

therefore, more deeply impressed than the right ear, and the singer appears to be on the left to the eight listeners of the group. When the singer is at A, the transmitter 6 is more affected than the transmitter 1, and the singer appears to the right of the audience; these aural impressions change with the relative positions of the singers, and their movements can in this way be followed."

The use of the double conducting wire has been necessary to obviate the effect of induction, and in this respect it has been entirely successful, although of course it increases the cost of installation.

It may be interesting to note that experiments have been made to connect the Théâtre Français with the Exhibition, but up to the present time these have not been successful, chiefly owing to the fact that the footlights create a powerful upward current and interfere with the vibrations to the transmitters. At the opera the footlights are closed at the top, and are burnt with a powerful down draught.—*Engineering.*

MISCELLANEOUS INVENTIONS.

An improved hermetically sealed paper package, admirably adapted for aromatic substances, such as spices, coffee, tea, also baking and yeast powders, and other materials injuriously affected by air or moisture, has been patented by Mr. Henry Clay Crocker, of Milwaukee, Wis. This invention covers both a process and the article produced by the process. The mode of procedure is as follows: A package is made of any desired kind of paper and is filled with the material it is intended to contain, and then sealed in the ordinary manner. The package is next steeped in a bath of paraffine, which effectually makes all the joints of the package air and watertight, and closes its pores. Such package is then inclosed by an exterior wrapper, which may be an ornamental one. Only clean paper, it will be observed, is next to the contents, and the paper being pasted before the paraffine is applied, a stable package is produced without bringing the contents in direct contact with the paraffine.

An improvement in siphons, which provides for their being charged or started automatically at a given moment, has been patented by Mr. James J. Powers, of Brooklyn, N. Y. The invention consists in providing a tank siphon with an automatic valve at its outer end, whereby on the water or other liquid reaching a given level in the tank, the weight of the liquid in the outer arm of the siphon will open said valve and the contents of the tank be discharged, the pressure of the liquid keeping the valve open as long as the flow continues, but the valve closing when the discharge ceases. To effect this action of the valve, it may be carried by a lever provided with an adjustable counterbalancing weight.

A very useful improvement in formers for making pulp pails has been patented by Mr. John W. Bartlett, of Grand Rapids, Mich. This improvement relates to conical formers upon which paper pulp pails are made. The object of the invention is to permit formation of the crease for receiving the bottom and the chine at the same time the pail is formed, and to permit removal of the pail from the cone without injury. The invention consists in an expansible head composed of adjustable segmental plates, which are provided with flanges that form the crease and chine of the pail, such expansible head being combined with a conical former, whereby the head may be expanded while the pail is being formed, and withdrawn to permit removal of the completed pail, without marring the crease or the chine.

An improved machine for fluting hair, moss, and other substances for upholstery, has been patented by Mr. James Taylor, of New York city. In this machine the material to be operated upon is dampened to make it flexible, and is spread upon a traveling feed apron, with its fibers longitudinal with the said apron. It is carried by the apron beneath a feed roller and up to and over a hollow heated fluted cylinder, and is pressed into the flutes of said cylinder by an endless chain of small rollers, arranged to fit the flutes for about one-third of the surface of the cylinder, whereby the fiber is fluted or corrugated and dried at one operation, and is delivered at the opposite side of the cylinder to that at which it was entered.

Mr. William A. Allen, of Jersey City, N. J., has patented an improvement in machines for sawing kindling wood. This invention is an improvement upon a former machine patented by the same party. In it the wood to be sawed is fed on to a slotted table and carried by hands attached to a series of traveling endless chains to a set of parallel circular saws which divide the wood as required. Arranged over the saws is a plate, sufficiently raised to receive the upper parts of the saws beneath it, and of a width equal to about

the diameter of the saws, so that the stick of wood to be sawed may pass beneath the forward edge of said plate before coming in contact with the saws, whereby the stick will be inclosed between said plate and the hands when first struck by the saws, and will thus be prevented from jumping out of place. Furthermore, to the forward part of the lower side of this plate are attached springs, which pass back between the saws, incline downward to the table, and terminate a little beyond the rear edge of the plate, so that the stick of wood will be securely held until it has been severed by the saws and carried past them. These attachments greatly improve the machine.

An improved continuous furnace for treating ores has been patented by Mr. Amedee G. Sebillot, of Denver, Col. This improved furnace is designed to be used for treating ores, pyrites, and other minerals, and is to be used for roasting ores and minerals and converting them into sulphates, oxides, etc. The invention consists in a tunnel-shaped furnace with heat flues on the top and sides, and with rails on the bottom, on which rail cars rest, fitting closely in the furnace and containing the ore or the ore and acid, the fumes and vapors produced passing through a side aperture into a flue which conducts them into a suitable condenser. The car

the convex head of the stopper, that has a hole for the bore constructed to terminate in a shouldered recess in its base. Thus constructed, the stopper is placed upon a shouldered pin which fits said hole and recess, and is secured at its lower end by a screw to the block. Said pin in revolving packs and smooths and thus finishes the inner surface of the bore of the stopper, and the recess in the block packs and smooths and so finishes the convex head of the stopper. A lever formed with a socket to fit over an extended portion of this pin, and provided with a knife, is used to cut the rabbet in the base of the stopper. These several devices perform their work accurately.

EBONY CABINET.

The engraving represents an ebony cabinet of great beauty made by Herr Türpe, of Dresden. It is an example of the highest order of art manufacture. The bass-reliefs are of pear wood, and the sculptured figures are the work of a master hand.

The Formation of Coal.

All attempts to explain satisfactorily the formation of coal have thus far proved unsuccessful, though it is generally understood that it is the product of the decomposition of vegetable matter. Just how that decomposition has been brought about chemically is a matter which chemists have not as yet been able to solve. The principal difficulty has been that it has been impossible to obtain a clear insight into the chemical constitution of coal. It has been thought hitherto, and this is still the popular belief, that coal is in the main pure carbon, mixed with varying quantities of bituminous substances. It has been generally believed that, as the product of the distillation of coal is principally carbon, it would be safe to conclude that free carbon actually does exist in coal. The fact that sugar, starch, etc., under similar circumstances, leaves a residuum consisting of carbon has never been considered a proof that that element existed in these bodies in a free state. It is well known that coals which may have the same percentage of carbon, hydrogen, and oxygen do not by any means, in coking, yield the same products of distillation, and we have a complete analogy for this in the behavior of cellulose and starch when subjected to distillation. Evidence points to the conclusion that coal is a mixture of many and complex compounds; and the difficulty, amounting almost to an impossibility, of separating these compounds has much to do in rendering a chemical solution of the questions involved in the formation of coal a very arduous task.

The production of coal by artificial means is met by great obstacles, among which the absence of all knowledge concerning the conditions under which that process actually took place is the principal one. The question whether the vegetable matter to which our coal veins owe their origin was amassed by drifting or was carbonized *in situ*, has been much debated, and there has been much discussion on the point whether it was obtained from water or from land plants. Dr. Muck, of Bochum, in a recent work to which we shall refer at greater length in the future, takes up the theory that algae have mainly contributed to the formation of coal. It is urged that the remains of marine plants are rarely found in coal veins, and that shells, etc., are not often met with. Dr. Muck calls attention to the fact that marine plants decompose easily and completely, losing their form entirely; and that the disappearance of the calcareous remains of mollusks is readily explained by the formation of large quantities of carbonic acid gas during the process of carbonization. In accepting the marine origin of coal it is not necessary to resort to the assumption of immense pressure and high temperatures to explain decomposition and the total destruction of the structure of the original substance. Dr. Muck combats Fremy's bog theory at



EBONY CABINET MADE BY TURPE, OF DRESDEN.

length. His views are well supported by recent investigations made by Herr P. F. Reinsch, who has examined 1,200 sections of coal, coming to the conclusion that that mineral substance has not been formed by the alteration of accumulated land plants. Herr Reinsch claims to have discovered that coal consists of microscopical organic forms of a low order of protoplasm; and though he carefully examined the cells and other remains of plants of a higher order he computed that they have contributed only a fraction of the matter of the coal veins, however numerous they may be in some instances.

Mr. William Driscoll, of Taunton, Mass., has patented an improvement in mechanism for finishing stoppers for steel ladles. The improvement comprises a block which is designed to be secured to a potter's wheel or other revolving device, and which is formed with a concave recess to receive

containing the fresh ore is subjected to the least heat, and when a car with fresh ore is introduced all the cars are pushed forward, so that the cars are gradually subjected to a greater temperature as the ores approach a complete transformation into oxides, etc. The invention also comprises a combination, in an ore furnace, with a series of cars having draught hooks, of a chain or rope, system of pulleys, and connected windlass, for passing the cars along and through the furnace. In a furnace constructed and provided as described, the waste heat that has acted on the first car acts on the contents of the other cars and but little heat is lost, so that the process may be conducted very economically.

DREDGING IN BARBADOS.—It will be seen by reference to an advertisement in this paper, that the Colonial Government, Barbados, ask for proposals for an extensive amount of dredging in the harbor of that island. Over five acres are to be dredged.