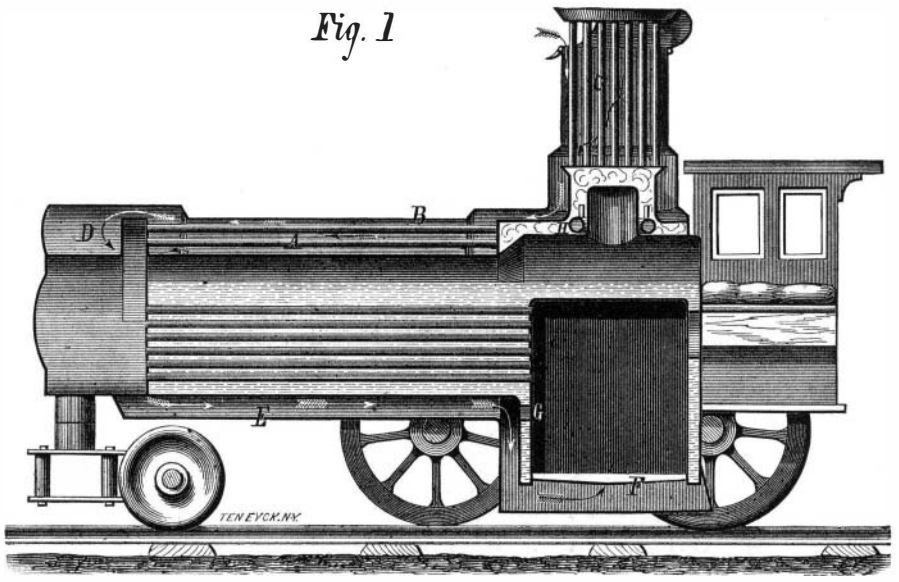
## IMPROVED DEVICE FOR HEATING AIR FOR FURNACES.

The invention herewith illustrated is designed to economize fuel through feeding the furnace with hot air for the support of combustion. The waste heat of the furnace is utilized to warm the entering draft, and the devices adopted for effecting this include a hot jacket for the boiler, which is another source of economy. The engraving represents the invention in longitudinal section, Fig. 1, and transverse section, Fig. 2, as applied to a locomotive boiler.

The products of combustion pass as usual through the boiler flues to the smoke box, and thence by tubes, A, extending through casings, B, to the building, whence they escape through the tubes, C, forming the smoke pipe. Surrounding tubes, C, is a casing into which the incoming cold air enters through the hood, as shown by the arrows, passes down into the casings, B, and along to jacket, D. The draft then passes to another casing, E, at the bottom, and finally enters the ash pit at F.

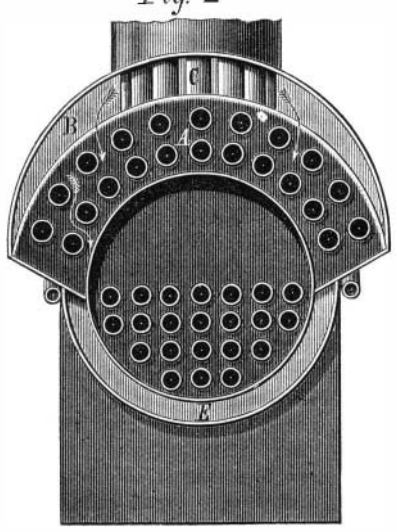
The hood on the smoke stack is made to turn so as to be adjusted to the motion of the engine. The water space at the back of the furnace may be provided with tubes, G, in place of stay bolts. These, leading into the hot air passage will, it is claimed, cause a current of heated air to be thrown in above the fuel to burn the smoke. They may be provided with dampers to regulate the current. The exhaust pipes are led into a coil or ring, at H, surrounding the steam dome. In the ring are numerous jets, so placed as to play into the annular space contained between the dome and casing, thus dividing the fresh air from the smoke. This arrangement, the inventor states, will allow of a much larger area than is usually given to the chimney of a locomotive, insuring a corresponding strength and steadiness of draft. It is also claimed that, in combination with

Fig. 1




THONGER'S DEVICE FOR HEATING AIR FOR FURNACES.

Fig. 2




the hood facing the motion of the engine, the device would probably so accelerate the draft as to allow feed water heaters to be introduced into the exhaust pipe. In addition to encasing the boiler in a hot jacket, a portion of the hot air may be led through the jacketing around the cylinders so as still further to check loss by radiation.

Patented through the Scientific American Patent Agency, in the United States and abroad, June 20, 1876. The inventor, Mr. Charles Thonger, of Courtright, Ontario, Canada (who may be addressed for further information), desires correspondence, relative to the device, with locomotive engine builders and railway managers.

## IMPROVED STEP AND EXTENSION LADDER.

We illustrate herewith a new ladder, which will doubtless prove convenient and useful for house and store use, for painters, for fruit gathering, etc. As represented in the engravings, it is constructed somewhat similarly to an ordinary step ladder, being really two ladders (one with steps and one with rounds) hinged together. We are informed that it is as simple and light as an ordinary step-ladder, and can be lengthened to double its length by simply swinging the ladder with the rounds upward, which can be done by anyone in a moment. When arranged as a step ladder, it can be used by two persons at the same time, one going up either side. One size of hinge will answer for any size or length of ladder, as the hinges are adjustable to various widths and thicknesses of wood. The locking bar is self-acting, and will lock the ladder together when not in use, as shown in Fig. 1. Fig. 2 represents the ladder in position as a stepladder, the same locking bar holding it, and Fig. 3 shows the ladder extended, the same locking bar again securing it. The inventor claims that the device can be manufactured as cheaply as any ordinary step ladder, and will find a ready market. Patented January 11 and April 11, 1876, by E. J. Schneider. For further information address M. Schneider & Sons, 35 South Main street, Dayton, Ohio.

Fig. 4

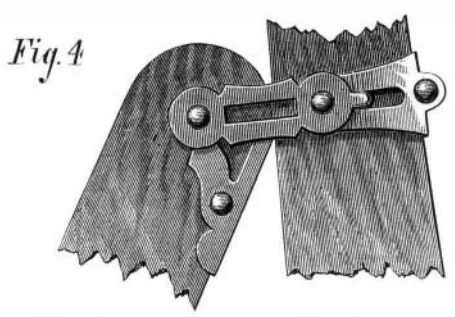


Fig. 3

Fig. 1

Fig. 2

SCHNEIDER'S STEP AND EXTENSION LADDER.

### A Gigantic Bird from New Mexico.

Professor Cope exhibited, recently, to the Philadelphia Academy of Science a tarso-metatarsus of a bird, discovered by himself during the explorations in New Mexico, conducted by Lieutenant G. M. Wheeler, U. S. A. The character of its proximal extremity resembles in many points those of the order *cursores* (represented by the *struthionidæ* and *dinornis*); while those of the distal end are, in the middle and inner trochleæ, like those of the *gastornis* of the Paris basin. Its size indicates a species with feet twice the bulk of those of the ostrich. The discovery introduces this group of birds to the known *faunæ* of North America, recent and extinct, and demonstrates that this continent has not been destitute of the gigantic form of birds, heretofore chiefly found in the Southern Hemisphere *faunæ*.

### Birds with Teeth.

The same author has also recently given an interesting account of a remarkable group of birds with teeth, obtained from the cretaceous beds of Kansas, where the associated vertebrate fossils are mainly mososauroid reptiles and pterodactyls. They constitute a sub-class, odontornithes, comprising two orders: The *ichthyornithes*, having teeth in sockets, biconcave vertebræ, a keeled sternum, and wings well developed, represented by ichthyornis and probably apatornis, and the *odontolcæ*, with the teeth in grooves, the vertebræ as in recent birds, a sternum without keel, and rudimentary wings, represented by hespeornis. The occurrence of toothed birds in England has been described by Professor Owen from the London clay of Sheppy.

### The Hoosac Tunnel.

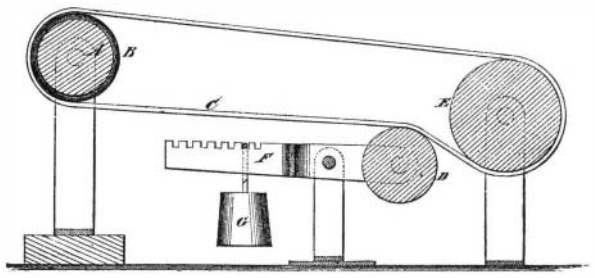
The North Adams *Transcript* says the temperature of the Hoosac Tunnel, at North Adams, Mass., is about the same all the year round, the thermometer standing generally at 60°. The air is pure except when there are a great many trains going through, filling the tunnel with smoke, the tunnel being able to thoroughly ventilate itself under ordinary circumstances.

The brick arching is not all in any one place, but in sections, wherever there was a possibility of danger from loose and crumbling rock. In all, about four thousand five hundred feet have been arched, the longest section being five hundred and the shortest ten feet. Thus the workmen were not all together, but were scattered along the line. After a section of the tunnel had been selected as needing arching, the miners began to remove the rock from the sides and roof for a depth of about three feet, that being the average thickness of the arching. In performing this work constant care was used; and when the extreme liability to danger from falling rock is considered, it is a wonder that so few accidents have occurred. The rock taken down was removed daily and dumped at different points along the road from the tunnel, that from the roof being received and carried out by platform cars that reached within a few feet of it. When the section to be arched had been properly prepared, the masons began their work, laying the brick on wooden centers, which were put up every five or six feet. The brick work was not laid close to the wall in all parts, a space being left for the water to run down. Sheet iron was placed between the brick and the wall for protection against water, and the brick was laid with waterproof cement. No part of the arching has been slighted, the whole work being carefully and thoroughly done.

A telegraph wire has been put through the tunnel, and offices stationed at both ends, and warning will be given every time a train enters and leaves the tunnel. Manager Prescott has appointed R. B. Campbell superintendent of the tunnel, for the present at least, and Mr. Campbell keeps ten men examining the sides and roof and taking down loose rock wherever found. Before each train goes through, the entire length of the tunnel is walked over by four men, stationed at different points, to see that the track is unobstructed The length of the tunnel is a little under five miles.

## IMPROVED SPEED GOVERNOR.

Mr. James M. King, Walnut Station, Minn., has recently invented a simple and practical regulator for the clearing apparatus of thrashing machines, to compensate for the irregular motion of the horse power. It consists of a belt-tightening pulley mounted on a counterbalanced beam, with means




for regulating the tension of the belt, and a slipping pulley or cover on the driving pulley. A is the driving pulley; B, the slipping pulley or slipping cover of the driving pulley; C the transmitting band; D the counterbalance tension pulley, and E the pulley to be driven. The tension pulley, D, is, in this example, controlled by an adjusting weight, G, on lever, F; but it may be actuated by other means, if preferred.

The invention was patented on May 30, 1876.

### The New U. S. Steamer Trenton.

The Trenton is said to be one of the finest and probably fastest vessels in the naval service, being fitted with compound engines, two low pressure and one high pressure cylinders, the former 78 inches in diameter, and the latter 58½ inches in diameter, and all of 4 feet stroke, with an indicated 3,500 horse power. She has eight cylindrical boilers, 12 feet in diameter, and 10·25 feet long, with 510 feet of grate surface, and 12,000 feet of heating surface. The propeller is the Hirsch four-bladed screw, 19·5 feet diameter, and 28 feet mean pitch The length of the vessel is 253 feet between perpendiculars, 48 feet beam, and 23 feet depth of hold from main deck. She is to be full ship rigged, and will be armed with eleven 8-inch rifled guns. She is also to be a ram, being provided with a prow extending eight feet beyond the bow. The vessel, of 2,300 tuns burden, was designed by Naval Constructor Isaiah Hanscom. Heretofore it has been difficult to make the sailors comfortable in cold weather, owing to the danger of the heating apparatus, from bursting tubes, and the necessity of shutting off the steam at night in order to sleep. This annoyance has been overcome by adopting a new open-base radiator, which is so arranged that water can never accumulate in the pipes from condensation, causing unequal expansion and frequent bursting of the tubes. Another improvement for the comfort of the sailors is a new kind of galley, capable of cooking for a force of 800 men at once, and in less time than has been consumed heretofore.

The Trenton will be capable of going at a mean speed of 13 knots, is very strongly built and braced, and will be, it is expected, one of the most formidable cruisers of the navy.