Tunnel under the St. Clair River.

Work is actively in progress on the preliminary excavations for the tunnel under the St. Clair river, which is intended to connect the Grand Trunk and Chicago & Grand Trunk Railway systems at Port Huron and Sarnia. It will be built by a company independent of the corporations owning and controlling these railways, but in their interest. At present the connection between the lines east and west of the river is maintained by a ferry, which transfers the trains between Point Edward, in Canada, and Fort Gratiot, in Michigan. This ferry is about three miles north of the proposed tunnel.

The location of the tunnel was determined by the following considerations, among others: (1) The comparatively small depth of water at the proposed crossing; (2) the tunnel and its approaches can be constructed on the same straight line; (3) the short length of new railway that will be required, the tunnel approaches connecting immediately with the main lines of both the Grand Trunk and Chicago & Grand Trunk Railways; (4) the distance to be run by all through trains to and from the Great Western division of the Grand Trunk will be reduced six miles, while it will not be increased for those to and from the Grand Trunk proper; (5) the favorable material in the bed of the river for tunneling, the borings showing that the rock is from ninety to ninety-five feet below the surface of the water, and that strong clay, in which not a trace of quicksand was discovered, overlies it; (6) the necessary land and right of way for the tunnel and its approaches will cost less than upon any other line within the limits available for selection.

The advantages to be gained by the construction of the tunnel are a reduction in the cost and time of transferring trains and a degree of regularity in the service not always attainable by the ferry, in consequence of the river being occasionally obstructed by ice in the winter and by vessels during the season of navigation.

The length of the tunnel will be 1 mile, of which 2,310 feet will be under the river, 1,160 feet under dry ground on the Canadian side, and 1,810 feet under dry ground on the American side. Of the portion under the river, 1,500 feet will be nearly level, having merely enough of fall toward the east to cause any water finding its way into the tunnel to flow in that direction. At either end of this part of the tunnel there will be a gradient rising 1 in 50, or at the rate of $105\frac{6}{10}$ feet per mile, which will be continued through the open cuttings forming the approaches. The total length of the ascent on the Canadian side will be 4,970 feet, and on the American side 4,900 feet. The length of the open cutting at the east end of the tunnel will be 3,270 feet, and at the west end 2,820 feet.

The depth of the lowest part of the tunnel below the surface of the water will be $80\frac{1}{2}$ feet; the minimum depth of the top of it below the bed of the river will be 15 feet. The tunnel will be for a single track only. In cross sections it will be circular, with a clear internal diameter of 20 feet.

The work which is now in progress is the construction of a trial heading or small cylindrical tunnel, with a clear diameter of six feet, under the river. This is being driven for the purpose of thoroughly testing the material. Although the borings were of a satisfactory character, there is of course a chance of pockets of quicksand being found between them. This heading, if successfully completed, will be of material assistance in the construction of the permanent work. It will be finished probably in about six or seven months. If the present operations are carried out satisfactorily, then the larger work of making the full sized tunnel will be proceeded with. The shafts at each end have been sunk to the bottom line of the tunnel without meeting with any difficulties, and so far the experience is all favorable.

Bradstreet's says the completion of this work must obviously have an important effect on transportation between the Eastern and Western States, and between Canada and the West. The route by way of the tunnel between Detroit and Buffalo or Toronto will be only eight miles longer than the direct route across the river at Detroit.

Progress of Electric Street Railways.

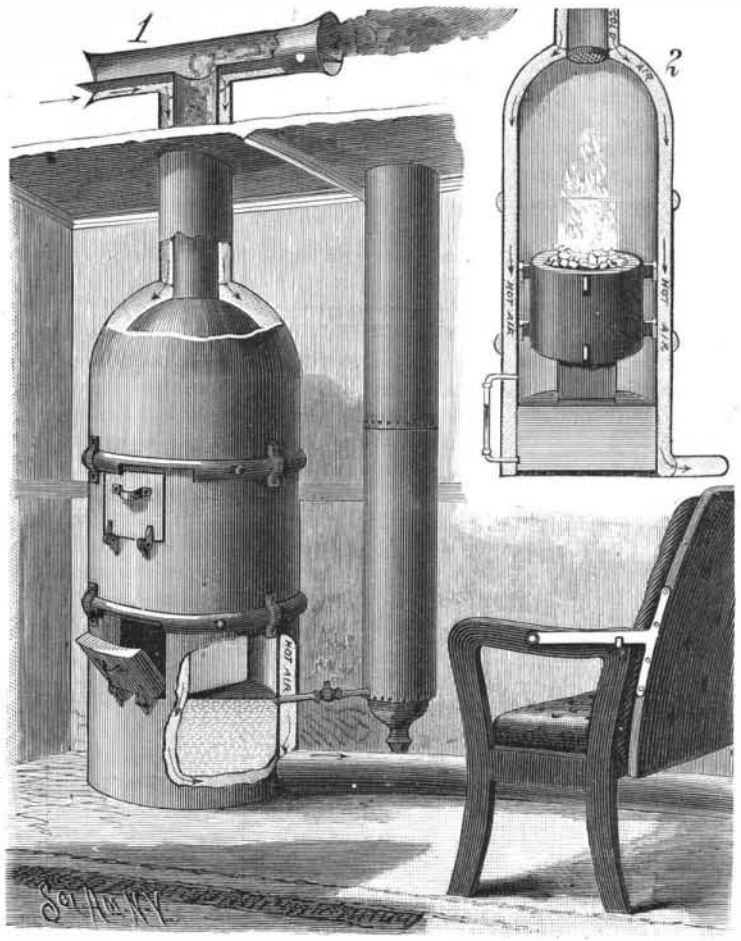
The Van Depoele electric street railways seem to be taking the lead in this country, being now in operation, with much success, in the following places: Minneapolis, Minn., Montgomery, Ala., Detroit, Mich., Appleton, Mich., Port Huron, Mich., Scranton, Pa.; also in Toronto and Windsor, Canada. In a short time the company will have electric cars running in Lima, O., and Binghamton, N. Y. More miles of electric railways on this system are now at work than all other systems put together.

SELF-EXTINGUISHING STOVE FOR RAILWAY CARS.

The accompanying engraving represents a car heater—the invention of Mr. James A. Faust, of Salt Lake City, Utah. It is most simple in construction, and is provided with a water reservoir, from which the water will flow to extinguish the fire should the heater be overturned or demolished by an accident. The outer shell or jacket is made watertight in the lower portion to form a water chamber. Within the shell are placed the firebox and ash pan, which are constructed with radial wings or ribs extending lengthwise, and by means of which they are connected with and suspended in the casing. An annular space is thus formed between the firebox and shell, as shown in the sectional view, Fig. 2, through which the water is free to pass should the stove be overturned. The doors of the stove are hinged at the bottom, while the opposite edge of each is overlapped by a band which encircles the stove and has a gap or recess, which, by turning the band, may be brought to a position coinciding with the door, to permit of its being opened. But by shifting this ring circumferentially, so that it will overlap and confine the closed door, the latter will be most securely held.

The air enters the top of the chimney, passes down and around the smokepipe and casing, by which it is heated, and then passes through pipes leading along the side of the car in the usual way. The course of the air is clearly indicated by the arrows.

It is evident that when the stove is overturned, the live coals will not be able to escape from the casing,



FAUST'S STOVE FOR RAILWAY CARS.

and the water in the reservoir will flow through the annular space and extinguish the fire. In order to prevent the coal and dirt from falling into the bottom of the casing, the annular space is covered by a guard plate, which is not fastened down, and will be at once displaced should the stove be overturned, so that it will not, therefore, obstruct the passage of the water. As the casing is made of heavy sheet metal, the danger of its being ruptured is greatly reduced. If considered desirable, a coil of pipe may be placed in the upper part of the casing for heating by steam instead of air.

Further particulars concerning this invention may be obtained, until April 1, from Mr. H. J. Faust, Grand Central Hotel, New York City.

Contagion in Barrels.

Health Commissioner De Wolf recently addressed a communication to the sanitary committees of the Legislature on a highly important subject. Dr. De Wolf states that it is the practice of families purchasing flour, lard, butter, etc., in quantities to sell their flour barrels, butter firkins, and lard tierces to persons who regularly call for them. These barrels, etc., are again sold to dealers, and they are repacked with similar articles. In very many cases, the Doctor says, these receptacles are kept in mouldy places, and frequently are purchased from families in whose houses infectious diseases have existed, and he considers the practice of refilling these receptacles as highly injurious to public health. A bill is now pending before the Legislature preventing the sale of these second-hand barrels, and the Health Commissioner will urge its passage and strict enforcement.—*Chicago Journal.*

Manganate of Baryta for Bleaching.

Manganate of baryta is a green crystalline powder, which is insoluble in water. Schad, in 1865, proposed to use it as a color in place of arsenic green; but so far it does not seem to have been applied in the printing trade. It is now proposed to use it for bleaching, and it is claimed that it acts equally as well as hydrogen peroxide, that it is cheaper and will keep better, that it acts on solutions, be they neutral, alkaline, or acid, and that it can be easily applied. The liquid which is to be bleached is heated, and the manganate of baryta, which has been previously ground together with water, is added until the liquid has been sufficiently discolored. The manganate of baryta becomes in this reaction decomposed into manganite of baryta, a brown insoluble substance which settles out, and can be separated by means of a filter press or by decantation, and into oxygen, which is in this case the bleaching agent. This material can, naturally, only be used in a limited number of cases; but in the preparation of certain fine chemicals it might be found useful. It is proposed to use it for discoloring glue, extracts, and other substances, and it is claimed that it does not decompose glue or tannin.

The Annual Attempt.

We are pleased to see that the annual attempt made by some member of Congress to nullify or irreparably injure our patent law system has been laid to rest for this year, at least; the bill introduced to render suit for infringement impossible where damages do not exceed $200, or where the purchaser of an infringing device bought it in *bona fides*, has been defeated.

This is proper. There are many among the vast number of patents recorded at Washington that cover, apparently, worthless devices, or such as are at least of insignificant value. Yet careful investigation and a knowledge of what has been accomplished in the mechanical world will show that nearly all have found employment, in some form or other, in some valuable invention that more than counterbalances in its widespread utility the insignificance of many of the members or parts of which it is composed.

Inventors are entitled not alone to protection, but respect; for while it is true that some "cranks" may be found among them, and though many of the patent devices are crude and impracticable, yet each one represents an original idea, which, combined with the original ideas represented in other devices, have made our people the foremost on the earth. It is not one inventor to whose genius is due the perfect machine of to-day, but it may be that the ideas of a thousand have been combined to produce that result, many of whom are dead, nearly all of whom are forgotten, and their names unknown, save as they are written upon the musty records of the Patent Office.

Without the encouragement to inventive genius the protection afforded by the patent laws provides, would any of the trades that are to-day in a prosperous and advanced condition have attained their standing? Some of the mightiest interests in the world would certainly have been far behind their present condition.

Unaided by the genius of humble, and sometimes cranky, inventors, the world with its billions of capital and its millions of strong and willing arms would have made but poor progress in bringing railroading up to its present state of perfection. The modern housewife is spared half her drudgery by the ingenuity of the inventor we dub a crank, and the workman finds his labors lightened and his wages increased by the tools and machines and many manufactured articles this same inventor has brought into practical shape.

We need not go outside of the plumbing trade in order to find evidence of what the inventor has accomplished for the good of the community. How many of the best appliances we use are protected by patents, while the materials we employ in all our work are cheapened directly or indirectly by improved and usually patented methods of production!

Under these circumstances we have a right to honor the inventor, and give him such protection for the smallest of his devices as will encourage him to improve on them and extend his efforts on behalf of society, already so deeply in his debt; and every effort, open or disguised, to impair the efficiency of our patent laws should meet with unflinching opposition from all interested in our mercantile and industrial progress.—*Sanitary Plumber.*

THE removal of superfluous hair from the skin is possible both by means of depilatories and by electricity. The former are mostly preparations of sulphide of barium or sulphide of calcium, and the process by electricity is very slow, each hair root having to be killed separately.

Decay of Stone.

The dissolving power of atmospheric moisture seems to depend greatly upon the quantity of free carbonic acid gas it holds in solution; and though this quantity in any given volume of water be extremely minute, in course of time every substance which has an affinity for it will yield more or less to its action. The silicates of potash and soda, for instance, which are present in the igneous rocks—or, to dwell especially on the class of materials under our notice, in the Devonshire granites—are easily decomposed when rain water falls upon them, and, the feldspar being removed mechanically by any of the countless actions of nature, it leaves the other ingredients of the material exposed to the mechanical disintegration of changes of temperature. The simple carbonates of lime, again, sometimes absorb carbonic acid with much avidity, and pass into the state of the soluble bicarbonates; and thus, in proportion as the original face of the stone is removed, does the lower surface become exposed to the action of the rain. The rain water of such a town as London not only does contain large quantities of free carbonic acid, but it also contains sulphuric acid and ammonia, which are capable of exercising a very deleterious influence upon the carbonates of lime. In discussing, however, the effects of these agents upon building stones, it is essential to bear in mind the fact that the mechanical state of the elements of those materials greatly modifies their resistance. Those which are of a crystalline character do not yield so readily as those which are amorphous, and the crystallization produced by volcanic or plutonic influence appears to be even more permanent than that which takes place in the ordinary way. It follows from these considerations that the stones of an irregular, confused, earthy texture, which are able to absorb considerable quantities of moisture, and which contain silica in a soluble form, or the carbonate of lime, should never be employed in positions where rain water could lodge upon them, beat against them, or be taken up from external sources by capillary or other action. In positions exposed to any of the above dangers, none but non-absorbent and decidedly crystalline materials should be used, and as those qualities are almost exclusively possessed by dense stones, it may be considered that the mere specific gravity of a stone is a *prima facie* indication of its constructive value. But atmospheric moisture when absorbed into building stones acts upon them quite as much through the changes in its own volume, in passing from the liquid to the solid state at the time of frost, as it does by the chemical dissolution it produces. If the stone should be placed in such a manner as that water should accumulate in any perceptible quantities between its various layers, and if the position of those layers be such that the expansion of the water in freezing cannot take place freely, the respective layers containing the water will be violently detached from one another.

Now all stones, even the crystalline limestones and slates, have certain planes or directions of cleavage or of stratification, along which water flows more readily than in any other course. If the stones be placed in a building with those planes in a direction likely to retain rain falling upon, or absorbed through, the surface (which is the case when stones are placed "bed to weather"), disintegration must ensue unless the edges of the beds be left free, and even in that case there is danger of frost detaching one layer from another.—*G. R. Burnell, in the Architect.*

Torpedoes and Torpedo Boats.

Mr. Edward C. Peck has submitted to the English Government a proposal for a torpedo to be propelled by steam obtained from the boiler of a torpedo boat through a superheater. The outside skin of a torpedo is utilized as a surface condenser. It is claimed that such a torpedo, 14 ft. by 14 ft., and with an explosive charge of 100 pounds of gun-cotton, would weigh only about one-half of those in use, and would have a speed of over 30 knots and a range of about 2,500 yards. The cost would be reduced nearly one-half. M. Lisbonne, who was recently Director of Naval Constructions in France, has published in the *Genie Civil* a table of English, French, German, Italian, and Russian torpedo boats of all sorts and descriptions:

England.....	boats,	156;	tonnage,	23,912;	cost,	$7,317,000
France.....	"	143;	"	20,450;	"	6,267,400
Germany.....	"	156;	"	14,597;	"	4,467,600
Russia.....	"	115;	"	5,104:	"	1.560,600
Italy.....	"	89;	"	7,966;	"	2,437,600

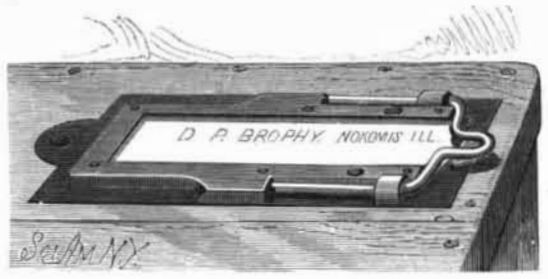
According to M. Lisbonne, where France is most behind England is in torpedo boats of a large size, of from 38 to 45 meters in length.

It is stated that the Italian Government has ordered from the firm of Schwartzkopf torpedoes to the value of 6,000,000 marks.

THE great value of isochromatic plates in microphotography has been demonstrated by Dr. Crookshank, who exhibited to the Royal Microscopical Society of London micro-photographs of bacteria obtained without staining the objects with aniline, as in Koch's process, and he has still more recently exhibited a photograph showing the flagella of a vibrio.

IMPROVED LABEL HOLDER.

The case of this simple and efficient label holder consists of an inner plate and a somewhat smaller outer plate, which are riveted together. The inner plate is made solid, and is provided with holes through which screws or nails may be driven, to attach the holder to a trunk or other receptacle for holding goods of any kind. The outer plate is a narrow U-shaped strip formed all around its inner margin with



BROPHY'S IMPROVED LABEL HOLDER.

a rabbet to receive the label, which extends a little beyond the other end of the plate. A spring is connected at the opposite extremities of its side arms to the case. The arms extend forward to the ends of the outer plate, where they join the cross bar of the spring. The center of the bar is bent to form a loop, to the under side of which is fixed a lug formed with a square inner shoulder, which normally stands in front of the outer end of the label, while the cross bar of the spring presses down on top of the label, which is thus held securely in the case. Loops fixed to the case hold the spring in proper position edgewise of the case, and also limit the upward movement of the spring when it is lifted away from the face of the label. To place a label in the case, it is only necessary to slip the end of the label between the raised latch lug and the inner plate, and then push it inward until the lug springs down behind its outer end.

This invention has been patented by Mr. Dennis P. Brophy, of Nokomis, Ill.

THE MULTUM-IN-PARVO IRON.

The sadiron herewith illustrated is the invention of Mr. H. S. Pease, of Peoria, Ill. It is a miniature stove, with polished surface, and is used in the same manner, and is as convenient, as the common flatiron. Upon the under side of the handle, which is detachable, is a curved fluting iron, corresponding with a fluted piece fixed to the side of the main iron, as shown in the right hand view. The iron is heated with charcoal, but live coals from a common wood fire are equal to the very best charcoal, if made of good, solid wood. This iron does the work of an entire set of ordinary irons, as the heat can be so regulated, by means of the dampers at the heel, as to keep the iron at a uniform temperature. As the iron does not come in contact with a range, it is always clean and nicely nickel plated. The many advantages to be derived from a fluting, polishing, and smoothing iron which is self-heating and extremely simple in construction are apparent.

IMPROVED PLOW.

The plow here illustrated is the invention of Mr. John Babcock, of Walton, N. Y. It is especially adapted for penetrating and breaking hard earth. The standard and beam are cast in one piece, and attached to the former are the handles and point. The point is a plate of steel, beveled both at top and bottom, at one end, to form a drooping point, as shown in the several figures. Back of the bevel the point is straight, to prevent it from entering the ground too far, and through it are several openings, for the passage of bolts for securing the point to the standard. In some cases these openings are made in the form of vertical slots, so that the whole point may be set at an angle on the standard, and in other cases, when these slots are used, the entire lower edge of the point is made straight, as shown in Fig. 2. In Fig. 4 the beveled edge is upset to form side flanges for spreading the dirt.

BABCOCK'S IMPROVED PLOW.

Steno-Telegraphy.

Mr. G. A. Cassagnes, editor of the *Chronique Industrielle*, has recently described before the French Academy a method of transmitting telegrams which he calls "steno-telegraphy," and which is a combination of mechanical stenography with telegraphy.

The apparatus are as follows: At the transmitting station: a keyboard perforator, an automatic transmitter, and a distributer. At the receiving station: a distributer, polarized relays equal in number to the keys of the keyboard of the perforator, and a printing apparatus.

At the transmitting station, the keyboard of the perforator, maneuvered by one stenographer only, perforates in a band of paper a series of apertures arranged in horizontal lines, and each of which represents at least one syllable. The perforating is done at the rate of two hundred or more words per minute.

Through the very position assigned to it by the maneuvering of the keyboard, each aperture corresponds to a definite stenographic sign, which is to be printed upon the stenographic band of paper at the other station.

The perforated band is placed under the transmitter, where it remains immovable, as does also the band that is to receive the impression at the receiving station. If, through one of the apertures, the transmitter then automatically emits a current that passes into the line wire through the brush of the transmitting distributer, this current, on reaching the other end of the line, will be received by the brush of the receiver, which will keep up a continuous motion synchronous with that of the brush of the other station, and will actuate a polarized relay that closes a local circuit designed to print the sign corresponding to the current emitted at the transmitting station.

Since, in consequence of the very revolution of the distributing brush at the transmitting station, the same operation is repeated for each of the apertures in succession (which form a small, perforated, horizontal line), and since the paper at the two stations remains always immovable, a horizontal line is printed, and the line of apertures of the transmitting station is thus converted into a line of signs, representing at least one syllable, at the other station.

The bands then move forward by the space of one interline at both stations, and everything is in readiness for the printing of another line, and so on.

The number of syllables that may be thus printed during one revolution of the brushes depends, then, solely upon the number of contacts into which the distributer and receiver of the two stations can be divided, and such number itself depends upon the possible duration of the emissions, that is to say, upon the length and state of the telegraph wire.

Numerous experiments made upon the French lines have given the following speeds of transmission with a single line wire:

1. As far as 210 miles, 400 words per minute; and with two keyboards, 24,000 words per hour.
2. As far as 390 miles, 280 words per minute; and with two keyboards, from 16,000 to 17,000 words per hour.
3. As far as 540 miles, 200 words per minute; and with a single keyboard, 12,000 words per hour.

The transmitting, moreover, may be done either entirely in one direction or the other, or simultaneously, partly in one direction and partly in the other, according to requirements.

Steno-telegraphy, then, affords a means of greatly increasing the number of words transmitted by the same conductor. It may consequently be employed to great advantage in telegraphy, since it prevents the encumbering of the wires, by utilizing each of them more perfectly than has been done in the past.

Again, it permits of stenographing a discourse while it is being delivered, and of transmitting it at the same time to distant points. In this way, the first sentences of a discourse begun at Paris at two o'clock might be put in type ten minutes afterward in a printing office at Marseilles; and as the keyboard and electric transmission (without relays and through a single wire) never cease to follow the orator, the latter's discourse might be distributed simultaneously in the two cities, which, as well known, are 578 miles apart.—*Revue Internat. de l'Electricite.*

Effect of Fog on the Electric Light.

It was recently announced that the electric light on May Island, at the mouth of the Firth of Forth, had been sighted in clear weather from a distance of forty-six miles at sea, by the master of the Swedish steamer Frithiof. The same steamer arrived at Granton recently, and the master of the vessel reports that early in the morning, when there was a very dense fog prevailing, he had got within three miles of the May Island before the very powerful electric light recently placed in the lighthouse could be observed, and that it then only resembled a dim light from a single candle. These two facts afford a very marked contrast in regard to the penetrative power of the electric light in clear weather and in a dense fog. It is well that such data should be put on record and accumulated for future reference.