SCIENTIFIC AMERICAN

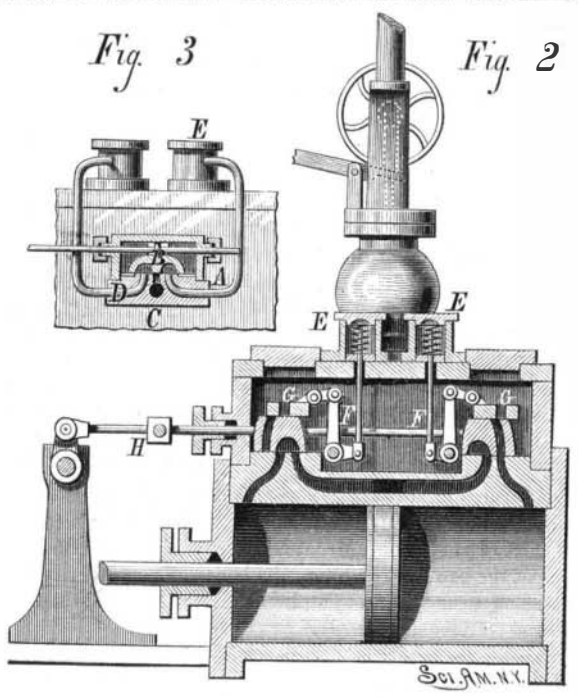
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXIX.—No. 3. [NEW SERIES.] NEW YORK, JULY 20, 1878. [$3.20 per Annum. [POSTAGE PREPAID.]

IMPROVED VARIABLE AUTOMATIC CUT-OFF.

In the device herewith illustrated the inventor has aimed to provide a variable automatic cut-off gear which may be applied to plain slide valve engines, and render the working of the same fully as economical as if they had been specially constructed in connection with an improved apparatus of the kind.

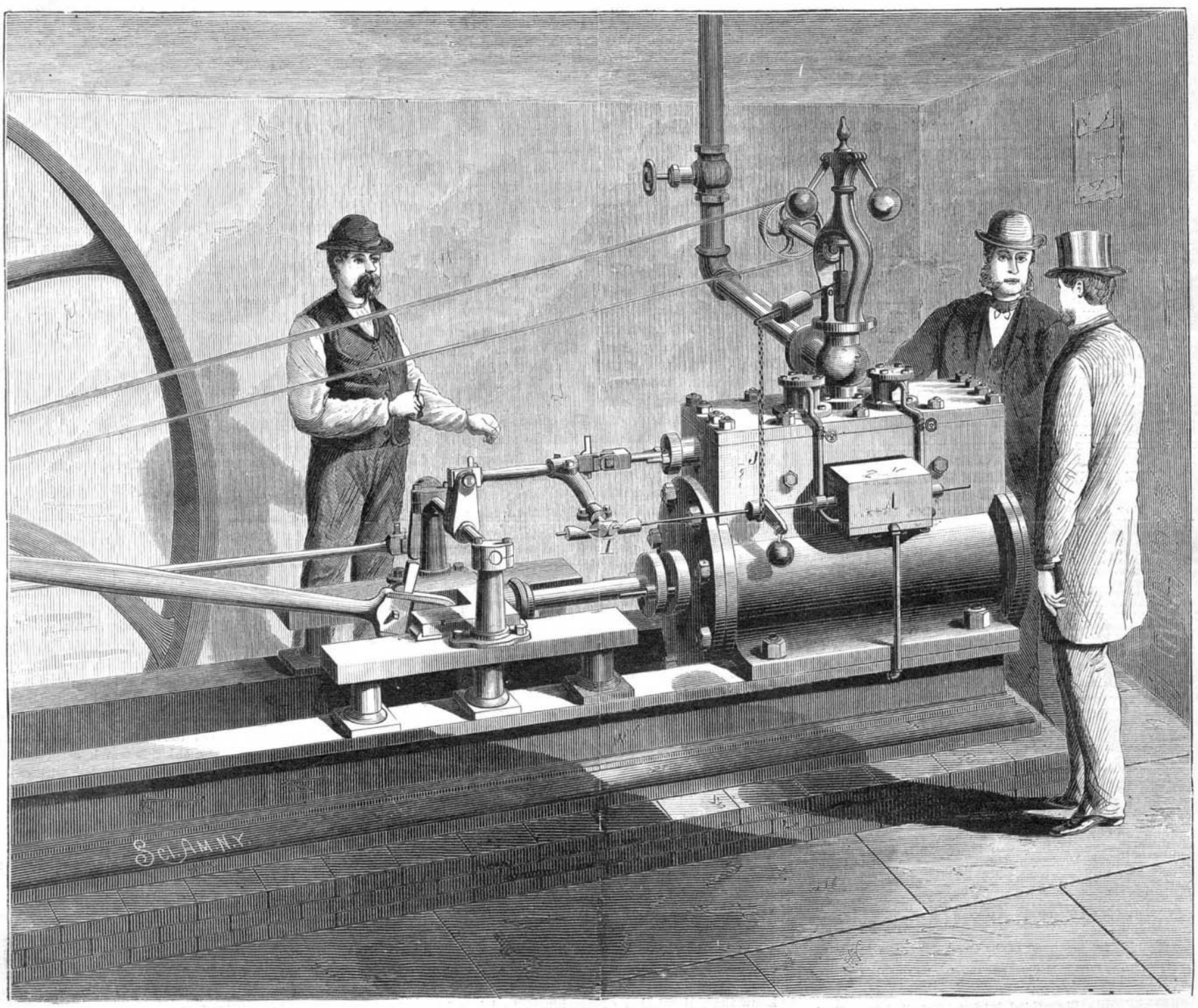
A general view of the apparatus in position is given in Fig. 1, and the details will be understood from Figs. 2 and 3. It is so constructed that should the motion of the engine become too rapid, it will cut off the steam automatically at each stroke of the piston until the engine has been slowed down to the proper speed. Beside the valve chest is a secondary chest, A, Fig. 3, in which is the valve, B. This chest has an exhaust port, C, and ports, D, leading to the cylinders, E, attached to the top of the main valve chest. The chest, A, is connected to the main chest by a passage, so that the pressure may always be the same in both chests. In the cylinders, E, are spiral springs which rest upon steam-tight pistons, to which are attached rods which pass down into the main valve chest and are attached to elbow levers, F. The holes in the chest through which the rods pass are made larger than the rods, so that the steam may have free passage. The elbow levers communicate, as shown, with plates, G, placed on top of the slide valves. These plates have ports through which the steam passes in its traverse



through the ports of the slide valve to the main cylinder ports. When the engine is running at ordinary speed the plates, G, are in such a position that their ports may be directly over the main ports. To the valve stem, H, is attached an arm which carries a wedge-shaped head, I (see Fig. 1), and through this passes the valve steam from the secondary chest. On the last mentioned stem are adjustable collars, and also connected to the stem is a chain, J, which carries a weight, and which, after making one or two turns around the stem, communicates with a lever which is connected with the governor.

With this construction, as the speed of the engine increases, the outward movement of the governor balls causes the lever to be depressed and the valve stem to be turned, so that the head on the arm will strike the collars on the stem and thus move the valve, B, on its seat. As this valve moves it connects one of the ports, D, with the exhaust, C, so that steam may escape from the upper part of the cylinder, E, with which said port is connected. This allows the steam pressure of the main valve chest to raise the piston in said cylinder, E, and hence to move the plate, G, with a positive motion to shut off steam. This happens at each stroke of the main piston until the speed of the engine has been reduced to its ordinary amount.

We give indicator diagrams from an engine, fitted with this cut-off in Fig. 4. The valve gear has been, we are in-



DINGLEY'S VARIABLE AUTOMATIC CUT-OFF.

formed, in successful operation for the past six months no H. L. Weston's engine, corner 29th street and Seventh avenue, New York city, where it may be seen in operation.

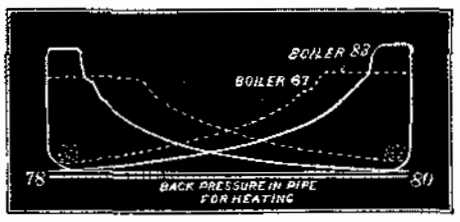


Fig. 4. IMPROVED VARIABLE CUT OFF.

For further particulars relative to sale of patent, etc. (dated April 30, 1878), address the inventor, Mr. E. L. Dingley, 112 Wooster street, New York city.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XXXIX., No. 3. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, JULY 20, 1878.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 188,
For the Week ending July 20, 1878.

THE USES OF MECHANISM.

The press reports inform us that at the beginning of the harvest season the farmers of Ohio were warned, through a circular letter signed "Working Men's Bread or Blood Committee," that if they used mowing or reaping machines in getting in their crops, the machines would be destroyed and the barns containing the gathered crops would be burnt.

The machines were used as a matter of course; and happily the threatened destruction of machines and crops has not been attempted. Whether we are to attribute the escape of the farmers to their extra vigilance or to the absence of any considerable following to the ill-named committee, it is impossible now to say. It would be pleasant to know that the latter reason was the true one, and that even among the lowest of the farm hands of the West there is no large number of men who keep up the ancient and witless feud against machinery. But what can we expect of the untaught, when men in the higher ranks of society, to whom the truth is easily accessible, persist in teaching the industrial foolishness that machinery lessens the demand for men?

Witness the venerable Thurlow Weed, whose advanced age and long association with political affairs ought to have given him, one would think, the means for forming a just judgment on this point. Yet this is the way he moralizes when he gets to talking of the changes he has witnessed:

"I am amazed when I look back and think of the changes that invention has wrought in the life of society," he said the other day to a *Tribune* reporter. "The gas jet has taken the place of the tallow candle, the telegraph of the post; but the changes are mainly due to steam and the multiplication of machinery. This affects—indeed, has revolutionized—all the industries of the country. Even the agriculturist has superseded hand labor almost wholly with machinery. This has thrown hundreds of thousands of people out of their ordinary employment." Further on, while deploring the influence of machinery, Mr. Weed remarked: "Take the example of the sewing machine. This has thrown tens of thousands of women out of employment, and affected the morals of the country alarmingly."

That position is not less powerless than age to ward off the foolishness of willing ignorance is evident from the following utterance of Senator Beck, which we find in the *Congressional Record* of May 2. He said:

"Machinery is driving out of the manufacture of products hundreds and thousands of human beings every year. We have machinery to-day in this country that can do the work of one hundred and seventy-five million men. I think it can do the work of two hundred millions; but the report says one hundred and seventy-five millions. Each machine that is invented and put in operation drives from the manufacture of the articles that it manufactures all the human labor that formerly did its work. I repeat that hundreds and thousands of human beings were at one time earning an honest living by doing the work that machinery now performs."

At a time like this, when so many designing demagogues are trying to make political capital by playing upon the ignorance and prejudice of the least informed of the working classes, talk like this from men in the position of Senator Beck and Thurlow Weed is unpardonable; it is worse than foolish; it is positively criminal. Not only is there no evidence to give it a shadow of justification, but the proofs of the contrary are abundant and accessible to all. The readers of the SCIENTIFIC AMERICAN have had almost a surfeit of such evidence in recent issues of this paper.

Mr. Weed tells us that tens of thousands of sewing women have been turned out of employment by the sewing machine, and multitudes have been driven in consequence to a life of crime. Where is the proof? The census reports show two things in this connection: first, that the earnings of sewing women have largely increased since the introduction of sewing machines; and second, that the number of persons earning a living by sewing has increased since that invention was made, in a ratio considerably larger than the ratio of increase for the entire population. The truth is, that so far from lessening the employment and wages of women, the sewing machine has largely increased both. If Mr. Weed has any private evidence to the contrary, we should be glad to see it. And so with the "hundreds of thousands of farm hands" that have been thrown out of farm work by farm machinery. Where are they? The best evidence we can find—the census reports—show that since the introduction of agricultural machinery there has been not only a large and rapid increase in the number of farm hands employed in this country, but the rate of such increase has been much greater than the rate for the population as a whole. More than that, as shown in a late issue of this paper, the increase of farm hands has been vastly greater and more rapid than would have been possible without the aid of machinery. As Elihu felt constrained to remark in that most ancient of symposiums, recorded in the Book of Job, "Great men are not always wise, nor does wisdom always come with age."

Witness again the honorable Senator from Kentucky. "We have machinery," he says, "that can do the work of two hundred million men, and every machine has turned out of employment as many men as it can do the work of." Such being the case, we cannot escape the conclusion that our machinery has usurped the employment of more men than were ever engaged in manual production in all the world!" Had Mr. Beck been possessed of the slightest desire to know the real relation of machinery to labor, he could easily have learned that in every instance the introduction of machinery has been attended by an increase in the number of men employed in the trade or trades affected. Abundant evidence of this great law of industrial economy has been given in recent issues of this paper. Here are some figures even more significant than any before given, since they cover a period of great industrial depression.

The little State of Rhode Island is nothing if not mechanical. There never was a time when machinery was more rapidly introduced and improved than during the years between 1870 and 1875. Comparing the manufacturing statistics of the State given in the National census report of the former year, and those of the State census of the latter year, it appears that notwithstanding the panic and its results there was, during these years, a considerable increase in the number of hands employed and in the wages paid:

All Manufactures.	1870.	1875.
Number of establishments	1,850	2,019
Capital invested	$66,557,322	$49,942,871
Hands employed	49,417	56,540
Wages paid (per annum)	$19,354,256	$23,707,513
Value of raw materials used	$73,154,109	$76,715,970
Value of products	$111,418,354	$126,659,875
Number of steam engines	402	523
Horse power of engines	23,546	34,241

A like comparison of State and National statistics with regard to the cotton factories of Massachusetts shows similar results, except in the latter case there was an increase in the amount of capital employed, and a larger increase in the number of hands at work:

Cotton Manufactures.	1870.	1875.
Number of establishments	191	220
Number of spindles	2,619,541	3,859,237
Persons employed	43,512	60,176
Capital invested	$44,714,375	$63,844,708
Value of stock used	$37,371,599	$41,059,893
Value of goods made	$59,403,153	$77,934,753

Thus we see that notwithstanding the increase in the number of steam engines and other productive machinery in Rhode Island—more properly, in consequence of such increase—there was a gain of 14 per cent in the number of operatives employed, while the gain in the cotton industries of Massachusetts was 26 per cent during the same five years. In Ohio, as in several other Western States, the progress of manufacturers and the increase in the number of hands employed were very much greater. The census of 1870 gives the value of the manufactured products of Ohio as $269,713,000. The report of the State Auditor for 1875 makes the value of the same line of products $400,000,000.

It is true that during late years financial disasters, not in any way due to machinery, have stopped many factories and thrown many operatives out of employment; but the number of such men out of work is as nothing compared with the swarms of laborers thrown out by the stopping of city "improvements," and other jobs of like nature. And those industries into which machinery has been most largely and successfully introduced are just the ones which suffer least to-day, and have suffered least since the hard times began.

It is time the cant about machinery hurting men was banished from respectable society; time that men who have learned that the world is not flat shall learn also the equally well demonstrated truth that it is not possible for machinery to give employment to steadily increasing numbers, and at the same time turn out of employment every year twice as many men as were ever at work. It is bad enough for Kearneyites and Socialists to indulge in such nonsense. From Senators and "venerable statesmen" it is intolerable.

WORKING GOLD ORES.

Communications are sometimes addressed to us asking our advice or opinions concerning various methods of working gold ores, and recently several correspondents have sought to know if there be any approved way of saving the fine gold which is coated or incased with iron or other substance that prevents or seriously interferes with amalgamation.

The chlorination process, which dispenses with amalgamation, has long been in practice in this country and gives very satisfactory results, being especially adapted to the treatment of ores containing fine gold. The ore is stamped, then roasted and stirred in a furnace at low temperature until all the sulphurets, etc., are decomposed, then removed, spread and cooled, after which it is moistened with water and introduced into wooden tubs or vats, with bottoms arranged for the admission of chlorine gas, which is generated by heating a mixture of sulphuric acid, manganese, and salt. This gas is conducted into the tubs until it has covered and penetrated the mass of ore, and is allowed to remain in this intimate contact for several hours (the time depending upon the size of the particles of gold), until all the gold is converted into a chloride which is soluble in and is then dissolved out by water, to be treated with sulphate of iron, which precipitates the precious metal in a metallic condition as a fine dark brown powder.

This is unquestionably a sure process, but its economical value depends very much upon the proportions or amounts of the base metals in the ore. To overcome what may almost be termed the repellent action of this coated fine gold upon mercury—to prepare it for amalgamation—nitric and sulphuric acids have been used and rejected because of the expense; for they will not select and remove this coating to the exclusion of the inferior metals, for all the copper, iron, etc., present equally demand their share of the reagents; so that it is only ores of exceptional character and richness that will justify such treatment.

As it is especially those particles of gold, so minute and thin that they escape the action of the stamps, which, in many instances, form the larger percentage of the assay, and