Proposal for the Classification of Pre-industrial Tilling Implements

/NÁVRH TŘÍDĚNÍ HISTORICKÝCH TYPŮ ORADEL/

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INTRODUCTION

By old pre-industrial tilling implements we mean implements of anonymous construction, made either by the farmers themselves or by village craftsmen. This implement drawn by means of human or animal force makes continuous furrows, thus breaking up, pushing apart or turning the soil surface to enable the primary adaption of the soil for the cultivation of plants, or, as was probably the case originally, for the putting of the seeds into the soil. The system of tilling implements mentioned in this article is limited to the cultural regions of the Old World. Most of the pre-industrial tilling implements of the Far East are most probably only apparently similar to the Western implements, and would therefore have to be dealt with separately.

The research work on the development of pre-industrial tilling implements during almost two centuries of its existence has prepared so much documentary material that today we are already able to gain a more reliable picture of the great variety of forms of the old tilling implements in Europe, Western Asia and North Africa. To bring some order into this great amount of constructions with varied requirements as to the function of the implement is the task of classification; this classification would divide on the basis of the evaluation of all materials from a uniform standpoint as to the function and form of the implement all known implements and would set the directives for the evaluation of their individual parts. A strict definition of all categories of pre-industrial tilling implements, perfected by criticism and finally generally accepted, would make a successful comparative study and a common language of the research workers in this field possible. Since the times of Rau (1845) numerous authors, e.g. Braungart (1881), Nopcsa (1919) and many others already tried to classify the pre-industrial tilling implements and to determine the main constructional types, or to establish the whole development line of tilling implements. Most
of them have been overridden by the development of science. As the most acceptable of the up to now published suggestions for the classification of preindustrial tilling implements can be considered those based on the work of Haudricourt and Brunhes Delamarre (1955). These authors treated in their study documents concerning the Primeval, Middle and recent ages from almost the whole world and they themselves also added many new and very useful data. As the main criterium of their classification they chose the main part of the construction of the ard, to which the other parts are added. According to examples from primeval documents they divided all tilling implements into three types:

1. "chambige"—through the rear end of the curved beam passes the stilt or sole which end in the working point;
2. "manche-sep"—the beam is mortised into the stilt carrying the working wedge, eventually passing into the sole;
3. "dental"—an arched or straight beam and a perpendicular stilt are mortised into the sole. A disadvantage of this certainly simple division is the fact that one type then includes implements of quite different character and from mutually unconnected regions, as is the case for the chambige type, e.g. the Ukrainian ards without sole and with a straight beam, into which an inclined ard head and one stilt are mortised. It is also quite impossible to include in this system, classified according to the three main parts of the construction (beam, stilt, and sole), the sokhas, which are a very closely defined type, their only common sign being the forked working part. First of all it is necessary to distinguish strictly between the ard head (without horizontal sole) and the sole in the sense of the horizontal sole only. The author of this article believes that a certain modification of this system, which would more closely define the types, while still using the common basic criteria, would make it more precise and extensive. The author has in mind an auxiliary typology, as the present, though extensive results of the studies of the development of the tilling implements can as yet not be conside-
The development of the tilling implements is marked by certain milestones, marked by the technical inventions, caused by the developing agrotechnics under the specific nature, economic and cultural conditions, as were e.g. the invention of the sowing funnels, forecarriage, coulter, asymmetrical plough, etc., with the aid of which the implement was adjusted to the required task. These agrotechnical elements, however, only had a very insignificant effect on the construction of the implements. They were used for all types of constructions, taking as the basis the form of construction of the implement used in the given region. This then spread to regions with quite different production conditions. These findings, therefore, force us to use two basic methods of evaluation of the agricultural implements, firstly according to their function, secondly according to their forms. It is necessary to study both these parallel courses in the development and spreading of the implements equally intensively, but keeping them strictly apart, as their cultural and historical significance is different. While the kinds of implements to a certain extent prove the development of agrotechnics and in connection with this also the state of the material basis of the society, the constructional types—their distribution and nomenclature can contribute in the ethnogenetic studies. The original advocate of the ethnological study of the pre-industrial tilling implements exclusively according to their form was Leser (1931, p. 51, footnote 4), based on the teachings of Graebner (1911, p. 106 and further). Of a quite different opinion were Haudricourt and Brunhes Delamarre (1955, p. 22), although in their work they were not able not to mix both the basic viewpoints. The first one to point out the difference between the kind and type of pre-industrial tilling implement was Bratanic (1952, pp. 92-93; 1956, pp. 33-34). This article is a further treaty of Bratanic’s basic classification of the tilling implements and as
to the study of the form of the implements, it follows the original viewpoint of Leser with certain modifications and with certain additions to the systems of Haudricourt and Brunhes Delamarre. In this classification the old pre-industrial tilling implements are divided, according to their agrotechnical functions into "kinds" and according to the forms of the constructions into "types" and "groups". The second part of this article deals with the directives for the evaluation of the individual parts of the implements. As examples this article also includes illustrations of some old tilling implements from Czechoslovakia in kinds, types and groups found within this region.

AGROTECHNICAL CLASSIFICATION OF PRE-INDUSTRIAL TILLING IMPLEMENTS

When studying the development of the pre-industrial tilling implements, we must first of all consider their function, way of work and utilization, i.e., determine them as an agrotechnical kind of implements. These findings will inform us how the farmer in the given region adapted himself to the soil and climatic conditions, what implements he had to choose to comply with the correct method of treating the soil under the given conditions of nature.

SURVEY OF THE KINDS OF OLD PRE-INDUSTRIAL TILLING IMPLEMENTS

I. Longwise symmetrical tilling implements
   A. Ards without soles (so-called hooks) and sokhas proper

   Tilling body 1): for hooks—shares, mounted on the ard head,

   1) By tilling or ploughing body we mean a total consisting of those parts of the tilling implement, which take a direct
in a relatively sheer angle to the soil, for sokhas -- two or more symmetrical (sometimes reversely asymmetrical) shares (soshnik), also placed in a sheer angle on the teeth of the forked part (rassokha).

Method of work: the symmetrical tilling body in the balanced position scratches a relatively shallow and uneven groove according to its shape and places the turned up soil equally on both sides. It requires less drawing force, is however, very exacting as to the output of the tiller. It performs the so-called "plain (lands-) tilling", which means that it places the furrows made in both directions constantly next to each other, on the mountain slopes in the direction of the isohypse from the bottom to the top.

Utilization: covering of seeds, perfect surface loosening of the soil, good uprooting of weeds, especially root weeds, cleaning and loosening after burning down a forest without harmful turning of the soil, all kinds of tilling work in mountainous regions.

B. Ards with sole s

Tilling body: symmetrical share, placed either horizontally or obliquely to the soil, more rarely also a coult er, sole, often widened towards its heel, mouldstrokers (ears) of various shapes and dimensions, later a sheat, participating with a horizontal share and low sole also in the tilling process, or also a flat shaft of the share joined obliquely upwards and backwards to the bevelled neck of the higher sole and leaning on the sheat or stilt.

Method of work: it scratches straighter furrows than the ard without a sole. When the implement is balan-
ced, it carries out plain (lands) tilling. In the slanting position it draws aside (and partly turns) the moulded earth—mostly to one side. It requires more drawing force; its manipulation, however, is less strenuous.

Utilization: ploughing in of seeds, surface loosening in arid regions or stony soils, destruction of weeds, especially if the implement has an obliquely placed share and, with suitable dimensions and inclination of the share, also deep ploughing. For the three-field-system it was used for crosswise tilling as an additional implement for the plough. For smaller farms, however, it was the only tool for all kinds of tillage. For the cultivation of root plants, especially potatoes, the role of the sole ard, to which later symmetrical and regulation mouldboards and two stilts were added, was to plant and play the role of a cultivation implement.

II. Longwise asymmetrical implements -- ploughs

A. One-sided ploughs

1. With one share (single ploughs)  a) Ploughs proper -

Ploughing body: as a rule an asymmetrical share, mouldboard, often a coulter, sole and sheat. The main part is the mouldboard, placed asymmetrically, on one side; it can be either flat, warped, cylindrical (ruchadlo share-mouldboard, blackland body or digging body), semi-screw (clay sod body), screw (breaking body)

Method of work: vertical and horizontal cutting of the furrow slice, lifting, moulding and turning to one side. The degree of moulding and turning of the soil are in indirect relation and depend on the profile and position of the mouldboard. Besides that the turning of the soil also depends on the ratio of the width of the furrow to the sole or the furrow and further the ard head or sole and sheat, which carry or support the share with the mouldstrokers or mouldboard.
depth of the ploughing (optimum 7:5). The plough makes so-called "ploughing in ridges", by pulling the furrows alternately from both longitudinal sides of the field or ridge towards the centre (ploughing up, cleaving down ridges) or oppositely from the centre to the sides (folding, casting up ridges).

**Utilization:** shallow ploughing of the virgin soil, both of and many years/one-year fallows, turning of grass land, deep ploughing of cultivated soil and covering of the manure.

b) Plough ards (ploughs with symmetrical shares)—

**Ploughing body:** the same as for the plough proper with wooden mouldboard, but horizontal longitudinally symmetrical share.

**Method of work and utilization:** the same as for the ploughs proper, but imperfect output, the bottom of the furrow unclean, the turning of the soil incomplete.

c) Ploughs without soles (asymmetrical sokhas, kosulya)—

**Ploughing body:** on a forked working part (rassokha) are placed two symmetrical or alternately asymmetrical shares (soshniks), placed in such a way that they work only on one side, sometimes the left share is also a coulter. In the sokha, the function of the mouldboard is taken over by an asymmetrical fixed small shovel or by two asymmetrical wings (politza). The more perfect types of ploughing sokhas (kosulya) have on the flat ard head an asymmetrical share with a mouldboard and coulter, but also not a sole.

**Method of work:** the asymmetrical sokhas turn the soil better than a slanting ard, the furrow, however, is not perfect. Even if the furrow is not straight the kosulya loosens and turns the soil well. Both implements (asymmetrical sokha and kosulya) plough in ridges with an uneven ploughing depth. It requires less drawing forces, the leading of the implement is, however, strenuous.
Utilization: in lighter soils for all kinds of work as ridge plough, otherwise for shallow ploughing.

2. Multishared

Ploughing body: as for the ridge ploughs with one share, mostly, however, without coulter and sometimes also without sole. They are fixed, one behind the other, to the common transom or frame. For the animal-drawn ploughs the dimensions of the ploughing bodies decrease with their numbers. Here we also have to mention two coupled ridge ploughs, the back one of which had a shortened beam.

Method of work: every ploughing body turns the soil into a furrow after the preceding body, the last (back) body leaves the furrow open. Ploughing in ridges.

Utilization: in the first place for ploughing in of the seed-corn, for flattening of the ploughed field, for light ploughing of stubble and for all rapid light ploughing.

B. Two-sided ploughs

1. With one share

a) With a shifting mouldboard, with sole-

Ploughing body: a horizontal symmetrical share is placed on the sole and in front of it a coulter the blade of which can be slightly oblique towards both sides. To the vertical sheath a free shifting mouldboard can be alternately grappled on both sides of the sole.

Method of work: less perfect plain ploughing and turning of the soil, requiring the change of the position of the mouldboard and coulter at the end of each furrow.

Utilization: all shallow ploughing on slightly sloping and straight fields.

b) Sokhas with a small shifting shovel, without sole-

Ploughing body: two small sokha shares are symmetrically placed on the forked rassokha. After each furrow a shifting
shovel is placed above them.

**Method of work:** less perfect plain ploughing and turning of the soil.

**Utilization:** all kinds of ploughing in light soil.

c) Swivel ploughs with turning shares, with sole-

**Ploughing body:** a large symmetrical (cylindrical) ruchadlo-share, turnable towards both sides around the vertical axis with the aid of a lever equipment. It also has the function of the mouldboard and coulter.

**Method of work:** plain ploughing requiring the turning of the share to the relevant side at the beginning of every furrow.

**Utilization:** good moulding and turning of light soil in plain ploughing on slightly sloping and straight fields.

d) Swivel ploughs with turning share, without sole-

**Ploughing body:** a large concave share, fixed on a sheer, partly turnable ard head without sole. The ard head with the share was turned with the aid of a lever equipment.

**Method of work:** plain ploughing on mountain slopes in the direction of the contour lines from the bottom to the top. Good loosening and removal of weeds during shallower ploughing, the turning of the soil less perfect.

**Utilization:** all kinds of ploughing on mountain slopes.

2. With two shares

a) Turn-about ploughs with three stilts-

**Ploughing body:** two complete ploughing bodies, one for each side, (asymmetrical share with coulter, one-sided mouldboard with sheat and sole) fixed to the common beam at an angle of $90^\circ$.

**Method of work:** plain ploughing requiring the turning of the whole implement to the relevant side by $90^\circ$ at the beginning of each furrow. The output of the implement depends
on the shape of the ploughing body.

**Utilization:** plain ploughing in slightly mountainous terrain.

b) **Turn-about ploughs with two stilts—**

**Ploughing body:** two complete ploughing bodies, one for each side, with a wooden sole, front and back sheat, equipped with a ruchadlo-share with a slightly screw-type wing, are fixed to the common beam at an angle of 180°.

**Method of work:** plain ploughing requiring the turning of the complete implement by 180° and the overturning of the stilts at the beginning of every furrow.

**Utilization:** the same as for the turning plough of the previous type.

The ploughing body, although it greatly affects the quality of the ploughing, cannot itself give full characteristics of the implement from the agrotechnical point of view. To complete the whole picture we also have to notice the drawing equipment and the equipment for the leading of the ploughing implement.

From the point of view of the drawing of the ploughing implements we differentiate ploughing implements with a long beam at the front end of which a team yoke for harnessing the cattle to the plough is fixed, or implements with a short beam supported either by a creeping or a wheel-foot or carried on the forecarriage. A free pole was loosely fixed by means of linking-planks to the wheelfoot or forecarriage leading to the double yoke or the swingletree or splitter bar with traces and with a horse collar or a single yoke for the cattle. Some of the light ploughing implements, for one drawing animal only, had, in place of the beam, two draught poles (brancards). The so-called swingle plough was completely without any support, it had, however, at the front end a regulator of the depth of the ploughing and the width of the furrow. This possibility also existed for the fore-
carriage, while the ploughing implement with a creeping or wheel foot, if it did not have any special regulator could only change the harnessing point in the vertical direction, i.e. to regulate the depth of the ploughing. The ploughing depth can, however, in most tilling implements be regulated also directly on the implement by a ligature or by wedging some of the loosely joined parts of the construction, consisting in the change of the angle, made by the beam and the sole.

The operation of the tilling implement is managed and controlled by the stilt (stilts) of various constructions. Two stilts are more suitable for keeping the implement in the balanced vertical position. The frequent carrying or lifting of the ploughing body during ploughing is shown by the horizontal or leaning backward position of the stilts, horizontal handles (in the sokhas) or the upper horizontal rough stave between the stilts, serving as handle. In all the above cases the ploughman walks behind the plough in the furrow. A single stilt, especially when placed vertically and equipped with a horizontal handle, makes it possible to incline the construction of the implement to one side; in this case the ploughman proceeds along the side of the implement. A similar purpose serve the North-European bar-stilts and the similar stilts of Asia Minor.

We are acquainted with the individual kinds of the pre-industrial animal drawn tilling implements, their varied purposes and methods of work, as they were constructed to meet the conditions of nature and as it was made possible to construct them by the cultural, social and economic levels of the given society. Knowledge about the tilling implements from these points of view makes it possible for the historian to get information on the method of treating the soil, on the intensity of plant cultivation, i.e., also to a great extent on the level of the material basis of the society of that time.

In two identical agrotechnical kinds of implements we can notice some formal differences, which are, however, irrelevant
for the output of the implement. On the other hand again, in two identical or different kinds of implements, which can come from quite different parts of the world, some constructional details are very similar. The main point is how two, three or four main parts of the implement are joined into a whole of the required shape (into a "construction") or what the position of some of its parts is. In the endeavour to obtain substantiated ethnogenetical conclusions, the ethnologist basis his study of the forms of the implements on these formal conformities or differences (in agreement with the terminological conformities), which can be explained by the common or assumed tradition. This comparative study of the material from various countries, while respecting the chronology, must be carried out with a uniform typological classification of the studied material and in connection with this also with a uniform nomenclature.

THE OLDEST DOCUMENTS OF THE CONSTRUCTIONS OF PRE-INDUSTRIAL TILLING IMPLEMENTS

The pre-industrial tilling implements, the basic building material of which was wood, have a number of different forms. Almost all of these forms can be found already in the oldest documents, either in pictures or in very rare remnants of the original implements, which are usually at least 3,000 years old. These show ards with two or one stilt. Although we are aware of the various functions as well as the manner of the management of these implements, in the typological classification we shall not consider the doubling or simplifying of some part, e.g. the stilt of the ards and ploughs or the ploughing body in multishared ploughs; neither shall we take into consideration the doubling of the beam in ards and sokhas with draught poles. The principle on which the construction of the implement is based remains the same in both cases. These differences in the construction of the im-
plements are, however, of a great agrotechnical importance and therefore they must be taken into account already when determining the kind of implement, as was dealt with in the previous chapter.

The oldest document of an ard comes from the Sumer pictograph from Uruk from the 4th millennium BC (BeB - 12). The connection between the beam and the stilt is not clear in the drawing. Clearer than this very schematic drawing is a similar construction depicted in one of the numerous seal rolls from the ancient Orient from the 2nd millennium BC (GPV 1951-134). On this ard the central stilt ard head to which a short arched beam prolonged by the free pole can already be clearly seen. Two stilts emerge from the working point of the stilt ard head, at the same time carrying out the function of the mouldstrokers. This drawing of an ard is repeated on other Babylonian seals of the same time.

From Egypt, which was originally influenced in the construction of tilling implements by the Mesopotamian culture, we have drawings of ards with two stilts turning into a sole and with a straight beam joined to the sole, from the 3rd millennium BC (LP 108). On more recent drawings of ploughing from Old Egypt there are also ards with two stilts and a working point which, however, have no horizontal sole (SF 1961-5).

On one of the Old Oriental seals from the 2nd millennium BC is an ard with a long stilt in the form of a rod passing through the base of the arched beam and forming by its lower

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2) The abbreviations in the brackets refer to the illustrations of tilling implements, published in other works. I use capital letters for the author and the relative work. If it is a question of numerous works by the same author I add the year, or the index to differentiate the works of one author published in the same year. The final number in the brackets refers to the illustrations. Tables which in the original work were numbered differently than the illustrations, are marked by the letters pl. and separately numbered photographs by the letters ph.
end the working point (LP 105). In the Danish peat-bogs a whole number of original implements and their parts of a simi-
lar form and function as represented by the types of ards from Døstrup (OPV 1951-37) and from Donneruplund (OPV 1951-
28, 29) have been preserved.

Of great importance for our purpose are the documents about the construction of ards, roughly shown in some of the 
pictographs on clay tablets from Knossos in Crete, from the 2nd millenary BC. These drawings show further forms of ards, 
this time already from Europe. Considering the well-known close relation between the cultures of Minos and Asia Minor, we can rightly consider the constructions of the ards from Crete (and also Cyprus) as the original cultural property of the people of the Asian continent\(^3\) (figs 1, 2). On the tablets from Crete there appears mainly a new construction of the ard with a long sole, with a curved beam and with one stilt with a crosswise handle (fig. 1: a, b, c). From these schematic drawings it is unfortunately not possible to see whether these are ards, whose beam is mortised or whether it emerges from the sole like a natural forking branch, as is the case for one form of ards found in the North European peat bogs from approximately the 1st millenary BC. If we can ma-
ke any presumptions from the schematic and rough drawings of the Cretian ards concerning the construction details, then we must note that in the ard in fig. 2 the beam and sole are only mounted on next to each other by their back ends. In three cases in figs. 1:a, b, 2 the Cretian ards have a short, almost vertical stilt, mortised into the sole very near to the beam or into the rear part of the beam. The ard from fig. 1 c has a longer stilt, passing through the beam in a slan-
ting forward direction and mortised into the sole between its working point and the rear end of the beam. This stilt to a certain extent takes the role of the sheat in its lower part.

\(^3\) The Sumere already knew Crete in 2,800 BC, as far as they themselves were not the first settlers. (Peake H.1922 p.108).
Fig. 1 - Ards of various constructions on the hieroglyphic tablets of Knossos (Crete) of the 2nd millenary BC. (After B. Brentjes 1955 fig. 4-6.)

Fig. 2 - Single-stilt ard with a beam placed next to the heel of the sole on the hieroglyphic tablet of Knossos (Crete) of the 2nd millenary BC. (After J. Falkowski 1931 fig. 12).
Of approximately the same age as the tablets from Crete is a group from burned clay from the island of Cyprus, representing the tilling with ards of a similar form as those in fig. 1:a, from which they differ only by their straight beam (H-BD ph.12). In more recent documents a similar ard has again a strongly curved beam, as is the case in pictures of a Babylonian seal or of Ancient Greek ards (LP 104, 93, 94, 95, pl. 9).

On one of the mentioned Cretian tablets is the picture of a long object, which very probably is supposed to be an ard, however, of a completely different construction (fig. 1:d). Its form is similar to that of some of the ards from the numerous rock-carvings in Val Fontanalba in the Maritime Alps (LP pl. 12, GPV 1951 - 124). None of these drawings, however, give us a clear picture about the production technology of the depicted ards, so that they cannot be considered as representatives of some constructional type.

The last of the Cretian pictograph ards (fig. 1:e) is, on the other hand, illustrated very clearly. It consists of a straight beam into which is mortised or naturally forked the ard head with the working wedge pointing slantingly forward. The stilt with a crosswise handle is also mortised into the base of the beam. In direct connection with this construction of ancient ards we should also mention the wellknown Etruscan sculpture of a ploughman with an ard from Arezzo (H-BD ph. 14), whose straight beam sharply turns at the back end downwards and forwards, thus forming the working part with the tilling wedge - ard head.

To the described ancient ards we can also add the wellknown votive bronze model of Roman origin from Köln am Rhein (LP 25). Its construction is noted by the stilt passing through the beam and changing in its lower part into a horizontal sole. The base of the beam is strongly curved. The elongated share in the shape of the leaf of the lance on a short rod-like tang also passes through the beam and leans along its whole length on the stilt sole.
If we study the forms, which are typical for the above-mentioned documents of ards, which are all of them older than our era, we find that some of them show great differences in shape and position of the individual parts as well as in their total arrangement. In these typical constructions we can find the basis of almost all the more extensive groups of recent ards with the exception of the construction with a bent beam, through which pass separately the horizontal sole and stilt and also with the exception of the East European and Siberian sokhas.

We can presume that these constructions, for which we have no samples in the ancient documents, have been the result of a later development; some of the mentioned ancient constructions, however, have already the basis for their future form.

QUESTIONS OF THE MAIN CRITERIUM

The choice of the point of view for the basic evaluation of the construction of ards with the aim of their typological classification, is of great importance. First of all it is necessary that the chosen main criterium should be valid and just as suitable for all evaluated subjects, to become some sort of common nominator. We speak about the main criterium because for the more precise characteristics and differentiation of the subject it is advisable and even necessary to choose further secondary and auxiliary criteria, from the more general to the more specific, related only to a certain group of pre-industrial ploughing implements.

The shape of the beam cannot be considered as the main criterium, as did e.g. Nopcsa (1919). The question of a straight or bent beam is of technical importance as the bent beam can generally be considered as more resistant. It acts like a spring, which softens the shaking and swinging caused by the obstacles in the ground or the movement of the draught animals. However, for most types of tilling implements the shape of
the beam is not decisive. We very often find close to each other ploughing implements of the same construction, but with differently shaped beams (see e.g. the already mentioned ard from Cyprus from the 2nd millenary BC and the ards from Crete from the same period according to figs 1:a, b, c, 2). On the other hand we are acquainted with constructions which are otherwise quite different but have the same shape of beam. A more generally valid shape of the beam can be found only in the group of ards whose working part of the construction passes through the beam which is extensively bent at the back, but also in this case there are exceptions, e.g. Estremadura (CHH 1912 - 92). The length of the beam and the method of the support of its front end are of importance for the technical description of the ploughing implement, however, neither can change anything as to its constructional type.

The stilt or stilts are of significant importance for the basic classification of the construction only in that case if during the ploughing they carry the tilling wedge. The stilt with the exclusive function of directing the implement can by its shape, position and method of joining to the implement contribute towards the more detailed characteristics of the construction, however, it cannot be the basic sign for the type of ard or plough. So e.g. a vertical stilt with horizontal handle, mortised into the sole, shows that it belongs to a type, the basic construction of which is a sole. There exists, however, a document of an ard of this type from the rock-carving in the Ligurian Alps (GPV 1954-6), which, perhaps by chance, does not have a stilt. There exists also a large group of sokhas, which does not have any stilts.

The sole always takes a direct part in the tilling process. Its neck ends in a working wedge or represents a bed for the metal share. In its evaluation, however, two things have to be borne in mind: its connection with the other parts of the construction and its form. While the shape of the sole as part of the ploughing body is related to the local ecological
conditions, the method of joining it to the construction is important for the construction type of the implement. The sole, however, is not the only part of the construction which influences the construction of the tilling implement. Therefore it cannot be the only criterium for the evaluation of all the constructions of the tilling implements, also for those without soles.

The share, originally only a sheathing of the working point, became in its further development more and more important from the agrotechnical point of view. Its shape and the shape of the whole ploughing body determine the agrotechnical kind of the implement. The form of the blade of the share, however, never influenced the construction of the implements. It was always related to the maturity of the local agrotechnics, to the conditions of the climate and soil and the strength of the draught animal. In the oldest times, of course, its shape and even more its dimensions were influenced by the possibility to obtain iron as a raw material for its production. However, also the method of fixing and the position of the share are mainly of agrotechnical importance. The shape, the fixing to the construction as well as the position of the share can sometimes give the implements of various types a common feature, which can become the basis of a characteristic group of tilling implements within the wider framework of a number of types. The share can, therefore, only be an auxiliary criterium and at that only to a limited extent.

For the part which expands the tilling body, the symmetrical mouldstrokes of the ards and the mouldboards of the ploughs can be said even to a greater extent what has already been said in relation to the shares and the type of implement construction. (By the term mouldstrokes or mouldbreakers we mean pegs (ears), laths (wings) or boards rising sidewise and upwards from the sole or the ard head or fixed to the sheet). Their significance is purely agrotechnical. The shape of the mouldstrokes is mostly determined locally, influenced by the conditions of nature and the purpose of the tillage, but also
by local traditions. Sometimes there are no mouldstrokers on
the ard at all, sometimes they are replaced by the lower pa-
rts of the stilt, by the widened sole and sometimes even by
foreign subjects, as e.g. on the Yugoslav island of Krk, a
bundle of twigs under the beam in the bend of the stilt and
sole (Bratanic 1939, p. 53, fig. 33), or a straw wisp on the
drill plough for potatoes in Bohemian Fryšava, district Žďár
on the Sázava (Mišurec 1952, p. 168 and fig. on p. 169), or
even two horses skulls tied to both sides of the sole of the
ard, as has been proved even in recent times from Afghanistan
(Vaněček 1950, p. 212, fig. 61).

The sheat is the youngest part of the construction of
the tilling implement. It originated in Europe, perhaps on
the basis of the Old Egyptian ligature between the sole and
the beam. In Asia Minor and Central Asia, with the exception
of the vicinity of the Caucasus it is completely missing. In
the more advanced development the sheat made it possible to
add a vertical plough mouldboard to the construction of the
implement (while the separate share was fixed to the sole)
and it has kept this function up to the present day. To a cer-
tain extent it thus became one of the parts of the construc-
tion, participating directly in the ploughing process. The
sheat has a number of forms and a number of positions which
can become an auxiliary measure when looking for the typolo-
gical and genetic relationship of the implement.

We found that none of the mentioned main parts can be
the criterium according to which it would be possible comple-
tely to classify typologically all tilling implements.

It is necessary to realize that the main interest of the
producer when building his ard was concentrated on the solu-
tion of the problem how, with the material at his disposal,
to build a firm working part ending in a tilling wedge, which
could be pulled forwards and the position and direction of
which could be controlled. There can be no doubt that the sha-
pe of the construction part and its arrangement into a whole
unit were subordinated to the required properties of the til-
ling body and other technological requirements of tillage (light weight and mobility of the implement or the constancy and balance of its operations, the inclination of the ard to one side, etc.).

As the main criterium we can therefore choose the working part of the construction (which carries or supports the tilling wedge and therefore cannot be missing in any implement), its shape, position and method of connecting it to the construction of the implement, as was mentioned already by Moszyński (1929, p. 178) in his classification of Slav ards. The working part in the construction is in most cases also the leading part to which the other parts are joined.

The method of the basic typological classification of tilling implements, suggested in this article, will be a modification of the system of Haudricourt and Brunhes Delamarre. I reached this conclusion by a uniform evaluation of the tilling implements from the point of view of the working part of the construction, which was also to a certain extent also used by Moszyński.

CONSTRUCTIONAL TYPES OF PRE-INDUSTRIAL TILLING IMPLEMENTS

If we take as the main criterium the shape and position of the working part of the construction, i.e., that part which carries or supports the ploughing wedge and if we at the same time also take into consideration its connection with the construction, we obtain, by our classification, a series of precisely defined constructions as to their shape - types. The advantage of this classification will be that it will include all known forms of pre-industrial tilling implements, as long as they did not arise from the mixing of pure types.

I. The stilt type. We can consider as the oldest form of tilling implement an ard without a sole, whose two stilts (or single stilt) cleave the soil with their lower end. Then
a beam, which was formerly slightly bent, later, however, mostly straight, was added to the stilts. At first the beam was fixed with the aid of ligatures, later by the mortising into the stilt in approximately the middle. In the Primeval Ages this type which we call "the stilt type" has been found as a two-stilt ard in Mesopotamia (BaB 1, H-BD ph.2) and in Egypt (LP pl. 11, H-BD ph.4), for the 1st century AD as a one-stilt ard in India - Budh Gaya (LP - pl.17:b), later also in India with a divided stilt - Bihar and Trankebar (H-BD 118) as well as with two stilts - Cutch in North-West India (LP 223) and in the territory of the primeval Elam (FGG 1). One stilt implements of this type can also be found in Iraq (LP 198), in Syria (H-BD ph. 38), in the Ukraine - Tagantcha, Zhukin (LP 90, MVS 7), in Central Poland - Buk (MK 130), in the Central Rhinelands - Siegen-Kroppach (LP ph. 4:a, b); from North-East Bulgaria there are documents from the first half of the 10th century AD - Pliska (SS 1:1, 2) and for the region of the Eastern Alps already from the beginning of the 9th century AD - The Salzburg manuscript - (PZ pl. III). In more recent times it has been found in Yugoslavia - Montenegro (MK 131), in South Italy - Calabria and in Sicily (PZ 32, 33), Morocco and Spain (H-BD 96, 86), in Portugal (DJ 1948-22), in Norway - Gudbrandsdal and in Sweden (SH 10, ES 20).

II. Type with a stilt ard head. The oldest Mesopotamian ards without soles had two stilts, also carrying out the function of mouldbreakers. In this case the working part, which

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4) The locations of the occurrence of the mentioned implements, the illustrations of which were published by other authors, are unfortunately not marked by geographical terms of the same order. The localization of the tilling implements in this article, sometimes narrower and sometimes wider, depends on how precise the local determination of the originally illustrated implements was. The enumeration of the individual types and groups of tilling implements does not include implements from monographies, whose construction is not clear on the relative illustration. This article also does not deal with tilling implements which were only described in literature, as
was cutting the furrow with its lower end, was the central stilt ard head, also serving as the basis to which all the other parts of the construction are joined. This ard head gives the impression that it is the remnant of the single stilt of the previous type and that the stilts added to it on the sides are already secondary. In the later development, the task of moulding the soil in the ards without sole was carried out by a widened share or wooden mouldstrokes joined to the ard head and secondary stilts anchored in the beam. This type with a "stilt ard head" represents the ards illustrated on the Sumerian seal rolls from the beginning of the 2nd century BC (GPV 1951 - 134, LP 102). Out of the European more recent material some types of the Czechoslovak ards without soles correspond to this type -- the East Slovakian (fig. 3), North Moravian, North Bohemian and West Bohemian hooks (ŠF 1963 - 14, 15, 16) and a similar German ard from the Central Rhinelands - Dumicker Hoch (LP pl. 4:c).

It will, however, be necessary to mention the constructional changes which the North Bohemian and North Moravian hook underwent in the 19th century. During this period of the rapid technical progress an equipment for the turning of the share alternately to both sides as in a swivel plough was developed on the original ard of the type with the stilt ard head, published at the end of the 18th century by Mehler as the Trutnov hook (MJ I pl.20-6). It consisted of a swivel ard head lo-

4) their descriptions were often carried out from various viewpoints and with the aid of various terminologies.

5) Most of the rock-carvings in the Maritime Alps and in the Swedish Bohuslän do not give -- because of their simplicity and inexactness -- a clear prove of the construction of the illustrated implement. For this reason only the ard from the rock carving in Aspeberg in Sweden from the 1st millenary BC can be included in the stilt type /GPV 1551-48, 50/.
sely joined to the beam and controlled by a hand lever. According to our system this also changed the constructional type of the implement, from the original type with a stilt ard head a type with a beam ard head occurs in the same locality (ŠL 7). In spite of these facts I mention the North Bohemian and North Moravian hook with the turnable ard head within the framework of their original type with the stilt ard head, as it has been proved that the present form was created at a later period only by the local development of the original local construction.

III. Type with the stilt sole. Already since the times of the oldest known development, the stilts of the ards as the working parts, bend and go along the earth. Thus the horizontal sole was produced, which to a great extent changed the character and work of the ard. The control of the implement was less strenuous, its operations more stable, the tilling was originally shallow. A sole produced by two stilts is documented in Old Egypt already from the 3rd millenary BC (PL 108). A single sole made of a single stilt is only known from a much later period. The shape of the beam depends mostly on the place in which it is joined to the "stilt sole". The beam mortised into the centre of the horizontal sole or only parallelly attached to it by its base, is usually extensively bent, sometimes in the shape of an S, very seldom is it straight. On the other hand, if it is joined in the valley of the stilt sole or above the place of the transition of the stilt into the sole, the beam is usually straight. This is related to the technology of the production of the tilling implements, where for technical reasons the rear end of the beam should be countersunk into another part at as far an open angle as possible. The most frequently found type of tilling implement in the Old World is the one with the stilt sole, either with the double (two stilts) or the single one (with one stilt), on tilling implements lengthwise symmetrical or asymmetrical. It is documented in Old Egypt (LP 106, 109, 110, 112, 113) but we
Fig. 3 - East-Slovak "huok" from Miklušovce, distr. Prešov. (From the collections of the Agricultural museum in Kačina). Kind: ard without sole with two stilts and forecarriage. Type: with stilt ard head. Group: stilts from the beam, straight beam.

Fig. 4 - Central-Slovak "pluh" from Detva, distr. Zvolen. (From the collections of the Slovak National museum in Martin). Kind: one sided plough (ridge plough), two stilts, vertical mouldboard and forecarriage (horizontal share and coulter missing). Type: with stilt sole. Group: quadrangular construction with curved beam and forwards leaning sheat.
also find it in modern Egypt (LP 193), in Algeria — ard of the Cabylls (LP 188, H-BD ph. 28), in Morocco — Anti-Atlas (LP 186), in Italy — Eastern Alps, Calabria and Sicily (SP 265, 263), in Spain — Sanabria, Basque, North Basque and Orense (LP 174, H-BD 89, 90, ph. 27), in Portugal (H-BD 87, DJ 1948- 19, 32, 57), in France — Haute Loire (LP 165), in Sweden — Småland, Helsingland (LP 49, 50), Dalarna (JR 155- 11), but also in Central Asia in Turkestan (LP 217), in Kirghizia (LP 218), in Tadjikistan (H-BD 114), in Afghanistan (H-BD 119, 120) and further in India — Azamgarh, Santal, Bengal, Malabar, Tranquebar, Vellore, Jhabua, Penjab (LP 224, 225, 226, 227, 228, 229, 230, H-BD 115, 116) and in Ceylon — Candy (LP 231), further in the Crimea — the Tartar ard and saban (H-BD 79, MVS 20), in the Central Volga regions — saban from Kazan (LP 65), in the Ukraine — the Ukrainian plough, Kaniev (LP 85, MVS 18), in Rumania (LP pl. 14), in Bulgaria — Arnautilar, Cacarovci, Kortenska, Tverdice, Nadar, Goptepe, Stoilovo (VCH 11: 5, 12: 1, 3, 4, 5, 13: 1, 2), in Macedonia (LP 118), in North and Central Albania (NF 87: c, g) and in Yugoslavia — Vučipolje, Ivanjska, Miljevci, Trogir (BB 15, 16, 27, 34). To the type of the stilt sole belong also some ploughing implements with a quadrangular construction from the territory of the Ukraine, Bulgaria, Albania, Yugoslavia, Poland, Czechoslovakia (fig. 4, 5 and ŠF 1963 - 18, 20) and Austria, to a smaller extent also from the South-West of the Iberian Peninsula, which will be dealt with later.

IV. Type with the passing through stilt. A special case of stilt, equipped with a working wedge can be found in implements, where the long and relatively thin stilt passes through the base of the beam. The stilt forming an unequal-armed lever with the shorter arm bent towards the earth at a very sharp angle, requires that the beam should be extensively bent towards the earth at its rear end. Let us call this construction the type with the "passing through stilt". By this, of course, we do not mean a stilt which also passes through
the beam, but is anchored in the sole, as is the case e.g. in the Mecklenburg ard, but only a stilt which carries the till- ing wedge. Ards of this construction have already been found in pre-historical times, in the 2nd millenary BC, in Scandina- via -- Döstrup (GPV 1951 - 37) and Donneruplund (GPV 1951 - 28, 29). In the Middle Ages this type was used in Ethiopia (LP pl.15), more recently it is only proved in those regions which are close to those of its early occurrence: Syria (ChH 1906 - 1), Iraq (LP 156, H-BD 29), Trans-Jordan (H-BD ph.25), Palestine (LP 199), Lebanon (ChH 1906 - 2), Ethiopia, where two symmetrical mouldstrokers made some kind of sole (LP 195, H-BD 27, 28), in a similar form again by the African tribe Galla (LP 196) and also in Sweden (ES 1).

V. Type with the passing through stilt sole. From the end of the last millenary BC we have a document from the Ger- man Rhinelands about the construction of an ard, whose stilt, strongly leaning towards the earth and passing through the beam, passed into a sole (LP 25). This construction called by us the type with the "passing through stilt sole", was not used extensively for any length of time. We can presume their existence with great probability according to the identical form of lance-shaped share with a short tang of the Roman vo- tive model of an ard from the Rhinelands with similar shares from the territory of Yugoslavia (NL pl.1:21 to 26) and from the territory of Slovakia (ŠF 1961 - 22, 24). From approxima- tely the same time come the ards of the same type, which have been maintained in Sweden in a rock-carving in Valla Östergard and in the original part (stilt sole) of an ard from the peat bogs in Svarbarbo (GPV 1951 - 51, 55). From the recent plou- ghing implements there belong to this type the Hunspflug aga- in from the Rhinelands (LP 23), and ards with shares with a wide socket from Sweden -- Medelpad (SH 14, ES 14, JR 1948 - 20), from Finland -- Eurâminne (SH 15) and from the island Runô (SH 16).

VI. Type with the beam sole. Only from recent times do we have ploughing implements whose sole by their elongated
heel passes through the base of the strongly bent beam. They belong to the constructional type which we shall call the type with the "beam sole". The ploughing implements belonging to this type can be divided into two constructionally different and territorially divided groups. The first group has an arrow-like ard share, the holder of which passes through the base of the beam, similarly as the sole and the single stilt by which the share is gripped. This ard share has its local names: Spanish "rella", Portuguese "relha", French "reille", Bulgarian "paleshnik". In the described group all the tilling implements have shares of this shape, however, tilling implements of quite different construction have them too (e.g. in Bulgaria), never, however, in such a compact extent. The regions in which these tilling implements could be found includes Tunis-Tébourba (ChH 1902 - 19, 20 LP 190). Spain -- Estramadura, Catalonia (ChH 1912 - 94, LP 177), Southern France -- Gers, Ariège, Castelnaudery, Auvergne (ChH 1909 -- 7, 18, 42 H-BD 31), in South-East of Europe, in North Greece -- Vardar (ChH 1912 - 85), in Northern Italy -- "rouersore forestiero", Milan (GA Ea 2, RKH 60), in Macedonia - Konsko (VCh 16a) and in Southern Bulgaria - Oshava, St. Vlas (VCh 16:b, c)\(^6\). The tilling implements of the second group differ from the previous as their beam sole carries on its neck a share with a wide socket and a single stilt no longer passes through the beam to the sole and is therefore usually countersunk into the beam above the slot for the sole. Their Northern regions include Scandinavia -- Aker and Akershus (SH 12) and the Shetland Islands (PFG 1956-7 pl. VI) and in Central Europe -- Switzerland -- Engadin, Grüssch, Lugnetz, Grisson (ChH 1912 - 56, 

\(^6\)Tilling implements of this construction in the lower Var-dar basin are given by F. Nopcsa (p. 123, 1925); he mentions that they were brought into the environment of the tilling implements of the type with the stilt sole and the sole type by immigrating Spaniards in the Middle Ages.
Fig. 5 – South-Bohemian "pluh" from Čimelice, distr. Písek. (From the collections of the Agricultural museum in Kačina). Kind: one sided plough with two stilts, vertical mouldboard, horizontal share with coulter and forecarriage. Type: with partial stilt sole. Group: quadrangular construction with curved beam and forwards leaning sheat.

Fig. 6 – Valakhian "hák" from Nový Hrozenkov, distr. Vsetín, South-East Moravia. (From the collections of the Agricultural museum in Kačina). Kind: ard without sole with two stilts and forecarriage. Type: with beam ard head. Group: stilts from beam, straight beam.
VII. Type with a beam and head. On the hieroglyphical tablets from Crete, which are three and a half millenary old, is a construction of an ard into whose straight beam a forward leaning ard head, carrying at its lower end the working wedge has been countersunk (fig. 1:e). The tilling implements constructed according to this principle belong to the type with a "beam and head". These tilling implements as well as all the other constructions documented by schematic drawings on tablets from Knossos, have most probably been transferred to Crete from the Asian continent. It seems, however, that later they were not extensively used in the Mediterranean. The drawings on rocks in the Maritime Alps and North Italian Alps illustrate a number of ards without soles, however, they do not clearly show, whether they are implements of this type or of the stilt type. The Etruscan sculpture of tilling with an ard with a natural grown ard head from Arezzo from the middle of the 1st millenary BC (H-BD ph. 14) can be considered as the only sure document of a tilling implement of the type with a beam ard head from the region of the Mediterranean.

A special kind of tilling implement, consisting only of a coulter, a straight beam with one stilt - "ristle" - corresponds by its total composition with this type. It is known from the regions of the Eastern Alps (OB 2:6, KH 10), from the Iberian Peninsula (DJ 6:a) and from Scandinavia (LP 54, JR 1938-16). The local names for this implement (Slovin. "rezalnica", Germ. "riise", Port. "seitorio", Sw. "rist"), express its function, which is the cutting up of the soil before the actual ploughing. By its historical development, it, however, differs from the ard proper and its origin is not earlier than the Celtic invention of the coultor.

The same function was fulfilled by the implement which has, in place of the coulter, an asymmetrical share (soshnik) with its cutting edge turned in the direction of the ploughing and fixed to the handle of the single fork sokha with draught
poles. Typologically, however, this implement must be considered an adaptation of the sokha, which will be dealt with later. It has been found in Finland (FJ 64:b) and in Soviet Karelia (FJ 73:a).

The task of the implement with a straight beam and fixed ard head from Northern Spain with the local names of "cambela" and "cambiecha" - León, Asturia (H-BD 92, 93) was also to pre-cut the furrow (at the same time slightly loosening the cut soil).

The actual representatives of the type with the beam ard head are, however, the Slav ards with a straight or even at the back upward curved beams, with one or two stilts anchored into the beam. The ard head of most of the Ukrainian and Polish ards of this type (Ukrainian "kopist", Polish "rylec", Czech "sloupek") is flattened, the symmetrical share is fixed to it with the aid of a socket or sleeve. Ards of this type have been found in the Ukraine - Niezhin and Priluki, Vasilkov, Zhukin, Staroselje, Novoselki (LP 91, MK 126, MVS 8-11), in Volynia - Horodok, Bobiy, Rovno (FE 16, MK 125, 129), in the Polish Mazowsze - Wysokie Mazowieckie, Koszelanka (FE 17, MK 127) and in Czechoslovakia - the Valachian hook from South-East Moravia (fig. 6). This Western direction branches off from Volynia also to the North, to the White Russian Polesie (FJ 35:a, b) and ends in Finland (HH 1, VK 18). The whole of this extensive and continuous region of East European ards is isolated from the tilling implements, whose working part of the construction passes through the curved beam. Only in Finland does the ard with the beam ard head meet with a different form of ard with a passing through stilt.

7) We also find traces of the ard without sole in the territory of the Southern Slavs in the Slovin cultivating implements (for drilling around and digging out potatoes) in the form of an ard with a naturally grown beam ard head, with two stilts and a large roof-shaped symmetrical share (OB 2: 3, 4).
VIII. The type with the forked working part. To the North and East of the territory of the previous type with a beam ard head there is an extensive region of implements whose part carrying the working points, is forked and flat, the so-called "sokhas". Initially the sokha served in wooded regions for the loosening of the soil after burning down the forest and mainly for putting the seeds into the soil between the tree stumps, amongst the roots and stones. For this kind of cultivation complete and deeper turning of the soil was harmful and therefore undesirable. A lengthwise symmetrical and light implement was therefore more suitable, as the tiller often had to lift it during his work. For this reason preference was also given to horizontal handles placed crosswise to the direction of the tillage. The forked working part of the sokha gradually settled for two forks (teeth).

The changing production system and as a result of this also the changed requirements concerning the type of ploughing also changed the original sokha into an asymmetrical implement, i.e., in two ways: in the North-East region of the sokha an asymmetry was gained by a "small shovel", to the South of the Niemen and to the West of the upper and central Dnieper with the aid of concave asymmetrical wings, the so-called "policas". The narrow sokha shares became also asymmetrical both as to their shape and mutual position. To make the implements as light as possible ligatures were usually used.

In agreement with the two constructions of the tilling body of the sokha - "shovel" and "wing" (polica) - we also meet two different constructions of the implements. While the shovel sokhas have draught poles in place of beam, usually fixed to the handles, the wing (polica) sokhas have a similar construction as some ards of the type with the beam ard head, or their beam is very much shortened and extended by draught poles. Both these groups of sokhas, the shovel and the wing type, as well as the original symmetrical Sokhas will be included in the type with the forked working part.
The oldest known documents of the construction of the sokha, i.e. a two forked sokha, are two illustrations of tillage from manuscripts from the 16th century (FJ 74:a, b). We can also consider as another document of the age of the tilling implement with a forked working part the schematic sketch on a building stone from Pliska, dated to the 10th century AD (SS 2).

Recent symmetrical double-forked sokhas were found in Finland - Nilsia (LP pl. 8: a, FJ 64: a, b), single-forked from Latvia (FJ 60: c) and a symmetrical sokha with three forks from Archangelsk and Kostroma (FJ 73: b).

The double-forked shovel sokha with draught poles had its domain in Great Russia - Tambov, Novgorod, Vjatka (LP 61, 62, MVS 28. LP 55). It was also extensively used in White Russia (LP 83), in Estonia (FJ 62: b) more rarely also with a beam and stilts (FJ 62: a), in the pure form again in Latvia (LP 75, FJ 60: a), in Lithuania (FE 11, 12, FJ 60: b), in East Prussia (FJ 57: a, b), and in West Siberia - Nizhni Novgorod (LP 68). The gradual perfection of the tilling body into a ploughing body, with a cylindrical share, mouldboard elongated into a wing and with a coulter, resulted in the Great Russian "kosulya" - Kostroma, Jaroslavl (LP 55, 60) and similar ploughs with the construction of the sokha and draught poles which could be found in Siberia, Jakutsk, Tobolsk, (LP 69, 72, 73). By the development of the ploughing body the sokha of this kind lost its forked shape, in the same way as the single-forked right-sided sokha with draught poles from Lithuania (LP 76).

The group of double-forked wing sokhas is represented in the Northern Ukraine - Czernigov, Kamenj Kashirskiy, Staroselje (LP 84, FE 6, MVS 14), in South East Poland and in the South of White Russia (FE 1, 10), in Mazowsze (FE 2, 3, 5), in East Prussia (LP 27) and in Lithuania (FE 7, 8, 9). Single-forked sokhas of the wing group are known from the White Russian Polesije, both with draught poles (FE 55: a) and with a beam (FE 55: b, c) further from Mazowsze (FE 4).
and in Lithuania (LP 77).

IX. The sole type. Illustrations on the hieroglyphic tablets from Crete show us further ancient constructions of tilling implements, characterized by a long horizontal sole and curved beam (fig. 1: a, b, c; 2). A small sculpture from Cyprus, also from the 2nd millennium BC represents a tilling scene with two ards of similar construction, as is illustrated in fig 1: a with the difference that both ards from Cyprus have a straight beam (H-BD ph. 12). A much younger Grecian sculpture (from the 7th century BC) represents a tiller with an ard of the same construction, but again with a curved beam (LP pl. 9). Further documents of the Old Grecian ards of a similar construction are only slightly younger (LP 92 - 95). The tilling wedge of all these ards is carried by a quite independent sole, to which a straight or curved beam and a single vertical stilt are added.

This type of construction will be called the "sole type"; we shall, however, differentiate it from the type, whose working part of the construction is also a sole, but formed by a stilt, bent at the bottom (stilt sole) or passing through the beam (beam sole). From the Cretian illustrations of ards only the construction marked in fig. 1 by the letter "a" corresponds to this type. The other constructions of ards from Crete (fig. 1: b, c; 2) must be considered as varieties, differing from the sole type proper by a different arrangement of the stilt and in fig. 2 also by the beam placed with its base next to the heel of the sole. These will be dealt with later.

But not even the sole type proper appears in a single standard form. The ards of this type show, besides the different shape of the beam, also other construction differences. Usually a share with the socket in a horizontal position is placed on their soles. However, in those regions where the sole type is or was near to the type with the beam sole, arrow-shaped shares with a thin tang could also be found. It seems that the fixing of the share with a flat wooden shaft to the construction of the implement in the ard with a forecarriage from South
Bohemia "nékolesník" and the related Mecklenburg ard was to a certain extent influenced by the type with the beam-sole.

The territory of the sole type proper tilling implement can be divided into three regions. The first extends along the shores of the Mediterranean from Cyprus to Greece, from where there are documents also from more recent times (ChH 1903-6, H-BD ph.33 and ChH 1903-6, 7, 10, LP 115, pl. 13, H-BD ph.32), from the 2nd to the 3rd century AD there are documents from Anatolia (H-BD ph. 11) and from the 11th century from Byzantium (FL 26), from the Roman times from Thrakia (VŽN 12), in recent times further across Bulgaria - Ímitlija (OJ VII: 2) and Albania - Stevaster (NF 87: D). On the territory of Italy ards of the sole type have been used since the Primeval and the classical ages (3PV 1954-6, LP 97, 99, pl. 10, H-BD ph.7, ph.22), in the Middle Ages in the region of the Eastern Alps (PZ 13) and in Italy also recently - Apulia, Campagnia, Toskana(LP 158, SP 262, 268, 269) and also in Malta (H-BD 99).

In the territory of Tunis the sole type could already be found on the Punian coins (H-BD ph. 18, 19) it has, however, also been found there still recently (ChH 1902 - 16, 18, LP 191), as also in Algeria (H-BD ph.30, 31). It has also been used in Balearas (ChH 1912-89) and in Spain - Andalusia, Malaga (ChH 1912 - 88, H-BD 39), - Asturia, León (LP 175) - Catalania, Gerona (LP 180). In France the sole type proper has been documented only by a miniature painting from the 7th century AD - Tours (H-BD ph.36).

Another region of the sole type tilling implements extends along the Asian continent and passes across the Caucasus to the Ukraine and from there it projects towards the West only with implements of the modified sole type. A sole type proper has been documented in Mesopotamia from the first millenary BC (LP 104) and in North West Pakistan from the first centuries AD (LP pl. 17: a). Recent documents of this type also come from Pakistan - Kaiber (H-BD ph.40), Iran - Hamadan (H-BD ph.34, 35), Afghanistan - Nuristan (LW 10) and from India - Ranchi, Chutia Nagpur (LP 221, 222). From Anatolia
there exists a document from the beginning of our era (H-BD ph. 11) and not long ago implements of this type could be found in Palestine (ChH 1506-1), in Kurdistan (LP 202), Armenia - Erzerum (LP 213), Dagestan (ChH 1906 - 4, LP 203 - 206, NS 2) and Georgia - Achalciche (LP 212). And finally the Ukraine is proved to have this type by a peak bog ard from the first millenary BC - Tokari (BDT 1), Polesie and Sergieiev (ShB 1, 2, 3, p. 92).

In the third region of the sole type proper there occurred only primeval peak bog ards found on the territory of today's Poland - Papowo, Wiewiorky (GPV 1951 - 18, 21), Northern Germany - Walle, Dabergotz with an arrow-shaped share (GPV 151-15, 16), Denmark - Hvoreslev, Vebbestrup, Sejbaek, Nysum (GPV 1951 7, 9 - 10, 11, 12, 14) and finally ards proved by rock-carvings in Sweden - Listleby, Fintorp I (GPV 1951 - 23, 26).

The schematic drawing on one of the hieroglyphic tablets from Crete (fig.2) gives the impression that the beam of the ard in the drawing was at the back reversly turned and parallely attached to the sole heel with this part. The profile of this implement otherwise fully corresponds with the sole type. The ard of the sole type illustrated on an Old Greecian goblet (LP 94) probably shows a similar detail.

A similar method of joining the beam can also be found in the Persian ard of the sole type with a handrail like stilt (LP 216). In the most Southern part of Azerbajdzjan an ard with a gently arched sole, whose stilt is also handrail like, has been found. Its straight beam is cranked in the place where it is joined to the sole - Talish (LP 215). In the North West Ukraine an ard of the sole type with a cranked beam attached to the sole - Petrycze (MK 123) was also used. Typologically and genetically related to this is the already previously mentioned South Bohemian ard with a forecarriage characterized by a thrice bent beam attached to the sole (fig.7). (Compare Šach 1962, pp.229-230, footnote 27). This is a very old relic which no doubt has its example in the attachment of the beam to the two-stilt ard with ligatures in the place of the connection of both the stilts, as could be seen in the Babylo-
Fig. 7 - South Bohemian "nákolesník" from Stachy, distr. Prachatice. (From the collections of the Agricultural museum in Kačina)

Kind: ard with sole, oblique position of the tilling wedge, single stilt and forecarriage.

Type: sole type influenced by type with beam sole.

Group: triangular construction, arched beam parallelly attached to the heel of the sole, exchangable sole.

Fig. 8 - Transition of the triangular construction into the quadrangular one on the stilt sole type

Fig. 9 - Transition of the triangular construction into the quadrangular one on the sole type.
nian sowing stilt type ard (SH 33) and in the Old Egyptian ard with a stilt sole (H-BD ph.5). The modern Egyptian ard also has a straight beam analogically attached to the heel of the stilt sole with the aid of iron bands (LP 152). The parallelly attached beam, however, also appears on more recent tilling implements of the stilt sole type, as e.g. the Asia Minor ard from Phrygia (LP 200), the South Russian saban (MK 151:LP 63) and to a certain extent also the Ukrainian plough (GJA 4, 8, 9 : MVS 18).

To the West of the region where the above mentioned tilling implements of the sole type with parallelly attached beam could be found, the author knows only about two similar cases i.e. the ard from Algeria (LP 169) and the plough from Southern France of the same type (as far as it can be ascertained according to the not too clear drawing of Chevalier), however, with a strongly bent backwards stilt (ChH 1909, 22).

The Cretian hieroglyphic sign, noticeable in fig 1: a, also represents an ard of the sole type, however, mixed with the type of the passing through stilt, as can be seen from its strongly backwards bent stilt passing through the bent beam, but anchored in the sole. This construction was clearly not very successful in its further development, as we encounter it only rarely in more modern times. As far as it can be ascertained from the small photographic reproduction an ard of the sole type with a similar backwards bent stilt was also pictured on a Roman coin (H-BD ph.21). Two recent ards of the sole type from South Italy and Sicily have a similar construction of the stilt (ChH 1503 - 17, 16). The first one of those with a straight beam, mortised into the lower part of the stilt remind us already to a great extent of the quadrangular construction. Two ards of the sole type from South and Central France show already noticeable characteristics of the type with the passing-through stilt - Rhône, Montflugon and Mende (ChH 1909 - 2, 9). These characteristics are a strongly backwards bent stilt, in the second ard even holding a rod-like share. To this group also belongs the North German
ard of the sole type, known as the "Mecklenburg ard" (SF 1963 - 32). An ard of the same form has also been found in the Yugoslav Phorje, the so called "kavej" (UT 1).

The fastening of the vertical stilt to the ard of the sole type proper often causes difficulties, especially if the stilt was supposed to be mortised into the low sole. When inclining the implement to one side this kind of stilt could easily break. That is why the heel of the sole is raised in such a way that the attached stilt could find an as long as possible support, e.g. in Pakistan, Kaiber (H-BD ph. 40). In the whole of the Mediterranean there appears on the heel of the sole of the ard of this type a short naturally growing-upwards branch, to which the stilt is attached or tied by its lower part, e.g. Greece - Sparta, Polopones (LP 13, 115), Albania - Stevaster (NF 67: d); in the Iberian Peninsula the stilt is usually attached to the sole in such a way as to create a composed stilt sole. This type can further be found in Spain - Gerona (LP 180), in Portugal (DJ 57) and in France -- Haute Loire (LP 155). Now we are witnessing a gradual transition of the sole type to the type with a stilt sole. This transition is, of course, secondary and does not mean that the type with the stilt sole was a direct continuation of the sole type ard.

Another large and significant group of one part of the tilling implements with a quadrangular construction, extended all over the European region of the mouldboard plough also belong to the sole type. It is described in greater detail in the chapter on the influence of the attachment of the beam to the construction of the implement.

We also have to mention the construction of the ard from the Cretian tablet, illustrated in fig.1 sub b. The primitive drawing does not make it possible to decide whether this is really a stilt mounted on the back of the beam, and still less if the beam is mounted on the cleaved back of the sole. This variety can quite frequently be found in Central and Southern
Schemas and names of the types of the pre-industrial tilling implements

I  Stilt type
   Ручковый тип
   Type de mancheron
   Sterzttyp

II Stilt ard head type
   Ручко-копистовый тип
   Type de manche-sep oblique
   Sterzacharbaumtyp

III Stilt sole type
   Ручко-полозный тип
   Type de manche-sep horizontal
   Sterzsohlentyp

IV Passing through stilt type
   Тип с проходящей ручкой
   Type de manche traversant
   Typ mit durchgehendem Sterz

+ The nomenclature of the nine types as well as the names of the groups of the tilling implements mentioned in this proposal are to be considered as auxiliary ones only with the aim to distinguish the main characteristics of the construction. It will be the task for the national experts to determine on the right equivalents of these names.
Schemas and names of the types of the pre-industrial tilling implements

V Passing through stilt sole type
Тип с проходящим ручковым полозом
Type de manche-sep horizontal traversant
Тyp mit durchgehender Sterzsohle

VI Beam sole type
Грядильно-половной тип
Type de timon-sep horizontal
Grindelsohlentyp

VII Beam ard head type
Грядильно-копистовый тип
Type de timon-sep oblique
Grindelscharbaumtyp

VIII Type with the forked working part (sokhas)
Рассошный тип /сокхи/
Type de sep oblique fourchu (sokhas)
Typ mit dem gegabelten Scharbaum (Zochen)

IX Sole type
Половой тип
Type de dental
Sohlentyp
Italy, where today the beam sole type proper is missing, whose influence, however, can be noticed in this construction - surroundings of Rome, Viterbo, Brindisi, South Apulia and South Sardinia (ChH 1903 - 19, LP 157, 159, SP 261). All the same, from the point of view of the character of the working part in the construction — in this case the sole — it is necessary to include also this variety in the sole type. We can find the same construction with the beam mortised into the heel of the sole and with one stilt mounted on the beam in the Estonian ard (HH 6). The handle of the stilt is made of a strong rod leading to the beam and extending beyond the upper end of the stilt, as is the case in the double forked polica sokhas. This ard also has those draught poles which some of the sokhas have.

By the above mentioned nine constructional types we have exhausted all the possibilities of attaching the parts carrying the ploughing wedge to the construction of the tilling implement. However, the influence of the other parts of the tilling implements than the working parts of the construction on the character and profile of the whole implement also has to be taken into consideration.

SECONDARY CRITERIA FOR THE TYPOLOGICAL CLASSIFICATION OF TILLING IMPLEMENTS

Some parts of the tilling implements have a shape, position and method of attachment to the construction of the implement which are so characteristic that even if they are transferred to implements of another type, they reveal the influence of the type where they originated. This we found e.g. in the very labile sole type. It is clear that if we choose other criteria than the working part of the construction we obtain different categories of the implements, than the ones we just determined in the form of the nine types.
However, we do not want to do away with the typological system which we just established. Therefore, when evaluating the implements from a secondary aspect we shall classify the implements of numerous types with a common secondary sign into so called groups, we shall, however, maintain their appurtenance to a certain constructional type.

1. Beam.—Although the shape of the beam cannot in itself create a certain type of implement, the beam appears in some cases almost exclusively only in one shape, as is the case in the type with the passing through stilt, with the passing through stilt sole as well as in the type with the beam sole. A beam, which at its base is strongly bent earthwards puts these tree types into one large group. In all the other types the shape of the beam is labile. However, sometimes they have within the framework of one or more types the traditional shape of the beam, as is the case of the Croatian tilling implements having a crooked beam with a distinctive fracture in front of the sheat (B3 9, 15, 16, 20, 21), or in the South-Bohemian ard with a forecarriage (nákolesník) with a three times deflected beam parallelly attached to the sole (fig.7). Similar groups found either inside one or more types are usually based on the local tradition and are therefore important for the cultural history.

Special attention, however, must be paid to the method of attachment of the beam to the construction of the implement in the tilling implement with the sheat, belonging to the type with a stilt sole and to the sole type. If the straight or crooked beam is mortised into the sole or attached to it by its parallel base, it creates, together with the sole and the sheat in both the mentioned types, a construction of a triangular construction. If, however, the straight or only slightly crooked beam leaves the sole and passes by its rear end through the stilt, the construction of the implement will be quadrangular. We therefore encounter here two main groups of implements with the sole and the
sheaf: the group with a triangolar construction and with a quadrangular construction. Haberlandt (1933, p.29) critizised Leser that he used the rather inexact term of Müller (1902) - "four sided plough" (vierseitiger Pflug) and recommended to maintain the term of "frame plough" (Rahmenpflug), which allegedly also clearly explains the construction of the implement. This term is today used by the Polish school of Moszyński. It is necessary that the names of these two important groups be clarified and that a uniform nomenclature be used. On the whole there is no doubt about the name of the first group of tilling implements with a sole and sheaf, whose beam is attached to the sole. These are tilling implements with a triangular construction, or in short -- triangular tilling implements. It must, however, be decided whether to call the second group of tilling implements quadrangular or frame construction. I suggest that this group should be called tilling implements with a quadrangular construction, for the following reasons:

1) It is more logical to use for both basic groups of tilling implements terms of the same category - tilling implements with a triangular or quadrangular construction.

2) The technical term "frame" does not have a geometrical meaning and does not mean only quadrangular frame.

3) It would be more suitable to reserve the term "frame" (chassis) for a construction, to which the ploughing bodies of multishare tilling implements are attached.

In my article I shall therefore use the term tilling implements of the quadrangular construction or quadrangular tilling implements, as compared with the triangular construction, belonging to various types.

The transition of the triangular construction into the quadrangular construction can securely be proved for some til-
ling implements of the type with a stilt sole (fig. 8). So e.g. in the East European ploughs with a double stilt sole the beam in its original state is parallelly attached to the heel of the sole by its base bent in the opposite direction—"saban" from Southern Russia (MK 151). The Ukrainian plough from the Kanjev district (MVS 16) whose beam still shows in its base the characteristic bend like the saban, is already mortised into the left stilt above the bend where the stilt naturally changed into the sole. The plough with the double stilt sole from Staroselje (MVS 15) has already a clearly developed quadrangular construction, created by the left stilt sole, the beam and the sheat. The origin of the same form can also be noticed in the ard with a single stilt sole from Podolje (MVS 21). The transition of the triangular construction into the quadrangular construction can be noticed in Yugoslavia, both in the ards of the type with the single stilt sole from the island of Krk and from Seget (BB 9, 8) and the ploughs with the double stilt sole from Vučipolje, Ivanjski, Miljevci and from Imbriovce (BB 16, 27, 22). The triangular and quadrangular construction in tilling implements of the type with a stilt sole can also be found in the territory of Rumania (LP t. 14), transitory forms are known from Bulgaria—St. Nikola, Devedere (VCh 10: 1, 3), as well as from Albania—Central Albania, Stevastar, Skutari (NF 57: c, d, e) and further across Yugoslavia also from North East Italy (SP 266, 264). A transitory state can also be found in Calabria and Sicily (SP 253), but also in Portugal (H-BD 87, 36) and in North East Spain (H-BD 91). All the above mentioned tilling implements of the type with a stilt sole show the transition of the group with a triangular construction into the group with a quadrangular construction.

Theoretically it is possible to deduct the construction of the similar form also from the implements of the sole type. In the South of Italy there were also the transitional states of the ard of the sole type whose straight beam passes by its
base through the lower end of the vertical stilt. In this way the construction in the form of a low and narrow quadrangle with a very short vertical rear is created above the separate sole, which could be found everywhere on the mainland of Southern Italy and in Northern and Central Toscana (SP 268, 269), (fig. 9). Nowhere in the vicinity of the occurrence of this form of ard, however, do we find the more mature quadrangular construction; its development was arrested here right from the start.

In the region of the Caucasus we can find, amongst the tilling implements of the triangular construction of the sole type, implements with an arched beam, whose rear end passes through the lower part of the vertical stilt almost next to the sole - Georgia, Achalciche (LP 210, 212). They can, however, also belong to the tilling implements of the sole type with a developed quadrangular construction, which we find in their vicinity, and differ from them only by a more expressively arched beam, which because of its shape must be supported in the stilt as far down as possible. A clearly transitional form was also found in Iran-Choramabad (H-BD ph.35), which arose by the attaching of the straight beam to the lower part of the vertical stilt just above the heel of the sole in the ard of the sole type. Almost quadrangular ards of the sole type, characterized also by a special construction of the stilt, could also be found in Armenia - Erzerurn (LP 213). We can, therefore, presume that also in the tilling implements of the sole type the quadrangular construction of the ards developed from the triangular construction.

The implements with the quadrangular construction, belonging both to the type with the stilt sole and the sole type, cannot compete as to their age, with the tilling implements with a triangular construction. The oldest witness of a quadrangular tilling implement is a drawing on a building stone in Vliska in Northern Bulgaria, from the first half of the 10th century, picturing an ard of the type with a stilt sole (SS 1493 - 2:3) and the illustration in the Anglo-Saxon manuscript from the end of the 10th century, representing a two
Fig. 10 - West-Moravian "rádlo" from Grešlové Mýto, distr. Třebíč (From open air).
Kind*: single stilt ard with sole, oblique position of the tilling wedge, forecarriage.
Type: sole type.
Group: quadrangular construction with forward leaning sheat, straight beam, high sole.

Fig. 11 - Central-Bohemian "rádlo" from Vlašim, distr. Benešov. (From the collections of the Agricultural museum in Kačina).
Kind*: single stilt ard with sole, oblique position of the tilling wedge, forecarriage.
Type: sole type.
Group: quadrangular construction with forwards leaning sheat, straight beam, high sole.
sided plough ard with a shifting mouldboard, whose forked stilt was probably mortised into a separate sole (PFG 1946 - pl. 10).6)

The group of quadrangular ploughing implements of the type with a stilt sole as well as with a separate sole concluded its development already in the Middle Ages. The ridge plough (mouldboard plough) were almost exclusively constructed in this form as soon as the asymmetry was achieved. The territorial boundaries of the quadrangular tilling implement, therefore, correspond with the region of the ridge plough, reaching from the Caucasus and South Urals roughly to the West towards Central and North West Europe, with projections in the Northern part of the Balkan and in the Western part of the Iberian Peninsula. In the Caucasus there were only tilling implements of the sole type with a quadrangular construction - Georgia, Caucasus. Achalciche, Azerbajdzhan (footnote 4)(LP 206, 210, 211, 212, 214), Dagestan - Kudiab-roso (NSh-4). In the Ukraine there were both quadrangular tilling implements with stilt sole - Staroselje (MVS 15) and the so called Ukrainian plough (GJA 4, 8, 9), and the sole type - Galicia (LP 81), on the territory of Poland also with a stilt sole - Cisów, Bochotnica, Rawa Mazowska (MK 134, 135, 146) as well as with a separate sole - Odrowąż, Klic, Stodoły, Opatów (FE 13, 20, 26, 30, 31). On the territory of Czechoslovakia with the exception of the mountainous regions

6) In the illustration of a two-sided ploughard from the Anglo-Saxon calendar from the end of the 10th century, exact as far as the suspension of the coulter and the equipment for the shifting of the mouldboard is concerned, a forked stilt is depicted in such a way, as if it naturally passed into a sole. It is, however, very improbable that a similar piece could be naturally grown in such a way as it is shown in the illustration. A.Steensberg (1936 a, p.262) is of the same opinion and he, therefore, remarks that probably one stilt was attached to the second. I consider it more probable that the forked stilt was naturally grown, that it was, however, mortised into a separate sole.
Fig. 12 - "Radélko" probably from the vicinity of Brno. (From the collections of the Ethnographical institute of the Moravian museum in Brno).  
**Kind**: drillplough with two mouldboards and two stilts, wheelfoot (right mouldboard and wheelfoot demounted), oblique position of the tilling wedge  
**Type**: sole type.  
**Group**: quadrangular construction, stilts from the beam with back standard, straight beam, high sole.

Fig. 13 - "Radýlko" from the vicinity of Plzeň. (From the collections of the West-Bohemian museum in Plzeň).  
**Kind**: drillplough with two adjustable mouldboards, oblique position of the tilling wedge, two stilts and fore-carriage.  
**Type**: sole type.  
**Group**: quadrangular construction, frame-stilts and straight beam, high sole.
tilling implements with a quadrangular construction were generally used. They could be found in the type with the stilt sole (there only exist documents on ploughs with two stilts), in Slovakia, in Southern Moravia and in a dying out form in Southern Bohemia (fig. 4, 5 and SF 1563 - 18, 20). Prevalent in the recent implements of Czechoslovakia, however, is the quadrangular construction of the sole type. It is clearly noticeable in a mural painting from Western Bohemia already from the 14th century (SF 1963-37). The same construction can be found in the single stilt ards from Slovakia (SF 1963-38), from West Moravia (fig.1C) and from Central Bohemia (fig.11), drill ploughs from Slovakia (SF 1963-41), from Moravia (fig. 12) and from Bohemia (fig.13), two sided plough ards with a shifting mouldboard from Slovakia (fig.14), Slovak ridge ploughs (SF 1963-45, 46), ridge ploughs from Moravia (fig.16), as well as from Bohemia (fig.15). Quadrangular ploughing implements with a stilt sole (LP pl.14) as well as with a separate sole - Bukurest (LP 126) were found in Rumania; in Bulgaria there were quadrangular ards as well as ploughs with a stilt sole - Nove Selo, Kolojanovo, Osman Pazar, Arnaoutlar - (MK 136, VCh 11: 1, 2, 3) as well as the sole type - Kostandovo, Kurilo, Shejtani, Kostinbrod, North West Bulgaria (MK 137, VCh 2: 2, 3: 2, 5: 1), in Macedonia were only quadrangular ards with a stilt sole (PL 120, 126), in Albania tilling implements of the same group from Dushl and from Skutari (NF 67: a, e) and also with a separate sole - Medua, Sapachi, Apripa (NF 87: b, h, i), in Yugoslavia ards as well as ploughs of the quadrangular type with a stilt sole - Pašman, Seget, Praputnjak, Kras, Jakelići and Miljevci, Babina Greda, Golubinci, Podter (BB 5, 8, 11, 13, 14 A-B, 23, 26, 28, OB IV 6) as well as the quadrangular sole type - Serbia, Ovšarevo, Pristava-Veternik, Jezersko (MK 135, BB 10 a, 80 - 82, OB 1), quadrangular tilling implements with a stilt sole in Italy - Brescia from the 16th century, more recently in Lombardy and Ligury, North East Italy, Umbria (GA Be 2, SP 264, 266, 267), in Austria quadrangular with a stilt sole - Prăbach, Preding (KH 17, 14) as well as with a separa-
Fig. 14 - East-Slovak "horník" from Holcmanovce, distr. Prešov.  
(From the collections of the Agricultural museum in Kačina)  
Kind: two-sided plough-ard with vertical shifting mouldboard, horizontal mounted symmetrical share, coulter (springbar missing), two handles and forecarriage.  
Type: sole type.  
Group: quadrangular construction, forked stilt, straight beam, narrow sole.

Fig. 15 - Central-Bohemian "pluň" from Plaňany, distr. Kolín.  
(From the collections of the Agricultural museum in Kačina)  
Kind: Plough proper with two stilts, vertical mouldboard, fenboard, horizontal share and forecarriage.  
Type: sole type.  
Group: quadrangular construction with forwards leaning sheet, straight beam, trapezium-shaped sole.
te sole - Gurktal, Gmünd, Perchau, Krakaudorf, Gössnitz (RK 2: 7, 10 a, KH 7, 8, 12). Quadrangular tilling implements of the sole type existed in Switzerland - Visperterminen, Vel- leart, Schötz, Graubünden (LP 145, 148, 149, SP 270), as well as in Germany, where we have a document coming from the 12th century (LP 20) and from very recent times a plough from Thüringen (SF 1963 - 49) also from Göllheim, Pelm, Braunschweig, Lüneburg (LP 6, 11, 14, 15), Hohenheim (SF 1963-50). Also in Belgium there were only sole type quadrangular tilling implements - the Belgian rouelle, Hoogkammer, Hennegau, Doornik - Kortryk, Woorde (LP 33, 34, 35, 36,38); in France the quadrangular plough with a stilt sole could be found in its initial development stage only at the extreme North West - Quimperlé (ChH 1909-46), the quadrangular sole plough comes from Arden and Sologne (ChH 1909 - 39: B, H-BD 65), in the North Western corner of Spain only a germinal quadrangular ard with a stilt sole from Orense (H-BD 91) is known. Quadrangular ards with a stilt sole (ChH 1912-99, H-BD 95) as well as with a separate sole (DJ 18) have been mentioned from Portugal. Only sole type quadrangular tilling implements are known from Great Britain - Hebrides, Wales? Hardfordshire (LP 40-41, PFG 1948-4, H-BD 160), as well as from Holland - Rijnsburg (PJ 1950-12), Alkmar, Wieringer Oudheidkamer (PJ 1962 - 1, 2), Denmark - Tommerby from the first millenary BC (SA 1936 a 2-5), from Southern Denmark from the beginning of the 14th century (SA 1936 a -12) and from more recent times - Mors, Sjaelland, Viborg, Gassum (SA 1936-1, MP 1958 - 7 - 10, MP 1959 - 111, 112).

Braungart (1912 fig. 265) mentions as the only document of a plough of a quadrangular construction of the type with a stilt sole from the territory of Germany a reproduction of the Nuremberg painter Barthel Beham from the year 1532 representing an allegoric ploughing scene. Braungart proclaimed that the quadrangular plough with a stilt sole and with a slightly forwards leaning sheaf illustrated here is Frankish. Beham, whose family came from Bohemia, studied in Italy. His plough is very similar to the plough from Brescia, also published in the 16th century (GA Be 2).
Fig.16 - "Pluh" from Slavíkovice near Brno. Original plough with which the emperor Joseph II tilled in 1769. (From the collection of the Ethnographical institute of the Moravian museum in Brno).

Kind: plough proper with two stilts, vertical mouldboard, horizontal share, deepening iron-tige and forecarriage (coulter missing).

Type: sole type.

Group: quadrangular construction with forwards leaning sheat, straight beam, trapezium-shaped sole.
In this connection it is necessary to mention the tilling implements of the group of the quadrangular construction of the type with the stilt sole, which, although maintaining their quadrangular form, change into the sole type. Niederle (1919 – I – p.352) found in Šumice in Moravia a quadrangular plough with a double stilt sole, coming from the 18th century; at the same time he also discovered two local names of the quadrangular plough "hladák" (i.e. smooth plough) for the type with the stilt sole and "dlabák" (i.e. a chiselled plough) for the sole type. It can be presumed that the people in Šumice used and produced ploughs of both types, both the plough with "smooth" stilts, changing into a sole, and the plough with stilts mortised into notches in the sole. Vyzharova (1956, p.6) found that besides the current quadrangular ard with a stilt sole "the Bulgarian farmers still in the 20th century, when producing quadrangular ards, made the stilt also from a separate piece of wood mortised into the sole". In Yugoslavia...

10) In the recent Danish ploughs we can always find a narrow, most often iron sole with a special attachment of the left or the single stilt. In those cases where the sole is still made of wood it sometimes forms together with the sheath one naturally grown piece – Boeslum (MP 1959 – 113), as is the case in the peat bog plough from Tommerby and some Polish ards. The left or single stilt is usually naturally bent at its lower end and screwed on by the bent bottom to the sole, similarly as in the plough from Southern Bohemia, Styria and Croatia. It is necessary to mention the illustration from the Danish church in Oxendrup from the end of the 15th century (SA 1936a-16). It is the only known document of a plough of a quadrangular construction of the stilt sole type in Jutland. A left stilt placed next to the heel of the narrow sole was also found in the Swedish Bohuslän (JR 1958-6). R.Jirlow pointed out (1958 p. 128) that this method of the attachment of the left stilt to the sole was older and extended along the shores of the North Sea. Even in Sweden occurred an implement with a pure stilt sole type. It therefore poses the question if the attachment of the left stilt in Jutland and Scandinavia did not have its source in the tilling implement of the stilt sole type previously predominant.
via the ordinary quadrangular ard with only a stilt sole was used, in spite of that, that there developed in Yugoslavia a quadrangular ard with an oblique and flat holder of the share (daska), which has a separate sole.

We can therefore presume that with the quadrangular tilling implement of the type with the stilt sole there arose spontaneously also the quadrangular implement of the sole type, if there occurred difficulties with the supply of natural wood of a suitable shape for the stilt sole. Such a transition from one type to another, even if of quite different constructions, was easily possible, as long as the style of implement and the method of work with this implement did not change.

The quadrangular construction can also be found in the implement of the type with a beam ard head. It did not arise from the changed position of the beam, as was the case with the tilling implements of the previous quadrangular groups, and they actually should not be mentioned in this chapter. However, we shall deal with them now because of their outward similarity with the quadrangular tilling implements of the type with the stilt sole, as well as the sole type. In the vicinity of Kijiv a quadrangular construction arose from the implement of the type with a beam ard head in a different way. The peg, originally fixing the ard head in the beam, was extended until it formed the back sheat and the ard head became a horizontal sole - Staroselje, Novoselki, Vasilkov, Trilpolje (MVS 9, 10, 11, MK 128, LP 87). At other times, in the same vicinity, another form of the beam ard head was so naturally bent that it formed a sole similar to the one passing through the stilt sole. The stilt was placed separately into the rear end of the beam - Bykovce, Niezhin and Priluki (MK 132, LP 88). However, the described constructions, as far as it is known, did not extend, but for a few exceptions - Kachetier (LP 209) to a greater territory. The quadrangle, created by the front and rear sheat, the sole and the beam, however, appeared again in the factory manufacture of an all iron
implement with a ploughing body and stilts fixed to the rear of the beam.

An analogous development of the construction in the form of a quadrangle can also be found in the Scandinavian tilling implements with one vertical stilt - Lier and Buskerud (SH 20) and also in some tilling implements with a bar stilt, characterized by its "front" and "rear sheet". Both sheets are extended above the beam and joined by a horizontal "handrail" - the Swedish Nord Jämtland and the Norwegian Molde (LP 48, 51). The Ukrainian ard from Niezhin and Friluki with the ard head turned into the sole has its opposite in Scandinavia in the Swedish ard with a bar stilt of the type with the beam sole (ES 48), which also has a quadrangular construction.

2. Stilt: - We already dealt with the influence of the shape and position of the stilt serving by its lower part for the mounting of the share. However, the stilt even if not taking a direct part in the tilling process, can give the implements of different constructional types certain common characteristics. So e.g. a single vertical stilt with a horizontal handle - we shall call it sole stilt - mortised into a narrow sole reveals the influence of the sole type. A forked stilt, proved already in the 10th century on the two-sided plough ard with a shifting moulboard (PFG 1945 pl.IX), is repeated in most ploughs of this kind, for which a narrow sole is suitable. In the tilling implements of another kind the forked stilt reveals the closeness of the mother implement.

In the East European ards with a beam ard head (MK 127, MVS 8, 9, 10, FJ J6: a) and their related police sokhas there appears a naturally grown stilt (or two stilts) in the elon-

11) The term bar ard or plough (Norwegian grindard - grindplog) was introduced by H. Stigum (1933 p.110), who justly compares the mentioned adjustment of the stilt for the easier handling of the tilling implement from the side, to a bar (small fence).
gation of the rear part of the beam. The handles in these beam stilts are adapted in a special way. A rod coming from the center of the beam and forming by its overtopping end the handle at the upper part of the stilt is fixed to the one or to the left stilt. A bent peg is usually tied at right angles to the right stilt serving as the second handle.

In Northern Europe the bar stilt is closely related to the triangular stilt, as it was called by Stigm (1933, p. 110). Its handle is formed by the rear overtopping end of the oblique rod fixed by its front end to the beam. We can find these on the ards with the passing through stilt sole - Euraäminne (SH 15), on the Baltic island Runø (SH 16), in the Estonian ard with a beam sole (HH 6), as well as on the Norwegian plough - Romedal (SH 27). The plough from the Shetland Islands of the type with the beam sole with a compound beam (PFG 1948, pl.VI) also has a triangular stilt. A similar construction also has the Swedish ristle (rist), whose stilt is, however, of a beam type, similar as in the ard with the beam ard head and in the polica sokhas (JR 1938 - 15).

A similar arrangement of the stilt as on the mentioned Scandinavian ards with bar stilt have those with parrallely attached beam from Iran, Armenia and Azerbajdzhan (LP 216, 213, 215). Their horizontal handrail, connecting the elongated sheet with the stilt, also serves to control the ard from the side. As compared to the Scandinavian bar stilts let us call these Asian stilts the handrail stilts. All the same, their mutual resemblance forces us to consider their genetic relationship.

The narrow sole of the Danish and British ploughs require a characteristic solution of the construction of the stilt. We already mentioned in remark 10 the left stilt of some of the Danish ploughs, which is placed next and tied with its lower bent part to the sole. The right stilt, for which there is no room on the sole, somehow "hangs in the air". It is supported by only a number of strong struts leading from the left stilt.
The right stilt, at the same time, has to carry on its outside the rear part of the mouldboard, which was nailed on to it - English manuscripts approximately from the years 1340 to 1380 (SA 1936a-13, 14). It was therefore necessary to alleviate and strengthen the right stilt. This was done in two ways: either a long, strong rod far overtopping backwards the straight and shortened right stilt, was led from the center of the beam or already from the sheat (as is the case in the triangular stilt) - Viborg, Boeslum, Wales? (MP 111, 113, PF3 1948-4), or a mast was anchored in the right stilt like a double-armed lever leading crosswise to the direction of the ploughing to the left stilt, on which it leans and which it overtops. If the tiller takes the left arm of the lever in his left hand and the handle of the left stilt in his right hand, he lifts the right stilt including the mouldboard (MP 67 - 69). We call this kind of right stilt the alleviated stilt with a lever.

Besides the already mentioned forked stilt, two stilts on a tilling implement with a narrow sole are also solved in another way. A standard carrying the beam is mortised to the sole of the quadrangular tilling implement and both the stilts are fixed to its lower part from the sides. A horizontal rough stave passes through (fig. 13) the upper part of the standard thus strengthening both the stilts. This a certain type of frame is created which we could call frame stilts or stilts with a central standard. Sometimes the stilts do not come out of the sole or the standard, but out of the middle of the beam and also lean on the rough stave passing through the extended standard carrying the beam (fig. 12). These could be called stilts from the beam with central standard.

3. Sheat. - This part of the tilling implement has not been mentioned in literature very often. In the oldest illustrations of tillage, the implements do not yet have any sheats. For the first time it appears on the Old Egyptian ard with a double stilt sole on a drawing coming from the period of the 12th Dynasty (LP 112). At that time probably a fixed sheat
was also used, besides the sheat in the form of the ligature, enabling a certain regulation of the depths of the furrow.
From the first millenary BC there exists a rock carving from Fintorp I near Bohuslän. Here the ard of the sole type has a crossbar from the beam to the neck of the sole (GPV 1951-26), which can represent a backward slanting sheat, but also an arrow-shaped share, which could be found in the peat bog ards from Dabergotz and from Tokari. Further proves of sheats appear only in the illustrations from the early historical period on tilling implements with a quadrangular construction (SS 1953-2: 3, PFG 1948 pl. IX) and since that time they appear already regularly. The sheat was originally used in tilling implements with a stilt sole or separate sole, characterised by a straight or slightly bent beam. The purpose was to strengthen the construction, both the triangular and the quadrangular, i.e. mainly to support the straight beam and to enable the regulation of the inclination of the beam and thus the depths of the furrow.
The third important function of the sheat is to ensure a balanced operation of the implement. This is obtained by transferring to the beam, near the harnessing point, part of the soil resistance acting on the ploughing body. This function is carried out more reliably by a forward leaning sheat. The sheat is, therefore, a very important part of the tilling implement, even without taking into account that in the implements with mouldboards, especially in the more recent types of ploughs, it also acts as the carrier of the ploughing wedge.

In almost all the Czechoslovak tilling implements with a quadrangular construction do we find strong, flat sheats, leaning with their upper end forwards. Only unimportant exceptions can be found, mainly in Slovakia, influenced by the mountainous twosided plough ard with the shifting mouldboard. The forward leaning sheat creates together with the vertical stilt or two stilts which are slightly bent backwards, with a relatively short sole and with the beam a trapezium with a longer upper base-line. This construction, in view of the
strength and stability of the operation of the implement is statically more balanced. By its position it is closest to the resultant force acting in the direction of the pull of the implement and the resistance of the soil. A slightly arched or straight beam was also strengthened, when it was supported by the sheat as far as possible from the stilt into which it was mortised (fig. 4, 5, 10, 11, 15, 16, and ŠF 1963-20, 38, 46, 47).

The geographical extension of the forward-leaning sheat on ploughs with a quadrangular construction corresponds with the whole Central and Eastern part of the European ridge plough. It reaches from the Caucasus and Ural up to the Bohemian Forest, the Eastern Alps and the Venetian lowlands. This extensive region roughly corresponds to the extension of the tilling implements of the type with the double stilt sole (compare the map of Bratanic of the extension of the ridge plough and some mixed transitional implements in Europe and Asia Minor) - (1954, map III.) A sheat leaning with its upper end backwards or vertical to the implements with a quadrangular construction can only rarely be found in this region. More often it can be found only in Poland and Bulgaria. In Poland a naturally grown piece of wood was used for the production of the backwards leaning sheat passing into the sole, which influenced the development of these implements was used for the quadrangular ards of the sole type (Frankowski 1929, p.16). The Polish ploughs with a long beam and without a forecarriage (pzuzyca) already had a forwards leaning sheat - Stodoły (FE 25, 27). Also in Bulgaria where the development of the construction of the local tilling implements was influenced by the imported ard with a beam sole and with a strongly backwards bent stilt, we encounter the forwards leaning sheat - Shejtani, Kostinbrod and North West Bulgaria (VCh 2: 2, 3: 2, 5: 1).

12) L. Kovács (1938 p. 228 and further) correctly pointed out the effect of the static moments, when the tilling implement proceeds through the soil, and the role of the sheat related to this.
In the continuation of the described territory, in which next to the quadrangular tilling implements with the stilt sole also currently appear quadrangular implements of the sole type and in both these implements the forwards leaning sheet is predominant, i.e. from the Eastern Alps and the Bohemian Forest to the North West, we find in the region of the ridge plough only tilling implements with a quadrangular construction of the sole type and with a sheet, which is exclusively in a backwards leaning or vertical position. Only between the Njemen and the Veser can we still find forwards leaning sheets - former East Prussia, Gdansk, Pommlitz in Saxon, Braunschweig (LP 14, 15, 16, 17, 18, 19), and rarely also in the Swedish ploughs with a bar stilt from Västmanland and in a unique document of a plough with a double stilt sole from Dalarna (JR 1958 - 10,11). This territory with the predominant occurrence of the forwards leaning sheet in Europe is noticeable in concurrence with the regions which at present or in the past was inhabited by Slavs. The forwards leaning sheet can therefore be considered as a construction element mainly used by the Slavs. In connection with the backwards leaning sheet in the North West of Europe there are also stilts (or a single stilt) strongly bent backwards and the sole is usually longer, by which the whole tilling implement gains a typical elongated and backwards leaning profile. Especially Belgian and British\textsuperscript{13)\textsuperscript{13}} ploughs have these prominent characteristics. It can therefore be presumed that this elongated shape was the result of the heavy and deep soil in the humid climate, requiring a good turning of the earth slice.

The implements with the quadrangular construction also sometimes had naturally grown sheet passing into a sole, made of a piece of wood which naturally curved backwards. This double part could be analogously with the stilt sole called the sheet sole.

\textsuperscript{13)F.J. Payne, in his discussion at the conference in Copenhagen in 1954 (1956 p. 38 and further) pointed out the}
It is known from the Danish peat bog ploughs from Tømmerby and Villersø as well as from the ploughs with sliding stones and a forecarriage from the 19th century (SA 1936 b 2-5, 6-7, 8) and from Polish ards - Odrowąż, Mława, Bochotnica (Fe 13, 14, MK 135).

The role of the shear in the implements with a triangular construction, be it of the type with the stilt sole, with the beam sole or the sole type, equipped with a curved beam, was limited mainly to the control of the depth of the furrow, to a much lesser extent was it used to strengthen the construction or to equally divide the impact of the soil between the sole and the beam. Therefore it no longer had to be as strong as in the quadrangular construction. A strong rod or a longer peg, secured to the beam by a small wedge, was sufficient for this purpose. During the further development the peg was split at the top and a small wedge was put into the split, thus making it possible to change the length of the peg and as a result also the depth of the furrow. The shear of this shape occurred more often in South East and South Europe in ards with a triangular construction. To the North of the Alps and the Danube they appear today only in isolated cases. Regularly, however, we can find it in the South Bohemian ard of the sole type - the ard of the triangular construction with a forecarriage from South Bohemia - nákolesنک - and its more recent modification - plužice. In both these ards the shear of this form is called "suk" (knot) (fig. 7, 17). The same part is more frequent on the territory of Bulgaria on ards of a triangular construction of the type with a stilt sole - St. Nikola, Devedere, Kurtbunar (VCh 10:1, 2, 4) and on the sole type - Imitlija (MK 122), in Yugoslavia it occurs even in the quadrangular ard - the island of Pašman, Rab (BB 5, 42) and further in Italy on the ards 13) noticeable difference between the tilling implements of South East Europe and the British ones, even if they were of the same constructional type.
with a triangular construction of the type with a stilt sole - South, North East and Central Italy (SP 263, 266, 267), on the sole type - South Italy and Toscana (SP 268, 269), namely, however, on the variety of the sole type influenced by the elements of the type with the beam sole - Brindisi, South Apulia and Sardinia, Roman Campagna (LP 159, SP 261, H-BD 103). A rod regulating the depth of the tillage also occurs on ards of a similar type in France in the Allier river basin (ChH 1909 - 19).

The wooden rod for the regulation of the depth of the tillage was more recently replaced by an iron rod with screw-threads and a screw nut above the beam. This equipment often occurs on wooden ploughs from the territory of Yugoslavia (cimer), Bulgaria as well as Czechoslovakia, usually in front of a wooden sheat. However, it also occurs in Italy, Switzerland and in the West and North of Europe. Its great advantage is that it is attached by its lower end to the neck of the sole and passes through the blade of the horizontal share. A firm connection of the beam with the ploughing wedge with the aid of this rod, makes it impossible for the share to get lose, it contributes towards the firmness of the construction and the stability of the operation of the implement. We find the rod for the regulation of the depth of the furrow on a plough from Slavíkovice near Brno from the year 1739 (fig.16).

In some of the Bulgarian and West European ards with an arrow-shaped share attached to a conous forward slanting sole the sheat is split at the bottom end, so that the tang of the share passing through the base of the bent beam could pass through it. On the Bulgarian implements we find that the sheat of this shape was originally of wood and that it was based on the form of the Bohemian "suk" - 3optepe (VCh 13:1). We meet the same shape in an iron finish on the German "Spitzpflug"-Hunsrück (LP 7, 8) in which, however, the depth of the furrow is controlled by the wedging of the beam in a forked stilt.

Another form of iron sheat for the same purpose, but also without regulation possibilities, is an iron rod bent in the
form of a horse-shoe on the beam and anchored by both its end in the sole - the Bulgarian "pertec" - Cacarocci, Stalivo (VCh 12: 1, 13: 2), or two rods connected in the form of a high equal-armed triangle in the French Auvergne, called "tendilles" - Bourg - Lastic, Puy-de-Dôme (H-BD 31).

Another sheet which has to be mentioned is the sheet overtopping the beam. There are usually two reasons for this overtopping: in the two-sided plough ards with a shifting mouldboard it supports the springbar by which the coulter alternatively deflects to both sides (fig. 14). The overtopping of the sheet in the ploughs of this type is usually not great; sometimes it is quite slight, only to give support to the springbar. The sheets of the ards, which the tiller holds from the sides, when controlling the implement, are often much higher. They occur also in the Yugoslav ards with a board - "daska", which will be dealt with later, and in the Scandinavian bar ards and the Asian Minor handrail ards, which have already been discussed.

4. Sole. - The sole and its relation to the construction of the implement was used as one of the basic criteria for the classification of pre-industrial tilling implements. We still have to deal with the shape of the sole inside the already determined constructional types of the tilling implements. Characteristic for Central Asia and India is a cone-shaped sole widening towards the rear, in the ards of the sole type and especially of the type with the stilt sole.

The great stream of the quadrangular ploughs with the stilt sole spreading from the East ends in West with a special construction of the sole. While the right stilt sole is represented by a tree branche natural grown, the left part of the sole consists of a wooden board next to which a stilt is attached with its bent base. With this partial stilt sole dies away the ploughs with double stilt sole in the Western boundery of its wide region. Proves of this partial stilt sole exist from South Bohemia (fig. 5), Styria (KH 14) and West Croatia (BB 19). In Southern Italy the ards of the sole type, changing into a quadrangular construction, have a
Fig. 17 - South-Bohemian "plužice" from Lenora, distr. Prachatice.
(From the collections of the Agricultural museum in Kačina).
Kind: ard with sole, oblique position of the tilling wedge, single stilt and forecarriage.
Type: originally sole type, later modification of "nákolesník".
Group: triangular construction mixed with the quadrangular one, curved beam, exchangeable sole.

Fig. 18 - Meadow-plough from Pastviny near Moldava, Ore Mountains, North-Bohemia.
(From the collections of the Agricultural museum in Kačina).
Kind: plough proper with a long vertical mouldboard, fenboard, horizontal share with coulter, two stilts and forecarriage.
Type: sole type.
Group: quadrangular construction with vertical shear, straight beam, trapezium-shaped sole.
wide and short triangular sole (SP 26L, 259). Modern Ethiopian ards of the type with the passing through stilt has moulders from the working wedge, which fold into a flat triangular sole (H-BD 26). The Swiss ard with a beam sole from Graubünden (SP 250) also has a similar sole. An especially narrow and easily exchangeable sole have the ards with a forecarriage (nákolesník and plužice) from South Bohemia (fig. 7, 17).

Kovács pointed out the different forms of ridge ploughs as far as they occurred on the territory of the former Hungary. He distinguished a simple narrow oblong sole, into which only one stilt can be mortised, further a compound sole with an attached auxiliary sole made of a lath. The auxiliary sole is attached to the main narrow sole at a sharp angle either with the aid of one mortise at the top or a number of rough staves. He considers as the final state a full trapezium-shaped sole widened at the heel, into which two stilts can be mortised next to each other. In the ethnographic material of the territory of Czechoslovakia there is no document of an auxiliary sole.

According to Kovács map of ploughs in the territory of the former Hungary a so called Debreczen plough with an auxiliary sole, attached to the main sole only with one peg on the common point, extended in Central Hungary in the vicinity of Transylvania (KL 23 and p. 279). In the territory of Yugoslavia there appears rarely a plough with two stilts and a narrow sole, whose right stilt hangs on two rough staves from the left stilt - Marija Trošt, Begovo Razdolje, (BB 16, 85).

14) The findings of L.Kovács (1936 p. 277) that the plough of Josef II placed in the Ethnographical Institute of the Moravian Museum has a sole made of two pieces, which form an equal-armed triangle, and are connected by transverse staves, are based on an error. It has a full trapezium-shaped sole with a small slit at the heel between the stilts.
Otherwise the narrow or composite sole on the plough with two stilts occurs only in the North West and North of Europe, where it is completely dominant. From Britain it is proved from the first half of the 14th century. The Luttrell Psalter, ed. Millar (SA 1936 a - 13), 1700 - Wales? (PP 1846 - 4), from the territory of Belgium the Brabant plough with an auxiliary sole (LP 36), only with a narrow sole from Denmark - Valby, Ågerup, Rosnaes, Nors, Viborg, Boeslum (MP 1559 - 3, 4, 7, 68, 111, 113) and from Sweden - Skåne (LP 43).

We have already mentioned the different character of the elongated and backwards slenting ploughs with a quadrangular construction of North West Europe as compared to the shorter ploughs with a forwards leaning sheat from Central, South East and East Europe, belonging to the same group of quadrangular tilling implements. To these differences now another one is added, in the construction of the sole and in connection with this also in the different method of attaching the stilts to the plough (see footnote 10 and p.57).

5. Share. - When judging the form of the share, especially on recent tilling implements, it must be born in mind that the tiller could exert much less influence on the production of the iron parts of the implement than on the wooden parts which he often made himself. The share, as a professional product was an object of trade and was, therefore, often transported to great distances from the place of production. For this reason its production was much less affected by local tradition. On the other hand, however, the investment cost of the iron parts of the implement was very high in the olden times -- iron was inherited from generation to generation. Even when the wooden part of the implement was changed, the share remained the same.

The shape of the blade of the share never influenced the constructional type, it could however, change the agrotechnical kind of the implement. And also the method of attaching the share was always adjusted to the construction and especially to the wooden working part of the tilling im-
plement and not the other way round. It gave however, the im-
plements belonging to different types a common character, or
on the other hand made a sharp distinction between implements
belonging to the same type. Let us therefore study the sha-
res, classified into groups, according to the equipment ne-
cessary for their attachment to the working part of the con-
struction and according to their position on the implement
(plate II).

1). One such group is formed by shares with a narrow
wooden or with an iron tang, which are generally called sho-
vel-or oar-shaped. They are attached to the implement in such
a way as to form a very sharp angle with the furrow. They
only scratch the soil with their narrow blade or the point
of the rod. According to the shape of the blade there belong
to this group lance-shaped, arrow-shaped (rella, relha,
reille, paleshnik), spear-shaped and rod-shaped (baguette)
shares. We find them on ards of the type with the passing
through stilt -- spear-shaped share -- Ethiopia (LP pl.15);
on the type with the passing through stilt sole -- lance-
shaped shares -- the Roman ard from Köln am Rhein (LP 25);
in more recent times very often on the type with the beam
sole -- arrow-shaped shares -- in France - Auvergne (H-BD 31)
and in Spain - Valencia (LP 179), in Portugal - Almeida (DG
9), in the same type also in Bulgaria - Konsko, Oshava, St.
Vlas (VCh 16: 1, 2, 3), at the same time also on the sole ty-
pe - Imitlija, Rezjena (MK 122, VCh 12: 2) and on the type
with the stilt sole - Tverdica, Nadar, Goptepe (VCh 12: 4, 5,
13: 1), even on the quadrangular construction of the type
with a stilt sole - Nomina Klishura, St.Petka (VCh 2: 1,3: 1),
as well as on the quadrangular ard of the sole type - Kostin-
brod (VCh 3: 2). Iron rod-shaped shares are found in France -
Monflucon and Mende, Bellegard en Marche (ChH 1505-5,FL 17 bis)
and in Spain - Esplugas, Catalania, Estramadura (LP 176, 177,
178). A wooden rod in place of a share has been reported from
Afganistan (H-BD 119, 120).
2. A large group is formed by shares mounted in various ways to a relatively low sole in a horizontal position, so that they undercut the soil. The blade of the share is usually widened by small arms making the share either symmetrical or asymmetrical. These shares occur on implements of all types with a sole, whether they belong to the basic group with a triangular or quadrangular construction. The soil loosened by the horizontal shares (often together with the coulter) is moulded with the ards by mouldstrokers, with the ploughs by mouldboards. We already mentioned the local character of the mouldstrokers on p. 15. According to the method of mounting to the low sole, the horizontal shares can be classified as follows:

a) Shares with a slightly closed, relatively short socket. Shares of this shape are quite frequent in Europe. They occur e.g. on almost all Central European ridge ploughs and ploughwoods with a wooden vertical mouldboard.

b) Associated with the first group are the shares with a pipe-like socket, a sharp point and narrow arm (or arms with the symmetrical shares). They were horizontally mounted to a rod-shaped neck of the sole of a quadrangular plough of the sole type in the 17th century in England (H-BD 160) and probably already in the 16th century in Italy on the plough ard of a quadrangular construction of the type with a stilt sole from Brescia and on the so called forest plough of the type with the stilt sole (GA - Ee 2, Ee 2).

c) Shares with a completely open socket, tied to the sole with the aid of an iron stirrup, are mounted in a horizontal position. The share with the stirrup is known from Switzerland - Enseigne, Evolène (LP 144, 146), from Spain - Gerona (LP 180), from Algeria (LP 188, 189), from Tunis (LP 191, FL 22) and also from Asia Minor - Urfa (LP 201) and from Kurdistan (LP 202).

d) Only nailed on or screwed on to the neck of the flat sole are the horizontal shares without sockets also in the shape of a flat equal-armed triangle, known from Egypt (LP
from Portugal (DJ 57; DG 2, 4, 8), from Denmark - Bornholm (MP 1959 - 16), from the model of the Danish plough (JR 1948 - 3) and from Sweden - Västmanland (JR 1958-10) and probably also Skåne (LP 43), from Finland - Eurašminne (SH 15), and the asymmetrical share from Rügen (BU 2). To this group also belong the asymmetrical shares of the more modern meadow ploughs from the Bohemian Ore Mountains with a long mouldboard and vertical sheat. The shares have no socket and are curved in the place where they are screwed to the relatively higher sole (fig. 18). To the horizontal flat shares without sockets it is possible to coordinate also the plough shares from West Sweden, the so called 'undershares' (underbill); these are fastened by means of a screw to the lower side of the sole (JR 1958-6).

e) In Denmark the flat triangular shares, symmetrical and asymmetrical, were attached to the construction of the tilling implement with the aid of a short and thin iron extension, which we could call a thorn. The thorn came from the base of the blade of the share without a socket and passed through the sheat. The blade had in its middle a central triangular opening, by which it was placed in the horizontal position on the neck of the sole - Sjaelland, Røsnaes (MP 1958 - 11, MP 1959 - 7 a, b).

f) From the North of Europe shares of a special shape and method of production, mounted in a horizontal position on a medium high semi-round sole, are known. They are forged from iron strips like a grate, in the shape of a semi-cone with an elongated top in the form of a chisel, suitable for stony soils. These narrow and higher strip shares proceed through the furrow on their flat side and therefore undercut the soil. There are documents from Scotland (PFG 1956 - 7, pl. I: b, c, d, pl. II) and on ards with a single stilt sole with draught poles from Finland - Hedemark (SH 11).

The strip shares by their method of mounting to the ard are close to the method of simple sheathing or metal-covering of the pyramid-shaped or cone-shaped point of the sole.
or ard head, as we can see on the ards with a cone-shaped stilt sole from Kirgizia and Tadzhikistan (LP 218, H-BD 114), on the sole ard with a handrail stilt from Erzerum (LP 213) and also on the Basque ards of the stilt type from the Northern part of the Iberian Peninsula (H-BD 88, 89).

3. The shares of this group are characterized by an oblique position, in which they are, in various ways attached to the ard. The common task of these always symmetrical shares, is to move the loosened soil upwards on the back of the blade, or even the socket and the shaft and to crumble it.

a) The symmetrical shares with the arms are, with the aid of a flat socket mounted to a boardlike shaft, with which they are in an oblique position put next to the neck of the sole. They can be found on ards of various constructional types and, therefore, also their attachment to the construction of the implant varies. The Central Bohemian ard of a quadrangular construction of the sole type has a shorter flat shaft with the share attached to the bevelled neck of the high sole and attached to the shaft which it embraces. The local term of this shaft is "náraz" (i.e. the part at which the share is being knocked at, fig.11). The South Bohemian ard with a forecarriage (nákolesník) has the same function and position -- sole type ard with parrellely attached beam to the sole. Its relatively small share with arms, chisel-shaped point (bar point) and flat socket is extended upwards by the so called shaft - "násada", projecting to the sides into mouldstrokres, the so called wings - "perutě" (fig. 7). The share with a flat shaft, fixed to the beam in an oblique position and supported by the neck of the sole, as is the case in nákolesník, can also be found in the constructionally related Mecklenburg ard (ŠF 1963-32). The Byzantium ard from the 11th century, also having an oblique shaft with a share, is of the same sole type as the two previous ards. Here, however, the shaft passes through the beam and leans on the oblique stilt (FL 26). In the territory of Yugoslavia there was a quadrangular ard of the sole type, which developed an
especially long oblique backwards rising shaft of the symmetrical share and socket, the so called "daska" (board). It fulfils the same task as the already mentioned Bohemian "násada" (shaft) - Ovčarovo, Dražindo, Podmiljačje, Crnići, Višnjica, Dištica (BB 10a, 49, 50, 53, 91, 93), Serbia (MK 135), Albania - Sapači (NF 67 h). In the Slovin territory the function of the daska (board) was taken over by a sizable, oblique, raised body connected by the mouldstrokers, called "lémože" - Matkovog kot, Slı, Lobnik, Konjakog vrh, Sulzbach (OB 1, 3, pl. III: 3, 4, 7, RK 2: 13). In Bohemia there were shares of this group which had no shafts, but are mounted in the same oblique position to the flutes on the bevelled neck of the very high and narrow sole (MJ II-pl. VIII). It is also noteworthy that all the quadrangular ards with the share mounted on the oblique flat shaft also have a strongly forwards leaning sheat.

b) Arched symmetrical shares, which however, were without shafts and sockets were also mounted in an oblique position. They were placed by their inner side of the blade to the bevelled neck of the high sole and fixed with the aid of an iron thorn projecting from the base of the blade of the share archwise upwards and secured in the sheat. They are known from quadrangular ards of the sole type from West Moravia (fig.10), where there also appeared on the thorn transverse narrow iron wings with the function of mouldstrokers (BF fig. on p. 351).

A certain transitional stage between the described shares with narrow Danish shares with the thorn (mentioned sub 2 a) are the arched shares with a short thorn on a slightly raised sole of a quadrangular ard of the sole type. They occurred in the Ukraine - Bochotnica (MK 135) and in Poland - Odrowąż, Wrzelów, Roszkowa Wola (FE 13, 15, 16).

4. The European ards without sole have flat shares placed in an oblique or sheer position. The method of their attachment to the ard head differs according to the type of the ard and according to local habits. They all, however, have a common constructional principle, based on the symmetri-
Groups of shares according to the way of their attachment to the implements

1 - Long and narrow shares (so called oar-shaped): a - lance-shaped, b - arrow-shaped, c - spear-shaped, d - rod-shaped.

2 - Horizontal flat shares: a - with slightly closed and relatively short socket, b - with pipe-like socket, c - with a stirrup, d - nailed or screwed, without socket, e - with a thorn, f - strip shares.

3 - Shares in an oblique position: a - with a board-like shaft, b - arched shares with a thorn.

4 - Shares in a sheer position: a - elongated with a wider socket, b - with a long and almost closed socket (soshniki), c - shovel-like mantel shares with a loop.

5 - Shares turning into mouldboard - e.g. cylindrical (ruchadlo) share.
cally oriented sheerer surface, which lifts and crumples the soil as the implement proceeds.

a) Relatively narrow and elongated shares with a wider socket were mounted on flat ard heads of ards with a beam ard head, making an angle of 30° - 45°, sometimes even 60° with the furrow. They could be found in the Ukraine – Staro-selje, Novoselki on D., Bobly, Vasilkov, Spanov (MVS 9, 10, MK 125, 128, 129).

b) A similar agrotechnical character had the shares on the polica and shovel sokha, the so called "soshnikes". They were mounted with the aid of usually long and almost closed sockets on sheer teeth of the sokha. The soshnikes had a relatively long flat blade without arms, on the double toothed sokhas the blades had small symmetrical arms or they were reversely asymmetrical – Novgorod, Kostroma, Tambov (MVS 28, FJ 73 b, LP 61).

c) Probably younger are the large shovel-shaped symmetrical shares of the Czechoslovak and neighbouring ards without sole. On their rear side they are equipped with a rivetted loop. In the mountainous regions of North Eastern Bohemia these ard shares are called "lopata" (shovel). Ards with these shares were used in West Poland – Brenno (MK 126), in Slovakia, in Moravia as well as in Bohemia, where they are called "hák" (hook), (fig.3, 6, and ŠF 1963 – 14, 15, 16). Similar is also the related "Hoch" from the Sicking Highlands in Germany (LP pl.4).

The Slav tradition of the use of the ards with a relatively sheer share, mounted on the ard head of the ard without sole or on the flat wooden shaft on the ard with a sole, led at the beginning of the 19th century in the Bohemian village to the construction of the "ruchadlo" (Sturzpflug), whose share with a cylindrical surface, changing at the upper end into the mouldboard, meets even today the strict requirements for ploughing in lighter and medium heavy soils.

5. The last group consists of shares turning into mould-
boards, either with a flat plane, curved, cylindrical (ru- 
chadlo-share, blackland body, digging body), semicircular - 
ched (clay sod body) and screw-shaped (breaking body). They 
were mounted on ploughs of triangular and quadrangular con-
structions, and were attached to their sheaths with the aid 
of screws or they formed part of the cast iron ploughing bo-
dy - the Brabant plough (LP 36, 38).

The tilling implement, has a number of further, less 
important parts, as e.g. the fen board, various wedges, bra-
ces, bends (genou according to H-BD), knife coulters, stirrups, 
rings, spikes, hooks for harnessing, regulators, linking planks, 
poles, draught poles, splinter bars, swingle trees, some of 
which should be noted for their shape or position. The method 
of the regulation of the depth of the furrow can be charac-
teristic as was already pointed out by Bratanic (1952 p. 94, 
remark 11 and map on fig. 3). In a similar way the regula-
tion of the width of the cut of the plough (with the aid of 
a horizontally deviated beam, regulator or equipment on the 
forecarriage) can also be followed. Important is also the 
method of the support of the beam - by means of the forecar-
riage, creeping - or wheelfoot, their constructions and the 
means of moving the tilling implements forwards. All these 
parts and equipments, however, can no longer directly influen-
ce the constructional type of the implement and are, there-
fore, not included in the subject of this discourse.

SUMMARY

The evaluation of the tilling implements exclusively 
according to their function leads to the determina-
tion of the kind, in every single one of which appear 
implements of completely different forms. When studying the 
implements, it is therefore necessary strictly to divide the 
point of view of the function from the point of view of the 
form.
By classifying the construction of the pre-industrial tilling implements according to the shape, position and method of the attachment of their working part to the construction I reached the conclusion that they can be divided into nine types, including according to my opinion all the known tilling implements of the Old World, with the exception of constructions created by the mixing of two or more types. I further pointed out groups of tilling implements, showing some more important common characteristics, which could explain certain agreements in the constructional details between a number of types, or also the differences inside one type. In a number of cases I also pointed out the transition of one constructional type into another, caused by abandoning the method of attachment of the working part to the construction of the implements, usually locally used. There exist more such similar transitions between the types, however, I mainly chose those concerning Czechoslovak implements. This could perhaps mean that one should abandon the strict differentiation of the method of attachment of the individual parts, namely, the working parts, to the construction of the implement and only take into consideration the main characteristics of the profile of the tilling implement. In this way the number of types would permit a greater freedom in the evaluation and judgement of the individual constructions. The point, however, is to exclude any doubts and any possibilities of a duplex explanation of a certain construction.

I should like to stress once more that this article does not endeavour to set up a development order, but only intends to point out the main constructional elements, which in the future, after intensive studies, could become the basis for the compilation of such an order or a number of orders. If I mentioned some wider phenomena, such as the extension of the forwards leaning sheat in the group of tilling implements with a quadrangular construction, the relation of the forwards leaning sheat with a stilt sole, the Slav principle of the obliquely or sheerly placed flat share with the shaft etc.,
I did this with the intention to point out these problems and to instigate a more intensive study. With the same intention I pointed out, in the evaluation of my typological system, some cases of transitions between the types proper.

The aim of this article is to submit some suggestions which would as far as possible fully meet the requirement submitted at the congress in Vienna in 1952 by Bratanić for a "clear, correct and uniform typology, which is very necessary for comparative studies" and "which would limit to the minimum the subjectiveness of the research worker when evaluating the similarities (of two implements)". It is easy to choose for the aforesaid kinds and types as well as for various parts of implements and their names of the different groups a system of signs which would make possible to elaborate the entire material with help of the mathematic-statistical methods. A generally accepted and maintained typology would also force a uniform nomenclature, without which a scientific exchange of opinions is impossible. If this article would provoke a discussion, which would lead to the clarification of the differing opinions, to their defence or correction and would lead to a typology most satisfactory for comparative studies, I would not consider the effort put into this article as futile.
Literature and Abbreviations


GJA Güldenstädt J.A.: Reisen durch Russland und im kaukasischen Gebirge in den Jahren 1768/73, herausge-
geben von P.S. Pallas, St. Petersburg 1787/91, Bd II.


MJ II Mehter J.: Zweyte Sammlung der böhmischen Acker-geräthe, Dresden 1794.


Michna E.: Böhmens Haus - und Landwirtschaftsgeräthe, 3d I, Prag 1825.


Poel J.M.G. van der: Nordhollandsche akkerbouwwerkui-
gen, anderhalve eeuw geleden. Overdruk uit west-Fries-


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Stipének L.: Hák v Orlických horách. Historie a mu-

Šratoko B.A.: Lrevnyj zerevijannyj plug iz Sergiev-


VCh Vakarelskl Ch.: Iz veshtchestvenata kultura na Bolgharite. Izvestija na Narodnija Ètnografski muzej v Sofija, VIII-IX/1929.


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