ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ
Государственное образовательное учреждение высшего профессионального образования
Магнитогорский государственный
технический университет им. Г.И. Носова

Л.И. Антропова
В.И. Биличенко
Т.Н. Долгушина

Geology and Mining Machines

Рекомендовано Учебно-методическим объединением
по образованию в области лингвистики
Министерства образования и науки Российской Федерации
в качестве учебного пособия для студентов и аспирантов,
обучающихся по специальностям в области горных технологий
и транспорта, и для студентов, обучающихся
по программе дополнительного образования
«Переводчик в сфере профессиональной коммуникации»

Магнитогорск
2009

УДК 802:622.002.5(07)

Рецензенты:

Заведующая кафедрой английского языка,
профессор Магнитогорской государственной консерватории,
кандидат филологических наук
Л.М. Калашникова

Заведующая кафедрой английского языка,
профессор Магнитогорского государственного университета,
кандидат педагогических наук
Л.В. Павлова

Антропова Л.И., Биличенко В.И., Долгушина Т.Н.
Geology and Mining Machines: учеб. пособие. Магнитогорск: ГОУ ВПО «МГТУ», 2009. – 119 с.
ISBN 978-5-9967-0063-9

Содержит аутентичные тексты для чтения по геологии и горным машинам. Цель пособия – развитие профессиональной коммуникативной компетенции будущих специалистов. Предназначено для студентов, соискателей и аспирантов факультета горных технологий и транспорта. Упражнения направлены на совершенствование навыков устной речи в ситуациях профессионального общения, а также навыков перевода, аннотирования и реферирования.

УДК 802:622.002.5(07)

ISBN 978-5-9967-0063-9

ВВЕДЕНИЕ

Учебно-методическое пособие «Geology and Mining Machines» представляет собой книгу для чтения на английском языке и является приложением к базовому учебнику по горным специальностям.

Пособие предназначено для студентов и аспирантов факультета горных технологий и транспорта, а также для студентов, обучающихся по дополнительной специальности «Переводчик в сфере профессиональной коммуникации». Специалисты, имеющие достаточную базовую подготовку по английскому языку, могут использовать этот учебник, чтобы научиться вести общение в ситуациях профессиональной сферы.

Поскольку целью пособия является формирование коммуникативной и профессиональной иноязычной компетенции будущих специалистов в области горных технологий, то в его основу положен принцип коммуникативно-деятельностного обучения. Речевые модели и языковые средства позволяют овладеть речевыми интенциями: обоснование, аргументирование, выражение собственного мнения.

Особенностью пособия, отличающего его от других подобных изданий, является подбор языкового инструментария, дающего возможность его интеграции в общий курс иностранного языка неязыкового высшего учебного заведения. Другая отличительная черта – учебная направленность пособия: тексты являются не только источником лингвистического (лексического, грамматического) материала, они также обучают студентов и аспирантов разным видам текстовой деятельности. И, наконец, фактологический материал подбирался с учетом интересов будущих специалистов.

Методическое пособие содержит материалы для чтения, составленые из современных аутентичных статей и текстов из Internet ресурсов, что делает пособие особенно актуальным. Тексты могут быть использованы как для языкового анализа, так и для изучения в рамках курса по специальностям горного профиля.

Для обучения чтению профессионально-ориентированных текстов на английском языке были отобраны лексические единицы, а также грамматические явления и конструкции, наиболее часто употребляемые в текстах по конкретной специальности.

Тексты и системы упражнений предназначены для решения нескольких задач:

– развитие умений изучающего, ознакомительного и поискового чтения;

– формирование навыков перевода, аннотирования и реферирования, что позволяет развивать дискурсивную компетенцию обучаемых;

– развитие умений работать со словарем;

– закрепление знаний и умений в области английской грамматики;

– расширение словарного запаса студентов;

– совершенствование навыков устной речи в ситуации профессионального общения.

Настоящее учебное пособие состоит из двух частей: часть I – «Geology», часть II – «Mining Machines». Всего в пособии 14 уроков. Каждый урок (Unit) содержит основной текст и систему предтекстовых и послетекстовых упражнений.

Система лексических упражнений направлена на закрепление активного словаря, на формирование терминологического словарного запаса и построена по принципу нарастания трудностей в соответствии с функциональностью.

Учебный словарь дается в конце каждой части и содержит общеупотребительную и терминологическую лексику с транскрипцией, что способствует организации самостоятельной текстовой деятельности студентов и аспирантов.

В пособии широко представлены графики, таблицы, схемы, рисунки, что, несомненно, способно вызвать интерес будущих специалистов, а также может помочь лучшему усвоению изучаемого материала.

Предлагаемая методика, безусловно, повысит уровень мотивации к владению иностранным языком студентов, а также будет способствовать развитию их профессиональной компетенции.

Практическая значимость пособия определяется тем, что в отечественных учебных материалах отсутствуют пособия такого типа.

Авторы благодарят рецензентов и будут признательны за критические замечания и предложения.

PART I. GEOLOGY

Unit I

Our Earth

I. Before you start:
Guess about the origin of the Earth:

1) It is the result of some processes in the Universe.
2) God created the Earth.
3) Nobody knows how the Earth was originated.

II. a) Remember the following words:

huge [hju:ʤ] – огромный;
scarce [skɛəs] – редкий;
in spite [spait] of – несмотря на;
vague [veig] – неопределенный;
related [ri'leitid] to – имеющий отношение к чему-либо;
accurately ['ækjuritli] – точно;
space [speis] – пространство;
to deal [di:l] with – иметь дело с чем-либо (кем-либо);
to obtain [əb'tein] – получать;
to occur [ə'kə:] – происходить;
comprehension [ˌkɔmpri'henʃ(ə)n] – понимание;
comprising [kəm'praiziŋ] – включающий;
widespread ['waidspred] – широко распространенный;
in existence [ig'zist(ə)ns] – существует (в природе);
weight [weit] – вес;
to survive [sə'vaiv] – выживать;
to occupy ['ɔkjupai] – занимать;
to include [in'klu:d] – включать;

b) Find the Russian equivalents:

1) rocky beach;	1) над уровнем моря;
2) slightly lopsided ball of rock;	2) всего лишь булавочный укол;
3) above the sea level;	3) не образованы в живых организмах или с их помощью;
4) a mere pinprick;	4) теми или иными средствами;

5) by some means or another;	5) это постоянное притяжение;
6) this ever present attraction;	6) скалистый берег;
7) not formed in or by living things;	7) составляет один процент;
8) add up to one per cent.	8) неровный твердый шар.

III. Read the text to find unknown information.

Text

Our Earth

The earth is a huge, slightly lopsided ball of rock, so enormous that we can scarcely imagine how heavy it is. It weighs about 6,600,000,000,000,000,000,000 tons. Its diameter through the equator is 7,926,68 miles, but from pole to pole the diameter is 7,899,98 miles, or 26.7 miles less. In spite of this very small flattening, and an even smaller bulge in the southern hemisphere, the earth is still nearly a perfect sphere.

When geologists talk of the earth as a ball of rock, they do not mean it is solidly made up of the stones you see on a rocky beach. Scientists actually know very little about the rocks deep inside the earth, and even the definition of a rock itself may seem vague and complicated. It is easy to define chemical elements and the minerals they form, but it is not easy to define the rocks of which the earth is made.

All life is, as we know, spread out in a thin layer on, or close to the surface of the rocky earth. Some plants and animals make their homes two or three miles above the sea level. Others can survive an equal depth below the surface of the sea. But it is within this thin six-mile layer, that over 99, 99 per cent of all plants and animals live, grow, and die.

The story of where rocks came from is closely related to the origin of the earth, and this mystery is yet to be unraveled. The best guess is that the earth and the entire solar system have been in existence for a little over four billion years.

Astronomers get a fairly good idea of the chemical composition of the universe by studying the light from the stars and the sun. But as soon as scientists have to deal with the smaller, colder bodies like the planets and satellites, information is more difficult to obtain. Our direct knowledge of rocks is limited very much to the crust of our earth. The deepest hole that man has ever been able to dig in it is an oil well that

goes more than 9 km deep. This is only about five miles down, a mere pinprick into the crust.

Scientists can measure the age of rocks that contain uranium quite accurately Uranium in a rock slowly but steadily decays into one kind of lead. Thus, careful measurements to find the relative weight of uranium and lead in the rock can be used to measure the rock's age. When about one quarter of the uranium has changed to lead, two billion years have passed. This is almost the age of the oldest known rocks, found in the mountains of India.

In recent years, astronomers and geologists have shown that the story of the origin of the world is very complicated. Yet everyone agrees that the earth, the planets and the sun are made of matter. Therefore, comprehension what is meant by matter is the first step in understanding rocks.

Matter is anything which occupies space, has weight and can be detected by some means or another. Each bit of matter on the earth or in the universe attracts all other bits of matter. This ever present attraction is known as gravity or gravitation.

All matter is made of chemical elements listed in the Mendeleyev's Periodic Table. Over 99 per cent of the material in the earth is made of about 30 lightest elements. All our rocks are also made of these 30 light elements. If the sun and the other stars are included the two lightest elements – hydrogen and helium – make up nearly all the matter in the universe.

On the hot surface of the sun, most atoms (the smallest particles of an element) are independent of each other. On the earth atoms usually combine to form molecules. Sometimes two or more atoms of the same kind will join together. Atoms of hydrogen and oxygen are usually joined in pairs. More often, two or more different elements unite, forming a molecule made of several kinds of atoms.

The hundred or more kinds of atoms can combine in millions of different ways. In each case a different molecule is formed. Living things contain large, complex molecules. Nearly all of them include atoms of carbon joined with atoms of hydrogen, oxygen, nitrogen, sulfur and phosphorus. In the crust of the earth 30 or so lightest elements have joined together to make thousands upon thousands of different molecules. These molecules form chemicals which occur naturally in the crust of the earth. When these natural chemicals have a definite crystal structure and are not formed in or by living things, they are then called minerals.

Thousands of kinds of minerals are known, but only a hundred or so are common. These common kinds are made mainly of eight

elements: oxygen, silicon, aluminum, iron, calcium, sodium, potassium and magnesium. These eight elements, joined together in various ways, make up nearly 99 per cent of the crust or outer part of the earth (Fig.1).

Composition of Earth's Crust

Element	Common charged Form	Wt% in Earth's crust	Resulting mineral groups
O (Oxygen)	O^{2-}	46.4	Oxides
Si (Silicon)	Si^{4+}	28.2	Silicates
Al (Aluminum)	Al^{3+}	8.1	
Fe (Iron)	Fe^{3+}	5.4	
Ca (Calcium)	Ca^{2+}	4.1	
Na (Sodium)	Na^{2+}	2.4	
Mg (Magnesium)	Mg^{2+}	2.3	
K (Potassium)	K^{+}	2.1	
Ti (Titanium)	Ti^{4+}	0.5	
H (Hydrogen)	H^{+}	0.14	
P (Phosphorus)	P^{5+}	0.11	(Phosphates)
Mn (Manganese)	Mn^{4+}	0.10	
F (Fluorine)	F^{-}	0.065	Halides
Ba (Barium)	Ba^{2+}	0.05	
Sr (Strontium)	Sr^{2+}	0.38	
S (Sulfur)	S^{2-} & S^{6+}	0.030	Sulfates & Sulfides
C (Carbon)	C^{4+} & C^{4-}	0.022	Carbonates
Zr (Zirconium)	Zr^{4+}	0.017	
Cl (Chlorine)	Cl^{-}	0.013	Halides

LBR 1/2002

Fig. 1. Main elements which compose the Earth's crust

One important group of minerals in the earth's crust is the oxides. Here, the molecule is made of one or more atoms of oxygen combined with one or more other elements. Best known and most im-

portant of all the oxides is silicon dioxide, the chemical name for quartz or sand. Quartz is the most widespread mineral that is found in the earth's crust.

Another common group of minerals is the silicates. Here silicon and oxygen are once again combined. But in addition, one or more metals such as aluminum, calcium, sodium or potassium are part of the molecule. Silicates are the most important group of rock-forming minerals. Whether in the form of silicon dioxide or in the form of silicates, the two elements – silicon and oxygen together make up 83 per cent of the crust of the earth. Six metals make up 16 per cent; other elements add up to one per cent. Iron, the most important metal, is in the less-than-one per cent group; so are all the precious metals. All of these together are the materials comprising the earth's crust.

IV. Have a comprehension check of the text.

Questions:

1) What is the diameter of the Earth?
2) How old is the Earth and the whole solar system?
3) What is the deepest hole in the Earth that man has ever been able to dig?
4) Where do most animals and plants live, grow and die?
5) What do the Earth, the planets and the sun consist of?
6) What is the gravity or gravitation?
7) What elements constitute most minerals?
8) What are the most important mineral groups?

V. a) Give the Russian for:

1) weight, lead, universe, dioxide, nitrogen, hydrogen, silicate, origin, crust, potassium, sulphur, to spread out, to produce, to deal with, to make use of, oxygen;

2) sea level, six mile layer, precious metals, rocks age, ever present, oil well;

3) in spite of, in order to, thus, as soon as, towards, inside, whether, therefore, once, even, in different ways, on the way, by means of.

b) Give the English for:

Земная кора; происхождение; азот; вес; свинец; окислы; двуокись; натрий; калий; производить; иметь дело с; весить; водо-

род; сера; кислород; несмотря на; для того чтобы; таким образом; как только; поэтому; благородные металлы; нефтяная скважина.

VI. Translate the sentences into Russian. Pay attention to the Passive voice.

1. Iron is found in veins and beds of the earth's crust. 2. All minerals are found in rocks. 3. The term volcanism is applied to the study of volcanic action. 4. The composition of magma governs what mineral will be formed from it. 5. Crystalline quartz is found in rocks which were once melted. 6. Beds of salt that were deposited from the sea water are found on the land. 7. Some volcanic rocks had been changed into schists. 8. It has been estimated that 95 per cent of the crust is composed of igneous rocks.

VII. Open the brackets. Use the Passive voice.

1) Crystalline quartz (to find) in rocks which once (to melt).
2) Beds of salt that (to deposit) from the sea water (to find) on the land.
3) The various techniques of geophysical prospecting (to base) on a number of fundamental principles.
4) Our Earth (not mean) only as a ball of rock.
5) Any molecule (to make) of atoms of oxygen and other elements.

VIII. Comment on the following:

1) Life is spread out in a layer close to the surface of the earth.
2) Scientists agree that the earth, the planets, the sun are made of matter.
3) The common kinds of minerals are made mainly of eight elements.

IX. Divide the text «Our Earth» into logically completed parts and give each a subtitle.

X. Retell any part of the text in English.

Unit II

The Nature of Rocks

I. Before you start:
What do you think the chemical compounds constituting rocks are?

II. a) These words and word – combinations will help you to understand the text:

immediately [i'mi:djətli] – немедленно;
angle ['æŋgl] – угол;
to eliminate [i'limineit] – устранять;
liquid ['likwid] – жидкость;
however [hau'evə] – тем не менее;
sense [sens] – чувство;
to sense [sens] – чувствовать;
cinder ['sində] – гарь;
muck [mʌk] – грязь;
ash [æʃ] – пепел, зола;
yield [ji:ld] – добыча, выход продукции;
to yield [ji:ld] – 1) давать (плоды), производить; 2) уступать, сдаваться; 3) пропускать;
to swamp [swɔmp] – заваливать; swamp [swɔmp] – болото;
to imply [im'plai] – подразумевать;
hand in hand – рука об руку (вместе);
shifting sands ['ʃiftiŋ sands] – барханы;
to look alike [luk ə'laik] – быть похожим;
but it may be well to point out – но следует также отметить;
there are also times [taims] – имеются такие случаи;
the identification [ai,dentifi'keiʃ(ə)n] of rocks involves [in'vɔlv] much more properties ['propətiz] – определение пород требует больше данных;
relative ['relətiv] weight of the rock – относительный вес породы;
shale [ʃeil] – глинистый сланец;
slate [sleit] – шиферный сланец;
schist [ʃist] – кристаллический сланец;
weak [wi:k] – слабый;

stable ['steibl] – устойчивый, стабильный,
metastable [,metə'steibl] – метастабильный,
ductile ['dʌktail] – ковкий;
soluble ['sɔljubl] – растворимый;
acid ['æsid] – кислота;
texture ['tekstʃə] – строение, степень плотности;
brittle ['britl] – хрупкий.

b) Give the Russian for:

a) man-made, smooth, alive, common, relative, liquid, to polish, desert, pattern, mixture, cement, shale, coal, aid, mud, deposit, to exist, to identify;

b) ice field, sea animal, mineral like substance, diamond saw, paper thin, glass slide, ocean life;

c) as, for, however, still, though, until.

III. Read the text and say what facts seem unknown and strange to you.

Text

The Nature of Rocks

To the geologist, rock is the natural, solid material that makes up the earth. The first word, natural, immediately eliminates man-made materials like cement, glass, brick, and steel, even though these all come from the crust of the earth.

The second word, solid, rules out the air and other gases, the oceans, rivers, lakes, and other liquids. However, solids can be changed to liquids and gases by being heated; liquids and gases can be changed into solid by being cooled. The definition of a rock means solid at temperatures which normally occur in the earth's crust. Even this does not cover everything, because one of the most common chemical compounds on the surface of the earth may or may not be a rock, depending on its temperature. This chemical compound is water – H_20. Water makes up nearly three fourths of the surface of the earth. Most of it is in the form of a liquid, and while liquid water affects the rocks of the earth in many ways, water is not a rock. However, in the arctic and antarctic regions, and in the temperate regions during winter, millions upon millions of tons of water are a hard, frozen solid. In

the antarctic, ice occurs in layers nearly two miles thick. Ice is, therefore, a rock, and geologists study the great ice fields just as they study other rock formations.

In speaking of rocks, geologists use the word solid in its technical sense. A solid is the matter that is not a liquid or gas. What the geologists would sometimes call solid rock might seem strange to you. The wet sands on the beach and the shifting sands in the desert are a solid and a rock. This is also true of the layers of mud and muck in the swamps, or the ash and cinders from volcanoes. They are rock also.

The third word, material, brings no additional problems to the definition of a rock. But it may be well to point out that the materials in the crust of the earth may have two distinct origins: organic and inorganic. Most of the material in the crust of the earth is inorganic. This means that it is in no way related to life or living things. Lava pouring from a volcano makes an excellent example of inorganic material. So do the great masses of granite pushed miles into the air.

While most of the rocks are made of materials which are not or ever have been alive, some rocks are organic — made up by living things. Coal and oil deposits, for example, are the remains of ancient plants. Oil, you might say, is a liquid and therefore is not a rock. However, there are no great underground lakes of oil as some people imagine. The oil is usually soaked up in the pores of sand and other rocks. Under special conditions it drains into wells from where it is pumped to the surface. Millions of gallons of oil are locked up in rocks, especially in the oil shales. Asphalt is another organic rock.

Less well-known are the rocks which have been formed from the remains of sea animals. Shells, cemented together form several kinds of limestones. Sometimes these are the shells of microscopic animals, sometimes they are much larger shells.

Coral is another kind of rock made by living things. Coral animals take lime from the sea water and build it into reefs in which millions upon millions of coral animals live. Islands of coral dot the South Pacific. A few microscopic plants and sponges have silica skeletons. Under certain conditions these, too, form organic rocks.

One final explanation in the definition of rocks is about as complete as it can be. The definition implies that rocks are large masses of natural, solid material, big enough to form a distinct part of the earth's crust.

Diamonds are not rocks, even though they are found in the crust of the earth. But if a whole mountain of diamonds was discovered, then it would be correct to call diamonds a rock. There are places where

one can see mountains of marble, quartz granite or limestone. You can find large beds of coal, shale or lava. These are rocks. There are the many miles of rich soil, more miles of sand in the desert and on the shores. They all make up major parts of the earth's crust, so they are called rocks.

You may have noticed that the definition of a rock does not say anything about minerals. This is odd, for we commonly think of rocks and minerals as going hand in hand. Most often they do. However, all minerals are inorganic. They are chemical compounds and therefore have a definite chemical composition. Mixtures of minerals often do form enough of the earth's crust to be considered rocks. Granite, made mainly of three minerals — mica, feldspar and quartz, is undoubtedly a rock.

There are also times when a single mineral may form a rock. Quartz is a common mineral. Some forms of sandstone are made up of 99 per cent pure quartz. In this and other cases the rock and the mineral are made of the same chemical substances. This may also happen in the case of the mineral, calcite, which forms a kind of pure marble. Here again the rock and the mineral are the same. Gypsum is another rock made of a single mineral. The mineral kaolin makes fine clay and forms still another kind of rock.

However, rocks may be made of materials which are not minerals at all. Volcanic glass or obsidian is not a mineral but it frequently forms rocks. Coal, peat and asphalt are not minerals but they are rocks.

In spite of the difficulty in defining rocks, most rocks are easily recognized when you see them, and most are made of minerals or mineral-like substances. They are usually solid, hard, and heavy, compared to the other materials you see and use daily.

The study of rocks is petrology. It is a difficult science, for most rocks are harder to identify than birds, flowers or trees. But the study of rocks is important, for rocks and minerals yield the materials that make modern civilization possible. The rock which forms soil is the basis for life on land. Dissolved minerals taken from the rocks by running water make the sea salty and make ocean life possible to exist.

The identification of rocks is easy when the rocks are made of minerals and when the minerals are large enough to be identified. When the rock is fine-grained and when the minerals all look alike, as they do in some of the dark rocks, it takes skill to identify them. The geologist will often cut a piece of rock with a diamond saw and polish one surface until it is perfectly smooth. He then cements the smooth surface to a glass slide, and polishes the rest of the rock until it is pa-

per thin. This thin layer of rock is examined under a microscope, using Polaroid light. As the light passes through the minerals in the rock, it is altered, producing beautiful colors. These colors depend on the kind of minerals and on the angle at which the crystals have been cut. Such patterns aid much in the process of identification.

The identification of rocks involves much more properties. The texture, color, hardness and relative weight of the rock can also be used as clues. The geologist also looks for the geologic structures in which the rock occurs. Certain rocks are found only in volcanoes, others in caves. Still others are more likely to be found in valleys than on high ridges.

IV. Answer the questions to have a comprehension check of the text:

1. What is rock to the geologist?
2. What is a solid rock?
3. What rocks can be formed from the remains of sea animals?
4. Is oil a rock?
5. Are diamonds rocks?
6. When is the identification of rocks easy?
7. What can be used as clues in identification of minerals?

V. a) Find synonyms among the following words:

man-made, to look for, layer, to change, help, strange, artificial, bed, to search for, odd, stratum, aid, to alter, pure, to eliminate, dirty, to remove.

b) Find antonyms among the following words:

alive, smooth, wet, possible, fine-grained, likely, thin, rough, course-grained, unlikely, thick, dead, dry, impossible, organic, ancient, inorganic, modern.

VI. Match the nouns with the adjectives and use them in the sentences of your own:

region	wet
composition	organic
quartz	fine-grained

rock
surface
zone
sand
layer
shifting

dark
smooth
thin
arctic
Antarctic
temperate
chemical
pure
relative

VII. Render the following in English.

Петрология – это наука, изучающая породы. Изучение пород очень важно, так как именно породы и минералы создают современную цивилизацию. Ведь породы, образующие почву, являются основой жизни на земле. Минералы, растворенные в воде, делают воду морей и океанов соленой, что позволяет существовать морским растениям и животным. Ученые проводят большую работу по идентификации пород, так как на этот процесс влияют многие факторы, но главным является характер материала, формирующего породу, и его свойства.

VIII. Divide the text into logically complete parts, and give each a subtitle.

IX. Put questions to the first, second or third parts of the text and retell it.

X. Describe the process of rock identification using the following words:

To look alike, fine-grained, skill, to identify, to cut, a peace of rock, diamond saw, to polish, surface, until, smooth, to cement, glass slide, paper thin, to examine, under microscope, polaroid light, to depend (on), angle, pattern, texture, color, hardness, relative weight.

Unit III

Rock-forming Minerals

I. Before you start:
Speak on your first exploration of minerals.

II. a) These words and expressions will help you to understand the text:

clue [klu:] – ключ;
cleavage ['kli:vidʒ] – раскол;
breakage ['breikidʒ] – помолка, дробление, измельчение;
to scratch [skrætʃ] – царапать;
streak [stri:k] – полоска;
impurity [im'pjuəriti] – примесь, нечистота;
luster ['lʌstə] – блеск;
occasionally [ə'keiʒnəli] – случайно;
to grade [greid] off – откалибровывать, переходить;
mention ['menʃ(ə)n] – ссылка;
to mention ['menʃ(ə)n] – упоминать;
to tell apart [tel ə'pa:t] – различать;
specific gravity [spi'sifik 'græviti] – удельный вес;
by and large [la:dʒ] – в общем и целом;
in turn [tə:n] – в свою очередь;
due [dju:] to – из-за;
on an arbitrary scale ['a:bitrəri skeil] – по произвольной шкале.

b) Find the Russian equivalents:

arrangement	сила тяжести
fracture	кристаллы граната
streak	расположение
gem	отражать
heat	слюда
mica	порошок кальция
hornblende	щелочная вода
zero	растворяться
amount	роговая обманка
to squeeze	складка
fold	подобный
to give the clue	драгоценный камень
to range	раздавливать

to crush	идентификация породы
to reflect	дать подсказку, ключ, наводку
to dissolve	количество
similar	жара, тепло
waste space	сжимать, сдавливать
alkali water	трещина, излом, разрыв
garnet crystal	шестигранный кристалл
calcium powder	во всей истории
rock identification	наука
gravity	наибольшее распространение
at all	нуль
besides	удельный вес
at least	полоска, черта
alike	
since	
in the overall history	
the most widespread	
a six- side crystal	

III. Read the text and say what science helps to study the minerals.

Text

Rock-forming minerals

Since most rocks contain minerals, some knowledge of minerals is necessary to identify rocks. Because minerals are chemicals, they have special properties which aid in their recognition. Minerals are easily identified by chemical analysis.

One of the properties of minerals which depend on their chemical composition is the specific gravity or relative weight of the minerals. When molecules are packed together with a minimum of waste space, as in the metals, the mineral weighs more. The specific gravity of minerals is compared to that of water, which has a specific gravity of 1. Common minerals range from 1.7 specific gravity, for borax, to 19.3, for gold.

Most minerals also have a distinct crystal form. This, in turn, depends on the arrangement of the molecules in each mineral. Mineral crystals fall into six systems, and these can be identified by the angles of the crystal. Even a small fragment of a crystal is enough to give a clue to its structure and its crystal form.

The way a mineral breaks in flat planes is called its cleavage. This, too, can be used in identification. Mica is an example of perfect

cleavage. Minerals also break in an irregular way. This kind of breakage is called fracture and it, too, helps to identify a mineral.

All minerals have a definite hardness, which is the minerals ability to scratch or be scratched. Hardness is generally measured on an arbitrary scale of 10. The color of minerals is not important in identification because the color may be due to impurities or surface changes. Streak is the color of a powdered mineral, and luster is the way the structure of a mineral reflects or breaks-up light. Besides these properties, certain minerals respond to ultraviolet light and give off brilliant colors. This fluorescence is also used in identification. Other minerals are magnetic. Some have electrical radioactive properties. These and many other properties of minerals help identify them in the field and in the laboratory (Fig.2).

Rock Type	Mechanical Strength	Chemical Stability	Human Use
Granite	Strong	Stable	Building stone & monuments
Rhyolite	Strong	Stable	
Andesite	Strong	Stable	
Diorite	Strong	Stable	
Basalt	Strong	Pretty stable	
Gabbro	Strong	Pretty stable	
Sandstone	Strong	Generally stable	Common building stone
Shale	**Weak**	Stable	
Limestone	Strong	**Soluble in acidic water**	Common building stone roadbed
Rock salt	**Ductile**	**Very soluble**	Salt
Coal	Brittle	**Metastable**	Fuel
Slate	~Strong	Stable	Roofs; blackboards
Schist	~Strong	Pretty stable	
Gneiss	Strong	Pretty stable	Occasional building stone
Marble	Strong	**Soluble in acidic water**	Building stone & monuments
Quartzite	Strong	Stable	
Anthracite	Brittle	**Metastable**	Fuel

LBR 1/2002

Fig. 2. Properties of rocks

The rock-forming minerals are a group of little importance as gems or as sources of metal. But they have great importance in the

overall history of the earth. The rock-forming minerals are the ones which make our land on which we live.

Of all the rock-forming minerals, the simplest and most widespread is the mineral quartz - silicon dioxide. Quartz occurs in many forms, some of them are beautifully colored. These are used as gems. Ordinary quartz is a colorless, glassy mineral which may form a six-sided crystal. It breaks in the same kind of shell-like surface you find in broken glass. Large crystals of quartz are rare and are valued for their use in radio and electronics. Crystalline quartz is found in rocks which were once melted, though this kind seldom forms good crystals.

Under certain conditions quartz will dissolve in alkali water and will reform as no crystalline quartz. These forms of quartz are called agate, onyx or chalcedony. Crystalline quartz is the usual rock-forming mineral. Non crystalline quartz is not.

Gypsum, calcite, dolomite, and halite (rock salt) are occasionally rock-forming minerals too, but, by and large, the rest of the rock-forming minerals are silicate minerals. Probably the most important of the rock-forming minerals are the feldspars. This is a difficult family of minerals to understand because they grade off one into the other, and are hard to tell apart. All feldspars contain aluminum, silicon and oxygen. They also contain one or two metals such as sodium, calcium and potassium. In a general way, potash or potassium feldspars are put into one group, and soda or sodium feldspars are put with the calcium feldspars into another group.

White, pinkish, orange or pale blue feldspar is used to manufacture glaze and enamel for pottery. When feldspars break down they form clay, another important rock.

Micas are better known than feldspars because the "books" of mica can be peeled into flat, thin sheets. This has made mica useful in electrical insulation. Micas nearly always occur in rocks which have been heated, squeezed or folded. They too are silicate minerals. Some varieties contain iron. In a general way they are made of the same elements as feldspars-silicon and oxygen plus metals such as potassium, sodium, magnesium and lithium.

Many rocks consist of mica or some other dark mineral combined with feldspar and quartz, two light minerals. In addition to mica, the two best known dark minerals are the amphiboles and the pyroxenes. These are also silicates. Hornblende is a common, dark green amphibole. Agate is a similar-looking pyroxene. They are easily confused but the cleavage angles are a very good way to tell them apart.

Another family of the rock-forming minerals is the zeolites, a group comprising two dozen minerals which are chemically similar to

feldspars. Most zeolites are soft, light minerals. Some have attractive crystal forms.

Garnets, which people often think of as gems, are common enough to be a rock-forming mineral. They too are silicate minerals, usually containing two metals. Garnet crystals often form with 12, 24, 36, or 48 faces. Because garnets are hard they are used in making sandpaper. Other less important rock-forming minerals should be mentioned. There is olivine, a green silicate containing magnesium and iron; chlorite, a darker green mineral, and serpentine, which is mainly magnesium silicate. Talc, from which talcum powder is made, is one of the serpentine forms.

The way minerals form rocks is a complicated process. It involves chemical reactions at high temperatures and pressures. These different conditions, which may occur within or beneath the crust of the earth, produce a variety of rocks. While these rocks are quite alike chemically, they differ greatly in their physical and mineral characteristics.

All minerals are found in rocks. Diamonds are found only in a volcanic rock called kimberlite. Other minerals, like quartz and calcite, may be found in many different rocks. The chance of finding gold in limestone is practically zero, but the chance of finding it in rocks which were once melted is much greater.

IV. Answer the questions to check up the knowledge of the text.

1) What properties of minerals depend on their chemical composition?
2) What is cleavage?
3) What other properties of minerals are used in their identification?
4) What is the role of rock-forming minerals?
5) Can you describe the properties of quartz?
6) What are the most important rock-forming minerals?
7) What dark minerals do you know?

V. Underline word-building prefixes and suffixes and translate the words. What part of speech do they belong to?

Knowledge, special, property, recognition, gravity, relative, specific, arrangement, structure, identification, irregular, fracture, ability, hardness, important, electrical, brilliant, importance, beautifully, temperature, pressure, condition, probably, attractive, mainly, reaction.

VI. Complete the sentences choosing the words below.

1) The way the mineral breaks into planes is called… .
2) Some properties of minerals depend on their… .
3) A colorless glassy mineral which forms a six-sided crystal is… .
4) In a volcanic rock called kimberlite we can find… .
5) Mica is generally used in… .

Quartz, insulation, cleavage, composition, diamonds.

VII. Look through the list of ideas and join them using "and", "but", "although", "because", "besides", "therefore", "since", "as well as".

1) Minerals are identified by chemical analyses …… minerals are chemicals.
2) Some minerals are magnetic …… some have radioactive properties.
3) The rock-forming minerals are not important as sources of metal …… they have great importance for the history of the earth.
4) The most important rock-forming minerals are feldspars …… this group of minerals is difficult to understand.
5) All feldspars contain aluminum, silicon and oxygen …… they contain sodium, calcium and potassium.
6) Some rocks are chemically alike …… differ greatly physically.

VIII. Speak on minerals and their properties. Use the following words:

Depend on, specific gravity, to range, crystal, fall into, angle, break, cleavage, hardness, to tell apart, arbitrary, scale, streak, powdered mineral, to confuse, to reflect, fluorescence, magnetic, electrical properties.

IX. Compare the properties of micas and garnets. What do they have in common? Use the expressions: to begin with, I'd like to say that, in addition to, as you know…

X. Describe the outward appearance, properties and usage of any mineral.

Unit IV

Igneous Rocks

I. Before you start:
What sciences deal with the study of the earth's structure?

II. Study the words that will help you to understand the text.

Igneous ['igniəs] rocks – вулканически-изверженная порода;
molten ['məult(ə)n] – расплавленный, литой;
core [kɔ:] – ядро;
liquid ['likwid] – жидкость;
mantle ['mæntl] – оболочка покров;
layer ['leiə] – слой;
sear [siə] – увядший, сухой;
fiery – ['faiəri] – огненный, горячий, воспламеняющийся;
soil [sɔil] – земля, почва;
sediment ['sedimənt] – осадок, гуща;
debris – ['debri:] – обломки пород;
abundant – [ə'bʌndənt] – обильный, богатый;
to jut [dʒʌt] up – выступать;
edge [edʒ] – край, крошка;
to shift [ʃift] – передвигаться, перемещаться;
dike [daik] – ров, плотина, препятствие;
extrusive [ek'srtu:siv] – выступающий на поверхность;
sill [sil] – силь;
blister ['blistə] – волдырь, вытяжной пластырь, купол, пузырь;
sial – [siəl] – литосфера;
sima – [simə] – оболочка земной коры, состоящая из силиция и магния;
shrinkage ['ʃriŋkidʒ] – уменьшение пород в объёме;
to bubble ['bʌbl] – пузыриться;
to froth [frɔə] – пениться;
pumice – ['pʌmis] – пемза;
cinder – ['sində] – пепел, шлак;
fine-grained [fain greind] – мелкозернистый;
chamber ['ʧeimbə] – камера, просек;
suspended [səs'pendid] – взвешенный.

III. Read the text and say what practical use the knowledge of rocks has.

Text

Igneous Rocks

The igneous rocks are those which were formed from melted or molten materials. Igneous rocks were once magma, a thick, hot liquid deep inside the earth. Since all igneous rocks come from inside the earth, let us take a quick look at what is inside.

The deeper we go into the earth the less is known about its structure. There is some knowledge based on earthquake waves, the behaviour of the earth as a spinning planet, and laboratory experiments with rocks under high pressure. These suggest that the very core of the earth is probably iron or iron alloyed with nickel and cobalt. Pressure on the rock near the earth's center equals to about 25,000 tons per square inch. The rock of this rigid inner core – which extends 790 miles out from the center of the earth- is somewhere between 10 and 15 times as dense as water. Surrounding this inner core is another zone some 1,360 miles in thickness. This outer part of the core of the earth also seems to be of dense material, but certain types of earthquake waves do not go through it. Since these earthquake waves travel through solids and not through liquids, it is possible that this outer part of the earth's core acts like a dense liquid. The heavy core of the earth is about 4,300 miles in diameter.

Surrounding the core of the earth is a zone or mantle layer close to 1,800 miles thick. This is a solid, rocky layer which may grade into the iron core. The last 20 or 30 miles from the center forms what is called the crust of the earth. This is a term left over from the old days when people imagined that the interior of the earth was a great mass of molten rock and searing flames. A thin crust was thought to surround this fiery interior. Every now and then the crust would crack and puncture to let flames and volcanic rock pour out. Even though this idea about the interior of the earth is false, the term "crust" is still used for the outermost layers of rock.

The crust of the earth contains two distinct types of rocks- forgetting for a moment the soil, sediments, debris, water and ice that coat the surface. The continents are supported by the crystalline sial. Sial is a word made from the abbreviations for silicon and aluminum and it is used because the rocks underlying the continents are rich in these elements combined with oxygen. Sial rocks are light in color and light in weight. They are the rocks that form our great mountain ranges.

Lying underneath the sial and lying directly under the great Pacific Ocean Basin is the sima. This word is made from the abbreviations for silica and magnesium – again because these two elements are abundant in the rock. Volcanic lavas are of a silica – magnesium type. They are dark rocks, and are generally heavier than those of the sial. The islands that jut up from the deep Pacific Basin are volcanic ones of the sima type.

A zone of glassy rock is believed to be just beneath the sima at the upper edge of the mantle. This glassy rock melts easily under the great heat and pressure 30 to 40 miles down inside the earth. The presence of this rock zone may occur due to movements below the crust of the earth and to the shifting of rock as mountains are formed and as ocean basins settle.

The melted magma which forms igneous rock seems to have its beginning at least 20 or 30 miles down. Somewhere in this zone the temperature is high enough to melt rock, while at the same time, the pressure is so high that the rock transmits earthquake waves and acts like a solid (Fig.3).

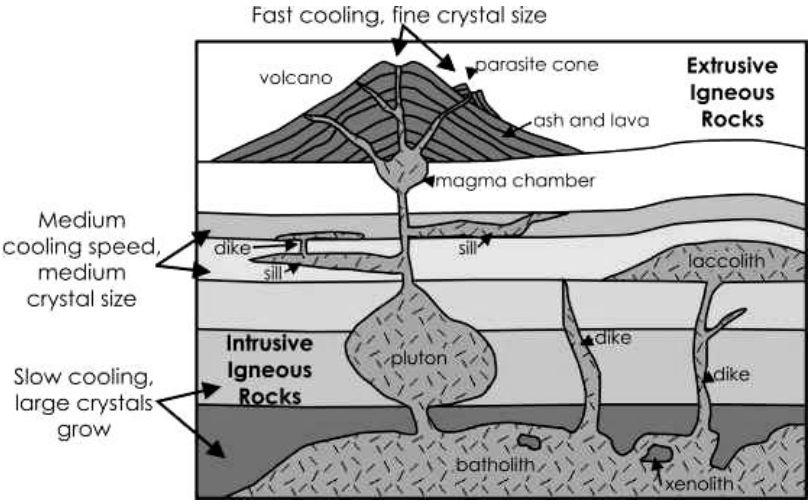


Fig. 3. Formation of igneous rocks

Earth movements relieving strains and pressures in the crust create zones of weakness or actual breaks. These permit some of the magma to find its way up into the crust either through cracks or by dissolving the weakened rock around it. Sometimes magma moves to the surface, spewing out of volcanoes or spreading over the countryside in

huge lava flows. Lava is only one type of igneous rock, but it is probably the best known. Most magma cools well below the surface of the earth. Under these conditions it cools very slowly.

Inside the crust of the earth, magma may flow into branching cracks forming veins. It may cut across layers of rock forming great sheet-like dikes. When magma flows between layers it forces the rock apart. Such an intrusion is known as a sill. Sills may be anywhere from a few inches to hundreds of feet in thickness.

Sometimes intrusive rock, forced between layers, will raise the upper layers like a blister. Such blisters a few miles or so across are called laccoliths. Large intrusive blisters may cover thousands of square miles.

Magma that intrudes or pushes in to other rock cools beneath the surface of the earth and hence cools more slowly. Minerals separate out and crystals develop. Shrinkage may split the cooling rock into huge regular columns. Millions of years later the rocks above may be worn down and the igneous rocks are exposed at the surface. Then these structures can be studied and the valuable minerals in or near them can be mined (Fig.4).

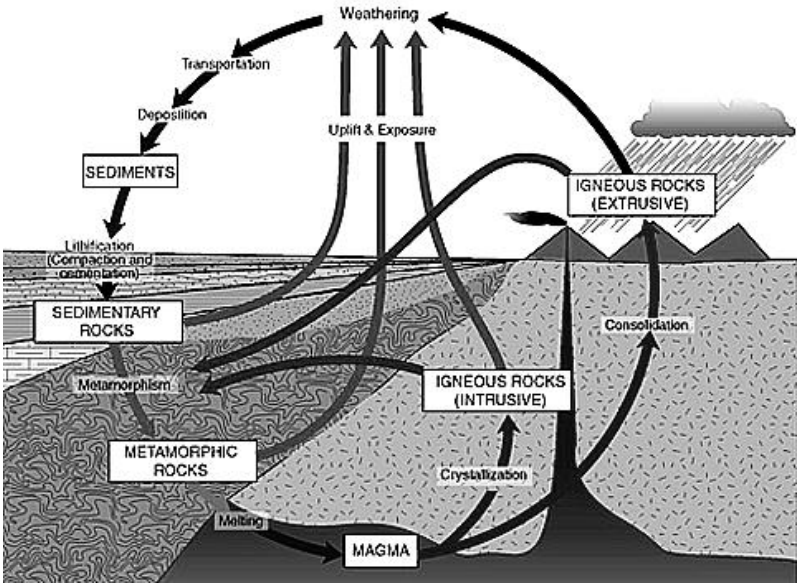


Fig. 4. The cycle of rock formation

When magma does reach the earth's surface it cools much more rapidly. The rock it forms is then called an extrusive rock be-

cause it is pushed out into the surface. The cooling of extrusive rock may be so fast that magma does not form mineral at all, but a kind of natural glass or obsidian. This natural glass, usually dark brown or black, is almost exactly the same as the glass used for window-glasses or bottles. Indians prized it for arrows and spearheads. It is sometimes used for simple jewelry.

Igneous rocks are important to us because of the rich mineral deposits in them or in veins which are found in them (Fig.5).

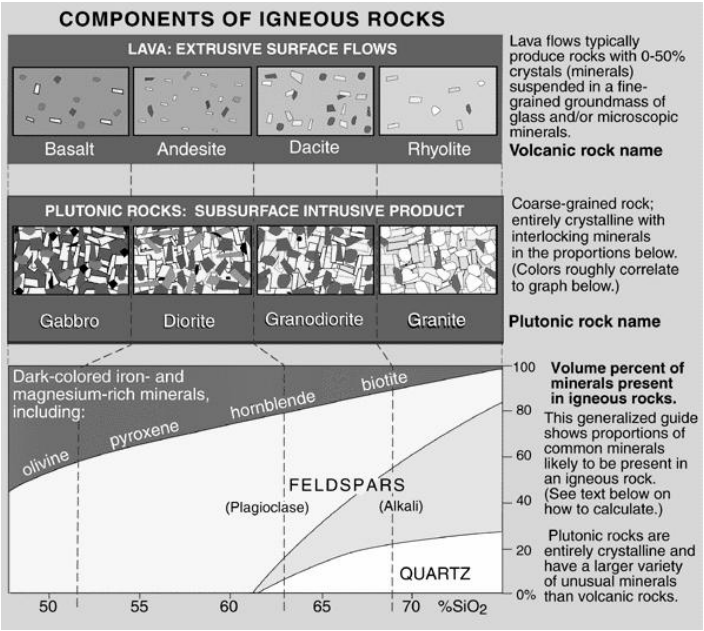


Fig. 5. Components of igneous rocks

Magma may contain a great deal of gas. As it reaches the surface this gas escapes, causing the magma to bubble and froth as the rock cools. When there are so many gas bubbles that the natural glass is whipped into a froth, the rock is called pumice – a rock usually light in color and so light in weight that it will float on water. When the gas bubbles are larger, the volcanic rock looks like coarse cinders. Dark, heavy basalt is one of the most abundant lavas, but there are also light colored lavas rich in silica. Some lavas, thrown high in the air, cool as they fall, forming rounded or twisted volcanic bombs.

From such veins we get most of our gold, lead, zinc, mercury, arsenic, antimony, nickel, cobalt and titanium.

Igneous rocks were the first kind of rocks to form. Some are known to be over two billion years old. At the same time, some other igneous rocks are the youngest rocks, for there are active volcanoes still spewing lava from their craters this very day. Igneous rocks, more than any other kind, offer proof that the earth is still growing, changing and constantly rebuilding its mountains and hillsides.

IV. Answer the questions to the text to have a comprehension check.

1) What is the origin of igneous rocks?
2) What is suggested to be the core of the earth?
3) Why is the term «crust» used for the outmost layers of the rocks?
4) What is known as a sill?
5) How do crystals develop?
6) What is called extrusive rock?
7) Why are igneous rocks important to us?
8) How old are igneous rocks?

V. a) Explain in English the meanings of the words.

Example: The core of the earth is a zone of mantle layer, solid, rocky which may grade into the iron core.

Igneous rocks, magma, crust of the earth, sial, sima, lava, pumice.

b) Fill in the gaps.

1) The outermost layers of rock are called … .
2) ... rocks form our great mountain ranges.
3) Silica and magnesium are abundant in the rock called ... .
4) Zones of actual breaks are created by … .
5) The best-known type of igneous rocks is ... .
6) We find most of our gold, lead, zinc, mercury, etc. from … .
7) Igneous rocks prove that … .

VI. Translate the sentences paying attention to the Subject Constructions:

1) All igneous rocks are believed to come from inside the earth.
2) The outer part of the earth's core seems to be of dense material.

3) The interior of the earth was imagined to be a great mass of molten rock.

4) A zone of glassy rock is supposed to occur due to movements below the crust of the earth.

5) Magma is believed to contain a great deal of gas.

6) Some igneous rocks are known to have been formed two billion years ago.

VII. Transform the sentences, using the Subject Constructions. Use the verbs: to seem, to believe, to expect, to know, to suggest.

1) Igneous rocks are formed from molten materials.

2) The very core of the earth is iron alloyed with nickel and cobalt.

3) The core of the earth is surrounded by a solid rocks layer.

4) The islands that get up from the Pacific basin are volcanic ones.

5) The melted magma had its beginning at least 20 or 30 miles down.

6) Indians used natural glass formed from cooled magma for arrows and spearheads.

VIII. Contradict to the following statements. Use the expressions: it seems to be wrong, I don't think so, as far as I know, etc.

1) The melted magma forms the very core of the earth.

2) Sima is believed to lie at the upper edge of the mantle.

3) Igneous rocks are rather young.

4) The deeper we go inside the earth the more we know about its structure.

5) Magma that intrudes into the rock cools very quickly.

6) Nobody knows the origin of the word «sima».

IX. Retell the text according to the plan. Use the words in brackets.

1) The core of the earth. (Knowledge, earthquake, iron alloyed with nickel, as dense as water, the inner core, diametre.)

2) Sial and sima. (The crust of the earth, abbreviations, oxygen, light in weight, underneath, silica and magnesium, abundant, islands.)

3) The behavior of magma. (Veins, forces the rock apart, intrusion, sheet-like dikes, sill, crystals, shrinkage.)

X. Tell your groupmates about magma and answer their questions.

Unit V

Sedimentary Rocks

I. Before you start:
What do you know about the origin of sedimentary rocks? What does the word «sediment» mean?

II. a) Pronounce the words correctly.

debris – ['debri:]
glacier –['glæsjə]
quartz – [kwɔ:ts]
stalactite –[‘stæləktait]
dolomite – [‘dɔləmait]
lignite – [‘lignait]
rubble – [rʌbl]
boulder – [‘bouldə]
coquina – [ko(u)'ki:nə]
stalagmite – ['stæləgmait]
halite – [‘hælait]
hydrogen – [‘haidriʤən]
erosion – [i’rouʒ(ə)n]
arkose – [‘a:kous]
gypsum – [‘ʤipsəm]
oxygen – [‘ɔksiʤən]

b) Remember the words to understand the text:

familiar [fə'miljə] – знакомый;
clastic ['klæstik] – обломочный;
primeval [prai'mi:v(ə)l] – первобытный;
to splinter ['splintə] – раскалываться, трескаться;
to swell [swel] – распухать, вздуваться;
boulder ['bəuldə] – валун;
pebble ['pebl] – галька;
volume ['vɔljum] – объём;
arkose [‘arkouz] – аркозовый песчаник, аркоз;
feldspar ['feldspa:] – полевой шпат;
shale [ʃeil] – сланец;
to circulate ['sə:kjuleit] – циркулировать, обращаться, распространяться;

lignite ['lignait] – лигнит;
iron rust ['aiən rʌst] – железная ржавчина;
tough [tʌf] – жесткий;
to trickle ['trikl] out – течь тонкой струйкой;
dripping ['dripiŋ] – капающий;
to squeeze [skwi:z] out – сжиматься;
clue [klu:] – ключ;
fossil ['fɔsl] – полезные ископаемые;
exposure [iks'pəuʒə] – выход пластов, обнажение;
chert [tʃə:t] – роговик;
lithification [liθifi'keiʃn] – окаменение, литификация;
deposition [,depə'ziʃ(ə)n] – отложение осадочных материалов, напластование;
laterites ['lætəraits] – латериты;
argillaceous [,a:dʒi'leiʃəs] – глинистый, содержащий глину;
rare [rɛə] – редкий;
nonexistent [,nonig'zist(ə)nt] – несуществующий.

c) Give the Russian equivalents.

By their very definition, were weathered and washed away, provide us with evidence, process of weathering and erosion, great ice sheets spread out, are filled with washed-in sediment, are composed of grains of sand, formed under desert conditions, big piles of sand and gravel, acid-bearing water, gases are liberated, as the amount of carbon increases, give a clue to the kinds of life.

III. Read the text to be ready to give the main idea of it.

Text

Sedimentary Rocks

The other and perhaps most familiar group of rocks are made of debris, waste and rubble. The geologist speaks of most of them as fragmental or classic rocks.

Classic rocks cannot be the oldest, for by their very definition they have been formed from other rocks. Yet in many cases, they are more interesting than any of the earliest rocks. Nobody knows what the surface of the earth was like when it was first formed.

But if in those primeval times, rocks were broken up, weathered and washed away, the forces of nature such as we know them today must have been also present long ago (Fig.6).

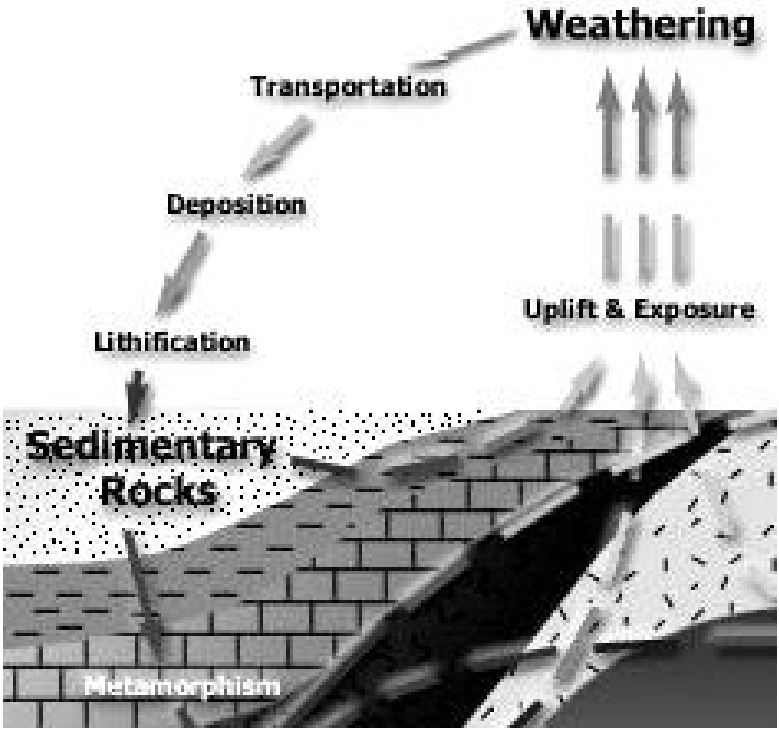


Fig. 6. Formation of sedimentary rocks

Sedimentary rocks provide us with evidence that for at least a billion years – and perhaps more – conditions on the earth's surface were very much the same as they are today. An atmosphere contained the sun's heat. Rain, wind, running water, and the chemicals of the air changed the surface rocks. This process of weathering and erosion began as soon as first rocks were formed and it continues today. In older regions, snow changes into ice and ice forms glaciers which move slowly over the land, wearing down the rocks and carrying fragments away. In past ages great ice spread out over much of North America, Europe, even covering parts of the African continent.

Even raindrops help wear away the rocks. But the water that runs over the land or through the cracks in the rocks wears them out even more. The heat of the sun splits rocks open. Frosts of winter splinter them too. Plant roots growing into cracks swell the rocks apart. All these kinds of actions break the rocks into smaller and smaller fragments which are finally carried away by gravity and even by the wind.

Sooner or later these fragments move down to lower and lower levels because of the action of gravity. Rivers drop sand and mud in deltas at the sea shores. Lakes are gradually tilled with washed – in sediment, so are the dry desert basins. Wherever sand, mud, silt and dust are deposited they become cemented together, forming sedimentary rock.

Sedimentary rocks form in ways in many places. But the rocks are always the formation of particles or fragments from older rocks. Sometimes fragments are stones and boulders, sometimes pebbles, sometimes fine sand or fine clay. Chemical action in shallow seas and in hot springs may form deposits of even finer chemical sediments. Sedimentary rocks make up about 75 per cent of the exposed land surface of the earth. But they make up less than 5 per cent of the total volume of the earth's crust.

Sedimentary rocks are often classified according to the way they had been formed and to the size of the particles in them. Following this classification, we begin with fragments which were broken or worn off from older rocks. When such fragments are of pebbles size or even larger, then cementing them form a rock called conglomerate.

When the rock fragments are smaller, like grains of sand, the rock is called a sandstone. Sandstone may be fine or coarse, hard or soft. Usually they are composed of grains of sand or silica. Sometimes other minerals are present and then the sandstone is given a special name. Arkoses, for example, is sandstone formed under desert conditions. It contains grains of feldspar as well as grains of quartz. Sandstones form about 32 per cent of all sedimentary rock (Fig.7).

When the rock particles are still smaller in size, so small that they are difficult to see, the rock is a shale. Shales are rich minerals, though they may contain large amounts of silica. Shales are usually fine-grained, light or dark in color, and they often break in a typical way. Shale's are the most common of sedimentary rocks, forming about 46 per cent of all sedimentary rocks known.

Limestone is a sedimentary rock, which does not easily fit in with the others. Limestone has many origins. In some cases, it is a classic rock formed of fragments of shells piled on beaches and cemented together by the lime itself. Coquina is coarse limestone made of shell fragments. Of the sedimentary rocks, 22 per cent are limestones.

When classic fragments are first deposited, nothing holds them together. They may remain in this state for hundreds of thousands of years. Big piles of sand and gravel were deposited 25,000 or more years ago during the great ice age in only a few places have these begun to cement together.

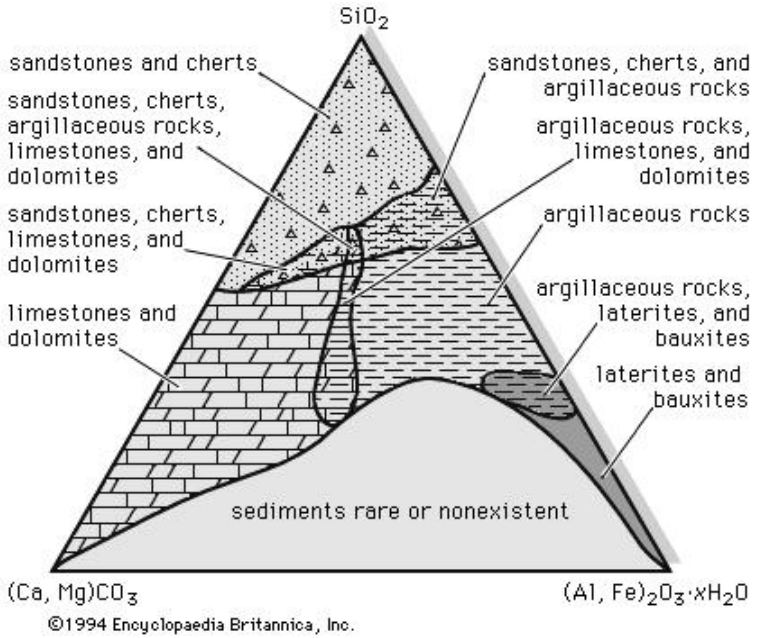


Fig. 7. Composition of sedimentary rocks

Rock fragments will cement together faster when water calculates through them especially if the water contains dissolved chemicals. Lime is such a chemical. Iron rust is another. It gives sandstone and shale a yellowish or reddish color. Silica is a third element and when sandstones are cemented by silica they are likely to be hard and tough.

The other group of sedimentary rocks includes those of chemical origin. In shallow seas, lakes and caves and certain special conditions, lime is deposited chemically. One form is underpolitic limestone of small round grains about the size of grains of sand. Acid-bearing water trickling out through limestone dissolves some of it. The limestone is redeposited as the water evaporates in cracks or caves. Such drippings form stalactites and stalagmites. Dolomite, a magnesium limestone, halite and gypsum may also be deposited chemically. All they form are beds that are large enough to be classified as sedimentary rock.

Finally, plants and animals produce a few sedimentary rocks. Coal deposits begin as peat, a soft organic material that is from decaying ferns and swamp plants. As this material is buried by layers of sand and debris, water in the peat is squeezed out and is liberated. The amount of carbon gradually increases as the material changes

from peat to lignite, a brown coal, and from the brown coal to soft, black coal. At each step, as the amount of carbon increases, the amount of hydrogen and oxygen in the material decreases. Coral and similar animals form deposits of organic lime in reefs.

Sometimes sedimentary rocks give a clue to the kinds of life and conditions which existed millions of years ago when the rocks were formed. Fossils are the remains or evidences of life buried in the rock. Sometimes the actual remains are buried; sometimes fossils are impressions, molds or casts. In nearly every case they are formed in sedimentary rock, when plants and animals have been buried under debris.

Tough parts of plants and hard parts of animals produce the best fossils. Shells, bones, teeth, leaves, wood and bark are often preserved. Fossils tell the history of the earth and the development of life. In the oldest rock, only the simplest kinds of plants and animals are found. In more recent rocks the plants and animals are different and more complex, showing a great range of adaptations to many environments. It is mainly through the study of fossils that scientists have come to understand how the plant and animal life of today came to be.

Sedimentary rocks, especially those formed in shallow waters; contain ripple marks, formed by the action of waves stirring the bottom. Mud cracks mark the places where the shallow waters dried out, exposing the cracked mud. Later the cracks were filled with silt, preserving their pattern.

The layers of sedimentary rock often form parallel beds. A storm may wash down coarse material. During the winter when a lake is covered with ice, only the finest material is deposited. Sometimes the beds are tilted where a stream is depositing sand and mud at its mouth. All these features are preserved in sedimentary rocks and help to show how they were formed.

IV. Distribute questions according to the contents of the text.

1) What are sedimentary rocks characterized by?
2) What action influences the decomposition of rocks?
3) What important information sedimentary rocks give us?
4) How old are sedimentary rocks?
5) What is the role of plants and animals in the production of sedimentary rocks?
6) What do fossils tell us about?

V. Find the English equivalents of the word – combinations and phrases and use them in your own sentences.

Образовались первые породы; рано или поздно; вследствие сил притяжения; как только песок и пыль оседают; это – всегда

образование частиц или фрагментов прежних пород; классифицирующиеся согласно способу своего образования; песчаники могут быть мелкозернистыми и крупнозернистыми; никто не знает, что представляла собой поверхность Земли.

VI. Read the sentences and name the functions of the verb "to be":

1) In many ways sedimentary rocks are more interesting than any other ones.
2) The process of weathering began as soon as the first rocks were formed.
3) The rocks are to be studied carefully so that geologists can be sure of their origin.
4) The deeper we go into the earth the less is known about its structure.
5) The scientist was working with equal skill in every branch of geology.
6) Some rocks have been formed from the remains of sea-animals.
7) Some rocks are made of materials which are not minerals at all.

VII. Find in the text the verb "to be" in different functions and explain their meanings.

VIII. Comment on the following points. Contradict to the statements if they aren't right.

1) In many ways sedimentary rocks are more interesting than any of the earliest rocks.
2) Sedimentary rocks are formed in different ways in many places.
3) Limestone easily fits in with other sedimentary rocks.
4) There are no sedimentary rocks formed as a result of chemical changes.
5) In the oldest rocks only the very simple forms of life are found.
6) The processes of erosion and weathering began only in recent years.

IX. Divide the text into logically completed parts and discuss one of them.

X. Ask your partner about sedimentary rocks.

Unit VI

Metamorphic Rocks

I. Before you start:
Do you know the meaning of the words "metamorphic", "metamorphism"? Perhaps you know the word "метаморфозы"? What do these words mean?

II. a) Remember the following words and expressions.

metamorphic [ˌmetə'mɔ:fik] – метаморфический;
feature ['fi:ʧə] – особенность, признак, свойство;
to be altered ['ɔ:ltəd] – быть изменчивым;
alteration [ˌɔ:ltə'reiʃ(ə)n] – изменение;
to intrude [in'tru:d] – вторгаться, вмешиваться;
to adjoin [ə'ʤɔin] – примыкать;
inch [inʧ] – дюйм;
due [dju:] – должное; то, что причитается;
volatile ['vɔlətail] – летучий, изменчивый;
deposit [di'pɔzit] – отложение, залежь, осадок, отстой;
solution [sə'lu:ʃ(ə)n] – раствор;
zeolite ['zi:əulait] – цеолит (минеральная часть почвы);
arsenic ['a:snik] – мышьяк;
foliated ['fəuliitid] – слоистый, сланцевый;
to squeeze [skwi:z] out – выталкивать, вытеснять;
percentage [pə'sentiʤ] – процентное соотношение;
texture ['tekstʃə] – структура, строение;
traces [treisiz] – следы;
border ['bɔ:də] – граница,
hornfelds [hɔ:nfelds] – роговик.

b) Give the Russian equivalent.

Cause changes, overlying rocks, on either side, volatile deposits, zeolites and arsenic minerals, shifting in the earth's crust, squeeze out the traces of water, circulating waters, the level of rocks, the alteration of soft sandstones, crystals and fossils, fine-grained slate, invading materials, increasing amount, elevate new mountains, relative position, areas of uplift, shallow ocean bottom, sooner or later. Due to, most of, as well as, little or no, look like, by means of, in turn, a good deal, unless.

III. Read the text about metamorphic rocks to reproduce the facts you didn't know.

Text

Metamorphic Rocks

If anything is characteristic of the world of rocks, it is change. Mountains are moved away and ocean basins are slowly filled over long periods of time. Changes that affect the features of the earth affect the rocks also. Rocks which have been changed so that their characters are altered are known as metamorphic rocks.

All rocks change after they are formed. The atmosphere, circulating water, the pressure of overlying rocks — all have some effect. But when these processes continue for a long time, or when they cause marked changes in the rock, then metamorphic rocks are formed. Some metamorphic rocks have been changed so much that they are completely different from the rocks from which they were formed. Unless these rocks are studied carefully, geologists cannot be sure of their origin.

Many forces in the crust of the earth change rocks. The most important of these forces are heat and pressure. Often heat comes from intruded magma. Magma at a temperature of 2,000 degrees or more may find its way into the overlying rock. The heat of the magma bakes and alters the nearby rock. If the mass of magma is large, the rate of cooling is slow. Then the effect of heat may be pronounced.

When hot, intruded rocks alter the rock on either side, the effect is described as contact metamorphism. The adjoining rocks are baked. Their mineral content may be changed, but the changes are usually limited to a narrow border zone, a few inches or a few feet (Fig.8).

Metamorphism is not only due to hot rocks, but to hot gases and hot liquids which flow from them. The hot gases move up through cracks to make a closer contact with nearby rocks and minerals. These volatile deposits may produce many new minerals. Hot solutions do the same thing and are likely to transport even more new minerals than hot gases. Heated waters have a much lower temperature than magma and bring their own kinds of minerals with them. The zeolites and arsenic minerals are examples of low-temperature deposits

The effect of heat and hot chemical solutions is sometimes called local metamorphism in contrast to regional metamorphism which affects large areas. Regional metamorphism usually involves movements with the crust of the earth. The origins of these movements are hard to explain. They are probably related to a shifting in the earth's crust as rocks and minerals are moved from one part of the earth to

another by erosion. Regional metamorphism can raise or lower the level of rocks. Rocks may be tilted, folded, stretched or broken. Great masses of rock may be pushed over one another, forming zones of crushed rock. Sometimes these actions are slow and gentle, taking place over many thousand of years. Then very little change in the rock takes place.

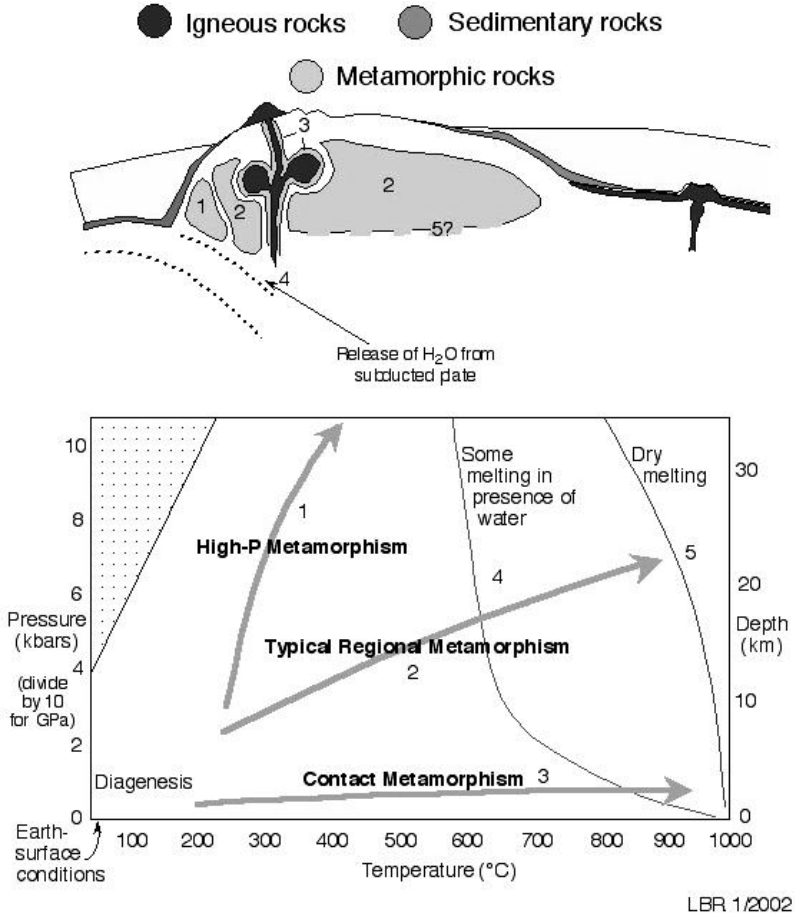


Fig. 8. Formation of metamorphic rocks

At other times metamorphism is more rugged and the rocks are altered very much. Layers of soft coal are transformed into anthracite. The folding and squeezing these layers of coal remove most

of the remaining gases and squeeze out any traces of water. This increases the percentage of carbon in the coal. Similar movements apply pressure to oils in shale or sand, and form where the oil and natural gas may be concentrated.

Metamorphic rocks are hard to describe and harder to classify. Their appearance depends on the kind and the degree of change. One example of metamorphism is the alteration of soft sandstones to quartzite. This is a hard, tough, metamorphic rock — so tough that it breaks through the grains of sand as well as through the cement. Quartzite is harder, tougher, and more durable than the sandstone from which it was made (Fig.9).

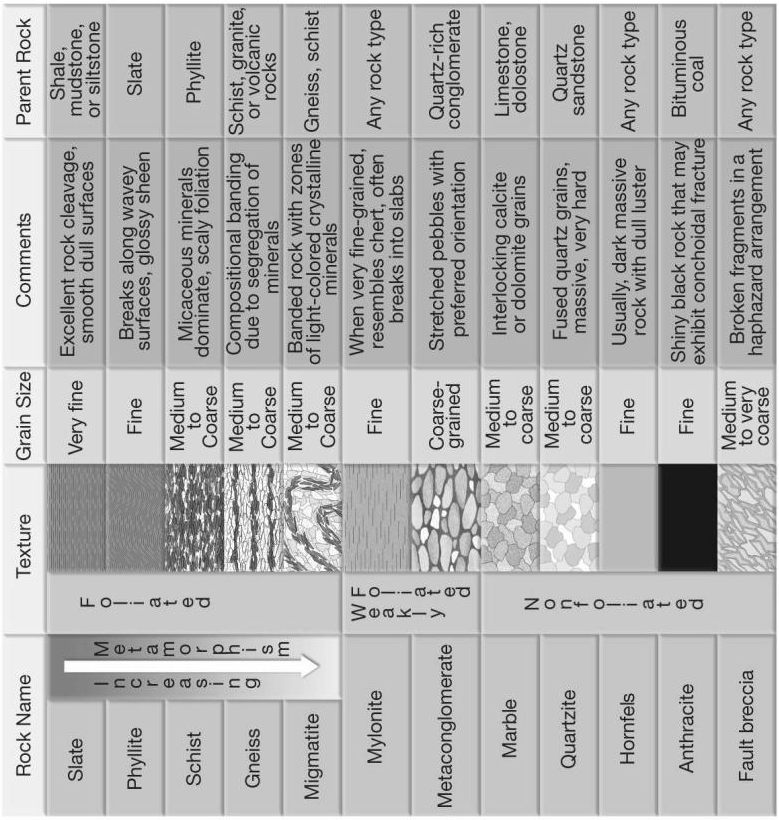


Fig. 9. Classifying metamorphic rocks

Limestones are affected by heat, pressure, and circulating liquids to produce marble, a metamorphic rock. Some limestones are

only slightly metamorphosed and the changes in them are difficult to see. Crystals and fossils in the rock are not altered much, if at all. While some of these slightly altered limestones are beautiful, they are not true marble. A more thorough metamorphism is needed.

Shale, formed from mud and silt, becomes metamorphosed into slate. Shale itself tends to break in flat layers. This is even more true of slate. However, slate breaks along lines that are usually at an angle to the original beds of the shale. Since slate splits so easily, it was once widely used for shingles, blackboards and paving. If the pressure that forms slate continues to act, a chemical reaction sets in, causing mica crystal to form. This new rock is called phyllite. It is a finegrained slate, glittering with almost microscopic flecks of mica. If the process continues further, the grains of mica grow larger and the result is a rock that is called schist.

All kinds of rock can be metamorphosed — even metamorphic rocks. Some volcanic rocks have been changed into schists. Quartz sandstone may be metamorphosed into quartzite, and in turn this may be altered into a quartz schist. Finally, granite, an igneous or metamorphic rock, may be changed into gneiss, a coarse rock which contains a good deal of mica. Hence, gneiss is not as strong a rock as the granite from which it was made. Other kinds of rock may be altered into gneiss, too.

Some of the changes in the crust of the earth and in the rocks have been so complex that geologists are not sure just what has happened. Granite, for example, is sometimes an igneous rock, coming from a magma rich in silica and aluminum. It may also be a type of metamorphic rock so altered by invading materials that there is little or no trace of what the original rock might have been. It is possible to find a whole series of rocks grading from normal sedimentary kinds through schists and gneisses, which show an increasing amount of mica and feldspar, into crystalline rocks which clearly look like granite.

The changes in the crust of the earth producing the different kinds of rocks are all parts of a great cycle in which mountains are built up and mountains are worn down; in which the land is raised and the land is lowered. As mountains are worn down over periods of millions of years, the debris finds its way into the ocean basins, increasing their weight, while the weight of the continent is lightened. This puts a strain on the crust of the earth. The strain adjusts itself by means of movements which cause earthquakes and which, over long periods of time, elevate new mountains. Volcanoes form a great circle around the deep Pacific Basin.

These earth movements are on such a large scale and involve such long periods of time that it is difficult to observe them first hand. It

is not likely that continents have been lost in the Atlantic or that large islands have suddenly appeared. Most of the continents have occupied the same relative positions in the crust of the earth for millions of years. During some eras, shallow seas invaded the continents and sedimentary rocks were deposited. But sooner or later the continents emerged and have continued to be areas of uplift. At other times the continental shelf (the shallow ocean bottom surrounding the continents), now submerged, has been raised, and the continents were much larger than at present. At one period Alaska and Siberia formed a land bridge between Asia and America, and Australia joined Southern Asia.

IV. Interview your partner about the contents of the text. Use the questions.

1. What is the origin of metamorphic rocks?
2. What factors influence the rocks?
3. What is the difference between regional metamorphism and local one?
4. Can you give the examples of metamorphism?
5. How is marble produced?
6. Is schist different from phyllite?
7. What kind of rock can be metamorphosed?
8. What processes are caused by changes in the earth's crust and why is it important to know the nature of these processes?

V. Analyze the structure of the following words and translate them into Russian.

Character – characteristic – characterize; differ – different – difference; care – careful – carefully – careless; geology – geological – geologist; describe – description; produce – product – production; move – movement; class – classify – classification; transform – transformation; remove – removal; press – pressure; appear – appearance; possible – impossible – impossibility; nature – natural – naturally.

VI. Translate the sentences into Russian. Name the functions of the Participles.

1. A rock is a substance composed of one or more minerals.
2. Rocks are composed of primary minerals and other minerals derived from them. 3. Dissolved minerals taken from the rocks by run-

ning water make the sea salty and make ocean life possible to exist. 4.The geologic work done by running water accounts for most erosive features on the earth's surface. 5. The instruments used now are capable of measuring extremely small differences in gravitational force. 6. A similar but more complicated device used for cleaning bore holes is a sand pipe. 7. Most rocks when exposed at the earth's surface soon show the effects of attack by the agents of the weathering.

VII. Find in the text the Participles and define their functions.

VIII. a) Tell if the statements are true or false. Use the formulas.

That's out of the question,
I don't think so,
It seems to be right,
It seems to be quite natural that,
You are mistaken.

1) Changes that affect the features of the earth don't affect the rocks.
2) All rocks change after they are founded.
3) If the mass of magma is large, the rate of cooling is quick.
4) Metamorphism is only due to hot rocks.
5) Heated waters have a much higher temperature than magma.
6) Local metamorphism usually involves movements of the crust of the earth.
7) Metamorphic rocks are easy to describe and easier to classify.

IX. What facts will you use telling about:

1) regional metamorphism;
2) quartzite;
3) shale;
4) granite?

X. Work in pairs. Discuss the three kinds of rocks you have read about.

VOCABULARY I

A

abundant [ə'bʌnd(ə)nt] обильный, изобилующий.

acceleration [ək,selə'reiʃ(ə)n] ускорение, разгон.

accumulation [ə,kju:mju'leiʃ(ə)n] 1) залежь; 2) скопление; 3) формирование залежи.

acid ['æsid] кислота.

admixture [əd'mikstʃə] примесь, смесь, включение.

aerate ['eiəreit] проветривать, газифицировать, подвергать действию воздуха.

agate ['ægət] агат.

angle ['æŋgl] угол.

angular ['æŋgjulə] угловатый, угловой, коленчатый.

apply [ə'plai] 1) обращаться; 2) употреблять; 3) касаться.

appreciable [ə'pri:ʃəbl] заметный, ощутимый.

approximate [ə'prɔksimit] приблизительный.

arbitrary ['a:bitrəri] произвободительный.

augite ['ɔ: dʒait] авгит.

B

balance ['bæləns] весы, балансир, баланс, равновесие.

bark [ba:k] оболочка, кора (дерева).

barium ['bɛəriəm] барий.

basalt ['bæsɔ:lt] базальт.

base [beis] основание, подошва, база, подстилающий слой.

basement ['beismənt] **rock** подстилающая порода, порода основания, нижележащая порода.

basic ['beisik] основной, базисный, служащий основанием.

bed слой, горизонт, пласт; залежь, залегание, месторождение.

beryllium [be'riljəm] бериллий.

bind [baind] вязать, связывать, сжимать, скреплять.

bituminous [bi'tju:minəs] битуминозный, битумный.

boring ['bɔ:riŋ] бурение.

bulge [bʌldʒ] выпуклость.

bunch [bʌntʃ] небольшая по всем направлениям залежь, гнездо.

C

calcareous [kæl'kɛəriəs] известковый, содержащий известь.
calcite ['kælsait] кальцит, известковый шпат.
calcium ['kælsiəm] кальций.
capacity [kə'pæsiti] мощность, нагрузка; емкость.
carbon ['ka:bən] черный алмаз, углерод.
carve [ka:v] высекать, долбить, подтачивать, выветривать.
cause [kɔ:z] 1) причина, мотив, повод; 2) быть причиной.
cavity ['kæviti] пустота, каверна в породе, трещина.
chlorite ['klɔrait] 1) хлорит; 2) хлоритовый.
chopping [ʧɔpiŋ] дробление, измельчение.
chromite ['krɔmait] хромит, хромистый железняк.
cinder ['sində] пепел, шлак покрывать.
comprehension [,kɔmpri'henʃ(ə)n] 1) понимание; 2) включение.
coat [kəut] пленка.
confirm [kən'fə:m] подтверждать, подкреплять, поддерживать.
constituent [kən'stitjuənt] составная часть.
content ['kɔntent] содержание, емкость.
convert [kɔn'və:t] превращать, переделывать.
core [kɔ:] ядро.
crushing [krʌʃiŋ] дробление, разрушение.

D

deal with ['di:l wið] иметь дело.
debris ['deibri:] осколки, наносы, пустая порода.
decrease ['di:kri:s] уменьшение, убывание.
deposit [di'pɔzit] месторождение, залежь.
deposition [,depə'ziʃ(ə)n] отложение осадочных материалов, нанос.
detect [di'tekt] открывать, обнаруживать.
detritus [di'traitəs] детрит.
devoid [di'vɔid] лишенный, свободный.
dioxide [dai'ɔksaid] двуокись.
drainage ['dreinidʒ] обезвоживание, спуск воды, осушение, дренаж.
driving force [driviŋ fɔ:s] движущая сила.

E

earth vibration ['ə:ɵ vai'breiʃ(ə)n] колебания земли.
earthquake ['ə:ɵkweik] землетрясение.
edge [edʒ] 1) край, кряж, хребет; 2) окаймлять, заострять.
elevation [,eli'veiʃ(ə)n] подъем, поднятие, высота подъема, возвышенность.
engineering geology [,endʒi'niəriŋ dʒi'ɔlədʒi] инженерная геология.
enormous [i'nɔ:məs] громадный, огромный.
environment [in'vaiər(ə)nmənt] окружение, среда.
era ['iərə] эра.
erode [i'rəud] выветривать, разрушать, размывать.
erosion [i'rəuʒ(ə)n] эрозия, обнажение.
evolve [i'vɔlv] эволюционировать, развивать.
expose [iks'pəuz] выходить на поверхность, обнажать(ся).

F

fault [fɔ:lt] сброс, сдвиг, разлом, нарушение.
feature ['fi:tʃə] особенность, признак, свойство.
feldspar ['feldspa:] полевой шпат.
ferrous ['feræs] содержащий двухвалентное железо.
fiery ['faiəri] огненный, газовый.
fracture ['fræktʃə] 1) трещина, излом; 2) ломаться.
foliated ['fəuliitid] слоистый, сланцеватый.
force [fɔ:s] сила.
formation [fɔ:'meiʃ(ə)n] наслоение, отложение, свита пластов.
friction ['frikʃ(ə)n] **rock** порода, возникающая вследствие трения.
fundamental [,fʌndə'mentl] основной; существенный, коренной.
fuse [fju:z] плавить, расплавлять.

G

gas [gæs] газ, горючее.
geodetic [,dʒi(:)əu'detik] геодезический.
gem [dʒem] самоцвет, драгоценный камень.
global ['gləub(ə)l] 1) шаровидный; 2) мировой, всемирный.

graphite ['græfait] графит.
gravitation [,grævi'teiʃ(ə)n] притяжение, гравитация.
gravity ['græviti] сила тяжести.
ground [graund] почва, грунт, поверхность, заземление.

H

halite ['hælait] каменная соль, галит, поваренная соль.
hard [ha:d] твердый, жесткий; **~ rock** крепкая порода; **~ water** жесткая или известковая вода.
helium ['hi:ljəm] гелий.
hemisphere ['hemisfiə] гемисфера, полушарие.
horizon [hə'raizn] отложения, одного возраста, ярус, горизонт.
hydrocarbon ['haidrəu'ka:bən] углеводород.
hornfels ['hɔ:nsfeld] роговик.

I

Identify [ai'dentifai] отождествлять, устанавливать, определять.
igneous ['igniəs] изверженный, вулканический, пирогенный.
imbricate ['imbrikeit] настилать, перекрывать, класть внахлестку.
inhibit [in'hibit] сдерживать, подавлять, тормозить.
interface [,intəfeis] поверхность раздела, граница раздела.
interpret [in'tə:prit] 1) объяснять; 2) перенять; 3) переводить.
intrusion [in'tru:ʒ(ə)n] интрузия (магмы), внедрение.
intrusive rock [in'tru:siv] интрузивная порода.
intrusive vein [in'tru:siv vein] жила изверженной породы.
inverse ['in'və:s] обратный, перевернутый, противоположный.
ionic [ai'ɔnik] ионный.
iron ['aiən] железо.
isotropic [aisətrɔpik] изотропный.

J

jasper ['ʤæspə] яшма.
jet [ʤet] черный янтарь, сопло.
joint [ʤɔint] трещина, стык.

jolite ['ʤəulait] иолит.
jut [ʤʌt] 1) выступ; 2) выступать.

K

kaolin ['keiəlin] каолин, белая фарфоровая глина.
kidneys ['kidnis] второстепенные рудные скопления.

L

labilize ['læbilaiz] астизировать.
lake bed озерный пласт.
lake deposits [leik di'pɔzit] озерные отложения.
latitude ['lætitju:d] географическая широта.
layer ['leiə] пласт, слой, наслоение.
lead [led] свинец, жила, проводник.
level ['levl] уровень, поверхность, откос.
lignite ['lignait] лигнит, бурый уголь.
lime [laim] известь.
lithium ['liθiəm] литий.
living rock порода в своем естественном состоянии.
location [ləu'keiʃ(ə)n] месторождение.
location of wells [wels] выбор места для бурения скважин.
lower bed подстилающий слой.

M

magnesium [mæg'ni:zjəm] магний.
major ['meiʤə] 1) большой; 2) старший, главный.
mantle ['mæntl] покров, оболочка, нанос, мантия.
mare [mɛə] море.
matter ['mætə] вещество, материя.
measurable ['meʒ(ə)rəbl] измеримый, умеренный.
measure ['meʒə] мера, размер, измерять.
measurement ['meʒəmənt] 1) измерение; 2) система мер.
medium ['mi:djəm] среда, середина.
melt [melt] таять, растворять.
melting point точка плавления.
metamorphic [mətа'mɔ:fik] метаморфический, изменчивый.

metamorphic rock метаморфическая порода.
mica ['maikə] слюда.
minute [mai'nju:t] мелкий, не значительный.
molten ['məult(ə)n] **rock** расплавленная порода.

N

natural ['nætʃr(ə)l] природный, натуральный.
nickel ['nikl] никель.
niobium [nai'əubiəm] ниобий.
nitrogen ['naitrədʒən] азот.
nitrogenuous [nai'tr ɔ:dʒinəs] азотный.

O

occur [ə'kə:] залегать, находиться, встречаться.
occurrence [ə'kʌr(ə)ns] залегание, распространение.
oil нефть.
overburden [ˌəuvə'bə:dn] 1) покрывающий пласт; 2) перегружать.
overlie [ˌəuvə'lai] перекрывать, покрывать.
oxide ['ɔksaid] окись.
oxygen ['ɔksidʒ(ə)n] кислород.

P

particle ['pa:tikl] частица, крупица.
pattern ['pætən] 1) структура, форма, строение; 2) узор, рисунок.
peak [pi:k] пик.
peat [pi:t] торф.
pebble ['pebl] булыжник, кремень, валун.
percentage [pə'sentidʒ] процент, часть, количество.
phosphate ['fɔsfeit] фосфат.
phosphorus ['fɔsf(ə)rəs] фосфор.
phreatic discharge [dis'tʃa:dʒ] выход грунтовых вод на поверхность.
pluton ['plutn] плутон, **plutonic** [plu't ɔ:nik] глубинный.
pocket ['pɔkit] карман, небольшая залежь; **~ of magma** магматический очаг; **~ of ore** рудный карман.

pollution [pə'lu:ʃ(ə)n] загрязнение.
precious ['preʃəs] драгоценный.
preserve [pri'zə:v] сохранять.
pressure ['preʃə] сжатие, давление.
primary ['praiməri] первоначальный, первичный.
property ['prɔpəti] свойство.
pyrite ['pairait] пирит.
pyroxene ['pairɔksi:n] пироксен.

Q

quake [kweik] землетрясение, выброс породы.
quartz [kwɔ:ts] кварц; ~ **granite** кварцевый гранит.
quick ground плывучая порода.

R

raindrop ['reindrɔp] дождевая капля.
recess [ri'ses] углубление, паз.
reconnaissance [ri'kɔnis(ə)ns] исследование.
recording [ri'kɔ:diŋ] записывающий, регистрирующий.
reduce [ri'dju:s] 1) уменьшать; 2) восстанавливать.
regardless [ri'ga:dlis] не взирая на; не обращая внимания на.
relative ['relətiv] относительный.
relief [ri'li:f] 1) облегчение; 2) рельеф, характер.
require [ri'kwaiə] требовать, приказывать.
research [ri'sə:tʃ] изучение, исследование.
reservoir ['rezəvwa:] бассейн, водоем.
residual [ri'zidjuəl] остаточный, получившийся на месте от разложения других пород.
ridge [ridʒ] гребень горы, гряда гор.
running water проточная вода.

S

saline [sə'lain] солончак, соленый источник.
sandstone ['sændstəun] песчаник.
saturate ['sætʃəreit] насыщать.

saturated zone насыщенная зона.
saturated rock насыщенная порода.
scale [skeil] шкала, масштаб, размер.
sear [siə] увядший, сухой.
sediment ['sedimənt] отложение, отстой.
sedimentary [ˌsedi'ment(ə)ri] осадочный, осажденный; **~ rock** осадочная порода.
sedimentation [ˌsedimen'teiʃ(ə)n] – образование осадков.
segment ['segmənt] часть, отрезок, сегмент.
sensitive ['sensitiv] чувствительный.
sewage ['sju(:)idʒ] сточные воды.
shaft [ʃa:ft] буровая скважина, ствол шахты.
shallow ['ʃæləu] мелкий, неглубокий.
shear [ʃiə] **failure** разрушение под действием скалывающего усилия.
sheer [ʃiə] 1) отвесный, перпендикулярный; 2) отклоняться от курса.
sheet [ʃi:t] прослойка, слой, плоскость, плоская залежь.
shingle ['ʃiŋgl] галька, гравий, валун, булыжник, галечник.
shooting ['ʃu:tiŋ] производство подрывных работ, паление шпуров, метод сейсмических наблюдений, взрывание.
significant [sig'nifikənt] значительный, существенный, многозначительный.
silica ['silikə] кварц, кремнезем.
silicate ['silikit] силикат, соль кремниевой кислоты.
silicon ['silikən] кремень, кремний, силиций.
sima ['saimə] оболочка земной коры, сложенная породами, состоящими преимущественно из силиция и магния, сима.
smooth [smu:ð] 1) гладкий, ровный; 2) приглаживать.
solution opening диссолюционная пустота, пустота растворения, каверна выщелачивания.
strain [strein] усилие, напряжение, деформация, растягиваться, поддаваться, фильтровать.
structural ['strʌktʃ(ə)r(ə)l] **map** структурная карта.
subdue [səb'dju:] 1) выветривающийся; 2) сглаженный; 3) подчиненный.
substance ['sʌbst(ə)ns] вещество, субстанция.
subsurface ['sʌb'sə:fis] подпочва, недра.
sulfur [salfə] сера.

sulphide ['sʌlfaid] сульфид.
surface water ['ˈs ə:fis] верхняя вода.
suspended [səs'pendid] взвешенный.

T

tabular ['tæbjulə] пластичный, плитчатый, плоский.
temperate ['temp(ə)rit] умеренный.
tensile ['tensail] тягучий, вязкий.
terrain ['terein] грунт, почва.
texture ['tekstʃə] структура, строение.
tillite ['tilait] тиллит.
topaz ['təupæz] топаз.
topography [tə'pɔgrəfi] топография.

U

ultimate ['ʌltimit] первичный, основной.
ultraviolet ['ʌltrəvaiəlit] ультрафиолетовый.
unconsolidated [ʌnkən'sɔlideitid] неуплотненный, рыхлый.
underlying [ˌʌndə'laiiŋ] подстилающий.
undisturbed [ˌʌndi'stə:bd] ненарушенный.
universe ['ju:nivə:s] вселенная, космос.
unravel [ʌn'ræv(ə)l] распутывать, разгадывать.
uplift ['ʌplift] 1) взброс; 2) хребет, поднятие.

V

valuable ['væljuəbl] ценный.
void [vɔid] пустота, вакуум.
volcanic vegetation [vɔl'kænik,vedʒi'teiʃ(ə)n] 1) растительность; 2) произрастание.
variation [ˌvɛəri'eiʃ(ə)n] изменение, перемена, отклонение.
vertical ['və:tik(ə)l] вертикальный, отвесный.
via ['vaiə] через.
virtually ['və:tjuəli] фактически.
volcanic [vɔl'kænik] вулканический.
volcano [vɔl'keinəu] вулкан.

W

wash [wɔʃ] размыв.
waste [weist] пустая порода; **~ mud** [mʌd] отработанный буровой раствор; **~ rock** [rɔk] пустая порода.
water-table зеркало воды.
widespread ['waidspred] – широко распространенный.

X

X-rays икс-лучи, рентгеновские лучи.
X-rays testing рентгеноскопический анализ.
xenolith [‘zenoliө] ксенолит.

Y

yellow earth [ə:ө] желтая глина.
yellow iron [ai ən] желтая охра.
yield [ji:ld] добыча, выход.

Z

zeolite [‘zi:olait] цеолит.
zenith ['zeniө] высшая точка.
zone of aeration [,eiə'reiʃ(ə)n] зона аэрации; **~ of fraction** ['frækʃ(ə)n] зона разлома.

PART II. MINING MACHINES

Unit I

Colmol Mining Machines

I. Before you start:

1. Have you ever seen the Colmol Mining Machine?
2. What do you think the purpose of it is?

II. The following words will help you understand the text.

The Colmol Mining Machine [ˌkol'mol 'mainiŋ mə'ʃi:n] – название американского комбайна (сокращены и слиты два слова: coal-mole – угольный крот)

to hew [hju] – подрубать, добывать, рубить

a solid ['sɔlid] – целик, масса угля

a chipping head [ʧipiŋ hed] – подрубная головка; подрубной бар

a row [rəu] – ряд

a bit [bit] – головка, коронка (бура); режущий инструмент

to supplement ['sʌplimənt] – дополнять, снабжать

teeth [ti:ɵ] – зубья

to step [step] back – отступать, выступать, снабжать

a kerf [kə:f] – врубная или зарубная щель

to overlap [ˌəuvə'læp] – перекрывать; заходить один за другой, внахлёстку

the production [prə'dʌkʃ(ə)n] of fines – измельчение угля

fines [fain] – угольная мелочь

a paddle ['pædl] – лопасть; лопатка; лоток (прил. – сгребающий)

a shearing ['ʃiəriŋ] blade [bleid] – подчищающий или сгребающий лемех, сгребающее устройство комбайна

a discharge [dis'ʧa:dʒ] – разгрузка

the rear [riə] – задняя часть (машины)

a seam [si:m] – пласт

to spread apart [spred ə'pa:t] – распространяться

to raise [reiz] – поднимать

ridges [ridʒiz] – выступы (оставляемые в кровле комбайна)

at cleavage ['kli:vidʒ] points [pɔints] – по кливажу

to mill [mil] out – измельчать, дробить
a particle ['pa:tikl] – частица
dust [dʌst] – пыль
to offset ['ɔfset] – передвигать, отставлять, отступать
to propel – [prə'pel] l – передвигать (ся)
caterpillar ['kætəpilə] – гусеничный
a drive [draiv] – привод
a room [ru:m] – камера
facilities [fə'silitis] – удобства; возможности

III. Read the text to be able to discuss it in detail.

The coal is hewed from the solid by ten rotating chipping heads in two rows of five, each with the lower row in advance of the upper. Each head consists of a bit supplemented by widely spaced teeth and each tooth is stepped back to the outside of the head The circular kerfs made by the heads overlap, and as the machine moves forward, the effect is to break the coal ahead of the teeth into the free spaces, thereby minimizing the production of fines. The rotary chipping heads act as paddle conveyors to sweep the floor, and with the aid of a floor shearing blade move the coal on to a conveyor for discharge at the rear of the machine to the transport system (Fig. 10). The two rows of chipping heads may be raised or lowered together or spread apart vertically to compensate for changes in seam conditions. A shearing

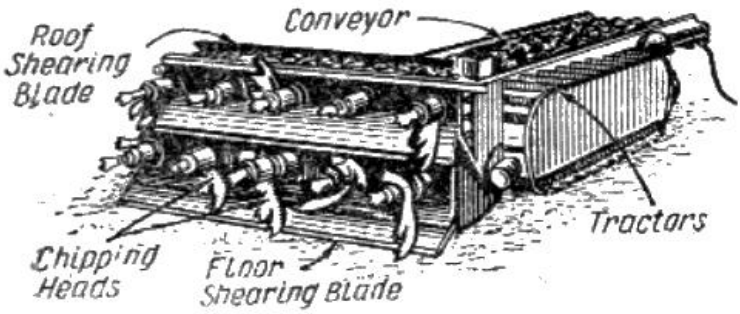


Fig. 10. Colmol mining machine

blade on the top of the machine removes ridges left by the upper chipping heads. It is claimed that the coal is broken off at cleavage points

ahead of the chipping heads, thus it is not milled out by actual contact of the bit with each particle, but is chipped out. Automatic water sprays are used to suppress dust, and the chipping heads are offset sufficiently to provide clearance for movement of the machine. A wide chain conveyor at floor level elevates the coal for conveyance to the transport system. The machine is propelled by caterpillar tractors, and hydraulic power generated on the machine drives the chipping heads, the caterpillar tracks and the conveyor. The total horse-power is 75 at 230 volts d.c. The machine drives a room 9 ft. 6 in. wide by 4 ft. high and advances at the rate of 18 to 36 in. per minute. The estimated production is 100 tons per man shift and from 500 to 1000 tons per day with teams as low as four men with continuous transport facilities.

IV. Interview your partner. Don't forget to change over.

1. Why is the Colmol mining machine named so?
2. Which parts of the Colmol mining machine perform the hewing of coal?
3. What does a chipping head consist of?
4. In what way is coal broken?
5. How does the rotary chipping head act?
6. What is done to compensate for changes in seam conditions?
7. What are automatic water sprays used for?
8. What mechanism elevates the coal?

V. In what connection do the following word combinations occur in the text?

1) in advance;
2) consist of;
3) a bit;
4) the outside of;
5) to overlap;
6) moves forward;
7) with the aid of.

VI. Complete the sentences. If necessary look through the text again.

1. The coal is hewed from the solid by… .
2. Each head consists of a bit supplemented… .

3. As the machine moves forward, the effect… .
4. Coal is not milled out by actual contact of the bit… .
5. The chipping heads are offset sufficiently to … .
6. The total horse power is… .
7. The machine advances at the rate… .

VII. Change the following passive constructions into active ones. Use the subjects given in brackets.

Example: The coal is hewed from the solid by ten rotating chipping heads. The machine hews the coal from the solid by ten rotating chipping heads.

1. Automatic water sprays are used to suppress dust. (The machine)

2. The coal is elevated for conveyance to the transport system. (a wide chain conveyor)

3. The machine is propelled by caterpillar tractors. (caterpillar tractors)

4. It is claimed that the coal is broken off at cleavage points. (specialists)

5. Ridges are removed left by the shearing blade on the top of the machine. (the shearing blade on the top of the machine)

VIII. Looking at the drawing of the Colmol Mining machine name the main parts of it.

IX. Describe the operation of the Colmol Mining machine.

X. Imagine that you are chief of the mine and you need to order the Colmol Mining machine. Write a business letter to your partner abroad.

Unit II

Continuous Miners

I. Before you start:

1. Do you know what a continuous miner is?
2. What is it intended for?

II. Learn the following words because you will come across them while reading the text below.

the continuous miner [kən'tinjues 'mainə] – горный комбайн с непрерывной последовательностью операций (по отбойке, навалке и транспортировке угля)

a ripping ['ripiŋ] bar (head) – режущая головка, режущий орган

a face [feis] – забой, грудь забоя, лава

to discharge [dis'ʧa:ʤ] – подавать, разгружать

an intermediate [,intə(:)'mi:djət] – вспомогательный или сборочный конвейер

a hopper ['hɔpə] – бункер

a rear conveyor [riə kən'vɛə] – хвостовой (разгрузочный) конвейер

are mounted [mauntid] – устанавливаются

a main framework ['freimwə:k] – несущий каркас; рама

to swing through [swiŋ əru:] – повертываться (на какой-то угол)

an arc [a:k] – дуга, свод

in – inch [inʧ] – дюйм (=2,5 см)

a replaceable [ri'pleisəbl] cutting bit – съемный зубок режущей цепи

a separate sprocket ['seprit 'sprɔkit] – отдельная звездочка (цепи зацепления); цепное или зубчатое колесо

the main driving shaft [ʃa:ft] – главный вал привода

available [ə'veiləbl] – наличный, имеющийся в распоряжении, доступный

h.p. – horse power [hɔ:s 'pauə] – лошадиная сила

is transmitted [trænz'mitid] – передается

a multiple ['mʌltipl] disc clutch [klʌʧ] – многодисковая или пластинчатая муфта

a telescoping spline shaft ['teliskəupiŋ splain ʃa:ft] – раздвижной шпоночный или шлицевой вал

the reduction gearing [ri'dʌkʃ(ə)n 'giəriŋ] – редукционная передача, редуктор

a turntable ['tə:n,teibl] – поворотная плита
slides [slaids] – салазки; направляющие; ползуны
incorporated [in'kɔ:p(ə)ritid] – вмонтированный
casting ['ka:stiŋ] – отливка, литье
a jack [ʤæk] – домкрат
a cantilever flight ['kæntili:və flait] – выступающий скребок
to articulate [a:'tikjuleit] – поворачивать
to provide [prə'vaid] – обеспечивать
to retract [ri'trækt] – переставлять в новое положение, перемещать
a seam [si:m] – пласт
a nozzle ['nɔzl] – насадка, сопло
an automatic [,ɔ:tə'mætik] cut-off valve [vælv] – клапан с автоматическим включением
entries ['entriz] – штреки, выработки (an entry – штрек, выработка)
per shift [pə: ʃift] – за смену

III. Read the text to get the information about the operation of the continuous miner.

The Continuous Miner consists of a ripping bar or head, which rips the coal from the face and discharges it into an intermediate conveyor. This in turn delivers it into a central hopper, from which the coal is removed by a rear conveyor to the thansport system. As shown in Fig. 11, both conveyors and the ripping head are mounted on the main framework carried on caterpillar tractors. The ripping bar and rear conveyor each swing through an arc of 90°. The former, 30 in. wide, can be raised or lowered by a hydraulic drive and is equipped with six chains, each carrying twenty replaceable cutting bits and each driven by a separate sprocket on the main driving shaft. The power available for this is 130 h.p. and is transmitted through a multiple disc clutch to telescoping spline shafts which allow the reduction gearing and ripper bar to move forward 18 in. The ripper bar is carried on a large turntable and advances in slides incorporated in the turntable casting. Hydraulic jacks are used to swing the turntable and to advance and elevate the ripper bar and the intermediate conveyor swings and advances with it.

The rear conveyor follows standard design, consisting of universal chain construction with cantilever flights to pick up the coal from the hopper and deliver it to the transport system. It is articulated to provide a 45° swing from centre, the swinging power together with raising and lowering operations is provided by hydraulic jacks.

The method of getting and loading is briefly as follows. With the ripping bar retracted, the machine is fed forward until the bar touches the coal face in the centre of the heading; the ripper bar is then swung to the right a distance to suit the width of the room. It is then lowered to floor level and hydraulically advanced 18 in. into the seam and upward pressure applied hydraulically, forcing the bar into the upper part of the seam, after which it is lowered and retracted. The operation is repeated at the centre and again to the left with an advance of 18 in. in each case.

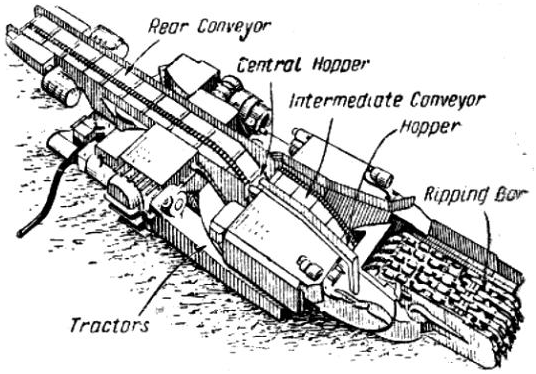


Fig. 11. The Continuous Miner

It is claimed that the proportion of fines below ¼ in. is less with this process than when the conventional methods of coal preparation are used, i.e. undercutting and blasting. Dust from the getting operation is suppressed by nineteen spray nozzles on the ripper head and controlled by an automatic cut off valve. This machine is claimed to be suitable for mining any seam where orthodox mechanized methods are applied. In a seam 7 ft. thick with 11 ft. wide entries, an advance of as much as 115 ft. per shift has been recorded.

IV. Answer the questions.

1. What is a continuous miner designed for?
2. Can you give the definition of a continuous miner?
3. What operation may be performed by a continuous miner?
4. What are conveyors mounted on?
5. What is the power transmitted through?
6. What is the ripper bar carried on?

7. What are hydraulic jacks used for?
8. Can you describe the above-mentioned method of getting and loading coal?

V. Find the translation of the following words and phrases in the text.

Съёмный зубок режущей цепи; отдельная звёздочка; главный вал привода; как показано на рисунке; может подниматься; многодисковая муфта; обычные методы; обогащение (угля); подрубка; взрывание; угольная мелочь; добыча (угля); редуктор; пласт; считается; подходящий; насадка; перемещать; выступающий скребок; поворотная плитка.

VI. Change the sentences using if (when...)-clauses (real condition)

Example: The continuous miner will rip the coal from the face. The continuous miner will discharge the coal into an intermediate conveyor. (After)

After the continuous miner rips the coal from the face it will discharge it into an intermediate conveyor.

1. Coal will be delivered into the central hopper. Coal will be removed by a rear conveyor to the transport system. (When)
2. It is known that the machine is fed forward. The bar touches the coal face in the center of the heading (Until)
3. Both conveyors and the ripping head will be mounted on the main framework. They will carry on caterpillar tractors. (When)
4. The ripping bar will be retracted. The machine will be fed forward. (If)
5. The bar will touch the coal face in the centre of the heading. It will then be swung to the right a distance to suit the width of the room. (When)
6. Upward pressure will hydraulically be applied to the ripping bar. It will be forced into the upper part of the seam. (After)

VII. Retell the text in short.
VIII. Compare the characteristics of the Colmon Mining Machine and the Continuous Miner.

IX. Using the picture tell the group mates everything you know about a continuous miner.

X. Write short thesis of the article about the continuous miner.

Unit III

Longwall Power Loading Machines

I. Before you start:

1. Have you ever heard of a longwall power loading machine?
2. What is the purpose of a longwall power loading machine?

II. Learn the following words. They will help you understand the text.

a longwall power [pauə] loading machine – погрузочная машина при сплошной системе разработки угля
a ramp [ræmp] – рама
a jib [ʤib] – бар врубовой машины
a guide plate [gaid] – направляющая плита
a profile plate ['prəufail pleit] – фасонная плита
a base [beis] plate – основная рама
a guard [ga:d] – предохранительное приспособление
a rope [rəup] – канат
a pulley ['puli] – шкив
a pick [pik] – зубок
to haul [hɔ:l] – тянуть, передвигаться
anchored ['æŋkəd] – закрепленный анкерной крепью
to fit [fit] – устанавливать, смонтировать, снабжать
an angle ['æŋgl] – угол
a tip [tip] – кромка, край
a slot [slot] – паз, впадина (зубка)
a safety length ['seifti leŋə] – предохранительное заграждение
overall ['əuvərɔ:l] length – общая длина
spanning [spæniŋ] – глубина подрубки
clearance ['kliər(ə)ns] – зазор, просвет, небольшое расстояние
gumming [gʌmiŋ] – штыб, угольная мелочь
edge [eʤ] – край, кромка
to steer [stiə] – управлять
past [pa:st] the face line of props [prɔps] – позади линии крепления забоя
flitting [flitiŋ] – маневрирование (машины)
excessive [ik'sesiv] – избыточный
drawbacks ['drɔ:bæks] – недостатки

comprising [kəm'praiziŋ] – включающий
a stable ['steibl] – ниша для машины
troughed [trɔft] – желобчатый, лотковый
a buttock [bʌtək] – забой
a socket ['sɔkit] – муфта, шарнир
a flexible coupling ['fleksəbl 'kʌpliŋ] – гибкое соединение, упругая муфта
undulations [ˌʌndju'leiʃ(ə)n] – неровности (почвы, выработки)
a crown wheel [kraun wi:l] – коренная шестерня
a tension screw ['tenʃ(ə)n skru:] – натяжной винт
a side-discharge spiral ['spaiərəl] gummer – спиральный расштыбовщик с разгрузкой штыба на одну сторону
spur [spə:] gears – цилиндрические зубчатые передачи
a turret ['tʌrit] – башня
a slat [slæt] – планка, перекладина, плита

III. Read the text to learn the facts which haven't been known to you.

Longwall Power Loading Machines

Longwall power loading machines are divisible into two categories, (a) those which load suitably prepared coal, and (b) those which simultaneously get and load the coal. The loader (Fig. 12) consists of an adapted coal-cutter in which the picks of the cutter chain are replaced by loading flights. The machine hauls itself along the face, the jib leading by means of an anchored rope. The flights push the prepared coal up a ramp on to the face conveyor. Between the base plate of the machine and the jib a steel profile plate is fitted, the purpose of which is to cause the flights to travel at right angles to the jib on the outward side and parallel to the jib on the inward side. From six to ten flights are fitted to the cutter chain by means of link boxes. The flights are 12 in. long, 7 in. high and 1 in. thick with a triangular base 6 in. by 12 in. A slot is cut in each flight 82 in. from the tip so as to allow a guard plate to be fitted in front of the jib and chain, to prevent the chain collecting coal and to serve as a safety fence. The jib length is 3 ft. 8 in. and the overall length of the jib section, including the flights is 6 ft. 9 in., thus spanning a 5 ft. cut and cutter track with 1 ft. clearance, so that gummings are loaded as well as the prepared coal.

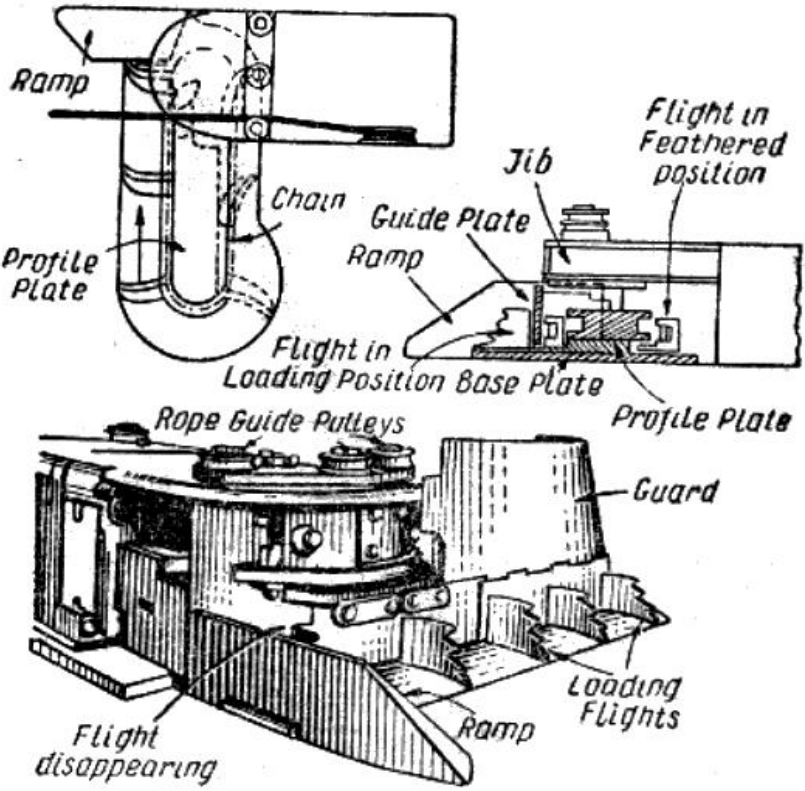


Fig. 12. The loader

The ramp, 9 in. high, is given a leading edge to steer the machine past the face line of props. The jib can be swung into line with the body of the machine for flitting, as the machine only loads in one direction. With a standard electric coal-cutter the flight speed is approximately 340 ft. per minute. This high speed tends to give excessive coal breakage. With a compressed-air drive, the speed can be suitably regulated within limits.

The machine is robust and has a good loading capacity, about 70 tons an hour according to conditions. The chief drawbacks are: the coal must be exceptionally well prepared, as large lumps tend to stall the loader; and the degradation of coal size is rather considerable.

The longwall loading machine (Fig. 13) is a modified loader 10 ft. long, 5 ft. 3 in. wide and 2 ft. 8 in. high, comprising a hydraulically

elevated loading head fitted with gathering arms. The elevating conveyor delivers coal into a horizontally troughed cross conveyor 5 ft. 3 in. long by I0 in. wide. The cross conveyor has a speed of 240 ft. per minute and delivers on to the face conveyor; it is extensible up to 1 ft. 6 in. on either side by means of ropes attached to hydraulic jacks on the underside. The machine is propelled by caterpillar tractors 5 ft. 6 in. long by 7 in. high and all controls are conveniently grouped at the rear. It has five 3-h.p. motors as follows: separate motors drive the gathering arms through plate clutches and the head conveyor is driven from the gathering-arm motion; a 3-h.p. motor operates through a clutch, the cross conveyor chain drive and the oil pump providing the pressure for the working of the head elevator jacks and cross conveyor jacks. The caterpillar tractors are each fitted with 3-h.p. motor drives, operating through reduction-gearing and chain drive.

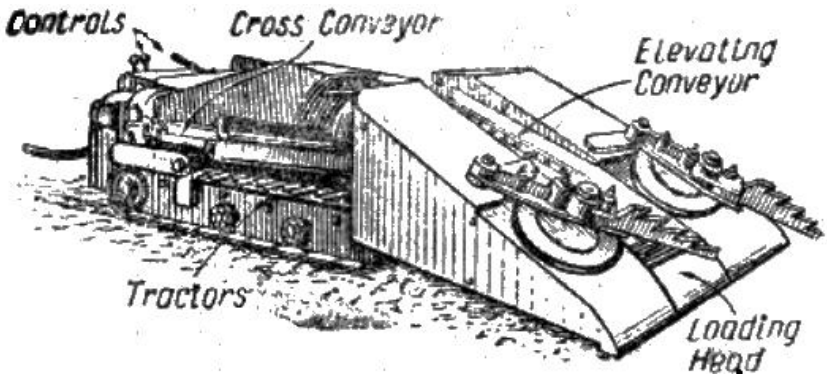


Fig. 13. The longwall loa9ding machine

The machine loads at the buttock of the prepared coal. It has a loading capacity of 50–60 tons an hour. The coal has to be well broken for loading; the size of lumps to be handled is governed by the headroom between the top of the elevator conveyor and the roof of the seam. This machine has not been applied extensively but war-time trials proved it to be a good loader in seams about 4 ft. thick and over.

The cutter-loader (Fig. 14) is the most successful getting and loading machine. It consists of two main portions: cutter and loader, with a suitable coupling between the two so as to negotiate floor undulations. The cutter portion follows standard coal-cutter practice, and is fitted with two horizontal jibs, one at floor level and the other at a

height to suit conditions. The upper chain runs in the opposite direction to the lower chain so as to assist in the coal preparation. The central portion of the cutter machine houses two 60-h.p. motors supplied by separate cables; one drives the horizontal jibs and the other drives through flexible couplings the shearer jib and the loading mechanism. The vertical shearer cuts the coal at the back of the horizontal cuts. Two starter switches are housed at the haulage end, and an interlock operated from the gearhead end of the machine is fitted to the loader motor switch, so that it may be locked "off" if anyone is working at the loader. At the control end of the machine there is an operating gear to engage or disengage either of the cutting chains as desired.

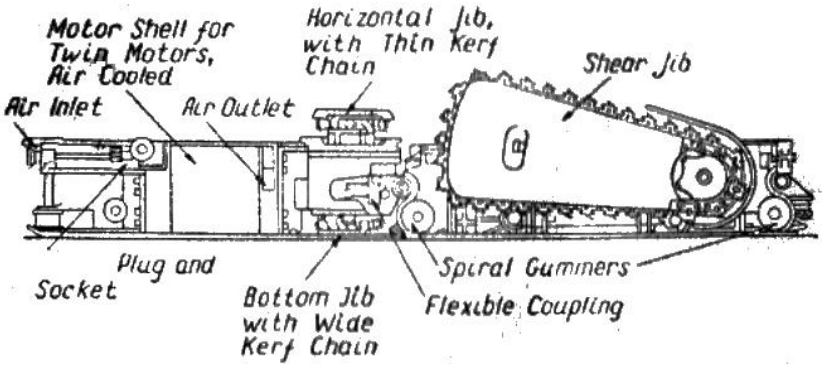


Fig. 14. The cutter-loader

The dislodged coal falls on to a short conveyor which transfers it to the face conveyor. The loader conveyor comprises steel slats attached to a rubber belt and is chain-driven. A loading bar with rotating fingers lifts coal from the floor on to the loader conveyor.

Two spiral gummers (Fig. 15) are provided at floor level. One extracts the gumming from the horizontal jibs; the other clears the gumming from the shearer. As these operate at floor level a low face conveyor is required — not more than 7 in. from floor level.

The position of the upper cutter jib can be altered by the use of different heights of jib brackets, the minimum height being 2 ft. 1 in. from floor level to the bottom pick.

Where the machine cuts its own roof, a hydraulically adjustable turret mounting for the upper jib is available, so that alternations in cut-

ter height can be made. The jib can also be lowered to facilitate turning when the machine reaches the stable.

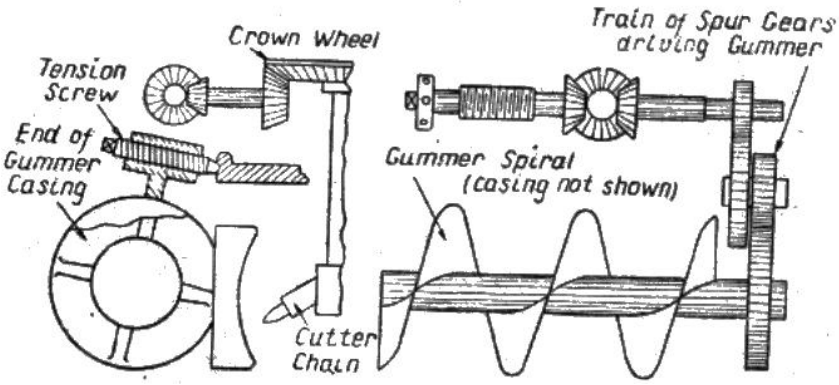


Fig. 15. The side-discharge gummer

The machine will operate in seams down to 3 ft. thick, and in seams less than about 3 ft. 6 in. thick.

IV. Interview your partner.

1. What do you think the purpose of a longwall loading machine is?
2. Are there any categories of longwall loading machines?
3. What does a loader consist of?
4. Could you name the main parts of a loader, please?
5. What are the flights used for?
6. What is in your opinion a steel profile plate fitted for?
7. Can you enumerate the chief drawbacks of a loader?
8. Have you got the information about the loading capacity of a cutler?

V. Test your memory translating the following phrases. Use them in sentences of your own:

a guide plate
a profile plate
a base plate

a safety plate
overall length
a flexible coupling
a crown wheel
a side – discharge spiral gummer
spur gears

VI. Add some more information to the following statements.

1. The picks of the cutter chain are replaced by loading flights.
2. Between the base plate of the machine and the jib a steel profile plate is fitted.
3. The longwall loading machine is a modified loader.
4. The coal has to be well broken for loading.
5. The cutter – loader is the most successful getting and loading machine.
6. Two spiral gummers are provided at floor level.

VII. Use substitutes of modal verbs in the past tense.

Example: The jib can be swung into line with the body of the machine.

The jib could be swung into line with the body of the machine

1. The coal must be exceptionally well prepared.
2. The speed can be suitably regulated within limits.
3. The coal must be well broken for loading.
4. An interlock is fitted to the loader motor switch, so that it may be locked “off” if anyone is working at the loader.
5. The jib can also be lowered to facilitate turning when the machine reaches the stable.

VIII. Dwell on the advantages of the cutter-loader.

IX. Using figure 15 describe the side discharge gummer.

X. Imagine that you are a sales manager at the exhibition of mining machines. Advertise the continuous miners and the longwall loading machines.

Unit IV

Standard Coal Ploughs

I. Before you start:

1. Can you compare a standard coal plough with other mining machines?
2. What do you think the advantages of a standard coal plough are?

II. The words below will help you understand the text:

a plough [plau] – струг (для добычи угля)
associated [ə'səuʃieitid] – соединенный
a to-and-fro motion ['məuʃ(ə)n] – движение вперед и назад
alloy ['ælɔi] – сплав
welded [weldid] on – наплавленный, сваренный
countersunk ['kauntəsʌŋk] bolts – раззенкованные болты, потайные болты
to ensure [in'ʃuə] – обеспечивать
a steel wire rope [sti:l 'waiə rəup] – трос из стальной проволоки
cutter blade holders ['kʌtə bleid 'həuldə] – держатели режущих лезвий
a track clearer [kliərə] – рельсоочистиель
to actuate ['æktjueit] – приводить в движение, запускать
a capstan winch ['kæpstən wintʃ] – лебедка, кабестан, ворот
a reeling [ri:liŋ] winch – разматывающая или наматывающая лебедка
in conjunction [kən'dʒʌŋkʃ(ə)n] with – в соединении с...
a tail drive [teil draiv] – хвостовой привод
a slack [slæk] – ослабление, провисание, штыб, угольная пыль
a smooth gliding surface [smu:ð 'glaidiŋ 'sə:fis] – ровная скользящая поверхность
a buffer – буфер, ослабляющее звено при натяжении цепи
yd. = yard [ja:d]– ярд = 0.9144 м
internal [in'tə:nl] – внутренний
a rail [reil] – рельс
ratchet gears ['rætʃit giəs] – шестерни храповика
a lateral bending ['læt(ə)r(ə)l bendiŋ] – боковой изгиб

a single unit layout ['siŋgl 'ju:nit 'leiaut] – разработка одиночным забоем, ведение работ одиночным забоем

on account [ə'kaunt] of – из-за, вследствие

to accommodate [ə'kɔmədeit] the equipment [i'kwipmənt] – размещать оборудование

roads – откаточные штреки

a clearance angle ['kliər(ə)ns 'æŋgl] – угол зазора

III. Read the text to find three facts which are quite new to you.

The standard coal plough (Fig. 16) has two cutter blades with associated ploughs which are coupled together to allow a to-and-fro motion along the face. The weight of the plough is 2½ tons. The cutter

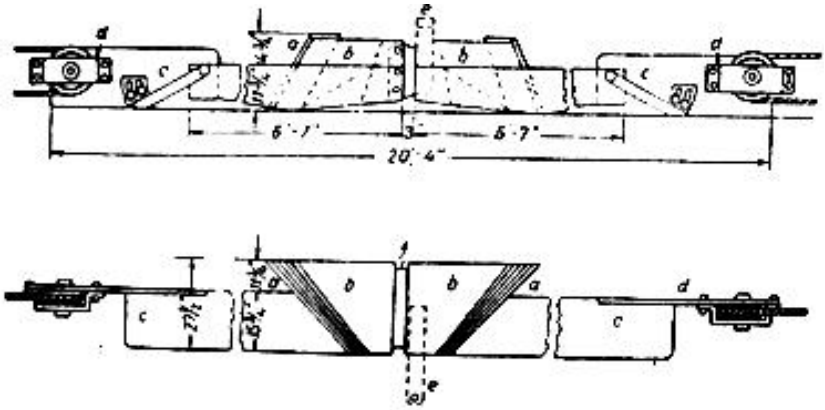


Fig.16. The standard coal plough:
a – cutter blades; b – cutter blade holders; c – track clearer;
d – pulling bar; e – wedge or “Torpedo” puller arm; f – flexible coupling

blades (Fig. 17) are made from 7/8-in. steel plate with a cutting edge of hard alloy welded on. The blades are attached to the cutter holder by countersunk bolts and are thus readily replaceable. The correct angles of the cutter edge are very important to ensure smooth operation.

The plough is hauled to and fro along the coal face by means of a steel wire rope, passing round a pulley on the plough and actuated by a specially designed haulage gear. In the relatively soft coal seam, the pull in the rope varies from 3 to 8 tons with peak loads of 20 tons

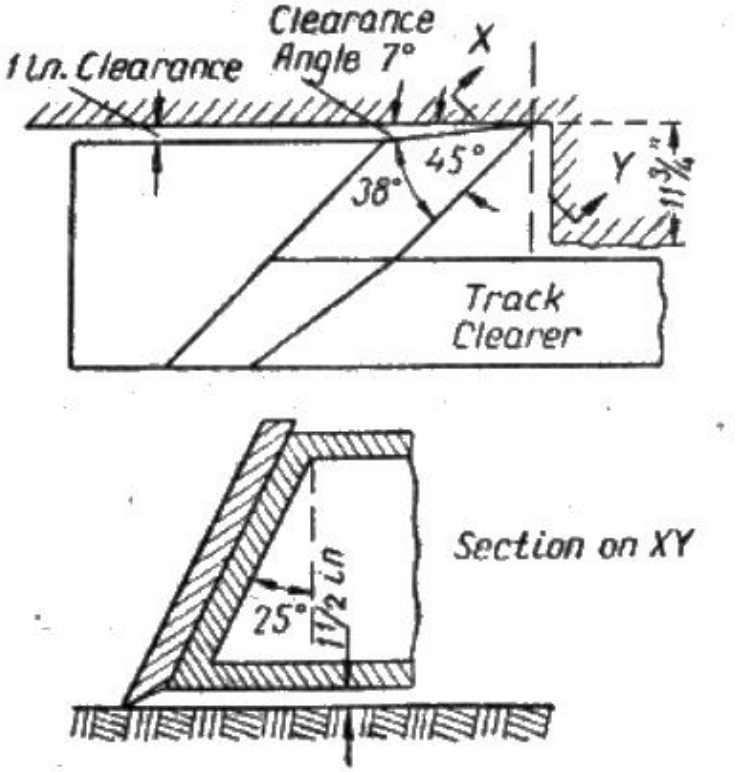


Fig. 17. Details of coal-plough cutter blade

when ploughing to a depth of $11^{3}/_{4}$ in. in a level seam at the rate of 17 ft. per minute. The haulage gears consist of two parts, the haulage or capstan winch, which applies the pulling force, and a reeling winch from which the rope is laid out as the plough travels along the face. These are placed in the roads at each end of the face, the rope passing round a pulley which is mounted on a frame to permit the rope line to be advanced as the coal is stripped off.

The chain conveyor, used in conjunction with the plough, is a very strong double-chain-scraper type with driving gears at each end. The tail drive takes up the slack of the bottom chain. The conveyor acts as a guide for the plough and a smooth gliding surface on the conveyor is provided for this purpose. The conveyor is forced forward behind the plough after each cut is made. The front row of supports is used as a buffer, there being no supports between the conveyor and

the coal face. The means used to force the conveyor forward consists of one of the following:

1. Hand-operated jacks placed against the feet of the props.

2. Compressed-air cylinders placed at intervals of 5 to 10 yd. apart. The cylinders are 1 to 2 yd. long and 6 to 10 in. internal diameter.

3. A steel wedge trailed by the plough and, with the line of supports as a guide or a special guide rail, forces the conveyor forward as the plough moves along the face. A small winch at each end of the face is necessary to complete the travel of the wedge.

4. Automatic ratchet gears operated by a regulator are attached to the plough.

The conveyor structure is provided with flexible joints to allow a lateral bending of 4° to 6° for forward movement operated by one or other of the above devices.

Coal faces worked by the coal plough are usually of single unit layout on account of the gear that has to be provided in the roads. In order to accommodate the equipment, stables at each end of the face up to 3 yd. long are necessary, and have to be made by hand with the assistance of pneumatic picks.

The length of face operated varies from 100 to 300 yards, the limiting factors being the strength of the conveyor and the horse-power required to operate it.

The power requirements are briefly as follows: two 20-h.p. capstan winches, two 10-h.p. reeling winches and two 50-h.p. driving motors on the conveyor, i.e. a total of 160 h.p.

IV. Find the answers to the following questions in the text.

1. Why are the two cutter blades coupled together in the standard coal plough?
2. What is the weight of the plough?
3. What is the cutter blade made from?
4. What are the blades attached to?
5. Why are the correct angles of cutter edges very important?
6. What do the haulage gears consist of?
7. What is the conveyor structure provided with?
8. Why are stables necessary at each end of the face?

V. Describe the means used to force the conveyor forward. The following phrases will help you:

Hand-operated jacks; the feet of the props; compressed-air cylinders; internal diameter; a steel wedge; the line of supports; a special guide rail; along the face; at each end of the face; a small winch; to

complete the travel of the wedge; automatic ratchet gears; attached to the plough.

VI. Prove the following, using the information from the text.

1. The correct angles of the cutter edge are very important.
2. The chain conveyor is a very strong double-chain-scraper type.
3. The conveyor structure is provided with flexible joints.
4. Stables at each end of the face are necessary.

VII. Make up question to which the italicized words are the answers.

1. The blades are attached to the cutter holder.
2. The plough is hauled to and fro along the coal face
3. The haulage gears consist of two parts.
4. The tail drive takes up the slack of the bottom chain.

VIII. Paraphrase sentences with participial constructions making two sentences out of one.

Example; The pull in the rope varies from 3 to 8 tons with peak loads of 2 tons, the machine ploughing to a depth of 11 ¾ in. in a level seam.

The pull in the rope varies from 3 to 8 tons with peak loads of 2 tons. The machine ploughs to a depth of 11 ¾ in. in a level seam.

1. The winches are placed in the roads at each end of the face, the rope passing round a pulley which is mounted on a frame.

2. The chain conveyor is used in conjunction with the plough, it being a very strong double-chain-scraper type with driving gears at each end.

3. The front row of supports is used as a buffer, there being no supports between the conveyor and the coal face.

4. The length of face operated varies from 100 to 300 yards, the limiting factors being the strength of the conveyor and the horse-power required to operate it.

IX. Using the drawings on figure 16 describe the functions of the parts of the standard coal plough.

X. Compose a dialogue between you and your partner wishing to sell standard coal ploughs to your firm.

Unit V

Longwall Coal-Cutters

I. Before you start:

1. Do you know anything about the classification of longwall coal-cutters?
2. What do you think the construction of a longwall cutter is?

II. Perhaps you don't know all the words. Learn their meanings to understand the contents of the text:

a longwall coal-cutter [lɔŋwɔ:l kəul 'kʌtə] – лонгвольная врубовая машина

a crown bevel wheel [kraun 'bev(ə)l wi:l] – коронная коническая шестерня

roller and ball bearings ['bɛəriŋz] – роликовые и шариковые подшипники

a yoke [jəuk] – хомут

a clutch [klʌʧ] – муфта

a pinion ['pinjən] – малое зубчатое колесо, ведущее колесо

a sprocket ['sprɔkit] – зубчатое колесо

a haulage gear ['hɔ:liʤ giə] – ходовая шестерня

reversing [ri'və:siŋ] – реверсивный переключатель

r.p.m. – revolutions per minute – обороты в минуту

consumption [kən'sʌmpʃ(ə)n] – потребление

cu.ft. – cubic foot – кубический фут

reduction gearing [ri'dʌkʃ(ə)n giəriŋ] – редукционная передача

a bush [buʃ] – вкладыш, втулка

a pin [pin] – шпилька, штырь

to rivet ['rivit] – заклепать

a recess [ri'ses] – паз, углубление, канавка

a box-link – соединительная планка кулачков режущей цепи

a curved jib [kə:vd ʤib] – изогнутый бар врубовой машины

a shot [ʃɔt] – взрыв

explosives [iks'pləusivz] – взрывчатые вещества

a paddle type gummer ['pædl taip 'gʌmə] – лопастной расштыбовщик

to clog [klɔg] – засорять, забивать мелочью, заклинивать

a hole [həul] – скважина, шпур

to obstruct [əb'strʌkt] – загораждать, препятствовать

close timbering ['timbəriŋ] – крепление в тесном рабочем месте, сплошная крепь

erected [i'rektid] – смонтированный, собранный

a casing ['keisiŋ] – кожух

intermittent [,intə(:)'mit(ə)nt] – прерывистый, периодический, пульсирующий

a driving shaft [ʃa:ft] – ведущий вал, приводный вал

a worm [wə:m] gearing ['gi əriŋ] – червячная передача

a reciprocating motion [ri'siprəkeitiŋ 'məuʃ(ə)n] – возвратно-поступательное движение

a crank [kræŋk] – коленчатый вал, кривошип

a connnecting rod [rɔd] – соединительная штанга, шток

a pawl [pɔ:l] – предохранитель, защелка, собачка

oscillating ['ɔsileitiŋ] – колебательный, вибрирующий

a stroke [strəuk] – ход

a handle ['hændl] – рукоятка

a handle-rope drum – барабан тягового каната

a planetary ['plænit(ə)ri] motion – кольцевое движение

a break [breik] – тормоз

a spring-loaded multiplate ['mʌltipleit] clutch – пружинная многопластинчатая муфта

a dog clutch – раздвижная зубчатая муфта, сцепная муфта

III. Read the text to find the information about the rate of travel of a longwall coal cutter.

A wide range of machines is available for this work and they are usually classified according to height, e. g. 12 in., 15 in., and 19 in., the low built models being used for undercutting thin seams. The longwall cutter is of three-unit construction, comprising the motor or central unit, the gear head consisting of the gearing between the motor and the cutting-chain sprocket (Fig. 18) and the haulage-gear unit.

The driving motor is either a compressed-air motor or an electric motor developing from 30 to 60 h.p. according to size.

The turbine motor is provided with reversing gear for cutter-chain reversal. The electric motor drive is provided with a reversing switch.

The compressed-air turbine rotors revolve at 1600 to 1800 r.p.m. and the air consumption is from 20 to 25 cu. ft. of free air per minute. The gearhead unit comprises a strong cast-steel casing which totally encloses the speed-reduction gear between the driving motor and the cutter-chain driving sprocket, and serves as the support for the cutting-chain jib.

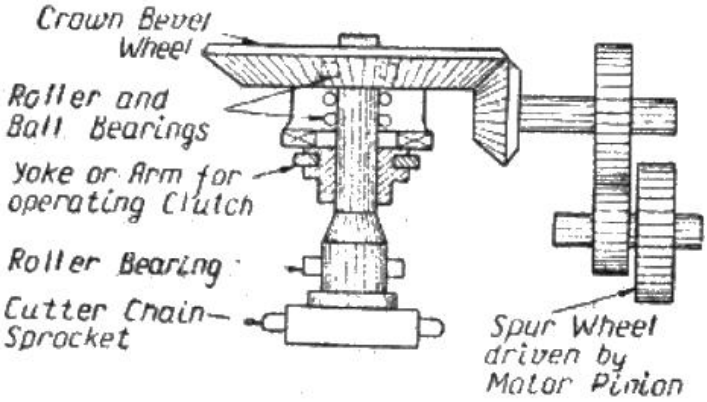


Fig. 18. The cutter-chain sprocket

Concerning the cutter-chain (Fig. 19) it is necessary to say that in England curved jibs and chains were introduced not so long ago with the object of reducing the number of shots and the amount of explosives used in coal preparation.

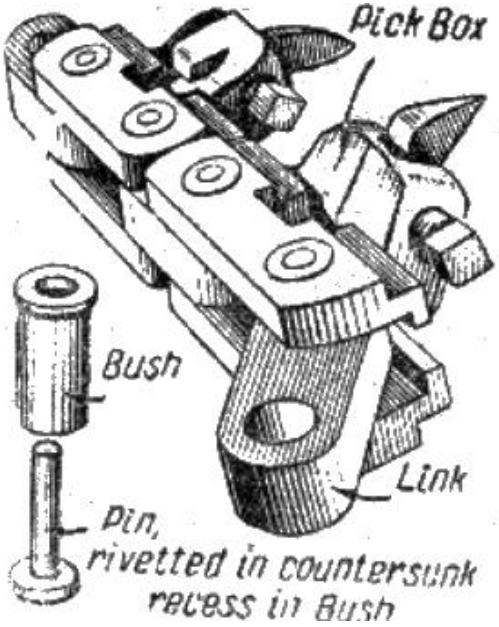


Fig.19. The box-link chain

Spiral or paddle-type gummers (Fig. 15) are used to prevent gumming being taken back by the chain into the undercut and to avoid clogging of the chain. The side-discharge spiral gummer is driven from the gearhead. It is provided for drive from either side according to the direction of cutting. Left- and right-hand spirals are provided to suit the direction of holing.

The end-discharge gummer working on a similar principle can be used where side discharge would be obstructed by close timbering or face conveyor erected close up to the cutter track.

The haulage unit. The front-unit casing houses the mechanism for hauling the machine along the coal face, the haulage medium being a steel wire rope. In rope-drive gears, the haulage action is intermittent, the machine being hauled a few inches at a time. The general principle of the gearing providing this action is briefly as follows.

The speed of the driving-rotor shaft is stepped down by spur-and-worm gearing, the rotary motion of the worm-wheel shaft being converted to a reciprocating motion by means of a crank. The connecting rod attached to the crank operates a pawl which in turn engages with the teeth of a ratchet wheel.

The pawl, in oscillating to and fro, pushes the ratchet wheel round a short distance at each stroke. The stroke or movement of the pawl can be varied by means of a cutting-speed control handle and thus the rate of travel of the machine can be varied. The ratchet-wheel shaft is geared to the haulage-rope drum. Thus the speed of travel can be varied to suit conditions. In some gears a planetary motion with brake control, or spring-loaded mutilate clutch, can be so adjusted as to slip at a predetermined rope pull, say 12,000 lb., in case the machine is obstructed. In addition to the variable intermittent cutting speed, spur gears usually engaged by a dog clutch are provided for flitting and turning the machine.

IV. Ask your partner to find answers to the following questions.

1. What can you say about the classification of the longwall coal-cutters?
2. What do you know about the construction of the longwall cutters?
3. What does the choice of a driving motor depend upon?
4. What does the gearhead unit serve for?
5. What do you think paddle-type gummers are used for?
6. Where can the end-discharge gummer be used?
7. What kind of the haulage is there in rope-drive gears?

V. Give derivatives from the following words and translate them into Russian.

To cut, to classify, to haul, to drive, to compress, to develop, to reverse, to revolve, to consume, to reduce, to support, to introduce, to vary.

VI. Insert proper connectives. Choose from those in brackets. (according to; either ...or...; as; by means of; thus; so...as...).

1. Longwall coal-cutters are usually classified ... height, e.g. 12 in., 15 in., and 19 in.
2. The driving motor is ... a compressed-air motor ... an electric motor developing from 30 to 60 h. p., ... size.
3. The gear head unit serves ... the support for the cutting-chain jib.
4. The rotary motion of the worm-wheel shaft is converted to a reciprocating motion ... a crank.
5. The movement of the pawl can be varied ... a cutting speed control handle and ... the rate of travel of the machine can be varied.
6. In some gears a planetary motion with brake control, or spring-loaded multiplate clutch can be ... adjusted ... to slip at a predetermined rope pull in case the machine is obstructed.

VII. Change the place of the adverbial infinitive construction in each sentence and translate them.

Example: Left-and right-hand spirals are provided to suit the direction of holing.

To suit the direction of holing left-and right-hand spirals are provided.

1. Spiral gummers are used to prevent gumming being taken back by the chain into the undercut.
2. Paddle-type gummers are used to avoid clogging of the chain.
3. Thus the speed of travel can be varied to suit the conditions.
4. The correct angles of the cutter edge are very important to ensure smooth operation.
5. At the control end of the machine there is an operating gear to engage or disengage either of the cutting chains as desired.

VIII. Make up a dialogue with your group mate on the contents of the lecture about longwall coal-cutters.

IX. Using the drawing of fig.18 describe the cutter-chain sprocket.

X. Retell the text in short.

Unit VI

Curved Coal-Cutter Jibs

I. Before you start:

1. Have you ever read about the history of development of the curved coal-cutter jibs?
2. What are the advantages of using curved coal-cutter jibs?

II. Learn the following words to understand the text better:

a curved coal-cutter jib [kə:vd kəul 'kʌtə ʤib] – изогнутый бар врубовой машины

a vertical ['və:tik(ə)l] shear [ʃiə] cut – вертикальный вруб

shotfiring [ʃɔt 'faiəriŋ] – взрывные работы

a consequent increase ['kɔnsikwənt 'inkri:s] – последующее увеличение

straighter [streitə] – более прямой

collieries ['kɔljəriz] – шахты, (a colliery ['kɔljəri] – шахта)

versatility [,və:sə'tiliti] – разнообразие

progenitors [prəu'ʤenitəz] – предшественники, основатели

a stripper ['stripə] – многолезвийный угольный струг

armoured conveyors ['a:məd kən'veiə] – панцирные конвейеры

the latter ['lætə] – последний

rigidity [ri'ʤiditi] – жесткость, прочность

to relieve [ri'li:v] – ослаблять

a channel-section beam ['ʧænl 'sekʃ(ə)n bi:m] – швеллерная балка

continuous [kən'tinjuəs] – непрерывный, поточный

heat-treated steel [hi:t-tri:tid sti:l] – сталь, подвергнутая термообработке

throughout [əru(:)'aut] – по всей площади, длине, через

wearing strips – прокладки, подверженные износу; съемные прокладки

to facilitate [fə'siliteit] – облегчать

replacement [ri'pleismənt] – замена

to enable [i'neibl] – давать возможность

to incorporate [in'kɔ:p(ə)reit] – включать (в состав), внедрять, вмонтировать

a ball-and- socket joint – универсальный (шаровой) шарнир

to retain [ri'tein] – удерживать, сохранять
a box – гнездо (в подшипнике)
a liner ['lainə] – вкладыш (подшипника)
a protruding stem [prə'tru:diŋ stem] – выступающий стержень
a socket ['sɔkit] – муфта, шарнир
adjacent [ə'dʒeis(ə)nt] – смежный, соседний, близлежащий
a stop – стопор, замок, защелка
integral ['intigr(ə)l] – встроенный
to ensure [in'ʃuə] – обеспечивать
to be negotiated [ni'gəuʃieitid] – быть проходимым, доступным
a jib [dʒib]– скоба
to interfere [,intə'fiə] – мешать, препятствовать
a pitch [pitʃ] – шаг, ступень,
to provide [prə'vaid] – обеспечивать
clunch – глина, огнеупорная глина
a dip – падение (пласта)
gradient ['greidjənt] – подъем, крутизна, наклон, уклон
d.c.-direct [di'rekt], [dai'rekt]-current ['kʌr(ə)nt] – постоянный ток
attendant [ə'tendənt] – рабочий

III. Read the text to tell your partner what he should know about curved coal-cutter jibs.

For many years mining engineers, both in Britain and on the Continent, have given thought to the development of a coal-cutter that would, in addition to making the usual horizontal cut, provide a vertical shear cut. The advantages expected from combined horizontal and shear cutting were twofold. The first expectation related to a reduction in shot firing with a consequent increase in the proportion of large coal and the second suggested that the faces would be much straighter so leading to improved roof control. Both expectations offered greater safety as well as improved productivity so making the idea doubly attractive.

Since the end of the war development along these lines has been considerably accelerated, probably the most important step being made when special cutting chains were introduced for the purpose. At present there is a considerable number of curved jibs (Fig. 20) working in English collieries and it would be safe to assume that the versatility of the device has surprised many of its early progenitors. Coal-cutters

fitted with curved jibs now operate in conjunction with many cutter-loaders, loaders, strippers, armored conveyors, and on conventional hand-filled faces.

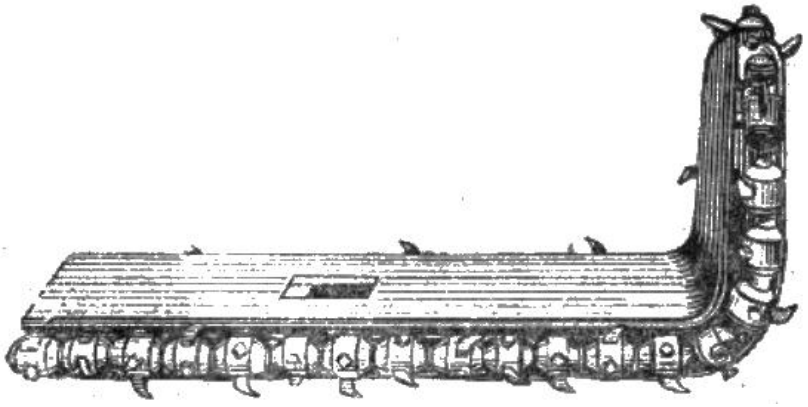


Fig. 20. The curved jib and chain

A curved coal-cutter jib consists of two main parts, the straight vertical portion and the horizontal section on which the curved piece of the jib is formed. Projecting from this curved section and welded to it is a centre plate over which the vertical section is closely fitted, the two parts being connected by two heavy bolts. Shear sections of varying height can therefore be fitted to suit seams of different thickness and this operation can be performed at the face. To ensure maximum strength and rigidity, three types of horizontal curved section are produced, the first of which is suitable for shear sections 1 ft. 9 in. to 2 ft. ½ in., the second for shear sections 2 ft. 2 ¼ in. to 2 ft. 4 in., and the third for shear sections 2 ft. 0 ½ in. to 3 ft. $0^{3}/_{4}$ in. The centre mounting plate is designed to bear the loads on the vertical section of the jib thereby relieving tensional loads on the two holding bolts.

Two channel-section beams of heat-treated steel form the main members of the horizontal and curved sections. These are continuous throughout so as to provide a strong foundation on which the vertical section is mounted. Riveted to the beams are top and bottom plates, to the inner sides of which carrying strips are riveted. These retain the chain in a fixed path, and both the plates and the carrying strips consist of three sections: the horizontal, the curved, and the vertical. This

is to facilitate easy replacement, for it is found out that the heaviest wear takes place on the curved portion.

Another type of chain is composed entirely of pick-carrying boxes without connections. Freedom to turn in two planes is necessary so as to enable the chain to turn in one direction round the sprocket and round the nose end of the jib and in the other direction round the curve from the horizontal to the vertical sections of the jib. This freedom is obtained through the incorporation of a ball-and-socket joint between each box. Each ball is retained in its box by spherical liners and from each ball there is a protruding stem the other end of which fits into a socket in the adjacent pick box; a ⅜ in. diameter rivet holds the stem in the socket. Integral back stops on the pick boxes ensure rigidity of the chain during cutting so maintaining the cutting angle and preventing the forcing backward of picks.

On each pick box there are gibs which run between the channel beams and wearing strips on the curved jib so keeping the chain in its race. To enable the vertical curve to be negotiated the gibs on the inner curve of the chain are shorter than those on the outer curve; this necessitates the chain being mounted in only one position but does not interfere with the direction of chain rotation. As will be appreciated, such a compact design enables a very short pitch to be provided and, in fact, there is only 3½ in. between adjacent pick points. Not only does this enable the radius of curvature of the jib to be kept to a minimum, but by giving the maximum number of picks in a given length of chain the share of the cutting load borne by each pick is kept as low as possible.

Operation: Cutting is done on the night shift and there are two attendants on the curved-jib machine. No reduction in the speed of travel has been noticed and the face is often cut through in four hours, but the management points out that such performance may not be possible where the coal is hard. While traveling along the face the jib shows no tendency to rise or fall. Nor is there any difficulty in keeping the machine parallel to the face. No gumming device is fitted, but clearing the kerf presents no difficulty and ample space is cleared both in the horizontal and the vertical sections of the cut,

IV. Work in pairs with your partner. Don’t forget to change over.

1. What is a curved coal-cutter jib?
2. Why were the advantages from combined horizontal and shear cutting twofold?

3. Why was the idea so attractive?
4. Can you name a mining machine in conjunction with which curved jibs operate?
5. What is the centre mounting plate designed for?
6. What forms the main members of the horizontal and curved sections?
7. Where does the heaviest wear take place?
8. Is any gumming device fitted if curved jibs are used?

V. Match the following words and expressions from column A with those in column B.

A	B
многолезвийный угольный струг	a linear
швеллерная балка	armoured conveyors
универсальный (шаровой) шарнир	a stripper
вкладыш (подшипника)	a ball-and-socket joint
взрывные работы	a channel-section beam
шахта	a colliery (a mine)
панцирные конвейеры	shotfiring

VI. Complete the sentences of part A with the Infinitive constructions given in part B. Translate them into Russian.

A

1. Shear sections of varying height can be fitted… .
2. Three types of horizontal curved sections are produced… .
3. The centre mounting plate is designed… .
4. Two channel-section beams of heat-treated steel are continuous throughout so as… .
5. Both the plates and carrying strips consist of three sections: the horizontal, the curved and the vertical… .
6. Freedom to turn in two planes is necessary so as… .

B

1. … to suit seams of different thickness.
2. … to ensure maximum strength and rigidity.
3. … to bear the loads on the vertical section of the jib.
4. … to provide a strong foundation on which the vertical section is mounted.

5. … to facilitate easy replacement.
6. … to enable the chain to turn in one direction round the sprocket and round the nose end of the jib, and in the other round the curve from the horizontal to the vertical sections of the jib.

VII. Change the sentences using the Complex Subject to express the same idea.

Example: 1. It is known that automatic water sprays suppress dust.

Automatic water sprays are known to suppress dust.

2. It appears that another type of chain is composed entirely of pick- carrying boxes without connections.

Another type of chain appears to be composed entirely of pick-carrying boxes without connections.

1. It is likely that the chipping heads offset sufficiently to provide clearance for movement of the machine.

2. It seems that the rear conveyor is of a standard design.

3. It is said that the machine is fed forward until the bar touches the coal face in the centre of the heading.

4. It is claimed that the proportion of fines below ¼ in, is less with the process of ripping by a continuous miner than when the conventional methods of coal preparation are used.

5. It is proved that two attendants are enough on the curve-jib machine.

VIII. Find the sentences with -ing forms in the text. State their functions and translate them.

IX. You are a mining engineer explaining the operation of a curved coal-cutter jib to the student. The picture on fig.20 will help you to do it.

X. Write a short summary of the text.

Unit VII

Auger Miners

I. Before you start:

1. According to what parameters are the auger miners classified?
2. What can you say about the design of the auger miners?

II. Learn the following terms and words because they will be of great help to you in understanding the text below:

an auger miner ['ɔ:gə 'mainə] – машина для разработки угля с применением спиральных буров; проходческий шнековый комбайн

attempts [ə'tempts] – попытки

to fail [feil] – терпеть неудачу, не оправдать ожидания

discerning [di'sə:niŋ] – проницательный, умеющий различать

prerequisite ['pri:'rekwizit] – предпосылка, предварительное условие

respectively [ris'pektivli] – соответственно

a chuck [ʧʌk] – буродержатель, патрон, поворотная букса

arrangement [ə'reinʤmənt] – устройство

flanged wheel [flængd wi:l] – колесо с ребордой

detachable [di'tæʧəbl] – съёмный

to facilitate [fə'siliteit] – облегчать

a hooked puller bar [hukd 'pulə ba:] – замкнутый тяговый шток, тяговая штанга

to retract [ri'trækt] – менять ход, перемещать(ся)

restriction [ris'trikʃ(ə)n] – ограничение

to employ [im'plɔi] – использовать

a barrel ['bær(ə)l] – цилиндр

to tolerate ['tɔləreit] – допускать

deg. = degree [di'gri:] – градус

an auger string ['ɔ:gə striŋ] – ряд буровых штанг

to inhibit [in'hibit] – запрещать, препятствовать, сдерживать

a fulcrum ['fʌlkrəm] – ось шарнира, точка вращения, точка приложения силы

to conform [kən'fɔ:m] – соответствовать

to incur [in'kə:] – подвергаться чему-либо, терпеть убытки

a retreat [ri'tri:t] – обратный ход; to retreat – отступать

a shaker ['ʃeikə] pan – плоский вибрационный грохот, качающийся конвейер

entries (an entry) ['entri] – входы

feasible ['fi:zəbl] – возможный, вероятный, подходящий

to dismantle [dis'mæntl] – демонтировать, разобрать

insuperable [in'sju:p(ə)rəbl] – непреодолимый

ingenious [in'dʒi:njəs] – изобретательный, искусный

to intersect [,intə(:)'sekt] – пересекать, перекрещиваться

to forbid [fə'bid] – запрещать

a brattice ['brætis] – перемычка, вентиляционная перегородка, вентиляционный щит (в шахтах)

to retard [ri'ta:d] – замедлять, задерживать

temporarily ['temp(ə)rərili] – временно

abutment [ə'bʌtmənt] – целик, служащий опорой кровли; пята свода давления

to reinforce [,ri:in'fɔ:s] – усиливать, подкреплять

a swivel ['swivl] pan – поворотный решетак (конвейера)

rubber-tyred wheel ['rʌbə 'taiəd wi:l] – колесо с резиновой шиной

III. Read the text to find out what problems are discussed in it.

In 1960-s determined efforts were made to introduce American mining methods and machinery into Great Britain. Many of these attempts failed because of inexperience, an intrinsic difference in conditions, and other reasons. This unfortunate experience has shown the need for a discerning selectivity when importing techniques and equipment from abroad. Later a machine has been developed which does not carry the prerequisite of excellent natural conditions which accompany most American machines. This is the auger miner.

The most popular and successful pioneer underground auger miners are the Cardex-Hardsock machines. They are available in three sizes, each differently powered according to whole size. The larger machine drills holes up to 42 in. diameter and the two smaller machines – holes up to 36 in. and 30 in., the motor sizes being 75, 50 and 25 h. p. respectively.

The smaller machine is extremely compact and may be used in thin seams and narrow headings. Overall dimensions are: length 10 ft. 6 in., width 6 ft. 4 in., height 24 in.

In terms of design the machine has much to recommend it. The body and main frame are to the side of the augers and so the heading has only to be of sufficient width to accommodate the body of the machine. Rotation is transmitted to the augers by a chuck which traverses 6 ½ ft. along slide bars on the side of the machine. Furthermore, this arrangement has the advantage of permitting drilling on both sides of the heading without moving the machine. Normal rotation speed is 45 r. p. m. The chuck picks up its drive from a square bar which runs the whole length of the machine between the guide tubes. Support for the chuck is by curved rollers which bear on the surface of the guide tubes.

These tubes have the additional function of oil reservoirs. Four floor and three roof jacks, of the hydraulic type, are provided to stabilize the machine during drilling and to select the elevation and direction of the hole. To move from hole to hole short rails are inserted under the machine and the machine then rests on four flanged wheels. For longer moves detachable rubber-tyred wheels are provided to facilitate movement. The larger machines have optional caterpillar mounting which takes care of both long and short moves.

A hooked puller bar is provided on the chuck so that as it retracts to accommodate another auger section for the present hole, one is withdrawn from the previous hole. Drilling is at the rate of 7 ft. per min. and retraction at 50 ft. per min.

Because the augers are inserted at the side rather than at the end of the machine, long augers place no restriction on the width of heading. For this reason 6 ft. auger sections can be used as compared with 4 ft. sections on end-feed machines. Sections are connected by fittings locked by a pin.

A variety of cutting heads is employed to accommodate different conditions. The most popular is the barrel type which can be relied upon to produce a fair proportion of lump coal. They consist of a periphery of renewable cutting bits and some arrangement to break the interior coal. This may be some arrangement of bits or even a plain hardened steel cone.

If slack coal is to be preferred or tolerated then a totally different arrangement is available. This merely consists of three radial arms set at 120 deg. which carry a number of cutter bits spaced along their length.

Steering is always a problem. In addition to the tendency of an auger string to curve down, due to the pull of gravity, there is a ten-

dency for clockwise rotation to induce a curve to the right. Providing all the holes exhibit the same degree of curvature however, this is no serious disadvantage.

There are methods of inhibiting the downward curve. One such device is a series of small rollers on the rear of the exterior of the barrel which serves as a fulcrum and tends to lift the cutting end.

Methods of working with auger miners.

It will, of course, be necessary to devise specific methods of working for British conditions, since American natural conditions, equipment, safety-regulations, and so on; do not conform to British ones. The following is an examination of a suggested method of working (Fig. 21).

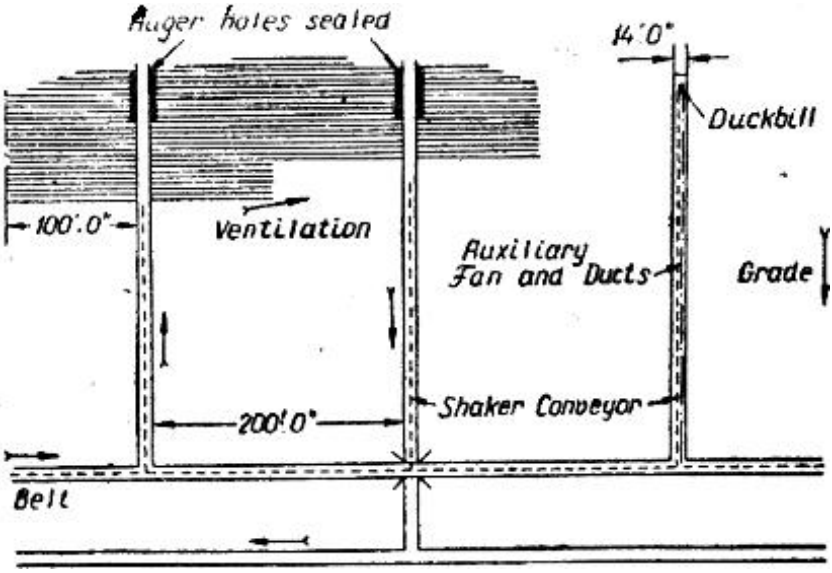


Fig. 21. Suggested layout of a district for auger mining

This method was designed to incur the minimum of development costs. For thin-seam mining, which is probably the most extensive potential field of use in Britain, duckbill loaders could be used to drive the rise entries. One of the characteristics of duckbills is that they are used to best advantage when worked to the rise. In addition, there is a further advantage: the pan line can be used to convey the auger mined coal on the retreat. It is explained elsewhere that the best device for

picking up coal brought out by the auger is a flat sheet built on to the end of a shaker-pan line. Certain augers are designed to drill holes to the left and to the right without moving the body of the machine, and with a single entry development it is feasible that this feature of the auger can be exploited. So far, however, no conveyor system has been proved that can pick up coal from both the left and right ribs of coal without dismantling and rebuilding. Nevertheless, this is not likely to prove an insuperable difficulty and some ingenious device is sure to be developed.

During the development of these single headings sufficient ventilation could be provided by portable auxiliary fans. On the retreat, air would circulate from one heading to the next through the intersected auger holes. Some states in America forbid the application of auxiliary fans and so it would be necessary to make connections at intervals of say 80 ft., which is the farthest distance permitted on line brattice. Rather than connect with expensive cross-cuts it was proposed to drill auger holes through as air passages. Unfortunately, this involved employing an auger on this work instead of on the more productive retreat work. At the same time the conveyor must be dismantled in the proximity of the auger while the holes are drilled, and this of course retards the progress of the development work.

Even in thin seams there is no reason to take down rock in the auger entries and this may be rated a major advantage of the system. On the other hand, supplying timber to the development face would be a laborious and arduous operation. It is a disadvantage of the shaker conveyor that it cannot be reversed for supplies handling, whereas some flight conveyors have this facility.

Method of operation of auger underground (Fig. 22)**. Roof Support.**

Because they have the support of solid coal on each side of the heading many of the American installations are enabled to avoid the necessity for timbering. Nevertheless augering has been successfully accomplished where close timbering is observed. Where props and bars are used it is possible to set a carrying bar down one side of the heading, and temporarily remove the props which obstruct the holes. The hydraulic roof jacks on the machine facilitate this operation.

The roof beds have the support of solid coal on both abutments and therefore roof bolting becomes an attractive proposition. This may be one of the specific applications that could be found for roof bolting in Great Britain. It obviates the difficulty due to timber and at the same time may reinforce the immediate roof beds to a greater extent than timbering.

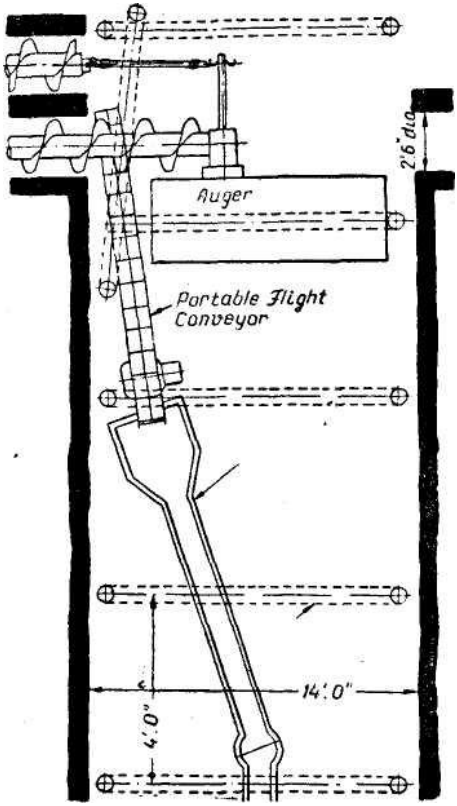


Fig. 22. Suggested method of operating an auger

Haulage. The problem of picking up coal from the mouth of the hole has not yet been solved completely. At present, shaker conveyor and flight conveyors have been used. It is of course, advantageous to use the same conveyor that was used on the development of the heading now being augered. If a shaker conveyor was used during development then a flat steel sheet could be inserted under the augers to pick up the coal Alternatively a low-built flight conveyor could be substituted. However, for the purpose of drivage it is desirable to install a conveyor in the centre of the heading whereas in extraction[1] by augers the coal is discharged along the rib-side. For this reason it is necessary to use a small portable conveyor to pick up at the rib-side and transfer its load to the conveyor running down the centre of the heading. A further suggestion is to incorporate a duckbill swivel pan on the

centre conveyor and swing the pan into the rib-side. If it is desired to auger both ribs then the position is further complicated. If adequate clearance is to be left for the conveyor and the place is timbered then a heading of 14 ft. is necessary.

IV. Ask your partner about auger miners.

1. What are overall dimensions of the smaller auger miners?
2. What part transmits rotation to the augers?
3. What is the normal rotation speed?
4. How many jacks provide stabilization of the machine during drilling?
5. What are short rails inserted for?
6. What does the machine rest on?
7. What is employed to accommodate different conditions?
8. Can you describe the operation method of an auger?

V. Find the antonyms in column B for the words in column A:

A	B
more	upward
downward	unnecessary
expensive	backward
advantage	inexpensive
necessary	less
forward	thick
thin	allow
forbid	disadvantage

VI. Fill in the prepositions where necessary (of, in, without, by, from, through).

1. There are methods … inhibiting the downward curve.

2. …addition, there is a further advantage: the pan line can be used to convey the auger mined coal on the retreat.

3. Certain augers are designed to drill holes to the left and to the right … moving the body…the machine.

4. Sufficient ventilation could be provided… portable auxiliary fans.

5. Air would circulate … one heading … the next … the intersected auger holes.

VII. Explain the use of Perfect Tenses in the following sentences and translate them into Russian.

1. This experience has shown the need for a discerning selectivity when importing techniques and equipment.
2. Recently a machine has been developed which does not carry the prerequisite of excellent natural conditions.
3. Augering has been successfully accomplished where close timbering is observed.
4. The problem of picking up coal from the mouth of the hole has not yet been solved completely.
5. At present, shaker conveyors and flight conveyors have been used.

VIII. Read the dialogue and render it in indirect speech.

-Mr. Simonov: I'm interested in the problem of haulage.
-Mr. Brown: The problem of picking up coal from the mouth of the hole has not yet been solved completely.
-Mr. Simonov: What conveyors have been used at present?
-Mr. Brown: At present, shaker conveyors and flight conveyors have been used.
-Mr. Simonov: Is it advantageous to use the same conveyor that was used on the development of the heading now being augered?
-Mr. Brown: Yes, of course. Alternatively a low-built flight conveyor could be substituted.
-Mr. Simonov: In what way can a shaker conveyor be used?
-Mr. Brown: It can be used during development, then a flat steel sheet can be inserted under the augers to pick up the coal.
-Mr. Simonov: Where should a conveyor be placed?
-Mr. Brown: For the purpose of drivage it is desirable to install a conveyor in the centre of the heading.
-Mr. Simonov: Are there any other improvements?
-Mr. Brown: A further suggestion is to incorporate a duckbill swivel pan on the centre conveyor and swing the pan into the ribside

IX. Looking at the drawing in fig 22 describe the method of operating an auger.

X. Discuss the problem of innovations in mining equipment with a group of specialists in this field.

Unit VIII

Anderton Disc Shearers

I. Before you start:

1. What do you know about the Anderton disk shearer?
2. Which do you think the most effective and economical mining machine is?

II. Learn the words and phrases and using them make up sentences of your own.

disc shearer ['ʃiərə(r)] – дисковый вертикальный зарубщик
a gearbox [giəboks] – коробка передач
to lag [læg] at an angle ['æŋgl] of 7 deg. – отставать на угол в 7 градусов
to require [ri'kwaiə] – требовать
to upset [ʌp'set] the balance ['bæləns] – нарушить равновесие
a cutter-pick ['kʌtəpik] box – кулачок режущего зубца
tungsten carbide ['tʌŋstən 'ka:baid] – карбид вольфрама
tipped [tipt] – с наконечником; наваренный
requisite ['rekwizit] – необходимый, требуемый
a gate [geit] – штрек
dead length [ded leŋə] – полная длина
a web – простенок, полотно
to deflect [di'flekt] – изменять направление
timbermen ['timbəmen] – крепильщики
to snake [sneik] – пробираться ползком
supervision [,sju:pə'viʒ(ə)n] – наблюдение, надзор
to dip – погружаться, падать, понижаться
to assess [ə'ses] – оценивать, определять
to extend [iks'tend] – расширяться, удлиняться
dia.=diameter [dai'æmitə] – диаметр
beneath [bi'ni:ə] – внизу, ниже
foregoing [fɔ:'gəuiŋ] – вышеупомянутый
to devise [di'vaiz] – разрабатывать, изобретать
goaf [gəuf] – завал, выработанное пространство
a packer ['pækə] – упаковочная машина

a ripper ['ripə] – врубовая машина
O.M.S. – output per manshift – производительность труда

III. Read the text to find the information about the power consumption by the Anderton disk shearer.

Considerable success under difficult conditions has been achieved in the North Western and Eastern Divisions of England with the Anderton shearer loader. This machine is limited to seams of more than 3 ft. 6 in. in thickness.

The Anderton shearer is based on a standard coal-cutter in which the normal cutting end has been replaced by a special gearbox driving a horizontal shaft which projects towards the face and lags at an angle of 7 ½ deg. to a line at right angles to the machine. On the horizontal shaft the shearing discs are mounted the number of which is varied to suit the hardness of the seam and the depth of the cut required to be taken. Today, cuts of 16 to 22 in. in depth have usually been taken; deeper cuts have been tried, but there is a danger of upsetting the balance of the machine. Each disc carries a number of cutter-pick boxes varying from four to eight, again depending upon the nature of the seam but which is normally six; special tungsten carbide tipped cutter picks are used. The cutting diameter of the discs to the tips of the picks is at present 36 in. or 40 in.; at a speed of 71 r. p. m. a pick speed of 740 ft. per min. is obtained with a 40 in. disc.

The loader, which is fitted with a wheel haulage, is mounted on an armoured flexible conveyor by means of a specially designed under-frame which raises it so that the discs cut to floor level. Behind the machine and attached by a rigid coupling is a fabricated plough which, during the cutting run, deflects the cut coal on to the conveyor, and during the reverse run loads all the loose coal left in the track.

Sprays for dust suppression are incorporated in the plough and are directed to the top of the shearing discs. At the front of the machine is a cable carrier designed to hold the requisite length of cable coiled as a figure eight.

Two stable holes are required for the loader: these are usually 6 yards long at the tail-gate end to accommodate the rear conveyor drive, the dead length of the machine and cable-carrier, and 10 yards long at the loader-gate end to allow for the forward drive unit, the plough and the main gate.

The operation, which is non-cyclic, can be started and finished at any point of the face. For the purpose of description it is assumed that at the start of operation the machine is in the loader-gate stable

hole and the conveyor is laid close to the coal along the face. The haulage rope is attached to each end of the conveyor and tensioned, as is usual when using wheel haulage. With the shearing discs revolving to cut upwards into the coal, the machine proceeds along the face cutting the first web, working on a buttock, and a large proportion of the coal cut is thrown over the discs and deflected by the plough on to the conveyor. Any top coal which does not fall after the passage of the machine is brought down into the cutter track, pneumatic picks or shot-firing being used, if necessary. The machine operates in a seam in which the top coal falls readily. On reaching the tail-gate end of the face, the machine is reversed and, with the discs in neutral, run back down the face pushing before it the plough which loads out all the coal left in the cutter track. Timbermen snake the conveyor behind the machine on this run and set temporary props under the bars, behind the conveyor.

On arrival back at the loader-gate stable hole, which at no time needs to be more than 5 ft. in advance of the face, the loader and the conveyor drive head are jacked over.

The machine then cuts the second web which proceeds similarly to the first, except that as the conveyor is snaked over the timbermen set a new bar and prop and withdraw the temporary middle prop set on the first cut.

Maximum speeds of 7 to 8 ft. per min. have been reached during the cutting run and, except in very hard coal, maximum power is not required. When only ploughing on the second run, the speed is governed by the rate at which the coal is removed by the conveyor chain traveling in the same direction and by the speed of cable handling; 160 yd. faces have been ploughed back in 10 min. The complete operation of loading, ploughing and moving over on a 150 yd. face can be completed in less than two hours in normal conditions. Since the Anderton shearer is a non-cyclic machine, the length of face is not critical. Up to the present, faces have been about 150 yd. long but the length of these has been controlled by other factors. The longer the face the higher the proportion of mechanically loaded coal and the smaller the proportion to be hand filled from the stables. The maximum length is controlled by the type of conveyor, capital cost of conveyor and supports, ventilation, ease of supervision, etc. An optimum length would appear to be between 200 and 250 yards. For such lengths it would be necessary to redesign the cable carrier to hold more cable.

Cuts of 16 and 18 in. were initially taken with the first machines installed, but experiments are at present being conducted with deeper cuts up to 24 inches in depth.

A deep cut has the advantage that the relative frequency of cable handling and conveyor moving are reduced for a given output as is the number of shots (if these are required) to bring down the top coal.

On the other hand, with a deep cut the machine is less stable and has a tendency to dip into the floor, a slower haulage speed may be necessary, resulting in a larger proportion of small coal, and the distance from the supports to the newly exposed face is increased.

It is necessary to strike a reasonable balance between these factors in assessing the relative merits of extending the cut. Experience suggests that a 20 in. cut should be accomplished satisfactorily. The discs at present in use are 40 in. dia., which allows a cut 4 in. higher than the body of the machine and a clearance of 5 ½ in. between the disc, gearbox and the conveyor flights passing beneath. However, trials are being conducted with discs of 44 and 50 in. diameter.

Although decreasing the disc diameter would appear to be desirable in that it lessens the proportion of the seam cut, it would reduce the overhead clearance and the clearance between the cutter and the conveyor.

It is necessary to maintain sufficient overhead clearance to allow the cutter to advance into a new track should the top coal stick to the roof. The clearance between the base of the cutter and the conveyor flights also must be sufficient to allow coal from the stable hole to pass along the face beneath the machine.

Present installations are working with a straight line cantilever bar support system with 3 ft. between props in the same row. For 16 to 18 in. cuts the length of bar used is twice the depth of cut. Over 24 in. bars may be used equal to the depth of cut. Temporary props are set as soon as the first cut has been completed and the conveyor moved forward. The props are moved forward to the next line of bars when these are set.

Although this method involves setting the props twice to every bar it does ensure that the maximum prop free distance is only 4 ft. 9 in. with an 18 in. cut and 3 ft. bar.

If the top coal does not fall the foregoing method is the best yet devised, but if the tops fall to each cut then the triangular support system can be used. With this system props would be set once to each bar, but the number of props and bars would be increased since the distance between bars in the same row would be 4 ft., i. e. 2 ft. between lines of bars at right angles to the face.

It is possible also, where the roof is smooth or where over cutting is practiced, to use the slide bar system. The prop intervals for this could be the same for the triangular system with cantilever bars.

The power consumption of the machine has been found to be low in comparison with other loaders. The cables are carried on hooks along the goaf side of the conveyor, and transferred by the cutter man to and from the cable carrier. The basic face team required for the operation of the Anderton shearer on a 150 yard face consists of 12 men.

In addition, depending on local conditions, rippers and packers are required; the average O.M.S. from faces employing the Anderton shearer is at present a little over 6 tons.

IV. As the major in mining you are sure to be interested in the answers to the questions below.

1. What conditions is the Anderton disk shearer suitable for?
2. What is special in the design of the Anderton shearer?
3. What is done to avoid the danger of upsetting the balance of the machine?
4. What picks are used on each disk?
5. What are the sprays for dust suppression incorporated in and directed to?
6. Can you describe the operation of the disc shearer?
7. What innovations would you introduce to reduce capital costs?

V. Find the synonyms in column B for the words in column A.

A	**B**
to use	different
to end	hard
various	a section
difficult	to inhibit
to perform	to employ
an arrangement	to begin
to forbid	to finish
to start	to accomplish
a part	a device

VI. Inset proper connectives. Choose from those in brackets (than, by means of, so that, as, since, the…the, as soon as).

1. This machine is limited to seams of more…3 ft.6 in. in thickness.
2. The loader is mounted on an armored flexible conveyor … a specially designed under frame.

3. The underframe raises the loader … the discs cut to floor level.
4. A cable carrier is designed to hold the requisite length of cable coiled … a figure eight.
5. The number of props and bars would be increased … the distance between bars in the same row would be 4ft.
6. … longer the face … higher the proportion of mechanically loaded coal.
7. Temporary props are set … the first cut has been completed.

VII. Explain the use of "should" and "would" and translate the sentences into Russian.

1. An optimum length would be between 200 and 250 yards.
2. For such lengths it would be necessary to redesign the cable carrier to hold more cable.
3. Experience suggests that a 20 in. cut should be accomplished satisfactorily.
4. Decreasing the disc diameter would appear to be desirable.
5. Decreasing the disc diameter would reduce the overhead clearance and the clearance between the cutter and the conveyor.
6. It is necessary to maintain sufficient overhead clearance to allow the cutter to advance into a new track should the top coal stick to the roof.

VIII. Divide the text into logical parts and name each of them.

IX. Speak on the parts and operation of a disc shearer.

X. Write a repot on contemporary mining machines.

VOCABULARY II

A

ability [ə'biliti] способность.
abutment [ə'bʌtmənt] целик, служащий опорой кровли; пята свода давления.
accelerate [æk'seləreit] ускорять(ся).
accessibility [æk'sesə'biliti] доступность, доступ.
accomodate [ə'komədeit] соответствовать; приспособлять.
actual ['æktjuəl] действительный, фактический.
actuate [‘æktjueit] приводить в движение.
adjust [ə'dʒʌst] регулировать; налаживать.
adjustable [ə'dʒʌstəbl] регулируемый.
advance [əd'vɑ:ns] 1) подвигание; 2) опережение; **in ~ of** впереди, вперед; продвигать(ся); **rapid face** ['ræpid 'feis] ~ быстрое подвигание забоя.
ahead [ə 'hed] вперед, перед; **~ of** [əv] спереди.
aid [eid] 1) помогать; 2) помощь; **with the ~ of** при помощи; посредством.
air [εə] воздух; **compressed** [kəm'prest] ~ сжатый воздух.
air consumption [' εə kən'sʌmpʃn] расход воздуха.
allow [ə'lau] позволять; давать возможность.
alter ['o:ltə] изменять(ся).
ample space ['æmpl 'speis] достаточное пространство.
anchored ['eŋkad] закрепленный анкерной крепью.
angle [æŋgl] угол; **at right** [ət'rait] ~ под прямым углом; **cutting** ['kʌtiŋ] ~ угол резания.
anticlockwise ['ænti'klokwaiz] против движения часовой стрелки.
anthracite ['ænθrəsait] антрацит.
apart [ə'pɑ:t] 1) друг от друга, один от другого; 2) в стороне, отдельно; в отдельности; 3) кроме, не считая.
arc [ɑ:k] 1) дуга; 2) свод.
arm [ɑ:m] 1) захват; 2) плечо (рычага); 3) загребная лапа.
gathering arms ['gæðəriŋ] 1) захватывающее устройство (погрузчика), загребные лапы; 2) захваты.
articulate [ɑ:`tikjuleit] поворачивать.
assembly [ə 'sembli] сборка деталей, монтаж.
attain [ə'tein] достигать, добиваться.
attendant [ə'təndənt] рабочий; работник, обслуживающий какую-либо установку.
auger ['o:gə] сверло, бур; шнек.

auger mining ['o:gə 'mainiŋ] разработка угля с применением спиральных буров.

auger string [' o:gə 'striŋ] ряд буровых штанг.

automatic water sprays [o:tə'mætik 'wo:tə 'spreiz] автоматические разбрызгиватели; автоматическое орошение.

auxiliary fan [o:g'ziljəri 'fæn] вентилятор частичного проветривания; вспомогательный вентилятор.

available [ə'veiləbl] имеющийся в распоряжении; наличный.

avoid [ə'void] 1) избежать; 2) обходиться (без чего-либо).

B

bar [bɑ:] 1) бар (врубовой, машины); 2) верхняк (в крепи); **carrying** ['kæriiŋ] ~ опорный верхняк [в крепи); **puller** ['pulə] ~ тяговый шток, тяговая штанга; **ripping** ['ripiŋ] ~ бар врубовой машины; **slide** [slaid] ~ ползун; направляющая прямого хода.

barrel ['bærəl] цилиндр.

beam [bi:m] балка; **channel-section** ['tʃænl 'sekʃn] ~ швеллерная балка.

bed [bed] 1) подстилающие породы; 2) пласт; слой; **roof** [ru:f] ~ слой в кровле;

immediate roof bb. [i'mi:djət 'ru:f] пласты пород, залегающие непосредственно в кровле.

bending ['bendiŋ] изгиб; **lateral** ['lætərəl] ~ боковой изгиб.

bit [bit] 1) головка; коронка (бура); 2. режущий инструмент;

replaceable cutting b. [ri:'pleisəbl 'kʌtiŋ] съемный зубок режущей цепи.

bituminous coal [bi'tju:minəs 'koul] каменный уголь.

blade [bleid] лезвие, резец, лемех.

blasting ['blɑ:stiŋ] 1) взрывание (шпуров); 2) взрыв; 3) взрывные работы.

body ['bodi] корпус (машины).

bolt [boult] болт; **countersunk** ['kauntəsʌŋk] ~ болт с потайной головкой.

boss [bos] клапан, вентиль.

box [boks] букса; кулачок (зубка); **adjacent pick** [ə'dʒeisənt 'pik] ~ кулачок рядом расположенного зубка, кулачок соседнего зубка;

link b. [liŋk] соединительная планка кулачков режущей цепи;

pick carrying bb. ['pik 'kæriiŋ] кулачки, в которые вставляются зубки.

bracket ['brækit] зажим, скоба.

brattice ['brætis] перемычка, вентиляционная перегородка; вентиляционный щит (в шахтах).

break [breik] (broke [brouk], broken [broukn]) 1) отбивать (уголь); 2) разрыхлять.

break off ['breik 'ɔf] (broke off ['brouk 'ɔf], broken off ['broukn 'ɔf]) отбивать, откладывать, подрубать.

buffer ['bʌfə] 1) буфер; 2) ослабляющее звено при натяжении цепи; 3) прокладка.

building packs ['bildiŋ 'pæks] выкладка породных полос.

buttock ['bʌtək] забой.

C

cable [keibl] кабель; канат.

capstan ['kæpstən] кабестан; ворот.

carry ['kæri] 1) нести; 2) держать, поддерживать.

carry on ['kæri 'ɔn] 1) перевозить на; 2) поставить на; укрепить на; смонтировать на.

casing ['keisiŋ] кожух; **strong cast-steel** ['stroŋ 'kɑ:st 'sti:l] ~ крепкий кожух из литой стали.

casting ['kɑ:stiŋ] отливка; литье; **strong steel** ['stroŋ 'sti:l] ~ отливка из крепкой стали.

caterpillar ['kætəpilə] гусеница; гусеничный.

caterpillar tractor ['kætəpilə 'træktə] гусеничный трактор.

chain [tʃein] цепь; **cutter** ['kʌtə] ~ режущая цепь; **cutting** ['kʌtiŋ] ~ режущая цепь.

chain conveyor ['tʃein kən'veiə] скребковый конвейер.

chain-driven ['tʃein 'drivn] приводимый в движение через привод с цепной передачей.

change [tjeindʒ] изменение; перемена.

chief [tʃi:f] главный, основной.

chipping ['tʃipiŋ] подрубка, зарубка.

chipping head ['tʃipiŋ 'hed] подрубная головка; подрубной бар; подрубной орган; отбойная или врубовая головка комбайна.

chuck [tʃʌk] 1) бородержатель; патрон; 2) поворотная букса.

circular ['sə:kjulə] круглый; круговой.

claim [kleim] 1) претендовать; 2) утверждать; 3) считать; предполагать.

clear [kliə] очищать.

clearance ['kliərəns] зазор; просвет; небольшое расстояние.

cleavage ['kli:vidʒ] кливаж; слоистость; **at ~ points** по кливажу.

clog [klog] засорять, забивать мелочью; заклинивать.

clunch [klʌntʃ] глина, огнеупорная глина.

clutch [klʌtʃ] муфта; **dog** [dog] ~ раздвижная зубчатая муфта; сцепная муфта; **multiple disc** ['mʌltipl 'disk] ~ многодисковая муфта; **plate** [pleit] ~ пластинчатая муфта; **spring-loaded multiplate** ['spriŋ 'loudid 'mʌltipleit] ~ пружинная многопластинчатая муфта.

coal [koul] каменный уголь.

coal getting ['koul 'getiŋ] 1) добыча угля; 2) угольная промышленность.

coal-cutter ['koul 'kʌtə] врубовая машина.

coal face ['koul'feis] угольный забой.

coal-face mechanization ['koul 'feis ,mekənai'zeiʃn] механизация работ в угольном забое.

Colmol ['koulmo(u)l] название американского комбайна (сокращены и слиты два слова: coal mole угольный крот).

combine ['kombain] комбайн для добычи угля.

compensate for ['kompənseit fə] приспособить(ся) к.

condition [kən'diʃn] 1) условие; 2) состояние; 3) положение.

consist of [kən'sist əv] состоять из; содержать.

contact ['kontækt] соприкосновение, контакт.

Continent ['kontinənt] континент; зд. Европа.

continuous [kən'tinjuəs] поточный; непрерывный; с непрерывной последовательностью операций.

Continuous Miner [kən'tinjuəs 'mainə] горный комбайн с непрерывной последовательностью операций (по отбойке, навалке и транспортировке угля).

control [kən'troul] управление (машиной); **brake** [breik] ~ управление тормозом; **roof** [ru:f] ~ управление кровлей.

convey [kən'vei] отгружать.

conveyance [kən'veiəns] транспортировка; перегрузка; доставка.

conveyor = conveyer [kən'veiə] конвейер, транспортер;

armoured [' ɑ:məd] ~ панцирный конвейер;

chain [tʃein] ~ цепной конвейер;

cross [kros] ~ поперечный конвейер, перегружающий конвейер;

face [feis] ~ забойный конвейер;

flight [flait] ~ скребковый конвейер;

head [hed] ~ головной конвейер;

intermediate [intə:mi:djət] ~ 1) вспомогательный конвейер; 2) сборочный конвейер;

rear [riə] ~ хвостовой или разгрузочный конвейер;

shaker ['ʃeikə] ~ качающийся конвейер;

troughed [troft] ~ желобчатый конвейер.

coupled [kʌpld] соединенный; сдвоенный.
coupling ['kʌpliŋ] муфта; **flexible** ['fleksəbl] ~ гибкое соединение; упругая муфта.
crank [kræŋk] 1) пусковая рукоятка; 2) коленчатый вал; кривошип.
cross-cut ['kros 'kʌt] квершлаг, орт, сбойка.
current mining practice ['kʌrənt 'mainiŋ 'præktis] практика добычи угля в данное время; современная практика добычи угля.
curvature ['kə:vətʃə] выгиб, изгиб.
curve [kə:v] изгиб, кривая.
curved [kə:vd] изогнутый.
cut-off ['kʌtɔof] выключение.
cutting ['kʌtiŋ] подрубка; зарубка; производство вруба.
cutting bit ['kʌtiŋ 'bit] зубок врубовой машины.
cutting edge ['kʌtiŋ 'edʒ] режущая кромка.
cycle [saikl] цикл.
cyclic ['siklik] цикличный.

D

d. c. = **direct current** [di'rekt 'kʌrənt] - постоянный ток.
d. c. motor = direct current motor [di'rekt 'kʌrənt 'moutə] двигатель постоянного тока.
deep mined coal production ['di:p 'maind 'koul prə'dʌkʃn] добыча угля с глубоких горизонтов.
degradation ['degrə'deiʃn] снижение.
deliver [di'livə] подавать; доставлять(ся).
detachable [ditætʃəbl] съемный; запасной.
development [di'veləpmənt] 1) подготовительные работы; 2) развитие; усовершенствование (машин); 3) изобретение;
single entry ['siŋgl 'entri] ~ проходка одинарной подготовительной выработки.
development costs [di'veləpmənt 'kosts] расходы на подготовительные работы.
device [di'vais] механизм; приспособление; устройство;
gumming ['gʌmiŋ] ~ расштыбовщик, расштыбовочное устройство.
dimension [di'menʃn] размер; **overall** ['ouvəro:l] ~ общий размер.
dip [dip] падение.
dirt [də:t] грязь; порода [пустая].
dirt band ['də:t 'bænd] пропласток породы.
discharge [dis'tʃa:dʒ] **I.** 1) разгружать; 2) подавать; 3) выдавать(ся); **II.** разгрузка; **III.** разгрузочный.

disengage ['disin'geidʒ] расцепление; разъединение.
dislodged coal [dis'lodʒd 'koul] отбитый уголь.
dismantling [dis'mæntliŋ] демонтаж, разборка.
double-chain scraper ['dʌbl 'ʃtein 'skreipə] скребковый конвейер с двойной цепью.
drill steel ['dril 'sti:l] буровая сталь.
drilling ['driliŋ] бурение.
drivage ['draivɪdʒ] проходка горизонтальных выработок;
room [rum] ~ проходка камер; проходка выработок.
drive [draiv] **I.** (drove [drouv], driven [drivn]) 1) приводить в движение; 2) проходить [горизонтальную выработку); **II.** привод;
chain [tʃein] ~ цепной привод;
compressed-air [kəm'prest ' ɛə] ~ пневматический привод;
cross conveyor chain ['kros kən'veiə 'tʃein] ~ цепной привод перегружающего конвейера;
hydraulic [hai'dro:lik] ~ гидропривод;
tail [teil] ~ хвостовой привод.
drive unit ['draiv 'ju:nit] узел привода.
driving motor ['draiviŋ 'moutə] приводной двигатель.
driving shaft ['draiviŋ 'ʃɑ:ft] ведущий вал; приводной вал;
main [mein] ~ главный вал.
dust [dʌst] пыль (угольная и др.); **suppress** [sə'pres] ~ бороться с пылью.

E

end [end] конец;
control [kən'troul] ~ часть машины, где расположен механизм управления;
gearhead ['giəhed] ~ часть машины, где расположен приводной механизм;
haulage ['hɔ:lidʒ] ~ подающая часть (комбайна, врубовой машины).
effect [i'fekt] 1) полезное действие; производительность; 2) эффект; 3) результат.
elevate ['eliveit] поднимать.
engage [ingeidʒ] сцепление.
entry ['entri] штрек; выработка; **rise** [raiz] ~ восстающая выработка.
equip [i'kwip] 1) снабжать; 2) оборудовать.
equipment [i'kwipmənt] оборудование; машины.
estimate ['estimeit] планировать; подсчитывать.
estimated ['estimeitid] ориентировочный.

evolve [i'volv] 1) разработать; 2) сконструировать; 3) изобрести.
extensible [iks'tensəbl] раздвижной; растяжимый.
extension [iks'tenʃn] наращивание; раздвижка.

F

face [feis] забой; грудь забоя; лава;
hand filled ['hænd 'fild] ~ забой с ручной навалкой.
facility [fə'siliti] удобство; возможность;
facilities [fə'silitiz] оборудование;
continuous transport ff. [kən'tinjues 'trænspo:t] непрерывный (механизированный) транспорт.
feed [fi:d] (fed [fed]) 1) подавать; подвигать; 2) питать.
feet [fi:t] основание, подошва; футы;
cu. ft = **cubic ff.** ['kju:bik] кубические футы.
fence [fens] заграждение; **safety** ['seifti] ~ предохранительное заграждение.
fig. = **figure** ['figə] 1) рисунок; фигура; 2) чертеж; 3) цифра.
filling ['filiŋ] навалка; погрузка.
fines [fainz] угольная мелочь;
production of ft. [prə'dʌkʃn əv] измельчение угля.
fit [fit] (fit) 1) установить, смонтировать; 2) придавать; 3) снабжать.
fitting ['fitiŋ] замыкающее приспособление, фитинг.
flight [flait] скребок; **cantilever** ['kæntili:və] ~ выступающий скребок.
flitting ['flitiŋ] маневрирование (машины).
floor [flo:] почва или подошва (выработки).
floor shearing blade ['flo: 'ʃiəriŋ 'bleid] нижний нож (для поддирки почвы).
force [fo:s] **I.** сила, усилие; **II.** заставлять, двигать;
pulling ['puliŋ] ~ сила тяги.
former ['fo:mə] прежний;
the former ... the latter первый ... последний.
framework ['freimwə:k] 1) рама; 2) каркас;
main f. [mein] 1) несущий каркас; 2) рама шасси.
ft. = foot [fut] фут (30,5 см).
fulcrum ['fʌlkrəm] 1) ось шарнира; 2) точка вращения; 3) точка приложения силы.

G

gate [geit] штрек.
gear [giə] шестерня, зубчатая передача; привод; механизм;
driving ['draiviŋ] ~ приводная шестерня;
haulage ['ho:lidʒ] ~ ходовая шестерня.
gearhead ['giəhed] механизм привода.

gearing ['giəriŋ] коробка скоростей; привод;
reduction [ri'dʌkʃn] ~ редукционная передача, редуктор;
spur [spə:] ~ цилиндрическая зубчатая передача;
worm [wə:m] ~ червячная передача.
generate [dʒenəreit] генерировать; развивать; подавать; производить.
get [get] (got [got]) добывать (уголь и т.д.).
getting ['getiŋ] добыча (угля и т.д.).
gib [dʒib] скоба.
goaf [gouf] завал, выработанное пространство.
govern ['gʌvən] 1) управлять; 2) указывать; 3) зависеть.
gravity ['grævіti] сила тяжести; тяготение.
grease [gri:s] смазочное масло.
guard [gɑ:d] **I.** 1. охрана; 2. предохранительное приспособление; **II.** предохранительный; внешний.
guide [gaid] **I.** направляющий; **II.** проводник; указатель.
guide rail ['gaid 'reil] направляющий рельс.
gummer ['gʌmə] расштыбовщик;
paddle type ['pædl 'taip] ~ лопастной расштыбовщик;
side-discharge spiral ['said dis'tʃɑ:dʒ 'spaiərəl] ~ спиральный расштыбовщик с разгрузкой штыба на одну сторону;
spiral type ['spaərəl 'taip] ~ спиральный расштыбовщик.
gummings ['gʌmiŋz] штыб, угольная мелочь.

H

hand drill [‘hændril] ручной бур или сверло.
hand loaded ['hænd 'loudid] погруженный вручную.
handle [hændl] 1. нагружать; 2. обращаться; рукоятка;
cutting-speed control ['kʌtiŋ 'spi:d kən'troul] ~ рычаг, рукоятка управления скоростью резания.
handling ['hændliŋ] перегрузка, доставка, транспортировка.
hard alloy ['hɑ:d 'ælɔi] твердый сплав.
haul [ho:l] тянуть; передвигать(ся).
haulage ['ho:lidʒ] откатка.
haulage-rope drum ['ho:lidʒ 'roup 'drʌm] барабан тягового каната.
head [hed] 1) головка; 2) бабка; 3) насадка; 4) напор (воды);
chipping ['tʃipiŋ] ~ 1) отбойная или врубовая головка; 2) бар врубовой машины;
cutting ['kʌtiŋ] ~ режущая или подрубная головка;
loading ['loudiŋ] ~ погружающий конец;
ripping ['ripiŋ] ~ бар врубовой машины.

heading ['hediŋ] выработка;
narrow ['nærou] ~ узкая выработка.
headroom ['hedrum] высота (выработки); пространство, расстояние.
height [hait] высота.
hew [hju:] подрубать, добывать, рубить; ~ **off** отбивать.
holder ['houldə] оправа; держатель, державка.
hole [houl] скважина, шпур.
holing ['houliŋ] направление скважин.
hollow ['holou] полый.
hooked [hukt] загнутый, кривой.
hopper ['hopə] бункер.
horse-power ['ho:s 'pauə] лошадиная сила; сокращенно **h. p.** или **H. P.**
house [haus] помещать(ся), располагать(ся) (о машинах).
hydraulic [hai'dro:lik] гидравлический; водяной.
hydraulic power [hai'dro:lik 'pauə] гидравлическая сила или энергия.
hydraulically [hai'dro:likəli] гидравлическим способом.
hydraulically adjustable turret mounting [hai'dro:likəli ə'dʒʌstəbl 'tʌrit 'mauntiŋ] башенная установка, регулируемая гидравлическим способом.

I

in. = **inch** [intʃ] дюйм (2,5 см).
in conjunction with [in kən'dʒʌŋkʃn wið] в сочетании с..., вместе с... .
incorporate [in'ko:pəreit] 1) включать (в состав); внедрять; 2) вмонтировать; 3) сформовать (в отливке).
inner ['inə] внутренний.
interlock ['intə:'lok] взаимосвязь; шпунтовое соединение; блокировка.
intermediate ['intə:'mi:djət] 1) промежуточный; 2) вспомогательный; 3) сборочный.
intermediate conveyor [intə:'mi:djət kən'veiə] вспомогательный или сборочный конвейер.
in terms of [in 'tə:mz əv] что касается; в отношении.
in turn [in 'tə:n] в свою очередь.

J

jack [dʒæk] домкрат;
hand operated ['hænd 'opəreitid] ~ домкрат, действующий вручную;
head elevator ['hed 'eliveitə] ~ домкрат головного подъемника;
hydraulic [hai'dro:lik] ~ гидравлический домкрат.

jib [dʒib] бар врубовой машины;
curved coal-cutter ['kə:vd 'koul 'kʌtə] ~ изогнутый бар врубовой машины;
horisontal [,hori'zontl] ~ бар для горизонтальной подрубки;
shearer ['ʃiərə] ~ бар для вертикальной подрубки.
joint ['dʒoint] соединение;
ball-and-socket ['bo:l ənd 'sokit] ~ универсальный (шаровой) шарнир;
flexible ['fleksəbl] ~ гибкое, податливое соединение.

K

kerf [kə:f] врубовая или зарубная щель; нижний вруб;
clearing the ['kliəriŋ ðə] ~ очистка зарубной щели.

L

layout ['lei'aut] 1) план, схема; 2) расположение; 3) порядок отработки; 4) план выработок, система разработки.
single unit (face) ['siŋgl 'ju:nit (feis)] ~ разработка одиночным забоем; ведение работ одиночным забоем.
level [levl] горизонт; уровень.
liner ['lainə] втулка, вкладыш; прокладка.
load [loud] грузить; погружать (породу, уголь); нагрузка;
peak [pi:k] ~ наивысшая нагрузка.
tensional ['tenʃnl] ~ нагрузка на растяжение.
loader ['loudə] погрузчик, погрузочная машина;
coal-cutter ['koul 'kʌtə] ~ врубово-погрузочная машина;
duckbill ['dʌkbil] ~ погрузчик с качающейся погрузочной головкой (в виде утиного носа).
loading ['loudiŋ] погрузка.
loading capacity ['loudiŋ kə'pæsiti] производительность при погрузке.
lock off ['lok 'of] отключать, выключать.
longwall coal-cutter ['loŋwo:l 'koul 'kʌtə] лонгвольная врубовая машина.
longwall face ['loŋwo:l 'feis] сплошной забой.
longwall system ['loŋwo:l 'sistəm] система разработки угля сплошным (длинным) забоем.
low [lou] 1) низкий; 2) небольшой.
low-built model ['lou 'bilt 'modl] низкогабаритная машина.
lower ['louə] опускать.
lump [lʌmp] кусок (угля или породы).
lump coal ['lʌmp 'koul] кусковатый уголь, уголь в кусках.
lumpy ['lʌmpi] кусковатый.

M

machine [mə'ʃi:n] 1) машина; 2) механизм; 3) станок; машинный; подвергать механической обработке;

coal-cutting ['koul 'kʌtiŋ] ~ врубовая машина;

ccm-1 coal cutting ~ комбайн;

longwall power loading ['lɔŋwɔ:l 'pauə 'loudiŋ] ~ погрузочная машина при сплошной системе разработки угля;

curved-jib ['kə:vd 'dʒib] ~ комбайн с изогнутым баром.

machinery [mə'ʃi:nəri] 1) машины; механизм(ы); 2) механизация.

main driving shaft ['mein 'draiviŋ 'ʃɑ:ft] главный вал.

main framework ['mein 'freimwə:k] 1) несущий каркас; 2) рама шасси.

maintain [men'tein] поддерживать; ремонтировать; содержать.

management ['mænidʒmənt] управление; дирекция (шахты, рудника).

manshift ['mænʃift] человеко-смена.

means [mi:nz] средство, способ.

mechanized aids ['mekənaizd 'eidz] механизированные приспособления; механизированные устройства.

medium ['mi:diəm] средство.

member ['membə] деталь; член.

mill out ['mil 'aut] измельчать; дробить.

mine [main] | разрабатывать; рудник.

miner ['mainə] **1.** горняк; горнорабочий; шахтер; **2.** горная машина;

auger m. ['ɔ:gə] **1.** шнек; **2.** проходческий шнековый комбайн.

minimize = **minimise** ['minimaiz] уменьшать; доводить до минимума.

mining ['mainiŋ] ведение горных работ; горное дело; разработка полезных ископаемых;

thin-seam m. ['θin 'si:m] разработка маломощных пластов.

mining engineer ['mainiŋ ,endʒi'niə] горный инженер.

mining machine ['mainiŋ mə'ʃi:n] горная машина; врубовая машина.

moisture ['moistʃə] влага.

moisture entering ['moistʃər 'entəriŋ] проникание влаги.

motion [mouʃn] движение; действие;

gathering-arm ['gæðəriŋ 'ɑ:m] ~ действие загребных лап погрузчика;

planetary ['plænitəri] ~ кольцевое движение;

reciprocating [ri'siprəkeitiŋ] ~ возвратно-поступательное движение;

rotary ['routəri] ~ вращательное движение;

to-and-fro ['tu: ənd 'frou] ~ движение туда и обратно, движение вперед и назад.

mount [maunt] 1) устанавливать; монтировать; 2) собрать.
mouth [mauθ] устье.
move [mu:v] передвигать(ся), двигать(ся).
move forward ['mu:v 'fɔ:wəd] подвигаться; продвигаться.
movement ['mu:vmənt] передвижение, движение.
multiple disc clutch ['mʌltipl 'disk 'klʌtʃ] многодисковая или пластинчатая муфта.

N

necessitate [ni'sesiteit] 1) вызывать необходимость; 2) требовать.
non-productive operations ['non prə'dʌktiv ,opə'reiʃnz] непроизводительные работы.
nozzle [nozl] насадка, сопло.

O

offset ['o:fset] (offset) передвигать; отставлять; отступать.
oil [oil] 1) смазочное масло; 2) нефть.
o.m.s. ['ou 'em 'es] см. **output per manshift.**
output ['autput] добыча, производительность;
output per manshift ['autput pə:'mænʃift] 1) производительность на человека в смену; 2) производительность труда.
outside ['aut'said] снаружи; вне; за; наружный; наружная часть;
to the ~ of наружу от.
overall length ['ouvero:l 'leŋθ] общая длина.
overlap [,ouvə'læp] перекрывать; заходить один на другой; внахлестку.

P

paddle [pædl] лопасть; лопатка; лоток; сгребающий.
pan [pæn] решетак;
shaker ['ʃeikə] ~ плоский вибрационный грохот; качающийся конвейер;
swivel [swivl] ~ вращающийся решетак; поворотный решетак (конвейера).
particle ['pɑ:tikl] частица.
pawl [po:l] собачка, защелка, предохранитель.
performance [pə'fo:məns] работа, выполнение.
per minute [pə: 'minit] в минуту.

pick [pik] зубок; кайло;

forcing backward of ['fo:siŋ 'bækwəd əv] ~ вынужденное возвращение зубка в первоначальное положение;

mechanical [mi'kænikəl] ~ отбойный молоток;

pneumatic [nju:'mætik] ~ пневматический отбойный молоток.

pick up ['pik'ʌp] 1) подхватывать; 2) черпать.

piece [pi:s] 1) часть; 2) деталь;

extension pp. [iks'tenʃn] раздвижные детали.

pillar and stall system ['pilər ənd 'sto:l 'sistim] камерно-столбовая система (разработки угля).

pin [pin] шпилька; штырь.

piston ['pistən] 1) поршень; 2) клапан.

pit [pit] шахта.

pitch [pitʃ] шаг; ступень.

plane [plein] плоскость.

plate [pleit] 1) плита; 2) пластина;

base [beis] ~ основная рама;

bottom ['botəm] ~ нижняя плита;

guard ['gɑ:d] ~ предохранительный щит; заслон;

top [top] ~ верхняя плита.

plough [plau] струг (для добычи угля).

ploughing ['plauiŋ] резание угля стругом, работа струга.

point [point] 1) место; 2) точка.

portable ['po:təbl] переносный; передвижной.

power ['pauə] 1) мощность; 2) сила; 3) энергия; 4) степень;

b. h. p. = **British horse power** ['britiʃ 'ho:s] ~ британская лошадиная сила

brake horse ['breik 'ho:s] ~ тормозная лошадиная сила;

h. p. = H. P. = **horse p.** ['ho:s] мощность в лошадиных силах;

swinging ['swiŋiŋ] ~ мощность поворота;

total horse ['toutl 'ho:s] ~ общая мощность в лошадиных силах.

power loading ['pauə 'loudiŋ] механическая погрузка.

pre-determined ['pri:di'tə:mind] заранее определенный; запланированный.

preparation ['prepə'reiʃn] обогащение (угля); подготовка.

prepared coal [pri'pɛəd 'koul] отбитый уголь.

pressure ['preʃə] давление.

prior to ['praiə tə, tu] до; перед.

production [prə'dʌkʃn] 1) выработка; 2) производительность; 3) добыча.

production of fines [prə'dʌkʃn əv 'fainz] измельчение угля.

profile ['proufi:l] фасонный.

project [prə'dʒekt] выступать; выдаваться.
projecting [prə'dʒektiŋ] выступающий (о детали машины).
prop [prop] стойка;
friction [frikʃn] ~ фрикционная стойка;
hydraulic [hai'dro:lik] ~ гидравлическая стойка;
past the face line of pp. ['pɑ:st ðə 'feis 'lain əv] позади линии крепления забоя.
prop and chock withdrawal ['prop ənd 'tʃok wið'dro:əl] удаление стоек и костров.
propel [prə'pel] передвигать(ся).
protruding stem [prə'tru:diŋ 'stem] выдвинутый вперед стержень; выдающийся вперед стержень.
pull [pul] 1) оттяжка; 2) пружинное устройство; 3) скоба.
pulley ['puli] шкив, ролик, блок.
pump [pʌmp] насос;
oil [oil] ~ масляный насос.
push [puʃ] толкать.

R

race [reis] путь; проток.
ramp [ræmp] рама.
range ['reindʒ] диапазон; предел изменений; выбор; степень.
ratchet ['rætʃit] 1) храповик; 2) золотник.
rate [reit] дать в итоге; скорость; степень.
ratio ['reiʃiou] коэффициент; соотношение.
rear [riə] тыловая часть, задняя часть (машины); задний, расположенный сзади.
rear conveyor ['riə kən'veiə] хвостовой или разгрузочный конвейер.
rebuilding [ri'bildiŋ] перестройка; перестановка.
reduction [ri'dʌkʃn] снижение.
reduction gearing [ri'dʌkʃn 'giəriŋ] редукционная передача; редуктор.
reinforce [,ri:in'fos] усиливать, подкреплять.
release [ri:'li:s] ослабление, разъединение; расцепление.
removal [ri'mu:vəl] передвижка; удаление; сдвиг; вскрыша; выемка.
remove [ri'mu:v] удалять; снимать.
renewable [ri'nju:əbl] съемный.
replace [ri'pleis] заменять.
replaceable [ri:'pleisəbl] съемный; заменяемый.
retard [ri'tɑ:d] замедлять; задерживать.
retract [ri'trækt] переставлять в новое положение (бар для зарубки, конвейер, врубовую машину); перемещать(ся); менять ход.
retreat [ri'tri:t] обратный ход; отступать.
retreat work [ri'tri:t 'wə:k] разработка обратным ходом.

reversal [ri'və:səl] изменение направления.
reversing [ri'və:siŋ] реверсивный, реверсирующий.
rib [rib] грудь забоя; стенка целика угля.
rib-side ['rib'said] забой, грудь забоя.
ridge [ridʒ] кровля выработки; выступ (оставляемый в кровле комбайном).
rigidity [ri'dʒiditi] прочность; жесткость.
rip [rip] резать; рыхлить; подчищать.
ripper bar ['ripə 'bɑ:] врубовый бар; бар врубовой машины.
ripping ['ripiŋ] рыхление, резание.
ripping bar or **head** ['ripiŋ 'bɑ: o: 'hed] режущая головка; режущий орган комбайна или врубовой машины.
rise [raiz] восстающая выработка; восстание (пласта);
to the ~ или **on the ~** по восстанию.
rivet ['rivit] заклепка; заклепать.
road [roud] путь; откаточный штрек.
robust [ro'b^st] прочный, крепкий.
rod [rod] 1) штанга; шток; 2) буровая сталь.
roller ['roulə] направляющий ролик, ходовой ролик.
roof [ru:f] кровля.
roof bolting ['ru:f 'boultiŋ] сбалчивание кровли; крепление кровли посредством болтов.
roof support ['ru:f sə'po:t] поддержание кровли.
room [ru:m] камера.
room and pillar system ['ru:m and 'pilə 'sistim] камерно-столбовая система (разработки угля).
room drivage ['ru:m 'draividʒ] проходка камеры; проходка выработки.
rope [roup] канат;
steel wire r. ['sti:l 'waiə] стальной канат.
rotary ['routəri] вращательный, вращающийся.
rotary motion ['routəri 'mouʃn] вращательное движение.
rotating [rou'teitiŋ] вращение; вращающийся.
rotating fingers [rou'teitiŋ 'fiŋgəz] вращающиеся щупальцы; захваты погрузчика.
rotation [rou'teiʃn] вращение;
clockwise ['klokwaiz] **~** вращение по часовой стрелке.
row [rou] ряд;
in two rr. of five [in 'tu: 'rouz əv 'faiv] два ряда по пять (в каждом ряду).
r. p. m. = **revolutions per minute** [,revə' lju:ʃnz pə 'minit] обороты в минуту.
rubber ['r^bə] резина.
rubber belt [' 'r^bə 'belt] резиновая лента (конвейера).

S

safety ['seifti] безопасность; техника безопасности.
safety regulations ['seifti ,regju'leiʃnz] законодательные постановления по технике безопасности и охране труда.
screwdriver ['skru:,draivə] отвертка.
seal [si:l] прокладка; соединение;
external ss. [eks'tə:nəl] внешние соединения.
seam [si:m] пласт;
thick [θik] ~ мощный пласт;
thin [θin] ~ тонкий пласт.
section [sekʃn] сечение; разрез; секция; участок; отрезок.
servicing ['sə:visiŋ] обслуживание.
shaft [ʃa:ft] 1) вал; 2) шахта;
main driving ['mein 'draiviŋ] ~ главный вал привода;
spline [splain] ~ шлицевой вал;
worm-wheel ['wə:m 'wi:l] ~ вал червячного колеса.
share [ʃзə] доля, часть.
shearing ['ʃiəriŋ] вертикальный вруб, вертикальная зарубка.
shearing blade ['ʃiəriŋ 'bleid] подчищающий или сгребающий лемех; сгребающее устройство комбайна.
shift [ʃift] смена (рабочих);
filling ['filiŋ] ~ смена навальщиков и закладчиков;
night [nait] ~ ночная смена.
short wall ['ʃo:t 'w o:l] короткий забой.
shotfiring ['ʃot'faiəriŋ] взрывные работы, взрывание взрывчатого вещества в скважинах.
shovel [ʃʌvl] простая лопата; механическая лопата; одноковшовый экскаватор.
simultaneously [siməl'teinjəsli] одновременно; сразу.
size [saiz] размер;
hole [houl] ~ размер скважины.
slack [slæk] 1) ослабление; 2) угольная пыль.
slack coal ['slæk 'koul] угольная мелочь.
slides [slaidz] 1) салазки; направляющие; 2) ползуны.
slot [slot] паз, впадина (зубка).
smooth operation ['smu:ð ,орə'reiʃn] ритмичная работа; работа без перебоев.
socket ['sokit] муфта, шарнир.
solid ['solid] масса угля, целик.

space [speis] место; пространство; размещать; расставлять.
spanning ['spæniŋ] натяжение; общая длина пролета; глубина подрубки.
speed [spi:d] скорость;
flight ['flait] ~ техническая скорость продвижения врубовой машины или комбайна;
normal rotation ['nə:məl rou'teiʃn] ~ нормальная скорость вращения.
spike [spaik] штырек; шпонка; костыль; оттяжка.
spray [sprei] разбрызгивать; увлажнять; струя, распылитель.
spread [spred] (spread) разъединять, располагать, распространять.
sprocket ['sprokit] звездочка (цепи зацепления); цепное или зубчатое колесо.
stable [steibl] ниша для машины; устойчивый.
stall [sto:l] камера, забой; помещать.
steel [sti:l] сталь;
heat-treated ['hi:t 'tri:tid] ~ термически закаленная сталь.
steep gradient ['sti:p 'greidiənt] крутое падение; крутое залегание угольных пластов.
steer [stiə] управлять.
steering ['stiəriŋ] управление, рулевое управление.
step [step] шаг, ступень, уступ; располагать уступообразно.
step back ['step 'bæk] 1) отступать; 2) выступать; выдаваться.
stop [stop] стопор, замок, защелка.
straight [streit] прямой, правильный.
strength [strəŋθ] сила, крепость.
strip [strip] полоса, планка, прокладка;
wearing ['wɛəriŋ] ~ прокладка, подверженная износу; съемные прокладки.
strip off ['strip 'of] срезать (уголь).
stripper ['stripə] многолезвийный угольный струг.
stroke [strouk] ход.
suit [sju:t] соответствовать; требованиям; быть полезным.
supplement ['s^pliment] 1) дополнить; 2) снабжать.
supplies [sə'plaiz] материалы; оборудование (подаваемое в шахту).
support [sə'po:t] поддержание, опора, крепление;
roof s. [ru:f] поддержание кровли;
setting roof ss. ['setiŋ 'ru:f] установка крепи кровли.
suppress [sə'pres] 1) подавить; 2) бороться (напр., с пылью).
surface ['sə:fis] поверхность.
sweep [swi:p] (swept [swept]) сметать, сгребать начисто; очищать, подчищать.

swing [swiŋ] (swung [swʌŋ]) **I.** вращать, поворачивать; **II.** поворот.
swing through ['swiŋ 'θru:] повертываться (на какой-то угол).
switch [switʃ] выключатель;
reversing s. [ri'və:siŋ] переключатель направления тока;
starter s. ['stɑ:tə] пусковой выключатель.

T

tail end хвостовая часть.
team [ti:m] бригада рабочих.
teeth [ti:θ] (pl от tooth) зубья; зубцы.
telescopic ['teliskoupik] телескопический, раздвижной.
telescopic spline shaft ['teli'skoupik 'splain 'ʃa:ft] раздвижной шпоночный или шлицевой вал(ик).
thereby [' ðɛə 'bai] тем самым.
thickness ['θiknis] мощность; плотность; толщина.
thin ['θin] маломощный.
three-unit construction [' θri: 'ju:nit kən'strʌkʃn] машина, состоящая из трех частей.
thrust [θrʌst] опора; тяга.
timber ['timbə] лесоматериалы; крепежный лес.
timbering ['timbəriŋ] возведение крепи; крепление;
close [klous] ~ сплошная крепь.
tip [tip] кромка, край.
tooth [tuθ:] (pl **teeth** [ti:θ]) зубок режущей цепи;
widely spaced tt. ['waidli 'speist] широко расставленные зубки.
top bearing ['top 'bɛəriŋ] верхнее основание.
total [toutl] **I.** общий; **II.** общее количество; сумма; итог.
track [træk] путь; колея;
caterpillar ['kætəpilə] ~ гусеничный ход, гусеница;
cutter ['kʌtə] ~ путь для врубовой машины.
transmit [trænz'mit] передавать, посылать.
transport ['trænspo:t] транспорт; перевозка; откатка; транспортный, откаточный; [træns'pɔo:t] транспортировать.
travel ['trævl] передвижение; ход.
traverse ['trævə:s] двигаться.
troughed [troft] желобчатый, лотковый.
tub [tʌb] небольшая рудничная вагонетка.
turn [tə:n] 1) оборот; 2) очередь;
in ~ в свою очередь.

turning ['tə:niŋ] разворот (машины).
turntable ['tə:n,teibl] поворотная плита.
turret ['tʌrit] башня.
twist bar ['twist 'bɑ:] стержень с косыми пазами.

U

undercutting [ʌndə 'kʌtiŋ] подрубка.
undulation ['ʌndju 'leiʃn] неровности (почвы выработки).
unit ['ju:nit] агрегат; часть машины; машина; установка; деталь.
unnecessary [ʌn'nesisəri] ненужный, излишний.

V

valve [vælv] клапан; вентиль;
air ['ɛə] ~ воздушный клапан;
automatic cut-off [o:tə'mætik 'kʌt ' of] ~ клапан с автоматическим включением;
water ['w o:tə] ~ водопроводный кран или задвижка.
yield [ji:ld] впускной клапан.
variety [və'raiəti] разнообразие.

W

waste [weist] пустая порода.
wedge [wedʒ] клин.
weight [weit] груз, нагрузка.
weld [weld] сваривать; сварка.
wheel [wi:l] колесо, шкив;
flanged [fleindʒd] ~ колесо с ребордой;
rubber-tyred ww. ['rʌbə 'taiəd] колесо с резиновой шиной.
winch [wintʃ] лебедка, ворот;
reeling ['ri:liŋ] ~ кабестан, бобина, катушка; разматывающая или наматывающая лебедка.
withdrawing [wið'dro:iŋ] удаление.

Y

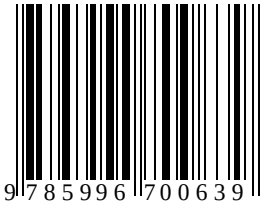
yield [ji:ld] 1) извлекать; 2) добывать; 3) сдавать, быть податливым.

THE LIST OF LITERATURE USED

1. American Mining Congress Journal. – November, 2002.
2. Application of Geology to Engineering Practice. The Geological Society of America, 1988.
3. Boky B. Mining. Translated from Russian by John Scott. – Moscow, 1967.
4. Bateman, Allan. Formation of Mineral Deposits. – London, 1979.
5. Canadian Machinery and metal-working, March, 1990, Toronto, Maclean Hunter Limited., Ohio.
6. Canadian Mining and Metallurgical Bulletin. – June, 1968.
7. Canadian Mining journal. – February, 1989.
8. Engineering and Mining Journal. – July, 1969.
9. Gray J.E., Coolbaugh M.F., Plumlee G.S. and Atkinson W.W., 1994 b, Environmental geology of the Summitville Mine, Colorado: Economic Geology, Special Issue on Volcanic Centers as Exploration Targets, v. 89, no. 8.
10. Introduction to Geophysical Prospecting by M. Dobrin. Second edition. – New York, Toronto, London, 1960.
11. King T.V., ed, 1995 a, Environmental considerations of active and abandoned mine lands: lessons from Summitville, Colorado: U.S. Geological Survey Bulletin 2220, 38 pp.
12. Kreiter V.M. Geological Prospecting and Exploration. Translated from Russian by Alexander Gurevich. – Moscow, 1968.
13. Mining Environment Journal. – July, 2000.
14. Materials Engineering. March, 1991, volume 108, number 3. Penton Publishing, Cleveland.
15. Principles of a Resource / Reserve Classification for Minerals. U.S. Geological Survey Circular, 831, 1980.
16. Robert L. Bates. Geology of the Industrial Rocks and Minerals. Harper and Brothers, N. Y., 1960.
17. Rocks and How They Were Formed. Golden Press. – New York, 1961.
18. Rock product. – April, 1987.
19. Баракова М., Журавлева Р. Английсский язык для горных инженеров. – М., Высш. шк., 2001.
    Материалы из INTERNET ресурсов.

CONTENTS

Св. темплан 2009, поз. 133
ISBN 978-5-9967-0063-9



Заявки на книгу присылать
по адресу: 455000, Магнитогорск,
пр. Ленина, 38, ГОУ ВПО «МГТУ»,
кафедра ин. яз.
Т. (3519) 29-84-48. Факс 29-84-26

Антропова Людмила Ильинична
Биличенко Валентина Игнатовна
Долгушина Татьяна Николаевна

Geology and Mining Machines

Учебное пособие

Компьютерная верстка Л.М. Недялковой
Подписано в печать 10.07.2009. Формат 60х84 1/16. Бумага тип. № 1.
Плоская печать. Усл.леч.л. 7,50. Уч.-изд.л. 7,88. Тираж 500 экз.
Заказ 453.

Издательский центр ГОУ ВПО «МГТУ»
455000, Магнитогорск, пр. Ленина, 38
Полиграфический участок ГОУ ВПО «МГТУ»