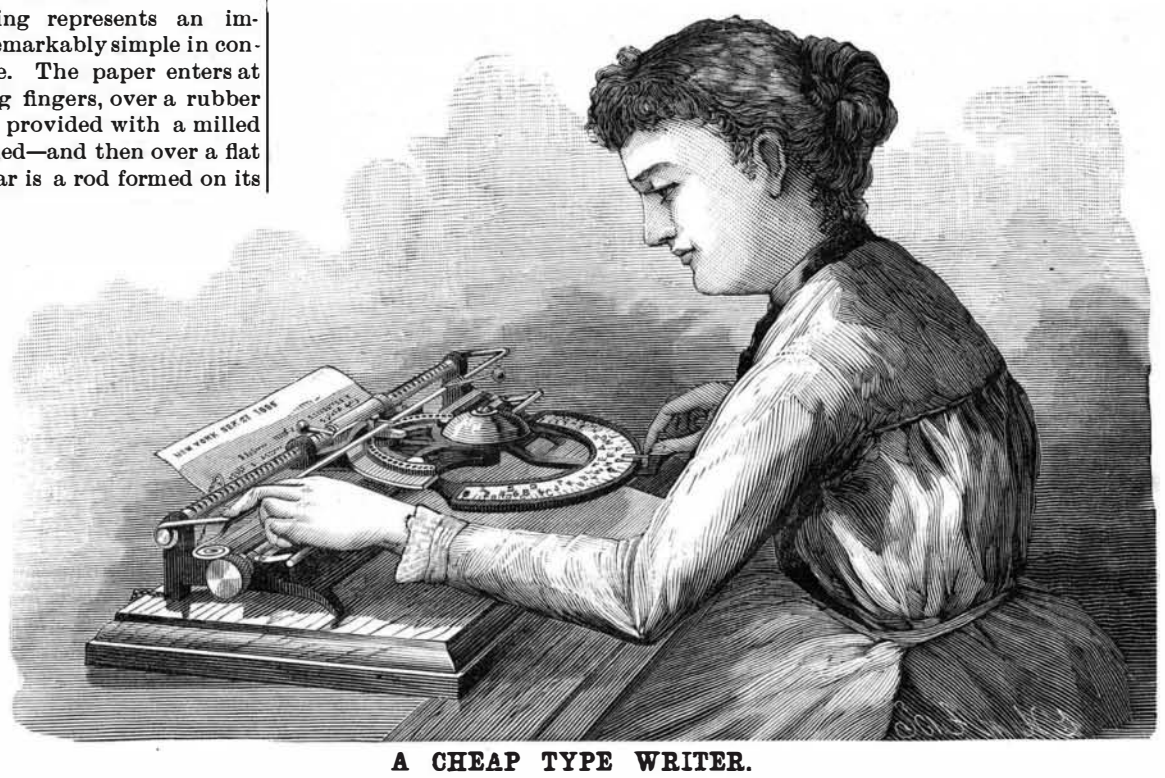
A CHEAP TYPE WRITER.

The accompanying engraving represents an improved type writer, which is remarkably simple in construction and easy to operate. The paper enters at the front, passes under spring fingers, over a rubber feed roll—one end of which is provided with a milled head, by which it may be turned—and then over a flat type bar. Just above this bar is a rod formed on its upper surface with teeth spaced to correspond with the spacing of the printed letters. Sliding upon this rod are two lugs, formed upon a thin cast plate, whose outer segmental portion is marked with the letters of the alphabet, numerals, and punctuation marks. In the center of this segment is pivoted a second one, carrying a curved rubber strip, formed with letters, etc., upon its under surface. This segment is also formed with holes, which are radially in line with the rubber letters. Pivoted to the plate is a lever, pivoted at its outer end to an arm provided with a horizontal pin adapted to enter between the teeth of the rod. The lever also carries two downwardly projecting pins, one of which, when the lever is depressed by means of a finger bar mounted upon the outer ends of the rod and extending across the machine, forces the letter under it down upon the paper, while the other, whose point is conical, enters one of the holes and serves to guide the first pin.

This simple construction prevents the rubber between the letters from being forced down, and, at the same time, renders unnecessary the accurate stopping before any particular letter of the pointer which is attached to and by which the type plate is moved. This pointer moves over the segment having the characters marked upon it, and can be rapidly shifted from letter to letter by one hand of the operator, the other hand pressing down the finger bar as each letter is indicated, this movement also shifting the type along the distance of one space. By pressing upon a thumb piece attached to the left hand end of the finger bar, the type can be moved along one space without any type making an impression. The striking of a bell notifies the operator that the end of the line has been reached. The free end of the plate is then elevated, when it can be moved back to begin another line, the paper being advanced any desired distance by turning the feed roll. Attached to the plate are two inking pads, upon which the type segment bears. The constant movement of the type over these pads insures the thorough inking of each character.

Provision is made for easily regulating the length of the printed lines. The machine has extremely few parts, not one of which is delicate or liable to get out of order.

Further particulars concerning this type writer may be obtained from World Type Writing Machine Company, 113 Prospect Street, Boston, Mass.



A CHEAP TYPE WRITER.

NEW PASSENGER DEPOT OF THE ERIE RAILROAD.

The extensive passenger train shed and depot shown in the engraving are now in course of erection for the New York, Lake Erie, and Western Railroad on the Pavonia Avenue, Jersey City. The work is carried out from the designs of the company's architect, Mr. G. E. Archer, under the superintendence of Mr. C. W. Buchholz, the Chief Engineer of the department of Bridges and Buildings.

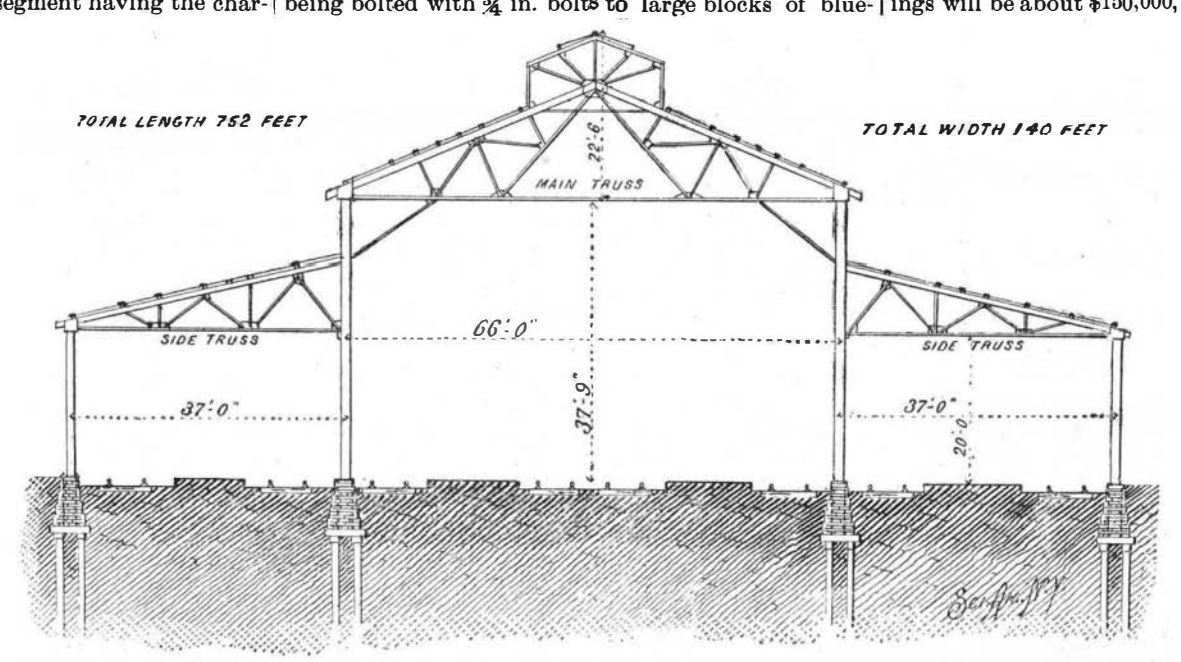
The train shed is 600 feet long and 140 wide, and is constructed in an unusually substantial manner. Iron standards or columns forming the main support of the structure are erected at distances apart of 25 ft., being bolted with ¾ in. bolts to large blocks of bluestone built on columns of brickwork which are supported on platforms, each constructed on four wooden piles. The side of the building is covered with Cameret tin and white pine sheathing, matched and planed on both sides and double beaded. Rendle's system of glazing is used for all the extensive skylights, and the main front of the building is covered in with ornamental galvanized iron.

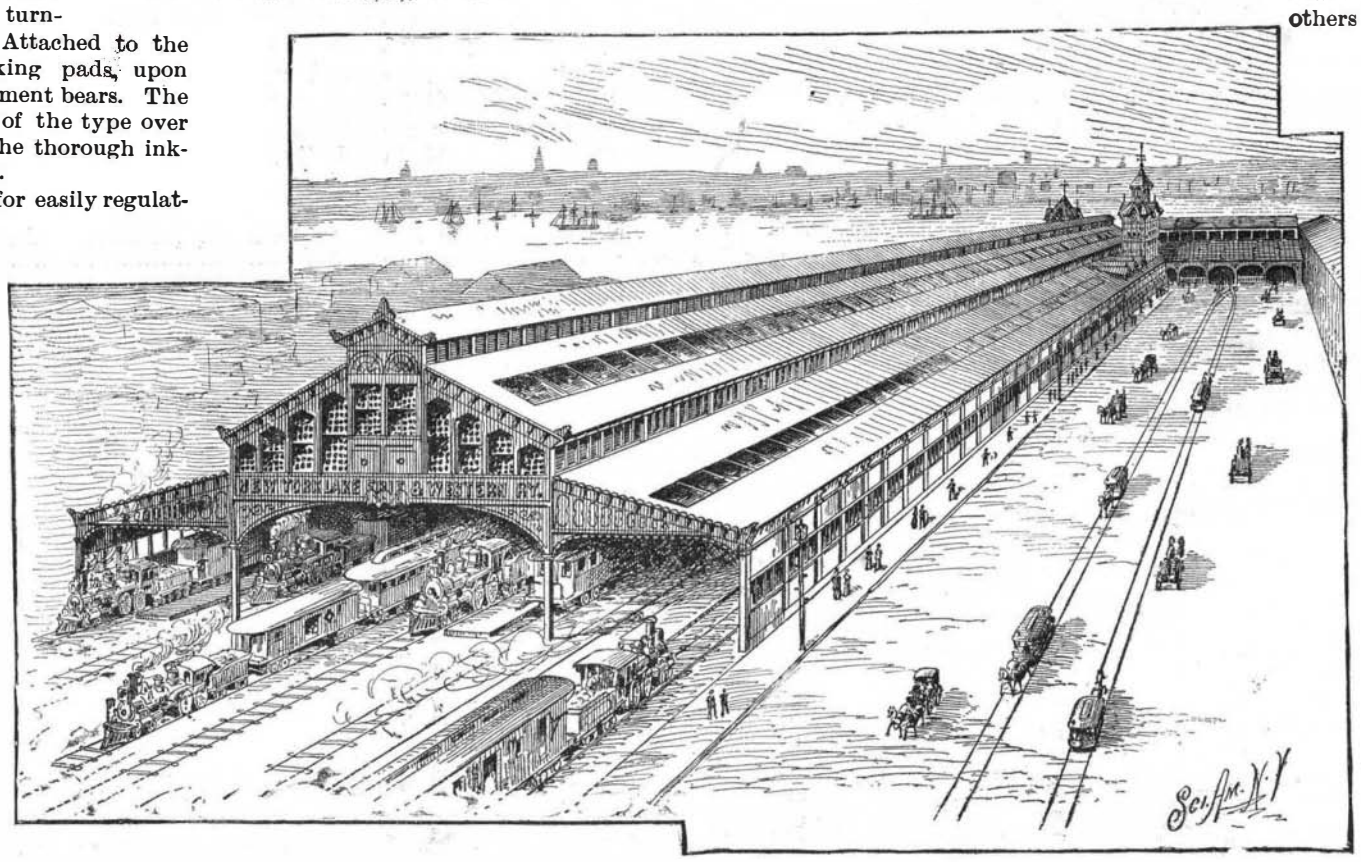
The construction of the roof is shown in our engraving of the sectional view. The main and side trusses are stiffened longitudinally with trussed purlins and latticed struts, and the roof is covered with tin laid on 1¼ in. yellow pine boards.

All the tin is painted with one coat of paint on the felt side and two coats on the outside, and the wood work is finished in three coats of olive green.

The passengers' depot, which will be shortly erected, will have a handsome elevation overlooking the river. It will be provided with two baggage rooms, office, two express rooms, restaurant and kitchen, emigrants' waiting room, and a general waiting room measuring 66 ft. × 100 ft. On the upper floor are to be the company's offices, arranged to be approached from a gallery extending around the general waiting room, which will reach the whole length of the building to the roof.

It is calculated that the total cost of the two buildings will be about $150,000, of which $75,000 will be expended on the train shed.





THE NEW PASSENGER DEPOT OF THE ERIE RAILWAY JERSEY CITY.

Cocoa Palms as Lightning Conductors.

In a recent article the *Ceylon Observer* refers to the power of the cocoa nut palm to conduct lightning. Sir Emerson Tennent long ago pointed out that this tree acts as a conductor in protecting houses from lightning, and in one instance 500 palms were struck in a single plantation during a succession of thunder storms, in April, 1859. But the trees themselves suffer terribly in the process, for however slightly they may be touched by the electric fluid, they die. Sometimes only the edges of the branches are singed, at others a few leaves turned brown alone show where the tree was touched, yet however slight the apparent effect, in course of time the tree withers gradually and dies.

In conclusion, the journal quoted inquires why it is that cocoa nut palms which have merely had their external parts, their foliage, almost imperceptibly singed, should be as much doomed to death as those which have had their vital parts permeated by the lightning, the fatal result being only protracted in the one case, while it is instantaneous in the other.

IN Egypt an engine specially constructed to use petroleum as fuel is drawing trains on the railway between Alexandria and Cairo.

The "Noble Forehead" Fallacy.

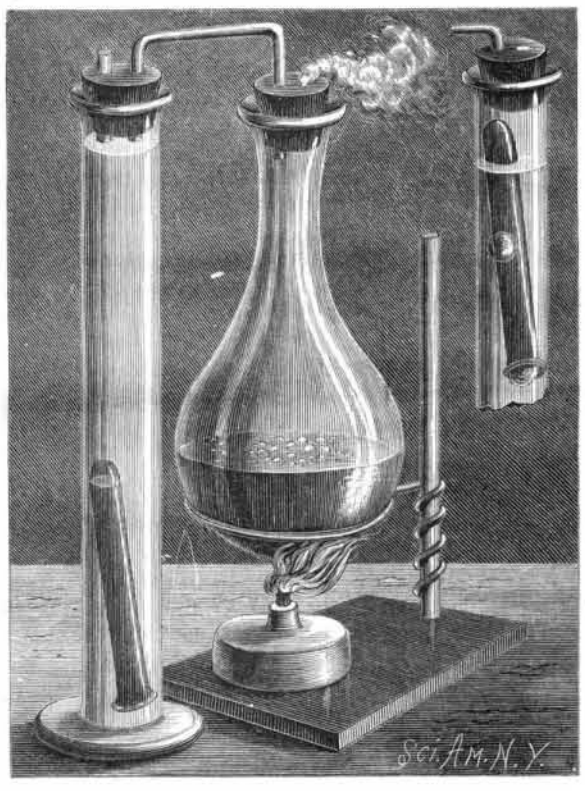
It is popularly supposed that the high forehead is essential to a good brain, and intellectual superiority is usually associated with the conception of a "two-storied brow." Dr. Wm. H. Mays ably combats this idea in the *Western Lancet*. He says:

"The size of the forehead depends much on the line of growth of the hair that limits it. A man may have what is called a low forehead; but if the hair could be removed to the height of four or five inches, the same individual would present as fine a specimen of the traditional "noble forehead" as could be wished, a perfect "dome of thought," particularly if the frontal sinuses happened to be large or protuberant. Again, a low forehead has ever been held a sign of beauty in woman, and has certainly never been regarded as an impeachment of her mental capacity. The truth is, the front part of the brain has very little to do with the intellectual process. It is the posterior lobes of the brain with which the higher faculties of the mind are associated. Gower assigns to the frontal lobes, excepting their lower and hinder portions, a negative position as regards psychical importance. Only man possesses posterior or occipital lobes; they are the latest achievements in the long line of cerebral development. In the higher apes they may be found in a very rudimentary condition; the lower mammals possess frontal or anterior lobes only. In the lower savages, and in congenital idiots, the occipital lobes are often ill developed, approaching the brute type, giving a flattened appearance to the back of the head. In the Stockton Asylum are several interesting idiots, some of whom, while possessing quite respectable foreheads, show a striking deficiency of back head. The neck and back of the head are in one line, and it is worth remarking what a foolish appearance such a contour gives an individual. When you see a lack of the rounded sweep or projection of the back of the head above the neck, you will find with it a low order of intellect. The idea that a high forehead is, taken alone, the index of mental superiority is as baseless as any of the exploded propositions of phrenology, with which pseudo-science it deserves to be classed."

EXPERIMENTS IN PNEUMATICS WITH A STEAM VACUUM.

T. O'CONOR SLOANE, PH.D.

From the two preceding articles in this series it will be seen that several experiments usually performed with an air pump can by simpler apparatus be shown almost or equally as well. It is proposed in the present paper to extend the list. After such a series as given has been followed in this work by the experimenter successfully, he will have little difficulty in going still



CARTESIAN DIVER IN VACUO.

further, and by a little ingenuity will be able to execute a full set of vacuum experiments.

The existence of air in the pores of wood has already been shown. Striking as the experiment is, the air and its movements are unseen until it enters the water. It is interesting to watch the expansion and expulsion of air from a transparent vessel. A test tube is nearly filled with water and inverted in the cylinder or bottle that held the piece of wood in the former experiment. The cylinder should be almost completely filled with water. Under these conditions the inverted test tube sinks to the bottom, and rests there, with a small bubble of air in its upper end. The boiling flask is connected and a vacuum produced. As the vacuum grows greater the small residue of air in the test tube expands, the tube grows lighter, and suddenly, when enough water has been expelled by expansion of the air, ascends to the surface.

The air continues to expand, and begins to bubble out of its lower and open end. This is the action that takes place in the pores of the wood, and, just as in that case, a surprising volume of air will escape. On the readmission of air the test tube fills again, preserving a still smaller air space, and sinks at once. Each pore within the wood acts as the test tube does, and the latter experiment may be accepted as a magnified representation of the first one. As a further illustration of the expulsion of air from porous bodies, a piece of chalk may be placed in water and a vacuum produced. Air will escape from it, just as from wood.

POROSITY OF WOOD. BOILING POINT. EXPANSION OF AIR.

The porosity of wood may be illustrated by the use of the flask alone. A round stick is thrust through a short piece of rubber tubing, so as to make a tight joint in the neck of the boiling flask. The latter contains a little water, and is boiled, and while boiling the stick is introduced with its end under the water, the rubber making a tight joint between it and the neck of the flask. As the steam condenses, air will begin to steam through the stick from the outer atmosphere, and out of its lower end into the flask. After all is cool, the stick can be easily withdrawn. The ease with which it comes out shows how the vacuum has been destroyed by the air thus drawn in.

To illustrate the effect of a reduction of pressure on the boiling point, a small flask should be three-quarters filled with water, which is to be heated to a temperature a little short of boiling. All is quiescent until a vacuum is produced by connecting the boiling flask to it, and operating as described. As soon as the reduction of pressure has gone far enough, the water in the small flask begins to boil.

In many of the experiments, the close observer will notice the appearance of minute bubbles in the water in the cylinder of the experimental vessel. These must not be confounded with the steam bubbles seen in this last experiment. The minute bubbles are not steam, but are due to dissolved gas—nitrogen, carbonic acid, and probably somewhat less oxygen.

Another example of the expansion of air may be executed by the aid of the small flask. It is fitted with a tube that protrudes to a length sufficient to reach nearly to the bottom of the boiling flask when inverted over it. The small flask is thus inverted while empty, the tube passing through the cork of the boiling flask. The cork of the latter has its plug removed, otherwise all is tight. The water in the lower flask is boiled, and, after full expulsion of the air, is plugged. As the vacuum begins to be felt, the air bubbles out of the immersed end of the tube with great rapidity. When all has come that will, the plug is withdrawn. The water immediately rushes into and partially fills the upper flask. This condition is shown in the cut. A second vacuum is produced. As this is more than the preceding, more air will be withdrawn from the upper flask. By repeating this often enough, almost all the air may be expelled from the inverted flask.

The balloon already used may be borrowed, to show the elasticity of air. Most of its contents are expelled, and it is suspended from a rod or sealed tube passed through the cork of the boiling flask. It is sufficient to drop the balloon into the flask. Its attachment to the tube is a matter of convenience for its extraction. In either case its neck is tightly tied, so as to make it air tight. All being arranged, the water is boiled, the cork is plugged, and the vacuum is produced. The balloon slowly expands, and assumes a globular shape. When air is readmitted by withdrawing the plug, it suddenly collapses. When inflated, it will be much larger than the neck of the flask, and might be cited as a parallel case to the apples in the dumpling.

The last experiment illustrated is the familiar one in acoustics. The transmission of sound through space is dependent on the existence of some material substance. In the case of its transmission, waves are formed by the vibrations of the sounding body, and these waves affect the organs of hearing. Solids, liquids, and gases convey sound. A solid, to act thus, must be elastic and tense or solid.

A short piece of India rubber tubing is slipped over the end of the glass rod or sealed tube used in the last experiment. A bell, small enough to pass through the neck of the boiling flask, is attached to the end of the tube by a pin. The other opening in the cork is plugged. The water is boiled, the cork is slowly placed in the neck, and the lamp removed. As soon as cool, the bell may be rung by shaking the flask. No sound whatever will be heard if the boiling was long enough and hard enough to expel the air. The India rubber, though elastic in one sense of the word, is too loose or limp to convey sound waves.

In the future some more examples of this class of experiments may be given. By consulting text-books, more especially the older ones, hints for experiments in pneumatics may be found. An egg, by a large rubber tube, may be cushioned in the neck of the flask, a pin hole having previously been made in its inner end. Before resting it there, the water must be boiled. If the fit is good enough to hermetically close the flask, so that a vacuum is produced, and if the smaller end be placed downward, its contents will be expelled partially, at least, by the expansion of the air bubble. If a second pin hole is made in the upper end, the contents will be driven out much faster. A sharp edged metallic tube, fitted to the neck by a large rubber tube, will core an apple. While the water is boiling, an apple is screwed down on it; and if the vacuum is good enough, the core will be drawn violently down into the flask. The tube protruding from the flask must be long enough to go completely through the apple.

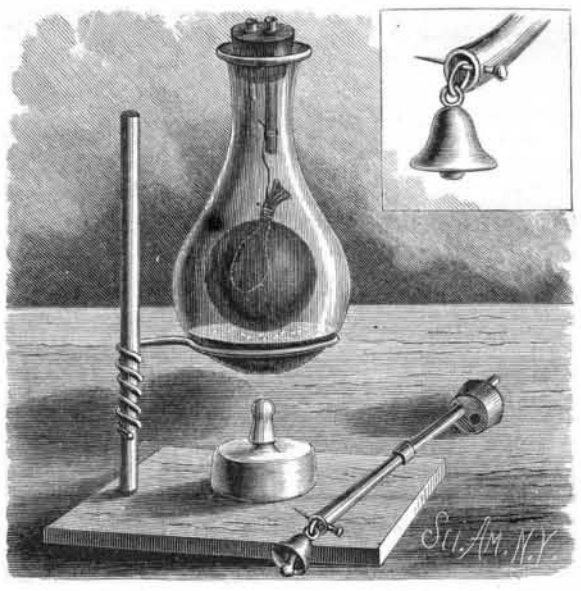
No difficulty will be encountered in these experiments if good rubber corks are used and rubber tube joinings between separate glass tubes are avoided.

Points on Patents.

One of the most common errors that inventors fall into is the mistaking of mere mechanical skill for invention; and one of the most puzzling things the examiner in the Patent Office and the judge on the bench are confronted with is the necessity of determining just where mechanical skill ends and invention begins.

Another error prevailing very commonly among inventors and others is that an individual or corporation has the right to manufacture a patented article, provided it is for their own use, and not made for sale. This is not so. The law gives the patentee the exclusive monopoly for seventeen years to make, use, and vend.

Another error of inventors, although not so common as those above, is that the object for which a machine is constructed, or the use to which it is to be put, is what the patent is granted for. This may be true, to a very limited extent, where the article thus produced is a new article of manufacture; but, generally, the patent is for the mechanical arrangement



BALLOON IN VACUO. ACOUSTIC PARADOX.

whereby the desired result is obtained, and not for the result itself, and the use of such patented machine for an entirely different purpose is an infringement of the patent. The granting of the patent carries with it the exclusive use of the machine, no matter for what purpose.—*C. N. Woodward, in Wood and Iron.*

Waterproofing Cloths.

The following mixture is given by a correspondent in *L'Industrie Textile* as suitable for waterproofing all kinds of woven fabrics: Linseed oil, 77·0; acetate of lead, 1·845; litharge, 10·0; amber earth, 0·4; vegetable wax, 1·3; soap powder, 1·2; Manila gum, 0·7; lamp black, 4·0; essence of turpentine, 2·0; India rubber varnish, 1·555; total, 100.