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THE CANADIAN ENGINEERING NEWS

A Monthly Journal

DEVOTED TO
Every Branch of Engineering.

EDITED BY W. E. GOWER, C. E.

Vol. I.—No. 4. MONTREAL, APRIL 29, 1893. $1.00 PER ANNUM. SINGLE COPIES, 10 CENTS.

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PUBLISHED AND EDITED BY W. E. GOWER, C. E.
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We herewith send you a copy of the Canadian Engineering News. As this is the only publication in Canada representing the general engineering profession and trades, I trust you will see your way to become one of my regular subscribers and would ask you to fill in the annexed form.

Yours truly,

W. E. GOWER,
PUBLISHER & EDITOR.

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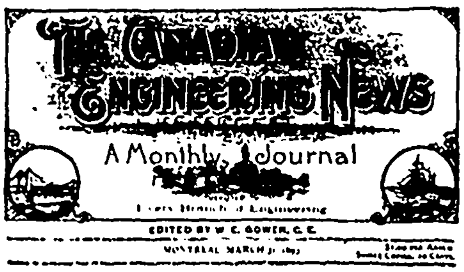

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We invite the criticism of our readers and ask their advice touching any points they may be posted on. We also invite any readers to send in any personal news, and should they desire we will send stamped and addressed postal cards for this purpose.

The General Committee of the Associated Engineering Societies of the United States and Canada are preparing headquarters in Chicago, at No. 10 Van Buren street, for the reception of American and Foreign Engineers who will attend the International Engineering Congress in August, or who will visit Chicago during the six months of the Exposition. The rooms will be made as attractive as possible by providing reading—professional reading matter, represented by the leading scintific journals of the world. THE CANADIAN ENGINEERING NEWS has been asked to furnish two copies of each issue during the six months, and to send a representative of our journal to the Congress.

We advise all Engineers to make early arrangements for being admitted to the privilege of the Headquarters.

In our columns we have again called attention to the sanitary condition of Toronto, and we trust we shall in time be the means of moving the Council to more expeditious action on so grave a matter.

We have already taken very strong ground in reference to the Water Supply of Montreal, and we will, during the next issue, go further into the criminal neglect of the Council on the subject.

There is also the question of Plumbing By-Laws. It is hoped that the amendments of the Master Plumbers Association will be acted upon. One of the things calling for prompt and radical remedy is that of privy pits. Let these be done away with at once.

We call our readers attention to a series of articles written for this journal by Mr. Hugh Vallance of Montreal. Mr. Vallance will be known to many as a practical Boiler maker and Engineer. These articles were arranged to be written in as plain terms as possible, free as possible from complicated calculations, and by their aid we hope to make the subject of use to all Stationary Engineers, as well as to those who have anything to do with steam power. We hope to make these as complete as possible, and to include later the question of economy in various types of Boilers for different districts.

We hope that all our readers will keep this series, as they will find when bound they will constitute a complete hand-book on Boiler construction and working.

We shall be glad to see an effort made in getting some good papers before the Canadian Society Civil Engineers.

The failure of the Committee to report to the Society the winner of last year's Gzowski medal is not the best way to obtain papers from the rank and file of the Society.

We shall be obliged if our readers will for purposes of reference give any statistics they may have as to death rates in their respective districts, also population, and if possible the number of zymotic cases; it is only by carefully watching these things and reporting them that we may hope to bring the causes home to the proper authorities.

One of the most important subjects to be considered all over Canada during the next few years is that of roadways for urban traffic, we will commence in our next issue a series of articles written by some of the few men competent to write and enlighten the public, and at the same time help such of our Professional Brethren whose duties include the making of temporary roads.

In view of the chances of Cholera appearing during the coming summer, some of the lay men are beginning to excite themselves and the public. Our advice is to live cleanly. Boil all potable and drinking water, and if you use a domestic filter, clean it out regularly, and at the same time see that the drainage in your houses are in perfect condition, and not much harm can come to you.

The neglect to properly ventilate apartments, and the placing of fixtures on basements of buildings, are probably the two greatest faults to be met with in modern plumbing. There is also another grave blunder being generally made in plumbing in cities, which is the use of tile pipes within a building.

Should any Stationary Engineer desire to make working tests of his boilers, as to consumption of coal and weight of water, to get at the evaporation per lb. of fuel, we will be pleased to assist him by sending a printed form of the course to be followed, and we will be glad to lend him, for one week, a water meter that will register either the hot feed water or cold water, on his paying simply the freight from Montreal and return. We will register the names as they come in and supply in rotation. We feel sure that in this way we shall assist many Stationary Engineers in becoming better fitted to take leading positions.

The columns of this paper are open to the discussion of all subjects relating to Civil, Railway, Hydraulic, Mining, Electrical, Sanitary, Mechanical and Stationary Engineering; also to water works, water supply, street lighting and paving, gas supply, &c. Practical information upon these subjects with photos and tracings which may be used for illustration are especially desired. We shall also be glad to receive brief notices as to improvements or works in progress or contemplated.

NOTES ON DESTROYERS OF SUBMERGED WOOD IN NOVA SCOTIA.

BY M. MURPHY, D. Sc., C.E.

(Paper Read before the Nova Scotian Institute of Science.)

(*Conclusion.*)

Kater observed them in large numbers on the surface of wood towards the end of June, and by the 15th of July he found them in the interior, in the form of perfectly developed Teredos.

They enter the wood thus in small openings, which, as I have before remarked, are necessary for their protection as well as, probably, for their growth and manner of sustenance. With such information before us, and with the knowledge, from my own observations, that they seldom, if ever, pass from one piece of timber to another, I was led to think that a pile made of boards, with a thick coating of tar or white lead between them, to protect the inner leaves from the attachment of larvæ or the penetration of the fully developed teredo itself, might arrest their depredations, or perhaps, prevent them from entering further than the outer covering.

Reasoning thus, and wishing to try the experiment suggested, I had four piles constructed from hemlock and spruce boards. They were formed, first by a core 4 x 4 in., and then by a board prepared through submergence in a bath of coal tar, then securely fastened, one by one, until the built pile attained the dimensions of 12 x 12 in. The piles were then hooped and shod with iron, and were driven, close to the Little Bras d'Or bridge, at one of the outlets of the Bras d'Or lakes, (tidal waters) Cape Breton. These piles, so formed, could well stand driving under a 16 cwt. pile hammer. They were placed in position in November, 1889, and examined in September, 1890. The teredos had completely riddled the outer board, and in some cases had entered the next board to it.

In July, 1891, they were again examined, when they were found to have penetrated to the third board, the two outer boards having been destroyed and the third perforated. The outer board is completely eaten away, scarcely any part of it being thicker than a leaf of packing paper. You can, by merely an impress of the fingers, rub it off in small leaflets. Still, it is evident that it was partially, if not totally, destroyed at the point where the entry was made to the second board before the entry was effected. In like manner the second board was destroyed before an entry at assailable points to the third was effected.

In the same place, not 100 yards from where these experiments were tried, creosoted piles, obtained from Messrs. Eppinger & Russell, Brooklyn, New York, have been driven for over five years, and there is not yet the slightest sign of a teredo having entered any one of them. Essential oil of creosote impregnated into such woods as are adapted to the purpose and treated in such manner, as is being done by Messrs. Eppinger & Russell, will, in my opinion, assure a long duration.

The Teredo requires a clear, pure, salt water. It has often been remarked that piles placed in dirty muddy water or in the neighbourhood of sewerage discharge are exempt from its attack. From these observations one is led to believe that where there is no current a strong application of a solution of common lime, applied in the months of June, July and August, whilst the expelled ova are undergoing development, might prove effective.

In such places as the Bras d'Or Lakes, or in land-locked harbours, where the lime would not be immediately carried away by the current, the experiment might be worth trying. An application of a barrel of lime, dissolved in about eight or nine barrels of water, and poured around the piles of a wharf, might be tried, or a stronger solution, if considered desirable, or still better, if forced around each pile through a hose and nozzle, with an ordinary force pump.

"I think we may conclude that in a current having a bottom velocity of about 3 miles per hour, the operations of the Limnoria would be much retarded, if not wholly prevented."

TESTING HOUSE DRAINAGE AND SANITARY MEASURES.

(*Continued*)

In the case of paraffin the process and precautions are exactly the same, except that no water is used and about a gallon of the oil itself is poured in.

The paraffin is not so strong a test as the oil of peppermint, but is often a very convenient one.

A much better test than either is the smoke test, which is applied by means of a small fan-blast, or "smoke-testing machine," worked by hand.

This machine is so well known that it is not necessary to describe it in detail, beyond noting that the burning, or, more properly speaking, the "smouldering," material is put into a funnel at the top, and the smoke is drawn down and projected through the outlet end of the machine by a small rotary fan. The fuel is generally old, used-up cotton-waste, which in consequence of its own fibre and the oil it has acquired in use, is a convenient material to burn slowly and give out clouds of smoke. Care must be taken, however, not to work the blast too quickly, and to leave the lid on the funnel part only open to allow of the escape of those gases which an overheating of the material often generates in the funnel, otherwise a serious explosion might occur—serious, that is to say, to the workman, who is likely to be bending over the machine in working it.

Although the apparatus is, no doubt, already known to most readers, there can be no harm in here showing a rough sketch of it in its usual form.

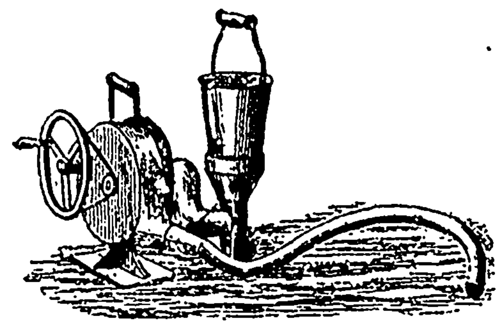


FIG. 1.

The first trial is generally to apply it outside, or in the areas, to such open gratings as are situated between the traps and the house. The machine pumps the smoke out at the pipe end of it, and, if the same be placed over the open grating, the smoke should be drawn in by the natural current. This is, of course, assuming that the sanitary arrangements are of modern type, where the design is always to have a current of fresh air blowing up the drain pipes and out at the ventilators. If this system be acting properly, the smoke will be found to be sucked in at the open grating, and eventually will come out at the tops of the ventilators.

In addition to the above trial, the smoke test should, in suspicious cases, be applied under pressure.

To do this, the grating or other place where the smoke enters should be covered all round with mats or with clay, &c., and the places of egress at the tops of the ventilating-pipes carefully stuffed up. The smoke being then forced in, the application will be under pressure, and will most severely test all the joints in the pipes and and other places, and will also most severely test the water-traps in the syphons under the bath and lavatory wastes and the traps under the water-closet basins. If these latter be defective, the smoke will rise up through the water-closet seat like a cloud, and will come out at all the joists of the woodwork.

If the smoke finds its way into the house at all, even in a slight degree, it is a sign that some defect exists, and, if it be a hidden one, the locality can generally be traced by following the indications of the smoke to some point of egress from the floors or walls. Whether or not this can be done, however, the mere presence of the tell-tale smoke within the premises is a certain condemnation of the sanitary work in some particular as then existing, and the whole of the pipes and appliances in the place should, if necessary, be exposed and minutely examined until the cause of the mischief is ascertained.

It may be well imagined that these tests are very useful in finding out "dry traps," and in detecting those ancient and long-forgotten connections of pipes leading the sewer-gas, in a concealed and disguised manner, right into bed-rooms, dressing-rooms, and bath-rooms.

Especial care should be taken not to forget possible cisterns in the roof, and the operator should go up there to see whether or not the smoke is finding its way out at the tops of the overflow pipes.

In old houses, where, perhaps, the plumbing work has been executed in times long gone by, the small overflow-pipe from the lead safe under the water-closet basin may be led into the soil pipe, or the overflow from bath or lavatory led direct to a drain, even when more important or conspicuous waste-pipes are ostentatiously cut off from such direct communication.

The accompanying sketch shows a diagram of a house the sanitary arrangements

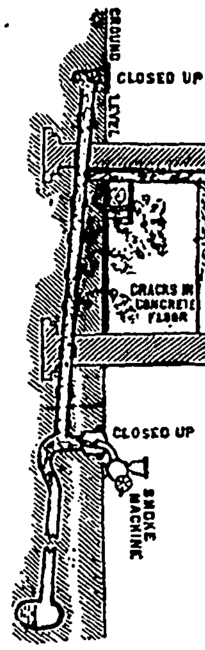


FIG. 2.

of which are almost as bad as they can be and are, unfortunately, like too many of even modern houses, where, if a ventilating pipe be made to the soil pipe, and a trap put in at the drain, the delusion obtains that all has been done to comply with modern requirement.

That such is not the case, however, the smoke test will readily discover.

(*To be continued.*)

TALKS ON BOILER CONSTRUCTION.

By Hugh Vallance.

FIRST ARTICLE.

(Written expressly for this Journal.)

In writing upon a subject such as the above it will be necessary to explain in the beginning that the intention of these articles are to place the subject as plainly and as simply as possible before the reader, and in such every day language that the ordinary engineer, with a little attention, may derive some knowledge from these articles. Boiler construction, until within a few years ago, was a much neglected branch of engineering, and boilers were built in a good many shops pretty much upon the rule of thumb, or what each particular boiler maker thought was the proper thing. These articles are intended to show that there is a rule and a reason for everything connected with boiler-making, as adapted at the present time.

Boilers are mostly constructed of steel, on account of its superior qualities of ductility and strength over iron. Before proceeding to calculate the strength of a boiler it is necessary for us to know what is the strength of the material of which it is composed, as that will determine the strength of the boiler. The T. S. (or tensile strength) is the amount of strain weight or pressure it will take to break or pull asunder one square inch of iron or steel. Hence we find that ordinary Dalzell or Steel Company of Scotland steel plate, has a T. S of from 56,000 lbs. to 65,000 lbs. per square inch of sectional area. According to the different grades or qualities, 60,000 lbs. is generally taken as being the average T. S. for steel plate. Now that we have ascertained the strength of the material, suppose we wish to know the bursting pressure of a solid steel boiler 60" in dia. ½" thick, having no rivetted joints,* we would proceed as follows:—Multiply the T. S. (60,000 lbs.) by twice the thickness (½") of the shell, then divide the product by the diameter of the boiler in inches, the answer will be the bursting pressure thus:

T. S.
60,000 lbs. x twice ½ thickness.
1" — 1

60") 60,000 (1000 lbs. bursting pressure.
D. of B. in inches

Suppose that this is a ring or part of a shell of a boiler 60" dia., ½" thick, and we wish to separate the shell into two pieces, say at B and B Fig. 1., you will notice

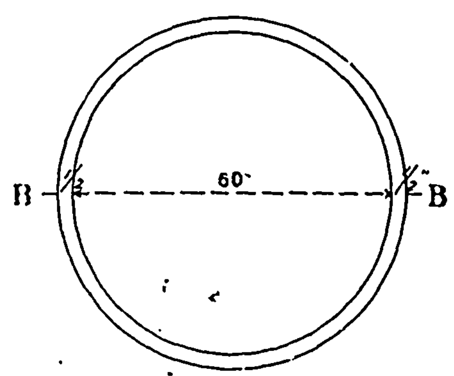


FIG. 1.

that there is ½" thick of metal on each side to be broken before we can divide or separate the ring, and as we have found the strength of the steel is 60,000 lbs., and we have ½" an inch of metal on each side, which is equal to 1" of steel, this will explain why we multiply the T.S. by twice the thickness, because we have two thicknesses to break. I think this has been made plain enough. The reason why we divide the product by the diameter is that the pressure exerted to burst the shell is equal on all parts of the inside of the boiler, and may be taken as radiating from the centre of the boiler, as in Fig. 2, which represents an end view of a strip an

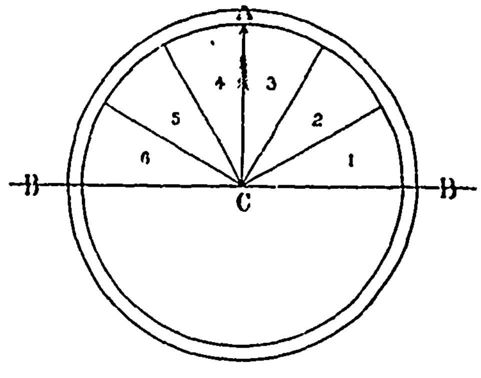


FIG. 2.

inch wide from the boiler, 60" dia. and ½" thick, and if the material is of uniform thickness and quality, and truly cylindrical in form, it will take as much pressure to burst it in one direction as another. We will suppose we wish to burst it in the direction of the arrow A, therefore it is the metal at B B. that is resisting breaking in that direction. Now suppose we divide one half of the shell into six equal divisions by lines from the centre C Fig. 3 (as we have ex-

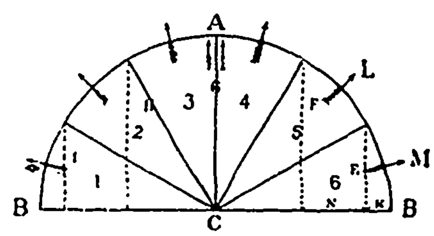


FIG. 3.

plained before the pressure radiates from the centre, therefore it is only necessary to take one half of the shell, the other half being precisely the same,) and to find the area acting on each division, let us drop perpendicular lines from the point of contact with the shell to the diametrical line B. B., and the length of line divided off by the perpendicular on the diameter represents the effectiveness of the area of that division to burst the boiler in the direction of the arrow A thus for that part of the boiler surface situate in the first division, or from B to line 6, the area acting to burst the boiler in the direction of A, is represented by the length of the line K, while the general direction of the pressure on this part of the shell is represented by arrow M. Similarly for that part of the shell situated between radial line 6 and 5, the general direction of the steam pressure is in the direction of the arrow L., while the proportion of this part that is acting to sever the boiler in the direction of A, is represented by the distance N, or from the line E to F measured on the line BB. By carrying out this process we will perceive that although the pressure acts upon the whole circumference, yet its effectiveness in bursting the boiler in any one direction is only equal to its diameter.

(To be continued.)

* These will be discussed later.

PERMANENT STREET PAVEMENTS.

BY J. W. TYRRELL, HAMILTON.

DURABILITY AND COST.

These are not the only characteristics to be considered in order to be able to arrive at a wise solution of one of our most urgent municipal questions, namely, "What description of pavement should we adopt?" but they are certainly two of the most important.

Other considerations should be cleanliness and sanitary conditions, resistance to traction, foothold afforded for horses, facilities for removal and repair, amount of noise created and appearance; but as a volume of no small proportions would be the outcome of an exhaustive paper upon the whole subject of Permanent Street Pavements, we will confine our remarks at this time to the questions of durability and cost.

Wooden pavements of various designs have been tried in many of our cities, but they have failed to give satisfactory results, and most grievously so, upon streets of very heavy traffic. In any case wooden pavements have proved to be most expensive luxuries on account of their necessity for constant repair and frequent renewal. They have, however, served a purpose in educating us to the point of realizing the necessity of something a step farther in advance. Wooden block pavements have beyond doubt some admirable qualities possessed by few, if any, other pavements, but, upon the whole, experience in this country has proved them to be sadly lacking in many important respects. We will not make further mention of wooden pavements, as they do not properly belong to the subject of this paper.

Neither will we take into consideration macadam or gravel pavements, for, though when properly constructed and cared for, they are well adapted to the requirements of many localities, they are not suitable or economical upon city streets of comparatively heavy traffic, and it is for such streets especially that we shall endeavour to reach a solution of the question.

It remains with us, therefore, to make our selection from pavements constructed of stone blocks, of bricks, or of asphalt.

The durability and cost of a pavement are, in a sense, inseparable characteristics, from the fact that the annual cost necessary to perpetuate a pavement depends largely upon the durability or number of years the pavement will wear; and also from the fact that a pavement of inferior durability, requiring constant repair and frequent renewal, is an abominable nuisance to the travelling public and the cause of serious loss to local business.

Durability is of itself, therefore, a quality of the greatest importance and consequently, with the object of arriving at some reliable comparison between a number of available paving materials, the following experimental tests were made by the writer:

THE SPECIMENS.

The specimens procured for the test were as follows:

NO. 1 GREY ABERDEEN GRANITE.—Two small pieces, weighing about four pounds, were procured from local dealers.

I endeavoured to obtain a piece large enough, from which to have an ordinary granite block, such as is generally used for paving purposes cut, but was unable to do so.

NO. 2. NEW BRUNSWICK RED GRANITE.—Of this a roughly squared block, about half the size of an ordinary paving sett, was used.

NO. 3. STANSTEAD GREY GRANITE.—This sample was a roughly dressed block about 6 x 5 x 1¾ inches. It was of much finer grain than the New Brunswick Granite, but much similar in appearance to those from Aberdeen.

NOS. 4 and 4A. HAMILTON LIMESTONES.—These were two specimens obtained from quarries in the neighborhood of Hamilton ("4" from Mr. Gallagher's quarry and "4A" from Mr. Handcock's). They were roughly dressed to the form of rectangular blocks. No. "4" was of a dark steely grey colour and "4A" was of a lighter bluish grey.

NO. 5. HAMILTON FREESTONE. This specimen was a rectangular block, 8" x 6¾" x 3", but judging from its sad experience under test I am inclined to believe that it could not have been a fair sample.

NO. 6. HAMILTON VITRIFIED BRICK. This brick was furnished me by Mr. Campbell, of the Hamilton and Toronto Sewer Pipe Company, and was said to have been manufactured from Hamilton clay by that company. The brick measured 8½" x 4" x 2½" and was of a dark reddish brown color. Sixty-one of them laid upon edge would make a square yard of pavement.

NO. 7. HAMILTON SAND BRICK. - This was a sample brick manufactured from Hamilton sand and Hamilton cement, but made in the United States by some patented process. It was a handsome looking brick, of a brownish color, resembling a good deal in appearance Credit Valley stone. It was not recommended to use as a paving brick, being only manufactured for building purposes.

NO. 8. HAMILTON COMMON HARD BRICK.—This was an ordinary hard building brick.

NO. 9. METROPOLITAN BLOCK. — This block is manufactured in Canton, Ohio. The several samples which were expressed to me upon application were of exactly the same size, measuring 9 3-16" x 3 15-16" x 3 3-16." It is a very handsome specimen of a re-pressed brick, having smooth surface, round corners, and being of a chocolate brown colour. The rounding of the corners, it is claimed, prevents the edges from becoming chipped by the pounding of the horses' shoes, and also affords good foothold. The blocks are exceedingly hard and fracture with a smooth surface, being thoroughly vitrified. In the process of manufacture they are brought to a white heat and kept in that condition for six days. Forty-four blocks will lay one yard of pavement, and their cost delivered at cars for shipment is $14 per thousand.

NO. 10. IMPERIAL BLOCK. -This specimen was virtually the same as Metropolitan Block with the exception of being smaller, it only measuring 8¼" x 4⅛" x 2½". It and the block just described are manufactured in Canton, Ohio, by the same company. Sixty-five of them would lay one yard of pavement and they are delivered at the cars for shipment at a cost of $10.50 per thousand.

NO. 11. VITRIFIED BRICK, also from Canton, Ohio, and the manufacturers of the last two numbers, but in appearance it is a very different brick from either of them. It is not what is known as a re-pressed brick, and is much rougher looking. Its corners are not rounded, and it breaks with a rougher fracture, not being so highly vitrified. Its colour is of a dark reddish brown; size 8¼" x 4⅛" x 2½" and cost delivered at cars $9.50.

NO. 12. HALLWOOD BLOCK, from Columbus, Ohio. This block is of peculiar construction and is patented by the makers. Its dimensions are 9" x 4" x 3". It is made by the re-press process and is finished with glazed surface, which feels dedidedly oily to the touch. The angles are rounded off slightly more than those of the other re-pressed blocks above described, and passing longitudinally around the block are two grooves, which, it is claimed, give additional strength to the joints of the pavement. Forty-four blocks lay a yard of pavement and their cost at cars is $18 per thousand.

NO. 13. VITRIFIED BRICK, also from the manufacturers of the Hallwood block. The sample was a large brick, measuring 9" x 4 5-16" x 2⅞", but inferior to the block, being only once pressed and of regular appearance, with sharp angles. Price $12 per thousand.

NO. 14. FIRE BRICK, from New Brighton, Pa. This was the only specimen of fire brick received. It was of a light buff colour, measured 8⅜" x 4⅛" x 2⅜' and was of the single pressed description with square angles.

NO. 15. DRY PRESSED BUILDING BRICK. This sample, with a variety of other very handsome building bricks, was kindly furnished me by Messrs. Taylor Brothers, of the Don Valley Brick Works, Ontario. It was subjected to my tests out of curiosity to see how it would compare with the vitrified bricks, rather than with any expectation that it would be suitable for paving purposes. I might just remark here in this connection that Messrs. Taylor Brothers are at present putting up a new plant for the special manufacture of paving brick.

Having collected the above fifteen varieties of paving materials, the weight of each specimen was carefully noted. The use of a" ordinary cast iron "rattler," such as is commonly used in foundries, was then procured, and the specimens, together with about two hundred pounds of coarse "shot" and small scrap iron, placed therein.

The "rattler" or cylinder, which was about 12 feet 6 inches in diameter by 4 feet in length, was then given 500 revolutions, at the rate of about 20 times per minute, and the samples taken out and again weighed. The object of this first rattling was merely to reduce all specimens as nearly as possible to the same condition preparatory to receiving a second and severer test. More iron was then placed in the rattler with the specimens, and pieces of larger size and greater weight. The broken castings for fire pots of stoves and other sharp angular pieces, varying in weight from 5 to 15 pounds, were made use of. The cylinder was then given 1500 additional revolutions, after which the surviving samples were again taken out and carefully weighed. I may just mention here that this was the second time that I had performed these tests. In the first instance the percentage of loss in the granites was remarkably small, as I had depended upon the samples themselves and the iron shot to produce the wear.

But in considering the matter afterwards, it occurred to me that this would not be a fair test, for the softer samples would be reduced by the harder ones, but the hard ones would be but little affected by the hammering of the softer ones.

Therefore I repeated the tests with the addition of the scrap iron, as above described, with the result that the loss of weight of the granite was increased 700 per cent., whilst the increase in the loss of the bricks was not more than 25 per cent. I have, therefore, adopted the second tests for the purposes of my comparison, excepting when otherwise noted.

(To be continued.)

THE SANITARY CONDITION OF TORONTO.

In our issue of the 31st March we called attention in somewhat strong language to the sanitary—or rather in-sanitary—condition of Toronto, and to the extraordinary apathy of the City Council upon this question, we pointed out that the various reports and recommendations that have been made by engineers advising the remedies to be taken, had been pigeon holed and left inoperative with almost criminal indifference, and that the citizens were left to drink polluted water and suffer from typhoid fever without any attempt being made to abolish this shocking state of affairs; and we affirmed that the condition of things in Toronto should guarantee that city to be a hot bed of zymotic disease.

A very precise confirmation of our remarks has been afforded by the publication (on the 25th April) of the report of Dr. Sheard, the Medical Health Officer of Toronto, upon the water supply, giving full scientific details of of the impurities of the water and shewing the intimate connection between impure water and the increase of typhoid. In order to emphasize his remarks, Dr. Shears gives an comparative statement of the number of typhoid cases, in 1892, in Toronto and other cities, and as this comparison is very instructive, it is here reproduced, worked out to the basis of 10,000 of population of each place.

City	Population	Typhoid Cases.	Cases per 10,000 of Population.
Boston	469,647	717	17.4
Cincinatti	296,000	279	9.1
Detroit	230,000	50	2.1
Montreal	216,650	243	11.2
Toledo	90,000	64	7.1
Toronto	181,220	947	52.3

It will thus be seen that Toronto has a most alarming pre-eminence. Her typhoid cases are as numerous as those of Boston, almost five times those of Montreal, and just twenty-five times those of Detroit. Surely there is enough here to rouse the citizens and the City Council to action. And Dr. Sheard deals only with typhoid fever, if he were to collect statistics of diphtheria, scarlet fever, measles and other zymotic diseases, the result would, in each case, be equally startling, and equally shameful.

What is the cause of this state of affairs? Dr. Sheard affirms that it is due to polluted drinking water. This is part of the cause, not the whole. It must be remembered that the figures given above for 1892 shew the typhoid fever existing in the city *before* the serious break in the conduit pipe in the early part of this year admitted the large amount of sewage pollution to the City's drinking water. It seems almost incredible that a city that has to draw its water supply from the outer lake by a pipe across a wide bay, would be guilty of the folly of wilfully polluting that bay by pouring its sewage into it, and thus purposely introducing an element of destruction to its supply—but such is the actual state of affairs. Even, however, if the conduit pipe and pumping well were made absolutely tight, so that no sewage contamination could reach the drinking water, there would still remain the very serious menace to public health from there being in front of the city a large mass of sewage polluted, stagnant water. All those who know Toronto know that the high levels of the city, about Bloor street and north of that, suffer from foul emanations of sewer gas, this gas flows up to the highest points and there finds its way out, just as liquid flows down to the lowest levels. From the stagnant masses of filth that collect at the mouths of all the sewers emptying into the bay, this gas is generated, and it is this gas, more surely than anything else, that breeds zymotic disease. Now, it is quite plain that even if the drinking water were rendered pure, only half of the evil has been cured. There would still remain the foul cesspool emanations from the bay to be dealt with. The true and radical cure for the evils with which Toronto is afflicted is to cleanse the bay; and this can only be done by the construction of a trunk sewer, that will prevent sewage pollution from flowing in, and will carry it elsewhere. With the bay clean and pure, there would no longer be any danger from sewage pollution, even though there were leaks in the conduit pipe conveying water from the outer lake, and with the bay pure, and the sewers discharging elsewhere, there would be no possibility of sewer gas flowing back up the sewers to carry disease and death to many unsuspecting families.

The construction of an intercepting trunk sewer, with a discharge somewhere near Victoria Park, is no new idea. It has been recommended and endorsed by numerous engineers, and has been just as frequently disregarded and neglected by numerous councils and aldermen. Until Toronto is blessed by having a council that does not consider itself all wise and above being advised by engineers, Toronto will continue to suffer from polluted drinking water and foul sewers.

MODERN CARS ON THE C. P. R.

The Canadian Pacific are again to the front with new ideas. This time in the matter of what might be called second class sleeping cars for the World's Fair traffic. These cars are, except in details of decoration, of the same build as the ordinary sleeping cars, but the charge for a berth from Montreal to Chicago will only be $2 instead of $5. Such a substantial reduction of rates will be welcome to many, and it shows a desire on the part of the Company to meet their patrons whose ways and means have to be considered. We feel sure that many a working engineer, if he can be assured of getting fair board and lodging in Chicago, will visit the Exhibition and come home a better man.

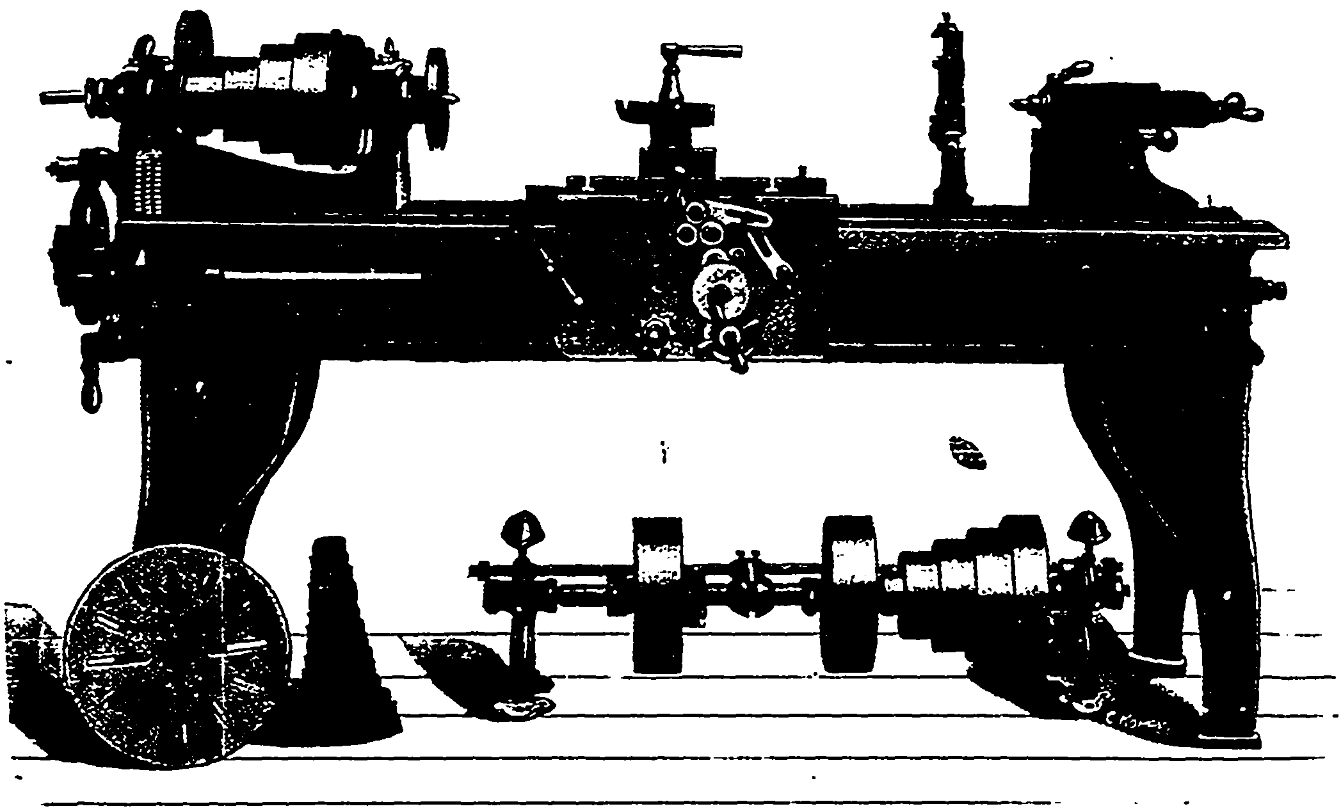
The Canadian Pacific Railway are looking ahead, too, in regard to their Oriental and Antipodean travel. They have now twelve new sleeping cars in hand bearing such suggestive names as the Kanagawa, Bombay, Gnoshina, Colombo, Calcutta, Tonquin and others.

The Parsee and Burra Sahib from Cawnpore and Jellahabad on landing at Vancouver, and seeing the familiar names of his own Bombay & Baroda or G.I.P. Railways, will feel more at ease, especially when he is comfortably placed in his section. These cars are a further improvement both in finish and comfort on any of the older cars. The body of the car is divided by two elaborately carved arches and the private stateroom is made more complete than any heretofore in its toilet arrangement; here the Nawab or Nizan can chew his Betel nut in peace in surroundings that recall something of his own home splendour. The upholstery is a semi-toned plush and the carving of the wookwork is really artistic and done by an artist's hand, not pressed in wood pulp from a pattern and turned out by thousands after the manner of these degenerate latter days.

TAPER ATTACHMENT LATHE.

This lathe, of which we give an illustration herewith, is patented by Mr. D. Currie, and is manufactured by Messrs. R. Gardner & Son, Montreal.

Heretofore adjustable grooved bars arranged at one side of the lathe have been used, a slide connected with the tool rest, travelling in the groove of the bar and serving to move the tool in the oblique line required, but this movement of the tool rest independently of the cross feed screw, and more or less against its action, is apt not only to cause excessive wearing of the screw and the guideways for the saddle carrying the tool rest, but also produces uneven work, owing to a jerky action of the tool.



At present the usual bevel gear or other connection between the longitudinal and cross feed screws is only capable of giving automatically a reciprocal feed to the tool rest, the speed of which is fixed or invariable except in so far as the rate may be changed by increasing or diminishing the speed of rotation of the longitudinal feed screw, and Mr. Currie therefore proposes to substitute for such bevel gear or other connection readily interchangeable and automatically operated mechanism, which will allow of the motion transmitted from the longitudinal screw to the cross feed screw being varied independently of the former.

Mr. Currie Claims:

In combination with the longitudinal and cross feed screw and apron of a lathe, a variable connection between said screws.

In combination with the longitudinal and cross feed screw and apron of a lathe, a variable gear wheel connection between said screws.

A taper attachment for lathes consisting of a series of interchangeable gear wheels, arranged externally of and carried by the lathe apron and connections between said gear wheels and the longitudinal and cross feed screws of the lathe.

In combination with the longitudinal and cross feed screws of a lathe, an adjustable carrier carried by the lathe apron, a series of interchangeable gear wheels set in said carrier and connections between said gear wheels and the longitudinal and cross feed screws of the lathe.

In combination with the longitudinal and cross feed screws and apron of a lathe, an adjustable carrier carried by said apron, a series of interchangeable gear wheels act in said carrier, a gear on the end of said cross feed screw intermeshing with said series, a worm moving with said apron and having sliding and rotatory connection with said longitudinal feed screw, and gear and spindle connections between said worm and said series of worm wheels.

In combination with the longitudinal and cross feedscrew and apron of a lathe, an adjustable carrier consisting of a pivotted bar grooved to receive the stud mountings of a series of interchangeable gear wheels, and provided with grooved segmental end piece, by means of which and a set screw it is fixed at the desired angle, a second carrier having a pivotal connection with said bar, being adjustable by pivotted link and set screw connections, and adapted to carry reversing gear wheels.

In combination with the longitudinal and cross feed screws and apron of a lathe, an adjustable carrier on the face of said apron, and means for setting same at various angles, a series of interchangeable gear wheels carried by said carrier, a gear wheel mounted on said cross-feed screw, in line with said series, an adjustable carrier and two reversing gear wheels carried by it and interposed between the said series and the gear wheel on the cross feed screw, a worm moving with said apron, and having sliding and rotatory connection with said longitudinal feed screw, a sleeve and spindle passing through the apron, a worm gear wheel mounted loosely on said sleeve and meshing with said worm, a gear act on said sleeve and meshing with said series of gear wheels and a friction device actuated by said spindle for effecting a union between said worm gear wheel and sleeve, as set forth.

The index is supplied with the gearing, showing the gear used to ensure any required taper.

Patents have been obtained in the United States. The lathe can of course be used as an ordinary engine lathe, by simply disconnecting the gears between the longitudinal and cross feed screw.

TIMBER AND OTHER TESTS.

Perhaps two of the most interesting and instructive evenings yet spent by those who take advantage of the Somerville course of lectures were those held in the testing Laboratory of the Engineering Building of McGill University, on March 30 and 31, when Prof. Bovey gave a demonstration on testing machines and the testing of materials. The large Laboratory was crowded on both evenings, and during the whole of the demonstration the greatest interest was taken in the various experiments, Professor Bovey's remarks being specially adapted to those who had not had the advantage of a technical education. The apparatus was managed by some of the advanced students under the direction of Mr. Withicombe. Prof. Bovey explained the action of the Buckton machine and then proceeded with the transverse tests of two pine beams 9 x 18 inches in section. These were the ends of a beam 25 feet in length which had been tested on the 11th of March, and had failed under a central load of 24,850 lbs. or a skin stress of 3,680 lbs. per square inch.

The first beam was 10ft. 10in. in length and the distance between supports 10 feet. This failed under a central load of 48,680, inducing a skin stress of 2,740 lbs. per square inch. The second piece was also 10 feet between supports and failed under a load of 44,400 lbs. equivalent to a skin stress of 2,997 lbs. per square inch. The deflections were carefully observed at three points on the neutral line, and from these data the average co-efficient of elasticity was found to be 587,000 lbs. per square inch.

On the second evening there were tested two similar beams, the ends of a 25 inch beam tested on the 8th of March, these failed under central loads of 48,600 and 87,800 respectively, inducing maximum fibre skin stresses of 3,000 and 3,200 lbs. per square inch respectively. The beams tested in these and other experiments are the largest which the records of testing show.

The usually accepted value of the maximum fibre stress is from 3,600 to 4,000, which Prof. Bovey proved to be much too large especially for large beams, and attributed the stability of many of our white pine structures to the fact that the elactic limit is practically equivalent to the breaking weight.

There were tested on the two evenings eight pillars of oak, white pine and spruce, which gave results as tabulated below :—

Section.	Length.	Material.	Bkg. Wt.
4¾ in. diam.	5 ft. 1 in.	Oak	68,000
4¾ "	1 ft. 3 in.	Oak	60,000
4¾ "	1 ft. 4 in.	Pine	81,000
4¾ "	1 ft. 2¾ in.	Pine	80,000
4¾ "	5 ft. 1 in.	Pine	49,000
4¾ "	1 ft. 2 in.	Spruce	59,000
4¾ "	5 ft. 1 in.	Spruce	44,000
4¾ "	5 ft. 1 in.	Spruce	57,000

A specimen of granite, 3⅞ inch square and 7 15-16 inches long, was found to require a load of 115,300 lbs. to produce fracture.

A block of ice, 16in. square, stood 67,000 lbs. max. load, but for first fracture stood 30,000 lbs.

Editor CANADIAN ENGINEERING NEWS :

DEAR SIR,—As though there were not enough of enemies at work to destroy gas and water pipes, a new one has arisen; this one bears a very scientific name, "Electrolysis," weighty enough in itself to wreck any ordinary well-behaved pipe. I think I will interest your readers if you publish an account of same, copied from the *American Gas Light Journal* of New York.

Yours,

J. W. HUGHES.

Montreal, April 27th, 1893.

ELECTROLSIS OF PIPES AT INDIANAPOLIS, IND.

We had a peculiar accident to one of our natural gas mains, caused by the trolly system used by the Citizen's Street Railroad Company of our city.

I beg to give you my opinion as to the cause of the accident. Indianapolis, at the section noted, is located on very sandy soil, a few feet of dirt covering forming the surface soil. Illinois street has been improved with asphalt pavement, which necessitates the concreteing of the street to the depth of eight inches before the asphalt is laid on. The concrete and asphalt render the street impervious to moisture, hence the earth and sand, for the distance of several feet below the street, form a very poor conductor. When the leak of electricity from the iron pole of the street car made its way to the ground, there was no way through the ground for it to return by the ground circuit to the power-house. Owing to the dryness of the earth, as above described, the base of the iron street car pole being in contact with our old abandoned cast-iron gas pipe, and the fact that the iron gas pipe was corroded, as was also the street car pole, the contact between the two was so poor that necessarily the current in passing from one to the other created an arc, the same as an arc in one of the street lights.

As the electric arc heat is the most intense heat that it is possible to obtain, hence the current, in making this arc, melted the cast-iron pipe, also the bottom of the street car pole in its path to find a ground, which it did, following the cast-iron pipe for about 300 feet north. At this point it encountered a wrought-iron natural gas pipe, that crossed the cast-iron pipe, which furnished the ground sought for by the current. The same conditions existed where the abandoned artificial gas pipe crossed the service pipe, extending to the base of the pole. The natural gas pipe was to some extent also corroded, hence the current, in seeking a ground through the natural gas main, created an arc, melting both the pipes, about the same as had occurred at the base of the street car pole. The natural gas then followed along the old artificial main, until it reached the street car pole, which was melted by the arc, passed up through the centre of the pole and escaped into the air. The trolley of the first car created a spark, which set fire to the natural gas, the flame from which leaped into the air 15 feet, melting the main current wires in a few minutes, and stopping all cars on the line for several hours. My object in writing you this letter is from the fact that, as all large cities are adopting the electric car systems, I fear that grave results will occur to water and gas mains, unless some better means are adopted than are now used to return the current back to the generator station. In our case it would have been a very serious matter to us if the natural gas had found its way into the cellars or basements of the large blocks adjacent, instead of coming out at the top of the pole, for then there would certainly have been an explosion, with great damage to life and property.—*John R. Pearson in American Gas Light Journal.*

To Editor CANADIAN ENGINEERING NEWS :

SIR,—Will you please answer the following questions in your paper : What qualifications must a man have to permit him to write after his name the letters M.E. and also the letters E.E.

M. E. in this case stand for Mechanical Engineer and E. E. for Electrical Engineer.

By answering the same through your paper you will oblige.

H. F. T., Montreal.

REPLY.

The letters M. E. is a University degree and means *Master of Engineering:* they also are intended to mean Mining Engineer, and in some parts of the United States is a university degree of Mining Engineer.

They cannot be used by an ordinary mechanical engineer as abbreviated.

M.I.M.E. means Member of the Institute of Mechanical Engineers.

The letters E.E. have no meaning whatever in Canada.

CLEANING CASTINGS.—Two methods of cleaning iron castings are in general use. One which is applicable to small castings, consists in treating the pieces in a tumbling barrel, the knocking of the castings together serving to dislodge the sand attached to the casting ; but the objection to this method is, that the treatment which removes the sand also defaces the castings, by removing the finer features and destroying the corners. The other method of cleaning castings consists in placing them, for several hours, in a pickle or acid bath (a mixture of 1 part of sulphuric acid to 10 or 12 of water.) The acid attacks the surface of the iron and releases the scale.

PAINT FOR WATER TANKS. — Oxide of iron paint, mixed with boiled linseed oil, is the only suitable paint for water tanks, wood or iron. For iron tanks there should be not less than two coats ; the first well dried before the second is put on. Use no turpentine. For wooden tanks a coat of boiled oil should be put on before the paint, and well dried.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

An ordinary meeting was held at their rooms on Thursday, the 6th April, Mr. E. P. Hannaford, President of the Society, in the chair. A paper was read on "Highway Roads," by Mr. Coutlee, student of the Society. The paper was very well written, and gave a fair idea of existing roads in many parts of Canada. There was not much discussion, but it is expected that other papers will follow on the subject from various members, and it is hoped that quite a lot of literature on this subject will be forthcoming for the Society's transactions.

Mr. Coutlee's suggestion that the Council of the Society should combine with the various County Councils in spreading knowledge on this subject, should be received with favour.

The following new members were elected to the Society :

MEMBERS.

Phelps Johnson, Manager Dominion Bridge Co., Lachine.

James Kennedy, Town Engineer of New Glasgow, N.S.

Geo. W. McCready, City Engineer of Moncton, N.B.

Donald A. Stewart, Engineer on Western Division C. P. Railway, Winnipeg.

Francis S. Williamson, Engineer with Rapid Transit Co., New York.

Transfer from Associate Member to Member :

Walter C. Brough, of Toronto, now Water Works Engineer of Erie, Pa.

ASSOCIATE MEMBERS.

Newton Ikes, Engineer Street Railway Co., Toronto.

Forbes M. Kerby, Engineer of Irrigation Works, Vernon, B.C.

Alexander Potter, City Engineer of Olean, New York.

Transfer from class of Student to Associate Member :

E. S. M. Lovelace, Engineer in Grand Trunk Railway, Montreal District.

ASSOCIATES.

J. A. Kammerer, of Royal Electric Co., Toronto.

Harry McLaren, B.A., Merchant, of Montreal.

STUDENTS.

T. H. Allison, School of Science, Toronto.
E. C. Amos, Montreal.
L. A. Amos, do.
H. A. Panet, C. P. Railway, Smith's Falls.
J. L. Spenard, Master, Quebec.
O. B. N. Wilkie, Langley, B.C.

A general meeting was held in the Society rooms on the 27th inst. and a paper read by Prof. Bovey, giving results of Tests at McGill. These tests included those on timber as described in another column.

THE HAMILTON CANADIAN ASSOCIATION STATIONARY ENGINEERS.

The Association of Stationary Engineers held its sixth annual dinner recently at the Commercial Hotel, York street, Hamilton. About one hundred of the members and their friends seated themselves at 8:30.

The chair was occupied by Mr. William Sweet, President of the association, and the vice-chairs by Messrs. W. Norris and A. Nash, first and second vice-presidents respectively. To the right of the Chairman sat Ald. A. D. Stewart, representing the Mayor and Corporation ; ex-President Mackie and Mr. James McFarlane. To the left were Mr. A. M. Wickens, chief of the Executive of the Canadian Association of Stationary Engineers, and Messrs. Weir and Bates, representing Stratford Association.

The usual toasts were given and responded to.

Mr. Duncan Robertson expressed regret that the Hon. J. M. Gibson, at the last moment, had been prevented from being present. He was sure that that gentleman would be gratified if he knew the kind feelings which the Engineers held towards him for services rendered the association. Not only the members, but the community at large, owed the Hon. Mr. Gibson and the Ontario Government a debt of gratitude in this connection.

"The Electrical Engineers," was responded to by Mr. Wells.

"The Mayor and Corporation" was ably responded to by Ald. A. D. Stewart, who said that he could handle the subject a good deal better if he was Mayor, but he hoped to occupy that position some of these days. He referred to the importance of the association of Stationary Engineers, a body of skilled artisans, without whose services the world would fare badly.

"The Manufacturers" was replied to briefly by Mr. McKeown.

"The Press" was acknowledged by Mr. Buchanan, of the *Times.*

"The Canadian Association of Stationary Engineers" was responded to by Mr. A. M. Wickens. He said he was proud of the organization, and there were a great many reasons why he was proud of it. He referred to the brainy men who had been engineers in Canada in the past, one of whom had built the first steamship to cross the Atlantic, and it was constructed of Canadian materials too. He mentioned the names of Edison and Bell, Canadians who had distinguished themselves in engineering science. And there were many others as well. A little over six years ago the association had been founded in the speaker's dining-room in the city of Toronto, when there were just eleven men present. Now a chain of branches extended from Ottawa to Winnipeg All of these are doing good work

TORONTO NO. 1, C. A. S. E. is getting along at a rapid rate receiving propositions and candidates at almost every meeting. We had the pleasure of listening to G. C. Robb, who gave a quiet talk on explosions and handled the subject in a masterly manner; the members were greatly benefitted by it.

TORONTO NO. 1 BRANCH has chosen a new Secretary - Mr. Geo. Fowler, 137 University street, Toronto.

GUELPH.—The CANADIAN ENGINEERING NEWS was well received by this Branch.

Mr. J. A. Angell at a meeting on the 15th inst. read a paper on "Lining up an Engine," which was duly discussed; there was a good attendance and further members were admitted.

The President and several members went to Berlin on the 22nd to start a Branch there with about 20 charter members.

MONTREAL NO. 1. C. A. S. E. -- There were four applications for membership in the Association during the month.

The report of the Hall Committee was favorable to the Association, showing there were only six nights in the month on which the hall would not be occupied, viz., two Mondays and four Fridays, but it is hoped that they will soon be taken, as the hall is centrally situated, No. 662½ Craig street, (near Bleury). It is on the first floor and very nicely furnished and heated.

The Association procured a model of the Corliss engine for the better education of its members in construction and valve setting of this particular type. This makes the second model is possession of the Association, the former being of the Slide Valve Engine presented by Mr. Cowper, Mechanical Superintendent of the Canadian Rubber Co. It is the intention of the Association to have a library of its own as soon as they get into working order in their new quarters. Friends wishing to show their appreciation of such a step can do so by donating books on engineering or electricity, in aid of the library. Arrangements are now being made to have an inaugural social on the occasion of occupying the new hall, which it is hoped will be attended by all members and their lady friends.

TO PREVENT SCREWS FROM RUSTING. -It is well known that iron screws are very liable to rust, more especially when they are placed in damp situations. When they are employed to pin parts of machinery they often become so tightly fixed that they can only be withdrawn with considerable trouble, fracture sometimes resulting. In order to avoid this inconvenience, screws are generly oiled before being put in their places ; but this is found to be insufficient. A mixture of oil and black lead will effectually prevent screws from becoming fixed, and moreover, protect them against rust. The mixture facilitates, is an excellent lubricant, and reduces the friction of the screw in its socket.

WATER METERS.

Editor of Canadian Engineering News:

Sir,—Your paper is a great advocate for the use of meters for measuring water and charging for quantity consumed. There is one point I never see noticed, and that is that meters will not register when water is poured through in a small stream. I have tested four different meters, and found that with pressure of 75 pounds they did not register when water was run through at the rate of half a gallon a minute. Can you explain this?

Sup't of Water Company.

April 26th, 1893.

We have shown the letter of our correspondent to the officials of several of the lead-meter companies, and they cannot understand why the meters referred to, if they have any merit at all, should not register water passing through them at the rate of half a gallon a minute, with a pressure of 75 pounds. It is their opinion that the fault is not with the meter. Most of the meter companies—in fact all, we believe—test meters for accuracy very closely before sending them out from the factory.

We should like to hear from some of the water works officials of cities on this question, where, we know, some exhaustive tests of water meters for accuracy have been made.

A VARIABLE SPEED PULLEY.

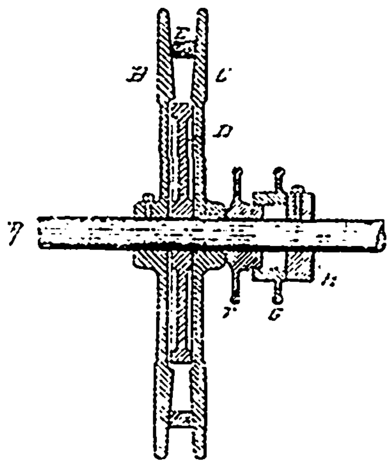
Every constructing engineer and designer knows how often it is desirable to provide a speed adjustment between parts of a machine performing different functions, or between a prime mover and the devices to which it furnishes power, and how bulky and unsatisfactory are most of the methods by which the result is usually accomplished. Of course the step-pulley is the most simple and generally used. It requires, (1) parallelism of shafts; (2) a considerable distance between centers; and (3) a cessation of power during the change from one speed to another. Add to this the necessity for careful design in order to obtain equal belt-tension for all positions; the weight and bulk required for a wide range; and the operative's positive conviction that better results could be obtained at a speed intermediate between those furnished by two successive steps, and we begin to realize the mechanical shortcomings of this old and familiar friend. The hundred and one other devices, patented and otherwise, for accomplishing similar results, present other objections of varying importance, which need not be discussed here.

Without pretending to overcome these entirely, and indeed without claiming absolute novelty, a recent invention by Mr. E. P. Gordon, of Dover, N.H., has seemed to the writer to offer such advantages in flexibility of range and application as to merit a more extended study and use than can be given in his own work, to which it is being applied as rapidly as opportunity permits.

Simply stated, the device consists of a narrow pulley with a deep V-groove, split by a plane passing through the bottom of the groove, one of the two symmetrical parts so formed being fixed to the shafts, and the second being capable of adjustment so as to bring the faces of the groove nearer or farther apart. By the use of a narrow or round belt, and with faces having the proper angle, the working radius may be varied within wide limits, while a loose sheave may be inserted between the two pieces, thus combining the differential-speed principle with the equivalent of a tight-and-loose pulley.

In the illustration, Fig. 1, A is the shaft; B, C, are the two halves of the pulley; D, is the idler; E, the belt; F, G, hand wheels;

Fig. 1.

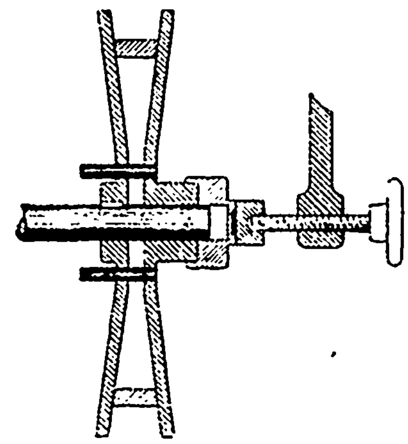


H, a collar, fast on the shaft. By the action of the belt, B and C tend to separate from each other; and since B is fast on the shaft, A C (which is spliced on the shaft, and hence must turn with it, although free to move along it) is forced against F. The hand-wheels, F and G, are free to turn on the shaft, but may be held at rest whenever desired. The hub of one carries a male screw, and that of the other a female, so that by altering the position of one on the other, they increase or decrease the distance between the collar, H, and the half of the pulley, C, thereby allowing C to recede to a greater or less distance from B, and determining the position of the belt, E, and its consequent speed relative to that of the shaft, A. It will be evident that in this construction, when used as a driving-shaft, the belt-speed will become less and less as F is screwed into C, until C has so far receded from B as to allow the belt to drop on to the idler, P, when the driven mechanism will come to a standstill, to be gradually started again by the adjustment of F and G.

Fig. 2 shows a still simpler form, applicable when the pulley is located on the end of a shaft. In this case the loose pulley is omitted, it being assumed that only a speed-adjustment is necessary, one part of the pulley being fast on the shaft, the other free, but loosely pinned to the first so as to rotate with it, and the working radius being determined by the adjustment of a hand-screw.

The belt may be either round or nearly square in section, though, for most of the experiments so far made, a narrow double-ply leather belt has been used, with the edge beveled to correspond with the angle of the pulley's face.

Fig. 2.



The construction shown in Fig. 2 has recently been applied to the feeding-rolls of a 48-inch band-re-sawing machine in a way which illustrates its simplicity and adaptation to this class of work.

The diameter of the split pulley is 12 inches, the minimum working-radius 3 inches, giving a linear speed to the surface of the feed-rolls of from 10 to 30 feet per minute. A double-ply belt, 1 inch wide is used, and its power is such that if the stock be held firm, the slip occurs between it and the feed-rolls (four in number, all geared, 18 inches long, 5 inches in diameter), and not at the belt, as in the case of the usual style of cone-pulley employed in another machine of the same capacity.

It will be seen that, unlike most devices of the kind, this one does not require parallelism of the driving and driven shafts; the distance between the shafts may be varied almost at will; speed may be adjusted to a fraction of a revolution within pre-arranged limits; these limits are wider than could be secured by most other methods at an expenditure of a much greater amount of material and space; and, finally, adjustment of speed may be made while under load.

The German Patent Office received last year 13,126 applications, and granted 5,900 patents.

To Fasten Labels on glass, porcelain and iron, take 120 grms of gum arabic; 30 grms of gum tragacanth are macerated separately in a little water. The latter mixture is agitated until a viscous emulsion is formed, when the gum arabic solution is added, and the whole filtered through fine linen. With this liquid is then incorporated 120 grms of glycerine, in which 2.5 grains of oil of thyme has been dissolved. The volume is made up to one litre, by the addition of distilled water. This paste is said to possess remarkable adhesiveness, and to keep well in sealed flasks.

WHAT ILLUMINATING GAS IS, AND SOME CURIOUS FACTS ABOUT IT.

Illuminating gas of all kinds is made up, almost wholly, of hydrogen gas, and of carbon reduced to infinitesimal atoms. Hydrogen is the lightest gas known, its specific gravity being less than a tenth that of air. Illuminating gas may be illustrated as this hydrogen gas packed and crammed with bits of carbon smaller than can be conceived of. Charcoal pulverized to a powder that will float in still air without settling must be exceedingly fine, but it must be ground up ten times finer to float in hydrogen. Nevertheless, minute as these particles are, they are solid lumps of carbon, and this hydrogen gas packed with carbon, reduced to this state of almost nothingness, constitutes, as has been said, illuminating gas. Out of this compound of hydrogen and carbon you are, so to speak, to manufacture light. Try it. Open a gas-cock and a sheet of gas is thrown into the air. The pressure behind forces it continually out. But you must do something more. What? Apply a flame. Light the gas. Ah, a wonderful phenomenon begins when the lighted match is applied to the gas. Nature's forces go frantically at work. The hydrogen is all ablaze in an instant. Burning hydrogen emits no light. There it is before you—the black spot at the bottom of every gas light. You have simply started a furnace in which to manufacture light, for, as we have said, the hydrogen is filled with specks of carbon. These impalpable mites are now in the very midst of the fiery furnace which your match has started. They are heated red or white hot according to the proportion of hydrogen and carbon, as well as to the pressure under which they issue. But the carbon cannot remain in the furnace a second in any case, for other particles from the open burner are driving them forward through the fire into the open air. In the second of time between leaving the burning hydrogen and entering the air, the burner is surrounded with that bright arc of millions and millions of blazing hot particles of carbon. These give to your eye the sensation called light, for a single second, and then vanish into midnight forever. The continuity of the flame is due to the hot atoms issuing continually from the fierce hydrogen furnace, which is so constantly replenished with fresh hydrogen fuel from the burner. It is a minute, spouting volcano throwing off molten carbon. This is nature's chemistry. Consider it a moment longer. Not one atom of this hydrogen or carbon can be destroyed. The particles merely change their relations to matter and assume new ones. Each incandescent speck of carbon is shot into the ocean of air. The oxygen seizes it and smothers its light in an instant. A new compound is made, oxygen and carbon united in chemical bonds and known by a new name—carbonic acid or oxide. The hydrogen atoms share a like fate. Driven forward into the air by multitudes of their fellows rushing behind they plunge into the arms of their oxygen affinities. They chemically unite, and the result of that union is pure water, so that every gas-light is a genuine manufacturer of water. Light a dozen gas-lights in a close room and the window will, after a time, be covered with moisture. It is the water manufactured by the gas-light.

When a gas-light smokes it means that more atoms of carbon are pushing through the fire than can be properly heated. Some may be heated to a lurid dull red, and some pass off as black smoke. The black smoke is what would have been brilliant flame if the furnace had been hot enough to have made incandescent the atoms of which it was composed. When gas burns blue and thin it is deficient in carbon, or is being burned under excessive pressure. A suitable mixture of hydrogen and carbon, burned under proper pressure, will bring all the carbon to the incandescent point, and this is a perfect gas-flame without smoke.

THE ELECTRIC LIGHTING OF ROME.

One can hardly imagine, says the *American Architect*, what Julius Cæsar, or, let us say, Cato the Censor, would have said, if he had read in the Sibylline books that a company of Scythians would, two thousand years after his death, install an apparatus through which the streets of Rome would be illuminated every night by a cascade at Tibur, twenty miles off in the Alban Hills; yet that is just what has come to pass. Several years ago an Italian company undertook the utilization of the Tibur, or Tivoli, water power, by means of turbine wheels and dynamos, for the purpose of lighting the little town of Tivoli. Soon afterward, the establishment passing under the control of the Roman Gas Company, the plant was increased, until it now collects and transmits a force of twenty-seven hundred horsepower, and wires have extended to Rome. The experiment proved so successful that it has now been determined to utilize the whole available force of the cascade, amounting to about five thousand horse-power, and the contract has been intrusted to a firm in Buda-Pesth, Hungary. The current will be transmitted, at a pressure of fifty-one hundred volts, through copper cables, protected with special care, as they must cross the desolate Campagna, and would otherwise be at the mercy of brigands. The cables enter Rome at the Porta Pia, where the current is converted by thirty-two transformers into one of two thousand volts, this being the pressure for which the city system of electric lighting is designed. In the city itself preparations are being made for increasing greatly the lighting plant. In place of two hundred and fifty arc lamps, the present number, six hundred will be installed, and the system, when complete, will be the most important example of transmission of electric force in the world.

TRADE NOTES.

The Provincial Government has passed an Act authorizing the payment of $15,000 per annum, for seven years, in aid of the construction of a railway and traffic bridge across the Fraser River at New Westminster. The construction of the bridge will probably be proceeded with at an early date.

The City of Winnipeg is advertising for offers from parties desirous of constructing and owning the Assiniboine water power works. The city has obtained permission from the Dominion Government to construct a dam, without locks, on plans prepared by H. M. Ruttan, City Engineer. The estimated cost of the works is $350,000. They will develop 3200 H. P. at low water.

NIAGARA FALLS. The Niagara Falls Park and River Railway is expected to begin running about the middle of May. The railway is completed from Queenston to Chippewa, the wiring is rapidly progressing and the machinery for 2000 horse power is being placed in the shaft at the falls. Engineers are making surveys in connection with the tunnel, &c., for the electrical power house on the Canadian side to supply power to this neighborhood and to Buffalo. The construction is expected to begin shortly.

DESERONTO.—Work on the Sydenham extension of the Kingston, Napanee and Western Railway is being pushed vigorously. The line will be opened for traffic by the first of August. This branch opens up the phosphate and mica district of Loughborough Township. It will also bring to the district a market for coarse timber now valueless. The extensive charcoal plant at Deseronto now requires 6000 cords of wood per year to keep it going.

COBOURG.—The erection of the Toronto, Hamilton and Buffalo Railway bridge over the Grand River at Brantford, contracted for by the Dominion Bridge Company, has been seriously delayed by spring freshets. One span resting on false work was carried away by the ice and considerably damaged. The Brantford Electric and Power Co. are remodelling and improving their water power on the Grand River. A new dam is to be built across the river and a new and larger penstock and flume erected with a capacity of 1000 H. P. Pending competition the lighting plant is being done by steam.

THREE RIVERS.—The council awarded a contract for a two million gallon compound steam pump to Messrs. Beauchemin & Co., of Sorel, at a higher price than either the Geo. F. Blake Co., of Boston, or the Snow Steam Pump Co., of Buffalo, offered to supply their pumps.

The City of Westminster, B. C., have decided to build the Frazer River Bridge over the Frazer opposite that city. Mr. D. Robson, City Clerk, will furnish particulars of same.

TORONTO. The city of Toronto have purchased another 10 million gallon pumping engine from the Geo. F. Blake Mfg. Co. of Boston. Mr. John Galt., C.E., of Toronto, has made a very complete commercial test of the 10 million gallon high duty pumping engine now at the main pumping station, Toronto; the result being a commercial capacity in 24 hours of 11,176,000 gallons.

PETERBOROUGH, ONT.—The town council are calling for tenders to be received on 5th May, for a large quantity of cast-iron pipes, etc., also for a 2¼ million gallon water-power pump.

DESERONTO, ONT.—Strong efforts are being put forth to establish charcoal smelting works here. At present charcoal enough to smelt 30 tons per day is produced. The bye-products are all saved and nearly all the methyl alcohol used in Canada is produced here; also large quantities of creosote, pitch, iron liquor and brown acetate of lime. Should the present efforts prove successful, it will lead to an enormous development, not only in mining, but in all the allied branches of trade where the bye-products are used. For instance, Paris green would use most of the acetate of lime, at present used by paint manufacturers, and so on. It is greatly to be hoped that such a laudable enterprise will receive the necessary encouragement- The new Portland cement works are producing 150 barrels of first class cement per day. Toronto tests, 3 to 1 with sand, give it first place.

MONCTON.—The Intercolonial Railway of Canada has let contracts for the following steel bridges:—One span deck plate-girder, 84 ft. 6 in. over all,—James Fleming, St. John, N. B., contractors. Four spans deck plate-girders, 19 ft. 9 in. over all, and one span deck plate-girder, 22 ft. 7 in. over all, —Dominion Bridge Company, Montreal, contractors. One span through Pratt-truss bridge, 122 ft. 6 in., centre to centre of end pins; two spans deck plate-girders, 34 ft. over all; one span deck plate-girder, 32 ft. over all; One span deck plate-girder, 30 ft. over all,—Canadian Bridge and Iron Company, Montreal, contractors.

PERSONAL.

Mr. Arthur Hill, C.E., lately connected with the Water Works of New Westminster, has gone into private practice in New Westminster.

Mr. B. D. McConnell, C.E., late Superintendent of Montreal Water Works, was appointed Town Engineer for Cote St. Antoine and will enter upon his duties at once.

Mr. Munro, C.E, is pushing on with the work at Soulanges canal and will have full force of men on at once.

Mr. C. Baillairge, C.E., City Engineer of Quebec, has written a pamphlet on the resources of the Hudson Bay.

Mr. Hogg, C. E., has returned from England and has commenced professional duties at Sherbrooke.

USEFUL INFORMATION.

In order to clean zinc, mix common whiting with ammonia, until it forms a smooth paste, and apply to the zinc with a soft woollen cloth. When it becomes dry, rub off with a piece of dry flannel.

A NEW METAL, possessing a beautiful violet colour, and having a brilliant appearance, has been discovered by Dr. Purcell Taylor. It has a high melting point, and is hard and crystalline. The specific gravity of the new metal is 8.2, and it is said that the cost will be high. Dr. Taylor has named the substance "farmanium."

TO HARDEN COPPER.—Among the latest methods resorted to for hardening copper is that of melting together and stirring until thoroughly incorporated, copper, and from 4 to 6 per. cent. of manganese oxide. Any other ingredients for bronze or other alloys may then be added. The copper thus becomes homogeneous, harder and tougher.

TO PREVENT BRASS FROM TARNISHING.—To prevent brass from tarnishing after it has been polished, use a solution of clear shellac in 95 per cent. alcohol;—½ oz. shellac to 1 pint alcohol. Cork tight in a clear bottle, shake and set in a warm place for a few days. Decant the clear solution at the top for your lacquer. Use a camel's hair flat brush. Heat the brasswork to nearly the temperature of boiling water, in an oven or otherwise, and varnish quickly, going only once over the work. Put the work back in the oven for a few minutes, to melt, and make the lacquer clear.

A CEMENT FOR JOINING IRON TO IRON.—Equal parts of sulphur and white lead, with about one-sixth proportion of borax, are the constituents of the mixture, and the three should be properly incorporated together, so as to form one homogeneous mass. When the composition is to be applied, it should be wetted with sulphuric acid, and a thin layer of it placed between the two pieces of iron to be connected, these being at once pressed together. The cement will hold so firmly as to resist the blows of a steam-hammer, and dry so completely in a few days as to leave no trace of the cement, the work then presenting the appearance of welding.

A NEW SANITARY WATER PIPE, named the Health, has, we are told, been placed on the market by an English firm. The pipe is formed of an outer casing of wrought iron with a core, or thin lining of pure block tin. It is claimed that as the action of water has no effect upon tin, the water passing through these pipes can have no trace of metallic taint. The pipe is made in all sizes, from ⅜ inch to 4 inches diameter, and in any desired lengths; and connections are made by screw-thread unions, also tin lined, which when screwed on the pipes to be joined, are said to give an unbroken and smooth internal core of tin.

TO REMOVE RUST-STAINS FROM NICKEL-PLATE.—Grease the rust stains with oil, and after a few days rub thoroughly with a cloth, moistened with ammonia. If any spots still remain, remove them with hydrochloric acid and polish with tripoli.

PRESERVING ROPES.—It may not be generally known that comparatively new ropes are often attacked by animal parasites as well as rot. In order to insure more safety in ropes used for derricks and scaffolding purposes, particularly in localities where the atmosphere is destructive of hemp fibre, such ropes should be dipped, when dry, into a bath containing 16 grains of sulphate of copper per pint of water, and kept in a soak in this solution some four days, afterwards being dried; the ropes will thus have absorbed a certain quantity of sulphate of copper, which will preserve them for some time, both from the attacks of parasites and from rot. The copper salt may further be fixed in the fibres by a coating of soapy water.

PUTTING OUT FIRE WITH SAND.—In connection with the equipment for fire protection, of wood working establishments, it is recommended that a gallon pail, filled with fine sand, be always placed within convenient reach of each workman employed where oiling and finishing is being done. This practice might well be followed wherever there is a possibility of fire starting in oils or oil soaked materials. There is nothing which will squelch an oil-fed fire in its incipiency more quickly and effectually than sand, and there are no after-claps, in the way of water damage, either.

A REMARKABLE LOCOMOTIVE PERFORMANCE.

In a letter to the *Railroad Gazette* of April 14, Mr. F. W. Dean makes public for the first time some results of a test with the compound locomotive of his design, made on the Providence Division of the Old Colony Railroad in May, 1892, which, so far as we know, gives the best economy which has thus far been obtained in locomotive work.

The average amount of power developed while the throttle valve was open was 745 indicated horse-power, the indicator cards being taken every two minutes during the whole run, which was of 57¼ minutes duration. The total weight of water consumed, including some steam which was lost by blowing off at the Mansfield stop, was 13,416 pounds, or 18.8 pounds per indicated horse-power per hour. The lowest published record for a simple locomotive of which we have knowledge is one given in the *Transactions* of the American Society of Mechanical Engineers, Vol. IX., page 630, for one of the engines of the Boston and Albany Railroad, on a test made by Mr. George H. Barrus, which gave a horse-power on a consumption of 23.66 pounds of feed water per hour. The result on Mr. Dean's engine is better than this by some 22 per cent.

ROAD IMPROVEMENTS IN NEW YORK.

A Bill has just been passed by the Legislature of New York which embodies to a large extent the recommendations concerning highway improvements recently made by Governor Flower and published in The Engineering Record of January 14. The bill allows the majority of the supervisors in any county to select a number of highways under their jurisdiction to serve as county roads. These highways must not be within an incorporated village or city and must be recorded in the County Clerk's office by suitable maps. Provision is also made for the appointment of a county engineer, to hold office for three years, unless removed by the supervisors before his term has expired. The expense of maintaining the county roads is to be a county charge, to be met by an annual appropriation by the supervisors. The law allows the board to designate the roads which are to be repaired and maintained by the appropriation but requires the expenditure to be made under the supervision of the County Engineer. There is also a clause which requires the apportionment of money to be made in such a manner that the work done in each town shall be as nearly as possible proportionate to the equalized valuation of the property of the place.

To provide the necessary funds for this work the supervisors are authorized to issue bonds bearing not more than 5 per cent. interest, running not more than 20 years and sold for not less than their par value.

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MANITOBA.

No. 1. Brandon, 1st & 3d Fri., 8 p.m., City Hall. Pres't, A. R. Crawford. Sec'y, Arthur Fleming, Brandon, Manitoba.

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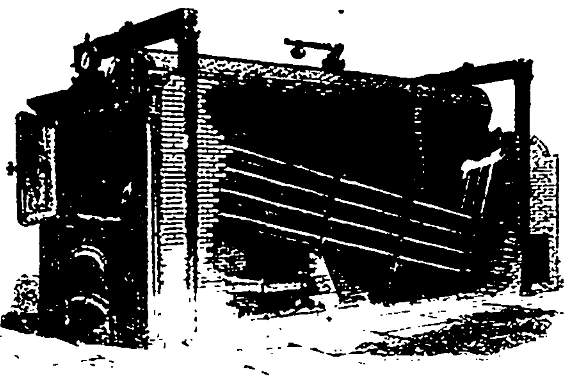

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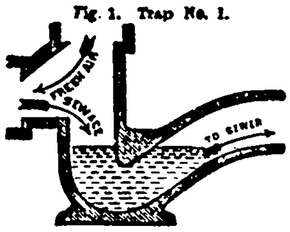

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