

www.e-rara.ch

Historical and descriptive anecdotes of steam-engines, and of their inventors and improvers

Stuart, R.

London, 1829

ETH-Bibliothek Zürich

Shelf Mark: Rar 1404

Persistent Link: <https://doi.org/10.3931/e-rara-16888>

Chapter twenty-second.

www.e-rara.ch

Die Plattform e-rara.ch macht die in Schweizer Bibliotheken vorhandenen Drucke online verfügbar. Das Spektrum reicht von Büchern über Karten bis zu illustrierten Materialien – von den Anfängen des Buchdrucks bis ins 20. Jahrhundert.

e-rara.ch provides online access to rare books available in Swiss libraries. The holdings extend from books and maps to illustrated material – from the beginnings of printing to the 20th century.

e-rara.ch met en ligne des reproductions numériques d'imprimés conservés dans les bibliothèques de Suisse. L'éventail va des livres aux documents iconographiques en passant par les cartes – des débuts de l'imprimerie jusqu'au 20e siècle.

e-rara.ch mette a disposizione in rete le edizioni antiche conservate nelle biblioteche svizzere. La collezione comprende libri, carte geografiche e materiale illustrato che risalgono agli inizi della tipografia fino ad arrivare al XX secolo.

Nutzungsbedingungen Dieses Digitalisat kann kostenfrei heruntergeladen werden. Die Lizenzierungsart und die Nutzungsbedingungen sind individuell zu jedem Dokument in den Titelinformationen angegeben. Für weitere Informationen siehe auch [Link]

Terms of Use This digital copy can be downloaded free of charge. The type of licensing and the terms of use are indicated in the title information for each document individually. For further information please refer to the terms of use on [Link]

Conditions d'utilisation Ce document numérique peut être téléchargé gratuitement. Son statut juridique et ses conditions d'utilisation sont précisés dans sa notice détaillée. Pour de plus amples informations, voir [Link]

Condizioni di utilizzo Questo documento può essere scaricato gratuitamente. Il tipo di licenza e le condizioni di utilizzo sono indicate nella notizia bibliografica del singolo documento. Per ulteriori informazioni vedi anche [Link]

the first step, the valves in both places
are open, and the water is drawn in.

The next step is, not to the screw to shift
the way to, upwards or downwards, on the axis,
and to regulate the size of the orifice, through
which water flows from the boiler.

"ALL MEN NATURALLY THINK THEMSELVES EQUALLY
WISE; AND, THEREFORE, AS ANY SHIP THAT SAILS FASTER
THAN ANOTHER, IS SAID, IN SEA PHRASE, TO WRONG IT, SO
MEN ARE APT TO THINK THEMSELVES WRONGED BY THOSE
WHO, WITH BETTER TALENTS THAN THEY, OR GREATER
SKILL IN THEIR USE, GET BEYOND THEM."—*Hartlib.*



IF Watt throughout has been remarkable for his good fortune, his merits seem equal to the highest success. But that very prosperity which should have been a source of pride and satisfaction to all ingenious men, seemed only calculated to excite their mercenary hostility. Many of the schemes which have been put forth as improvements, aspire to no higher character than attempts to make use of Watt's ideas, but to evade his claims; and if, during the last ten years, in his engines improvement appeared to have been nearly stationary, and the invention of their author to be apparently in a state of repose, while that of his enemies was in incessant activity, yet he must be considered as having been reclining on any thing but a bed of roses. In fact, he had long been harassed by a series of insidious and persevering attacks, both on his reputation as an inventor, and on his rights as a patentee; and in

repelling these, years of his time had been thrown away.

The condenser was the part coveted, and its shape, action, position, had all been altered, or disguised in the progress of evasion.

One course alone was open to Watt and Bolton, and that course they pursued silently but vigorously. And probably there is no other instance of a patent being the subject of so many appeals to the law, coming out unimpaired of the struggle.

When it was contested on the plea of being wanting in originality and merit—men of the highest personal and professional character, united in the most unqualified commendation of the singular value of the condensing engine, which they described to be as original in its conception, as it was transcendant in the ingenuity of the means by which the idea was carried into effect; and the witnesses, jury, and judges, felt and acknowledged its importance, as an element of national prosperity. When overwhelmed by the concurrent testimony of a host of eminent men, Watt's opponents were driven off the ground they themselves had chosen, a fresh attack was organised and commenced on the patent, on the plea of the written description which Watt had given in 1769, shortly after he had made the discovery of the condenser being imperfect. This, as has been already stated, was drawn up, after the erection of a rude model, at Kinneil, which was all that his means or his patron enabled him to construct—and with no more experience than he had acquired from this coarse experiment.

But twenty years afterwards, or rather after a series of experiments in which he had been engaged for twenty years, to develop his ideas, the

splendid result of his genius and perseverance—the perfect machine—was raised up in judgment against him, to prove that between the years 1790 and 1800, the engines which were sent from Soho, were more perfect than could be fabricated from the description he gave of the one he erected in 1769!! Generous rivals! nay, several of his adversaries confessed, that the machine was yet the subject of expensive and elaborate experiments; for they had, it seems, seen recent engines with very varied proportions,—and they went so far as to acknowledge that some of the parts which Watt had introduced, did not appear to them to be essential to the precise, or effective action of the mechanism; yet these parts were pointed out as having no existence in the document of 1769—and, because they had not, Watt, in their opinion, was not entitled to the reward of his admirable invention. Consistent reasoners! But when men of genius come into hostile collision, we seek to find a spark of that spirit, which raises them above the vulgar herd, tempering, and infusing a generous feeling into their rivalry—and it is on this account, that among all those who gave vent to their splenetic disappointment, in their opposition to Watt, the name most conspicuous, and one most to be regretted as being found there, is that of the excellent Bramah; and yet from his known regard to truth, and his personal integrity, his opposition, notwithstanding its asperity, must be considered far removed from the imputation of being tainted by corrupt, or even interested motives.

His printed letter to the Judge, who presided at a trial, in which Bramah appeared as a witness, on the side opposed to Watt, evinces great acuteness, a perfect knowledge of the subject, a caustic wit,

and a sturdiness of opinion, which made him a formidable opponent. But resting on the necessity of a rigid adherence to the very letter of the law, he lost sight of its kind and benevolent intention as well as of the broadest principles of justice.

His production throughout is a series of admissions of the value of Watt's contrivances; and he points out inventions that had escaped the notice of others, with all the fine feeling of what is beautiful in an art, in which he himself was a master; and while displaying them, he extols their ingenuity. But he ceases not by inference to ask, if the inventor has described these in a proper manner; and he comes always to the conclusion, that because he has not, therefore he is not entitled to any reward for his superlative invention. It did not once occur to this gifted individual, to refer to the form of the first machine, from which only, Watt could write a description.

Some of the judges who had paused at points raised by the sophistry of counsel in a former trial, were unanimous on this. "Every new invention," says the Chief Justice, "is of importance to the wealth and convenience of the public, and when they are enjoying the fruits of a useful discovery, it would be hard on the inventor to deprive him of his reward—the Jury have found that the inventor has sufficiently described the nature of his invention, and I think he is, in point of law, as well as justice, entitled to the benefit which was intended to be conferred on him, by the patent and Act of Parliament."*

* "Laws for securing MENTAL PROPERTY meet with but little of the respect paid to those which guarantee the enjoyment of more substantial and visible acquisitions. It is not difficult for the artful and avaricious, to make it be believed

But in point of fact, no more unanswerable arguments could be adduced in favour of Watt's claims, than this identical letter, which was meant to destroy them. Its author might be pointed to as the greatest and most gifted of his opponents—as a man of experience, almost equal to Watt himself, in mechanical labours—and possessing an imagination, of a cast as creative as his—himself the author of inventions described in more than twenty patents—some of them equal, in their value to society, even with the steam-engine. And above all, as connected with this matter, Bramah was well learned, in what may be called the erudition of his art—a knowledge of what had been done by others. Yet even he, in opposing Watt, stood on no higher ground, could justify his *volunteer* opposition, on no other principle, than the technical imperfections of a document, drawn up by a man, at that time possessing little skill in the matter he was describing, and still less in the art of putting what he meant to say, upon paper.

It is not, however, to be regretted, for the fame of Watt, that he had so acute and so powerful an adversary; for the weakness of the ground that could alone be occupied against him is a test of the strength of his own position.

But it had been more gratifying to have seen Bramah, with more kind feeling in his rivalry, for

that they are unmerited and odious monopolies, or to persuade that the adversary of exclusive rights is their friend. Very many think there is no injustice in attacking or evading patents; on the contrary, if the letter of the law can be evaded by any subterfuge, they think it would be meritorious to do it. They consider a patentee's privileges as fair objects of plunder, and have no hesitation to endeavour to rob him of them under the most frivolous pretences."—*Colden*, p. 142.

it does not require the gift of prophecy to foretell, that the names of Watt and Bramah, who lived in the same age, and adorned the same art by their exquisite inventions, will be classed together, as entitled to the grateful remembrance of posterity, for the benefits their labours have conferred on their country.

It is probable that the harassing nature of the opposition he had for years encountered, had some influence in determining Watt's resolution to withdraw altogether from business, on the expiration of his patent. Resigning to his son, and the son of his colleague, the future management of that establishment which his genius had matured, and to which it had given a celebrity, as wide as the boundaries of civilization, he retired to the enjoyment of the fortune, which he had accumulated from the meritorious and well directed exertions of a life distinguished for its activity and usefulness.

The period, in our narrative, at which we have now arrived, had long been anticipated with great anxiety, by all those engaged in the manufacture of steam-engines, and by the still more numerous class interested in their use and extension. The term of twenty-five years, during which Parliament had granted to Watt the sole benefit arising from the condensing engines, expired in 1800, when the fabrication of his beautiful machines was thrown open to the public.

Numerous schemes in embryo, it was supposed, would make their appearance when their authors could bring them into being, with all the advantages of an unrestrained participation in Watt's contrivances; not a few failures also were to be retrieved, when the parts which were held forth as being essential to their perfect action might be

added:—there were a crowd of mechanics, who, without so much ambition as to aspire to the character of inventors, yet saw a great field open for improvement, in the opportunities for putting their own ideas, of the best forms and proportions, into practice. All announced the commencement of a new era, in which exertions, hitherto borne down by the Soho monopoly, were, at their emancipation, to expand and give the finishing touches to the perfection of the mechanism in those parts, allowed on all hands to be capable of great improvement.

A point on which practical men were, however, well agreed, was the effect of the unrestricted use of Watt's engine leading to its more general introduction as a first mover, into manufactories; for although the "*third part of the savings of fuel,*" which was reserved by Bolton and Watt, ought, in reason and fairness, to have been considered as an index only of the benefit conferred by Watt's invention, it was more often felt as an oppressive and heavy tax, particularly by those whose knowledge of steam-engines was acquired from their experience with Watt's alone, and who only knew of Newcomen's machine from its connexion with the payment they were called upon to transmit to Soho; and this feeling made many persevere in employing Newcomen's apparatus, or the labour of animals, until the invention became common property. In Cornwall, however, where, from the dearness of fuel, its advantages were seen in the true light, its use had become nearly general. But in other districts, where coals were cheaper, it had made but comparatively slow progress; and, strange as it must appear to us, where a continuous rotary motion was indispensable, New-

comen's engine was still resorted to; and even Savery's machine was used in many places to pump water to turn a water-wheel.

In London, at the expiration of the patent, not more than a power equal to the energy of six hundred and fifty horses was exerted by Watt's engines; in Manchester about four hundred and fifty horse-powers; and at Leeds about three hundred horse-powers, and at the same time (in 1800) not more than four steam-engines of any importance were at work in the whole continent of America. One of these supplied New York with water, and the other two belonged to the corporation of Philadelphia.

These facts will give some notion of the extent to which steam was applied as a first moving-power in other places; and from its limited amount will offer a remarkable illustration of the effect of an exclusive privilege in fettering production, even although the monopoly was one held by the fairest claim, and managed on the most liberal system; and showing that a diffusion of interest is essential to the spread of improvement. In this particular instance, a circumstance, which has already been adverted to*, as being a fortunate one for Watt's reputation as an inventor, his becoming the sole manufacturer of his machines, had great influence in exciting the commercial hostility against its introduction in a class which might have been conciliated by permitting it to participate in the manufacture of the engines. The fact is extraordinary, that in five years after the patent had expired, the number of Watt's engines in London had doubled, and in that time Watt and Bolton had sold a greater number of ma-

* Page 271.

chines than they had done in an equal time, when they possessed the sole right to manufacture all the engines used in England.

The first invention which is recorded in the new era is Crowther's. He placed the fly-wheel above the cylinder, in the same manner as Cartwright did, and connected it to the steam piston rod, without the intervention of a great lever. The combination, although not altogether original, was clever, but yet it offered no advantage to machines constructed on the common model. In Cartwright's second project, he only professed to combine the parts of the condensing engine, to produce a more portable, light, and compact machine. Hase, instead of conducting the steam which had moved the piston at once from the cylinder into the condenser, made it pass through a number of small pipes, all of which communicated with the condenser; these being inclosed in a vessel surrounded with cold water, some of the heat was extricated from the vapour, and the water which by this means became heated, was pumped into the boiler, at a temperature higher than could be done by the common mode of using that which had been heated by the air-pump, or drawn from the condenser.

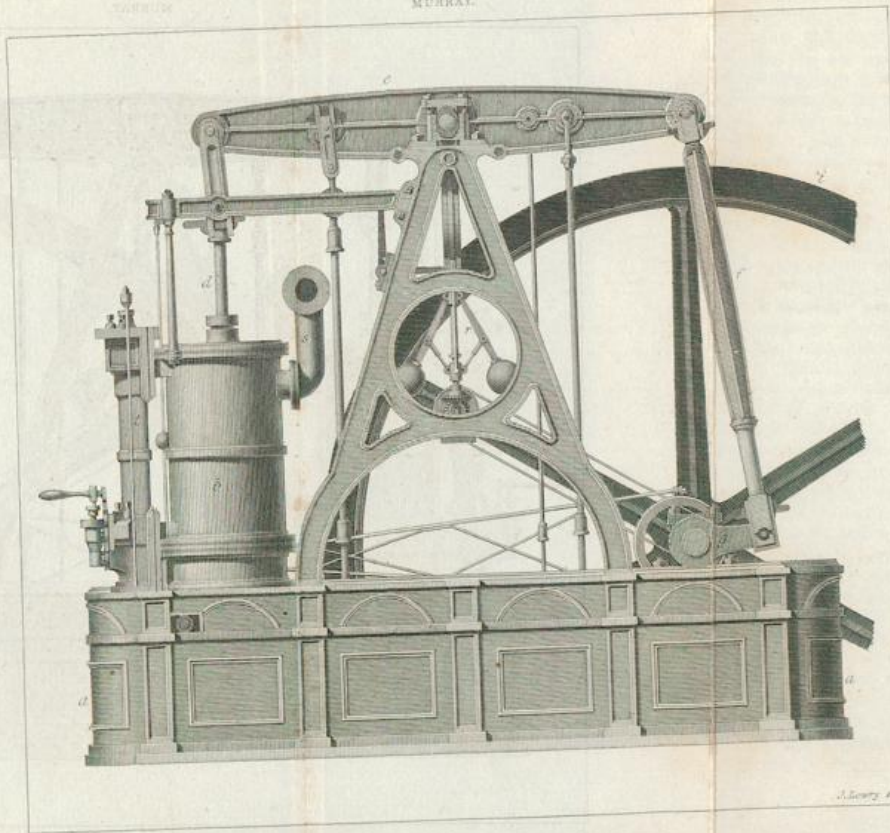
Murray's ingenuity was again exhibited in his construction of a pump to discharge the air without the use of valves, as in the common method, and also to discharge the air and water separately.

The pump is shown as attached to the condenser; *b*, the piston; *c*, a pipe connecting the top and bottom of the air-pump, having a valve *d* opening downwards into the cylinder; another valve *e*, on the top of the pump, opens upward; *f*, pipe connecting the air and water pump, of which *h* is the bucket; when the piston *b* is at

the top of the cylinder, the air which remains after condensation, occupies the area of the air-pump and the condenser. When the piston *b* descends, the air which was beneath it flows through the pipe *c*, into the space above it, and when it ascends, the air being prevented from returning by the valve *d*, it is forced out through the valve *e*; the water falling into the pipe *g*, is lifted by the bucket *h*.

In another part of the same engine, he introduced a capital improvement in the arrangement and construction of his valves, the axis of one was inserted through the spindle of the other; this, in appearance, was similar to Murdoch's, but the form adopted by Murray was excellent, and is now very generally used in steam-engines.

Murdoch, to whom, on the retirement of Mr. Watt, the management of the manufacture of steam-engines at Soho was confided, had, before the date of Murray's patent, put in practice a similar mode of forming the spindles of the steam valves like tubes, to allow the spindles of the other valves to slide through them, but it does not appear that he had made public any description of his improvement; although it must be admitted, the transition from the spindle being made hollow to serve as an eduction-pipe, to a solid spindle, was so obvious, as to follow almost as a matter of course; and this coincidence between the inventions gave rise to a lawsuit, in which the opinion of the court was given against the patentee; and the other schemes which were described in the same document, and which all allowed to be original and remained unquestioned, were at the same time thrown open to the public, or rather destroyed to the inventor; in accordance with that most extraordinary principle of the



equitable law, that a patent must be good for every thing contained in it, or good for nothing.

The three engravings marked MURRAY exhibit an elevation, and a vertical and horizontal sections of a species of engine, usually constructed by this engineer; and although this identical form should have been described a few years later, it is placed here to give an idea of Murray's style of mechanism in connexion with a notice of his improvements upon it generally.

Murray, and his associates, Fenton and Wood, at Leeds, were among the first who studied to improve the general symmetry of appearance of the steam-engine, by arranging its parts with a view to elegance, as an object of taste, as well as to its portability, compactness, and durability as a mechanical agent; in the attempt they were eminently successful; for on an inspection—

“Of this frame, the bearings and the ties,
The strong connections, nice dependencies,
Gradations just”

it will challenge our unqualified admiration, as a specimen of the most picturesque elegance in forms and grouping; and this machine, capable of exerting a power equal to that of forty or fifty horses, (or that of between 200 and 300 men,) from its tasteful ornamental appearance, may vie, as a decoration of a drawing-room cabinet, with the most costly piece of embellished clockwork mechanism.

It were superfluous to describe the action of this fine machine,—this will be easily understood by a mere enumeration of its parts, and an inspection of the figures.

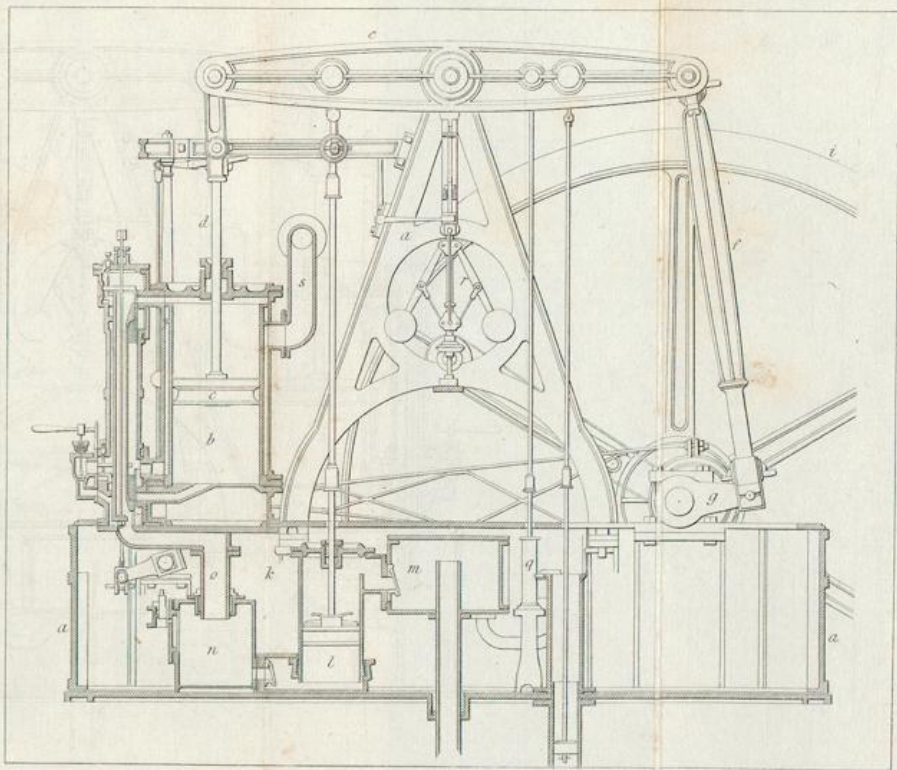
a, the cast iron frame, within which the engine is placed, and to which its parts are firmly united; *b*, the steam-cylinder; *c*, steam-piston; *d*, piston

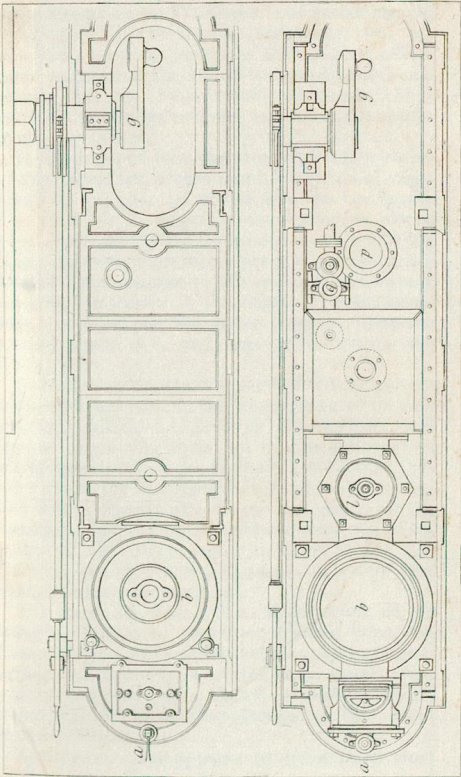
rod attached to the parallel motion; *e*, beam; *f*, connecting rod; *g*, crank with globe pin; *i*, fly wheel; *k*, condensing cistern; *l*, air-pump; *m*, hot well; *n*, condenser; *o*, eduction-pipe; *p*, cold water pump; *q*, hot water pump; *r*, governor; *s*, steam pipe; *t*, valve case. The manner of admitting the steam above and below the piston, is different from any that have been described—it is by a *sliding valve*; this contrivance was introduced by Murdoch, into some of the small engines made at Soho, and called by him the D valve—it was also much used by Murray and Fenton, in the engines they fabricated at Leeds, and with some variation. We know not, however, whether to ascribe its invention to Watt, or Murdoch, or Murray. It is very simple, and on a small scale; it can be made very effective, and is easily kept in order.

From Bramah the four-way cock of Papin received a great improvement, by the passage for the steam being made at the larger end of the revolving cone, and passing off at the smaller end; by the pressure of the vapour being upon one extremity of the cone, while the opposite one was relieved from it, the valve was always kept tight in its socket. And instead of the cock being turned into its position, and returned alternately, Bramah by an alteration in the tappets, made it act so as to revolve continually.

In the erection of machinery, Mr. John Robertson, of Glasgow, had acquired much local celebrity; and his practice on the large scale, particularly at the formation and extension of the great establishment on the Isle of Bute, opened to him some original views on hydraulic action, of which he availed himself with much skill in his subsequent practice. Robertson made a very inge-

MURRAY.





n
c
F
s
c
s
F
c
f
r
c
l
f
t
s
f

nious alteration on Watt's mode of producing the combustion of the smoke, and which was applied in numerous instances with a good effect; some improvements, which he introduced in machinery for the manufacture of cotton, have since his time been revived, and the merit appropriated by others.

In the hands of even the most expert fabricators of steam-engines, a considerable portion of steam found its way past the piston, into the condenser. To avoid this, he employed two cylinders, placed over each other; the under one, *b*, of somewhat larger diameter than the upper one, *a*, of which it formed a continuation. When the valves were in the position shown in the engraving, the steam which escaped past the upper piston *c*, filled the annular space *d e*, and assisted to depress the lower piston.

Roberton enumerated several of the advantages of this mechanism, in the description of its construction which he gave to the public, and erected some machines on this peculiar plan, which gave satisfaction to their proprietors, besides one in his own manufactory; but the perfection which shortly afterwards was given to the mechanism of the piston and cylinder, removing many of the objections which his clever mechanism was introduced to avoid, it is now probably obsolete in practice.

The narrative which Mr. Miller gave of his father's attempt to construct a steam-boat, and from which we have made some copious extracts, agrees with an account of the same experiments which was given in a sketch of navigation by steam, inserted in the Supplement to the *Encyclopaedia Britannica*.

Symington, who appears to have been more

sanguine than his first patron, of the practicability of navigating vessels by steam, nearly twelve years after his experiments at Dalswinton Loch, found an opportunity to bring his scheme under the notice of a nobleman, who was zealous to encourage projects which had for their object the improvement of inland navigation. Symington, who imagined that a boat moved by wheels could be introduced with great economy, as a substitute for horses, in towing boats on canals, succeeded in inducing Lord Dundas, of Kerse, to assist him to make an experiment, on a great scale, on the Forth and Clyde Canal, with machinery, resembling in its principle that of the Dalswinton model, but modified to suit the purpose which he had more immediately in contemplation.

The result of this application, and the character of his patron, may here be noticed with reference to Symington on another account, besides its connexion with a history of his experiment. From an expression in Miller's narrative, that his father was discouraged from proceeding farther from a feeling of disgust at having been involved in unnecessary expenses, an inference might be drawn unfavourable to the memory of an ingenious and worthy man.

But Miller's complaint is, in truth, a very common one; and the estimates even of the most experienced mechanics will probably continue to differ widely from the final outlay, even although those artists have been experimenting on their own means. But patrons can hardly be blamed for their keen expression of disappointment at the cost of labours purely executive, being so little understood by practical men, though operators, on the other hand, will cast the reproaches from

themselves as being groundless and unmerited, from viewing their object through a medium somewhat tinged with enthusiasm. Nothing, however, can be more clear, than that Lord Dundas, himself a man of experience, and who had the best means of being correctly informed on every point connected with the operation at Dalswinton, was satisfied with Symington's conduct and judgment on that occasion; for those experiments which were made at his Lordship's cost, and on which a large sum of money was expended, were conducted solely under Symington's superintendence; and he, also, subsequently, received the commendations of his noble patron for his exertions.

"Mr. Miller," says Symington, in his narrative, "being very much engaged in improving his estate in Dumfriesshire, and I also employed in constructing large machinery, for the lead mines at Wanlockhead, the idea of carrying the experiments at that time any further, was entirely given up, till meeting with the late Thomas Lord Dundas of Kerse, who wished that I would construct a steam-boat for dragging vessels on the Forth and Clyde Canal, instead of horses. Agreeably to his Lordship's request, a series of experiments, which cost nearly three thousand pounds, were set on foot in 1801, and ending in 1802, upon a larger scale (than those on Dalswinton Loch) and more improved plan, having a steam cylinder twenty-two inches diameter, and four feet stroke, which proved itself very much adapted for the intended purposes. Having previously made various experiments in March 1802, on the Forth and Clyde Canal, Lord Dundas and several other gentlemen being on board, the steam-packet took in tow two loaded vessels, each of seventy tons burden, and moved with great ease through the canal,

a distance of nineteen and a-half miles in six hours, although the whole time it blew a strong breeze right a-head of us, so much so, that no other vessels could move to windward in the canal that day but those we had in tow, which put beyond the possibility of a doubt, the utility of the scheme in canals and rivers, and ultimately in open seas. Though in this state of forwardness, it was opposed by some narrow-minded proprietors of the canal, under a very mistaken idea that the undulation of the water, occasioned by the motion of the wheel, would wash and injure its banks. In consequence, it was with great reluctance laid up in a creek of the canal, exposed for years to public view, where Henry Bell from Glasgow, who also frequently inspected the steam boat at Carron, in 1789, did also particularly examine this."

During the time that he was engaged in this experiment, Symington received a visit from a Mr. Fulton, "who," says he, "politely made himself known, and candidly told me, he was lately from North America, and intended to return thither in a few months; but having heard of our steam-boat operations, he could not think of leaving the country without first waiting upon me, in expectation of seeing the boat, and procuring such information regarding it as I might be pleased to communicate. He at the same time mentioned, however advantageous such an invention might be to Great Britain, it would certainly be more so to North America, on account of the many extensive navigable rivers in that country. And as timber of the first quality for building the vessels, and also for fuel to the engines, could be purchased there at a small expense, he was decidedly of opinion, it could hardly fail, in a few years, to be

come very beneficial to trade in that part of the world; and that his carrying the plan to North America, could not turn out otherwise than to my advantage; as if I were inclined to do it, both the making and superintending of such vessels would naturally fall upon me, provided my engagements with steam-boats at home did not occupy so much of my time, as to prevent me from paying any attention to those which might afterwards be constructed abroad. In compliance with his earnest request, I caused the engine fire to be lighted up, and in a short time thereafter put the steam-boat in motion, and carrying him four miles on the canal, returned to the place of starting, to the great astonishment of Fulton and several gentlemen, who at our request came on board. During the above trip, Fulton asked me, 'if I had any objections to his taking notes respecting the steam-boat?' to which question, I said 'none;' and after putting several pointed questions respecting the general construction and effect of the machine, which I answered in a most explicit manner, he jotted down, particularly, every thing then described, with his own remarks upon the boat;" "but he seems," says Symington, "to have been altogether forgetful of this, as, notwithstanding his fair promises, I never heard anything more of him till reading in a newspaper an account of his death."

From these facts, the author of the sketch thinks it is very evident Symington was the first person who had the merit of *successfully* applying the power of the steam-engine to the propulsion of vessels, and that there can be but one opinion, that in its influence on the fate of a most ingenious man, there existed not enterprise enough in Scotland, to encourage this excellent artisan to repeat

his interesting and important experiments on the river Clyde.

About the time Symington had abandoned his experiments, M. Des Blanc, a watchmaker at Trevoux, had built a steam-boat, and made some experiments with it on the river Soane. The first attempts were so successful as to bring forth the Marquis de Jouffroi, with his prior claim; the final result, however, was as hapless as the Marquis's.

