DOI: 10.32703/2415-7422-2021-11-1-171-190

UDC 378.2: 631.3:006.86 (477)(091) Schindler

Victor Verhunov
National Scientific Agricultural Library of National Academy of Agrarian Sciences of Ukraine
10, Heroes Oborony Street, Kiev, Ukraine, 03127
e-mail: dnsgb_uaan@ukr.net
https://orcid.org/0000-0002-5476-4845

Contribution of Professor K. G. Schindler (1869–1940) in formation of agricultural mechanics, theory and practice of testing of the agricultural machines and tools in Ukraine

Abstract. *The article highlights the life and creative path of the outstanding domestic scientist, theorist, methodologist and practitioner of agricultural engineering K. G. Schindler, associated with the formation of agricultural mechanics in Ukraine. The methodological foundation of the research is the principles of historicism, scientific nature and objectivity in reproducing the phenomena of the past based on the complex use of general scientific, special, interdisciplinary methods. For the first time a number of documents from Russian and Ukrainian archives, which reflect some facts of the professional biography of the scientist, were introduced into scientific circulation. The main directions of fruitful pedagogical and scientific activities of K. G. Schindler, key segments of his creative search, which determined the further development of agricultural engineering, his leadership in the scientific community were described. It was proved that Professor K. G. Schindler has the primacy in founding the Station of Testing for Agricultural Machines and Tools at the Kiev Polytechnic Institute, which provided students of agronomic and mechanical faculties with the opportunity to get acquainted with the existing types and designs of tillage machines, systematically test its research methods. In addition, the station carried out scientific work on the study of certain issues of agricultural mechanization, development of methods and devices for research of agricultural machinery and implements. The seven functions of the agronomic-type research station developed by scientists for the first time in Europe at the beginning of the last century have become a reference point for many generations of researchers of agricultural machinery. K. G. Schindler was the first in the world to theoretically substantiate the need to improve the design of tillage equipment depending on soil and climatic conditions, made a significant contribution to the theory of soil deformation with the shelf of the plow body. In addition, he improved the Sakka dynamometer, developed a control dynamometer to check traction dynamometers and other devices, improved existing*

and developed new designs of tillage machines. K. G. Schindler was the first in Ukraine to teach a course in agricultural engineering.

***Keywords**: K. G. Schindler; agricultural industry; research station of agricultural machines and implements; Kiev Polytechnic Institute*

Introduction.

One of the basic directions of the modern history of agricultural science in Ukraine is the study of the intellectual biographies of its prominent representatives, which express domestic priorities in the modern information space, contribute to the formation of ideas about the integral process of organizing agricultural research and the dissemination of industry education. The study of their creative heritage will help to revive the national idea in Ukraine, to ensure the unity and continuity of generations of agricultural scientists. Considering this, agricultural biography should become the fundamental segment of research on the history of domestic agricultural science. The development of this direction is especially important in conditions when the biography of the humanities is becoming more active, the scientists of which have suffered more from political actions than the researchers of natural disciplines.

At the same time, a new surge in the development of biography studies and the reconstruction of biographies of agricultural scientists is associated with a rethinking of previous historical knowledge, a shift in research emphasis from the "history of elites" to "second plan" personalities, a turn to historical anthropology, micro-level research, and an appeal to interdisciplinary methods in the study biographical information. A striking figure in the history of agricultural science in Ukraine is Professor K. G. Schindler – a talented scientist in the field of agricultural mechanics, teacher and organizer of the educational process. Generating approaches laid down by K. G. Schindler have not lost its relevance and are a roadmap for posterity.

The purpose of this work is to reconstruct the contribution of Professor K. G. Schindler in the formation of agricultural mechanics, theory and practice of testing the agricultural machines and tools, to show his role in the organization of higher branch education in Ukraine.

Research methods.

The methodological basis of the research is formed by the principles of historicism, scientific nature and objectivity in converging the phenomena of the past based on the complex use of general scientific, special, interdisciplinary methods. The general scientific methods such as synthesis, analysis, induction and deduction were used to determine the object and subject, goals and objectives, scientific novelty of the article, formulation of conclusions and generalizations. The article uses a modern categorical-conceptual apparatus applied by historians, biographers and specialists in other branches of science, taking into account the interdisciplinary nature of this research. The complex application of various means of search, analysis and synthesis

provided the possibility of optimal use of archival documents and materials, published sources, scientific works.

Results and discussion.

The special role of K. G. Schindler in the development of domestic mechanical engineering was noted in a number of publications by his contemporaries, colleagues and students. First of all, it should be noted the publication of A. Beretti about the article by the scientist on American threshers (Beretti, 1898). The articles of M. M. Kagan, V. I. Nagibin, S. N. Bogoiavlensky about the Station for Testing of Agricultural Machines and Tools at the KPI (Kagan, 1902; Nagibin, 1909; Bogoiavlensky, 1913). After the emigration of K. G. Schindler in 1919, the situation with regard to the results of his work changed radically and moved, at best, into the format of statements of some facts of his biography and activities. In the early 1920's, the compilers of a joint collection dedicated to the 25th anniversary of the Kiev Polytechnic and Kiev Agricultural Institutes (Kiev Polytechnic and Kiev Agricultural Institute, 1923) first spoke about the role of K. G. Schindler in creating the Station of Testing for Agricultural Machines and Tools at the KPI, as well as the Cathedra of Mechanical Engineering created by him, where a new scientific school was born; in a stated form, his pedagogical activity is revealed, and especially as the Dean of the Mechanical and Agricultural departments of the Kiev Polytechnic Institute of Emperor Alexander II. In the future, all references to K. G. Schindler pass into the fragmentariness of practically the same direction.

Some information about the life and work of K. G. Schindler is reconstructed in publications on the Russian emigration by S. Narizhnyi, Z. Sladek, L. Ye. Kovalevsky (Narizhnyi, 1942; Sladek, 1991; Kovalevsky, 1991). In the essay on history, prepared for the 100th anniversary of the KPI, its authors named K. G. Schindler in the galaxy of "... outstanding scientists ..." who, together with E. F. Votchal and P. R. Slezkin taught at the agronomic department, as well as with V. L. Kirpichev, S. P. Timoshenko, E. O. Paton, G. G. Metz, S. P. Sheinterg, etc. formed his own scientific school "...agricultural engineering" and it became "... leading in training for agricultural engineering" (Bieliakov, et al., 1995, 20-21).

Academicians of the Russian Agricultural Academy and the Ukrainian Academy of Agricultural Sciences P. M. Vasilenko and L.V. Poghorily have addressed some achievements in the field of agricultural engineering of this famous scientist (Vasylenko & Voitiuk, 1998; Poghorily, Mudruk & Shkvyra, 2003). A number of publications about K. G. Schindler have prepared by the author of this article (Verhunov, 2019; Verhunov, Mudruk, 2001; Verhunov, Mudruk, & Shkvyra, 2019). However, all the listed works do not give a complete picture of the scientist's personality and only fragmentarily coverage certain aspects of his life and work.

K. G. Schindler occupies an honorable place in domestic and world agricultural science. Despite the high assessment given by Academician V. I. Vernadsky in 1911, an ordinary professor of the KPI of Emperor Alexander II K. G. Schindler, as an

outstanding scientist and teacher, other luminaries regarding his creative research, first of all, in the field of testing agricultural machines and tools (Vernadsky, 2002, p. 197), fundamental discoveries in the field of plow construction, and historians regarding the organization of educational process in the KPI, as well as inventions presented at all kinds of competitions, however, due to the solely ascertaining of individual facts of the biography, numerous inconsistencies continue to remain and even the pages of his good deeds that have not been fully investigated in the name of the further development of domestic and world science.

Two editions, prepared on the basis of materials from Ukrainian and Russian archives, to some extent reveal in some detail some of them, especially regarding the stay and work of K. G. Schindler during the period of emigration (1919–1940) (Verhunov & Mudruk, 2001, p. 6; Verhunov, Mudruk, & Shkvyra, 2019, p. 12–15). The new documents that became available not so long ago made it possible to reveal more contextually the activities of K. G. Schindler during his work at the KPI of Emperor Alexander III and especially fill the years of stay in KPI with theoretical, methodological and practical meaning in the field of testing agricultural machines and tools. The same applies to expanding the understanding of his creative activity to create new types of plows, seeders and other agricultural implements.

Thanks to familiarization with previously unavailable archival documents, unknown facts about the biography of the scientist were revealed. He was born on June 15, 1869, in Tver in a family of Swiss citizens – Gabriel Schindler and Emilia Müller, who had a residence permit in the Russian Empire (SA Tver region. F. 848. D. 1. C. 228. P. 25). In 1887, he graduated from the additional class of the Tver real school, receiving secondary education. Demonstrating a penchant for the exact sciences, from September 1 of the year he entered the Mechanical Engineering Department of the Imperial Moscow Technical School (SAK. F. 18. D. 2. C. 289. P. 102). After completing a full course of study, in 1893, he was awarded the title of mechanical engineer, as well as personal honorary citizenship, provided for in paragraph 2 of § 23 of the "Charter" of the school. During studies, he first got acquainted with the competition for testing agricultural tools, held on September 12, 1892 at the educational and practical Butyrsk farm of the Agricultural School of the Imperial Moscow Society of Agriculture, already then noted the absence of specially trained specialists for expert assessment of the economic suitability of agricultural machines and tools in some soil and climatic conditions of the country (Perepelkin, 1896, p. 11).

K. G. Schindler began a career as a mechanic at the Borinsk sugar plant of brothers S. and N. Gardenin, located near Lipetsk, Tambov province, where he worked until 1895. In the same year he went to Germany, Austria, Switzerland for study the agricultural machines and tools. For some time he performed private work on the installation of equipment at the factories of the Central Industrial Region, in the summer of 1896 he taught and supervised practical classes for students on the study of agricultural machines at the Moscow Agricultural Institute, where K. G. Schindler got to know the future Honorary Academician of the USSR Academy of Sciences

V. P. Goriachkin (1868–1935). Together with him, he organized the Second Competition-Exhibition of Agricultural Machines from July 10 to August 12, 1896 under the auspices of the Imperial Moscow Society of Agriculture at Butyrsk Farm.

K. G. Schindler prepared two fundamental "Reports" for the sections of the exhibition: 1) reapers and reapers-binder; 2) complex threshers and locomotives (Perepelkin, 1897, pp. 6–89). The level of professionally prepared reports testified to the emergence of a talented specialist in this field. In his opening remarks, K. G. Schindler and V.I. Grinevetsky first proposed to organize the special stations for the theoretical and practical study of agricultural machines and implements (Kagan, 1902, p. 8). They proved the need for state transfer of agricultural engineering issues to the specialized scientific institutes.

As one of the best specialists in the field of agricultural machinery, the Ministry of Agriculture and State Property sent K. G. Schindler to Germany, France, England and North America to study industrial mechanical engineering. In Paris, he got acquainted with the activities of the Station for Testing Machines and Tools headed by Professor Ringelmann. The scientist displayed the results of what he saw in the United States in a series of articles on the pages of the magazine "Boss" published in 1897–1898. These publications not only brought him well-deserved fame and authority, but also became the impetus for the beginning of a professional discussion among specialists. An example was the presentation of K. G. Schindler features grain storage at American elevators (Beretti, 1898, p. 1184). In the end, the discussion contributed to the introduction of the American approach in the Russian Empire.

In 1897, K. G. Schindler published an original brochure with 48 figures in the text – "From Practice for Practice. Agricultural tools and machines. I. Plow", which was recognized as a helpful manual for both farmers and students of agricultural educational institutions of the Ministry of Agriculture and State Property (Bibliografiya, 1898, p. 388). According to the proposal of the Governor of the Kharkov Educational District of September 25, 1898 No. 79042, K. G. Schindler was appointed a lecturer for the hire of the Kharkov Technology Institute of Emperor Alexander III (KhTI), which opened in July 1885, with the instruction to lead the drawing lessons in one of the first-year groups for six annual hours with a reward for each annual hour of 120 rubles (SAK. F. 18. D. 2. C. 289. P. 71).

There are several reasons for K. G. Schindler's move to Kharkov. In the first place was the government's decision to start systematic training of specialists for agricultural engineering. To this end, on the basis of the recommendation of the ministers of public education and finance, KhTI was proposed to open an appropriate cathedra, as well as a Station for Testing of Agricultural Machines and Tools. At a meeting of the Scientific Committee of the KhTI on May 14, 1895, this recommendation was unanimously supported (SA Kharkov region. F. R-1682. D. 2. C. 370. pp. 13–16). The new cathedra was headed by Adjunct Professor G.A. Latyshev (1857–1922), who also performed the duties of equipping a Station for Testing of Agricultural Machines and Tools similar to a station at the University of Halle (Germany) (SA Kharkov region. F. R-1682. D. 2.

C. 370. P. 134). After moving to Kharkov, K. G. Schindler and G. A. Latyshev took an active part in an attempt to reorganize the educational process at the institute.

K. G. Schindler in the presence of the director and the clerk of the institute signed the "Sworn List", in which he made an oath to serve faithfully and obey His Imperial Majesty in everything (SA Kharkov region. F. R-1682. D. 2. C. 370. P. 3). A little later, on October 8, 1898, a new proposal was received from the trustee of the Kharkov Educational District under No. 7444 – to work as a laboratory assistant created in 1895 at the KhTI and in fact the first in the Russian Empire specialized station for testing agricultural machines and tools with retaining the right to conduct drawing classes for first year students (SAK. F. 18. R-1682. D. 2. C. 289. P. 71).

By letter No. 91 of December 19, 1898, classified as "secret", the director of the KhTI turned to the Moscow chief police officer with a request to provide information about "... police reliability ... of mechanical engineer K. G. Schindler". Already on December 25, 1898, he allowed K. Schindler to be a teacher at the Kharkov Technology Institute of Emperor Alexander III (SA Kharkov region. F. R-1682. D. 2. C. 370. P. 10). In turn, the director of the institute notified "His Excellency Mr. Trustee of the Kharkov Educational District "About receiving a document on the reliability of K. G. Schindler". At that time, obtaining such a document was more important than the professional qualities of the applicant for the position. In his letter of consent, the chief police officer asserted that K. G. Schindler, while living in Moscow, had "... approving behavior and moral qualities, he was not involved in political matters" (SA Kharkov region. F. R-1682. D. 2. C. 370. P. 15). Almost immediately, K. G. Schindler became involved in all the components of the organization of the scientific and educational process at the institute. He was appointed a temporary member of the economic committee for summer time instead of Professor Gemilian, who was on leave (SA Kharkov region. F. R-1682. D. 2. C. 370. P. 27). In fact, he was considered at the institute as deputy members of the economic committee during their vacations.

K. G. Schindler was invited to participate in competitions for testing agricultural machines and tools produced, first of all, in the European part of the Russian Empire. So, according to the petition of the Kursk Provincial Zemstvo Board of June 28, 1899, which followed the recommendation of Professor G.A. Latyshev, K. G. Schindler was invited to take part in the corresponding competition on August 25–31 in Kursk and September 15–17, 1899, in Korochi, Kursk province. The zemstvo asked K. G. Schindler to prepare general characteristics of the known tools before the start of the competition, as well as to inform what devices were needed for expert assessment, including the Burg's dynomometer. The director of the KhTI asked the Trustee of the Kharkov Educational District to send K. G. Schindler to these competitions, as a result of which he received consent and an advance payment of 75 rubles "... from the amounts to strengthen the funds of the Kharkov Technology Institute" (SA Kharkov region. F. R-1682. D. 2. C. 370. pp. 28, 29).

At that time, the director of the KhTI – a well-known scientist in the field of mechanics and strength of materials, Professor V. L. Kirpichev (1845–1913) drew

attention to a young, gifted, hardworking employee. After his appointment in 1898 as director of the newly established Kiev Polytechnic Institute of Emperor Alexander II, he, by letter dated May 16, 1899, invited K. G. Schindler to the position of Extraordinary Professor of the Cathedra of Applied Mechanics (SAK. F. 18. D. 2. C. 289. P. 103). It was agreed that K. G. Schindler, starting from September 1, 1899, would officially teach mechanics at the agricultural department and a special course in agricultural engineering at the Mechanical Department (SAK. F. 18. D. 2. C. 289. P. 18). Nevertheless, the process of official admission to the KPI, unfortunately, was delayed for various reasons. There was a possibility that K. G. Schindler would take the position of acting Extraordinary Professor in the Cathedra of Mechanics at the Warsaw Polytechnic Institute of Emperor Nicholas II (SAK. F. 18. D. 2. C. 289. P. 14), as evidenced by a letter dated November 3, 1899, from the Vice-Director of the Department of Trade and Manufactures of the Ministry of Finance to the director of this institute. K. G. Schindler became a full-fledged full-time teacher only from December 31, 1899, according to the transferring and permission of "... His Excellency Mr. Minister of Finance" (SAK. F. 18. D. 2. C. 289. P. 72), but not beginning of 1900, as D. Zhurilo writes in monograph (Zhurilo, 2016, p. 88).

There is reason to assert that the choice of Kiev for the implementation of creative plans for K. G. Schindler was no accident. As it was possible to establish, the stories and letters of his cousin, R.F. Schindler, who completed a full course of sciences at the Faculty of Medicine of the Imperial University of St. Vladimir and from December 16, 1881, was approved as a Doctor with honors, served as a positive perception of this possibility (SAK. F. 16. D. 465. C. 4761. P. 168). However, the main argument in favor of Kiev and its polytechnic institute was, of course, a personal Professor V. L. Kirpichev's invitation for K. G. Schindler with the prospects of conducting research in the field of testing of the agricultural machines and tools (SAK. F. 18. D. 2. C. 289. P. 103). Before starting teaching at KPI, with the permission of the Minister of Finance, he went on an overseas leave to Germany for a month to inspect the factories of the agricultural machines (SAK. F. 16. D. 465. C. 4761. P. 71).

At a joint meeting of the agricultural and chemical faculties on March 18, 1900, K. G. Schindler substantiated the need to open a Station for the Testing of Agricultural Machines and Tools at the KPI (Kramarenko, 1924, p. 188; Nagibin, 1909, pp. 38–53). Director of the institute K.A. Zvorykin, recommending K. G. Schindler for the position of acting Dean of the Agricultural Department, wrote that he not only possesses "... excellent lecturer qualities ...", but also outstanding "... organizational and administrative skills" (SAK. F. 18. D. 2. C. 289. P. 30). These qualities, in his opinion, K. G. Schindler demonstrated by creating a machine testing station at the KPI, without adequate budgetary funding. Thanks to the researches of the scientist, it was possible to prove "... a great importance of the mechanical tillage, contributing to both a more perfect way of using existing soil constituents, and saving moisture, depending on its type and condition" (SAK. F. 18. D. 2. C. 289. P. 31).

By constantly experimenting, the station made it possible to expand the design possibilities of using agricultural machines and tools obtained under strict scientific conditions. In addition to considering exclusively the technical side of the issue, K. G. Schindler structurally filled the Station for Testing Agricultural Machines and Tools of the KPI, which he was creating, not only with a special laboratory, but also with an experimental field. The scientist argued that in the study of agricultural machines and tools, as much attention as possible should be paid to the final result of all agricultural operations, namely, the level of the yield of cultivated plants. In addition, the station provided an opportunity for students of the agronomic and mechanical faculties of the KPI to get acquainted with the existing types and designs of agricultural machines and tools directly in operation, as well as study the methods of its research. Besides, scientific work was carried out on the study of some issues of agricultural mechanization, as well as the development of techniques and instruments for testing of the agricultural machines.

Among the devices which almost until the end of the 30s of 20th century used in the country when testing agricultural implements should, in the first place, put the redesigned K. G. Schindler traction Sakka dynamometer. There was a serious flaw in its primary design, namely the absence of a device giving a zero line on the diagram and the use of a simple wooden pencil, reinforced with a clamping screw. As a consequence, the control measurements gave a significant error in the measurement values. Practically from the first days of its activity, the Kiev Station of Testing for Agricultural Machines and Tools faced this shortcoming. As a consequence, K. G. Schindler developed and proposed some design improvements. The wooden drum was replaced with an aluminum one, in which two spring plates were fixed. Instead of millimeter steel, use specially lined and cut paper into separate sheets. A small sharp-toothed roller was adapted to draw a constant line, which was pressed by a spiral spring. They started using a specially designed metal pencil. In addition, they completely abandoned the hinges, redesigning the dynamometer by replacing the conical buffer spring with a cylindrical one. Moreover, another type of self-recording dynamometers '... with a flat spring" was made. By the way, all dynamometers designed by K. G. Schindler were manufactured by the KPI Mechanical Workshop, whose products in 1903 '... at the exhibition of professional schools ... from the organizing committee took second place after the Imperial Moscow Technical School.' On the basis of about 5000 annual measurement diagrams obtained, the corresponding measurement procedures for both new structures based on the Sakka dynamometer were developed, and two basic principles of their use were proposed: stress gets tired and deformed; 2) conclusions with the existing theory of agricultural machines and implements should be based on a large number of repeated observations or on mass experiments. As a consequence, K. G. Schindler proposed a method for dynamometric accounting when plowing simultaneously with measuring the width and depth of the furrow. According to it, the assessment was carried out on eight furrows (4 in one and the other direction). However, the general conclusion was taken for six furrows. As for

the self-regulating device redesigned by K. G. Schindler, for a long time in the Russian Empire he was considered a control (reference) and all institutions that had traction dynamometers annually sent them to the Station for testing agricultural machines and tools of the KPI for verification. Among them is the Imperial Agricultural Museum in St. Petersburg, where "... a dynamometer for horse drives designed by Prof. K. G. Schindler ... "was used for... inspection of plow dumps and their correction' (Bogoiavlensky, 1913, pp. 290–292).

K. G. Schindler was directly related to the opening of the Station for Testing of Agricultural Machines and Tools of the Elisavetgrad Agricultural Society in 1907. He developed principles and an estimate, chose the location of the station and the director-learner – V. I. Nagibin. All the proposals were accepted by the society during K. G. Schindler's visit to Elisavetgrad on February 10–13, 1907 (SAK. F. 18. D. 2. C. 289. P. 52). Subsequently, on its basis, according to the decision of the Kherson provincial zemstvo of April 20, 1911, the famous Ajam Experimental Station was created, headed by M. I. Irlikov (now the Institute of Agriculture of the Steppe of NAAS). A little later, in 1912, the Yakimovsk Test Station was opened under the leadership of D. D. Artsybashev, and then – in Orel, Samara, Tashkent, Blagoveshchensk, Vyatka and at the Plotyansk Experimental Station.

K. G. Schindler was one of the first in Europe to develop the seven functions of the agronomic-type test station, which have been a reference point for many generations of agricultural technicians (Verhunov, & Mudruk, 2001, p. 21; The tasks, 1907, p. 6). Today, only the number of tests have changed, and the equipment has become more energy-intensive, automated and using a space navigation system. However, the generating approaches laid down by K. G. Schindler have not lost its relevance. In accordance with its, only in Ukraine, Leonid Poghorily's Ukrainian Research Institute for Forecasting and Testing of Equipment and Technologies for Agricultural Production, Cathedra of Mechanization of Tillage and Sowing of Agricultural Crops of the NSC "Institute of Mechanization and Electrification of NAAS", Academician P. M. Vasilenko's Department of Agricultural Machines and Systems Engineering of Faculty of Mechanics and Technology of National University of Life and Environmental Sciences of Ukraine are functioning.

The first in world practice, the scientist prepared and published in 1902 a fundamental work – the atlas of agricultural machines "Polytypes, sketches and drawings of machines-tools of modern agriculture" in the series "The doctrine of agricultural machines and tools" (Polytypes, 1902). In 1904, based on the "Atlas", K. G. Schindler publishes no less, as they say, the requested special monographs: "Machinery-tools of modern agriculture" (The machines – implements, 1904) and "Theory and design of arable tools" (Schindler, 1904). These publications revealed the evolution of the design and manufacturing technology of plows, and K. G. Schindler established himself as an outstanding historian of science and technology.

The competitions for testing agricultural machines and tools brought K. G. Schindler deserved fame as a leading specialist in his field in the country and the

world. The first official of these was the competition for testing sugar beet seeders (from six manufacturing plants) held in the summer of 1902 in the "Sukhoi Yar" estate of the Countess M. E. Branitska's countryseat near Bila Tserkva. The initiator of the event was the Kiev Society for Mutual Assistance of Farmers and Foresters with Higher and Secondary Education, in which K. G. Schindler was one of ten honorary members. He became the developer of the "Test Program" published prior to the competition. After this competition, dozens of similar ones took place. Suffice it to recall: 1) the test of self-feeders for steam threshers in the Zhukovsk economy of Prince V. S. Kochubei in the Poltava region in July 1904; 2) in the estate "Pady" V. L. Naryshkina (Saratov province) in the summer of 1905; 3) in the Sharov economy of L. Ye. Kening (Kharkov province) in September 10–22, 1905; 4) in the economy "Sukhoi Yar" in the estate of Countess M. E. Branitska near Bila Tserkva – beet cutters in May 24, 1907; 5) in the spring of 1908, organized by the Elisavetgrad Society of Agriculture – plows and seeders; 6) testing of combined seeders under the auspices of the Kiev Mutual Aid Society of Farmers and Foresters with Higher and Secondary Education in the summer of 1908; 7) threshers under the auspices of the Ekaterinoslav Provincial Zemstvo on June 3, 1908; 8) plows, organized by the Benderov District Zemstvo Council (Bessarabian province) on May 26, 1909; 9) agricultural machines and implements on the Freidenberg estate, organized by the Finnish Central Agricultural Society on August 25, 1909; 10) tools for surface tillage, the organizer of the competition of which was the Poltava Provincial Zemstvo on June 25–26, 1910, and others. And these are only those for which, under the editorship of K. G. Schindler, large-circulation available official "Reports" were published. There is documentary evidence the competitions were held in other regions of the Russian Empire, for example, in the Caucasus and Crimea (SAK. F. 18. D. 2. C. 289. P. 60).

On November 14, 1905, in the main physical auditorium of the Kiev Polytechnic Institute, K. G. Schindler, after six years of promises, publicly defended his dissertation presented at the Mechanical Department entitled "Theory and design of arable tools" for the title of Adjunct Professor of the Institute (SAK. F. 18. D. 2. C. 289. P. 40). The level of the prepared dissertation, the depth of the results examined in questions of theory and methodology, as well as the brilliant defense almost immediately brought K. G. Schindler into the ranks of the leading scientists in the field of applied mechanics not only in the country, but also in the world. After successfully defending his dissertation, by orders of the Minister of Trade and Industry of December 13, 1905, K. G. Schindler was appointed an Extraordinary Professor in the Cathedra of Mechanics, and on January 19, 1907, an Ordinary Professor in the same cathedra. The desire to be approved as an Ordinary Professor in the Cathedra of Mechanics of the KPI prompted him on May 4, 1906 to officially resign from the post of Dean of the Agricultural Department (SAK. F. 18. D. 2. C. 289. P. 71, 49).

Since 1907 K. G. Schindler was among the first 14 members of the Bureau of Agricultural Mechanics of the Scientific Committee of the Main Directorate of Land Management and Agriculture, created by the Tsar's Decree in 1894 (Erk, 2004, pp. 40–

41). The scientist took part in almost all official events organized by the Bureau in the capital, as well as machine competitions throughout the country: Yekaterinoslavl, Bezenchuk, Vitebsk, Odessa, held in 1910–1911. During its visit, he prepared expert opinions and assessments. K. G. Schindler received an invitation to become a member of the editorial board of the well-known 12-volume edition "Complete Encyclopedia of Russian Agriculture and Related Sciences". He not only reviewed, but also wrote articles for it, for example "Steam Plows" to Volume VI (Schindler, 1912). He was among the members of the editorial committee of the agricultural and economic journal of the South Russian Society for the Promotion of Agriculture and Agricultural Industry, better known as the Kiev Agricultural Syndicate – "Economy" (1906).

The outstanding authority of K. G. Schindler in the professional environment of scientists and teachers is evidenced by the fact of his election as Chairman of the Board of a specialized creative branch scientific association – the Kiev Agronomic Society, which the author of this publication considers as one of the forerunners of the modern National Academy of Agrarian Sciences of Ukraine. The date of its formation should be considered February 12, 1909, when the Kiev City Administration approved the "Statute". Already on February 17, 1909, the first general meeting of 39 founders took place, at which the election was held under the comrade (deputy) of the Chairman of the Management Board – S.L. Frankfurt (Iost, Skuratov & Skvortsov, 1910, p. 9). K. G. Schindler held this position until March 1911.

In 1911, K. G. Schindler, as the Dean of the Mechanical Department, together with seven leading professors and three teachers, by "... order of His Excellency Mr. Minister of Trade and Industry ..." (SAK. F. 18. D. 2. C. 289. P. 66), was relieved of his post at the KPI for political reasons: for defending the rights of students in the well-known case of Kasso on violation of the restrictive 5% rule and admitting an additional twenty Jewish students to the institute (Los', Plygunov, & Chernenko, 1961). As for the Station for Testing of Agricultural Machines and Tools at the KPI, after K. G. Schindler's dismissal, it practically lost its significance and, most importantly, its authority. The same fate befell the cathedra headed by him. The authority of the scientist was evidenced by the fact that even after his release from official posts, he was invited to participate in the All-Russian conference on the organization and tasks of stations in relation to agricultural engineering, convened on January 28–30, 1912 (Erk, 2004, p. 54).

In mid-April 1915, the cultural plow of the SFP, designed by K. G. Schindler during 1911–1915, were tested in the presence of representatives of the Society of Western Zemstvos, the "Worker" partnership and farmers, on two plots of land with an area of 100 sq. fathoms of the peasant Matvey Yursky in the village Demeevka of the Kiev district of the Kiev province. According to some criteria, it turned out to be preferable in comparison with the existing analogs "... Sakka plows and Russian copies ..." (P.P., 1915, p. 346).

At the competition organized in 1912 by the Moscow provincial zemstvo for the construction of a rational peasant plow, the one created by K. G. Schindler plow OK 7

manufactured by the Bryansk plant. The standard of construction K. G. Schindler plows was confirmed by the All-Russian Agricultural Exhibition held on May 29 – October 15, 1913 in Kiev. This was confirmed by the exhibit made by the Kolomensky plant with an original front end of a scooter and a parset dump of a special shape (Yaroshevich, 1914, p. 236). In addition, the improved cultivator designed by K. G. Schindler, who united the possible harrows, represented by the partnership "Worker". The organizing committee of the exhibition also noted the reaper-loader, improved by the scientist. High agrotechnical qualities were shown during tests at the Omsk machine-building station at the end of the summer of 1913 by the colonist plow of the Kolomensky plant of the K2 brand with a blade designed by K. G. Schindler. High competitive capabilities of plows designed by K. G. Schindler was confirmed by the corresponding competitive tests from 10 plants carried out in two stages (June 3–4 and September 4–9, 1915) by the Kiev Association of Western Zemstvos. In terms of plow lightness and productivity (0.55–0.77 dessiatines per day), he peremptorily took first place and outstripped the widely advertised foreign model of the Sakka type.

K. G. Schindler justly achieved his triumph as a designer at the First All-Russian Exhibition of Agricultural Machines of Domestic Production, which opened in Moscow on October 11, 1915, where the "Schindler's" plow of the "Worker" partnership No. 35 was noticed. At the exhibition, the scientist presented a whole a series of his inventions. So, among a large group of plows of the Sakka type, he presented some plows from the "Worker" partnership. It could be designated as an attempt to create an original self-propelled front plow. The designer managed to achieve a hinged connection of the rack with the beam of the plow body.

This, among other things, made it easier to carry out the correct assembly of the plow at the factory. Although, at the same time, the front of the plow was a complex device, not very convenient for machine. A very detailed assessment of the single-body plows created by K. G. Schindler under the auspices of the "Worker" partnership was given by V. D. Koval in a special publication "On the plow of the "Worker" partnership on the pages of "Agricultural Gazette" No. 44, 1915. He emphasizes that its appeared not only "... in a difficult time for the Russian agricultural engineering industry ...", but also "... its had a number of original features in constructive part" thereby refuting the well-established idea that there was no better Sakka plow for tillage (Koval, 1915, p. 1202). K. G. Schindler's new plow, with its appearance and design solutions, gave grounds for its further improvement.

The February bourgeois-democratic revolution of 1917 in tsarist Russia made changes in the life of the scientist. There is every reason to believe that K. G. Schindler accepted it and even planned to return to Kiev to teach at the KPI. On March 21, 1917, an emergency meeting of the Council of Professors of the KPI took place, at which a corresponding Commission was created from representatives of the professors and students. The participants also made a decision "... on the return of the professors dismissed in 1911 during the period of student unrest" (At Polytechnic, 1917, p. 3). A

corresponding petition was also sent to K. G. Schindler, but his move to Kiev became actually impossible due to rapidly developing events.

Until 1919, the scientist worked in various private institutions in Russia that were engaged in the import, sale and manufacture of agricultural machinery. In 1919, he emigrated to England, where he acted as an authorized representative of "Agryunion", as well as director of the British company "Agryunion Limited". In August 1921, he moved to Czechoslovakia, where he became a member of the council of the authoritative emigrant body – the Russian Academic Group, and from October 1921 – of the Council of Russian Professors under the Committee for the Education of Russian Students in Czechoslovakia under the Ministry of Foreign Affairs. He headed the Department of Natural and Agronomic Sciences of the Academic College. In 1921–1922, he lectured at Czech agricultural courses, and also headed the Russian Agricultural Club in Prague. In 1922–1928, he headed the Agricultural Department, the Cathedra of Mechanical Engineering of the Russian Institute of Agricultural Cooperation in Prague. Concurrently, he was a Professor at the Cathedra of Agricultural Engineering Science of the Agronomy and Forestry Department of the Ukrainian Economic Academy in Podebrady, where he created the Cathedra of Agricultural Engineering Science, and in 1924 – a cabinet for practical training. For various reasons, he was forced to leave his job at both universities. He received an invitation to teach in several leading educational institutions in Europe and America, but refused for various reasons. Until the end of life, he worked on the improvement and development of new designs of tillage machines. K. G. Schindler died in 1940 and was buried in Prague.

The conducted research allowed the creative heritage of K. G. Schindler for the formation of agricultural mechanics, theory and practice of testing of the agricultural machines and tools, conditionally divided into periods:

the first (1887–1898) – the formation of scientific interests under the guidance of a corresponding member of the Imperial St. Petersburg Academy of Sciences N. Ye. Zhukovsky at the Imperial Moscow Technical School. Consolidation of the acquired knowledge by the mechanic of the Gardenin brothers' sugar factory (1893–1895); during a seven-month trip to Germany, Austria and Switzerland (1895); private work on the installation of equipment in factories of the Central Industrial Region (1896); business trips from the Department of Agriculture to Germany, France, England, North America (1897–1898). The experience of competitive examinations at the Butyrsky Khutor of the Moscow Agricultural Institute (1896–1897) for testing agricultural machines and tools;

the second (1889–1911) – theoretical and methodological, practical, research and educational activities on the formation and development of agricultural mechanics for the needs of testing agricultural machines and tools of agronomic orientation with work at the corresponding station at the KhTI of Emperor Alexander III (1898-1899) and organizations, as well as the leadership of the specialized KPI (1900–1911). Organization of carrying out and instrumental and methodological support of

competitions-tests of agricultural machines and implements throughout the European part of the Russian Empire and, first of all, the Ukrainian provinces (1902–1910). The beginning of theoretical and design developments regarding the plow blade, which was realized in a dissertation defended in 1905 and a series of fundamental monographs. Outstanding scientific and educational activities for the training of specialists for the needs of agriculture and especially – testing of agricultural machines and implements;

the third (1911–1919) – commissioning activities in the trade of agricultural machines of the "Rabotnik" partnership in St. Petersburg and consulting of their production at supplier factories. Systematic design work on the creation of various types of plows, seeders, reaping machines and cultivators, which was recognized at various regional competitions and all-Russian exhibitions. Bryansk and Kolomna plants began their mass production;

the fourth (1919–1940) – an attempt to organize the export of agricultural machines and implements from England to Soviet Russia. Teaching, scientific and design activities for the training of emigrant Russian and Ukrainian youth in Czechoslovakia. Preparation of a series of publications, which, first of all, summed up many years of research on the foundations of mechanical engineering and the guiding principles of the rational use of agricultural machines and tools (unfortunately, they remained in manuscripts). Continues to develop new designs of tillage machines (1930–1940). The most famous of them is the moto-cultivating plow – "steel shaft", which was patented in Czechoslovakia and Poland.

In the aggregate of the above, it can be argued that, based on his discoveries in the field of agricultural mechanics and especially agricultural engineering, he has the right to claim personalities – "historical elites", and not as perceived for a long time by secondary personalities. He achieved his greatest scientific achievements while working in the Ukrainian lands at the KhTI and KPI (1898–1911).

Conclusions.

On the basis of the conducted research a conditional periodization of K. G. Schindler's contribution to the theory and practice of testing the agricultural machines and tools, as well as the formation of agricultural mechanics in Ukraine, is proposed for the first time. It made it possible to assert that the most fruitful scientist in this field was represented, working on the Ukrainian lands in the KhTI (1898–1899) and especially in the KPI (1899–1911). These results became the basis for further research into the period of emigration in Czechoslovakia (1921–1940). It should be noted that, since 1902, K. G. Schindler was directly involved in the design, first for the needs of the testing agricultural machines and tools in the form of improving and creating a series of appropriate instruments, as well as methods for their use. From the second half of 1911 to 1918 he actively designed the agricultural tools, primarily plows. While in exile, he did not continue inventing so successfully, from 1928 until his death.

Funding.
This research received no external funding.

Conflicts of Interest.
The author declare no conflict of interest.

References

Anonymous (1917, Marth 7). V politekhnicheskom institute [At Polytechnic Institute]. *Vechernyaya gazeta – Evening newspaper,* (1357), 3 [in Russian].

Beretti, A. (1898, August 30). Po povodu stat'i K. Schindlera "Amerikanskie molotilki" [About article "American Thresher" by K. Schindler]. *Hozyain – Farmer*, (35), pp. 1184–1185 [in Russian].

Bibliografiya [Iz praktiki dlya praktiki. Zemledel'cheskie orudiya i mashiny. I. Plug. K.Schindler. Moskva, 1897. 16 s] [Review [From practice for practice. Agricultural tools and machines. I. Plow. K. Schindler. Moscow, 1897. 16 p.]. (1898, June 18). *Izvestiya Ministerstva zemledeliya i gosudarstvennyh imushchestv – News of the Ministry of Agriculture and State Property,* (25), 388 [in Russian].

Bieliakov, G. F., Vasylenko, Ye. S., Vilkov, M. F., Gavrysh, S. A., Gorovsky, F. Ya., Zavinovsky, M. L., Karpenko, M. F., … Shehovtsov, V. I. (1995). *Narys istorii: Kyivskyi Politekhnichnyi instytut [Essay on history: Kyiv Polytechnic Institute]* Kyiv : Naukova dumka. [in Ukrainian].

Bogoiavlensky, S. N. (1913). Sel'skohozyajstvennaya mashinoispytatel'naya stanciya pri Kievskom Politekhnicheskom Institute. Sel'skohozyajstvennoe mashinostroenie [Agricultural machine testing station at the Kiev Polytechnic Institute. Agricultural engineering]. *Trudy II-go Vserossijskogo S"ezda Deyatelej po gornomu delu, metallurgii i mashinostroeniyu 17–24 aprelya 1913 g. – Proceedings of the Second All-Russian Congress of Mining, Metallurgy and Mechanical Engineering Workers April 17–24, 1913.* (pp. 278–292). Sankt-Petersburg: Tipografiya M. Merkushina. [in Russian].

Erk, F. (2004). *Iz istorii stanovleniya sel'skohozyaystvennoj mekhaniki v Rossii [From the history of the formation of agricultural mechanics in Russia]*. Sankt-Peterburg: Publishing House of the North-West Research Institute of Agricultural Mechanization and Electrification [in Russian].

Iost, A., Skuratov, F., & Skvortsov, A. (1910). *Otchet o deyatel'nosti Kievskogo Agrnomicheskogo obshchestva [Report about activities Kiev Agronomic Society]*. Kiev: Kiev Agronomic Society [in Russian].

Kagan, M. K. (1902). K voprosu ob eksperimental'nom izuchenii zemledel'cheskikh mashin i orudij [To the question of experimental study of agricultural machines and implements]. *Stantsiya ispytanij zemledel'cheskikh mashin i orudij pri Kievskom politekhnicheskom institute Imperatora Aleksandra II – Station for*

Testing of Agricultural Machines and Implements at the Kiev Politechnic Institute of Emperor Alexander II. (Vol. 2). Kiev: Publishing House of the Laboratory of Agricultural Machinery at the Kiev Polytechnic Institute [in Russian].

Kagan, M. M. (1910). *O teorii pluga [About the plow theory]*. Kiev: Publishing House of the Laboratory of Agricultural Machinery at the Kiev Polytechnic Institute [in Russian].

Koval, V.D. (1915). O pluge Tovarishchestva "Rabotnik" [About the plow of the "Worker" Partnership]. *Zemledel'cheskaya gazeta – Agricultural newspaper*, *44*(108), 31 oktyabrya, 1202. [in Russian].

Kovalevsky, L. E. (1991). *Zarubezhnaya Rossiya: Istoriya i kul'turno-prosvetitel'skaya rabota russkogo zarubezh'ya za polveka (1920–1970) [Russia Abroad: History and Cultural and Educational Work of the Russian Abroad for Half a Century (1920–1970)]*. Parizh: Librairie des Cinq continents [in Russian].

Kramarenko, L. P. (1924). Dosvidna stancija dlja vyprobuvannja siljsjkoghospodarsjkykh mashyn pry KPI [Experimental station for testing agricultural machines at KPI]. *Kyjivsjkyj politekhnichnyj i Kyjivsjkyj siljsjkoghospodarsjkyj instytuty: 25 rokiv (1898–1923) – Kyiv Polytechnic and Kyiv Agricultural Institutes: 25 years (1898–1923): juvilejnyj zbirnyk* (p. 188). Kyiv: Kyiv University Publishing House [in Ukrainian].

Los', F. E., Plygunov, A. S., & Chernenko, N. V. (Eds.). (1961). *Iz istorii Kievskogo politekhnicheskogo instituta: sbornik dokumentov i materialov [From history of Kiev Politechnic Institute: collection of documents and materials]*. (Vol. 1). Kiev: Kiev State University Publishing House [in Russian].

Mashiny – orudiya sovremennago sel'skago khozyaystva [The machines – implements of modern agriculture]. (1904). Kiev: Pechatnya S. P. Yakovleva [in Russian].

Nagibin, V. I. (1909). Zadachi, ocherk razvitiya, plan organizatcii i deyatel'nosti za 2008 g. stantcii ispytaniya zemledel'cheskih mashin i orudij Elisavetgradskogo obshchestva sel'skogo hozyajstva [The tasks, development outline, plan of organization and activities for 2008 testing station for agricultural machines and tools of the Elisavetgrad Agricultural Society]. *Izvestiya byuro po sel'skohozyajstvennoj mekhanike – News of the Bureau of Agricultural Mechanics*, (1), 38–53 [in Russian].

Narizhnyi, S. (1942). Ukrajinsjka emighracija: Kuljturna pracja Ukrajinsjkoji emighraciji mizh dvoma svitovymy [Ukrainian emigration: Cultural work of Ukrainian emigration between two worlds]. (Vol. 1). Pragha: Liberation Struggle Museum Studies Ukraine [in Ukrainian].

P. P. (1915). Demonstratsiya raboty pluga tovarishchestva "Rabotnik" konstrukcii professora Shindlera [Demostration of the plow of Society "Worker" of construction by Professor Schyndler]. *Mashiny v sel'skom hozyaystve – Machines in Agriculture*, (8), 346 [in Russian].

Perepelkin, A. P. (Ed.). (1896) *Otchet o Pervoj sel'skohozyajstvennoj mashinnoj vystavke, byvshej v 1895 godu, s 21 maya po 18-e iyunya na Butyrskom hutore*

Zemledel'cheskoj shkoly Imperatorskogo Moskovskogo Obshchestva sel'skogo hozyaystva, po sluchayu 75-letiya Obshchestva [Report about the first agricultural machine exhibition held in 1895, from 21st May to 18th on the Butyr farm of the Agricultural School of the Imperial Moscow Society of Agriculture on the occasion of the 75th anniversary of Society]. Moscow: Society of Printing A. A. Levenson [in Russian].

Perepelkin, A. P. (Ed.). (1897). *Zhnei i zhnei-snopovyazalki. Otchet o Vtoroj ocherednoj vystavke sel'skokhozyaystvennykh mashin i orudij, byvshej v 1896 g. s 10-go iyulya po 18-e avgusta, na Butyrskom hutore Zemledel'cheskoj shkoly Imperatorskogo Moskovskogo obshchestva sel'skogo hozyajstva [Reapers and reapers-sheaves. Report about the second regular exhibition of agricultural machines and implements, held from 10th to 18th August 1896 on the Butyr farm of the Agricultural School of the Imperial Moscow Society of Agriculture]*. Moscow [in Russian].

Poghorily, L. V., Mudruk, O. S., & Shkvyra Z. A. (2003). Istorija zarodzhennja systemy vyprobuvannja siljsjkoghospodarsjkoji tekhniky v Ukrajiny [History of the origin of the testing system of agricultural machinery in Ukraine]. *Tekhniko-tekhnologhichni aspekty rozvytku ta vyprobuvannja novoji tekhniky i tekhnologhij dlja siljsjkogho ghospodarstva Ukrajiny [Technical and technological aspects of development and testing of new equipment and technologies for agriculture of Ukraine]* (Vol. 1), (pp. 43–50) [in Ukrainian].

Politipazhi, eskizy i chertezhi mashin-orudij sovremennogo sel'skogo hozyaystva. Uchenie o zemledel'cheskikh mashinakh i orudiyah inzhener-mekhanika K. G. Schindlera [Polytypes, sketches and drawings of modern agriculture. Study about agricultural machines and implements of mechanical engineer K. G. Schindler] (Vol. 3). *Mashiny-orudiya: 1. – Obrabotki pochvy, seva i uhoda za rasteniyami. 2. – Uborki urozhaev. 3. – Obrabotki urozhaev [III. Machine tools: 1. – Soil cultivation, sowing and plant care. 2. – Harvesting. 3. – Harvest handling]*. (1902). Kiev: Svetopechat' S. V. Kul'zhenko [in Russian].

Schindler, K. G. (1904). *Teoriya i konstrukciya pakhotnykh orudiy [Theory and design of tillage tools]*. (Vol. 1). Kiev: Publisher S. P. Yakovleva [in Russian].

Schindler, K.G. (1912). *Parovye plugi. Polnaya enciklopediya russkogo sel'skogo hozyaystva i soprikasayushchikhsya s nim nauk [Steam Plows. Complete Encyclopedia of Russian Agriculture and Sciences Related to It]*. (Vol. VI). Sankt-Peterburg: Publisher A. V. Devriena [in Russian].

Sladek, Z. (1991). Russkaya i ukrainskaya emigratciya v Chekhoslovakii: (1920-e g. st. iz ChSFR) [Russian and Ukrainian emigration in Czechoslovakia: (1920s from the CSFR)]. *Sovetskoe slavyanovedenie – Soviet Slavic Studies*, (6), 24–36.

State Archives of Kiev (SAK).

State Archives of the Kharkov Region (SA of the Kharkov Region).

State Archives of the Tver Region (SA of the Tver Region).

Vasylenko, P. M., & Voitiuk, D. Gh. (1998). Do istoriji rozvytku zemlerobsjkoji mekhaniky na Ukrajini [Prior to the history of development of agricultural machinery in Ukraine]. *Naukovyj visnyk NAU – Scientific bulletin of NAU,* (9), 3–18 [in Ukrainian].

Verhunov, V. A., & Mudruk, O. S. (2001). Hruntoobrobna tekhnika v zhytti profesora Schindlera [Tillage equipment in Professor Schindler's life]. *Istorychna pam'yat' – Historical memory,* (1–2), 154–158 [in Ukrainian].

Verhunov, V. A. (2019). *Profesor Shyndler Kamill Gavrylovych (1869–1940): hromadyanyn Shveytsariyi, shcho proslavyv naukovo-osvitnyu skladovu Ukrayiny [Professor Kamill Gavrilovych Schindler (1869–1940): citizen of Switzerland, who glorified the Ukrainian scientific-educational component]*. Kyiv: FOP Yamchyns′kyy O. V. [in Ukrainian].

Verhunov, V. A., Mudruk, A. C., & Shkvyra, Z. A. (2019). *Kamill Gavrylovych Schyndler (1869–1990) [Kamill Gavrilovich Schindler (1869–1990)]*. Kyiv: FOP Yamchyns′kyy O. V. [in Ukrainian].

Vernadsky, V. I. (2002). *O nauke [About sciense]*. (Vol. 2). Moscow: Rol'f [in Russian].

Yaroshevich, S. (1914, February 20). Obshchee i sel'skohozyajstvennoe mashinostroeniya na Vserossijskoj vystavke v Kieve [General and agricultural engineering at the All-Russian exhibition in Kiev]. *Hutoryanin – Farmer,* (8), 236 [in Russian].

Zadachi i funkcii Kievskoj stancii ispytaniya zemledel'cheskih mashin i orudij. [The tasks and functions of Kiev Station for Testing of Agricultural Machines and Implements]. (1907). *Izvestiya stancii ispytaniya zemledel'cheskih mashin i orudij pri Kievskom politekhnicheskom institute Imperatora Aleksandra II – News of Station for Testing of Agricultural Machines and Implements at Kiev Politechnic Institute of Emperor Alexander II*. Kiev: Publisher S. V. Kul'zhenka [in Russian].

Zhurilo, D. Yu. (2016). *Stanovlenie i razvitie Har'kovskogo tekhnologicheskogo instituta v konce XIX – nachale XX veka [Formation and development of the Kharkov Institute of Technology in the late 19th – early 20th century]*. Kharkiv: Publisher NTU "KhPI" [in Russian].

Віктор Вергунов
Національна наукова сільськогосподарська бібліотека Національної академії аграрних наук України, Україна

Внесок професора К. Г. Шиндлера (1869–1940) в становлення сільськогосподарської механіки, теорії та практики випробувань землеробських машин і знарядь в Україні

Анотація. *В статті висвітлено життєвий і творчий шлях видатного вітчизняного вченого, теоретика, методолога і практика*

сільськогосподарського машинобудування К. Г. Шиндлера, пов'язаний зі становленням сільськогосподарської механіки в Україні. Методологічну основу дослідження склали принципи історизму, науковості і об'єктивності у висвітленні явищ минулого на базі комплексного використання загальнонаукових, спеціальних, міждисциплінарних методів. Вперше введено до наукового обігу низку документів з російських і українських архівів, які відображають окремі факти професійної біографії вченого. Охарактеризовано основні напрями плідної педагогічної і наукової діяльності К. Г. Шиндлера, ключові сегменти його творчих пошуків, які визначили подальший розвиток сільськогосподарського машинобудування, його лідерство в науковому співтоваристві. Доведено, що професору К. Г. Шиндлеру належить першість в заснуванні Станції випробувань землеробських машині і знарядь агрономічної спрямованості при Київському політехнічному інституті, яка забезпечила можливість студентам сільськогосподарського і механічного факультетів ознайомитися з існуючими типами і конструкціями ґрунтообробних механізмів, системно відпрацьовувати методи їх дослідження. Окрім того, станцією здійснювалася наукова робота з вивчення окремих питань механізації сільського господарства, розробки методик і приладів для проведення випробувань землеробських машин і знарядь. Відпрацьовані вченим вперше в Європі на початку минулого століття сім функцій дослідної станції агрономічного типу стали орієнтиром для багатьох поколінь дослідників сільськогосподарської техніки. К. Г. Шиндлер першим у світі теоретично обґрунтував необхідність удосконалення конструкції ґрунтообробної техніки залежно від ґрунтово-кліматичних умов, зробив вагомий внесок в теорію деформації ґрунту полицею корпусу плуга. Окрім того, удосконалив динамометр Сакка, розробив контрольний динамометр для провірки тягових динамометрів та інші прилади, удосконалив існуючі і розробив нові конструкції ґрунтообробних машин. К. Г. Шиндлер першим в Україні почав викладати курс сільськогосподарського машинобудування.

Ключові слова: *К. Г. Шиндлер; сільськогосподарська промисловість; станція випробувань землеробських машин і знарядь; Київський політехнічний інститут*

Виктор Вергунов
Национальная научная сельскохозяйственная библиотека Национальной академии аграрных наук Украины, Украина

Вклад профессора К. Г. Шиндлера (1869–1940) в становление сельскохозяйственной механики, теории и практики испытаний земледельческих машин и орудий в Украине

Аннотация. *В статье представлен жизненный и творческий путь выдающегося отечественного ученого, теоретика, методолога и практика сельскохозяйственного машиностроения К. Г. Шиндлера, связанный со становлением сельскохозяйственной механики в Украине. Методологическую основу исследования составили принципы историзма, научности и объективности в освещении явлений прошлого на базе комплексного использования общенаучных, специальных, междисциплинарных методов. Впервые введено в научный оборот ряд документов из российских и украинских архивов, отражающие отдельные факты профессиональной биографии ученого. Охарактеризованы основные направления плодотворной педагогической и научной деятельности К. Г. Шиндлера, ключевые сегменты его творческих поисков, которые определили дальнейшее развитие сельскохозяйственного машиностроения, его лидерство в научном сообществе. Доказано, что профессору К. Г. Шиндлеру принадлежит первенство в создании Станции испытаний земледельческих машин и орудий агрономической направленности при Киевском политехническом институте, которая обеспечила возможность студентам сельскохозяйственного и механического факультетов ознакомиться с существующими типами и конструкциями почвообрабатывающих механизмов, системно отрабатывать методы их исследования. Кроме того, станцией осуществлялась научная работа по изучению отдельных вопросов механизации сельского хозяйства, разработки методик и приборов для проведения испытаний земледельческих машин и орудий. Отработанные ученым впервые в Европе в начале прошлого века семь функций опытной станции агрономического типа стали ориентиром для многих поколений исследователей сельскохозяйственной техники. К. Г. Шиндлер первым в мире теоретически обосновал необходимость усовершенствования конструкции почвообрабатывающей техники в зависимости от почвенно-климатических условий, внес весомый вклад в теорию деформации почвы полкой корпуса плуга. Кроме того, усовершенствовал динамометр Сакка, разработал контрольный динамометр для провирки тяговых динамометров и другие приборы, усовершенствовал существующие и разработал новые конструкции почвообрабатывающих машин. К. Г. Шиндлер первым в Украине начал преподавать курс сельскохозяйственного машиностроения.*

Ключевые слова: *К. Г. Шиндлер; сельскохозяйственная промышленность; станция испытаний земледельческих машин и орудий; Киевский политехнический институт*

Received 20.10.2020
Received in revised form 14.02.2021
Accepted 23.02.2021