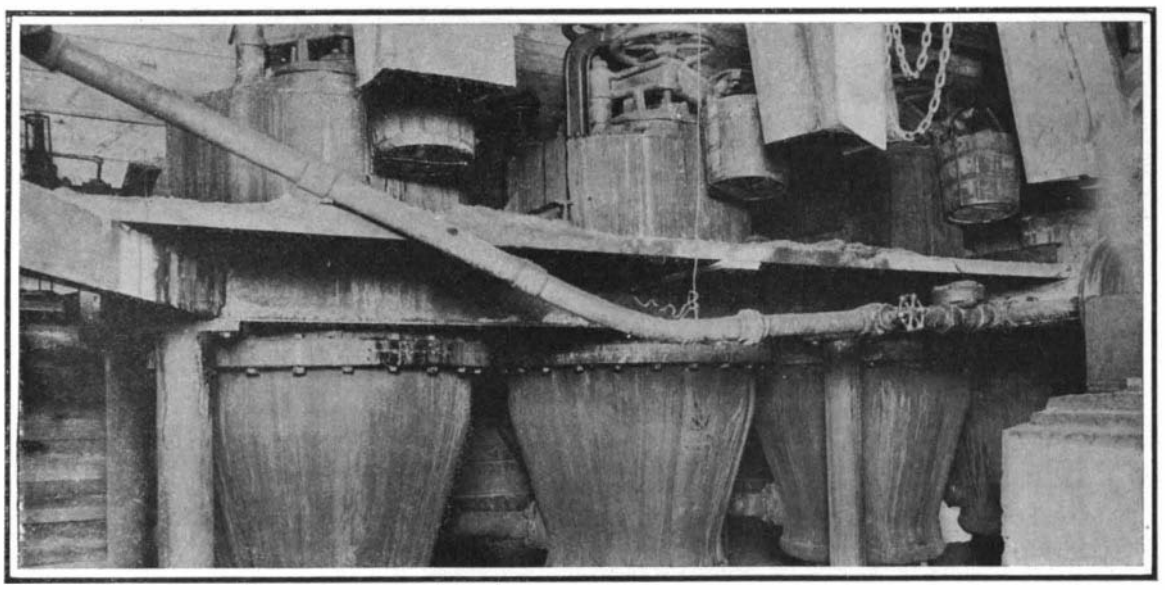
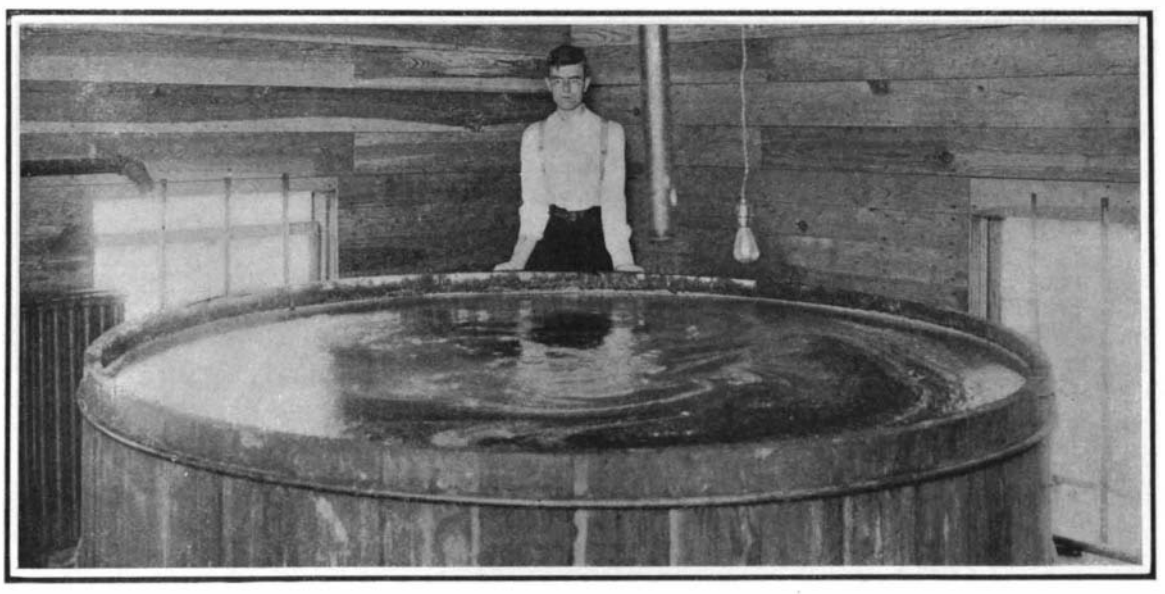
MAKING ALCOHOL FROM WOOD WASTE.

A middle West industry, for which a great future is promised, is that of the manufacture of alcohol from sawdust, shavings, slabs, and other refuse of the lumber mill.

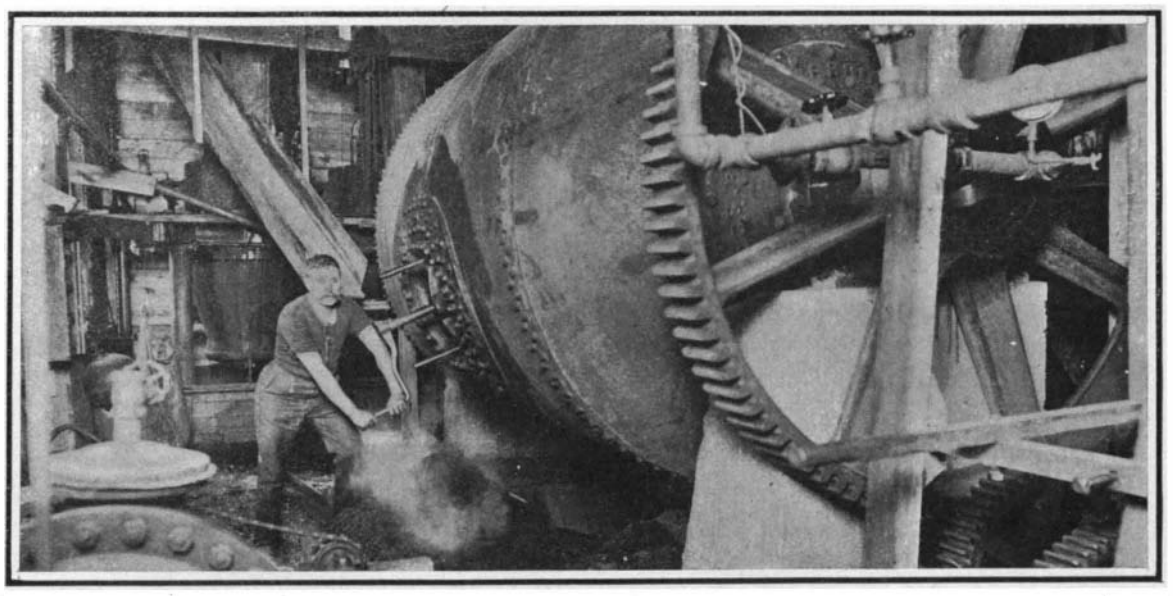
Rumors of improved methods and great economies in the manufacture of wood alcohol have been "in the air" for some time, and we have received a number of inquiries on the subject from subscribers and correspondents. We are glad, therefore, to be able to give now some details of the new process, for which patents have recently been granted to Mr. Malcolm F. Ewen and Mr. George H. Tomlinson of Chicago.



A diffusing battery of four units.



One of the large tanks in which the wood pulp is fermented.



The digesting machine which performs the functions of a mechanical stomach. It converts the starch of wood waste into sugar.

It has long been known that ethyl alcohol and other valuable by-products could be made from wood waste in laboratory experiments, and many processes have been developed, but practically none of them has reached the stage of economic success on a commercial scale.

One of these aroused the interest of Mr. John M. Ewen, better known as a constructional steel work engineer and manager of the Fuller Construction Company, builders of so many "skyscrapers." Although it was not found practicable commercially, Mr. Ewen was so much impressed with the possibilities of cheap alcohol from wood waste that he spared enough time and energy from his other great responsibilities to continue independent investigations, and it is largely owing to his personal and financial support that the present successful process has been developed, one of the patentees being his brother.

Lumbermen have long been alive to the necessity of finding a use for the appaling piles of waste they are compelled annually to destroy, if only as a means of additional profit, before the question of conservation of natural resources became of national interest. In addition, there are many and various uses to which alcohol is applicable with advantage, and from which it has hitherto been excluded by its cost.

All kinds of internal-combustion engines, for instance, can use alcohol as fuel with advantage over gasoline and with very little modification.

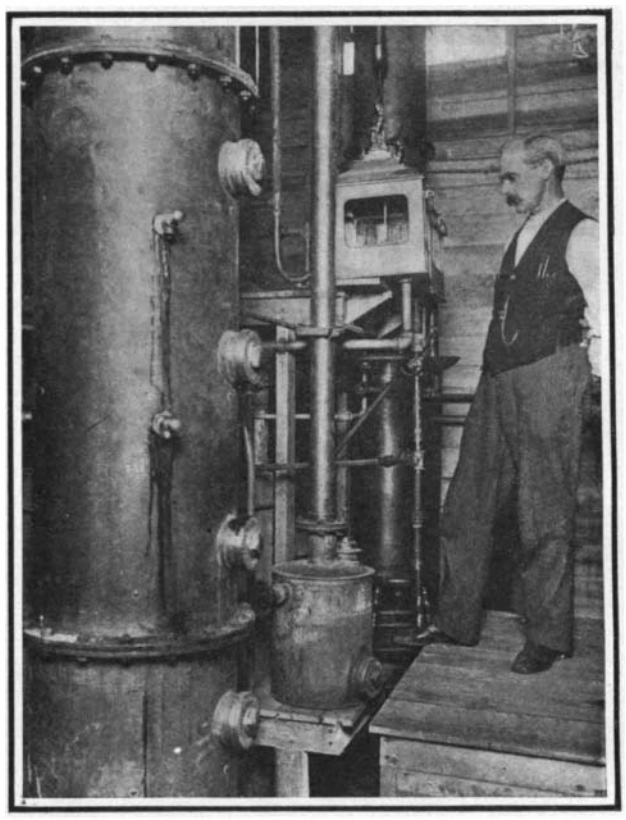
One of the greatest advantages of the production of a pure alcohol from wood, however, will be the release for food purposes of the millions of bushels of corn and barley now consumed in the manufacture of grain alcohol.

The price of grain alcohol is at present $2.60 a gallon at 188 proof, of which $2.07 is internal revenue tax, the net wholesale price being only 53 cents. Corn worth 26 cents is required for the manufacture of a

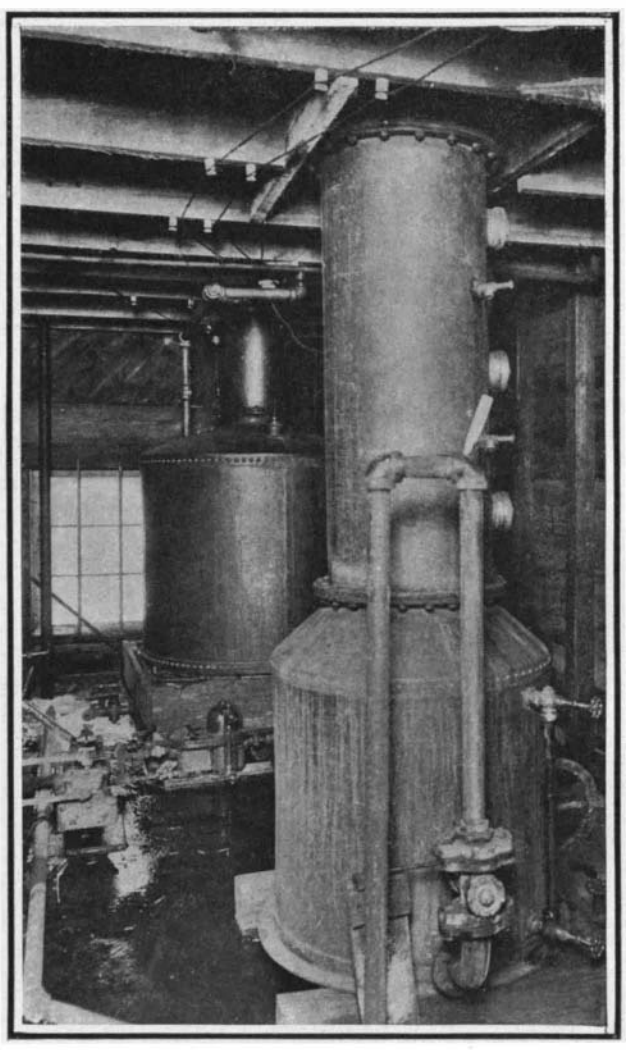
(*Continued on page 359.*)

TRIALS OF THE NEW "DREADNOUGHT"—"NORTH DAKOTA."

In view of the fact that the first two "Dreadnoughts" to be built for the United States navy are identical in everything except motive power, the "Delaware" being driven by reciprocating engines and the "North Dakota" by Curtis turbines, an unusual amount of interest has been aroused by the recent speed trials of these two ships. The "Delaware," which was built by the Newport News Shipbuilding Company, was tried out over the course off Rockland, Maine. She is equipped with Babcock & Wilcox boilers, and in the five trial runs for standardization of her propellers,



Reading the thermometers.



Still by which a fine grade of ethyl or grain alcohol has been made out of sawdust and slabs.

MAKING ALCOHOL FROM WOOD WASTE.

which were made over the mile course, she developed a maximum speed for one mile of 21.98 knots, a mean speed for the five runs of 21.44 knots; a maximum horse-power of 30,000, and a mean horse-power of 28,578.

The "North Dakota" is not only an exact duplicate of the "Delaware" in the form of her hull and in the displacement, but in common with that ship is equipped with fourteen Babcock & Wilcox boilers. Consequently, the Navy Department was in a position to make a most exact comparison of the efficiency of the respective motive power, all the conditions except

(*Continued on page 360.*)

Percolator, C. A. Stelle..... 938,906
Percolator, simple syrup, S. T. Hensel..... 939,131
Phenol halogen phthalein compound, W. R. Orndorff 939,075
Phonogram, F. C. Applegate..... 939,120
Phonograms, making, F. C. Applegate..... 939,119
Phonograph records, holder and index for, Alexander & Knickerbocker..... 938,809
Phorometer, J. E. Cogan..... 938,463
Piano actions, tool for applying bridles to, A. G. Crawford..... 938,826
Piano pedal connection, adjustable, H. Meyer 939,053
Pick, C. H. Blow..... 938,955
Picker stick attachment, W. D. Park..... 938,694
Picture apparatus, moving, H. Voege..... 938,729
Picture exhibiting machine, F. H. Richards. 938,895
Picture machines and stereopticons, controlling switch for moving, T. Taira... 939,110
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Pipe coupling, E. Marek..... 939,146
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Press feeding mechanism, automatic, L. C. Krummel 938,876
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Propelling device, ship, M. Franklin..... 938,750
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Propelling mechanism, boat, B. F. Jacobs... 939,028
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Pump for automobile tires, H. Swain..... 938,522
Pump for wells, W. H. Larkin..... 938,878
Pump, steam, H. L. Thompson..... 938,724
Punch, F. Harling..... 938,580
Punching holes in metal plates, machine for, C. H. Clark..... 939,185
Puzzle, L. W. Pullen..... 938,509
Puzzle, G. B. Matthews..... 939,050
Puzzle postal card, N. Olinger..... 939,074
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Rack, C. J. Hawkins..... 938,854
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Rail clamp, guard, G. L. Hall..... 938,848
Rail joint, boltless, F. Kelly..... 938,587
Railway rail anchor, J. M. Scott..... 938,716
Railway rail joint, A. P. Finley..... 938,467
Railway spike, F. B. Kobert..... 938,875
Railway switch, A. A. Schumacher..... 938,610
Railway switch, street, J. Leith..... 939,041
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Railway tie, L. Wylder.....938,538, 938,539
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Rivet, W. P. Bartel..... 938,812
Roasting separation process, H. A. Wentworth 938,732
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Rolling flanged bars, universal rolls for, H. Sack 939,170
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Rolling mill, universal H. Sack, 939,167, 939,172, 939,173
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Screw threading implement, G. F. Chapman 938,973
Seal, W. Collins..... 938,979
Seal lock, W. K. Blodgett..... 938,813
Seals on papers, device for impressing, F. Gottschalk 938,756, 938,757
Seaming machine, tinner's double, H. Poell. 939,083
Section liner, E. B. Kerst..... 938,769
Seeder, G. A. Knoblock..... 938,492
Seeding device, Pricer & Bartow..... 939,087
Separator, E. H. Frickey..... 938,657
Sewing machine, lock stitch, F. W. Merrick. 939,152
Sewing shank-eyed buttons, machine for, J. Perley 939,161
Shade roller and curtain bracket, combined, C. Wright 938,934
Shade roller bracket, window, V. T. Crawford 938,642
Shaft coupling, L. A. Westman..... 938,531
Shaft detaching device, M. P. Powell, Jr... 938,890
Sharpening lawn mowers, skates, etc., machine for, J. L. Kyle..... 938,494
Shears, A. J. Baur..... 938,630
Sheet feeding apparatus, A. S. Allen..... 939,182
Sheet feeding machine, B. R. Stickney..... 939,177
Shelf, hanging, J. E. Lee..... 938,596
Ship, H. C. Davis..... 938,645
Ship cleaner, H. Schwartz..... 938,794
Shipping cylinder cap, C. Schraudenbach..... 938,793
Shock absorbing pad, L. R. Nodine..... 938,504
Shock loader, J. B. Schuman..... 938,611
Shoe shank randing and cutting-in machine, Gooding & Taft..... 939,007
Shoe, sporting, D. J. Golden..... 938,843
Shoe tree, A. H. Taft..... 938,615
Shoes, machine for pressing and shaping the backs of, Smith & Hadsell..... 939,105
Shovel and hoe, combined, D. B. Hartwell.. 939,019
Shredding machine, Williams & Frickey.... 938,734
Shutter fastener or bower, G. Erwin..... 938,748
Sign, advertising, A. Russell..... 938,710
Signal transmitting and receiving apparatus, electrical, Dawson & Buckham..... 938,830
Sink, kitchen, W. J. Reed..... 938,607
Siphon, beverage, H. J. Schmitt..... 938,517
Skirt marker, F. C. Luethy..... 938,677
Sleigh, self-propelled, J. H. Hayes..... 939,104
Small arm, J. Tambour..... 939.112
Soldering machine, can, C. W. Sleeper..... 939,104
Soles for boots and shoes, making, O. C. Davis 938,829
Speed apparatus, variable, E. C. Marble.... 938,679
Speed indicator, W. Schaufelberger..... 938,898
Spindle. See Knob spindle.
Spring structure, H. Reidenbach..... 939,090
Stacker, hay, E. G. Carter..... 938,461
Stair guard, J. Lalonde..... 938,771
Stamps, automatic machine for attaching postage, H. S. Brewington..... 938,820
Steel ingots, treating manganese, W. S. Potter 938,892
Steel, manganese, W. S. Potter..... 939,084
Steel, producing finished shapes from manganese, W. S. Potter..... 939,164
Steel, producing finished shapes of manganese, W. S. Potter..... 938,891
Steel, treating manganese, W. S. Potter.... 939,163

(Concluded from page 359.)

a day may profitably combine to operate a joint distillery for the conversion of their refuse into alcohol.

Whereas it may be not a little alarming to the prohibitionists to suggest that a drinkable alcohol may be so cheaply made from sawdust, much as one may deprecate the manufacture of artificial wines and liquors and adulteration with alcohol, it is at least satisfactory that the product of the new process is actually purer than that made from grain.

TRIALS OF THE "NORTH DAKOTA."

(Continued from page 352.)

that of the motors being identical.

The five trials of the "North Dakota" over the mile course gave the following speeds: 22.25, 21.48, 22.13, 21.51, and 23.13, the average speed working out at 21.83 knots. She thus not only exceeded the mean speed of the "Delaware" by 0.39 knot, but the turbines exceeded the reciprocating engines by over 5000 horse-power. The maximum number of revolutions of her propellers was 286 a minute, and it was found that 263 revolutions were sufficient to maintain the contract speed of 21 knots.

In the four-hour test under full power the "North Dakota" made 21.71 knots for the first two hours, and 21.64 knots in the third hour. On the fourth mile the failure of a tube in one of the boilers necessitated the shutting down of four out of the fourteen boilers; but even under this greatly reduced power, the speed of the ship was exactly 21 knots.

A feature which, from the military standpoint, is of the greatest importance is the remarkable steadiness of the ship, even when the turbines are being pushed to the limit. Throughout the greater part of the length of the ship it was scarcely possible to tell, from any vibration, that the engines were in motion. This is a feature which is particularly appreciated by ordnance officers; since the vibration which is noticeable on ships driven by reciprocating engines is more or less disturbing to the gun sights. The "North Dakota," which is considerably the largest warship yet built for our navy, has been constructed in record time; and the Fore River Company is to be congratulated on the fact that, had it not been for delays in the furnishing of armor, they would have cut down the record for construction even more than they have. Her dimensions are: Total length, 518 feet 9 inches; beam, 85 feet 2½ inches; draft on trial, 27 feet; displacement on trial, 20,000 tons. She is the most completely armored ship afloat. Her main belt, 7 feet 6 inches wide, tapers from 10 inches at its bottom edge to 12 inches at its top edge. Above this, extending to the gun deck, is a second belt 8 feet wide, tapering from 10 inches at its bottom edge to 8 inches at the top. The 5-inch guns have a protection of 5 inches of armor, and the main turrets and barbettes are protected by 11 inches.

The lines of the ship are particularly fine, in fact, as fine as those of our armored cruisers. She will prove to be a splendid vessel when heading into a heavy sea; for not only has she freeboard, due to her forecastle deck, of 27 feet, but she is given a very pronounced outward flare, which should serve to lift her comfortably over the waves, and enable the ship to be driven at full speed in heavy weather. An innovation is the placing of the officers' quarters forward under the forecastle deck and in the superstructure immediately abaft of the two forward turrets.

The battery is mounted on the longitudinal axis of the ship, a disposition which originated with our Construction Department, and is being followed by some foreign navies. The placing of all the guns on the center line enables the whole battery to be trained on either beam, giving the ship a broadside discharge either to port or starboard of ten 12-inch guns. This arrangement, it is true, weakens the end-on fire, which, in

(Concluded on page 361.)

Home-Made Experimental Apparatus

In addition to the following articles, the **Scientific American Supplement** has published innumerable papers of immense practical value, of which over 17,000 are listed in a carefully prepared catalogue, which will be sent free of charge to any address. Copies of the **Scientific American Supplement** cost 10 cents each.

If there is any scientific, mechanical, or engineering subject on which special information is desired, some papers will be found in this catalogue, in which it is fully discussed by competent authority.

A few of the many valuable articles on the making of experimental apparatus at home are given in the following list:

ELECTRIC LIGHTING FOR AMATEURS. The article tells how a small and simple experimental installation can be set up at home. **Scientific American Supplement 1551.**

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THE CONSTRUCTION OF AN ELECTRIC THERMOSTAT is explained in **Scientific American Supplement 1566.**

HOW TO MAKE A 100-MILE WIRELESS TELEGRAPH OUTFIT is told by A. Frederick Collins in **Scientific American Supplement 1605.**

A SIMPLE TRANSFORMER FOR AMATEUR'S USE is so plainly described in **Scientific American Supplement 1572** that anyone can make it.

A ⅛-H.-P. ALTERNATING CURRENT DYNAMO. Scientific American Supplement 1558.

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HOW TO MAKE AN AEROPLANE OR GLIDING MACHINE is explained in **Scientific American Supplement 1582,** with working drawings.

EXPERIMENTS WITH A LAMP CHIMNEY. In this article it is shown how a lamp chimney may serve to indicate the pressure in the interior of a liquid; to explain the meaning of capillary elevation and depression; to serve as a hydraulic tournique, an aspirator, and intermittent siphon; to demonstrate the ascent of liquids in exhaustive tubes; to illustrate the phenomena of the bursting bladder and of the expansive force of gases. **Scientific American Supplement 1583.**

HOW A TANGENT GALVANOMETER CAN BE USED FOR MAKING ELECTRICAL MEASUREMENTS is described in **Scientific American Supplement 1584.**

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AN EASILY MADE HIGH FREQUENCY APPARATUS WHICH CAN BE USED TO OBTAIN EITHER D'ARSONVAL OR OUDIN CURRENTS is described in **Scientific American Supplement 1618.** A plunge battery of six cells, a two-inch spark induction coil, a pair of one-pint Leyden jars, and an inductance coil, and all the apparatus required, most of which can be made at home.

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THE INSTALLATION AND ADJUSTMENT OF A 100-MILE WIRELESS TELEGRAPH OUTFIT, illustrated with diagrams, **Scientific American Supplement 1623.**

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HOW TO MAKE A MAGIC LANTERN, Scientific American Supplement 1546.

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HOW TO MAKE A THERMOSTAT is explained in **Scientific American Supplements 1561, 1563,** and **1566.**

ANEROID BAROMETERS, Scientific American Supplements 1500 and **1554.**

A WATER BATH, Scientific American Supplement 1464.

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Inquiry No. 8996.—Wanted addresses of manufacturers of machinery for working orange wood manicure sticks.

PATENTS FOR SALE.

FOR SALE.—Patent No. 936,141. Improvements on airships and aeroplanes. For further information write to A. E. G. Lubke, 852 Clayton Street, San Francisco, Cal.

Inquiry No. 8990.—For information regarding shoes not made of leather but similar to the same and are as durable.

FOR SALE.—Patent for preserving and purifying milk and cream to keep indefinitely in sealed cans, and for Pasteurizing in 5 and 10-gallon tanks for commercial use. For further particulars address Mr. A. V. Russell, Newman, California.

Inquiry No. 9001.—For the address of progressive manufacturers of fruit jars.

FOR SALE. Patent No. 900,457. An improved lathe rest for holding cylinders while being bored in an engine lathe. For further particulars address A. E. Whiting, Weston, W. Va.

Inquiry No. 9010.—Wanted to buy a "Rector Help-a-Phone."

FOR SALE.—Combined folding ironing table and sleeve board. Is adjustable to any height; folds into a compact bundle; special skirt board feature. Can be manufactured for 85c. each. Must sell. Send offer or write for particulars. Theo. C. Krings, Clarinda, Iowa.

Inquiry No. 9014.—For manufacturers of machinery, supplies, etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

PATENT FOR SALE.—Combination trunk and typewriter desk; a very useful device for travelers. The change can be made in a minute from a trunk to office desk, with typewriter in place, and pigeon hole annex; remove typewriter and put in its place a looking glass, and you will have a perfect dressing table, useful for either sex. I will sell this parent outright or grant license to manufacture on royalty. U. S. Patent No. 917,161, April 6, 1909. Address M. R. Schultze, Southampton, N. Y.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

FOR SALE.

FOR SALE on a royalty basis, a Bundle Tying Machine for mercantile use. A new field of enormous possibilities. Cheap in comparison with its need. Address J. W. Hall, Wrightstown, Pa.

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Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

Inquiry No. 9030.—Wanted, the address of firms manufacturing a wood fiber bottle and case made from same material.

Inquiry No. 9034.—For manufacturers of machinery that could reduce stumps to kindling wood.

Inquiry No. 9036.—Wanted, the address of the manufacturers of "Cycle Ball Bearing Suspenders."

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these ships, consists of only four guns, as against six guns in several foreign navies; but it is the belief of our naval officers that future engagements will be fought almost entirely broadside to broadside. Personally, we are inclined to the belief that if the third and fourth turrets were staggered, the third being moved over to starboard and the fourth turret to port, the effectiveness of the gunfire would be increased without diminishing the broadside fire.

The foremost pair of guns have a command of 33 feet. The pair immediately astern have a command of 41 feet. Turret No. 3 carries its guns about 32 feet above the sea, and those in the two after turrets have a command of about 25 feet. We shall hope in a later article to give further particulars of the trials of this vessel.

Radiations of Short Wave Length.

At the recent meeting of the British Association for the Advancement of Science, at Winnipeg, Prof. Lyman, of Harvard University, described his interesting researches on radiations of very short wave lengths. The radiations involved in ordinary laboratory work are comprised between 6,800 and 2,600 of Angstrom's scale. Schumann has demonstrated the great effect of the atmosphere in limiting the spectrum in the ultra-violet region. By the employment of lenses of fluorine, Prof. Lyman has extended Schumann's researches, especially to the region between 2,000 and 1,030 Angstrom, which exhibits peculiarities of great interest. No visible hydrogen line was found between 2,000 and 1,650. Between 1,650 and 1,030 conspicuous lines of hydrogen were observed, but they did not exhibit the grouping which is characteristic of hydrogen lines in other parts of the spectrum. No lines of nitrogen, oxygen, or helium and only a few lines of argon were detected between 2,000 and 1,030. In this region carbon dioxide and carbon monoxide show spectra of many bands. Hydrogen, argon, and helium are very transparent to these radiations, but oxygen absorbs them energetically. Here, probably, is the explanation of the opacity of air to these radiations. Prof. Lyman has corrected the limit of absorption by fluorine. This absorption begins at 1,265 Angstrom and not at 846, as had previously been believed. The chemical effects of these radiations of short wave length are very intense. Oxygen, especially at low pressures, is strongly ozonized. Gases, in general, are ionized, the more strongly as their pressure is lowered. Bumstead has shown that the photochemical action of these radiations is 25 times more intense than that of ordinary ultra-violet rays.—La Nature.

The Fortieth Birthday of the Post Card.

The first post cards were issued in Austria on October 1st, 1869. The idea had already been suggested, but not adopted, at the fifth German postal congress, in 1865. Its adoption in Austria appears to be due to an article published in 1869 by Prof. Emanuel Hermann of Vienna, who is sometimes called the inventor of the post card. In 1870 post cards were issued by the North German Postal Union, Bavaria, England, and

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Switzerland. The German cards were printed without the impression of a stamp until 1872, in which year also the first return post cards were issued, in Germany. At the postal congress which met at Berne in 1874, and at which 22 countries were represented, the international post card of the value of 10 pfennigs, 12½ centimes, 1 penny, or 2 cents was adopted. The post card soon became popular and its use extended to other countries. Post cards are now issued in great numbers by 22 governments. In Germany alone more than 1,500 million post cards are used annually.

The private picture post card, which has attained such amazing popularity within the last decade, is nearly as old as the government post card. It is also of German invention and it owes its origin to the Franco-Prussian war. On July 16th, 1870, the first illustrated post card, bearing the picture of a gunner, was placed on sale by Schwartz, in Oldenburg. The manufacture of picture cards was afterward taken up by Brandt in Dresden. The industry, which is still carried on chiefly in Germany, has developed to gigantic proportions. Although many of the cards are striking examples of bad taste and vulgarity it cannot be denied that the best of the so-called art cards and the reproductions of famous paintings and statues have extended the love for the beautiful and that the landscape views have given to many persons some idea of the beauties of their own and foreign lands of which they would otherwise have remained in ignorance.

Expenditure of Muscular Energy in Bicycling.

Bulletin 208 of the U. S. Department of Agriculture contains a description of experiments made by Profs. Benedict and Carpenter, of Wesleyan University, on the expenditure of muscular energy in bicycling. The chief result of the experiments, which were conducted with the aid of the respiration calorimeter, is that in bicycling the muscles of the legs work with an efficiency of 20 to 22 per cent, or, in other words, for each unit of heat produced by the external work of the muscles about four units of heat are lost by radiation, in addition to the heat so lost when the body is at rest. The external work was measured by an ergometer, consisting of a bicycle, the rear wheel of which was replaced by a copper disk, which rotated between the poles of an electromagnet, forming an electromagnetic brake. By this means the work was consumed in the production of induced currents in the disk and was ultimately converted into heat, which was measured by inclosing the whole machine in the calorimeter. The rider was then inclosed, with the machine, in the calorimeter and the heat produced in a definite interval of time was again measured. This heat was made up of three parts: the heat generated in the body in consequence of its muscular activity, the heat which would be evolved in the same time by the body at rest, and the heat produced in the ergometer by the external work of the muscles. The last-named portion had been measured in the preliminary experiment already described, and the second portion was measured by inclosing the man at rest in the calorimeter. These portions having been subtracted from the total quantity of heat produced in the main experiment, the remainder represented the heat generated in the body in consequence of the activity of the muscles employed in bicycling. This remainder was found to be about four times the heat generated in the ergometer, whether the bicyclist worked moderately or strenuously and whether he was experienced or not. Training, therefore, appears to have little effect upon the thermo-dynamical efficiency. It has long been known that the human body is a highly efficient engine, but it should be noted that the high efficiency of 20 to 22 per cent, exhibited in these experiments, has been exceeded by the Diesel and some other highly developed motors.

The Middle West Number of the SCIENTIFIC AMERICAN

On December 11th, 1909, the Scientific American will issue a number devoted entirely to the wonderful Middle West region of the United States, a number which will set forth broadly and lucidly not only the agricultural interests of that region, but also those larger engineering undertakings which are destined to transform the Middle West, in part at least, into a manufacturing territory.

With that object in view the Middle West Number will publish articles on the following subjects:

I. The Chicago and Gulf Waterway.—An illustrated description of Chicago's drainage canal, an engineering work which stands without a parallel in the world.

II. Chicago as a Railroad Center.—Chicago is the greatest railroad center in the world.

III. The Wonderful Grain Trade of Chicago.—Chicago is an enormous wheat bin, into which much of the grain raised in the middle West is poured.

IV. Shipping on the Great Lakes.—Most of the iron ore that is now smelted in Pennsylvania is mined in the middle West. To transport it to the blast furnaces of the East at a cost which will enable American steel makers to compete with foreign steel makers, it has been necessary to devise a new kind of lake transportation. Ships of 10,000 and 12,000 tons burden have been constructed which convey ore at small cost through the Great Lakes, and which are without a counterpart anywhere in the world.

V. The Handling and Shipment of Iron Ore.—The above-mentioned fact that iron ore is mined in the middle West and smelted in the East has necessitated not only the construction of special freight-carrying steamers, but also the designing of special machinery for loading and unloading the ore from the steamers.

VI. Freighting on the Mississippi.—Freighting on the Mississippi is a more important industry than most of us may realize.

VII. The Steel Industry.—One of the greatest steel plants in the world is that which has been built at Gary.

VIII. The Freight Subway System of Chicago.—Chicago can boast of a rational system of handling freight by means of subways.

IX. The Water Supply of Chicago.—Chicago's source of water is Lake Michigan. The city is supplied with water by means of a tunnel which extends two miles out into the lake.

X. Reclaiming Arid Lands.—The United States Government has under way many irrigation projects for the purpose of reclaiming lands which are arid, but which will blossom if properly watered.

XI. Harvesting the Grain of the Middle West.—Farms that cover not acres but square miles, crops that aggregate not simply bushels, but car-loads, have rendered it necessary to plant and harvest on an unprecedented scale in the middle West. The ingenious agricultural machinery which has been designed to cope with these peculiar conditions is described and illustrated.

The Middle West Number will be more than twice the size of the regular SCIENTIFIC AMERICAN. It will be lavishly illustrated. It will be contained in a colored cover which strikingly depicts Chicago's grain elevators at work. Order from your newsdealer or from

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A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., Inc., 361 Broadway, New York.

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