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SILICOSIS AND SILICOTUBERCULOSIS OF QUARRIERS IN THE REGION OF POPINA AND DUBLJE

The authors discuss the problem of silicosis and silicotuberculosis in the stonecutters of the villages of Popina and Dublje, district of Trstenik, People's Republic of Serbia. They also put forward various geomorphological and mineralogical data indicating that in this country there are large areas where, in view of rapid industrialization, an increase of the silicosis and silicotuberculosis sickness rate can be expected in the near future.

They also analysed data on socio-economic conditions and other environmental factors at Popina and Dublje. The methods of work of the stonecutters are described in detail.

Among health problems first to be discussed are those of the tuberculin index and of the fluorography of the local population. Sickness rate of silicosis and silicotuberculosis in stonecutters and their family members is dealt with, especially the problem of the silicosis in children. The following clinical features are described – characteristic radiographic changes, clinical pictures, complications and the treatment of silicosis and silicotuberculosis.

The last chapter of the paper contains a short presentation of the legal situation with regard to silicosis and silicotuberculosis control and discusses the laws and regulations in force at present in this country.

Geomorphological and mineralogical data

The central part of the Balkan Peninsula is covered by the mighty Rhodope Mountain System, which had, during long geological periods, remained firm land (»the Eastern Island«). Although the boundaries of this mountain system – as against the surrounding mountains that are geologically much younger – are not everywhere clearly marked, its limits can nevertheless be drawn in the main lines (4), (5).

The western boundary of the Rhodope Mountains follows the river Drina to its easternmost curve (near Bajina Bašta) and from there

passes through Dragačevo to reach the river Ibar at its westernmost curve, then follows the old dislocation zone and depression and the Ibar, crosses Kosovo to reach the Šar Planina and the Ohrid–Prespa lake district; it then follows the upper course of the river Vistritsa and crosses Thessaly to reach the Gulf of Volos. The eastern boundary skirts the river Maritsa in Bulgaria. In the south this system comprises also the Greek islands of Thasos and Samothraki (6). The northern boundary is controversial: some maintain it to be the promontory on which the Belgrade Fortress has been built, while others consider that it crosses to the left bank of the Save and of the Danube into the Pannonian Basin. There is no doubt that the Vršačke Čuke belong to it. The southern part of the Rhodope Mountains is the broadest one, it is narrowest in its northern part in the district of the Morava.

The Rhodope Mass is composed of rocks belonging to pre-Cambrian periods, to the Archeozoic and Algonkian periods, such as crystalline schists, gneiss, mica schists, phylites, amphibolite [silica contents: 45–90% and even beyond that (19), (20)] with sporadic intercalations of marble. In the period of Hercynian foldings (lower and upper Carboniferus), i. e. in the period when two well-known mountain systems were built in Europe, the Armorican (Ireland – Southern England – Brittany – Central French Plateau) and the Variscial (Central French Plateau – Vosges – Black Forest – Thuringia – Bohemia – Silesia), granite broke through those rocks here and there (as e. g. on the Kopaonik).

All through the Paleozoic and until the end of the Eocene the Rhodopes were surronded by sea, and only in the Oligomiocene there appeared flexures along the geosynclinales on vast areas of the present-day Balkan and Dinaric–Šara–Pindus System. These mountain systems therefore date back only as far as the tertiary (the end of Paleocene and beginning of Neocene).

Geomorphological investigations have proved that the crystalline mass of the Rhodope system arose much before Perm and therefore remained firm land while its outskirts were washed by seas. A considerable part of the Rhodopes, the mountains of the Kopaonik massive, were also surrounded by sea in the Paleozoic (Carboniferus) in which layers of phylite and – in shallower parts – argil, that in due course turned into argilloschists with inclusions of graphite, originated from organic matter (38).

The northern part of the Kopaonik (Željin, Ljukten and Goč) running parallel to the Dinaric mountain system – this being also a proof of the powerful influence which the folding of the Dinarides had on this part of the Rhodopes – is composed of quartz conglomerates and quartz schists, serpentines, granite, phylite (silica contents: 40–95%), marble and vast deposits of asbesto. This whole region is on the frontier of the Transition Zone lying between the Rhodope massive and the shores of the former Neocene seas.

This area is therefore important for many reasons both geomorphologically and mineralogically as well as indirectly for mining–industrial and socio–medical reasons, such as:

1. The area finds itself on the Rhodopes Transition Zone between the large geosynclinales along which the flexures of younger mountain systems had formed;
2. This region and its nearest neighbourhood toward west and east, and even toward south and north, harbours the greatest mineral treasures of Yugoslavia. These have been partly exploited already;
3. The future mining potential of this region seems enormous;
4. The mineral wealth of this region can be reached only after penetrating rocks exceedingly rich in free silica which cannot be lookend upon as indifferent to occupational health;
5. Finally, here we meet also with the largest deposits of asbestos in this country, and their exploitation represents also an occupational health hazard.

The whole region towards the Western Morava up to the »Sarmatic Etage« (upper Miocene) was once firm land and the deposits of quartz-sandstone in the village of Popina (district of Trstenik) probably originated in some gulf of the Sarmatic Sea. In addition to fossiles and impressions of parts of plants found in the quarries of this rock (38), this view is also confirmed by following analyses of rocks from quarries in the villages of Popina and Dublje (39).

1. QUARTZITE, quarry »Gavranovica«:

a) Chemical analysis:

SiO_2 97,79%

Fe_2O_3 / Al_2O_3 2,17% (slightly more iron than aluminium)

b) Microscopic analysis:

Opal, developed as a stalactitic mass, is very likely to have been deposited from warm waters around former wells.

Composition. The amorphus mass of the opal is finely crystallized in places. Enbedded in this basis are fine ramifications and lumps of quartz and chalcedony. There are, here and there in this opalic basis, also admixions (possibly through absorption) of larger quantities of iron hydroxide. Microscopic observation reveals easily a stalactitic structure. The mass must have been created by deposits of layer over layer.

2. QUARTZ SANDSTONE, quarry »Peščar«:

a) Chemical analysis:

SiO_2 85,53%

Fe_2O_3 / Al_2O_3 9,40%

Qualitatively contains calcium and magnesium.

b) Microscopic analysis:

Quartz sandstone, rock of sedimentary origin of classical character.

Composition. Quartz grains (ower 90%) and then in smaller quantities acid feldspars (microline, orthoclase, albite) and very small amounts of muscovite.

Structure: manifestly psammitic.

Cement: preponderantly silicated.

3. Rock »PIJUKOVAC«, quarry »Ravno Bučje«:

a) Chemical analysis:

SiO_2	96,00%
Fe_2O_3 + Al_2O_3	2,70%

b) Microscopic analysis:

Opalic mass, composed of amorphous and finely crystallized silica with ramifications and lumps of chalcedony and some quartz. In some place a small quantity of iron hydroxide is admixed to the opal in guise of pigment. The texture of the rock is mostly stalactitic with frequent transitions into spongiform.

4. PENIŠ–»PENA«, quarry of ordinary Dublje stone:

a) Chemical analysis:

SiO_2	95,10%
Fe_2O_3 + Al_2O_3	3,80%

b) Microscopic analysis:

Opalic mass entirely similar to that of the rock »Pijukovac« (analysis N° 3) only with slightly superior contents of iron hydroxide and chalcedony.

In addition to the above there are 10 other quarries at Popina and Dublje of similar chemical and microscopic composition. All these rocks are exploited and the stone is dressed. Granite and trachyte are transported to Popina and Dublje from farther away (e. g. from Željin). The contents of silica in all these rocks is about or above 85–95%.

Historical data concerning stone-cutting in the villages of Popina and Dublje.

Stone-cutting is doubtless as ancient as the settlements in Popina and Dublje, i. e. about 200–300 years.

It seems that the first to be discovered was the quarry »Peniš«, from which the millstones were cut for water-mills on brooks, as they have been cut ever since. These stones were monolithic and were taken out of the rock at the quarry. The principal tool was the »špic«, an old-

fashioned hammer, pointed on the one end as our present-day pick and square-faced on the other as our present-day hammer. It was much larger than the modern hammer. The pointed end of that old hammer was used instead of a pick (Fig. 1).

At first water-mill stones were made out of a single piece of rock and later from several pieces and as concrete was unknown, the pieces were glued together with argil.

Later the quarry »Peščar« was discovered and supplied stone for monuments, grindstone as well as building stone. The method of work and the dressing were quite primitive.

The individual workers worked at their homes. They would canvass »customers« in Serbia travelling 15–20 days in ox-carts and in larger groups so that they would even take a cartwright along with them.

A major change set in in 1894 when a 50-years concession was given to an Austrian firm from Novi Sad. That firm discovered the quarry »Gavranovica« and began to exploit it. It would hire our stonecutters to break the stone and hew it into semi-finished blocks, and then would transport these to Novi Sad where they were further dressed into millstones.

Our stonecutters learned from Austrian craftsmen to work millstones as they do it to-day and which we shall describe presently. Private stonecutters were not allowed to break stone from »Gavranovica«, but they continued to work on products from »Peščar« and »Peniš« as well as from other quarries that began to open and of whom there are fourteen already.

That was the position as it continued until World War I. During that war the firm was idle, but individual cutters who had not been mobilized continued to work.

In 1916 the Serbian Government adopted a decision at Corfu annulling all concessions to enemy aliens. Thus, after the war, the people entered »Gavranovica« and everybody started working for himself, private stonecutter undertakings began to appear, to hire cutters and to buy ready-made stones from individuals. However, soon a struggle began to develop between the former Austrian firm and the owners of the small national stonecutter undertakings concerning the exclusive concession for domestic and foreign trade. This struggle lasted until 1935 when it ended to the disadvantage of the Austrian firm and also to that of the individual stonecutters, because the owners of national stonecutters undertakings obtained an exclusive concession for the foreign market, while they could share the domestic market with small producers.

This situation continued until the Second World War and during that war. After the war, in 1945, a stonecutters' cooperative was established and in 1947 a district stonecutting concern was created. Moreover there is quite a number of private stonecutters.

Data concerning socio-economic conditions and the way of life.

This study covers only the quarries belonging to the villages of Popina and Dublje (Fig. 2).

The inhabitants of those two villages are mostly immigrants. Some families seem to have arrived 200–300 years ago from Montenegro and from Kosovo and Metohija, while the majority came in the course of the last fifty years from economically passive but nearer regions, attracted precisely by the stonecutting which had, since the establishment of the Austrian firm, begun to offer better possibilities for a livelihood.

All these cutters are in reality peasants. Their possessions vary between 0.10 and 17 hectares: mostly forests and grasslands with some vineyards. There is little arable land and it is (especially at Popina) of poor quality. Therefore the population rather goes in for stock-breeding and fruitgrowing than for the tilling of the soil. As only a small amount of cereals is grown at home, they must buy them elsewhere. There are only five families at Popina and ten at Dublje who need not buy bread.

We analysed the plots of peasants who did and of those who did not work in stonecutting (Table I). The analyses shows that there

Table I

Land owned by stonecutters and farmers respectively

Villages	Average area per head of population (in hectares)	
	Stonecutters	Farmers
Popina	0,57	0,60
Dublje	0,70	0,75

is no essential difference in the size of the plots, although the average is slightly higher for the farmers. We conclude therefrom that the size of the plot is not in itself the decisive factor for adopting a stonecutter's career. There are several other factors playing a more or less important part e. g. family tradition, quality of the land, number of family members capable for work etc.

In any case the population has to look for sources of revenue outside agriculture, and as on the one hand this region abounds in suitable stone and on the other peasants are loth to go away from their homes, these very conditions direct them towards stonecutting.

Table II shows the social structure of the inhabitants of the two villages. The majority are stonecutters.

Table II

Social structure of the population

Village	Stonecutter profession			Other professions									
	Principal	Secondary	Total	Farmers	Farriers	Cartwrights	Mechanics-locksmiths	Masons	Employees	Pupils	Turners	Country tailors	Total
Popina	85	23	108	48	3	1	2	1	2	38	—	—	95
Dublje	145	7	152	21	—	—	3	—	3	32	1	1	61
Altogether	230	30	260	69	3	1	5	1	5	70	1	1	156

In view of the fact that the stonecutter profession usually passes through generations from father to son and that to–day the majority of the people live in family cooperatives, it may be interesting to mention the total number of homes in the villages as against the number of the stonecutters houses:

At Popina total number of houses 90, stonecutters'houses 67 i. e. 74.44%

At Dublje „ „ „ „ 103, „ „ 86 „ 83.49%

At Dublje there are 17 families whose only occupation is farming: of these 11 are widows of early deceased cutters. Therefore there are in reality only 6. At Popina, on the other hand, there are 23 only farming households. These families have some extra income from water-mills.

Stonecutting is done exclusively by males. They start to work very young (Fig. 3 & 4). Earlier the boys started to work in quarries as soon as they had finished the elementary school. Now they begin somewhat later (between 14 and 16): in both villages there is only one cutter under 14. They continue to work for anything between 3 months and 56 years. The average duration of their activity is 17.4 years at Popina and 15.3 at Dublje.

It is characteristic that even to-day children are helping their parents at work. Our photograph (Fig. 4) which was taken in December 1948 shows a nine-year old boy assisting his father and holding the so–called »burgija«. He thus starts to inhale quartz dust from his ninth year. As a rule, however, children are not allowed to work on quartzite: they usually start on sandstone because it is »softer«.

Real stonecutters do no agricultural work, not even two or three days a year. If they do not work as hired workers they stay at home summer and winter busy with dressing stones. In the winter they keep their children in the same room (which is usually also the kitchen and often the only room); these sit on the floor near their father, or stand in the »dubak« (a special appliance for teaching children to walk) or lie in the cradle. In any case the children thus start to inhale stone dust from their earliest youth.

Women do agricultural work and the majority do not shun even the heaviest work which elsewhere is done only by man. Their help in stonecutting is only exceptional and consists either in the transport of raw materials from the quarry or during work with concrete and iron when adult males are not at home.

In both villages there are altogether 160 stonecutters' and 29 farmers' marriages (Table III). There is no statistically significant difference between the average number of births in those two groups, although the stonecutters'marriages are slightly more fertile.

Table III

Number of births in stonecutters' and farmers' families

Village	Stonecuttters			Farmers		
	Marriages	Births	Average of births per marriage	Marriages	Births	Average of births per marriage
Popina	73	282	3,8	22	72	3,2
Dublje	87	322	3,7	7	25	3,5
Altogether	160	604	3,7	29	97	3,3

The stonecutters wear the same sort of clothes as other peasants in the village and as all highlanders of this region: in winter a suit of coarse peasant cloth, and a woollen jumper; in summer trousers and a hemp shirt. Recently, those who work in the state concern started to wear also summer working clothes. As footwear, rubber moccasins are in great favour. In summer they also go barefooted (Fig. 5 & 6).

The food is that of the highlanders of the region: in summer mostly dry food. Great quantities of corn-flour bread prevail in both summer and winter. They consume scarcely any meat at all.

The houses have a sort of shed i. e. a covered open space usually under the same roof as the house or leaning against it (Fig. 7). It serves for winter work outdoors. Most houses have a high stone-built cellar and beautiful stone stairs. The houses are built of unburnt bricks

and then whitewashed (Fig. 8). They give an impression of cleanliness from outside that is not matched inside. However, most houses have enough air and light. Furniture is scanty except for a few richer ones. There are still houses with open fire-places and floors of battered earth. The number of rooms is insufficient and so is the number of beds as shown in Table IV.

Table IV

Numbers of rooms and beds

Village	Total number of rooms	Rooms per member of family	Total number of beds	Beds per member of family
Popina . . .	258	0,48	243	0,45
Dublje . . .	352	0,60	357	0,61

The villages live their peculiar lives which anyhow do not differ much from that of their grandfathers. A great number live still in family cooperatives. It is rare for a married son to move away from the family while his father lives, and it is by no means an uncommon sight to find in the same house the father, his son and two grandsons who are all stonecutters.

Upon entering the village one hears from everywhere the metallic sounds of stonecutting and everything reminds one of the bitter struggle for bread. If after an explosion in a quarry a large rock settles down on one of the miners, a sandstone monument is placed on his grave that he had cut while he was alive and that stood ready for sale. If it was only an arm or a leg that had suffered in such an accident, the casualty is brought to the peasant »expert« who »sets« bones by means of small laths which be then glues together with pine resin. If a piece of stone or, still more frequently, of steel breaks away and enters the eye, it is taken out by the village »ophthalmologist« by means of large needles, used for making mattresses. It sometimes happens that the eye runs out in the course of such an »operation«. We know of several cases of blindness brought about in that way.

The peasants-stonecutters are conscious of the hazards connected with their occupation, but they take them rather fatalistically. They all know that stone dust »corrodes« the »white liver«. Their initial treatment against coughs are infusions of various herbs they receive from old women specialists in the village. Some go to see the doctor. They get medicines and hear they suffer from »bronchitis«. When cough becomes tougher and when it is accompanied by blood in the sputum they know that this means the »kamena morija« (stone plague)

and that he whom it gets hold of cannot be saved any more. The stonecutters know that his end will be either of the two possibilities: he will either have increasing difficulties in breathing and will get »filled with air« before dying, or else he will have light fevers, grow thinner and thinner, perspire, feel exhausted, lose appetite and finally succomb to the »stone plague« one spring or autumn.

The stonecutters maintain that their average life expectancy is about 50 years and that if one of them lives longer it is because he had more land (i. e. was richer) or because he worked only sandstone, or because he worked more in the mine and less dressing stones, or because he worked for himself and not as hired worker or else because he ate well (esp. much fats). The cutters know even more: they know that the »stone plague« is quick in overwhelming a poor man who works also in winter in a closed room and that it exterminates his family as well.

This means that the stonecutters are perfectly aware of the hazards of their profession and of their personal fate but that they do little to remedy it. Although they are in reality professional workers, according to their mentality they are peasants which means that they are conservative and attached to their soil. The case was by no means rare that we failed when advising to change the profession for reasons of health.

Nevertheless after the Second World War and especially because of the shortage of manpower in connection with post-war reconstruction, the number of stonecutters has been decreasing and the younger ones are choosing other professions when they are unable to live on their land. It has been noted that more and more frequently they send their children to town schools. Our dispensary may have contributed to this to some extent by tracing the sick, advising a change of profession or discontinuance of work, occasionally proposing pensions or special allowances, and spreading knowledge about silicosis.

Data concerning the method and the conditions of work

The main product of our stonecutters are various stones for the building–industry (for almost all houses at Trstenik and Vrnjačka Banja that stone has been used): stones for the frontages, basement, stairs etc. Then also stone for bridges, all sorts of monuments and tombstones, grindstones, watermills for salt (Fig. 9), watering-troughs for cattle, stone tables and benches and also stone for fireproof stoves. A particularly conspicuous place is occupied by millstones and stones for grinding colours as well as other industrial stones.

The millstones are renowned all over this country and even abroad (Austria, Bulgaria, Hungary, Rumania, Greece, Turkey and as far as Japan). This is due not only to the excellent quality of the stone but also to its first-class finish. This has not been learned at a course or in a school, but the craft has been passed through generations from

father to son. This applies particularly to sandstones where the methods of work have been constantly improving through generations and are still improving (it is used in the building industry, for tombstones, watermills for salt etc.). While in the beginning work was rather primitive, progress has been achieved gradually with regard to precision and artistic presentation (Fig. 10 & 11).

As regards millstones a great change set in some 60 years ago when our cutters, after the discovery of the mine »Gavranovica«, learned from foreign craftsmen to use concrete instead of argil and iron rails which are put on millstones like hoops. Instead of the old large pick-hammer (Fig. 1) that could be used universally they started to use the ordinary hammer and a pointed chisel.

Moreover, to-day they have a whole series of various tools (Fig. 12) some of whom are identical with those used by their grandfathers while some have somewhat changed although all are very primitive because the stonecutters produce them themselves. This applies also to iron tools. The stonecutters hammer them themselves out of rails. Almost every house has a primitive forge.

With these tools, however primitive, our stonecutters succeed in dressing millstones. In accordance with the method of foreign craftsmen they now make first a circular kernel (»the heart«) from sandstone. This kernel consists of a stone with a hole in its centre (»the throat«). Dressed pieces of quartzite are set around this sandstone kernel and the whole is fastened with concrete. The quartzite periphery of such a millstone is the actual corn-crushing surface. The manufacture of such a millstone of medium size requires 12 days or 120 working hours.

The dressing of the stones is done by individual cutters at their homes, outdoors in their shed partly standing and partly sitting on small wooden three-legged stools. Knowing the hazards of the stone dust, they contrive to work outdoors also in winter, and then they light fires to warm their stiff fingers. However, when the winter is too severe they work in the kitchen or in some other room where the whole family lives.

Since the creation of the new concern this method of work has not changed except that the workmen now work in collective workshops either hired from former stonecutting concerns or in the large workshop built by the new concern. This workshop has also a porch for outdoor work. The advantage of this method is that family members (especially children) do not suffer from breathing stone dust during winter work indoors, but the disadvantage consists in the accumulation of dust from several chisels. Moreover, the work in the concern is much more intense and without interruptions which is not the case with home work.

No special machinery is used for the work at the quarry. Work is done with pikes, grub–axes, »gimlets« and in some quarries by means of mines. Sandstone products are often dressed at the quarry itself.

Categories of workers

On the whole, workers are not specialized. This applies especially to individual work where the cutter, with the help of the members of his family, does both the work at the mine and the finishing at home. However, richer cutters used to hire workers to clean the stones and to transport them in their carts.

To-day, at the state-owned concern, cases of specialization are more frequent. Thus we meet with »miners« (specialists in handling and using explosive mines), with hewers (who cut the stone with steel wedges into large blocks), with »carpenters« (who are qualified for finishing stones in workshops). Finally, there are also unskilled workers in quarries, pushing carts etc. There are also smiths, mostly drafted from former stonecutters who took this less dangerous work because of fear of silicosis.

It is interesting to note that from ages ago specialization exists according to the stone wrought. Some families have for generations been working on sandstone, particularly those who specialized in tombstones and monuments. Others specialized in quartzite and millstones. Some work on granite from Željin and still others on trachyte.

Protective measures

In individual work no protective measures are taken just as none were taken by the fathers and grandfathers of the present workers. Sometimes a cutter may be seen with protective goggles, although entirely irregular ones. Some cutters working on sandstone discovered by themselves that the stone is less dangerous for indoor work if moisted with water. In the state concern there are no protective devices. Our dispensary carries out serial examinations from time to time, separates the sick, proposes changes of profession although these proposals usually meet with difficulties.

Tuberculin index

In autumn, 1945, we discovered the first cases and since then we began to study the »stone plague« at Popina and Dublje. The first results were published in 1950 (39). We recorded that stonecutters suffer from *silicosis* and *silico–tuberculosis* and their families from progressive and exudative forms of tuberculosis.

The comparison of the tuberculin index of primary-school children from stonecutters villages with that of children from other villages of our district (including Vrnjačka Banja) with no stonecutting activities, is very instructive (Table V).

At Popina and Dublje (index 58.00% and 45.90% respectively) where the stonecutting is most developed this index is much higher than at Štulac (40.00%) where it is least developed and in all three

villages it is above the index of the children in the town elementary school at Vrnjačka Banja (36.8%). This is all the more striking as these are mountain–villages and tuberculosis has been imported through decades into Vrnjačka Banja by spa visitors.

Table V

Tuberculin index in villages with and without stonecutting activities

Seat of the elementary school	Number of children			Tuberculin index %	Remarks
	Tuberculin ⌀	Tuberculin +	Total		
Dublje	21	29	50	58,00	Most developed stonecutting activities
Popina	33	28	61	45,90	Very developed stonecutting activities
Štulac	24	16	40	40,00	Poorly developed stonecutting activities
Vrnjačka Banja	256	149	405	36,80	Tbc imported through decades by spa visitors
Grabovac	43	16	59	27,11	Village near Morava near the seat of the district administration
Brezovica	111	32	143	22,37	Lime producing village
Ugljarevo	58	15	73	20,54	Village on the Morava
Rsovci	66	10	76	13,15	Village under the Goč

This difference is still more striking if the values found in villages with stonecutting activities are compared with those in some other villages: Grabovac on the bank of the Morava and in the immediate neighbourhood of the seat of the district administration has, with a far greater promiscuity of the populations, an index of 27.11%; Brezovica, a village adjacent to the area of Popina and with a well–developed production of lime, has an index of 22.37%; Ugljarevo, a village on the Morava near the road and opposite to the Vrnjačka Banja has an idex of 20.54% and the mountain village of Rsovci, on the slopes of the Goč, above the spa, has an index of 13.15%.

It follows from the aforesaid that children from villages where stonecutting is developed are considerably more exposed to tuberculous infection than children from other villages and even than the children from the spa of Vrnjačka Banja. The low standard of life of the stonecutters cannot explain by itself this high percentage, because this standard is no better in those villages where the index is much smaller (p. e. Rsovci). We suppose that the reason for this high tuberculosis index in those villages is the spreading of silico-tuberculosis among the stonecutters.

Fluorographic results

We obtained a better conspectus of the situation by a fluorographic action intended to cover the entire population in all three villages of stonecutters. Altogether 1568 people were fluorographed. During our field investigations many people were unfortunately out of their villages – according to incomplete data there were absent about 230 males over 14. However, in spite of that our Table VI shows clearly enough what happens in those villages.

Table VI

Fluorographic data

Groups of population	Fluorographic data										
	Miscarried photographs	No pathologic findings	Remnants of a healed primary compl.	Slight indurative (fibrous, sclerotic) changes	Adhesive, obliterative pleurisy	Clear tuberculous changes on the lungs	Desiructive (cavernous) tuberculosis	Exudative pleurisy	Silicosis and silico-tuberculosis	Non-tuberculous diseases of the thorax	Total
Men over 14	39	212	27	108	14	4	6	0	133	6	549
Women over 14 . .	15	128	51	197	101	4	6	7	0	13	522
Men under 14 . . .	45	107	14	62	5	15	6	0	0	0	254
Women under 14 .	36	129	18	42	8	10	0	0	0	0	243
Total	135	576	110	409	128	33	18	7	133	19	1568

First of all it should be noted that out of 549 men over 14 who were fluorographed, 133 showed clearly recognizable silicotic changes i. e. 24.22%. This is all the more significant as we were informed that of these 549 men only 235 had been stonecutters.

Another striking fact is that among the remaining fluorographed population comprising men under 14 as well as women both under and over 14 and amounting to 1019 persons, 58 had severe exudative forms of pumonary tuberculosis (phthisical index 5.78%). Particularly alarming are the figurcs showing that of this number 25 are children under 14 (15 boys ond 10 girls).

We made a small enquiry concerning these 58 cases of severe tuberculosis of family members. We found out that 29 of these lived in houses where the father of the family suffered from silico-tuberculosis and where he regularly worked stone in living quaters, 14 lived in houscs where the father suffered from silicosis and regularly worked stone in living quarters. Out of the above 58 cases only 15 lived in houses where there was no silicosis or silico-tuberculosis and no stone-cutting was done in living quarters.

Silicosis and silicotuberculosis among the stonecutters

In order to collect reliable data we carried out constant and systematic clinical examinations of stonecutters in our dispensary. We proceeded, with our team for field work, to the filling of special enquiry forms in August 1951. We limited our field activity to Dublje and Popina. The population of these two villages is 1105; there are 108 stonecutters at Popina and 152 at Dublje i. e. altogether 260. We succeeded in examining systematically 219 out of these 260 and our findings are shown in Table VII.

Table VII

Silicosis and silicotuberculosis among stonecutters

Village	Silicosis	Silico-tuberculosis	Healthy	Total
Popina . . .	57 = 64,0%	15 = 16,9%	17 = 19,1%	89
Dublje . . .	68 = 52,3%	28 = 21,5%	34 = 26,2%	130
Total	125 = 57,1%	43 = 19,6%	51 = 23,3%	219

Out of 219 workers 168 (125 + 43) suffer from silicosis or silico-tuberculosis i. e. 76,7%. This table shows that silicosis is represented with 57,1%, silicotuberculosis with 19,6% and that there are only 23,3% healthy stonecutters.

The relation between the sickness rate and the duration of stone-cutting activities is shown in Table VIII.

Table VIII

Duration of stonecutting activities and the incidence of silicosis and silicotuberculosis

Worked for years	Silicosis	Silico-tuberculosis	Healthy	Total
0 — 10	34 = 35,8%	19 = 20,0%	41 = 43,2%	95
11 — 20	30 = 65,2%	9 = 19,6%	7 = 15,2%	46
21 — 25	13 = 61,9%	5 = 23,8%	3 = 14,3%	21
26 — 30	18 = 81,8%	5 = 22,7%	—	22
Over 30	30 = 85,7%	5 = 14,3%	—	35
Total	125 = 57,1%	43 = 19,6%	51 = 23,3%	219

We investigaded the average life expectancy of our stonecutters as compared with their fellow-countrymen who are farmers. We were all the more decided to do it as there is a belief among the stonecutters that those of them are rare who live beyond 50. We found that the average duration of life was 51 years in the last two generations of stonecutters, while that of the farmers from the same villages vas 61. The average life expectancy among males in Serbia is 49.81 years, according to the census of 1948. It follows therefore that our stonecutters have relatively a fairly long life expectancy and that they bear quite well their pneumoconiosis.

An interesting idea to consider is whether a particular resistance to conioses is acquired through generations. There are interesting data in favour of this assumption: old men with pneumoconiosis belong to the families who first came to this region (250–300 years ago). It is, on the other hand, well known that the later a family came to the region and the shorter its contact with the pneumoconiotic agent, the severer and more malignant are the forms of the disease. This subject is now being studied at our dispensary.

Another problem studied at present is the influence of hired work both on the severity of silicotic changes and on the incidence of silicotuberculosis. In this connection we are already able to state that:

1. The highest percentage of silicotuberculosis is to be found among stonecutters with longer experiences in stonecutting activities as hired workers.

2. With equally long experiences in stonecutting silicotuberculous changes are more severe among hired workers.

It seems that, among others, one of the most decisive factors is the more intense and more strenuous hired work.

Clinical data and characteristics

We found, among our stonecutters, a great number of silicoses with all characteristic X–ray and clinical symptoms well–known from literature. The casuistics is discussed in another place (39). Here we propose only to put forward cases and findings typical for the Popina-Dublje silicosis. We shall consider the silicosis of our stonecutters' children, the X–ray findings of hiluses, the phenomenon of pure coniotic excavations, hippocratic fingers, complications, treatment etc.

Silicosis in children

We mentioned already that the families of our stonecutters suffered much more from severe forms of tuberculosis than the families of the farmers from the same villages. However, the stonecutters'families suffer also in another way, especially among poorer cutters who dress the stone also in winter in a closed room where other members of their families live, including children.

We shall draw a very rapid and rough picture of the consequences such way of life and work has brought about in only three stonecutters' families.

I. The stonecutter V. D. S. has been dressing stone among his children for years. His lungs are shown on our Radiogram I with almost symmetrical micronodular shadows on both sides. This and a good general condition of the patient – he still continues dressing stone – might cause us to think that we are in presence of pure silicosis. However, the granulogram shows that the sum of GN and G± elements is altogether 23%, and, in spite of repeatedly negative sputum, we filed his case under silicotuberculosis.

He has two sons:

One (M.) *who never worked stone* and is now 20 years old suffers from severe cavitary silicotuberculosis (Radiogram II).

The other (Lj.) *has never worked stone either* and is 7 now. The child feels all right and goes to school but suffers from silicotuberculosis. His lungs are shown on our Radiogram III: the pneumoconiotic component is shown in the form of a beginning fibrosis of the lung. An intensified broncho–vascular arborisation of fine reticular and ribbon–like pattern contains, in lower parts – juxtacardially left and right, in the meshes of the net – small miliumsized knots. The granulogram of this child is GN=12%, G±=24%, G+=45%, G++= 19%.

II. The stonecutter P. T. M. suffers from severe silicotuberculosis. The radiogram of his lung (Radiogram IV) shows symmetrically distributed shadows on both sides (size: millet grain to wheat grain), most dense in the lower middle and side parts with beginning excavation in a right parahilar position. His granulogram is GN= 0%, G±=13%, G+=84%, G++=3%. After several unsuccessful examinations we succeeded in finding the Mycobacterium tuberculosis in the sputum.

Radiogram V shows the radiogram of the lung of this cutter's 12-year old daughter. This girl, rather well developed for her years and prima facie healthy-looking, goes to school. The radiogram, however, reveals, in addition to WRISBERG's infiltrated flap (Lobus venae Azygos lat. dx.) in the basic reticular and ribbon-shaped fibrosis of the lung small shadows symmetrically distributed on both sides (size: up to that of a wheat grain). The sparse sputum was always BK-negative, but the girl had hemophtisies on several occasions and the sum of the elements G+ and G++ amounts to 86 in the granulogram, we conclude that she suffers from silicotuberculosis.

III. The stonecutter S. D. V. altbough having worked for many years has no particularly severe pulmonary lesions as shown in Radiogram VI. However, in the region of the right hilus polygonal shadows are already visible: they are unhomogeneous, of unequal intensity, framed in with a sharp border, characteristic for the lymph nodes in the hili of our silicotics. His lungs show a clearly marked incipient fibrosis and in some places a silicotic knot along the broncho–vascular arborization. His sputum always BK-negative, however, the sum of the elements G+ and G++ in his granulogram is higher than 50% (72%) and therefore we classify him as suffering from silicotuberculosis. This does not prevent him from continuing his stonecutting activities in a fairly good physical condition.

He has three sons:

The first (Ž.) is sixteen years old. *He never worked stone.* His lungs are shown in Radiograph VII. The left middle region is marred by a specific infiltration showing signs of decomposition but in lower parts, both right and left, along a clear broncho–vascular arborization silicotic changes are apparent. Both BK and elastic filaments were found in the sputum. To–day he is receiving an artificial pneumothorax on the left side.

The second (M.) is six years old, apparently in good health. *He never helped in stonecutting.* His lungs (Radiogram VIII) show, in the meshes of pulmonary fibrosis, typical silicotic knots on both sides in the lower and lateral parts near a healed primary complex and underneath the lower half of the right hilus. Sputum is BK-negative and the granulogram speaks for silicotuberculosis (the sum of G+ and G++ elements is above 50%).

The third (R.) is only 2½ years old. He has the radiological and clinical signs of ELIASBERG's epituberculosis on the right-hand side and a still more clearly shown shadow in the lung (which is still more visible on the free, left side – Radiogram IX).

These children had inhaled stone dust produced during the work of their fathers, the stonecutters, and the bacillary infection originated probably as well from their fathers irrespective of whether Mycobacterium tuberculosis was found in their sputum or not.

We find ourselves, therefore, in front of the difficult and interesting problem of children's silicosis among our stonecutters. The studying of this problem, however, requires long observation of our small patients and the following up of the radiological evolution of the lesions. At present we would only like to put its existance on record.

The characteristics of radiographies

We have the most different-looking radiograms of our silicotics. In the first stages of silicosis, particularly in children, the radiograms only show a clearly presented arborization corresponding to the peri-bronchovascular ways, later becoming coarser and obtaining a reticular and thereafter a trabecular appearance. In the beginning it is a »tree without leaves«. As the changes develop »the tree covers itself with leaves«, the web shows an ever-growing amount of small shadows, the size up to that of a corn grain. The shadows are partly sharply designed, and partly confluent. In both pure silicosis and silicotuberculosis their distribution can be symmetrical and their density is usually greatest in the middle pulmonary regions, especially in their lateral parts.

The more the case has progresed the more accentuated is the merging of these shadows and gives the most varied, very polymorphous and often very bizarre pictures: such snapshots sometimes resemble those of acute miliary tuberculosis and sometimes they look like a snowstorm.

Our preterminal and terminal cases show »pseudotumorous« shadows. These have sometimes the shape of blocks with appendices resembling cords. Sometimes they are like small, fluffy islands with more or less clear borders and with gradual transitions to the surroundings that look like granulated.

In our cases with such pseudotumorous shadows we found pneumoconiotic excavations with a completely and constantly BK-negative sputum and with a granulogram having the sum of GN and G± elements above 50% in 1.2% cases.

The hilus region of our silicotic and silicotuberculous patients is also very interesting. Either the whole hilus is dense, raised to the third intracostal area in the front, broad and dark with two dark bands descending juxtacardially from it, or else many polygonal, eggshaped, unhomogeneous shadows, framed with a sharp and dark border similar to an »egg–shell« (LOMMEL, SWEANY) (Radiograms X & XI.

Among our silicotics there are some with unusual and bizarre radiologic pictures. Thus on Radiogram XII only changes are registered that are localized supraclavicularly, to the left, in the shape of an enormous circular unhomogeneous conglomerate of shadows of most varying intensity so that the whole formation resembles a dead and calcified parasyte of the lung. In spite of such an asymmetric and unusual

localization we have to deal with pure silicosis and not with silico-tuberculosis. This is confirmed by the granulogram of this case and by frequent examinations of the sputum.

Clinical pictures

The complaints of our silicotics were quite slight: a light cough, sometimes light stitches in the thorax and sometimes some insignificant mucous sputum. Only later on, when these changes have progresed – and this occurs after 10–15 years of work in stone dust – the most charecteristic symptom occurs: dyspnoea. At first it occurs only in case of great strain, and later even without it, even at night, when it arouses the patient especially before dawn. In our cases dyspnoea without stress took usually 3–5 years to take the place of dyspnoea under stress. Tough cough is often accompanied by the feeling of great exhaustedness and free perspiration. The sputum becomes yellowish-purulent and often is tinged with blood even in stonecutters with pure silicosis. Sometimes our patients expectorate a »mouthful« in the morning although we were not able to prove the existence of bronchiectasis, abscessus or a similar condition causing vomica.

The complexion of our silicotics is usually pale and in advanced stages we noticed a bluish colour of lips and cheeks. Their thorax is usually barrel–like although this is not always the case; it is usually symmetric and in advanced stages the respiratory mobility of both hemithoraxes is reduced and we are under the impression that during inhalation there is more or less rigidity. The respiratory murmur is usually weakened by a sharpened inspirium and a prolonged, rather rough expirium. The percussion gives often a somewhat hypersonorous sometimes even a slightly tympanic sound. All these symptoms in our silicotics are usually clearer in the back than in the front.

We should perhaps put forward among other signs that hypocratic fingers are fairly common among typical elderly silicotics (cca 2.5%).

Our experience was that in the early stages of silicosis slight tachycardia was accompanied by an irregular relation of the duration of apnoea and an almost maintained vital capacity, especially in cases where the rate of sedimentation of the red blood corpuscles is approximately normal. As we enter into more advanced stages of silicosis the frequency of respiration and of pulse increases, the values for inspiratory and expiratory volumen of the thorax diminish and approach one another. The sedimentation of erythrocytes may be much accelerated in pure silicosis, i. e. without the influence of bacillary infection.

Considerable and close (in terms of time) oscillations of the rate of sedimentation of the red blood corpuscles without a new apparent reason appear characteristic for our patients with silicosis and silico-tuberculosis. We never saw a negative tuberculin test in a case of pure silicosis in our stonecutters.

With regard to the weight of our patients we would like to point out that it usually accompanies the onset of one of the complications we shall enumerate hereafter. Moreover, increasing emaciation up to real cachexia among our old-age silicotics was usually a sign of nearing end, even in case of pure silicosis.

Among other symptoms appearing in all stages of silicosis we often observed hoarseness, a feeling of pulling in the region of the heart, dizziness, dryness of mouth and throat, more or less apparent cyanoses, small, low, soft and usually accelerated pulse.

We noticed certain regularities in the relations between the pathological findings in the nose on the one hand and the localization, the distribution and the type of pneumoconiotic radiological changes on the other.

The most frequently observed pre-mortal symptoms were those in the cardiovascular system. An initial hypertrophy of the heart (especially its right half) is soon joined by dilatation. Edema on feet ascites, and a stasis in the kidneys are a sign of an approaching end. We noticed that death sets in in cachexia together with the failling of the heart.

In classifying the silicotics we follow WINKLER's proposal because it is exempt from the otherwise very fitting remark that all radiological classifications are mere iconography. We do not assess the degree of reduced working capacity only on the basis of a radiography but we proceed also to functional respiration and blood-circulation tests and therefore we adopted the above classification. It makes possible a comparative and objective use of radiological and other clinical data and gives the quickest account of the real situation in each individual case.

Complications

Bronchiectasis was observed relatively rarely and then usually in more advanced cases with pseudotumorous changes (1.7%). On the other hand pleurisies are very common among our silicotics and we are inclined to explain in this way the very frequent complaints of the patients regarding pains in the chest. Contrary to the view very commonly held that exudative pleurisy is rare in silicosis we found it to be very frequent among our patients. The exudates are, however, not very copious and evacuational punctures are therefore almost unnecessary. Liquid effusion is seen among our patients almost equally often in costodiaphragmatic sinuses as in the interlobium (most frequently in the lower right interlobar space). Although these pleural effusions are scant and often difficult to diagnose, they can be followed up radiologically for quite some time and sometimes they pass without temperature. It is also characteristic for our patients that after the absorption of small exudates there appear unexpectedly large and mighty pleural adhesions, although real fibrothorax is exceptional. In exudative

pleurisy the granulogram was clearly pathologic in 82% of cases. We deduce therefore that our stonecutters with silicotuberculosis suffer much more from this complication than those with pure silicosis.

Empyemas are an exception. The only ones we observed were the metapneumonic ones (in 0,32% of all pneumonias in our silicotics).

Bronchitis is fairly frequent among our patients. We noticed that it is related to the advanced stage of silicotic lesions and that it is also influenced by the season (bronchitic exacerbation in our silicotics occur usually in autumn and spring). The following table presents the incidence of bronchitis among our patients according the stage of the disease (November 1950) (Table IX).

Incidence of bronchitis among silicotics in the Dublje–Popina region according to the stage of the disease (November 1950)

0 – I	7,2%
I	10,4%
I – II	14,7%
II	25,3%
II – III	28,4%
III	39,6%

As to our III[rd] stage patients who are not working any more they had bronchitis in 69.5% cases in November 1950; while our silicotuberculous stonecutters had bronchitis in 49.7% cases.

Compensatory emphysema was more or less apparent in all our cases.

Bronchopneumonia was a frequent complication among our patients – 15.8% among the silicotics registered in our files between 1945–1951. It usually passes without particularly dramatic signs and it is characterized by a frequent and rapid failure of the myocardium. We have also a bad recollection of pulmonary abscesses (8%) characterized by torpidity and chronicity and a tendency to recidivation (e. g. after transthoracal penicillotherapy).

Hemoptyses are in some cases so frequent that our silicotics pay no attention to them and they neither interrupt work because of them nor do they consult a physician. We noted deadly hemoptoias in pure silicosis in only four of our patients.

Therapy of silicosis and silicotuberculosis

Although silicosis has so far been incurable, symptomatic treatment is possible and we have often been able to alleviate the pains of our patients for a lengthy period of time. We were not able, however, to form an opinion of our own about the aluminium therapy which has been discussed so much lately and has on the one hand many enthusiastic

partisans and on the other many sceptical adversaries. Moreover, we have for the present no possibilities of relieving dyspnoea by giving oxygen or of treating our patients with aerosol–drugs.

We consider the control of dyspnoea to be one of our chief tasks. Our experience showed that for the present the best treatment was strict confinement to bed with administration of small quantities of strophantine preparations intravenously together with Theophylline. We avoid the sympathicomimetics because we have been taught by experience that short-term relief may be achieved but that then the pains re–appear and become even more severe and unbearable.

We also observed that when the myocardium begins to fail, digitalis preparations have a better effect if administered after a strophantine preparation. We found that good results were obtained if from time to time we discontinued the administration of digitalis in order to give – after a pause of 3–4 days – a few injections of strophantine, after which we return, even without a pause, to digitalis. In ascites and edema we give mercury diuretics whenever possible, after a preparation with Ammonium chloratum. We gave up morphium.

Dry, rough cough is equally difficult to cure and all means proved unsuccessful or of short duration.

In bronchopneumonias combined therapy with sulfa-drugs and penicillin produced quick afebrility, but radiological cleaning of lesions progressed exceedingly slowly.

We completely gave up the treatment of the abscess of the lung with large doses of natrium benzoicum and neosalvarsan administered intravenously. The method we use now is postular drainage in addition to intrafocal transthoracal plus intramuscular penicillotherapy combined with sulfonamides administered perorally and intramuscular injections of emetinum hydrochloricum (watch blood pressure!). The results are the better, the earlier we start this therapy. They are better in vesicular, solitary abscesses than in multiple (bronchopneumonic) ones, better in aputrid than in fetid ones.

In silicotuberculosis where destruction of the parenchyma has taken place, artificial pneumothorax and pneumoperitoneum yielded only modest results. Complications in the form of pulmonary perforations with all sorts of serious sequelae are frequent. In a few cases streptomycin and PAS therapy could be applied. We achieved with streptomycin a temporary increase in body weight, decrease in expectoration and temperature but never abacillarity or an essential change in the radiological picture. We could exerce no influence on the existing destructions. In one case we even observed the formation, under streptomycin therapy, of a cavern until then invisible. We obtained similar results also with PAS. The number of the cases thus treated is insignificant and it does not warrant any general conclusions.

In the treatment of exudative pleurisy the best results were obtained by high doses of sodium salycilicum and sodium bicarbonicum (up to 6 gr. daily). Calcium not only did not help but usually produced resorbtion of exudates and the creation of much thicker pleural adhesions. The need for evacuation punctions was only exceptional. In some cases we had very good results with the filtrate of Professor NEDELJKOVIĆ from Belgrade, obtained from old cultures of Mycotuberculosis hom. on Buc's medium 50% diluted with distilled water and 5% glycerin and 4‰ formalin. The filtration was effectuated through SEITZ's filtre. Intradermal injections of 0.05–0.1 ccm (2 to 4), according to a scheme prescribed by the inventor, are given every fifth day. The main feature of the beneficial action of this filtrate in exudative pleurisy was a rapid drop of temperature and a quicker resorbtion of the exudate.

Legislation concerning silicosis and silicotuberculosis

We shal discuss this question here only in so far as the Yugoslav legislation is concerned.

In the first place we must mention the »Opšti pravilnik o higijenskim i tehničkim merama pri radu« (Sl. list FNRJ br. 16/1947) (General regulation concerning hygienic and technical measures relating to work – Federal Offic. Gazette N⁰ 16/1947) and the »Pravilnik o higijenskim i zaštitnim merama pri radu u kamenolomima i ciglanama, kao i pri vađenju gline, peska i šljunka (Sl. list FNRJ br. 69/1948) (Rules on hygienic and protective measures relating to work in quarries and brickkilns and to the extraction of argil, sand and gravel – Federal Offic. Gazette N⁰ 16/1948).

The first one gives general directions and principles of protection, common to all branches of the workers' activities, leaving it to subsequent special regulations to deal with measures necessitated in some industries because of the special character of work done there.

This regulation has – within the possibilities existing at present in this country – fulfilled its object fairly well. Thus art. 31 orders that »dust« (among other harmful materials) should »be removed in an innocuous way« and »if this does not prove adequate that workers must wear protective devices (for the protection of lungs, head, hands etc.)«. Art. 84 orders that »dust must be removed immediately from the spot where it originates by means of special appliances (exhaustors)«, while art. 90 provides that »employees whose respiratory organs are endangered during work should have protective devices put at their disposal (respirators, masks, isolation apparatuses)«.

Relating to the protection of lungs the regulation provides as follows in its art. 49: »The dust produced in stone dressing by various machines and equipment in closed premises must be pumped out of the spot where it originates and led out of the premises where the work is done«.

Fig. 1. An old hammer, the only tool of the Popina-Dublje stonecutters two hundred years ago

Sl. 1. Stari čekić, jedini alat popinsko-dubljanskih kamenorezaca prije 200 godina

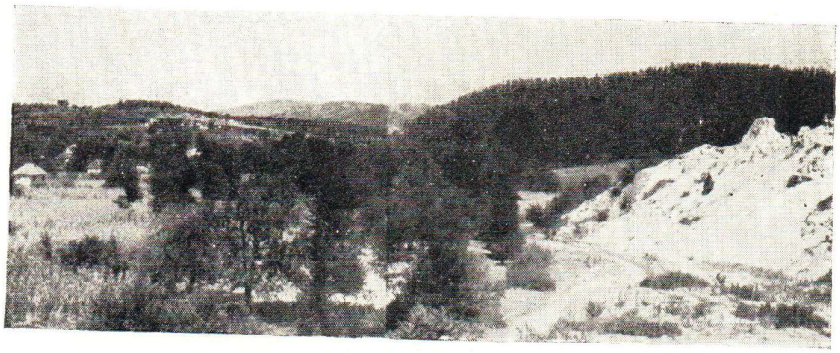


Fig. 2. View of the stonecutter's villages of Popina and Dublje from one part of the quarry Pešćar. On the left, uphill, is the village of Dublje and in the foreground a few houses of the village of Popina; on the right – the quarry »Pešćar« and the small Popina river. The central part of the picture shows the crest of the Gledić Mountains beyond the river Morava

Sl. 2. Panorama kamenorezačkih sela Popina i Dublje snimljena iz jednog dijela kamenoloma Pešćara. Lijevo na brdu je selo Dublje, a dolje nekoliko kuća sela Popine. Desno je kamenolom »Pešćar«, pod kojim teče Popinska rijeka. Sasvim na horizontu u sredini su Gledićske planine preko Morave

Fig. 3. Even the youngest stonecutters are good as forging and welding. One boy on the left blows the bellows while the one on the right makes a »špic« (sort of small pick and hammer without shaft, combined in one tool, cf. »m« on Fig. 12) on an anvil of heated iron

Sl 3. Najmlađi kamenorezci su već i dobri kovači. Dječak lijevo duva u mjehove, dok onaj desno na nakovnju od usijanog gvožđa pravi »špic«.

Fig. 4. Quartzite quarry of »Gavranovica«. Father and his nine-years-old son hewing off stone

Sl. 4. Kamenolom »Gavranovica« (kvarcit). Otac i devetgodišnji sin pri kamenorezačkom poslu

Fig. 5. Typical picture of an old stonecutter
Sl. 5. Tip staroga kamenoresca

Fig. 6. Final dressing of stone is often done right in the quarry. The stonecutter wears no protective goggles, he is bare-footed and unprotected from sun

Sl. 6. U kamenolomu »Pešćar« često se vrši i definitivna obrada tamo izvađene stijene. Kamenorezac nema nikakvih zaštitnih naočari, on je bos i nije zaklonjen od sunca

Fig. 7. Stonecutters working in front of the »shed«. The man standing on the left is working sandstone, the others quartzite

Sl. 7. Kamenorezci na radu pred »trijemom«. Lijevo: obrada »cokle« od pješćara. U sredini i desno: obrada komada kvarcita za periferiju mlinskog žrvnja

Fig. 8. A group of houses belonging to a stonecutters' family at Popina
Sl. 8. Zaselak kuća jedne kamenorezačke porodice u Popini

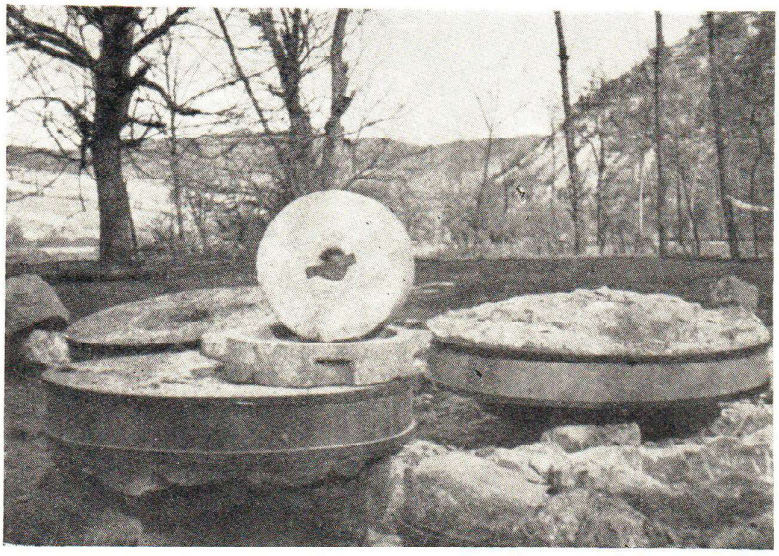


Fig. 9. In the foreground, on a millstone confined by rails, are the two main parts of a mill for grinding salt. On the right is the back side of a millstone still uncovered by concrete
Sl. 9. Na prednjoj strani šinjama okovanog mlinskog kamena je raskloplјena vodeničica za sol od pješćara. Desno: zadnja strana mlinskog kamena još nezalivena cementom

Fig. 10. & 11. Characteristic examples of tombstones: influence of the rustic style and of the old traditions in folk art
Sl. 10. i 11. Karakteristični primjeri obrade nadgrobnog kamenja: naslanjanje na rustični stil i nastavak stare tradicije narodne umjetnosti

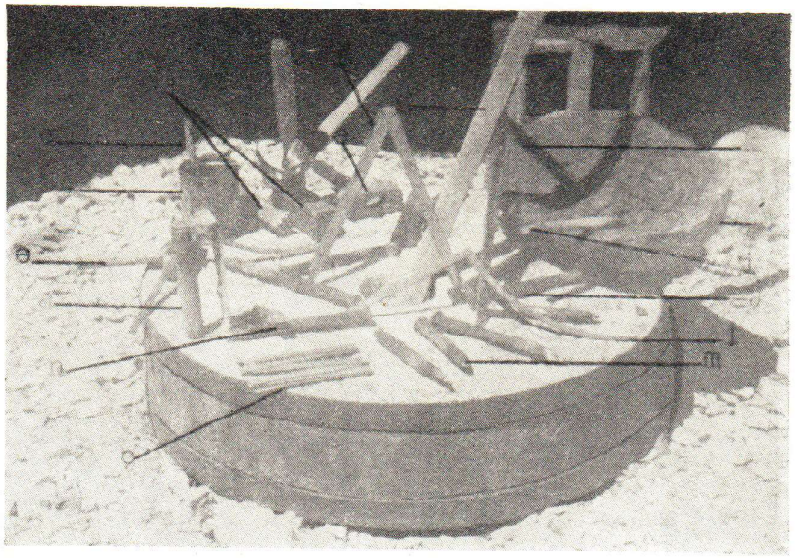
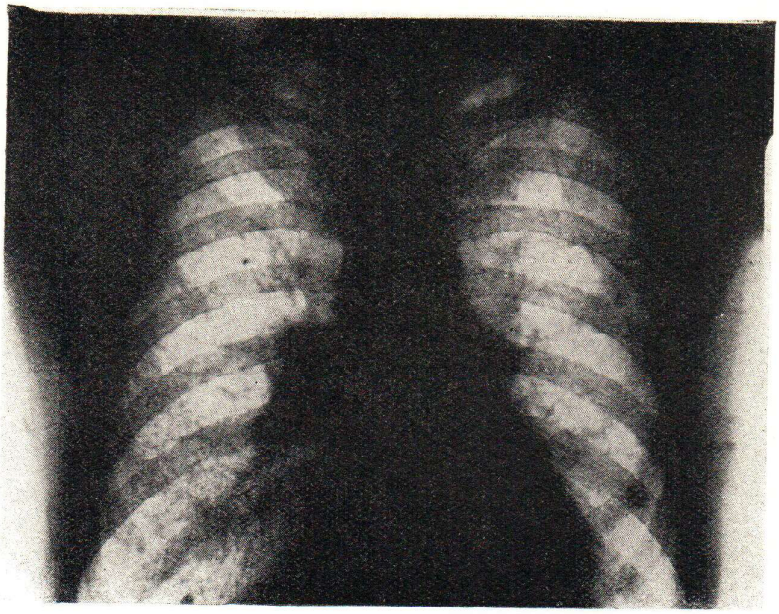


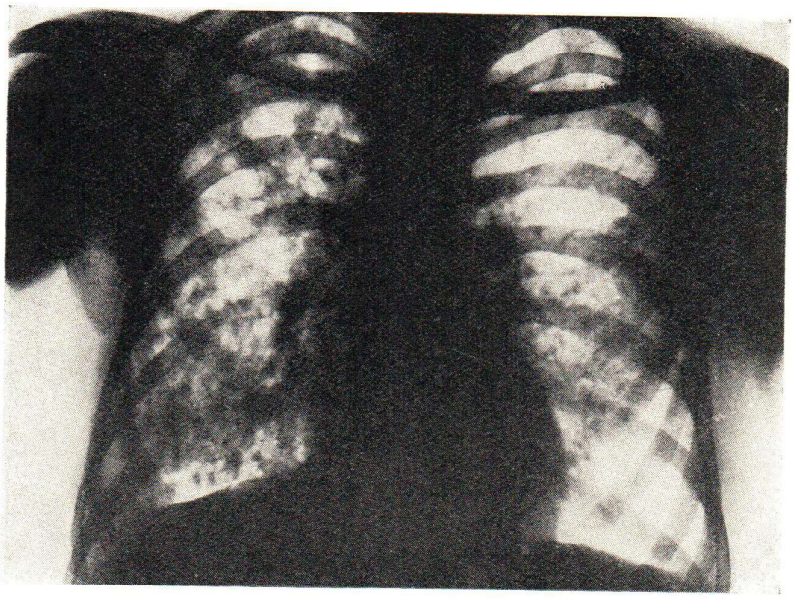
Fig. 12. Stonecutters'tools in use to-day
Sl. 12. Raznovrsni kamenorezački alat, koji se danas upotrebljava

Fig. 13. The antituberculous dispensary at Urnjačka Banja disposes of an ambulance for fluorography. Picture shows field work: the whole rural population is fluorographed including the children of stonecutters

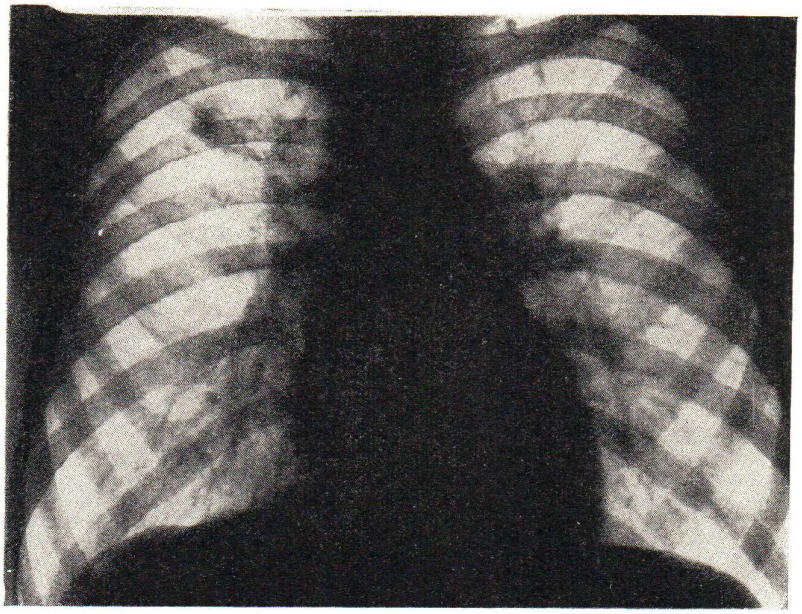
Sl. 13. Antituberkulozni dispanzer u Urnjačkoj Banji raspolaže pokretnom ambulantom za fluorografiju. Slika prikazuje izlazak na teren, gdje se vrše snimanja svega seoskog stanovništva, pa i djece kamenorezaca



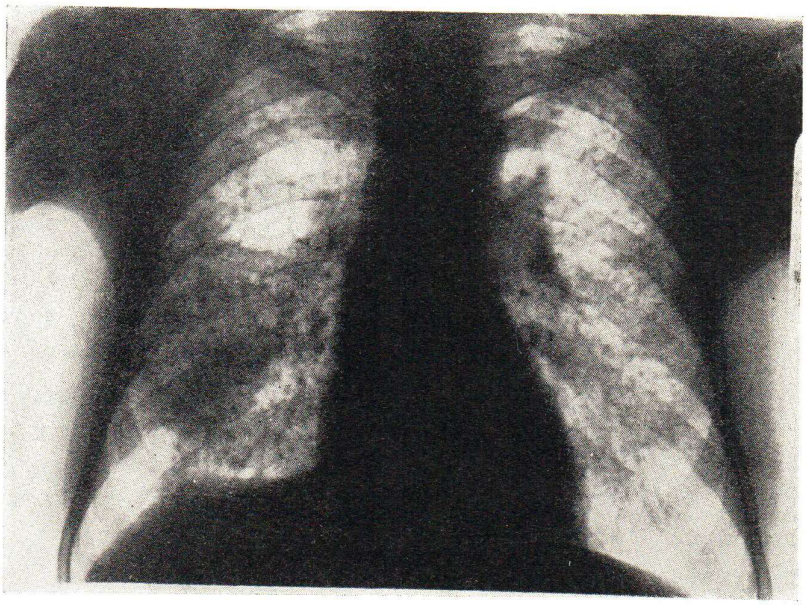
Radiogram I. — Rentgenska snimka I.



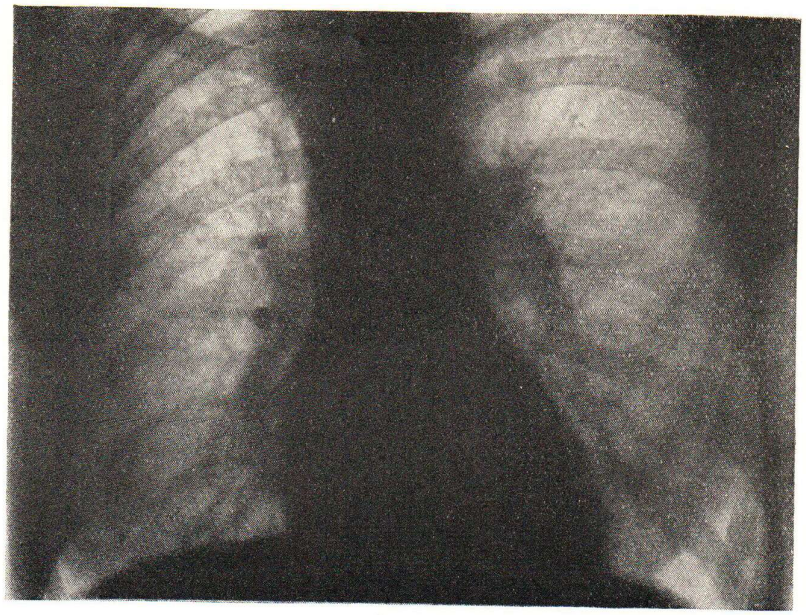
Radiogram II. — Rentgenska snimka II.



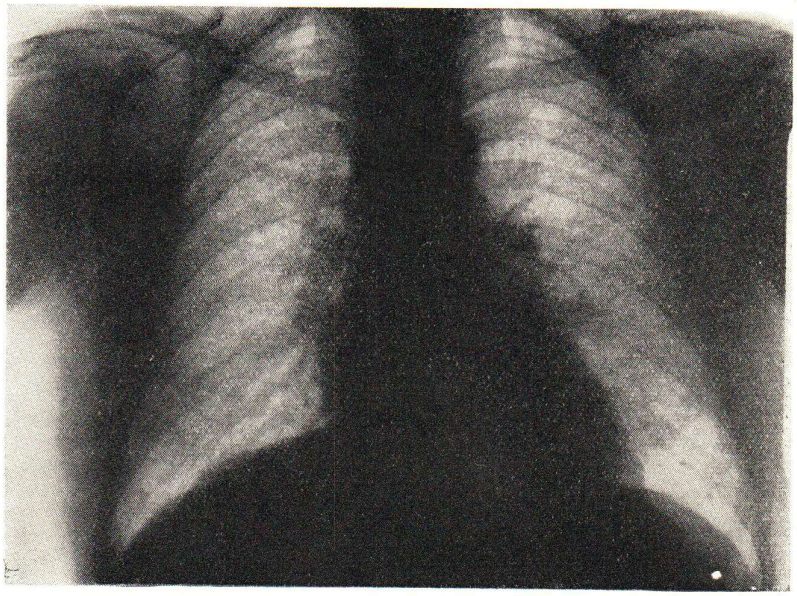
Radiogram III. — Rentgenska snimka III.



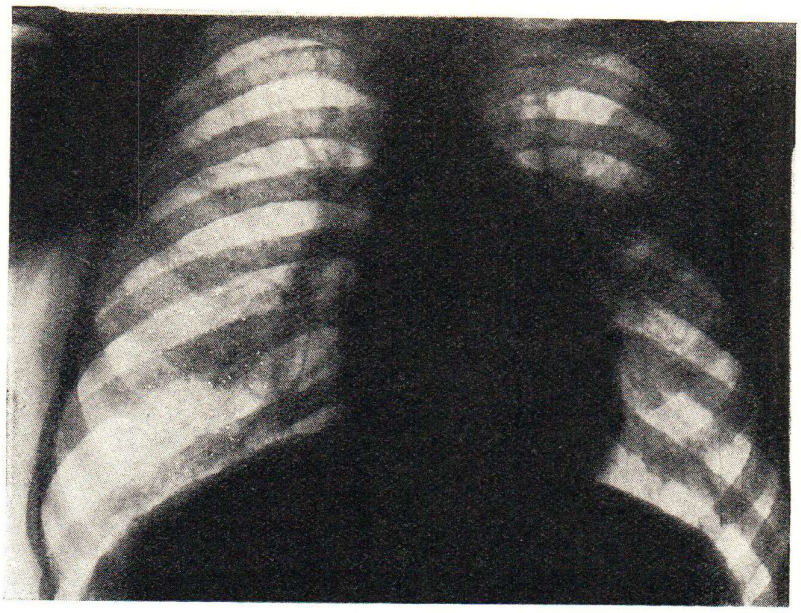
Radiogram IV. — Rentgenska snimka IV.



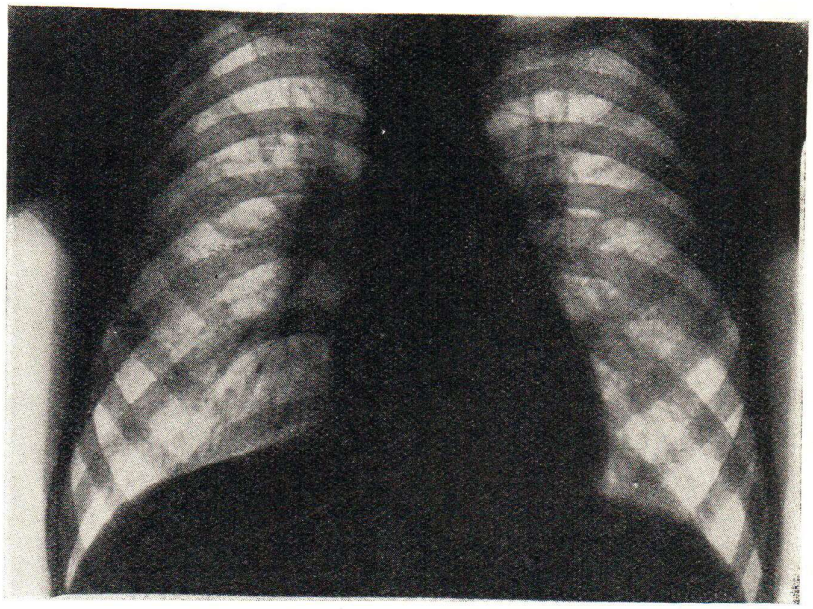
Radiogram V. – Rentgenska snimka V.



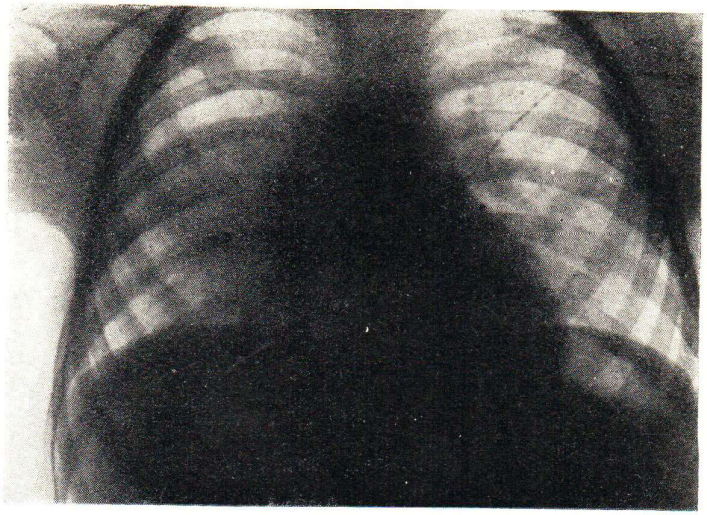
Radiogram VI. – Rentgenska snimka VI.



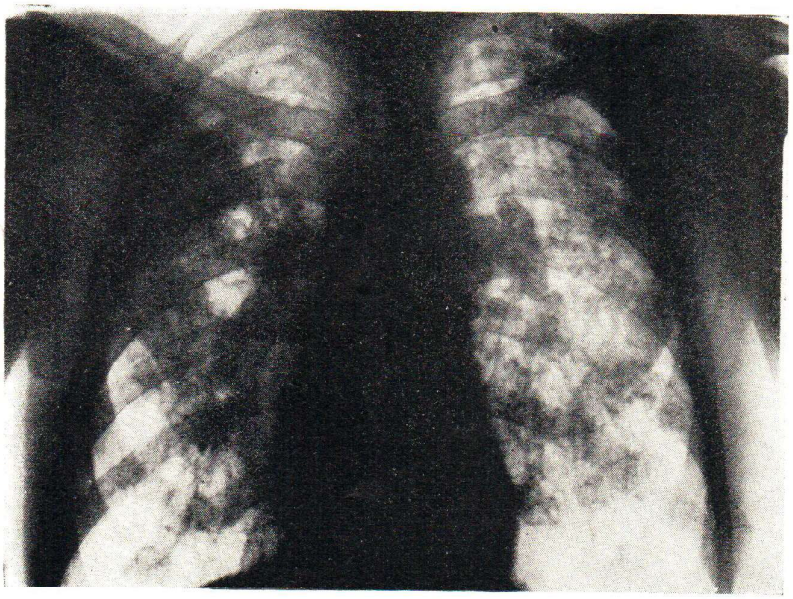
Radiogram VII. — Rentgenska snimka VII.



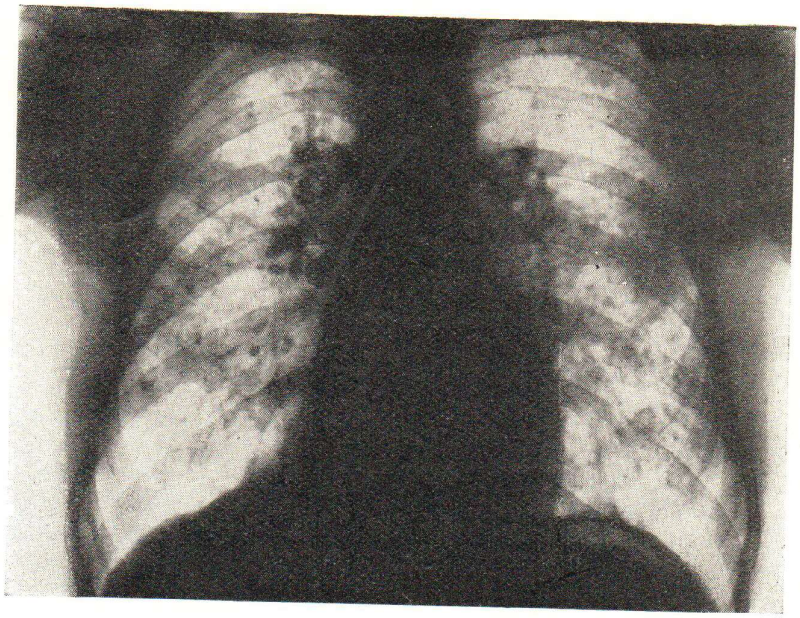
Radiogram VIII. — Rentgenska snimka VIII.



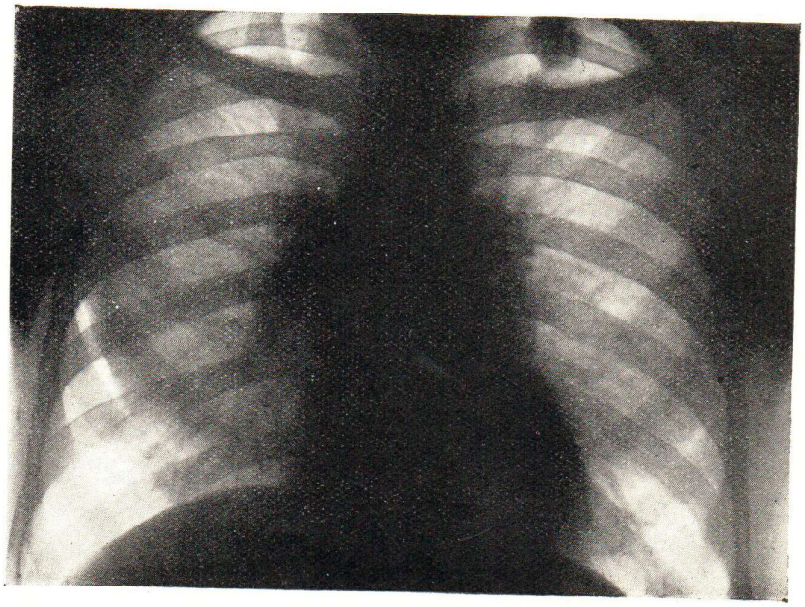
Radiogram IX. — Rentgenska snimka IX.



Radiogram X. — Rentgenska snimka X.



Radiogram XI. — Rentgenska snimka XI.



Radiogram XII. — Rentgenska snimka XII.

There are no provisions concerning protection from free silica dust either in the first or in the second regulations. However, the »Ordinance on compulsory periodical medical examinations of workmen« (Federal Offic. Gazette N° 48/1947) (Naredba o obaveznom vršenju periodičnih medicinskih pregleda radnika – Sl. list FNRJ br. 48/1947) specifies that »those working in places where silicon dioxide dust is produced must be examined every twelve months«.

Our laws take great care of workers already suffering from silicosis. Our modern law of the 21st January 1950 (Federal Offic. Gazette N° 10/1950) greatly improved the position of silicotics. In this respect the most important are the provisions of art. 46 of the said Law stating that the »insured invalidated by an accident during work receives an invalid's pension *irrespective of the length* of his employment« and of art. 36 defining accidents during work and including among them *occupational ailments* entailing permanent general invalidity. The earlier»Ordinance on occupational diseases which are, according to social insurance rules, considered as industrial accidents« being still in force considers silicosis and silicotuberculosis as such diseases (Federal Offic. N° 98/1946, pp. 1255–6).

We should also like to point out that this Law provides for a considerable recompense to those suffering from silicosis and silicotuberculosis in the form of treatment, assistance to their families, family pensions, funeral expenses (both in case of the workman's own death and that of a member of his family) etc.

* * *

The introduction to this paper purports to show that the mineral wealth of this country depends on geomorphological and mineralogical conditions so well known that we already can foresee at which points of our territory there should be created centres for the examination of pneumoconioses. These centres would be directed by a Chair for Industrial Medicine as the most qualified institution for these questions in the country. It would be one of the duties of such centres to furnish data from the field to the legislative bodies of the country, because without such data no really good general law can be drafted.

It would be another duty of such centres to assess the fitness for work of silicotics, to decide upon their pensions etc. They would also give the initiative for efficacious protective measures in imperilled areas of the territory for which they are responsible.

Finally, such centres would offer the best possibilities for scientific research on various problems connected with pneumoconioses.

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SADRŽAJ

SILIKOZA I SILIKO-TUBERKULOZA POPINSKO-DUBLJANSKIH KAMENOREZACA

Prikazan je problem silikoze i siliko–tuberkuloze kamenorezaca u selima Popina i Dublje (trstenički srez NR Srbije). Opisani su geomorfološki i mineraloški podaci, na osnovu kojih se može zaključiti, da u našoj zemlji ima velikih područja, gdje se u skoroj budućnosti može očekivati povećan broj oboljenja od silikoze i siliko-tuberkuloze s obzirom na razvoj naše industrije i privrede.

Analizirani su podaci o socijalno-ekonomskim prilikama i načinu života u selima Popina i Dublje. Potanko je opisan način rada.

Od zdravstvenih pitanja najprije su raspravljeni problemi tuberkulinskog indeksa i fluorografski nalazi stanovništva spomenutih sela i okolice.

Prikazan je pobol od silikoze i siliko-tuberkuloze među kamenorescima i članovima njihovih obitelji. Naročito se upozorava na problem silikoze kod djece. Od kliničkih podataka opisane su karakteristične radiografske promjene, kliničke slike, komplikacije i terapija silikoze i siliko-tuberkuloze.

Rad se završava kratkim prikazom zakonskih odredaba o suzbijanju silikoze i siliko-tuberkuloze, koje su danas na snazi u našoj zemlji.

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