pushed further, therefore it is not known what the actual power of the gas is. The nearest oil wells are nearly two miles away, and they are very small, so the territory in the neighborhood will not likely be drilled, which will give the gas well a long lease of life.—*Petroleum Age.*

DRY STEAM PORTABLE ENGINE.

We give an engraving of an engine representing a line of portable and agricultural engines manufactured by the Taylor Manufacturing Company, of Westminster, Md. These engines are mounted on skids or on wheels, and embody many important and valuable features in their construction, which are worthy of the careful consideration of all who are interested in steam power. The engine has a rectangular frame secured to the cylinder, and supported under the crank bearings by two strong stands bolted to the frame and boiler. By this construction the boiler is relieved of the working strain of the engine, and as the crank boxes or bearings are cast in each side of the frame and on the center line through the engine, all the working strain comes on a direct line through the frame, and is distributed equally.

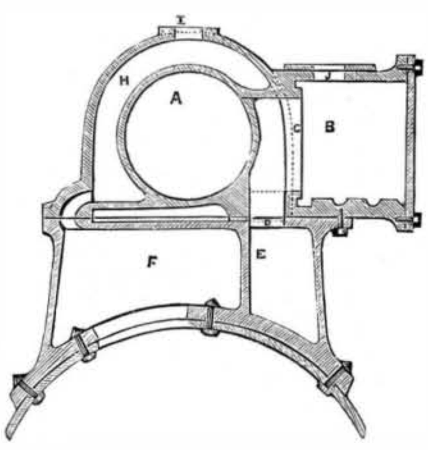
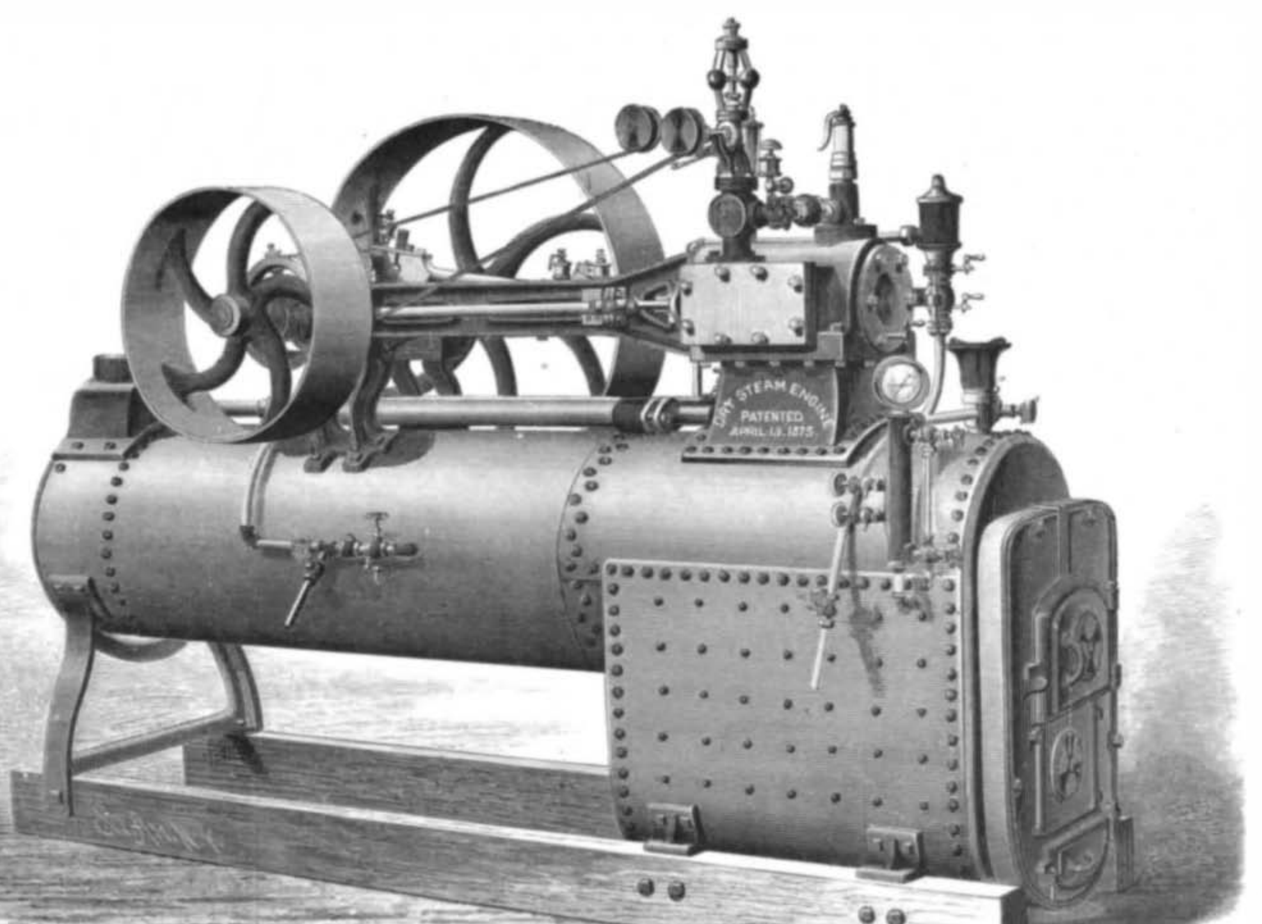


Fig. 1.—Cross Section of Cylinder, Dome, and Exhaust Chamber.

Fig. 1 shows the manner in which the cylinder of Taylor's patent engine is placed upon and attached to the steam dome of the boiler. It will be seen that it must necessarily be constantly surrounded by steam of the same temperature as that in the boiler, which completely protects it from cold, and prevents the condensation of steam in it.

The steam dome, F, shown in cross section in Fig. 1, communicates with the dome chamber, H, surrounding the cylinder, A. I is the opening for steam to pass into the steam chest, B, through the opening, J. C is one of the steam ports, and D is the opening for exhaust steam to pass into the chamber, E, to which the exhaust pipe is connected. The dome is of cast iron and securely riveted to the boiler, and the cylinder is fitted and bolted to it.

It will be readily seen, from the above description and explanation, that this is truly a steam engine, that it works only steam of the same temperature and elastic force as in the boiler; as a consequence, less boiler pressure is required to drive this engine than is needed to carry one in which the cylinder is exposed to outside temperature, which would condense and destroy its expansive power. In ordinary engines the only remedy for this is to carry an excess of pressure in the boiler to maintain the required pressure in the cylinder to perform the required work. By examination of the indicator card, Fig. 4, it will be seen that the steam line is well maintained throughout the stroke, and as the point of cut-off is at seven-eighths of the stroke and under a full opening of the throttle valve, it shows that there is a small percentage of loss from condensation in the cylinder; in fact, what loss there is must take place in passing through the short connection of steam pipe and in the steam chest.



DRY STEAM PORTABLE ENGINE—MADE BY THE TAYLOR MANUFACTURING COMPANY WESTMINSTER, MD.

The crank bearings or journal boxes are large and have gibs for quarter adjustment. The guides are the usual locomotive pattern, and the crosshead has large and ample wearing surface. The connecting rod is made of the best

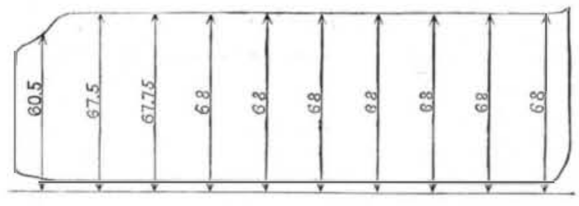


Fig. 4.—Indicator Card—Engine 10 x 18 inches: dry steam; pressure on boiler 70 lb.

hammered iron, the straps being keyed and bolted and well fitted with gun metal boxes. The box in the crank end of the rod is made square to prevent rocking. The crank shaft, which is of good size, is forged of the best hammered steel. The fly wheels are heavy and carefully balanced. Much care is taken in the casting of the cylinder so as to have good wearing metal. The piston is fitted with brass and Babbitt packing rings, all joints of the rings being ground and fitted so that the rings may readily adjust themselves to the surface of the cylinder. The slide valve is of the usual D-valve pattern, proportioned on correct principles. The steam ports are large and the distance to the cylinder short, giving the best results for a quick-acting engine. Eccentric strap is made in halves, and the eccentric rod is connected to the valve steam wristpin by means of an adjustable brass box. The engine is fitted with either pump or inspirator, as is desired, and is provided with a heater that surrounds the exhaust pipe nearly through its entire length. The exhaust steam heats the feed water, and escapes through a pipe into the smoke stack. A nozzle is placed on the end of the exhaust pipe, by which the effect of the escaping steam can be regulated at will and made to produce a very strong draught if desired.

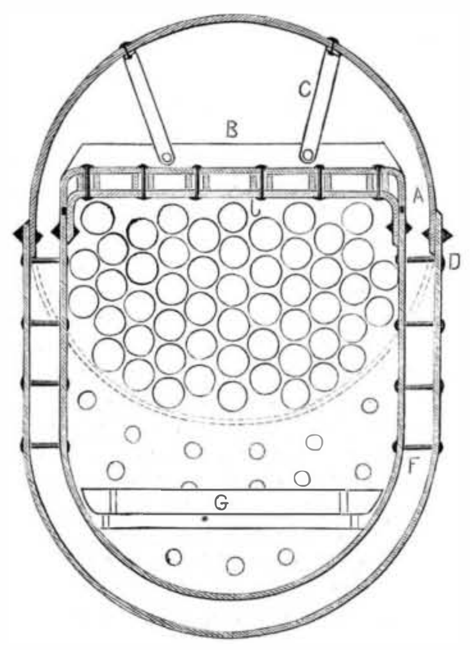


Fig. 2.—Section of Boiler through Firebox, showing Stays to the Crown Sheet.

The Pickering governor used in connection with this engine is provided with a double valve that does not stick, and also with a stop motion that prevents the engine from running away in case the governor belt breaks. The speeder attachment is so arranged that the speed of the engine can be changed fifty revolutions or less without altering the size of the pulleys or stopping the engine. The engine is provided with automatic glass oilers and cylinder lubricator, a full set of wrenches, oil can, and, in fact, everything that should be found on a perfect engine. The boiler is made of the best Pennsylvania charcoal iron and carefully fitted. A successful boiler is a necessary counterpart of a good engine, and no matter how well an engine may be built, if particular care and judgment is not exercised in the proportions and constructions of the boiler, satisfactory results cannot be attained from the working of the engine. There are certain particular points in the construction of a boiler that are important, perhaps the most important is the proper staying of flat surfaces, especially the crownsheet.

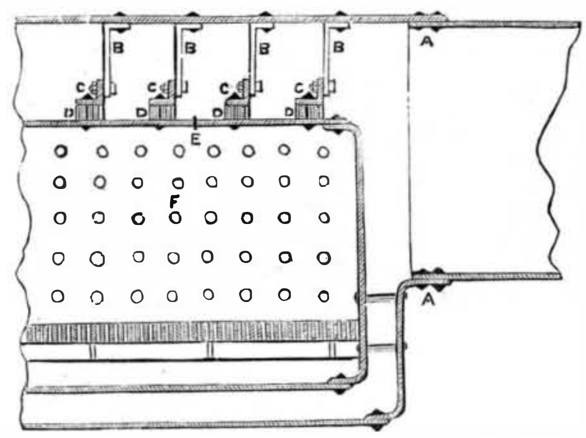


Fig 3.—Sectional view of Fire Box, showing Stays and Crown Sheet.

A careful comparison will convince most any one that that mode of staying, as shown in Fig. 2, is much the safest and best. B is a truss or crown bar, made of wrought angle iron, extending the whole width of the crown sheet, with the ends turned down and resting on the edge of the side sheets, F, of the fire box, at A, and, as may readily be seen, making a very stiff support, the strongest kind of a bridge truss, for the crown sheet. These trusses are spaced only four inches apart over the whole length of the crown sheet. In addition to these angle trusses, two braces, C, are fastened from the outside shell of the boiler to each truss, but independent of the trusses. The combining of the two makes a secure support to the crown sheets.

Fig. 3 is a sectional side view of the firebox, showing the angle trusses, C, and braces, B, arranged on the crown sheet. Washers, D, are placed between the trusses and sheet, and the two riveted together as shown, leaving ample space for the circulation of the water, thus preventing sediment and mud from collecting on the sheet. F F are the stay bolts in the sides of the fire box. There is a double row of rivets around the throat or connecting sheet of the boiler, as this requires extra staying. In the majority of the explosions that occur the rupture is at this connecting joint. E, in Figs. 2 and 3, is a safety plug, which, when the water is off the crown sheet, melts, when the steam puts out the fire No locomotive boiler should ever be built without this plug.

The boiler is fitted with steam blower for blowing the fire, three gauge cocks, glass water gauge, steam gauge, pop valves, steam whistle, steam flue cleaner, fire irons, twenty feet of smoke stack, and double spark arrester for engine on skids, and on wheels ten feet of stack hinged to lay down, or a locomotive stack, as the purchaser may desire. The engraving represents only one style or class of portable engine. In addition to this the company manufacture the well-known Utica portable engine, the Utica adjustable cut-off valve stationary engine, sawmills, and the "Clipper" vertical engines.

Further particulars in regard to this engine may be obtained by addressing the Taylor Manufacturing Company, Westminster, Md.

Life and Age of a Telegraph Pole.

This subject may seem of trivial account to the great mass of business people, but when it is proved to them that it actually affects the cost and convenience of telegraph messages and of dividends to stockholders, an interest may be awakened that will make the inquiry on the subject one of unusual interest, inasmuch as it affects the high or low price of rates for messages. The original cost of the erection of telegraph lines is important, but not so important in a series of thirty or forty years as is that of its maintenance in working order during that period. Some of the lines now owned and used by the Western Union Telegraph Company were first built more than forty years ago. When one is told that they have been built three or four times since that at great expense, it would seem to lead to the conclusion that a large amount of capital is necessary to represent the actual cost of the telegraph lines which have been in existence for many years.

The size of a telegraph pole has much to do with the duty which it is expected to do—that is, the number of wires it is calculated to carry. Many telegraph companies now owned by the Western Union Telegraph Company of to day were organized and their lines built many years ago, before the organization of the "N. Y. and Mississippi Valley Printing Telegraph Company" in 1851, its name being changed to that of the "Western Union Telegraph Company" in 1856, by an act of the legislature of New York State.

The contract to build the original line required that the posts be not less than thirty feet long and twenty-seven inches or more in circumference four and a half feet from the butt, and twelve inches in circumference at the top, and set in the ground five feet. There were to be at least thirty of these posts to the mile, and they were to carry two lines of iron wire, one of which should weigh not less than six hundred pounds to the mile, and the other not less than four hundred and fifty pounds to the mile. These posts were to be of the best and most durable timber obtainable along the route they were to be stationed. These posts were intended for light lines only. When it was found necessary to increase the number of wires it was found to be necessary to have larger and more heavy poles, not necessarily much taller only in cities and large towns.

When considered apart from any local catastrophe or universal storm, the poles which were cut in winter were found to last as follows, according to the wood used, without being renewed. Cedar, 16 years; chestnut, 13 years; these are used in the Eastern, Middle, and Western States. Juniper and cypress are used in the Southern States, and redwood is used in California. Spruce lasts 7 years and juniper 13 years. If poles are cut in the summer their life will be about five years shorter than if cut in the winter. The soil in which they are set, and also the atmosphere and sunlight, have much to do with their life, for if one breaks off at the surface of the ground, or near the surface, as is usually the case, it will be five feet or more shorter than the others, and hence it is generally regarded as unfit to reset, and a new one must take its place. In some location this is provided for by having all the poles long enough to reset if they are sound enough for it to be economical to do so. The average period of the usefulness of a pole under ordinary circumstances is as above mentioned. It is seldom that mixed woods are used on a line; they are all of one kind of wood.

The official return of the Western Union Telegraph Company to the Superintendent of the United States Census, in July last, shows the following facts as to the poles used during the year: Average length of poles, 27 feet; diameter at top, 6 inches; kind of wood used, cedar, chestnut, juniper, cypress, and redwood. These poles were obtained in all parts of the United States and in Canada. The average cost of each pole delivered without freight was one dollar and two cents. All these poles were round except about one-fiftieth, which were sawed or squared. No process was used for preserving poles, and their average life, according to the wood used and the location where set, was twelve to fifteen years, and most durable wood in favorable situations did not exceed twenty-five years. The woods preferred were red cedar, white cedar, chestnut, and redwood. It is to be observed that pine and hemlock are not used. It may be remarked here that American telegraph poles make an agreeable contrast with the crooked and unsightly larch poles used in England.

The falling of a pole generally does much damage to the arms, insulators, and wires. If they were all put up new at once plain wire will last from twelve to fifteen years, and the galvanized wire used at the present day, being the best conductor, will last in the most favorable atmosphere for from sixteen to twenty years, but no longer; and where there are strains by poles or wires falling they will not last so long, and in cities and large towns, where there is much gas and moisture, it will not last more than two or three years. At all events, when a line begins to be about ten or twelve years old, and has plain wire, it is regarded as unreliable, and the safest and most economical way is to rebuild it throughout of new materials. The cost of constant repair and isolated and frequent transportation of posts and other materials, and the labor of repairs and resetting, are almost as much in a short time as it would to rebuild. The gauge of wire and the number of pounds to the mile are as follows: No. 4, 730 pounds; No. 6, 540 pounds; No. 8, 380 pounds; No. 9, 320 pounds.

From these facts we can see that a telegraph line that is thirty-six years old has been entirely rebuilt three times at least under the usual course of things, and that it may have been nearly four times rebuilt. The trunk lines of the Western Union Telegraph Company were first built more than thirty years ago, and nearly all of their lines have been rebuilt at least once. Where a line is built for only a few wires and it is proved that more are required it is then necessary to rebuild it entirely, with longer poles, and in such cases all wires are also put up new, if they are expected to be in constant use.

The maintenance in working order of a telegraph line is of continual expense to provide for the wear and tear incident thereto, the same as is the case with railroad lines, where it is always calculated that there are to be a certain proportion of new ties, rails, etc., every year, and it is charged to the maintenance account and reckoned as part of the cost of running the road.—*Journal of the Telegraph.*

Crystallization of Metals by Heat.

Some interesting facts regarding the influence of heat on the molecular structure of zinc are given in a recent paper by Herr Kalischer to the Berlin Chemical Society. Rolled zinc becomes crystalline when strongly heated, and the author recommends as a lecture experiment dipping a heated strip of zinc for half a minute in concentrated sulphate of copper solution, then washing off the precipitated copper with water, whereupon distinct signs of crystallization appear. The effect is not merely superficial; plates $\frac{1}{25}$ mm. to 5 mm. thick (no thicker were tried) proved crystalline throughout. The mode of cooling (quick or slow) has no marked influence. Zinc, when heated, loses its ring, and if bent, gives a sound like the "cry" of tin; this fact, with the crystallization, confirms the view that the cry of tin is also due to crystalline structure. Zinc must be heated over 150° C. to show crystallization on corrosion, but the "cry" is perceptible at about 130°, and increases with the temperature. As the tenacity of rolled zinc diminishes with crystallization, and the cry undoubtedly proves incipient crystallization, some important deductions for technical work are indicated. Herr Kalischer finds the ratio of the specific gravity of zinc in crystalline to that in ordinary state is 1·0004 : 1, or an increase for the former of about $\frac{1}{25}$ per cent. The ratio of electric resistance of zinc wire ordinary to crystalline = 1·0302 : 1, or a decrease for the latter of about 3 per cent. Herr Kalischer was unable to prove so fully crystallization in copper, brass, iron, and aluminum, but there were indications of it in some of these.

Cultivation of the Sumac Tree in Italy.

The leaves of the sumac tree are extensively used throughout Europe for tanning purposes, and a large amount of care and attention is expended on the cultivation of the tree in Italy, with considerable profit to the planters. It thrives best, says the *Journal of the Society of Arts*, in southern exposures and hot temperature: its life is from twenty-five to fifty years, according to the conditions of the ground, climate, and culture. It spreads through shoots rising from the bottom of the tree, and it is for this reason that plants two or three years old are selected for transplanting; the price for which they are to be obtained in Italy is 50 centimes per 100.

In preparing a sumac plantation, ditches are dug in the ground about three feet three inches apart, with a breadth and depth of about seventeen inches. In stony ground the plant is set in holes, the shoots are placed at a distance of about three feet from each other, so that every hectare (2½ acres) will have 10,000 trees. In digging the ditches, and more especially the holes, great care is always taken to prevent water remaining in the bottom, and when there are no other means to provide against it the ground is cut transversely. The tree does not flourish in heavy or damp ground, especially when the substratum is impermeable. The plantation is made in December, and then, during the first year, the ground is dug up from four to six times, to preserve it from weeds; manure is but sparingly used. The first digging, which is the deepest, is made in January, and the following in March, May, June, August, and October. In September of the first year the leaves are stripped off with the hands, a little before their falling. It is better, however, not to touch the young bark, but to allow them to fall off naturally. Young trees are sometimes too quickly stripped and damaged, while the crop of leaves will bring, when sold, half the price of that obtained in the following years, in which the sumac ground is dug over more frequently; this is done between December and January, and March and May, when the earth is heaped up round the stem, at the time of the first digging, and then smoothed down. In Sicily they heap up the earth among plants, cultivated as vines, to ventilate it by increasing the surface through hills, to make the running off of water easy, and to facilitate the future transplantings. In the times of the greatest dryness the hills are always leveled. In the second year open spaces left by dead plants are filled up. The harvest is made when the leaves have acquired all their development and consistency and are about to change color; it takes place between July and August, yet before the month of May the leaves of the lower branches grow yellow and fall, and these are also gathered.

Usually, in collecting the crops, secondary branches are cut off, leaving only the trunk of the tree for the new buds. Some planters strip off the leaves by hand in July, and lop the trees in December, but this has the disadvantage of causing the new buds to grow too soft and the leaves too flabby. The branches are either left in bundles on the ground, for two or three days, after which they are carried to the thrashing floor; or they are brought at once to the thrashing-floor, where, after two or three days, according to the season, they are ready for thrashing, and are beaten out with flails, or by means of horses. When beaten with flails, the twig is fairer and less torn, and is sold in bales, but when trodden out by horses, it is crushed into minute particles before it is exposed for sale. When long leaves are required for the bales, the bales are thrashed early in the morning, before the heart of the day has dried up the leaves; but for crushing, the operation must be done in the hottest hours, when the branches already thrashed once are thrashed again. Square linen sheets, six feet square, with a ring in each corner, to pass a rope through, are generally used for carrying the dried branches and leaves to the storehouse. The leaves for bales are carried to the storehouses, and the rest to the mill, which is similar to that used for olives. After being ground, the large lumps are sifted out, and the branches and other impurities thrown away, and the leaves, if any, are ground again. In this work the leaf loses a seventh part of its original weight. The thrashing floor is always kept in good condition, paved and covered with cement or bricks, and the storehouse is generally exposed to the sun. When the sumac becomes old, and its verdure scanty, another crop is cultivated, and for this the vineyard is especially adapted by the previous preparation.

NEW INVENTIONS.

A novel piano sounding-board attachment has been patented by Mr. John G. Seebold, of Montreal, Quebec, Canada. The object of this invention is to provide a sounding-board attachment whereby the quantity and quality of the tones will be augmented and equalized. The invention consists in the combination with a sounding-board of an upright strip furnished with an aperture for each string between the bridge and the hitch-pin block, the strings resting against the upper edge of the apertures.

An improved floor-covering, patented by Messrs. Charles T. Meyer and Victor E. Meyer, of Jersey City, N. J., is made of a fabric covered with a coating of a mixture of ground leather or analogous fiber with mineral fiber and a binding material, such as a hard varnish. The same inventors have patented a floor covering made of a fabric covered with a coating or mixture of ground wood or other vegetable fiber with mineral fiber and a binding material, such as copal or other varnish.

Messrs. George Gregory and George Austin, of Skaneateles, N. Y., have patented an improved road-scraper which can be guided and directed very easily and can be adjusted in its inclination to the road.

An improved mechanical musical instrument has been patented by Mr. Robert W. Pain, of New York city. This invention relates to organs and other wind musical instruments which are mechanically played or controlled by means of one or more strips or sheets of paper or other suitable material perforated to represent the different notes or sounds it is desired to produce, and caused to pass automatically over air ducts or tubes, which, accordingly as they are opened by the perforations in the paper that has a valvular action relatively to said ducts or tubes, cause the reeds or other sounding devices to be played as desired. The invention consists in an arrangement by which the bellows or air reservoir is fed or exhausted, as the case may be, by pumps or feeders placed beneath the action board, the connection from the pumps or feeders to the bellows being preferably made by means of a wind trunk placed in one or both ends of the action board. It also consists of a rotating toggle-shaft connected to the hand crank of the instrument, carrying toggles arranged so as to operate in alternation their respective pumps or feeders, whereby a continuous supply of air is furnished to the air reservoir or bellows.

Mr. Justus H. Ibel, of Marshall, Texas, has recently patented an improvement in bridges which is applicable to both iron and wooden bridges, and not only facilitates the construction, but insures a strong secure structure.

An improved sluice box for use in placer mining and for working tailings from quartz mills has been patented by Mr. Cornelius Driscoll, of Pioche, Nev. The invention consists of a box containing a series of connected steps or platforms, rising one above another in horizontal planes, and provided with transverse stops or riffles, the said box being provided with a partial or complete lining of sheet copper or blankets, according to the use to which it is applied.

An improvement in platform gear for wagons has been patented by Mr. Edward Clark, of New York city. The object of this invention is to provide for trucks and wagons durable and substantial platform gear less expensive than the leaf-spring gearing generally employed; and the invention consists in a platform of novel form, supported on both light and heavy spiral springs.