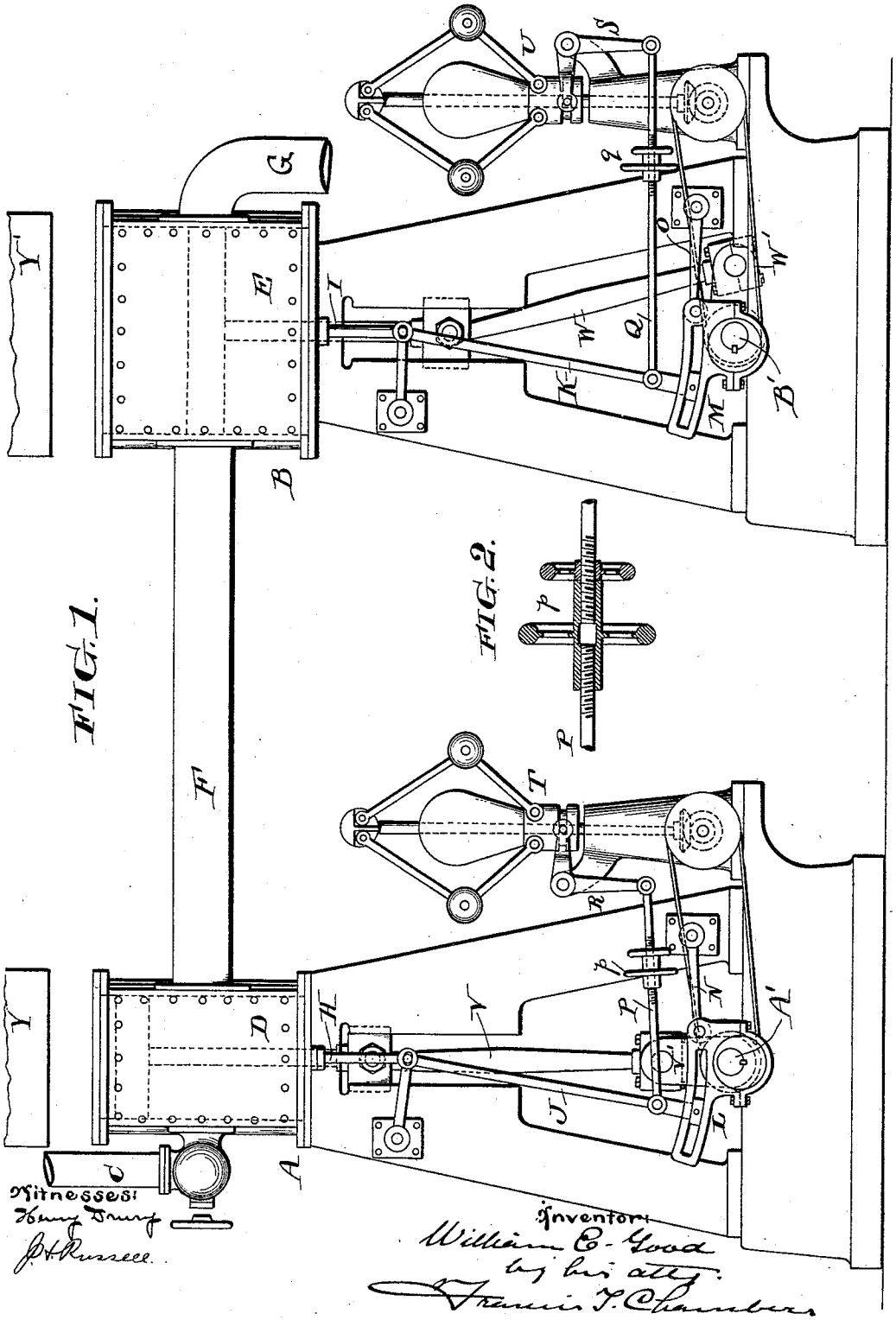
(No Model.) 2 Sheets—Sheet 1.

W. E. GOOD.

STEAM ENGINE.

No. 482,038. Patented Sept. 6, 1892.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

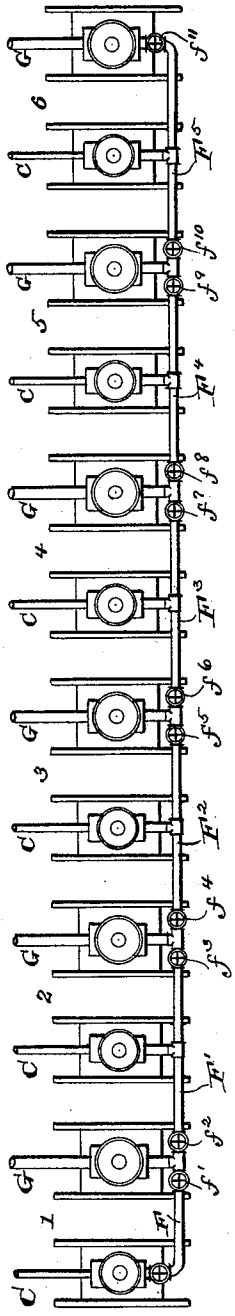
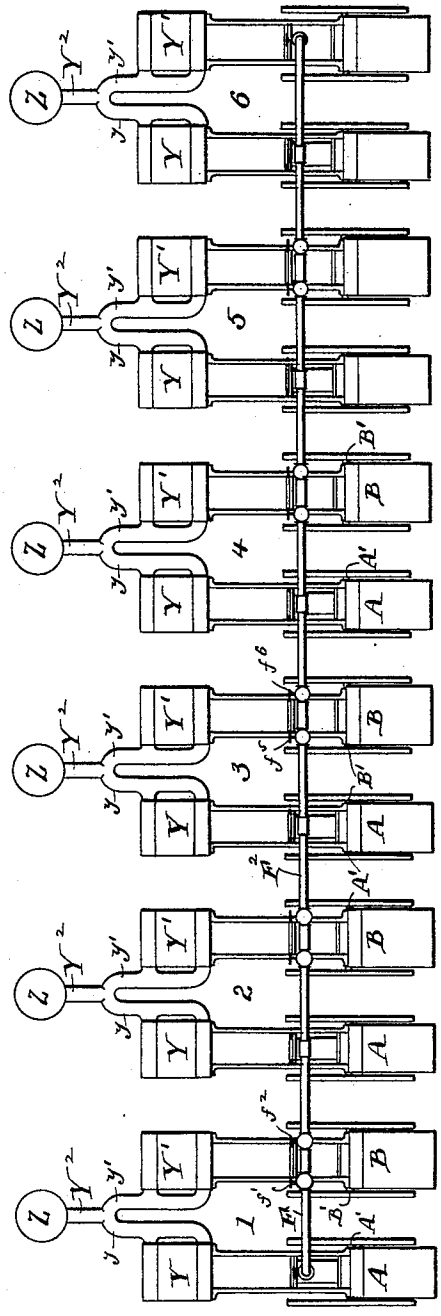


FIG. 4.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C

UNITED STATES PATENT OFFICE.

WILLIAM E. GOOD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE SOUTHWARK FOUNDRY AND MACHINE COMPANY, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 482,038, dated September 6, 1892.

Application filed March 28, 1892. Serial No. 426,684. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. GOOD, of the city and county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Steam-Engines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to the economical use of steam in steam-engines, my object being principally to secure (by a novel combination of parts) the well-known advantages of compound or multiple expansion engines without the disadvantages arising from the combination of two or more cylinders into a single engine, the moving parts of which necessarily act together and with a fixed ratio of speed.

A further object of my invention is to effect the regulation of the engines largely by controlling the admission of steam to the low-pressure cylinder, this feature being to a certain extent applicable to ordinary compound or multiple expansion engines.

The nature of my invention will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is an elevation showing two blowing-engines combined in accordance with my invention; Fig. 2, a detail of the governing mechanism; Fig. 3, a plan of a series of blowing-engines embodying my invention, and Fig. 4 an elevation of the same series.

A indicates a high-pressure cylinder blowing-engine, and B a low-pressure cylinder blowing-engine, A′ being the shaft of the one engine and B′ the shaft of the other engine, and these shafts being entirely disconnected and independent.

C is the steam-admission pipe leading to the valve-chest D of the high-pressure engine, and F a receiver leading from the exhaust of the high-pressure engine to the valve-chest E of the low-pressure engine.

G is a conduit leading from the exhaust of the low-pressure engine and which may connect with still another engine, if the multiple compound arrangements is required, or may serve simply as an exhaust, leading either to the air or a condenser.

H indicates the valve-stem of the high-pressure engine, and I the valve-stem of the low-pressure engine, a connecting-rod J leading from stem H to link-motion L N in the one case and a similar connecting-rod K leading to a link-motion M O in the other case. The motion of the steam-admission valve for the high-pressure engine is governed by the position of the end of rod J in the slotted link L, and this is regulated by an ordinary governor (indicated at T) connecting through a bell-crank lever R to rod P with the rod J.

p indicates an adjustment device for regulating the length of rod P. The governing arrangement, as shown, is of the ordinary type, which will increase the admission to the high-pressure cylinder as the work upon that cylinder increases. The admission of steam to the low-pressure cylinder is also governed by the position of the end of the rod K in the slotted link M, and this position is regulated by a governor (indicated at U) acting on the rod K through the bell-crank lever S and adjustable rod Q. It will be noticed, however, that owing to the position of the bell-crank lever S the action of the governor on the rod K is directly inverted or reversed from the action of the governor on the rod J, and therefore the governor U acts to decrease the admission to the low-pressure cylinder as the work upon that cylinder increases. It will be seen that as the work of the low-pressure cylinder increases its admission and the quantity of steam used by it decreases, and supposing a uniform quantity of steam to be coming from the exhaust of the high-pressure engine, the result will be an accumulation of steam at a considerable pressure in the receiver or conduit leading from the exhaust of the high-pressure engine. This accumulation of steam by increasing the back-pressure on the high-pressure engine will increase the work upon that engine, and the increase of work will cause the governor T to increase the admission of steam to the high-pressure cylinder, and in this way I secure steam from the exhaust of the high-pressure engine both greater in quantity and in pressure. Thus it will be

seen that by the paradoxical means of shortening the admission to the low-pressure cylinder as its work increases I secure an increased supply of steam for it and at a higher pressure. It is of course obvious that a decrease of work in the low-pressure cylinder will, acting through its inverted governor, diminish the back-pressure in the high-pressure engine, and by thus diminishing the work to be performed by that engine will effect a shortening of admission of high-pressure steam to it.

Referring now to a special use of my device, I would state that Y and Y′ indicate the blowing-cylinders of the high and low pressure blowing-engines. As shown in Figs. 4 and 5, there are six pairs of blowing-engines, each having one high-pressure engine and one low-pressure engine and six points of use (indicated at Z Z Z) and which may be blast-furnaces, converters, or any other device where air is used. Each pair of blowing-engines connects with a single point of use Z—as, for instance, through the air-conduits y y'—uniting in a single conduit Y′, or passed independently, if desired, to the point of use. The receiver F in the plan shown is made continuous by extensions F′ F^2 F^3 F^4 F^5, and valves f' f^2 f^3 f^4, &c., are arranged in it, as shown. In the diagram of my plant I have marked each pair of engines with a numeral from one to six. Normally, I will suppose that the valves f' f^3 f^5 f^7 f^9 f^{11} are open and the others closed. This will connect each pair of high and low pressure engines, as indicated at Fig. 1. If now one of the engines breaks down, or it is desired for other reasons to throw it out of use, taking, for instance, the high-pressure cylinder-engine of the first set, it is necessary only to close the valve f', when the low-pressure engine of the set can be run independently of the high-pressure engine. The plan would then be as before, except that live steam would be admitted to the low-pressure engine independently, or by opening the valve f^2 the exhaust from the high-pressure engine in the second set would pass both to it and to its own proper engine in the low-pressure set, the admission of the high-pressure engine being increased to the extent which would enable it to supply steam to the two low-pressure engines. The other combinations are obvious and need not be specifically pointed out.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with high and low pressure cylinders connected by a conduit or receiver, a governor regulating the admission of steam to the high-pressure cylinder, said governor being arranged to lengthen the admission as the work on said cylinder increases, and a governor regulating the admission of steam to the low-pressure cylinder, said governor being arranged to shorten the admission as the work on that cylinder increases, substantially as and for the purpose specified.

2. The combination of two steam-engines disconnected as to their reciprocating or rotative movements, a receiver connecting the exhaust of one engine-cylinder with the admission of the second, a governor regulating the admission of steam to the high-pressure cylinder and arranged to increase the admission as the work on said cylinder increases, and a governor regulating the admission of steam to the low-pressure cylinder, arranged to shorten the admission as the work on said cylinder increases, substantially as and for the purpose specified.

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