

the balance sheet showed an aggregate production estimated at \$7,000,000.

Meanwhile a change was wrought, and lead instead of zinc became the by-product. An increasing degree of attention was paid to the more recently discovered mineral, until at the present time ten dollars' worth of zinc is produced for every dollar's worth of lead taken from the ground. This new field has enabled the United States to become an important factor in the zinc market of the world. A few years since America contributed scarcely one-eighth of the world's supply. At the present rate of increase this country will ere long furnish more than one-fourth of the aggregate consumption. This little tract, which is now yielding as high as \$300,000 worth of zinc ore per week, is at present supplying fully seven-eighths of all the zinc used in the United States, and it must therefore be apparent that the export trade has not as yet undergone any considerable development, but this is only a question of time, and in anticipation of it a number of the smelters of Belgium and Wales have already established agencies in Joplin, the commercial center of the mineral belt.

The three zinc ores found in the district are the sulphide, silicate and carbonate. The sulphide, which is at once the most abundant and most valuable ore, occurs in several varieties, distinguished chiefly by color. The purity of this ore is well illustrated by the fact that it seldom runs below sixty per cent metal, and in some cases it is practically chemically pure, running two-thirds metal and one-third sulphur. The future developments in the working of the zinc properties are difficult of prediction, not only because geologists contend that still larger bodies of ore will be found at greater depths than have yet been reached, but also by reason of the irregular distribution of the zinc ore; it being found in thin sheets in crevasses of limestone; in huge chambers; buried in clay; disseminated through solid brecciated rock which requires blasting, and forming a lining for cavities. Zinc and lead are very frequently mined together, the two ores being found in close proximity.

Not only do the peculiarities already noted exist, but the distribution of the zinc ore is by no means regular, and the test drills have pierced half a dozen strata. All the mining yet done has been at shallow depths. The Eleventh Hour, the deepest mine operated in the district, is only 240 feet deep, and the average shaft has a depth of not more than half that distance. Deep drilling has shown, however, that beyond the four hundred-foot level there are larger bodies of mineral deposits than in any of the shallow diggings now being worked. It is now estimated that it will require twenty years to exhaust the surface

workings and get down to the workings of only two hundred feet and over, so that it will doubtless be some time before the miners are ready to get at the five hundred foot level, which experts declare will contain more ore than all the shallow mines combined.

The formation of the district is such that very little timber support is required in any of the mines. The mines are free from fire damp, and the miners are subjected to none of the inconveniences which must be borne by coal miners, who necessarily operate in very cramped quarters. Frequently these zinc miners work in great caverns two hundred feet in length, perhaps a third as wide, and fully forty feet in height—a chamber of sufficient size to insure the presence of good air.

The cleaning of the ore is a somewhat complicated operation. Immediately upon its arrival at the surface it is transferred to huge bins in the mills, from which it is fed into the crushers, a good-sized stream of water being turned into the crusher simultaneously with the raw material. The ore after it has been crushed to the fineness of sand, is carried by the water into sluice boxes, which are provided with false bottoms that collect the ore and allow the dross to escape in much the same manner that gold is washed out of gravel by placer miners. It is during the cleaning process that the lead and zinc are separated, the former having nearly double the specific gravity of the latter. The average mill has a capacity of one hundred tons per day, but each one hundred tons of material fed into the crushers yields only about one-tenth that amount of pure cleaned ore. This may seem a surprisingly small proportion, and the mine operators themselves agree that there is a tremendous waste, but say that the loss will shortly be greatly reduced by the introduction of improved methods.

There has been in the history of the development of America's natural resources few instances to parallel the manner in which the prices of zinc have gone up within the past few years. The average for the year 1897 was slightly over \$18 per ton; for 1898, \$21 per ton, and for the year which closed in June, 1899, over \$34 per ton. More surprising still is the fact that in the first six months of 1899 the average price of all the zinc sold in the Joplin district was \$44 per ton, and in some instances sales were made at \$55 per ton. Some idea of the profits made possible to the producers may be gained from the fact that the average cost of production does not exceed \$14 per ton, and in many localities the ore can be cleaned and made ready for market at a total expenditure of \$10 per ton.

There are almost eight hundred mines in the Joplin district, and they give employment to over ten thou-

sand men. All classes of citizens have engaged in the mining operations, some with almost no capital. In other cases a group of miners will go into partnership with some local merchant, who furnishes the money with which to purchase powder and the necessary tools. Joplin, which a few years ago was little more than a village, now has a population of thirty thousand and there are in the district several other mining camps, all of which are connected by the longest electric railway in the world.

The Building Edition for July.

The SCIENTIFIC AMERICAN Building Edition for July is a beautiful number of this artistic periodical. In addition to houses of various prices there are a number of illustrations of the Pan-American Exposition and also a very important interview with Mr. John M. Carrère on the Pan-American Exposition. Among the other attractive features are a Spanish-American house at Alhambra, and two English gardens accompanied by two beautiful illustrations. An editorial is devoted to "The Situation of the House." The departments of this issue are "Monthly Comments," "Talks with Architects," "New Books," "Household Notes" and "New Building Patents."

The Current Supplement.

The current SUPPLEMENT, No. 1332, has many important articles. "Greek Gold Ornaments from Scythia" describes the remarkable examples of ancient gold jewelry presented to the Metropolitan Museum of Art by J. Pierpont Morgan, Esq. "The Rise and Development of Egyptian Art" is by Prof. W. M. Flinders Petrie. "The Sea Bottom—Its Physical Conditions and Its Fauna" is by Prof. C. C. Nutting. "The Making of a Great Atlas" is by Spencer Townsend. "The Manufacture of Portland Cement in California" is by Edwin Booth. "Historical Geology" is by Prof. W. B. Scott, of Princeton University. "Astronomical Laboratories" is an article by Arthur R. Hinks. "Installation, Operation and Economy of Storage Batteries" is by Ernest Lunn and is accompanied by a number of illustrations and diagrams.

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RECENTLY PATENTED INVENTIONS.

Mechanical Devices.

STRIPING AND ORNAMENTING DEVICE.—WILLIAM M. GLENZINGER, Fernandina, Fla. This device conveniently and effectively applies gold leaf and other thin sheets of material to woodwork, and may be used to apply any color or pattern desired. It comprises means for carrying a roll of the article applied, which is in the form of a long strip with a suitable cement on one side, the device having a moistening appliance so as to wet the cement.

COIN-CONTROLLED VENDING-MACHINE.—CHARLES DUHAMEL, Rue Le Pelletier 11, Paris France. The discharge of the article is controlled by the insertion of a coin. The articles to be delivered are preferably of a uniform shape to facilitate delivery. To prevent fraud the coins must be inserted through a slit of a given length. Coins of smaller diameter than the length of the slit have no action.

TIRE REMOVING AND REPLACING DEVICE.—CLARENCE G. DINSMORE, Staatsburg, N. Y. This device comprises an arm adapted to engage with one end one side of a wheel-rim, the arm being fashioned to extend transversely over the tire. A lever is pivoted to the other end of the arm; and a presser-plate is carried by the lever and adapted to engage the tire at the side opposite the one on which the arm engages the wheel-rim. The tool is easily manipulated, and enables the operator readily to remove the tire from the rim.

DUPLICATE SALES-RECORDER.—JOHN T. GILBERT, Eufaula, Ala. The invention relates to devices for producing duplicates of memoranda, by the use of a number of paper strips with interposed carbon paper. The apparatus is provided with an efficient mechanism for feeding the paper a predetermined distance and, with another mechanism for perforating the paper, to facilitate the tearing off of the slips written upon.

SURGICAL TABLE.—CARLOS F. DARDANO, San Salvador, San Salvador. In this surgical table the various parts are adjusted to facilitate placing a patient in different positions. The table comprises a frame on which legs are supported; a table-top formed in two sections hinged together; a rack connected with the pinte of the hinges; and a pinion with which the rack is engaged, by which to move the rack.

Railway Appliances.

CAR-LOADER.—SAMUEL E. KURTZ, Sac City, Iowa. The apparatus carries grain or other

material into a car and simultaneously loads or discharges the material toward opposite ends of the car. The grain passes through a hopper into a conveyor tube extending through the doorway of a car. A screw-conveyor forces the material to the end of the tube where it will be thrown by a rapidly rotating fan toward opposite ends of the car. The apparatus is comparatively light, so that it can be readily handled.

Miscellaneous Inventions.

COMBINED FEED-BOX AND SEAT.—ROBERT C. JARVIS, West Pullman, Ill. This invention provides a feed-box for a team, which box, when not needed, can be used as a seat, and which, when required, can be quickly and conveniently secured upon the tongue of a vehicle. The construction is simple, durable and cheap.

HEATER.—JAMES M. JEFFREY, Waynesville, Ill. The heater is designed to be used in connection with brooding-rooms, and comprises a main flue under the floor of the room, leading from the furnace to a smokestack, and a number of risers on the main flue, these risers extending through the room and having removable caps for opening or closing their outer ends. When the caps are removed the products of combustion pass out through the risers. By manipulating the damper of the smokestack and the caps of the risers, the temperature of the room can be readily changed.

PROVISION-BINDER.—HENRY WEIL and SAMUEL SCHWEISHEIMER, Manhattan, New York city. The object of the inventors is to provide a device which may be quickly fastened around boned ham or other meats, and which will dispense with the usual binding strings. The binder consists of a skeleton frame formed of a series of straight wires laced to a series of circularly-bent wires which are separated at one side.

BADGE.—BENJAMIN HARRIS, Manhattan, New York city. This invention relates to certain improvements in the means for holding in place the pins of badges and like articles which are to be attached to one's clothing. To this end the invention comprises a pin, the shank of which is bent back preferably parallel with the body of the pin and held in a casing or sleeve forming part of the collet or annulus to which the base of the badge is generally fastened, this part of the annulus extending inwardly from and preferably across from one side to the other.

SHADE-ROLLER.—CHARLES F. FLOS, New York city. A portion of the shade-roller

is so constructed that a retaining device is longitudinally formed therein. In this device one end of a shade can be quickly and conveniently entered. The device serves to hold fast the entered portion of the shade without the aid of cement or tacks. The retaining device does not tear or mutilate the cloth.

BOTTLE-STOPPER.—JOSEPH FELDMANN, Manhattan, New York city. This stopper is especially adapted for beer-bottles, and effectually seals the mouth even though the glass may be chipped or broken. The stopper and its attached gasket are made to enter the mouth of the bottle to a much greater extent than the ordinary stoppers, the gasket itself bearing against the inner face of the neck of the bottle from the upper edge to some distance within the neck.

STOOL.—ALBERT F. CURRIER, St. Regis Falls, N. Y. The stool is a piano-stool of improved construction, and is arranged to move horizontally to enable the user to reach about in the immediate neighborhood without leaving the seat.

SWINGING HOSE-RACK.—REUBEN D. WIRT, Independence, Mo. The invention provides a hose-rack or swinging support for folded hose, which rack is adapted to prevent the hose from leaving the rack in a mass when pulled upon at the upper end, thereby preventing the hose from becoming entangled when it is quickly withdrawn.

CONVERTIBLE TRUNK AND WRITING-DESK.—LAURA E. BUCKINGHAM, Manhattan, New York city. This convertible trunk and writing-desk is arranged to be conveniently converted from a trunk into a writing-desk, or vice versa, so that the owner may use the structure as a trunk when traveling, or as a writing-desk when at home.

PUMP-BOX.—JOSEPH H. RODGERS and JOHN A. POWELL, Pittsburg, Penn. The pump-boxes of ships are built from deck to floor and are intended to receive the pumps by which the vessel is kept clear of water. Ordinarily these boxes are built of wood, and are liable to be broken by the cargo, especially in loading and unloading the vessel. This invention seeks to overcome the objection by forming a box of metal pressed into the proper form.

COMBINED NECKTIE-FASTENER AND COLLAR-BUTTON.—ORIN H. PEAK, Parsons, Kans. The invention relates to improvements in necktie-fasteners and collar-buttons in which a spring, levers, and pins or points hold the necktie in position, the whole constituting a collar-button. The invention provides novel

levers and points to hold the tie and bow in place.

APPARATUS FOR THE DESTRUCTIVE DISTILLATION OF WOOD.—GEORGE O. GILMER, New Orleans, La. By the simple construction invented by Mr. Gilmer, the vapors from the closed retort are drawn from the bottom, while the heat is applied to the top of the retort, so that the top portion of the wood will give off its vapors first. These vapors are made to descend through the cool wood below, so that the turpentine vapors, which are first given off, are discharged uncontaminated by the tarry or creosote vapors.

PROJECTILE.—ALVIS F. CROOM, 180 Bryan Street, Dallas, Texas. The cylindrical body and conical point of the projectile are provided with two opposite spiral semi-circular grooves. When fired from a smooth-bore gun, the inventor states that the projectile will rotate once in every eight or ten inches of its flight and maintain a flat trajectory for a comparatively long distance. The invention is designed to reduce the cost of manufacture of guns by providing projectiles which, when discharged from the muzzle, will rotate as if discharged by a rifle.

KNOCKDOWN CAMP-STOVE.—STEPHEN J. COCHRAN, Silcox, Mo. The body of the stove is composed of six separable parts connected by sliding joints. The body of the oven is composed of four parts which are supported by and between the sides of the body, the sides forming the ends of the oven. The detachable connection between the parts of the oven and stove body is constructed upon the principle of tenon and mortise.

CARTRIDGE-CARRIER.—EDWARD T. GIBSON, U. S. A., Fort Harrison, Helena, Mont. The object of the invention is to provide paper cases in which are placed the number of cartridges required to fill the magazine of a Krag-Jorgensen rifle, or any other suitably constructed breech-loading gun. The paper case is so shaped as to bunch the cartridges together compactly so that they cannot pound each other; but in order to be prepared to interpose strips of paper between them, should it be deemed advisable, and at the same time not interfere with the free "running" of the cartridges from the paper, an intervening piece is provided. The cartridges will readily roll out of the case when the intervening space is formed as the inventor desires.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.