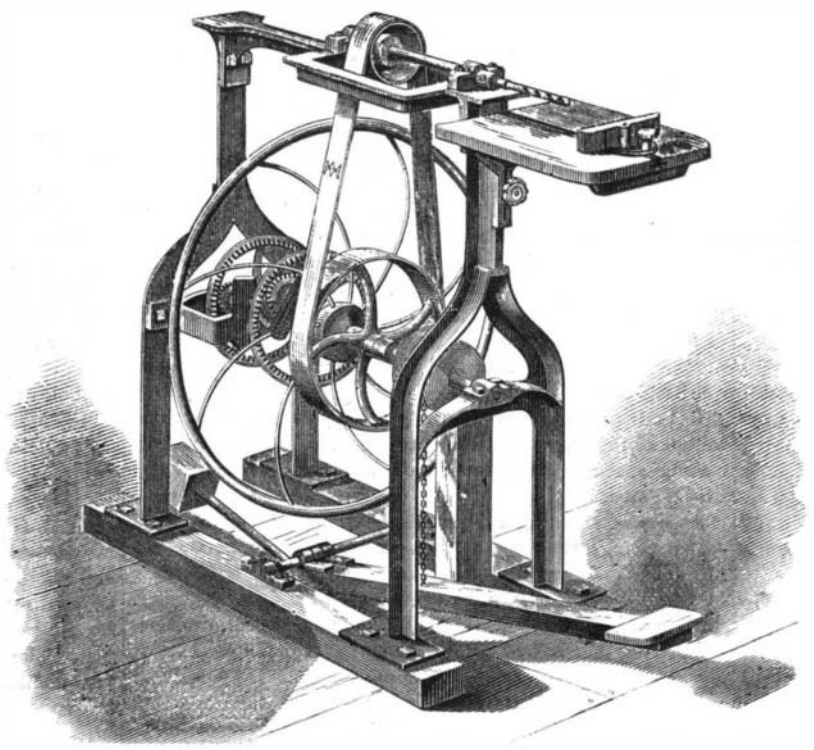
THE VERTICAL MULTIPLIER BORING MACHINE.

We have already laid before our readers three applications of that ingenious combination of gearing, the vertical multiplier, to woodworking machinery. By its use the band saw, the jig saw, and the circular saw have been adapted to run by the foot power of the operator, thus enabling the mechanic whose shop is not of sufficient extent to require the work of a steam engine to supply its place, on the machines most employed, by a device which affords a means of applying his available force at perhaps the best advantage.

We now present, in the annexed engraving, a representation of still another adaptation of the invention, recently made to the boring machine. The nature of the peculiar mechanism through which the power is communicated has already been fully described and explained in other connections, so that no further allusion to its construction is necessary. By its aid, however, in the present machine, forty revolutions of the shaft, actuated by the treadle, correspond to 1,640 revolutions of the bit, a four inch pulley being connected with the latter, making a proportion of one to forty-one. The general arrangement of the boring mechanism will be readily understood from the engraving. A table is provided which, by a slotted support through which passes a set screw, may be adjusted at a hight suitable to the dimensions of the work to be operated upon. It has a longitudinal slot on its surface, in which travels a guide piece, against which the wood to be bored is held by the hand of the operator, as it is advanced toward the tool. This guide piece, by means of a slotted semicir cular bar and set screw, may be placed at any desired angle so as to allow for the boring of inclined holes.

We recently had occasion to examine this machine, and found that the tool penetrated through knots or woods in any direction, with much facility and with the exercise of a quite small amount of effort on the part of the operator. It is evident that any sized bit, which can be adjusted to the shaft, may be used. This device will doubtless prove a useful addition to the shops of wood workers generally.

For further information, address the Combined Power Company, 23 Dey street, New York city.



VERTICAL MULTIPLIER BORING MACHINE.

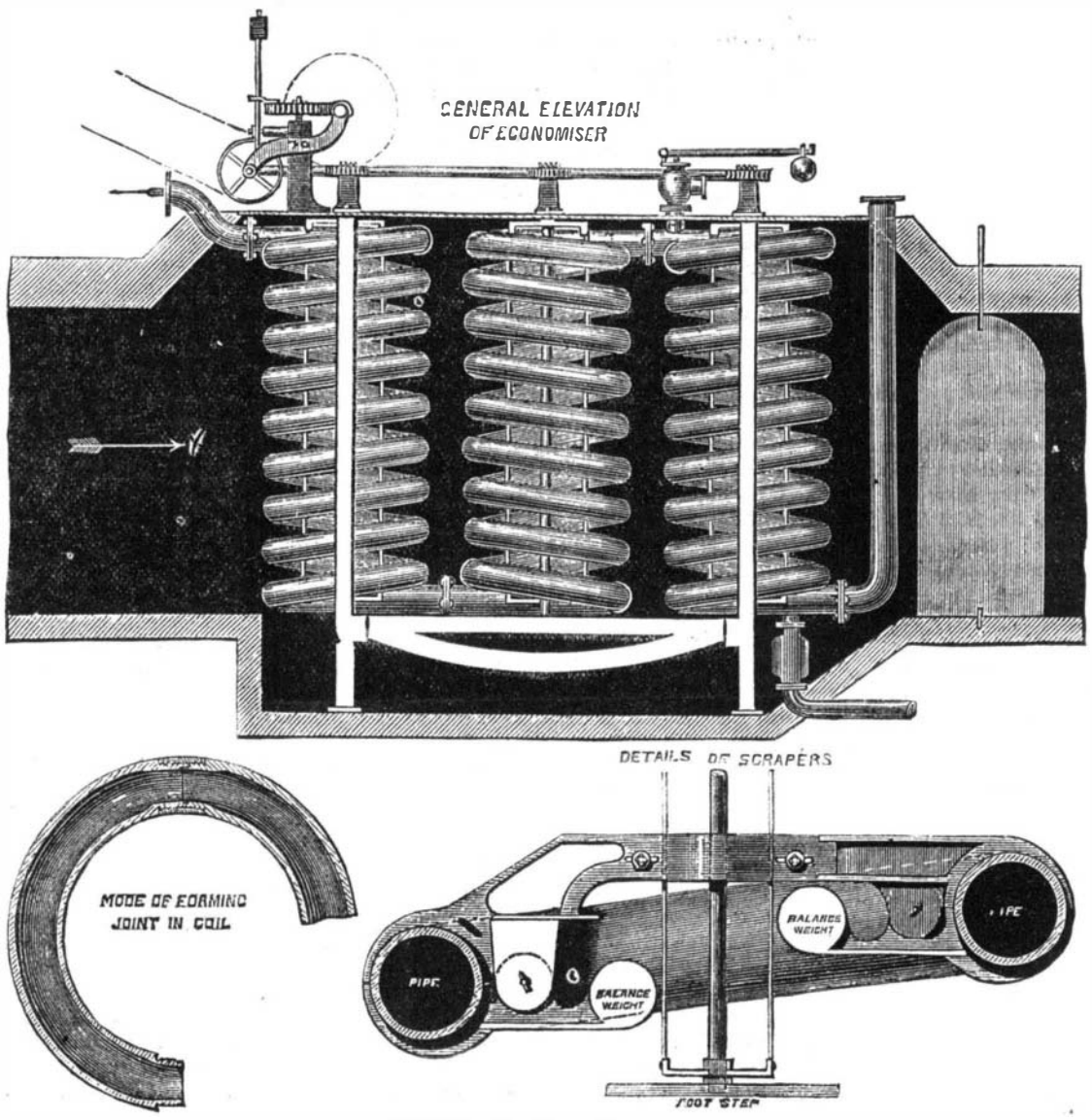
IMPROVED FUEL ECONOMIZER.

Among many novel devices displayed at the recent exhibition of fuel-economizing appliances, held at Manchester, England, is a steam generator composed of three coils of cast iron piping, of four inches internal diameter. These coils are not cast whole, as stated in the inventor's descriptive circular, but are formed of a number of half circles, bored and turned to spigot and faucet joints. The ends of these half circles are reduced to three inches in diameter, and have ribs cast on the exterior surface. After the segments have been placed together an iron hoop or thimble is cast on over the joints, and, by the contraction of the metal in cooling, draws the ends of the pipe close together. The exterior of the thimble is of the same diameter as the pipes, and thus a perfectly smooth joint is obtained for scrapers to travel over; the pipes are held securely together, while all cement or rust joints are dispensed with.

Should a coil become fractured it can be repaired by splitting two hoops and removing the damaged segment.

The form of scraper will be readily understood by referring to the engraving. One half rests upon the pipe, embracing the upper portion of it, while the lower scraper is kept up to the pipe by means of a balance weight; these scrapers are pushed forward by arms or propellers fastened to a center shaft, driven by a worm and wheel at the top of the machine, and supported by a footstep in the center of each coil; the scrapers follow the line of pipes until they reach the bottom, when, by the action of the reversing motion, they again ascend the coil to the top. These scrapers will, undoubtedly, clean the coils from soot, provided the pipes are cast truly cylindrical and the scrapers made to fit them exactly; but in the apparatus exhibited at Manchester this was not the case—the pipes being very rough castings and far from cylindrical, consequently many portions of the pipes were untouched by the scrapers, the points of which were frequently more than an inch apart. The inventor states that this machine was not made in his own foundery, but that in all economizers now supplied by him he will guarantee the accuracy of the form of the coils.

Many advantages are claimed for this economizer over those with vertical pipes. The first is that the whole piping presents a surface for the heat to beat against, the back part of the coil being exactly opposite the front space. We can see no difficulty, says the *Engineer*, to which we are indebted for the engraving, in arranging vertical pipes, so that those in the second row should be placed exactly opposite the spaces between the pipes in the first row, and so on alternately. Another advantage claimed is the rapid and continuous circulation of the water, there being only one unbroken stream, free from all sharp turns and angles, thus avoiding strains upon the pumps and joints. By means of this rapid circulation it is maintained that incrustation and deposit of scale on the interior of the pipes are avoided, and their heating surface kept uninjured. The feed water enters at the bottom of the coil furthest from the boiler, which is the coolest end; it passes into the second coil at the top, and, descending through it, enters the third coil at the bottom, becoming gradually hotter until it enters the boiler at a temperature varying from 200° to 300°. From the absence of abrupt corners and bends, the coils can be well cleaned out by blowing through them with steam. It stands independent of all brickwork, and is self-contained in its own frame, which reduces the cost of fixing. The three coils are estimated by the inventor to give as good results as an economizer comprising seventy vertical pipes.



BELL'S FUEL ECONOMIZER.

American and European Locomotives.

American engines have, as it were, gradually crystallized into certain definite and fixed forms. Outside cylinders and inside frames are now universally used here, whereas, on the continent, cylinders and frames are sometimes placed inside of the wheels and sometimes outside. The steam chests here are always placed on the outside and top of the cylinders; thus there are often placed on the side and inside the frames. Almost the only kind of pistons which seems to be used there is that made with solid heads, with simple grooves turned on the outside, into which steel, cast iron, or brass rings are sprung. Here the varieties of packing in use are numberless. For simplicity and cheapness the European is certainly very much superior to ours. Here the only valve gear now made is the shifting link motion worked from eccentrics on the main axle: there the shifting link, the suspended link, the Allen or straight link, the Walschaert, and several other kinds of valve gear are used. Some of them are worked from eccentrics placed outside of the wheels; and in at least one engine we notice that the axle bearings are outside of the wheels, and then the eccentrics are placed next the bearings, and a crank outside, to which the connecting rods are attached. All wheel centers are made of cast iron; there, of wrought iron. In the tyres of our truck wheels we are imitating Europeans, and steel tyres are now much used here for that purpose. The springs in American engines are, if we except the Boston and Albany railroad, always placed above the axles and frames. In Europe they are often below. Here they are, excepting in four-wheeled engines, always arranged with equalizing levers; there this is not always the case. The use of plate frames is universal in Europe, whereas in this country they are now never used.

In the construction of locomotive boilers there is also a very great difference in their practice. The steam dome is there always placed either about the middle or near the front end or smoke box. The Becker pattern of boiler is also much used, especially in Germany and Austria. In this plan the outside of the fire box, instead of being arched, is rectangular, that is, the top of what we call the wagon top, instead of being round, is flat, and is raised somewhat above the barrel of the boiler. The corners are, however, rounded somewhat. The crown sheet, instead of being stayed with crown bars and braces, is supported by long stay bolts screwed through the outside shell and the crown sheet. Some of the engines which are to be built at the Grant Locomotive Works, for a Russian road, are to be made in this way. This is, we think, a very excellent plan, and is quite certain to be adopted in this country when its merits become known. Shaking grates are, however, seldom shown in the illustrations of European engines; but grates very steeply inclined are still much used there. It is very singular that in Europe the exhaust steam almost universally is allowed to escape at the base of the smoke stack instead of the bottom of the smoke box as is the practice here. It will also be observed that there many of the smoke stacks are made conical; that is, the base of the inside of the stack is smaller than the upper part. We have seen it stated that it is found that the steam blast is much more effective with this form than with a straight stack. We do not know, however, upon what the assertion was based, and would be glad to get some further information in reference thereto. The differences in points of detail are almost numberless, and are well worth study. The reasons for many of these differences would be very interesting if carefully examined, and we intend to return to the subject again. A very striking fact, however, is the much greater variety in the methods of construction adopted in Europe than is in use here. The reason for this we believe to be, singular as it may seem, partly political. The suppression, or rather repression, of individuality under republican governments has often been remarked. In this country, perhaps, no principle is more generally believed than that "the majority should rule." The result is that this axiom produces a kind of intellectual subserviency of the individual to the will of the majority, which thus, to a very great extent, becomes the standard of right and wrong