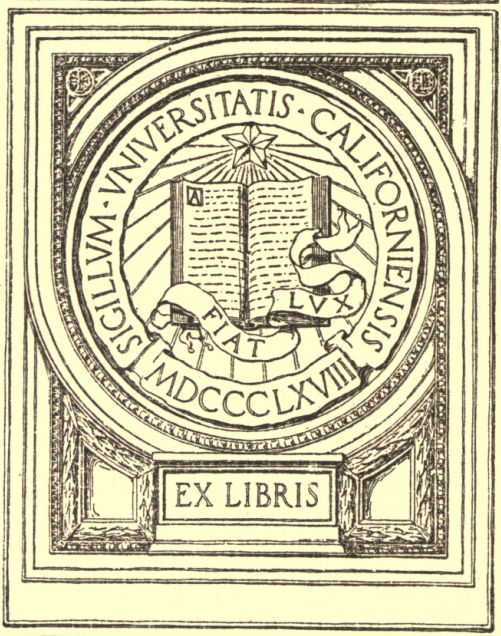
SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
LVX
FIAT
MDCCCLXVIII
EX LIBRIS

Quarterly

of the

Colorado School of Mines

VOL. SEVEN OCTOBER, 1912 NUMBER THREE

An Extension of the Dewey System of Classification as applied to Mining

By CARL A. ALLEN, E. M.
Assistant Professor of Mining
Colorado School of Mines

INTRODUCTION.

A serious problem that confronts every engineer is how to make most available that mass of information to which he must constantly refer. Probably of all the engineers, he who follows mining has the most widely varying problems to solve. Each new one that presents itself requires thorough study and the bringing to bear upon it of all the data that can be found. If a mining engineer is called upon to report on a mine, he will be aided if he can find descriptions written by some previous investigator. Too often, however, the information that is wanted is just the information that cannot be found. Public and private libraries have on their shelves an enormous amount of material that should be available with the least loss of time. Many methods of indexing have been used, based often on alphabetical order. The trouble with an alphabetical arrangement is that it is difficult to pick from the titles of many books the word the initial letter of which should determine its place in the alphabetical list. With an alphabetical shelf arrangement, a book on

"Child Study" might come next to one on "Chilian Mills," and one on "Grinding Machines" would be placed considerably farther along. To overcome these difficulties, most libraries now use what is known as the "Decimal Classification and Relative Index," called the "Dewey Decimal System." As its name indicates, this system is a numerical one. Each subject is given a number, and the shelf arrangement, being by number, brings similar subjects together. All knowledge—that is, we might say, all reading matter—is divided into ten classes, as follows:

0 General Works.
1 Philosophy.
2 Religion.
3 Sociology.
4 Philology.
5 Natural Science.
6 Useful Arts.
7 Fine Arts.
8 Literature.
9 History.

These classes are divided into divisions. Number 6, or "Useful Arts," is subdivided as follows:

610. Medicine.
620. Engineering.
630. Agriculture.
640. Domestic Economy.
650. Communication and Commerce.
660. Chemical Technology.
670. Manufactures.
680. Mechanic Trades.
690. Building.

These divisions are again subdivided into sections, and number 620, or "Engineering," is divided as follows:

621. Mechanical Engineering.
622. Mining Engineering.
623. Military.
624. Bridge and Roof.
625. Road and Railroad.
626. Canal.
627. River and Harbor.

628. Sanitary. Water Works.
629. Other Branches.

"Mining Engineering" has the number 622, and books or articles numbered 622 would be placed on the shelf between those numbered 621 and those numbered 623. As can readily be seen, this subdivision can be carried as far as desired. In the original classification it was carried to five figures, as is given on page 11, and for a general library this is sufficient. For the library of a mining man, however, it is not enough. For example, it will be noted that 622.69 is "Surface Transportation." The average mining engineer will accumulate too many articles that would be classed under "Surface Transportation," but yet would be different; as, for instance, "Aerial Tramways" and "Wagon Roads." Hence, a further extension or subdivision is necessary, and this extension has been carried out in this bulletin.

The principle of the system has been explained in order that a better understanding of its application may be gained. Never was there the wealth of valuable information to be found in technical books and periodicals as at the present time. Every engineer must have some system of making available the information that he may want at any time, and the "Dewey System" is probably the only scheme that has stood the test. At the University of Illinois the effectiveness of the system has been tried in the Engineering College and has been found thoroughly satisfactory. If engineers will take the small amount of trouble necessary to become familiar with the system they will find it well adopted to their needs, and it will make available a large amount of technical literature that would otherwise be lost.

APPLICATION OF THE SYSTEM.

There are three ways in which the classification may be used by engineers. First, by a card index; second, in filing articles and clippings without an index; and, third, in a combination of the two or filing away the material according to the decimal system, with a card index arranged either alphabetically or according to the "Dewey System." As to which of the three ways is best, opinions differ; also, it depends on the extent of the material to be indexed.

CARD INDEX.

Many engineers use a card index arranged alphabetically. If they notice an article on "Sinking and Timbering Shafts," they

make out two cards, stating the title, length and perhaps the character of the article and where it may be found. One of these cards will be placed in the drawer under "S" for "Shaft Sinking," and one under "T" for "Timbering." The only difference, if the decimal system of arrangement is employed, is that the cards, after being made out, would be given proper numbers and, placed in the drawer in their numerical order, would thus avoid the weakness of any alphabetical arrangement.

The card index finds its best application when the user has in his office only a few of the articles to which reference is made. The objections to it are two: First, there is usually trouble in finding the magazine in which the article occurs, and, if the amount of material is large, the card index alone would not be sufficient. Second, many engineers will not keep up a card index. This is without doubt the most serious objection. Its beneficial use and general adoption by large business concerns has led many to believe that the card index alone is a "panacea for all ills," but they should remember that these concerns have competent and sufficient clerical help to keep the cards up to date, an advantage which many engineers do not enjoy.

FILING MATERIAL WITHOUT AN INDEX.

As to the second way of using the classification—that is, for filing information without an index—the following description of its adoption at the Colorado School of Mines will probably serve best to enable the reader to judge if it is applicable to his requirements. The mining department has a case containing a large number of pigeon holes 5″ wide, 12″ high and 14″ deep, which are numbered according to the Dewey System, 622.11, 622.12, etc. When a new copy of the "Engineering and Mining Journal" arrives it is read and then, by removing the binding clips, the different articles it contains are taken out and placed in their proper pigeon holes. That is, if there be an article on "Timbering," it will be placed in number 622.28 along with articles on "Timbering" that may be taken from "Mines and Minerals," "Mining and Scientific Press," or "Mining Science." Then when any information is desired on "Timbering," by going to that pigeon hole we have all the latest information together. If the number of articles in the pigeon hole becomes great, they are divided into their proper classes and placed in large envelopes with the proper number on the outside. That is, envelope numbered 622.281 would contain all the articles on "Kinds and

Properties of Timber for Mine Use." If crowded for room, envelopes could be used entirely, arranged in large drawers or otherwise. Where an article might be classed under two headings, it is placed where it has the most weight, and, if desired, a reference to it on a blank sheet in the other pigeon hole can be made. Also on the blank sheet can be written references to articles occurring in some book or paper which may be found only in the library. As most strong articles occur in at least two of the mining papers, very little cross referencing has been found necessary. The article taken from one magazine is put in one place, and from the other magazine in the other place. This also often prevents losing one article, because part of it is on the same sheet with another article, and, of course, the same results would be secured by having more than one copy of the same paper. Two advantages of the method are worthy of mention: First, the articles are immediately available, and, second, in case it is desired to take the information on a trip, it can be done without having to take a complete bound volume.

BOTH CARD INDEX AND FILING.

The third way of using the "Dewey System" is really a combination. Books and magazines are placed on the shelves in their proper order numerically and a card index is maintained referring to subjects to be found on the shelves or elsewhere. Where there are many books and the mass of material is large, this is to be recommended. It is the method used in libraries where only the card index is alphabetical for the use of the public.

EXTENSION OF THE CLASSIFICATION.

In extending the classification, the aim has been towards as logical a subdivision as possible. The original classification, although imperfect, has not been changed. This is because of the copyright restrictions; also, because of the reverence for the master mind that evolved the entire subdivision of all knowledge. The imperfections can be seen in the subdivision of "Drainage," but to attempt to change it would be inadvisable, because so many have already adopted it. The original subdivision is printed separately, so that it may be torn out and posted near the filing case. For placing many articles this will suffice and will save many references to the extended classification.

In order to cover the ground of mining fully it was necessary to go into Geology and Mechanical Engineering, and the

subjects coming under those divisions that are found in the mining engineer's library have been put in. Those on Mechanical Engineering were taken from Bulletin No. 9 of the University of Illinois, which is an extension of that subject. Nothing has been put in on Metallurgy and Assaying. A bulletin covering the extension on these subjects has already been issued by the Colorado School of Mines, and copies may be obtained from the President of the school.

FORM DISTINCTIONS.

In the application of the "Dewey System" it has been found useful to employ a series of form distinctions or divisions. The literature of any subject may often be advantageously separated into these subdivisions, which are as follows:

.001. Statistics.
.002. Quantities and costs.
.003. Contracts and specifications.
.004. Designs and drawings. *Maps.*
.005. Executive.
.006. Working and maintenance.
.007. Laws.
.008. Patents. *Machinery.*
.009. Reports.
.01. Philosophy or theory.
.02. Compends. *Indices. Directories.*
.03. Cyclopedias. Dictionaries.
.04. Essays. Address. Letters. *Theses.*
.05. Periodicals. Magazines.
.06. Societies.
.07. Education. Study and teaching.
.08. Tables and calculations.
.09. History. Progress and development.

These form distinctions may be used not only to subdivide general subjects, as is done for 622 on page 25, but they can also be used for the minor subdivisions, as, for example, 622.141.09 would be the history of mine surveying instruments.

ALPHABETICAL SUBDIVISION.

The use of an alphabetical arrangement for minute subdivisions may sometimes be used to advantage, as has been done for mines and mining districts on page 33. This is by no

means an alteration of the Dewey System, but one that is indicated in his book, and for this particular case is the only logical arrangement.

RELATIVE INDEX.

The second part of the bulletin consists of the relative index, which is merely a finding list where the subjects or headings are arranged alphabetically and the proper number is given. The placing of a period after every three figures in a number is simply for convenience in reading. The first three figures for mining engineering are always 622, and may be replaced by a letter or sign if desired.

ACKNOWLEDGMENTS.

In preparing this work the writer has referred without hesitation to the indices or the subject matter of the available books on mining. Acknowledgments are due to Victor C. Alderson, President of the Colorado School of Mines, and to Miss Mabel Shrum, Librarian, for their kindly assistance in correcting manuscript; to George W. Schneider, for his extension of "Mine Accounting," "Hoisting," and "Transportation," and to Miss Ella J. Colburn for her painstaking assistance in preparing the material for the printer.

GOLDEN, COLORADO, August 20, 1912.

Original Classification

(Subjects in italics have been added)

622. Mining Engineering

(See also 338.2, Mining products.)
May be subdivided like 620 and 620.0; *e. g.* Societies, 622.06; Reports, 622.009.

.1 Exploration and prospecting.

.11 Theory. Applied geology, etc.
.12 Prospecting. Practical methods.
Including Divining Rods.
.13 Mineral surveys.
.14 Mine surveying.
.15 Magnetic surveys.
.16 Theory of faults (See 551.87 and 553.19).
.17 *Valuation of mines. Sampling.*
.18 *Mines and mining districts.*
.19 Mining prospectuses. *Photography in mining.* (See 553.)

.2 Practical mining.

.21 Excavation.
.22 Quarrying.
.23 Drilling and blasting.
.24 Deep boring.
.25 Shaft sinking.
.26 Tunneling and drifting.
.27 Stoping.
.28 Timbering *and mine support.* Masonry lining. (See also 622.56.)
.29 *Handling and erecting machinery. Foundations.*

622.3 Working of mines. Exploration.

- .31 Open workings.
- .32 Hydraulic mining and sluicing. *Dredging.*
- .33 Coal mining. (See 553.2.)
- .34 Metal mining. *Development.* (See 533.3 and .4.)
- .35 Working thick deposits.
- .36 Salt mining. (See 553.63.)
- .37 *Submarine mining.*
- .38 *Gem mining.*
- .39 *Mining miscellaneous minerals.*

.4 Ventilation and lighting of mines.

- .41 Theory. Gases met with, etc.
- .42 Natural ventilation.
- .43 Furnaces, steam jets, etc.
- .44 Fans. (See 621.62.)
- .45 Airways. Stoppings. Regulators.
- .46 Measurement of ventilation. *Temperature. Humidity.*
- .47 Lighting. Safety lamps, etc.
- .48 *Coal dust.*
- .49 *Miscellaneous.*

.5 Drainage.

- .51 Theory of infiltration of water.
- .52 Natural drainage.
- .53 Cornish pumps. (See 621.64.)
- .54 Steam pumps. (See 621.64.)
- .55 Hoisting of water.
- .56 Dams and water-tight linings. (See also 622.28, Timbering.)
- .57 Acid waters. *Mine waters.*
- .58 *Underground drainage systems. Piping.*
- .59 *Drainage districts.*

622.6 Extraction. Hoisting and transportation.

.61 Handling mineral in working place.
.62 Underground roads.
.63 Mine cars. Trams, etc.
.64 Gravity roads and planes.
.65 Tramming and animal haulage. (See 625.7.)
.66 Mechanical haulage.
.67 Hoisting engines. Drums. Ropes.
.68 Cages. Skips. Buckets.
.69 Surface transportation.
Including Mineral Roads, Wire Rope-ways, Transhipment, Loading and Unloading, etc.

.7 Mechanical preparation. Ore dressing.

.71 Theory. Preliminary operations.
.72 Hand dressing.
.73 Crushing. Stamping engine.
.74 Screening. *Classification.*
.75 Jigging. Ore concentrators.
.76 Slime treatment. *Flotation.*
.77 Magnetic separation.
.78 Coal washing.
.79 Dressing works.

.8 Dangers and accidents. Sociology.
(See also 613.6, Hygiene; 331.82, Laboring classes.)

.81 Explosions of fire-damp.
.82 Mine fires.
.83 Crushing and fall of ground.
.84 Flooding of mines.
.85 Accidents to miners.
.86 Rescue and relief.
.87 *Inspection of mines. Mine bureaus and laboratories.*
.88 *Health and care of workmen. Institutions for miners.*

622.89 *Miners' customs and life. Miners and mining men.*

.9 **Mine economics. Accounting. Miscellaneous.**

.91 *Mine investments. Stocks and stockholders.* (See 332.)
.92 *Management of mines.*
.93 *Organized labor.* (See 331.87.)
.94 *Contract systems and leasing. Ore purchasing.*
.95 *Mine accounts. Bookkeeping.* (See 657.)
.96 *Systems for keeping mine notes. Recording engineering and geological data.*
.97 *Taxation. Insurance.* (See 336.2 and 725.23.)
.98 *Miscellaneous data on business side of mining.*
.99 *Unclassified data on mining in general.*

EXTENDED CLASSIFICATION.

510. Mathematics.
520. Astronomy.
526. Geodesy.
530. Physics.
531. Mechanics.
532. Liquids. Hydrostatics. Hydraulics.
533. Gases. Pneumatics.
540. Chemistry.
548. Crystallography.
549. Mineralogy.
550. Geology.
551. Physical and Dynamical Geology.

551.1 Structure of earth as a whole.

.3 Erosion and deposition.

.5 Meteorology.

.6 Metamorphism.

.7 Stratigraphical geology (Archean, Cambrian, etc.)

.8 Structural geology.

.81 Stratification.
.84 Joints. Cleavage. Polarity in rocks.
.85 Dip. Outcrop. Strike.
.88 Veins. Dykes. Necks. Bosses.

.9 Agents of geological work (Frost, Water, etc.)

552. Lithology. Petrography. Petrology.

553. Economic Geology.

.1 Ore deposits.

.11 Formation and structure.

.111 Syngenetic deposits or contemporaneous with country rocks.
.1 Magmatic segregations.
.2 Deposits of sedimentary origin.
.112 Epigenetic deposits or formed after country rocks.
.1 Deposits from magmatic emanations.
.2 Contact metamorphic deposits.
.113 Precipitation of metal from solution.
.114 Replacement.
.115 Secondary enrichment.
.116 Ore shoots.

.12 Classification.

.13 Superficial. Placers.

.14 Stratified. Beds, etc.

.15 Unstratified.

553.16 Disseminated through country rock.
.17 Stockwerks. Fahlbands. Contacts.
.18 Chambers and Pockets. Impregnations.
.19 Mineral veins.

.2 Carbon series.

(Note—Under the following headings should be placed data on the occurrence, origin, production, uses, value, market, etc., as this is the only place where the minerals are classified and separated.)

.21 Peat.
.22 Lignite and jet.
.23 Cannel coal. Bituminous shale.
.24 Bituminous and semi-bituminous coals.
.241 Coking coals.
.242 Non-coking coals.
.25 Anthracite and graphitic anthracite.
.26 Graphite. Plumbago. Natural coke. Carbonite.
.27 Asphalt and asphaltic coals. Ozocerite.
.271 Albertite.
.272 Ozocerite.
.273 Grahamite.
.274 Uintaite or gilsonite.
.275 Maltha.
.276 Asphalt.
.28 Petroleum. Natural gas.
.29 Fossil gums and resins.

.3 Ores of iron.

.31 Hematite.
.32 Magnetite.
.33 Limonite.
.34 Gossan deposits.

553.4 Ores of metals other than iron.

.41 Ores of gold.

.42 Ores of silver.

.43 Ores of copper.

.44 Ores of lead.

.45 Ores of zinc and tin. Mercury.

.451 Zinc.

.452 Tin.

.453 Mercury.

.46 Ores of manganese and chromium.

.461 Manganese.

.462 Chromium.

.47 Ores of antimony and arsenic.

.471 Antimony.

.472 Arsenic.

.48 Ores of nickel and cobalt.

.481 Nickel.

.482 Cobalt.

.49 Other metallic ores.

.491 Ores of miscellaneous common metals.

.1 Aluminum.

.2 Platinum.

.3 Bismuth.

.4 Cadmium.

.5 Molybdenum.

.6

.7

.8

.9

.492 Ores of rare metals.

.1 Palladium.

.2 Osmium.

.3 Iridium.

.4 Titanium.

.5 Uranium.

.6 Vanadium.

.7 Tungsten.

.8 Radium.

.9 Others.

553.5 Building stones.

.51 Marbles and limestones.
.52 Granites and syenites.
.53 Sandstones.
.54 Slates.
.55 Serpentines. Soapstones.
.56 Porphyries.
.57 Trap.
.58 Tufa. Peperino.
.59 Other building stones.

.6 Earthy economic minerals.

.61 Fire clays. Brick clays. Potter's clays.
.611 Kaolins.
.612 Brick and tile clays.
.613 Pottery clays.
.614 Fire clays.
.62 Sands.
.621 Foundry sands.
.622 Glass sands.

.63 Rock salt. Gypsum. Other salines, etc.
.631 Salt.
.632 Bromine.
.633 Sodium sulphate.
.634 Sodium carbonate.
.635 Soda niter.
.636 Borax.
.637 Iodine.
.638 Gypsum.
.639 Others.

.64 Phosphates. Apatite. Guano. Greensand.
(See also 631.)
.641 Phosphate of lime.
.642 Apatite.
.643 Amorphous phosphates.
.644 Guano.
.645 Greensand.

553.65 Emery. Other abrasives.

.651 Millstones and buhrstones.
.652 Whetstones and oilstones.
.653 Pumice and volcanic ash.
.654 Diatomaceous earth.
.655 Crystalline quartz.
.656 Feldspar.
.657 Garnets. (See also 553.8).
.658 Corundum and emery.
.659 Other abrasives.

.66 Heavy Spar. Sulphur.

.661 Heavy spar or barite.
.662 Sulphur.
.663 Fluorspar.
.664 Fuller's earth.
.665 Diatomaceous earth. (See also 553.654)
.666

.67 Asbestos. Magnesite.

.671 Asbestos.
.672 Magnesite.

.68 Limes, and mineral cements.

.681 Limestones.
.682 Hydraulic cements.
.683 Pozzuolan cement.
.684 Hydraulic limes.
.685 Natural rock cements.
.686 Portland cements.
.687

.69 Other earthy economic minerals

.691 Monazite.
.692 Lithium.
.693 Meerschaum.
.694 Mica.
.695 Ocher.
.696 Lithographic stone.
.697

.7 Mineral waters.

553.8 Gems. Ornamental stones.

.81 Diamonds.

.82 Corundum gems.
.821 Ruby.
.822 Sapphire.
.823

.83 Beryl gems.
.831 Emerald.
.832 Aquamarine.
.833 Morganite.

.84 Pearl.

.85 Opal.

.86 Turquoise (matrix).

.87 Tourmaline gems.
.871 Rubellite.
.872 Indicolite.

.88 Quartz gems.
.881 Amethyst, prase.
.882 Jasper.
.883 Rose quartz.
.884 Onyx.
.885 Agate.
.886 Bloodstone.
.887 Chrysoprase.
.888 Sardonyx.
.889 Carnelian and others.

.89 Miscellaneous gems.
.891 Peridot.
.892 Topaz.
.893 Garnet.
.894 Moonstone.
.895 Alexandrite.
.896 Cymophane.
.897 Hiddenite.
.898 Kunzite.
.899 Jade and others.

.9 Other economic minerals.

620. Engineering.

620.1 Strength of materials.

.13 Properties and tests of stone, concrete, cement, etc.

621. Mechanical Engineering,

.1 Steam engineering.

.10 Power plants. Central stations.

.11 Mechanism of the steam engine. Design of engine parts.

.115 Governors.

.116 Valves and valve gears.

.13 Locomotives.

.132 Types of locomotives.

.14 Traction engines (agricultural, road roller, etc.).

.15 Portable engines.

.16 Stationary engines.

.17 Steam economy.

.171 Instruments and apparatus used in boiler and engine tests. Indicators, counters, dynamometers, gages, etc.

.172 Records and results of engine tests. Measurement of power; efficiency, engine friction, etc.

.173 Records and results of tests on miscellaneous steam apparatus.

.174 Theory: Expansion, superheating, cylinder condensation, jacketing, etc. (See also 536.73).

.175 Condensors and cooling towers.

.176 Injectors and ejectors.

.177 Steam separators.

.178 Accidents, engine failures, fly-wheel failures, boiler explosions.

.179 Management of engines and boilers, engine rooms, boiler rooms, etc.

621.18 Steam generation. Boilers. Furnaces.
.182 Fuels. Comparative efficiency of.
.183 Boiler fittings. Safety valves, water gages, cocks, manholes, etc.
.184 Furnace fittings. Appliances connected with combustion of fuel.
.1 Mechanical stokers.
.2 Forced draft apparatus.
.3 Chimneys.
.4 Smoke consumption and prevention.
.5 Oil feed apparatus, burners, etc.
.6 Coal and ash conveyors.
.9 Miscellaneous appliances.
.185 Construction and setting of boilers.
.186 Steam transmission and distribution.

.19 Steam heating. (See 697.)

621.2 Water engines or motors.

.21 Water wheels. Impulse.
.22 Overshot and breast wheel.
.23 Undershot wheel.
.24 Turbines.
.27 Hydraulic ram.
.28 Hydraulic machinery.

621.3 Electrical engineering.

.31 Generation of electricity.
.311 Central stations.
.312 Dynamo electric machines.
.312.1 Theory.
.2 General types and description.
.3 Commutating machines.
.342 Constant speed motors.
.343 Multispeed motors.
.344 Adjustable speed motors.
.345 Varying speed motors (railway motors).
.4 Synchronous machines.
.43 Alternating current generators.
.6 Asynchronous machines.
.63 Induction generators.

621.312.64 Induction motors.
.65 Series alternating current motors.
.66 Repulsion motors.
313 Stationary induction apparatus.
.3 Transformers.
.4 Auto transformers.
314 Electrostatic apparatus.
317 Switchboards and control devices.

.32 Electric lighting.

.33 Electric traction.

331 Systems.
.2 Trunk.
.3 Interurban.

.34 Transmission of electrical energy.

.35 Electrical processes. Storage of electricity.

.36 Telegraph and telephones.

361 Pole lines.
365 Telephone systems.
366 Telephone instruments.

.37 Instruments and meters.

.39 Industrial applications of electricity.

391 General.
392 Electricity applied to agriculture.
393 Electricity applied to mining.

.4 Air and gas engines and other motors.

.41 Hot air engines.

.42 Compressed air engines.

.43 Ignited gas or oil engines.

431 General theory of gas, gasolene, or oil engines.
434 Diesel motor.
436 Gas producers.

.5 Air compression. Ice machines. Refrigerators.

.51 Dry air compressors.

.52 Wet air compressors.

.53 Compressed air transmission and distribution

621.7 Manufactories. Engineering works. (See also 670)

.702 Arrangements of shops. Shop buildings.

.71 Machine shop.

.72 Foundry.

.73 Forge shop.

.74 Woodworking shop. Pattern shop.

.8 Millwork and machinery of transmission. Design of machinery parts.

.82 Journals, shafting, etc.

.87 Cranes and elevators.

.89 Lubricants. Friction.

.9 Machine tools.

.91 Planing machines.

.911 Metal planers, shapers, and slotters.

.912 Wood planing machinery.

.92 Grinding and filing.

.93 Cutting and sawing.

.931 Metal sawing and cutting machinery.

.932 Wood sawing machinery.

.94 Turning and milling.

.944 Pipe threading machines.

.95 Perforating machinery. Drills.

.96 Punching and shearing machinery.

.97 Hammers. Nail and rivet machinery.

.98 Bending, straightening and shaping.

622. Mining Engineering.

622.01 Theory or philosophy of mining.

622.02 Mining compends, indices, directories.

622.03 Mining cyclopedias, dictionaries, hand books.

622.04 Mining essays, addresses, letters, theses.

644.05 Mining periodicals, magazines.

622.06 Mining societies.

622.07 Mining education, study, teaching.

622.08 Tables and calculations for mining.

622.09 Mining history. Progress and development of mining.

622.001 Mining statistics. Mineral industry.

622.002 Mining quantities and costs.

622.003 Mining contracts and specifications.

622.004 Mining designs and drawings. Mining maps.

622.005 Mining executive.

622.006 Working and maintenance.

622.007 Mining laws.

622.008 Mining patents. Mining machinery.

622.009 Mining reports. Examinations. Investigations.

622.1 Exploration and prospecting.

622.11 Theory. Applied geology, etc.

.111 Types and general geology of ore deposits. (See also 553).

.112 Mineralized areas. Descriptions.

.113 Origin of float. Theory of placer formation.

.1 Stream placers.

.2 Bench placers.

.3 Beach placers.

.4 Bar placers.

.5 Buried placers.

.6 Theory of nuggets.

.7 Cemented placers.

.114 Theory of prospecting. Scientific prospecting.

.115 Influence of topography in prospecting. Canons coulees.

.116 Influence of vegetation in prospecting.

622.12 Prospecting. Practical methods, including divining rods.

.121 Prospecting outfits.
.1 Prospecting outfits for frigid countries.
.2 Prospecting outfits for tropical countries.
.3 Animals, saddles, tents, beds, for prospecting.
.4 Cooking utensils, food supplies, medicines.
.5 Camping out. Pitching tent. Packing.
.6

.122 Practical methods of field prospecting.
.1 Panning and sluicing.
.2 Trenching and test pits.
.3 Prospecting by cross-cuts and drifts.
.4 Prospecting by shafts.
.5
.6 Prospecting by drilling. (See also 622.33.)

.123 Testing devices and tools used in prospecting.
.1 Dipping needles. Divining rods.
.2 Magnetometer.
.3 Swedish mining compass.
.4 Chemical tests for gold.
.41 Stannous chloride method.
.42 Iodine or bromine method.
.5 Fire tests for gold.
.51 Blowpiping. Blowpiping outfits.
.52 Portable assay outfits.
.521 Pocket smelters.
.6 Pan, batea, horn spoon, rocker, sluice.
.7 Picks, shovels, drills.
.8
.9

.124 Underground prospecting.

.125 Acquiring mineral lands in the United States.
.1 Public mineral lands and forest reserves.
.2 Private lands. Land grants.
.3 Government land subdivisions.
.4 Acquiring lode claims.
.5 Acquiring placer lands.
.6 Acquiring tunnel and mill sites.
.7 Acquiring coal lands. Timber and stone lands.
.8 Acquiring water rights.
.9 Miscellaneous.
.126 Acquiring mineral lands in Canada.
.127 Acquiring mineral lands in Mexico.

622.128 Acquiring mineral lands in other countries.
(Note. Acquiring mineral lands in other countries may be placed as laws of the countries and placed under 622.18, Mines and Mining Districts.)
.129 Miscellaneous.

622.13 Mineral surveys.

.131 Preliminary or location surveys.
.1 Conditions governing location of mining lands.
.2 Size and shape of lode claims.
.3 Size and shape of placer claims.
.4 Size and shape of tunnel sites.
.5 Size and shape of mill sites.
.6 Preparing and filing location certificates.
.7 General requirements of survey.
.8
.9
.132 Final or patent surveys.
.1 Conditions governing patent surveys.
.2 Methods of using instruments and measuring.
.3 Field methods and adjustment of claim.
.4 Tieing in claims.
.5 Field notes.
.6 Amended surveys.
.7 Adverse surveys.
.8
.9
.133 Mineral surveys in Canada.
.134 Mineral surveys in Mexico.
.135 Mineral surveys in other countries. (See note under 622.128).
.136
.137

622.14 Mine surveying.

.141 Instruments for mine surveying.
.1 Compasses. Pocket Transits.
.2 Theodolites and transits.
.3 Levels.
.4 Chains and tapes.
.5 Tripod sights. Stations.
.6
.7 Adjustment of instruments.
.8 Repair of instruments.
.9

622.142	Surface surveys and traverses.
.1	Determination of meridian.
.11	From polaris.
.12	With solar attachments.
.13	By direct observation of sun.
.14	By equal altitudes of stars.
.15	Other methods.
.2	Surface traverses.
.3	Reservoir surveys.
.4	Ditch surveys.
.5	Surveys of pipe lines.
.6	
.143	Carrying the meridian underground.
.1	By traverse on slope or level.
.2	By plumb lines in two or more shafts.
.3	By plumb wires in one shaft.
.31	Two wire method.
.32	Three wire method.
.33	Four wire method.
.4	Wires and weights.
.41	Size and kind of wires.
.42	Lowering wires.
.43	Weights.
.44	Suspending weights in fluid.
.45	
.5	Carrying meridian underground with auxiliary telescope or special transit.
.6	
.7	
.144	Survey of underground workings.
.1	Drifts and cross-cuts. Entries.
.2	Rooms, etc., in coal mines.
.3	Stopes.
.4	String surveys.
.5	Sights and stations.
.6	Illumination.
.7	
.8	
.9	
.145	Record of surveys.
.1	Kinds and uses of field note-books.
.2	Keeping field notes.
.21	Side notes.
.22	Sketches.
.3	Kinds and uses of office books.
.4	Calculation books.

622.145.5 Loose-leaf books.
.6
.7
.146 Maps of mine surveys.
.1 Kinds and uses of mine maps.
.11 Topographic maps.
.12 Geologic maps and sections.
.13 Assay maps.
.14 Maps of old workings.
.15 Plan maps.
.16 Elevation maps. Projections.
.17 Sectional maps.
.18 Maps for court work or litigation.
.19 Miscellaneous.
.2 Making mine maps.
.21 Papers.
.22 Scale and size.
.23 Instruments for mapping.
.24 Platting by angles and distances.
.25 Platting by latitudes and departures.
.26 Platting by parallel rule and protractor.
.27 Platting by tangents and chords.
.26 Coloring maps. Inks and colors.
.29 Prints and tracings. Miscellaneous.
.3 Filing mine maps. (See also 622.96.)
.31 Labeling and numbering maps.
.32 Filing maps in drawers.
.33 Filing maps in frames.
.34 Filing maps in books.
.35 Filing maps on rollers.
.147 Models of mines.
.1 Uses of mine models.
.11 Working models.
.12 Models for stockholders.
.13 Court models.
.2 Kinds of mine models.
.21 Plate models.
.22 Skeleton models.
.23 Solid models.
.24
.3 Materials and methods of construction.
.31 Glass.
.32 Plaster of Paris.
.33 Wood.
.34 Cement.
35. Papier-mache.
.36 Wires and wire screens.

622.147.37
.4
.5
.148 Special surveys.
.1 Surveys for connections.
.2 Surveys for bore holes. (See 622.247)
.3
.4
.149 Descriptions of survey methods at various mines.
Miscellaneous.

622.15 Magnetic surveys.

.151
.152
.153

622.16 Theory of faults.

.161 Formation of faults.
.1 Normal faults.
.2 Reverse faults.
.162 Locating faulted areas.
.163
.164

622.17 Valuation of mines. Sampling.

.171 Valuation of surface equipment.
.1 Buildings.
.2 Shops.
.3 Head frames, ore bins, etc.
.4 Machinery and apparatus.
.5 Tools
.6 Supplies.
.7 Live stock.
.8
.9 Miscellaneous.
.172 Valuation of underground equipment.
.1 Machinery and apparatus.
.2 Tools.
.3 Supplies.
.4 Live stock.
.5 Trackage
.6 Piping.
.7 Wiring.
.8
.9 Miscellaneous.

622.173 Valuation of development work.
.1 Shafts and inclines. Stopes.
.2 Tunnels and adits.
.3 Drifts and crosscuts. Entries.
.4 Winzes and raises.
.5 Stations and pockets.
.6
.7
.174 Sampling ore bodies.
.1 Spacing and size of mine samples.
.2 Blasting large samples.
.21 Mill-run samples.
.3 Methods of taking groove samples.
.4 Sampling spotty breasts.
.5 Sampling dumps and stock piles.
.6 Sampling placer ground.
.61 By shafts.
.62 By bore holes.
.63 Location of samples.
.64
.65
.7 Sampling coal seams.
.8 Sampling massive deposits by bore holes.
.9 Cutting and grinding samples. Miscellaneous.
.175 Valuation of ore bodies.
.1 Classification of ore bodies.
.11 Ore blocked out.
.12 Positive ore.
.13 Probable ore.
.14 Possible ore.
.15
.2 Calculating amount and gross value of ore.
.21 Calculation of foot-ounces.
.22 Calculation of foot or inch-dollars.
.23 Influence of ore shoots.
.24
.25
.176 Economic factors in mine valuation.
.1 Treatment of ores.
.2 Labor.
.3 Transportation.
.4 Timber.
.5 Water.
.6 Government.
.7 Climate.
.8
.9 Miscellaneous.

622.177 Factors influencing probable future value.
.1 Previous production.
.2 History of neighboring mines.
.3 Geology.
.4
.5
.6
.178
.179

622.18 Mines and mining districts.
.181 Famous mines of antiquity.
.182 Famous mines of modern times.
.183
.184 Mines and mining districts in Europe.
.1 Scotland. Ireland.
.2 England. Wales.
.3 Germany. Austria.
.4 France.
.5 Italy.
.6 Spain. Portugal.
.7 Russia.
.8 Norway, Sweden, Denmark.
.9 Minor countries.
.185 Mines and mining districts in Asia.
.1 China.
.2 Japan.
.3 Arabia.
.4 India.
.5 Persia.
.6 Turkey in Asia.
.7 Siberia.
.8 Turkestan. Afghanistan. Beloochistan.
.9 Minor countries.
.186 Mines and mining districts in Africa.
.1 North Africa.
.2 Egypt. Nubia.
.3 Abyssinia.
.4 Morocco.
.5 Algeria.
.6 North Central Africa.
.7 South Central Africa.
.8 South Africa.
.9 Madagascar.
.187 Mines and mining districts in North America.
.1 British America.

622.187.2 Mexico. Central America. Other countries.
.3 United States.
.4 North Atlantic States.
.5 South Atlantic States
.6 South Central or Gulf States.
.7 Northeast Central or Lake States.
.8 West Central or Mountain States.
.9 Pacific States.
.188 Mines and mining districts in South America.
.1 Brazil.
.2 Argentine Republic.
.3 Chile.
.4 Bolivia.
.5 Peru.
.6 Colombia. Ecuador.
.7 Venezuela.
.8 Guiana.
.9 Paraguay. Uruguay. Other countries.
.189 Mines and mining districts in Oceanica. Polar regions
.1 Malaysia.
.2 Sunda.
.3 Australasia.
.4 Australia.
.5 New Guinea.
.6 Polynesia.
.7 Isolated Islands.
.8 Arctic Regions.
.9 Antarctic Regions.

Note. Further subdivision may be arranged alphabetical or first divided into minerals and then subdivided according to alphabetical order. The production of a mine or district, the mining regulations, history or anything peculiar to a district, may be filed under this subdivision.

622.19 Mining prospectuses. Photography in mining

(See 553.3.)

.191 Mining prospectuses.
.192 Photography in mining.
.1 Surface photography .
.2 Underground photography.
.193 Printing and reproduction of photographs.
.1 Half tones.
.2 Zinc etchings.
.3
.4

622.2 Practical mining.

622.21 Excavation.

.211 Classification and measurement of materials.
- .1 Classification of materials.
  - .11 Earth.
  - .12 Hardpan.
  - .13 Rock.
  - .14 Other classifications.
- .2 Measurement of materials.
  - .21 Measuring materials in place.
  - .22 Measuring excavated materials.
  - .23 Methods of calculation.
  - .24 Earth shrinkage.
  - .25 Voids in broken stone.
  - .26
  - .27

.212 Picking and shoveling. (See 622.313 and 622.321.1).
- .1 Capacity of man picking.
- .2 Capacity of man shoveling.
- .3 Economical lifts and throws in shoveling.
- .4 Kinds and use of picks.
- .5 Kinds and use of shovels.
- .6
- .7

.213 Plowing.
- .1 Capacity of plow.
- .2 Steam plows.
- .3
- .4

.214 Scrapers.
- .1 Slips or drag scrapers.
  - .11 Capacity.
  - .12 Economical lead.
  - .13 Organization of force.
- .2 Fresnoes and bucks.
- .3 Wheeled scrapers.
- .4 Steam scrapers.
- .5

.215 Elevating graders.

.216 Steam shovels.
- .1 Construction.
- .2 Operation.
- .3 Capacities.
- .4 Repairing.

622.216.5 Proper bank heights.
.6 Arrangement of tracks.
.217 Dredges, other than bucket-elevator. (See 622.316 and 622.325).
.1 Grad bucket dredges.
.11 Construction.
.12 Operation.
.13 Capaciities.
.14
.15
.2 Suction dredges.
.218 Bucket elevator dredges. (See 622.326).
.219 Hydraulicking. Other methods. (See 622.322)

622.22 Quarrying.

.221 Methods of quarrying rock.
.1 Quarrying squared rock.
.2 Quarrying rough and fragmental stone.
.222 Implements for quarrying.
.1 Plug and feather.
.2 Mechanical picks.
.3 Channelers.
.4 Power saws.
.5
6
.7

622.23 Drilling and blasting.

.231 Drill steel, sharpening.
.1 Kind and sizes of hand drill steel.
.2 Kind and sizes of machine drill steel.
.3 Size and shapes of bits for hand work.
.4 Size and shape of bits for machine work.
.5 Sharpening and tempering drills.
.51 Hand sharpening and tempering.
.52 Machine sharpeners.
.6
.7
.232 Hand drills and drilling.
.1 Methods of hand drilling.
.11 Single hand.
.12 Double hand.
.13 Hand churn drill.
.2 Hand power drills.
.21 Jackson.
.22 Hand augers.

622.233 Care and operation of machine drills accessories.
.234 Piston or reciprocating machine drills.
.1 Tappet valve piston machines.
.11 Ingersoll-Rand.
.12 Rand Little Giant.
.13 Chicago Giant Rock drill.
.14 Sullivan Tappet valve drill.
.15 Taylor's Horsfield drill.
.16 Holman's Tappet drill.
.17 Stephen's Climax Tappet valve drill.
.18 Rio Tinto drill.
.19 Others.
.2 Air valve.
.21 Ingersoll-Eclipse.
.22 Rand Slugger.
.23 Konomax.
.24 Sullivan differential valve.
.25 Little Hardy.
.26 Stephen's Climax Imperial.
.27 Wood.
.28 McKiernan.
.29 Little Hercules and others.
.3 Auxiliary valve.
.31 Ingersoll-Sargeant drill.
.32 Holman Auxiliary Ball Valve drill.
.235 Hammer drills.
.1 Cradle mounted.
.11 Leyner.
.12 Leyner Rock Terrier.
.13 Stephen's Imperial hammer.
.14 Kimber.
.2 Air feed.
.21 Gordon.
.22 Murphy.
.23 Waugh.
.24 Little Wonder.
.25 Sullivan stoper.
.26 Ingersoll-Rand stoper.
.27 Leyner stoper.
.28
.29
.3 Hand air hammer drills.
.31 Murphy.
.32 Little Wonder.
.33 Hardscog.
.34 Shaw.

622.235.35 Hardy.
.36
.37
.38
.236 Electric, hydraulic rotary and miscellaneous drills.
.1 Electric drills.
.11 Fort Wayne.
.12 Dietz.
.13 Box.
.2 Airo-electric drills.
.21 Temple-Ingersoll.
.22
.23
.3 Hydraulic rotary.
.31 Brandt.
.32
.33
.237 Kinds and care of explosives.
.1 Low explosives.
.11 Black powder.
.111 Potassium nitrate powder.
.112 Sodium nitrate powder.
.2 High explosives.
.21 Uncombined.
.211 Fulminates.
.212 Nitroglycerine.
.213 Gun cotton.
.214 Nitrostarch.
.215 Chlorate of potash.
.22 Combined.
.221 Nitroglycerine dynamites.
.222 Gelatin dynamites.
.223 Nitrate of ammonia dynamite.
.224 Nitrotoluene dynamites.
.225 Nitrostarch explosives.
.3 Combination of high and low explosives.
.4 Prolonged pressure.
.41 Lime.
.42 Hydraulic cartridge.
.5 Permissible explosives.
.51 Nitroglycerine explosives.
.52 Nitrate of ammonia.
.6 Handling and storage of explosives.
.61 Shipping explosives.
.62 Storing explosives.
.63 Thawing explosives.
.631 Thawing explosives in small quantities.

622.237.632 Powder thawers.
.633 Powder thawing houses.
.7 Adaptability of different explosives.
.8
.9 Miscellaneous.
.238 Charging and firing holes.
.1 Charging holes.
.11 Placing powder.
.12 Placing detonators.
.13 Tamping.
.2 Methods of firing charges.
.21 Squibs.
.211 Common.
.212 Electric.
.22 Fuses.
.23 Caps or detonators.
.24 Electric detonators.
.241 Instantaneous.
.242 Delay action.
.25 Electric shot firing systems.
.3 Theory of blasting.
.31 Calculation of charges.
.32 Number and size of free faces.
.33 Nature of rock.
.34 Strength of powder.
.35 Kind of powder.
.36 Completeness of detonation.
.4
.5
.239 Miscellaneous notes on drilling and blasting. Subaqueous work.

622.24 Deep boring.

.241 Hand augers.
.1 Tools
.2 Operation.
.3 Adaptability.
.242 Percussion drilling.
.1 Operation.
.2 Spring pole rig.
.3 Standard rig.
.31 Outfit.
.32 Adaptability.
.4 Portable rigs.
.41 Outfit.
.42 Adaptability.

622.242.5 Self cleaning or hollow rod method.
.6 Pole tool method.
.7 Empire drill.
.71 Outfit.
.72 Operation.
.73 Adaptability.
.8 Percussion core drill.
.9

.243 Hydraulic methods.
.1 Hydraulic rotary.
.11 Outfit.
.12 Operation.
.13 Adaptability.
.2 Jetting method.
.21 Outfit.
.22 Operation
.23 Adaptability

.244 Abrasive or rotary core drills.
.1 Diamond drill.
.11 Outfit.
.12 Operation.
.13 Adaptability.
.2 Chilled shot drill.
.21 Outfit.
.22 Operation.
.23 Adaptability.
.3 Calyx drill.
.31 Outfit.
.32 Operation.
.33 Adaptability.

.245 Other methods.
.246 Comparison of drilling methods.
.247 Surveying bore holes.
.248
.249

622.25 Shaft sinking.

.251 Timber lined shafts in overburden.
.1 Firm ground.
.2 Soft ground.
.21 Forepoling or spiling.
.22 Wooden sheet piling.
.23 Steel sheet piling.

.252 Concrete drop shafts and caissons.
.1 Wooden caissons.

622.252.2 Steel caissons.
.3 Masonry or concrete caissons.
.31 Excavating by hand.
.32 Excavating by orange peal bucket.
.33 Excavating by sack borer.
.34 Excavating by churn borer.
.35 Excavating by mammoth pump.
.4 Pneumatic caissons.
.5 Cast iron tubbing sinking drums or caissons.
.6 Shield method.
.7
.8
.253 Freezing method (Poetsch).
.1 Freezing mixtures.
.2 Arrangement of pipes.
.3 Excavation.
.254 Kind-Chaudron method.
.1 Outfit.
.2 Operation.
.255 Sinking in rock and timbering.
.1 Machine drilling.
.12 Method of placing holes.
.13 Sinking frames.
.14 Arrangement of working shifts.
.2 Hand work.
.21 Method of placing holes.
.22 Arrangement of working shifts.
.3 Long hole method.
.4 Sinking winzes.
.5 Driving raises.
.256 Concrete shaft lining in rock. Steel sets (See 622.28).
.1 Shapes of shafts, forms.
.2 Method of placing concrete.
.3 Steel shaft sets and lining.
.257 Head frames, buckets, etc., used in shaft sinking. (See 622.67).
.1 Head frames, methods of dumping.
.2 Derricks.
.3 Buckets.
.4 Cross heads, guides.
.258 Handling water in shaft sinking (See 622.5).
.1 Shaft sinking pumps.
.11 Vertical plunger type.
.12 Pulsometer.
.259 Descriptions of various shafts.

622.26 Tunneling and drifting.

.261 Kinds of tunnels and adits, size and grade.
.1 Mining adits.
.2 Drainage adits.
.3 Transportation adits.
.4 Irrigation or water works tunnels.
.5 Railroad tunnels.
.6 Sewerage and water works tunnels of small sections.
.7
.8

.262 Considerations governing selection of tunnel sites.
.1 Loose materials at mouth.
.11 Nature.
.12 Extent.
.2 Danger from snow or earth slides.
.3 Formations to be penetrated.
.4 Water to be handled.
.41 Surface.
.42 Underground.
.5 Getting under cover.

.263 Tunneling through rock.
.1 Drilling.
.11 Drill frames.
.2 Systems of placing holes.
.21 Square cut.
.22 V. cut
.23 Number and placing of holes.
.3 Explosives for tunnel driving.
.4 Methods of enlarging headings.
.41 English.
.42 Belgian.
.43 German.
.44 Austrian.
.45 American.
.46 Simplon.
.5 Methods of handling waste.

.264 Tunneling through soft material. Subaqueous tunnels.
.1 Forepoling and breast boards.
.2 Wedging.
.3 Tunnel shields.
.4 Pneumatic caissons.
.5 Sub-aqueous tunnels.

.265 Drifting and cross-cutting.

.266 Driving entries in coal.

.267 Alignment of tunnels.

622.268 Tunneling machines.
.269 Descriptions of tunnels. Miscellaneous.

622.27 Stoping

.271 Overhand.
.1 Longitudinal back, flat-back, or long wall.
.2 Rill cut.
.3 Raise stoping.
.4 Cutting-out.
.5 Drift stoping.
.6 Transverse.
.7 Shrinkage.
.8
.9
.272 Underhand.
.1 Ore drawn from bottom.
.2 Ore hoisted to level above, Cornish.
.273 Combination stoping.
.274 Breast stoping.
.275
.276
.277
.278
.279 Other methods.

622.28 Timbering and mine supports. Masonry lining.

.281 Kinds and properties of timber for mine use.
.1 Coniferous trees.
.11 Pine.
.12 Spruce.
.13 Firs.
.14 Larch.
.15 Hemlock.
.16 Cedar.
.17
.18
.19 Others.
.2 Deciduous trees.
.21 Oak.
.22 Hickory.
.23 Ash.
.24 Elm.
.25 Maple.
.26 Poplar.
.27

622.281.28
.29 Others.
.3 Eucalyptus
.4
.5
.282 Cutting and seasoning trees.
.1 Influence of season on felling of trees.
.2. Peeling mine timber.
.3 Seasoning timbers for mine.
.31 Air drying.
.32 Kiln dying.
.283 Preserving mine timbers.
1. Methods of application of preservatives.
.11 Brush treatment.
.12 Open tank treatment.
.13 Closed tank pressure treatment.
.2 Kinds of liquid preservatives.
.21 Salt solution.
.22 Zinc chloride—Burnett's process.
.221 Zinc chloride and glue—Wellshouses's process.
.23 Zinc or copper sulphate.
.231 Thilmany's process.
.232 Boucherie's process.
.24 Bichloride of mercury—Kyan's process.
.25 Creosote
.26 Sulphate of iron—Payne's process.
.3 Vulcanizing wood.
.284 Rock pressures.
.1 General theory of rock pressures.
.2 Weights of different rocks and earths.
.3 Action of different roofs.
.31 Creeps.
.32 Squeezes.
.33 Swelling ground.
.285 One and two stick timbering.
.1 Props or posts.
.2 Stulls.
.21 Angle of underlie of stulls.
.22 Hitches and caps with stulls.
.23 Calculating strengths of stulls.
.286 Three and four stick timbering. Timber framing machines.
.1 Drift sets.
.11 Framing drift sets.
.111 Framing drift sets for top pressure.
.112 Framing drift sets for side pressure.

622.286.113 Sills in drift sets.
.114 Lagging for drift sets.
.115 Squeeze boards, etc.
.12 Placing drift sets.
.2 Shaft sets.
.21 Methods of framing sets for shafts.
.211 Wall plates.
.212 End plates.
.213 Dividing pieces or buntons.
.214 Posts or studdles.
.215 Guides.
.22 Bearing timbers.
.23 Placing and blocking shaft sets.
.24
.25
.25
.3 Square sets.
.31 General principles of square sets.
.32 Diedesheimer square sets.
.33 Anaconda.
.34 Homestake square sets.
.35 Use of square sets in inclined seams.
.36 Modified square sets.
.37 Limiting heights of square sets.
.38 Individual members of square sets.
.39 Placing square sets.
.4 Timbering swelling ground.
.5 Timber framing machines.
.6
.7
.287 Miscellaneous timbering.
.1 Cribbing.
.2 Timbering raises and winzes.
.3 Timbering shaft stations.
.4 Chutes and chute mouths.
.5 Head frames.
.6 Bins.
.7 Trestles and bridges.
.8 Towers for tramways.
.9 Miscellaneous.
.288 Steel and concrete in mining. Masonry. (See 622.257).
.1 Steel sets.
.11 Shaft sets.
.12 Drift sets.
.2 Concrete and masonry linings.

622.289 Other methods of support.
.1 Ore pillars.
.11 Arch pillars.
.12 Shaft pillars.
.13 Dead ends.
.2 Waste filling.
.21 Flushing.
.3 Ore filling.

622.29 Handling and erecting machinery. Foundations.
.291 Handling heavy machinery.
.292 Transporting machinery.
.293 Machinery foundations.
.294 Setting machinery.
.295
.296

622.3 Working of mines.

622.31 Open wokings.
.311 General considerations.
.1 Geological conditions.
.2 Topography.
.3 Magnitude of deposit.
.4 Value of deposit.
.5 Thickness and character of overburden.
.6 Disposal of waste.
.7
.8
.312 Blasting material in open pit work.
.1 Placing blasts in churn drill holes.
.2 Placing blasts in toe holes.
.3 Placing blasts by gophering.
.313 Open pit mining by manual labor. (See 622.212 and 622.321.1).
.1 Wheelbarrows.
.2 Dump carts and wagons.
.3 Cars.
.314 Open pit mining with scrapers. (See 622.214 and 622.321.2).
.1 Slip or drag scrapers.
.2 Wheel scrapers.
.3 Fresnoes or bucks.
.4 Steam scrapers.

622.315 Open pit mining by steam shovels. (See 622.216 and 622.321.7).
.1 Methods of opening deposit.
.11 Thorough cut.
.12 Spiral cut.
.2 Height and slope of benches.
.3 Arrangement of track.
.316 Open pit mining by clam shell or orange peal dredges. (See 622.217).
.317 Open pit mining by self-dumping carriers. (See 622.321.4).
.318 Other methods of open pit work.
.319 Milling or mill holing.
.1 Opening up deposit; shafts; levels, etc.
.2 Size and spacing of mill holes.
.3 Breaking ore into mill holes.
.31 Slope of working face.
.32 Height of benches.
.33 Method of blasting.

622.32 Hydraulic mining and sluicing. Dredging.

.321 Methods of getting gravel to sluice other than hydraulicking.
.1 Hand shoveling. (See 622.212 and 622.313).
.11 Limitations.
.12 Arrangement of shoveling pits and drains.
.2 Scrapers. (See 622.214 and 622.314).
.21 Slip or drag scrapers.
.22 Steam scrapers.
.3 Track and incline.
.4 Self dumping carriers. (See 622.317).
.5 Derricks.
.6
.7 Steam shovel. (See 622.216).
.71 Gravel trammed to sluice.
.72 Dumps direct into sluice.
.322 Hydraulicking. (See 622.219).
.1 Hydraulic installations.
.11 Headgates.
.12 Diversion wiers.
.13 Ditches.
.14 Flumes.
.15 Pipe lines.
.16 Pressure boxes.
.17
.18

622.322.2 Ground sluicing.
.3 Booming.
.4 Hydraulic giants and monitors.
.41 Construction.
.42 Operation.
.43 Capacities.
.44 Deflectors.
.441 Hoskins.
.442 Smith-La Grange.
.5 Hydraulic elevators—injector type.
.51 Construction.
.52 Operation.
.53 Capacities and efficiencies.
.54 Gravel elevators.
.55 Water lifters.
.6 Other elevators.
.61 Ruble.
.62
.63

.323 Sluicing.
.1 Primitive methods.
.11 Pan, Batea. Horn-spoon.
.12 Rocker.
.13 Oregon Tom.
.14 Puddling box.
.2 Construction of sluices.
.21 Construction of boxes.
.211 Posts.
.212 Braces.
.213 Sides.
.214 Lining.
.22 Construction of riffles.
.221 Pole riffles.
.222 Rock riffles.
.223 Block riffles.
.224 Steel rail riffles.
.225 Hungarian riffles.
.226
.227
.228
.229 Other riffles.
.3 Grade and capacity of sluices.
.31 Proper grade of sluices.
.311 Influence of kind of gravel.
.312 Influence of amount of water available.
.313 Influence of kind of riffles.

622.323.32 Capacity of sluices.
.4 Undercurrents.
.41 Construction.
.42 Grade and capacity.
.5 Descriptions of installations.
.324 General considerations in hydraulic mining and sluicing.
.1 Duty of water.
.2 Topographical considerations.
.3 Dump room.
.4 Waste or debris laws.
.325 Dipper, clam shell, orange peal and suction dredges. (See 622.217).
.1 Dipper dredges for placer mining.
.2 Clam shell and orange peal dredges for placer mining.
.3 Suction dredges for placer mining.
.31 History.
.32 Construction.
.33 Operation.
.34 Uses.
.326 Bucket elevator dredges. (See 622.218).
.1 History and development.
.11 Single lift dredges.
.12 Double lift dredges.
.13 New Zealand type.
.14 California type.
.15 Sluice dredges.
.16 Table dredges.
.17 Working on head lines.
.18 Working on spuds.
.2 Mechanical construction.
.21 Hulls.
.211 Wood.
.212 Steel.
.22 Gantries.
.221 Bow.
.222 Middle.
.223 Stern.
.23 Digging ladder.
.231 Tumblers.
.24 Bucket line.
.241 Open connected.
.242 Close connected.
.243 Construction of bucket.
.1 Two lug.

622.326.243.2 Three lug.
·3 Hood.
·4 Lip.
·5 Bottom
.25 Winches and tie lines.
.26 Trommels, or screens, sprays.
.27 Gold saving tables or sluices.
.28 Spuds and tailing stacker.
.29 Other details of construction.
·3 Operation of bucket elevator dredges.
·31 Clearing ground.
·32 Breaking down gravel.
·321 By hydraulic monitors.
·322 By blasting.
·33 Digging.
·331 Order of excavation.
·332 Width of cut.
·333 Disposing of large stones.
·334 Cleaning bed rock.
·34 Stepping ahead.
·35 Cleaning up.
·4 Miscellaneous.
·327 Drift mining and thawing frozen ground.
.1 Opening drift mines.
.11 Adit.
.12 Shaft.
.2 Working drift mines.
.21 Long breast retreating.
.22 Checker board system.
.23 Other systems.
·3 Conveying gravel.
·31 Wheelbarrows.
·32 Cars.
·33 Self-dumping carriers.
·4 Thawing frozen gravel.
·41 By fires.
·42 By streams of water.
·43 By steam points.
·328 Dry placer mining.
.1 Excavating.
.2 Drying.
·3 Screening.
·4 Gold saving appliances.
·41 Pneumatic.
·411 Bellows actions—Woods.
·412 Steady air currents—Edison.

622.328.5 Miscellaneous dry placer machines.
.329

622.33 Coal mining.

.331 Opening or developing coal mines. (See 622.291).
.1 Shafts.
.12 Advantages and disadvantages.
.13 Shapes and sizes. Location.
.2 Slopes.
.21 Advantages and disadvantages.
.22 Size.
.3 Water level drifts and stone headings.
.31 Advantages.
.32 Size, location.
.4 Entries.
.41 Kind of entry; face entries; butt entries, etc.
.42 Size of entries.
.43 Grade and alignment of entries.
.5 Single entry system of development.
.6 Double entry system of development.
.7 Triple entry system of development.
.8 Slope landings, shaft bottoms, partings, sidings.
.9 Mine stables, pump rooms, shanties, lamp stations.
.332 Methods of mining coal at the face.
.1 Undercutting by pick.
.2 Undercutting by machines.
.21 Coal cutting machines.
.3 Mining in center or top of seam.
.4 Effect of roof pressure in mining. Draw slate.
.5 Wedging down the coal.
.6 Shooting down undercut coal.
.7 Shooting off the solid.
.8 Mining coal in benches.
.333 Working coal mines by room and pillar.
.1 Turning off rooms.
.11 Sighting in rooms.
.12 Direction of rooms, face on, long horn, half on, short horn etc.
.13 Running rooms both sides of entries.
.14 Double rooms.
.2 Dimensions of rooms.
.21 Slope a condition.
.22 Depth of seam and nature of roof.
.23 Character of coal.
.3 Size of pillars.
.31 Squeezes.

622.333.4 Drawing pillars.
.5 Working contiguous seams by room and pillar.
.6 Miscellaneous notes on room and pillar.
.334 Working by pillar and stall.
.335 Working by panel system.
.336 Working inclined seams.
.1 Buggy breasts.
.2 Self acting inclines.
.3 Working on battery.
.4 Lengths of rooms in inclined seams.
.5 Drawing pillars.
.6 Working contiguous seams.
.7 Methods of mining anthracite coal.
.71 Arrangement of breasts.
.72 Working the breasts.
.337 Working coal mines by long-wall.
.1 Roof pressure in long-wall work.
.2 Roadways in long-wall advancing.
.3 Roadways in long-wall retreating.
.4 Handling coal on long-wall face.
.5 Long wall on inclined seams.
.6 Long-wall on thick seams.
.7
.8
.9
.338 Miscellaneous or special coal mining methods.
.339 Comparison of coal mining methods.

622.34 Metal mining. Development.

.341 General notes on gold and silver mining.
.342 General notes on copper mining.
.343 General notes on tin mining.
.344 General notes on lead and zinc mining.
.345 General notes on iron mining.
.346 General notes on rare metal mining.
.347 Development of metal mines.
.1 Size, shape and advantages of vertical shafts.
.2 Size, shape and advantages of inclined shafts.
.3 Size, shape and advantages of cross-cut adits.
.4 Size, shape and advantages of adits on the vein.
.5 Blocking out ore bodies.
.51 Levels, factors determining distance between levels, etc.
.52 Drifts, and winzes, location and size.
.53 Stations, ore pockets, etc.

622.35 Working thick deposits.
.351 Overhand shrinkage stopes.
.352 Mining by square sets.
.353 Transverse stoping.
.354 Filling systems.
.355 Top slicing.
.356 Sub-level drifts and back caving. Chute caving.
.357 Block caving.
.358 Chamber and pillar.
.359 Other methods.

622.36 Salt mining.
.361 Dissolution method.
.362 Chamber and pillar method.

622.37 Submarine mining.

622.38 Gem mining.

622.39 Mining miscellaneous minerals.

622.4 Ventilation and lighting of mines.

622.41 Theory, gases met with, etc.
.411 Conditions demanding ventilation.
.1 Requirements of human system for oxygen.
.2 Need of carrying away poisonous or inert gases.
.3 Need of diluting or removing inflammable gases.
.4 Need of cooling deep mines or those hot from oxidation.
.5
.6
.412 Gases met with in mines.
.1 Powder smoke.
.2 Methane or fire damp.
.3 Carbonic oxide gas or white-damp.
.4 Carbon dioxide gas or choke damp.
.5 Hydrogen sulphide or stink-damp.
.6
.7
.8
.9 Other gases.
.413 Actions and effects of mine gases.
.1 Effect of gases on animal life.
.2 Inflammable and explosive mixtures.
.3

622.413.4
.5
.414 Testing for mine gases.
.1 With safety lamps. (See 622.472.33).
.11 Method of using lamps.
.12 Length of flame caps.
.13
.14
.2 Platinum wire indicators.
.21 Liveing.
.22 Beard.
.23 Mackie.
.24
.25
.3 Laboratory gas tests.
.31 Shaw machine.
.32 Gas analyses.
.33
.34
.4
.5
.6
.415 General principles of mine ventilation.
.1 Travel of air currents.
.11 Through room and pillar workings.
.111 Single entry.
.112 Double entry.
.113 Triple entry.
.14 Through long-wall workings.
.15
.16
.2 Air splits.
.3 Cubic feet of air required by law.
.31 In gaseous mines.
.32 In non-gaseous mines.
.4 Force and exhaust ventilation.
.41 Advantages and disadvantages of forcing.
.42 Advantages and disadvantages of exhausting.
.5
.6
.7
.416 Theory and calculations on ventilation.
.1 Ventilating pressure.
.2 Air velocity.
.3 Laws of friction.
.4 Coefficient of friction.

622.416.5 Quantity of air.
.6 Work and power.
.7 Laws of ventilation.
.8 Practical formulae.
.9 Miscellaneous.
.417
.418
.419

622.42 Natural ventilation.

.421 Theory of natural ventilation.
.1 Power of motive column.
.2
.3
.422 Effect of temperature and barometer on natural ventilation.
.1 Reversal of air current.
.423 Ventilation of rise and dip workings.
.424
.425
.426

622.43 Furnaces. Steam jets. Trompes.

.431 General theory of furnaces.
.432 Effective power of coal burned in furnace.
.433 Application of furnace in gaseous mine.
.1 Dumb entries.
.434 General notes on steam jets.
.435 General theory of waterfalls or trompes.
.1 Effect of cooling the air.
.2 Injector effect of trompe.
.436

622.44 Fans. Mechanical ventilators.

.441 General notes on mechanical ventilators.
.1 Extent of use and adaptability.
.2 Advantages.
.21 Efficiency.
.22 Reliability.
.23 Ability to regulate amount of air.
.24 Ability to reverse direction of air.
.25 Ease of operation.
.26
.3 Disadvantages.
.31 Cost.

622.442 Positive blowers.
.1 Reciprocating.
.11 Construction.
.12 Operation.
.13 Advantages and disadvantages.
.14 Different makes.
.2 Rotating.
.21 Construction.
.22 Operation.
.23 Advantages.
.24 Disadvantages.
.25 Different makes.
.251 Root.
.252 Connersville.
.253 Green.
.254 Baker.
.255
.3
.4

.443 Centrifugal fans.
.1 General theory of centrifugal fans.
.11 Calculation for capacity and efficiencies.
.2 Waddle type.
.21 Construction.
.22 Operation
.23 Efficiency.
.24 Makes.
.3 Guibal type.
.31 Construction.
.32 Operation.
.33 Efficiency
.34 Makes.
.35
.4 Capell type.
.41 Construction.
.411 Old design.
.412 New design.
.42 Operation.
.43 Efficiency.
.44 Makes.
.45
.5 Modern steel plate fans.
.51 Construction.
.52 Operation.
.53 Efficiency.

622.443.54 Makes.
.541 Beard-Stine.
.542 Allis-Chalmers.
.543 Jeffrey.
.544 Buffalo.
.545
.6 High-speed, multivane, fans.
.61 Construction.
.62 Operation.
.63 Efficiency.
.64 Makes.
.641 Sirocco.
.642 Sullivan.
.643 Ser.
.644
.7 Compound, Turbo fans.
.71 Construction.
.72 Operation.
.73 Efficiency.
.74 Makes.
.741 Clifford-Capell.
.742
.8
.9 Other centrifugal fans.

.444 Disc or propeller fans.
.1 General theory of disc fans.
.2 Calculations for capacity and efficiencies.
.3 Adaptability.
.4 Construction.
.5 Operation.
.6 Makes.
.61 Stine.
.62 Sturtevant.
.63
.64

.445 Motive power for mine fans.
.1 Steam.
.2 Compressed air.
.3 Electricity.
.4 Gasolene.
.5 Water power.
.6 Direct connections and drives.
.61 Chain drives.
.62 Belt drives.
.63 Gear drives.

622.446 Fan setting. Reversing.
.1 Location of fans.
.2 Construction of fan houses.
.21 Materials of construction.
.22 General design (of doors).
.23 Arrangements.
.24 Explosion doors.
.25
.3 Reversing direction of air.
.31 By changing direction of rotation.
.32 By doors.
.33 By revolving casing.
.447 Theory and calculations on mechanical ventilators.
.1 Theory and calculations for positive blowers.
.11 Reciprocating.
.12 Rotating
.2 Theory and calculations for centrifugal fans.
.3 Theory and calculations for disc fans.
.448 Descriptions of installations.
.449 Comparisons. Miscellaneous.

622.45 Airways. Stoppings. Regulators.

.451 Airways.
.1 Size and shape of airways.
.2 Use of airways for haulage or travel.
.3 Doors on airways
.4 Overcasts.
.5 Undercasts.
.6
.452 Stoppings.
.1 Construction.
.2 Brattices.
.3 Curtains.
.4
.5
.453 Regulators.
.1 Shifting Doors.
.2 Box regulators.
.454
.455

622.46 Measurements of ventilation. Temperature. Humidity.

.461 Measuring air pressure.
.1 Water gauge and manometer.
.2

622.462 Measuring air velocity.
.1 Air meter or anemometer.
.2
.463 Determining air temperatures.
.1 Thermometer.
.2
.464 Determining humidity of air.
.1 Hygrometer.
.2 Hydrodeik.
.465
.466

622.47 Lighting. Safety lamps, etc.

.471 Stationary illuminators.
.1 Reflected daylight.
.2 Electric.
.21 Searchlights.
.22 Arc lights.
.23 Incandescent.
.24
.3 Gas.
.31 Natural gas.
.32 Coal gas.
.33 Acetylene gas.
.4 Gasolene.
.472 Candles.
.473 Torches.
.474 Lamps.
.1 Oil.
.2 Acelylene.
.3 Safety.
.31 Construction of safety lamps.
.32 Use and care of safety lamps. (See 622.414.1)
.33 Illuminating power of safety lamps.
.34 Kinds of safety lamps.
.341 Davy.
.342 Clanny.
.343 Evan Thomas.
.344 Ashworth-Hepplewhite-Gray.
.345 Pieler.
.346 Wolf.
.347
.348
.349
.35 Oils for safety lamps.
.351 Animal.

622.474.351.1 Lard.
.2 Seal.
.3 Whale.
.352 Vegetable.
.1 Rape.
.2 Colza.
.3 Cottonseed.
.4 Cocoanut.
.353 Mineral.
.1 Gasolene.
.2 Naphtha.
.3 Benzine.
.4 Kerosene.
.354 Alcohol.
.355 Special and mixed oils.
.4 Electric storage-battery lamps.
.41 Non-rechargeable batteries.
.411 Construction.
.412 Kinds of batteries.
.413 Makes of lamps.
.413.1 Every ready.
.42 Rechargeable batteries.
.421 Construction of lamps.
.422 Batteries.
.423 Makes.
.1 Hubbell.
.2 Hirsch.
.3 Victor.

622.48 Coal dust.

.481 Occurrence and formation of coal dust.
.1 In rooms.
.2 Along entries and haulage ways.
.482 Properties of coal dust.
.1 Explosive action of coals of different analysis.
2. Effect of fineness of dust.
.483 Conditions to start dust explosion.
.484 Propagation of explosions.
.485 Preventing coal dust explosions.
485.1 Allaying dust.
.11 By sprinkling.
.12 By humidification.
.2 Dust treatment.
.486 After results of dust explosions.
.486.1 Physical effects.
.2 Resulting gases.

622.487
.488
.489
622.49 Miscellaneous on ventilation and lighting.

622.5 Drainage.

622.51 Theory of infiltration of water.

.511 Rainfall.
.1 Extent.
.2 Effect of climatic and seasonal changes on rainfall.
.3 Watershed.
.4 Runoff.
.5 Evaporation.
.512 Seepage waters.
.1 Extent and variation of.
.2 Conditions affecting seepage.
.21 Topography.
.22 Geology.
.221 Unconsolidated deposits.
.222 Stratified deposits.
.223 Massive deposits.
.224 Dykes.
.225 Fault planes.
.23 Climate.
.24 Vegetation.
.513 Water level. Hydraulic gradient.
.514 Movement of underground waters. Water courses.
.515 Artesian wells.
.516 Springs.
.517 Magmatic waters. Ground water.
.1 Theory of ground water level.
.2 Conditions effecting depth of ground water.
.3 Limits of ground water in horizontal sheets.
.518 Drainage of old workings.
.519

622.52 Natural drainage.

.521 Surface diversions.
.1 Ditches.
.2 Dams.
.3 Drains, etc., to prevent waters entering mine openings or surface works.
.522 Underground diversions.
.1 Dams. Barriers. Bulkheads. (See 622.56.)

622.522.2 Adits. (See 622.261.)
.21 Size. Cross-section and grade of drainage adits.
.22 Methods of carrying water
.222 Side ditches.
.222 Ditches under track.
.223 Boxes.
.3 Siphons.
.31 Theory.
.32 Adaptability
.33 Operation.
.523 Drainage down shafts.
.1 Effect on timbers.
.2 Effect on ventilation.
.3 Collecting rings.
.4 Sumps.
.5 Swamps.
.524 Drainage through bore holes.
.525
.526

622.53 Cornish pumps.

.531 General description.
.532 Operation of Cornish pumps.
.533 Efficiency of Cornish pumps.
.534 Cornish pump rods.
.534.1 Materials of construction.
.2 Connections.
.3 Catches and bumpers.
.4 Guides.
.5 Adjustment of weights.
.6 Balancing.
.7 Strains in rods.
.8 Wire rope.
.9
.535 Cornish pump cylinders.
.535.1 Arrangement of valves.

622.54 Steam pumps. Compressed air. Electric.

.541 Operation of pumps by steam.
.1 General considerations.
.2 Efficiency.
.3 Simple steam ends.
.4 Compound steam ends.
.5 Running steam pumps condensing.
.6 Valves for steam pumps.

622.541.7
.8
.9
.542 Operating pumps by compressed air.
.1 General conditions.
.11 Advantages.
.12 Disadvantages.
.2 Efficiency.
.543 Operating pumps by electricity.
.1 General considerations.
.11 Adaptability.
.12 Advantages.
.13 Disadvantages.
.2 Efficiency.
.3 Motors for pump service.
.544 Miscellaneous power for pumps.
.545 General notes on adaptability and efficiencies of pumps.
.1 Pumps for high pressure duty.
.2 Pumps for low pressure duty.
.546 General notes on care and operation of pumps.
.547 Types of pumps.
.1 Lift pumps
.2 Force pumps.
.21 Duplex.
.22 Triplex.
.23 Quintuplex.
.3 Double acting pumps.
.31 Simplex.
.32 Duplex.
.33 Piston.
.34 Plunger.
.341 Inside packed.
.342 Outside packed.
.343 Center packed.
.4 Sinking pumps.
.41 Construction.
.42 Efficiency.
.5 Centrifugal pumps.
.51 Construction.
.52 Operation.
.53 Adaptability.
.54 Efficiency.
.6 Injector pump. Hydraulic water lifters.
.61 Construction.
.62 Operation.

622.547.63 Efficiency.
.7 Pulsometers.
.71 Construction.
.72 Operation.
.73 Efficiency.
.8 Air lift pumps.
.9 Hydraulic rams and miscellaneous pumps.
.548 Pump details.
.1 Valves.
.2 Cylinders.
.3 Air chambers.
.549 Descriptions of individual pumps and pump installations.

622.55 Hoisting of water.

.551 Principles of water hoists.
.552 Efficiency of water hoists.
.553 General arrangement of water hoists.
.1 Hoist used for water and other service.
.2 Automatic hoists for water only
.554 Advantages and disadvantages of water hoists.
.1 Effect of splash on timbering.
.2 Freezing.
.3
.4
.555 Water buckets and tanks.
.556 Water skips.
.557 Methods of dumping water tanks.
.1 Tank valves.
.2 End dump tanks.
.3 Self-dumping water skips.
.558 Sump arangements for hoisting water.
.559

622.56 Dams and water tight lining.

(See also 622.28, Timbering.)
.561 Necessity of mine dams.
.562 Pressure on mine dams.
.563 Construction of dams.
.564 Wooden dams.
.1 Flat.
.2 Wedge shaped.
.565 Masonry dams.
.566 Concrete dams.
.567 Other dams.

622.57 Acid waters. Mine waters.
.571 Pollution of mine waters.
.572 Testing mine waters.
.573 Handling acid waters.
.574 Handling other deleterious mine waters.

622.58 Underground drainage systems. Piping.
.581 Underground drainage systems.
.582 Underground piping.
.1 Kinds of pipe for mine use.
.2 Laying pipe.
.3 Care and life of pipe lines.
.4 Anchoring pipe in shafts.

622.59 Drainage districts.
.591 Formation of drainage districts.
.1 Extent.
.592 Laws relating to drainage districts.
.593 Taxation.
.594 Drainage companies.

622.6 Extraction. Hoisting and transportation.

622.61 Handling mineral in working place.
.611 Picking and shoveling to.
.1 Sacks.
.2 Baskets.
.3 Zurrones.
.4 Barrows.
.5 Buckets.
.6 Cars.
.7 Conveyors.
.8
.9
.612 Steam shovel underground.
.613 Gravity.
.1 Chutes.
.2 Pockets.
.3 Batteries.

622.62 Underground roads.
.621 Earth.
.622 Plank.
.623 Railroads.
.1 Gauge.

622.623.2 Grades.
.3 Curves.
.4 Roadbed.
.5 Track.
.51 Rails.
.511 Wooden.
.512 Strap iron or steel.
.513 T-rails.
.52 Rail fastenings.
.53 Spikes.
.54 Ties.
.6 Switches.
.61 Latch and point.
.62 Stub.
.63 Turnout.
.64 Cross-over.
.65 Diamond.
.66 Automatic.
.67 Pass-bys.
.68
.69
.7 Crossings.
.71 Cross-overs.
.72 Turn sheets.
.73 Turn-tables.
.74
.8 Track laying, sheaves, rollers, etc.
.9 Miscellaneous data.
.624
.625
.626

622.63 Mine cars, trams, etc.

.631 Coal cars (standard).
.632 Ore cars.
.633 Car bodies.
.634 Car trucks.
.635 Wheels and axles.
.636 Car fastenings. Hitching. Latchings.
.637 Trollies.
.638 Man cars.

622.64 Gravity roads and planes.

.641 Self-acting incline or gravity plane.
.1 Three-rail.
.2 Four-rail.

622.641.3 Two track planes.
.4 Grade.
.5 Length.
.6 Capacity.
.642 Engine planes.
.1 Single track.
.2 Double track.
.3 Single plane with balance weight.
.4 Engine or motors.
.5 Grade.
.6 Length.
.643 Monorail.

622.65 Tramming and animal haulage.

.651 Human.
.652 Animal.
.1 Dog.
.2 Burro.
.3 Horse.
.4 Mule.
.653 Selection of animals.
.654 Care of animals.
.1 Feeding.
.2 Stabling.
.3 Shoeing.
.4 Harness.
.655 Favoring conditions.
.656 Average work done.

622.66 Mechanical haulage.

.661 Rope haulage.
.1 Engine planes, etc. (See 622.64.)
.2 Tail rope system.
.3 Endless rope system.
.662 Locomotives.
.1 Steam.
.11 Tractive.
.12 Positive or rack rail.
.2 Compressed air.
.21 Types.
.22 Changing stations.
663 Electric motors.
.1 Types.
.2 Trolleys.
.3 Current used.
.4 Storage battery.

622.664 Gas and gasolene motors.
.1 Types.
.2 Gases exhausted.
.3 Safety.
.665 Rating of locomotives or motors.
.1 Drawbar pull.
.2 Haulage resistance.
.3 Ton miles.
.666 Gathering.
.667 Size of trains.
.668 Main road haulage.
.669 Miscellaneous.

622.67 Hoisting engines. Drums. Ropes.

.671 Human.
.1 Direct pull.
.2 Packing.
.3 Windless.
.4 Winch.
.672 Animal.
.1 Whips.
.2 Whims.
.673 Mechanical.
.1 Water wheel. Impact. Turbine.
.2 Steam hoists
.21 Types.
.3 Compressed air hoists.
.31 Types.
.32 Storage of air.
.33 Reheating of air.
.34 Regeneration of air.
.4 Electric hoists.
.41 Types.
.42 Motors used.
.43 Current.
.44 Motor-generator sets.
.45 Storage battery systems.
.5 Gas and gasolene hoists.
.51 Types.
.52 Adaptability.
.674 Drums. Spools. Reels.
.1 Cylindrical drums.
.2 Conical drums.
.3 Cylindro-conical.
.4 Spools.
.5 Reels.

622.674.6 Fixed drums. Spools. Reels.
.7 Loose drums. Spools. Reels.
.8 Clutches.
.9 Brakes.
.675 Rating and selection of hoists.
.1 Motors.
.2 Drums.
.3 Spools.
.4 Reels.
.676 Hoisting systems. Hoisting problems.
.1 Unbalanced.
.2 Balanced.
.3 Koepe.
.4 Whiting.
.5 Butte air regeneration.
.6
.7
.8 Hoisting problems.
.677 Indicators. Overwinding devices.
.1 Target or dial indicators.
.2 Shaft indicators. Vertical, horizontal.
.3 Differential or compensating indicators.
.4 Signal devices. Signal codes.
.5 Overwinding devices.
.6 Automatic cut off.
.7 Auxiliary brakes.
.8 Detachable hooks.
.9 Miscellaneous.
.678 Hoisting and haulage ropes.
.1 Class.
.11 Round.
.12 Tapering.
.13 Flat.
.2 Material.
.21 Vegetable fibre.
.22 Iron.
.23 Cast steel.
.24 Plow steel.
.3 Section.
.31 Wires.
.32 Strands.
.33 Cores.
.34 Lays.
.4 Selection of ropes.
.5 Care of ropes.
.6 Splicing of ropes.

622.678.7 Calculations.
.8 Sheave wheels. Rope fittings.
.9 Miscellaneous.
.679

622.68 Cages. Skips. Buckets.

.681 Single deck cages.
.682 Multiple deck cages.
.683 Slope cages.
.684 Shaft skips.
.685 Slope or incline skips.
.686 Buckets.
.687 Automatic dumping devices.
.688 Safety devices, chairs, etc.
.689 Guides, track, skids, etc.

622.69 Surface transportation, including mineral roads, wire ropeways, transhipment, loading, unloading, etc.

.691 Human.
.1 Load carried.
.692 Animal.
.1 Pack train.
.2 Wagon haulage.
.3 Animals employed.
.31 Dogs.
.32 Burros.
.33 Mules.
.34 Horses.
.35 Oxen.
.36 Llamas.
.4 Trails.
.5 Roads.
.6 Loads.
.7
.8
.9 Miscellaneous.
.693 Mechanical.
.1 Railroad (steam).
.2 Electric motors.
.3 Compressed air engines.
.4 Gas and gasolene motors.
.5 Motor trucks.
.6 Wire rope ways.
.61 Single cable.
.611 Fixed buckets.

622.693.612 Detachable buckets.
.62 Double cable.
.621 Fixed buckets.
.622 Detachable buckets.
.63 Reversible rope ways.
.631 Single cable.
.632 Double cable.
.64 Track cable. Traction cables.
.65 Rolling stock.
.651 Buckets.
.652 Carriages.
.653 Grips.
.654 Trolleys.
.66 Supports.
.661 Towers.
.662 Trestles.
.663 Tension stations.
.664 Bridges. Guard-nets.
.665 Sheaves.
.666 Saddles.
.667 Length of span.
.67 Stations.
.671 Terminal stations.
.672 Angle stations.
.673 Methods of loading and unloading.
.674 Automatic loading devices.
.675 Automatic unloading devices.
.68 Suspension cableways.
.681 Inclined cableways.
.682 Horizontal cableways.
.683 Ropes.
.684 Carriages.
.685 Towers.
.7 Conveyors.
.71 Gravity discharge elevators.
.72 Rigid bucket carriers.
.73 Pivoted bucket carriers.
.74 Cable conveyors.
.75 Flight or scraper conveyors.
.76 Bucket conveyors.
.77 Screw conveyors.
.78 Belt conveyors.
.781 Belt.
.782 Belt carriers.
.783 Trippers.
.784 Incline.

622.693.79 Miscellaneous.
.694 Water transportation.
.695 Headframes. Tipples. Ore bins.
.696 Terminal stations. Depots.
.697 Mechanical devices for loading and unloading.
.698 Tariffs. Duties. Customs. Taxes on ores.
.699

622.7 Mechanical preparation. Ore dressing.

622.71 Theory. Preliminary operations.

.711 Character of minerals.
.1 Specific gravity.
.2 Size of grains.
.3 Shape of grains.
.4
.5

.712 Character of gangue material.
.1 Brittleness.
.2 Friability.
.3 Specific gravity.
.4 Porosity.
.5
.6

.713 Theory of momentum in concentration.
.714 Theory of centrifugal force.
.715 Free settling of particles in water.
.716 Electro-conductivity and magnetism.
.717 Colloid hydrates.
.718 Theory of surface tension.
.719

622.72 Hand dressing.

.721 Underground sorting.
.722 Hand sorting or picking on surface.
.1 Picking belts.
.723 Hand cobbing.
.724 Slate picking.

622.73 Crushing. Stamping engine.

.731 Preliminary crushing.
.1 Jaw crushers.
.11 Blake type.
.12 Dodge type.
.13

622.731.2	Gyratory crushers.
.3	
.4	
.5	Disc crushers.
.732	Rolls.
.1	Principles of roll crushing.
.11	Wet crushing.
.12	Dry crushing.
.2	Speed and capacity.
.3	Care and operation. Foundations.
.4	Repairing. Roll shells.
.5	Spring rolls.
.6	Rigid rolls.
.7	Corrugated or toothed rolls.
.8	Vertical rolls: Triplex rolls.
.9	Other rolls Comparisons. Miscellaneous
.733	Steam, pneumatic and spring stamps.
.1	Steam stamps.
.11	Single cylinder.
.12	Cross-compound.
.13	Tandem-compound.
.14	Operation of steam stamps.
.15	
.16	
.2	Pneumatic stamps.
.3	Hydraulic stamps.
.4	Spring stamps.
.734	Gravity stamps.
.1	Action and capacity.
.11	Stamping dry.
.12	Stamping wet.
.2	Operation and repair.
.21	Life of shoes and dies.
.22	
.23	
.3	Mortar blocks. Foundations.
.4	Mortars.
.41	Individual mortars.
.42	Double discharge mortars.
.43	Single discharge mortars.
.44	Sectionalized mortars.
.45	
.46	
.5	Other details of construction.
.51	Guide blocks.
.52	Stems.

622.734.53 Cams.
·54
·55
.6 Power for stamps.
·7
.8
·9
.735 Chilian and Huntington mills.
.1 Chilian mills.
.11 Construction.
.12 Adaptability.
.13 Operation and repair.
.14 Power and capacity.
.15 Makes.
.2 Huntington mills.
.21 Construction.
.22 Adaptability.
.23 Operation and repair.
.24 Power and capacity.
.25 Makes.
·3
·4
·5
.736 Grinding pans.
.737 Disintegrators and pulverizers.
.738 Ball and tube mills.
.1 Construction.
.2 Adaptability.
.3 Operation and repair.
.31 Pebbles.
.32 Linings.
.4 Power and capacity.
.5 Makes.
.51 Conical ball mill.
·52
·53
·54
.739 Other crushers. Laws of crushing. Miscellaneous.

622.74 Screening. Classification.

.741 Principles of screen sizing.
.742 Kinds of screen cloths. Openings.
.743 Makes of screens and sizers.
.1 Stationary screens and grizzlies.
.2 Shaking and pulsating screens.
.3 Impact screens.

622.743·4 Revolving screens. Trommels.
·5 Belt screens.
.6 Sizers.
·7
.8
·9 Comparisons. Miscellaneous.
·744
·745 Principles of classification.
·746 Classification schemes. Practical details.
·747 Kinds of classifiers.
.1 Free settling classifiers. Cones.
.2 Hindered settling classifiers. Hydraulic classifiers.
·3 Dewatering classifiers and sand and slime separators.
·4
·5
.6
·748
·749 Other data on classifiers and classification.

622.75 Jigging. Ore concentrators.

·751 Laws of jigging.
·752 Operation and adaptability of jigs.
·753 Kinds of jigs.
.1 Jigs for coal washing.
·754 Table concentrators.
.1 Theory and practice.
.2 Wilfley table.
·3 Card.
.4 Standard.
·5 Overstrom.
.6 Deister.
·7
.8
.9 Others. Camparisons.
·755 Belt concentrators.
·756 Dry concentrators.
·757 Preliminary washers.
.1 Trough washers.
.2 Log washers.
·3 Wash trommels.
·758
·759 Comparisons. Miscellaneous.

622.76 Slime treatment. Flotation.

·761 Principles of slime treatment.
·762 Settling and thickening of slimes.

622.763 Table slimers.
.1
.2
.3
.764 Traveling belt slimers.
.1 Shaking
.2 Stationary.
.765 Buddles. Rotary slime concentrators.
.766 Other slimers. Comparisons. Miscellaneous.
.767 Principles and theory of flotation.
.768 Flotation proceesses.
.1 Elmore process.
.2 Potter and Delprat.
.3 Minerals Separation Co.'s process.
.4 DeBavay process.
.5 Macquisten's process.
.6 Wood's flotation method.
.7
.8
.9 Other processes. Adaptability. Comparisons.
.769 Miscellaneous data on flotation.

622.77 Magnetic separation.

.771 Principles and theory of magnetic separation.
.772 Preparing ores for treatment. Magnetic roasting.
.773 Primary magnet separators.
.1 Wetherill.
.2 Ball-Norton.
.3 Ferraris.
.4 Leighton.
.5
.6
.7
.8
.9 Others. Comparisons.
.774 Induced magnet separators.
.1 International.
.2 Ulrich.
.3 Grondal.
.4 Cleveland-Knowles.
.5
.6
.7
.8
.9 Others. Comparisons.

622.775 Electrostatic separators.
.1 Blake-Morscher.
.2 Huff.
.3
.776
.777

622.78 Coal washing. Washeries.
.781 Necessity for washing coal.
.782 Theory and principles of coal washing.
.783 Laboratory tests and analyses.
.784 Construction of washeries.
.785 Accessory apparatus for washeries.
.786 Arrangement of machinery and order of treatment.
.787 Descriptions of coal washing plants.
.788 Operation of washeries.
.789 Miscellaneous data.

622.79 Dressing works. Accessory apparatus.
.791 Construction of mill buildings.
.1 Steel.
.2 Wood.
.792 Foundations and setting of mill machinery.
.793 Accessory apparatus in mills.
.1 Bins.
.11 Construction.
.12 Bin gates.
.13 Capacities.
.2 Feeders.
.21 Apron feeders.
.22 Reciprocating plate.
.23 Shaking.
.24 Automatic roll.
.25 Automatic rotary.
.26 Revolving disc.
.27 Push feeders.
.28
.29
.3 Conveyors.
.4 Elevators.
.5 Pumps.
.6 Launders.
.61 Construction.
.62 Grade and capacity.
.63
.7 Driers and dewatering wheels.

622.793.8 Sampling and weighing devices.
.9 Miscellaneous.
.794 Power in milling.
.795 Water for concentration.
.796 Operation of mills. Practical milling.
.797 Testing and sampling mills. Laboratory outfits.
.798 Descriptions and flow sheets of concentrators.
.799 Miscellaneous data.

622.8 Dangers and accidents. Sociology.

622.81 Explosions of fire-damp, dust, etc.

.811 Fire-damp explosions.
.1 Causes of fire-damp explosions.
.2 Prevention of fire-damp explosions.
.3 Effect of fire-damp explosions.
.4 Handling of fire-damp explosions.
.812 Coal dust explosions. (See 622.48.)
.1 Causes of coal dust explosions.
.2 Prevention of coal dust explosions.
.3 Effect of coal dust explosions.
.4 Handling of coal dust explosions.
.813
.814

622.82 Mine fires.

.821 Causes of mine fires.
.822 Prevention of mine fires.
.823 Effect of mine fires.
.824 Handling of mine fires.
.825
.826
.827 Descriptions of metal mine fires.
.828 Descriptions of coal mine fires.
.829

622.83 Crushing and fall of ground.

.831 Causes of caving ground.
.832 Prevention of caving ground.
.833 Effect of caving ground.
.834 Handling of caving ground.
.835 Surface caving or subsidence.

622.84 Flooding of mines.

.841 Causes of mine floods.

622.842 Prevention of mine floods.
.843 Effect of mine floods.
.844 Handling mine floods.

622.85 Accidents to miners.

.851 Classification of metal mine accidents.
(Note—If desired, each class may be divided into fatal and non fatal accidents.)
.1 Surface accidents.
.11 Overwinding cage, skip or bucket.
.12 Falls from ladders, bins, etc.
.13 Falling down shaft or prospect hole
.14 Machinery accidents.
.15 Handling loose rock or ore.
.16 Tramming—gravity trams.
.17 Coming in contact with live wire.
.18 Operating hydraulic or placer machines
.19 Miscellaneous.
.191 Boiler explosions.
.192 Lightning.
.193 Avalanches.
.194 Snow slides.
.2 Shaft accidents.
.21 Falls from buckets, cage, etc., while in motion.
.22 Getting off while in motion.
.23 Caught in shaft while being hoisted or lowered.
.24 Falls of material.
.241 From shaft sides.
.242 From overloaded bucket, car or skip.
.25 Falls.
.251 Falls from ladder.
.252 Falling down shaft from level.
.253 Pushing car into open shaft.
.26 Carrying tools, timber or explosive.
.27 Struck by descending cage, bucket or skip.
.28 Cable becoming detached, cage falling.
.29 Miscellaneous.
.3 Underground accidents.
.31 Falls.
.311 From ladders.
.312 From overloaded staging.
.313 Down chute, winze, or manway.
.32 Falls of material.
.321 Falls of rock.
.322 Falls of timber while timbering.
.33 By tram car. Tramming.

622.851.34 Handling loose rock or ore.
.35 Caught by running material.
.36 Drilling.
.361 Machine drilling.
.362 Hand drilling.
.37 Machinery accidents.
.38 Suffocation.
.381 Burning shaft house or tunnel building.
.382 By powder smoke.
.39 Miscellaneous.
.4 Accidents from explosives.
.41 Handling explosives.
.411 Carrying explosives.
.412 Storing explosives.
.413 Thawing explosives.
.42 Picking out missed shot.
.43 Drilling into missed hole.
.44 Blast exploding while loading.
.45 Waiting too long after spitting.
.46 Returning before blast goes off.
.47 Striking unexploded powder while mucking.
.48 Hit with flying rock from blast.
.49 Miscellaneous.

.852 Classification of coal mine accidents.
(Note—If desired, each class may be divided into fatal and non-fatal accidents.

.1 Surface accidents.
.11 Overwinding cage.
.12 Falls from ladders, tipples, etc.
.13 Being struck by car.
.14 Machinery accidents.
.15 Coming in contact with live wire.
.16 Falling down shaft or prospect hole.
.17 Injured by cable.
.18
.19 Miscellaneous.
.191 Boiler explosions.
.192 Lightning.
.193 Avalanches.
.194 Snow slides.
.2 Shaft or slope accidents.
.21 Falls from cage while in motion.
.22 Getting off cage while in motion.
.23 Falls.
.231 From ladder.
.232 Falling down shaft from landing.

622.852.24	Falling material.
.241	From sides of shaft.
.242	From overloaded cars.
.25	Carrying tools, timber, or explosives.
.26	Being struck by descending bucket or trip.
.27	Injuries on falling cage.
.271	When cable becomes detached.
.272	When engineer loses control.
.28	Miscellaneous.
.29	
.3	Underground or drift accidents.
.31	Falls.
.32	Falls of material.
.321	Falls of drawslate.
.322	Falls of rock.
.323	Falls of coal.
.33	Struck by car.
.34	Burns.
.35	Machinery accidents.
.36	Suffocation.
.361	By smoke from burning building.
.362	By smoke from mine fires.
.363	By after-damp.
.37	Coming in contact with live wire.
.38	Injuries from horses or mules.
.39	Miscellaneous.
.4	Accidents from explosives.
.41	Handling explosives.
.411	Carrying explosives.
.412	Storing explosives.
.413	Thawing explosives.
.42	Blast exploding while loading.
.43	Waiting too long after spitting.
.44	Returning before blast goes off.
.45	Premature explosion by electricity.
.46	Striking unexploded powder.
.47	Hit with flying coal or rock.
.48	Starting fires or explosion by blasts.
.49	Miscellaneous.
.853	Percentages of fatal and non-fatal accidents in metal mines.
.854	Percentages of fatal and non-fatal accidents in coal mines.
.855	Miners insurance.
.1	Life insurance.
.2	Accident insurance.

622.855.3 Workmen's aid.
.856 Liability for accidents.
.1 Employer's liability.
.2 Employee's liability.
.3 Contributory negligence.
.857
.858

622.86 Rescue and relief.

.861 Rescue work in good air.
.1 Organization of rescue parties.
.2 Conducting rescue parties.
.3 Rescuing imprisoned men.
.4 Rescuing injured men.
.5 Descriptions of rescues.
.6

.862 Rescue work in irrespirable atmosphere; breathing apparatus for use in noxious atmosphere.
.1 Necessity of organized rescue work.
.2 Organization of rescue teams.
.3 Oxygen breathing apparatus—self-contained.
.31 Free oxygen injector type.
.311 Draeger.
.312 Westfalia.
.32 Free oxygen type without injector.
.321 Proto or Fleuss.
.33 Oxygen generating apparatus.
.331 Aerolith (liquid air).
.332 Servus.
.34 Other types.
.35 Notes on oxygen regenerators.
.36 Notes on helmets and mouth breathing apparatus and equipment.
.37 Supplies for breathing apparatus.
.371 Pumps.
.372 Oxygen and tanks.
.38 Miscellaneous.
.4 Stationary breathing apparatus.
.5 Special oxygen reviving apparatus.
.51 Draeger Pulmotor.
.52 Dr. Brat.
.6 Mine rescue stations.
.7 Mine rescue cars.
.8 Conducting rescues and miscellaneous equipment.
.9 Descriptions of rescues. Miscellaneous.

622.863 First-aid work.
.1 Necessity of first-aid instruction.
.2 First-aid instruction. Classes.
.21 Federal.
.22 State.
.23 Private.
.3 First-aid materials and supplies.
.4 Methods of first-aid treatment.
.5 Organization of first-aid teams.
.6 First-aid meets.
.7
.8
.9
.864
.865
.866

622.87 Inspection of mines. Mine bureaus and laboratories.

.871 Necessity of mine inspection.
.872 Federal inspection of mines.
.873 State inspection of mines.
.1 Organization of state offices.
.2 Duties of state inspectors.
.3 Authority and responsiblity of state inspectors.
.4 Qualifications of state inspectors.
.5 Appointment.
.6

.874 Company inspection of mines.
.1 Organization of inspecting force.
.11 Inspectors.
.12 Fire bosses.
.13 Shot firers.
.2 Qualifications of inspecting force.
.3 Duties of inspecting force.
.4 Authority of inspecting force.
.5 Responsibility of inspecting force.
.6

.875 Federal bureau of mines.
.876 State mining bureaus.
.877 Mining laboratories.
.878
.879

622.88 Health and care of workmen. Institutions for miners.

.881 Sanitary arrangements and care of workmen under ground.
.1 Miner's diseases.
.882 Sanitary arrangement and care of workmen on the surface.
.1 Change houses and dry rooms.
.2 Workmen's dwellings.
.3 Model towns.
.4
.883 Medical aid for workmen.
.1 Company doctors.
.2 Company hospitals.
.21 Underground hospitals. (See 622.862.)
.22 Camp hospitals.
.23 General hospitals.
.3 Hospital and medical funds.
.884 Company stores and boarding houses.
.885 Social clubs.
.886 Schools.
.887 Churches.
.888 Asylums and prisons.
.889

622.89 Miners' customs and life. Miners and mining men.

.891 Life of miners.
.892 Miners' customs.
.893 Etiquette of miners.
.894 Mine superstitions and traditions.
.895 Miners of all ages.
.896 Human side of mining.
.1 Mining ethics.
.2 Moral responsibilities.
.897 Histories and biographies of miners.
.898 Histories and biographies of mining men.
.899 Miscellaneous.

622.9 Mine economics. Accounting. Miscellaneous.

622.91 Mine investments. Stocks and stockholders.

.911 Mines as investments.
.912 Mining risks.

622.913 Causes of mine failures.
.1 Natural causes.
.2 Lack of management.
.3 Litigation.
.4
.5

.914 Mine frauds.
.1 Wild-cat mines.
.2 Salting mines.
.3
.4

.915 Mine promotion.
.1 Capital for mines.
.2 Mine promoters.
.3 Floating mines.
.4 Selling mines.
.5 Buying mines.
.6
.7

.916 Mining companies.
.1 Organization.
.2 Foreign.
.3 Domestic.
.4 Offices.
.5 Meetings.
.6 Regulation of.
.7
.8 Reports.
.9 Miscellaneous.

.917 Mine stocks and bonds.
.1 Assessable stock.
.2 Non-assessable stock
.3 Listing stocks.
.4 Stock speculation.
.5 Watered stock.
.6 Bonds.
.7 Capitalization.
.8 Valuation.
.9 Dividends.

.918 Mine stockholders.
.1 Protection of stockholders.
.2 Information to stockholders.
.3 Duties of stockholders.
.4 Liabilities of stockholders.
.5 Rights of stockholders.

.919

622.92 Management of mines.

.921 General principles of mine management.
.1 Application of sound engineering principles.
.11 Efficiency engineering.
.2 Coordination and efficiency of human units.
.3 Coordination and efficiency of mechanical units.
.4 Economy in purchase and consumption of supplies.
.5 Economy in disposal of product.
.6 Scientific management.

.922 Organization of mine force.
.1 Managers and general superintendents.
.2 Superintendents and foremen.
.3 Shift bosses and gang bosses.
.4 Engineering staff.
.5 Mechanics and electricians.
.6 Purchasing agents.
.7 Auditors and cashiers.
.8 Timekeepers and clerical force.
.9 Other help.

.923 Mine labor.
.1 Kinds of labor—skilled and unskilled.
.11 White.
.12 Southern Europe.
.13 Mexican.
.14 Chinese and Japanese.
.15 Kaffir.
.16 Convict.
.17 Child.
.18 Women mine workers.
.19 Other labor.

.924 Payment of mine labor.
.1 Straight wage.
.2 Script.
.3 Sliding scales.
.4 Piece or task work.
.5 Bonus system.
.6 Cooperative mining.
.7 Workmen's compensation.
.8 Employer's liability.
.9 Miscellaneous. Pensions.

.925 Administration of mine force.
.1 Mine rules and regulations.
.2 Mine discipline.
.3 Rights of the miner.

.926 Ore thefts. High grading.

.927 Responsibility of mine officials and relation to society.

622.928 Qualification of successful mine officials.
.929 Capital and labor.

622.93 Organized labor.

.931 Organization of labor union.
.1 Oficers.
.2 Membership.
.3 Walking delegates.
.4 Labor agitators.
.932 Responsibility of labor unions. Treating with labor unions.
.1 Open shop.
.2 Closed shop.
.3 Right to discharge.
.4 Arbitration.
.5 Card system.
.6 Black list
.933 Labor strikes.
.1 Strikes with grievances.
.2 Sympathetic strikes.
.3 Referendum votes.
.4 Picketing.
.5 Boycotts.
.6 Courts and strikes.

622.94 Contract systems and leasing. Ore purchasing.

.941 Contract work in mines.
.1 Kinds of contract work.
.2 Forms of contracts
.3 Premiums and bonuses.
.942 Leasing mines.
.1 Forms for mine leases.
.2 Advantages of leasing
.3 Disadvantages of leasing.
.4 Royalties.
.5 Tribute system.
.943 Marketing of ore and ore contracts.
.1 Sampling.
.2 Mixing and grading ores.
.3 Ore contracts.
.944

622.95 Mine accounts. Bookkeeping.

.951 Bookkeeping .
.1 Single entry.

622.951.2	Double entry.
.952	Standardization of mine accounts.
.953	Classification of mine accounts.
.1	Capital account.
.11	Property.
.12	Machinery and plant.
.13	Buildings.
.14	Surface works.
.15	Main opening—shafts, adits.
.16	Underground development.
.17	Depreciation.
.18	Amortization.
.2	Development.
.21	Shaft sinking.
.22	Drifting.
.23	Cross cutting.
.24	Raising.
.25	Sinking.
.26	Prospecting.
.3	Ore extraction.
.31	Stoping or breaking ore.
.32	Timbering or filling.
.33	Underground tramming.
.34	Hoisting.
.35	Pumping.
.36	Sampling, assaying, and surveying.
.37	General underground maintenance.
.38	Sorting.
.39	Miscellaneous.
.4	Transportation.
.41	Wagon.
.42	Animal train.
.43	Railroad.
44.	Water.
.5	Ore reduction or treatment.
.51	Crushing.
.52	Amalgamation.
.53	Concentration.
.54	Cyaniding.
.55	Slime treatment.
.56	Roasting
.57	Smelting—converting.
.58	Refining.
.59	Miscellaneous.
.6	Ores and bullion.

622.953.7 Administration.
.71 Salaries (managers and office force).
.72 Office expense.
.73 Traveling expense.
.74 Insurance.
.75 Legal expense.
.76 Accidents.
.77 Medical—hospital, sanitary.
.78 Stable and transport.
.79 Miscellaneous.
.8 Head office.
.81 Agency expense.
.82 Directors' fees.
.83 Consulting engineer.
.84 Auditor.
.85 Bank charges.
.86 Interest on debentures.
.9 Miscellaneous.

.954 Books employed.
.1 Cash book.
.2 Time book.
.3 Supply book.
.4 Voucher book.
.5 Journal.
.6 Ledger book.
.7
.8
.9 Others.

.955 Forms.
.956 Card and loose leaf system.
.957 Cost account and analysis of costs.
.958 Balance sheets.
.959 Miscellaneous.

622.96 Systems for keeping mine notes. Recording engineering and geological data.

.961 Keeping notes in the field.
.1 General notes.
.2 Special notes.
.3 Note books.
.962 Recording geological data in the field.
.963 Recording geological data in the office.
.964 Keeping permanent notes.
.1 General notes.
.2 Special notes.
.3 Note books.

622.965 Filing information.
.966 Card indexes.
.967

622.97 Taxation. Insurance.

.971 Taxation of mines.
.972
.973 Mine insurance. Buildings and shipments. Liability.

622.98 Miscellaneous data on business side of mining.

622.99 Unclassified data on mining in general.

RELATIVE INDEX

C.

D.

E.

H.

I.

M.

Q.

R.

S.

T.

Z.