

NEW RAILWAY ENTERPRISES IN PARIS.

The transportation facilities, always good in connection with former expositions, will be vastly improved during the Exposition of 1900. First, the Paris terminal of the Orleans Railway, now located in the eastern portion of the city, near the Pont d'Austerlitz, is to be brought closer to the business center and to the very gates of the Exposition grounds, on the south bank of the Seine.

Then a small portion of the proposed great belt line, which is to be constructed by the Paris Metropolitan Railway, as a "subterranean boulevard," and somewhat similar to the London underground, will be ready by 1900, which will also land its passengers at the Exposition.

The other railways entering Paris have the terminals of their lines well placed, the terminals of the Compagnie de l'Ouest being especially convenient through the march of city improvements, that known as the Gare Saint Lazare being most central, and the Orleans Railway has suffered therefore from the powerful competition which, naturally, has followed. Such a state of affairs has necessitated the extension of its lines into the heart of Paris, and the establishment of a new terminus, with convenient stations for suburban traffic at other points.

The present terminus is at Place Valhubert, on the east side, not far from the Place de la Bastille, but on the south bank of the Seine. Such an improvement has been contemplated for many years, but the main difficulty in the way was to secure the necessary seven or eight acres of land which would give proper track facilities. Recently, the opportunity to profit through the acquirement of lands, which were to be disposed of on the left bank of the river, and the fact of the approaching Exposition, decided the company that the time for the desired extension had come. A law passed in December, 1897, ceded to the Orleans Railway Company the lands occupied by the former Cour des Comptes and the barracks contiguous, and, the project having been previously planned in all its details, the work began almost immediately upon the company's obtaining possession of the ground, and the ruins of the Cour des Comptes were soon demolished.

In 1892 the company purchased the old Sceaux line, which had its station at Place Denfert, somewhat remote from the city proper. The old road, which was antiquated, was at once reconstructed under its new proprietorship, and it was deemed a necessity to transfer its distant terminus to a point, provisionally secured, near the Jardin du Luxembourg, in order, eventually, to effect a junction with the other lines which would terminate at the new station of the Orleans Railway on Quai d'Orsay, at the gates of the Exposition.

The extension of the Orleans Railway proper, the present terminus of which is at Place Valhubert, will follow the Seine in the direction of Quai St. Bernard up to the approaches of the Quai d'Orsay. Referring to the accompanying map, the present Orleans Railway station will be noticed on the extreme right, from which point it proceeds to the left toward the Exposition Grounds along the Seine, as indicated by heavy dotted lines, and terminates between Pont Royal and Pont Solferino. The unbroken part of the line shows the location and extent of the open cut.

Starting from the old station, the new tracks will be laid below the surface, so that the line will pass under existing

structures in the vicinity, and, by a sharp curve, reach the embankment by means of a subway directly under the Place Valhubert. The approaches to the Seine along Quai Saint Bernard are so broad that a strip of 9 meters width can be taken without detriment to public interests. This means that the road will be practically a surface road to a point near the Sully Pont. The Quai being much narrower from this point onward, the tracks have had to be placed at a lower level, the bed of the road being nearly on a plane with the surface of the river, as shown in

by Fig. 2. In one section, however, a double arch and four tracks are a necessity to allow for the proposed extension of the old Sceaux line, to which reference has already been made. The double arch construction will be formed by running a line of central supports or pillars connected with arches of heavy masonry. The two sections will each have a width of 8 meters instead of 9 meters, the width of the section shown in Fig. 2. The two sections will run side by side for a distance of 500 meters.

In the prosecution of the work of excavation and construction, there has been, practically, no interference with surface traffic, and, in fact, the public have hardly realized what was going on. En passant, New York city might profit from examining into this admirable system in carrying out any future underground rapid transit projects. An attempt of this kind was made in Boston while the great subway was being constructed, but not without complete obstruction to public circulation, at certain points. The work on the Orleans Railway extension is being

carried on by the construction of subterranean vaults, the roof soil being held in place by large metal shields which are pushed along, as the work advances, by hydraulic jack screws, the masonry work immediately following, while the debris is removed automatically. The shield used is the same in principle as that invented and used by the late Alfred E. Beach in building a section of road under Broadway, New York, in 1869. This system was followed in the construction of the Clichy Electric Line with perfect success, and it will be employed by the Metro-

politan Company when the work of constructing the new belt system is begun.

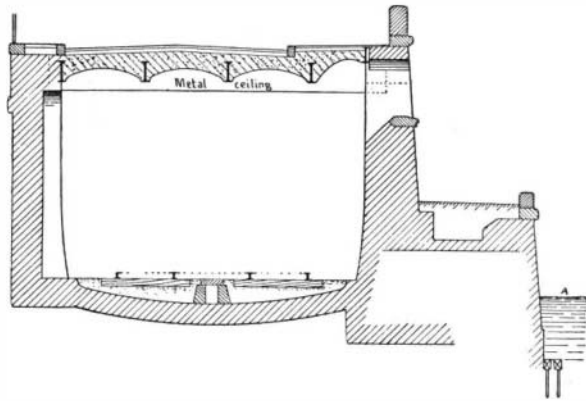
While the Quai d'Orsay terminus will be the general station of arrival for travelers, there will be a station at Place Saint Michel for the suburban travel, to be open only to passengers without baggage. And that the suburban patron may be subject to as little annoyance as possible, the station levels will be raised to the level of the car floors, a practice common in all English railway stations, and to some extent in those of France. Such a system would, of course, be out of the question in our own country, because the ponderous American railway coach is an entirely different proposition.

The old station of the Place Valhubert, the present terminus, will become a way station, a yard station for the sorting of trains, and the point of departure for troops or other large bodies of men.

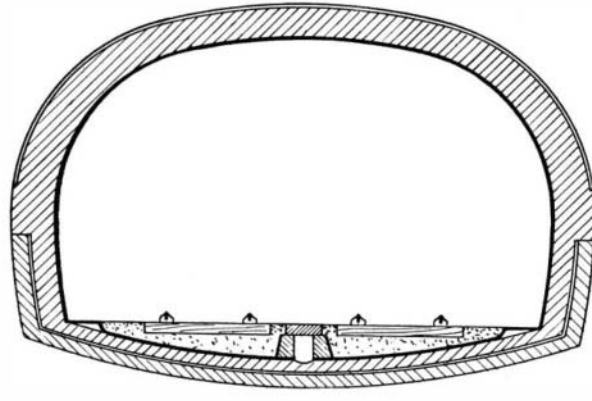
The work on the new station at Quai d'Orsay has progressed no further than the foundation, which is a superb piece of engineer work.

The accompanying illustration shows the state of the work about the first of October, 1898, at which time the photograph was taken. The anticipated expense of the work of extending the Orleans Railway to its terminus is stated to be 40,000,000 francs.

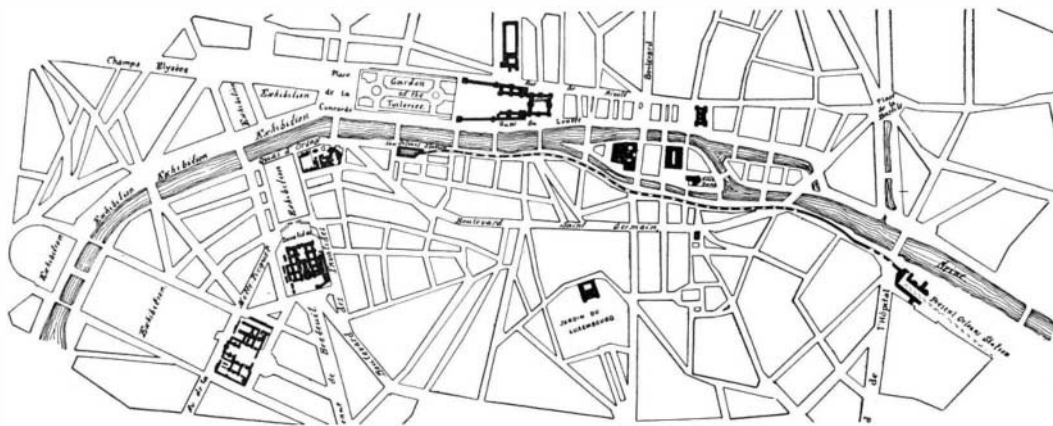
The Paris Metropolitan Railway project is a much greater undertaking. While it is said that a portion of the system will be in operation during the Exposition, the work in its entirety will require a decade for its completion. The portions of the new line that, it is hoped, will be in operation in 1900 are: a section from Place du Danube to the round point of La Villette and another from the Triumphant Arch to the Trocadero, the arch being at the highest point on the Avenue des Champs



1.—CROSS SECTION NEAR PETIT PONT.



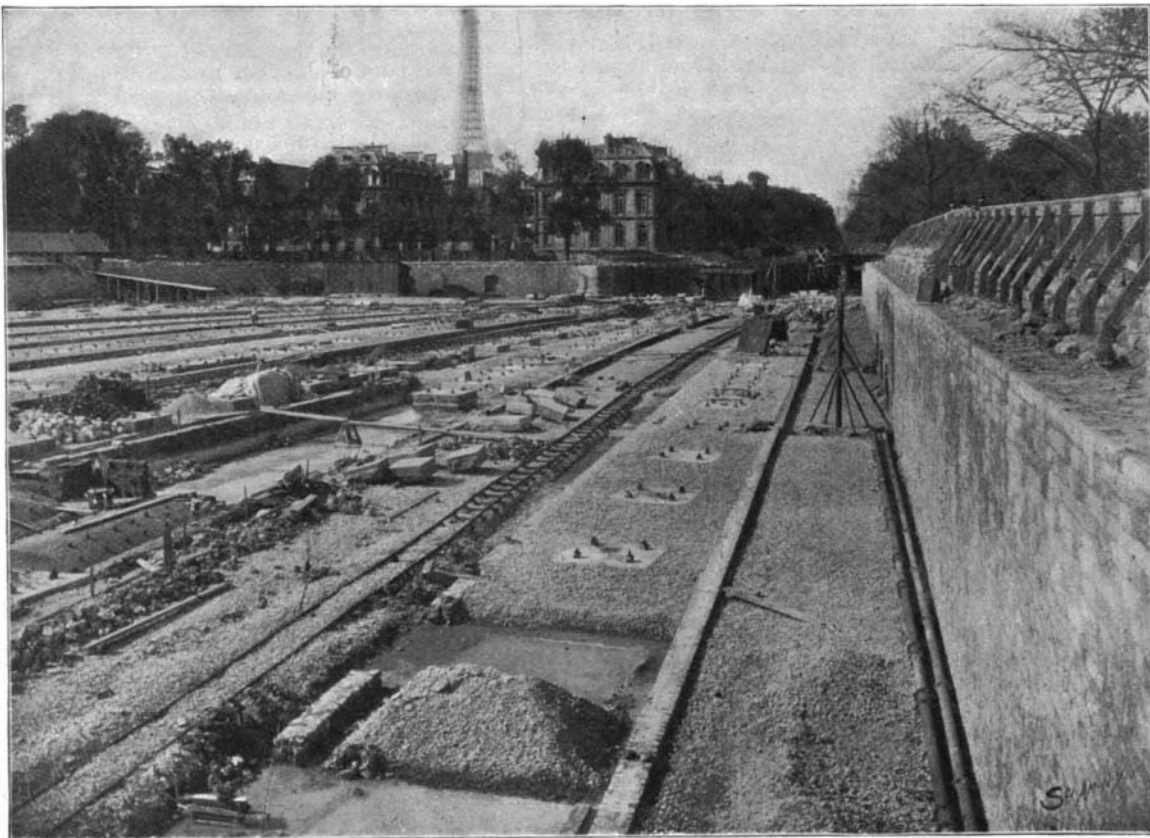
2.—CROSS SECTION BETWEEN PONT SULLY AND PETIT PONT.



3.—MAP OF THE EXPOSITION GROUNDS AND EXTENSION OF THE ORLEANS RAILWAY.

Fig. 1, which gives a transverse view of the line along the Seine. A metal ceiling supports the causeway, there being no indication above ground of a railway line. Light and air are supplied through frequent apertures placed in the wall, which are apparent in the outline. It is needless to remark that all precautions have been taken against danger of flooding the subway through any pressure that might be caused by a rapid rise in the river. Attention is called to the inverted arch below the bed of the railway in the outline, for which we are indebted to Le Moniteur des Expositions. An aqueduct or drain is also placed between the tracks to carry off the water, and when the natural drainage cannot be depended upon, as in time of inundation from a rise in the Seine, pumps have been provided at intervals.

The construction of the subway between the Sully Pont and the Petit Pont, a few hundred yards west of Notre Dame, is on a different plan, as shown



4.—PARIS 1900 EXPOSITION TERMINAL, GARE DES INVALIDES, OCTOBER, 1898.

Elysées, and the point of intersection of several important avenues.

From a recent number of Nineteen Hundred the following statements are gleaned regarding the different lines which, connecting with each other, will form the "belt" when completed. The first line, subterranean, will run from Parc Vincennes to Porte Dauphine, a distance of nearly seven miles, with eighteen stations; The second line is circular in shape and follows the exterior boulevards. Starting in the immediate vicinity of the Arc de Triomphe, it runs (underground in the Avenue Wagram) to the Boulevards de Courcelles, de Batignolles, de Clichy, de Rochechouart, along which the line is intrenched. It becomes an elevated line on Boulevard de Rochechouart and continues thus as far as the Rue de Meaux. Thence, it proceeds to La Villette, and on to Belleville and Ménilmontant, and the Lyons Railway terminus, where it connects with line No. 1. It next crosses the Seine, and after reaching Place Denfert-Rochereau and Montparnasse, extends as far as Grenelle, where it crosses the Seine again and passes beneath the Trocadero and Avenue Kleber. Its total length is 14½ miles, with forty-six stations. The third line, subterranean, runs from Porte Maillot to Ménilmontant, 5¾ miles, with sixteen stations.

The fourth line will start at the Porte de Clignancourt and work its way to the Porte d'Orleans, via Boulevards Ornano, Barbes, de Magenta, de Strasbourg and de Sebastopol. As it emerges from Rue du Louvre it will pass under the Seine, and when it reaches the left bank will continue its route via Rue de Rennes and Boulevard Raspail as far as Place Denfert-Rochereau. It then follows Avenue d'Orléans. It is nearly seven miles in length and will have twenty stations.

The fifth line starts from Boulevard de Strasbourg and runs about 2¼ miles to Boulevard de la Contrescarpe, when it joins line 4, with eight stations. It passes Austerlitz Bridge, Place de la République and Place de la Bastille. The sixth line runs from Cours de Vincennes to Place d'Italie, via Pont de Bercy, about 3¼ miles, with nine stations. A study of the location of the stations shows that the line connects with all prominent points in the city, and it will therefore give Paris an unsurpassed rapid transit system.

The Chemin de Fer de l'Ouest will also be connected with the Exposition, and a new line is being extended from the Gare St. Lazare, running around to the westward of the Exposition grounds, thence passing down the Seine through an uncovered way, below the surface, to the Exposition terminal, the Gare des Invalides. Our illustration gives an idea of the present appearance of the excavation and foundation of this terminal station, the line being known as the "railway des Moulineaux," so called from its first terminal. This will be wholly covered, and at the surface will, in fact, form a part of the new Avenue Alexander II., which crosses the magnificent Alexander III. Bridge, now in process of construction. The station, therefore, will be wholly underground, and directly beneath a central point of that portion of the Exposition grounds which lies nearest the Place de la Concorde and the heart of Paris.

A CIPPUS, a low pillar belonging to the early republican period, has been found in the Forum, at Rome, close to the arch of Severus. The inscription on the cippus indicates that it marked a sacred place.

The Current Supplement.

The current SUPPLEMENT, No. 1209, is a very important issue. The first article is "Progress of Experiments with Kites at the Blue Hill Observatory;" this article illustrates, for the first time, the mechanism employed in flying kites carrying meteorological instruments. It is accompanied by sixteen illustrations showing the kites and all parts of the flying mechanism. It is by Mr. S. P. Fergusson. "Memorandum on the Mineral Resources of the Philippine Islands" is a report by George F. Becker, published in the Mineral Resources of the United States. The usual notes are published and they number some twenty-two. "The Toy Industry of Nuremberg" describes a curious industry carried on in the old German city. "Acetylene," by Vivian B. Lewes, is the fourth lecture and is accompanied by important tables. "Apparatus for Nickel Plating Numerous Small Objects at a Time" describes a form of apparatus concerning which our readers have often inquired. "The Economic Status of Insects as a Class," by Dr. L. O. Howard, is an interesting and scholarly article.

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RECENTLY PATENTED INVENTIONS.

Bicycle Appliances.

GEAR-CASE.—CONSTANT A. CHEVALIER and NORBERT G. VASSEUR, Caen, France. The essential characteristic of this novel construction is that the chain-wheel may be fixedly attached to the crank-axle between the ball-bearings, while still maintaining the axle in one piece and fixing on its ends, as usual, the two cranks. There is hence secured a normal traction action of the chain, which prevents all twisting motion and which increases the rigidity of the machine. Particular arrangements for mounting and fitting the ball-bearings, combined with a novel system for lubricating the moving parts, complete the improvements.

Electrical Improvements.

ELECTRIC PRINTING-MACHINE.—GEORGE L. CAMPBELL, Dushore, Pa. This invention provides an improvement in electrically-operated printing-devices, and has for its especial object the printing of bulletins in public places. The improved machine is so constructed that a large number of printing devices may be simultaneously operated from a central point. The machine comprises a frame carrying a sheet of paper with proper mechanism attached thereto for rolling the paper from one roller to another. Mechanism is also provided, by means of which the frame carrying the paper is given a traversing motion in order that a line may be printed upon the paper. The invention furthermore provides a type-wheel, which is rotated by an electromagnet, and a type-impressing mechanism, also operated by an electromagnet, the two magnets being in the same circuit, but the second being operated only by a current of greater strength than the normal.

Mechanical Devices.

FAN-ATTACHMENT FOR SEWING-MACHINES.—ALPHEUS RUSSEL, Wickliffe, Ky. The attachment comprises essentially a fan carried by a vertical spindle driven by a rubber-tired friction wheel, which may be shifted in and out of engagement with the fly-wheel of the sewing-machine. The fan may be adjusted so that the sewing-machine case may be applied when the fan-attachment is out of operative connection with the sewing-machine.

DRILLING-MACHINE.—ROBERT BINNIE, Bolivar, Pa. The machine is mounted upon tripod, carrying a standard on which the drill frame or carriage slides. The drill-spindle can be reciprocated and rotated, or merely rotated. To impart a reciprocating motion, a spring-pressed cross-head is mounted on the frame, and is pivotally connected by a pitman with a crank-arm, driven by a motor through the medium of gearing. The novel arrangement of springs provided, prevents the transmission of shocks to the cross-head. In order to impart a continuous turning motion to the drill, in addition to the reciprocating motion, the crank-shaft is provided with a worm, by means of which the drill spindle is rotated. When it is desired to dispense with the reciprocating motion, the pitman is disconnected from the cross-head and the crank-shaft, and only a rotary motion is given to the drill-spindle by the worm. An arrangement is provided whereby an intermittent feed motion can be imparted to the frame.

Railway Appliances.

CAR-COUPLING.—JOHN O. STOW, Lawrence, Mich. This car-coupling is so constructed that a brakeman can uncouple the cars while they are in motion. The coupler has a beam with a bifurcated front portion. A hook is pivoted in the bifurcated portion, and a link is connected with the hook. On the coupling, a lever is fulcrumed and connected with the link. When the levers rest on the solid portion of the beams, then the coupling is closed, the arrangement of the parts serving to prevent the hooks from swinging out to release the couplings; but, should one of the levers be drawn aside, the strain on the coupling will throw out one of the hooks, and the couplings will be released.

RAILWAY-SPIKE.—JOHN R. KUNZELMAN, Stillwater, Minn. The spike has a shank and a laterally-projecting wing attached to the shank. The wing has a sharpened lower edge; its lower portion is of greater thickness than the upper portion. A spike thus constructed, when driven into the wood, will be firmly held in place. The spreading action of the rails will not throw the spike out of place, owing to the action of the wings as they engage the wood.

Miscellaneous Inventions.

LOCK.—ADOLPHE MIROT, Manhattan, New York city. The bolt of this lock is thrown by an eccentric, notched throwing-arm provided with a projecting pin concentric with its journal. The key of the lock has a hole in the end of its shank adapted to receive the pin, and has slots in its side communicating with the hole. Dogs, each pivoted by one end in the slot, are spread by engagement with the pin so as to enter the recesses in the throwing-arm. When the bolt is thrown by the eccentric, it is given a half-revolution, the eccentric acting as a lock to prevent the bolt's being forced backwardly by engagement with a knife inserted in the crevice between the door and jamb. It is, hence, impossible to throw the bolt by any other means than a key of the character described.

TEMPORARY-BINDER.—CHARLES T. ROSENTHAL, Batesville, Kan. The binder comprises an upper and a lower member having hinged connection. The members are provided with means for holding leaves between them. Guide-plates are secured to the inner faces of the members, extend in opposite directions and are placed out of vertical alignment. Each guide consists of a body and of a hook-section carried by the body. A locking-plate is held to slide between the hook and the body-sections of the guides, and is provided with recesses arranged to register with the hook portions of the guides. Each section is capable of independent use. By reason of the peculiar construction described, the leaves contained in a section may be removed without disturbing those of an adjoining section.

GATE.—CHARLES RICE, Durham, Ill. This gate is provided with latch-devices operated by levers projected to each side of the gateway, so that the gate can be opened or closed by a horseback rider or by a person seated in a carriage, without the necessity of dismounting or descending to the ground. The novel features of the invention are found in a construction whereby the end of the gate is adapted to strike against the abutment-posts in such a manner as to relieve the latch from undue shock and also permit a quick operation thereof as the gate moves to its open or closed position.

VEHICLE TRACK.—SANFORD B. DICKINSON, Corning, N. Y. This improved vehicle-track is adapted especially for wagons and bicycles, and is designed to render more easy the passage of such vehicles over streets and roads. The track comprises a series of supported columns provided at their upper ends with vertical slots in alignment with one another. The track itself consists of a length of sheet metal provided with a marginal flange at each side, and with a central flange between the marginal flanges. All of the flanges are projected downwardly. The marginal flanges are located, one on each side of the columns; while the central flange is projected into the slots of the columns.

SNAP-HOOK.—CHARLES M. BEARD, Elroy, Wis. The body of this hook is provided at one end with a hook and at the other end with a loop. A tongue is pivotally mounted on the body adjacent to the loop and has its free end adapted to engage with the hook at the limit of the outward movement of the tongue. The free portion of the tongue is formed with a head comprising two oppositely-extending shoulders which are engaged by two lugs formed on the body of the snap-hook. A hook thus constructed can be readily opened with a gloved or ungloved hand.

WINDMILL.—ALBERT J. SMALLEY, El Reno, Oklahoma Territory. The wind-wheel of this mill comprises spiders or end frames having radial arms to which blades are attached. The spiders are connected with a shaft, to one end of which a crank is secured for operat-

ing the pumping-rod. A boxing extends around the tower to cut off the lower portion of the wheel from wind force. Above the boxing, the tower is wholly open at opposite sides. The openings are designed to be closed automatically by doors controlled by the governor-shaft. On the outer end of the governor-rod a vane is mounted to swing. The vane operates to cause the governor-rod to draw the doors upwardly as the velocity of the wind increases, in order to cut off a portion of the wind. When the wind becomes exceedingly violent, the doors will rise to the top of the towers and entirely cut off the wind. The mill is thus enabled to run at a uniform speed, no matter what the velocity of the wind may be.

COMPASS.—LUDWIG RELLSTAB, Kiel, Germany. This compass is designed especially for use on ship-board, and is constructed so that the deflection of the compass occasioned by the influence of adjacent magnetic bodies will be automatically corrected. This end is attained by mounting on the compass-card an electromagnet, which, upon the deflection of the card carrying the main and auxiliary needles, is energized so that a counter influence will be exercised and the card returned to its proper position.

ROADWAY.—JOHN W. MALTEY, Gates, N. Y. In the construction of a roadway according to this invention, metal plates are so placed between receivers adapted to contain concrete, that the road-bed may be made in sections. The sections of the roadway are completed by introducing asphalt or concrete into the receivers and between the receivers; or a suitable plastic foundation may be laid in the receivers, in which blocks of granite or other material may be introduced, if preferred.

APPARATUS FOR DISTILLING PETROLEUM.—FREDERICK W. MANN, Franklin, Pa. In the fractional distillation of petroleum, a residuum of heavy hydrocarbons is left, which has but little market value. To decrease the proportion of this residuum a process known as the "cracking" process is employed, which submits the hydrocarbon vapors to the action of heat in order to break up the molecules into other arrangements, resulting in the production of a larger proportion of valuable compounds. The inventor of the present process has discovered that the results produced by the "cracking" process may be improved upon, by subjecting the hydrocarbon vapors to the simultaneous action of heat and pressure.

IRONING-BOARD.—EDWARD G. HUMMELL, Lancaster, N. Y. The present invention is a combination ironing-board, wash-bench, and portable shelf. There is a table to which a leg is pivoted; and an extensible brace consisting of sliding sections is connected with the table and leg. One of the sections is tubular and has its free end bent laterally; while the other section is toothed and passes into the tubular section. A locking-member is fitted to slide in the lateral extension of the tubular section and to engage the toothed section of the brace.

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(7603) H. E. asks the meaning of the familiar expression, "Too cold to snow." A. "Too cold to snow" means that it is not probable that there will be snow till the weather becomes warmer. It is never too cold to snow in an absolute sense. Snow falls at the North Pole in great quantities, but during a period of great cold the air over large areas is very uniform in temperature and pressure, and also in dryness. The result of all this is a continuance of good weather until, on the approach of a "low" area, the wind hauls into the south, the temperature rises, and ere long snow begins to fall. The warm air from the south on being chilled cannot contain as much water vapor as before, and the excess freezes and falls as snow.

(7604) F. H. writes: 1. I intend to construct a 50 watt dynamo for the schoolroom. Which should I prefer—50 volts 1 ampere, or ½ ampere at 100 volts? I would like to show the arc if possible, besides other experiments. A. There is little difference between a dynamo giving 1 ampere at 50 volts and one giving ½ ampere at 100 volts. Fifty volts are all you can use in one arc, but one ampere will not give a strong arc. A dynamo giving 5 amperes at 10 volts, or 10 amperes at 5 volts, would be more serviceable for experiments in schoolroom. 2. Is there any book for amateurs in the line of Bottone's "Instrument Making for Amateurs," dealing with the construction of apparatus for different branches of physics? A. Hopkins' "Experimental Science," price \$4, is the book you need. A good book to go with it is Weinhold's "Experimental Physics."