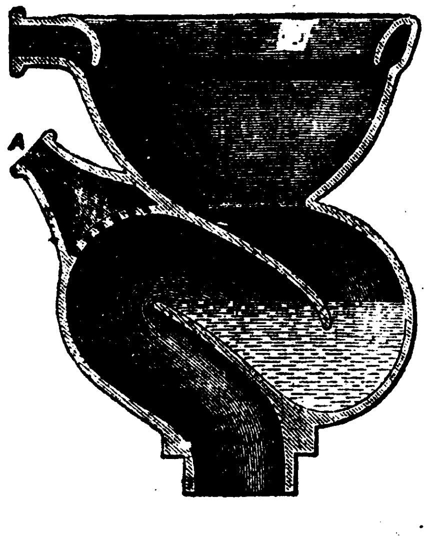
1,500 yards of water in a four-inch pipe, and up 150 ft, high. If we divide 33,000 lbs. by 150 ft. it will be 220 lbs for a horse power. If we divide our days' work 288,800 lbs. by 220 lbs., it will give our day's work equal to 1,767 horse power; from these considerations it must be very clear to you, that this rule will not make known to us the power of our high pressure engine, and that some other must be brought before us by some one, and the sooner the better. I will now show to you we have not lost any power or made any mistake in our calculations; that whatever power or pressure is put on the piston and steam, is the power. It must be found in work done, viz., the area of our piston = 113·097 square inches multiplied by the steam there. I told you our engine would work for a short time with 25 lbs., the steam valve being fully open, and the fire kept for that purpose, also she cut off 4 in. before the end of her stroke will give 20·83 lbs. for the full stroke instead of 25 lbs. for 5-6 of it, and to allow a little for drawing out the air or filling the role case and nozzle on the one side; while the other is pushing the water out from the nozzle into the main, we will allow 3 lbs only for cutting off, × by 22 lbs. = 2488·134 lbs. × 4 ft. =9952.536 lbs. this is the power of the engine up and down every stroke, with regard to the number of strokes per minute depends on the boiler-room and ability to generate steam enough to fill the cylinder so often in a minute. Now we want to find this power on the effect of the other end of our supply pipe; first the column of water 150 ft. high × 5·454 lbs. in each foot of pipe = 818·1 lbs. of water to be raised every stroke of the pump before any will run out. Secondly, the water laying in the 1500 yards = 4500 ft. of main pipe 4-inch is equal to 2 lbs. per foot = 9000 lbs. + 818·1 = 9818·1 lbs. of water every stroke of the pump. The pressure of the steam on the piston = 9952·536 9818·1 lbs. of water = 134·436 lbs. of steam over for friction or the rubbing of the water against the pipes. Here you see the whole of the power accounted for, which ought to be the rule for the power of the engine, and if you want one first find what you have to do, and then the pressure on the piston beside the moving of the engine, pump, etc. The size of the boiler you can find by the number of strokes per minute, always provide plenty of steam room, and run your steam up to 10 or 15 lbs. higher than you require, so that the fire may not be forced, but burn naturally with the dampers nearly closed. You ask me what pressure the steam leaves the cylinder? About 17 lbs. in this case, the faster you run the higher the steam ought to be; you must not forget the higher the steam the stronger the boiler cylinder, and cost more for repairs. I prefer to use steam about 50 lbs. or less, because I have found it to be less cost. We will now look into the fire, I told you we have no bridge but the bars and brickbed are on an incline from the dead plate to the back of the boiler, here is our bridge, about 6 in. between the bricks and the boiler, you see every time I put in a stick, I push back the charcoal, so that the gas may pass over it, to be burnt, our fire bars are 3 ft. 6 in. long by 3 ft. wide = 10½ square feet to perform this work it takes two cords of hard wood per six days. To-morrow we will fire up with coal, without any alterations in the fire-place. At the proper time we have a nice clean fire of ⅔ hard and ⅓ soft; you see every time I put in coal, I push back the clear burning coal and lay the new on the dead plate which allows the gas to pass over the clear burning coal; by this means we burn pretty much of the smoke, now if we had a bridge I would have a clear fire about one foot deep melting the bars and bricks; but this way we have no more than 4 or 6 in. of solid fire acting on the full length of the boiler instead of so much heat under one part, liable to burn the plate or rivets. To fire as we do and perform the same work every day it will take 1½ tons of coal for every six days. I have run a boiler for twenty years, and fire bars 10 like these. The engine and boiler with a little repairs is good; to-day the cost for every thousand gallons you can count for yourself (with labour 10 cents). I must not infringe on our good editor's space, in his excellent magazine just now but will bring before you other pictures, through his valuable kaleidoscope, some future day, (all questions answered for information only). Now, my dear young friends, allow me to advise you to accept of our nice little engine, as an example for our journey through life. At the end may we be able to account for every pound of privilege which has fallen to our lot. God made man upright, but they have sought out many inventions; as our first parents had the poisonous tree of the knowledge of good and evil amidst the Garden, so have we before us, good and evil for ourselves and our children to guard against evil.

P. T.
Engineer, Toronto.

A NEW WATER CLOSET.

The London *Ironmonger*, in its last issue, publishes an account of a new water-closet made by C. Winn & Co., of Birmingham. The article says:

"It is made entirely of one piece of earthenware, and a reference to the accompanying sectional illustration clearly explains the arrangement. It is trapped above the floor line, and is narrowest at the inlet, rendering stoppage scarcely possible. At the apex of this trap a deodorizing chamber is provided, to be filled with charcoal in connection with the ventilating outlet A. The area of the closet for solid matter is very small, and there are no spaces where soil can in any way lodge or accumulate. The flushing apparatus, which, it will be understood, is an independent pump, having no connection with the closet except by the inlet pipe, is of the best-known kind, and the force of water is concentrated where most required. After use, the whole of the water, soil, &c., passes from sight. We understand these closets are giving great satisfaction wherever fixed. The firm also make another on the same principle, called a shop-closet, having a strong grating over the outlet, which prevents the loss of anything thrown in by accident."



A water-closet made in this form has some very important advantages, especially in the fact that the whole of the trap is smooth and without joints to catch soil or other solid matter. In effect, this closet is identical with an ordinary hopper, depending, as it does, entirely upon the one trap for its security, In some portions of the Eastern States the hopper is in great favor. It certainly does very well, and gives much greater satisfaction than could be expected. From the description, we judge that an unusually violent flush of water is obtained by means of a special pump. This, in connection with the form of the basin and trap, would effectually empty the latter at each discharge.

NEWLY-DISCOVERED NERVOUS ENERGY.—During the past year, Dr. Brown-Sequard has often noticed that the irritation produced by a transverse section of the base of the brain produces opposite effects upon the nerves which are before and behind the section. Following the lead of these indications, he finds that some parts of the nervous system are able, when irritated, to produce a sudden notable augmentation of the properties, or of the motion or sensitive activities, of other parts of the system.—*Comptes Rendus*.

NEW THEORY OF THE FORMATION OF HAIL.—Colladon supposes that the heavy rains and the hail-storms which follow them produce, by the very effect of their fall, a vertical wind due to the air which they draw from the upper regions of the atmosphere by their own friction. This vertical wind, which extends from the cloud to the ground, necessarily leaves behind it a partial vacuum, which produces an influx of air during the whole continuance of the storm.—*Les Mondes*.