The Plethysmograph.

This is an apparatus for detecting the variation in the size or dilatation of a body. For example, by its use the dilatation or contraction of the human hand, arm, or other organ can be ascertained. The hand or organ to be tested is placed in a vessel containing a liquid. Connected with the vessel is a test tube, a stylus, rotating cylinder, etc.

At a meeting of the Massachusetts Institute of Technology, Dr. Bowditch proceeded to exhibit this use of the instrument. For this purpose an assistant placed his arm in the apparatus, and the arm was then surrounded by water heated to a blood heat. The connections having been made, Dr. Bowditch waited until the style was describing a line nearly horizontal, and then directed the assistant to multiply twenty-three by seventeen in his head. As soon as he began to think this out, the style rose rapidly and remained up till he had finished the computation, when it fell, thus showing that during this process a certain amount of blood rushed away from the arm. When the style began again, after a minute or two, to trace a line nearly horizontal, the assistant was directed to multiply thirteen by twelve. During this process the style rose, but not nearly as much as in the former case, showing that a smaller quantity of blood left the arm in this case than in the preceding.

Dr. Bowditch then related the story that a friend of Prof. Mosso, who claimed that he could read Greek as easily as he could Italian, had his arm placed in the apparatus by the professor, who presented him successively an Italian and a Greek book to read. While reading Greek the style rose very much more than while reading Italian, and thus the instrument demonstrated that the friend was mistaken in regard to his powers, and that it was much easier for him to read Italian than Greek.

In answer to a question as to whether it could be used to study the effect of digestion, Dr. Bowditch replied that it probably could, but that the fact that digestion is exceedingly slow might present a difficulty.

In answer to some other questions, Dr. Bowditch said that the results shown by the instrument in its present state of advancement are purely qualitative, and that no quantitative determinations have been made; also, that, because we have a certain amount of blood leaving one arm during a mental process, it would not be safe to assume that the same amount left the other arm, or even to assume that the amounts of blood leaving one arm during certain mental processes were proportional to the amounts leaving the whole body.

IMPROVED JOURNAL BOX.

The improved journal box shown in the annexed engraving is especially designed for car axles, and it is claimed by the inventor a very large percentage (40 to 50 per cent) of the power required for drawing cars is saved, the effect being to practically double the propelling power of an engine. A great advantage possessed by this journal box is that it cannot become heated even at the greatest speed attainable. The construction of the box is such as to exclude dirt and dispense with the use of cotton waste. It uses only about one-fourth the quantity of lubricant consumed by the ordinary journal box. It can be readily substituted for the ordinary journal box, and as the most of the sliding friction is converted into rolling friction the journal box is practically indestructible by wear.

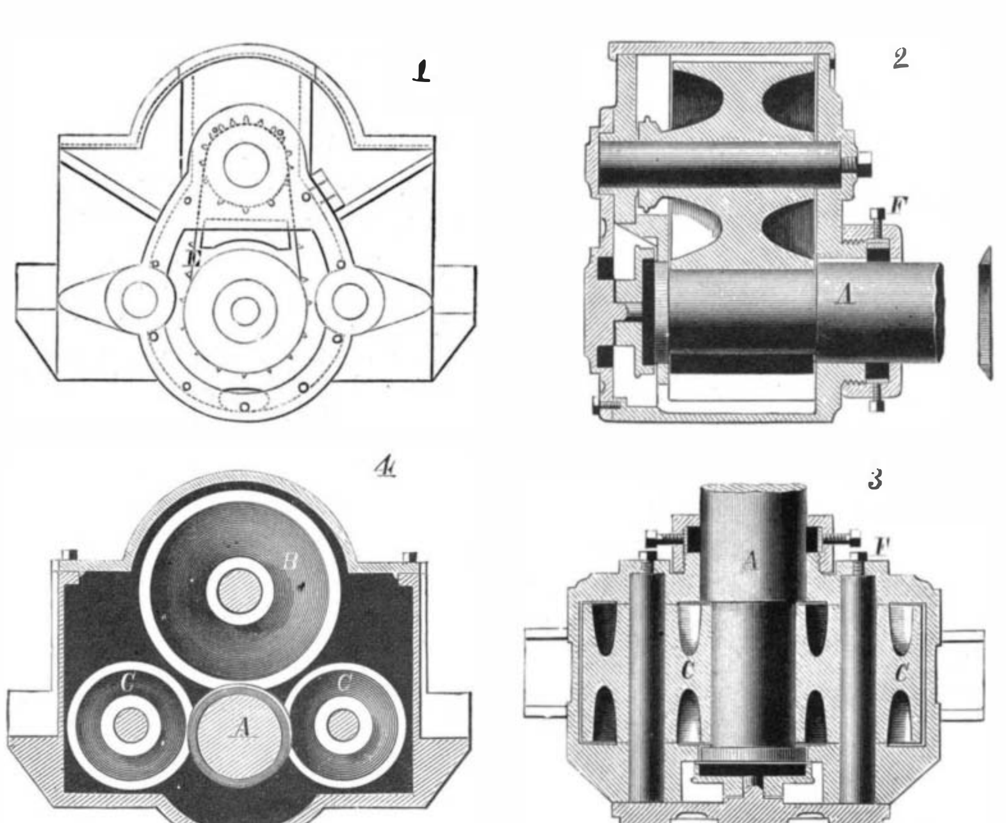
The engraving shows four views of the journal box, Fig. 1 being a side view, Fig. 2 a vertical transverse section, Fig. 3 a horizontal section, and Fig. 4 a vertical section taken at right angles to the car axle.

The lower portion of the box forms a basin containing the lubricant. The box is closed on all sides, and all of the joints are packed to exclude dust. It is divided by a vertical partition forming two chambers, the larger one containing the anti-friction rollers and journal of the axle, the smaller one containing the lubricating devices.

The smaller chamber is made accessible by the removal of the front plate, and the two chambers connect by an opening in the lower part of the partition, so that the lubricant may be at the same level in both and pass freely from one to the other.

The axle extends through a stuffing box, F, in the back plate and through the larger chamber. Friction rollers, B and C C, are placed in the larger chamber, the roller, B, being directly above the axle journal, with the two smaller rollers, C, at opposite sides of the axle, with their axes slightly above the center of the axle. The rollers turn loosely on spindles secured in the boxes. The hub of the upper friction roller projects over the oil chamber, and is toothed, forming a wheel carrying a chain provided with buckets or knobs which carry up the oil to the roller, B, insuring a continuous supply of lubricant to the roller.

This invention was recently patented by Mr. Charles E. Candee, and is owned by the Candee Anti-Friction Journal Bearing Company, 38 Dey street, New York city.



CANDEE'S ANTI-FRICTION JOURNAL BOX.

A NEW FIRE ESCAPE.

Our engraving represents the construction and use of a simple and cheap fire escape, which any one is free to make and use.

It would seem to be particularly well adapted to meet the requirements of travelers, ordinary households, and especially operatives in the upper rooms of factories.

NEW FIRE ESCAPE.

It consists of a maple stick an inch thick, two inches wide, and about fifteen inches long, and having five holes, of the size of the rope used, bored through it, as shown in the engraving. In the lower single hole is the loop for the feet, in which to stand while descending. With the upper end of the rope secured to any fixed object, the stick is held in the left hand, and the rope paid out as rapidly as desired with the right hand. With this device, which should not cost above twenty-five cents, a person may descend from any height with safety. Employers' of operatives in upper stories could well afford to furnish this cheap affair to each employe, and instruct them in its use from slight altitudes.

Importation of Vegetables.

Large importations of potatoes from Europe are a peculiar feature of this year's trade, the receipts at this port amounting at times to 3,000 tons a week. The potatoes cost in Liverpool from $15 to $20 a ton, and are sold in this city at 90 cents to $1 a bushel, domestic potatoes bringing about $1.25 a bushel. Including freight and other expenses, the foreign potatoes cost about $33 a ton. Most of the imported potatoes are raised in England and Scotland, but a few come from Ireland and Germany. Those that come from the last named country are of an inferior quality and do not sell very readily. They are soft, greenish in color, and watery when boiled or baked. The dealers regard the present trade in imported potatoes as being only temporary.

The high price of cabbages—from $15 to $30 a hundred, wholesale—has led to large importations from Germany. They are brought in crates; and some sauerkraut is imported ready pickled in tierces. Turnips, celery, carrots, are also to be seen among the freight of incoming vessels. While we are importing vegetables we are exporting large cargoes of hay, that crop having been a comparative failure in England and Scotland.

Cattle Poisoned by Lead.

The *Kolnische Zeitung* remarks that in some parts of the Enskirchen district there have occurred sudden cases of illness and subsequent deaths of cattle, which have been ascribed to lead poisoning. According to the details given, it would seem that particles of ore frequently find their way into a stream which passes Clausthal, a seat of mineral industry. This metallic deposit is carried over the adjacent fields when inundations occur (which are not unfrequent). After the subsidence of the water, the lead remains on the ground and affects the vegetation. An instance is quoted of some cattle having been poisoned which had been fed upon beetroot grown upon land subject to the conditions described. The presence of lead in minute quantity (one-tenth per cent of the weight of the vegetables) was discovered by chemical analysis upon the surface of the beetroot. It is recommended for agriculturists to be cautious as to the use of vegetables, etc., which have been grown upon land subject to the overflow of any stream likely to receive particles of lead from mineral works on its banks.

Rats in Granaries.

A correspondent of the *Journal d'Agriculture Progressive* suggests a method of getting rid of these pests, that has the advantage of having been most successful in his own case It is to fill their holes with chloride of lime and oxalic acid, when a violent disengagement of chlorine takes place, their holes are filled with this gas, and they are suffocated.

Remarkable Gas Well.

In the spring of 1881, C. A. & D. Cornen were drilling a wildcat well on lot 586, Clarendon, Pa., when, at a depth of a little more than a thousand feet, they encountered a powerful vein of gas. Drilling was continued only about five feet in the gas sand, as it was very difficult to make much progress under the circumstances. All the sand rock cut by the drill was thrown out as soon as loosened from the main body of rock. Chunks the size of hens' eggs were sent up through the derrick as though shot from a cannon. All idea of an oil well was abandoned, and a project was inaugurated for utilizing the enormous amount of gas for light and fuel. A gas company was formed, with sufficient capital stock to make the venture a success. A charter was obtained, and a pipe line laid to Clarendon, a distance of three and a quarter miles. It was the company's intention to continue the line to Warren, six miles further, but winter coming on when the line was completed to Clarendon, work was temporarily suspended until spring. The well is now furnishing fuel to twenty-six drilling wells, three pumping wells, one hundred and twenty-five stoves, two machine shops, and two pump stations. Recently, on a rather cold day, the gauge in the company's office showed a pressure then of seventy-three pounds to the square inch. This gas is dry, containing no oil, gasoline, or water, and has never frozen on any part of the line, although the pipe is, in many places, exposed to the weather. An effort was made at one time to test the pressure, and the stopcock could not be turned more than half-way round, when the indicator would fly as far as possible, showing two hundred pounds to the square inch. It was feared that the casing would be torn to pieces if the investigations were

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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

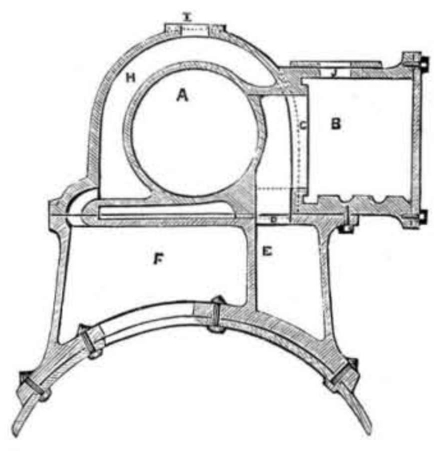


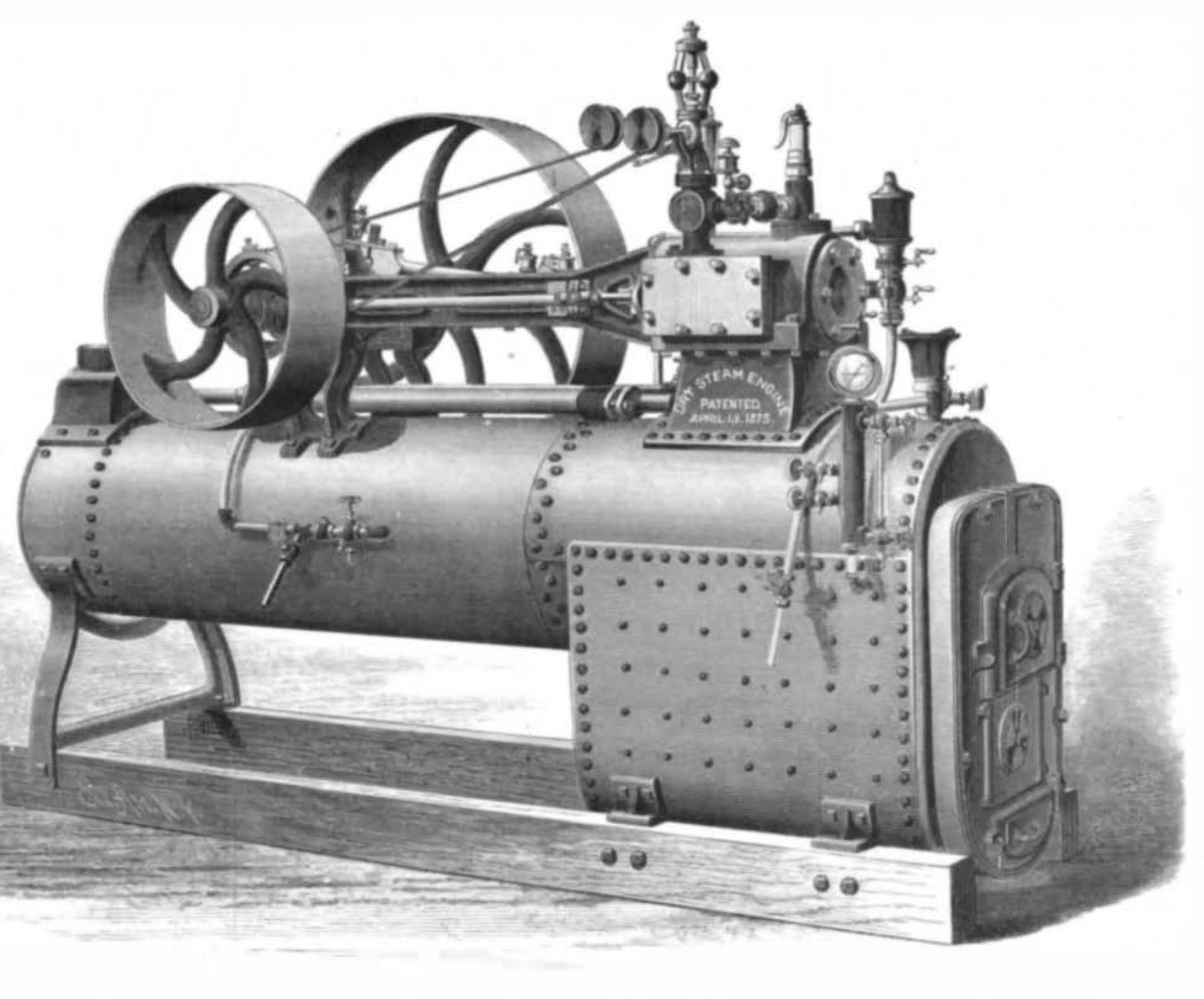
Fig. 1.—Cross Section of Cylinder, Dome, and Exhaust Chamber.

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 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

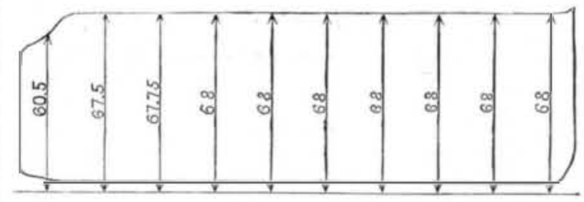


Fig. 4.—Indicator Card—Engine 10 x 18 inches: dry steam; pressure on boiler 70 lb.

hammered iron, the straps being keyed and bolted and well fitted with gun metal boxes. The box in the crank end of

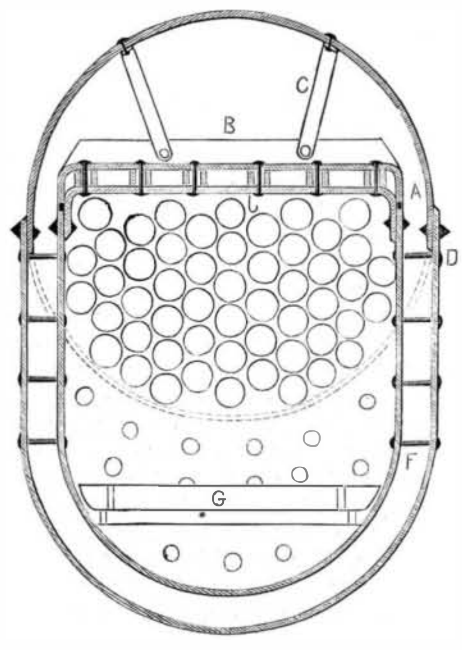


Fig. 2.—Section of Boiler through Firebox, showing Stays to the Crown Sheet.

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.

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

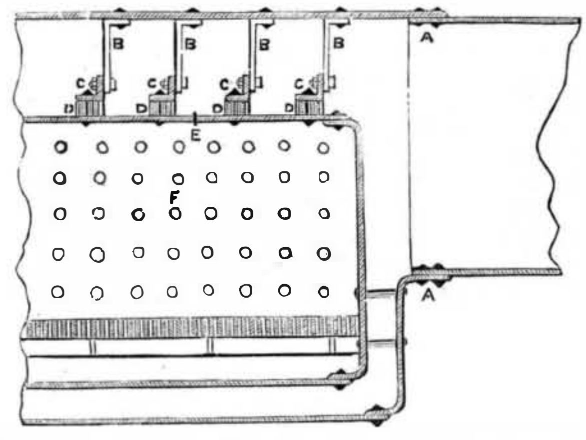


Fig. 3.—Sectional view of Fire Box, showing Stays and Crown Sheet.

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.

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

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