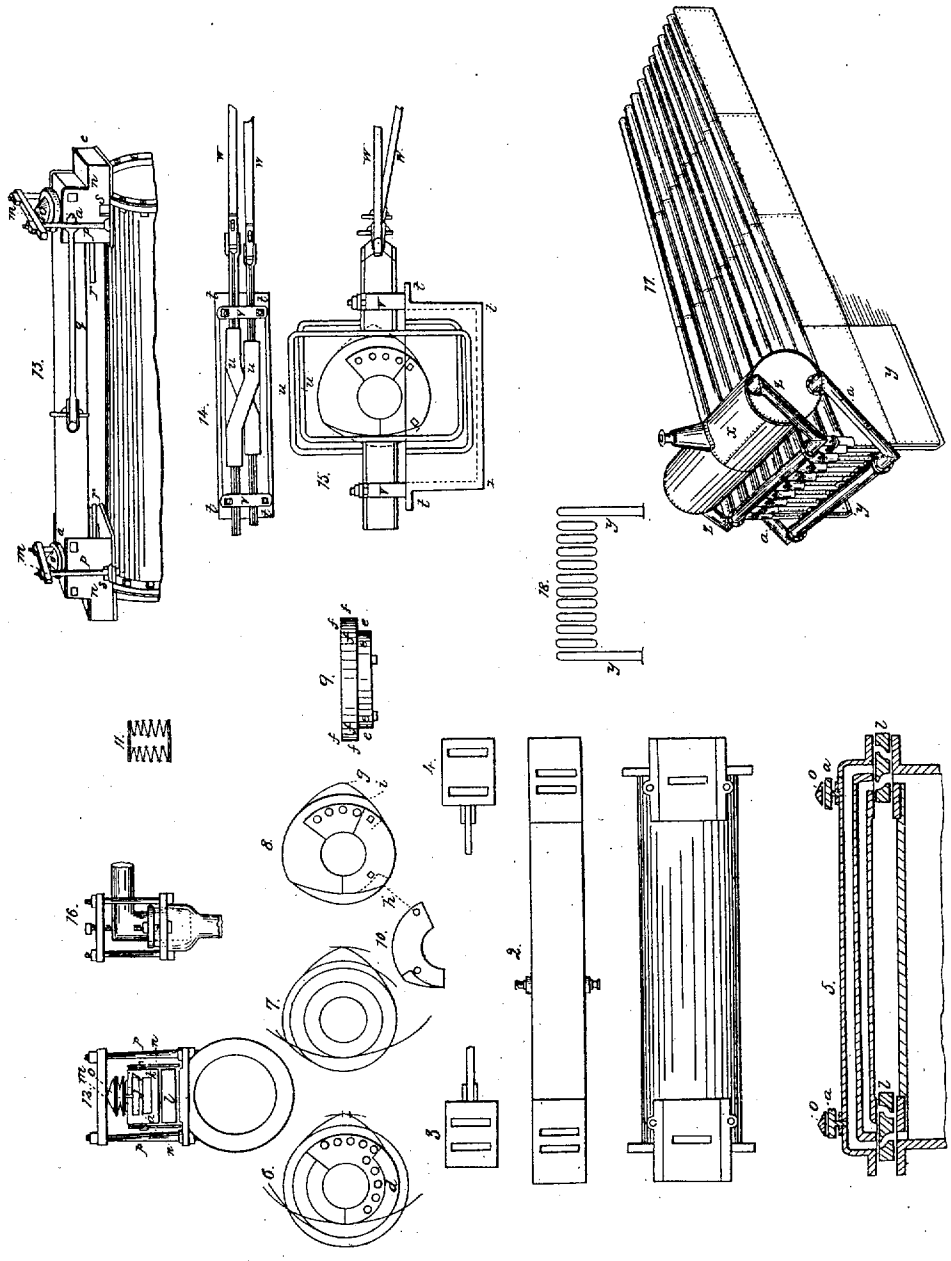
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J. Kirkpatrick.

Steam-Engine Valve-Gear.

Patented May 29, 1835.



AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS.)

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John Kirkpatrick
Letters Patent
N° 525

The Schedule referred to in these Letters Patent and making part of the same containing a description in the words of the said John Kirkpatrick himself of his improvement in the Boilers, Valves and Cams of the Steam Engine

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To All to Whom these Presents shall Come, Be it known that I John Kirkpatrick of the City of Baltimore in the State of Maryland have invented certain new and useful improvements in the Steam Engine, which improvements I denominate the plate valve, the cross yokes, the Double Cam, the reacting drum, the circulating boiler and receiver, and the steam damper, and that the following is a full and exact description of the construction and operation of the said machinery as invented or improved by me, reference being had to the drawing which accompanies and makes a part of this description. The plate valve as the name implies is a flat plate. it has two openings through it obliquely one for the admission of steam from the steam passage of the side pipe into the cylinder, the other for the escape of steam from the cylinder into the escape passage of the side pipe, these operations are alternately performed as the valves at each end of the cylinder are moved by the double cam to be presently described, which likewise sets the space of each valve over the openings when required to shut off during stroke. The moveable projection plate although used and described is not a part of this patent being formerly patented by me in the shifting Cam. N° 1 in the accompanying drawing represents a cylinder with two faces suitable for plate valves. N° 2. is a view of a side pipe suitable to N° 1. N° 3. is a view of that side of a plate valve next to the cylinder and suitable to N°s 1 & 2. N° 4. is a view of the side of a plate valve next the side pipe and suitable to N°s 1 & 2. N° 5 is a longitudinal section of the side pipe, valves and a portion of the Cylinder corresponding to the above, also the drums &c &c. each of which is composed of two plates of steel or other metal rivetted through a ring or hoop

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on the outer edges and connected with the steam passage of the side pipe f. No 5 the self balancing principle being applied without a piston by the elasticity of the plate, greater elasticity can be obtained by making the sides of the drum in the form shown at Nos 11 & 12, the outer edge may be screwed firm by the inner ones turned and ground to fit steam tight, or put together with joints; k, is the exhaust passage of the side pipe. No 6. is a view of that side of the cam used in exhausting without the half stroke plate, the dark part represents the recess in which the plate slides. The projection b No 10. moves in the space d. No. 6. No 7 represents that side of the cam which alternately opens the valves at each end of the cylinder for the admission of steam. No 8 is a side view of the whole cam with the half stroke plate at each end which is half the thickness of the exhaust of the cam, the projection being of the same thickness reaches entirely across that side of the cam. The line left at No 6 and No 7. compared with No 9 sufficiently illustrate the formation of No 8. - e.e. No 9. is an edge view of No 6. and f.f. No 9 is an edge view of No. 7. No 9 is an edge view of the whole double cam No 8. which requires 2 yokes as shown at No 14. & 15. they cross each other and are acted upon alternately by the points of each side of the double cam, the point g No 8. opens to let on steam, the point h, shuts off during the stroke, and the point i, exhausts, the valve then remains stationary, till the other performs similar operations, when it in turn remains stationary, and the first commences as before, and so they continue onward alternately changing operation. No 10 Is a cross section of the Cylinder side pipe valves and guides, f. is the side passage. k, the exhaust passage. b, the valve, m. the cross bar. n. the guides. o. the conical plate which is pressed against the drum by the action of the screws on the columns p. p. through the cross bar m. by which means the degree of pressure on the valve is regulated. No 13 Is a perspective view of No 6. with the necessary appurtenances attached. q, is one of the two rods that hold the weight of the side pipe when vertical and prevent it from moving longitudinally when horizontal. r. r. are the valve rods and S. S. the holes in the guiding plate through which the movements of the valve are observed when at work, all other parts of 13. are explained by the corresponding parts of No 12. and No 6. In No 14 & 15. b, b, b, b, c, c, c, c, express

represent the four corners of the slide box upon which the two pillow blocks O. O. are cast solid; W W. are the two Cam yokes and w w. the cam rods. No. 16 is a view of an elbow pipe and stuffing box that may sometimes be necessary, to prevent the side pipe from pressing too forcibly against the guides. Here the width of the opening added to the difference between the width of the opening and that of the valve space (which covers the opening in the cylinder when shut off during the stroke) is the whole distance through which the valve is required to move; in opening the whole distance is passed through at one move, but in returning one half the distance is first passed through to shut off during the stroke and the remainder at proper time to exhaust. This motion is particularly applicable to one modification for the condensing engine of the self balancing slide valve formerly patented by me. No. 17 and 18. are different views of a boiler which I call a circulating Boiler and which may be composed of one or more regular parallelo or other former longitudinal vessels, exposing to the action of the fire the whole surface except the ends which on account of convenience in making may be cast, the forward end having two pipes cast on it, one at the top for the steam to pass out at, and one at the bottom for the water to pass in at, the back head has one hole cast in it at the bottom into which a scraper or brush can be passed to clean out the boiler. No. 17 is a perspective view of a large circulating Boiler comprised of ten small ones, connected with a circulating receiver N. No. 18. is a transverse section of No. 17. at the furnace and under the receiver; the letters of designation are common to both. J. J. represents the legs of the outside parallels which form the sides of the furnace and are necessary only on board of boats to avoid weight, the intermediate ones form the top and have sufficient space left between them for the passage of flame which is conducted on to the chimney at the back end. The size of the receiver should be of such proportion to that of the Boilers and of the surface they expose that the water which fills the Boilers only when cold will fill about one half the receiver in addition when at a proper temperature to generate a continual supply of steam for the Engines. Those Boilers having the greatest exposure of surface in proportion to the quantity of water they contain and being subjected to the most

most intense heat, will require the capacity of the receiver to be greatest in proportion to that of the boiler. The Boilers being all connected at the top of the pipes x. x. with the top of the receiver R. the steam passes freely into the receiver taking with it a portion of water which immediately settles down and passes back in to boilers by the pipes a, a, which connect the lower part of the receiver with the lower part of each of the boilers and preserves an equilibrium between the boilers and receiver, equalling the difference in gravity, between the ascending column of steam and water and the descending column of water only added to the difference in altitude between the boilers and receiver. the former difference preserves a continual circulation between the boilers and receiver while generating steam, and the latter insures a supply to each of the Boilers, while there is any in the receiver which should always be about half full when the steam is at a proper height. The stay bolts which are to pass through parallels of this boiler should be of sufficient strength to bear twice the pressure to be applied without straining (which may be tried by a hydraulic apparatus) they ought to be put in without thimbles before the sides of the parallel are rivetted at the edges, having shoulders to receive the sheet, they should be small and numerous as by that means the sheet may be thinner and the rivetting more easily done cold, besides the advantage of water passing more readily through a thin sheet, it is less apt to blister than a thick one, and as nearly the whole surface is exposed to the fire, there is little danger of cast but if thimbles are used they should have holes in them to admit the water to circulate freely round the bolt. The same rules should govern the builder respecting the strength of material and exposure of surface in this as in other Boilers where the same pressure is applied and the same kind of fuel made use of. Such boilers constructed for burning coal may have the receiver made as represented in the accompanying drawings. But for long Boilers calculated to burn wood as in board of boats the receiver can be made about the length of the Boilers and set longitudinally to suit that arrangement of engine most common in high pressure boats the steam being taken out of the back end. The flame may allowed to return under the

receiver after a sufficient supply of water has been forced into it by the action of the fire upon the water in the Boilers, until then the flame must be let into the chimney by means of a seperate flue without coming in contact with the receiver, which must always be done when the water is low in the receiver from any cause, it is only in land engines that much benefit can be expected from using the flame returning under the receiver, the weight of a seperate flue and casing being too great for Boats. In setting such Boilers it is necessary to place the end connected with the receiver highest that the steam may pass from the boilers into the receiver as fast as it is generated. The casing or brick work should come close to the bottom of the boilers to confine the flame principally between them the top to be covered with brick work or the upper part of the Boilers may be so formed as to meet, the boilers are cleaned out at an opening in the lower part of the back head, which end being the lowest is favourably situated for that purpose by opening one at a time and pumping water into the receiver, a current will be sent through each at such opening to assist in cleaning. The front of the ash pits is made to shut close and a pipe connected with the lower part of the escape steam pipe leads into it when the engine is stopped and steam escaping, the fire may then be damped or even extinguished by merely shutting the ash pit doors. These boilers afford various advantages in the extent of surface exposed, the small quantity of water contained the facility with which they can be constructed, repaired or transported from place to place, the small space which they occupy and the high pressure which they will bear compared with the low pressure boilers now in use. Boilers have been to some extent constructed with a fire front connected with the main boiler allowing the water there from to flow in front of the fire, & the boiler has been fed by means of a force pump passing water through the fire front, but by the arrangement adopted by me each of the combined parallel Boilers becomes a generator, the whole surface of which may be exposed to the action of the fire as completely as are the tubes of tubular boilers, whilst by attaching a receiver for the steam, and connecting therewith and with the Boilers two pipes open-

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ating upon the principle herein explained the steam and water are effectually seperated And the parallel boilers are each kept full of water which Continually flows into them through the lower pipes while their inclined positions facilitates their operation. What I claim in this part is forming a boiler by the combination of any number of what I have called parallel boilers which are placed in an inclined position to promote the passage of steam out, and the flow of water into them and the placing above them a receiver connected by means of one common steam tube with the upper edges of the parallel boilers and by means of a second or water tube with their lower edges for the purposes herein set forth. I also claim the manner of connecting the waste steam pipe with the ash pit for the purpose of damping or extinguishing the fire varying the particular arrangement of the respective parts in any way which I may deem proper, whilst I do not depart from the general principles or mode of operation. What I claim in the valve and cam herein described is the particular arrangement of the openings of the valve as shewn at fig 5. and the parts connected with it. the particular construction of the double cam with its manner of action through the medium of the projections herein described and the adjustment by which it is adapted to the purpose intended, the reacting drum, applied upon the principles and for the purpose described, together with such modifications and variations in the form and arrangement of these parts which are substantially in accordance with the general principle

John Kirkpatrick

Witnesses
Sam Stettinius
R R Burr

(Patented May 29. 1835) (2780 Words)

See Additional Improvements No. 1. granted 6th day of October 1837 — Vol. 1. page 1. additional Improvement. —

(Drawing)