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Improved Grain Hulling Machine.

This machine is claimed to do its work in a very superior manner, removing the exterior woody portion or bran of the grain, and leaving the nutritious portions, which are in some degree always wasted by the best milling in the ordinary way, so that the flour is enriched in quality upon subsequent grinding.

The attrition of the surfaces, by which the woody portions or hulls of the grain are removed, may be regulated with the utmost nicety; and the machine seems well adapted to the preparing of rice for market, as well as for the purpose already mentioned.

Its construction is very simple. Our engravings illustrate, first, the entire machine shown in perspective; second, a vertical section of a machine, with its internal or hulling cylinder made of stone, and the exterior of stone sections inclosed in a metallic case; and, lastly, a vertical section of a machine made wholly of metal. The principle of action is the same in both constructions. A hopper chute, A, Figs. 1 and 3, conveys the grain to the interior of the case, to be acted upon by the hulling cylinder, E, and the external grinding sections, F. The internal cylinder is grooved as shown, and the ribs thus formed enter between corresponding ribs formed in the exterior cylinder or shell.

It will be seen that raising or lowering the cylinder, E, will cause the upper surfaces of its ribs to approach or recede from the under surfaces of the ribs on the shell, by which the attrition upon the grain is regulated as required. This is accomplished by means of the adjusting lever, G, which supports the step of the cylinder, having a threaded rod pivoted to its outer end, upon which a nut turns, as shown.

The comminuted portions of the hulls are ejected through one or more screens, B, placed at suitable intervals over openings in the case and exterior grinding shell, the screens being boxed in so that the dust thus thrown out descends to the floor, upon which the machine rests, from which it is readily removed. The grain, when hulled escapes through the chute, C. Power is applied to the pulley, D, upon the vertical spindle of the cylinder, E.

The grooves on the internal cylinder extend outward and upward, so as to retain the grain and retard its passage through the machine.

By the method of hulling, introduced with this invention, the grain is treated with such a degree of nicety that only the particles not fit for flour—and none of the nutritious portions—will be removed. Experiments made by the inventor lead him to assert that from grain hulled in his machine 80 pounds of flour can be obtained, where but 70 pounds could be produced from a like quantity hulled in the ordinary way. But apart from the increase in weight, there is a further advantage gained by superiority in kind, as all the matter not applicable to good flour is entirely removed. Higher priced flour, and more of it, are therefore the inducements offered by the inventor to the enterprising millers who wish to adopt his huller. For the use of persons desiring to test the merits of the invention, the inventor has forwarded a complete hulling machine from Europe, which is now in the New York Custom House. Responsible parties may obtain the right to remove the same to their mills and use it for a limited term, free of charge, if they will have it put up, repacked, and returned after use, at their expense.

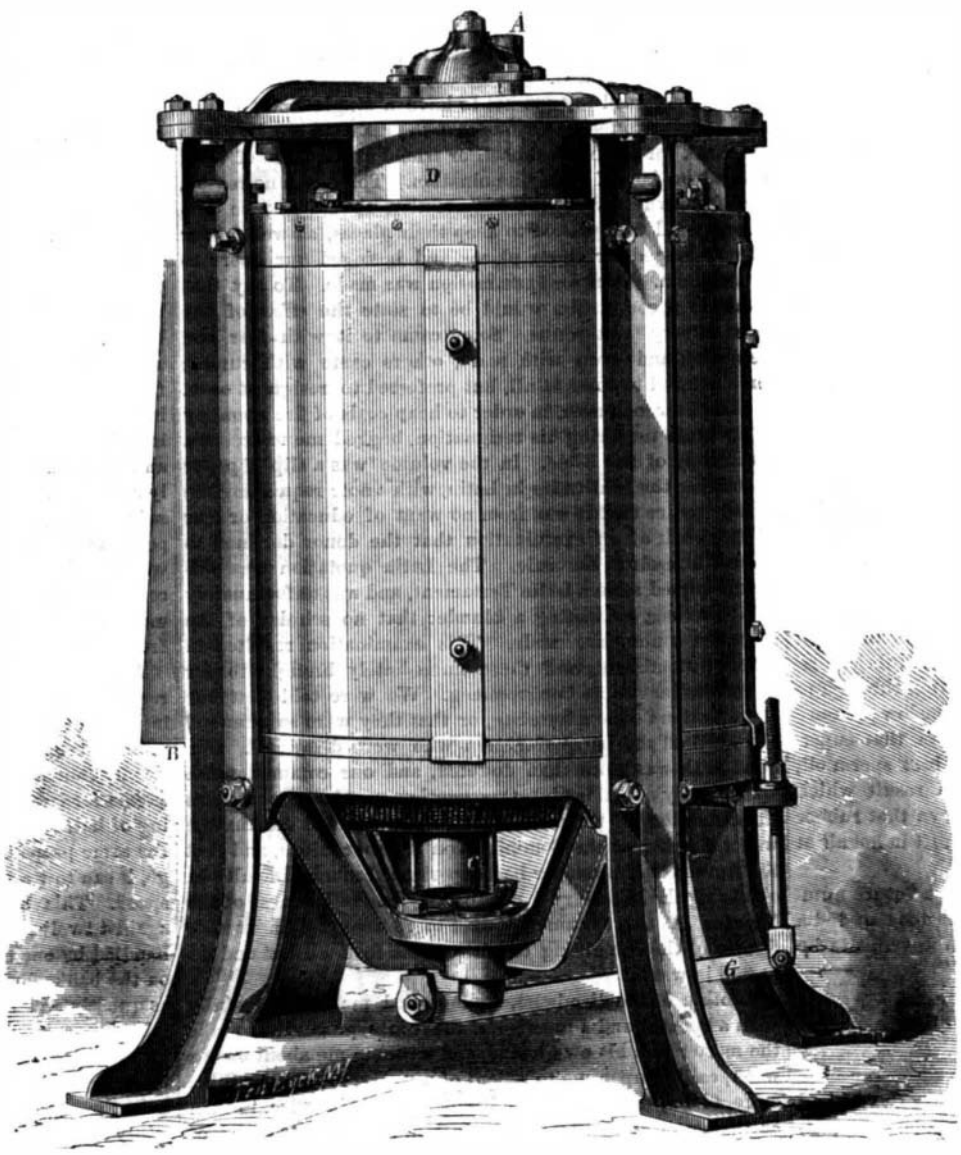


Fig. 2

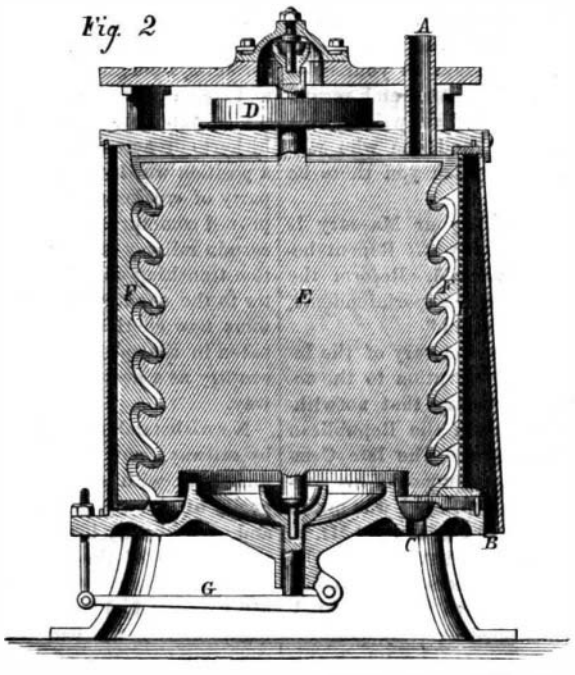
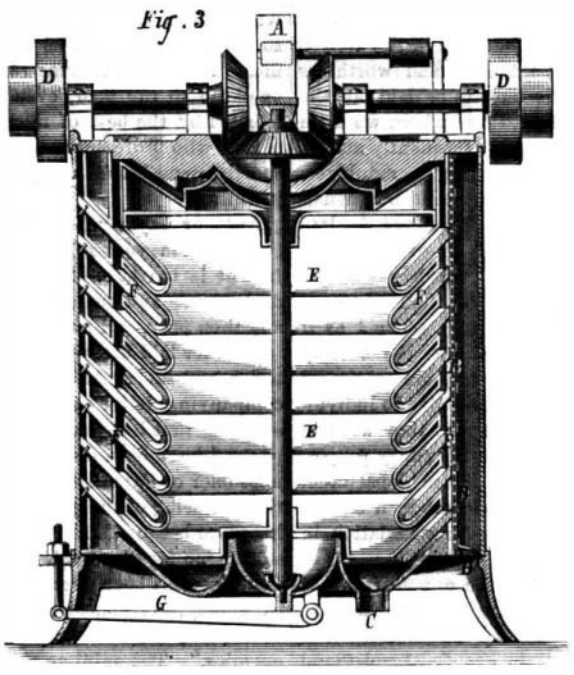


Fig. 3



HOFFMAN'S GRAIN HULLING MACHINE.

Patented through the Scientific American Patent Agency, April 18, 1871, by Michael Hoffman, of Munich, Germany. For further information address Louis Kölbl, Munich, or care Box 773, New York city.

Applications of Vulcanized Rubber.

The applications of vulcanized rubber are so numerous and so varied in their nature that we cannot perhaps do better than follow the selection of Mr. James Syme, Sen., in a paper read before the Institution of Engineers in Scotland, which is replete with practical information on the subject, but too long for the space at our disposal. In testing some specimens to ascertain the relation between breaking strain and price and density, Mr. Syme said he found the higher priced light qualities withstood less strain than the cheaper and denser, the utmost weight in direct strain borne on an area one quarter inch square being 85 lbs.; this was with rubber of 102¼ lbs. specific gravity to the cubic foot.

Probably one of the most important applications of vulcanized rubber is its use for the valves of marine engines. An opinion has been very general for some years that pure rubber valves of a floatable or nearly floatable quality were best for almost all purposes, but it is equally generally believed that good rubber is not readily to be obtained. Mr. Syme, however, thinks that there are other causes than the quality of the rubber influencing the duration of valves, such as a bad construction of grid seats and covers, employing them as bending valves under too great a pressure, or from the action of lubricants mixed with the water coming in contact with them. The conditions of service under which the rubber should probably last longest, are as circulating pump valves, where the hight to which the water has to be thrown requires but a low pressure, and the temperature ranges from 28° in cold, to 83° Fah. in tropical seas. The actual results obtained from two valves taken from the same steamer were clearly shown by Mr. Syme. Each was seven and five eighths inches diameter by five eighths of an inch thick; but one was white in color, and of a specific gravity of 100$\frac{5}{16}$ lbs. to the cubic foot, of the quality known as "pure." The other was a "mixed" of a drab color, and had a specific gravity of 73$\frac{5}{8}$ lbs. to the cubic foot; while, however, the latter withstood 90 days' steaming, the former only worked 21. In both the rubber was in good condition, but was split outwards from the hole in the center. Mr. Syme considers that they were both too dense, and while thinking that the white specimen would be the best for cold water or hot water untainted with grease, he is persuaded that the size and curve of the valve guard had more to do with their early destruction than the quality of the rubber. In this case the guard was only four and five eighths inches diameter, leaving a projection of one inch and a half of rubber all round the cover; thus the rush of water acting on a leverage of one inch and a half to five eighths of an inch thick, turned up the edge of the valve into the form of a cup at each stroke, tending to tear and split the rubber. To obviate this destructive action Mr. Syme lays down a rule that circular valve covers should have a *minimum* diameter only two thicknesses of rubber less than that of the valve, and in foot valves or oblong suspended valves, only one thickness of rubber less. The mischief done by making the valve cover too small was further proved by an air pump valve which had been in action for 28,000 miles. The cover had a diameter three inches less than the rubber, which, originally three fourths of an inch thick, was worn away to one quarter of an inch at the thickest part.

It appears, however, that the air pump valves are the most unreliable in duration, presenting a puzzle which it is scarcely possible to explain. Mr. Syme exhibited specimens which had been employed in single cylinder condensing engines for periods ranging from a few months to twelve years. One of these, constructed of pure vulcanized rubber nine sixteenths of an inch thick, worked only nine months, and was found to be black and rotten, being more like strong size or glue than vulcanized rubber. It was worn on both sides, but in all probability would have lasted much longer if it had not been fixed at the center, and compelled to beat in one po-

sition. In extreme contrast to this was a valve which had been in work for twelve years. It had a specific gravity of 75⅝ lbs. to the cubic foot, and was probably seven eighths or one inch thick when new, the portions still sound retaining their original elasticity. This valve, however, was constructed of a mixed rubber, and Mr. Syme considers that rubber to which a metallic pigment is added, in addition to the usual quantity of sulphur for thorough vulcanization, is best adapted for the construction of air pump valves, the specific gravity being from 72 lbs to 77 lbs. per cubic foot. He thinks that pure vulcanized rubber is dissolved and worn away more rapidly when acting in oily water than the "mixed," which is protected by a pigment impermeable by oil or fluid grease. The general conclusions drawn from the examination of these specimens were that circular valves should be allowed to rotate, and that the angles of the apertures in the grid plate and the edges of bearing bars should be rounded off, as when these are left too sharp and the valve beats always in one position, the rubber is cut, and the oil getting in produces a viscid effect in each incision.

Speaking of oblong foot or discharge valves, Mr. Syme says they should be of a third quality mixed rubber from 92 lbs to 102 lbs. per cubic feet, and not above three quarters of an inch thick, because within certain limits the thicker they are, the shorter their life, from the fact that, being fixed along one side, when thrown back the difference in stretching between outer and inner curves tends to break the valve—this quality of rubber having too little elasticity to withstand extreme bending for any length of time. In modern compound engines the cause of the destruction of rubber air pump suction and discharge valves is the large quantity of lubricant —oil or grease—which permeates or saturates the steam before passing through the two cylinders, and all of which passes over the faces of the rubber valves among a much smaller proportion of water than in the older condensing engines. In order to prevent this destructive action as much as possible, Mr. Syme suggests that these valves should be constructed to work without bending—rising and falling as some feed pump valves do; by which arrangement it would be possible to employ a heavier rubber, and one better adapted to withstand the action of solvents.

Referring to the applications of rubber for packing joints in steam pipes, Mr. Syme showed the rapidly destructive effects of high pressure, high temperature, and lubricated steam on best red rubber. A flange joint of a supply pipe immediately under the injecting lubricator (best sperm oil) was packed with red rubber one sixteenth of an inch thick, the pressure in the pipe being 40 lbs. In three to four months it was eaten through to the bolt holes—in six months quite through. Joints of the same thickness, used for the high pressure cylinder covers, further away from the lubricators, stood from six to nine months before being eaten through to the bolt holes, while those in connection with the low pressure steam lasted two years and more. This shows that superheated, high pressure steam, permeated with best sperm oil, destroy vulcanized rubber very quickly, a result which might have been anticipated when it is known that rubber vulcanized at about 300° Fah. becomes quite soft in hot air at 460° Fah.

We shall probably return to this subject in a future number, and give illustrations of various applications of india rubber in mechanics, with some proposed improvements by Mr. Syme.—*English Mechanic.*

EXPERIENCES OF A BUREAU OFFICER.

[Extract from a speech of Hon. S. S. Fisher, late Commissioner of Patents.

In one of my earliest interviews with Secretary Cox he had called my attention to the act of March 2, 1853, and suggested that no one should be nominated who had not passed a rigid examination. Indeed, he proposed that we should go farther. A tremendous pressure was, of course, being made for the removal of clerks from all the bureaux of the department. There were some drunken, ignorant, and worthless men in all of them, but the ax was not to be laid at the root of all such trees. On the contrary, those whom we were most earnestly besought to remove were frequently among the most intelligent, experienced, and skilful employés. Their offence was not that they were incompetent, but usually that they had spoken against the impeachment of the late President. This view, which they shared in common with not a few members of the dominant party, was by no means to be overlooked or atoned for by reason of their admitted capacity or valuable experience. As it really seemed as if the outcry for the creation of vacancies for the hungry crowd must in some way be satisfied, and as there was good reason to believe that a large part of the hostility to individuals arose in great measure from the fact that they were in while their accusers were out of office, the Secretary proposed that a thorough examination of the entire department should be made under the act of 1853, and that men should be dismissed for incompetence rather than for a variation in the shade of their Republicanism.

The act of 1853, after providing for the appointment of four classes or grades of clerks in the various departments, proceeds as follows: "No clerk shall be appointed in either of the four classes until after he has been examined and found qualified by a board, to consist of three examiners, one of them to be chief of the bureau or office into which he is to be appointed, and the two others to be selected by the head of the department to which the said clerk will be assigned." Here is authority amply sufficient for the inauguration of a thorough civil service reform. It is obvious that the examination here referred to may be made as searching as desired; that every precaution may be adopted to insure its entire fairness; that such examinations may be either mere pass examinations, or may be made competitive, and that the President of the United States, as the executive head of the government, might if he chose, without further hesitation, issue a general order controlling all the departments, and establishing therein the principle of competitive examinations. There were circumstances which rendered the application of this statute to the Patent Office a matter of comparative ease. If I had been an applicant for the office of Commissioner, and had obtained it by reason of the active exertions and warm recommendation of Senators and congressmen, I should upon taking office have many debts to pay. It would have been hardly the fair thing to say to one of my Congressional friends that his candidate could not be received on his recommendation, but that he must first pass the ordeal of a stringent examination. He would have replied, "Why you were yourself appointed upon my recommendation. You have passed no such examination. If my indorsement was good enough to make the head of a bureau, it ought to be amply sufficient to guarantee the fitness of one of his subordinates." And then he would, perhaps, gently remind the reluctant officer that the influence that could make might also unmake, and that he must of course "provide for his friends." But it is obvious that if this gentleman's nominees were appointed without proper examination, that the independence of the office was lost, and that other members would demand the same consideration for their indorsement of their candidates, until the old system was fully inaugurated.

It was my good fortune not to have a single debt of this kind to pay; to feel conscious that the man did not live who could ask for office for himself or friend as the price of word or deed on behalf of my nomination. There was no reason, therefore, why a stringent examination should not be provided for all who wished to keep their places, as well as for all who longed for those places and besieged our doors to obtain them. Such an examination was made. To say that it caused a commotion would be to state the effect of the order in very faint terms. Some came to it with fear and trembling and even with tears, others came with curses; some refused to come at all, but preferred to resign at once. Of the latter, one man, in order to heap coals of fire upon my head, while tendering his resignation, begged me to accept a small copy of the Bible. In the volume was a slip of paper containing the beatitudes in Latin, with a note requesting me to take notice that it was from no want of education or fear of the result of an examination that the donor declined to submit himself to the rule. The Latin quotation was evidently copied from a Latin Testament, and was unfortunately copied wrong, containing a blunder that no scholar of the language could have made. This examination resulted in several dismissals, and these immediately brought to our doors the inevitable Congressmen. We were told that our examinations were a humbug, or that they were so arranged as to kill off the particular men who were dismissed. Our good faith was more than doubted, and our common sense was broadly questioned. One gentleman who appeared as the champion of the most worthless, reminded me that he was a member of the Committee on Appropriations, and that the former Commissioner had experienced much difficulty in obtaining the necessary funds to carry on the business of the bureau. As this argument failed to reverse the inexorable figures of the examining committee, he took his hat and departed in wrath.

Another of the dismissed, having plied me unsuccessfully with a Senator and a member of the House, proceeded to take the matter into his own hands, and wrote to me about once a week, calling upon me to repent of my sins, to read my Bible more, to do justice to him and reinstate him in office, to turn out his enemies, or prepare to meet him at the tribunal of an unprejudiced judge in another world. I give one of the shortest of these letters entire: "Is it not singular," says the writer, "that you should have selected to be dismissed one so thoroughly radical as myself—the only one in the four model rooms of the same religious profession as yourself—one kind to the poor, even beyond his means, and recommended by the best of men? Remember, I am writing to a person who professes to delight in truth, and one who will shortly stand before a supreme tribunal. Can you there be justified?"

Another says: "Now, S. S. Fisher, if your Masonry is greater than your religion, God will curse you. Repent before it is too late. See Psalm 101, verse 5. Reform the draftsman's and model rooms, dismiss the superintendents, and then pray, and may be God will hear you."

Another laid his complaint before the Secretary of the Interior, and said: "Allow me to call your attention to the accompanying letter of Mr. Wade, and to say that notwithstanding that letter and my long service in the Republican party, I have been dismissed by Mr. Fisher. The late Commissioner of Patents was removed in consequence of his politics not being of the proper stamp, and Mr. Fisher was put in his place because his are of the proper stamp, and yet Mr. F. selects me for dismissal. I wish you would have Mr. F., who doubtless has been urged to this by some personal or political enemy, to reconsider his action and have me reinstated, that I may not be taunted or triumphed over by political enemies." The sublime coolness of this appeal will be better appreciated when it is added that in an examination in which the highest mark was 100 and the lowest 1, this man received 14, and his utter inefficiency was notorious to every one who had dealings with the office. In the application of the system of pass examinations to applicants for admission to the bureau there were found to be many practical difficulties. In the first place the law was sixteen years old. It had been nominally observed in many of the departments, until at length it had notoriously become a mere form, was habitually disregarded, or totally ignored, and was found to be convenient only for the purpose of getting rid of some man who was sacrificed by an unfair application of it, or it was manipulated for the benefit of some favorite who was allowed to slip through its meshes. It was in bad repute. Instances were current, and were authentic, in which the examiners had been requested to make the proposed test a mere formality. Many who had been subjected to it were able to tell of trifling questions concerning routes of travel or the state of the weather, or the health of their families, or the welfare of their aged parents, which comprised the total examination as to their education or capacity.

THE APPLICATION OF STEAM TO CANALS.---NO. 5.

BY GEORGE EDWARD HARDING., ESQ., C.E.

We close the list by calling attention to the arrangement for applying steam power to canal boats, which has been recently designed and practically operated in the United States by Mr. Thomas Main, mechanical engineer, of New York, and presented in longitudinal section and plan on the diagram. It will be seen that it possesses all the happy features for obtaining propulsion by steam on narrow channels, for which many have striven, but none before fully accomplished; but, as has been justly remarked by a modern writer, "an invention is progressive in a regular series." There may be a long order of elementary principles developed without the occurrence of a single practical result, so far as any useful application is concerned, but the perfect machine will be found by somebody. Analyze the diagrams, and there will be found a propeller placed in the bow of the boat (its advantages are readily seen), working in a channel underneath the vessel. The peculiar sloping of the channel is the most convenient arrangement for overcoming any tendency to create a wash, which has been, in some form or under some name, the object of several inventions. The high pressure machinery and tubular boiler is the very locomotive engine so strongly urged by Mr. Fairbairn, only in this instance the inverted cylinder and upright boiler economize the space to the utmost. In fact, the general position of both the channel and the motor interferes least with the cargo bulk; and the water, after passing the propeller, is deflected in the line of least resistance, and passes under the entire length of the boat, to form scarcely a ripple upon the surface, while the channel sides are a safeguard against any lateral waves. It may be asked if the peculiar shape of this channel does not cause friction of the water, and great loss of power. This would certainly be inconvenient in any case of high speed, but in the slower movement of canal traffic we shall not find any appreciable loss from this cause.

A boat constructed on this principle has been for some time regularly employed upon the Erie Canal in America, carrying, besides the machinery, 200 tuns of cargo, at a rate of three miles per hour, including lockages, or seventy-two miles in twenty-four hours, consuming only a tun of coal, at $5, against $28·50 for two horses' towage for the same distance—a saving of half the wages of crew, and transporting the goods in the same proportion of time—and, additional to its own cargo, it can tow a similar loaded barge at very nearly the same speed. This boat can go through a lock in six minutes, against twelve minutes required for a horse boat, and is then handled by one man with ease. There is no injurious action on the banks, and the boat can leave the canal and proceed as quickly and safely on river navigation with her self-contained power. In twelve months, such a boat, 70 feet long by 16 feet wide, and 9 feet depth of hold, with an 8 inch cylinder, driving a 4½ feet propeller, can pay for her entire cost from the saving over horse boats, to say nothing of the certainty and dispatch which alone insures the confidence of the mercantile community, and is the foundation of extensive patronage.

Every comparison between the expense of steam *versus* horse carriage that is attainable, gives great economy to the former system; and, sooner or later, with hercanals enlarged, and steam propelled boats giving a system of trackage indefinitely superior, cheaper, and more regular, than anything hitherto dreamed of, England's internal navigation will take a position worthy of those talents that conceived them. The party of croakers who are ever found in opposition to improved communication, will, with the present employés and certain railway interests, loudly cry out against any innovation trenching on this special province, and predict sad disaster to the country by any interference with the ancient customs now cherished so fondly; but if the step is not now taken in the spirit of enterprise, it will be forced upon the country as a necessity, after other nations shall have led the way.

Notwithstanding the immense amount of freight conveyed by railways, now burdened nearly to their utmost limits, we find trade, with its gigantic strides, tasking the carrying capacity of the canals, in spite of their many disadvantages, and ever steadily increasing in its demands. In 1835, before the opening of the London and Birmingham Railway, the through tunnage conveyed on the Grand Junction Canal was 310,475 tuns, and in 1845, after ten years opposition of this road, the tunnage had increased to 480,526 tuns; while, at the annual meeting of the canal proprietors, in 1860, the receipts for the previous six months had been the largest ever experienced.

America, at the present moment, is alive to the necessity of canal improvement. Nearly £4,000,000 have recently been recommended by the Canadian Canal Commissioners for the enlargement and construction of slack water navigations. And, within a few weeks, the Legislature of New York have introduced a bill offering a reward of $100,000 for the best plan of canal navigation, in the substitution of steam, or