

Mr.  
C. W. Lancaster.  
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of arms supplied in 10 years to the Government and the East India Company includes all sorts of arms, inferior as well as superior?—The arms for the East India Company, I believe, are of the recognised pattern of the arms for the Government; they are always of the recognised pattern. I do not conceive that any arm delivered would be inferior to that; and assuming the data to be correct, I should think that the arms would have been fully equal, or they would not have been received.

2625. Do not the Ordnance contract for the sea service muskets?—Yes; and they are of a vastly inferior character.

Mr. Richard Prosser, called in; and Examined.

Mr. R. Prosser.

2626. *Chairman.*] WHAT is your profession?—A civil engineer, in Birmingham.

2627. Are you acquainted with machinery?—I am.

2628. What kind of machinery?—That class of machinery which is used in the hardware trades.

2629. Working in iron and wood?—Yes.

2630. Have you written a work on the construction and manufacture of fire-arms?—I have not; I am writing one now. Her Majesty's Commissioners of Patents are publishing specifications relating to fire-arms; those that are patented in this country.

2631. Will those specifications be contained in an appendix to your work?—The specifications are before the Committee, and the appendix will be in addition. These are the specifications of arms published under the new Act of 1852.

2632. Are you the patentee of any machinery?—Yes.

2633. Of what kind?—Of machinery for making nails, buttons, and tubes.

2634. For what purposes?—Steam boilers and rocket tubes, iron-welded tubes.

2635. Have you supplied large quantities of such tubes to America and to France?—I have.

2636. Are your tubes for tubular boilers in general use?—They are.

2637. Have you supplied the United States with tubes?—Yes.

2638. For what purposes?—Rocket tubes.

2639. Are you acquainted with Osborne's patent of 1817 for making barrels?—I am acquainted with all the patents that have ever been taken out in this or any other country for that purpose.

2640. Have any improvements been made in the manufacture of gun barrels since that period?—Not that I am aware of.

2641. Is Osborne's process still in general use?—It is.

2642. Are you acquainted with the gun trade?—I know it generally, not specifically.

2643. Do you know it sufficiently to be able to give an opinion as to the introduction of machinery into the trade?—I think that I am competent to do so.

2644. Will you state your opinion to the Committee on that subject?—I think that machinery may be largely introduced in the manufacture of guns, but instead of employing the word "machinery," as I never expect to see a gun made by machinery, I should prefer to use Mr. Whitworth's expression, "labour-saving machines."

2645. Will you explain the distinction?—I have made machines to make nails. When you put a strap upon the machine, and the iron to it, it goes on making nails till all the iron is used up. That I call a machine; but I never expect to see lumps of wood put into one end of a machine, and bar-iron at the other, and come out a musket.

2646. In your opinion, could labour-saving machinery be introduced to any considerable extent in gun making?—Very largely. In 1811, James & Jones, of Birmingham, took out a patent for improvements in fire-arms. That machinery was offered to the English Government, and refused; and a friend of mine, who is dead now, or I would have produced him, recommended James & Jones to the Russian Government, and the Russian Government took up this invention, and they established at Toola a manufactory for manufacturing arms, of which these are the plates, and the description. There are 42 plates (*producing the same*). I do not think that there is any part of the gun except the stock, but what is in some way operated upon by means of labour-saving machines, or tools; and the result of that machinery is this, that about 1822 Mr.

Fairy,

Fairy, engineer, of London, went to Russia, and at Tools he saw this machinery in operation. It was some time about 1817 that it went out, and he saw there 12 Russian soldiers come with muskets made by this machinery; there were 12 baskets before them, into which they put the stocks, locks, and barrels, and everything else, and then fell into rank again. Each man then went to the basket and took up a stock, a barrel, and everything, and put them together, and fired them off in two minutes.

2647. Were they made by this machinery?—Yes, by the machinery of which that is a description. The work is in Russ, and it is now being translated.

2648. Are you aware whether that machinery is still in use in Russia?—I believe it is; I heard to-day that there is an Englishman there managing it now.

2649. Could similar machinery be introduced into this country for making muskets with advantage?—I think that that machinery is too complicated, and not sufficiently up to the knowledge of the day.

2650. Mr. Dundas.] Do you know who made this machinery?—It was made at Tools, in Russia; the Russian Government have always had emissaries over here buying tools, and taking the best of everything. I had Dr. Hamel with me eight years ago.

2651. Chairman.] If the introduction of machinery would facilitate the making of guns, why should not private gunmakers have introduced it?—There is not the slightest inducement for them to spend a penny in machinery; I would not do it.

2652. Why not?—Because there is no certainty that they would have Government work to make that machinery remunerative.

2653. If a manufacturer had a contract for a long time, do you think that machinery could be introduced with advantage by private gunmakers?—No question about it; if you gave them 500,000 to make a year, there would be no difficulty in finding money to erect machinery.

2654. If you had that number of guns to make a year, would you introduce machinery?—I could not make them without. I have a man in my employment, to whom, I pay 35s. a week, and he has been offered 3l. to go into the gun trade; but he will not go.

2655. Why not?—He is a beautiful workman, and says that the gun trade is so uncertain, that he prefers staying with me. This is the handle of an American axe (*exhibiting the same*), turned in America by machinery; I have had it for many years; but I never could find anybody to believe my statement.

2656. For what reason?—Because they do not know how it was done.

2657. Is the machinery that is used in America superior to ours?—We have nothing of the sort in this country; that is turned in a similar machine to what is used in turning gun stocks; I have been familiar with that machinery for many years, it was patented in 1820 by Blanchard, and the patent renewed in 1834, because it had not paid.

2658. Is similar machinery employed in America for gun stocks?—It is similar machinery.

2659. Are you acquainted with Colonel Colt's manufactory?—I have not seen it; I know his pistol, and I have one here.

2660. You have never seen his manufactory?—I have not.

2661. Are you acquainted with the Minié rifle?—Yes.

2662. What is your opinion of it?—I think it is a first-rate piece of workmanship; I have never seen work better done; it is an Enfield gun, but this has come from the Tower in Birmingham.

2663. Mr. Newdegate.] Is there any difference between that and those guns which are completed in Birmingham?—There is no difference in point of workmanship.

2664. Chairman.] Is the lock a good lock?—A very good lock; I do not think that there are 20 men in Birmingham who could file that lock (*pointing to the same*) so as to pass this view, and get a living, at 5s. each lock.

2665. Do you think that you could produce as good an arm by machinery?—You may employ a good deal to save labour, and reduce the expense; for instance, the filing of this plate is a very heavy and laborious job out of the rough.

2666. Mr. Dundas.] Is the cock made by machinery?—It is stamped between dies; that is a swivel lock (*exhibiting the same*), and this is the old hook lock (*exhibiting the same*.) The swivel lock has been introduced lately with the army guns.

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2667. Lord Seymour.] You supply the tubes for rockets, do you not?—Yes, to the United States.

2668. Do you supply any tubes for rockets to the Ordnance here?—No.

2669. Are the tubes used by the Ordnance of the same kind as the tubes that you supply?—The tubes that I have seen used by the Ordnance are very clumsy things; they are brazed.

2670. At what rate do you supply the tubes to the United States Arsenal?—I have not supplied many rocket tubes; I have sent tubes to the United States.

2671. Have you supplied any other Government?—Yes, the French Government.

2672. Then the French and American Governments have the advantage of your superior tubes, while the English Government are still using their clumsily contrived ones made by themselves?—The French Government gave an order for my tubes in Birmingham, and inspected the process, to see that they were all right; and now they are made in France by my process.

2673. They paid you for the patent, did they not?—Nothing; people never think of paying inventors; I supplied them to the Government; they were prohibited tubes, but as they were for the Government steamers, they got over that; I supplied the Government engineer, the late Mr. Barnes.

2674. Have you ever offered to supply the Government here?—No, I am not a tube-maker; it is my patent, and the Patent Tube Company at Birmingham are working it, and supply the Government.

2675. What is your own business?—I am a civil engineer.

2676. You have been chiefly concerned in the invention of machinery, and the application of it, have you not?—Yes, and the bringing it out.

2677. That has made you acquainted with all the different patents which have been taken out for barrel-making?—Yes, that, and having the advantage of being at law for some years to defend my patent.

2678. Has there been any improvement in barrel-making within your experience?—Not since 1817; not the slightest, except my own patent, 1840.

2679. Not in machinery or anything else?—Not the slightest, that I am aware of, except my own.

2680. You have stated, that you do not think that any private gunmaker has any inducement to use machinery to any great extent?—Not the slightest, unless he had a large contract for arms.

2681. Is there any private trade in America using machinery?—Not that I am aware of; I do not know of it.

2682. If there is no inducement in this country, from which there is a considerable export trade in arms, there would be less in America, where there is not even that export trade in arms?—I apprehend that the private trade in America is very small in arms.

2683. Then they would have less inducement to use machinery than we have?—Certainly; with the Americans it is a scattered trade; ours is more concentrated.

2684. Therefore, again, ours being more concentrated, there would be more facility for using machinery than where, as in America, it is scattered throughout the country?—Yes.

2685. You have referred to the machinery that was invented by James and Jones in 1811; are you aware whether anything was made with that machinery in this country before it went to Russia?—I know that it succeeded very well, and it is in use now. About 14 years ago, the Ordnance introduced a regulation that all gun barrels should be turned; but James & Jones proposed that in 1811, and it got to the Ordnance Department about 14 or 15 years ago.

2686. Did the Ordnance reject the invention?—They could see no merit in the machine.

2687. You are not acquainted more than very generally with the gun trade, are you?—No, generally; as a matter of workmanship, it is a matter of interest to me.

2688. Mr. Newdigate.] If I correctly understood, you stated that there had been no improvement in barrel making since 1817?—I am not aware of any, except my own patent of 1840.

2689. Did you not state, that subsequently the process of turning barrels had been adopted, and within a few years?—It was invented in 1811 by James and Jones.

2690. It has been adopted since 1817?—My remark applied to welding the gun barrel, not to the turning of it; the barrel used to be ground before on the outside, and James and Jones proposed to supersede the grinding, which was a dangerous operation, by a lathe, which is now in use.

2691. Then the Committee are to understand, that the application of the lathe to the production of gun barrels has been subsequent to 1817?—It was proposed in 1811 by James and Jones, and is now used by the Russian Government at Toola.

2692. But the application of it in our country has been since 1817?—I am told that it was about 13 or 14 years ago.

2693. That is an exception to your original statement?—No, I spoke of welding the gun barrel; there has been no improvement in that since 1817.

2694. You stated that some person in 1822 saw 12 Russian soldiers bring the parts of several muskets in a basket from a manufactory, and put the muskets together, and then fire them off?—Yes, in two minutes.

2695. Do you know whether those parts had been previously fitted?—They had been made at Toola.

2696. Do you know whether those parts had been previously fitted after leaving the machinery?—I apprehend they must have been; there can be no doubt in the mind of any practical man that it must have been so.

2697. Do you think that the machinery adopted in Russia is too complicated?—Yes, and such as should not be employed now. Our machinery has very much improved in the last 20 years.

2698. Is there, or was there ever the same amount of skilled labour applied to the production of arms in Russia that there is in England?—I do not know the labour that they employ in Russia. I know that they have machinery which we have not, because these are the drawings. The literature of invention is at a very low ebb in this country. Absence of knowledge on such points should not be considered a qualification for employment in mechanical affairs.

2699. You stated that there was not sufficient inducement on the part of the private trade to introduce machinery?—I do not think there is any under the present system.

2700. Do you think that in the production of from 250,000 to 300,000 stand of arms in a year there is not a sufficient inducement to adopt the best machinery?—Not an inducement for any manufacturer to spend money, unless he has previously the assurance that he will have a contract for a time, and at a price, and with a proper view. You cannot make a musket like that (*pointing to the same*) by machinery without highly skilled hand labour.

2701. Do you consider that the present view is such as to have necessarily increased the difficulty of production within the last few years?—I consider the severity of the view so great, that I do not believe there are 20 men in Birmingham who could file the lock to pass the present severe view.

2702. Are the Committee to understand positively that there are not 20 men who could produce it?—That is my opinion, and I have made inquiry.

2703. You are not in the gun trade, are you?—No, and therefore I have no bias.

2704. Your opinion is, that the absolute severity of the view, taking into account the price, is such as to render the production of that arm extremely difficult in Birmingham?—I do not see how a man gets a living by that lock (*pointing to the same*).

2705. Are you aware that the view has been much more stringent within the last three years?—No. In consequence of writing an Appendix on Fire-arms I waited upon the Ordnance, who gave me permission to visit the Tower. I am accidentally here, and I had not been in the Tower for many years before a week or two ago.

2706. You are not aware of any change in the system of view which has taken place within the last few years?—No, I am not; but I have seen things refused which makes me know that the view is more severe than I consider it ought to be, or for safety it should be.

2707. Are you of opinion that sometimes things are refused by the viewer, when it is doubtful whether they ought to be refused or not?—I do not know; but I should say that the severity of the view leads to that, of necessity.

2708. And that would be a great impediment to production, would it not?—Very great.

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2709. Are you aware of the fact that hitherto this country has been more fortunately situated for the production of arms than any country in the world?—That is my opinion.

2710. Is it not your opinion that if such resources were properly used, the means of producing arms which has hitherto existed ought to continue in this country?—I think that our means of producing Government arms in this country have been very small indeed; but, under a proper system, I think they are unlimited.

2711. Are you aware that this country has supplied many other nations with arms?—Yes, I am. I know a merchant in Birmingham who supplied 35,000 in about three months; this is the tool (*exhibiting the same*), and I think the price is 10s. 8d.

2712. Are you aware that there are firms in Birmingham who have the largest export trade of first-class guns of any firms in the United Kingdom?—Yes; and I know that there are firms in Birmingham who sell those pistols. A merchant lent me this (*pointing to a pistol*), and I consider that his clerk, Mr. Johnson, knows as much about a gun as any man in Europe.

2713. Are you aware of the fact that there are firms in Birmingham who have the largest export trade in first-class arms of any firms in the United Kingdom?—I should think so.

2714. Are you aware of the fact that there is a greater variety of quality, and a greater quantity of arms exported from Birmingham than from any other town in the world?—Yes, I should say that it is so.

2715. Does not that prove that in Birmingham there exists great resources for the production of arms?—It proves that there are a large number employed, but not that they have the means of producing arms rapidly.

2716. Does a large annual production prove a power of rapid production or not?—It does prove a power of production by hand labour.

2717. Such as they are, a large quantity has been produced?—No doubt of it; but at a great expense.

2718. What you anticipate, then, from the application of machinery, is a reduction in the cost?—Yes.

2719. You stated that the uncertainty of the demand for the Government was such, that a workman in your employ would not go into the arms trade?—No; I think that does operate.

2720. Are you aware of the fact that within the last two years the demand for the Government has been unnaturally restricted?—I know that, generally.

2721. Then when this man of yours refused to go into the arms trade, it was the period immediately subsequent to the unnatural restriction of the demand on the part of the Government?—Yes.

2722. Mr. Geach.] You stated, with regard to the lock, that the workmanship was required to be such, that very few men could do it; you do not mean to say that a superior lock for a gun would be produced by machinery?—No, I do not think it can be produced by machinery at all; parts can, to a very considerable extent.

2723. Supposing those parts to be made by hand and by machinery, you can obtain the same accuracy by hand as you can by machinery, can you not?—Yes.

2724. It is merely a question of expense?—Machinery enables one to get over the work quicker, and it saves the labour.

2725. You have stated that you do not see any encouragement held out to the gun trade to erect machinery?—No; I cannot see the slightest.

2726. Why is there not as much inducement to erect machinery in that trade, seeing that there is a large general demand for guns, as there would be in any other trade?—If any man erected machinery for making guns, and then went to the Ordnance and said he was ready, they might alter the pattern, and then what would be the use of his machinery.

2727. They might alter the pattern if they had their own machinery, might they not?—Yes; but in the case of a contractor, his machinery would be thrown out of commission.

2728. If the Government altered the pattern when it was generally made by machinery, that would, of course, increase the expense, would it not?—Yes; and the gentlemen who have talked of making arms by machinery are aware of the weak places. Colonel Colt and Mr. Anderson do not like turning sharp corners by machinery; they want the thing rounded off, and made nice and easy, and then it becomes an easier thing to be done by hand.

2729. Mr. Muntz.] You were aware, were you, that the gun was to be suited to the machinery, and not the machinery to the gun?—That is the tendency of all those who have spoken upon the subject, and I think it should be so.

2730. You are aware that if such alterations were made in the pattern which is now used, a great reduction would take place in the price?—It would.

2731. You were speaking of Osborne's patent just now; the date which you gave was the date of its first introduction, was it not?—Yes.

2732. Are you aware how long it was before it came into general use?—A good many years; I cannot tell how long.

2733. Did he ever realise *à d.* by it?—I do not think he did; he was driven into it by strikes.

2734. You also spoke about the lathe invented by James and Jones?—Yes.

2735. Are you aware that those lathes were all worked at my manufactory for some years?—I have heard so.

2736. Did you ever hear that the Emperor of Russia came there to see them?—To see some, I know he did.

2737. Are you aware that when those lathes were sold, a portion of them were bought by the trade?—No, I am not.

2738. Did you ever hear how many were sold to the Emperor?—No.

2739. Did you ever know how many were worked at my manufactory?—I did not.

2740. You do not know that such lathes are now in use?—There are a variety of lathes in Birmingham, and I say that the lathe now used is similar to that which James and Jones used; I did not know that the same identical lathe was in use now.

2741. Have you seen a barrel turned by it?—Yes; by a similar sort of lathe.

2742. You have seen barrels ground in the old way?—Yes.

2743. Some parties are in the habit of grinding the surface after they are turned?—Yes.

2744. What they call wiping it over the stone?—Yes.

2745. You would prefer, would you not, that they should be finished off at the lathe?—You could not finish them off at the lathe; the finish depends entirely upon degree.

2746. I mean finished so far as regards the barrel?—I think it should be finished in the lathe, and then finished by hand, with that degree of surface that you require.

2747. Have you ever taken any notice of the exterior of the barrel; that is required according to the pattern, with regard to its straightness?—No; I have not done that, because I have fancied sometimes that they are curved; I thought it was a mere matter of caprice; James and Jones say that the barrel is to be turned according to the pattern.

2748. You say that this barrel must be draw-filed afterwards, before it is finished?—Yes.

2749. Is that requisite?—Yes; to get that surface.

2750. It would not be possible to finish it from the lathe, so as not to want any draw-filing?—No; not to give that surface; the marks are the long way of the barrel.

2751. Did you ever notice the present mode of boring a gun-barrel?—Yes.

2752. Did you ever see any experiments made with the view of boring them upon a better principle?—No.

2753. Are you of opinion that if, instead of the barrel being fixed and the tool revolving, the barrel was made to revolve and the tool fixed, that would economise the boring?—I think that the present plan of boring the barrel is the most bungling process that is carried on in mechanics; the barrel ought to revolve.

2754. Do you think that by adopting the plan that is recommended, of making the barrel turn round, and the tool being fixed instead of working the square bit, it might be done better and cheaper than now?—I do.

2755. Did you ever see it tried?—I bored a cylinder last week in that way, four inches diameter.

2756. Would it be more difficult to bore a barrel?—You must exercise care in both instances; you must have care; I wanted this cylinder for a metallic piston to work in.

2757. What was the substance of the piston?—It was about four inches in diameter.

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2758. But compare that with the substance of a rifle?—Then you must use less pressure.

2759. Would it not be a tedious and expensive process?—No. This cylinder began at six o'clock in the morning and was finished at eight at night.

2760. How long was it?—Five feet, perhaps.

2761-2. You never saw a barrel attempted to be bored in that way?—No.

2763. Are you aware that it has been attempted?—I do not know that it has for a gun barrel. I should imagine that the American rifle, turned out of solid steel, must be so done.

2764. Do you mean in rifles?—Yes, Whissou's rifle.

2765. Why do you say so?—There is no other way of boring a cylinder that I know of, to get the hole straight.

2766. Have you ever examined the inside of one of those barrels?—Yes, I have.

2767. How far do they vary from a cylinder?—I should think there is a variation of the  $\frac{1}{100}$ th of an inch in those that I have tried.

2768. Did you ever try them with plugs, so minutely fitted as to answer to the  $\frac{1}{100}$ th of an inch?—I have tried them with plugs, but when you come to the  $\frac{1}{100}$ th of an inch, I cannot see it. This is one of Mr. Whitworth's gauges (*exhibiting the same*). In the tubes that I sent to America, considerable loss was suffered by the tubes being made in England, and the holes in the boilers being bored in America. As I have a set of Mr. Whitworth's gauges, we know what an inch is. Those gauges are very accurately made, and I sent a set of gauges to the United States and I kept my own, and we have never had the slightest difficulty since then.

2769. What variation, in trying one of those Minié rifles with the proper plug, did you find in the interior of the rifle?—The  $\frac{1}{100}$ th of an inch between the different parts of it.

2770. Did you try it by a series of plugs?—By plugs.

2771. Is it not a matter of bearing too?—The  $\frac{1}{1000}$ th of an inch is so delicate, that you can only feel it.

2772. Did you find the  $\frac{1}{100}$ th part of an inch difference between the breech and the nose?—That was the greatest difference between all the different parts of the barrel. The American Board of Ordnance allow a variation of  $\cdot 015$  inches in the diameter of barrels of small arms  $\cdot 69$  inches diameter.

2773. Suppose that you bored a gun on the principle that I have just spoken of, namely, the barrel revolving and the cutter fixed, would you get nearer to perfection?—Yes.

2774. Or so near?—I do not know how near.

2775. Then you do not think there would be any advantage in that?—It would be straight, but there would be the irregularities of the cut in it.

2776. You are aware that the straightness of the barrel is determined by the sight of it?—Yes.

2777. Did you ever practise that sufficiently to be able to perform that operation?—Sufficiently, I think, so that in a very short time I could get as expert at it as any man of ordinary practice.

2778. Did you ever see any other plan succeed but the sighting?—No.

2779. With respect to locks, you said just now that you did not think a lock could be made completely by machinery; have you seen locks made in the neighbourhood of Birmingham?—I have not seen them manufactured of late years. I know the tools that they use.

2780. Are you of opinion that any great saving may be effected in the construction of a lock by applying machinery to it?—Yes, 50 per cent. in labour.

2781. Will the lock be finished when that is done?—No; it must be hand-finished.

2782. Have you any idea of what reduction in the cost of a lock there would be by applying more machinery to it?—I look upon this lock (*pointing to the same*) as a piece of workmanship to be worth 5 s. or 6 s. to file.

2783. Supposing it to be sold for 7 s. 6 d. finished, viewed, and accepted, what reduction could be made by using increased machinery in the manufacture of the lock?—If it costs now 7 s. 6 d., I am satisfied that it could be made for 3 s.

2784. Not in a finished state?—Yes.

2785. Could you finish a lock by machinery without any hand labour?—No, except that I am sure that so much machinery could be employed as to enable a person to finish this lock for 3 s.

2786. Are you aware of the extent to which machinery is applied now?—I am not aware of anything but the ordinary grinder being used, and I think they have put a steam strap to it.

2787. Suppose one of those locks to be made by machinery, could you insure those locks all fitting in the way you spoke of?—I do not know what degree of hand labour had been employed to make the locks do that.

2788. It has been stated that a lock may be made solely by machinery so perfectly that when a cart load of them are mixed together they will all fit without hand labour?—I do not believe that; it is contrary to all my experience. I have made thousands of hardened steel tubes, and never in my life could I get a plug to fit a hole, or a punch to go into a hole without grinding; and in that the  $\frac{1}{100}$ th of an inch would be fatal to the workmanship.

2789. Did you ever see Colonel Colt's manufactory?—No.

2790. You do not know the machinery that he uses for making those locks?—I think it is very much like the Russian plan.

2791. You have never seen two locks taken to pieces, and the parts fitted indiscriminately into one another?—Yes.

2792. What locks were they?—These two do (*pointing to the same*).

2793. What are those?—I had these from the Tower in Birmingham.

2794. Those are hand-made locks, are they not?—Yes.

2795. Are you sure that the parts of those locks fit one another?—I had these locks from the Tower, and I asked a man to take them to pieces, and I put one upon one piece of paper, and the other upon another sheet of paper, and I changed the plate and the rollers, and I said, "Now put them together." He said, "They will not;" but I said, "I want you to put them together," and he did it. And I said, "Now view those locks;" and he passed them, and they are now in the state in which he put them together.

2796. The parts of one being fitted into the parts of the other?—Yes.

2797. How did they get the parts exactly to fit?—By gauges.

2798. They jiggged them, did they not?—Yes.

2799. Are you of opinion that, so far as the correctness of the work is concerned, a lock made by the jig is quite as correct as a lock made by machinery?—I do not see how there can be any difference.

2800. Those locks fit, do they not?—They do.

2801. You are confident that they were changed?—I took these locks off the workbench, and told the man to take them apart, and he put one on one sheet of paper and the other upon another, and I changed the plates and the tumblers myself.

2802. Was the man surprised at it?—Yes.

2803. He never tried it before, perhaps?—I should say not.

2804. You have practised in steel work and the hardening of steel; are you of opinion that, in any cases where steel of various forms has to be hardened, you can ever be certain of all the parts of locks fitting, after they are hardened, without altering?—They never can. I have sunk medal dies, and hardened them, and hardened the collar in which the dies fit, and I never could get a collar but what went oval in the hardening, and required to be corrected by hand labour.

2805. The more irregular the form, the more difficult it is to keep it in form?—Yes.

2806. Speaking of the additional machinery requisite to make locks, would it be very expensive for a lockmaker to obtain the machinery requisite for making locks?—I do not think that machinery for making locks would be very expensive.

2807. Have you any idea of the expense?—It might cost 1,000 *l*.

2808. Merely to make one lock?—No, the lock machinery.

2809. I mean such machines as are requisite for perfecting the lock; what would the expense of that be?—About 1,000 *l*.

2810. How many machines do you contemplate?—Probably a dozen.

2811. You do not know how many are used at present?—No.

2812. You think that 1,000 *l*. would make the thing perfect?—Yes.

2813. It does not seem to be quite out of the reach of individuals to have such machines as that?—No; and I think they would have them if they had any assurance that they could have the work regularly.

2814. Do you happen to know a man of the name of Minton, in the Potteries?—Yes; Mr. Minton is working my patent for buttons.



Mr. R. Fraser.

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2815. I believe he is a potter, and he makes tiles and bricks?—Yes.
2816. Has he got machinery for making tiles?—He has a great many.
2817. When Mr. Nasmyth was examined, he stated that he had been making a machine for Mr. Minton?—He has a patent for a machine with Mr. Minton, jointly.
2818. Has he ever made a machine for Mr. Minton?—There is one at Stoke now.
2819. How long is it since he made it?—It is a patented machine, on the 26th of April 1851.
2820. Was that the first that he made?—The first, and the only one.
2821. Has it ever made any tiles?—It has; I had a letter from Mr. Minton this morning; I am often applied to for machinery for making bricks, and I wrote to Mr. Minton to know how they were getting on; and he says “Mr. Nasmyth’s machine has worked well for a short time, but each time it has broken; we are now strengthening some of the parts, and hope soon to have it at work again.”
2822. How long has it been put up?—Between three and four years.
2823. And it has not got to work yet?—In a new machine there is generally a screw loose.
2824. Have you ever seen it?—Yes.
2825. What is the matter with it?—I told Mr. Minton, when I saw the specification, it never would make a brick.
2826. But it has done so?—No; I distinguish between making and manufacturing, in a manufacturing sense.
2827. It has not turned out well, has it?—I should say not.
2828. Is Mr. Minton satisfied with it?—He is a very liberal man, and he does not grumble at a little expense.
2829. Is he connected with Mr. Nasmyth in the machine?—Yes.
2830. Who is the inventor?—They are joint inventors.
2831. Then Mr. Minton cannot complain of Mr. Nasmyth, because it would seem that they are both in fault?—Yes.
2832. You know a great deal about Birmingham and the neighbourhood, and something about London and the neighbourhood; taking into consideration the locality, the circumstances of the two places, the rates of wages in the two places, and various other advantages and disadvantages, can you form any idea as to the cost at which a Birmingham man can manufacture muskets, as compared with a London man?—The wages would be higher here, and coals would be higher, and rates and taxes; and when you are carrying all those materials, I suppose the finished article is less than about one-third of the gross weight.
2833. Can you form any idea, having had much experience, of how much cheaper a Birmingham man can manufacture arms than a London man?—I should think at least 10 per cent.
2834. Have you ever been at the Government manufactory at Enfield?—No.
2835. You do not know whether they have been making any experiments as to machinery there?—No.
- 2835\*. Supposing they have a manufactory now competent to produce a certain portion of arms, what is your opinion with regard to their adding to their means there, instead of having a new establishment?—I think that the Government have gone in such a higgledy-piggledy way about their mechanical operations that they get the worst of everything; they go and visit, and see machines, and then take them away in their head, and then put them to work.
2836. Have you ever heard of their sending down to Birmingham to get plans of other persons’ machines?—Yes, I have heard of that.
2837. Did they ever come into contact with you?—I did see Mr. Lovell some years ago; he wanted some tubes rolled for sword scabbards.
2838. Did you ever hear of the Government sending down two men to Mr. Rivers, the cap manufacturer, to learn how he made caps?—No.
2839. What plan should you recommend to the Government now?—I think the Government ought to spend a sum of money in machinery, for making arms.
2840. To what extent?—I think to the extent of 25,000*l.* or 50,000*l.*; they ought to have two manufactories, one wherever they please, and one in Birmingham, and keep books by double entry, and have a public accountant, and I think the Birmingham people would very soon show them what o’clock it was.

2841. Do you think that the manufacture in London would compete with the manufacture in Birmingham?—Where a man is his own judge, jury, and executioner, he has a light sentence. The London works would be in that position.

2842. What portion of the manufacture should you recommend to be done by the Government, with a view of securing themselves against the consequence of misunderstandings between the manufacturers and workmen?—I think that they ought not to touch the barrel at all.

2843. Do you think that they ought to touch the lock?—I think they are better without it: they should do the stock, and the setting up, I think.

2844. You think that they ought to put up machinery for stocking barrels, in addition to their present means?—All machinery that, on consulting intelligent men, they might consider would be beneficial in the gun trade.

2845. If, when they had set up that machinery, they found that they could not compete with private manufacturers, should they let it stand still?—They ought to do. I consider when Brigadier-general Bentham brought out his machinery, it effected a great national saving. The savings in copper, in one year, were 40,954*l.* 12*s.* 8*d.* when the copper mills were erected. The expense of reconverting copper into sheathing by the Government was 1*d.* per pound, and Greenfield and Williams charged them 4*d.* They had an inquiry before The House, and they then offered to do for 2*d.* what they had previously charged 4*d.* for. I think that was a great saving in one year, but I think there is a time when the Government should cease to manufacture also.

2846. You do not know that at this time they cannot make copper at all, and they cannot keep it on the bottoms of the ships?—They should use Muntz's metal, and they have got as far as that. I was at Woolwich a few days ago, and they had got as far as that metal in some screws, about as big as your finger; it is a mixture of 60 parts of copper and 40 of zinc, and it has the property of not corroding like copper, and it is much cheaper and better.

2847. Colonel *Dumas*.] You stated, did you not, that it was a Mr. Osborne who invented some machinery?—Yes.

2848. You state that he did not gain by it?—I do not think he did.

2849. You stated, did you not, that he was forced to use it from a combination among the workmen?—Yes, that introduced the machinery; skelps used to be forged by hand, and Mr. Bradley introduced machinery for that.

2850. Do you think that combinations still exist at Birmingham?—Yes; if there is a bit of an order, the master and men cannot go on at all in the gun trade for Government.

2851. That increases the difficulty of obtaining those orders, does it not?—Yes.

2852. Is not that pressure greater the greater the want of arms?—No doubt of it.

2853. Mr. *Muntz*.] That is why you recommend that the Government should have an establishment of their own to keep them in check?—Yes; apart from the application of machinery, the Government have never given the engineers of this country any chance to do what they can do. At the Great Exhibition the place was filled with inventions; for instance, American reaping machines. I said, "That is an old invention." I thought the Yankees were going to ent me, and they got a council medal for it. We have published the specifications on reaping in this Appendix, and it proves now to be an English invention brought back from America, and put up here as an American invention, and they are constantly doing that; whereas all the improvements in the working of wood that I have ever seen are due entirely to General Bentham's patent of 1791 and 1793.

2854. Mr. *Muntz*.] Are those what the Americans now are adopting?—Yes, they have patented them over and over again. General Bentham introduced Mr. Brunel to the Government, and Mr. Brunel has in all the printed books the credit of it, but it does not belong to him. This is Mr. Brunel's specification (*producing the same*); he was employed under General Bentham to carry out this notion, which was patented in 1801; General Bentham's was in 1793. This specification of Mr. Brunel's is contained in General Bentham's, but Mr. Brunel received 16,021*l.* 10*s.* 10*d.* for his remuneration, being the savings in one year by making blocks by the Government machinery, instead of buying them from the contractors.

2855. That is, Mr. Brunel applied the principles of General Bentham to making blocks?—Yes, he took out this patent, but he was under General Bentham.

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2856. There has been much money saved by making those blocks. Supposing that machinery had been in the hands of individuals, do you not consider that there would have been as much saving?—Yes, but I cannot see the inducement in gun-making for any individual to spend money; he has no security as to time and price; I would not engage in it.

2857. Do the Government generally spend money to more advantage than individuals?—I think, in the instance of General Bootham, if the Government had continued it, we should have very largely benefited.

2858. Are you aware that the Government had an arm manufactory at Lewisham?—I have heard so.

2859. And that they proposed to spend 16,000*l.*, and they spent 66,000*l.*, and then abandoned it. Suppose the Government act upon the same principle now, and spend 150,000*l.*, do you think that they will confine themselves to that amount?—It is not usual in estimates for machinery. I recollect ordering a lathe from Mr. Whitworth, and I was to have it in six weeks, but it was 12. Every mechanical week is a fortnight. I think you should have double the money, and then you would get about right.

2860. If every mechanical week is a fortnight with regard to Mr. Whitworth, is there not the same allowance to be made for the unfortunate gunmakers who set out to make the guns that are now made, for the delay that takes place?—Yes, I think so. The above was an exception to Mr. Whitworth's usual practice.

2861. Should not an allowance be made for the Minié rifle work?—Yes; I consider the bayonet very difficult to make.

2862. It has been stated that bayonets could be made for 2*s.* 6*d.* apiece; what is your opinion upon that?—The bayonet on that stool (*pointing to the same*) is only 1*s.* 3*d.*

2863. But not such as that; it is to be a better one, made by Ryder's machine?—Ryder's hammer is a first-rate tool, and I think it is applicable to any drawing out process.

2864. What do you think of the price of that bayonet; would you like to make it for 2*s.* 6*d.*?—That depends upon the quantity.

2865. And subject to the view?—I would not have the view at all; no shading.

2866. Have you ever examined the shank of it?—Yes.

2867. The least variance in form and size is an objection to the bayonet?—This looks as if it were made of iron and steel.

2868. The Ordnance insist upon having them precisely as they are, or else they are not received?—That bayonet cannot be made by any man in England for 2*s.* 6*d.*

2869. Can it be made for 4*s.*?—This is a most difficult thing to make; it is three-curved; I can see exactly where it hurts; it is taper, and there is a constant change of curvature.

2870. You never saw machinery for the express purpose of making them?—No.

2871. It is to be done, it is said, and it will be a very simple machine?—If a man has a machine, I think it is worth 2,000*l.* if it will do that.

2872. Did you ever see a machine that could do it?—I cannot conceive of it; I would not do it, nor think of it; I could make that bayonet by tools, but not by machinery.

2873. Can you make a machine to make anything?—You may go too far.

2874. Have you seen it carried so far as to become a burden?—Yes; I remember in regard to some machinery that must have cost, I think, 10,000*l.* or 12,000*l.*; I recommended it to be divided; I said, "You will then make some money by it." That hurt their pride, and so their pocket suffered, and they never made a halfpenny; but other persons in Birmingham use that machinery; it is used very extensively now in divisions, and has been very profitable; it is a button-making machine.

2875. Colonel Boldero.] Did you hear the evidence of Mr. Lancaster?—Yes.

2876. With your knowledge of the trade of gunmaking, do you agree with him that the gunmakers, if they combined together to make the Government 25,000 muskets, such as you have before you, could not accomplish the work in six months?—I do not believe a word of it; I am sure I could accomplish 25,000 in six months.

2877. Mr. Geach.] Will you state whether your experience has not shown that the progress of the application of machinery to supersede hand labour has

been a very slow one; and been the work of a great number of individuals?—  
Yes, and a work of time.

2878. Although you may imagine that a machine will do a certain work, it is a long time before you will get it to what you have properly described, namely, to manufacture the article it may make?—Yes.

2879. There is a distinction between making and manufacturing?—Yes, that was first defined by Mr. Babbage.

2880. It is stated that there is a large amount of hand labour now employed in making guns; would you have confidence in the success of any one individual who proposed to apply machinery to all those parts to which machinery had not been applied before, and erected a large manufactory, expending 150,000 *l.* upon it, expecting that at the end of 12 months he would manufacture perfectly 100 guns a day, and 12 months afterwards 500 guns a day; would you believe that such an expenditure of capital as that would be successful to the extent stated?—I do not think it is possible.

2881. You know very well that these things can only be brought about by slow degrees and time?—Yes; if Mr. Whitworth were to assure me that he had considered the subject of manufacturing arms, and told me what he thought he could do, I should believe him.

2882. The cut-nail trade has arrived at a very great state of proficiency; as you say, the iron is put in, and without any attendance it comes out nails, but that was arrived at very slowly; there were very many improvements?—Very slowly.

2883. You were not the only person who made improvements in that trade?—No.

2884. There were a great number of manufacturers, and many minds were brought to operate upon the same thing?—Yes, I do not know a more difficult thing than the thing that has not yet been accomplished, namely, the manufacture of wrought-iron nails by machinery.

2885. Wrought-iron nails have not yet been manufactured by machinery?—Yes, I mean that; they have not superseded the hand nail, and they would not pass the Ordnance view.

2886. Mr. *Mantz*.] You have been in the habit of erecting and making a good deal of machinery, and you can give the Committee a correct opinion as to the probable results of any outlay upon machinery; Her Majesty's Government contemplate laying out 150,000 *l.* to make guns by machinery, say within 12 months from the commencement, though they have not yet got a machine made, and in 18 months from the time of the commencement they are to make 500 guns a week; do you believe, knowing what you do about machinery, that the manufactory will be completed in 12 months, or that they will produce a gun in 18 months?—If you were to lock me up, with a good salary, I would not engage to give an opinion upon such a manufactory under 12 months; I must have all the drawings and specifications before me.

2887. Mr. *Dundas*.] You stated that you thought any private firm could make blocks more cheaply than the Government?—I think they could now.

2888. Then there is an imperfection in the machinery?—It is in a transition state; we are going constantly on improving; it was beautiful at the time it was introduced.

2889. At the time that it was invented of course it could make blocks cheaper than anything else?—It was made by the great Mr. Maudslay, under the directions of General Bentham.

2890. That has nothing to do with its being in the hands of the Government?—If a private manufacturer used that machinery now it would ruin him; great improvements have been made in machinery since that was erected.

2891. Mr. *Mantz*.] Mr. Maudslay, you say, made the machinery, but Mr. Brunel applied it?—Mr. Maudslay schemed it, and made it under the direction of General Bentham.

2892. What did Mr. Brunel do?—He drew the feather "over" the eye of the Government, and he got 16,621 *l.* 8s. 10d., to which he was not entitled.

2893. What did the machinery cost?—I do not know; this is Mr. Brunel's specification, and if you take this specification to Portsmouth you cannot find machinery like it.

2894. It has been altered since?—It never was like it; it was schemed by Mr. Maudslay, and General Bentham, and Mr. Brunel, who was very clever at

- Mr. R. Prazer.** gimerackery. Mr. Maudslay was a great mechanic, and so was General Bentham.
- 21 March 1854.** 2895. They did it between them?—Yes.  
 2896. Her Majesty's Government did not do much towards it, except paying for it?—Nothing else; General Bentham spent out of his own property 20,000 £. in making machines according to this specification; I asked Mr. Anderson if he had read this specification, and he said that he had not; I also asked those in Woolwich Dock-yard last week, and they had not; so that there they are working General Bentham's machinery, and nobody knows his name.  
 2897. Did you go into the carriage department?—Yes.  
 2898. Did you see the machinery for rolling scrap iron?—Yes.  
 2899. Did you see the way in which it was put down?—No.  
 2900. Did you see that they were working, instead of at the centre, all on the one side?—Yes.  
 2901. Did you ask who had done that work?—No, I did not.

*Mercurii, 22<sup>a</sup> die Martii, 1854.*

MEMBERS PRESENT.

Sir W. Molesworth.	Lord Seymour.
Mr. G. Dundas.	Mr. Monell.
Mr. Muntz.	Mr. Walpole.
Colonel Lindsay.	Colonel Dunne.
Mr. Newdegate.	Mr. Geach.
Colonel Boldero.	Lord Paget.

THE RIGHT HON. SIR WILLIAM MOLESWORTH, BART., IN THE CHAIR.

*Richard Webb Gunner, Esq., called in; and Examined.*

- R. W. Gunner, Esq.** 2902. *Chairman.*] WHAT office do you hold?—I am inspector of small arms.
- 22 March 1854.** 2903. How long have you held that office?—One month.  
 2904. *Mr. Muntz.*] Prior to that time you were viewer at Enfield, were you not?—I was storekeeper there.  
 2905. You superintended the work, did you not?—I was the superintendent of the royal manufactory, and also the storekeeper.  
 2906. You did not view the guns made at Enfield?—No.  
 2907. Did your son do so?—No; there are viewers there for the purpose.  
 2908. Since then you have been appointed inspector at Birmingham?—Yes; and inspector of small arms generally.  
 2909. At Enfield as well as at Birmingham?—Yes.  
 2910. When you first went to Birmingham as inspector, did you find any written instructions which had been given by the previous inspector to the viewers?—There were written ones.  
 2911. Have they been since withdrawn?—I have withdrawn them with the view of looking them over, but I have not had time to do it.  
 2912. Have you any of them with you?—No.  
 2913. What was your object in withdrawing those instructions?—To see what the instructions were, and to see whether they required any alteration.  
 2914. Since they have been withdrawn, the men have been viewing without instructions, have they not?—For a short time, under my general directions.  
 2915. Do you find that under your general instructions the viewers take sufficient care, and only reject such articles as ought to be rejected?—Up to this time I find it so.  
 2916. Is the quality of the materials received equal to what they were under the late instructions?—I believe so; I have heard nothing to the contrary at present.  
 2917. *Lord Seymour.*] Were the instructions to the viewers withdrawn?—For the present; not entirely.  
 2918. As I understand, when you went down to Birmingham you withdrew the instructions to the viewers; is that so?—Yes.

2919. Did