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THE INVENTION OF THE BESSEMER PROCESS.

The recent controversy between the aged Sir Henry Bessemer, who carries his knighthood by virtue of the fact that he has been considered the inventor of the famous process which bears his name, and Mr. Joseph D. Weeks, president of the American Institute of Mining Engineers, who disputes his right to the glory of the invention in favor of William Kelly, formerly of Pittsburg, Pa., and lately deceased, is notable both for the unexpected nature of the claim and for the high position of the contending parties.

The statement that the Bessemer process is not Bessemer's is so startling and seemingly so improbable that nothing short of the highest authority could render it worthy of serious consideration. As it is, the announcement was made by the president of the American Institute of Mining Engineers, and it formed the subject of his annual address before that distinguished body. Both the high official position of the author of the address and the occasion on which it was delivered gave an importance to the statement which no one was quicker to realize than the veteran inventor himself—he is now in his eighty-fourth year—and he at once wrote a lengthy reply to Mr. Weeks, which showed that he had lost in his old age none of that controversial power for which he was famous in his prime. Mr. Weeks' address and Bessemer's reply are both extremely interesting, and we give them in full in the current number of the SUPPLEMENT, together with a reproduction of the drawings accompanying the original patents granted to Bessemer and Kelly by the United States Patent Office.

Briefly stated, the facts of the controversy are as follows: In 1847, and from that date on to 1851, when he appears to have given up in discouragement, Kelly was experimenting with an apparatus for blowing air upon fluid iron for the purpose of refining it. The apparatus was crude, and as far as the evidence goes no attempt was made to force the air up through the body of the metal itself, as the blowing was all done by one tuyere, which was "swung down into the metal" from above. Mr. Kelly would appear to have met with little success in these experiments, and this for technical reasons which we now well understand, and which are clearly pointed out by Bessemer in his reply. At any rate, Kelly does not appear to have thought it worth while to cover his apparatus with a patent.

Mr. Weeks, however, claims that, crude as Kelly's appliance may have been, the fact that he used the pneumatic process in any form entitles him to the credit of the latent possibilities which it possessed. Bessemer, on the other hand, claims that the way in which Kelly went to work shows that he was ignorant of the true principles of the production of steel by decarburization with the air blast in a separate vessel; and that his single tuyere directed down upon the surface of the molten iron was merely a modification of the old "finery furnace," in which the molten pig was slowly decarburized by blowing air from several tuyeres upon its surface. [In this, it should be noted, Bessemer does not quote correctly the description of Kelly's tuyere, which is spoken of as being "swung down into the metal," not above or "upon it."]

It is certainly significant that during this early period the public heard nothing of Kelly's experiments, and that he made no claim for a patent until after the world had been startled in 1856 by the celebrated paper read by Bessemer at Cheltenham, England, describing his steel-making process in detail.

If during these years of experiment, prior to Bessemer's announcement, Kelly was seeking to make steel by "blowing blasts of air up and through a mass of liquid iron," as subsequently to the announcement he asserted he was, and if his apparatus contained all the essential features of the invention, it is a mystery that he did not patent it. As a practical forge master he must have been well aware of the enormous value of the secret which he possessed.

Is it not possible that a clear conception of the principles of the process, and of its inestimable value, only dawned upon Kelly after its successful development and announcement by Bessemer; and that he hastened to claim (in all honesty let us admit) a substance of which he in reality had only possessed the shadow?

Mr. Weeks has brought forward his claim in good faith, and has gone carefully into the subject, and his claim for Kelly is based principally upon the interference proceedings, which were instituted at the time, and which were favorable to Kelly's claim and which enabled him to procure his patent. Whatever glory from a legal point of view Kelly obtained from the issuing of this patent, the hard facts remain that whatever apparatus he had ever constructed was of the crudest description, and the results obtained were so unsatisfactory that he did not proceed to apply for a patent until some eight or nine years after his first experiments took place.

The question as to who was morally entitled to the credit of this great invention was well thrashed out, at the time it was first agitated, now some forty years ago; and the accumulated honors which America has

showered upon Bessemer showed that the public at large decided it emphatically in his favor. This tribute of the American people was the more remarkable and conclusive because it was rendered with the full knowledge that there were in existence the rival patents of their own countryman Kelly. It is abundantly evident that the people of that day who were in touch with all the facts of the case, and had access to the evidence, concluded that, whatever technical claim Kelly had established upon the invention, the moral claim belonged to the man who had put it into a practical mechanical shape.

It seems as if the true standard of invention should rest upon the broad basis of public service or utility and not upon a mere nebulous idea which the inventor has failed to develop. The object lesson taught by the controversy is that whatever the technical nature of the claim may be, the world at large is inclined to regard diligence on the part of the inventor as an essential, and to award the laurel of success to him who has been the first to confer a boon upon humanity by developing the idea into a practical and useful invention.

PASSAGE OF THE FORTIFICATIONS BILL.

The Fortifications Bill, as passed by the House on the 14th inst., is in every way an admirable measure. Its appropriations are based upon the recommendations of the Endicott board of 1885, which made an exhaustive examination of the various harbors and sea coast cities, and devised a complete system of land fortifications, whose total cost was to be \$100,000,000. It is evident that such a large sum could not be immediately expended, for the reason that our plant for making guns and mounts has an annual capacity of only 10 per cent of the material represented by that amount of money.

The present bill authorizes a total expenditure of \$11,384,613, of which sum \$5,842,337 is specifically appropriated, and authority is given to the Secretary of War to make contracts involving the further expenditure of \$5,542,276.

The amount appropriated and authorized by contract under each subdivision of the bill is as follows: Gun and mortar batteries, \$5,260,000; sites for fortifications, \$250,000; preservation and repair of fortifications, \$50,000; plans for fortifications, \$5,000; sea walls and embankments, \$17,975; torpedoes for harbor defense, \$100,000; armament of fortifications, \$5,502,673; proving ground, Sandy Hook, N. J., \$38,000; Watertown Arsenal, Mass., \$43,500; Watervliet Arsenal, N. Y., \$3,105; Benecia Arsenal, Cal., \$4,500; Ordnance and Fortification Board, \$100,000; Fortress Monroe sewerage system, \$9,860.

This generous appropriation, which is even larger than the government can expend during the ensuing year, may be taken as a pledge of the fact that the country is waking up to the imperative necessity of providing for national defense by means of a system of coast fortifications.

While this appropriation was being passed by the House, Mr. Squire was speaking in the Senate in support of his bill to authorize an expenditure of \$80,000,000, of which \$10,000,000 are to be appropriated for the fiscal year ending June 30, 1897, and an expenditure is to be authorized of \$10,000,000 for each of the seven fiscal years ending June 30, 1904.

The total sum is less than that contemplated by the Endicott board, but the number of guns, mounts, etc., provided for in the bill is amply sufficient to put our principal maritime cities in a thorough state of defense.

The total number of direct fire high power guns of all calibers provided for is 517, and of mortars, 1,056. To construct these guns and their mounts, and to build their emplacements, about eight years will be required. This is the least time in which the money could be expended to good advantage.

The bill before the Senate may be considered as complementary to that just passed by the House, and it is earnestly to be hoped that it will be incorporated with it. There are some questions which ought to lie beyond the reach of party politics, and of these the question of national defense is first. The considerations which have led to the appropriation and authorization of over \$11,000,000 for immediate works of defense are equally cogent for the authorization of the other \$70,000,000. These considerations are strong today, but they may be weak and futile to-morrow. We are just now involved in, or threatened with, international complications, and the views of Congress on national defense are certain to be sounder in the presence of danger than those of a future Congress that may have to consider this same question in a time of profound peace.

The passage of the Squire bill would insure the completion within a measurable time, and at a regular rate of progress, of a complete system of land defenses. The nation would be committed to it, and the necessary funds would be voted and forthcoming as fast as the government factories and engineers required it.