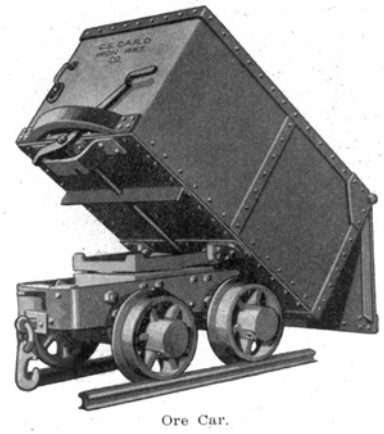
THE SIERRA NEVADA MINES DATABASE

California Gold Rush History

ACADEMIC PACKET



Ore Car.

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The Sierra Nevada Mines Database Academic Packet

California Gold Rush History

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Contents:

Introduction

Welcome to the Sierra Nevada Mines Database Academic Packet. This packet has been developed to supplement the study of the California Gold Rush, and/or Mining Industry by students, teachers and schools. For further information, contact Webcentric Computer Services at the email address above.

The contents of this packet may be copied freely and distributed to students for the classroom. Included are historical fact sheets, illustrations of historic mine mills and equipment, underground workings and educational games. **The content and illustrations are Copyright 2005 with All Rights Reserved, and are licensed for classroom use only.** Educators may choose which information and activities to include, however, each sheet chosen must be copied as is, with no alteration.

The Sierra Nevada Mines Database is a work in progress and currently lists historical mines in Amador, Calaveras and Alpine counties. Mining has been very important to California both in the present and in the past. Mining was a major industry in many California counties historically, and helped drive the tremendous changes that took place in the state from 1848 to 1930.

Although mining in California has mostly ceased due to environmental and labor costs, the demand for minerals still increases at an amazing rate. More metal and mineral products have been used in the United States, Europe and the rest of the world since World War II than were used in the entire previous history of the world, and the need for minerals rises each year. The sale of metal, minerals, and products manufactured from them, continues to increase in importance as a source of United States income overseas.

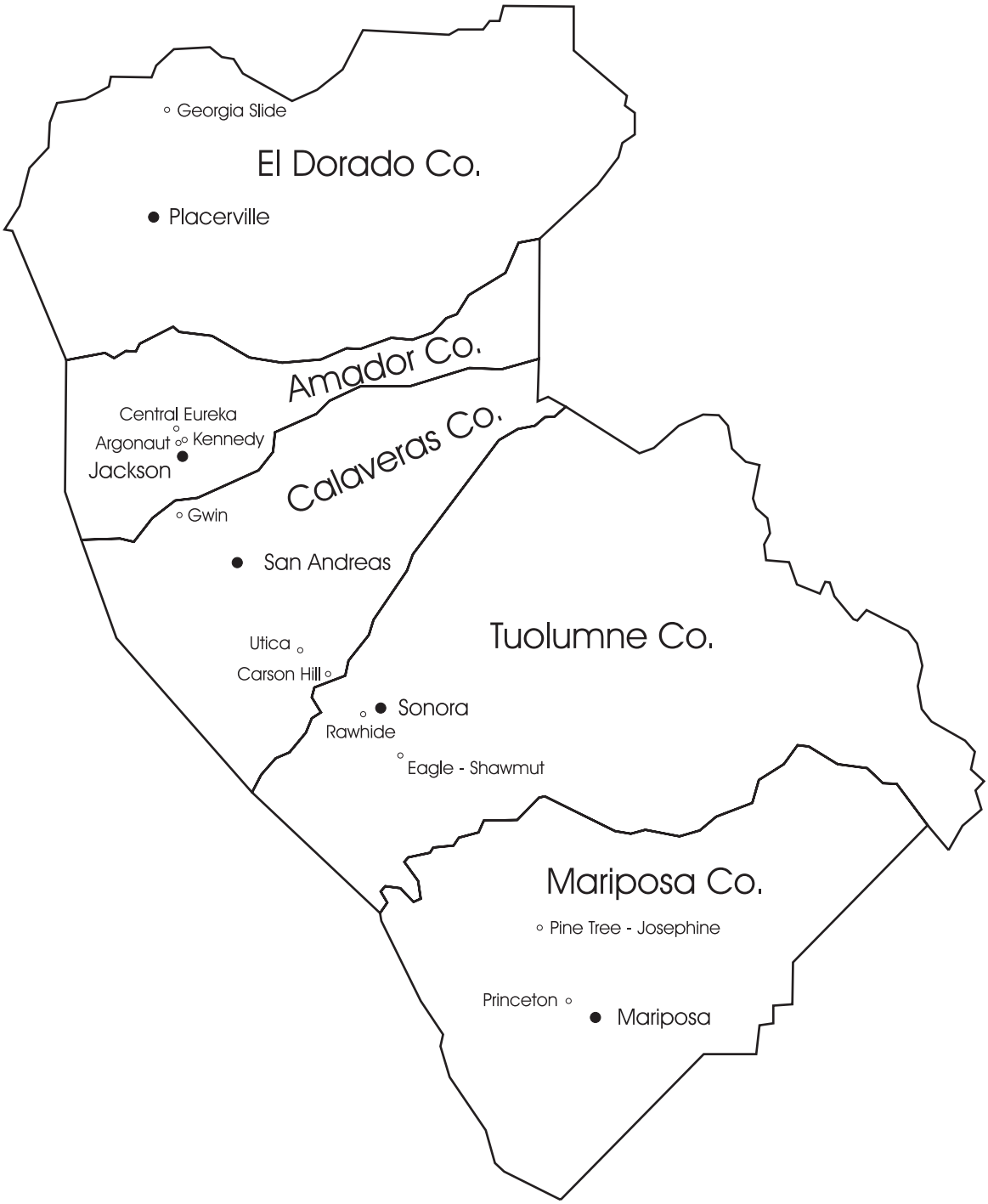
Our society receives major benefits from mineral production. For example, copper is used in many industries. Today's major copper mining activity in the West takes place in the copper mines of Arizona, New Mexico, Utah, Nevada, and Montana. Without these mines, copper could not be produced in large quantities and at low cost, allowing its general use in mass production of electrical power, machinery, engines, electronics, communications, transportation, and other conveniences enjoyed by all of us. Historic California towns such as 'Copperopolis', historic copper mines such as the Penn Mine and the 'Copper Belt' as well as the 'Gold Belt' that runs through Amador and Calaveras Counties were and are a vital part of California's mining and historic past.

Minerals such as lead, zinc, silver, gold, iron, coal, tungsten, uranium and many more enable industry to give us thousands of vital and important products that we use every day. Take a look at the 'Mystery Mining Quiz' in this packet to understand a small part of how minerals affect our daily life. A healthy mining industry is important to the economy of the United States. The future need for minerals will not decrease unless there is a major downward turn in the standard of living that people enjoy.

This educational packet and the Sierra Nevada Mines Database allows students to take a look back at the mining industry historically, while getting a feel for the men, equipment, and importance of mining today. We use the Historic Kennedy Gold Mine in Jackson, California as an example. The Kennedy Mine is open for school tours, you may contact them for details at: www.kennedygoldmine.com . **Several fun games and educational exercises have been included for use in the classroom. These emphasize critical thinking skills, drawing, reading, math, science and comprehension skills. They lend themselves well for further discussion in the classroom.**

If you are using this material in your classroom or for your studies, please email us. We would appreciate your suggestions and feedback on this packet, thank you.

MAJOR GOLD MINES OF THE MOTHER LODE



CALIFORNIA MINING HISTORICAL TIMELINE – 205 YEARS

1775: First discovery of gold in California in Imperial County.
1828: Placer gold deposit found in San Diego County.
1835: Placer gold deposit found in Los Angeles County.
1848: Gold nugget discovered at Sutter's Mill at Coloma on the American River by James Marshall. General John Bidwell discovers gold in the Feather River. Major Pearson Reading discovers gold in the Trinity River. The 1848 Gold Rush begins.
1849: Mariposa Mine in Mariposa County begins quartz mining. First stamp mill in the state is installed.
1850: Quartz found at Gold Hill in Grass Valley has gold. Mining began here that lasted over 100 years.
1852: California gold production reaches $81 million dollars.
Hydraulic mining begins north of Nevada City at American Hill, and in Placer County.
Placer County miners begin underground mining of ancient river channels.
1853: Columbia, in Tuolumne County, becomes one of the biggest Goldrush cities in the state because of local placer mining.
1854: The largest mass of gold ever discovered in California was found at Carson Hill, Calaveras County. It weighed 195 pounds.
1855: Surface placers are exhausted. Rivers are now being mined.
1859: Miners in Butte County find a 54 pound nugget. After a celebration, they melt it down.
The Comstock Silver Rush in Nevada begins, many gold miners leave. Gold & silver prospecting in California increases.
1860: Four mining claims are filed near Jackson, which later become the Kennedy Mine on 4-2-1870.
1864: The 1848 California Gold Rush officially ends, placers are exhausted, but hydraulic and hard rock mining continues.
1868: First air drills for hard rock mining are introduced.
1876: Bodie district in Mono County has a Gold Rush.
1880: Hydraulic mining reaches its peak. Many reservoirs, tunnels, water ditches and flumes are built to carry water to service the mines.
1884: Judge Lorenzo Sawyer oversees a lawsuit in the case of Woodruff v. North Bloomfield Gravel Mining Company. The dumping of debris in the Sacramento and San Joaquin Rivers and the streams and creeks that flow into them is prohibited. Most hydraulic mining shuts down. Some continue to operate by using containment dams. Drift mining is used instead.
1890: Great improvements in mining and milling equipment are introduced for the next 20-30 years. This enabled many low grade gold deposits to be profitably worked. Air drills, explosives, pumps, and electric power lowered costs. Rock crushers, larger stamp mills and concentrators such as Frue vanners were more efficient. Chlorination was used in the milling process.
1893: The Caminetti Act was passed by the legislature which formed the California Debris Commission. This act and subsequent later laws forced mines to impound their tailings behind dams to keep debris out of streams and rivers. Gold is discovered in Kern County.
1896: Cyanide plants begin to be used to process tailings and start to replace the chlorination process at the mill.
1898: Gold dredging becomes a major industry with the first successful bucket-line dredge on the Feather River near Oroville.
1914: The Kennedy Mine builds and operates four tailing wheels to move tailings to an impound dam.
1922: Disastrous Argonaut Mine Fire on the 3550 foot level kills 47 miners. Heroic attempt to reach them from the Kennedy Mine is too late. Both mines are out of commission for some time.
1933: The Kennedy Mine cyanide plant is constructed to recover gold from the tailings.
1942: World War II. War Production Board Limitation Order L-208 shuts most mines. The Kennedy Mine the deepest mine in North America at 5,912 vertical feet, with over 50 miles of workings, closes.
1945: Order L-208 is lifted, but most mines are flooded, costs are too high, and they are unable to reopen. Only a few gold mines in Grass Valley, Alleghany and Sutter Creek were opened.
1953: The last remaining mine on the Mother Lode, the Central Eureka mine at Sutter Creek, closes.
1965: Gold was declared to be the official mineral of the State of California. The last remaining continuously operating lode gold mine, the Sixteen-to-One at Alleghany, Sierra County, closes.
1968: The last remaining gold dredge at Hammonton was shut down and ended the last commercial gold mining operation in California.
1980: The price of gold exceeded $600 per ounce.

MINING CLAIMS

A mining claim is a particular parcel of land, where a valuable mineral deposit is discovered. The claim is restricted to the mining and removal of the mineral deposit. Anyone who is a citizen of the United States or has declared an intention to become a citizen may locate a mining claim on Federal land. Claims may not be staked in areas closed by a special act of Congress, regulation, or public land order such as: National Parks, National Monuments, Indian reservations, most reclamation projects, military reservations, scientific testing areas, and most wildlife protection areas (such as Federal wildlife refuges). Also, lands withdrawn from mineral use for other reasons such as: power development, designation as a wild portion of a Wild and Scenic River, or withdrawn for study by Congress for such purposes, cannot be claimed.

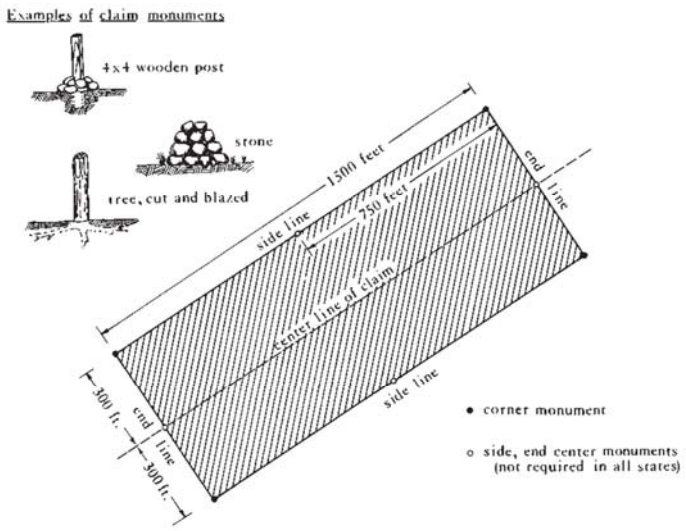


Figure 1.—Lode mining claim.

The 1872 Federal Mining Laws allow States to establish their own laws regarding the manner in which mining claims and sites are located. Most States have statutes and regulations adding to the Mining Law concerning the actual staking and recording of mining claims. State regulations should always be checked first.

There Are Two Types of Mining Claims: Lode and Placer.

Lode Claims: A lode deposit may be formed from cracks or 'veins' in the rock that have been refilled with quartz or other stone which carry gold, silver, lead, tin, copper, or other valuable minerals. Federal law limits the claim size to a maximum of 1,500 feet in length along the vein or lode. Their width is a maximum of 600 feet, 300 feet on either side of the centerline of the vein or lode on the surface. The end lines of the lode claim must be parallel. An adit or shaft is dug into the claim to develop a vein or lode. These may also be used for the discovery of unknown veins or lodes underground. Lode claims can include any or all unknown veins or lodes crossed by the workings. These are "extralateral rights": the right to mine minerals that extend under the ground beyond the vertical boundaries of the claim. This includes all veins, lodes, or ledges throughout their entire depth, if they begin inside of the surface claim lines extended downward vertically, even though such veins may extend outside the vertical side lines of the surface location. The area claimed must not extend under private land, however.

Placer Claims: include all other mineral deposits that are not lode claims. Originally, these included only deposits of loose materials, such as sand and gravel from ancient or existing river and stream beds, containing free gold or other minerals. Now, many nonmetallic bedded or layered deposits, such as gypsum and high calcium limestone, are also considered placer deposits. The maximum size of a placer claim is 20 acres per person. An association of 2 to 8 or more persons, may claim 20 acres per person up to a maximum area of 160 acres, but all must work the claim.

Generally, Staking a Mining Claim Includes:

(1) Prospecting for and finding a valuable mineral.
(2) Erecting corner posts or rock monuments as required, marking the boundary of the claim.
(3) Posting a notice of location on a post or monument in a conspicuous place, usually the point of discovery which includes name, date and legal description of the claim boundary.
(4) Filing official notices of claim location with the county recorder and with the Bureau of Land Management, Division of Mines. There are fees charged that must be paid.
(5) Working the claim each year, along with annual maintenance fees which must be paid each year.

THE FAMOUS KENNEDY MINE TAILING WHEELS

Mining in California was done by hydraulic, lode and placer methods. All of these used, and affected local waterways in some degree. Hydraulic mining, which used thousands of gallons of water under pressure to wash whole mountains away, was so damaging and created so much silt and erosion that farmland and ship navigation were severely impacted on and near the rivers. Farmers could not ship their goods to market. Ship channels had to be dredged out at considerable cost. Millions of dollars in damage resulted, and an uproar amongst both farmers and captains of commerce culminated in a major lawsuit in 1884: Edwards Woodruff vs. North Bloomfield Gravel Mining Co., et al defendants. Federal 9th Circuit Court judge Lorenzo Sawyer and District Judge Matthew Deady ruled against the North Bloomfield Mine in Nevada County, ordering an immediate halt to dumping tailings into rivers and streambeds. The Federal Caminetti Act passed in 1893 allowed hydraulic mines to reopen only if they built impoundment dams to catch their tailings.

In addition, placer mining had impacted local streams and rivers, especially during high water in the winter which carried tailing sediment down to damage farm land in the Jackson and Ione Valleys in Amador County. By 1912, lode mines like the Kennedy and the Argonaut in Jackson, who had for years piled tailings on the property and flushed mine water down Jackson Creek, found that they too were subject to the law which now forced the mines to either impound their tailings or go out of business.

Some mines found no way to deal with all the tailings they generated. The Zeila Mine in south Jackson closed. The Argonaut moved its mill from below, to on top of a hill above Jackson so that it could run tailings down the other side. The Kennedy mine came up with a unique solution. Giant wooden elevator wheels had been used in the Lake Superior Copper Mines and South African mines prior to 1902 to move tailings, and a mine in Montana was using the same system. Up to 60 foot in diameter wheels lifted tailings in buckets on their inside peripheries to dump them in elevated flumes. This method would enable the Kennedy to carry the tailings away from the mine and Jackson Creek, up a hill to an impound dam which would be built to house the tailings. Kennedy engineer James Spears was sent to Montana to study the wheel system and bring back a design.

Built between 1912 and 1914, four 56 foot in diameter Kennedy elevator wheels were housed on concrete platforms, each enclosed and protected by a roofed building. Each wheel had 16 spokes and 208 wooden 5.25 gallon capacity buckets, which were bolted to the inside rims. A 40 foot wooden pulley on each wheel, made of laminated wood, was driven by a canvas belt with a 25 horse-power motor and a gear ratio of 3 to 1. This enabled the wheels to turn at a rate of about 14 revolutions per minute. The buckets lifted the tailings about 38 feet in height with each wheel, and emptied into sections of flume totaling 2000 feet in length which connected the wheels with the mill and so carried the water and tailing slurry up the hills to an impoundment dam south of the head frame.

The elevator wheel system successfully operated from 1914 to 1942. In 1942, after the issuance of the WWII War Production Board Order L-208 limiting mining, and because of a shortage of labor plus high costs, most gold mines including the Kennedy were shut down. The equipment and the buildings housing the mill and wheels were sold. Because there were no longer buildings protecting the wheels from the weather, the fragile wood was exposed to the elements. Two of the original four wheels have rotted and collapsed. The remaining wheels are currently in a state of arrested decay. Recently, considerable restoration work was done, a parking lot for visitors was constructed, and the wheels continue to be maintained by the City of Jackson.

Photo © 2004 by Webcentric Computer Services

MINE HOISTING SIGNALS

SIGNALS FROM MINE TO HOIST ENGINEER

2-1 BELLS, TO HOIST ROCK

I BELL, TO STOP IF IN MOTION

1-2 BELLS, TO RELEASE SKIP

2 BELLS, TO LOWER

3-1 BELLS, MAN ON; RUN SLOWLY; MEN TO BE HOISTED

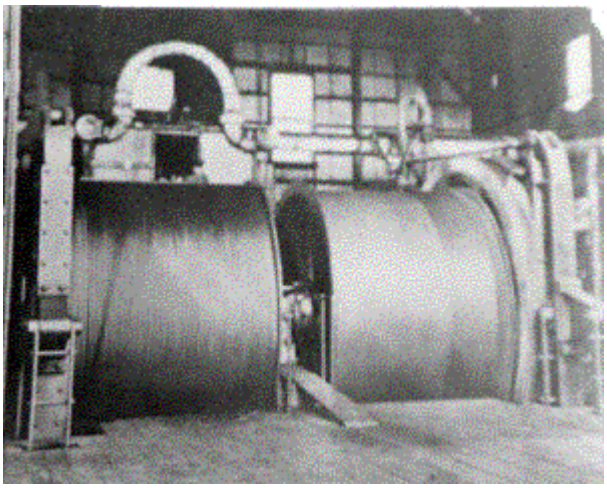
3-2 BELLS, MAN ON; RUN SLOWLY; MEN TO BE LOWERED

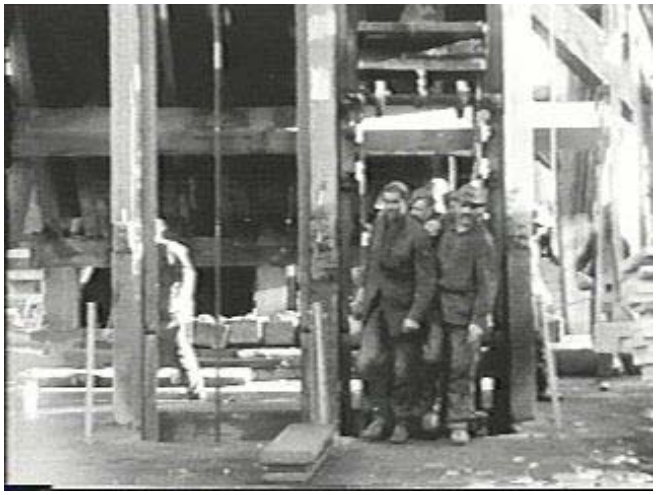
7 BELLS AND REPEAT; ACCIDENT

3-3-1 BELLS, HOIST CAUTIOUSLY

3-2-1 BELLS, READY TO BLAST

AFTER SIGNAL "READY TO BLAST" ENGINEER MUST GIVE HIS SIGNAL
WHEN HE IS READY TO HOIST- ENGINEER'S SIGNAL THAT HE IS READY TO HOIST,
IS TO RAISE THE SKIP TWO FEET AND LOWER IT AGAIN.





The hoist, winch and cable drums lowered the miners into the main shaft under the head frame of the Kennedy Mine in Jackson, California. In the early days, mules were also lowered into the mine to help pull the heavy ore cars. A fully loaded ore car weighed close to a ton (2000 pounds).

Digital stills from “A Vintage Film of Kennedy Mining and Milling Co. Circa 1914” - Webcentric Computer Services
This film is shown during the Kennedy Mine tour and a video is available for purchase: www.kennedygoldmine.com

THE AMALGAMATION – CONCENTRATION MILL

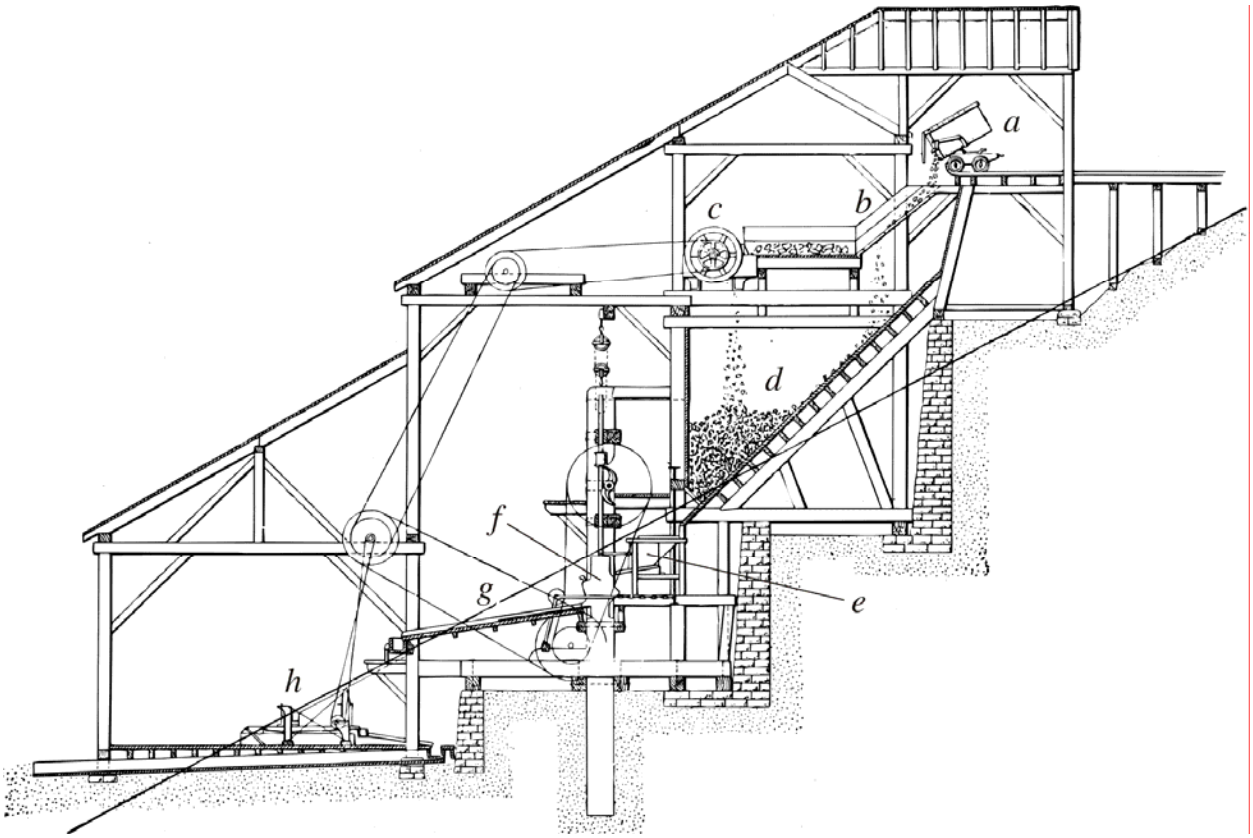
In this example of a gold mill, the ore was brought from the mine by an ore car *(a)* either by hand or mules and was dumped onto an inclined grating, known as a grizzly *(b)*. As the ore slid down the grizzly, all the ore that was small enough to pass through the grate fell directly into the ore bin *(d)*. Ore that was too large was run through a jaw crusher *(c)* to reduce it to the appropriate size. This system was used to reduce the load on the crusher, as any ore that was already small enough was sent directly to the ore bin. Kennedy ore consisted of free gold in quartz with auriferous* pyrite and galena.

The ore feeder *(e)* fed ore from the ore bin into the stamp battery *(f)* at a constant rate. In the stamp battery, stamps were raised by a cam and dropped into the mortar, pulverizing the ore into pulp. In 1892, the Kennedy Mine mill was using forty stamps weighing 850 pounds each, dropping eighty-five times a minute. By 1920, the mill had 100 stamps weighing 1250 pounds each. The noise of the dropping stamps could be heard for miles.

The pulp was then washed with water over the apron plate *(g)*, which was a long flat sheet of copper electroplated with silver and coated with mercury. The gold that was freed from the rock by stamps dissolved in the mercury and the gold-mercury amalgam stuck to the plate. The amalgamation did not occur evenly over the plate, but in ridges which mill workers had to periodically scrape off using a stiff whisk-broom or a piece of rubber attached to a board. Amalgamation also took place on plates inside the battery, which also had to be cleaned. This amalgam was then heated so that the mercury evaporated, leaving the pure gold behind.

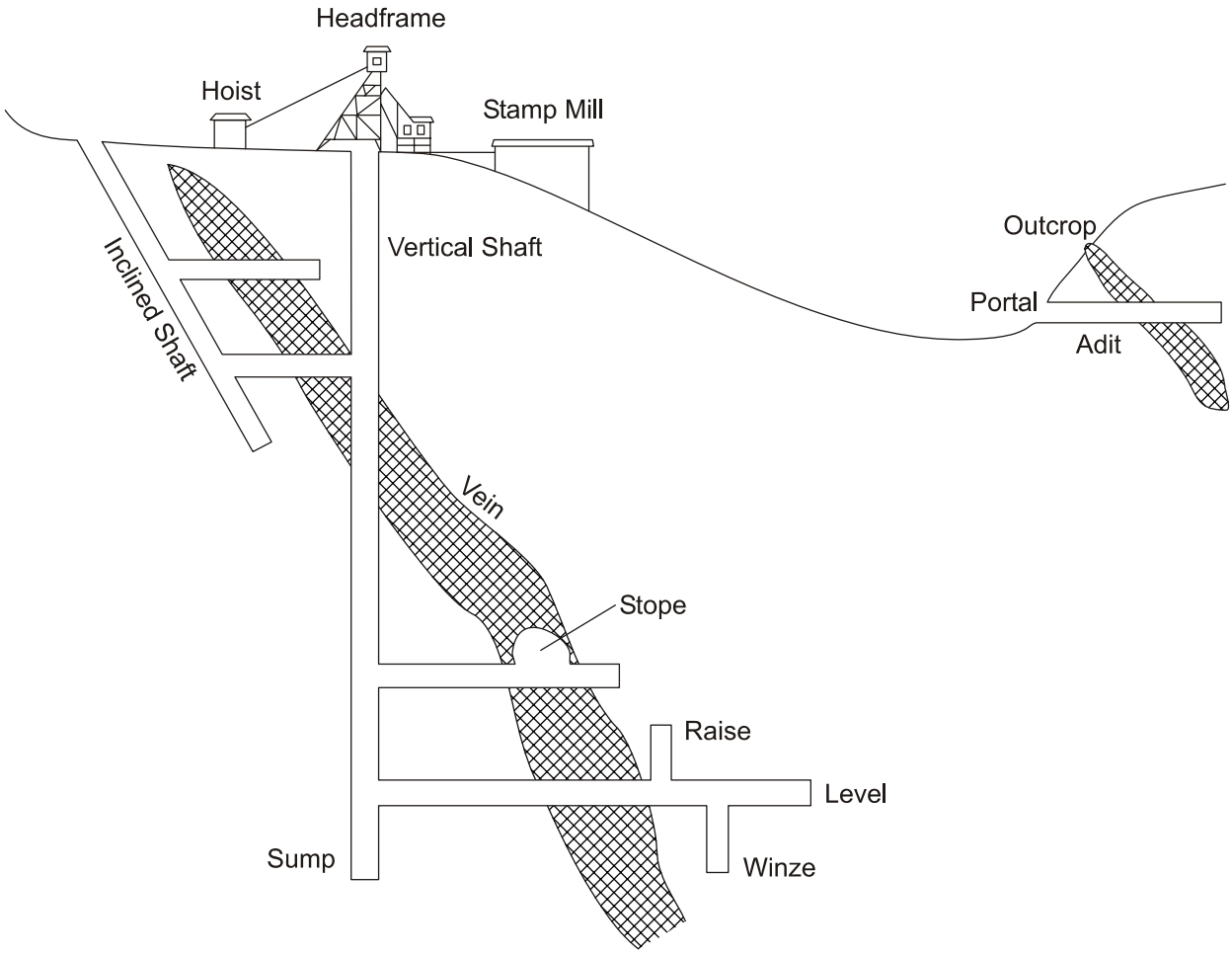
If the ore contained gold-bearing sulphurets** then the pulp was sent to a concentrator such as a Frue Vanner *(h)* after passing over the apron plate. In 1920, the Kennedy mill had 42 Frue vanners. The concentrator consists of a vibrating rubber conveyor belt set on a slight incline. The sulphurets, being heavier, settled onto the belt and were carried to a holding bin while the lighter material was washed away as tailings. The gold was then freed from the sulphurets by the Plattner chlorination process, in which the sulphurets were roasted in a furnace and subjected to a series of chemical reactions. By 1892, the Kennedy Mine had erected a three ton capacity chlorination plant.

*Auriferous = gold. ** A Pacific Coast mining term meaning metallic ore; sulphides; usually applied to gold-bearing pyrites.

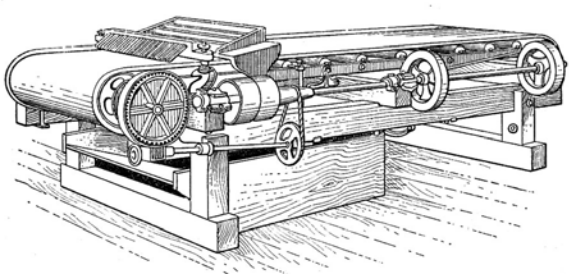


UNDERGROUND WORKINGS OF A MINE

A Simplified Drawing of the Kennedy Mine
and the Jackson Gate (Massa) Mine
of Jackson, Amador County, California



MYSTERY MINING QUIZ



What is this Mysterious Machine?

The Frue Vanner was used to separate gold from the crushed tailings in the Amalgamation-Concentration Mill.
It was installed after the stamp battery and the apron plate. The long slanted belt rolled upwards and shook at the same time.
Light materials moved to the bottom, heavy metallic minerals moved to the top for easier removal.
In 1920, the Kennedy Mine mill had 42 Frue Vanners installed.

Mining is one of the most important industries in the United States and the World. Minerals are used to make many products that all of us use every day. Here are just a few examples. See if you can choose which mineral is used to produce each product. Draw a line from the mineral to its use. No minerals can be used more than once in this game.

Your bicycle	DIATOMITE
The picture tube in your Television:	BARITE
The filament in your bedroom light bulb:	GOLD
Your car's airbags:	GYPSUM
Mother's ceramic coffee cup:	LEAD
Spot's kitty litter:	LITHIUM
The sheet rock wall in your kitchen:	SILVER
Family bathroom mirror:	COPPER
School computer	TUNGSTEN
Uncle Bob’s Bowling ball:	IRON

WHAT IS IT?

This is your first day on the job at a busy gold mine that is just starting up in 1914. Crates of machinery have been delivered and opened. The boss wants you to identify and set up all the new equipment that will be needed in the mine. Can you tell what each piece of equipment is by looking at the picture and matching it to the name? Hint: read your Mining Academic Packet for valuable clues. Write the number of the equipment under the picture of the object. Write what it is used for in the space next to the word.

1] Grizzly

2] Headframe

3] Ball mill

4] Ore car

5] Miners candlestick

6] Frue Vanner

7] Tailing wheel

8] Stamp Mill

9] Furnace

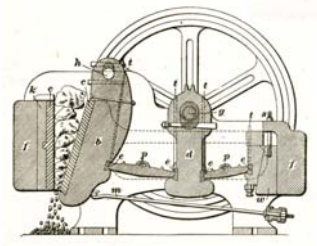
10] Miners pick

11] Crucible

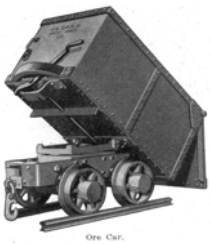
12] Jaw crusher

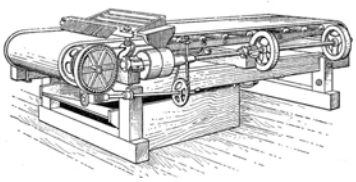
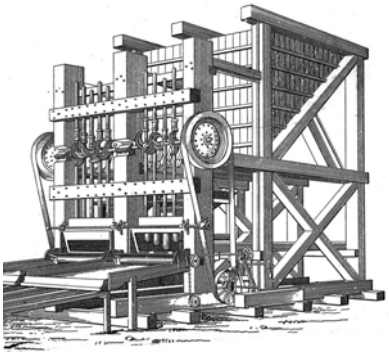
13] Gold pan






MORE ACTIVITIES: FUN WITH MINING

DRAW YOUR OWN MINE

Using the Kennedy Mine diagram as a guide, draw your own mine. Name the mine, and label the different parts. Show where the ore vein is. What kind of ore is it? How is the ore important and what is it used for? Write about your mine and your mill and explain what equipment you will use to process the ore.

DRAW A MINER

Using your imagination, draw a miner to work in your mine. Show what he would have worn. What kind of clothes, hat and shoes would he have worn? Show his tools that he will use to work in the mine. What will he use for light? What will he need for safety? How will he get the ore out of the mine? Write about what his work day will be like.

DRAW YOUR MINING CLAIM

Using the Mining Claims sheet as a guide, draw your claim boundaries. Measure carefully and write down the measurements. Mark them with posts. Make an imaginary claim notice. Are you making a Placer claim or a Lode claim? What kind of ore have you discovered? How is the ore important and what will it be used for?

BE A MINING ENGINEER

You are a mining engineer for a new gold mine. The claim is close to a large creek, with lots of fish and wild life. The claim was made there because the creek has washed past a quartz ledge and gold has been found in the stream bed below the ledge. You must engineer the mine so that the tailings will not harm the creek and the fish. What will you do? Write down your plans, and draw a picture to illustrate them.

BE A MINE INSPECTOR

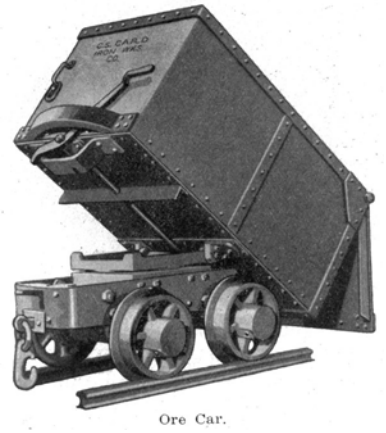
You are a mine inspector working for the California Department of Mines. Your boss has asked you to write a report about the Kennedy Mine. Research the mine on the Internet by going to www.kennedygoldmine.com and to the Sierra Mines Database at www.web-centric.net/mines/ Write down key facts and then write your report in your own words. Describe the mine, tell about what equipment was used, and how much ore was produced. Include as many important facts as you can.

BE A CARTOGRAPHER

A cartographer draws maps. Using the Mother Lode Map in this packet as a guide, add more Gold Rush cities and towns. Draw in the Mother Lode vein. Draw in Hwy 49 and other major roads. Add in major rivers and lakes. Add in the bordering counties. Hint: Find maps of the area in your school library. Tell why good maps were important to miners, prospectors, farmers, businessmen, and the ordinary person?

MINING VOCABULARY

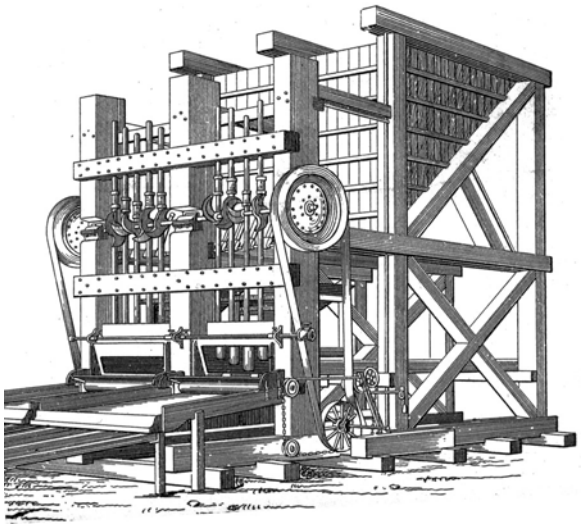
Adit: horizontal or nearly horizontal passage driven from the surface for the working or dewatering of a mine. If driven through the hill or mountain to the surface on the opposite side, it would be a tunnel.
Amalgamation: combining mercury with another metal such as gold or silver. Gold bearing minerals, after crushing, are allowed to come in contact with mercury in stamp mill batteries, sluices or mercury-coated copper plates. The small particles of gold easily unite with mercury, making it easier to collect the gold. The alloy (amalgam) is then collected and the mercury is later removed, leaving the gold.
Assay: the process of measuring the percentage of gold in an ore sample.
Ball mill: a rotating horizontal cylinder with a diameter almost equal to the length, supported by a frame or shaft, in which materials are ground using steel balls. The ground material is usually discharged through a screen. Used from 1898, installed at the Kennedy Mine in 1931.
Change house: building where miners changed clothes before and after their work shift.
Claim: land that is staked out with paperwork filed and recorded for mining purposes.
Crucible: a melting pot; a cup-like container used for melting metal.
Drift: tunnel dug horizontally from the adit following the ore ledge or vein.
Face: any part of a mine where rock is to be blasted loose.
Furnace: where assay samples are heated to the melting point.
Gold: a yellow metallic element, one of the heaviest substances known. Symbol Au; atomic weight 197.2, specific gravity, 19.2 to10.4. The most malleable and conductive of all metals. Used in many products such as computers, satellites, phones and electronics, also used for jewelry, money, and other products.
Gold pan: a shallow pan used by miners to separate gold nuggets, flakes and dust from dirt and gravel.
Grizzly: a grating of iron or steel bars for screening ore.
Hard rock mining: lode mining. A lode deposit may be formed from cracks or 'veins' in the rock that have been refilled with quartz or other stone which carry gold, silver, lead, tin, copper, or other valuable minerals.
Headframe: structure over a mine shaft which holds a pulley for the steel cable that raises and lowers the skip in the mine shaft.
Highgrading: stealing rich ore. Miners at the Kennedy were required to take showers and change their clothes after work while being inspected, to help prevent theft.
Hoist: an engine for raising ore and water from a mine and for lowering and raising men, material and machinery utilizing a drum and steel cable.
Iron pyrite: a common, metallic looking Iron Sulphide; an isometric mineral, FeS_2; crystallizes in cubes; sparks readily if struck by steel; pale bronze to brass yellow in color; hardness varies from 6.0 to 6.5; occurs in veins, in igneous rocks, and in metamorphic rocks; a source of sulfur. Also known as 'fool's gold' because many inexperienced miners found it while prospecting and thought it was gold.


Ore Car.

Jaw crusher: A machine for reducing the size of materials by impact or crushing between a fixed plate and an oscillating plate, or between two oscillating plates, (forming a tapered jaw) before sending the ore through a stamp mill.
Lode: a fissure or vein in rock filled with minerals, a vein producing valuable metallic ore between definite boundaries, as in the Mother Lode.
Milling: the process of dressing ore by crushing, stamping, amalgamation, leaching, etc. to separate the gold from the base rock.
Miners candlestick: iron candle holder with a circular ring at one end and a spike for driving it into mine timbers on the other end. Used for lighting mines before carbide lanterns and electric lamps.
Miners pick: a heavy iron or steel tool pointed at one or both ends with a wood handle.
Mother Lode: The California Mother Lode was a band of gold bearing rock that extended from El Dorado County, through Amador, Calaveras and Mariposa Counties. Many large gold mines were situated on it.
Muck: the debris left after blasting hard rock in a mine. The Mucker was a miner who cleared up the muck by shoveling it into the mine car.
Mule: an animal bred from a horse and donkey used in mines to pull ore cars, and on the surface in teams to pull logging, lumber and supply wagons. Mules were used because they had greater endurance and were stronger and less excitable than a horse.

MINING VOCABULARY, cont.

Ore: mineral rock that contains precious or useful metals such as gold or silver.
Ore car: a mine car for carrying ore or waste rock with a dumping mechanism. Pushed or pulled along iron tracks or rails by miners or mules, the cars could weigh nearly a ton when fully loaded.
Prospecting: searching for new ore deposits usually by digging shafts, drifts, pits, drilling, ditching or other similar work.
Raise: a mine shaft driven upward from a level to connect with the level above, or to explore the ground for a limited distance above one level. After two levels are connected, the connection may be a winze or a raise, depending upon which level is taken as the point of reference.
Refining: separating the metal wanted (gold) from combinations of metals (gold-mercury).
Shaft: a vertical or nearly vertical opening of a mine.
Skip: a large hoisting bucket which slides between guides in a shaft or on wheels running on rails in inclined shafts. Used to raise and lower men, mules, and equipment, into and out of the mine. Also used to raise ore to the surface and to de-water the mine (water skip).
Stamp mill: a machine, and the building containing it, in which crushed rock is crushed even smaller by descending rods with stamp shoes, usually lifted and dropped by a cam, and operated by water power, steam power or later on by electric motor. Usually arranged in groups of five, each stamp weighed up to 2000 pounds and dropped 6 to 8 inches. Each stamp battery dropped up to 100 times per minute, and could be heard for miles. Amalgamation was usually combined with the crushing when gold or silver ore was processed. The Kennedy Mine's stamp mill dates from 1886.



Stope: any excavation in a mine, other than development workings, made for the purpose of extracting ore. The outlines of the ore body determine the outlines of the stope.
Sump: an excavation made at the bottom of the shaft, beneath the last level to collect ground water. The Kennedy removed collected water during the night by lowering water skips into the sump, filling them and bringing the water to the surface. After 1942 when the Kennedy was closed and no longer 'dewatered', the entire mine filled with ground water.
Tailings: the waste material left after ore has been crushed and the desired mineral removed. At first dumped near the mine entrance, after 1914 the Kennedy Mine used large tailing wheels to move the mine tailings to an impound dam away from the mill site.
Vanner: a machine for dressing ore; an ore separator. (See Mystery Mining Quiz for a Frue Vanner).
Vein: a rock fissure re-filled by mineral matter. Many valuable minerals are co-deposited with other rock in veins. Usually the formation is steep to vertical, unlike a bedded deposit in which values are sandwiched horizontally. A vein is typically long, deep, and relatively narrow.
Winze: a vertical opening driven downward connecting two levels in a mine. When one is standing at the top of a completed connection the opening is referred to as a winze, while when standing at the bottom, the opening is a raise, or rise.

MYSTERY MINING QUIZ ANSWER SHEET

Mystery Mining Quiz Answers

Your bicycle:	….. Iron
The tube in your TV:	….. Lead
Bedroom light:	….. Tungsten
Car airbags:	….. Gold
Ceramic cup:	….. Lithium
Kitty Litter:	….. Diatomite
Wall in your kitchen:	….. Gypsum
Bathroom mirror:	….. Silver
School computer:	….. Copper
Bowling ball:	….. Barite

WHAT IS IT? ANSWER SHEET

This is your first day on the job at a busy gold mine that is just starting up in 1914. Crates of machinery have been delivered and opened. The boss wants you to identify and set up all the new equipment that will be needed in the mine. Can you tell what each piece of equipment is by looking at the picture and matching it to the name? Hint: read your Mining Academic Packet for valuable clues. Write the number of the equipment under the picture of the object. Write what it is used for in the space next to the word.

1] Grizzly

2] Headframe

3] Ball mill

4] Ore car

5] Miners candlestick

6] Frue vanner

7] Tailing wheel

8] Stamp mill

9] Furnace

10] Miners pick

11] Crucible

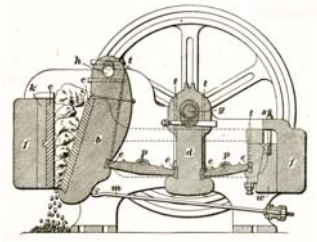
12] Jaw crusher

13] Gold pan

11

10

7



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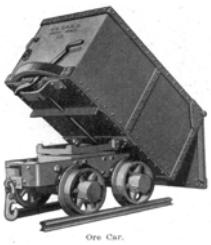

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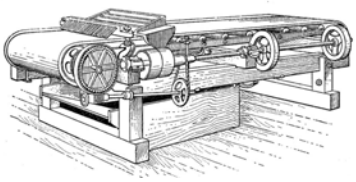

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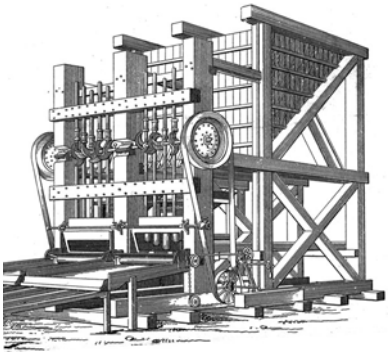

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