

we are satisfied of the approximate accuracy of the bearings, and Mr. Campbell assures us of their general correctness.

Following the brink of Pluto's Chasm toward the northern end we find its character changed and its bare and gloomy walls hung by fine stalactitic drapery. By burning red fire and magnesium we gained some idea of its grandeur and beauty, both above and below.

Threading our way still further amid very old and decayed pillars, we climb to a balcony inclosed by clustering columns of more modern date, and overhanging a dark and forbidding pool far below. Within this lovely balcony, which, as a compliment to the **SCIENTIFIC AMERICAN**, the cave owners have named for your correspondent, there are rich marvels of nature's loom. Sixteen alabaster scarfs hang side by side, of exquisite color and texture. Three are snow white; thirteen are striated like rich bands of agate, showing every imaginable shade of brown, and all are translucent. The shape of each is that of one wing of a narrow lambrequin, one edge being straight and the other meeting it by an undulating curve. The stripes follow the curve in each detail. The scarf most admired resembles a white crêpe shawl, both in size and in its graceful, wavy folds, excelling the most artistic creation of the sculptor's chisel. Down the edge of each piece of drapery trickles a tiny rill, glistening like silver in the lamplight. This is the ever-plying shuttle that weaves the fairy fabric.

(To be Continued.)

**General Daniel Craig McCallum.**

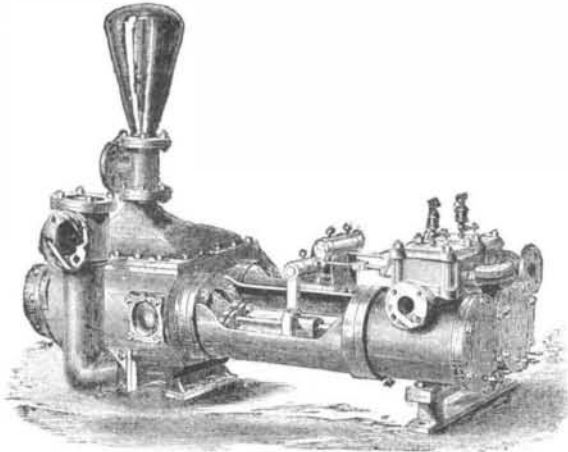
The necrology of 1878 contains few names of men who had served their day and country more worthily, in peace and in war, than Major-General D. C. McCallum, who died at his residence in Brooklyn, N. Y., December 27.

General McCallum was born in Scotland in January, 1815. Soon after his parents came to this country and settled in Rochester, N. Y., where young McCallum was bred to the trade of the carpenter. His attention was early directed to bridge building, at which he was notably successful. In 1851 he invented and patented the McCallum arch truss bridge, so widely introduced throughout the country. In 1855 he was appointed general superintendent of the New York and Erie Railway, but left the position two years later to superintend the construction of bridges of his design, chiefly on new roads in the West. At the same time he served as consulting engineer in the department of bridge construction for the Atlantic and Great Western Railway. When the war broke out he was called upon to serve his adopted country in connection with the transportation service, being assigned to the Department of the West, with the rank of colonel. In 1864 he was appointed general manager of all the military railroads of the United States, with the brevet rank of brigadier-general, in which capacity his splendid abilities in handling troops and supplies prepared the way for many important victories in the field. His final report on the military roads of the country, made in 1866, showed that he had had under his supervision 2,105 miles of railway, of which he had constructed 641 miles, with upward of 26 miles of bridges. On these roads there had been employed 419 locomotives and a large number of cars. The expenditure of the Government on this branch of the service exceeded \$42,000,000. In June, 1865, General McCallum was mustered out of service with the brevet rank of major-general; and with the exception of a short service as inspector of the Union Pacific Railroad, has since lived for the most part in retirement. To the last General McCallum was proud of having carried the tin dinner pail of the mechanic, and of having made his way in life by hard and honest work.

**DUPLEX STEAM PUMPING ENGINES.**

The hydraulic works at South Brooklyn, N. Y., owned by Henry R. Worthington, the well known constructor of steam pumping machinery, are among the most extensive and complete of their class in this country. The buildings are nearly quadrangular in figure and cover an area of about 10,000 square feet, or about two city blocks. They consist, principally, of a large foundry, blacksmith, pattern, erecting and machine shops that are stocked with superior machine tools, many of which were designed and constructed for special purposes in the construction of steam pumps. At this establishment water works engines, condensing and non-condensing, of the largest size; air and circulating pumps for marine engines; stationary steam fire engines; boiler feed pumps; pumps for hydraulic pressure, and others especially adapted for oil pipe lines; water and oil meters; hydraulic cranes and hoisting machinery, etc., are constructed. Some of the larger steam pumping engines made at these works have already been described in this journal. The engraving now given represents one of the smaller description of pumps known as a duplex steam pump adapted to boiler feeding and other purposes where the service is of ordinary character. Pumps of this type have two double-acting plungers. The water valves are made of either rubber or metal. The diameter of steam cylinders ranges from 4½ to 20 inches, and that of the water plungers from 2¾ to 15 inches. The stroke varies from 4 to 15 inches. One of the most important features of the Worthington duplex steam pumping engines is the peculiar arrangement of the valve motion, which prevents all noise or concussive action. For this reason the pumps are highly

suitable for hospitals, hotels, and public buildings. By reference to the engraving it will be seen that two steam pumps are placed side by side, and so combined as to act reciprocally upon the steam valves of each other. The one piston acts to give steam to the other, after which it finishes its own stroke, and waits for its valve to be acted upon before it can renew its motion. This pause allows all the water valves to seat quietly, and removes everything like harshness of motion. As one or the other of the steam valves must be always open, there can be no center or dead point. The pump is, therefore, always ready to start when steam is admitted, and is managed by the simple opening and shutting of a valve. The manufacturers state that special care has been taken to have all the parts easily accessible for inspection or repairs. All the moving parts are made to gauge, and therefore can be readily renewed.



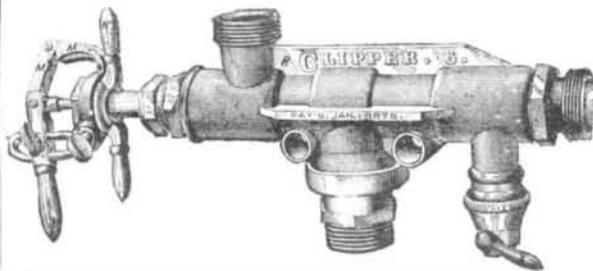
**DUPLEX STEAM PUMPING ENGINES.**

The makers of this pump have adopted an excellent system of manufacture, and employ a large number of special tools, which, together with the increasing demand for their pumps, enables them to make their prices in accordance with the times.

The offices of Henry R. Worthington's Hydraulic Works are at 239 Broadway, New York, and 83 Water street, Boston, Mass.

**THE CLIPPER INJECTOR.**

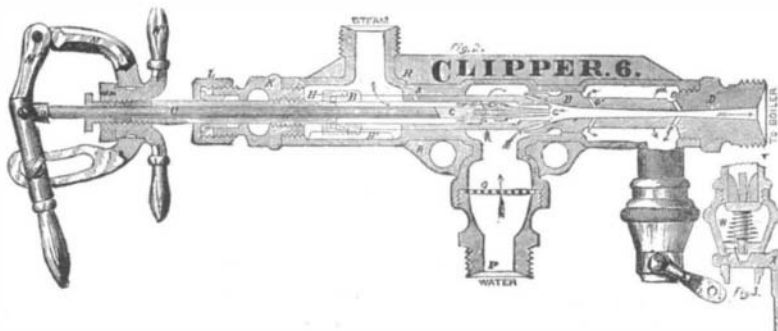
Manufacturers of the different forms of injectors have each endeavored to accomplish some particular result—one, to feed the largest amount of water; another, to secure in



**FIG. 1.—THE CLIPPER INJECTOR.**

one instrument a large maximum and small minimum capacity; another gives prominence to lifting power; and still others to simplicity of construction and facility of adjustment.

The inventor of the injector shown in the accompanying engravings claims to have accomplished in one instrument all that is desirable in the perfect feeding of boilers, and states that it works at high or low pressure of steam; lifts the water, or receives it from tank or hydrant; can be regulated, without reference to steam or water valves, to feed from about one half to the full capacity; is not affected by jarring or jolting, as on a locomotive; cannot get clogged by anything entering with the water; cannot be sprung when the attachments are made; and it can be readily taken apart. The parts being made interchangeable are easily replaced, should it from any cause become necessary.



**FIG. 2.—LONGITUDINAL SECTION OF INJECTOR.**

The inventor says that every injector should be capable of drawing water whether it is overheated or not, without altering the adjustment. The Clipper being constructed in this way may be set so that it will feed either the maximum or minimum quantity. It is provided with a device which effectually prevents the entrance of foreign substances which might clog and impede the action of the instrument, and it

is capable of working under either high or low pressure, is readily started and regulated, and is exceedingly simple and complete. The several parts are described as follows, reference being made to Fig. 2:

A is the shell, or body; B, the steam tube; C, jet, or lifting tube; D, main, or water tube; H, swivel, kept from turning by fin H'; K, bonnet, by unscrewing which, tubes, B and C, are removed; M and M', revolving lever and handle, to regulate water and steam; N, extra revolving handle, used to regulate water when room is insufficient to receive lever, M'; O, overflow holes; O', holes to assist in lifting and starting; Q, strainer, preventing anything from entering too large to go through injector; R, ribs to prevent springing or bending shell, A; W, overflow valve and spring. In Fig. 3 is shown a longitudinal section of overflow, turned one fourth round to show construction. X is the lever and revolving pin to set overflow valve when using injector to heat water in tank. A check valve is provided in connection with the swivel at the feeding end of the injector.

The injector is started by drawing the steam tube, B, back by revolving the lever and handle, M M', which turn the tube, B. The steam is fully turned on, and when it blows out at the overflow, the lever, M', is pushed forward and the water valve is opened. When the water appears at the overflow the lever, M', is pulled back and the tube, B, is moved forward slowly until no water appears at the overflow. The injector will then feed the maximum amount. It may as easily be set to feed the minimum. After adjusting in this manner it can be started without moving the lever, M'.

For further information address J. D. Lynde, patentee and manufacturer, 405 North 8th St., Philadelphia, Pa.

**New Inventions.**

Mr. Samuel Whitnum, of Greenpoint, N. Y., has patented a Novel Fire Shovel, having its handle and blade made in two separate pieces and connected together by a simple and strong fastening.

Mr. William Smith, of Carmi, Ill., has patented an improved Fly Trap which has an alarm mechanism in connection with a bait holder and wire gauze cone or other form of prison receptacle for flies. The alarm mechanism is operated intermittently, but at regular intervals it frightens the flies that have collected around the bait, when they ascend and pass into the prison chamber, from which they cannot escape.

Mr. Elias G. Sternberg, of Depauville, N. Y., has patented an improved Ventilator consisting of one or more perforated pipes, extending along and secured to the ceiling of a room, and provided with an outlet pipe, extending into and up through the chimney.

An improved Connector for Battery Carbons has been patented by Mr. Adam C. Kreis, of New York city. The object of this invention is to provide a connector for the carbons of batteries with the copper disks or strips that will prevent the rapid destruction of the metal attachments, which are subject to corrosion by the exciting fluid in the batteries.

Mr. Joseph H. König, of Mason City, W. Va., has patented a Process of Recovering Chloride of Sodium from its admixture with impurities in crude brine, which consists in precipitating the chloride of barium by sulphuric acid, filtering out the precipitate, then precipitating the calcium and iron together as a subcarbonate by the addition of sal soda, and afterward separating the clear liquor and crystallizing the pure salt out of solution from the bromide of magnesium.

Mr. Napoleon B. Heafer, of Bloomington, Ill., has patented an improved Kiln for burning tile, brick, pottery, or any other clay wares. It is so constructed that the heat passes directly through the wares in its upward course, and thus produces better results than it would if separated from them by a fire wall or bag, as is usual in a down draught kiln.

An improved Gas Light Extinguisher has been patented by Messrs. Philipp Brand and Edward J. King, of Jacksonville, Ill. The object of this invention is to improve the construction of the gas light extinguisher for which Letters Patent No. 206,926 were granted to the same inventors August 13, 1878, to make it simpler in construction and less expensive in manufacture, while being equally sensitive to variations in the gas pressure.

Mr. Ebenezer Miller, of Fredericton, N. B., Canada, has devised an improved Shifting Rail for carriage tops, which can readily be attached to and detached from the body of the carriage when the top is not needed. It consists of a rail provided with lugs having upper and lower lips, between which the flange or rim of the seat is clamped by thumb screws.

Mr. Henry E. Griffin, of Olympia, Washington Ter., has devised an improved Door Hinge that may be put on at a saving of screws without difficulty even by inexperienced hands, forming a cheap, neat, and strong support for the door.

Messrs. Thomas W. Platt and Arthur M. Orwig, of Windfall, Ind., has devised an improved Lifting Jack or Press Power, which is capable of exerting an immense power. It is simple and compact, and it may be used in a vertical, inclined, or horizontal position, as may be desired.