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Compressed Air Refrigerating Apparatus. By HENRY BELL AMES BELL, and JOSEPH JAMES COLEMAN, Glasgow. 1 figure. By HENRY BELL, ction of apparatus.

HOW GREAT INVENTIONS ARE MADE.

well considered purpose in view, are ever busy at nothing, making a show of invention without ever inventing any- to a scale." thing. But such men are no more worthy of the name of inventor than the corner loafer who wrangles over the affairs of local politics is worthy of the name of statesman.

The real inventor is a man of an entirely different type. He knows precisely what he is driving at, and very frequently his invention is entirely thought out before the first stroke is made to put it upon paper or to shape it in a more material form. "When you strike a difficulty, what do you do?" many achievements in overcoming alleged impossibilities. "I sit down and think," was the sufficient reply.

The capacity to think is the inventor's first and most essential endowment, and no amount of tinkering, however bination it is far harder to recast it, in the third stage of inpatient and mechanically skillful, can ever take its place. A vention as described by Mr. Bigelow, than it would be if striking example of the true inventor's ability to think creatively is furnished in the inventions of the late Erastus B. Bigelow. He was not a mechanic, he had no practice in the use of tools, he could not even handle a pencil with skill and facility. His inventions were made in the recesses of his brain, where the complicated machinery of each was created, thought out in detail, before any attempt was made to give it material embodiment. To a writer in the last issue of the Bulletin of the National Association of Wool Manufacturers. Mr. Bigelow said that his most recent carpet loom-one upon which seventy-two yards of Brussels carpet have been woven by one girl in ten hours-was completely worked out in his mind and mapped upon his brain, not in his study or factory, but in the railroad cars while making his last visit in Europe. After sating his mind and eyes with foreign sights and scenery, an irresistible fit of invention came over him. Re tiring within himself, the machine soon assumed in his mind complete form in every part and detail. Showing a rough sketch of the invention, the only drawing of it that had been made, Mr. Bigelow said: "All I have now to do is to direct a draughtsman to work in the details." Subsequently the narrator saw the draughtsman in the inventor's study, under his direction, at work upon the drawings from which the machine was to be constructed. The inventor, copying from the plans imprinted on his brain, dictated to the draughtsman (who acted as a mere pantograph) every line, circle, and curve which was to be transferred to the paper, giving its exact place, length, and dimensions. The result was a working drawing, from which alone the machinists were able to construct a perfect machine, working without experiment or adjustment exactly as it was contrived by the inventor.

The difference between the working of a mind like Mr. Bigelow's and that of an inferior inventor is one of degree, not of kind. The same kind of thinking is done with more ing by paths of unintelligent experimentation.

In that wide field of invention in which the self-imposed policy. task of the worker is to accomplish a new result by a wise point he said:

withdraw my mind from any subject in which it has once There is a very prevalent notion that an inventor is a become interested until its general bearings, at least, are tinkering fellow, an uneasy sort of mechanic who is always fully ascertained. I always mature in my mind the general experimenting, cutting, and trying, with a vague expecta- plan of an invention before attempting to execute it, resorttion of some day hitting upon something novel and possibly ing occasionally to sketches on paper for the more intricate useful. Doubtless there are in almost every community men parts. In building a machine a draughtsman prepares the who waste their time and means in brainless labor of that working drawing from sketches furnished by me, which incharacter, would-be inventors, who, having no clean cut or dicate in figures the proportion of the parts, I never making anything with my own hands. I do not like even drawing

Inventors less favored by nature with the power of close and long continued mental concentration which Mr. Bigelow was blessed with, or lacking the vividness and accuracy of his conceptions and the strength of memory which enabled him to hold fast the mental image of a complicated machine which his imagination had put together, may have to resort sooner to the pencil sketch or the material model. But these are apt to become distractions rather than aids, was asked of an inventor whose fame is world wide for his and the young inventor should study to do without them as long as possible. The moment the inventor materializes an idea his power over it is so far lessened. If the material form is not just what it should be to suit the ultimate compreserved as a purely mental conception.

> Of course to the man who has creative mental power, a hand skilled in the arts of drawing and mechanical construction may be, and if properly exercised will be, a desirable adjunct in the art of invention; but it is not an essential factor, for many successful inventors have been, like Mr. Bigelow, unable to give their new conceptions material embodiment; and where manual skill furnishes a too ready incentive to the overhasty materialization of crude ideas, it is an accomplishment which the genuine inventor can well afford to dispense with.

THE IMPOLICY OF ANTI-PATENT COMBINATIONS.

The report of the Executive Committee of the Western Railroad Association for 1879 sets off with the following:

"Duties of Members.—The members of the association can not be too frequently or too forcibly reminded of their duties in the association, which consist, chiefly:

"I. In introducing no new device, process, or appliance, and to make no change in those now in use, without submitting the same for an opinion as to what and how many patent or patents the same is subject to: and

"II. The entertaining, much less the settling, of no patent claim without an investigation thereof by the association; and never, except in extraordinary cases, settling any such claim contrary to the advice received."

When the National Association of Wool Manufacturers was founded, an especial object of many of its prominent promoters was a combination to resist certain patents which were supposed to bear heavily upon wool manufacturers, Against this course the first president, Erastus B. Bigelow, took the high ground that the association had better work to do. He said that if the association should attempt to inquire into the validity of patents they would be liable to the or less thoroughness by every true inventor And those who imputation of combining to defeat inventors. They had no stop short in their creative thinking and begin to materialize power to decide questions of patent rights; and if they were their invention too soon only multiply their chances for to go into any court as a body in opposition to any patent, going wrong, increase their labor needlessly, and demonstrate they would only invite defeat through the prejudice which their incapacity to reach the higher levels of the art of in- such a combination would excite. He begged the associavention. To begin to build when the object is but vaguely tion not to weaken its influence by going before the public apprehended is to invite confusion and failure by turning with any object which public opinion would not regard as the mind off from the highway of invention to the bewilder- perfectly legitimate; and his wisdom carried the associated wool manufacturers with him, and decided their future

We are confident that the association has not regretted its choice and combination of known means, the rules to be fol- diversion from what at first seemed to many its primary purlowed are admirably set forth in Mr. Bigelow's description pose, and we have never heard that the wool manufacturing of the working of his own mind in developing the inventions interest has grievously suffered at the hands of the numerous for which he is so honorably known. Speaking upon this inventors who have so largely revolutionized the work of the woolen trade.

"My first step toward an invention has always been to get The Western Railway Association have undertaken to do a clear idea of the object aimed at. I learn its requirements what the wool manufacturers wisely saw to be impolitic, as a whole, and also as composed of separate parts. If, for and the peculiar relations subsisting between railway corexample, that object be the weaving of coach lace, I ascer- porations and the public are such as to make it vastly more tain the character of the several motions required, and the impolitic on their part to combine for anti-patent purposes. relations these must sustain to each other in order to effect. The manufacturers of wool had received no favors at the the combined result; secondly, I devise means to produce hands of the general public, and their work was strictly those motions; and thirdly, I combine those means and re-private in character. Not so the work of the railway comduce them to a state of harmonious co-operation. To carry panies. They have received large grants of land and other n invention through the first and second stages is compara-; valuable franchises from the public, not for the enrichment tively easy: the first is simply an investigation of facts; the of their stockholders, but for the public good. They are second, so far as I can trace the operations of my own mind, common carriers, and in view of the conditions under which comes through the exercise of the imagination. I am never they come into existence, the community has a right to at a loss for means in the sense above explained. On the insist that the carriage of persons, property, and mails by contrary, my chief difficulty is to select from the variety them shall not be needlessly delayed or rendered needalways at command those which are most appropriate. To lessly hazardous. make this choice of elementary means and to combine them i Should an association of wool manufacturers decline to in unity and harmony-to conduct, that is, an invention give place in their factories to an improved loom, they through its last practical stages-constitutes the chief would be foolish, but, being under no obligation to the public, they would not be amenable to that public for their labor. "In making this choice of elementary parts one must folly. For railway companies to combine to prevent the reason from what is known to what is not so-keeping in adoption, say, of an improved brake, is a very different mind, at the same time, the necessary combinations, examin- matter; and the associated railway companies cannot afford ing each element, not only in reference to its peculiar func- even to be suspected of such action. As a natural effect of their unwisdom in this respect, we see before Congress a tion, but to its fitness also for becoming a part of the whole. Each device must be thus examined and re-examined until bill to compel railways to adopt and use improvements calharmony and unity are fully established. I find no difficulty culated to increase the safety of passengers and mails. The in effecting that concentration of thought which is so neces- railway managers say that this is an unwarrantable and an

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