ALLEN'S APPARATUS FOR FEEDING BLAST AND OTHER FURNACES.

This invention is an improvement in the feeding apparatus of a blast, cupola, or other like furnace of the class employing a cup and cone or a bell and hopper.

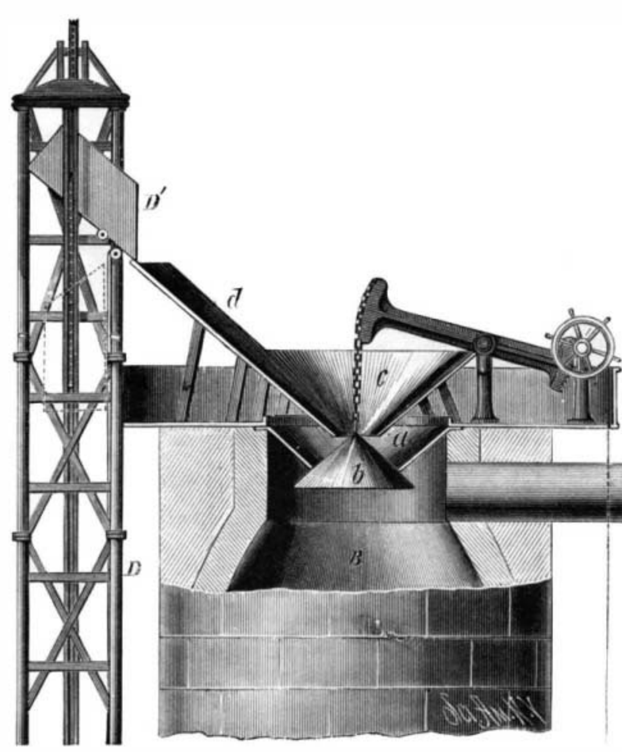
The design of the invention is to enable the ordinary feeding or charging operations to be performed from the ground. To accomplish this there is arranged immediately over the bell or cone, *b*, an open bottomed hopper, *c*, and so arranged with reference to the bell or cone that charges of material for the blast furnace, on being dumped or discharged into the hopper, *c*, will be delivered through its open bottom on to the bell or cone at or near its apex, and consequently will pass down the sides of the bell or cone uniformly all around, and so will be distributed with practical uniformity around the annular receptacle formed at the junction of the bell and lower hopper, *a*. Then, when the bell is lowered to discharge such material into the furnace, B, such charge will be supplied to the burden below uniformly all around, or practically so. Then, by the addition of a chute, *d*, from the elevator, D, to the auxiliary hopper, and of a self-tilting or dumping car, D', so that the car containing the material shall be automatically emptied into the chute, the entire work of feeding is done without the necessary presence of workmen at the top or mouth of the furnace to do or superintend the feeding.

The material may be dumped in from barrows by hand in the usual way; but the inventor prefers to so organize the apparatus that the work of feeding may be done from the ground, and without the necessary presence of workmen for such purpose at the top or mouth of the furnace.

The engraving shows an elevator, D, which may be of any suitable construction, adapted to be operated from the ground, and to raise and lower the car, D', loaded with the material to be charged or fed into the furnace. A suitable tilting mechanism is added, so that when it reaches the proper height it will be tilted, and its contents will be dumped into the chute, *d*, which discharges into the hopper, *c*. As soon as the car is thus emptied it may be lowered in the usual way and at the proper intervals. The bell, *b*, is also lowered from below by the use of a windlass and rope.

In the engraving the windlass, rope, etc., are on the side of the furnace opposite the elevator, but for ease and facility of operation, the bell lowering and raising appliances should be arranged over and down the side of the furnace near the elevator.

This invention has been patented by Mr. William H. Allen, of Pittsburg, Pa. (P. O. Box 943.)



ALLEN'S APPARATUS FOR FEEDING BLAST AND OTHER FURNACES.

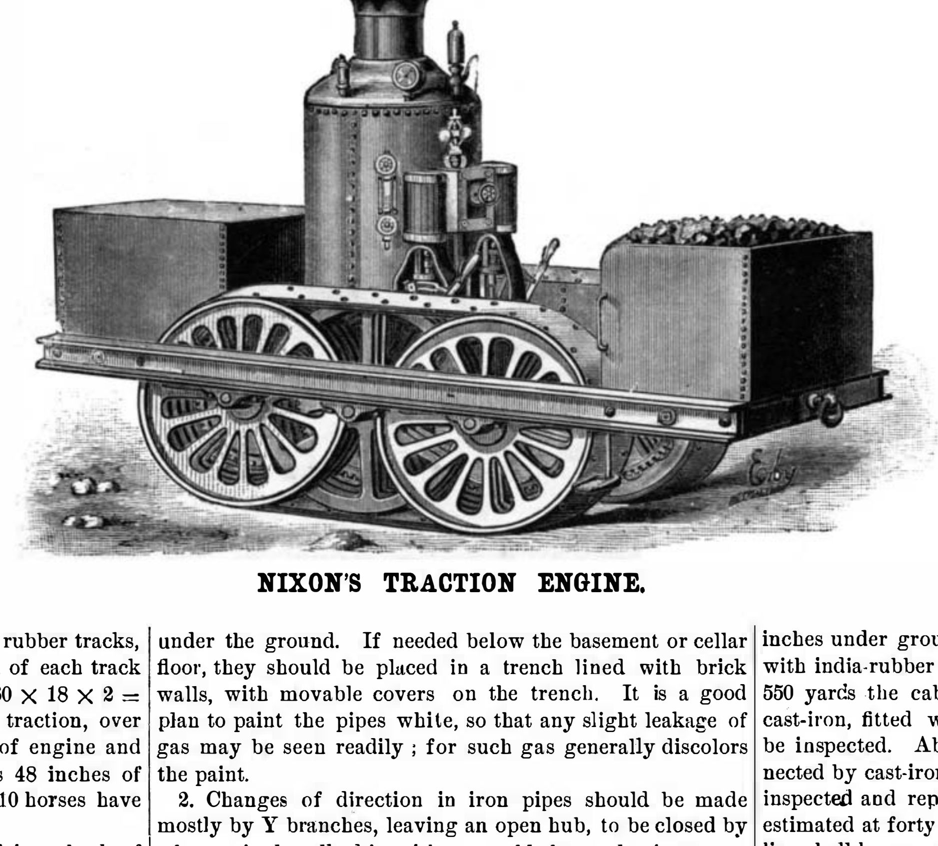
NEW TRACTION ENGINE.

This new engine is made for plowing, thrashing, road, mining, and yard transportation. The frame is constructed of four parallel T steel sills with cross beams at ends, and diagonal braces throughout, except at base of boiler, giving stiffness to frame, and supporting at ends the coal tender and water tank, thereby giving equal distribution of weight and balance on the tracks. The parallel sills are 24 inches apart from centers, to which are attached on the under side of sills, by adjustable boxes, three axles on each side. On these axles are firmly keyed three driving wheels of 2 and 3 inch faces, with a space of 2½ inches apart on axles. On the front and rear axles are four wheels; the first and fourth, or outer wheels, are 3-inch face, and are flanged with flanges on outside of wheels to prevent track from slipping off in turning. The center axles have three wheels of 2-inch face. The gangs of wheels intermesh or overlap each other; the tires of center gangs work close to the hubs of the front and rear gangs. Revolving over with these gangs of wheels are two tracks of rubber or other suitable elastic material composed of an outer and inner layer, between which are transverse metallic plates, secured through layers and plates by rivets or bolts, to retain tracks in shape transversely. The front and rear gangs of wheels are driven forward or backward, or one forward and the other backward in turning, by spur gears secured to inside of wheels; front and rear gangs are connected by idle gears on center axles. The center gangs are driven in the same direction by spur gears on axles, of the same diameter as those on front and rear gangs. Motion is given by long pinion to these gears from reversing yacht engine, one on each side of upright boiler for each track. The width of each track is 18 inches; thickness of rubber tracks, 4½ inches; height of wheels, 4½ feet; length of each track in contact with the earth, 60 inches; hence 60 × 18 × 2 = 2,160 inches of effective earth contact or traction, over which is distributed the 6 tons of weight of engine and track. A horse of 1,000 pounds weight has 48 inches of effective earth contact while pulling; hence 10 horses have 480 inches of traction.

The engines now on the market with two drive wheels of 8 to 10-inch tires, have 48 to 72 inches only of effective earth contact, consequently are useless for plowing, or hauling their own weight over spongy ground.

This engine's tracks have no suction or adherence when the tracks leave the ground, therefore no loss of power by carrying its tracks forward. The tracks cannot be broken by passing over an obstruction, as the rubber will give to wheels until the wheel rotates over, and then instantly return to place.

The adherence of the tracks to the periphery of the one-half of the front and rear gangs and the bottom and top of center gangs of wheels, insures no slipping of wheels on the tracks when worked to its fullest capacity on steep inclines. Patented in the United States, August 29, and in Canada, August 31, 1882, by Jacob Nixon, of Winfield, Kansas, who can be addressed for further information.



NIXON'S TRACTION ENGINE.

House Plumbing and Drainage.

This subject is well worn, but so important to the well-being of every household that we believe it is doing the greatest good to the largest number of our readers by calling their attention frequently to it.

The last annual report of the Massachusetts State Board of Health, Lunacy, and Charity contains some excellent suggestions in regard to this subject of house drainage. They are the result of much study and research, and until something better is proposed much good will result if they are followed by builders throughout the country :

1. All drain pipes inside the house should be of metal, and all joints of well-calked lead or solder. Metal is recommended in preference to stone-ware, owing to the difficulty in keeping tight the joints of the latter. All connections between lead and iron should be by a calked brass nipple and solder. It is best to keep drain-pipes in sight, or at least of easy access. They should never be hidden under the ground. If needed below the basement or cellar floor, they should be placed in a trench lined with brick walls, with movable covers on the trench. It is a good plan to paint the pipes white, so that any slight leakage of gas may be seen readily ; for such gas generally discolors the paint.

2. Changes of direction in iron pipes should be made mostly by Y branches, leaving an open hub, to be closed by a brass nipple calked in with a movable brass clearing screw as large as the drain, to be removed for inspection and cleaning. In straight reaches of fifty feet or more in length, these Y branches and clearing holes should be introduced at intervals of not over forty feet.

3 No T branches should be allowed, except in vertical pipes.

4. All pipes should be put together by a series of straight lines, and with a general direction as straight as possible.

5. All pipes should have a fall of not less than two per cent of their length, where no special apparatus is provided for flushing. All drains should be kept free from deposit ; and, if this cannot be effected without flushing, special apparatus should be applied for this purpose.

6. A trap should be placed on the main drain outside the house walls, made of glazed earthenware, with a vent hole as large as the pipe directly above the trap, communicating with the open air. This should be made accessible for cleaning out, and a rain-spout had best be discharged into it or into the drain at some point above it. This trap should be near the house, and can be alongside the grease tank, if convenient.

7. Every separate stack of soil or waste pipe within the house should extend out through the roof, at least four inches in diameter ; smaller pipes than this are liable to be choked with ice from condensation of steam in winter.

8. Separate traps should be placed under all receptacles of drainage, as close to them as possible, and no other traps allowed to intervene between these and the outside or main trap described above (6). Each one of these separate traps should have an air pipe of iron or lead connected just below the water seal, as large as the waste pipe, and either connecting at its upper end with the soil-pipe above all other branches, or passing through the roof independently, as found most convenient. Several traps can be served by the same vertical line of vent pipe.

9. No drain pipe from any safe pan under any tub, sink, bowl, or water closet should be connected below to the drain system, but should discharge over an open sink or cellar floor.

10. No waste pipe from an ice chest or refrigerator should be connected with the drains.

11. Rain water leaders should not be used as soil or drain pipes, nor should they be depended on to ventilate drains. If connected with the drains at all, care should be taken to so connect them below the water of some trap otherwise supplied with water, unless their upper ends are remote from windows.

12. A tank or small cistern should be provided in the upper part of the house, from which the kitchen boiler should be supplied, together with the bowls and sinks; also any water closets that happen to be close by. The drinking water should not be drawn from this tank, but from a separate tap on the supply pipe direct from the street main. The overflow of this tank should not be connected with any drain, but discharge as directed for safe drains above (9). It is common in mild climates to discharge such pipes through the house wall into the open air; but this plan would be worthless in frosty climates.

13. All water closets should be supplied by a small tank directly above them, and not by valves attached to the closets themselves, nor by pipes branched from those from which drinking water is drawn.

14. Concentrate the fixtures used for drainage—such as water closets, bowls, sinks, tubs, etc.—as nearly as possible in vertical groups, to avoid waste pipes passing across under floors, which are rarely satisfactory.

15. Never locate a fixture, especially a water closet, in a dark corner where a good ventilation cannot be had. If outer air cannot be got, seek to draw off the foul air from the closet by a pipe leading up through the kitchen fire flue to the chimney top, built into the chimney for the purpose, at least four inches in diameter. Small pipes branched into the fire flues for this purpose soon get choked with soot at their mouths, and become worthless, unless extending quite to the top of the chimney.

Underground Wires.

The laying down of the telegraphic wire which is to put Marseilles in direct communication with the capital, is being rapidly pushed forward. The distance is 536 miles. Two hundred and fifty workmen are at present employed on the right bank of the Rhone, following the high-roads as far as possible. The cable is inclosed in a cast-iron pipe, laid at a depth of 5 feet 6 inches under ground, the joints of the pipes being covered with india-rubber washers and leaden rings. About every 550 yards the cable passes through a covered chamber of cast-iron, fitted with a manhole, by means of which it can be inspected. About every 110 yards the pipes are connected by cast-iron boxes, which also enable the wires to be inspected and repaired. The expense of the whole work is estimated at forty million francs, or £1,600,000. When this line shall be completed it is intended to connect it with the Transatlantic and Mediterranean cables.

Telephonic Experiments.

As a result of numerous experiments on induction in telephonic circuits, Prof. Cross, says the *Tech*, has found that the induction operating to produce telephonic disturbances is almost entirely electro-dynamic.

The effect of thin sheets of tin foil surrounding an insulated conducting wire is very slight. The diminution of inductive effect produced when a plate of metal or a spare wire is placed between the wires carrying the inducing and induced currents was found to be much greater than with the foil, and also greater with the overtones of the sounds transmitted than with the fundamental. That electrostatic induction is almost ineffective, so far as producing sounds in the receiving telephone is concerned, is shown by the fact that if a small secondary coil with a large and deep primary is held at right angles to its plane, the sound disappears; also, if the metal plate between the coils is slit radially, its effect in diminishing induction disappears.

If intermittent or variable currents are passed through a coil of wire forming a closed circuit, within which a second closed parallel coil is placed, the secondary current induced in the latter can be investigated to a certain extent by inserting a receiving telephone in the secondary circuit. If a closed wire coil is placed near to the other coils, there is a current induced in it, which, as Henry first showed, diminishes the strength of the current in the secondary coil. A heavy sheet of metal, as of brass, placed between the primary and secondary coils, also diminishes the current in the secondary for the same reason. Hence, in both of these cases, the sound produced in the telephone by induction is considerably reduced. The effect of brass, copper, and iron is very marked. Lead, also, contrary to an opinion that has been advanced, exerts a very decided effect. Thin foil, even if it completely envelops the secondary, produces but slight effect. The application of these important results to telephonic cables is obvious.

If, instead of being placed in a simple secondary coil, the telephone is placed in a double circuit of twisted wires, so arranged that the current induced in these will be in opposite directions, complete neutralization of currents is produced, and consequently cessation of sound.

Various other experiments have been performed to test the value of different "anti-induction" devices.

Prof. Cross has also found that a Hughes microphone and a Blake transmitter were capable of transmitting the sound of a high pitch bar giving 12,000 double vibrations per second, thus showing the excessive sensitiveness of the ordinary hand receiving telephone. If the capacity of the line were increased, it was found that its ability to transmit high vibrations was diminished. These experiments also showed that change in quality in the sounds transmitted is not due, as has been stated, to an inability of the microphone or any part of this circuit to respond rapidly enough to their higher overtones.

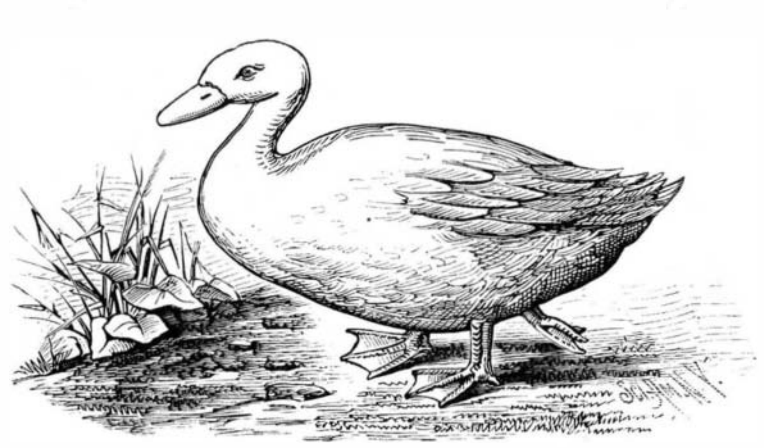
Preservation of Railway Ties.

Some interesting data are published showing the relative value of different methods of injecting railroad ties. On the route from Hanover and Cologne to Minden, for example, the pine ties injected with chloride of zinc required a renewal of twenty-one per cent, after a lapse of twenty-one years; beech ties injected with creosote required a renewal of forty-six per cent after twenty-two years' wear; oak ties injected with chloride of zinc required renewal to the extent of about twenty-one per cent after seventeen years; while the same kind of ties not injected necessitated fully forty-nine per cent of renewals. The conditions in all these cases were very favorable for reliable tests, and the road bed was good, permitting of easy desiccation; the unrenewed ties showed, on cutting, that they were in condition of perfect health. On another road, where the oak ties were not injected, as large a proportion as 74·48 per cent had to be renewed after twelve years; the same description of ties injected with chloride of zinc required only 3·29 per cent renewals after seven years, while similar ties injected with creosote involved, after six years, but 0·09 per cent.

THE stock of ivory in London is estimated at about forty tons in dealers' private warehouses, whereas formerly they usually held about one hundred tons One-fourth of all imported into England goes to the Sheffield cutlers. No really satisfactory substitute for ivory has been found, and millions await the discoverer of one. The existing substitutes won't take the needed polish.

DUCK WITH THREE LEGS.

We give below a sketch of an ornithological curiosity, in the shape of a three-legged duck, kindly sent for our inspection by Mr. George Ely, Hill-road, Wimbleton. The following particulars may be interesting to some of our readers. The bird was of no particular breed, being of the nondescript species common to farm yards. That the redundant crural appendage did not interfere with the duck's bodily welfare was evident, for its condition was excellent, and it weighed nearly five pounds. The third leg was connected to the body about two inches behind the two ordinary legs merely by skin and flesh, without the intervention of the bone called the *tibia* (more commonly the "drumstick"), and, consequently, was of no practical use to the bird, but merely trailed behind it as it walked.—*Land and Water*.



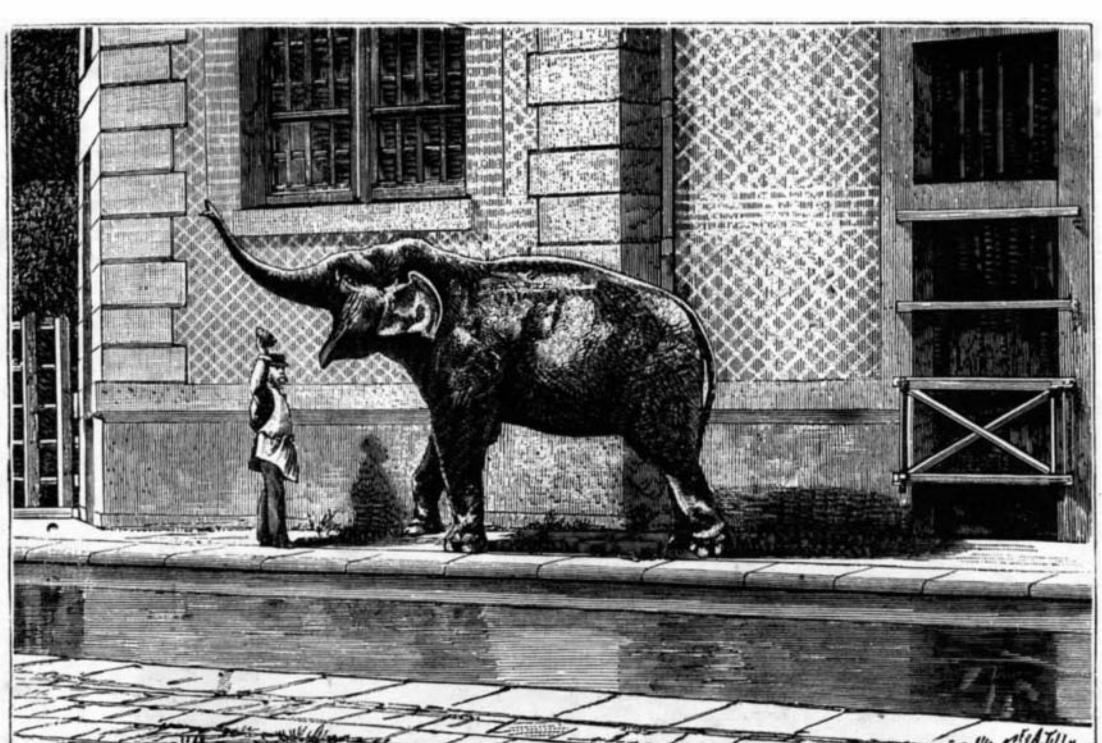
DUCK WITH THREE LEGS

Leaf Copying.

Take a piece of thin muslin, and wrap it tightly round a ball of cotton-wool as big as an orange. This forms a *dabber*, and should have something to hold it by. Then squeeze on to the corner of a half-sheet of foolscap a little color from a tube of oil paint. Take up a very little color on the dabber, and work it about on the center of the paper for some time, till the dabber is evenly covered with a thin coating. A little oil can be used to dilute or moisten the color if necessary. Then put your leaf down on the paper and dab some color evenly *over both sides*. Place it then between the pages of a folded sheet of paper (unglazed is best), and rub the paper above it well all over with the finger. Open the sheet, remove the leaf, and you will have an impression of *each side* of the leaf. Any color may be used. Burnt or raw sienna works the most satisfactorily.—*Knowledge*.

THE ELEPHANT BY INSTANTANEOUS PHOTOGRAPHY.

The great rotunda of the Museum of Natural History, of Paris, gives shelter to the large mammiferæ. Here dwell especially the giraffes, camels, elephants, etc. We give herewith, from *La Nature*, a copy of an instantaneous photograph taken in this part of the Jardin. The elephant shown was taken just as he was in the act of opening his mouth to receive a piece of bread that his keeper was about to throw to him. Here is seen faithfully represented the reservoir for water that runs around the rotunda, and the external wall of the latter. We may recall the fact that six very similar parks that radiate from the rotunda permit of the large mammiferæ taking the air when the temperature is favorable. With each of these parks there is connected a stable, in which the animals are housed, cared for, and kept warm during winter.



INSTANTANEOUS PHOTOGRAPH OF AN ELEPHANT.

The Exhaust Injector.

On November 11, the members of the Manchester Association of Employers, Foremen, and Draughtsmen had an opportunity of inspecting, on the premises of Messrs. George Fraser, Son & Co., a feed water injector, which is actuated solely by the exhaust steam from the engine. The injector is the invention of Messrs. Davis, Hamer, and Metcalf, and the perfectly successful operation of the apparatus by steam drawn from the ordinary exhaust pipe was a matter of considerable surprise to many of the visitors. Afterward a paper descriptive of the injector was read before the members, at their ordinary meeting held in the Mechanics' Institute, by Mr. A. S. Savill, who, before explaining the invention, said it seemed to have been the opinion of engineers that it would not be possible to work an injector with steam at atmospheric pressure; that an injector must have a pressure of steam to work at; and that with the exhaust injector, this pressure must be got up in the exhaust pipe, which of course would act as a back pressure on the piston of the engine, under which conditions there would not be much, if any, economy in the adoption of an exhaust injector. This reasoning had, however, been proved entirely wrong, and the injector he had brought before them did not in any way put on back pressure, but, on the contrary, reduced or altogether removed it. The injector was simply fixed in a vertical position to a branch from the main exhaust pipe, and to start the injector all that was necessary was to turn on the steam and water. With regard to the apparatus itself, the most important point was its automatic action. As soon as the first puff of steam from the cylinders had cleared out the air from the exhaust pipe, the injector commenced to work, and kept on until the engine ceased to give out steam, restarting again as the engine restarted, without any manipulation being required. In the construction of the injector there were, as in the ordinary types, three nozzles—the steam nozzle, the combining or mixing nozzle, and the delivery nozzle. The steam nozzle was similar to the one in the Giffard injector, but of a very large bore, and inside was fixed a small spindle to concentrate the steam. The chief feature, however, was the combining nozzle, which was constructed to start the injector automatically. The nozzle was split from its smallest bore for rather more than half its length, one-half being solid with the nozzle itself, and the other half arranged to work freely on a hinge, by which it was enabled to enlarge or contract its area. The delivery nozzle was very similar to that of a Giffard injector. When not working, the hinged flap in the injector was open, and a large area was presented for the egress of steam and water When steam and water were turned on, some condensation took place, which instantly formed a partial vacuum, into which more steam and water were drawn until such a vacuum was formed that steam was attracted with a velocity so great as to impart to the water sufficient speed to enter the boiler, the flap being at the same moment sucked down, and forming to all intents and purposes a solid nozzle. Results from actual experience had shown that by one of these injectors, the feed water entering at 66° Fahr., and a minimum delivery of 960 gallons per hour, the temperature had been raised to 190° Fahr. The injector was capable of feeding against 70 pounds to 75 pounds pressure, but when the pressure was above this an arrangement was attached for supplementing "live" steam from the boiler, which in addition further increased the temperature of the feed water. In the discussion which followed, the injector met with general commendation, the results which had been seen in actual working being admitted as surprising; and Mr. Gresham, who has long been connected with the manufacture of injectors, said he considered the exhaust injector as great an advance upon the present methods as the introduction of the Giffard was upon the methods then in vogue. He thought, however, that automaticity might be carried too far, and that the exhaust injector would scarcely be suitable for locomotives, as it only delivered its feed when the engine was working. Mr. Savill in reply, however, stated that, by connecting the injector with the boiler steam, it could be worked when the engine was standing, and that, although it did not seem a very nice arrangement for locomotives, it had been worked successfully on a locomotive both when it was running and when it was standing.

IT is estimated that there passed through the booms of the St. John River, N. B., this season about 126,000,000 ft. of logs.