Germany's Brown Coal

How Teuton Chemists Have Converted the Lowly Swamp Muck Into an Industrial Cinderella

By Robert G. Skerrett

FOR decades brown coal in Germany was generally considered scarcely better than peat for the generation of heat, and was used sporadically by people who dug it for their own consumption because black coal was not available or cost too much for their modest purses. Broadly stated, brown coal may be termed bituminous coal in the making—vegetable matter which has not been subjected to the compression and the high temperatures that brought about the formation of the well-known combustible. As brown coal comes from the ground it resembles woody, half-dried peat or muck such as may be found in many swampy forests. Before it is dried the stuff may be cut easily, and when dry the fibrous matter is apparently no more carbonized than the wood so often present in peat beds. The lignite, for such the fuel really is, is certainly unpromising when first dug, for its average moisture content is about 60 per cent; and when most of this water has evaporated the material tends to crumble. This affects both its keeping and its burning quali-

ties, more especially if the ordinary grates are used. doing in utilizing brown coal, and the data gathered is suggestively of great value. From the facts garnered by our experts it is not hard to realize why the Teutons are undismayed by their enforced separation from the bituminous coal fields which were formerly under their control. The brown coal lies in beds having a vertical thickness ranging from 32 to 328 feet with an average of 72 feet. The deposits are overlaid by relatively thin strata of gravel and clay, and this overburden is removed to facilitate the mining of the coal by open-cut methods. The gravel and clay are cleared away by steam shovels which dump the stuff directly on to cars that carry the spoils to banking grounds. Not infrequently, clay-working plants are operated close by and employ the brown coal for fuel.

When a satisfactory area of the brown coal has been exposed, movable rails are laid and powerful excavating machines of the chain-and-bucket pattern are advanced on them to the desired points of action. There the face of the cut is attacked at an angle of from 45

close to the pit, and is typical of kindred factories reared at numerous points throughout the lignite fields of Germany. The establishment is supplied daily with 800 carloads of the raw material, each load weighing 1,320 pounds.

The lignite is passed through one or two pairs of crushing rolls and is screened by inclined vibrating sieves, and such of the stuff as still remains coarse is carried through a third crusher. The woody parts and hard lumps which will not drop through any of the sieves are taken by a belt conveyor to the boiler furnaces and there burned. In the course of ten or twelve hours enough brown coal is crushed and screened to supply the briquetting machines for a period of twenty-four hours. One man can look after the functioning of two sets of sieves.

The duly crushed, fine, moist lignite is distributed by belt conveyors to bins near the driers. The driers are sheet-iron cylinders 23 feet long and 10 feet in diameter, supported on trunnions and mounted longitudi-

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Diagrammatic showing of the benefits that Germany can reap by the skillful use of her inexhaustible beds of brown coal

ties, more especially if the ordinary grates are used.

Offhand, one might be justified in the assumption that no nation, until hard put to it, would take any serious steps toward exploiting a fuel that seems to have so little to commend it. Yet, back in the "nineties," the Germans saw possibilities in their widespread and well-nigh inexhaustible deposits of brown coal, and with typical Teuton thoroughness evolved, in a comparatively short while, ways and facilities by which the initially indifferent combustible could be transformed into a fuel of undeniable merit. They did this by a briquetting process; and from a friable, unstable commodity they made a product that would stand rough handling and endure exposure to the weather for months without disintegrating. Right here let it be emphasized that Germany's brown coal is much inferior in fuel value to most of the lignites that prevail abundantly in certain sections of the United States.

The U. S. Bureau of Mines has kept in touch as far as practicable with what the Germans have been

to 50 degrees, and each machine disposes of a slice of lignite to a depth of 43 to 49 feet. The succession of sharp-edged buckets, trailed by an endless chain, dig into the exposed slopes of the beds as they are dragged from the bottom to the top of the excavation. The buckets empty into hoppers from which the brown coal is loaded into small cars having a capacity of 1.3 cubic yards. One mechanical excavator, calling for the attendance of only three men, can cut about 1,650 tons in the course of 24 hours. The filled cars are drawn by locomotives to a station where they are attached to a chain belt which pulls them up an incline to the upper floor of the briquet factory. When the excavations reach still deeper, the chain-tractor system is extended to the terraces adjacent to the steam diggers, and the laden trams are then hauled right from the pits without the aid of locomotives.

One of the best examples of a brown-coal briquetting plant is that at Zisselsmarr, in the neighborhood of Cologne. It is a substantial brick structure placed

nally at an angle of 7 degrees from the horizontal. Each drier contains an inner cylinder carrying more than 360 four-inch tubes set parallel with the axis of that drum. Exhaust steam from the plant engines circulates around the tubes through which the damp coal is moved continually under the impulse of spiral feeders. The speed at which the ground material travels through the drier depends upon its moisture content. When this is 60 per cent the passage takes about 45 minutes; and during that time the moisture is reduced to 15 per cent. There are several driers, and each has a capacity of 77 short tons of dry lignite every twenty-four hours. It is said that the air in all parts of the establishment is substantially free from floating dust by reason of certain precautionary features, and this effectually obviates any risk of dust explosion—a danger that was not absent from some of the earlier briquetting factories. Before the war the drying cost was 17½ cents per ton of product.

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A New Form of Hydraulic Propulsion

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through A divides and passes into the impeller through the unmasked portions of the holes in the sides of the drum. This internal drum can be rotated about the impeller shaft by means of the lever shown and can be held in any desired position. When it is set as shown in the drawing, the orifice for the discharge stream is of maximum area and the pump is set for full speed ahead. If the drum be rotated clockwise, the effective area of the discharge port and also of the inlet ports is reduced. As a consequence, the volume of water handled by the impeller and the speed of the vessel is lessened. In the extreme position, as shown in dotted lines, the inlet ports and the outlet port are completely masked, the impeller merely churns the water inside the casing, and the engine is practically relieved of the load. Consequently, no mechanical clutch is required between the engine and the pump.

Now, let us suppose that the inner drum is rotated anti-clockwise from the position shown in the side view. The effect is first to decrease the outlet orifice and throttle the discharge stream. The continuation of the rotation results in the passageway 1 being increasingly opened by the orifice in the periphery of the drum, while the unmasked portions of the side orifice remain substantially constant in area. In this condition a portion of the discharge stream is sent rearward and a portion forward through the passageway A. If the movement be continued a point will be reached at which the momenta of the two portions are equal and the vessel will remain stationary, although the engine is running under full load. Still further rotation will result in the entire discharge stream being delivered forwardly to A, when the propulsive equipment will immediately develop full speed astern.

Since the two pumps are controlled independently, one may be set full ahead and the other full astern, and the boat can be turned within its own length; in fact, the course of the vessel can be controlled by the pump only, if so desired. In its investigation of this very interesting experimental boat, *The Engineer* found that the speed developed at 950 revolutions and $7\frac{3}{4}$ brake horsepower was 5.6 knots, and the calculations by Mr. Hotchkiss, the inventor, showed a jet efficiency of 73 per cent. He assumes the efficiency of the pumps at 90 per cent, and thus arrives at a propulsive efficiency of 65.7 per cent. Taking the engine efficiency at 75 per cent, the over-all efficiency works out at 49.3 per cent. This, *The Engineer* considers would be a fair showing in a vessel propelled by the old screw propeller, although our contemporary takes no responsibility for the data on which the calculation is based.

It should be mentioned that the pumps can be arranged to draw their supply of water from within the hull, in the event of the vessel being holed; and if the pumps are capable of handling in twelve seconds or so, as is claimed, a weight of water equal to the displacement of the vessel, they should be able to salvage a craft in which they were fitted, even though it was very seriously injured.

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From the driers the coal goes through pulverizers which reduce it to fairly uniform size; thence the powdered material is shifted mechanically to a cooling room, fitted with slanting floors or shelves over which it drops by gravitation; and at the bottom of the cooling chamber the lignite is in a condition to be handled by the briquetting presses to which it is led directly. The presses are of the open-mold plunger type, which subject the powdered brown coal, containing about 15

NEW BOOKS, ETC.

PERSONNEL ADMINISTRATION. Its Principles and Practice. By Ordway Tead and Henry C. Metcalf, Ph.D. New York: McGraw-Hill Book Company, 1920. 8vo.; 538 pp.

The fallacious but still dominant formula, that results are directly proportional to the power of enforcing obedience, fails to cover the complex relationship between managers and managed. We glimpse the fact that the quality of the obedience as determined by the mental reactions of the managed is overwhelmingly important—economically as well as sociologically, if indeed the two factors are ever sundered. In "Personnel Administration" we find a sane balancing of these constituents, a comprehensive survey of the field, an evaluation of educational and health elements, specific research, the coordination of departments, and joint relations. Vital topics are logically grouped and suggestively handled for the benefit of students, executives and employers. The best practice from innumerable sources is incorporated in the volume.

DIRECT-CURRENT MOTOR AND GENERATOR TROUBLES. By Theodore S. Gandy and Elmer C. Schacht, Lt. J. G., U.S.N.R.F. New York: McGraw-Hill Book Company, 1920. 8vo.; 274 pp.; illustrated.

This is in the main a compilation of the simplest and most effective methods of tracing and correcting troubles, preceded by adequate descriptions of the various types of motors and generators, and their uses. There is also an analysis, from the operator's standpoint, of problems centering about operation, care, and repair. The illustrations are necessarily taken from standard machines, but the instruction is so given as to be general, and applicable to the operation of all types. The question, "What is the matter?" confronts the operator again and again; in giving a true, understandable answer, this handbook fills a daily need.

AMERICAN MACHINISTS' HANDBOOK AND DICTIONARY OF SHOP TERMS. By Fred H. Colvin and Frank A. Stanley. New York: McGraw-Hill Book Company, 1920. 16mo.; 758 pp.; illustrated.

Shop and draughting-room are not immune from change, and this third edition of a work that is creating many friends for itself takes the changes into due consideration and adds much timely information. Mathematics being the heart of mechanics, the tables and data here carefully selected and brought together, some of them from almost inaccessible sources, will soon pay for the elbow-room they occupy; tools, processes and accepted practice are treated at length; shop and drawing room standards, horse-power, belts and shafting, and shop trigonometry are presented in convenient arrangement, and the illustrated dictionary of terms is a valuable feature.

MECHANICAL DRAWING FOR HIGH SCHOOLS. A Text with Problem Layouts. By Thomas E. French and Carl L. Svensen. New York: McGraw-Hill Book Company, 1919. 8vo.; 221 pp.; illustrated.

In many ways this is an exceptionally good text, and will be recognized as such by the industrial educator. More than the ordinary care has gone to teaching the best ways of using the drawing board and instruments; shape visualization and description are rightly treated as of prime importance; other expositions include the technic of the finished drawing, mechanical and architectural practice, and graphic solutions and sheet-metal drafting. Eighty pages of problems cover all phases of the study, and the instructions are amply illustrated.

HUMAN AND INDUSTRIAL EFFICIENCY. By Henry Chellow, Ph.D., D.Sc. Preface by Rt. Hon. Lord Sydenham, F.R.S. New York and London: G. P. Putnam's Sons, 1920. 12mo.; 149 pp.

This short study of the factors of efficiency recognizes two fatigues, "and the most important is that of the mind." Lord Sydenham, in his preface, lays unrest at the door of our neglect of the psychological requirements of the human machine, and the author, whose instruction at the University of London will be remembered by many American officers, writes as practical philosopher rather than as engineer. His synthetic study gives brief glimpses of the broad field, and is but the forerunner of a projected volume that will deal more exhaustively with vocational adaptation and training.

MOTOR QUERY ENCYCLOPEDIA. Cincinnati: American Automobile Digest, 1919. 16mo.; 129 pp.; 160 illustrations.

A very large proportion of our people are practically interested in motors. Questions as to cause and effect are continually arising in

their minds. The chances are that you will find your pressing question of the moment formulated in this little handbook, and answered to your full satisfaction. Axles, batteries, chassis, clutches, cooling, lighting, ignition, steering gear, transmission—in short, everything about the car is explained in brief, simply-worded paragraphs.

HYDRAULIC TABLES. By Gardner S. Williams, M.Am.Soc.C.E. and Allen Hazen, M.Am.Soc.C.E. New York: John Wiley and Sons, 1920. 8vo.; 115 pp.; illustrated.

These important tables, accompanied by brief explanations, deal with gaging, the friction of water flowing in pipes, sewers, etc., as determined by the Williams-Hazen formula, and the flow of water over sharp-edged and irregular weirs and the quantity discharged. There is a new chapter of additional data in this third edition, and a graph showing the relations of the chief results both new and old. These tables have proved their value in fifteen years of use.

MEXICO IN REVOLUTION. By V. Blasco Ibañez. Translated by Arthur Livingston and José Padin. New York: E. P. Dutton and Company, 1920. 8vo.; 245 pages.

Ibañez, caught in the "vertiginous" storm of a Mexican revolution, tells us how it all came about. These articles first appeared in American newspapers, and they constitute a chatty, keen account in which Mexican society, character, and politics parade before the edified reader. Bonillas, Obregon and Gonzalez are drawn with a sure hand, the condition of the country is set nakedly before us, and in the final chapter, on Mexico's attitude toward the United States, amusing and serious elements mix to define a situation of which we should all have more knowledge.

A MANUAL OF THE TIMBERS OF THE WORLD. By Alexander L. Howard. New York: The Macmillan Company, 1920. 8vo.; 446 pp.; 100 illustrations.

This notable handbook is intended to supplement rather than to supersede other works. The characteristics and uses of all commercial timbers are alphabetically catalogued, pictured, and described. Other material includes the conversion and preservation of timber, specifications and conditions of contract, Lasset's tables, a classification of timbers according to the country of origin, and a bibliography. The section by S. Fitzgerald, on artificial seasoning, is a noteworthy feature, and there is an index to scientific names in addition to the general index.

SURFACE WATER SUPPLY OF THE UNITED STATES. 1917. Part I. North Atlantic Slope Drainage Basins. Washington: Government Printing Office, 1920. 8vo.; 200 pp.; 2 plates.

Data collected by the Geological Survey during 1917, and presenting results of measurements of flow made on streams, occupy 14 reports, of which this is one. It describes the typical gaging station and its equipment, and tabulates the records of the North Atlantic Slope.

AMERICAN LUBRICANTS. From the Standpoint of the Consumer. By I. B. Lockhart. Easton, Pa.: The Chemical Publishing Company, 1920. 8vo.; 341 pp.; illustrated.

The difference between this and most other books on lubrication is indicated in the subtitle; the user's interests are made paramount, and the buyer and consumer of oils and greases is taught to select intelligently those best suited to his purposes. From crude petroleum to its refined products, characteristics and properties are described; solid and fluid friction and the lubricants and systems dealing with them are discussed; following this come chapters on the demands of special machinery, from the internal combustion engine to the steam railway. Mills and plants of all kinds are considered, and tests, analyses, and up-to-date specifications are dealt with at great length. Important tables conclude the informing and helpful work.

THE COLONIZATION OF NORTH AMERICA. 1492-1783. By Herbert Eugene Bolton, Ph.D. and Thomas Maitland Marshall, Ph.D. New York: The Macmillan Company, 1920. 8vo.; 609 pp.; 49 maps.

Eastern insularity may be to blame; however that may be, it is a fact that most of our works on colonization are devoted to the thirteen English colonies, slighting France, dismissing Spain with a word, and largely ignoring Holland, Sweden, Russia and Denmark. The substantial volume in hand corrects this narrow viewpoint and brings local developments together as integral parts of a complete picture. It rehearses the whole drama of civilization in North America, with strict attention to time sequence and the compara-

tive importance of racial activities. This breadth of treatment is commendable, and readers will gain from it an expanded consciousness of the multiplex factors that left us what we were at the close of the Revolutionary War.

FUEL OIL IN INDUSTRY. By Stephen O. Andros, A.B., E.M. Chicago: The Shaw Publishing Company, 1920. 8vo.; 244 pp.; illustrated.

The principles of fuel oil combustion and its physical and chemical properties are here outlined in a highly satisfactory manner. There is a comparison of coal and oil fuel, a chapter on colloidal fuel, and a long and valuable discourse on distribution and storage. Other chapters treat of heating and pumping; boiler furnaces; fuel oil burners; fuel oil in steam navigation, locomotives, iron and steel manufacture, the production of electricity; in the sugar, glass, and ceramic industries, the heating of buildings, and the making of gas. The publication is timely, the theme well handled, and the appeal wide.

A COURSE IN PRACTICAL MATHEMATICS. By F. M. Saxelby, M.Sc., B.A. New York and London: Longmans, Green and Company, 1917. 8vo.; 472 pp.; illustrated.

This thorough course takes cognizance of the needs of the technical student. The deductive treatment is accompanied at every step by graphic or arithmetical verification; the arbitrary system of symbols is illuminated by the facts of experience. Thus the mind is gradually prepared for the analytical methods of differentiation, and trigonometry is made comprehensible to the earnest student. The same method is extended to the mastery of definite integration, and the best educational order of subjects is followed, rather than the merely logical or historical order.

THE CERAMIC INDUSTRIES POCKET BOOK. By Alfred B. Searle. New York: Isaac Pitman and Sons, 1920. 16mo.; 267 pp.; illustrated.

From various sources this manual takes information that has been of practical assistance to those engaged in the clay-working, glass, and allied industries, and arranges it in convenient form. It describes materials, gives data on water and steam, briefly treats of mechanics and dynamics, gives pertinent facts relating to machinery and burning and kilns, and presents ceramic calculations. A bibliography and a list of technical and other associations round out a handbook of high value to students and workers.

DICTIONARY OF EXPLOSIVES. By Arthur Marshall. Philadelphia: P. Blakiston's Son and Company, 1920. 8vo.; 159 pp.

Those who are acquainted with Mr. Marshall's authoritative works on explosives will be glad to note this up-to-date dictionary, which replaces old books of a similar nature. Very little is included beyond explosives with special or proprietary names, so that practicality is assured. We find those used in British, American and European coal mines, in blasting, in shells, bombs, shotguns and rifled firearms; descriptions and formulas are given, and there is an index of constituents.

A TEXT-BOOK OF PHYSICS. By Louis Bevier Spinney. New York: The Macmillan Company, 1920. 8vo.; 617 pp.; illustrated.

Professor Spinney has taken pains to make the fundamental subject of mechanics as interesting and understandable as possible to the college student. Heat, electricity, sound and light are so presented as to include descriptions of all experimental laws and phenomena that directly contribute to a logical development of general physics without becoming digressive. A knowledge of algebra, geometry, and the trigonometrical functions is assumed; practical aspects are emphasized, illustrations use mainly familiar phenomena, and principles are exemplified by investigating their applications.

A GUIDE TO THE MILITARY HISTORY OF THE WORLD WAR. 1914-1918. By Thomas G. Frothingham, Captain U.S.R. Boston: Little, Brown and Company, 1920.

It is exceedingly difficult to find within a year or two after a war, a history of the conflict treating events in their proportional importance, or with anything like a true perspective. Yet the consensus of military opinion seems to be that Capt. Frothingham has accomplished this feat. His narrative synopsis covers the strategy and grand tactics of the whole war. Students and the general reader should find the outline invaluable as a check against the misleading tendency of phase study and as a guide in forming a clearcut, orderly conception of the wave-action of the forces employed. The author's analysis of the battle of Jutland is a striking instance of his critical, descriptive and deductive powers.

Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

Pertaining to Apparel

GARMENT FASTENER.—B. A. SHAMMO, 106 W. 79th St., New York, N. Y. This invention has for its object to provide a construction which may be easily attached to the garment and which in operation will properly hold the garment while permitting easy engagement or disengagement. A further object is to provide a fastener in which a bridge and interlocking tongue are used, and giving the finished appearance of a rounded button.

SHOE FASTENER.—B. A. SHAMMO, 106 W. 79th St., New York, N. Y. This invention relates to a fastening device which is especially adapted for use with shoes. An object is to provide a fastener wherein a proper clamping action is secured when first used, and means are presented which will permit a readjustment of the parts to maintain a desired position of the garment fastened, and which will thereby automatically take up any stretching or distending of the material of the article.

Electrical Devices

SWITCH FOR FLASH LIGHTS.—H. M. KORETZKY, c/o Bright Star Battery Co., 310 Hudson St., New York, N. Y. More particularly the invention relates to a switch for intermittently or continuously closing the circuit of the battery and lamp. The general object is to provide a combination of push-button and slide button so arranged that they are employed independently for closing the circuit by engagement with the contact strip within the casing of the flash light.

STORAGE BATTERY.—P. M. MARKO, 1191 Bedford Ave., Brooklyn, N. Y. The invention has for its general object to provide a form of jar cover which permits of the level of the electrolyte to be easily and quickly ascertained without removing the vent or filling plug; this is accomplished by the making of the cover of transparent pressed glass of special design, and within the cell are two distinctly colored arrows attached to the terminal posts, which serve as means for determining the proper level of the electrolyte.

ELECTRIC SWITCH.—A. M. CONDIT, 19 Essex St., East Orange, N. J. The object of the invention is to provide an electric switch arranged to permit of conveniently closing an electric circuit temporarily or for any length of time according to the desires of the user, and without requiring his attention for the time being. Another object is to permit of conveniently attaching the switch to a desired support on an automobile for use in signaling devices to enable the operator to control the display signals.

BLASTING APPARATUS.—S. T. HOAR, 2216 Cottonwood St., Meaderville, Mont. The invention relates to electrical apparatus for use in blasting, and has particular reference to a switch adapted for closing a number of circuits for exploding electric primers. A further object is to provide an explosive charge which may be completely assembled before being distributed to the miner, so that all the miner need do is to place the same in the hole to be blasted and connect it in the circuit.

ELECTRIC LIGHT FIXTURE.—B. B. STEN-VALL, 521 45th St., Brooklyn, N. Y. The invention has for its object to provide a fixture of the type generally employed on a desk, the important features residing in means for variously adjusting the light, novel supporting means and the manner of arranging the conductor cord with respect to the adjustable and supporting elements, whereby the light may be employed as an effective and convenient searchlight.

Of General Interest

GARMENT HANGER.—M. ROSENTHAL, 501 W. 170th St., New York, N. Y. Among the objects of the invention is to provide a garment hanger which in addition to supporting a coat, or similar article, is capable of supporting a plurality of other garments, and also has the advantage of having the supports for the other garments removably attached. The device may be formed of wood or metal, and either rigid, or foldable for convenience of travelers.

STONE MOUNTING.—A. L. ELIASOFF, and C. BIRNBAUM, 80 Nassau St., New York, N. Y. The invention relates to jewelry, and more particularly to ornamental gem settings. An object is to produce a stone setting having a light reflecting medium which adds to the

charm and luster, and also provides means for securely anchoring a precious stone in the prongs of a ring, the prongs being protected from wear, thus decreasing the possibility of the loss of the stone.

TRAFFIC REGISTER.—G. HENRY, 55 d'Artigny St., Quebec, Canada. It is the purpose of this invention to provide a systematic, automatic and continuous registration of the actual traffic at any point on a highway. The object being to provide an apparatus which will

A VIEW IN SECTION, SHOWING A VEHICLE PASSING THE POINT OF OPERATOR

take an instantaneous photograph of traffic on a street or road, so that vehicles of all speeds can be photographed as they pass a given point in such form that the film may later be used as a permanent record in connection with a projecting device.

ARTIFICIAL LIMB.—J. W. SMITH, 1621 Francisco Ave., Chicago, Ill. It is one of the objects of this invention to provide an artificial arm which is capable of use in cases where the natural arm has been amputated either between the shoulder and elbow or between the elbow and the wrist. A further object is to construct an artificial arm in such manner that the forearm section is movable with relation to the upper arm section, the hand section universally movable with respect to the forearm, and the finger sections movable with respect to the body portion of the hand, the finger sections having means to cause them to grip articles of various sizes.

MOVING PICTURE CAMERA AND PROJECTOR.—D. TAIFIRNOPOULOS, 67 Cherry St., New York, N. Y. An object of the invention is to provide means wherein the parts may be quickly and easily adjusted or rearranged to act as a camera or as a projecting machine. A further object is to provide a simplified and small construction for family use, the structure being such that a minimum of space will be required for its use.

SNAP ORNAMENT FASTENER.—N. BANDELL, address L. M. Friedman, 233 Broadway, New York, N. Y. The invention relates to an ornamental stud or button. An object is to provide a snap fastener which is adapted for use as an ornament or as a fastening means for a garment, and which permits the removal of the stud during the laundering operation of the garment so that the ornamental exterior of the fastener will not be broken or injured.

CONCENTRATING TABLE.—J. F. MCNEIL, Death Valley, Cal. In order to obtain a larger proportion of concentrates and increase the capacity of the table with minimum power, this patentee arranges a series of oblique riffles inclining upwardly toward the high side of the table and adjacent to the opposite side, or tailing discharge, are riffles parallel with the axis of the table. Between the two series of

PLAN VIEW OF THE TABLE

riffles is a bank riffle the top surface of which slopes toward the tailing side, all the riffles being gradually of reduced height toward the discharge end of the table. A feed device extends across the oblique riffles and there is essentially a feeding to all the riffles adjacent the head of the table. The bank riffle results in a pond being formed at the area of the oblique riffles. The material is required to travel upward toward the high side of the table before escaping to the table surface to be carried laterally toward the parallel riffles.

DEVICE FOR USE IN LEARNING TO SWIM.—G. JORDAHN, Palm Beach, Fla. The

invention relates more particularly to an inflatable device adapted to encircle the body and to be positioned in such manner as to preclude accidental displacement. The device is provided with means for readily tying the ends of the tube, which tying serves the double function of retaining air in the tube and properly holding the tube around the body.

CLOTHESLINE CLAMP.—W. A. JOHNSON, 202 Quincy St., Fairmont, W. Va. Among the objects of this invention is to provide a simple, inexpensive and efficient metal hook and eye clamp which will effect a locking of the clothes line to the prop so that accidental displacement of the line is positively prevented; the only way in which the line can be removed from the clamp is by manually removing the eye from the hook.

CONTAINER FOR CEDAR SHAVINGS.—J. E. TRACY, Box 839, Orlando, Fla. The invention relates to a comparatively small box which may be placed in a trunk or clothes closet for preventing moths from attacking the clothes. The purpose is to provide a container which will allow of the exposing of cedar shavings to the air at the same time preventing the shavings from being displaced.

STORE SIGN.—B. H. SCHARF, 635 W. 170th St., New York, N. Y. An object of the invention is to provide a sign with a changeable display to be mounted on the door and readable through the glass of a store door or other institution having public patronage to announce whether or not the store is open or closed, and to further announce good will and a spirit of welcomeness to customers entering and leaving.

HUMIDIFIER.—L. A. SMITH, Port Gibson, Mississippi. This invention has for its object to provide a small portable humidifier capable of being carried in the pocket if desired by means of which a cigar may be simultaneously moistened and impregnated with a flavoring by drawing a blast of air laden with the flavoring through the cigar.

Hardware and Tools

RAZOR.—D. A. FENWICK, Box 222, Bisbee, Arizona. The invention relates more particularly to a razor having a removable double edged blade supported in a holder or frame which has the general appearance of and operates in the same way as the ordinary old style razor. An object is to provide means for securing the razor in the holder and permitting the use of a thin steel double edged blade which can be sharpened on an ordinary strop and cheaply manufactured.

CURTAIN ADJUSTER.—E. M. MENZL, cor. Riker and Steinway Ave., Steinway, Long Island City, N. Y. Among the objects of the invention is to provide a neat and inconspicuous cross bar, which when in operation will hold a lace curtain well spaced from the window sashes so as to afford a free flow of ventilation, and prevent the blowing of the curtain or the soiling thereof, and permit unobstructed cleaning of the window and other purposes.

COMBINATION SCALE JACK.—C. D. STEELE, 59 W. 44th St., New York, N. Y. The invention relates to a device such for example as lifting jacks and weighing or load indicating devices. Among the objects is to provide a relatively simple implement easily manipulated by any ordinary person for the purpose of checking the weight of loads such as coal, grain or hay, when carried either on horse-drawn or self-propelled vehicles.

We wish to call attention to the fact that we are in a position to render competent services in every branch of patent or trade-mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and prosecute all patent applications, irrespective of the complex nature of the subject-matter involved, or of the specialized, technical or scientific knowledge required therefor.

We also have associates throughout the world, who assist in the prosecution of patent and trade-mark applications filed in all countries foreign to the United States.

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per cent of moisture, to a pressure of from 18,000 to 22,500 pounds per square inch. The briquets are lozenge-shaped, 7 inches long, and 2½ inches wide, weighing 1 pound each. No binder is required because the heat of compression liberates from the lignite sufficient tarry matter to insure adhesion. Each press has a capacity of 77 short tons of briquets during a 24-hour run; and 120 horsepower are required for its operation.

Because the briquets are very hot when first molded, it is necessary to cool them to guard against ignition if they be piled immediately. Therefore, they drop from each press into a trough-shaped conveyor which moves the briquets to the storage sheds; and this journey of 325 feet is long enough to chill them sufficiently.

Shortly before the war a large central power station for the generation of electricity was placed at a brown-coal mine in the Cologne district, and was able to furnish current to that city at the rate of about ¾ cent per kilowatt hour. Two years ago Mr. George S. Rice of the Bureau of Mines was in that neighborhood, and at the Fortuna mine he visited a central station which was developing 40,000 electrical horsepower and transmitting that energy to Cologne 12 miles away. Such of the brown coal as was not burned under the boilers was being made into briquets, which were used in competition with bituminous coal both on the railways and for factory and domestic use.

It has been proved by the Germans that boilers can be constructed that will work well when fired with either hard-coal or brown-coal briquets. It seems that the heating value of either fuel is substantially the same for continuous operation. Brown-coal briquets, however, are less suitable for intermittent service. A well-known German engineering concern has recently developed a special boiler for the use of brown-coal briquets and even inferior grades of fuel, and the tests have been highly satisfactory. The efficiency is reported to have run between 78 and 84.2 per cent.

How great this industry is can be readily grasped from the following comparative figures: In 1913 the brown coal output totaled 79,741,825 tons, and last year it aggregated 121,202,215 tons. Relatively 5 per cent less of the lignite production was worked into briquets during 1920 and this probably indicates not only the wider direct burning of the raw brown coal for the development of power but gives us an inkling of that other line of activity which is engrossing many of the best technical minds of Germany—the dry distillation of this low-grade fuel, in which notable results have been achieved.

Not quite a year ago the German Government determined to regulate the coal-tar trade, and called into being the "Economic Union for Crude Coal Tar and Coal-Tar Products." Prior to the war Germany obtained, in round figures, 380,000 tons of tar oil from coal; and her lignites yielded about 47,000 tons of paraffin oil, gas oil, etc. In 1919 there was produced from coal substantially 300,000 tons of tar oils, but, according to the Treaty of Versailles, Germany must deliver annually, for a period of three years, no less than 35,000 tons of benzol and 50,000 tons of coal tar or products distilled therefrom. Naturally, stripped as the Teutons are of so much of their black coal region, they must make the most of the native lignites in order to meet their own wants and to satisfy the terms of peace. It is estimated that 50,000 tons of tar oils were distilled from brown coal in 1920.

War-time experiments revealed that the distillation of lignites, at high temperature, would give a liquid coal tar which contains certain ingredients that could be substituted for gasoline, kerosene and lubricating oils. Through a later process it is possible to get benzine and kerosene from coal tar distilled from brown coal at a lower temperature; and by reason of this development all industries that can do so are being urged to provide them-

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selves with facilities for this purpose. To this end, the authorities have put a premium upon the distillation of lignites by promising to remit the coal tax in the case of the brown coal so treated.

About a year back a German technician stated, in making an address before the Prussian Ministry of Public Works, that one ton of brown coal would yield enough gas to generate 408 kilowatt hours of electricity, and provide in addition 77 pounds of tar, 8.8 pounds of pitch, 8.8 pounds of paraffin, 8.8 pounds of "solid oil," and 22 pounds each of two other kinds of industrial oils. At that time the expert said that a method had been discovered by which edible fats, suitable for the manufacture of margarine, could be derived from this coal tar, and it seems that soap has been made from the same source.

Another consequence of the peace treaty is Germany's obligation to give to France each twelvemonth also for three years 30,000 tons of ammonia, and here, again, brown coal comes to the rescue. While this discovery of industrial salvation is heralded as another proof of Teuton technical cunning, it serves the while to confirm independent work done on this side of the Atlantic by some of our own people even before the World War. It was found here that from the distillation of lignite it would be practicable to realize approximately 17.4 pounds of ammonium sulphate per ton of the dried fuel, and the Germans are turning this fact to good account in the treatment that they have adopted.

It is now well known that lignite, if carbonized at the relatively low temperature of about 1,200 degrees Fahrenheit, will give off gas freely, and that the by-products recovered will be of satisfactory quality. Above that temperature the destructive distillation of the tar in the raw fuel begins, and the greater heat not only reduces the amount of recoverable tar but affects the character of that material and the oils that may be subsequently obtained from it. It has been established that heavy oils from lignite tar are admirably suited for use in internal combustion engines because the oil does not deposit tarry matter. And what is of equal significance, lignite gas is what is termed a "dry" gas—i.e., it is substantially free from tar, and gives no troublesome condensation when distributed through slightly protected pipes even in cold weather. The gas is well adapted to power purposes.

Probably one of the most interesting phases of the dry distillation of brown coal or lignite is that the carbonized residue, of very little value in the form in which it comes from the retort, may nevertheless, be converted into a really excellent smokeless fuel by briquetting. Indeed, briquets of this nature are distinctly superior to those made from dried brown coal. Comparative tests with high-grade bituminous coal have shown carbonized lignite briquets to be more efficient. For instance, 3.76 pounds of briquets and 3.88 pounds of soft coal were severally required to develop a horsepower hour; the quantity of water evaporated per pound of fuel was, in the case of the briquets, 9.18 against 8.88 pounds on the part of the bituminous coal; and the average boiler horsepower developed was 98 with the soft coal and 101.5 with the briquets.

It should be kept in mind that, by exhaustive distillation and treatment of the tars and oils, it is practicable to derive hundreds of synthetic products, such as paraffin, acids, antiseptics, photographic chemicals, aniline dyes, drugs, perfumes, preservatives, etc. From the light oils can be got benzol, toluol, dyes, photochemicals, certain drugs, etc. From the carbolic and creosote fractions are obtained carbolic acid, creosote, picric acid, photodyes, coloring materials, perfumes, etc. The anthracene oils yield, among other things, alizarin, valuable acid used in the production of dyes, and carbolineum, effective as a wood preservative.

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