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SOVIET MACHINE BUILDING

NO. 16

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SOVIET MACHINE BUILDING

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SELECTED TRANSLATIONS

(CONSTRUCTION MACHINERY)

Introduction

This is a serial publication containing selected translations on machine building in the Soviet Union. This report contains translations on subjects listed in the table of contents below.

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1. New Construction Machines

/Following is a translation of an unsigned article in Stroitel' i Dorozhnoye Mashinostroyeniye (Construction and Road Machine Building), No. 3, March 1960, page 34./

Leningradskiy Sovnarkhoz

New Designs of Concrete-Laying Machines. The Leningrad Branch of the VNIIStroydormash /All-Union Scientific Research Institute of Construction and Road Machine Building/ has completed its tests of an experimental tracked concrete-laying machine. This machine is designed for building road surfacings as much as 30 cm thick. It will lay concrete on the road base, tamp it, and conduct the finishing of the surfacing. Previously all these operations had been conducted successively by four different machines whose combined weight reached 86 tons. The new concrete-laying machine weighs only 14 tons.

In addition, the Institute has designed a lightweight concrete-laying machine for operation on main urban thoroughfares, distinguished by its high maneuverability.

Tests of experimental models of these machines have been successful.

Khersonskiy Sovnarkhoz

D-337 Rubble-Laying Machine. The "Dormashina" Nikolayevskiy Road Machinery Plant has constructed the experimental model of the D-337 rubble-laying machine.

Previously the building of the rubble road base was conducted by a team of roadworkers by means of motorized graders and 5-10-ton motorized rollers; the operations were of low efficiency.

The new machine is used to lay rubble into the prepared road trench. It can lay rubble in a strip 3-3.6 meters wide and as much as 20 cm. thick (compacted). When at low gear alone, the rate of the laying of rubble amounts to 65-70 cm an hour.

The D-337 rubble-laying machine has proved its worth when in operation.

Kostromskoy Sovnarkhoz

New Excavator Attachment. The "Rabochyy Metallist" Plant has designed, constructed and tested an experimental model of a new attachment -- a backhoe shovel -- to the E-801 and E-10011 excavators. It is designed for ditching operations, and digging pits under laminated foundations and pipe trenches.

The new backhoe shovel will make it possible to mechanize a number of hitherto manually executed excavation operations. The capacity of its bucket is 0.8 m^3, the maximum depth of its digging is 6.5 m., the height of its dumping into means of transport is 4.8 m., and the radius of its dumping -- 2.2 m.

A special design feature of the new removable attachment is the presence of a special curved-profile boom, which makes it possible to dig deep ditches while manipulating a relatively short lever. The curved boom coupled with a short lever reduces the danger of a cave-in of the ditch floor when digging deep ditches in weak soil, and it makes possible a convenient dumping into means of transport. Dumping into ordinary rear dump wagons is also possible.

A bucket with a continuous cutting edge, which had been devised by D. I. Fedorov, is mounted on the shovel. The use of this bucket reduces the digging effort. It is much simpler to construct, and it is 15-20 percent lighter in weight than the bucket normally used on backhoe shovels.

The installation of this backhoe shovel in E-801 and E-10011 excavators expands the scope of application of these machines and creates the conditions for their broader employment.

Tests of the new removable attachment have yielded positive results....

2. Types of Cranes Needed by the Construction Industry

/Following is a translation of an article by V. A. Ivanov and V. I. Polyakov in Mekhanizatsiya Stroitel'stva (Mechanization of Construction), No. 3, March 1960, pages 3-8./

At present the principal type of installation machines used in residential and industrial construction are tower cranes, whose pool totals 21,000. Approximately 80-85 percent of that pool is composed by tower cranes with lifting capacities of one to two tons which, consequently, cannot be used for erecting large-panel and large-block mass residential buildings; 10-12 percent of the pool is represented by tower cranes with lifting capacities of three to five tons, and of an obsolete design (with swiveling heads and counterweights) which does not satisfy the contemporary requirements of the conduct of installation operations.

In addition to tower cranes, tracked and rubber-tired cranes are used in industrial construction. These tracked and rubber-tired cranes are constituted mainly by general-purpose excavator cranes which are not adapted to installation operations; the special installation cranes account for only about five percent of the total pool of all construction cranes.

The E-1254 and E-2006 tracked installation cranes with lifting capacities of 15 and 50 tons and the SKG-25 crane with its 25-ton lifting capacity have been manufactured in very limited quantities.

Industry is manufacturing rubber-tired cranes of three models: K-102, K-123, K-252 (K-255), with lifting capacities of 10, 12 and 25 tons, respectively.

However, the K-102 and K-123 cranes are insufficiently adapted to installation operations, because they have short jibs without "goosenecks" and ordinary screw-jack supports (the K-123 crane).

The K-32, LAZ-690, DEK-51, K-51, AK-5, and AK-5G type automobile-mounted cranes with lifting capacities of three to five tons, used in construction, are not suitable for installation operations. There is a limited number of K-104 cranes with 10-ton lifting capacity in construction organizations.

Builders have extremely few gantry cranes with 5-ton lifting capacity for erecting residential buildings, and with 50-ton lifting capacity for assembling industrial objects.

T-37 and T-41 hoists are fundamentally used for hoisting various construction loads.

At present, more efficient hoists -- self-propelled KP-0.6's and portable C-446's and C-589's -- have begun to be delivered to construction sites on an experimental basis.

Construction organizations at present operate with about 22,000 hoists i. e., nearly as many hoists as tower cranes, which cannot be deemed satisfactory.

As a result of such a situation, during the post-installation period, in an overwhelming majority of cases, builders are compelled to use high-power and expensive installation cranes in finishing operations. Thus, the cost of lifting one ton of load increases 12-15 times and reaches 15 rubles instead of the one-ruble cost during the period of installation and execution of brick masonry.

The number of hoists used in brick construction should be fourfold or fivefold greater than the number of tower cranes, and it should be equal to the latter in the assembling of prefabricated buildings.

As is known, the cost of the technical maintenance and repair of cranes with lifting capacities of 1.5-10 tons accounts for 25-55 percent of the cost of a machine-shift.

Such a high share of the expenditures on crane maintenance and repair stems largely from shortcomings in the designs of cranes. For the same reason, the duration of per-shift upkeep of excavator cranes is extremely high, reaching 75-120 man-minutes (according to the power rating of the machine). The duration of the upkeep of Nos. 1 and 2, respectively, lasts 320-410 man-minutes (according to chronometrage data of the NIIOMTIP /Scientific Research Institute of Organization and Mechanization of and Assistance to Construction, Academy of Construction and Architecture USSR/.

The high labor input involved in such upkeep stems from the great number of points requiring lubrication which, e. g., in the K-51 crane amounts to 50, and in the SBK-1 and E-652 cranes -- 190 and 240, respectively.

No provision has been made for the centralized lubrication of units and parts in any tower crane type, and the existing system of lubrication by means of oil cans is technically obsolete; many lubrication points are not easily accessible.

As a result the stoppages of machinery for repair take considerable time. Thus, tower cranes with lifting capacities of up to five tons take three, 11 and 18 days for current, medium and capital repairs, respectively (in accordance with instructions I 117-56).

The principal units of a crane are executed in the

form of individual nonunified subassemblies built directly into every machine, which does not make it possible to apply progressive repair methods such as, among others, the assembly-unit one, and which greatly complicates the servicing of machines and the replacement of spare parts, and which leads to prolonged stoppages under job-site conditions.

Nonstandard reducing gears are installed in many types of tower cranes. The cabs of all tower cranes, except for the MBTK-80 and in part the MSK-3-5/20 and MSK-5/20, do not assure normal working conditions of the operator.

The cabs of jib cranes are not as a rule isolated from the engine compartment, nor are they heat-insulated.

Certain jib crane models have exposed gear trains and chain drives, worm gears, and sliding bearings, which reduces the efficiency of mechanisms, accelerates the wear of parts, and increases the consumption of operating supplies.

A serious shortcoming is the low wuality of electrical equipment and of its installation in the machine.

In addition to the shortcomings of the design and manufacture of cranes and hoists, grave shortcomings take place in the development of complementing crane equipment, primarily diesels, electric motors, apparatuses, ropes, friction materials, and ball bearings.

The currently used internal combustion engines sometimes display unsatisfactory technical and operating indexes: low motor transportation potential, excessive weight and dimensions, and high unit consumption of fuel compared with up-to-date engines.

The absence of special diesels, inclusive of the air-cooled ones, and the limited variety of the serially manufactured diesels are holding up the establishment of unified standard series of type-sizes of tracked and rubber-tired cranes of various power ratings.

The electrical engineering industry does not provide the special multiple-speed electric motors with built-in brakes and flanged and vertical shafts, and small-size control panels needed for cranes.

The currently produced electrical equipment is not provided with an appropriate set of spare parts, and this leads to considerable stoppages of cranes and hoists.

The controls previously used in cranes have been of imperfect design, heavy and ponderous, making it impossible to create a compact control panel, and this aggravates greatly the working conditions of crane operators.

The rubber industry does not satisfy the needs of road and construction machine building with the up-to-date chamberless low-pressure balloon and arched tires which are

so greatly needed by the heavy road conditions on construction sites.

The instrument building plants do not develop computing and control devices for calculating machine performance and restricting work movements, and neither do they develop industrial type radio and tele/vision?/ installations for mounting in cranes and hoists.

Special control cabs with built-in seats and devices are not being manufactured, and neither are ball thrust bearing-based turntables.

The currently used ropes display an insufficient breaking load limit, which shortens their service life and increases the dimensions of winches and other mechanisms.

Thus, the existing crane pool does not, from the standpoint of its quantity, characteristics, variety and type-sizes, satisfy fully the requirements of construction work, including the installation of mass residential and industrial buildings of precast reinforced concrete.

The volume of scientific-research and experimental work in the field of construction cranes and hoists is limited and incommensurate with present-day problems.

The NIIOMTP -- the main institute called upon to solve the problems of the development of crane types, series and parameters, crane operation and repair, improved utilization of cranes and hoists, and drafting technical requirements for new models, has but a limited number of scientific research workers who specialize in the mechanization of installation operations, limited experimenting facilities, and an insufficiently strong design bureau, and hence it is unable to resolve these problems on the proper scale.

It should be noted that while the opportunities of research institutes are limited, they moreover duplicate their activities mutually.

Hitherto, such important questions as the coordination of methods of computing crane design and unification of technical requirements and design standards for cranes and hoists have not been settled. Standard series of type-sizes of boom cranes and hoists with unified units and parts have not been devised and the GOST /All-Union State Standard/ for tower cranes has not been revised.

The volume of theoretical and experimental research is too limited in the following fields: strength, durability and efficiency of cranes; crane drive; determination of wind loads on cranes; development of new types of safe grabbing devices and improved crane runways, and studies of the problems pertaining to the designing of cranes with automatic guidance as well.

Hitherto no unified standards have been developed for

the assembling, dismantling and haulage of tower cranes and the construction of crane runways.

The existing administrative standards do not take into account the new progressive operating methods, so that as a result builders have to expend 450,000 man-shifts annually on transferring the BKSM-5 and SBK-1 type cranes to new bases of operations, and the resulting crane stoppages reach 90,000 machine-shifts.

In addition to the devising of new crane designs, considerable attention should be paid to improving the utilization of the existing machinery pool -- in particular through its modernization.

At present, a number of construction and installation organizations, including the Stroytrest Construction Trust No. 1 of the Dnepropetrovskiy Sovnarkhoz, the Glavkievstroy Main Kiev Construction Trust, the Minsredmash Ministry of Medium Machine Building, and the Kievskiy Sovnarkhoz, are conducting the modernization of SBK-1 type cranes, which makes it possible to raise their lifting capacity to three and four to five tons.

Considering that the crane pool includes about 6,000 SBK-1 type tower cranes, the effect of this modernization may be expressed by the figure of approximately 12,000 tons of /added/ lifting capacity, which is equivalent to an annual output of 24,000 new five-ton cranes and a steel saving of the order of 42,000 tons.

...The adopted new grouping of units makes it possible, while doubling the crane lifting capacity, to apply many structural-metal units from the SBK-1 crane with minimal modifications.

The amount of the new metal needed for the modernization of the crane is about two tons.

In view of the high technical and economic indexes of the new crane, the expenditures on modernization (about 20,000 rubles) could be recouped within a year.

The unsatisfactory situation in the development of the cranes and hoists needed by builders is largely attributable to the absence of a single coordinating scientific-research center for studies of new progressive designs of construction cranes and hoists.

Another reason is the dispersion of effort on the designing of cranes and hoists. As a result, the designing of tower cranes alone is handled by as many as over nine different design bureaus, offices and institutes, and of hoists -- by two, including one plant design bureau.

Still another reason for the shortcomings in crane design work is to be seen in the absence of a strong industrial base and, in addition, in the absence of the speciali-

zation and cooperation of the crane and hoist plants, and in the dispersion of production.

Tower cranes are manufactured by about 40 plants, one-half of this total belonging to construction organizations. In this connection, the geographical distribution of these plants among the economic rayons is extremely irregular. Thus, e. g., nearly 95 percent of all plants are located in the European USSR, and eight of them lie in Moscow and in Moscovskaya Oblast.

Only three plants exist in Siberia. In Central Asia and the Far East there are no crane building plants at all.

In the majority of plants the annual output of tower cranes is planned within the limits of 20 to 50-80 units. Only seven plants manufacture 150-350 machines each annually and can export their output to other sovnarkhozes.

The irregular geographical distribution of the manufacture and the administrative dispersion of designing of cranes have engendered an extraordinarily broad variety of crane types.

At present about 100 different models and type-sizes of tower cranes are in operation -- 80 of them in residential and civic construction.

In 1959 tower cranes for the erection of residential and civic buildings alone were manufactured in 19 different models.

The tower cranes being manufactured include not only the up-to-date types but also the obsolete metal-consuming S-419, M-3-5-5 (NZBK-5/24), BKSM-5-5A, and T-226 types. As a result, about 6,000 tons of metals annually are unproductively consumed.

According to the data of the NIIOMPTI, to ensure the installation of precast reinforced concrete, the number of rubber-tired and tracked cranes to be manufactured in the 1959-1965 period should amount to approximately 60 percent -- or together with railroad and gantry cranes, 65 percent -- compared with the total number of tower cranes.

However, the plans of crane output for the new few years stipulate a four-to-one ratio of tower cranes to jib cranes.

The number of new jib cranes with 10-15 ton lifting capacity needed for the 1959-1965 period totals about 5,000 units, and that of cranes with 20-60 ton lifting capacity -- 2,000 units. Special attention should be devoted to the production of E-2006 installation cranes with 50-ton lifting capacity and E-1254 type tracked 20-ton diesel cranes of the tower type with improved installation characteristics based on the Technical Requirements of the Ministry of Construction RSFSR, and 20-25 ton tracked installation

cranes with a turbo-transformer ensuring a broad and smooth regulation of operating speeds.

The heavy-duty tracked cranes with 50- and 75-ton lifting capacities of the Voronezh Excavator Plant and the 75-ton cranes of the Uralmashzavod Ural Machine Building Plant, which are being developed on the basis of excavators, should have all the characteristics of regular cranes.

The serial production of diesel-hydraulic and turbo-transformer rubber-tired cranes with lifting capacity of 10-15 tons and the mastering of the production of heavy-duty rubber-tired 40-60 ton cranes designed for installation operations, as intended at the Odessa Heavy Crane Building Plant, should be accelerated. This will make it possible to count on complementing substantially with these cranes the pools of construction organizations within the next few years.

The design work on rubber-tired cranes with lifting capacities of over 60 tons should be speeded up.

At present the construction ministries and agencies themselves have to be occupied with the mastering and production of jib-type installation cranes, and this situation cannot be regarded as satisfactory.

...The research conducted by the NIIOMTP has shown that, in application to the planned 10-30 day periods of erecting prefabricated large buildings up to five stories high, including buildings assembled of entire-room units, the use of rubber-tired and tracked cranes is most economical.

Rubber-tired cranes with five-ton lifting capacity are, in terms of the labor input and cost of installation operations involved in erecting prefabricated buildings, 20-25 percent more efficient than tower rail cranes of the same capacity (taking into account the construction of crane platforms in buildings).

The Leningrad Central Polytechnical Design Bureau of the Orgtekhstroy /Organization of Technical Construction/ was commissioned by the NIIOMTP to draft the blueprints for two rubber-tired tower cranes with three- and five-ton lifting capacities for the construction of large-panel buildings. It has done so, and now these blueprints are used by the Leningradskiy Sovnarkhoz and the Ministry of Construction Belorussian SSR to construct experimental models of these machines....

3. Improve the Supply of Installation Cranes to the Construction Industry

/Following is a translation of an unsigned article in Mekhanizatsiya Stroitel'stva (Mechanization of Construction), No. 3, March 1960, pages 1-2./

In recent years considerable achievements have been made in the field of the mechanization of hoisting, transporting and installation operations and the provision of construction with lifting cranes.

Diverse load-lifting cranes have been designed and are being serially manufactured for the purpose of elevating the technological level of construction, ensuring the rapid erection of large structures, improving the technology of construction production, and raising the labor productivity of construction workers.

Tower cranes with lifting capacities of three to five tons are widely used in the construction of residential buildings, schools, hospitals and civic and public-utility structures. In recent years, new, less metal-consuming mobile tower cranes which can be easily transferred to new operating bases with minimal expenditures have been developed and transmitted for industrial production.

Tower cranes with lifting capacities of as much as 75 tons are being successfully used for installation operations in industrial construction.

The serial manufacture of tracked, automobile-mounted and rubber-tired cranes with lifting capacities of up to 50 tons has been set into smooth gear; such cranes are used for loading, unloading and hoisting building materials and structures and for conducting installation operations as well. By the end of 1959 the number of tower cranes and self-propelled jib cranes in the construction organizations of the sovnarkhozes ministries and agencies had totaled 40,000.

However, the existing pool of construction and installation cranes and the scale of their production do not assure a successful solving of the tasks facing construction in this seven-year period.

The rising tempo and scale of construction require not only the expansion of the scope of the output of hoisting and transporting machinery but also an expansion of the variety of its types, improvement of its technical and

economic indexes and, to a not lesser degree, substantial improvement in the management of cranes on construction sites.

A large part of the existing tower cranes is designed for lifting capacities of up to 1.5 tons, and in its dimensions it is incommensurate with the conditions of industrial construction, with the use of precast structures and parts and, the more so, with the assembling of entire buildings of large components. The recently designed mobile tower cranes are manufactured in insufficient quantity.

The production of tower cranes is dispersed among many unspecialized enterprises and they are as a rule manufactured in small series, which makes it impossible to organize technological progress in a suitable manner and which by the same token raises crane costs.

Construction has not been provided with a sufficient number of tracked and automobile-mounted construction-installation cranes, which are the most economical and universal means of the mechanization of many forms of industrial construction.

The machine building industry produces few self-propelled jib cranes with the technical and economic characteristics satisfying the requirements posed to up-to-date construction-installation cranes.

Many types of automobile-mounted and rubber-tired cranes are excessively heavy, display an insufficient lifting capacity when operating without outriggers, have a limited maneuverability, and their designs do not assure a safe manipulation of the jib with load.

Previously no tower installation cranes of the rubber-tired type with rapidly operated outriggers had been designed.

The use of general-purpose tracked excavators with crane attachments for installation operations is dictated by necessity and it hardly improves the situation, because such machines are not geared for conduting installation operations.

The design and operating qualities of new construction-installation cranes are vitiated because the allied branches of industry do not provide the crane building industry with sufficient accessories and parts of the proper size and quality, particularly air-cooled diesels, hydraulic drives, and electrical crane equipment, which, as delivered in the present form, are extremely ponderous and complex.

The further development of the industrialized methods of construction and the introduction of large-panel prefabricated components and parts into construction practice require a radical improvement in the composition of the crane

pool through the expansion of that pool with new high-power self-propelled cranes of up-to-date design, whose production in the necessary quantities should be organized in the enterprises of the machine-building industry.

Construction organizations are under the obligation of taking resolute measures to improve the utilization of the present pool of construction-installation cranes. It cannot be overlooked that construction cranes had previously not been adequately utilized in construction. In a majority of construction organizations, tower cranes operate for a single shift only, and the amount of time worked does not exceed 2,000-2,500 hours a year, which is to a large degree attributable to the unsatisfactory organization and efficiency of the front of operations, irregularities in the supply of materials and parts to job sites, and dispersion of the crane pool among numerous smaller administrations and trusts.

It is necessary to apply more broadly the positive experience of the specialized organizations of the Glavmosstroy, Glavleningradstroy, Glavkievstroy, etc. /main construction administrations in Moscow, Leningrad, Kiev, etc./ where, thanks to the concentration of cranes in trusts and administrations, mechanization, and efficient servicing and repair, the coefficient of technical readiness of cranes is much higher than in other organizations, and where the daily use of cranes lasts 1.5-1.7 working shifts per average listed crane.

One of the reasons for the unsatisfactory utilization of tower cranes in housing construction is because these cranes are, after the completion of installation work in a building, not infrequently retained for hoisting the finishing materials.

A considerable potential for increasing crane productivity lies latent in applying the more efficient method of installing structures and parts directly from the means of transport.

The experience of the pace-setting installation organizations indicates that, by employing progressive methods of transferring the base of operations of tower cranes by utilizing mast and jib attachments and suspension ballast, transporting larger units, and hoisting together the tower, jib and counterweight, it is possible to reduce the stoppages in crane operation by 30-60 percent compared with previous methods.

It is necessary to generalize more rapidly and to introduce more broadly the pace-setting methods of the assembling, disassembling and transport of tower cranes, and to draft unified standards for these operations.

The positive experience of Trust No. 17 of the Dnepropretrovskiy Sovnarkhoz and of the Glavmosstroy, Glavkievstroy and other construction organizations attests to the feasibility of a substantial increase in the lifting capacity of tower cranes of the obsolete types without any major modification of their design and with minimal expenditures of material means.

This pertains primarily to such widely used cranes as the BKSM-5 and SBK-1, whose lifting capacity can be successfully increased by 30-50 and more percent through modernization.

It is necessary to generalize the available experience in the modernization of construction-installation cranes, to draft and popularize recommendations concerning the most efficient methods of renovating the obsolete-type cranes.

The research and project-design work on the designing of new efficient construction-installation cranes and modernization of the existing ones, and in the field of improving the utilization and operation of the crane pool, is conducted by many organizations without a single overall plan and without the necessary mutual ties; there occur fairly frequent cases of unjustified duplication of activities, and excessive delays in the solving of individual problems of pressing importance. This results in the excessive diversity of crane types and absence of the standardization of crane designs.

It is necessary to eliminate, with the assistance of the leading scientific-research institutes, this unnecessary "parallelism" and to achieve a strict coordination of activities in the field of construction-crane building and application of cranes in construction.

During the period from 30 November to 2 December 1959 a conference on improving the design and operation of construction-installation cranes was convened in Stalino (Donets Basin) at the behest of the Scientific and Technical Society of the Construction Industry, the Central Committee of the Trade Union of Workers of the Construction and Building Materials Industry, and the Scientific Research Institute of the Organization, Mechanization and Technical Assistance to Construction, Academy of Construction and Architecture USSR.

The Conference, which was attended by over 300 specialists from enterprises, construction sites, and scientific-research and design organizations, had adopted a number of practical recommendations concerning the improvement in the designing of special-purpose cranes and their more efficient utilization....

4. A Crane for the Installation of Trestles and Bridge Girders

/Following is a translation of an article written by A. Z. Amstislavskiy, A. A. Brovkin, and K. A. Roshchin in Mekhanizatsiya Stroitel'stva (Mechanization of Construction), No. 3, March 1960, pages 17-19./

...Technical Specifications of the Crane

Lifting capacity of main attachment suspended on a fixed-length 27-meter jib	80 tons
Lifting capacity of auxiliary attachment suspended on a fixed-length 49-meter jib	30 tons
Maximal lifting height of main attachment, in terms of distance from rail head	6 meters
Maximal lowering height of main attachment, in terms of distance from rail	15 meters
Hoisting speed of main attachment	1 meter/minute
Speed of lateral movement of main attachment	1.5 meters/minute
Maximal lifting height of auxiliary attachment, in terms of distance from rail head	15 meters
Maximal lowering height of auxiliary attachment, in terms of distance from rail	80 meters
Lifting speed of auxiliary attachment	7 meters/minute
Speed of lateral movement of auxiliary attachment	5.5 meters/minute
Traveling speed of crane	9.5 meters/minute
Total weight of crane	571 tons...

...This installation crane, with its 80/30-ton lifting capacity, is being used in the construction of the Bratsk Hydroelectric Power Station for erecting a main concrete-car trestle provided with span structures measuring 44 meters in length and weighing up to 80 tons (Figs. 2 and 3) /page 18 of Source/. In its technical parameters this crane satisfies fully the conditions for installing the trestle by a pioneering method, and it makes possible the installation of pillars with the 49-meter jib and when the structural unit to be installed weighs 30 tons, as well

the installation of 80-ton span structures with the 27-meter jib. Comments from construction men indicate that this crane has fully justified its purpose.

The design of this crane was drafted by the Moscow Project-Design Office of the Gidrostal'proyekt /State Institute for the Design and Planning of Steel Structures for Hydroelectric Developments/. The crane itself was built by the Dnepr Machine Plant in the city of Zaporozh'ye.

5. Universal Jib-Type Self-Propelled Tower Cranes

/Following is a translation of an article written by M. P. Khodov and L. N. Shchipakin in Mekhanizatsiya Stroitel'stva (Mechanization of Construction), No. 3, March 1960, pages 9-14./

...In the immediate future our industry should organize the production of self-propelled installation cranes with a load moment within the limits of 150-450 tons/meter, moving on crawler treads, rubber tires and rails.

The solving of this problem should be ensured by the serial production of standardized units of the mechanisms used in various crane versions.

As shown below, there exists a possibility of using identical standardized turntables, jibs and other working attachments in different crane models for different conditions of the conduct of installation operations.

The designing of new models and the modernization of the existing types of self-propelled cranes will reduce the need for using tower cranes with a load moment of 150-450 tons/meter, a fact which will curtail the labor input and costs of construction and installation operations and improve the utilization of installation equipment.

Below is cited the description of a number of new self-propelled mobile installation cranes based on standardized units and components and on a combined jib-and-tower design, which are either in production or being mastered for production or in their final designing stages, and which expand considerably the range of applications of cranes in construction and installation operations and supplant the less mobile and less productive tower cranes with medium lifting capacity.

The Promstal'konstruktsiya /Design and Planning Office of the Main Administration for the Building and Installation of Fabricated Steel Structures/ has in recent years been conducting large-scale work on the designing of universal installation cranes in which the advantages of jib cranes and tower cranes could be combined.

...Previously the installation of water-tower structures used to be conducted by means of a special 55-meter jib with a lifting capacity of three tons, mounted on a SKG-30 tracked crane. A tower-and-jib attachment mounted on the same crane has a lifting capacity of 7.5 tons and a somewhat higher lifting height of hook.

The increase in the crane's lifting capacity as a result of the use of the tower-and-jib attachment has made it possible to install water-tower walls together with their sheathing, which has reduced considerably the labor input and time of the installation.

The turntable of the new universal cranes is, together with all of its mechanisms and power plant, identically adapted for mounting in tracked, rubber-tired or rail cranes -- e. g., the SK-30 and SKU-101 railroad cranes, the SKG-30, SKG-30/10 and SKG-30/7.5 tracked cranes and the new SKP-30/10 rubber-tired crane all are provided with an identically designed turntable. The standardization of the turntable substantially reduces the production and operation costs of cranes and broadens their universality.

In addition to the turntable, the working equipment (jib, "hammer head") of these cranes has also been standardized, and this makes it possible to adjust the cranes to various working conditions easily.

At present, the following models of cranes with tower-and-jib equipment have been developed: tracked SKG-30/10, SKG-30/7.5, SKG-50, and SKG-75 cranes; universal SKU-101 and SKU-102 cranes, and the SK-300 jib crane.

The tracked SKG-30/10 and SKG-30/7.5 cranes are modifications of the SKG-30A (SKG-30) crane (Fig. 1) [Page 9 of Source]. The SKG-30/10 crane, whose specifications are cited below, differs from the SKG-30A crane by possessing a 20.85 meters long maneuvering "beak."

To alter a SKG-30 crane into a SKG-30/10 crane, it is necessary to replace its jib.

The SKG-30/7.5 tracked crane differs from the SKG-30/10 crane in that additional inserts five meters long each are mounted in its jib and "beak." The SKG-30/7.5 crane can lift on a 15-meter jib a load weighing 30 tons to a height of 14 meters, and on a 30-meter jib with a 25.93-meter "beak" -- a load weighing 7.5 tons to a height of 54 meters.

The SKG-30A (SKG-30) crane can also serve as the basis for still other new versions substructed on altering the length of jib or "hammer head."

The SKG-30/10 and SKG-30/7.5 cranes have been operationally tested with good results.

The tracked SKG-50 crane (Figs. 2, 3) [Pages 9-10 of Source], whose production is being mastered at the Ramenskiy Machine Plant of the Glavstal'konstruktsiya [Main Administration for the Building and Installation of Fabricated Steel Structures], of the Ministry of Construction RSFSR can be equipped with 15-, 30-, 35-, and 40-meter jibs and with a tower-and-jib attachment having a 35-meter jib and a 28.9-meter "beak."

Specifications of the SKG-30/10 Tracked Crane

Maximal lifting capacity of:	
15-meter jib	30 tons
20-meter "	20 "
25-meter "	15 "
25-meter " plus 20.85 meter "beak"	10 "
Load Lifting Speed	18-9 meters/minute
Swiverling speed of crane	0.7 RPM
Traveling speed of crane	0.7 km/hour
Diesel:	
Type	KDM-100
Power rating	100 horsepower
Generator:	
Type	SG-60/6
Power rating	50 kwt
Total weight of crane with 15-meter jib	61.4 tons

The complete set of jib equipment of the SKG-50 crane includes section No. 1, two meters long, designed for the 15-meter jib and geared for a 50-ton lifting capacity, and section No. 2, four meters long, designed for a 30-ton lifting capacity, and adapted for mounting the maneuvering "beak."

In addition to the maneuvering "beak," an ordinary 10-meter "beak" provided with an auxiliary lifting mechanism with an eight-ton lifting capacity can be mounted on all the jibs of the SKG-50 crane. The specifications of the SKG-50 crane are cited in Table 2.

The SKG-75 tracked crane with 75-ton lifting capacity (Fig. 4) planned by the Promstalkonstruktsiya for this year, has a 40-meter jib, a 29.165-meter maneuvering "beak" and a 10-meter removable "beak" with 10-ton lifting capacity.

By removing the inserts, the jib can be shortened to 30 or 20 meters in length. The length of the maneuvering "beak" can be shortened in the same manner to 19.165 meters.

Two jib sections are included in the complete set of working equipment of the SKG-75 crane. One, two meters long, is designed for a 75-ton lifting capacity. The other, No. 2, four meters long, is designed for a 30-ton lifting capacity and is adapted for mounting the maneuvering "beak" in it.

In the SKU-101 and SKU-102 universal cranes the crawler treads of the SKG-30/10 crane are replaced by /bogies designed for/ five-meter gauge rails. These cranes

Table 27

Specifications of Tracked Cranes

	SKG-50	SKG-75
Maximal lifting capacity of:		
15-meter jib	50 tons	75 tons*
30-meter "	30 "	50 "
40-meter "	15 "	30 "
35-meter " with 28.9 meter "beak"	15	20** "
Load Lifting Speed		
15-meter jib	6-0.96 m/min	
30-meter "	9-1.45 " "	17-0.7 m/min
40-meter "	18-2.9 " "	
Rotating speed of crane	0.26 RPM	0.24 RPM
Traveling speed of crane	0.765 km/hr	0.5-1 km/hr
Diesel:		
Type	1D6	1D6
Power rating	150 HP	150 HP
Generator Power	100 kwt	100 kwt
Total rated weight of crane with 15-meter jib	90 tons	120 tons
Weight of counterweight	20 tons	20 tons

* With 20-meter jib
** With 40-meter jib and 29-meter "beak."

have somewhat higher load characteristics than the SKG-30/10 and SKG-30/7.5 cranes, because the rated grade of the runway of rail cranes is less steep than that of the runway of crawler-tread cranes.

As for the other characteristics, except for traveling speed, they are the same in these cranes.

The SKU-102 crane can be rigged with tower-and-jib attachments from the SKG-30/10 or KSG-30/7.5 crane. The SKU-101 crane differs from the SKU-102 only by the length of its jib and "beak." Both cranes (SKU-101 and SKU-102) can operate both with maneuvering "beaks" and without them, with the jib alone.

The SKU-101 cranes, built at the Ramenskiy Machine Plant, have passed prolonged industrial tests and have demonstrated their high operating qualities.

The SK-300 construction crane (Fig. 5) is currently in the developmental stage. It is adapted wholly for operation with the turntable and tower and jib attachments of

the SKG-50 crane, which are mounted on a railroad platform with two standard two-axle bogies of the freightcar type and on a special intermediate platform with a monorail bogie.

...The load characteristics of the SK-300 crane are somewhat higher than those of the SKG-50 crane. The increased load lifting capacity of the SKG-300 crane is to be explained, first, by the fact that in the SKG-50 crane the jib, when rigged with a "beak," is installed at a slight angle of inclination, whereas in the Sk-300 crane it is installed vertically, and second, by the fact that the rated grade of the path of the SKG-50 crane is steeper than that of the SK-300 crane.

The SK-300 crane, once it arrives along a railroad line, can be brought into operational state within two or three days, whereas the on-site assembling of the Bk-300 tower crane with analogous load characteristics requires at least 20-25 days.

The principal advantage of tower-and-jib cranes consists in that they can conduct the entire complex whole of installation operations, beginning with the installation of heavy components at a low height and ending with the installation of comparatively lightweight components at great heights.

These cranes require much less expenditure of funds and time on assembling, disassembling and transport than tower cranes. The SKG-30/10, SKG-30/7.5, SKU-101, and SKU-102 cranes are transported on trailers in three parts: travel unit, turntable and working equipment.

...The decrease in expenditures on the assembling and transport of tower-and-jib cranes, compared with tower cranes, is evidenced by the following data:

The dismantling and assembling of a SKU-101 crane can be carried out within 32 hours by a team of four persons without using any additional devices whatsoever.

The conduct of the same operations with regard to a conventional BK-102 type tower crane having the same maximal lifting capacity and lifting height as the SKU-101 crane and a load moment that is nearly two times less requires the use of special hoisting mechanisms and the expending of 160 hours of work by a team of eight persons.

The transport of SKG-50 and SKG-75 cranes can be conducted like the transport of the SKG-30/10 and SKG-30/7.5 cranes, with the difference that a part of the counterweight has to be removed from their turntables.

Compared with tower cranes, the tower-and-jib cranes with identical load characteristics and lifting heights

weigh less, even though crawler tread /"tracked"/ machines are much heavier than rail machines.

Another advantage of the new tower-and-jib cranes compared with tower cranes is that the former are equipped with diesel-electric stations which can, if desired, switch to current from an outside power system....

6. Experimental Modernization of Tower Cranes

/Following is a translation of an article by A. G. Lobov in Mekhanizatsiya Stroitel'stva (Mechanization of Construction), No. 3, March 1960, pages 14-17./

Specifications of the KTS-3-5 Crane

Lifting capacity with 20-meter jib	3 tons
" " " 14-meter "	4.5 "
" " " 12-meter "	5 "
Lifting height of hook	21 meters
Speed of:	
Load lifting	15 meters/minute
Travel	30 " "
Carriage travel	32 " "
Rotation of crane	0.6 RPM
Rail gauge and base of crane	4x4 meters
Radius of swivel of rear part	3.9 "
Power rating of installed electric motors of:	
MT-42 cargo winch	16 kwt
Swivel engine	2.2 "
Carriage-travel engine	1.7 "
Jib-winch engine	10 "
Weight of Structure and mechanisms of crane	24 tons
Weight of ballast	19 "
Total weight of crane	43 "
Pressure on bull wheel	20 "

...When mobile MSK-3-5/20 and BTK-80 type cranes are transported on semitrailers with the head of the column resting on the vehicle's body, the base of the semitrailer has to be very large (e. g., for the MSK-3-5/20 crane, 14.5 meters). The KTS-3-5 crane /on the other hand/ can be transported on ordinary heavy truck trailers whose base is no larger than 4.5-6 meters.

...The expenditures on the construction of special facilities crane transport cannot be effectively recouped by crane operation because of the lack of possibilities for a better utilization of these facilities. Thus, e. g., the rubber tires and wheels necessary for constructing special semitrailers for transporting 100 cranes could be used to equip 20 heavy truck trailers. Considering that the base

of operations of the average crane has to be shifted about four times in a year, the servicing of a pool of 100 cranes requires 400 work shifts of these special semi trailers, whereas 20 heavy trucks can accomplish 5,000 work shifts in a year. Should heavy trucks be used /instead of semitrailers/ for transporting cranes, they could be utilized for this purpose to the extent of eight percent of their working time, and for the remaining 92 percent of their time they could be utilized for transporting other types of equipment or components for large-panel construction sites. A similar utilization of the special-purpose semitrailers could not have been possible.

Side by side with their positive qualities, the KTS-3-5 cranes display a very essential shortcoming related to the conditions of the conducted plant modernization.

The modernization of the BKSM-3 cranes was carried out in two stages. First the structural-metal parts of the crane were modernized without touching the old mechanisms. The mechanisms left in the BKSM-3 crane, though quite efficient, lag far behind the level of up-to-date designs, because their operation involves the need for more frequent repairs and hence is not smooth enough.

The general plan of modernization of the KTS-3-5 cranes provides for the group principle of mounting of mechanisms in separate frames. Therefore the replacement of these mechanisms by new ones will cause no special difficulties, not even in the cranes actually in operation.

The KTS-3-5 cranes have been manufactured serially by the Zolotonoshskiy Plant since the second half of 1959, and at present they operate successfully on the construction sites of the Ministry of Transport Construction in a number of cities and settlements along railroad lines.

7. The D-464 Asphalt-Laying Machine of a Lightweight Type

/Following is a translation of an article by B. F. Taryanskiy and M. S. Tobak in Stroitel'noye i Dorozhnoye Mashinostroyeniye (Construction and Road Machine Building), No. 3, March 1960, pages 12-13./

The "Dormashina" Nikolayevskiy Road Machine Building Plant has devised and built the prototype of a D-464 self-propelled asphalt-laying machine of a lightweight type, designed for conducting small- and medium-scale operations involved in the laying of asphalt concrete during the construction, renovation and repairs of improved road surfacings.

Specifications of the D-464 Asphalt Layer

Dimensions of strip laid by the machine:	
Width	1,000-3,500 mm
Thickness	20-100 "
Productivity	65 tons/hour
Base	1,170 mm
Track	2,625 "
Road span	100 "
Traveling speed:	
Forward	1.92; 3.37; 5.96; 6.93;12.2; 21.5; meters/minute
Reverse	1.59 and 5.77 meters/minute
Speed of transporting the machine on a trailer	25 km/hour
Operating rate of the compacting bar	750 strokes per min.
Height of stroke of the bar	4.5 mm
Weight of mixture charged into the bin	3,500 kg
Engine:	
Grade	T-62
Power rating	13 HP
RPM	1,200
Dimensions:	
Length	5,200 mm
Width	2,600 mm
Height	2,365 mm
Weight of:	
Machine	4,660 kg
Single-axle trailer for transporting the machine	1,260 kg

The new crawler asphalt-laying machine (Fig. 1) [Page 13 of Source] is distinguished by the simplicity of its design and servicing, good maneuverability, and transportability. It can be used under the most variegated conditions of restricted space -- in the construction of street sidewalks and roads one to three-and-one-half meters wide, inside the buildings of industrial enterprises, and in the repair of road surfacings.

The D-464 asphalt layer consists of three self-contained units easily coupled to each other: receiving unit 1 (Fig. 2) [Page 13 of Source], travel unit 2 and working unit 3. The machine's receiving unit is constituted by a hopper bin for receiving the asphalt-concrete mixture from a dump truck. The working unit consists of two bottom slide rails resting on the road surface and rigidly coupled by cross-beam 5. As a result of the presence of these slide rails which counteract the effect of irregularities of the road surface, the mixture can be laid in an even, smooth layer. A tamping bar and a road drag are mounted on the cross-beam. The travel unit of the machine fulfills the role of a tractor hauling the machine's working and receiving parts. It is constituted by a chassis resting on crawler treads.

...The asphalt-concrete mass is discharged by a dump truck into the receiving bin of the asphalt-laying machine without halting the [operation of the] latter. The mass then drops directly onto the roadbed through a rectangular opening in the bottom of the bin. The compacting of the asphalt mixture is conducted by a vibrating bar; the thickness of the layer is regulated by three flaps mounted on the rear wall of the bin. The compacting bar distributes the mixture uniformly on the roadbed, shears off the surplus at the top and leaves behind a compacted layer of the desired thickness.

The surplus mass creates a ridge moving in front of the compacting bar, which prevents the formation of gaps and depressions in the laid strip of the mixture. The surface compacted by the bar is leveled by the road drag, and the final compacting operation is conducted by the rollers following behind the asphalt-laying machine.

The complete set of the asphalt-laying machine includes a single-axle trailer designed for transporting the machine over large distances.

The loading of the asphalt-laying machine onto the trailer is conducted by moving the machine by its own propulsion system up a collapsible gangway. Prior to loading, the machine is adjusted to its in-transport position, in

order to reduce its dimensions: the slide rails of the working units are folded and the receiving bin is turned onto its side.

The D-464 asphalt-laying machine has successfully passed its tests and has been approved for serial production.

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