ON AN IMPROVED SAFETY VALVE.

The growing tendency to use steam of higher pressure, and the greater care which this involves, have led engineers of late years to direct more particular attention to the design and construction of steam boilers, and also to their fittings; and amongst the latter the Safety Valve has received much consideration. Although there may be a difference of opinion as to the proportion which the working pressure of a boiler should bear to its absolute strength, it will doubtless be admitted, that the greater the certainty of a safety valve opening at the required pressure, and the greater its range of lift under a given excess of pressure, the less will be the excess of strength required. If a perfect safety valve could be made, that is, one which would absolutely prevent the boiler to which it was applied from being subjected to a higher pressure than that to which the valve was adjusted, it would of course be conducive in a high degree both to the safety and durability of such boiler.

The writer believes that the arrangement of safety valve now submitted to the meeting, shown in Plates 48 and 49, goes far to realise these advantages, the only rubbing parts being those upon the valves themselves in their seatings; and the small amount of friction thus occasioned may be entirely avoided by the substitution of spherical valves, if thought desirable. In addition to this, the range of lift for blowing off, owing to the non-intervention of levers between the valve and the spring by which it is loaded, and also to the dimensions of the spring itself, is about three times as great, under the same excess of steam pressure, as in the ordinary arrangement with lever and spring balance.

Fig. 1, Plate 48, is a vertical section, Fig. 2 a plan, and Fig. 3 a transverse section of the valve. AA are two brass pillars, bolted upon the manhole cover B, and bored out at the upper ends to serve as seatings for the conical valves CC in the ordinary manner. The valves are loaded by the cross bar D, which is elongated at the end E, to form a handle, to enable the engineman to ascertain the working condition of the valves and the approximate pressure of the steam. To this bar is attached, at a point mid-way between the valves (when these are of equal size), and rather lower than the points which press upon them, the main spring F, which the writer prefers of the helical form, as shown. The spring is made of sufficient strength to resist the pressure upon both valves, and the pressure is regulated by the nuts G and the bridle H, the latter being made of such a length that the shoulder upon it shall be screwed home when the maximum load is put upon the valve. To provide against the valves being blown away in the event of the spring breaking, the lower part of the cross bar D is passed through a slot in the guard I, which in this arrangement is pivoted into the tops of the main pillars, and the shoulder upon the bridle H, Fig. 6, being unable to pass through the slot, prevents the valves being blown away. To compensate for the very slight difference that may arise in some cases (in the valves of large steam boats for instance), between the distance of the centres of the valves and the distance of the points of the cross bar, owing to the greater expansion of the former, the writer proposes to make one of the points K upon the cross bar loose; this is not necessary however, where the dimensions are small.

A similar arrangement may be adopted with the spring sunk in a well or recess L in the manhole cover, as shown in Figs. 4 and 5, so as to be more out of the way; and the chance of failure may be provided against by a cover plate corresponding to the guard I in Fig. 1. It is evident that under any form the valves constructed upon this principle cannot be easily tampered with; and a brass funnel may be placed over them in the ordinary manner.

The valves being equally loaded and of equal size will be bodily and simultaneously lifted together with the cross bar D when the steam pressure exceeds the proper limit, and the spring will be elongated through a range equal to the lift of the valves, and no more; so that, except when the engineman is testing the action of the valves, there is no movement in the joints of the apparatus, and therefore no friction.

A spring of $\frac{5}{8}$ inch round steel, and about 7 coils, is sufficiently strong to load two 3 inch valves to 80 lbs. pressure per square inch; and in order to load them to this extent, it will have to be stretched about $1\frac{3}{4}$ inch, or ·218 inch for each successive increase of 10 lbs. pressure per square inch.

Figs. 6 to 9, Plate 49, show a pillar arrangement, consisting of one entire casting B, which answers the part of a manhole cover. The steam passes up to the valves through the annular space between the well L and the outer casing. The spring F is lengthened to compensate for its reduced diameter, and is adjusted at the top in the same manner as in the plans previously described. This arrangement may be modified to suit the tops of square high fireboxes, by allowing the well L to project downwards into the boiler, in the same manner as shown in Fig. 4.

Figs. 10 and 11 show the application of the volute spring, which is placed in a shallow well L in the manhole cover and adjusted by the four nuts GG, which force down the small cover plate I, and so compress the spring until the requisite pressure is obtained; packings are then fitted between the cover plate and the manhole lid, to prevent any extra pressure being applied.

The spring may also be placed above the cross bar D, but the writer prefers to have it below, wherever practicable.

Mr. Ramsbottom exhibited a model, half-size, of a pair of safety valves with the spring between them, similar to those that he had at work, on the plan shown in Fig. 1.

The Chairman asked whether many of the new valves were at work, and with what results.

Mr. Ramsbottom answered that he had several of them at work, and they had proved quite satisfactory; they were found to be very sensitive, having such freedom of action as to get into a state of vibration producing in some cases a musical note when at the point of blowing off; and they allowed the steam to blow off more freely than other safety valves, under a given excess of pressure. The arrangement of the two valves under one lever was the same as in Mr. Fenton's Safety Valve, but the object had been to increase the lift of the valves, making it equal to the full extension of the spring, and also to dispense with the spring balances. The point of attachment of the spring was rather below the level of the two points bearing on the valves, so that in the event of one valve lifting before the other it was overloaded, the other being proportionately relieved; this tended to secure their simultaneous action.

Mr. H. Wright enquired whether any graduated scale was attached to the spring to indicate the pressure, as the ordinary spring balance was on this plan dispensed with.

Mr. Ramsbottom replied that there had not been any scale attached; the spring was adjusted originally to the maximum pressure intended, by measuring the amount of elongation under a given load, and in this way it was found it could be regulated by the adjusting screw to within 2 or 3 per cent. of the desired pressure. The valves were tested previous to being used, by comparing them with a pressure gauge attached to the same boiler.

Mr. Fenton observed that he had seen the new valve at work, and it appeared very satisfactory; the increased range of lift of the valves gave great freedom for the discharge of the steam, and prevented the pressure from rising.

The Chairman proposed a vote of thanks to Mr. Ramsbottom for his paper, which was passed.

The Chairman, in vacating the chair, said he could not relinquish his office of President without expressing the great satisfaction he felt at the progress the Institution had made, and the gratification that he had in looking back upon the number of valuable and interesting communications that had been laid before the several meetings at which he had presided during the last two years; and he trusted that the same cordial support which he had invariably received from the Members would be extended to his successor, and that equally important and useful papers would be forthcoming at the meetings of the present year.

The Meeting then terminated, and after the meeting, Mr. H. Woodhouse, of Stafford, exhibited a model, half-size, of an improved Switch.

In the evening, a number of the Members and their friends dined together, according to the annual custom, in celebration of the Ninth Anniversary of the Institution.

INSTITUTION OF MECHANICAL ENGINEERS.

BALANCE SHEET.

For the year ending 31*st December*, 1855.

Dr.	£	s.	d.
To Balance 31st December, 1854.	266	1	0
„ Subscriptions from 15 Members in arrear	45	0	0
„ ditto from 162 Members for 1855	486	0	0
„ ditto from 2 Graduates for 1855	4	0	0
„ ditto from 7 new Members	35	0	0
„ ditto from 4 Members in advance for 1856	12	0	0
„ Sale of extra Reports	33	4	3
„ Interest from Bank	5	9	7
	£886	14	10

Cr.	£	s.	d.
By Printing and Engraving Reports of Proceedings	105	5	9
„ Stationery and Printing	16	9	9
„ Office Expenses and Petty Disbursements	26	11	0
„ Furniture and Fittings	8	14	10
„ Travelling Expenses	7	19	2
„ Parcels	3	10	8
„ Postages	18	17	7
„ Salary	350	0	0
„ Rent and Taxes	113	15	6
„ Balance 31st December, 1855	235	10	7
	£886	14	10

(Signed) JOHN E. CLIFT, SAMPSON LLOYD, } Finance Committee.

19*th January*, 1856.

SUBJECTS FOR PAPERS.

STEAM ENGINE BOILERS, particulars of construction—form of heating surface—relative value of radiant surface in effect and economy—cost—consumption of fuel—evaporation of water—pressure of steam—density and heat of steam—superheated steam—steam gauges, high pressure and low pressure—explosion of boilers, and means of prevention—effects of heat on the metal of boilers, low pressure and high pressure—incrustation of boilers, and means of prevention—evaporative power and economy of different kinds of fuel, coal, wood, charcoal, peat, patent coal, and coke—moveable grates, and smoke-consuming apparatus, facts to show the best plan, and results of working.

STEAM ENGINES, expansive force of steam, and best means of using it—power obtained by various plans—comparison of double and single cylinder engines—combined engines—comparative advantages of direct-acting and beam engines—engines for manufacturing purposes—horizontal and vertical—condensing and non-condensing—governors—valves, bearings, &c.—indicator figures from engines, with details of useful effects, consumption of fuel, &c.—contributions of indicator figures for reference in the Institution.

PUMPING ENGINES, particulars of various constructions—size of cylinder and degree of expansion—strokes per minute, and horse-power—number and size of pumps, and strokes per minute—comparison of double-acting and single-acting pumping engines—construction of pumps—plunger pumps—bucket pumps—particular details of different valves—application of pumps—fen-draining engines—comparative advantages of scoop wheels and centrifugal pumps, lifting trough, &c.

BLAST ENGINES, best kind of engine—size of cylinder, strokes per minute, and horse-power—details of boilers—size of blowing cylinder, and strokes per minute—pressure, and means of regulating the blast—improvements in blast cylinders—rotary blowing machines—indicator diagrams from air main and steam cylinder.

MARINE ENGINES, power of engines in proportion to tonnage—different constructions of engines—dynamical effect compared with indicator figures—comparative economy and durability of different boilers, tubular boilers, flat flue boilers, &c.—weight of machinery and boilers—kind of paddle wheels—speed obtained in British war steamers, in British merchant steamers, and in Foreign ditto, with particulars of the construction of engines with paddle wheels, &c.—screw propellers, particulars of different kinds, improvements in form and position, number of arms, material, means for unshipping, bearings, horse-power applied, speed obtained, section of vessel—iron and wood ships, details of construction, lines, tonnage, cost, &c.

ROTARY ENGINES, particulars of construction and practical application—details of results of working.

LOCOMOTIVE ENGINES, express, passenger, and luggage engines—particulars of construction, details of experiments, and results of working—speed of engines, cost, power, weight, steadiness—consumption of fuel—use of coal—consumption of smoke—heating surface, length and diameter of tubes—experiments on size of tubes and blast pipe—comparative expense of working and repairing—best make of pistons, valve gear, expansion gear, &c.

AGRICULTURAL ENGINES, details of construction and results of working—duty obtained—application of machinery to agricultural purposes.

CALORIC ENGINES, and Engines worked by Gas, Gun-cotton, or other explosive compounds—comparative consumption per horse-power per hour.

ELECTRO-MAGNETIC ENGINES, particulars and results.

WATER-WHEELS, particulars of construction and dimensions—form and depth of buckets—head of water, velocity, per-centage of power obtained—turbines, construction and practical application, power obtained, comparative effect and economy.

WIND MILLS, particulars of construction—number of sails, surface and form of sails—velocity, and power obtained—average number of days' work per annum.

CORN MILLS, particulars of improvements—power employed—application of steam power—results of working with an air blast and small stones—advantages of regularity of motion.

SUGAR MILLS, particulars of construction and working—results of the application of the hydraulic press in place of rolls.

SAW MILLS, particulars of construction—mode of driving—power employed—particulars of work done—best speeds for vertical and circular saws—form of saw teeth—saw mills for cutting ship timbers—veneer saws.

OIL MILLS, facts relating to the construction and working, by stampers and by pressure.

COTTON MILLS, information respecting the construction and arrangement of the machinery—power employed, and application of power—cotton presses, mode of construction and working, power employed—improvements in spinning and carding machinery, &c.

MACHINERY for manufacturing Flax, both in the natural length of staple and when cut.

ROLLING MILLS, improvements in machinery for making iron and steel—mode of applying power—steam hammers—piling of iron—plates—fancy sections—arrangement of rolls.

STAMPING AND COINING MACHINERY, particulars of improvements, &c.

PAPER-MAKING AND PAPER-CUTTING MACHINES, ditto ditto

PRINTING MACHINES, ditto ditto

CALICO-PRINTING MACHINERY, ditto ditto

WATER PUMPS, facts relating to the best construction, means of working, and application—best forms—velocity of piston—construction of valves.

AIR PUMPS, ditto ditto ditto

Hydraulic Presses, facts relating to the best construction, means of working, and application.

Rotary and Centrifugal Pumps,	ditto	ditto	ditto
Fire Engines,	ditto	ditto	ditto
Sluices and Sluice Cocks,	ditto	ditto	ditto
Cranes,	ditto	ditto	ditto
Steam Cranes, Hydraulic Cranes, Pneumatic Cranes,			ditto
Lifts for raising Trucks, &c.	ditto	ditto	ditto

Lathes, Planing, Boring, and Slotting Machines, &c., particulars of improvements—description of new self-acting tools.

Wood-working Machines, morticing, planing, &c.

Toothed Wheels, best construction and form of teeth—results of working—power transmitted—method of moulding.

Driving Belts and Straps, best make and material, leather, rope, wire, gutta percha, &c.—comparative durability, and results of working—power communicated by certain sizes.

Dynamometers, pressure gauges, governors, construction and working.

Strength of Materials—facts relating to experiments on ditto, and general details of the proof of girders, &c.—girders of cast and wrought iron, particulars of different constructions, and experiments on them—best forms and proportions of girders for different purposes—best mixture of metal—mixtures of wrought iron with cast.

Durability of Timber of various kinds—best plans for seasoning timber and cordage—results of Kyan's, Payne's, Bethell's, and Burnett's processes, &c.—comparative durability of timber in different situations.

Corrosion of Metals by salt and fresh water, and by the atmosphere, &c.—facts relating to corrosion, and best means of prevention—means of keeping ships' bottoms clean—galvanic action, nature, and preventives.

Alloys of Metals—facts relating to different alloys.

Friction of various Bodies—facts relating to friction under ordinary circumstances—friction of iron, brass, copper, tin, wood, &c.—proportion of weight to rubbing surface—best forms of journals, and construction of axle boxes, &c.—lubrication, best materials, and means of application, and results of practical trials—best plans for oil tests.

Iron Roofs, particulars of construction for different purposes—durability in various climates and situations—comparative cost, weight, and durability—roofs for slips of cast-iron, wrought-iron, timber, &c., best construction, form, and material—details of large roofs, and cost.

Fire-proof Buildings, particulars of construction—most efficient plan—results of trials.

Chimney Stacks of large size—particulars, form, force of draught, mode of building, cheapest construction, &c.

Bricks, manufacture and durability—hollow bricks, fire bricks, and fire clay—perforated bricks, cost of manufacture, and advantages—machines for brick making.

GAS WORKS—best form, size, and material for retorts—construction of retort ovens—quantity and quality of gas from different coals—oil gas, water gas, &c.—improvements in purifiers, condensers, and gas-holders—wet and dry gas-meters—pressure of gas, gas-exhauster—gas-pipes, strength and durability, and construction of joints—proportionate diameter and length of gas-mains, and velocity of the passage of gas—experiments on ditto, and on the friction of gas in mains, and loss of pressure.

WATER WORKS—facts relating to water works—application of power, and economy of working—proportionate diameter and length of pipes—experiments on the discharge of water from pipes, and friction through pipes—strength and durability of pipes, and construction of joints—relative advantages of stand pipes and air vessels.

WELL SINKING, AND ARTESIAN WELLS, facts relating to.

COFFER DAMS AND PILING, facts relating to the construction.

PIERS, fixed and floating, and Pontoons, ditto ditto

PILE-DRIVING APPARATUS, particulars of improvements—use of steam power—Pott's apparatus—the compressed air system.

DREDGING MACHINES, particulars of improvements—application of dredging machines—power required and work done.

DIVING BELLS AND DIVING DRESSES, facts relating to the best construction.

CAST IRON AND WROUGHT IRON LIGHTHOUSES, ditto ditto

MINING OPERATIONS, facts relating to mining—means of ventilating mines, use of steam jet and ventilating machinery—mode of raising materials—mode of breaking, pulverising, and sifting various descriptions of ores.

BLASTING, facts relating to blasting under water, and blasting generally—use of gun-cotton, &c.—effects produced by large and small charges of powder.

BLAST FURNACES—consumption of fuel in different kinds—burden, make, and quality of metal—pressure of blast—horse-power required—economy of working—improvements in manufacture of iron—comparative results of hot and cold blast.

PUDDLING FURNACES, best forms and construction—worked with coal, charcoal, &c.

HEATING FURNACES, best construction—consumption of fuel, &c.

CONVERTING FURNACES—manufacture of steel—casehardening, &c.

SMITHS' FORGES, best construction—size and material—power of blast—hot blast, &c.—construction of tuyeres.

SMITHS' FANS, and FANS generally, best construction, form of blades, &c., with facts relating to the amount of power employed and the per-centage of effect produced.

COKE AND CHARCOAL, particulars of the best mode of making, and construction of ovens, &c.

RAILWAYS—construction of permanent way—section of rails, and mode of manufacture—experiments on rails, deflection, deterioration, and comparative durability—material and form of sleepers, size, and distances—improvements in chairs, keys, and joint fastenings—permanent way for hot climates.

SWITCHES and CROSSINGS, particulars of improvements, and results of working—advantages obtained by steeling points and tongues.

TURN-TABLES, particulars of various constructions and improvements.

SIGNALS for Stations and Trains, and self-acting signals.

BREAKS for Carriages and Waggons, best construction.

BUFFERS for Carriages, &c., and Station Buffers—different construction and materials.

SPRINGS for Carriages, &c., buffing and bearing springs—particulars of different constructions and materials, and results of working.

RAILWAY WHEELS, wrought iron, cast iron, and wood—particulars of different constructions, and results of working—comparative expense and durability—wrought iron and steel tires, comparative economy and results of working—solid wrought iron wheels.

RAILWAY AXLES, best description, form, material, and mode of manufacture—comparison of solid and hollow axles.

The Council invite communications from the Members and their friends on the preceding subjects, and on any Engineering subjects that will be useful and interesting to the Institution;—also presentations of Engineering drawings, models, and books for the library of the Institution.

The communications should be written on foolscap paper, on one side only of each page, leaving a clear margin on the left side for binding, and they should be written in the third person. The drawings illustrating the communication should be on so large a scale as to be clearly visible to the meeting at the time of reading the communication, or enlarged diagrams should be sent for the illustration of any particular portions.

Fig. 1. *Vertical Section.*

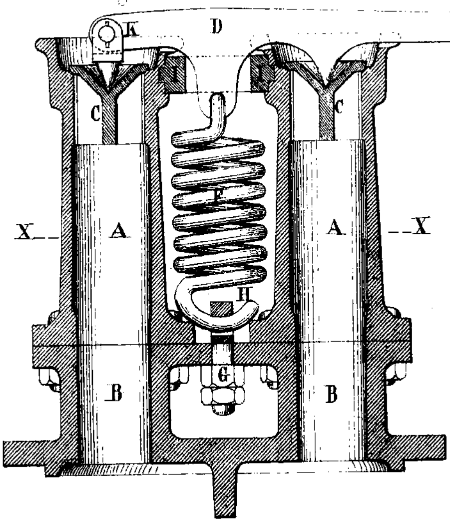


Fig. 3. *Section at XX.*

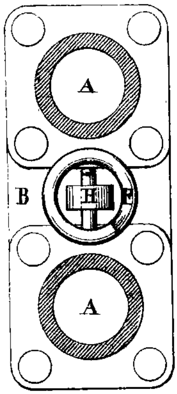


Fig. 2. *Plan.*

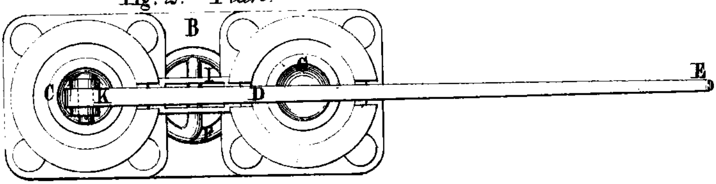


Fig. 4. *Vertical Section.*

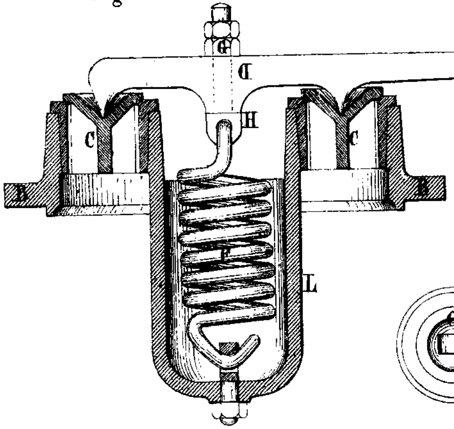
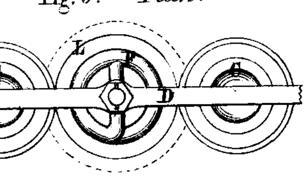


Fig. 5. *Plan.*



Scale 1/8th. 0 1 2 3 4 5 6 7 8 9 10 11 12 *Inches.*

(Proceedings Inst. M.E. 1856. Page 37.)

SAFETY VALVE.

Fig. 6. *Vertical Section.*

Fig. 8. *Section at YY.*

Fig 9. *Section at ZZ.*

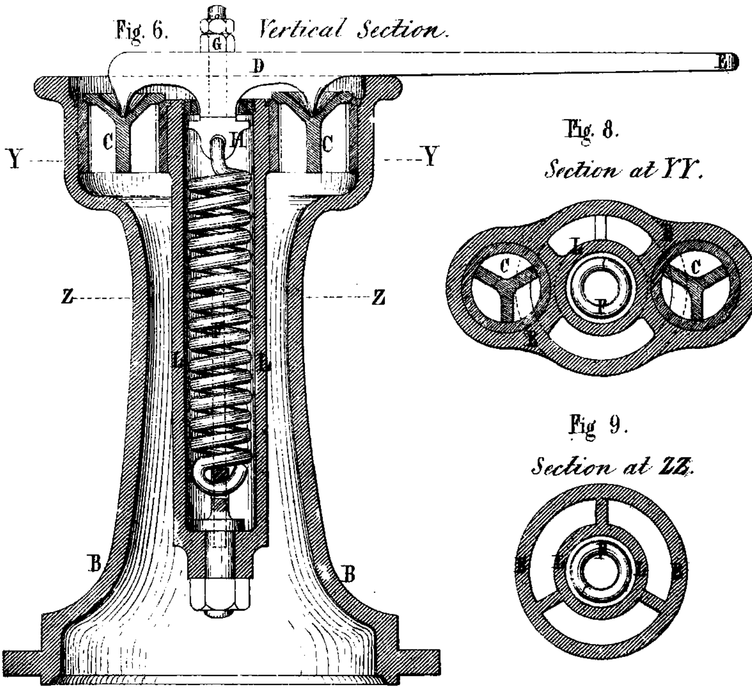


Fig. 7. *Plan.*

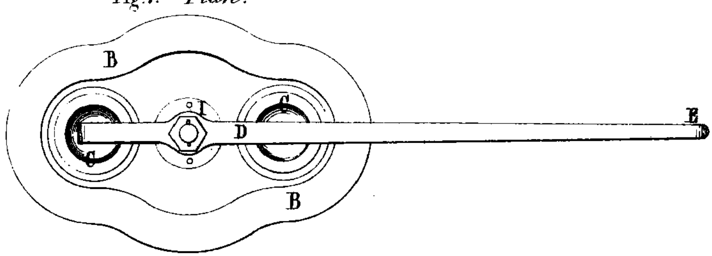
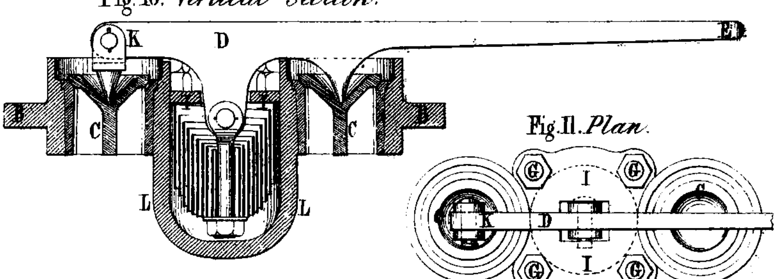


Fig. 10. *Vertical Section.*

Fig. 11. *Plan.*



Scale 1/8th. 0 1 2 3 4 5 6 7 8 9 10 11 12 *Inches.*

(Proceedings Inst. M. E. 1856. Page 71.)