrete.

6. BĂDEASCĂ MILL [*Moara Bădească*]

Mill located within the built-up village area is integrated into the village structure (Pl. 32, 33, Fig. 12). The stone wall building, with wall gables, is attached to a household. The gabled roof has tile covering. Quadrilateral plane dimension of the building are 5.56 m / 4.90 m.

Grinding plant was rebuilt up to the original model (Fig. 12). Hydrotechnical facility preserves its archaic form with wooden wheel (Pl. 33, Fig. 12). It is housed in the underground wall room, which descends to a rate of -2.16 m (Pl. 32). Access to the mill wheel is practiced through a hatch in the wooden floor. Bed stone has a diameter of 0.90 m.

7. BĂLTONIȚA MILL [*Moara Băltonița*]

It is a construction is of plastered stone wall with a gabled roof. Stone walls were built up to a rate of +1.65 m. Covering is from shaped tile (Pl. 35, 36). Rectangular plan of building is of 3.40 / 4.24 m (Pl. 35). A concrete floor separates the two mill rooms. The tympanum is made from brick wall. Grinding installation preserves its ancient wooden forms and baseline characteristics.

Hydrotechnical installation with wheel, its axle and lifting device with wooden levers preserved the original constructive structures. Non-essential modifications by use of concrete are noted to the mill pool. Runner stone diameter is of 0.60 m.

8. PLEŞOANEA MILL [*Moara Pleşoanea*]

It is an archaic construction made from wood partly (Fig. 13, Pl. 37, 38). Gabled roof has now a covering of corrugated cement. Tympana are closed now with an improvised solution from cement plates. Dimensions of basic planimetry are 4.60 / 3.30 m (Pl. 37). The walls from horizontal crowns of beams have a height of 1.55 m. They are closed in joinders system just at the corner door. Upright beams were used for tongue-and-grooves walls joining (Fig. 13). Grinding installation preserves all ancient wooden elements as met also at other mills from Şopotu Vechi. The whole mill house sits on a dry without binder wall construction. This carefully worked carved stone structure has an underground part with the wheel; the other part, of 1.15 meters, is built above the ground level (Pl. 38, Fig. 13). We may note a large stone lintel within the dry wall, above the empty space for sluice box access (Fig. 13).

9. THE SMALL MILL [*Moara Mică*]

It is a mill from plastered brick wall and rectangular plan of 4.18 / 3.15 m (Pl. 39, 40). A concrete floor separates the two construction levels. The gabled roof has a tile covering. Rate at the roof ridge is of +3.94 m. Hydrotechnical installation was upgraded by use of some modern materials. Storage tank is made of concrete. The same mterial was used for forced pipe (Pl. 39, Fig. 14, 141). Wooden wheel with shaft and bridge tree with wooden levers preserved the hydrotechnical facilities from the area archaic characteristics (Pl. 39, Fig. 14, 141). Runner stone diameter is of 0.70 m.

10. GLIMEICA MILL [*Moara Glimeica*]

Builders used stone for walls raised to +2.06 m (Pl. 41). Gabled roof has a painted tin covering. Gables were closed with shingles. Rectangular plan dimensions are of 6.20 / 3.70 m. Lower mill room has dry masonry walls. Concrete materials were used for the storage tank, forced pipeline and refuge channel mouth.The traditional solution with (little) bucket was kept for the forced pipe that brings water to the mill wheel. Wheel and its shaft are made of wood (Fig. 14).

TEREGOVA

Village located along the Timiş upper valley, at the Semenic Mountains foot, had at 1957 survey on thr Romanian mills, a number of 36 watermills working on the Timiş and the Teregova rivers. Just one plant remains nowadays there, another one being brought at the Village Museum from Bucharest, in 1961 (Lazarus, Dinuță, 1974, p 37).

1. VILLAGE MUSEUM MILL (Fig. 69/2)

The transferred facility has a rectangular plan of modest sizes. The walls were made of mechanically processed wood boards, completed in jinders system. Wall height does not exceed 1.50 m. The square hipped roof has shingles covering. Mill sole is placed on two dry wall piles. Water intake was done through a sluice box and this section adjustment was made by a (little) bucket (Fig. 69/2).

TOPLA

The Topla creek has its origin south of Cornereva and has an oriented from south to north course; after meeting the Studena River it suddenly turns west up to the confluence with the Belareca. Topla hamlet is situated on the same named river having border with Dolina and Zoina villages.

1. VÂLCULEŞTI'S MILL
[*Moara Vâlculeştilor*]

The whole installation is a simple, archaic arrangement, entirely made of wood (Pl.49, 50). It has a square plan of 3.50 / 3.50 m. Sole from a carved beam is resting on the dry wall that plated the lower room. The walls are from beams placed in horizontal crowns ended in joinders system, rising to a height of +1.33 m (Fig. 17, Pl. 50). The framework supports a gabled roof with tile covering. A floor of planks separates the two chambers of mill. Let us note that the grinding installations, as well as the bridge tree are mounted on a floor high about 0.70 m (Fig. 149, Pl. 49). Simple and ingenious lifting installation is entirely of wood (Fig. 149). Basket is fixed in a frame of two pillars, with base dimensions of 0.70 / 0.65 m. Stone case headpiece is entirely of wood (Fig. 149). Runner stone has a diameter of 0.68 m.

Water supply is done through a small channel; a primitive pool was made at the channel end; it is made from board fixed with poles to plate both bottom and the sides of the channel [*ieruga*]. A cut inside tree trunk leads the water from storage tank to hydrotechnical facility (Fig. 147-148). Mill wheel is very simple and archaic, using blades in a shape of stright pieces of boards fixed in wheel's hub (Fig. 147). Fork on which frog with the wheel axle heel is placed is made of wood (Fig. 148). Viewed from the perspective of technical solutions used both to hydrotechnical facility and the grinding, Vălculeşti's Mill appears as one of the simplest arrangements of mills with horizontal wheel in the Banat area.

2. DRIMEASCĂ MILL

[*Moara Drimească*]

The plant is located on the Topla creek, to the west of Broască's Mill, near which in fact it is located. The Topla flows on south-north direction, and mill with supply channel is on its east bank. Unicellular building plan is a rectangular one, of 3.70 / 2.96 m (Pl. 55, 56). Construction was made entirely of wood, walls having a height of 1.41 m; the gabled roof reaches up to rate of +3.24 m. Roof covering is made from tiles. Walls, from four carved wide planks, are placed on a sole made from a tree trunk (Pl. 56, Fig. 20, 143). Walls closing was made in joinders system, except for the corner with the door where two corner columns were used (Pl. 56, Fig. 20, 143). Grinding facility is placed on a bed of four carved tree trunks; they are placed on two massive cross beams set on mill house sole and in the lateral walls. Runner stone has a diameter of 0.55 m. Stone case is made of summarily processed wood (Fig. 20, 143, Pl. 55). The lower room that houses hydrotechnical installation is very carefully made from a stone wall without glue. On long sides, on the southern one through which goes down forced pipeline, and on the northern one through which goes out water running channel, there were two openings practiced in walls. What is interesting at these practiced in dry wall gaps is the long stone slab to play a beam lintel role (Fig. 20, 143, Pl. 56). Wheel is made from metal up a technically concept invoked at other mills on the Topla rivulet.

3. ADĂMEŞTI'S MILL

[*Moara Adămeştilor*]

Mill is built near Ion Adam's household, on the upper course of the Topla. It has a rectangular plan of 3.36 / 2.80 m (Pl. 53, 54). The mill was built entirely of wood, with a gabled roof that rises up to +3.31 m, covered with tiles. The lower chamber has a depth of -1.98 m. Sole construction was made from a thick tree trunk; five wide boards of planks were placed up to 1.51 m hight over the sole. Beam walls end in joinders system; only for the door were used two poles embedded in the sole and crown (Pl. 54, Fig. 19, 144). High basket is sat on a simple framework of two pillars fixed on mill bed (Fig. 19, 145). Runner stone has a diameter of 0.60 m.

Hydrotechnical facility has the same mix of old and metal elements noticed yet at other mills on the Topla. Wooden wheel was replaced with a rim of a jeep wheel, on which metal wings were welded. Two wire rings welded on wheel blades are designed to give stability to wheel. Spindle and bridge tree are from metal pipe. Intake gutter is made of metal, while the storage basin preserved a primitive arrangement of beams and concrete. It has two openings, one for the supply gutter to the wheel, the other one for water evacuation in a lateral channel, the refuge channel, when the mill is not working. Pit that houses the hydrotechnical facility has a dry wall wrapping (Fig. 19, 144, Pl. 54).

4. BOAŞCĂ'S MILL [*Moara lui Boaşcă*]

Mill is located on the upper course of the Topla stream, being a rectangular building of 2.87 / 2.30 m, entirely of wood (Fig. 18, Pl. 51, 52). Walls from wide boards in horizontal crown closing at corners in joinders system, are of 1.41 m in height. Door located in the corner was fixed between two embedded in the sole and crown upright beams (Pl. 51). Gabled roof supported by four pairs of rafters reaches up to +3.11 m. The roof covering is from tile. Grinding plant is structurally identical to the other mills built on the Topla. Two cross beams that pierce the side walls support a floor of 0.70 m in hight, on which was laid grinding installation. It calls for our attention basket shape as two attached trunks of pyramid (Fig. 146, Pl. 52). Driver is hollowed out from a small tree trunk with round mouth (Fig. 146). An ingenious way was found in order to fix driver through a perch. Everything is caught in wood nails. A wood notched in steps settles the driver sloping degree, adjusting in this way the amount of grain that comes from the basket. Adjusting of the distance between the stones is made by an archaic bridge tree with wooden wedges (Pl. 51, Fig. 146).

Hydrotechnical facility is a mixture of ancient elements and modern structures of the metal; wheel, spindle and metal bridge tree represent the inovative elements there. Wheel was made from a jeep wheel rim, on which were welded steel blades, all mounted on a vertical metal axle. All these are light metal elements designed to increase efficiency. Storage tank from the end of the supply channel is made from boards and stakes; it has two mouths with wooden weirs. It is structurally similar with many others mill pools from the Belareca basin. Forced pipe is made of wood (Fig. 18, Pl. 52). The entire hydrotechnical facility is located underground in a pit limited by a pile and the dry wall without binder, on the other side.

TOPLEȚ

The systematized village with stone houses is located on the left bank of the Cerna valley not far from Băile Herculane and Pecinişca. The landscape of the area is fragmented by valleys with low flow waters like the Spring Water [*Apa Izvorului*], known in the local toponymy as *Bigăr* or Mills Rivulet [*Pârâul Morilor*] (Taranu, 1977, p 62). The Spring Water has its origin among limestone peaks north of the village, which it crosses up to its flow in the Cerna. Along this creek with little water about 20 mills with bucket stood once; only seven of them are are preserved today, one in advanced state of ruin.

1. BRIDGE MILL [*Moara de la Pod*]

Mill is located at the south-western extremity of the Bigar course, at its confluence with the Cerna. It was abandoned and partially covered with vegetation and trash. Mill has a rectangular plan with a gabled roof and tile covering. Walls from horizontal logs crowns were closed in straight joinders. Sole from a carved beam in square section was placed on two pillars of wall with mortar. Inlet gutter and wheel were made of metal (Taban, 1988, p 17 fig. 1).

2. DAMŞESCU'S MILL
[*Moara lui Damşescu*]

The mill is built within the built-up village area at about 100 m upstream the Bridge Mill. Mill construction was made of plastered brick wall, with a gabled roof. The two gables are of plastered masonry. The upper level of mill with grinding plant is placed on two high masonry pillars. Floor of massive metal rails beams and concrete is placed on two masonry piles. Access in mill is done through a metal scale (Taban, 1988, p 17, fig. 3).

3. HAŞCĂ'S MILL [*Moara lui Haşcă*]

Construction is integrated in the urban landcape of the settlement, with a unitary architecture from brick wall, similar to this one of the household to which it is organically bounded (Pl. 64, 65). It was raised in a restricted space, which required its development on vertical up to a height of 4.52 m. Concrete floor which separates the two mill levels is at a rate of +2.10 m from the ground level (Pl. 64). Access in the mill is done through wall steps, from the street, at -1.42 m.

Mill planimetry was adapted to the narrow space between two buildings, with the plan of an irregular polygon that measures inside 2.65 / 2.55 / 2.80 / 3.03 m (Pl. 65).

Hydrotechnical facility is located in a built room coated with a semi-cylindrical vault of brick. Vault arch of brick masonry stands otherwise this building out within this area architectural landscape (Fig. 24, Pl. 65). The forced pipeline was constructed of iron sheet, in square section, having a metal (little) bucket in its mouth (Pl. 66, Fig. 24). Wheel axle is from a metal pipe as well as the bridge tree (Fig. 24). Wooden wheel was replaced with a metal one. Construction is a simple one benefiting of loans from the latest technology (Fig. 24).

Grinding installation preserves largely the archaic structures on which recent technical innovations have been embroided however. We note in this regard a grain flow from basket adjusting and closing device, a device for closing the forced water pipe operated from the mill house. Bridge tree is upgraded with a modern screw (Fig. 24). Runner stone has a diameter of 0.80 m.

4. ŞANDRU'S MILL [*Moara lui Şandru*]

It is built on the Mills Rivulet or the Bigăr, upstream of Haşcă's Mill. In the back of the brick wall of some households, on which otherwise it is propped up partly (Fig. 25, Pl. 67, 68). Mill is located on a pile of brick and stone wall of a household; it mounts in this way the delicate water flow of the Bigăr (Fig. 25, 151). Mill house is entirely of wood. The walls of 1.64 m in hight are from round beams, easyly shaped in joinders system. A floor of planks was placed on the pillar and wall, above which the mill building was set, fixed in a sole of thick carved beams (Fig. 25, 152, Pl. 68). Mill plan is a rectangular one, measuring on sides 2.96 / 3.76 m. North side, which is actually the mill access, has floor beams with an expansion about 1 m wide outside mill wall; so it led to a porch along one of the mill walls (Fig. 25, 151-152, Pl. 68). Grinding plant stands out with the runner stone, which has a diameter of 0.95 m (Fig. 25). Basket mill is set only on a pillar in the back of the wall. The stone case rim is of carved wood.

Forced pipe, called *butoni* at Topleţ, was modernized, being cast of concrete. Low flow imposed location of a pipe with diameter of 0.10 m in the sluice box mouth that plays the (little) bucket role (Fig. 151, Pl. 67). Sluice box has in plan the form of a truncated pyramid. Advancements brought to the hydraulic system aimed wheel made of iron sheet, its vertical axle made of a pipe and the bridge tree shaft made of metal.

5. JĂRGEA'S MILL [*Moara lui Jărgea*]

It is located right next Şandru's Mill, at the end of one of Topleţ streets (Fig. 26). Mill with verandah or porch [local name: *cindă*], built on two piles, has a distinctive silhouette, being harmoniously integrated into the landscape of a systematized mountain village (Pl. 69, 70). Planimetric it is in a shape of a rectangle of 2.90 / 2.94 m (Pl. 69). The walls are from crowns of carved beams concluded in joinders system (Fig. 26). They are of 1.69 m in height, and the gabled roof reaches at +3.71 m rate (Pl. 70). Floor of hewn beams is placed over the sole fixed on the two piles. Piles are made from local rock binded with mortar, and are of 1.44 m in height (Pl. 70). Access in the mill is done on cement steps, which replaced the wooden staircase to the front door porch.

Hydrotechnical facility, located between the two piles of masonry, shows recent changes of the mill. Storage pool is from concrete, as well as the sluice box in a shape of truncated pyramid. A metal pipe of 0.10 m diameter was mounted in the mouth of the concrete supply pipe to increase water spurt pressure (Fig. 26, Pl. 69). Wheel and its spindle are from metal.

6. CHIGE'S MILL [*Moara lui Chige*]

It is about fifty steps upstream of water of the Bigăr. Monument architecture and its mechanical and hydrotechnical structure are identical to those ones of downstream Jărgea's Mill and of the upstream one. It is a building located on two pillars and a pile of masonry, with mill house entirely of wood (Fig. 77, Pl. 71, 72). Access to the mill from slope land is a direct one. Roof in two waters, on one of side was lowered more down thus creating a Polat (Fig. 77, Pl. 72). Mill house with rectangular plan is of 3.44 / 2.94 m. Walls placed on a sole are of 1.79 m in height, and roof ridge rises up to +3.58 m (Pl. 72).

Grinding plant stands out through several structural elements that define it in relation to other mills. The entire grinding facility is located on a platform (Fig. 77). Grist basket is mounted on a vertical pole attached to one of the rafters and floor. We may remark at this mill the stones lifting plant, a fixed timber crane which a screw mounted on an arm, as we met at mills from Răcăşdia, Vrăniuţ and Bogodinţ. Runner stone has a diameter of 0.90 m.

Hydrotechnical facility has been adjusted; traditional wooden elements were replaced with metal. Wheel and its vertical axle are of metal, as well as the supply gutter (Fig. 77).

7. CUNICEL'S MILL [*Moara lui Cunicel*]

Located at the northern extremity of the village, upstream of Chige's Mill it represents the main conservation point of mills built on the Mills rivulet from Topleţ. It has an identical construction to that of Chige's Mill. It is built on two pillars and a pile of masonry, which gives it a slim silhouette within the village architecture (Fig. 27, Pl. 73, 74). Square plan with sizes 3/3 m and a roof ridge of 3.39 m in height brings it also closer to downstream Chige's Mill with respect of plan and volumes. Abandoned today, it still preserves traces of the industrial civilization impact on hydrotechnical installation. Forced pipeline bringing water from storage tank to wheel is a metal pipe with a (little) bucket. Wheel with vertical axle are from metal (Fig. 27, 150, Pl. 73).

We may note that Cunicel's Mill keeps pillars a wood pile near one of the masonry. Mill originally stood on wooden pillars, as proves the remained pillar, and later they were replaced by pillars of masonry, or masonry pile built along a mill wall (Pl. 74).

8. *Mill from Museum of Traditional Folk Civilization „Astra”* from Sibiu

Mill was transferred from Topleţ to Museum from Sibiu in 1966 (Bucur, 2007, p 141). Construction is built on four masonry pillars that separate the lower chamber of mill with wooden wheel, shaft and bridge tree with lever from same material. The mill walls are from wreaths logs closed in joinders system. Gabled roof covering is of shingles, as it was in the initial form (Bucur, 2007, p 141). Access is made on a staircase, through the porch with rails, arranged by extending wooden floor which separates the two levels of the construction.

VRĂNIUŢ

1. GHITERA MILL [*Moara Ghitera*]

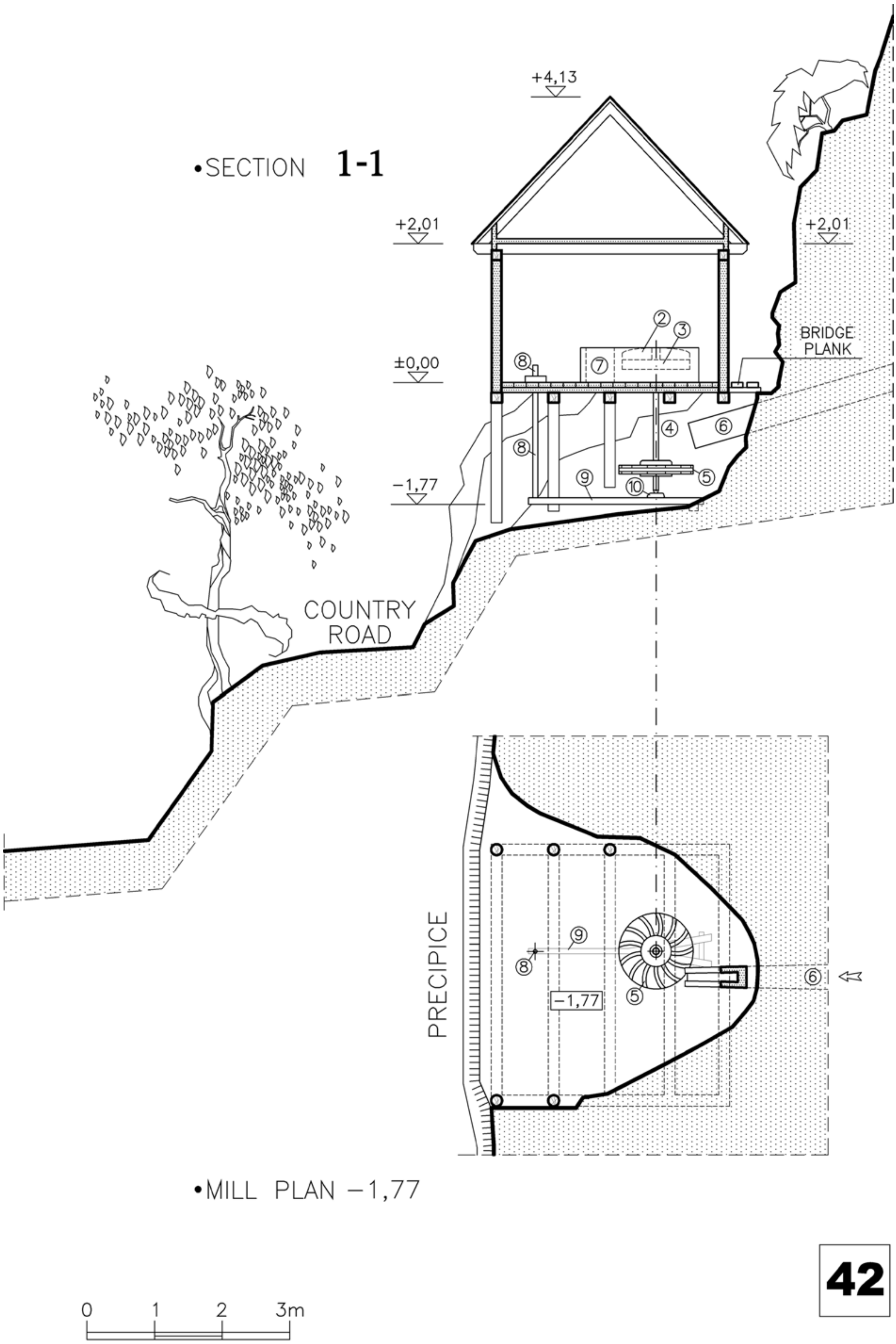
Vrăniuţ village is situated in the Caraş Plain, 6 km about west of Răcăşdia. The Ciclova Creek, which separates north-western frame of the Răcăşdia village, continues its course towards Vrăniuţ and Iertof to the confluence with the Caraş River outside the village of Vrani. Rivulet has little water. The Vrani rivulet which comes from the commune Ciclova Română border joins the Ciclova water in the eastern edge of the village Vrăniuţ. Nowadays only two disabled mills are preserved at Vrăniuţ, located on the southern edge of the village. A pond, now broken, directs water to the two mills located on bank of Ciclova brook.

Ghitera Mill calls our attention by a special planimetry, which stands it outt among mills with bucket from the Banat. It is a building with three compartments arranged in a shape of L, the mill itself being flanked on two sides with one of the rooms (Pl. 5, 6). One of them, equipped with bench, was destined for servant rest, the other one holds two drum pulleys installations acting water floodgates.

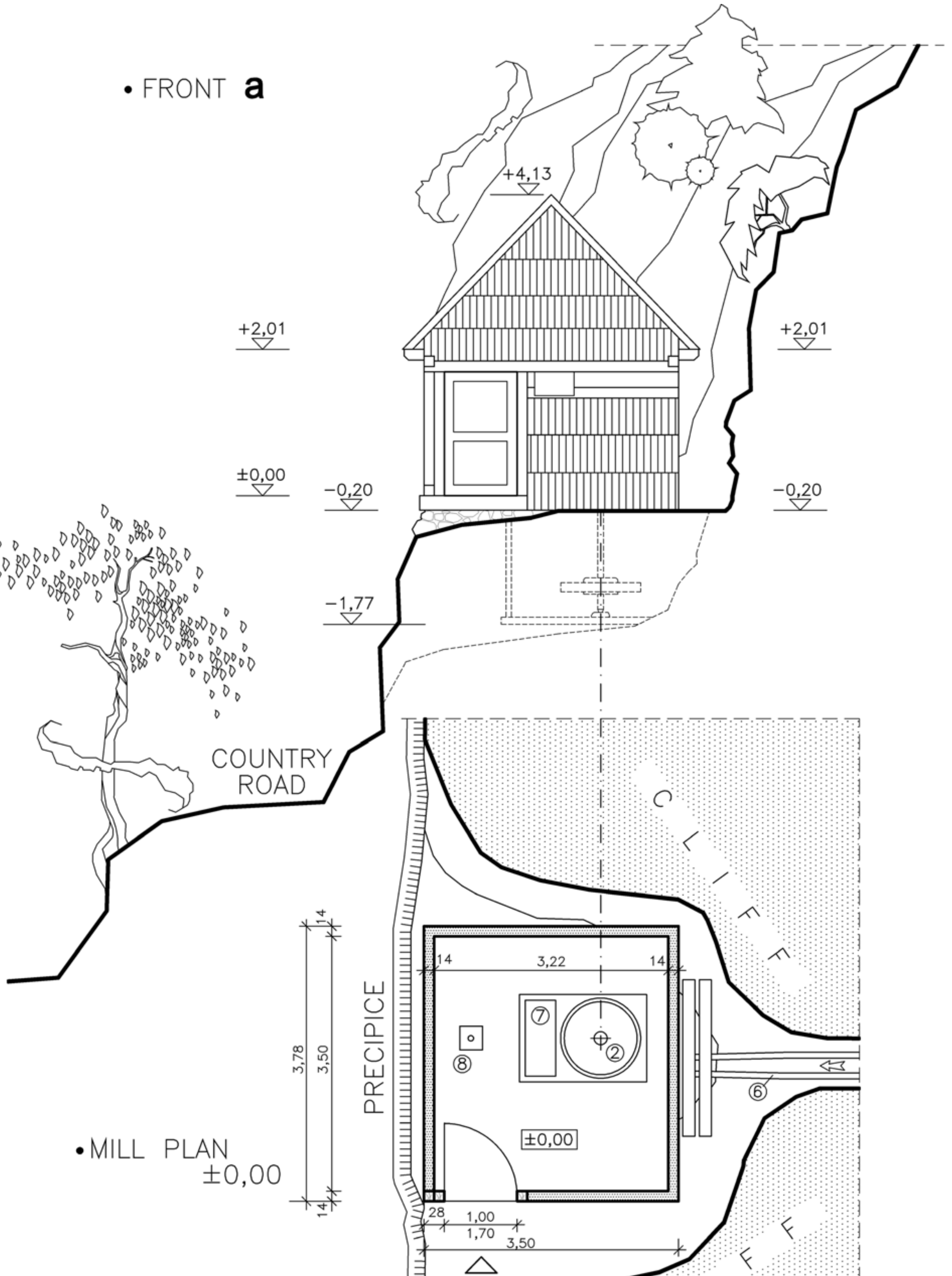
The whole building was made of wooden planks fixed in upright beams. The walls were covered inside and outside with straw, over which a layer of clay is applied. Gables are from wattle covered with clay. Gabled roof has tile covering. The room housing the grinding plant measures at interior 3.10 / 3.38 m, servant rest room is of 3.38 / 2.44 m, and dams operating room is of 2.52 / 3.01 m

(Pl . 5). Grinding installation is a simple one, having similarities with mills from Răcăşdia in some respects; that is a transfer of technology regarding stones raising system. Mill stone has as base two parallel logs, overlapping with other two shorter trunks, transversal placed to support millstones and basket. Basket is mounted on a wooden frame, consisting of two pillars embedded in mill bed, and two arms embedded in the wall and upright beams (Fig. 3). A carved beam fixed in the floor and ceiling, which rotates around its own axle has an arm with two claws to raise runner stone for repairs.

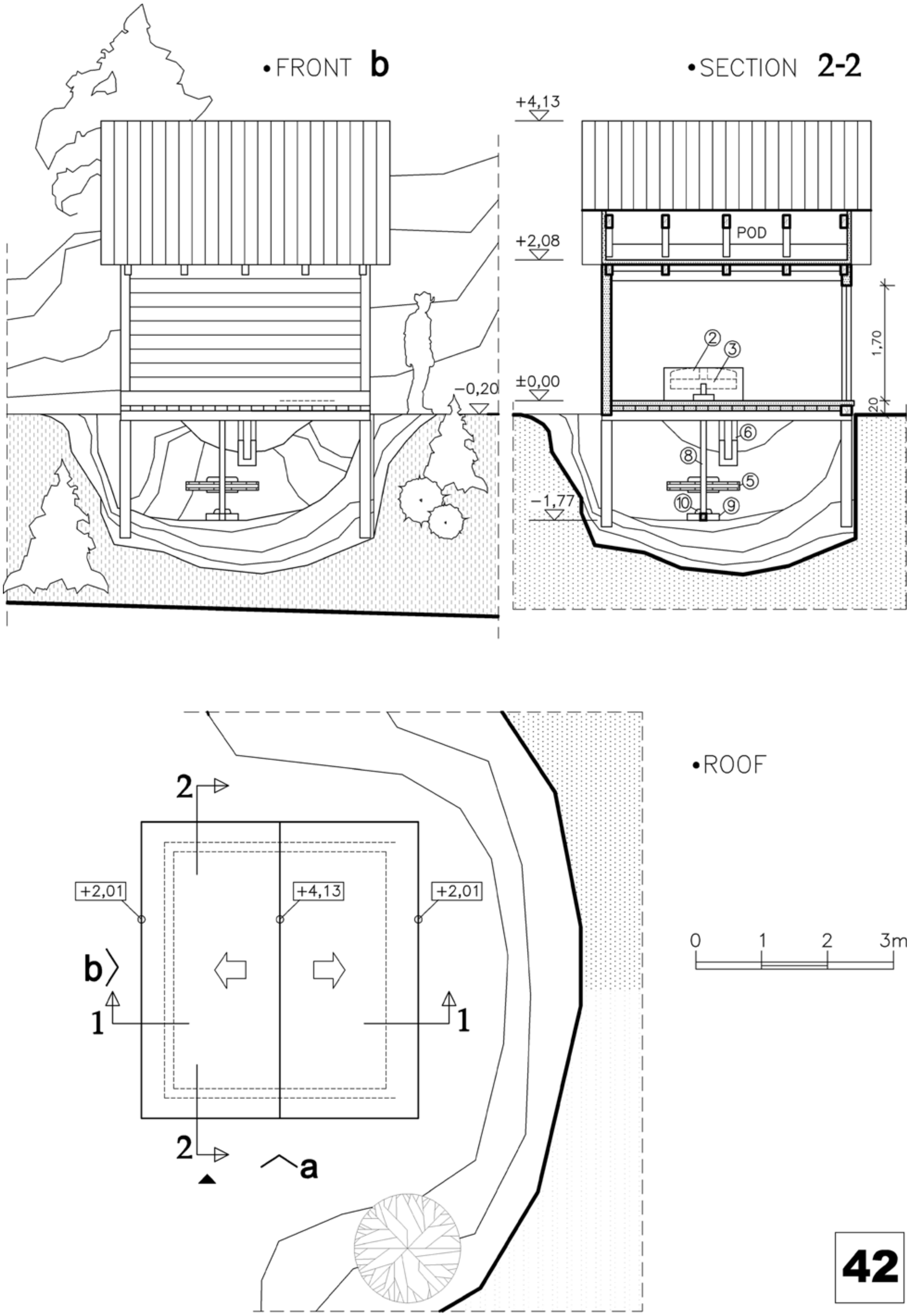
Hydrotechnical facility is located in underground space arranged on purpose, in a shape of rectangular pit of -2.45 m deepth. Water supply gutter to the mill wheel is located in a dug in the slope channel (Pl. 6).



Pl. 86. Eftimie Murgu. ***Mill from Tunnel***



Pl. 87. Eftimie Murgu. *Mill from Tunnel*



Pl. 88. Eftimie Murgu. *Mill from Tunnel*

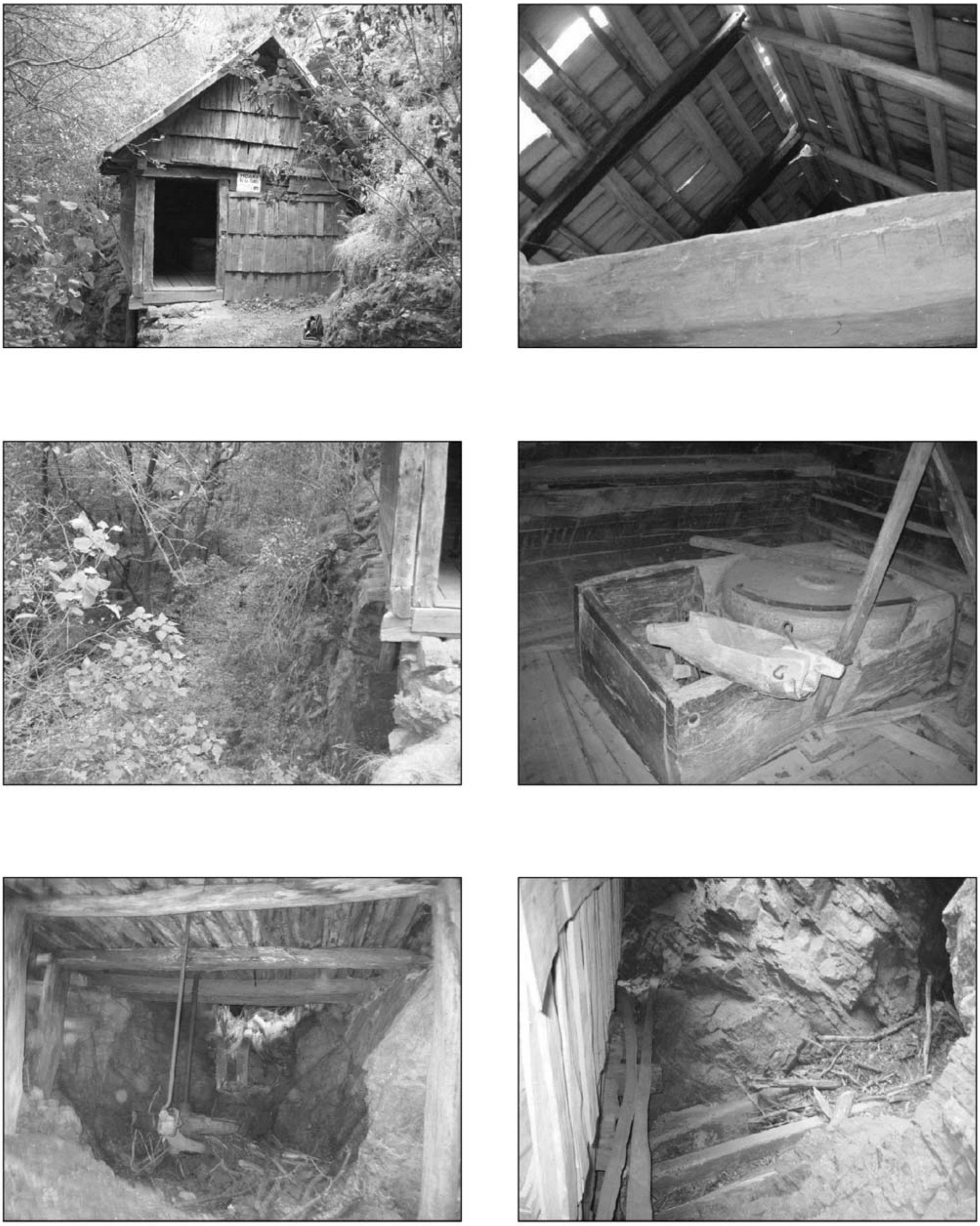
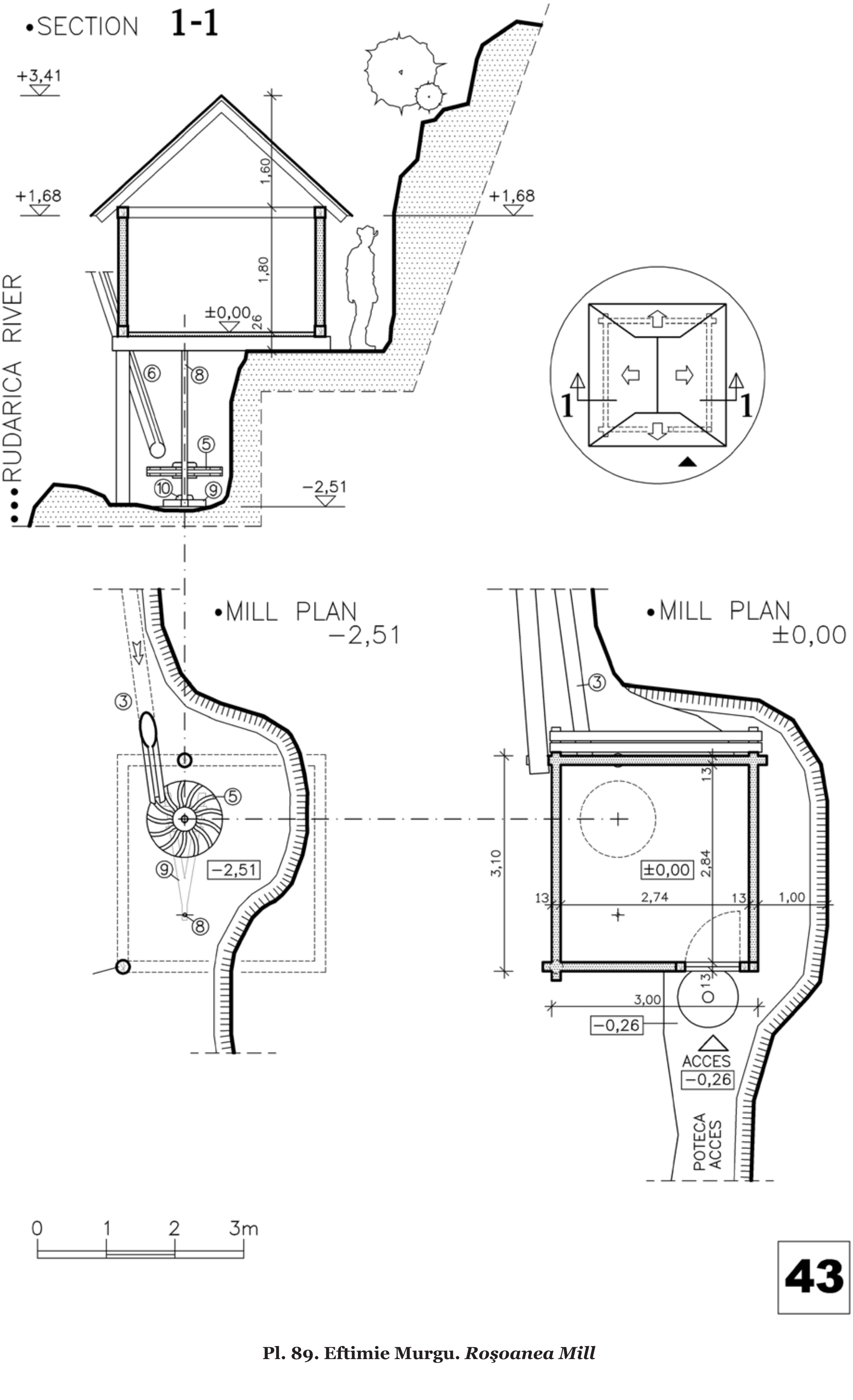
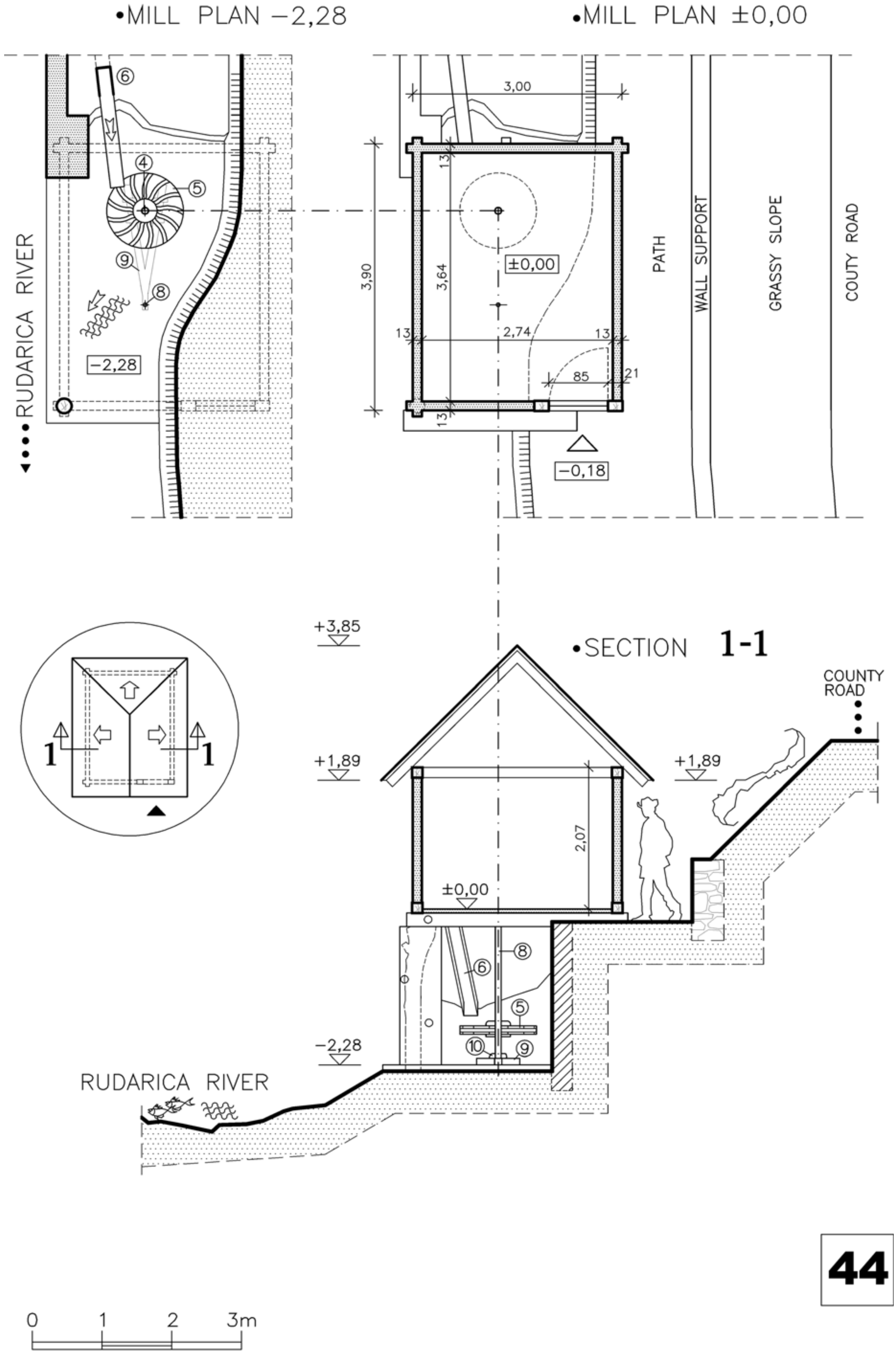


Fig. 29. Eftimie Murgu. ***Mill fromTunnel***



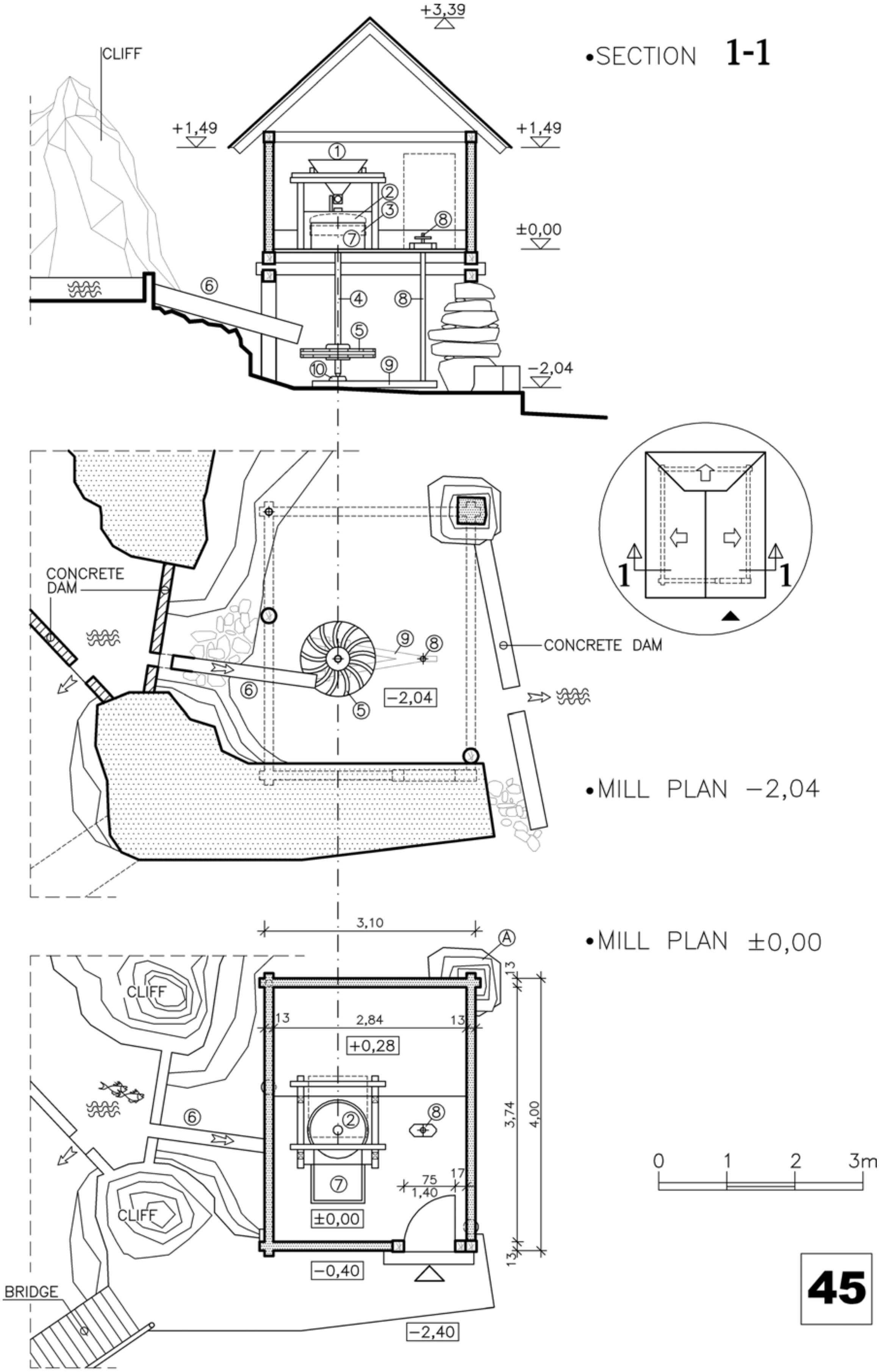
Pl. 89. Eftimie Murgu. ***Roşoanea Mill***

Fig. 30. Eftimie Murgu. *Roşoanea Mill*



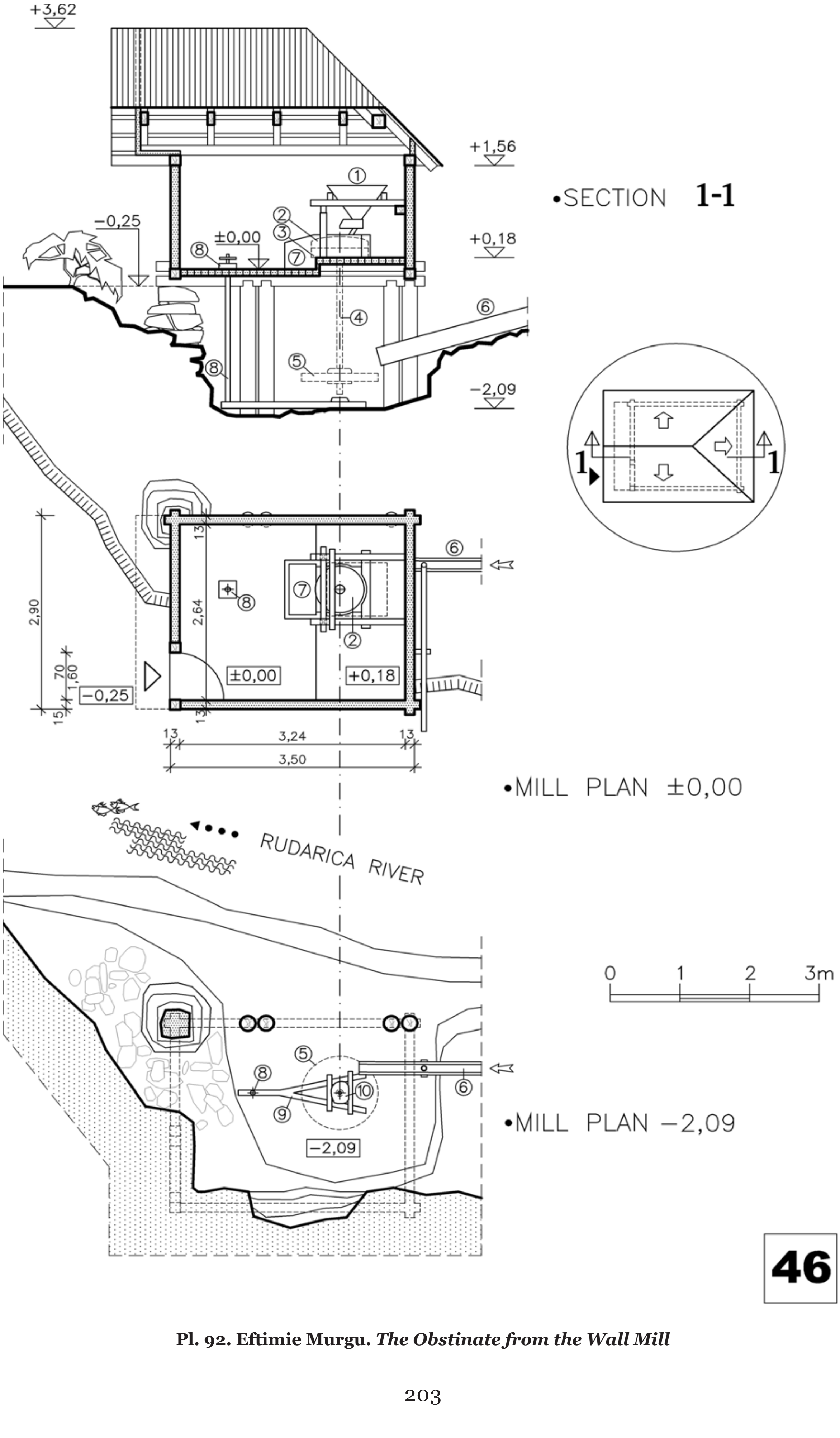
Pl. 90. Eftimie Murgu. ***Viloanea Mill***

Fig. 31. Eftimie Murgu. *Viloanea Mill*



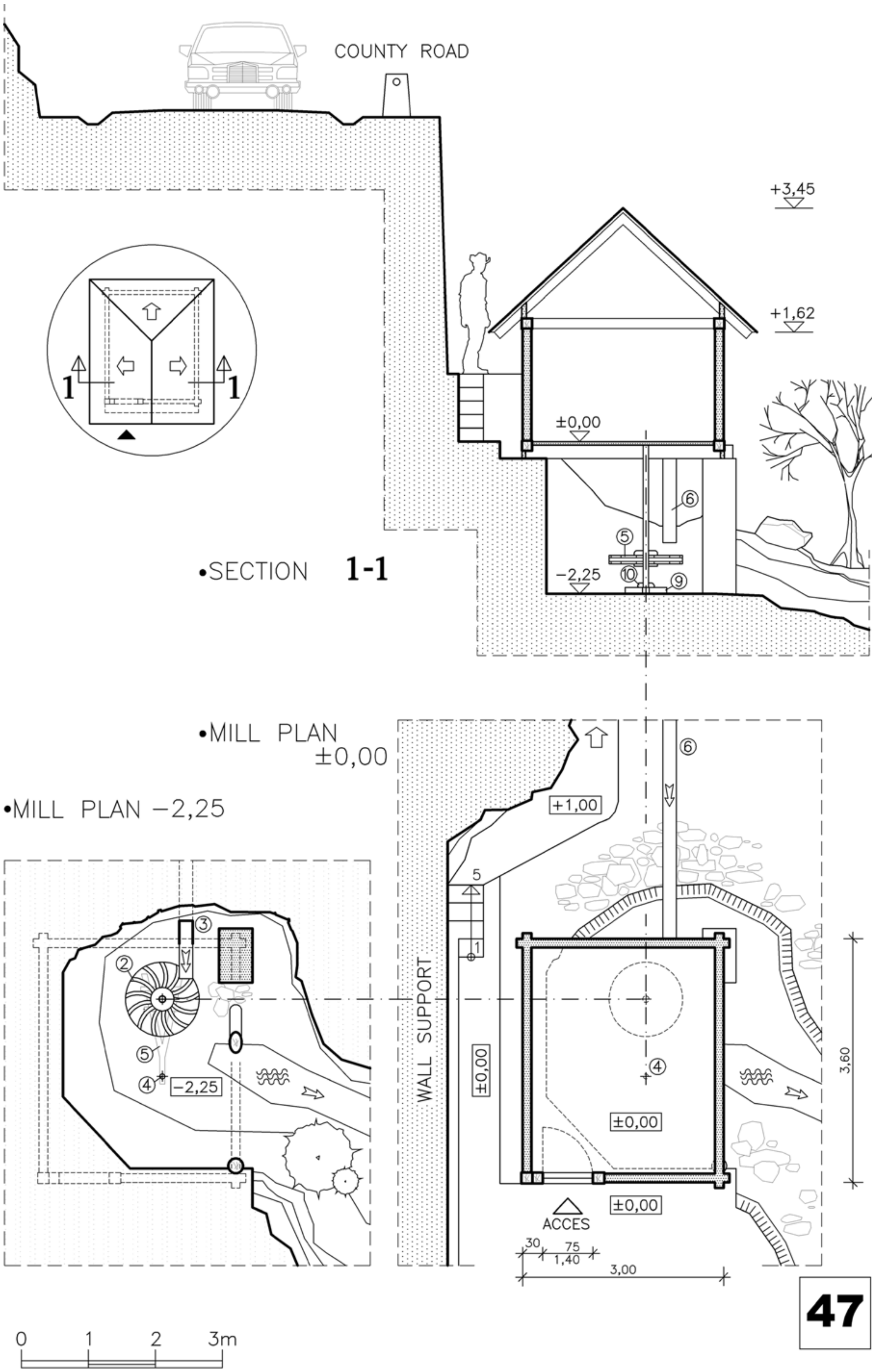
Pl. 91. Eftimie Murgu. ***The Obstinate between Rivers Mill***

Fig. 32. Eftimie Murgu. *The Obstinate between Rivers Mill* -



Pl. 92. Eftimie Murgu. ***The Obstinate from the Wall Mill***

Fig. 33. Eftimie Murgu. ***The Obstinate from the Wall Mill***



Pl. 93. Eftimie Murgu. ***Trăiloanea Mill***

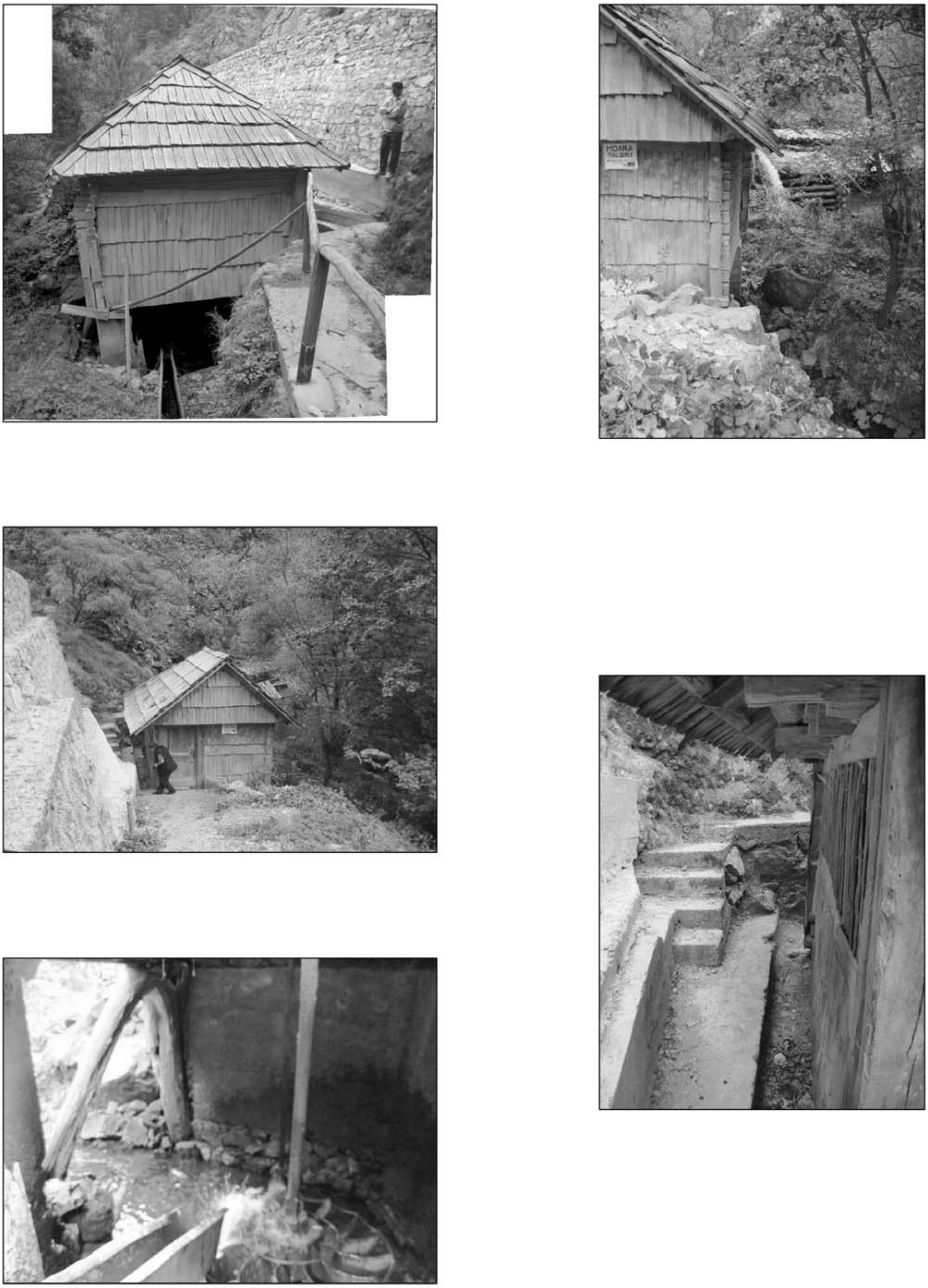
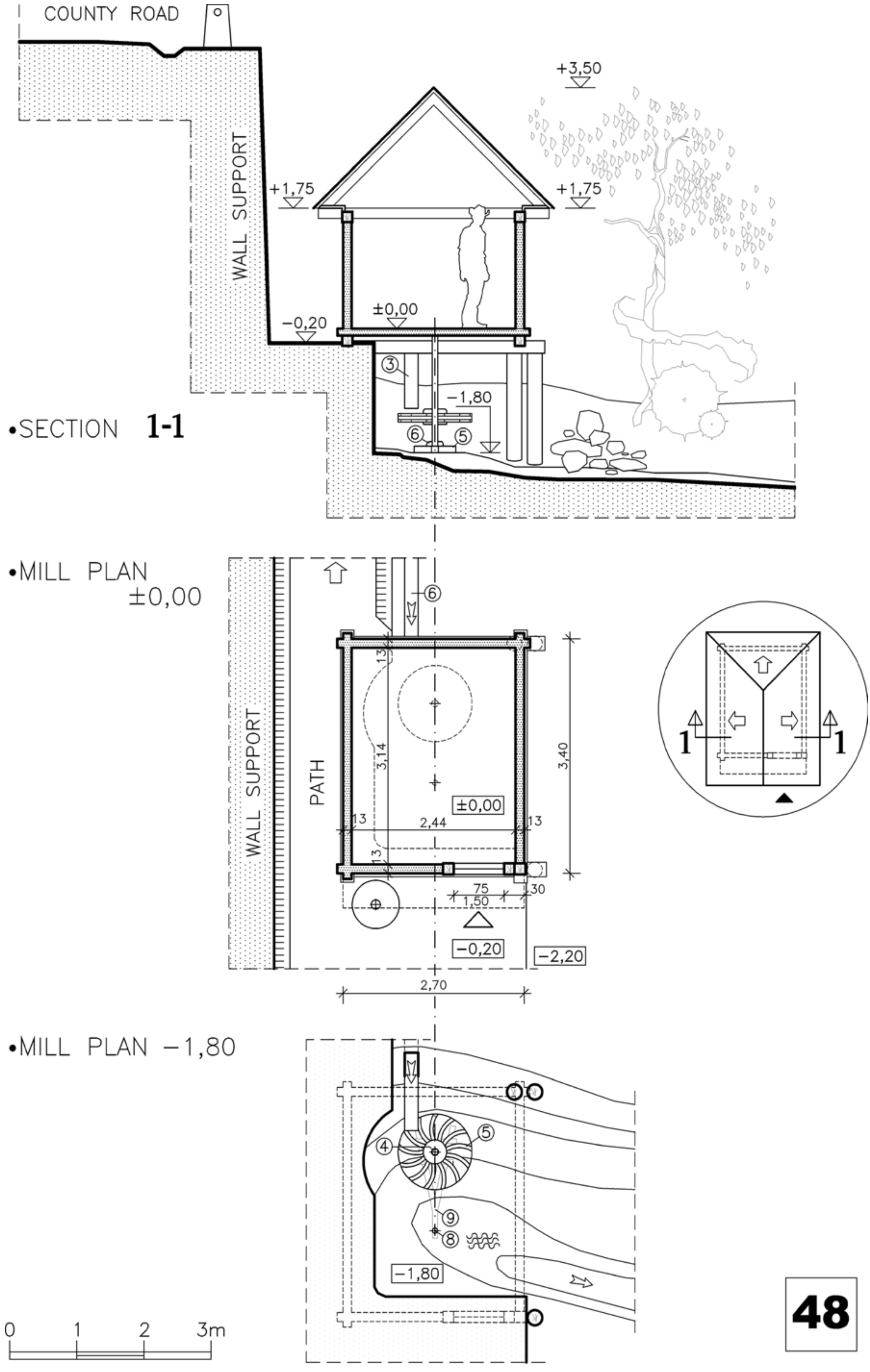


Fig. 34. Eftimie Murgu. ***Trăiloanea Mill***



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Pl. 94. Eftimie Murgu. *Bâţolea Mill*

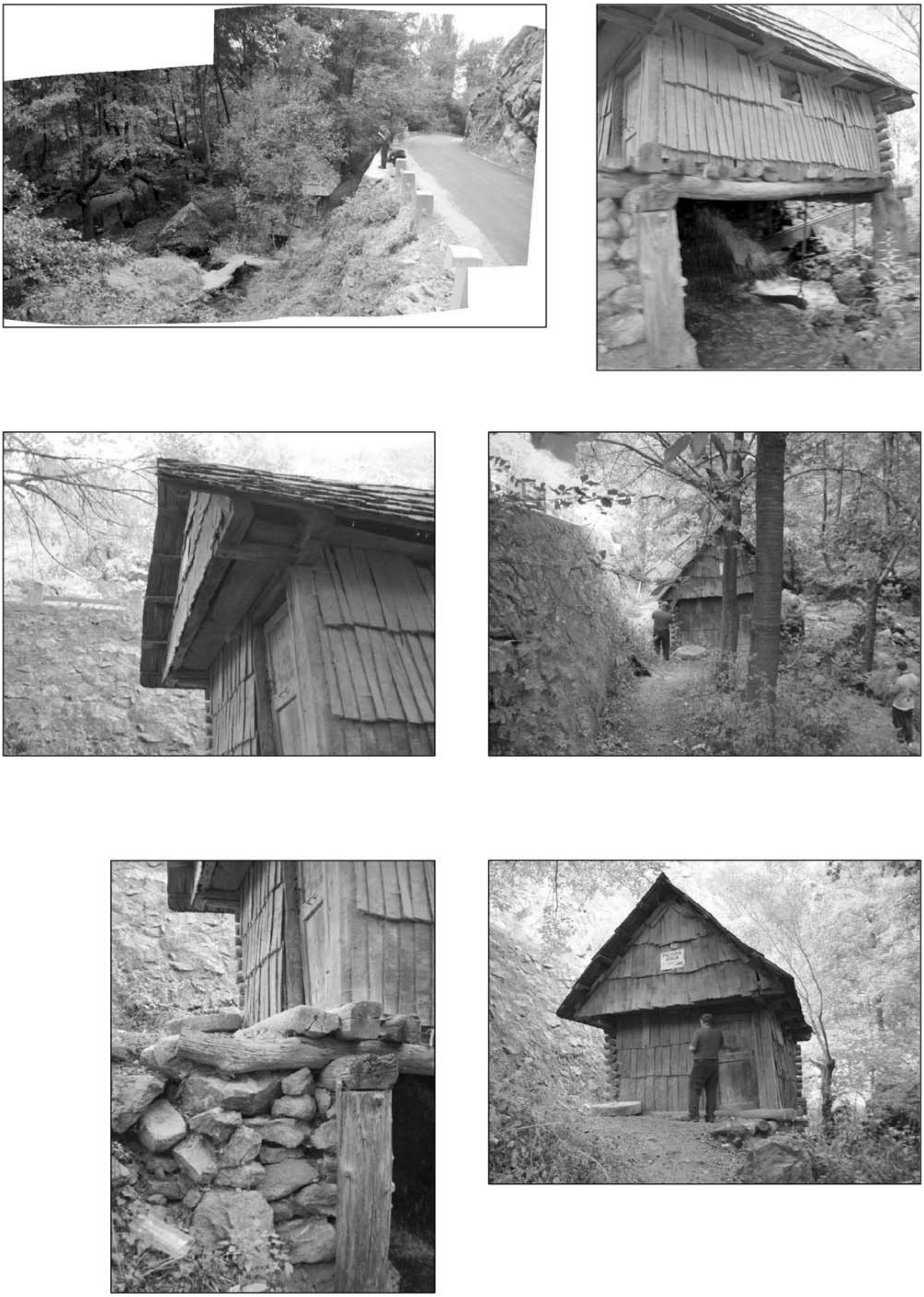
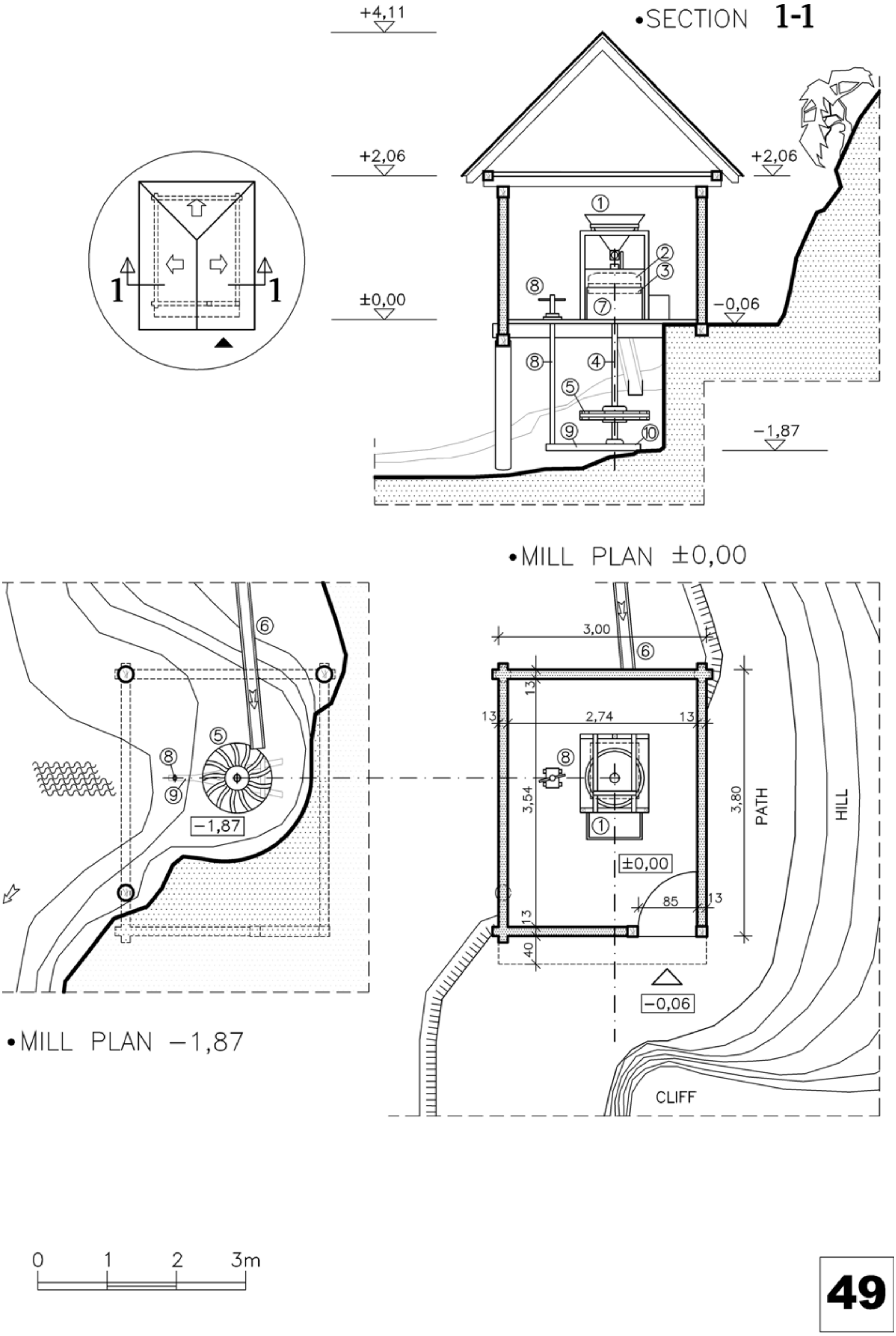
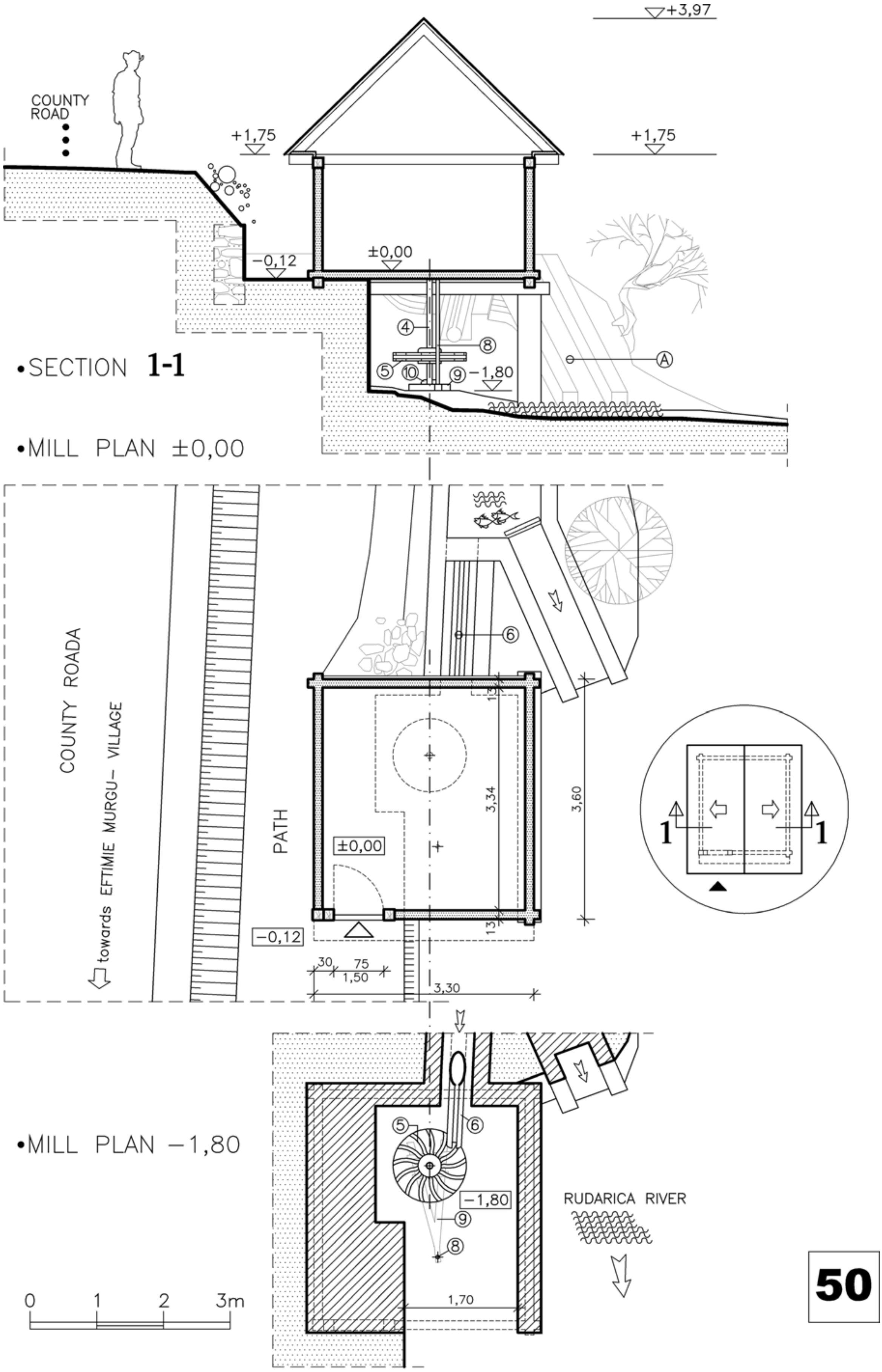


Fig. 35. Eftimie Murgu. *Bâțolea Mill*



Pl. 95. Eftimie Murgu. ***Pățoanea Mill***

Fig. 36. Eftimie Murgu. *Păţoanea Mill*



Pl. 96. Eftimie Murgu. ***Mill from Firiz***

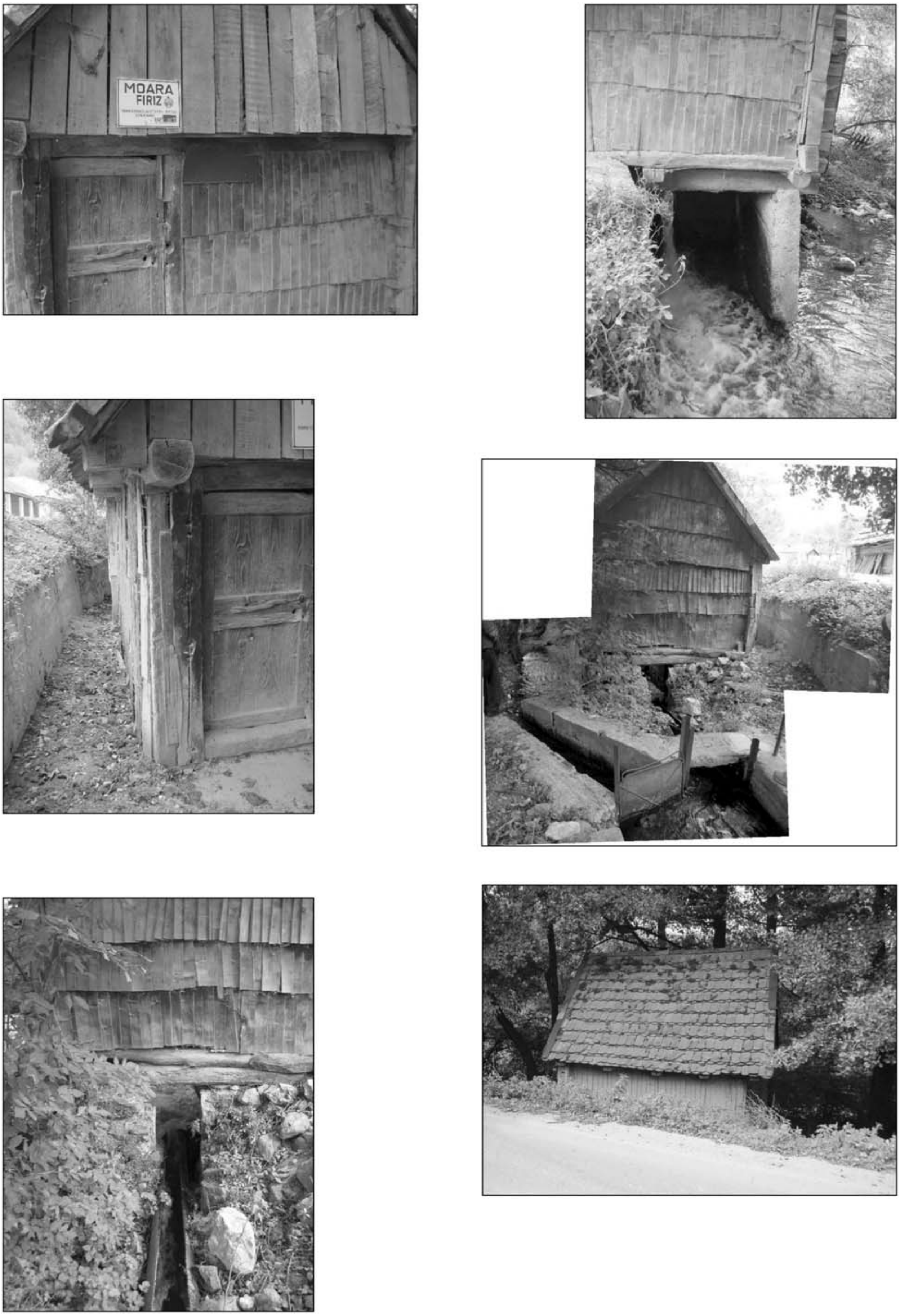
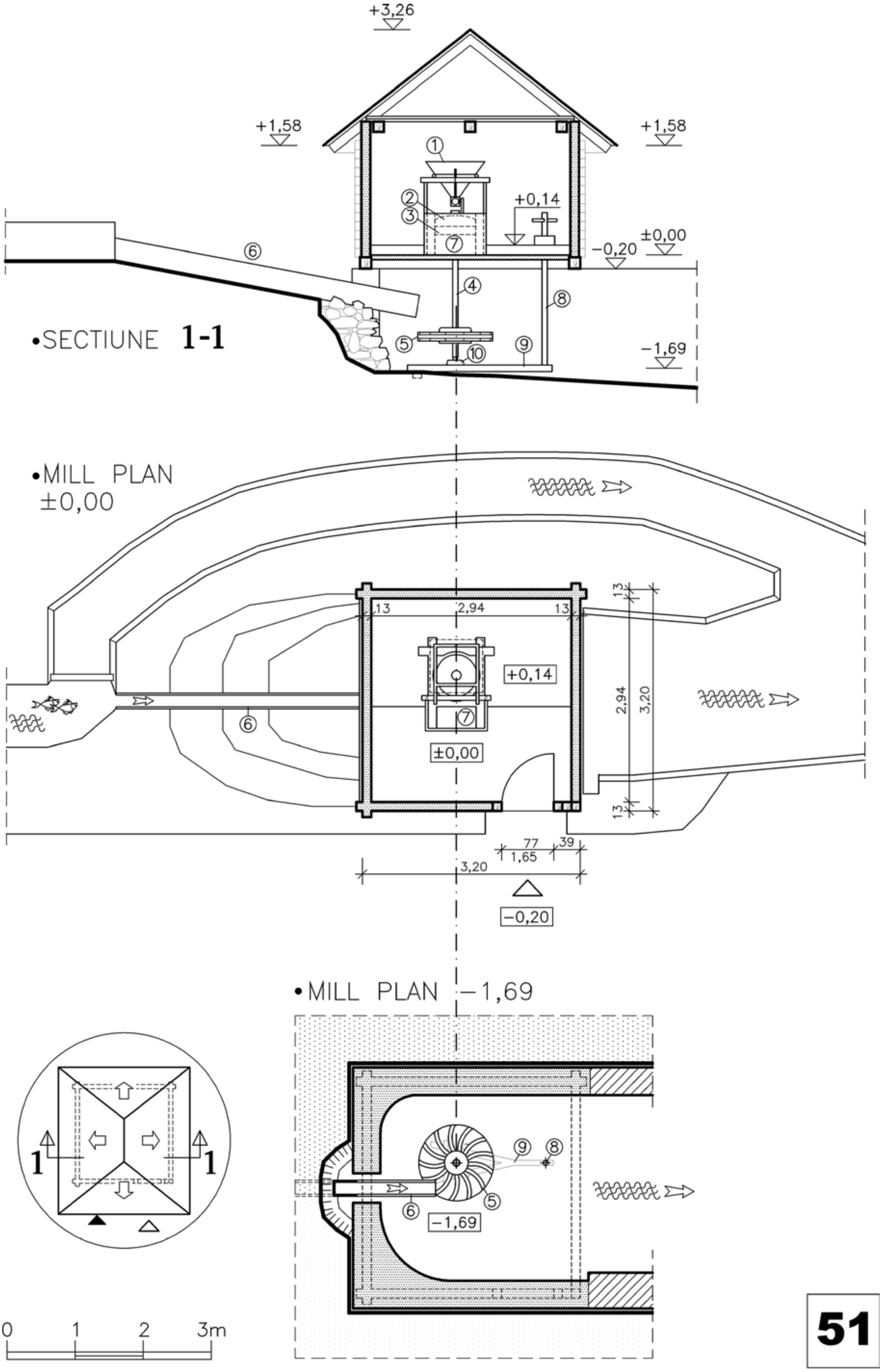


Fig. 37. Eftimie Murgu. ***Mill from Firiz***



Pl. 97. Eftimie Murgu. ***Hămbăroanea Mill***

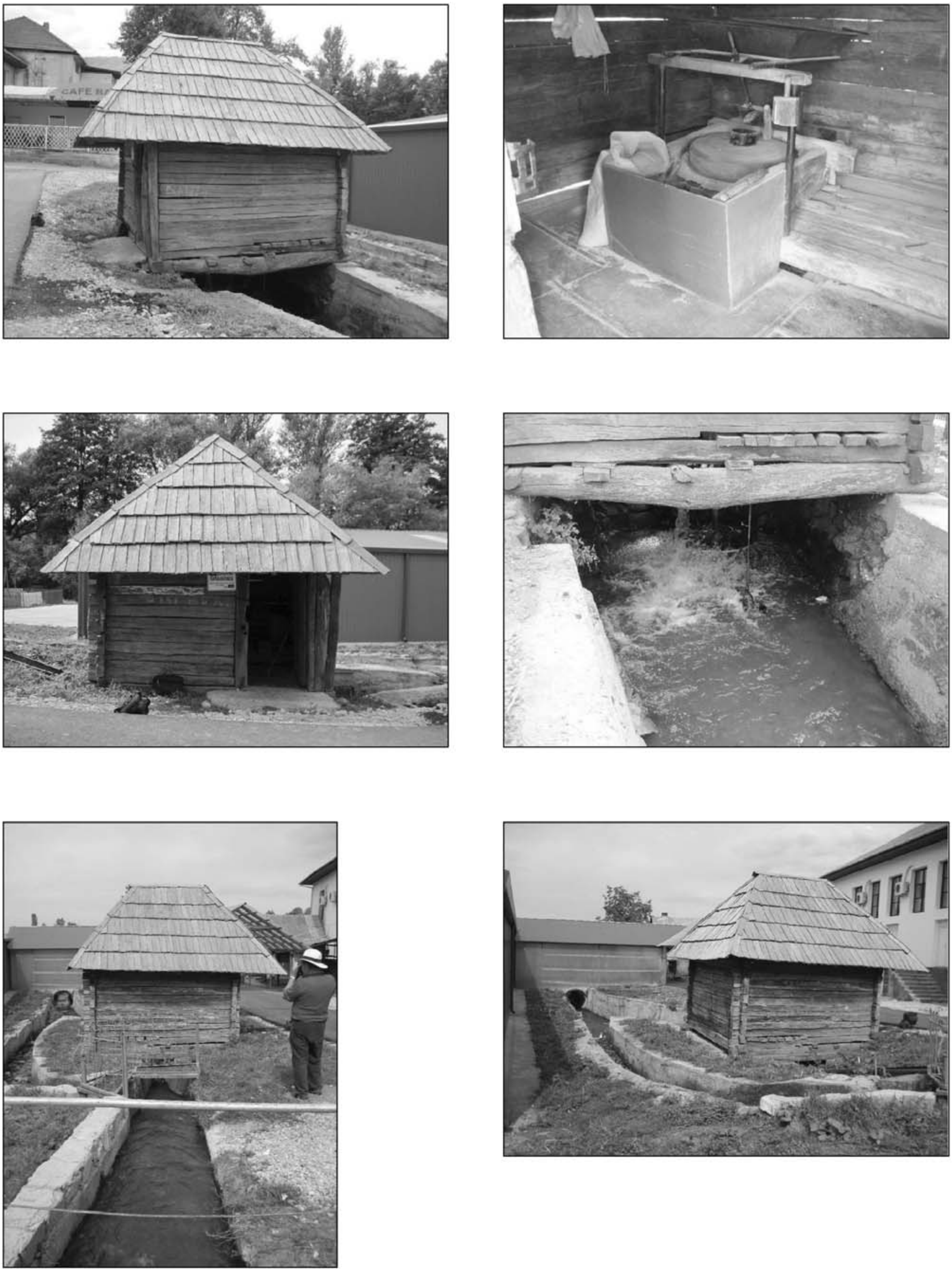
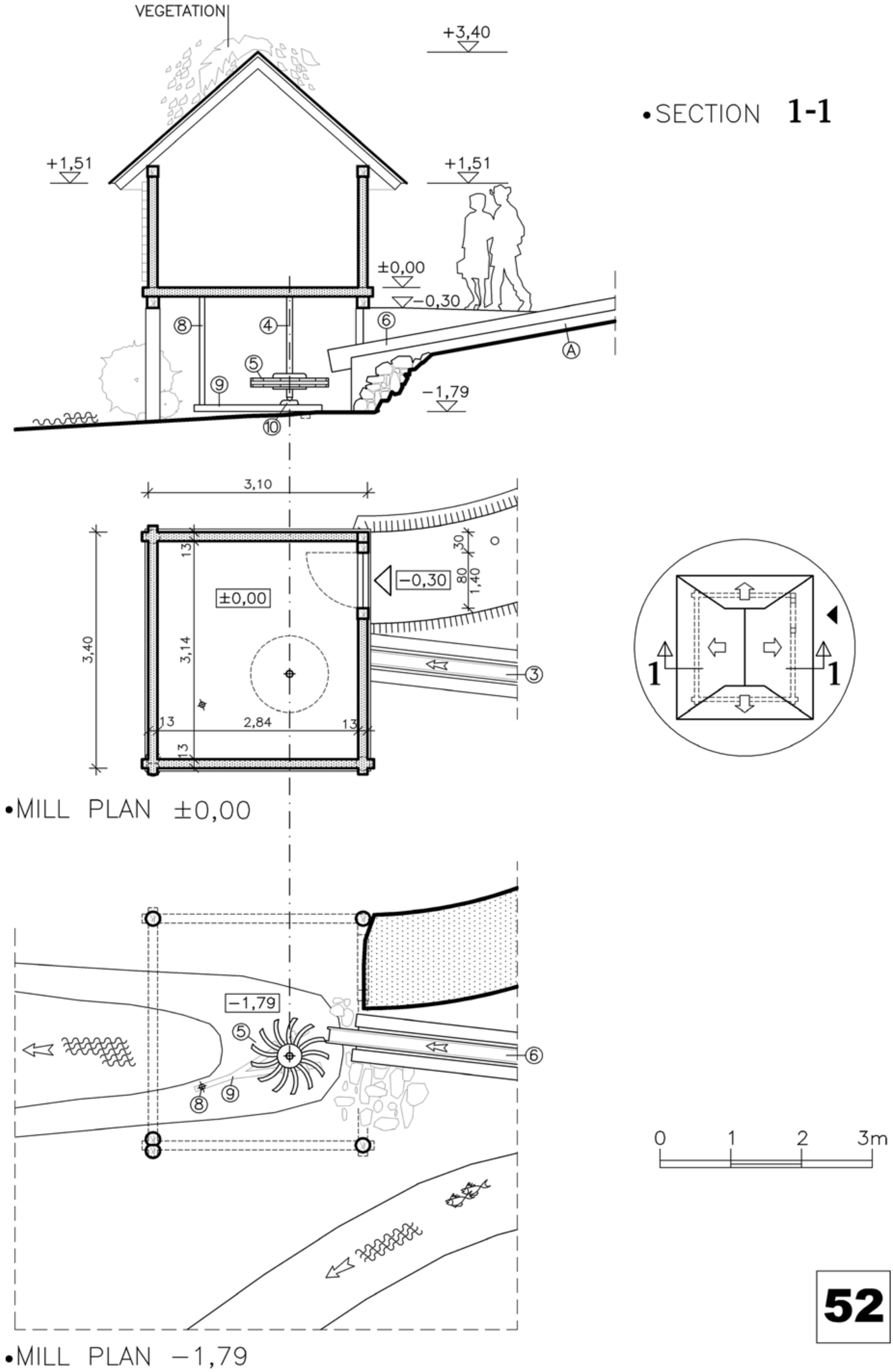


Fig. 38. Eftimie Murgu. ***Hămbăroanea Mill***



Pl. 98. Eftimie Murgu. ***Firizoanea Mill***

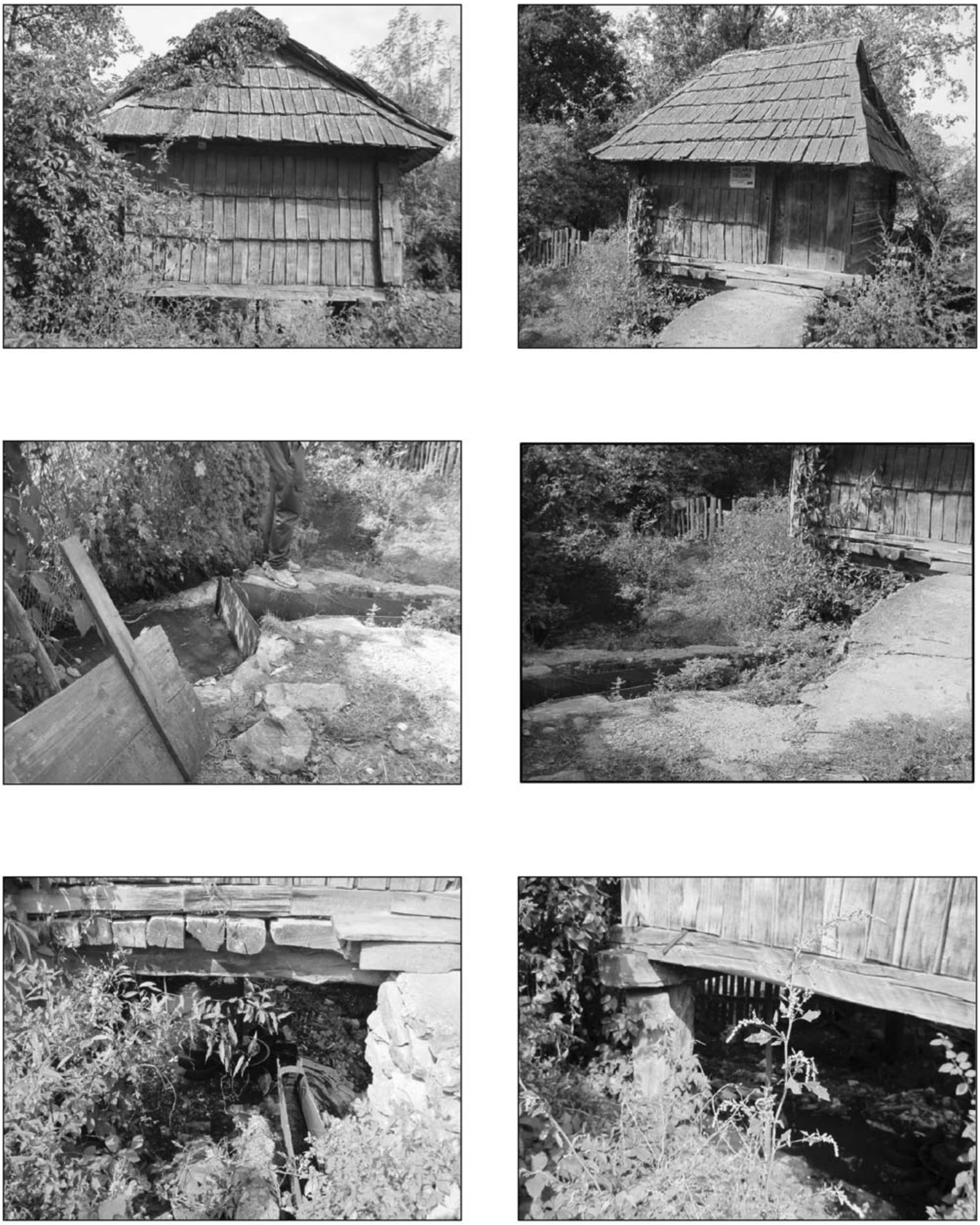
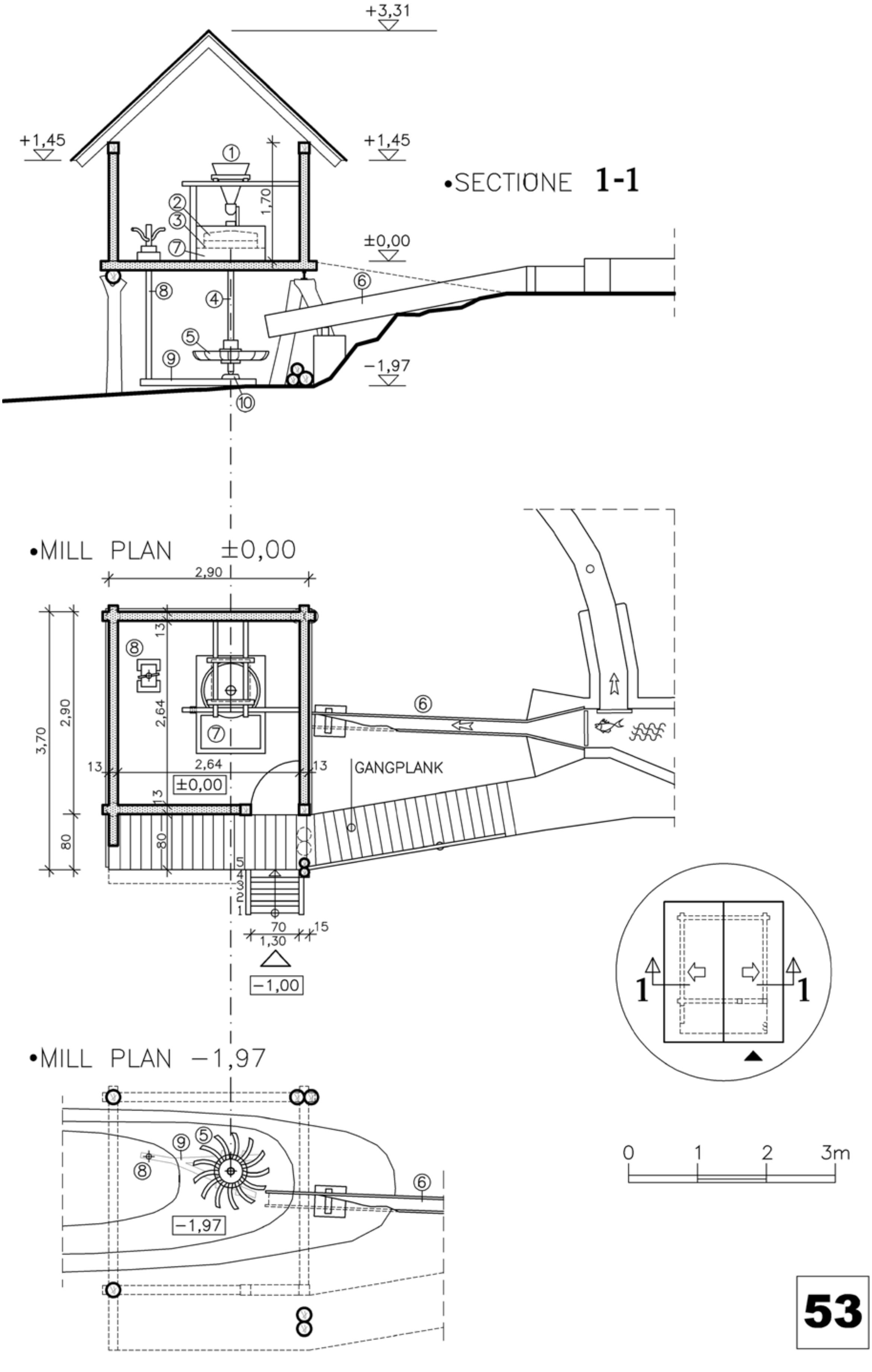


Fig. 39. Eftimie Murgu. ***Firizoanea Mill***



Pl. 99. Eftimie Murgu. ***Micloşoanea Mill***

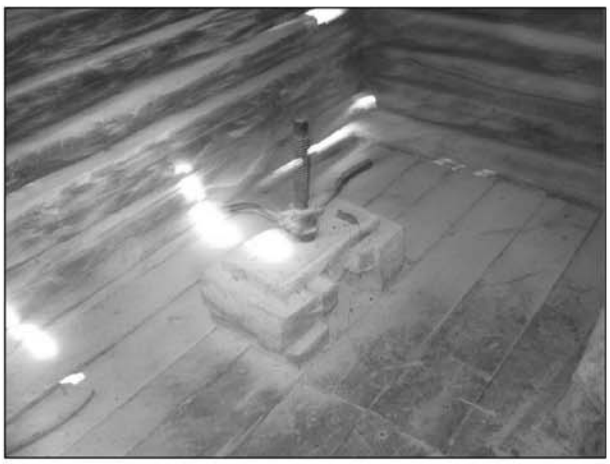
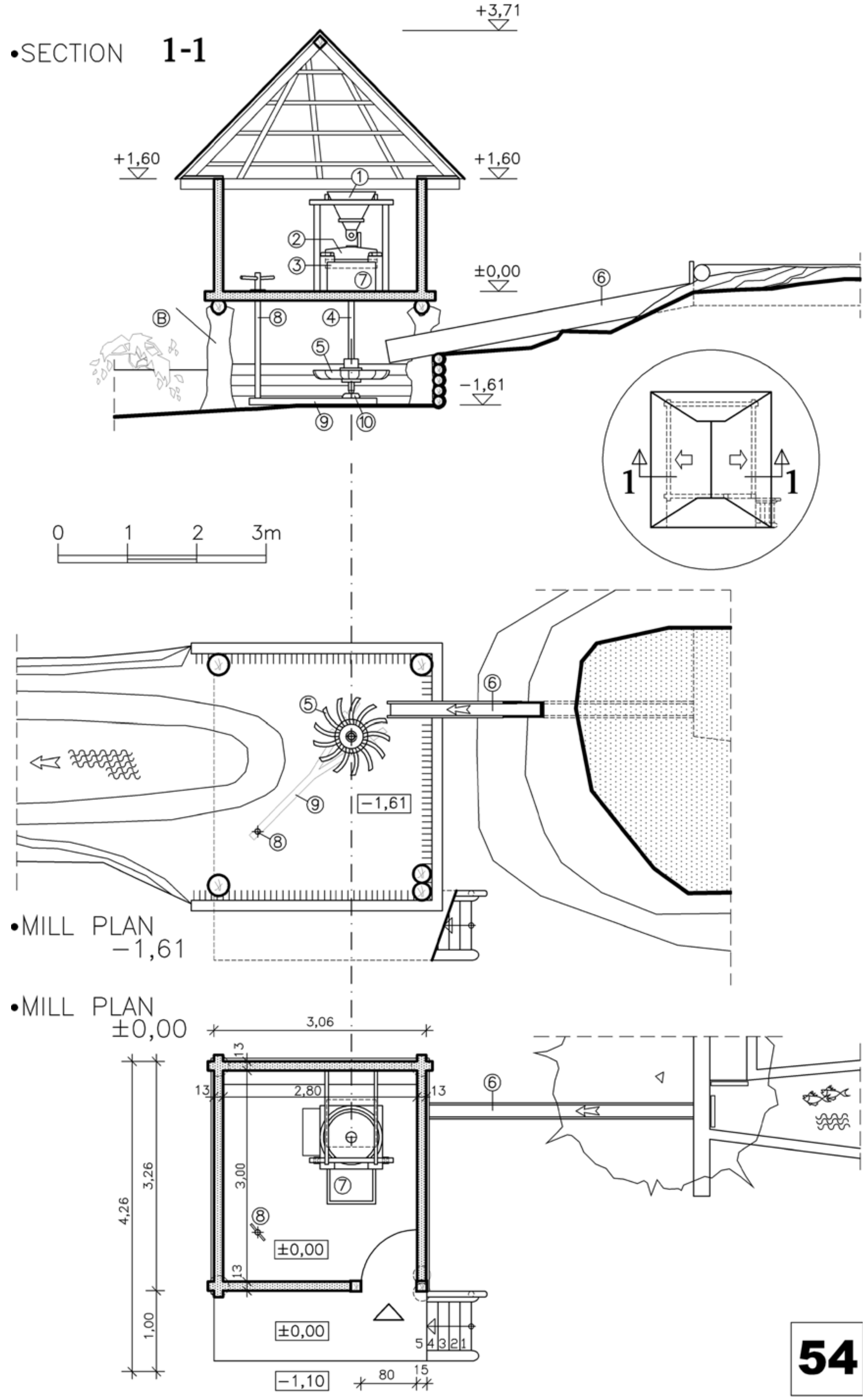
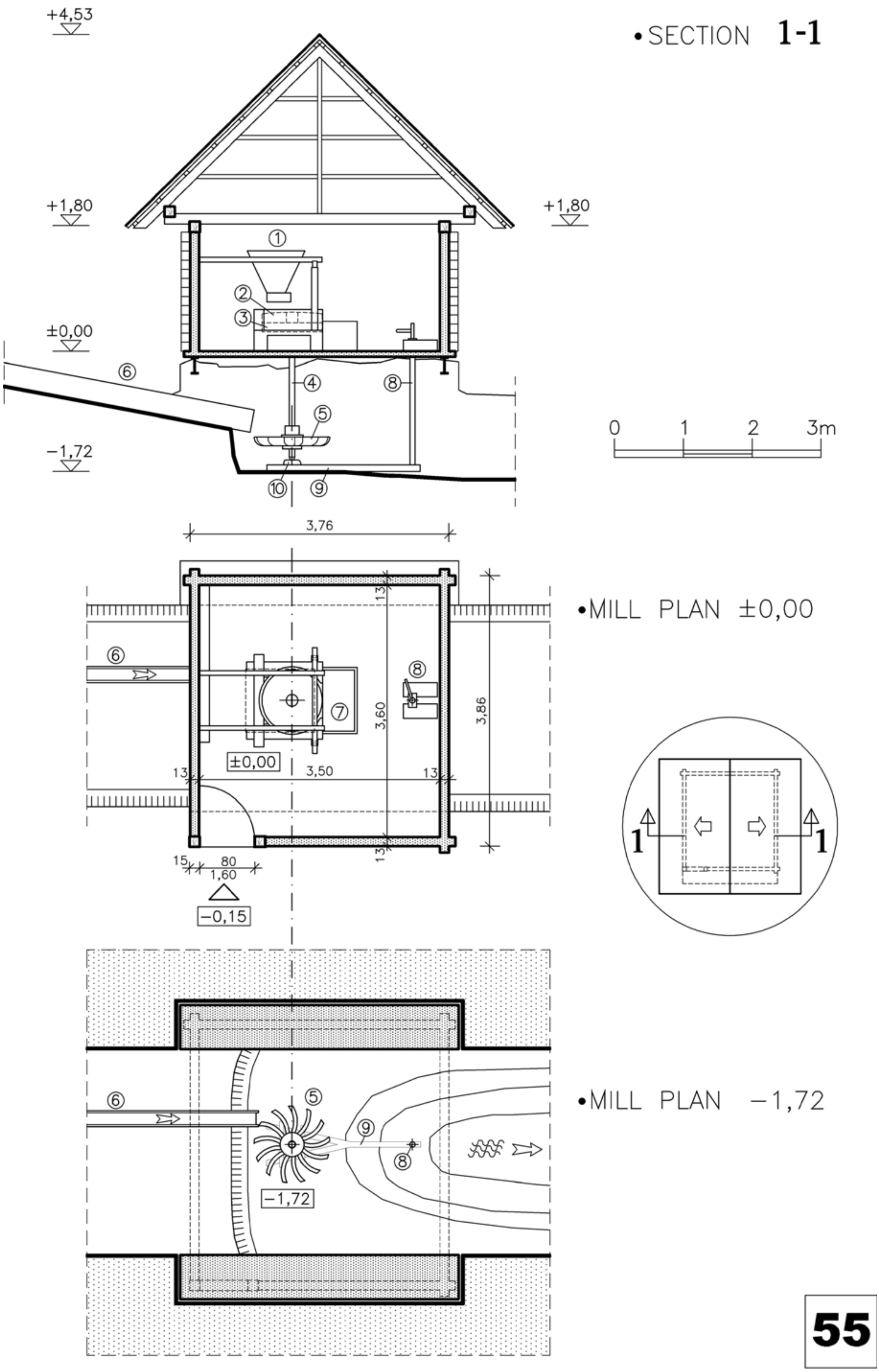


Fig. 40. Eftimie Murgu. ***Micloşoanea Mill***



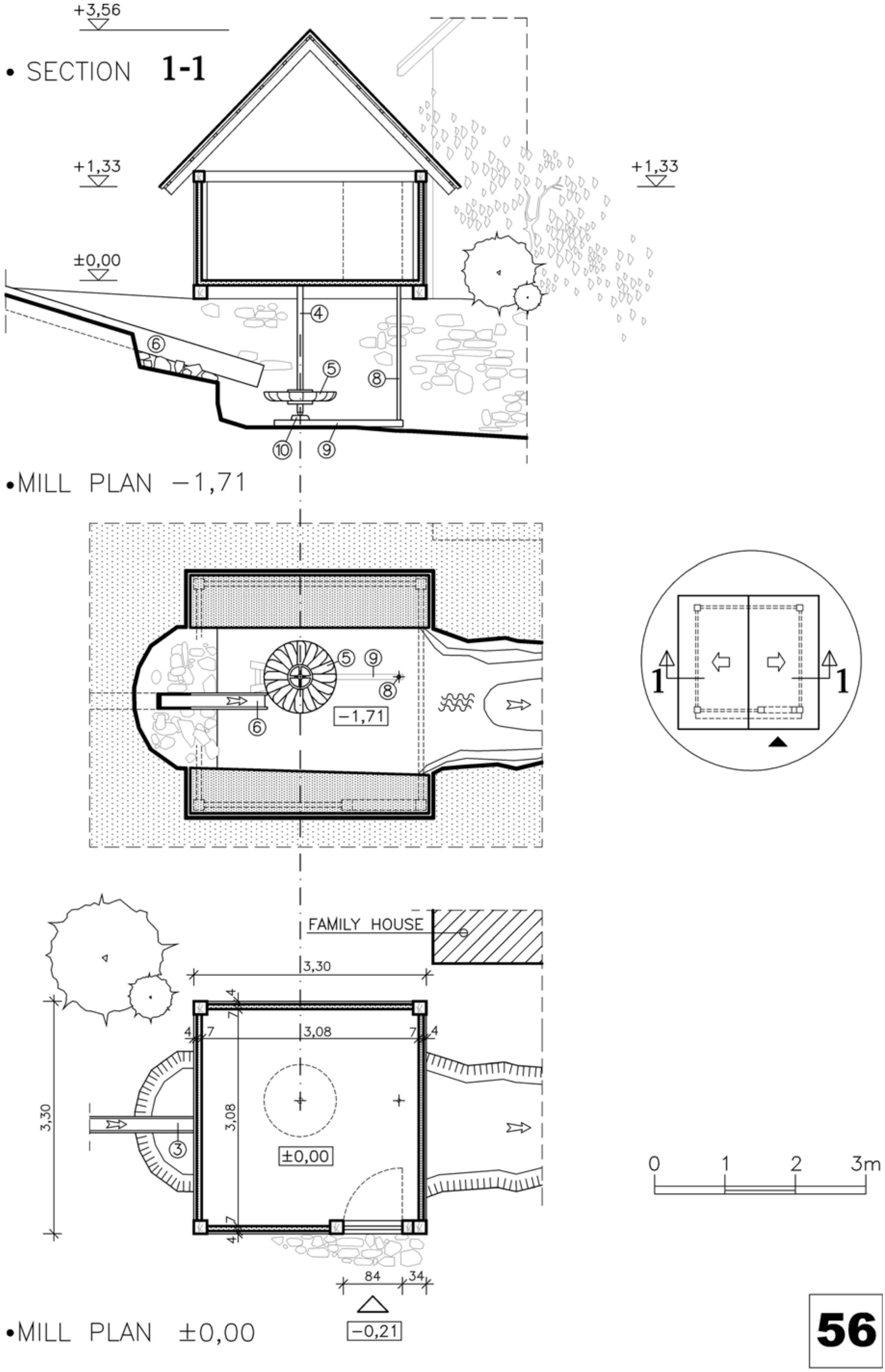
Pl. 100. Eftimie Murgu. ***Brusoanea Mill***

Fig. 41. Eftimie Murgu. ***Brusoanea Mill***



Pl. 101. Eftimie Murgu. ***Mill from the Field***

Fig. 42. Eftimie Murgu. *Mill from the Field*



Pl. 102. Pârvova. ***Cheia Mill***

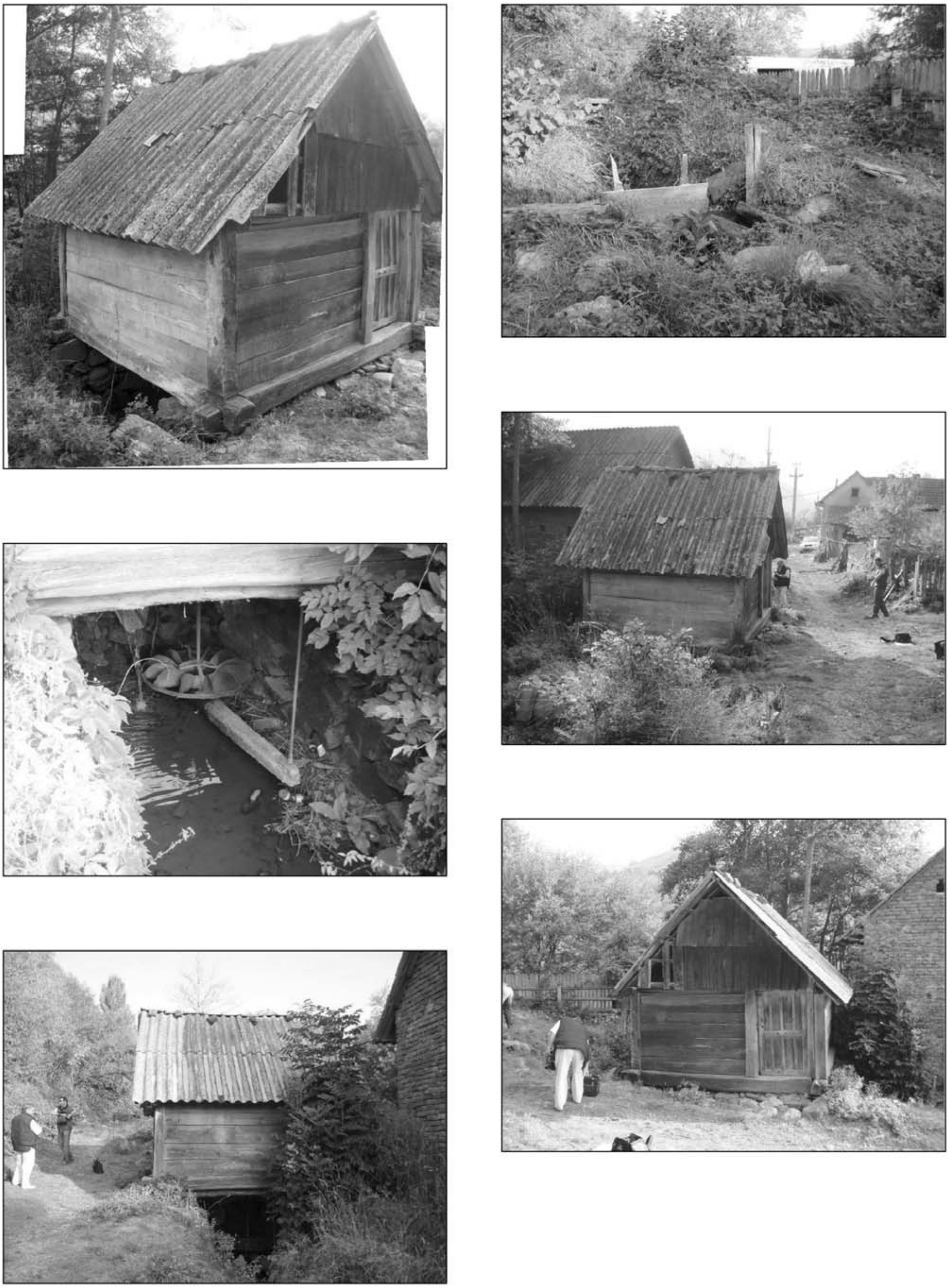
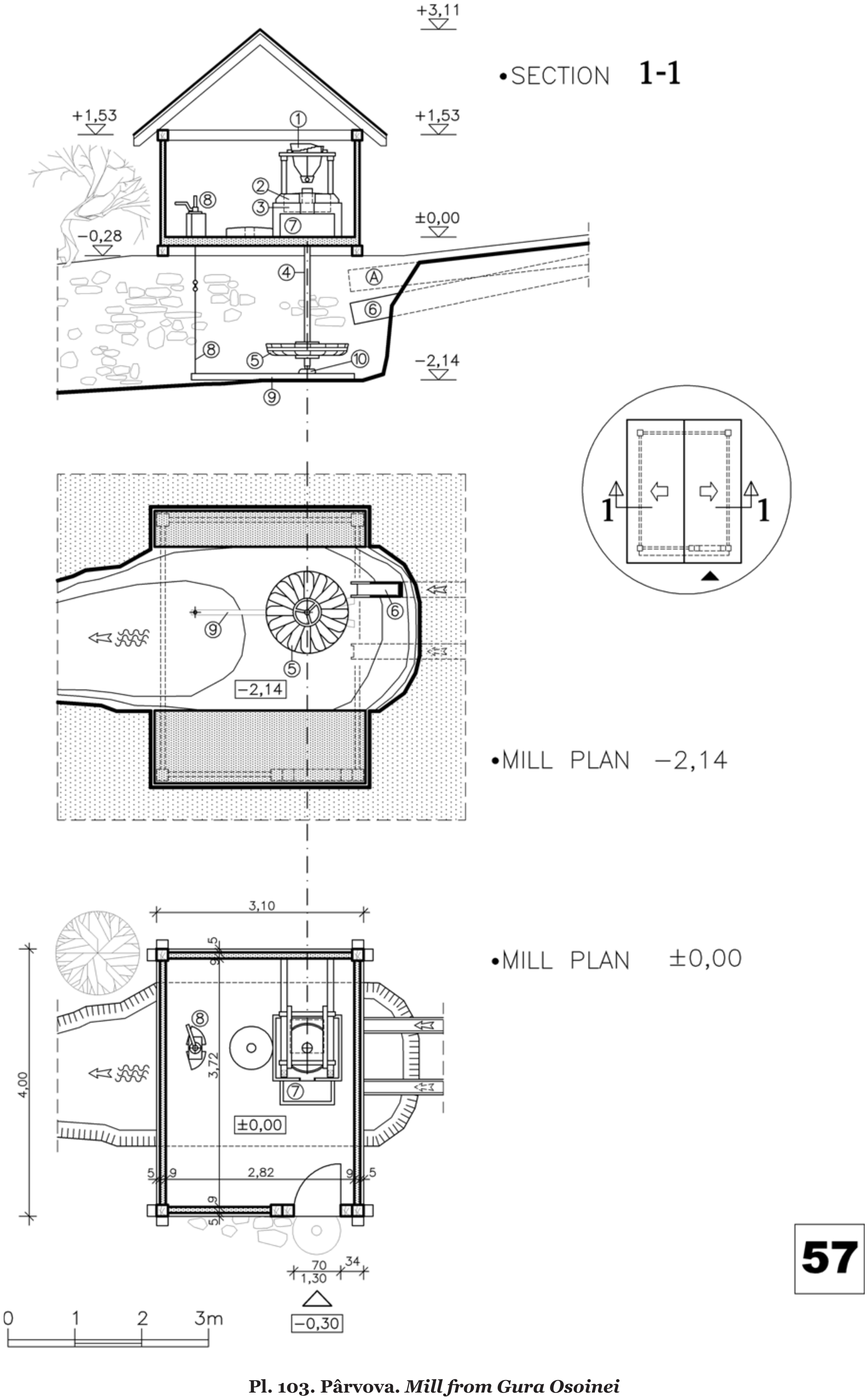


Fig. 43. Pârvova. ***Cheia Mill***



Pl. 103. Pârvova. ***Mill from Gura Osoinei***

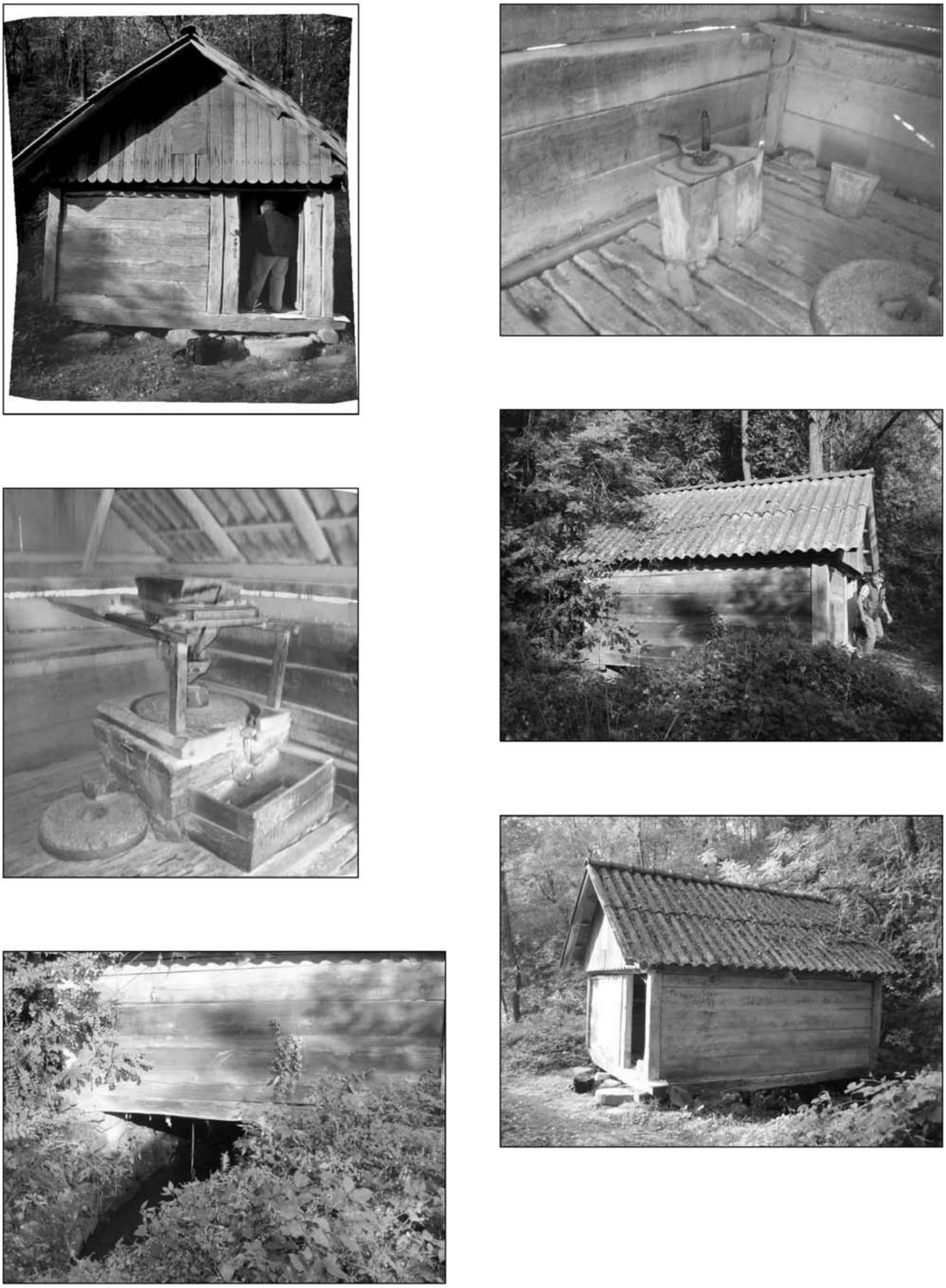
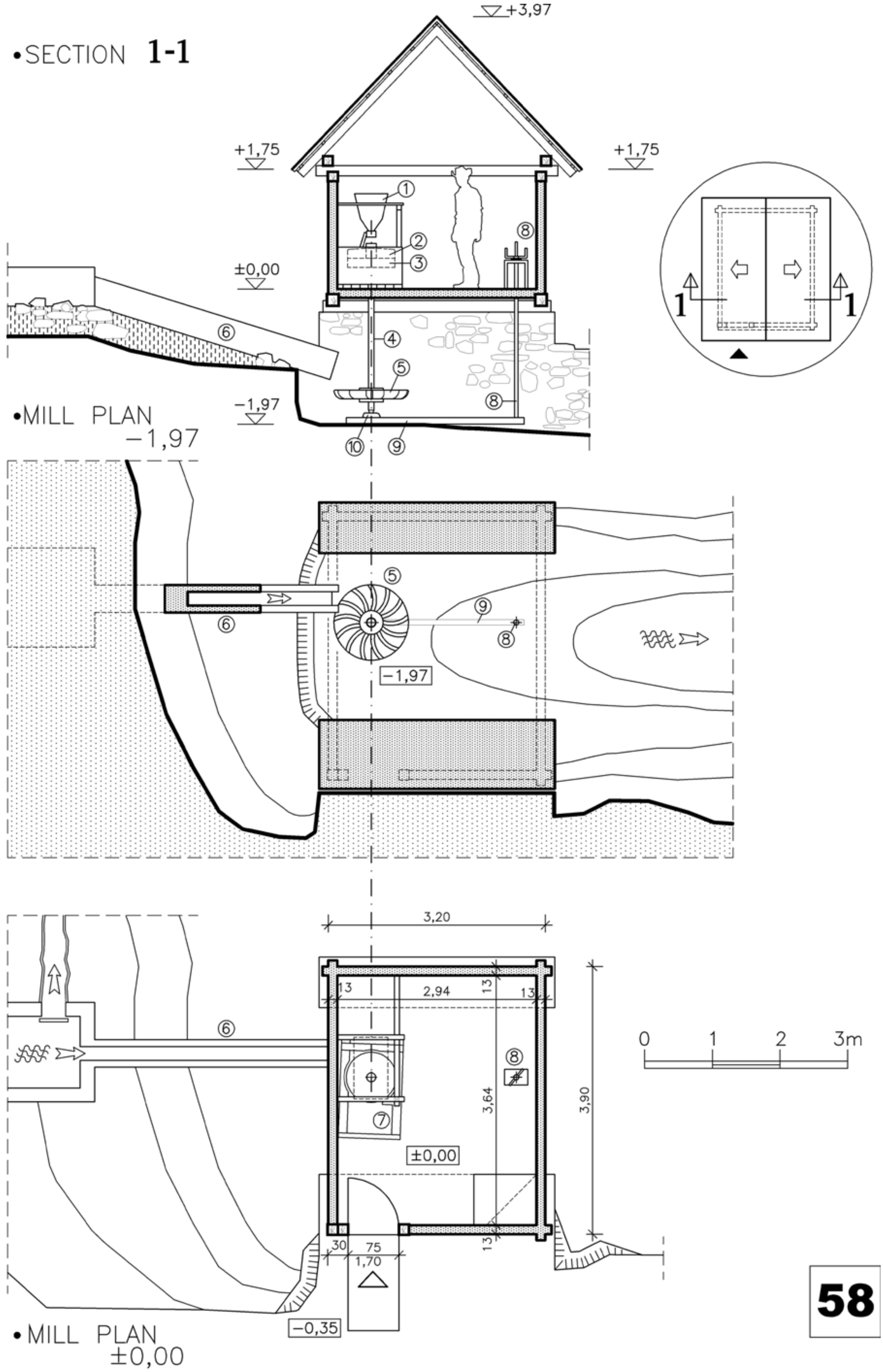


Fig. 44. Pârvova. ***Mill from Gura Osoinei***



Pl. 104. Prigor. ***Mills from Ibâlcina Mouth - Mill 1-***

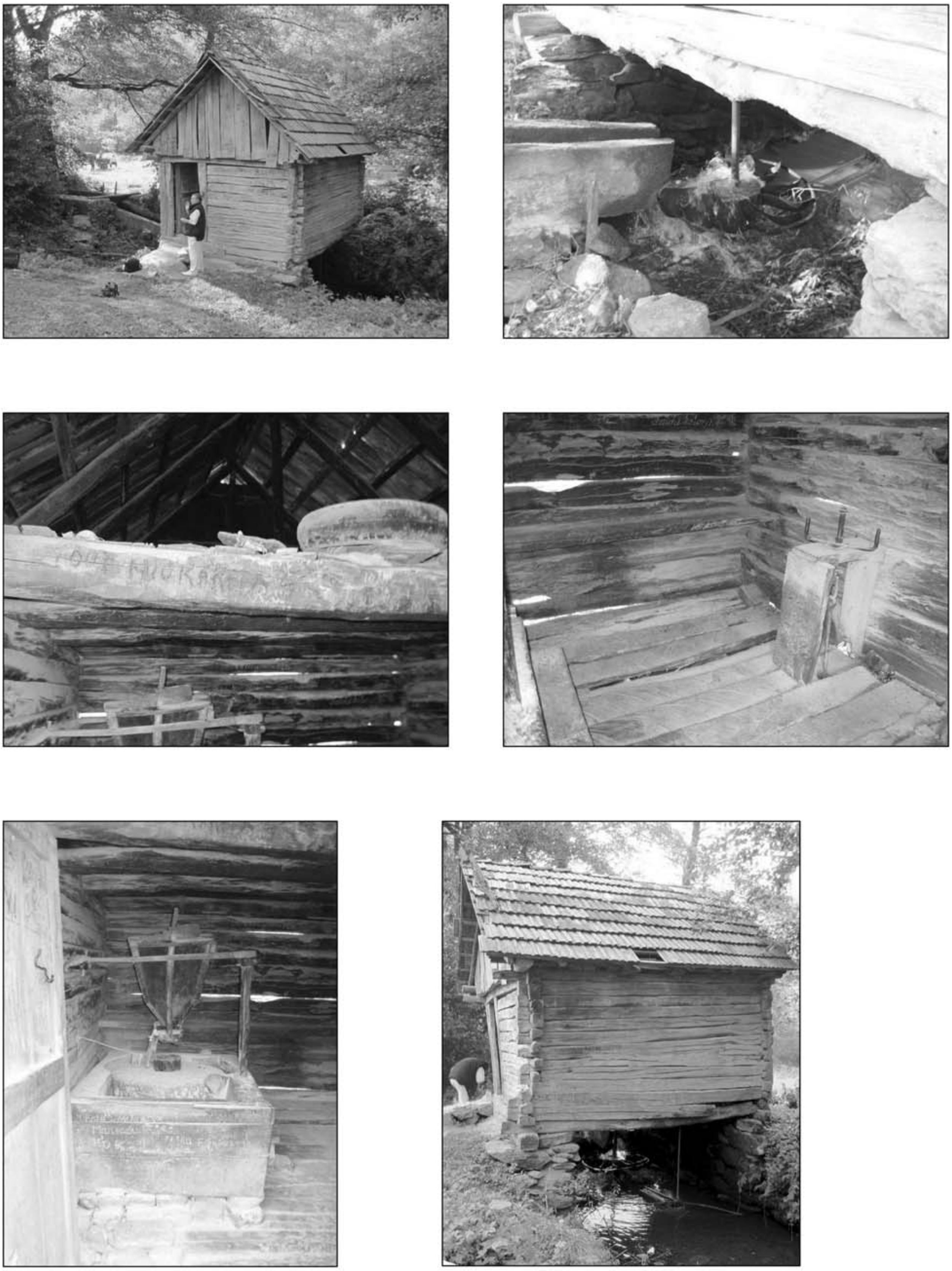
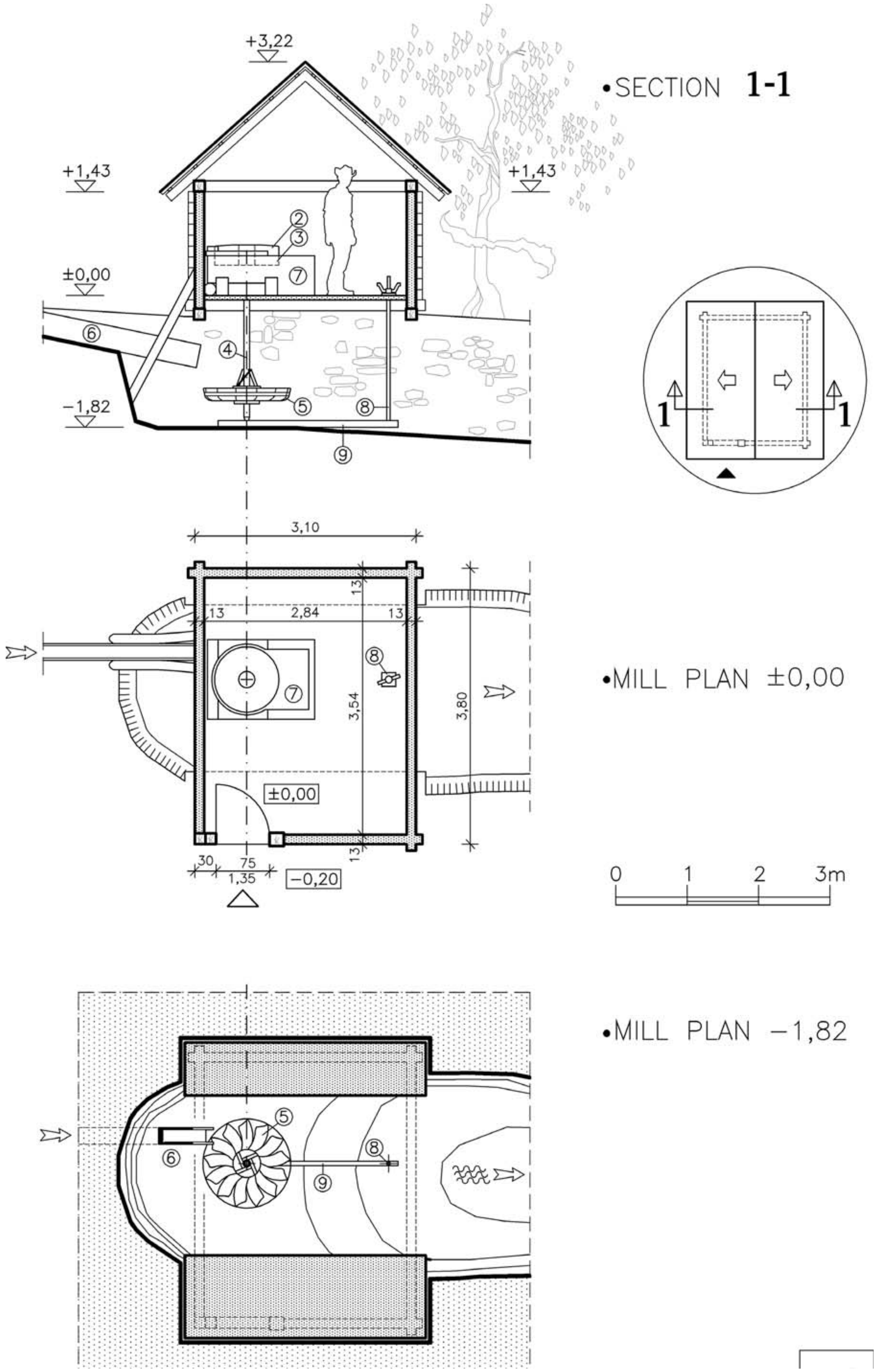


Fig. 45. Prigor. ***Mill from Ibâlcina Mouth***



Pl. 105. Prigor. ***Mills from Ibâlcina Mmouth - Mill 2 -***

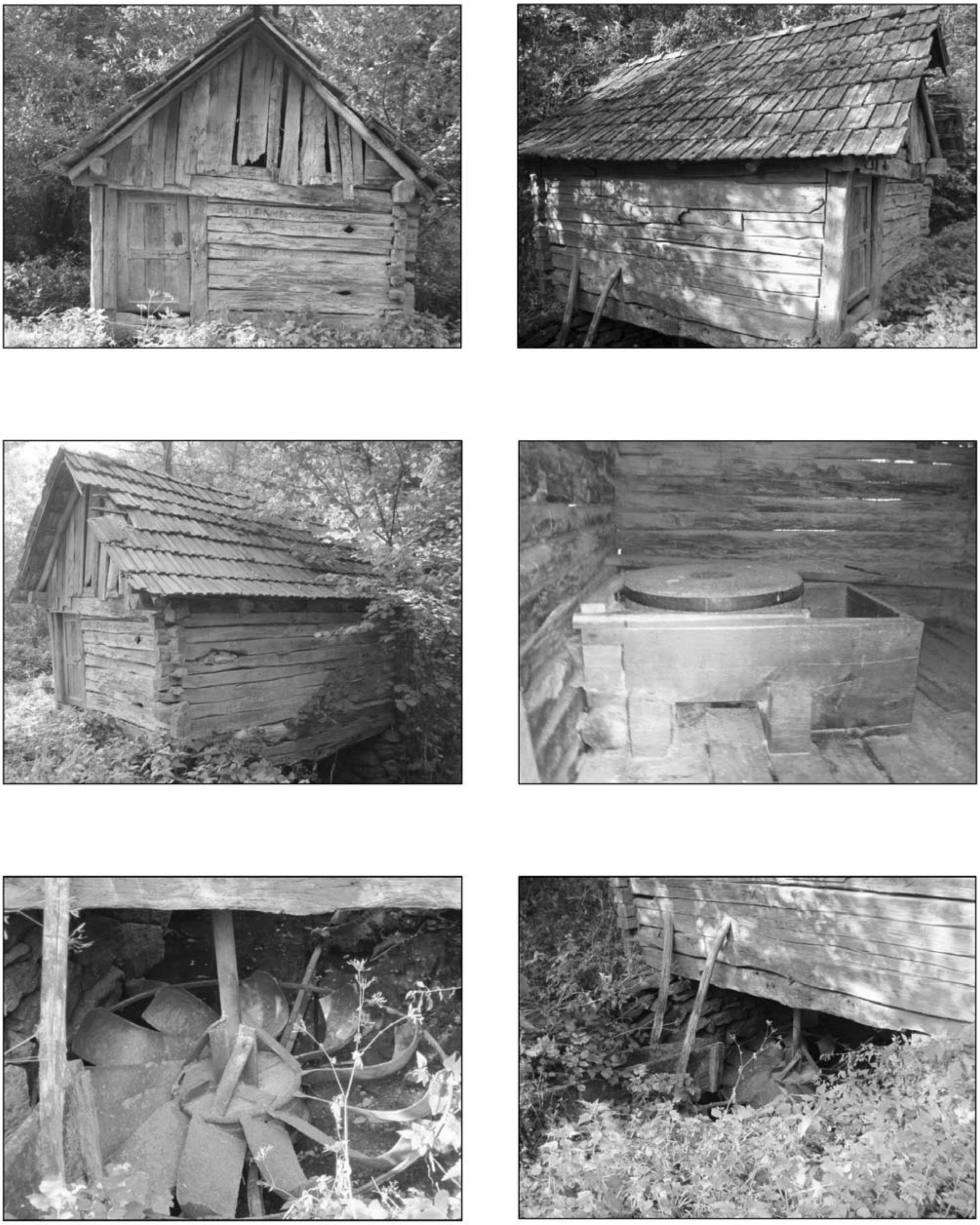
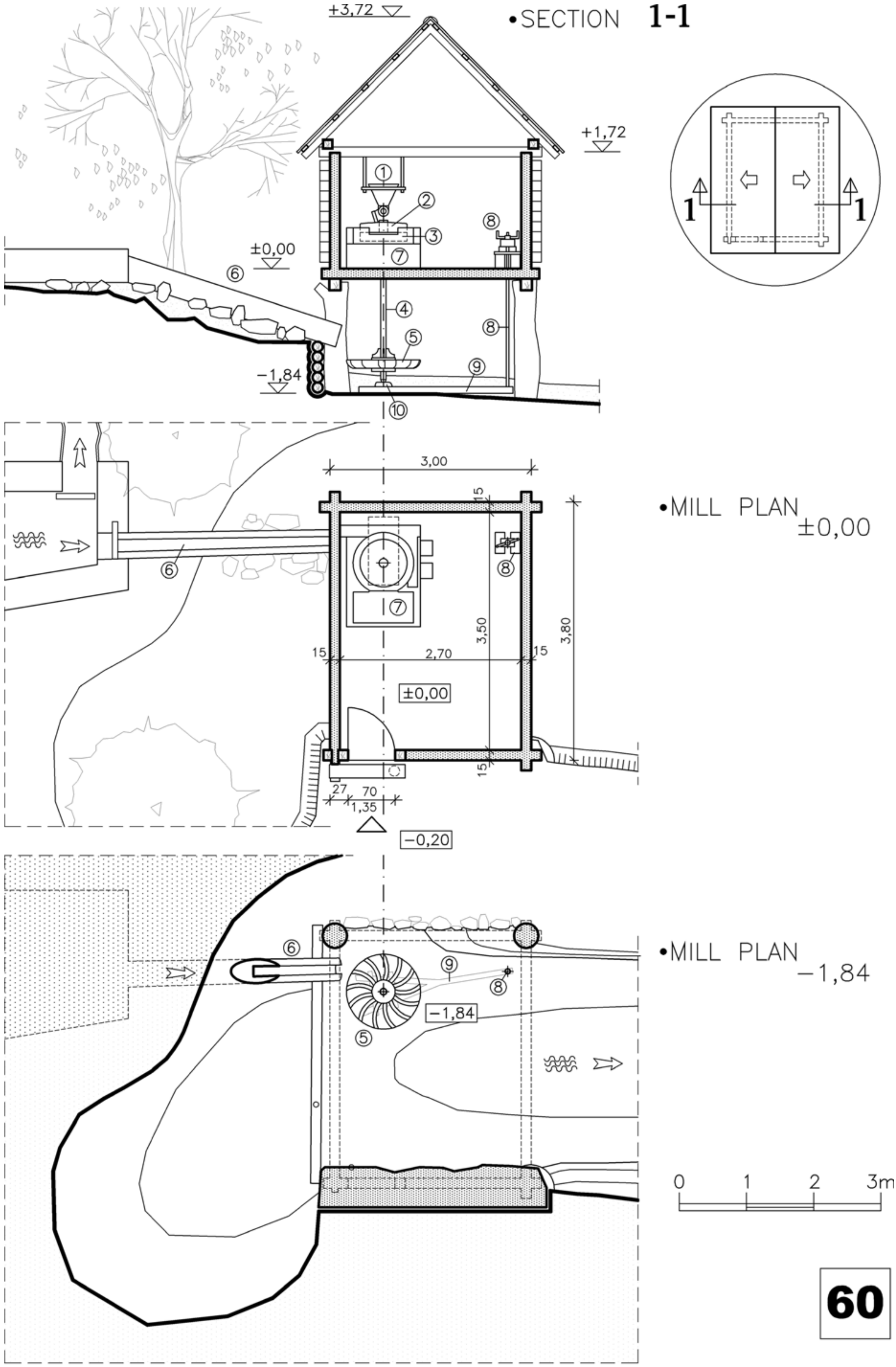


Fig. 46. Prigor. ***Mill from Ibâlcina Mouth***



Pl. 106. Putna. *Valley Mill*

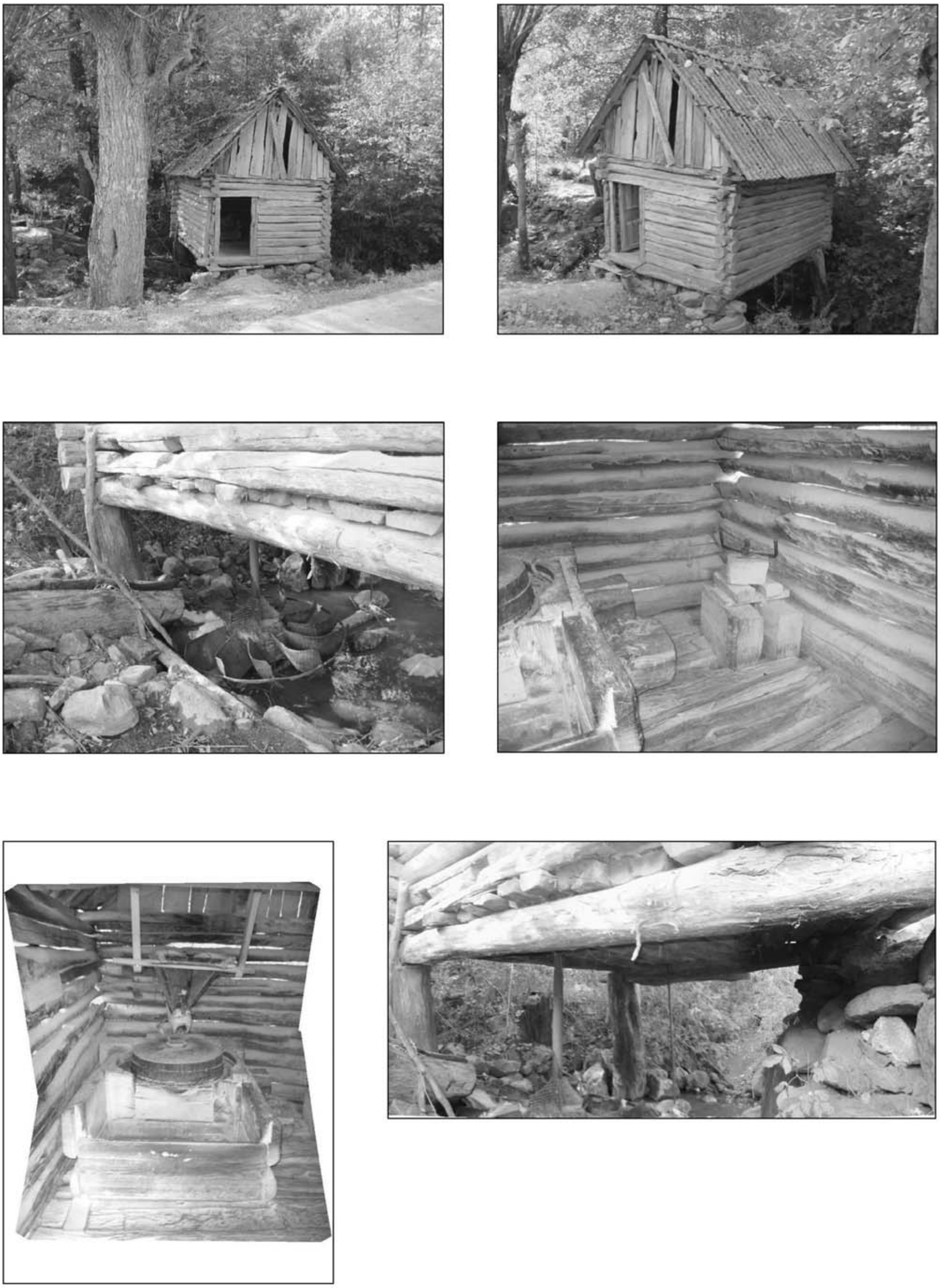
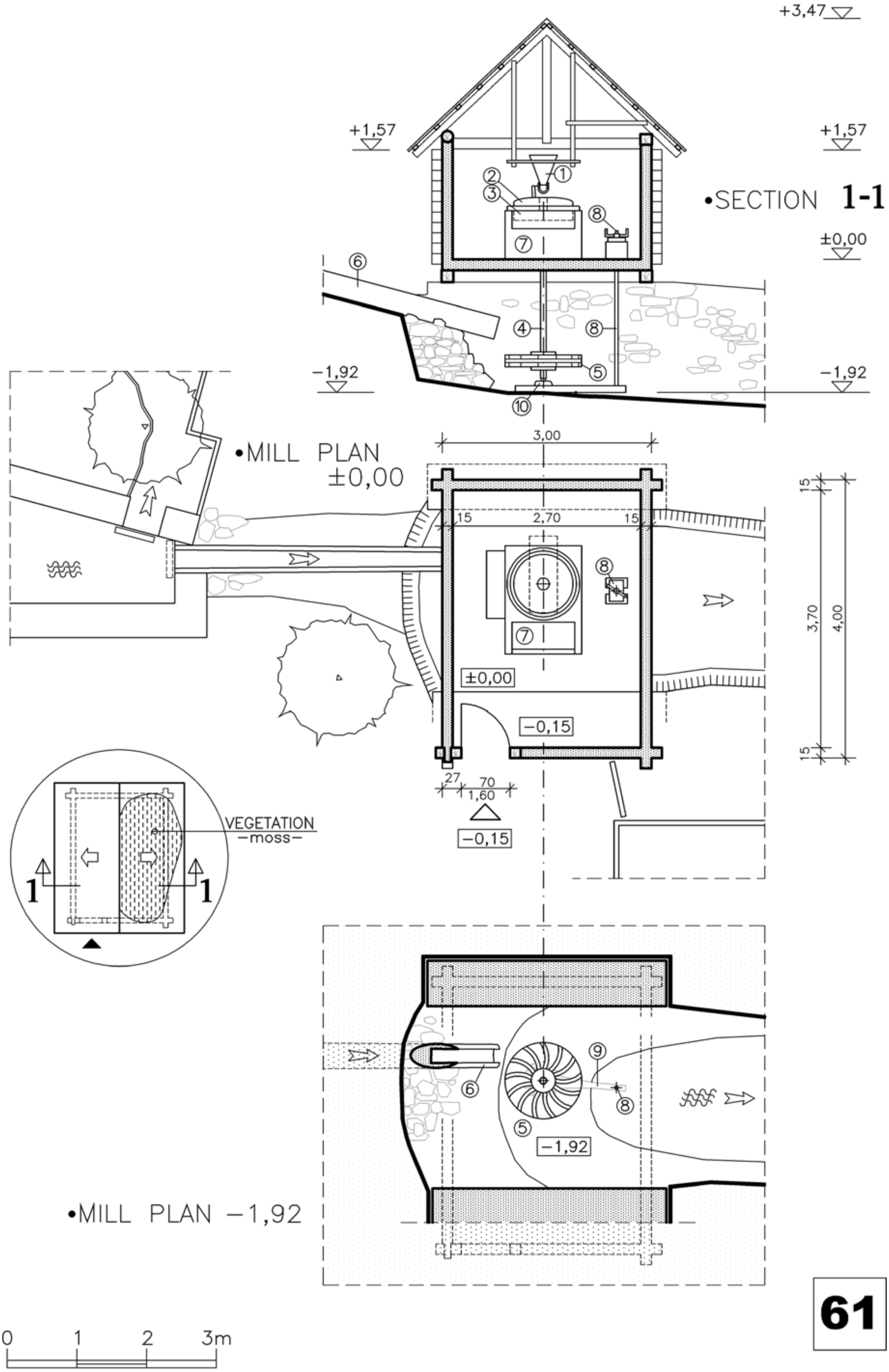


Fig. 47. Putna. ***Valley Mill***



Pl. 107. Putna. *Hill Milll*

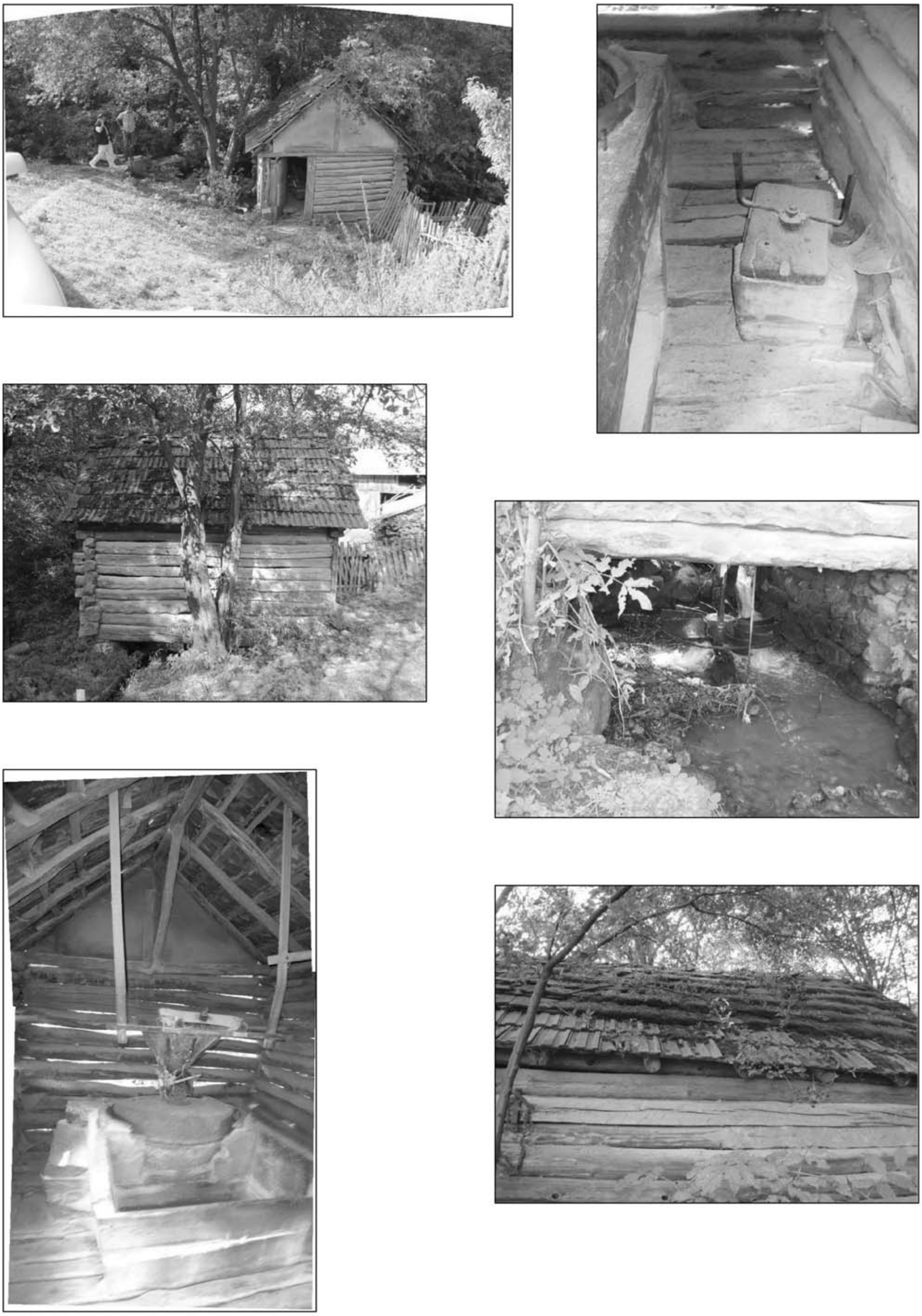
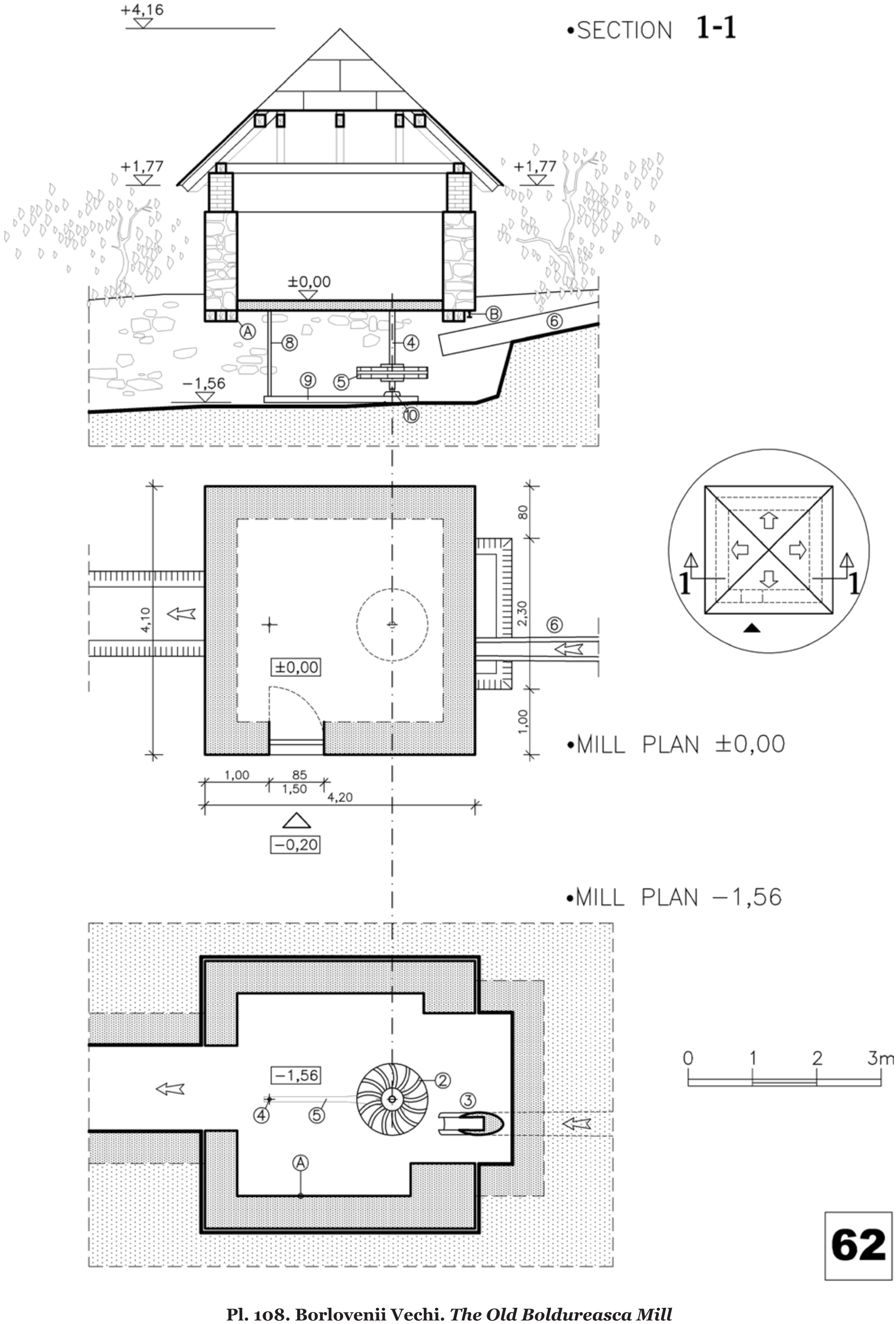
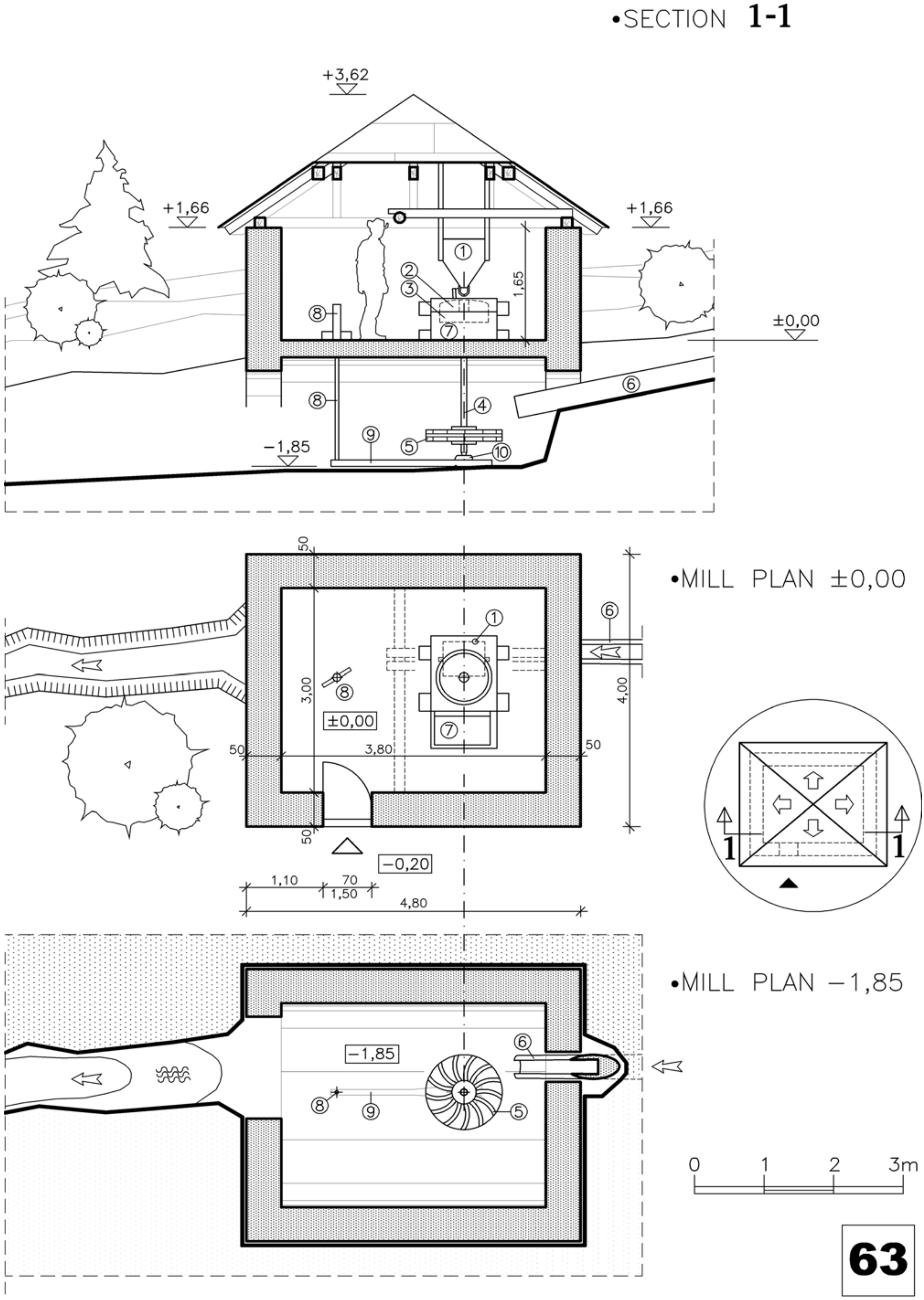


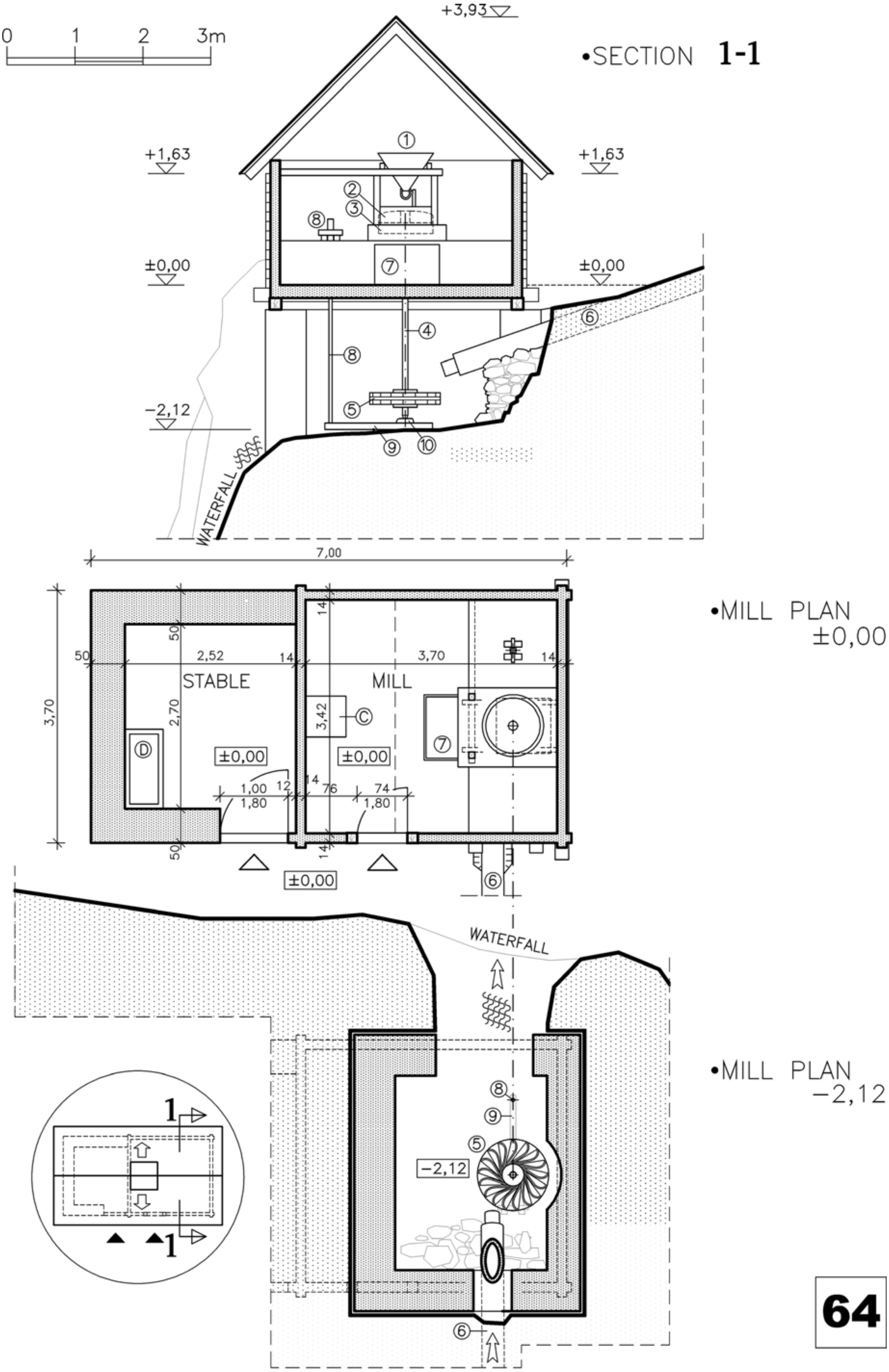
Fig. 48. Putna. *Hill Mill*



Pl. 108. Borlovenii Vechi. ***The Old Boldureasca Mill***



Pl. 109. Borlovenii Vechi. ***The New Boldureasca Mill***



Pl. 110. Gârnic. ***Țilindar Mill***

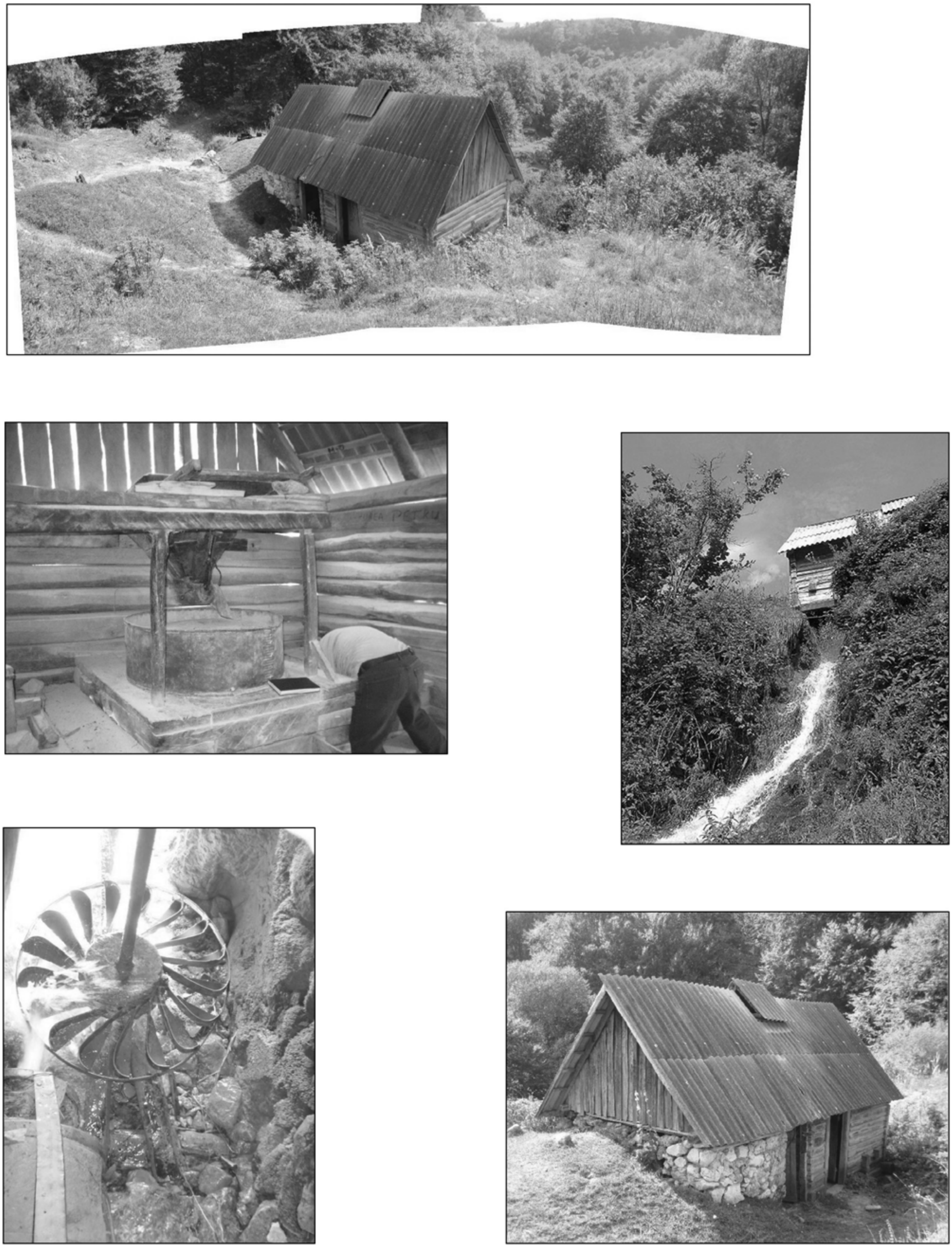
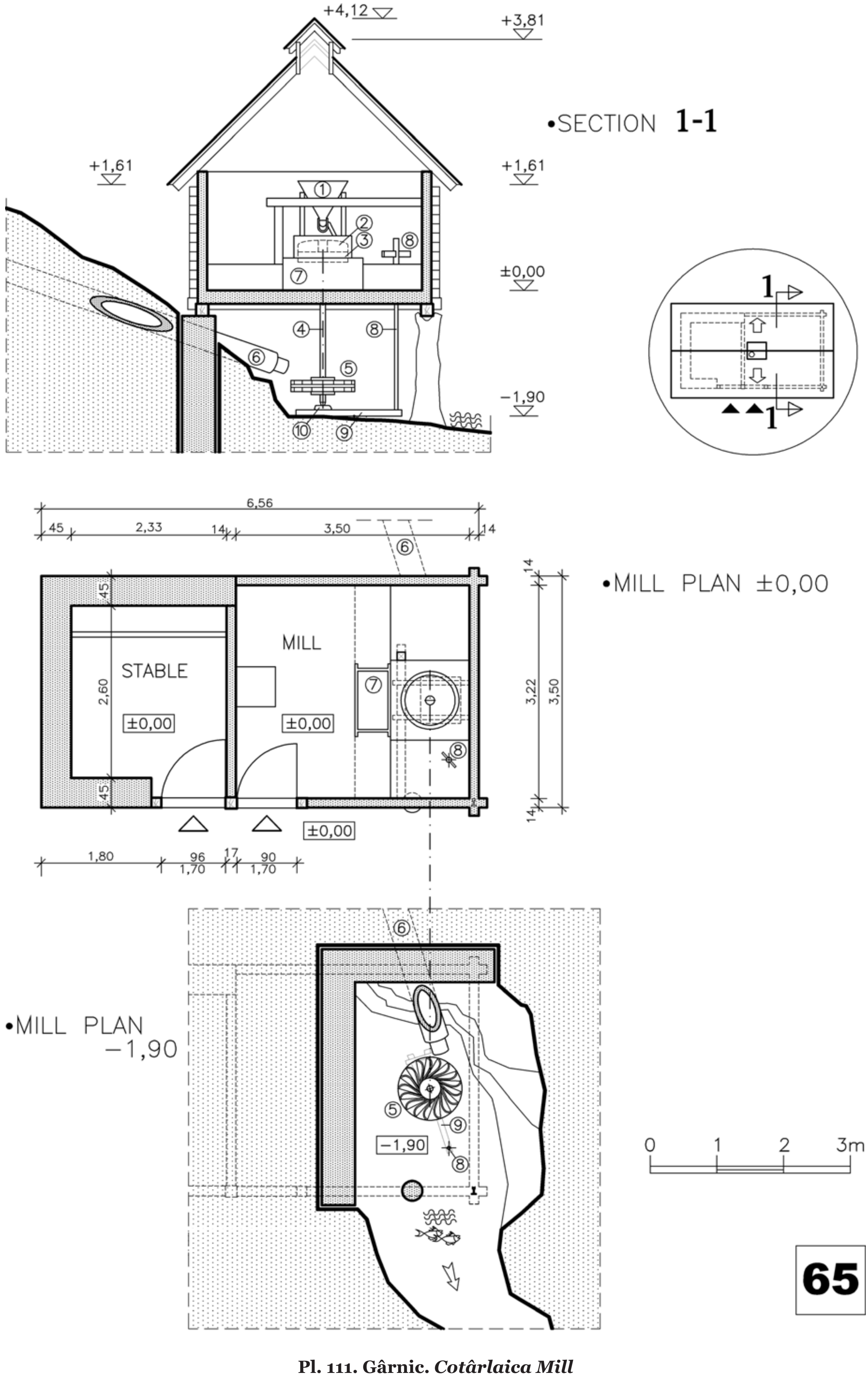


Fig. 49. Gârnic. *Ţilindar Mill*



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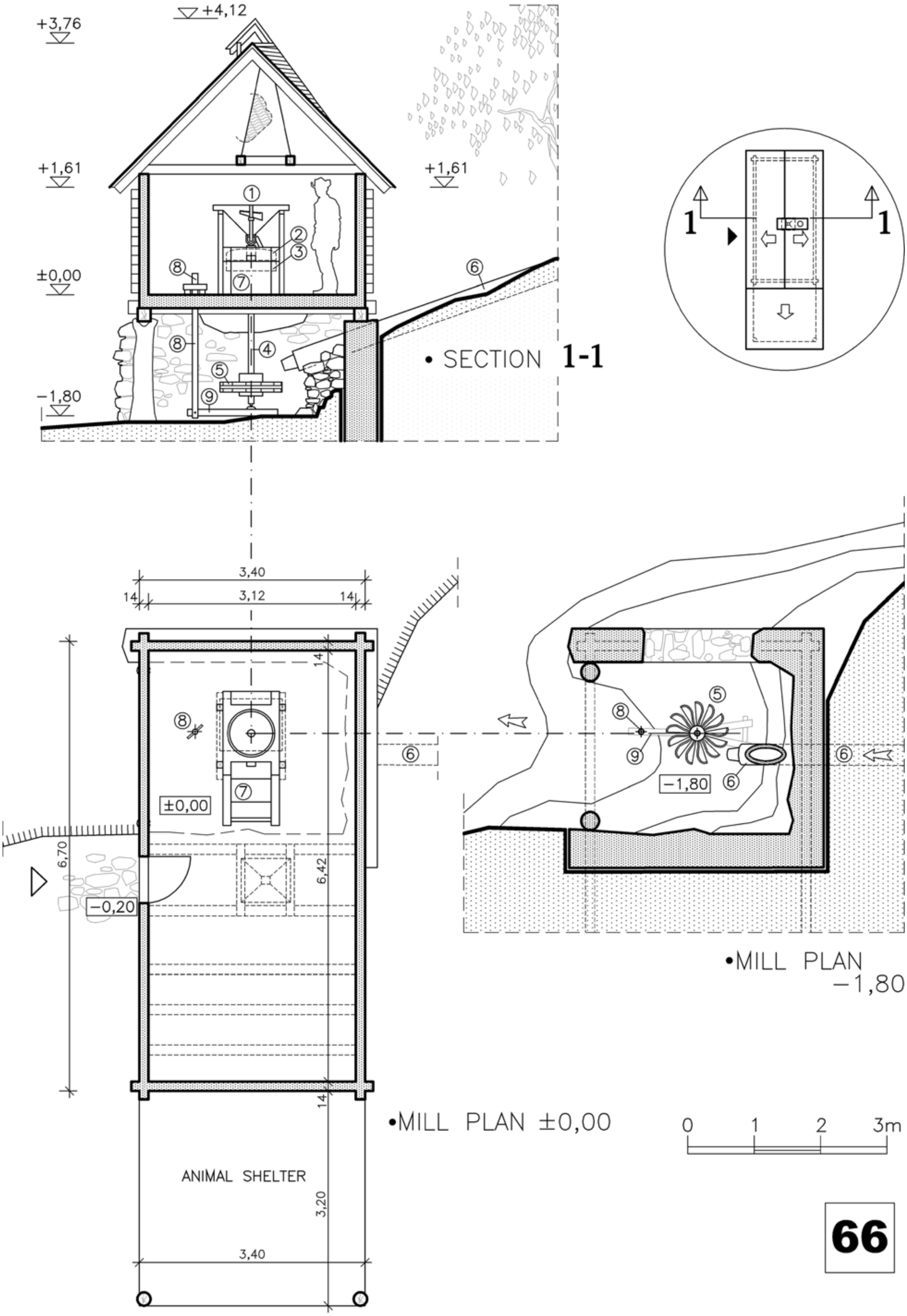
Pl. 111. Gârnic. *Cotârlaica Mill*

Fig. 50. Gârnic. *Cotârlaica Mill*



Pl. 112. Sichevița. ***Raia Mill***

Fig. 51. Bogodinț. *Valley Mill*

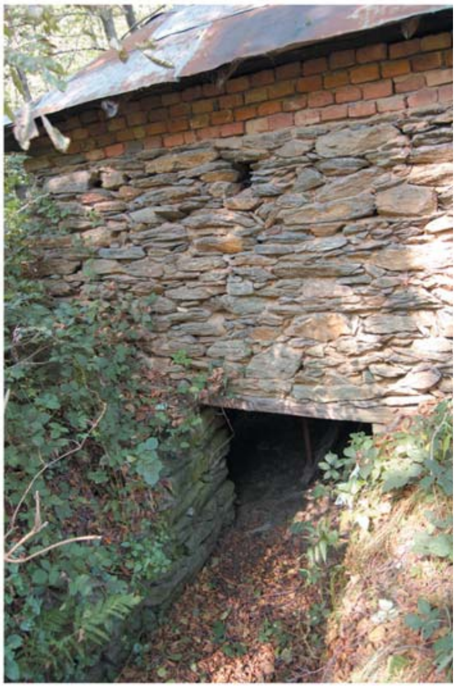


Fig. 52. **Borlovenii Vechi.** ***The Old Boldeasca Mill***

Fig. 53. Borlovenii Vechi. *The New Boldeasca Mill*

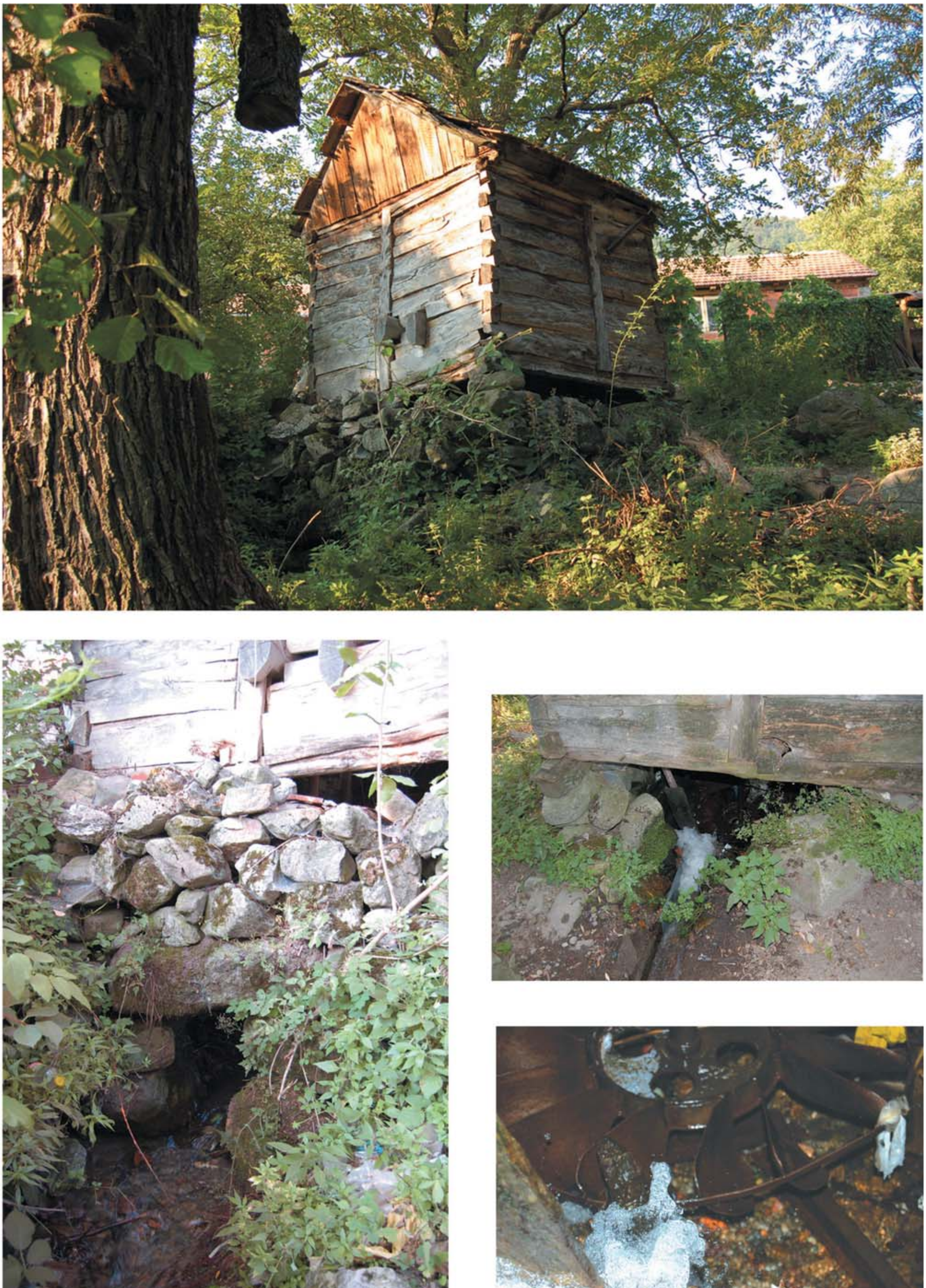


Fig. 54. Bogâltin. *Pălean's Mill*

Fig. 55. Bozovici. ***The Small Mill***

Fig. 56. Bozovici. ***Neamțu's Mill***

Fig. 57. Cornereva *Popeşti's Mill*

Fig. 58. Cornereva. ***Dărăban's Mill***

Fig. 59. Gârnic. ***Village Mill***

Fig. 60. Gârnic. ***Village Mill***

Fig. 61. Gârnic. *Berana Mill*

Fig. 62. Gârnic. *Țilindar Mill*

Fig. 63. Gârnic. ***Cotârlaica Mill***

Fig. 64. Lăpuşnicu Mare. *Luchii Mill*

Fig. 65. Lăpuşnicu Mare. ***Bălăceni's Mill***

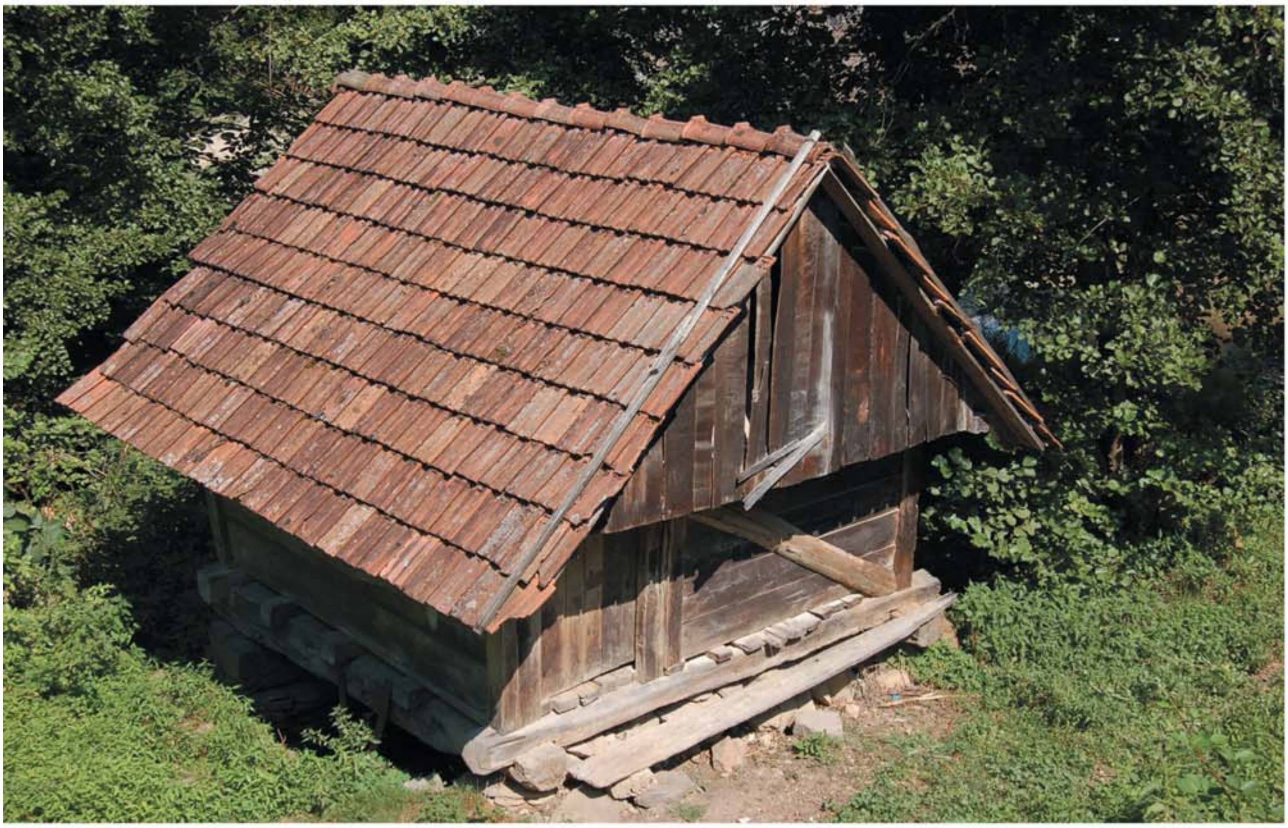


Fig. 66. Mehadica. *Stone Mill*

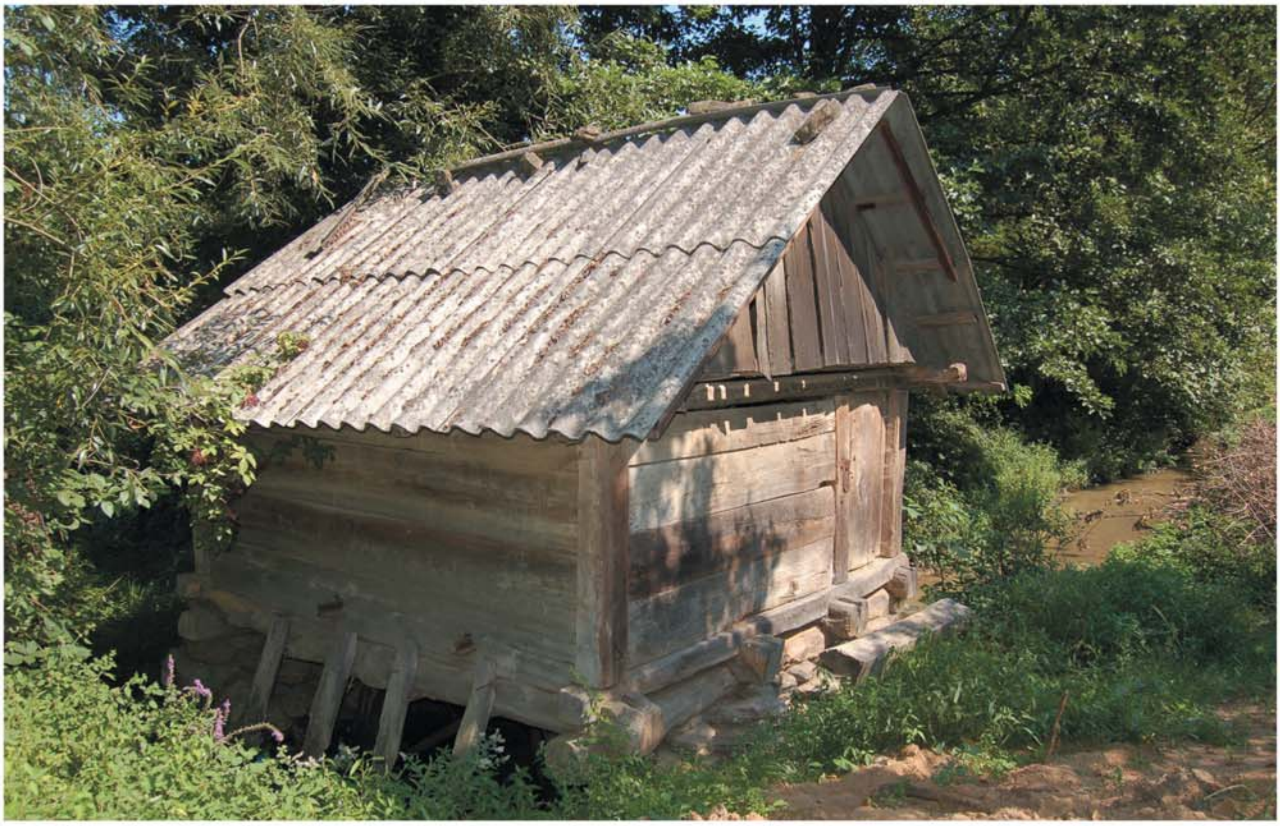


Fig. 67. Mehadica. *Gherghinească Mill*

Fig. 68. Mehadica. ***Orască Mill***

Fig. 69. 1. Plavişeviţa; 2. Teregova. Mills broght to Village Museum, Bucharest

Fig. 70. Prisăcina. 1. *Mill from Locul Golului*; 2. *Mill from Prisăcina Gorges entrance*

Fig. 71. Putna. *Hill Mill*

Fig. 72. Sichievița. *Hill Mill*

Fig. 73. Sichievița. ***Mill from Apiary***

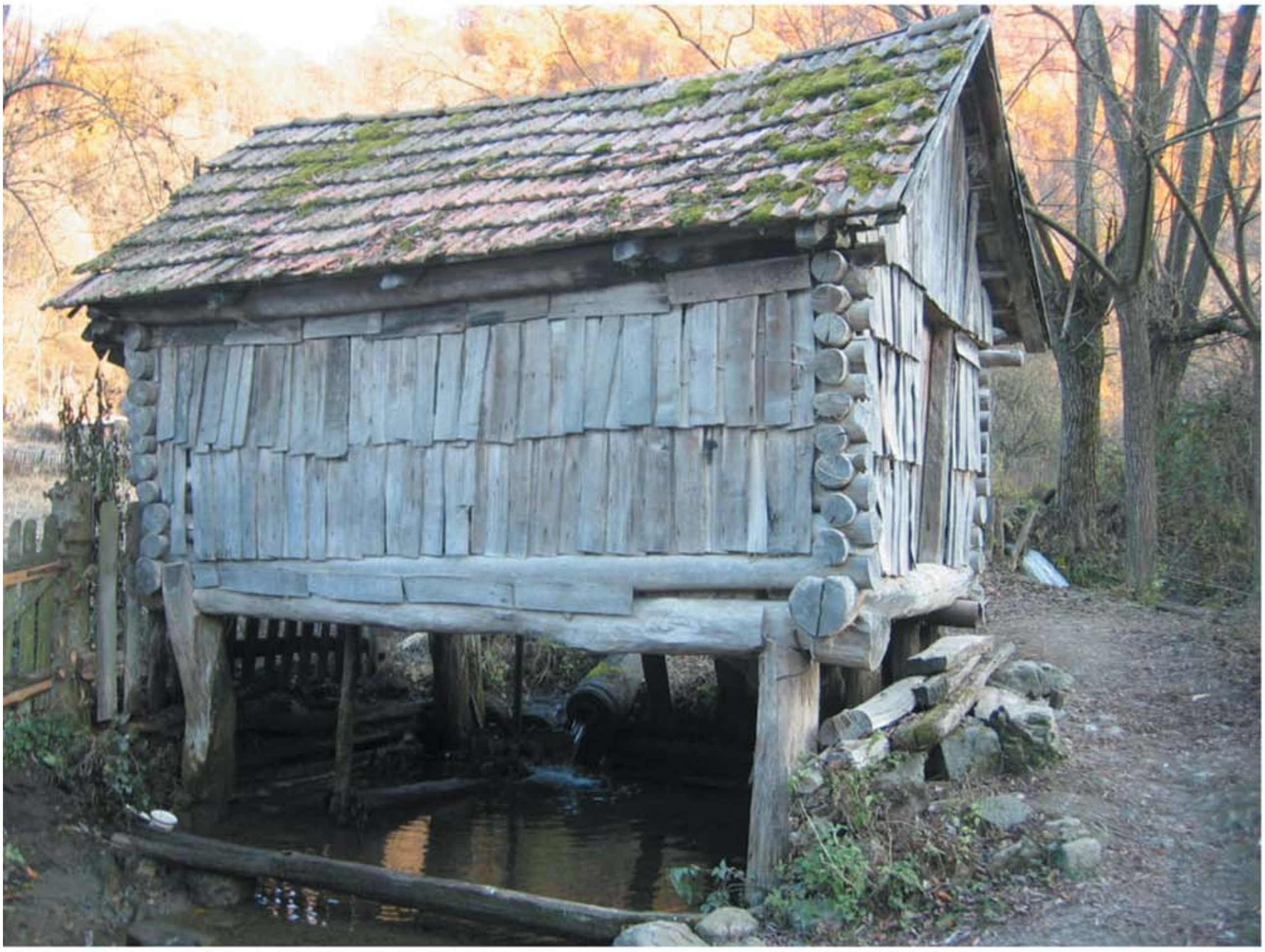


Fig. 74. Şopotu Nou. *The Lower Mill*

Fig. 75. Şopotu Nou. ***The Upper Mill***

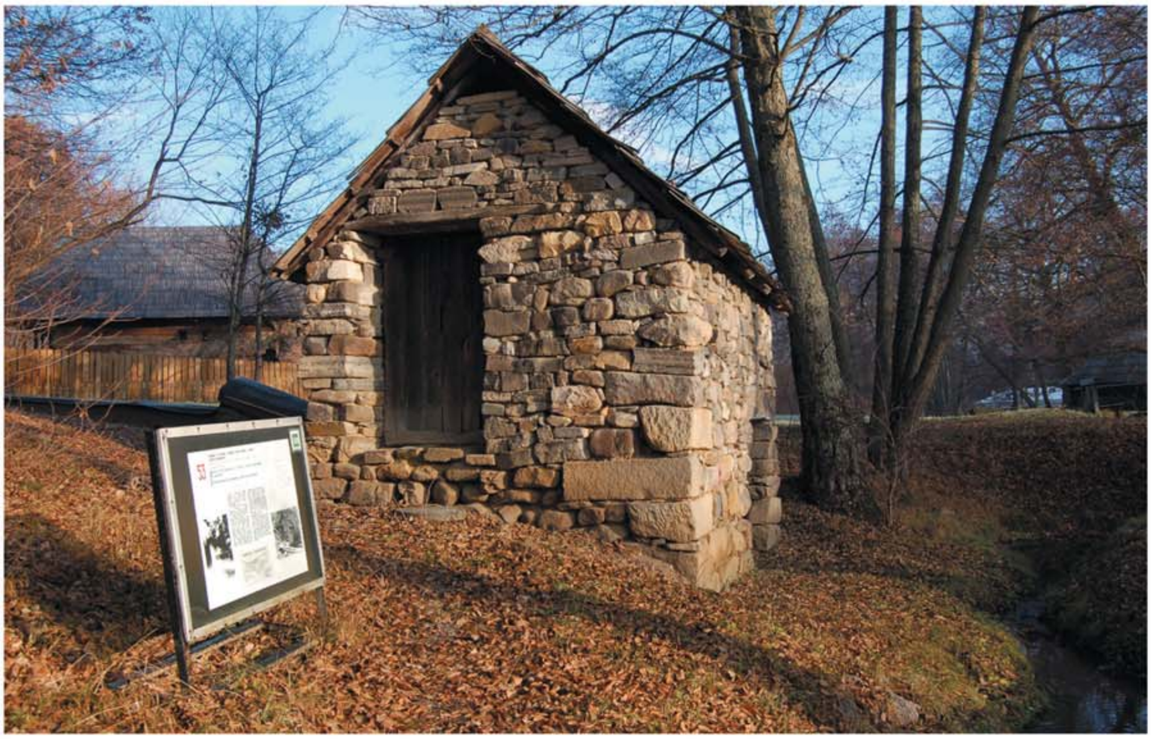


Fig. 76. Svinița. *Novana Mill* broght in Museum „Astra” Sibiu

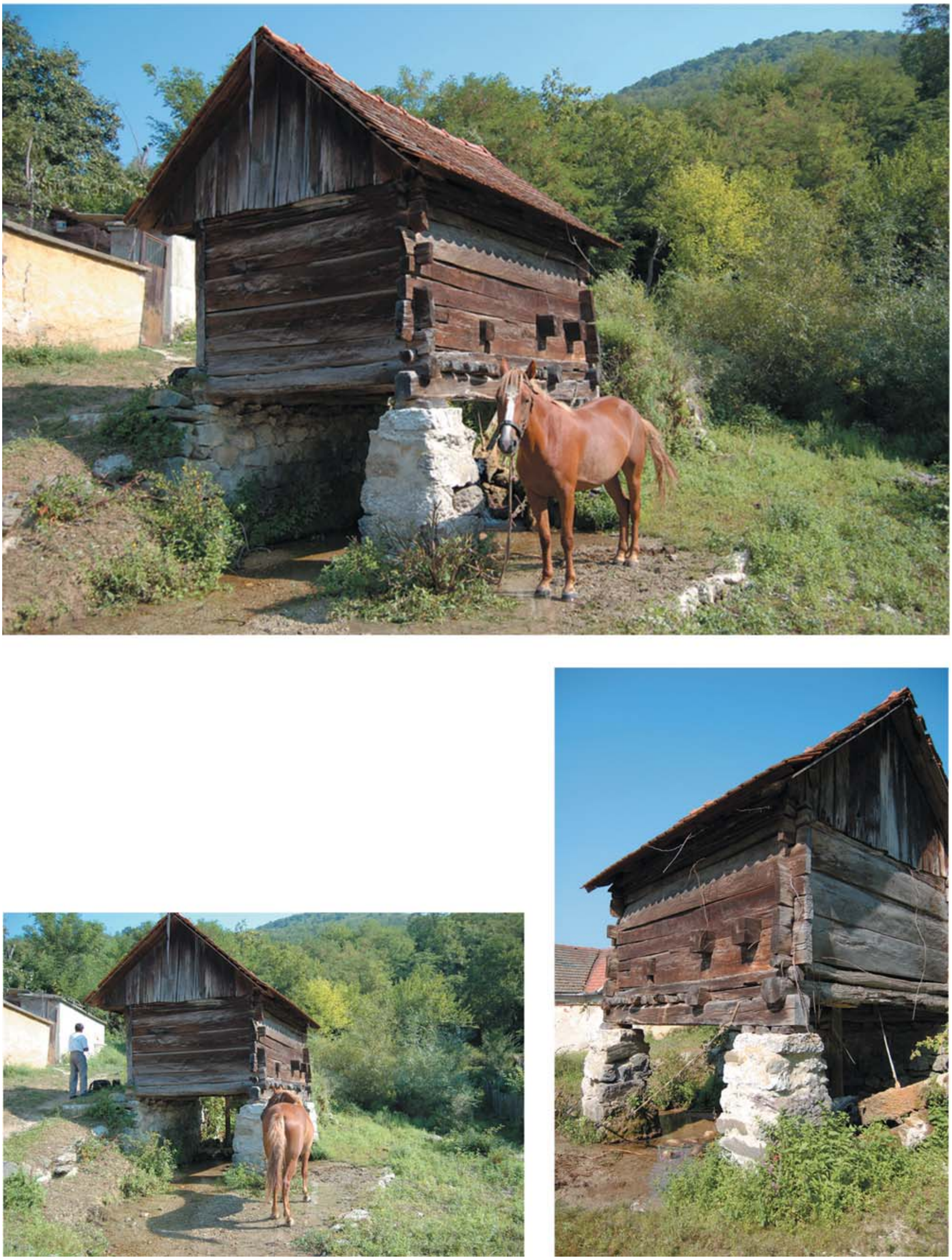


Fig. 77. Topleț. ***Chige's Mill***

Fig. 78. ***Sluice-boxes*** **and** ***buckets*****: from Sichievița, Socolari and Gârnic.**

Fig. 79. Floating mills from Lugoj, Perian. Arad.

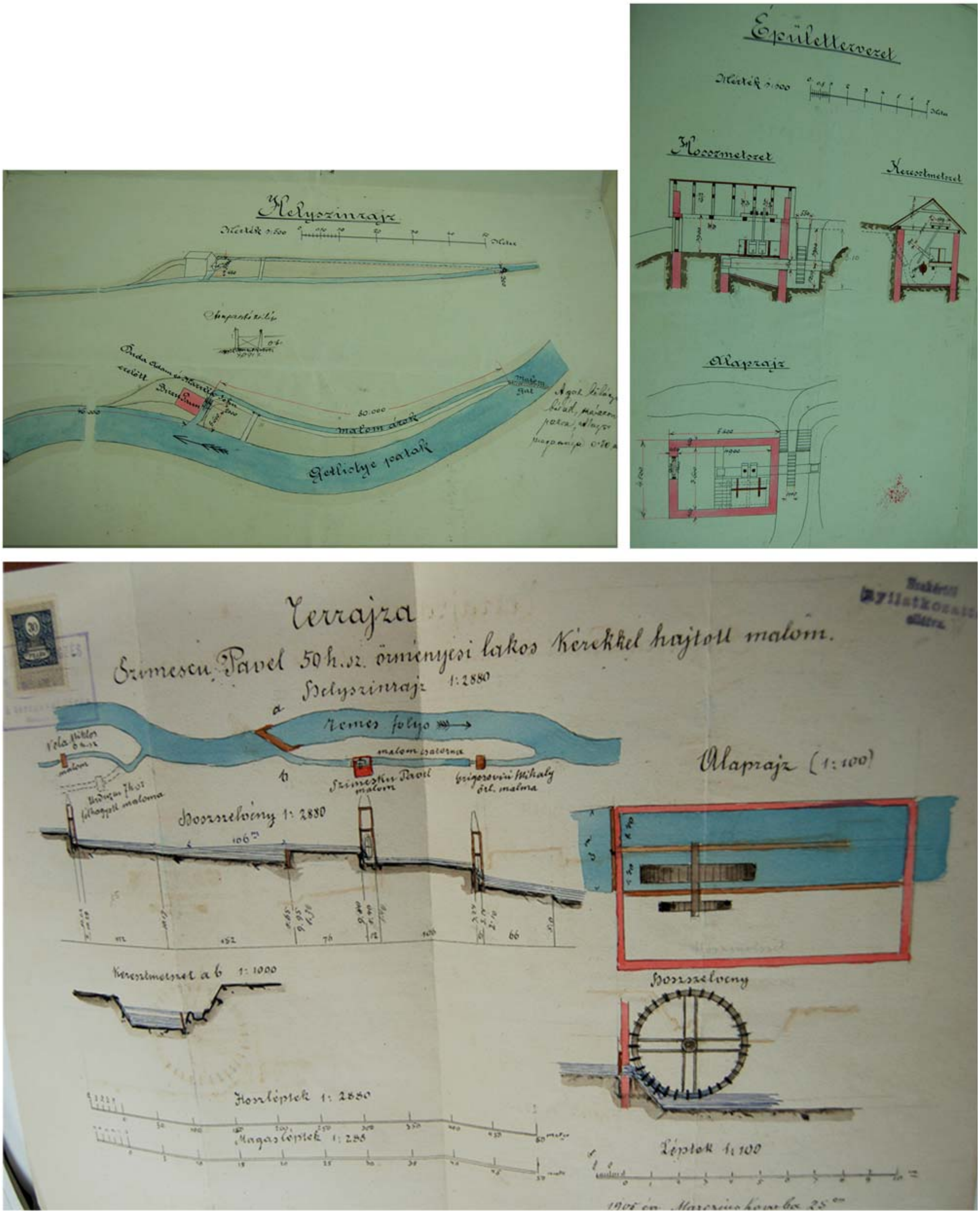
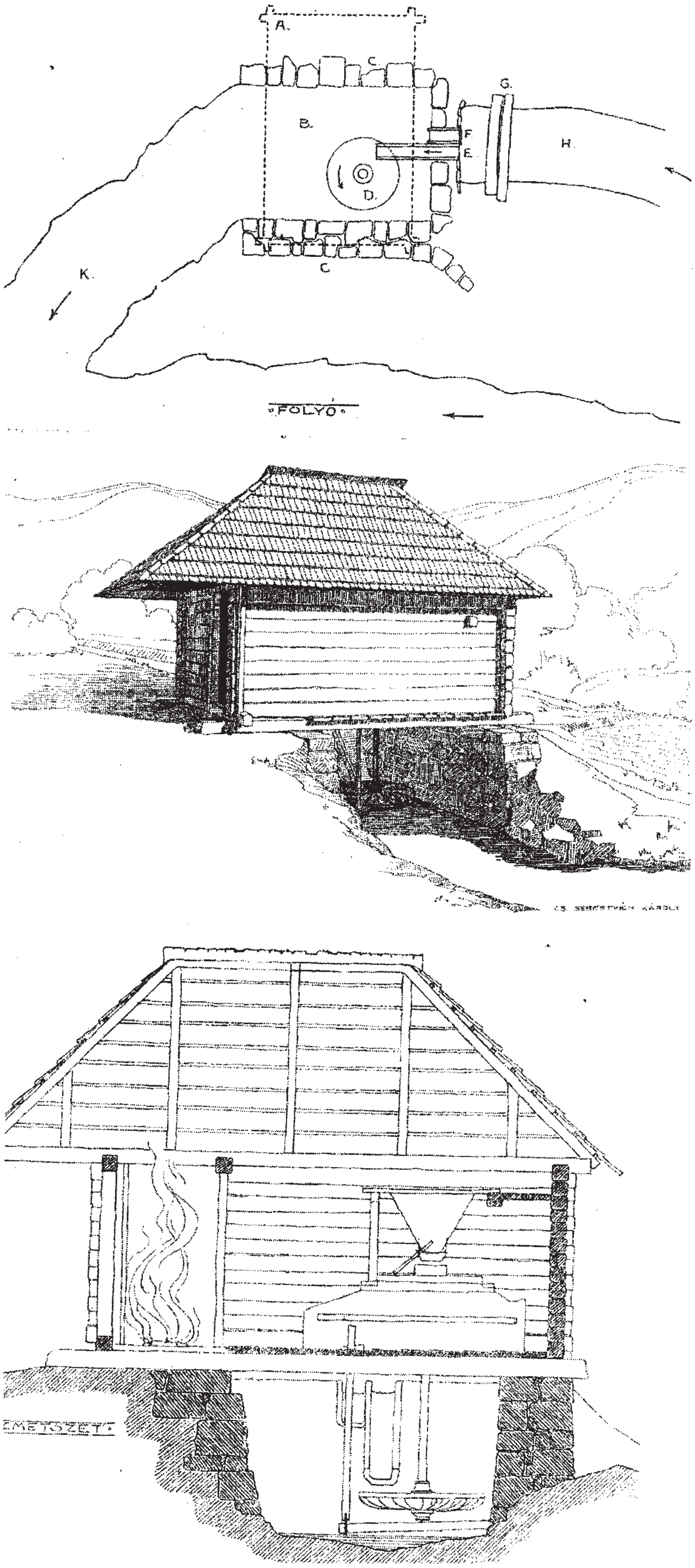
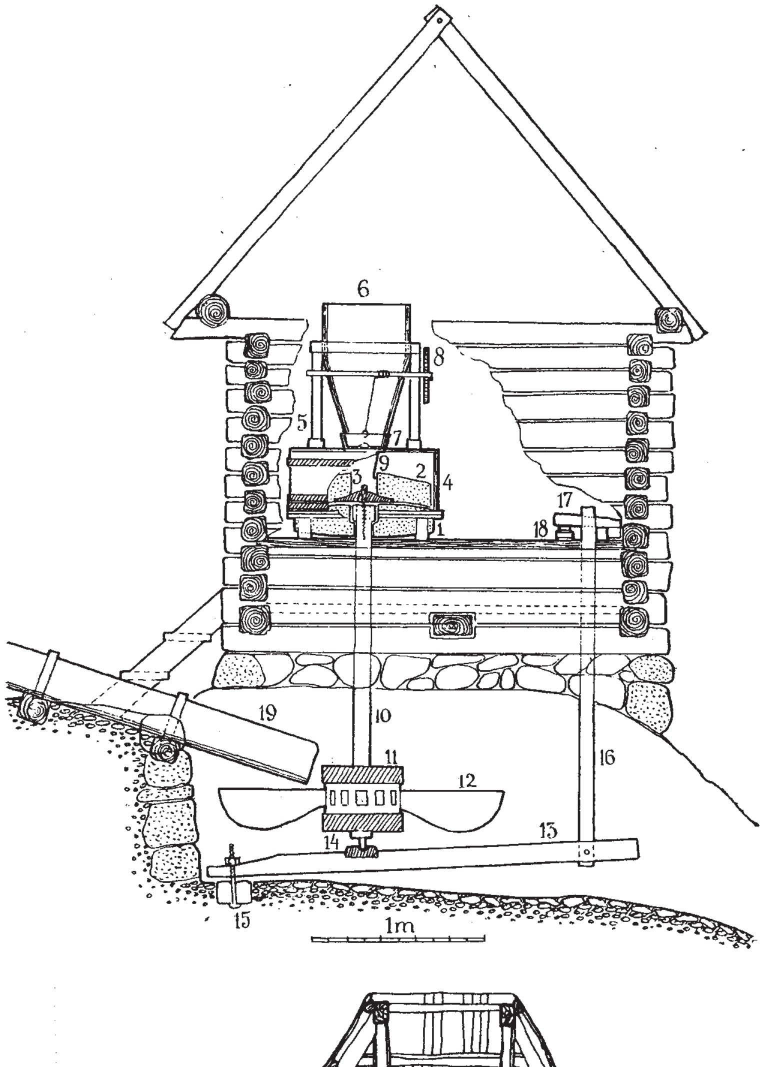


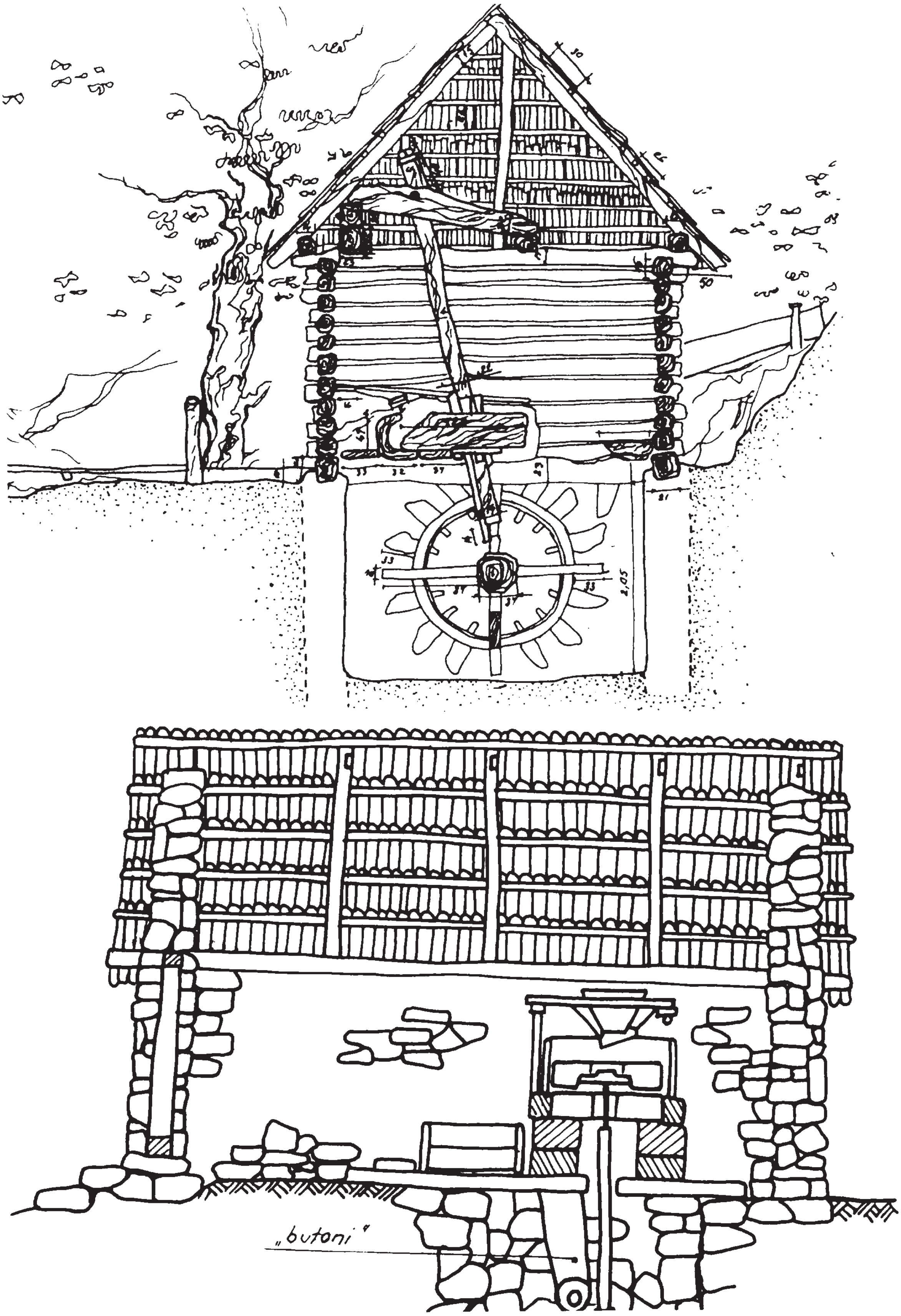
Fig. 80. Mill plans from 1906 from Armeniş, Lăpuşnicu Mare and Gârlişte



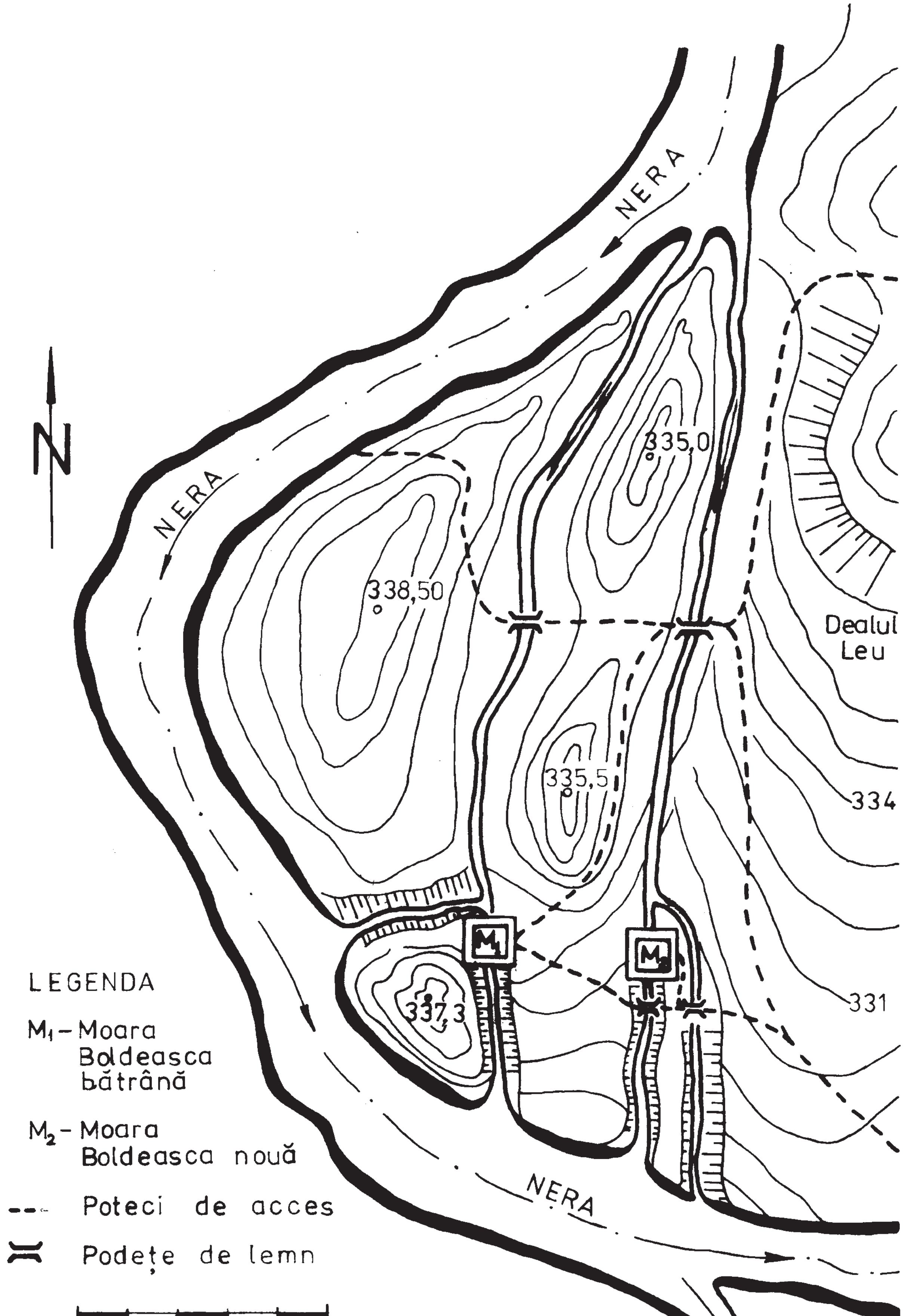
Pl. 113. Caraşova. Mill. Plan from 1908 (in accordance to Cs. Sebestyen)



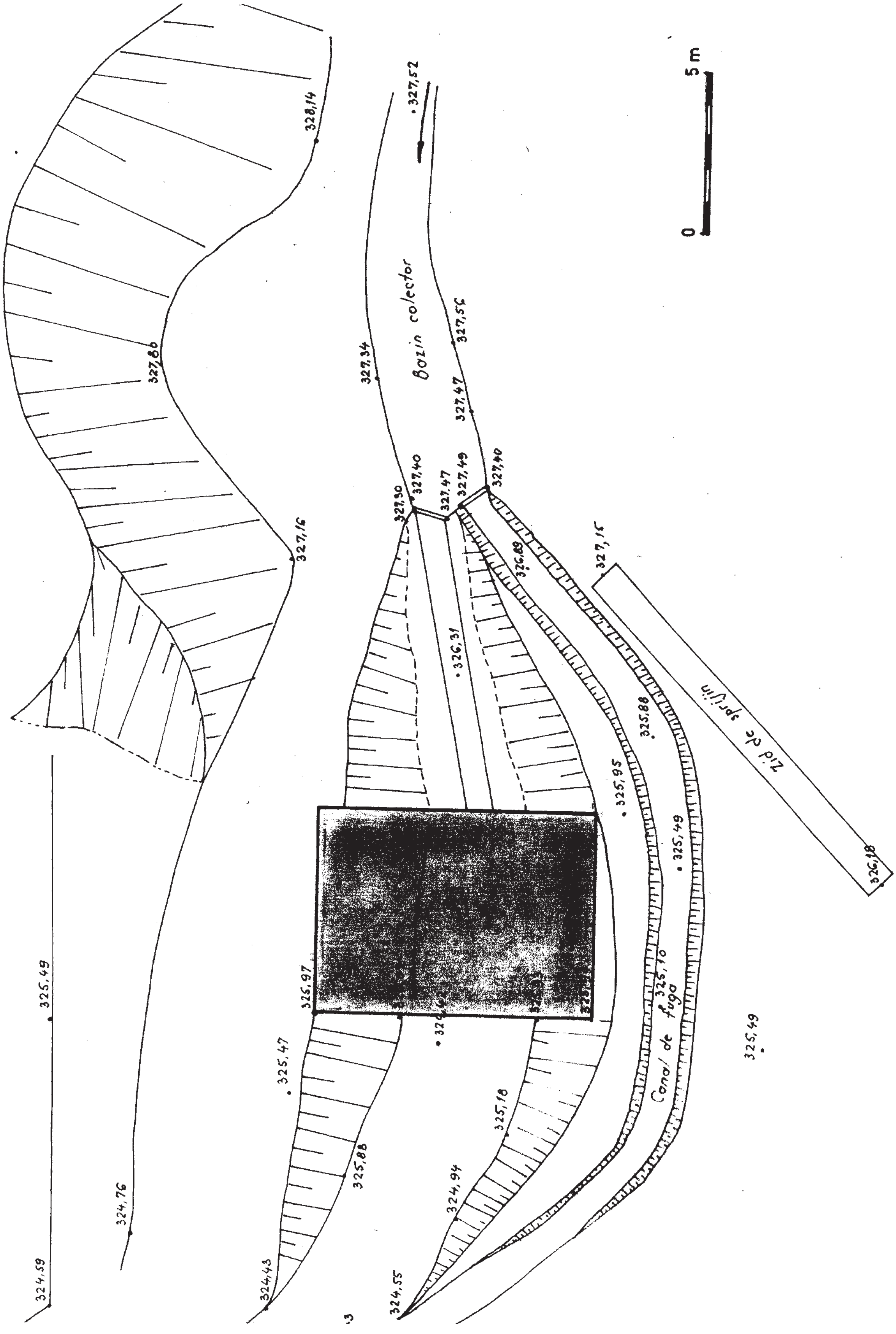
Pl. 114. A. Teregova. B. Topleț (in accordance to V. Butură; C. Bucur)



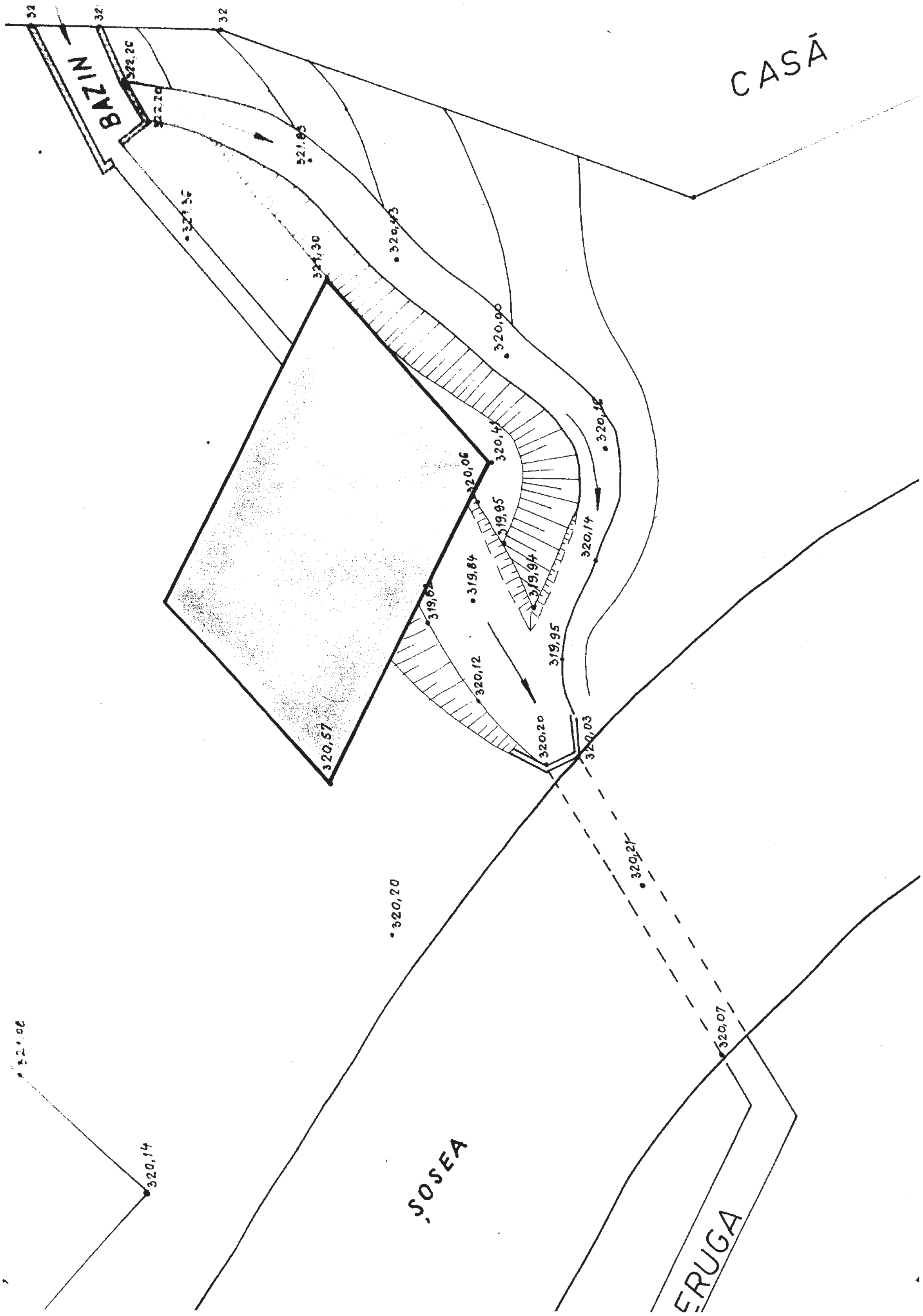
Pl. 115. A. Teregova. B. Svinița



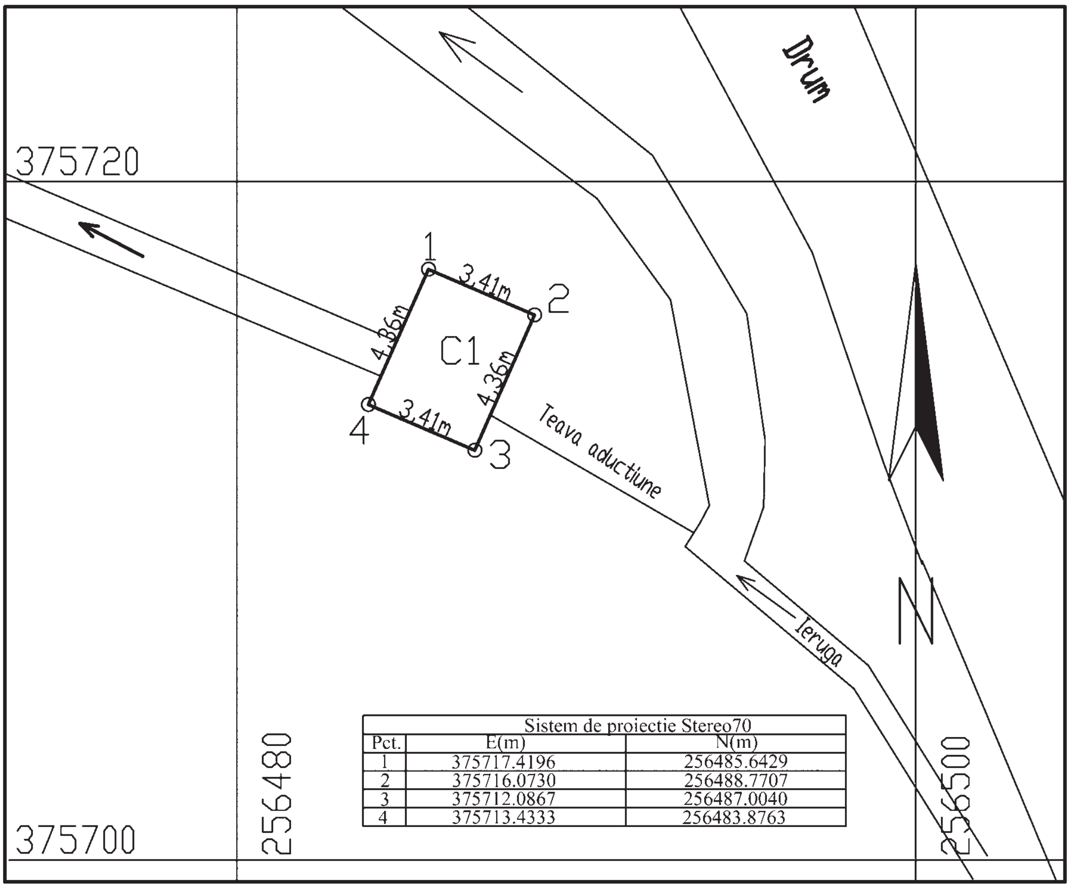
Pl. 116. Borlovenii Vechi. Mills site plan



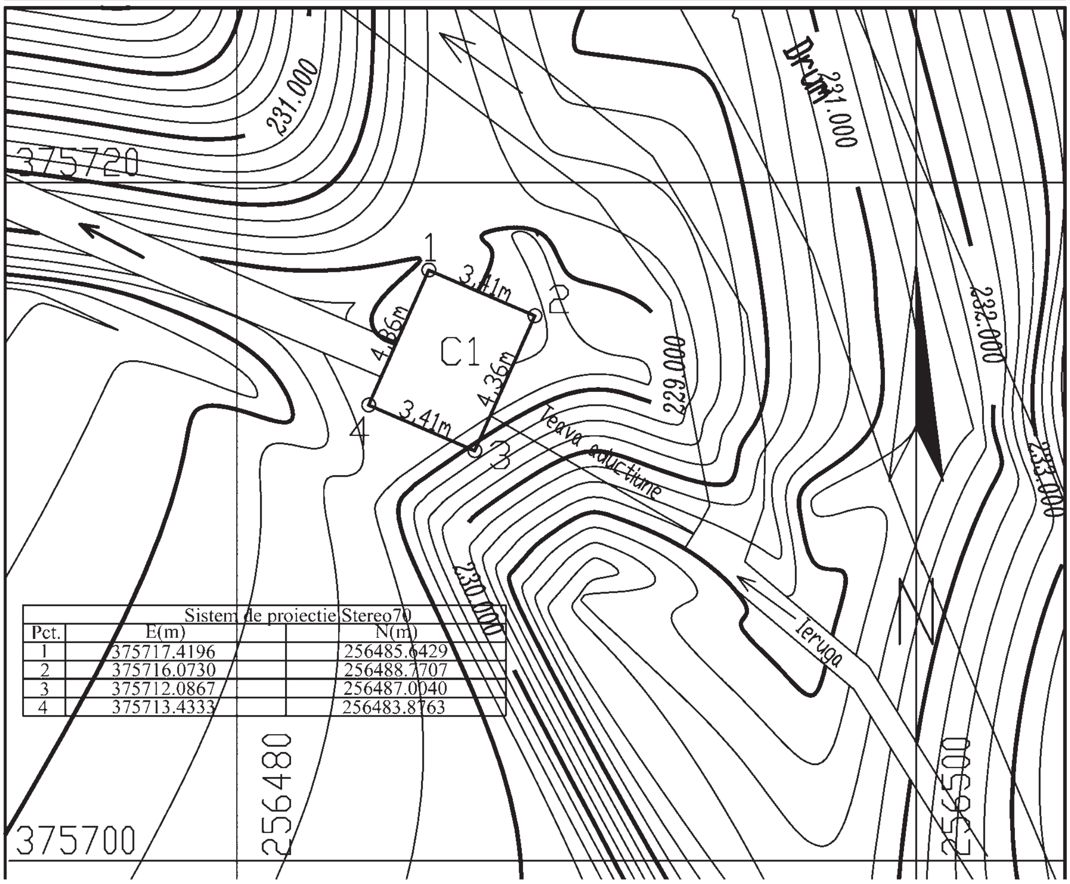
Pl. 117. Ilidia. Site plan of *Muica Mill*



Pl. 118. Ilidia. Site plan of *Bălani's Mill*



Sistem de proiectie Stereo70		
Pct.	E(m)	N(m)
1	375717.4196	256485.6429
2	375716.0730	256488.7707
3	375712.0867	256487.0040
4	375713.4333	256483.8763



Sistem de proiectie Stereo70		
Pct.	E(m)	N(m)
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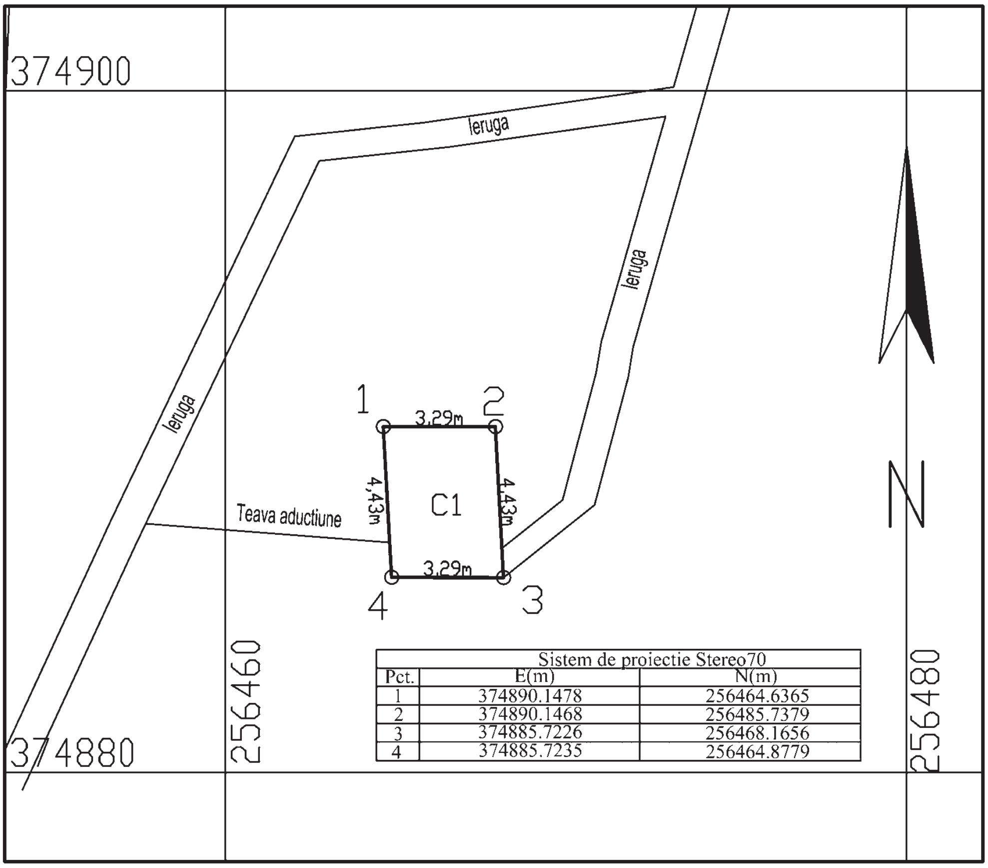
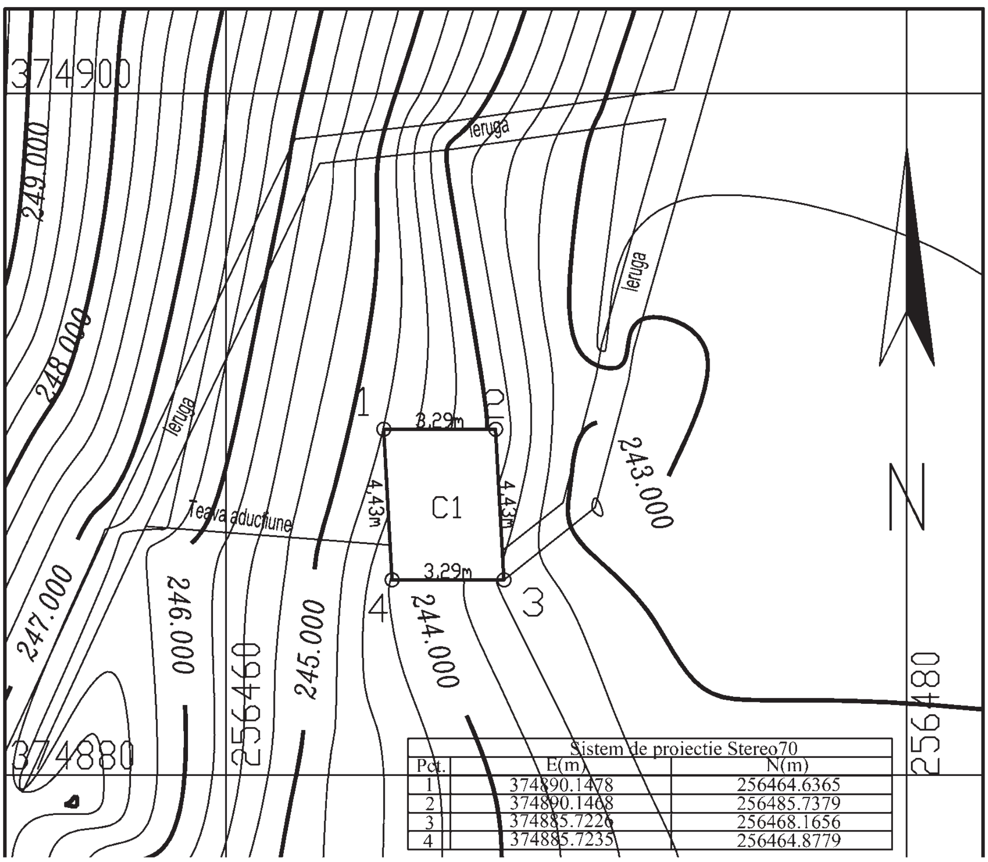
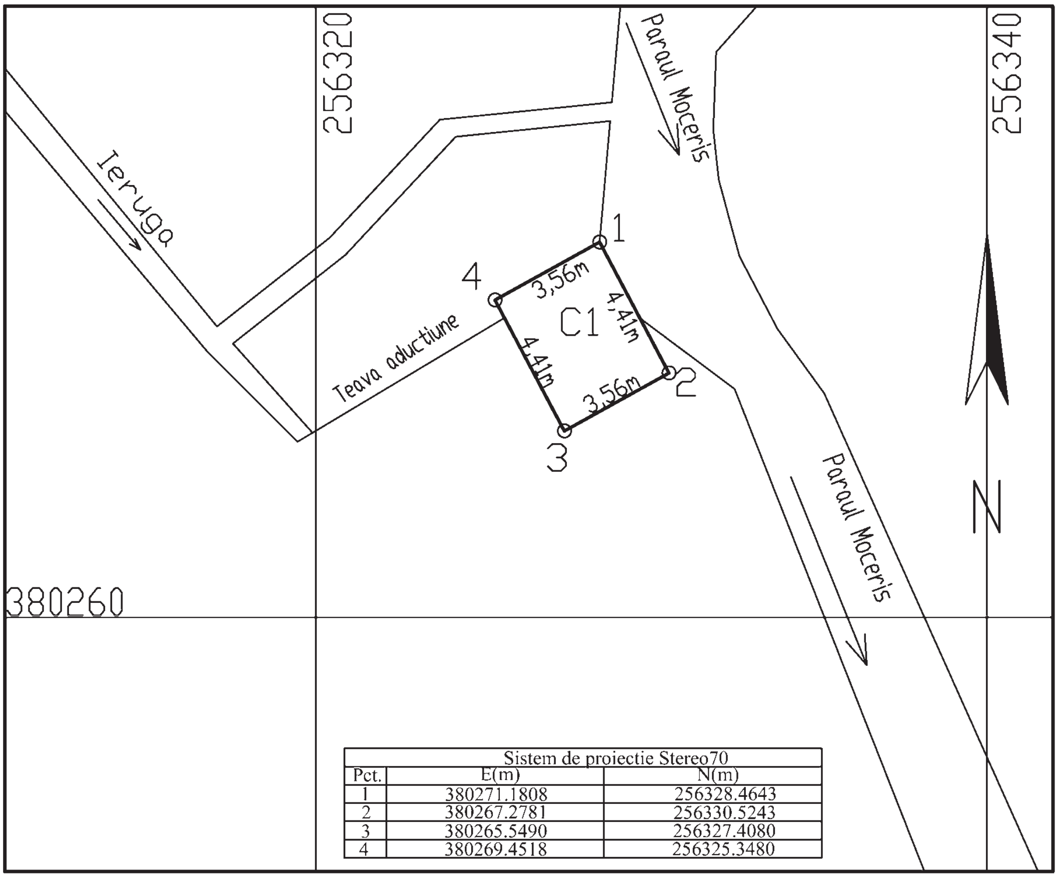
2	375716.0730	256488.7707
3	375712.0867	256487.0040
4	375713.4333	256483.8763

Pl. 119. Bârz. Site plan of *Marineasca Mill*





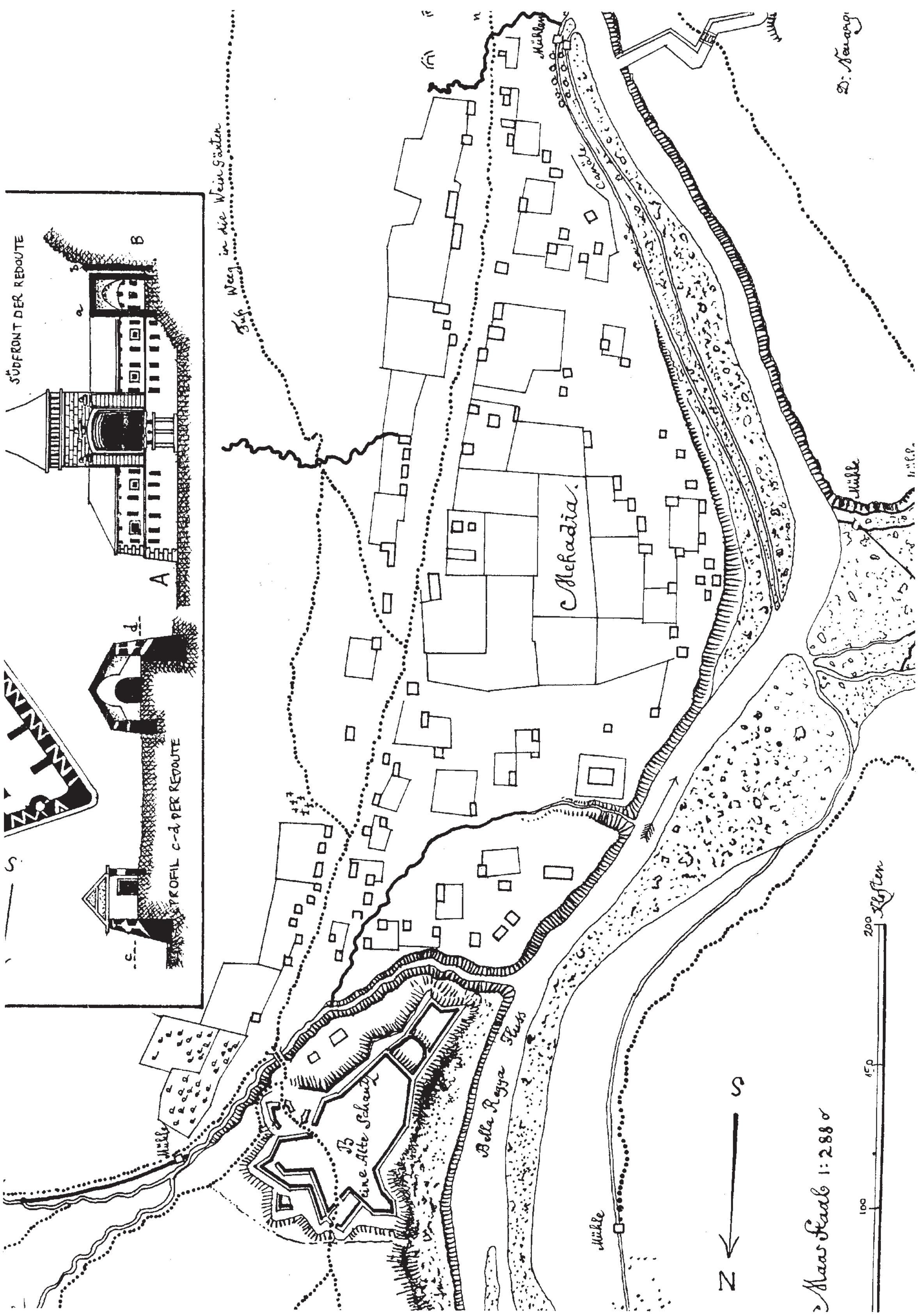
Pl. 120. Ilidia. Site plan of *The Small Mill*



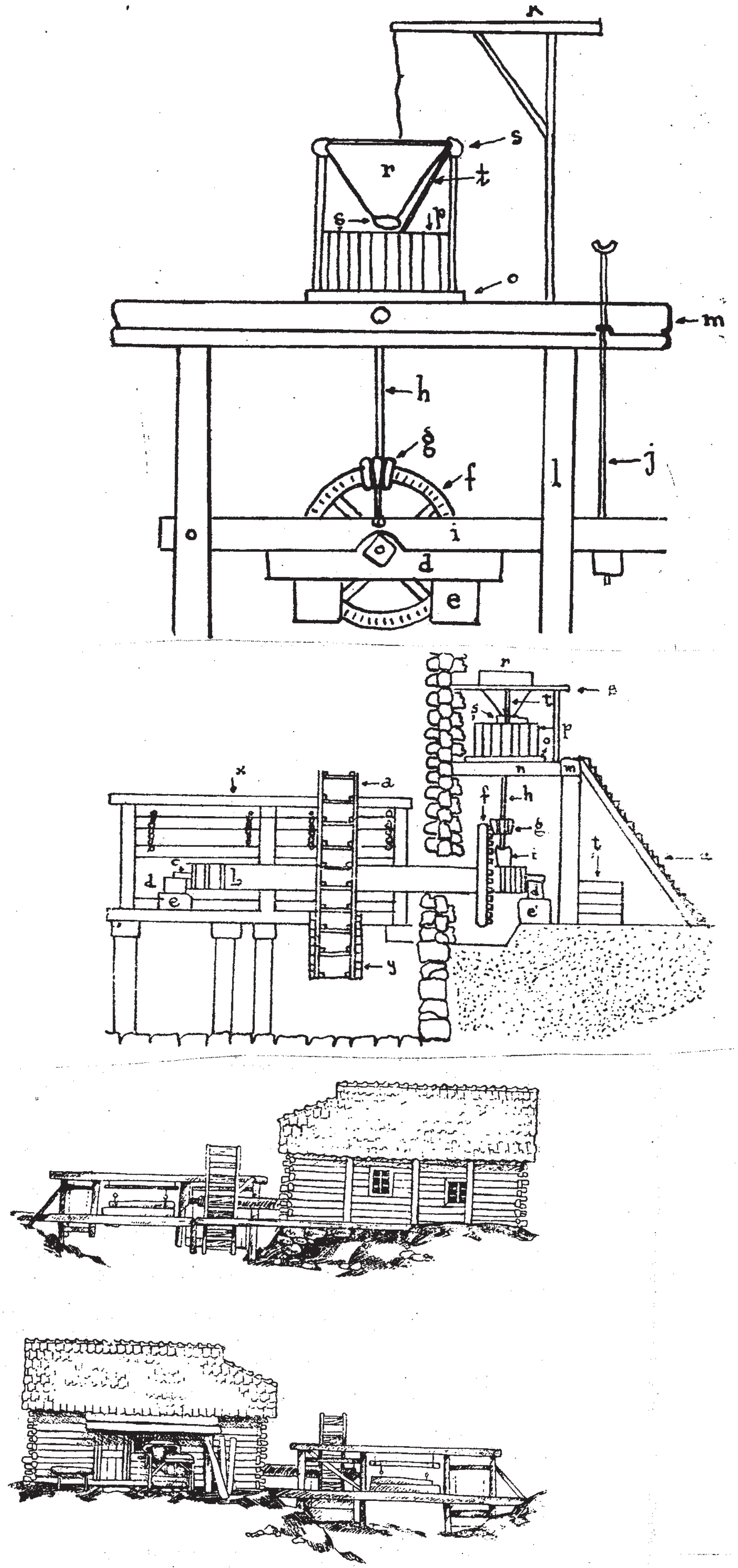
Sistem de proiectie Stereo70		
Pct.	E(m)	N(m)
1	380271.1808	256328.4643
2	380267.2781	256330.5243
3	380265.5490	256327.4080
4	380269.4518	256325.3480

Sistem de proiectie Stereo70		
Pct.	E(m)	N(m)
1	380271.1808	256328.4643
2	380267.2781	256330.5243
3	380265.5490	256327.4080
4	380269.4518	256325.3480

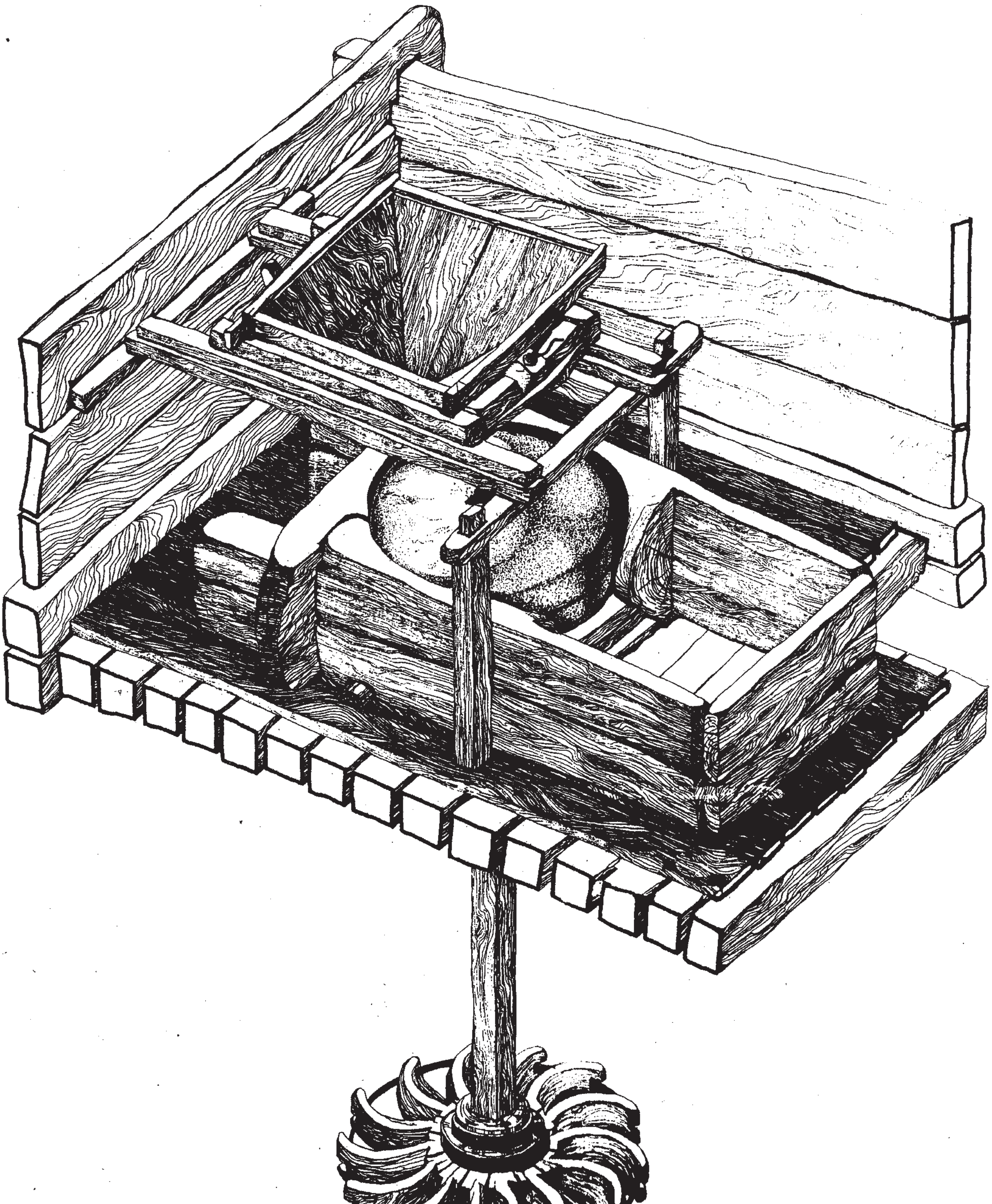
Pl. 121. Moceriş. Site plan of *Zăboane Mill*



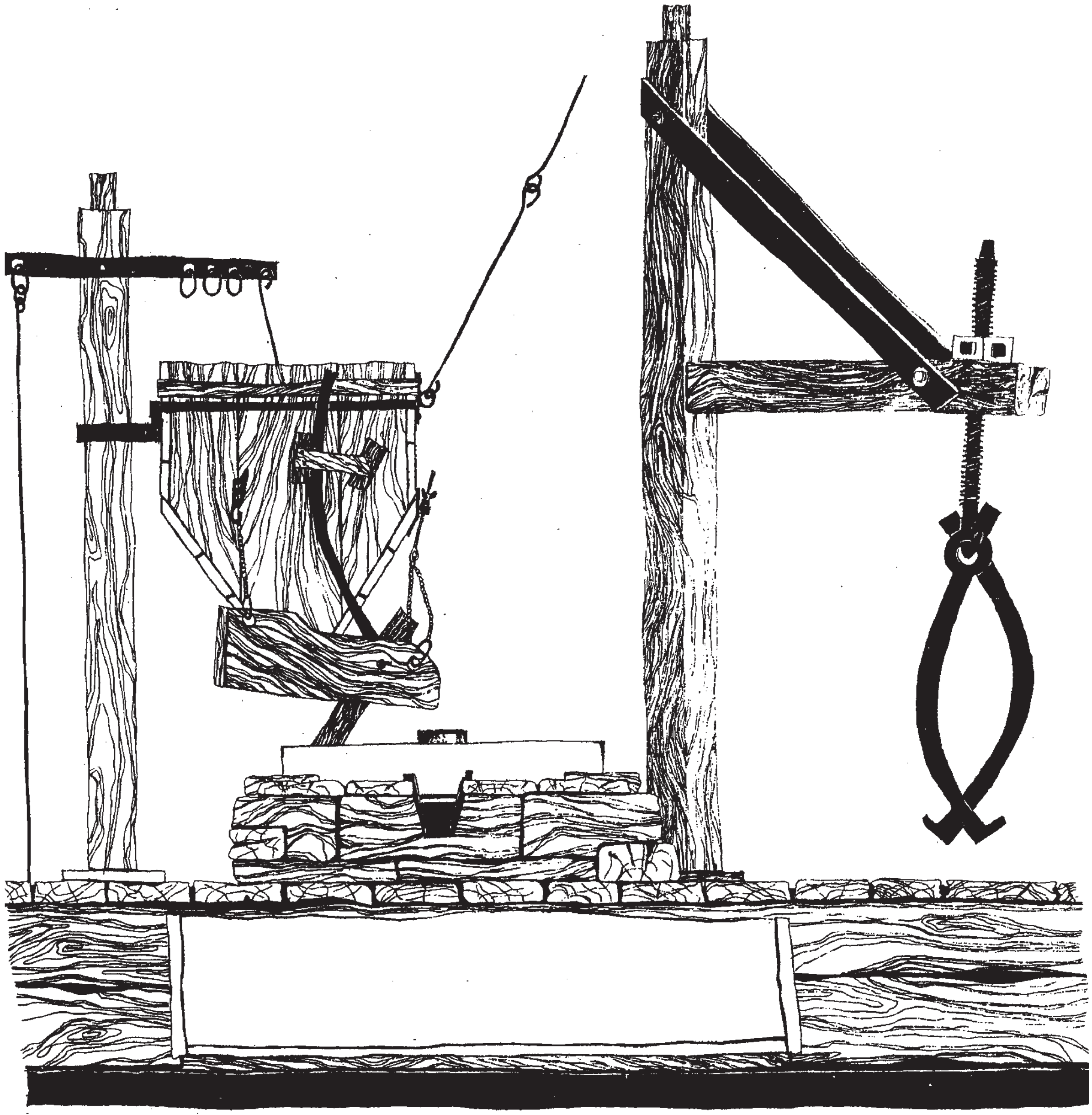
Pl. 122. Mehadia. Plan of locality from 1751 with mill location



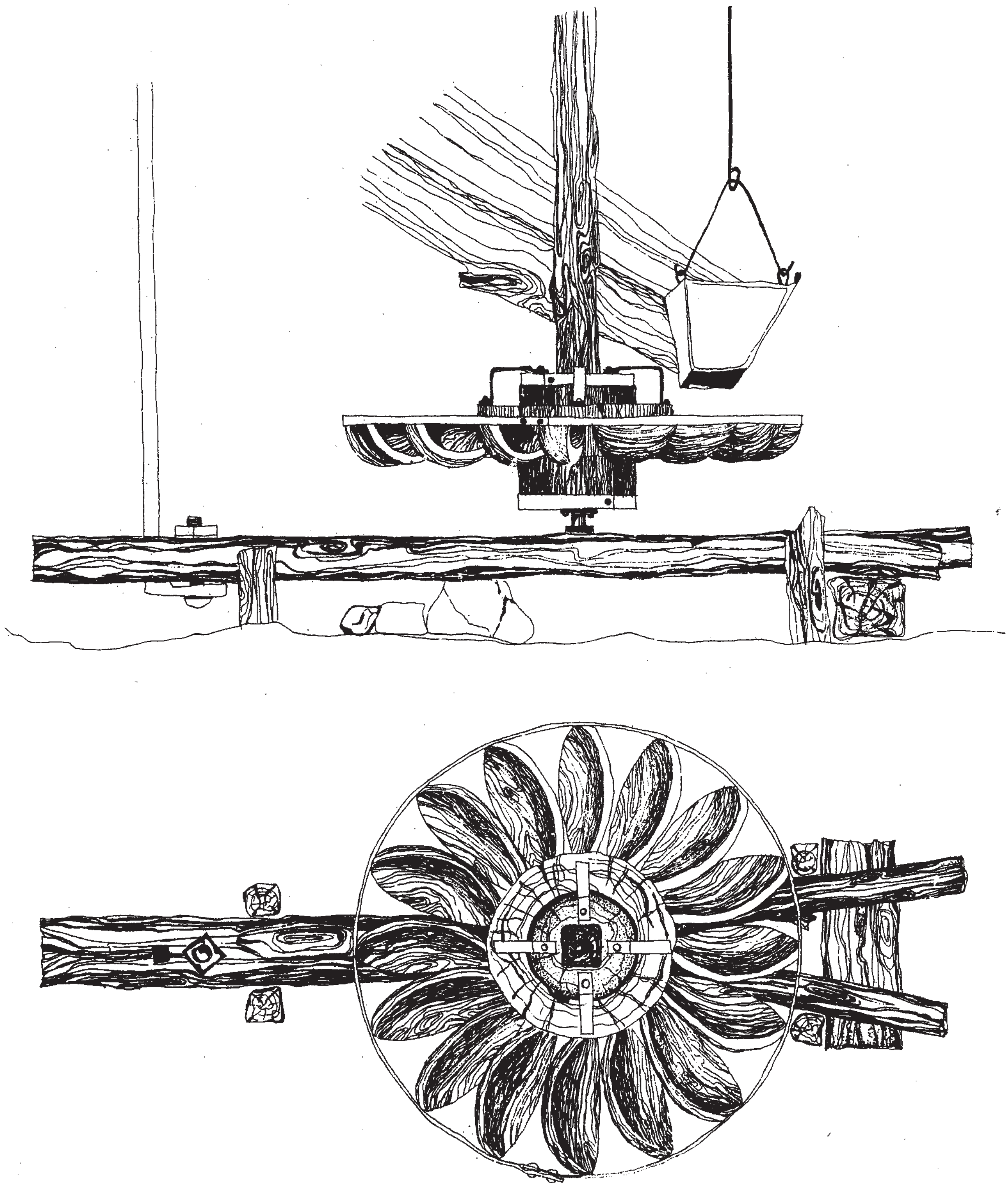
Pl. 123. Poeni. Mill with vertical wheel (in accordance to N. Ţăranu)



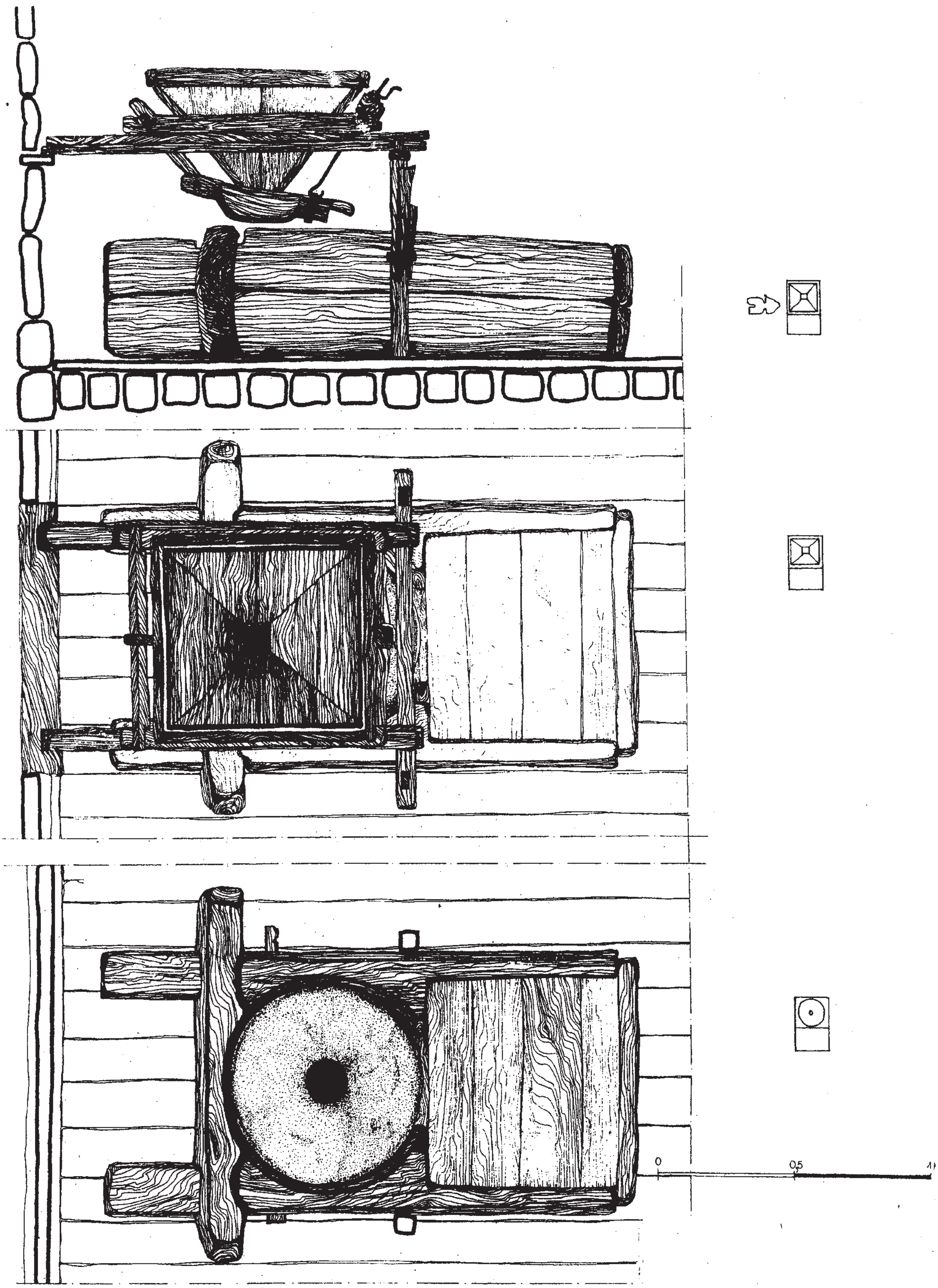
Pl. 124. Eftimie Murgu. Structure of a mill



Pl. 125. Topleț. Hydrotechnical installation of a mill

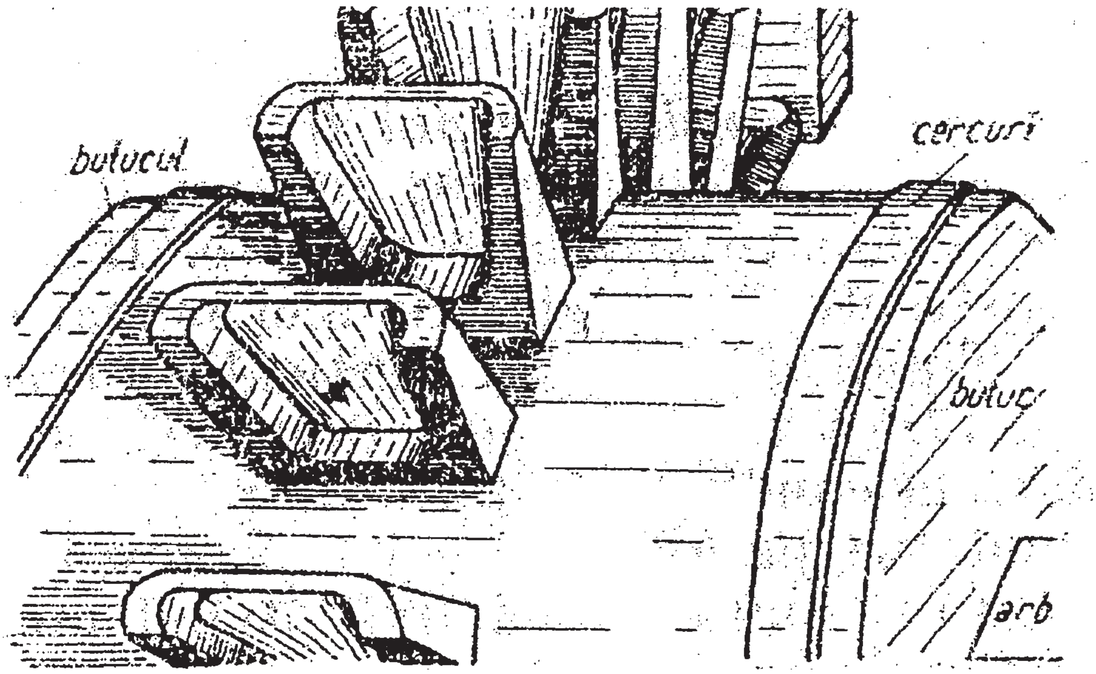


Pl. 126. Granic. Installation for lifting stones [*Bridge tree*]

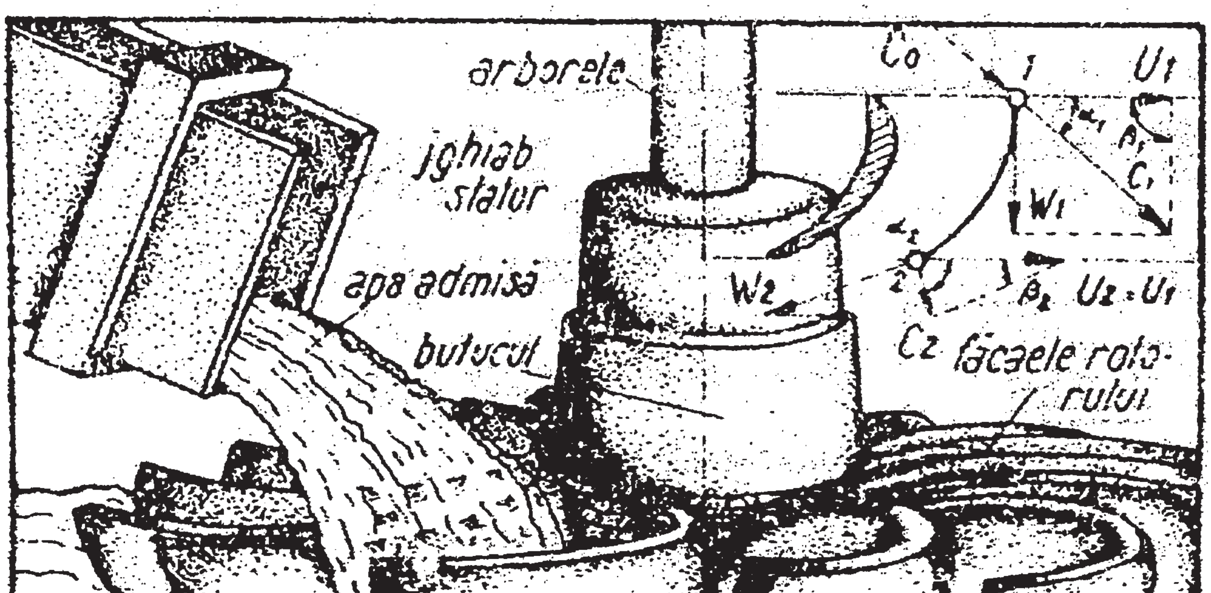


Pl. 127. Grinding installation. Plan and views

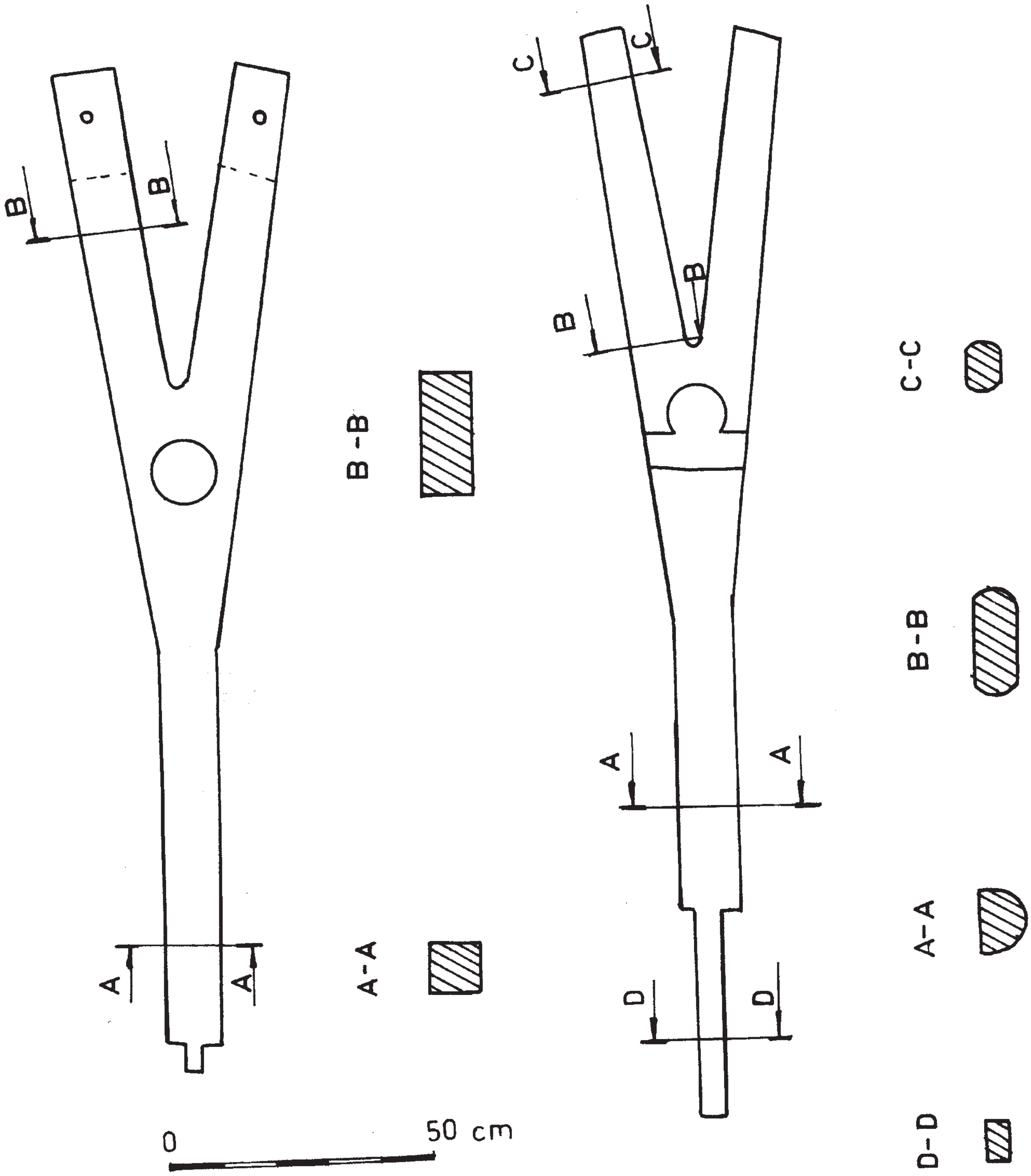
1



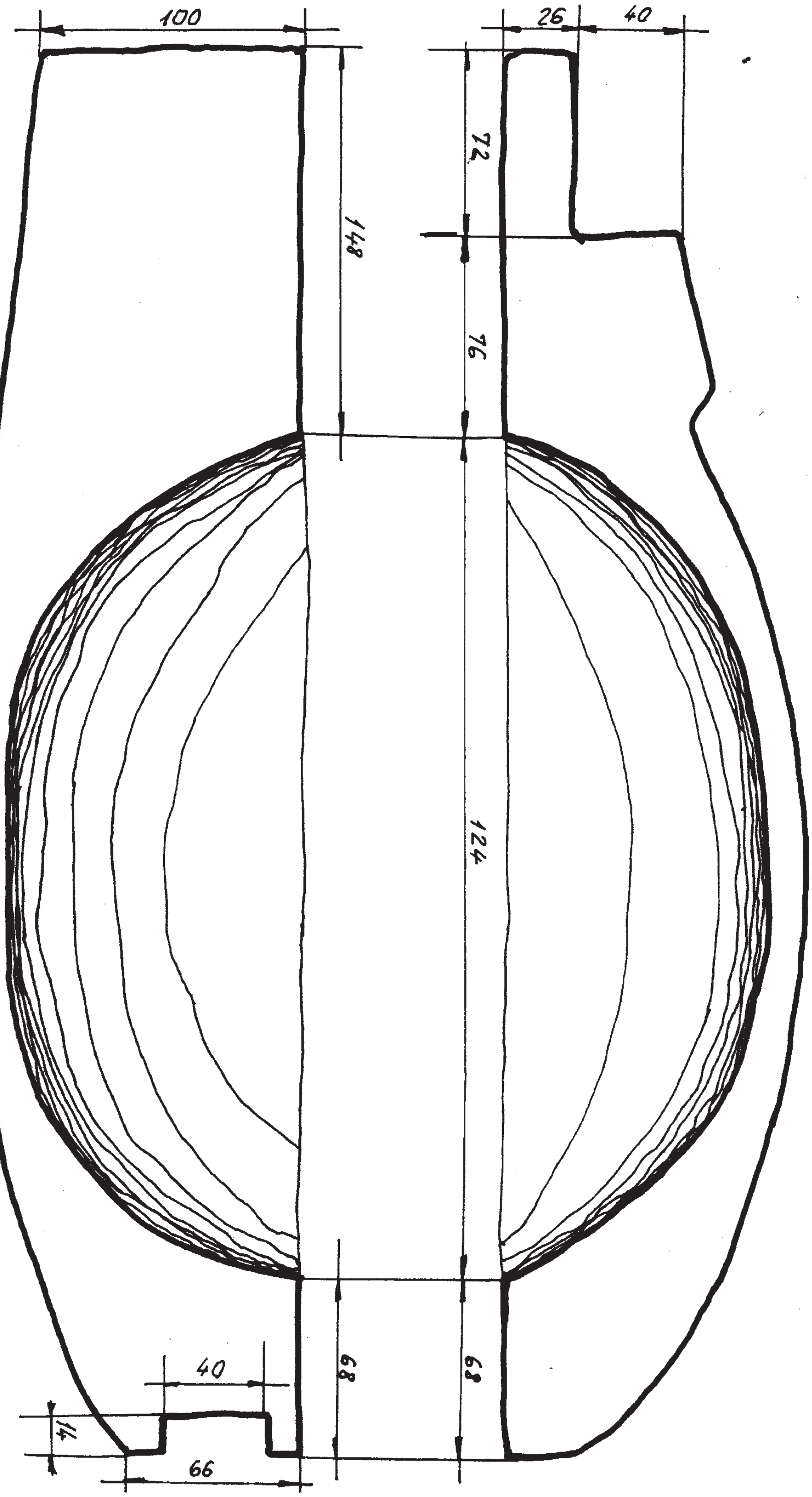
2



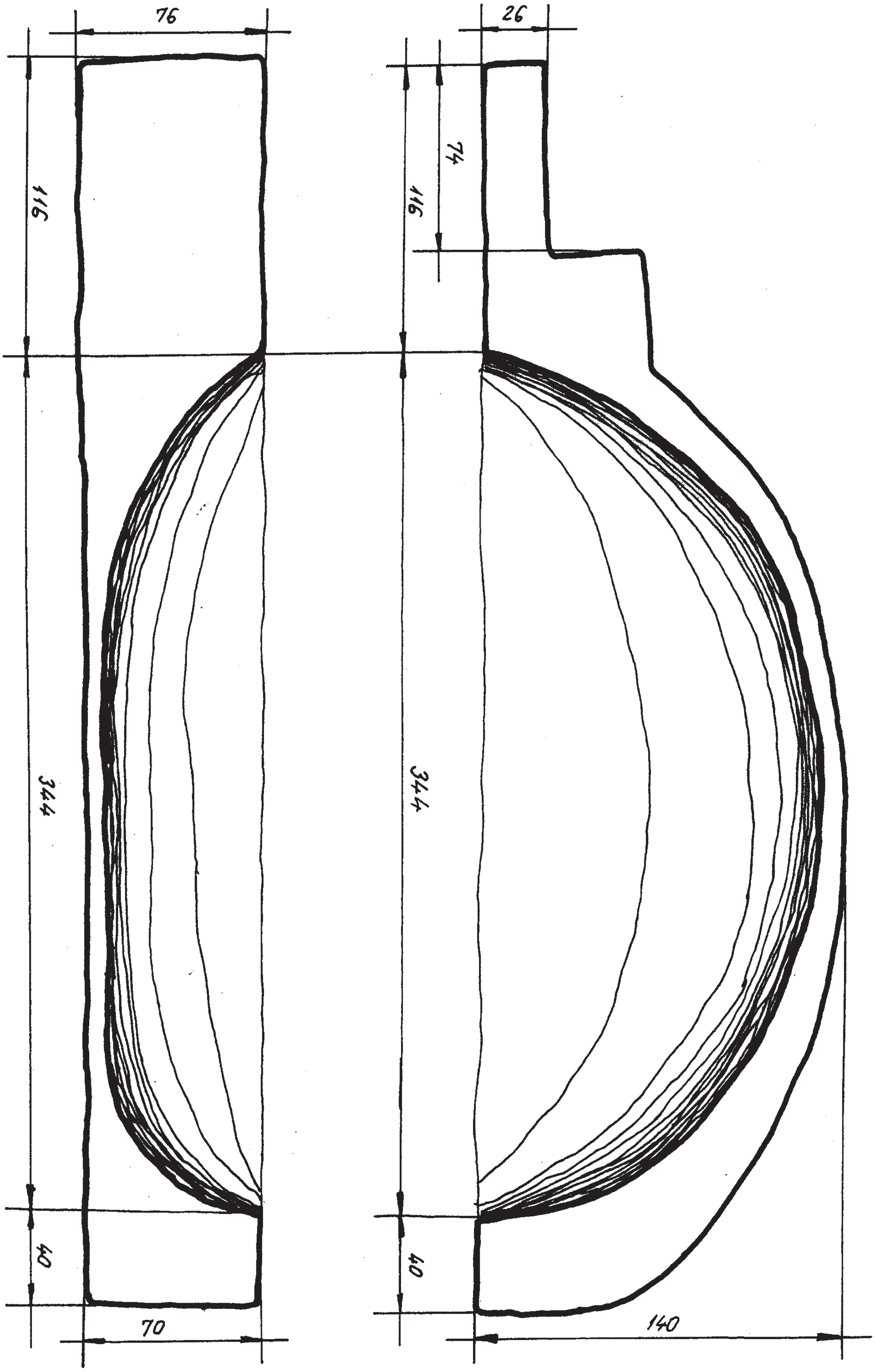
Pl. 128. 1. Hydraulic wheel; 2. Structure of a mill with horizontal wheel (in accordance to D. Pavel)



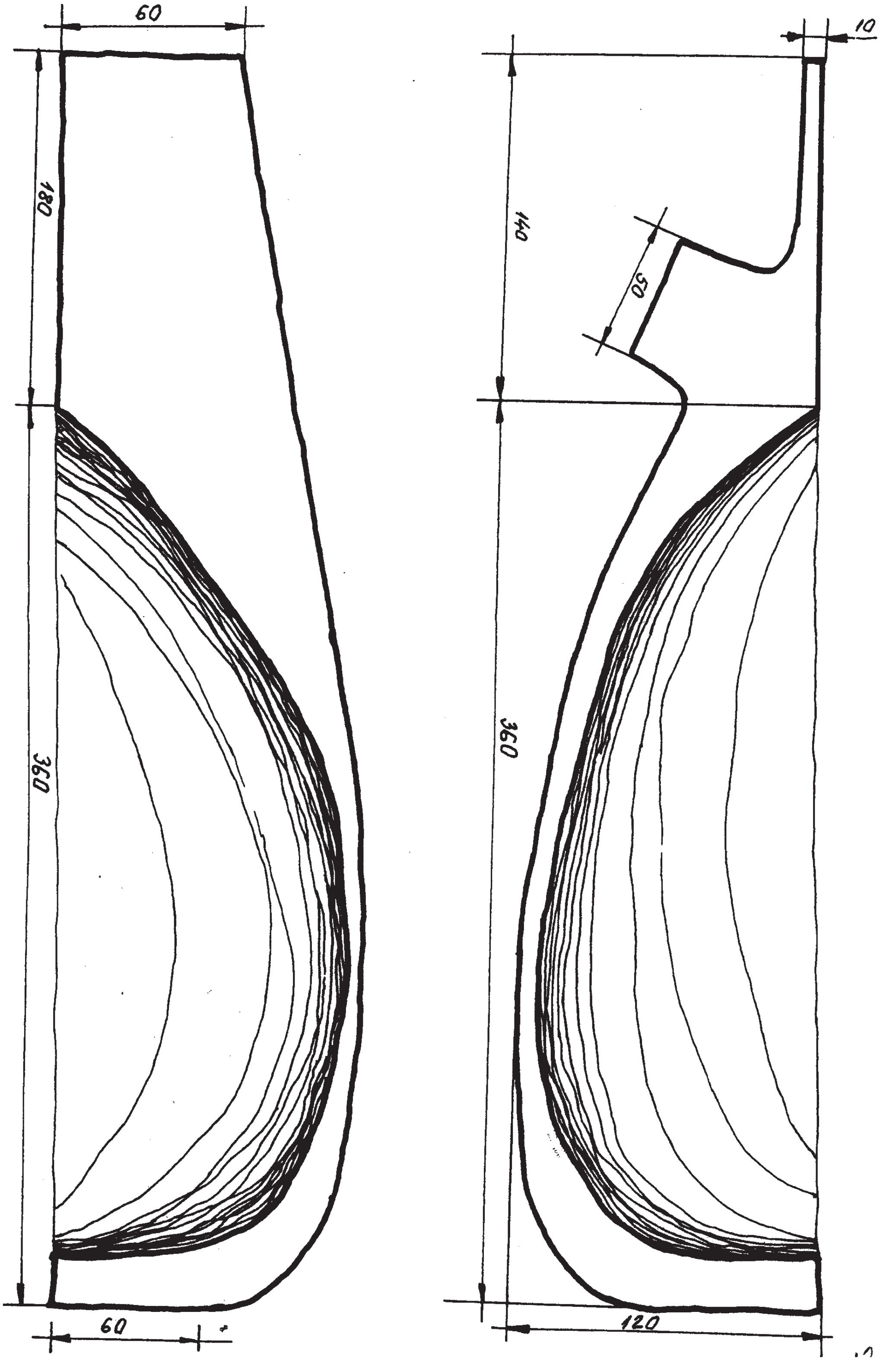
Pl. 129. Sichievița. Fork or yoke from hydrotechnical installation



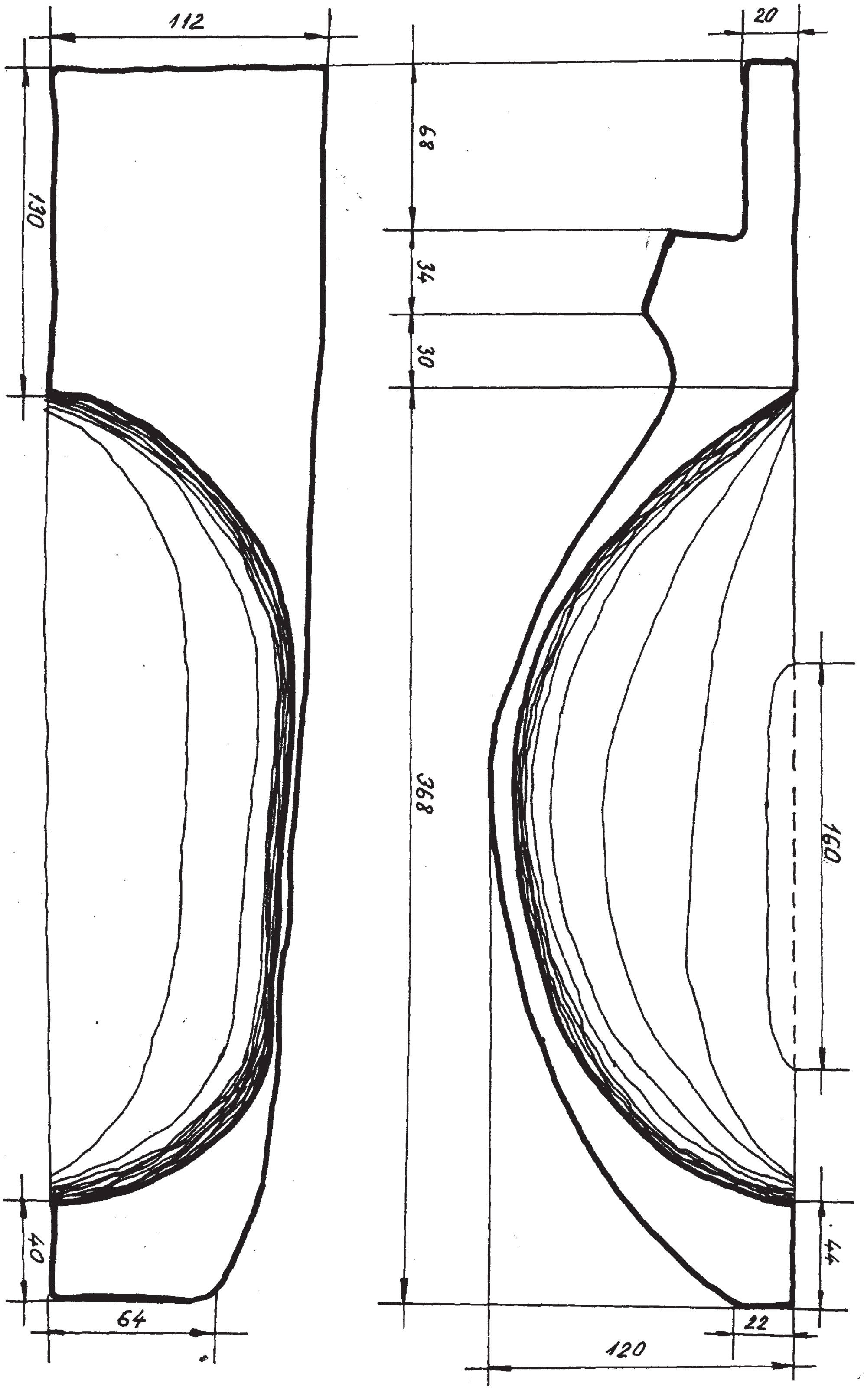
Pl. 130. Ilidia. Mill wheel spoons [*buckets*]



Pl. 131. Ilidia. Mill wheel spoons [*buckets*]

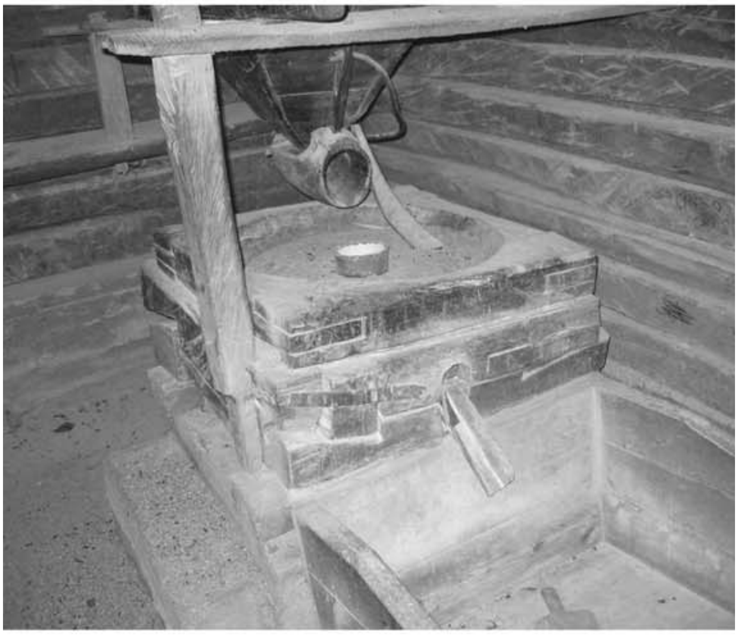


Pl. 132. Ilidia. Mill wheel spoons [*buckets*]



Pl. 133. Ilidia. Mill wheel spoons [*buckets*]

Fig. 81. Bârz. *Marinească Mill*



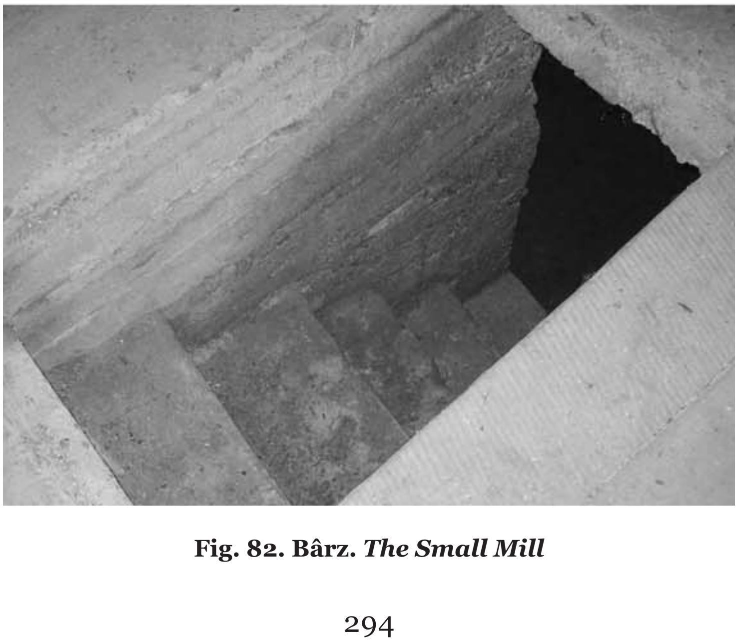


Fig. 82. Bârz. ***The Small Mill***




Fig. 83. Bogâltin. *Pălean's Mill*

Fig. 84. Bogâltin. ***Bădâni's Mill***

Fig. 85. Bogâltin. *Bădâni's Mill*

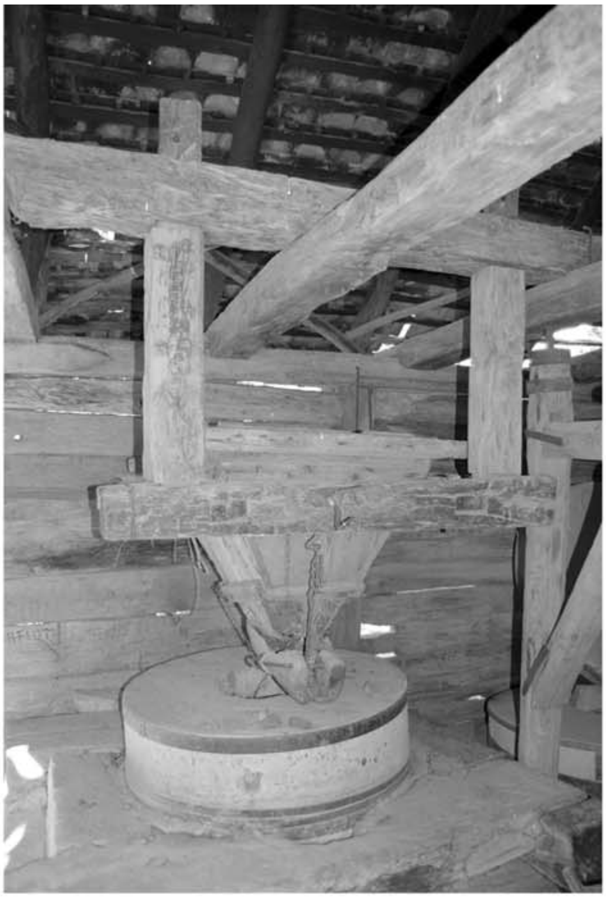


Fig. 86. Bogodinți. ***Valley Mill***

Fig. 87. Borlovenii Vechi. ***The New Boldeasca Mill***

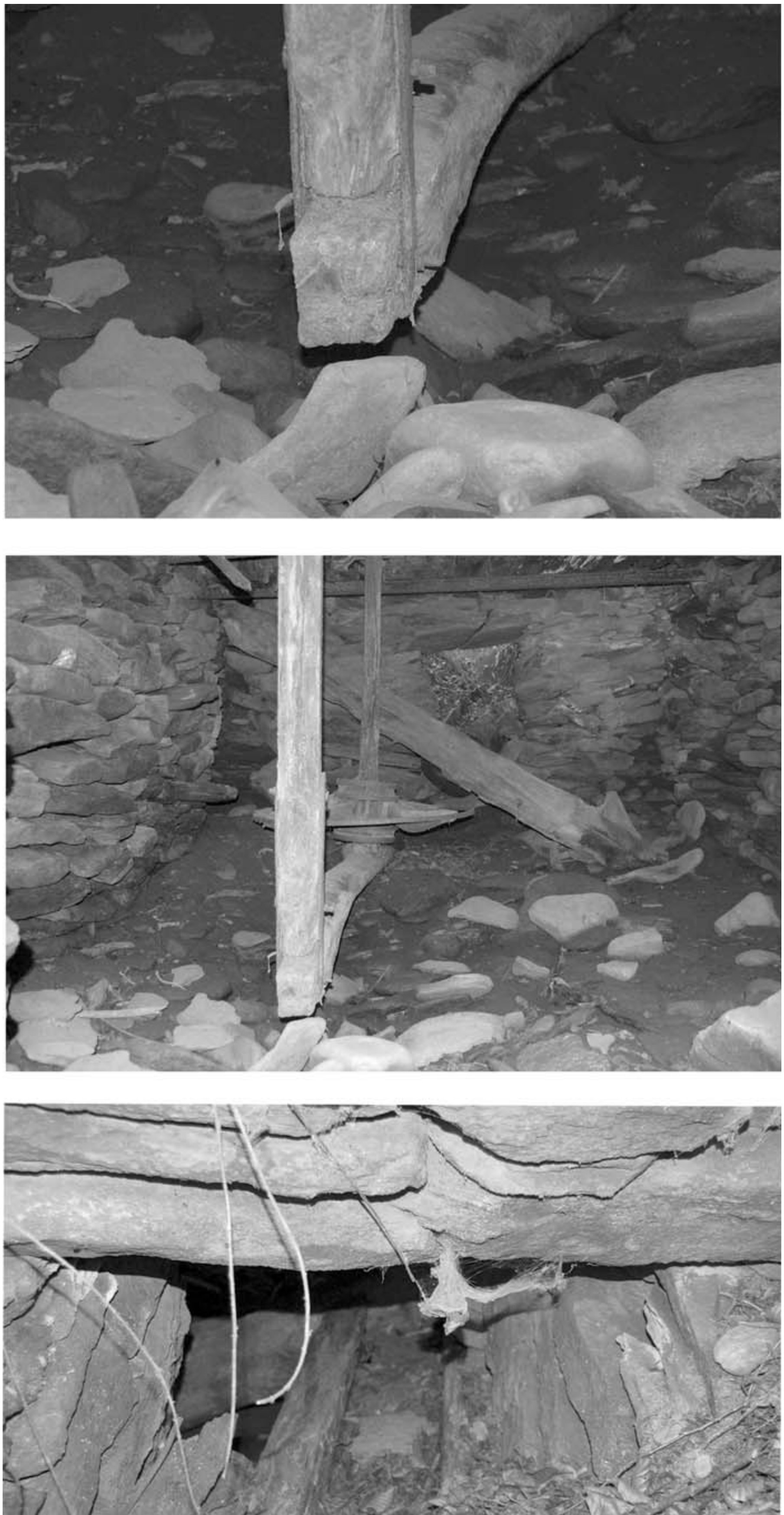


Fig. 88. Borlovenii Vechi. ***The Old Boldeasca Mill***

Fig. 89. Bozovici. *The Small Mill*

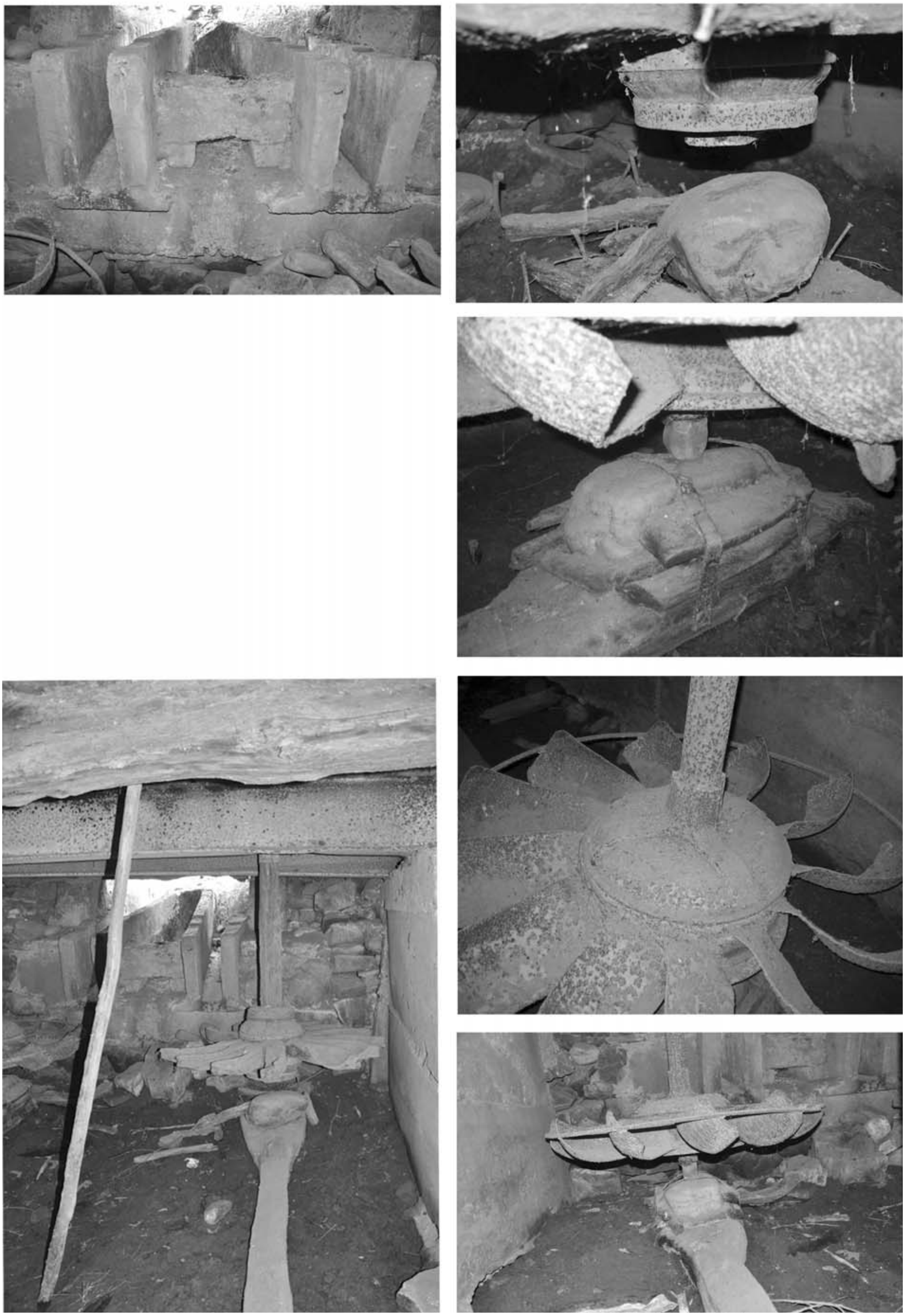


Fig. 90. Bozovici. *Neamțu's Mill*

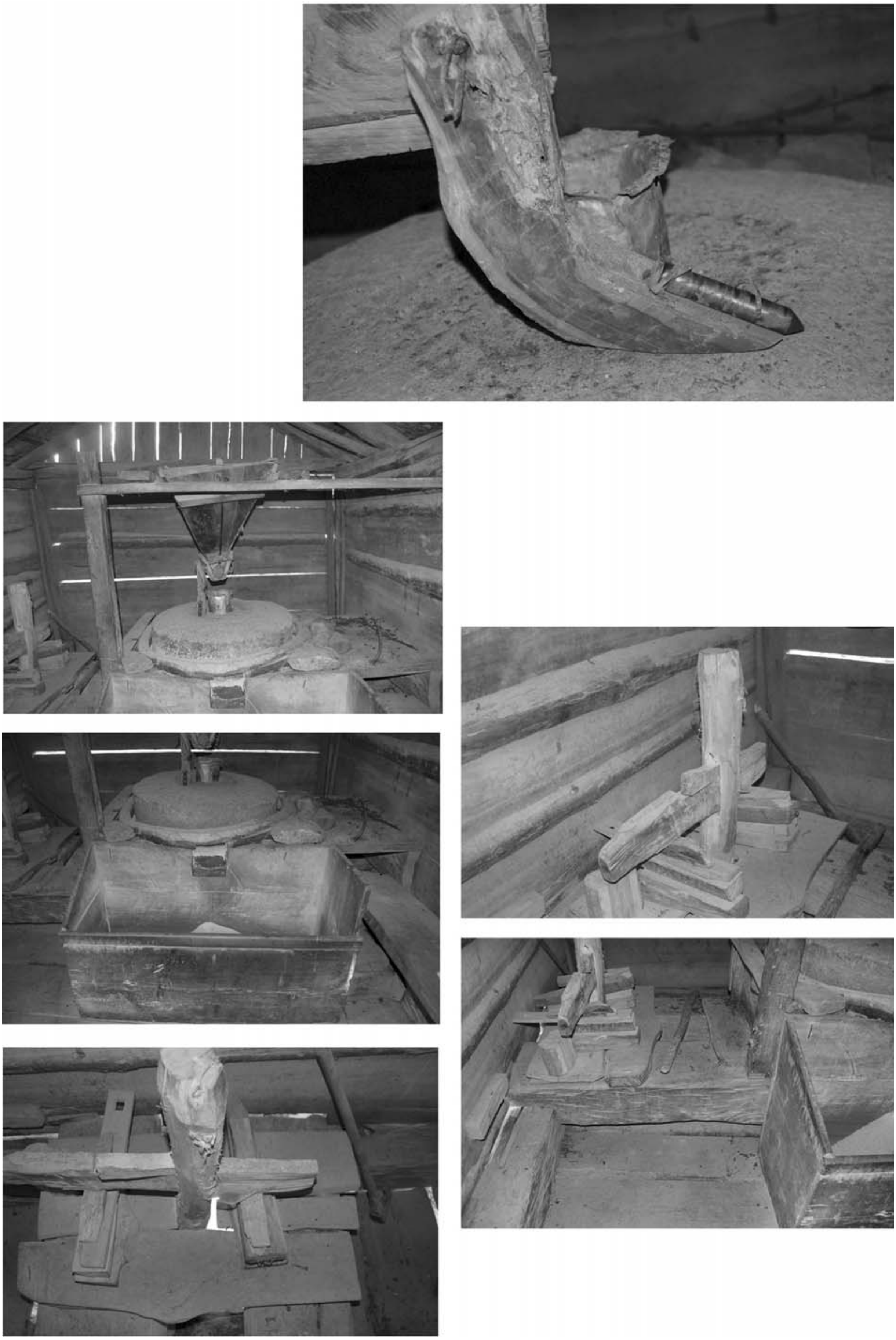


Fig. 91. Cornereva. *Popeşti's Mill*

Fig. 92. Cornereva. ***Dărăban's Mill***

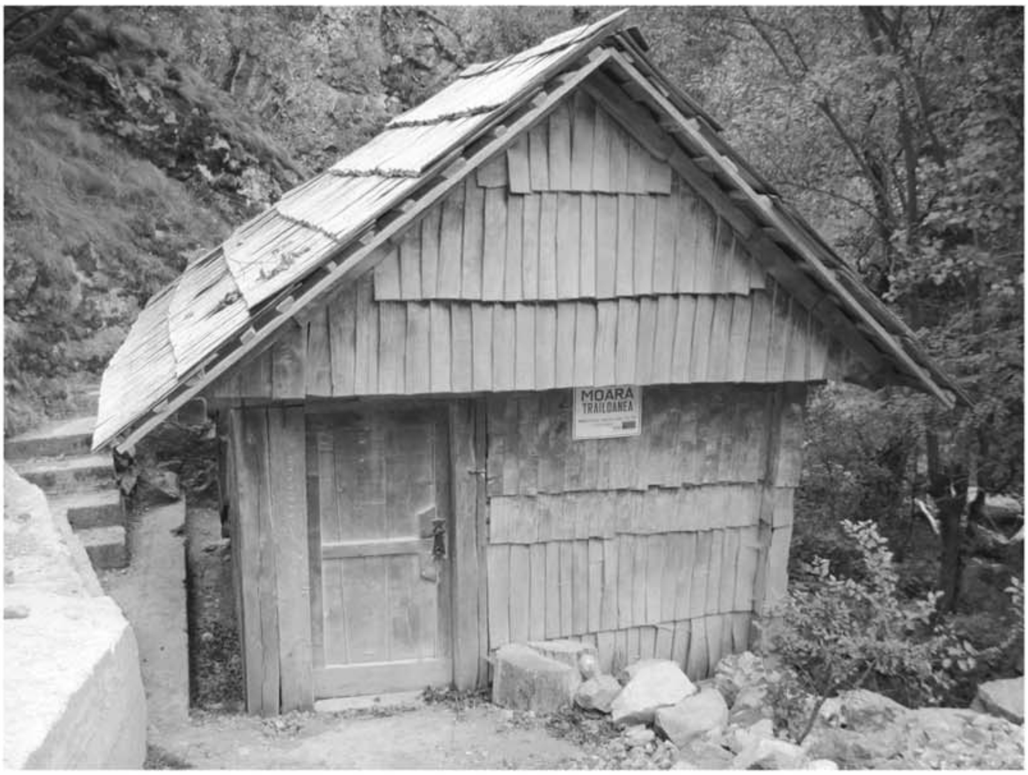


Fig. 93. Eftimie Murgu. *Trăiloanea Mill.* Pond on the Rudăria.





Fig. 94. Eftimie Murgu. *Trăiloanea Mill*

Fig. 95. Eftimie Murgu. *Bățolea Mill*

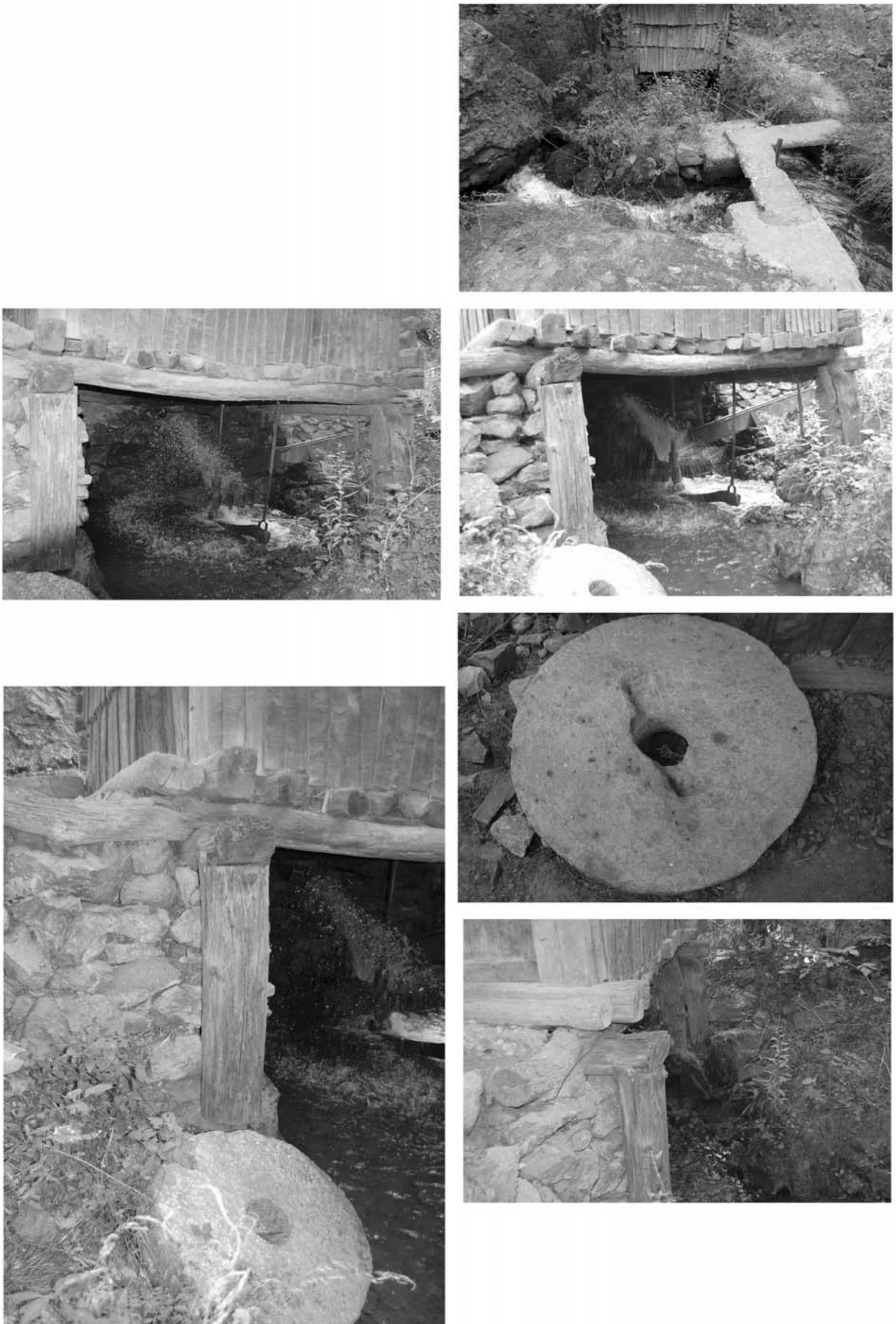


Fig. 96. Eftimie Murgu. ***Bățolea Mill***

Fig. 97. Eftimie Murgu. ***Brusoanea Mill***

Fig. 98. Eftimie Murgu. *Brusoanea Mill*

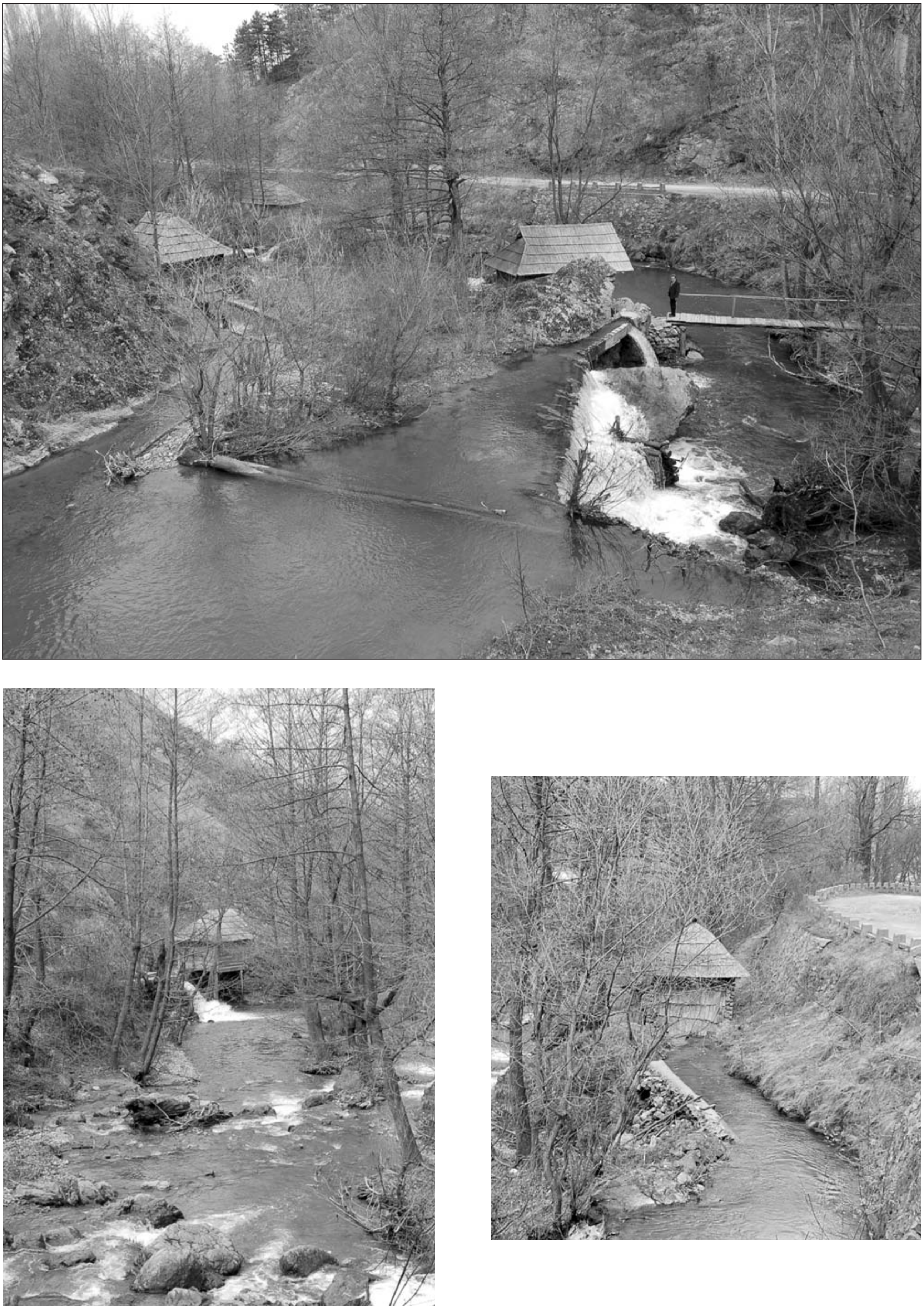


Fig. 99. Eftimie Murgu. ***Mill – The Obstinate between Rivers Mill***

Fig. 100. Eftimie Murgu. ***The Obstinate from the Wall Mill***

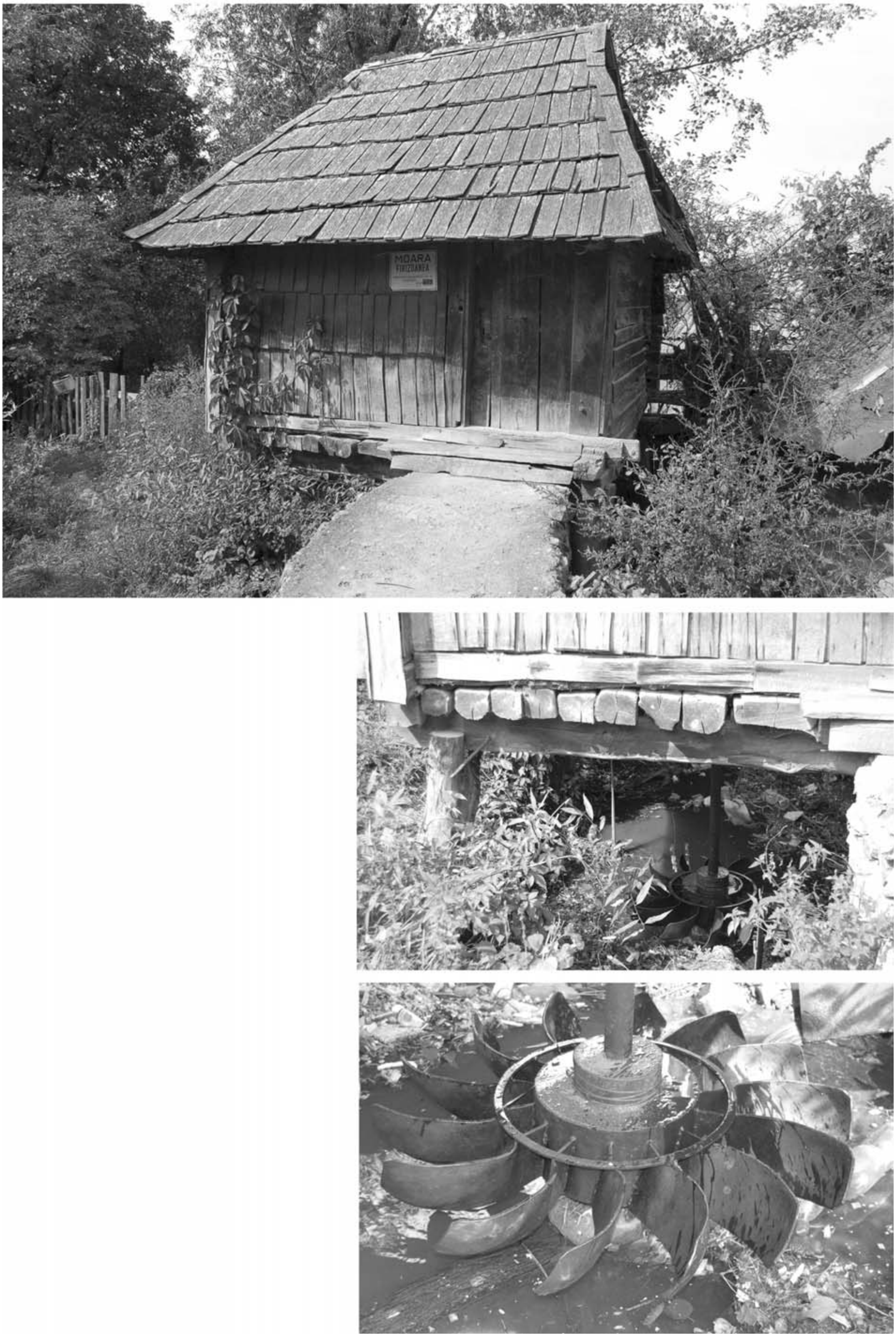


Fig. 101. Eftimie Murgu. ***Firizoanea Mill***

Fig. 102. Eftimie Murgu. *Firizoanea Mill*

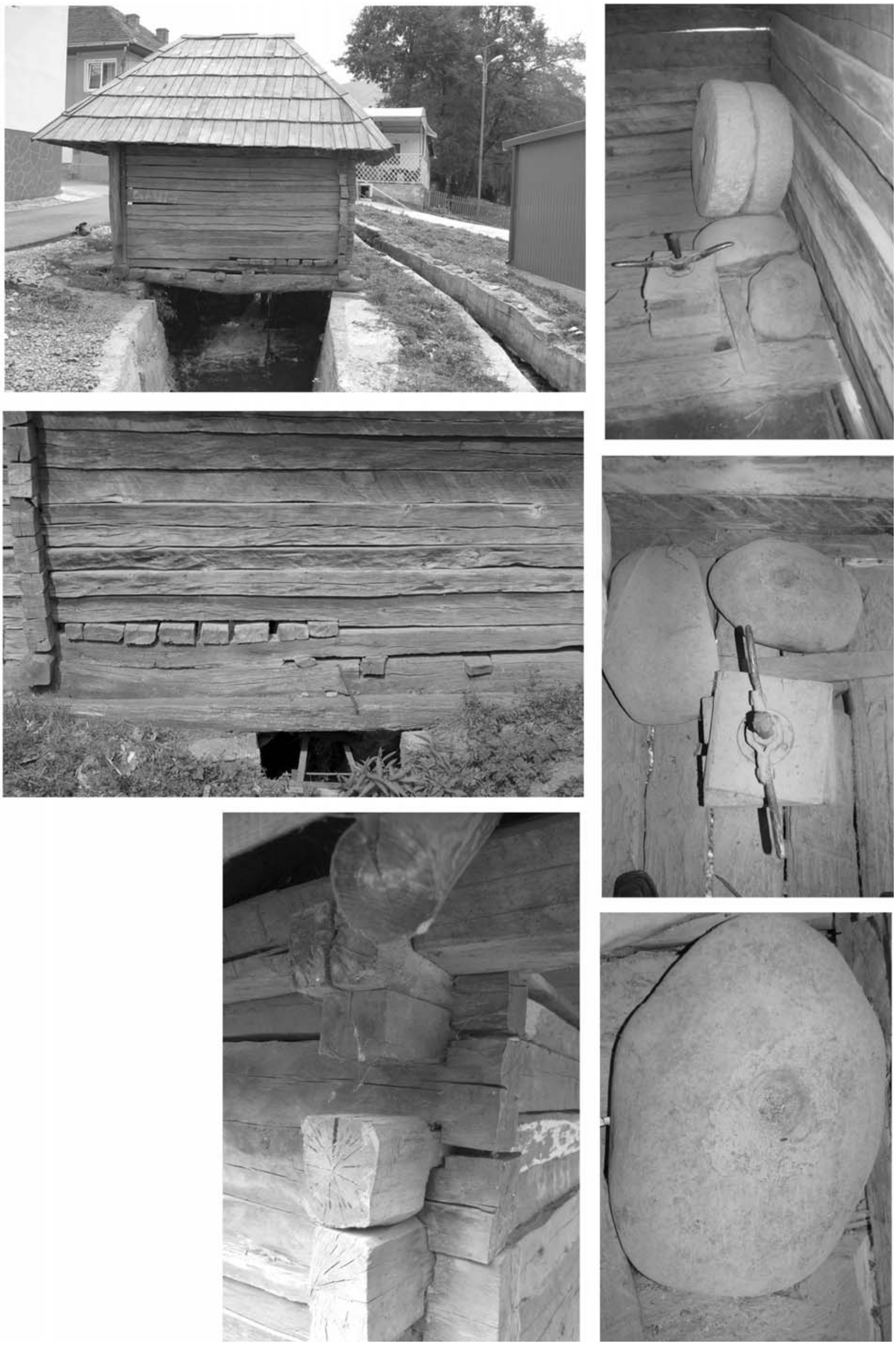


Fig. 103. Eftimie Murgu. *Hămbăroanea Mill*

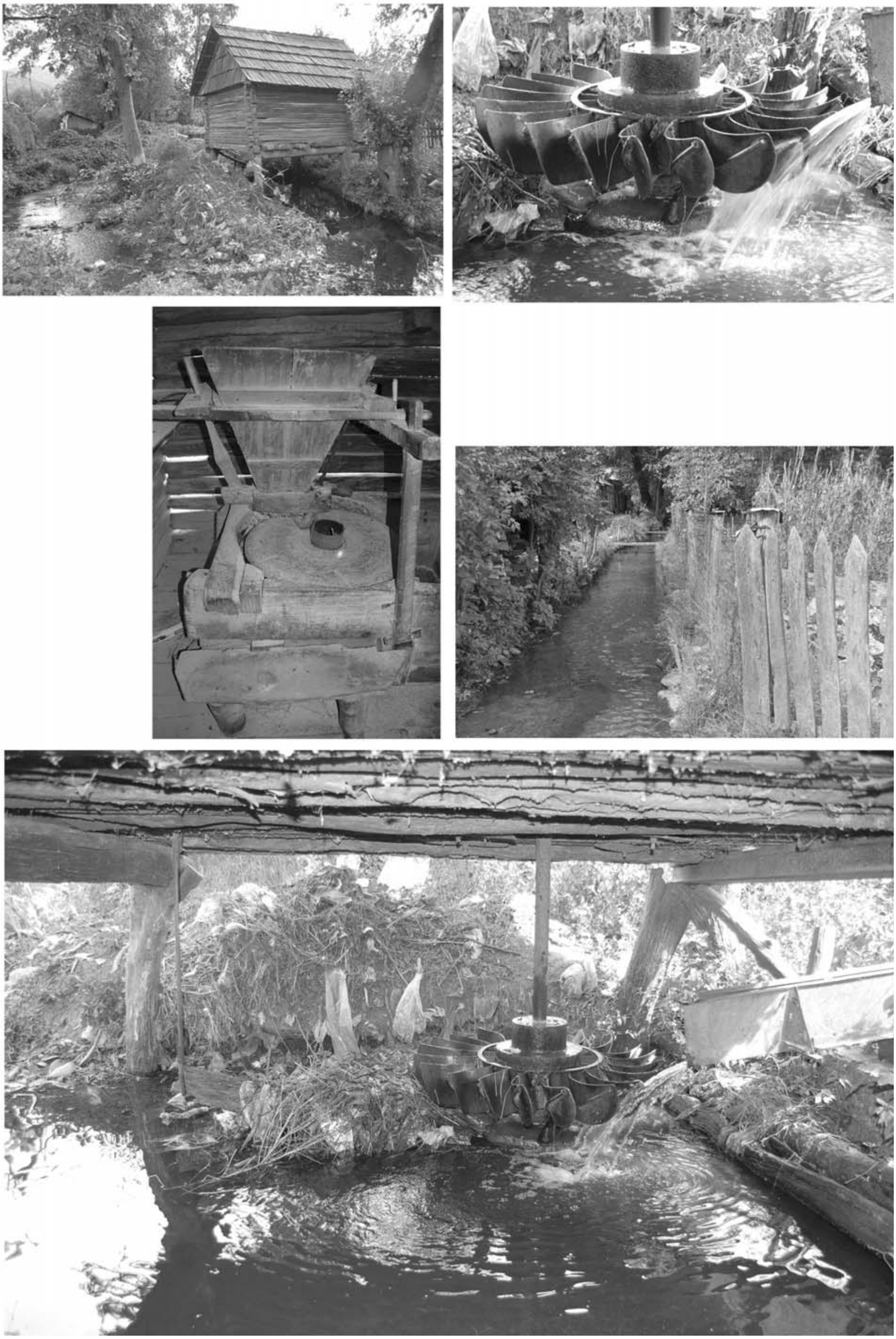


Fig. 104. Eftimie Murgu. ***Micloşoanea Mill***

Fig. 105. Eftimie Murgu. ***Mill from Firiz***

Fig. 106. Eftimie Murgu. ***Mill from Firiz***

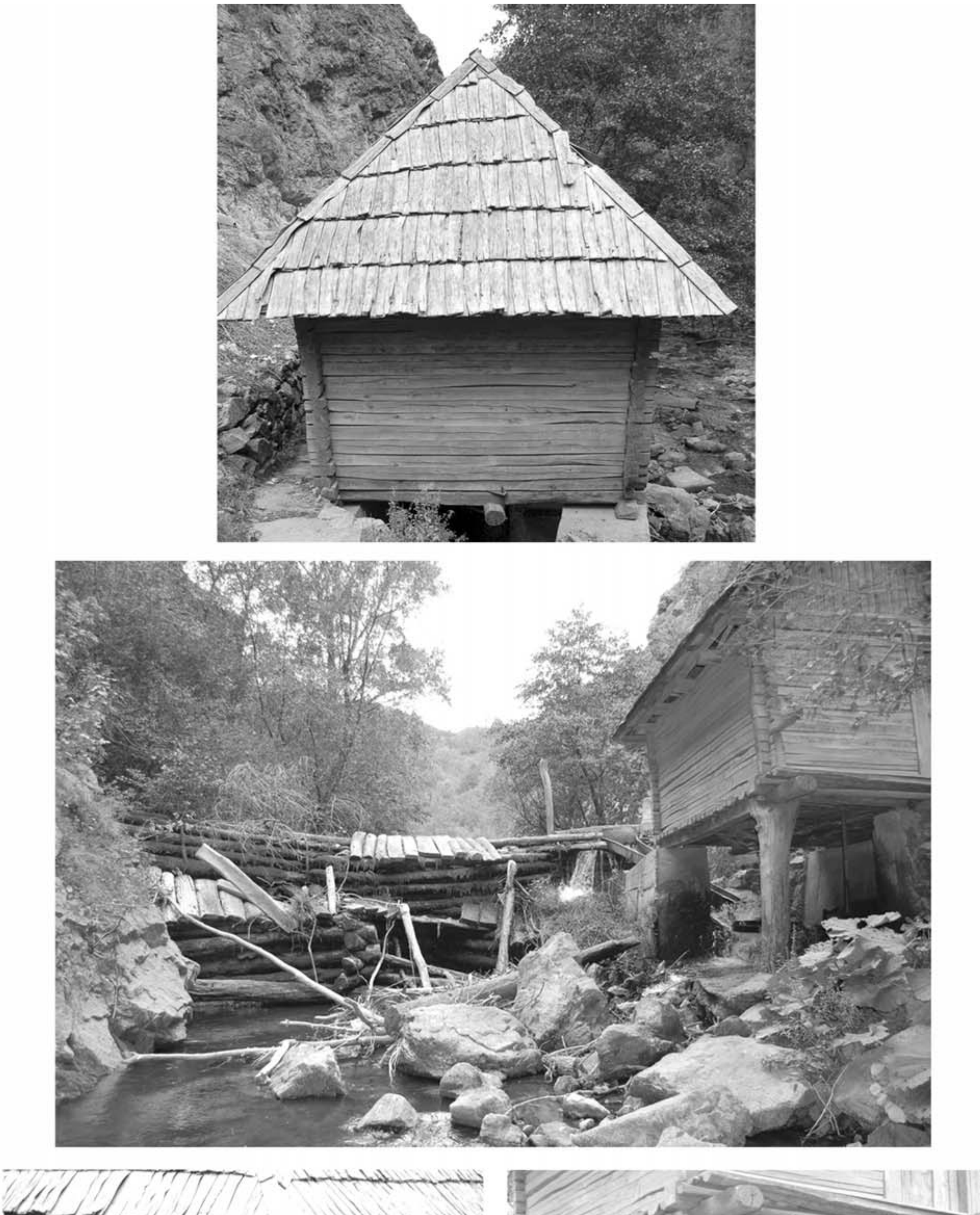


Fig. 107. Eftimie Murgu. *Viloanea Mill*

Fig. 108. Gârlişte. ***Brani's Mill***

Fig. 109. Gârnic. *Berana Mill*

Fig. 110. Gârnic. *Țilindar Mill*

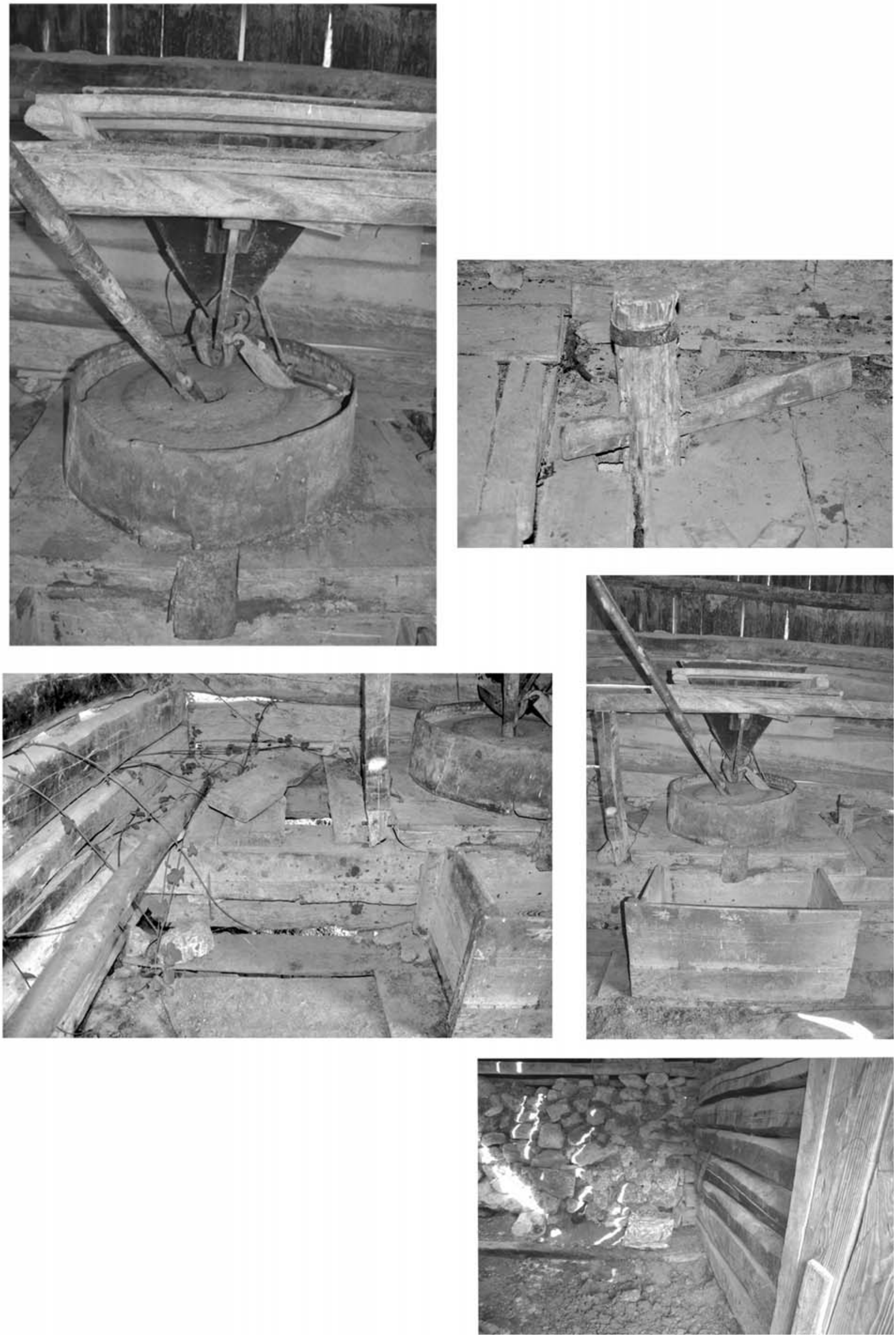


Fig. 111. Gârnic. *Cotârlaica Mill*

Fig. 112. Globurău. ***Mill 1***



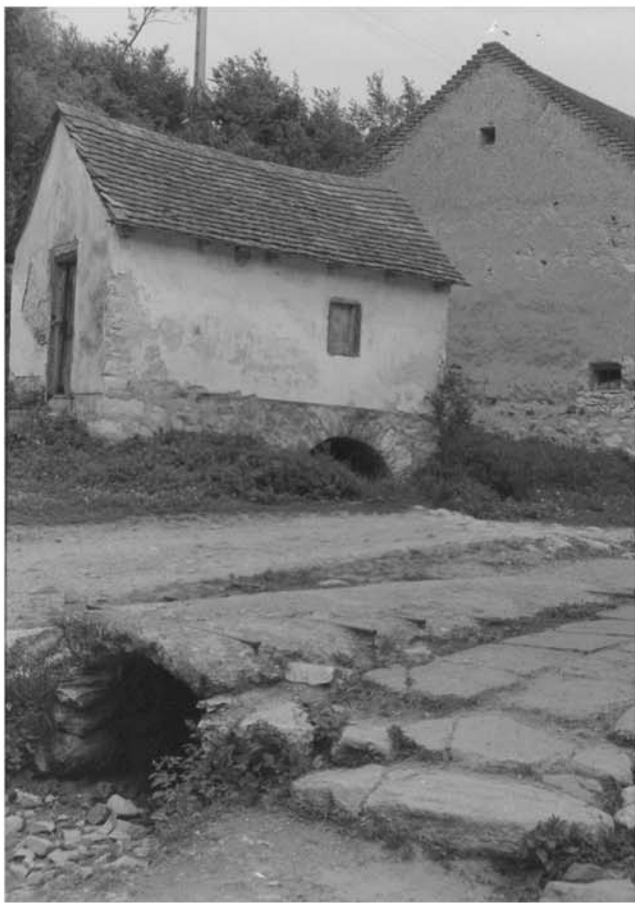




Fig. 113. Ilidia. *Mill from Pit, Mill from Muican, Bălani's Mill.*
Underground room with hydrotechnical installation

Fig. 114. Ilidia. ***The two mills***

Fig. 115. Ilidia. ***The two mills*****,** ***Wooden Mill***

Fig. 116. Ilidia. *Bălani's Mill*

Fig. 117. Ilidia. ***Mill from Pit***

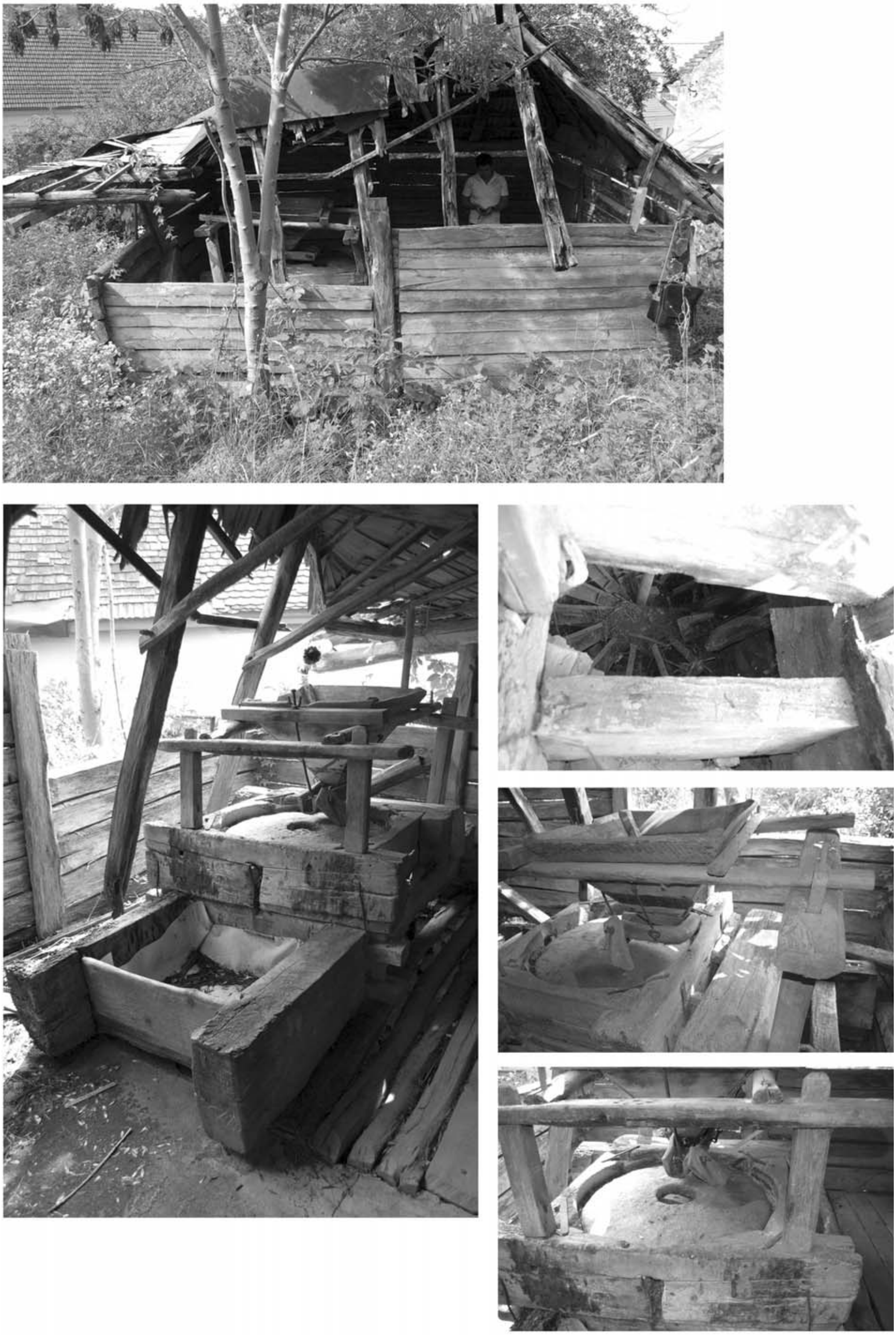


Fig. 118. Ilidia. ***Mill from Muican***

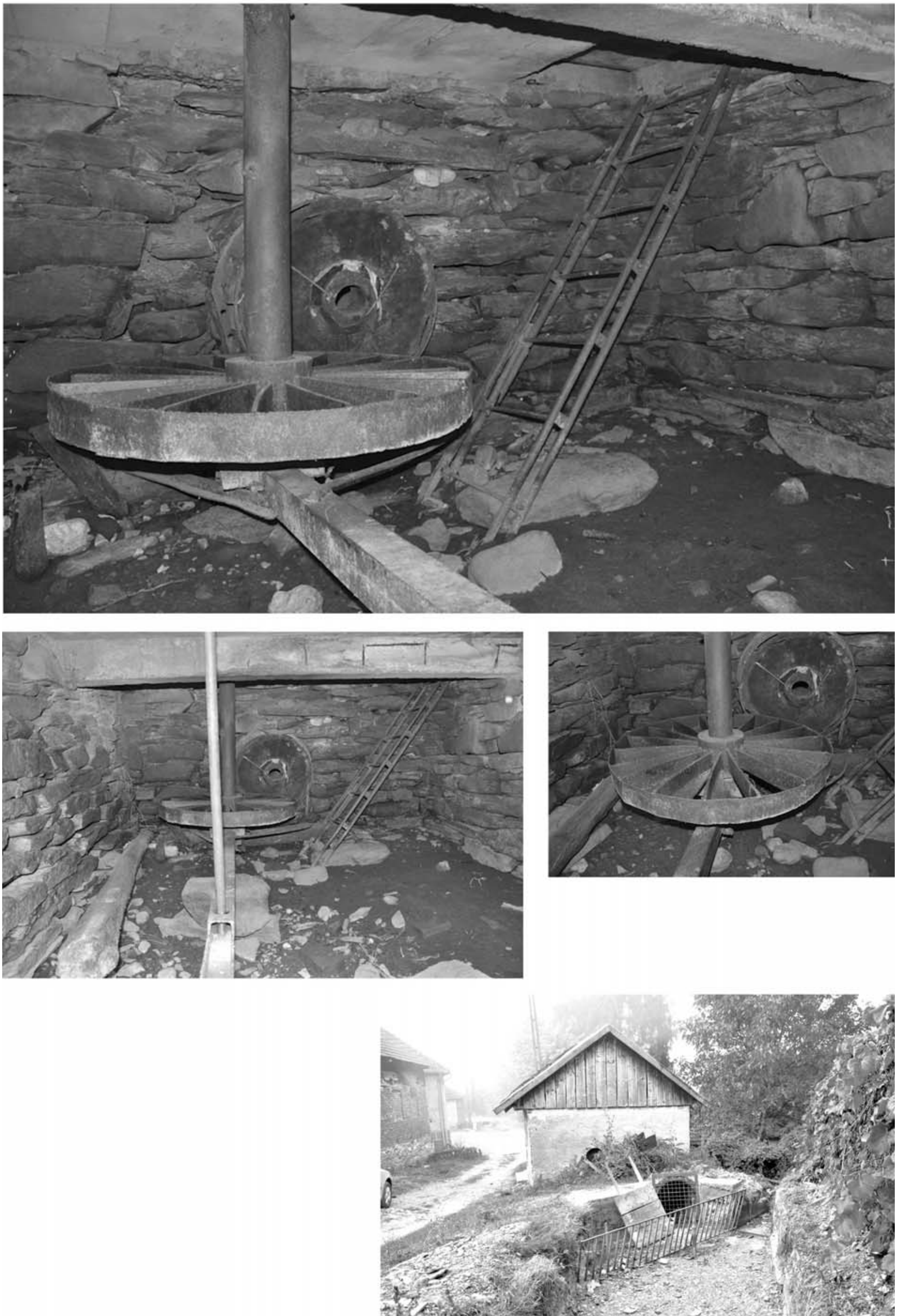


Fig. 119. Lăpuşnicu Mare. ***Luchii Mill***

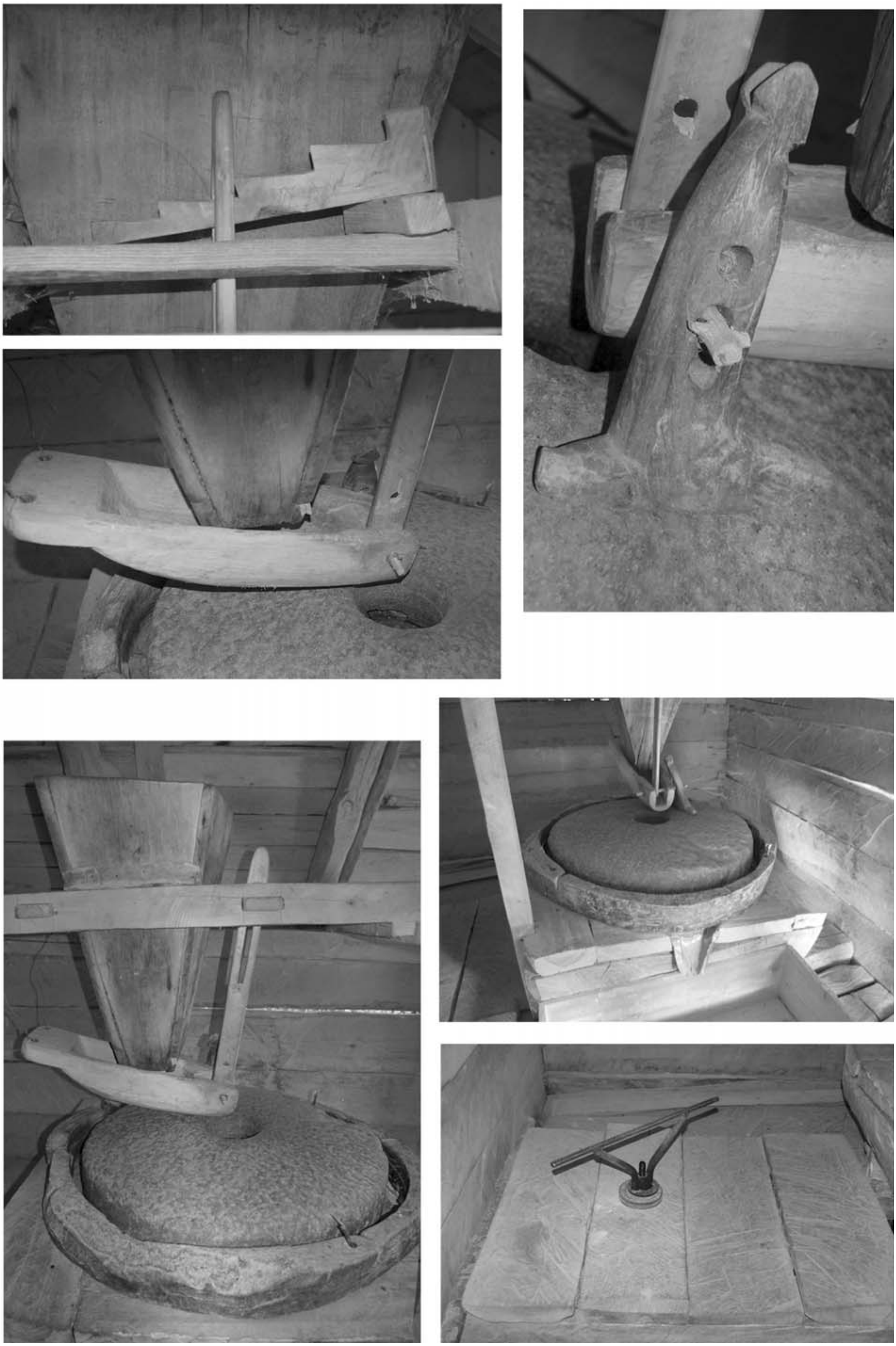


Fig. 120. Lunca Florii. ***Căpaț's Mill***

Fig. 121. Lunca Zaicii. *Vulpeş's Mill*

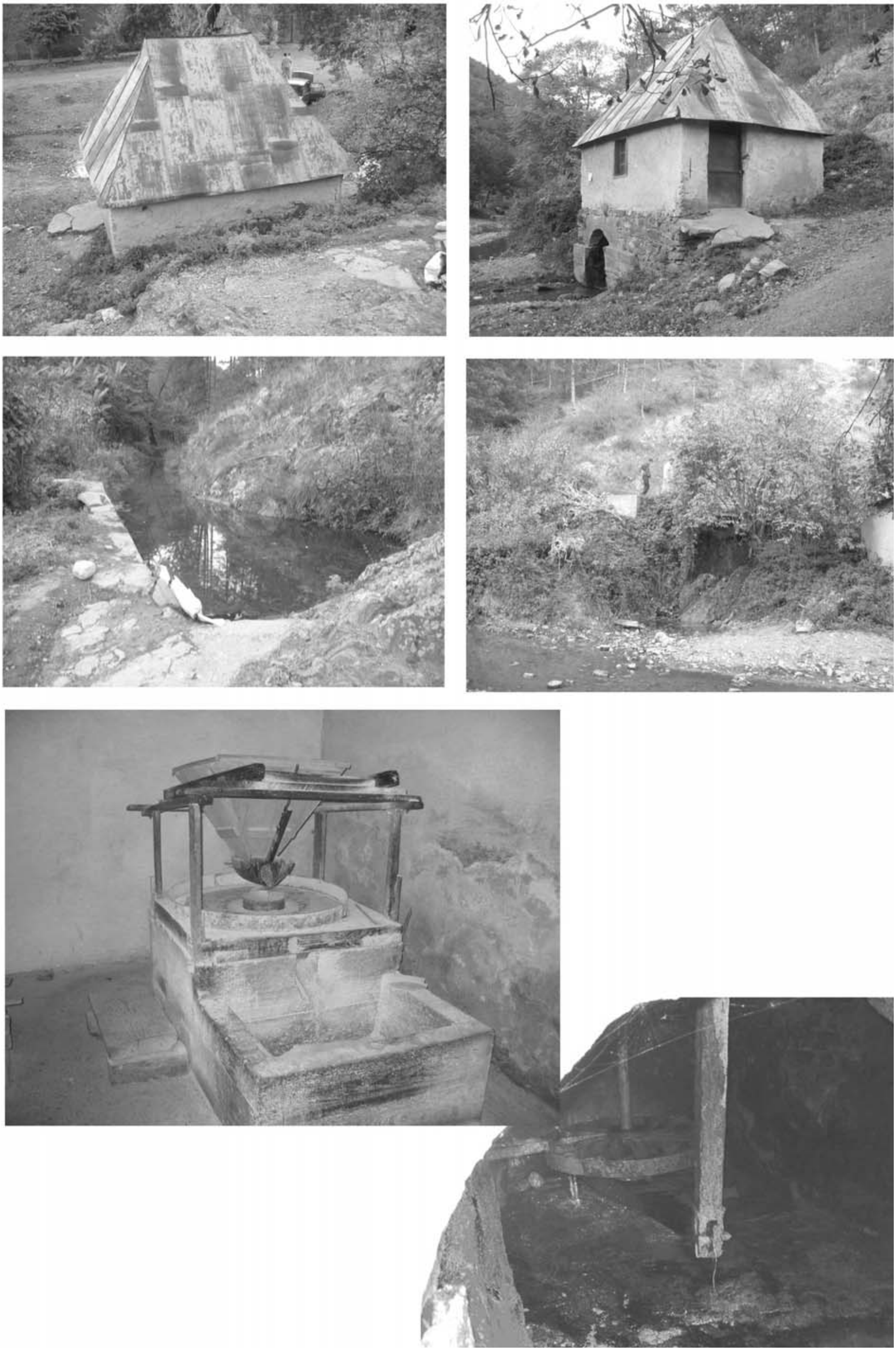


Fig. 122. Moceriş. ***Stone Mill***

Fig. 123. Pârvova. ***Cheia Mill***

Fig. 124. Pârvova. *Osoina Mill*

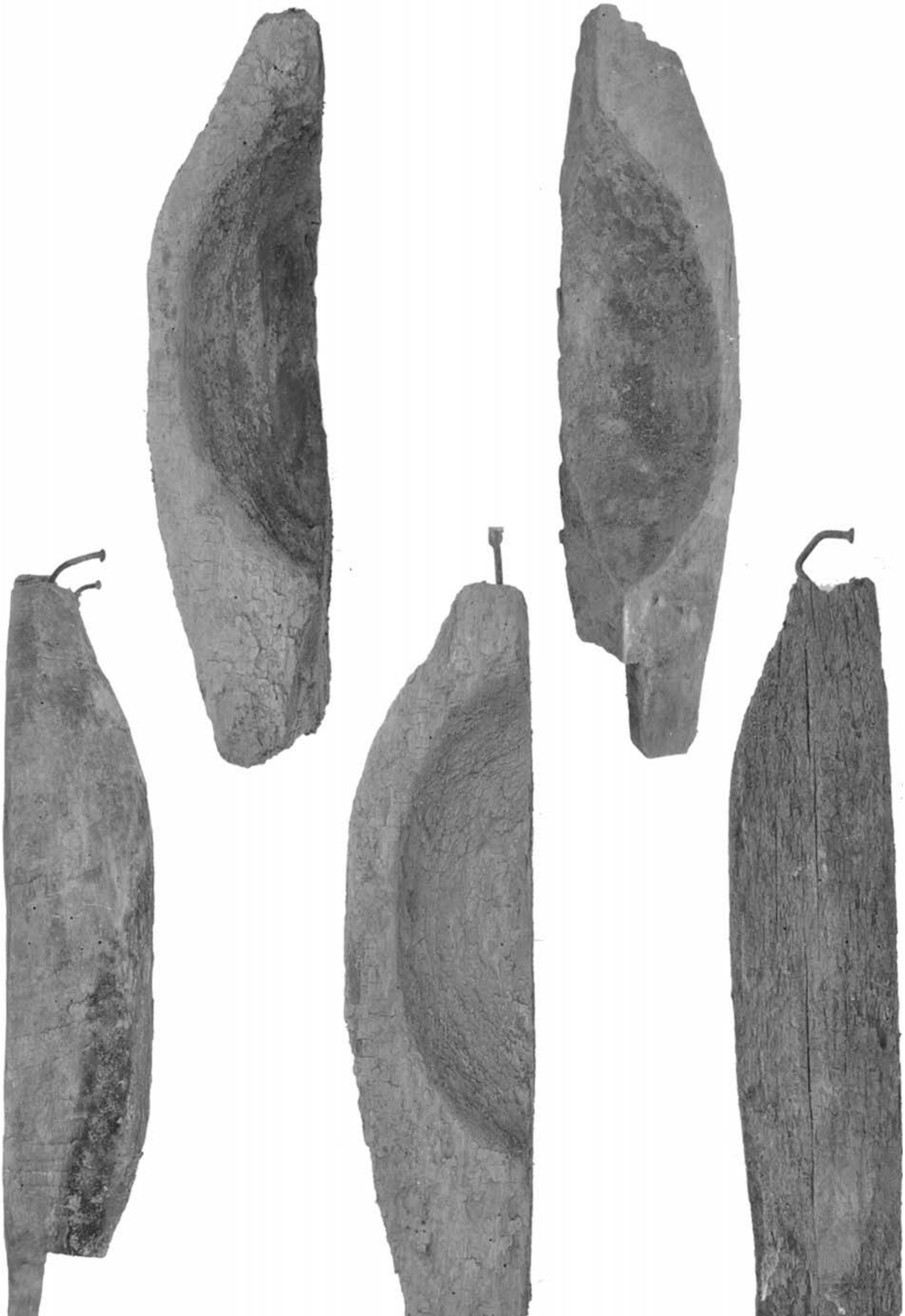


Fig. 125. Ilidia. ***Mill wheel spoons***

Fig. 126. Sichievița. Fork or yoke from mill hydrotechnical installation

1

2

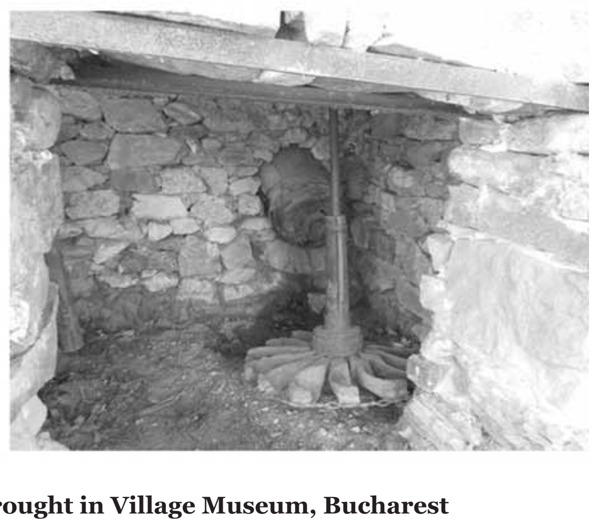


Fig. 127. 1. Plavişeviţa; Teregova. Mill brought in Village Museum, Bucharest

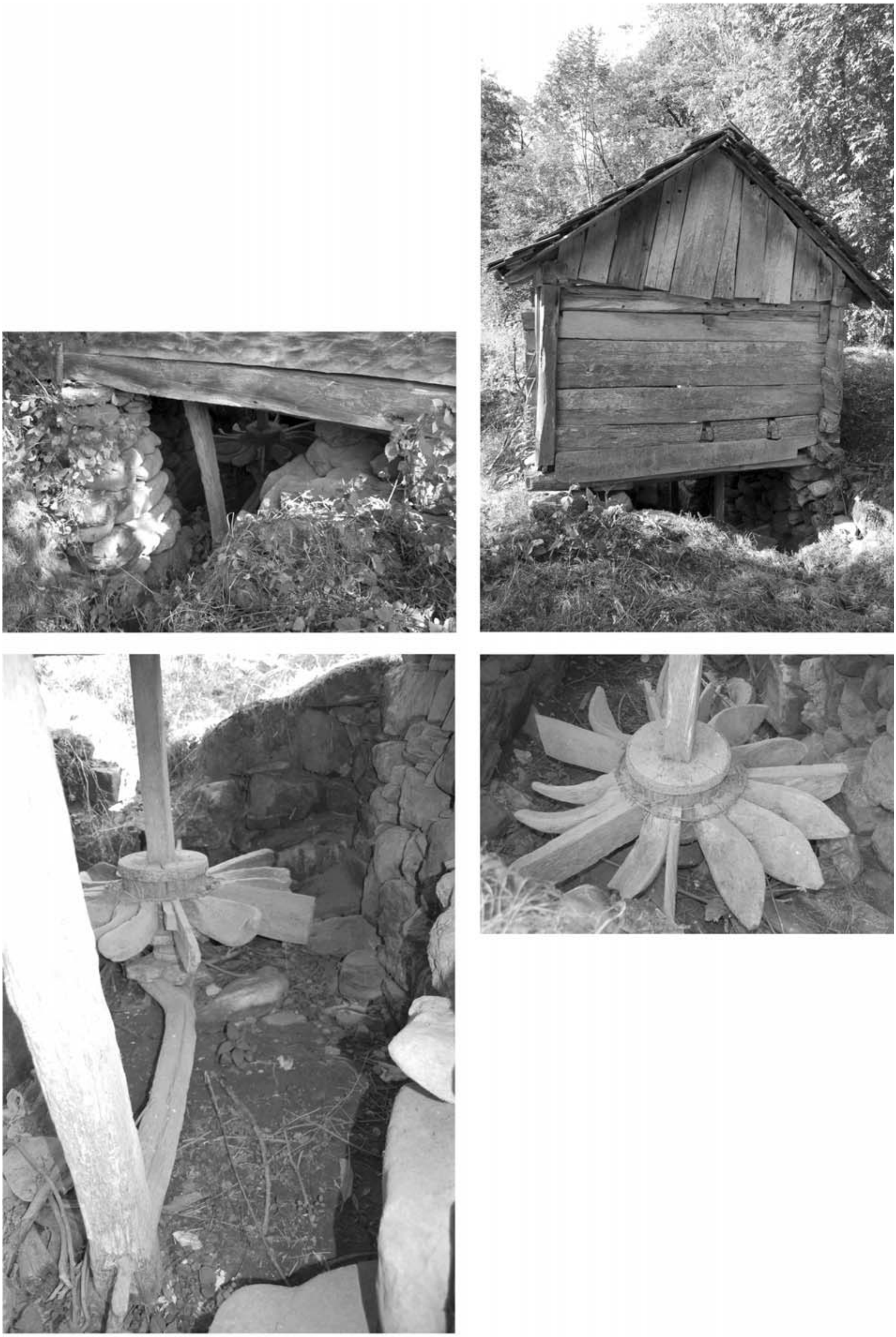


Fig. 128. Pogara. ***Cernescu's Mill***

Fig. 129. Prigor. ***Mill from Ibălcina Mouth***

Fig. 130. Putna. *Valley Mill*

Fig. 131. Răcăşdia. ***Village Mill***

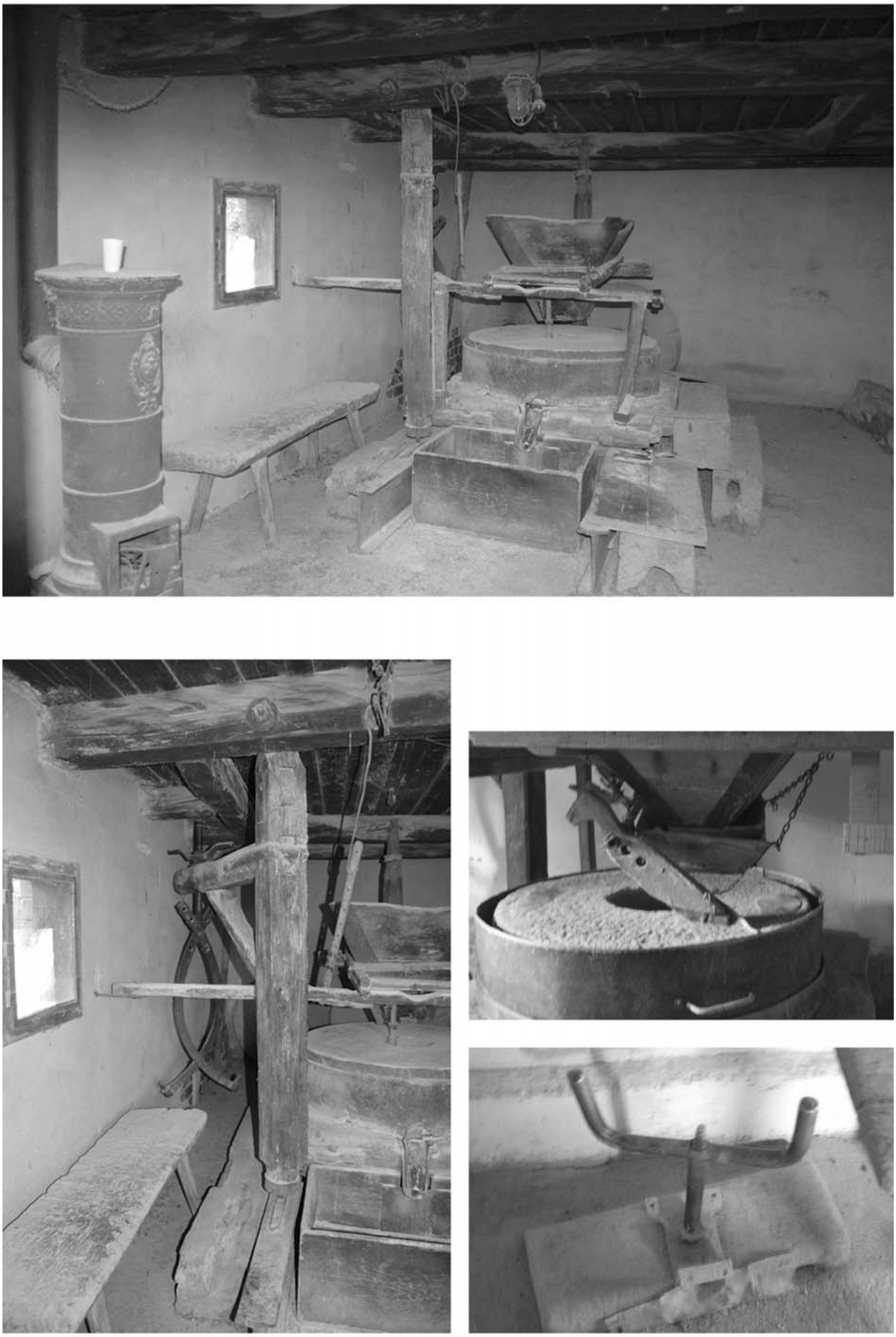


Fig. 132. Răcăşdia. ***Village Mill***

Fig. 133. Răcăşdia. *Mill from Vârtop*

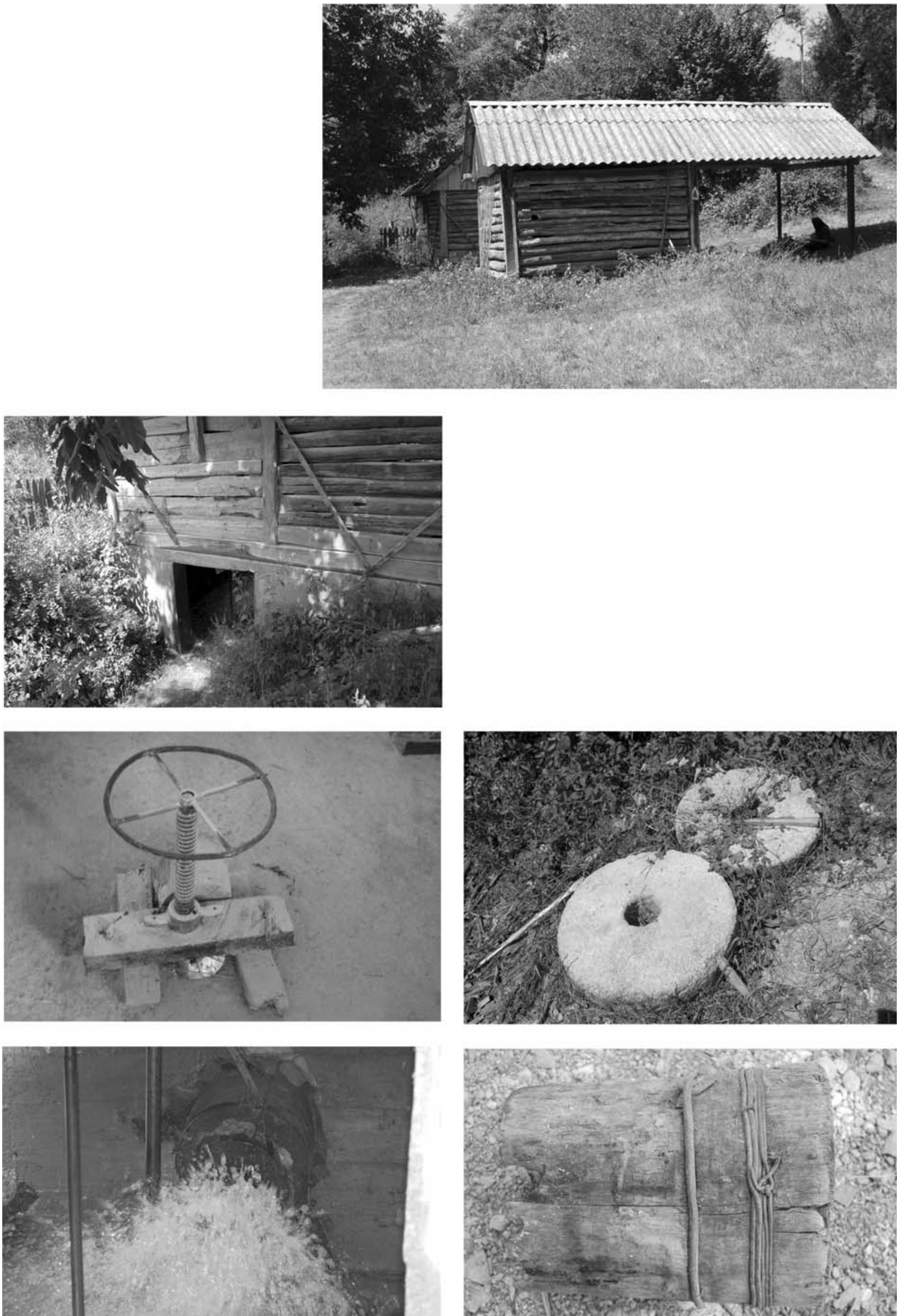


Fig. 134. Sichievița. ***Mill from Botul Cracului***

Fig. 135. Sichievița. ***Mill from Apiary***

Fig. 136. Sichievița. ***Raia Mill***

Fig. 137. Socolari. ***Mill from Sultana***

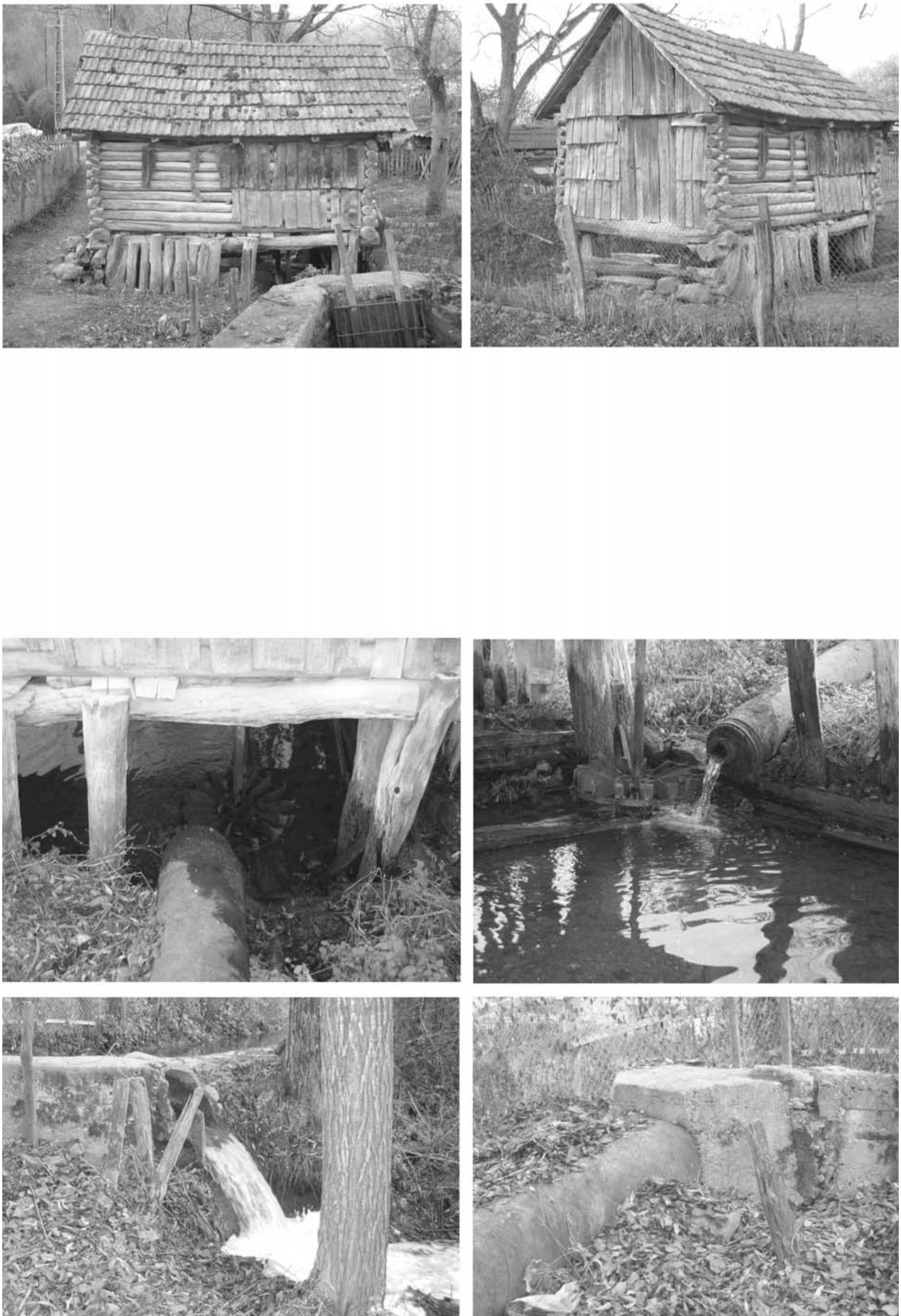


Fig. 138. Şopotu Nou. ***The Lower Mill***






Fig. 139. Şopotu Vechi. ***Stone Mill***

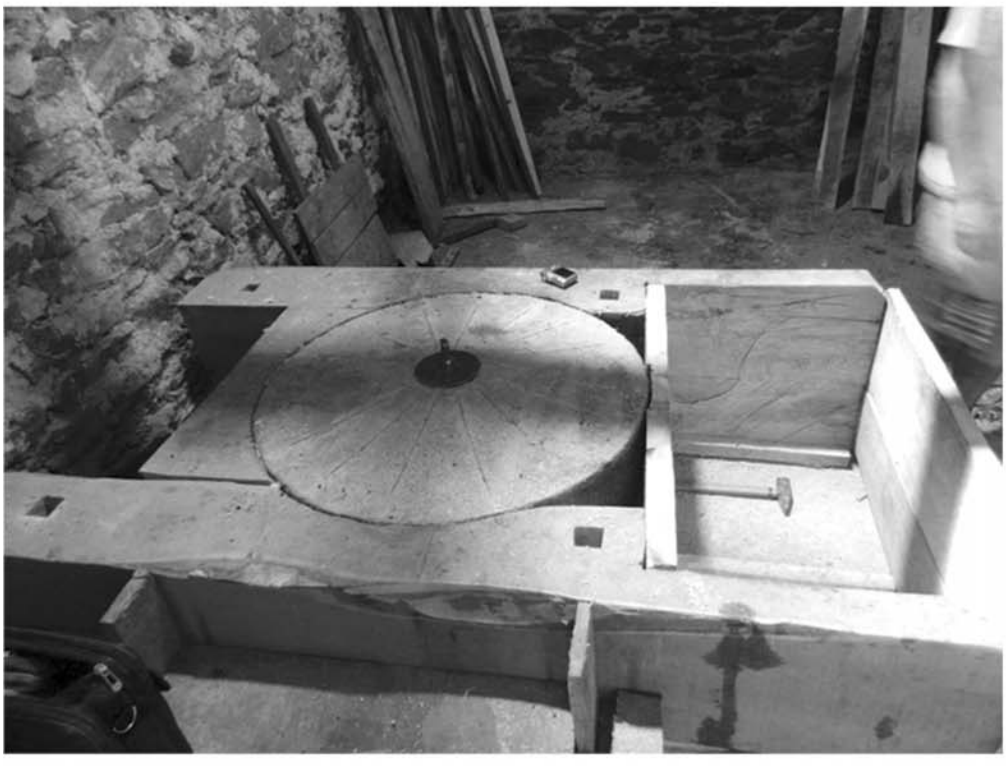


Fig. 140. Şopotu Vechi. ***Ghereta Mill***

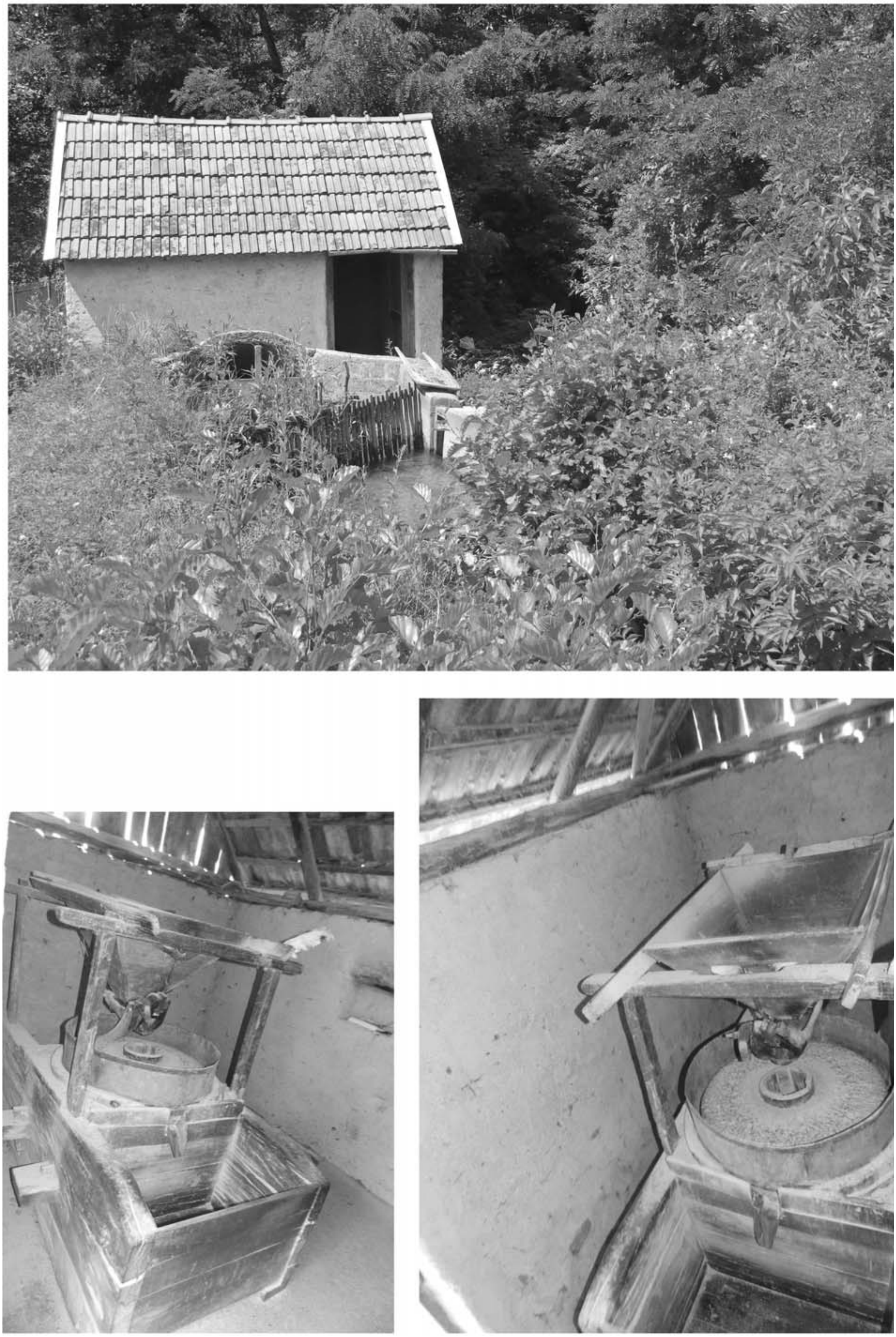


Fig. 141. Şopotu Vechi. ***The Small Mill***

Fig. 142. Şopotu Vechi. ***Gipsy Mill***

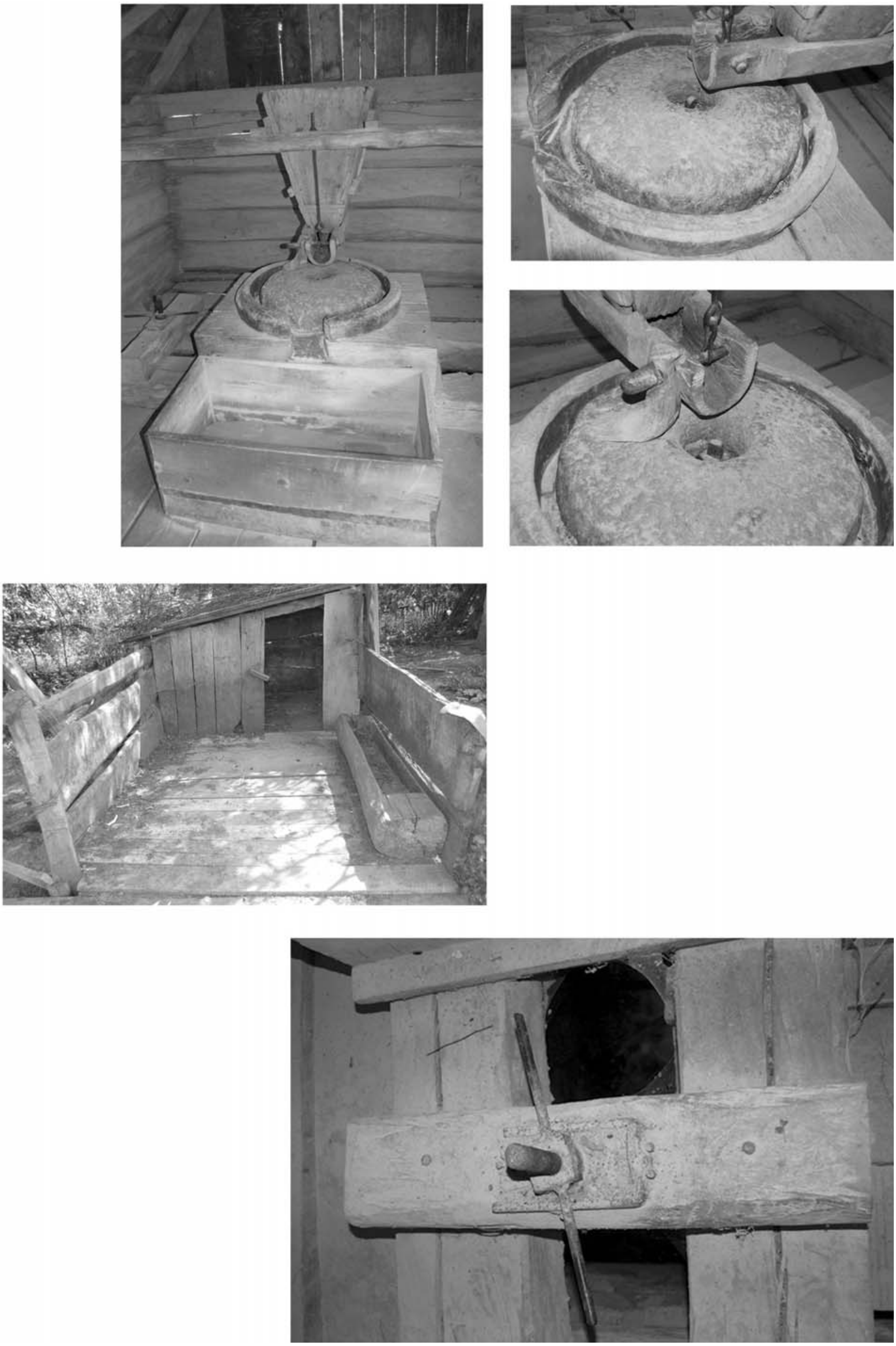
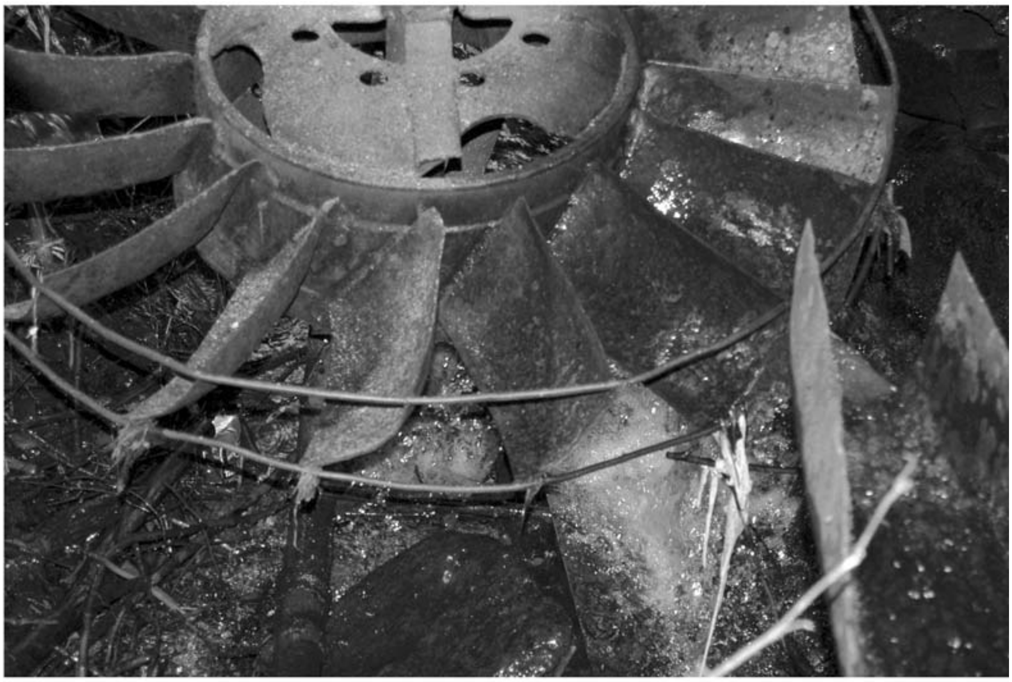


Fig. 143. Topla. *Drimească Mill*



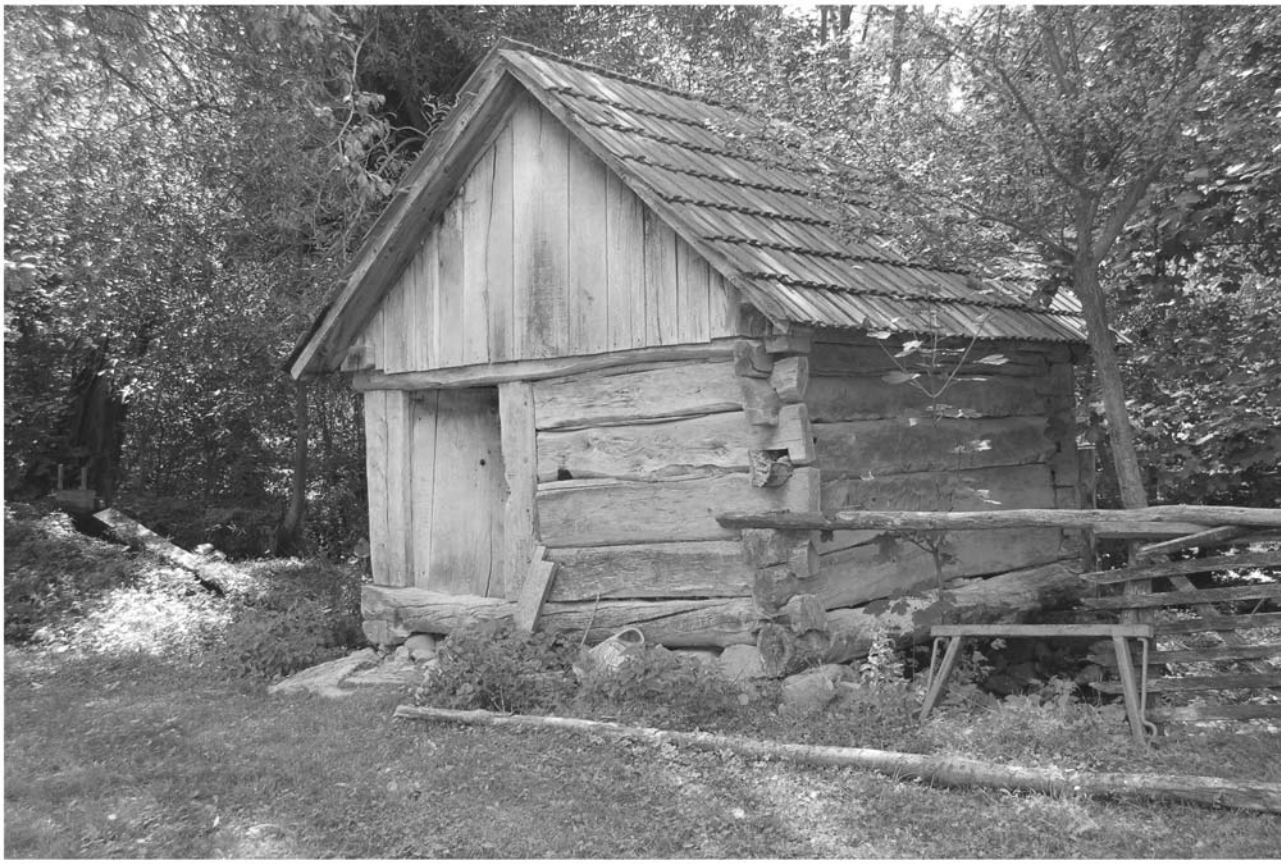


Fig. 144. Topla. ***Adămeşti's Mill***

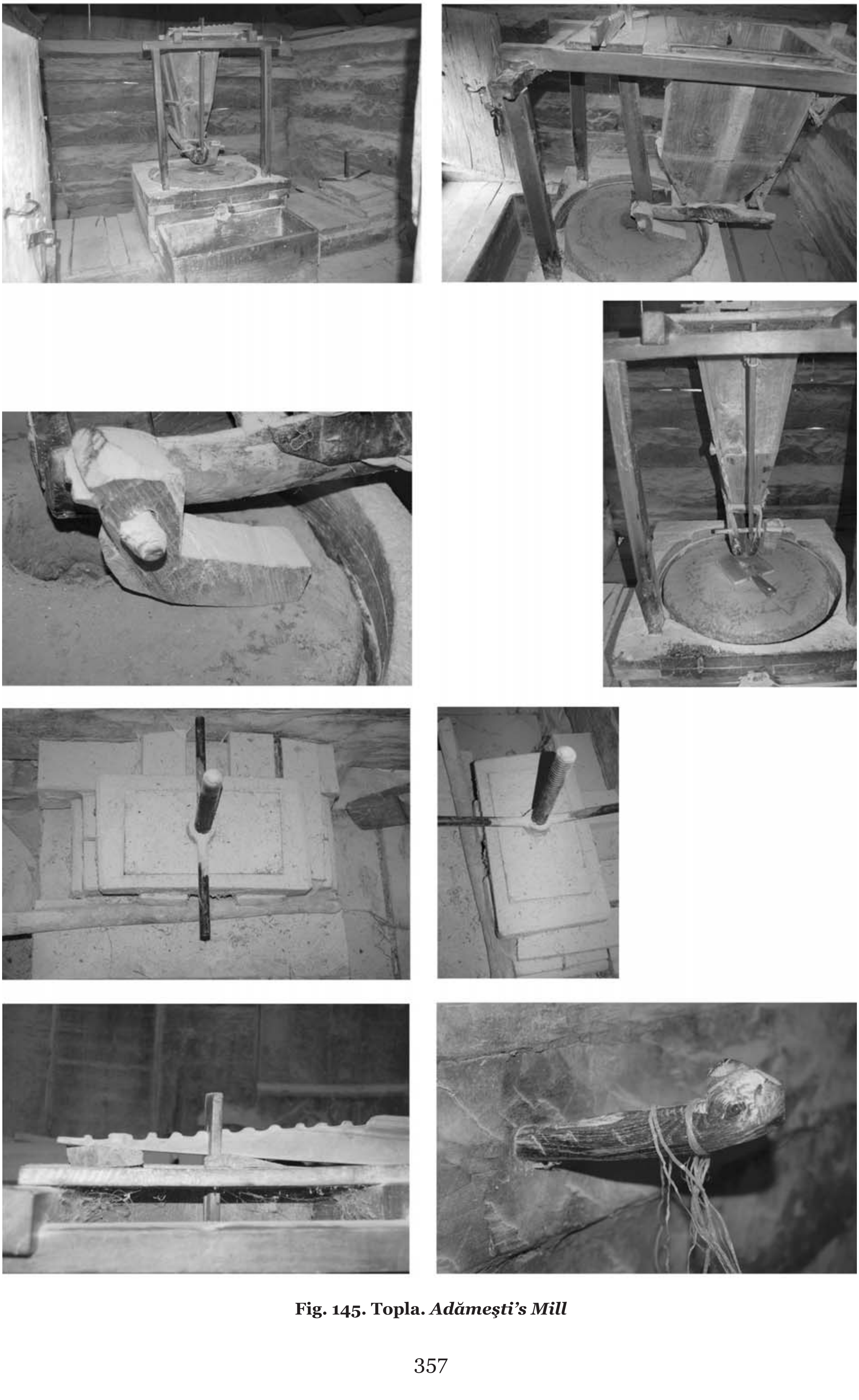


Fig. 145. Topla. ***Adămeşti's Mill***






Fig. 146. Topla. *Boască's Mill*

Fig. 147. Topla. ***Vâlculeşti's Mill***

Fig. 148. Topla. ***Vâlculeşti's Mill***

Fig. 149. Topla. *Vâlculeşti's Mill*

Fig. 150. Topleț. *Cunicel's Mill*

Fig. 151. Topleţ. *Şăndreşti's Mill*





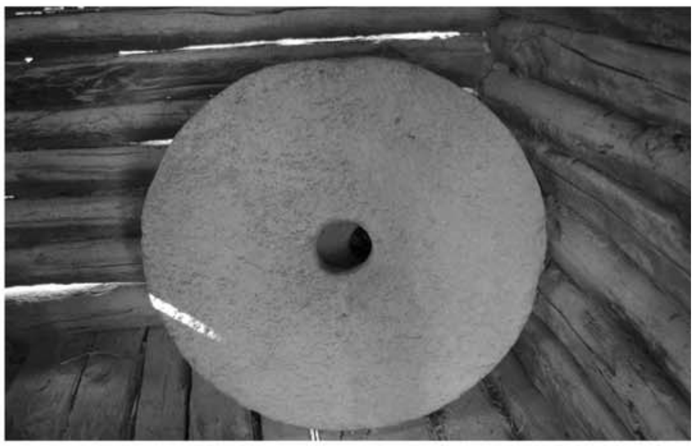


Fig. 152. Topleţ. *Şăndreşti's Mill*

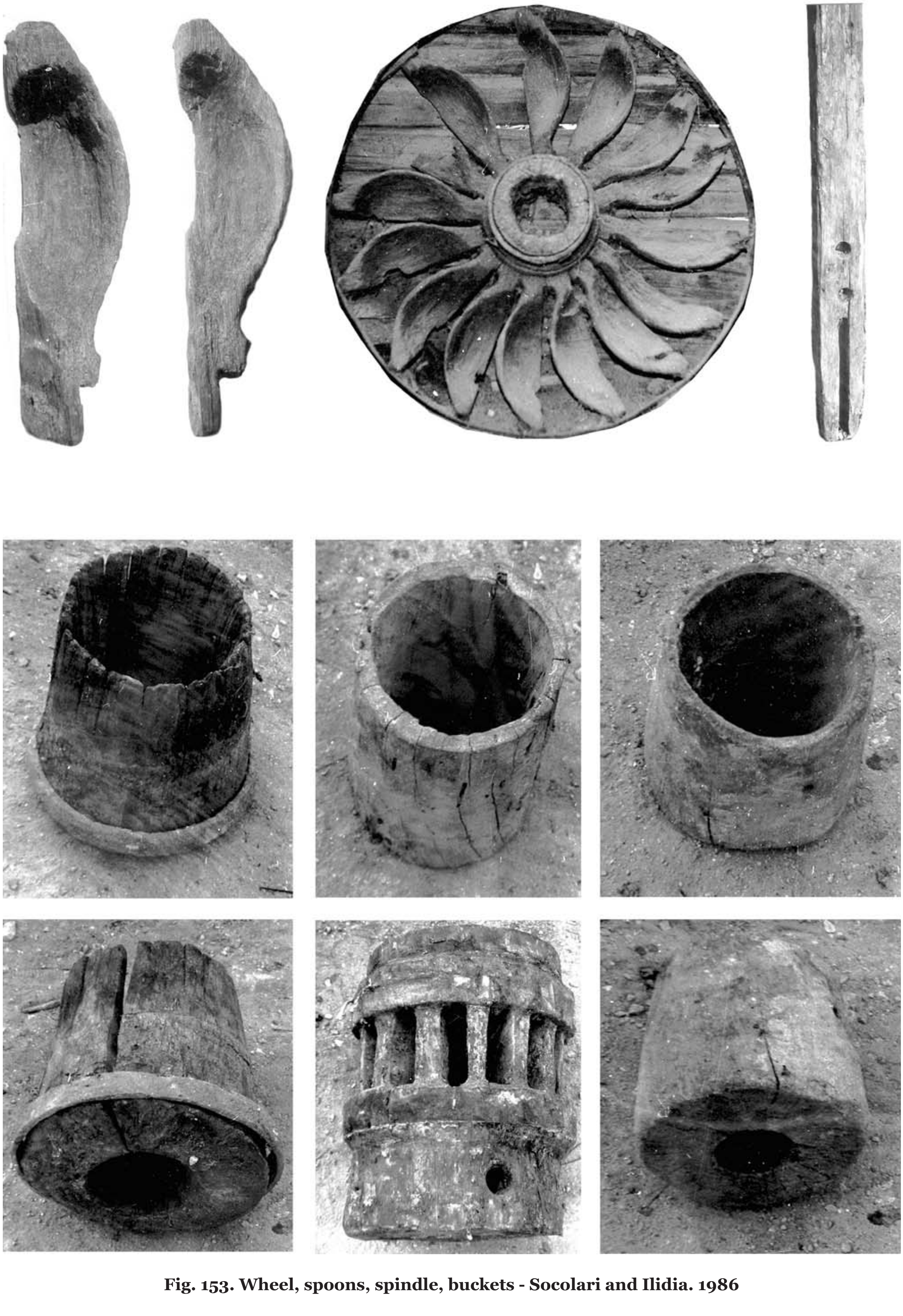


Fig. 153. Wheel, spoons, spindle, buckets - Socolari and Ilidia. 1986

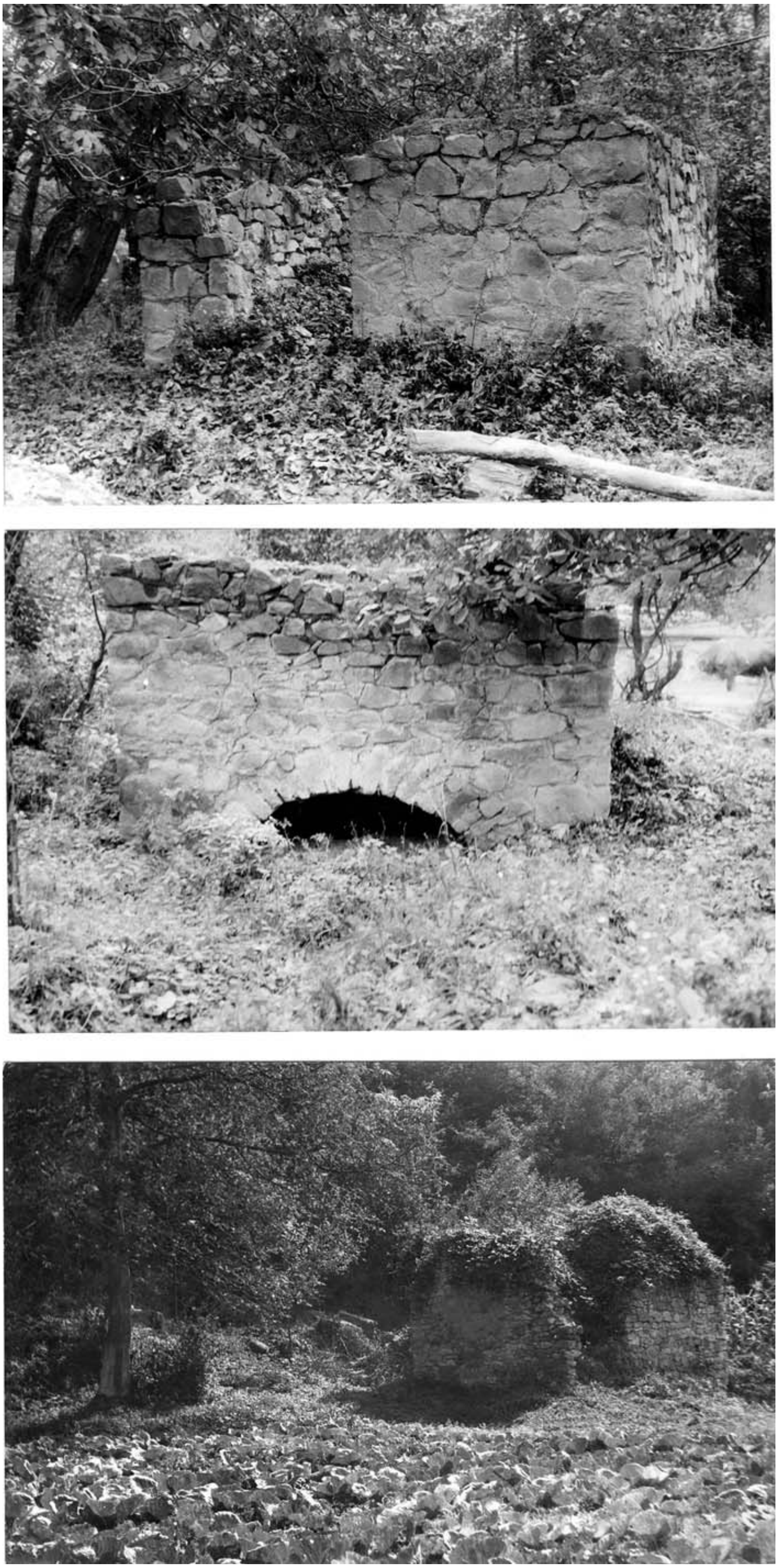
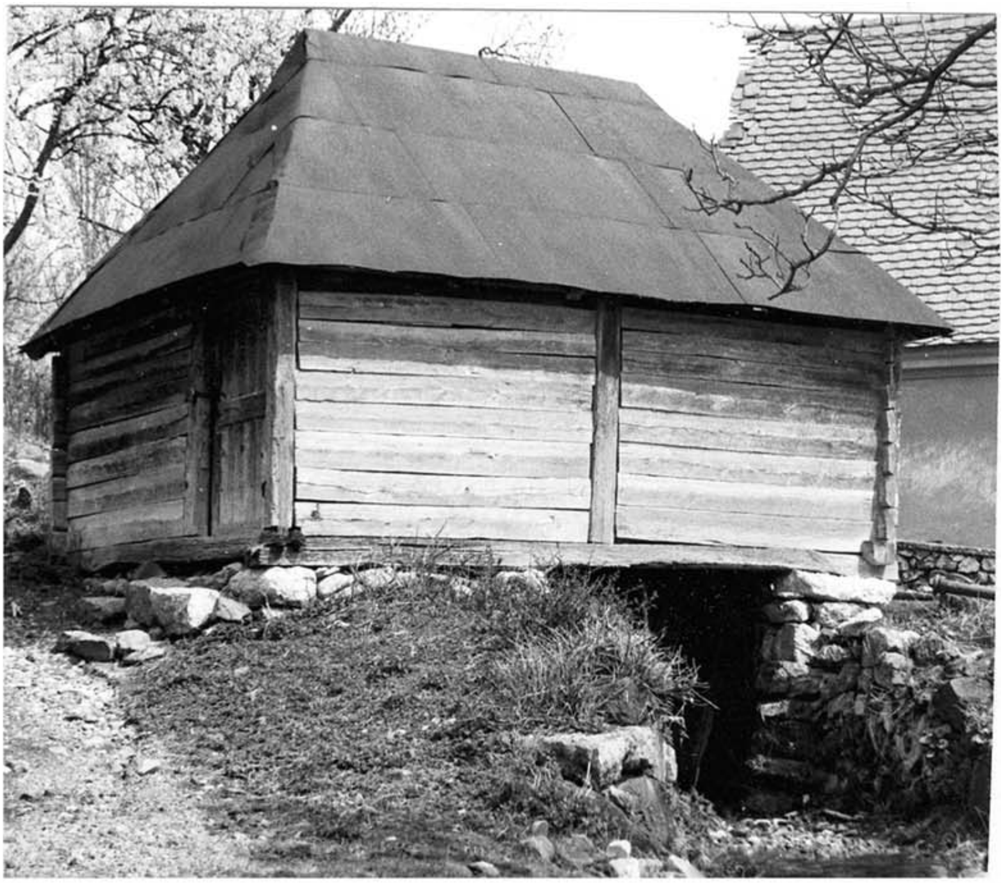


Fig. 154. Ilidia. *Vesoni's Mill*. Ruin in 1985



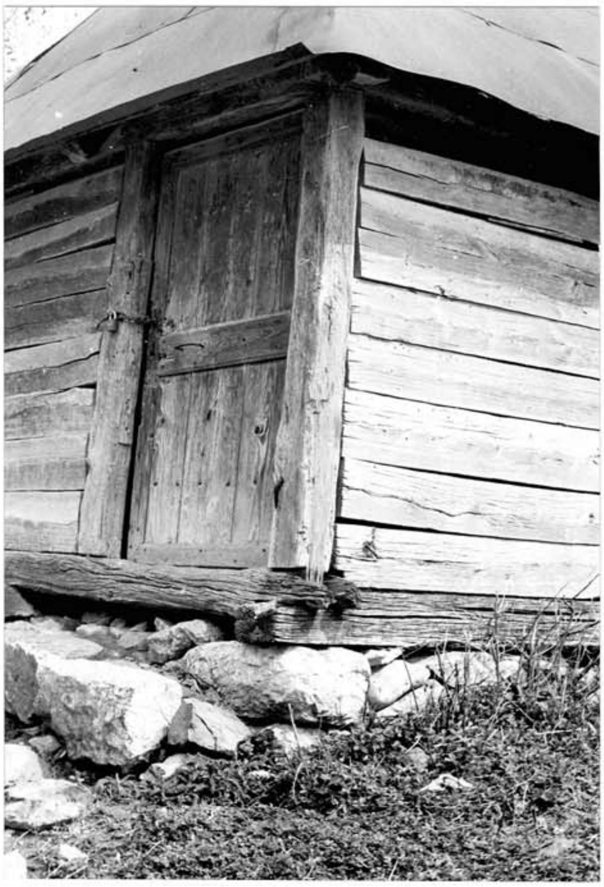


Fig. 155. Ilidia. *Mill from Muican* in 1990

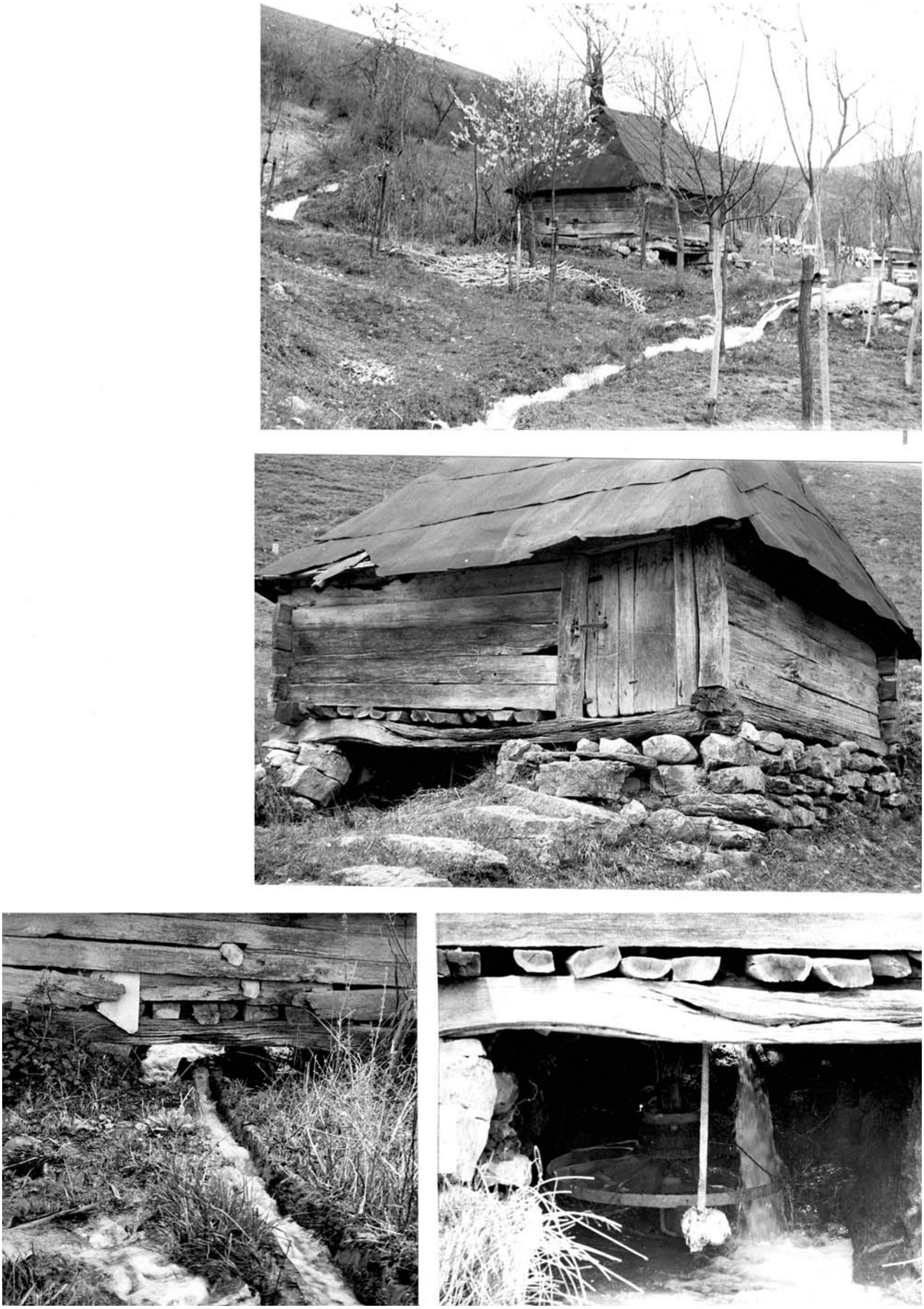


Fig. 156. Ilidia. ***The two mills***

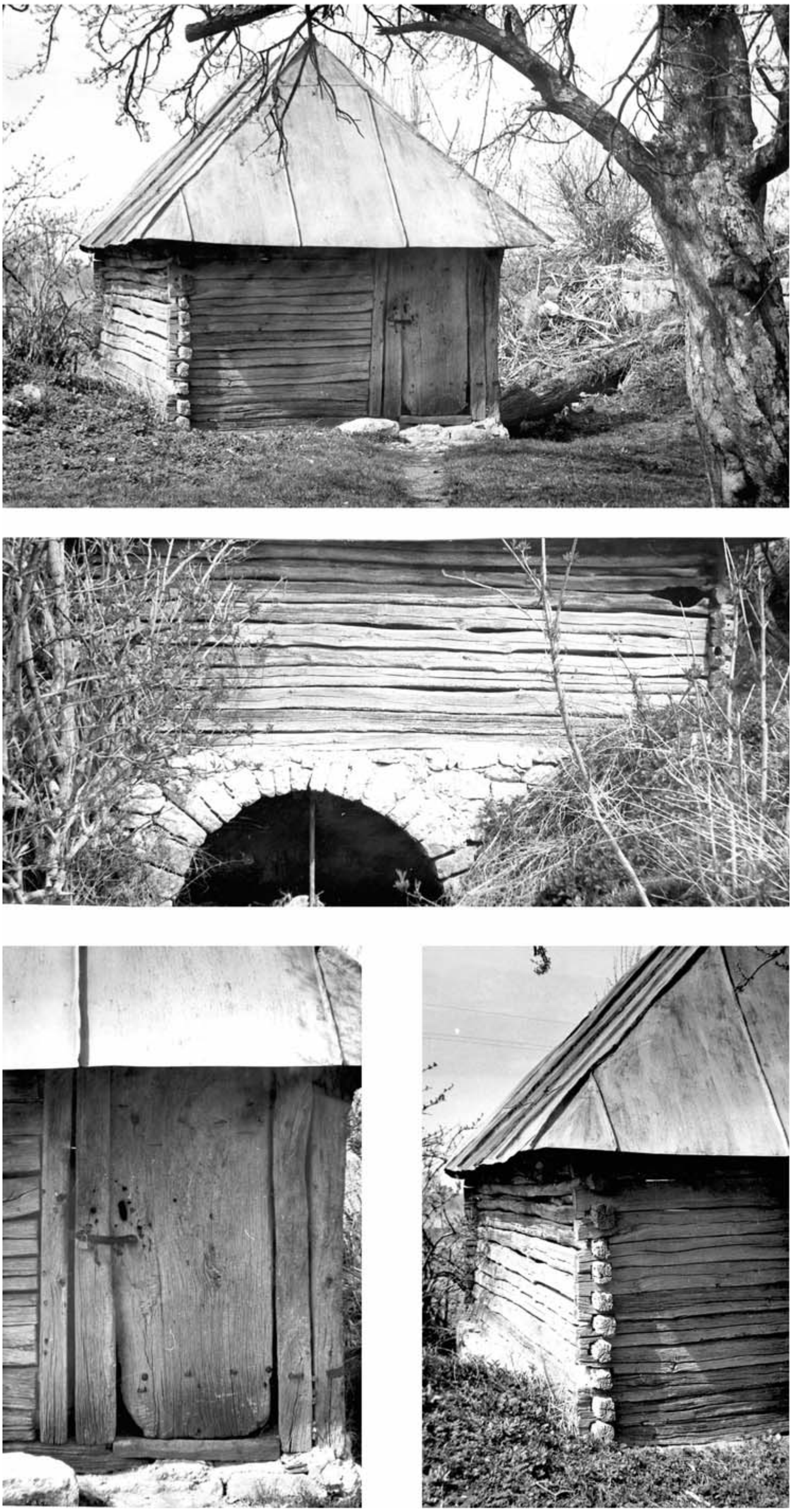


Fig. 157. Ilidia. ***Mill from Pit***

Fig. 158. Moceriş. ***Mill***

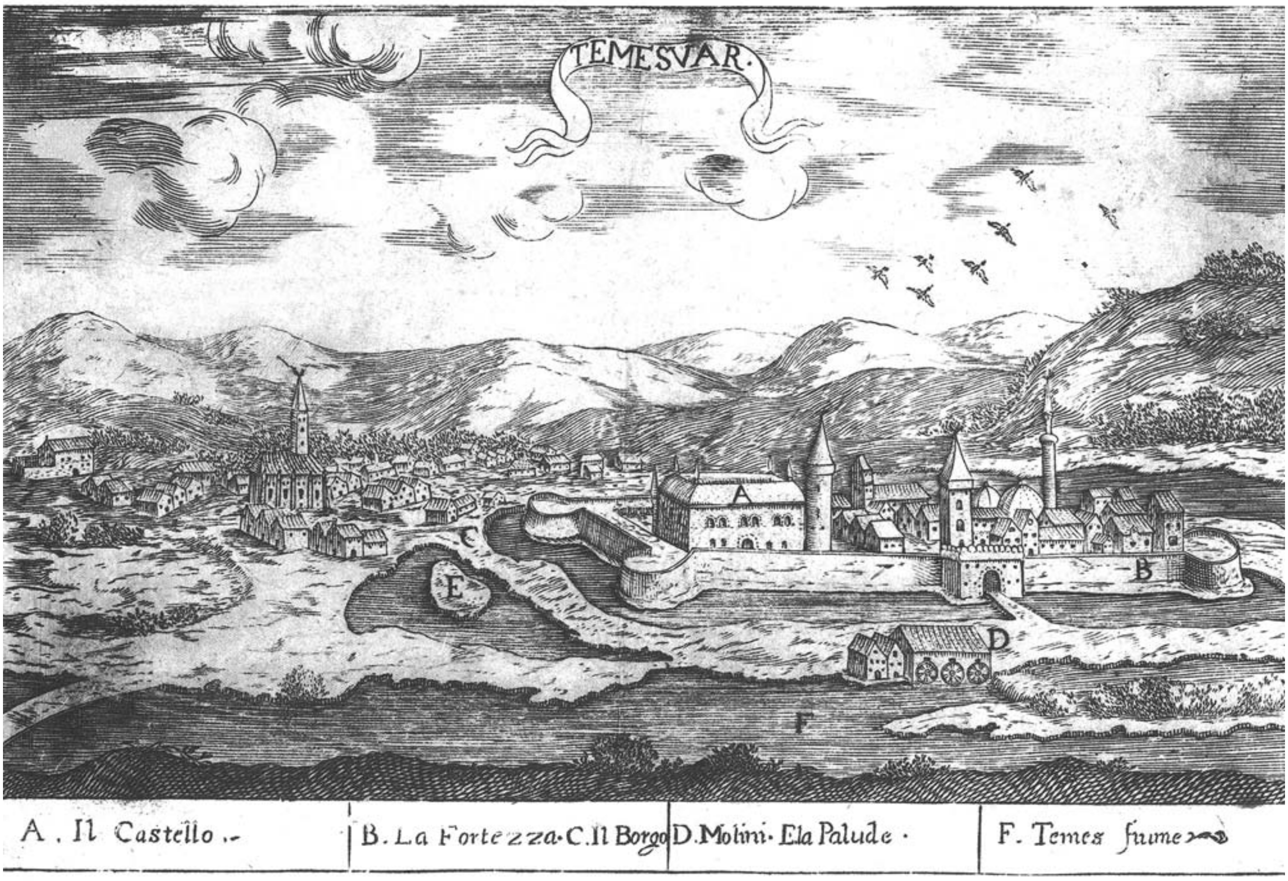


Fig. 159. Timişoara. Engraving of the 17th century. City mills location

8.

WATERMILL HISTORY IN THE BANAT. THE MIDDLE AGES AND THE MODERN ERA

1. HIGHLIGHTS OF A EUROPEAN HISTORY

Historiography of watermill is marked by long-term concerns in which were involved historians, ethnologists, archaeologists and linguists. There were sought for answers to questions on the origin of this technology, genesis moment and on its diffusion in European space from antiquity to the Middle Ages. Approaches were built on various historical information, ancient writers' testimonies, Codex of laws, and diplomatic sources; the iconographical and archaeological sources from a recent period nuanced the knowledge horizon[190].

Watermill can be found placed among remarkable technical victories of medieval times and it is registered by Jacques Le Goff among the defining elements of medieval machineries[191]. The same historian indicates that diffusion of watermill gave it the banner of victory. He reiterated thus an earlier Marc Bloch's finding published in a study in the journal *Annales*[192]. Invention of Antiquity, watermill belongs to the Middle Ages, according to that historian from *Annales*, only for its diffusion in European space[193].

The watermill itinerary starts in the third century BC from the Greek world of Hellenistic Orient, reaching by the first century BC in the Roman Italy. Origin of mill with horizontal wheel must be searched, in the historian M.J.T. Levis' opinion, in Greek world of Byzantium colony, in the first half of the third century BC, and of mill with vertical wheel in Alexandria in the same time of the 3rd century BC[194]. Gradually adopted in the Roman world, mill with vertical wheel improved the intake system and transmission, as Roman sources from the 1st century BC confirm. Archeological documents from the 2nd - 3rd centuries of the Roman Empire reveal the technical accumulations regarding watermill, as well as its dissemination in the Roman world. Since antiquity two classes of watermills developed up to the axle and wheel position: mill with horizontal wheel and vertical axle, often called Greek mill, and mill with vertical wheel and horizontal axle called Roman mill. They coexisted throughout antiquity and spread in the same time in European space in the age of migrations and in the early Middle Ages, as the archeological documentation gathered on this subject suggests[195].

Watermill experienced a slow diffusion from the late antiquity until around year One Thousand in a Europe upset by migrations, with subsistence agriculture, totally dependent on climate changes, with rudimentary technical equipment[196]. Documentary attestations for the 5th and 6th centuries are rare and usually come from legal documents that began to regulate the mill condition. Otherwise even for age subsequent to the 8th – 9th centuries sources do not abound in information. There were invoked moments from years 732, 770-775, that cores watermill entering the area of southern Germany, or year 838 for the British space[197].

[190] Bloch, 1959, p. 85-87 with the diverse bibliography on the item.

[191] Le Goff, 1970, p. 303.

[192] Bloch, 1935, p. 538-563.

[193] Bloch, 1959, p. 59.

[194] Wilson, 2001, p. 234 nota 18.

[195] *Ibidem*, p. 235.

[196] Duby, 1973, p. 14-15, 23; Šebesto, 1977, p. 101.

[197] Bloch, 1959, p. 50-51.

Knowledge horizon of watermill structure, but also of its diffusion within the 8th – 10th centuries in Western Europe experienced a deep opening thanks to the medieval archeology. It is an obvious crystallization of a direction of research of medieval mill in medieval archeology soon after 1950. Researches on mill with horizontal wheel from Ireland occurred in this period gave an impulse in this direction[198]. A mill with vertical wheel from the 6th century was identified at Kiloteran, in Iceland; another one dated around the year 630 was investigated at Little Island. Mill with horizontal wheel from Cloontycarthy was built around 833[199]. Extremely spectacular proved to be the medieval archaeological researches through the monastic center from Nendrum, where structures of a horizontal-wheeled mill from 787 were identified, with preserved wooden pieces from the hydrotechnical installation[200].

Watermill spread rate increased rapidly after the year one thousand as a result of technical progress in agriculture and the medieval economy. Iron metallurgy saw significant accumulation after the middle of the 12th century, which undoubtedly was reflected also on the mills construction. The necessary metal parts for the mill operation, in stone and wood processing represented an important investment for that period of the Second millennium beginning[201]. Mutation suffered by the medieval harness and horse traction system had repercussions on the medieval economy from feudal estates of Western continent too. Massive use of the horse, commonly found after the middle of the 13th century in agricultural works, the change of horse traction system had tracks on agriculture that time[202]. Statistics of mills in different European regions reflects this boom of medieval economy. In Picardia 49 mills were registered from the middle of the 9th century until 1080; half a century later, in 1125, another 40 mills are functional so that in 1165 a number of 245 mills[203] are quantified. There can be invoke from French space the mills evolution on a tributary of the Seine, near Rouen, where two mills were operating in the 10th century, four mills in the 11th century and ten mills in the 13th century[204]. The best known and the most cited statistics of period is *Domesday Book*, an impressive cadastral work started in 1086 in England of William the Conqueror, which scored a number of 5624 mills at that time. England had at the time cited above an average of one mill at 50 homes, but there were counties where one mill was serving 26 families and other counties where one mill served 96 families[205]. It was estimated that the mills number in England, in 1300, reached a figure of 10-15000.

Two issues cannot be omitted from the watermills history in Central and Western European space: mill monopoly in medieval economy and the role of abbeys in the 11th -13th c. in diffusion of that technology to the eastern border of medieval Christian world. The mill was a source of income in the feudal society, because it is found among the monopolies established in the Western rural world after the 10th century[206].

Dimension of mill monopoly was not the same everywhere in the Western medieval world. Professor Gautier Dalché's researches on watermill in the medieval economy of northern Spain in the 9th – 12th centuries revealed the existence of a different reality in this regard[207].

Diffusion of watermill, both within the Western European space and the Christian world Eastern border, was always associated with the Catholic monasteries presence.

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[198] Rynne, 1989, p. 21-23.

[199] http: //en.wichipendia.org/wiki/wattermil 30.10.2010.

[200] http: //www.nendrum.utvinternet.com/tmill/ index.htm

[201] Duby, 1973, p. 212.

[202] Noets, 1930, p. 183; Duby, 1973, p. 218-219; Haudricourt, 1986, p. 155.

[203] Duby, 1973, p. 212.

[204] Gimpel, 1983, p. 15.

[205] *Ibidem*, p. 16.

[206] Bloch, 1959, p. 73; Duby, 1962, II, p. 72.

[207] Gautier Dalché,1982, p. 342-349.

Benedictine monks, but especially Cistercians, were those who spread throughout the continent the inventions of medieval "industrial revolution"[208]. Historical discourse on work, on the technical accumulation and promotion by the monks in the medieval world highlighted the crucial role of the abbey in this regard[209]. Normal physical work in a society divided into three orders, those who pray, those who fight and those who work, although governed by rules of orders for monks, it was found only within their collateral obligations[210]. Construction of a mill by the monks was initially a curiosity, a show; gradually during the 12th - 13th centuries it became a compulsory arrangement, natural in each abbey's landscape.

2. WATERMILL HISTORY IN THE BANAT

The Banat watermill is recorded in chancery documents of the 13th century. An isolated piece of news from a hagiographic source long invoked for the Banat history at the beginning of the 11th century, *St. Gerard of Cenad's Life*, mentions a slave who grinded grain with a grinder because there were no mills in Cenad region that time[211]. Information is complex and nuanced because it records, on one hand, the rarity of mills at the time, use of hand grinder and of that one pulled by horses[212]. The first news recorded mills from the powerful noble family of Cenad domains, with the occasion of land sharing in 1256. Partition document from December 17, 1256 recorded "Ciavos village with two mill places and a half for customs; then half of the village *Kalanthelwk*, near the Bârzava, with a mill wheel."[213]. The two mills on the Timiş River, the one from Ciavoş and the other one on the Bârzava, from the village *Kalanteluc*, are recorded in King Ladislau's privilege from 1285, which confirmed a new domains division between the Cenad family nobles[214]. Mill from the Bârzava River, at *Mezensumlow* is found recorded in a document from 1270[215]. On the middle course of the Bârzava, in Gătaia Plain a centre of power of the Arpadian kingdom arose, in the 12th century, namely the Caraş County core, which may be identified within the current boundary of Şemlacu Mare settlement. The invoked before Act of 1270 included a royal mill on the Bârzava in the topography of the area, exploited by monks from *Mezensumlow*[216].

With the 14th century watermill incidence within everyday life becomes more frequent in the Banat. But the watermill itineraries analysis is related to the preserved archival documents. Therefore information favors certain areas of the province, the Bârzava and the Caraş valleys, for instance, where nobles from powerful Himfy family had large estates, a family who played a major role in the political life of the province and the Kingdom of Hungary in 14th century. Himfy family documents, which had the chance to be preserved in archives, reflect, from a certain perspective, also the economic life of the Banat at the turn of 14th and 15th centuries. The mill from Ciavoş, on the Timiş, is stated in the act of partition of Cenad nobles'estates in the counties of Timiş and Cenad. Documents of June 11, 1337 state that "an estate called Ciavoş, in the county of Timiş, with all its benefits and employments, meaning mills and clearing customs was divided it into two parts"[217].

Information from the acts of donation in the second half of the 14th century set mills on the Timişul Mic from Recaş and Chizătău, within the province historical geography. Act

[208] Šebesta, 1977, p. 103; Gimpel, 1983, p. 10.
[209] Gaudillac, 1968, p. 43-45.
[210] Le Goff, 1986, p.1, p. 185-186, 197.
[211] Suciu, Constantinescu, 1980, p. 50.
[212] *Ibidem*, p. 50 she works „with skill and pains, without any horse to tug at, but spinning it only with her hand"..
[213] DIR, C, XIII, II, 1251-1300, p. 21.
[214] DIR, C, XIII, II, 1251-1300, p. 275.
[215] Kaunz, I, 1870, p. 583.
[216] Kaunz, I, 1870, p. 583.
[217] DIR, C, XIV, III, 1331-1340, p. 416.

of donation of King Ludovic I from 29 August 1359 through which he rewards for faithful services the apostate landowners from Wallachia, "our faithful Romanians Karapeh, Stanislau, Neagu, Wlanijk, Nicolae and Ladislau, sons of Ladislau ... gave them as our new gift, an estate called Recaş, located near the river named the Timişul Mic ...., and the mills and customs related to that estate Recaş, and, also, Chisătău estate, with villages called *Estephanfolna* and *Tynkfalu,* also with mills and customs related to estate called Chizătău"[218]. The two estates along with accessories were confiscated for acts of treason and given with the title of *nova donatio* to fugitive nobles, frequent acts during the reign of Ludovic I. An act of July 30, 1364 records the existence of a watermill on the Nera River, in the Almaj Depression. The Nera River was included in medieval document as *Narad*, a name close to the Nergăni and the Nergana used by Romanian population from the area[219]. The certified mill in the act of 1364 had been on the estate Cuieşti (Kuesd), that belonged to the noble Petru Himfy , and was destroyed by the serfs from village Halmaş, which was the Archbishop of Kalocea's possession[220]. The disappeared village *Halmas* and estate Kuesd (*possessio Kuesd*) were identified in the south-eastern extremity of Bozovici Depression, in Şopotu Nou village borderland[221]. Watermills from the middle course of the Bârzava, where a great feudal estate of Himfy noble family was set up, begin to be documented from the second half of the 14th century. Şoşdea, which was on the boundary with Himfy nobles'estate from Remetea, had several mills on water of the Bârzava. Pledge Act of August 25, 1369 enshrined an agreement between Ioan, son of Hench from Şoşdea, and Petru, son of Egidiu from Şoşdea. Parts of Ioan's, son of Hench, possession at mills on the Bârzava River were pledged for forty florins[222]. We have data from the same time about a mill concession and its value in a more complicated process of selling a property by Petru Himfy. Noble Himfy obtained, under conditions not very transparent, the estate Ciornovăţ from Nicolae of Oslow *Halimba* for which it undertook to pay, after obtaining the royal donation, the sum of one hundred florins and the right to use one of its mills on the Bârzava. Act of September 14, 1364, who scored the terms of this agreement, stipulated that the right to use the mill with a wheel on the Bârzava River was assigned for a period of seven years[223]. Withdrawal of right to use before the proper term would oblige the noble Petru Himfy to pay a compensation of ten marks. Documents with title of new donation from time of Ludovic registered within the province geography the mills placed in the north-eastern space of the Banat, from springs of the Bega River, where the family of Karapciu boyards got the Icuş estate. Act of September 22, 1365 included the royal donation of Icuş domain with villages *Padushauasa*, Margina, *Wechepataka*, *Eudredhpataka* "with lands, estates, mountains, hills, forests and others of them which bring benefits" for Carapciu and his brothers, who were so rewarded for faith services[224].

The existence of mills on the Timiş, in Caran district, in the 14th century, is known only if they were subject of a conflict recorded in documents. Guests established in urban core of Caran, located on the border of present settlement of Căvăran, came often in violent conflict with the Mâtnic nobles, whose domain they frequently violated. Act of June 19, 1376 recorded the Mâtnic nobles' agreement, on one hand, and citizens and guests from Caran, on the other one, regarding mills ponds from the Timiş[225].

Documents from archives of family Himfy give a more nuanced image of histori-

[218] DRH, C, XI, 1981, p. 408.
[219] Ioniţă, 1982, p. 206.
[220] DRH, C, XII, 1985, p. 310.
[221] Györffy, 1987, III, p. 477; Ţeicu, 1998, p. 291.
[222] DRH, C, XIII, p. 630.
[223] DRH, C, XII, p. 333.
[224] DRH, C, XII, p. 446.
[225] Pesty, *Szöreny*, III, 1878, p. 6-8.

cal geography of the Bârzava River during the second half of the 14th century and the next one, in which we find useful information on the use of a large feudal domain, on its economy, in which mill is always found between income generating sources. Himfy family domain is delimited on the northern shore by the Bârzava, from current boundary of Bocşa city and up to the west of Şoşdea. It also held a part of the Pogăniş valley from Ersig to Izgar.

Residential nuclei of the domain were found at Remetea, today's Berzovia, on the Bârzava Valley, and Ersig, on the Pogăniş Valley[226]. Mills from the Bârzava Valley and those from the Pogăniş Valley were always subject of conflict with neighboring domains from Gherteniş, or the castellans of royal fortress from Cuieşti and, equally, were the subject of property litigation in the Himfy family bosom. A written document, probably of around 1372 registered the amount of 5 florins received as revenues brought by mills from the Remetea estate and half of florins from other mills[227].

We know the boundaries and topography of the Remetea Ersig domain from the partition documents from 1369, 1377 and the one from 1389. The latter two documents had written also the situation of mills from Himfy family domain, with their arrangement on the Bârzava and the Pogăniş. The document through which ban Himfy Benedict, his brother Nicolae and their brother nephew, Petru, decided to divide the domain from the Bârzava and the Pogăniş, was dated by editors sometime in the period 1369-1377[228]. Watermills were the subject of priority partition, what suggests the importance afforded to them in the domain economy: "Item primo et principaliter fecimus sortes super molendina nostra" scored in the Himfy nobles' decision[229]. There were recorded in 1377 a number of four mills on the Bârzava and other three on the Pogăniş. Mill from village Golonia returned to ban Benedict Himfy, the one from village Lybur and the one near his court were assigned by destiny to noble Ştefan, and mills from *villa Nicolai filii Prebyl* and from *villa Moyan* returned to noble Nicolae Himfy[230]. Desolated village Golonia is located on the banks of the Bârzava, near Ramna, where the place name Goloanea and the archaeological material allow identification of the settlement. On the same toponymic essence disappeared village Lybur may be identified in the border of Berzovia, at a place called Ibor, on the the Bârzava bank[231]. Mills on the Pogăniş River returned to ban Benedict, the ones from village Dobrotă and village Luca, and one, the one from village of Mihail, remained in common use[232]. A complaint of the knezes from Remetea domain, written to wife of Benedict Himfy, where we find *Nicolaus quenessius filius Pribill,* mentions a mill of knez Ioan[233]. Act is dated by the editor in 1380. Document of 12 August 1389 agreed a new rearrangement of properties of domain Remetea Ersig following the death of Nicolae Himfy, between Margareta, his daughter and Basilius, the son of the same Nicolae, and Ştefan of Remetea[234]. The village Ersig had at the partition time three mills, a desolated courtyard and twenty households with serfs[235]. The village Moyan, from the Bârzava valley, is recorded now too, in 1389, with mill, as well as village Pribil, with a mill on the Bârzava River[236].

The same family of large landowners had domains in the second half of the 14th century, in the low Caraş plain. Valley estate "locum sessionalem Potok, qui alia nomine Woya nominaretum" was a knezes dominion

[226] Ţeicu, 1998, p. 325, 367-368.
[227] Dani, Feneşan, 1975, p. 149-150.
[228] Doc. Val., p. 221-223.
[229] Doc. Val., p. 221.

[230] Doc. Val., p. 221; DRH, C, XIII, p. 571.
[231] Ţeicu, 1998, p. 332,339.
[232] Doc. Val., p. 223.
[233] Doc. Val., p. 287.
[234] Pesty, *Krassó*, III, p. 185-191.
[235] Pesty, *Krassó*, III, p. 188; 190 *item tria molendina in predicto fluvio Paganch deccurencia nobili puelle prenotate commissisent*.
[236] Pesty, *Krassó*, III, p. 147; *Ibidem,* p. 190.

that by depriving reached in 1363 under the rule of nobles Himfy. Implementing the Act of March 22, 1363 registered in the borders of Valley estate a church, part of wall, part of wood, forests, pastures, meadows and a mill on the Caraş. It belonged to class of mills with vertical wheel, "unum molendinum inferius pellens"[237]. Millpond from village Woia was destroyed in the conflicts which involved the neighboring areas of Jaank noble family and Himfy from the Caraş Valley. A complaint of March 6, 1383 had as subject just such an action of turning the Caraş river course[238] "clausuram cuisdam molendini sui in fluvio Crassow decurrentis permattari destrui et anichilari fecisset". Existence of other mills on the Caraş River, in the 14th century, is confirmed in acts from 1388 and 1389[239]. Villages *Lawreuch* and *Teers* from Caraş County had two mills on water of the Caraş. An act of May 10, 1382 was issued in a case of conflicts between a servant of noble Ştefan Himfy and nobles of Jaank[240]. Nadraz estate, belonging to Jaank nobles, had a mill on the Caraş River. Intention to raise another building nearby, which would affect the mill from Nadraz, was blocked and caused the complaint made by Ştefan Himfy. Nadraz estate from the Caraş Valley was on the boundary with Woia estate, owned by Himfy nobles. It is located probably somewhere near Broşteni and Mercina, where some toponyms kept its memory[241]. Documents dating from the 14th century, with information on the watermill geography, recorded mills on the course of the Caraş, on estates Nadraz and Woia, on those of the Bârzava and the Pogăniş and mills on the Timiş River, near the mediaeval fair of Caran. An act of June 1, 1397 awarded Ladislau called Românul, son of Petru of Wazylowa, with the royal estate Pogăniş,[242] The Pogăniş River mills were included in the act of donation, among other utilities from the of the Pogăniş estate pertinences. Data from documents held in the 15th century do not change the image of the Banat watermill. Best preserved archives of the Himfy family provide consistent documentation about the economy of the Bârzava and the Pogăniş Valley in the 15th century, where the mill has a considerable weight. Conflicts between Himfy nobles of Remetea's large domain on the northern bank of the Bârzava and their neighbors on the southern shore, with domains at Gherteniş and Halimba, were caused by water management for the Bârzava mills. Himfy nobles of Remetea had raised, in 1408, a number of 24 mills on the Bârzava River; the fact says more about the purpose and mill weight in a large feudal domain economy. The concord, confirmed in written on March 20, 1406, regarding the Bârzava water sharing for mills, shows an earlier existence of a state of conflict between Himfy nobles and those from Gherteniş. Ştefan, son of Peter of Remetea, undertakes together with Iacob, Andrei and Nicolae of Gherteniş to manage water equitably for both sides of the Bârzava „flumen Borzava vocata sub certis obligacionibus... certis signis et districcionibus divisonem feciset... super predicta aqua positum"[243]. Violation of this agreement entailed a fine of 200 florins in the new currency. Preserved documents from 1407 and 1408 reveal a breach of this agreement. Ştefan of Remetea, in a complaint against the nobles from the neighbor domain of Gherteniş, shows that they had destroyed his ponds on the Bârzava and brought water on Gherteniş domain. The noble of Remetea had a loss of a thousand gold florins, because the 24 mills were left without water[244]. Documents from 1415 reflect the same state of conflict in joint management of the Bârzava River. The nobles of Gherteniş are accused that „fluvium Borza vocatum de teritoria dicte pos-

[237] Pesty, *Krassó*, III, p. 147.
[238] Pesty, *Krassó*, III, p. 160.
[239] Pesty, *Krassó*, III, p. 177, 194.
[240] Pesty, *Krassó*, III, p. 158-159.
[241] Ţeicu, 1998, p. 356.
[242] Pesty, *Szöreny*, III, p. 15.
[243] Pesty *Krassó*, III, p. 252.
[244] Ortvay, 1896, p. 395; 397.

sessiois Remethe... suo videlicet vero et antiquo excipiendo in alium novum meatum versus predictam possessionem Gertyanues transmitti procurasset"[245]. An act of June 16, 1418 confirms the same old misunderstandings between the two domains from Remetea and Gherteniş regarding mills on the Bârzava, whose course is directed to the Gherteniş domain[246]. Cleavages appeared within the Himfy family in mills administration and ruling on the Bârzava. An act of December 21, 1409 shows Ştefan of Remetea raising opposition regarding the parts of mill and revenues brought by mill from Golonia[247]. The same Ştefan of Remetea raises in 1421 objections regarding the intentions of some family members to build ponds on the Bârzava (Ortvay, p 566).

Document of 20 May 1424 scored a punctual deal in sharing water for mills between the nobles of Remetea and those of Halimba that bordered with their domain from Şoşdea[248]. The pond on a branch of the Bârzava was administered half for Halimba estate mills, and half near Şoşdea estate brought water for Şoşdea nobility mills. It was agreed that the parties announce fifteen days before of any water stops or changes of the pond[249]. Information about mills and mill sites in the second half of the 15th century is vague and appears in the context of confirmation of some estate ownerships from the Sebeş district. Implementing documents from 1465 mentioned mill sites and mills from Jupa and Tincova estates[250]. The same general information is found in documents from the 1480 and 1487[251]. Mill from Jebel estate, recorded in 1424, had three wheels and the intake system was on water current "suptus pelens"[252].

An act of 1478, published by Pesty Fr., presents a complaint of Romanian nobleman Kopaz from Vad against George, son of Găman Ladislau of Bizere, who destroyed him a mill on the Bistra. The latter one burned a mill on the Bistra "more Turcorum", as specifies the act, which brought him a loss of 60 gold florins[253].

The 16th century documents restrict the area of information within Caransebeş and Lugoj area, on one hand, and record, on the other, only mill places usually in the border of an estate. Acts of 1500 and 1505, confirming the estates from the Mehadia district and Comiat district, vaguely mention only mills and mill sites[254]. Bolvaşniţa and Henzerova estates from Caransebeş district were recorded in 1515 with mill sites[255]. Confirmation of some possessions in the Danube Clisura, at Tisoviţa in 1596, or in Bârzava district, at Bratova, Târnova, Ţerova, Văliug, where in 1597 mills and mill sites were mentioned[256]. Document of 18 March 1518 provides information on the topography of Caransebeş. Nicolae's and George Gârlişteanu's mill was a landmark in the delineation of some properties: "quatrum terras arabiles quarum tres ". sunt transfluvium Sebeş in directione molendini Egregiorum Nicolay necnon Georgÿ Gherlisthey"[257]. Another mill was in 1591 in Caransebeş "in content and at the end of the market ... in the street called the lower on the river and the flowing rivulet Sebeş". The spring of 1599 brought big flows on the Timiş River that destroyed or demolished ponds and the supply channel from the Timiş for the mills from the village Prisaca. Maintenance of ponds and the supply channel for the two mills from Prisaca was made jointly by the two nobles Iacob Gârleşteanu and Ştefan Nyakazo. Mills from Caransebeş and city topography are found in a document dated

245 Ortvay, 1896, p. 511.
246 *Ibidem*, p. 543-544.
247 Mályusz, II-2, p. 305.
248 Pesty *Krassó*, III, p. 303-304; Ţeicu, 1998, p. 336.
249 Pesty *Krassó*, III, p. 304.
250 Feneşan, *Documente*, 1978, p. 45.
251 Pesty, *Szöreny*, III, p. 88-89; idem, *Krassó*, III, p. 461.
252 Zichy. *Okm.*, VIII, p. 150-152.
253 Pesty, *Olách keűletek*, p. 82.
254 Pesty, *Szöreny*, III, p. 128; idem, *Krassó*, III, p. 481.
255 Pesty, *Szöreny*, III, p. 158.
256 Feneşan, *Documente,* 1978, p. 90.
257 Pesty, *Szöreny*, III, p. 160.

March 25, 1622. On the city supply channel [*ieruga*] were settled the city mill, the ban's mill and Maciova mill possessed in joint by Sigismund Fiat and other Găman family's members[258].

The medieval mill history in the Banat restoring is completed only by recourse to office documents, which restricts a lot the investigation field. Archaeological documentation from the settlements archeology does not provide even incidentally information in this regard. Statistics of medieval mills as recorded in documents spoke for the period of the 13th – 17th centuries, about 58 mills of which 15 mills in the 14th century, 29 mills in the 15th century and 6 mills in the 16th century[259]. Geography of medieval mill reveals an unequal dispersion of them on the province streams. We found in the 13th – 17th centuries mills that operated on course of the Timiş River, in the mountain area in Caransebeş, but also in the plain area at Ciavoş, in the 13th century, on its tributaries, the Sebeş, and on the Timişul Mic (Bârzava), the Pogăniş and the Caraş. The most numerous medieval mills are known on the Bârzava River in the 15th century. Preserving medieval archives hazard reflects directly the medieval mill statistics on one hand, and the return of its diffusion in the Banat, on the other. Establishing of some evolutionary comparisons with other European regions regarding the mills number, their reporting up to the number of households using a mill, cannot be conclusive because it operates with a fragmented and summary documentation, in which entire areas of the province remained outside of the light cone of medieval documents. Information gaps do not allow comments on mill with horizontal wheel, at its appearance, or of the direction from which the impulse came. We know this class of the Banat watermill only from ethnological sources. With an age comparable to that of mill with vertical wheel and archeologically attested during the Middle Ages for other areas of Western Europe, mill with horizontal wheel, often seen in modern and recent time, is still waiting for answers on its beginning in the Banat. Mills with hydraulic wheel and lower intake were recorded on the Caraş River, on its plain course, on Voia estate and another mill at Jebel. Act of 1378 explicitly stated, for the first time in the Banat area, operation of an undershot mill with vertical wheel. Jebel mill that worked in 1424 had three undershot water wheels. There is no evidence to make clarifications or assumptions about mills on the Bârzava and the Timiş for instance, rivers that provide conditions for operation of mills with vertical wheel.

Little information from documents suggests revenues brought by mills, their market value and compensation paid for mill damage. Act of September 14, 1364 stipulated a value of 10 marks for the redemption of a mill with wheel on the Bârzava. Damages expected for stopping of the 24 mills on the Bârzava in 1408, raised up to an amount of 1,000 gold florins. Reconstruction of a burn mill on the Bistra in 1478 required 60 gold florins. We believe that invocation of some real estate values or consumer goods from the same time would be suggestive to compare the prices charged at medieval mills.

Hideg and Timişel estates from Mehadia district were sold in 1392 for the sum of 200 florins, 300 sheep and 100 cattle[260]. A vineyard from Recaş was sold in 1447 for 32 gold florins, but at the same time, in 1406, Ştefan of Remethe bought with 40 florins two vessels with wine[261].

Watermills from the Banat, documentary recorded in the 13th century and up to early 17th century, were aristocratic possessions. They belonged to great secular or ecclesiast feudal lords. Royal possessions from the Banat had watermills that were ceded together with royal donation. A royal mill

[258] Feneşan, *Documente*, 1978, p. 149-150.

[259] Răuţ, 1993, p. 32.

[260] Pesty, *Szöreny*, III, p. 14.

[261] Pesty, *Krassó*, III, p. 253; Feneşan, *Documente*, 1978, p. 38-39.

worked in 1372 in the Temesku district. Veytzeh estate from Timiş County was a royal possession, where two mills operated in 1410 "quasdam possessiones nostram regales Weytheh, cum duobus Molendinis in fluvio Themes decurrentibus"[262]. The overwhelming majority of medieval mills belonged to province nobility, to some great feudal lords like those from families of Cenad, Himfy, Mâtnic, Gârlişte, Bizerea and Armenis. There stands out from far Himfy noble family with mill possessions, 25 only on the Bârzava, other on the Pogăniş and the Caraş, in the late 14th century and the first half of the 15th century. Nobles from Gherteniş, Halimba, Jank ruled a smaller number of mills. Mills were knezes' possessions as inherited under Romanian common law, some of them being maintained also in the 14th century. Mill from Voia estate was a knezial possession at the mid 14th century, and reached through seizures in possession of Himfy nobles in 1361[263]. A knezial mill still worked in 1380 on the domain of Himfy at Remethe and belonged to knez Ioan, from where the servants took by force field 13 florins[264].

The question of mill monopoly in medieval economy of Hungarian kingdom has been approached in studies on medieval mill. Mill was an important source of revenue for the feudal domain, be it lay or ecclesiastical, and as such was included in the acts of donation in the first property elements of a domain. L. Makkay, discussing the problem of mill monopoly for the Arpadian era, found a moderate exercise of this senior right, in relation with requirements with which it was applied on large domains from Western Europe[265]. Landowners, who had rights on water, could therefore build mills. Exercising the right of monopoly on watermills from Temeskuz district, royal properties, is reported in the act of King Ludovic I, in 1372, as obliging the serfs to grind only in royal mill. Violation of this law draws penalties[266]. The impressive number of 25 mills on Remetea estate of Himfy nobles, which operated in the early 15th century, can be an illustration of the mill monopoly right exercised against the domain villages' serfs.

Documents from the 15th century and 16th from Romanian Principalities, from east and south of the Carpathians, prove an exercise of mill feudal monopoly by landowners[267].

The 18th century brought profound background changes regarding the Banat province, which would be politically and administratively completed after the Turkish-Austrian wars from 1716-1718. The Banat came into the political, administrative and military structures of Habsburg Empire, becoming an imperial province during 1716-1778.

Turned a domain of Crown and Imperial Chamber, it was directly administered by the central imperial Vienna authorities[268]. The special status of the border province of the empire was reflected in the economic and social field throughout the 18th century, as benefiting from a coherent economic and demographic politic. The agrarian policy in Banat, immediately after the peace from 1718 would be followed by the river courses regularization, drainage, intensive cultivation measures and land management, systematic introduction of crops of wheat, barley and oats[269]. Corn crop was restricted to hills and mountains area but it enjoyed the local population support as well as of the settlers[270]. Animal breeding enjoyed similar coherent policy of practicing a performance animal economy, with bred animals colonized here from the Austrian Alpine lands. The role of German settlers with experience in farming but also with advanced equip-

262 Ortvay, 1896, p. 426.
263 Ţeicu, 1998, p. 387.
264 Doc. Val., p. 288.
265 Makkay, 1974, p.45.
266 Feneşan, 1977, p. 229.
267 Costăchel, 1945, p. 171-182; Emerit, 1933, p. 245-254; Costăchel, 1944, p. 61-65.
268 Feneşan, 1997, p. 13-17.
269 Jordan, 1967, p. 28-29; 98-99.
270 Jordan, 1967, p. 31, 103.

ment cannot be neglected in the deep structural changes brought to the agricultural economy of the Banat in the 18th century[271]. Another factor that should be noted in this context of the province development is the demographic growth registered at the end of the 18th century and during the next one[272]. Population growth due to natural increase, on one hand, and colonization in the province, on the other hand, had direct effects on the growth of agricultural areas and in modern farming in the Banat. Demographic factor is reflected in growth of province mills number. From this perspective, we want to invoke only some demographic marks of the Banat rural world from the 19th century. Thus, Ilidia village had in 1890 a number of 2230 inhabitants, Răcăşdia from its neighborhood had 2941, Sicheviţa from Clisura had a population of 2972 inhabitants, Lăpuşnicul and Rudăria had in the same period 2247 and respectively 2741 inhabitants[273]. The large number of mills in the Banat, reviewed in the 19th century until the middle of the 20th century, was a consequence of province demography and of rural economy with a well organized agriculture and animal breeding in hilly and mountainous area of it. Census of 1828 provides information about registered craftsmen from the province villages, where we also find the number of villages millers. Villages from the mountains and hills area of the province had certainly mills with horizontal wheel, which do not require a miller and, certainly, recorded figures actually reflect the number of mills from the villages. We find in the census invoked from 1828 a total of 340 mills in the county of Caraş, which is essentially mountainous and hilly area and where mills with horizontal wheel operated predominantly. Timiş County had a total of 367 mills. Millers' statistics from the Caraş County villages actually reflects the following mills situation: at Ilidia a total of 12 mills worked, at Răcăşdia 7 mills, at Socolari 9 mills, at Maidan 16 mills operated[274].

The mill construction and location on water courses was uniform legally regulated in the second half of the 19th century, through water law regime imposed by the Austro-Hungarian monarchy. Building permits for mills in the years 1905-1906, as kept in archives, reflect going through absolutely necessary bureaucratic steps. Floating mills site was regulated in the same spirit of the law, authorized each year.

Watermill statistics from 1957 scored a number of 74 mills with vertical wheel and a number of 500 mills with horizontal wheel in the Banat. The layout of this class of watermill was uneven in the Province area: in the Cerna River Basin 231 mills in operation were, on the Nera and its tributaries 150 mills, on the Timiş 90, while on the Caraş only 31 mills operated. The Cerna basin settlements, for example, those from Cornereva, with 36 mills, Plugova, with 26 mills, and Mehadia, with 19 mills, shows the extent of diffusion and persistence of this rural industry in the mountainous Banat area. The same area reveals at the time of our investigation, in 2011 massive losses of monuments. Villages Globul Craiovei with a total of 15 mills, Domaşnea with 19 mills, Cuptoare with 10 mills can be entered with watermills total and permanent losses. Current statistics of mill with horizontal wheel in the Banat province counts today little over 100 preserved plants.

The moment marked the beginning of the end for the Banat watermill. Rural world has suffered a major impact after 1962, together with the completion of collectivization of agriculture. Radical changes regarding ownership of land that led to the disappearance of small properties had a devastating impact on the Banat watermills too. The forced industrialization of the seventh and eighth decade of last century, followed by the rural population exodus to

[271] Jordan, 1967, p. 98-103.
[272] Bocşan, 1986, p.31-36.
[273] Ilieşiu, 2011, p.156, 247, 257, 163.
[274] Kovách, 1998, p. 245, 249-250.

urban areas has felt profoundly also in few and restricted areas of the Banat space where has still preserved the individual property.

3. THE WATERMILL ORIGIN IN ROMANIA. A FALSE HISTORIOGRAPHIC PROBLEM AND OF ITS CONTINUITY

Romanian watermill age issue began to know special connotations in historical writing from 1973-1974 thanks to studies published by the C.C. Giurescu and C. Bucur[275]. There was accredited then the idea of watermill appearance in Roman time and of its continuous persistence during migration period until the 13th century, when we find it mentioned in the office documents. Watermill in Dacia was recorded in historiography before 1989 between the defining elements of Romanian autochthonism and protochronism. It became a mythological subject in historical writing, one that found a little grip then or later. Historiographer C.C. Giurescu was the one who tried to score the mill between Romanian medieval continuity milestones. The one who brought watermill between protochronism vectors was ethnologist Cornel Bucur. The protochronism phenomenon and the autochthonism, an expression of ideological factor interference in historical writing, revealed a phenomenon of rejection and separation of those who practiced the craft of historian with honesty[276].

Mediaeval historians who lingered on this aspect of the matter in Transylvania or south of the Carpathians fixed the watermill diffusion beginnings in the 12th century[277]. Mill was a feudal monopoly for the nobles who had benefits[278]. Watermill was introduced in Dacia in the 2nd - 3rd centuries by the Romans and, in Giurescu's opinion, there are no reason to doubt that once adopted in Dacia it continued to be used after the Aurelian withdrawal in 271[279]. He invokes "in the meaning of *continuity* of this watermill and namely its essential terminology, *terminology that is of Latin origin*" [280].

Along with some general elements of Latin terminology, Giurescu appealed to toponyms, to places names like *Râu de mori* [River of Mills] in Haţeg, Argeş and other areas[281]. His opinion regarding the watermill origin was a firm one: watermill is a legacy of the Daco-Roman period with uninterrupted continuity[282]. Linguistic argument for Romanian watermill age is found in onomatology studies. The toponym *river* for water supply channels for mill at Streisângeorz was raised between the arguments for supporting a permanency of the ancient watermill in this region[283].

The appearance of watermill in Romania had preoccupied Corneliu Bucur, matter to which he dedicated two contradictory studies, in which the appearance moment was set in the 9th century and the beginning of 10th century. We found in the debate proposed in 1974 a call to information from historical, archaeological, linguistic and ethnological sources. The absence of archaeological documentation on watermill in Dacia was considered a strong argument to reject its introduction in the 2nd – 3rd centuries AD, and to formulate criticism on grounds of historiography that held linguistic basis or analogies of this idea[284]. Linguistic argument is the defining element with which he operated in a very dense study, to fix the time of appearance of the watermill and the impulse under which it propagated. He contradicts rightly Giurescu's argument of Latin terminology of watermill. Terms derived from classic Latin that are found both at watermill and manual

[275] Giurescu, 1973, p. 134-142; Bucur, 1977, p. 43-61; Bucur, 1979, p. 197-198.
[276] Boia, 2000, p. 124.
[277] Pascu, 1962, p. 60; 225.
[278] Ştefănescu, 1962, p. 313.
[279] Giurescu, 1973, p. 139.
[280] *Ibidem*, p. 139.
[281] *Ibidem*, p. 141.
[282] *Ibidem*, p. 142.
[283] Homorodean, 1977, p. 61-62.
[284] Bucur, 1977, p. 52-53.

mill, the grinder, concern mechanical installation meaning the two stones and their connecting axle, which remained unchanged. Their keeping throughout the entire millennium of migrations proves only the permanence of the manual mill, of its ancient elements[285]. Two terms specific only to watermill *părpărița* and *crângul,* and that only for the mill with vertical wheel, of an undeniable Slavic origin, gives the argument of demonstration proposed by Bucur for watermill adoption after the Slavic time from the 8th century[286]. Basically he has right in its assertion about the use of linguistic elements in this discussion. His opinion fixes the time of the watermill appearance, sometime in the 9th century until the mid-10th century[287]. Without arguments, he rejects in the same context a possible direction of penetration of the watermill from the Slavic world. Ethnological arguments of the 20th century, meaning spread of watermill with horizontal wheel predominantly in the Banat and Oltenia area and of that with vertical wheel in Transylvania, are elements through which Cornel Bucur suggests the mill entering in the 9th and 10th centuries north of the Danube. The diffusion impulse of mill with horizontal wheel comes from the South, from Byzantium, through Serbia and Bulgaria, on communication paths that played also the role of cultural corridors, and mill with vertical wheel origin should be sought in Western civilization from where it spread in Transylvania[288]. Ethnological argument is used unfounded as long as there are no exact chronological circumscribing of it for setting a major historical phenomenon of the early Middle Ages. Use of recent ethnological sources in a regressive historical reconstruction on long history time requires very great caution. Designing of some realities of 19th - 20th centuries on a distant past time from 9th – 10th century cannot offer a reliable refund guarantee, given the multiple and repeated influences that they suffered during the modern era.

Origin of watermill and its diffusion in Roman Dacia were punctually resumed by Corneliu Bucur in a later study in 1979. Reanalyzing the millstones from Transylvanian museums deposits, he concludes its appearance and diffusion in province Dacia in the 2nd - 3rd centuries AD[289]. This second step of Bucur adopts this way the chronological moment proposed by Giurescu, which he just had criticized in the study from 1974 regarding the appearance of the water installations in Romania. His speech obviously marked by the language and ideology of time took protochronist shades: "this way we beat the deadline set by other historians for the phenomenon of watermill diffusion: 4th - 5th centuries o.e. being another convincing evidence of rapid life Romanization in Dacia"[290]. He spoke in the same context about a limitation of watermill use during the migration era and generalization of it at the end of millennium one, the peak moment of the process being registered in the 12th - 13th centuries[291]. Historiographical discourse sequences cited above are part of the Romanian protochronist current which marked, in part, also the approaches of medieval civilization[292]. Reflexes of this type of approach of watermill age are found in recent writings on the watermill from the Banat[293].

Watermill, a discovery of the ancient world, has come a long way, with small steps, until the European diffusion after year one thousand. History of watermill in Romania is part of an overall European process in which the north space of the Danube was integrated after the fall of the Roman world and genesis of feudal society. Mill diffusion is intrinsically linked to birth of Romanian feudal society, the genesis of feudality, the

[285] *Ibidem*, p. 56.
[286] *Ibidem*, p. 61.
[287] *Ibidem*, p. 68.
[288] *Ibidem*, p. 69-71.
[289] Bucur, 1979, p. 183-195.
[290] *Ibidem*, p. 197.
[291] *Ibidem*, p. 198.
[292] Boia, 2000, p. 122.
[293] Răuț, 1993, p. 25-26.

noble class. Mill, as seen in medieval documents from the early Middle Ages, was a knezes and noble rule. Slavic contribution to origin of Romanian feudality also left traces within the economic life[294]. Panaitescu's studies show Slavic influence exerted on Romanians also concerning the agriculture, tools belonging to the ruling class have Slavic terminology, while serfs work products have Roman names[295]. Agriculture in the early Middle Ages was one of subsistence, dependent on the whims of weather, even for regions of Europe that had a certain documentation on this regard, and more natural for our spaces where we are deprived of minimal information. Primitive state of agriculture that continues to use archaic forms of the plow in the Middle Ages cannot be a prerequisite for intense and widespread use of the watermill. The cited documents for south and east of areas the Carpathians suggest the manual mill use, of grinder, until late in feudal time[296]. Diffusion of watermill can be reconstituted only on the information of office documents. The Banat and Transylvania area, privileged in the resources regard, knew the watermill use starting with the 12th century. The presence of western religious orders on the Mureş corridor separates clearly also a corridor of technical accumulation diffusion in which the watermill has certainly found place in the 12th – 13th centuries. The impulse in watermill diffusion from the Byzantine world, whose borders reached at the beginning of the 11th century on the Danube, remains a working hypothesis, without documentary support, in the present state of knowledge.

[294] Panaitescu, 1994, p. 47.

[295] *Ibidem*, p. 47.

[296] Panaitescu, 2000, p. 136-137.

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I. JOURNALS

AMET = Anuarul Muzeului Etnografic al Transilvaniei, Cluj.

An B = Analele Banatului.

Annales Bt = Annales de Bretagne.

BMK = A Békés megyei múzeummok közleményei, Bekescsaba

CL = Cercetări lingvistice, Cluj

GPSKV = Grada za prouačavane spomenika kulture Vojvodine, Novi Sad

Rad VM = Rad Vojvodanki Muzeja, Novi Sad

LIGC = Lucrările Institutului de Geografie, Cluj

Zbor EM = Zbornik. Etnografskog Muzeja u Beogradu 1901-1951, Belgrad, 1953

GEISA = Glasnik Etnografskag Instituta Srpske Akademie Nauka i Ulmetnostu, Belgrad

MNMNE = Magyar Nemzeti Múzeum Néprajzi Oszályának Értesitöje, Budapesta

MSR = Anuarul Muzeului Bănățean, Timişoara

RHSEE = Revue historique du sud-est européen, Bucureşti

RI = Revista istorică, Bucureşti

StCEIC =Studii şi cercetări de etnografie-istorie, Caransebeş

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