No. 692,678. Patented Feb. 4, 1902.

C. W. A. KOELKEBECK.

HOT BLAST STOVE.

(Application filed Oct. 28, 1897.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 3.

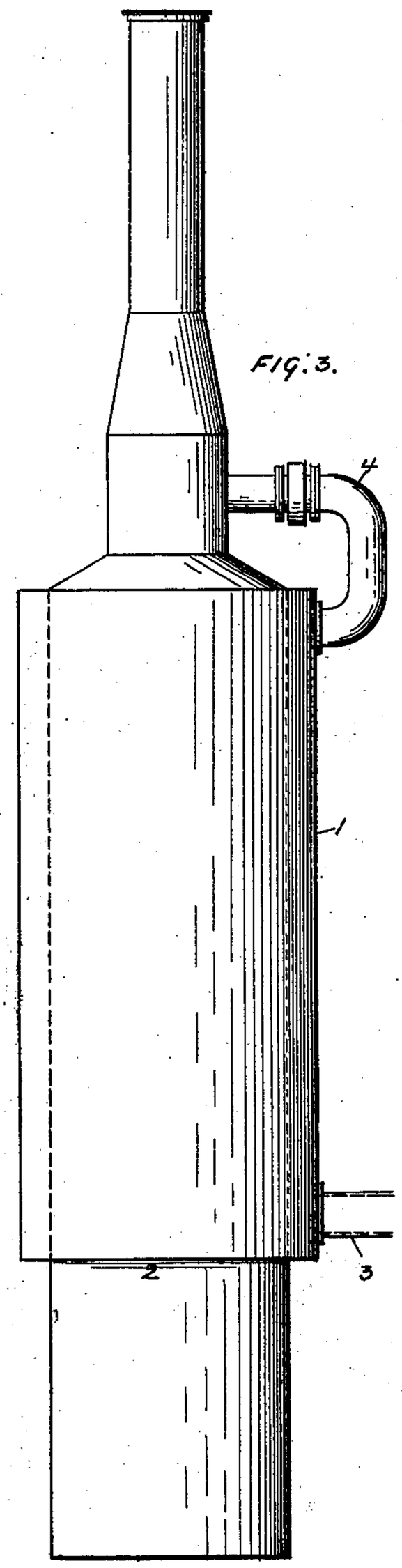


FIG. 2.

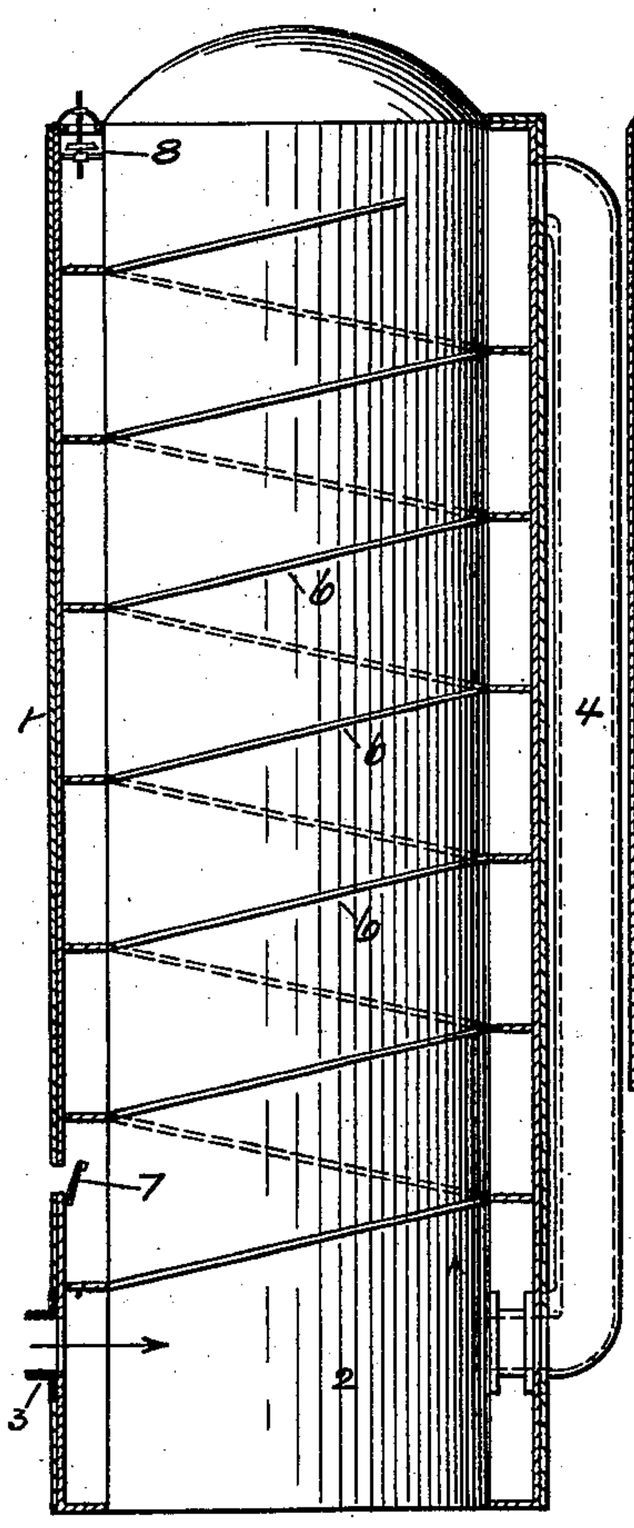
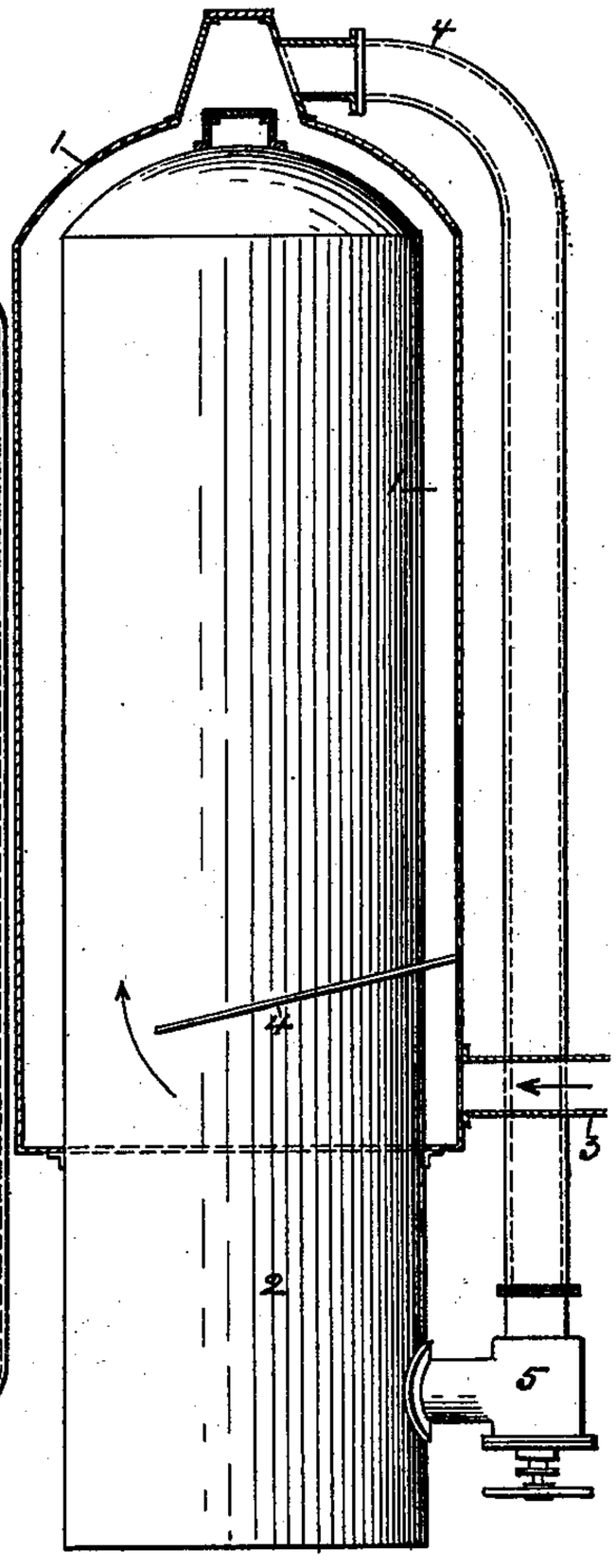


FIG. 1.



WITNESSES

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FIG. 5.

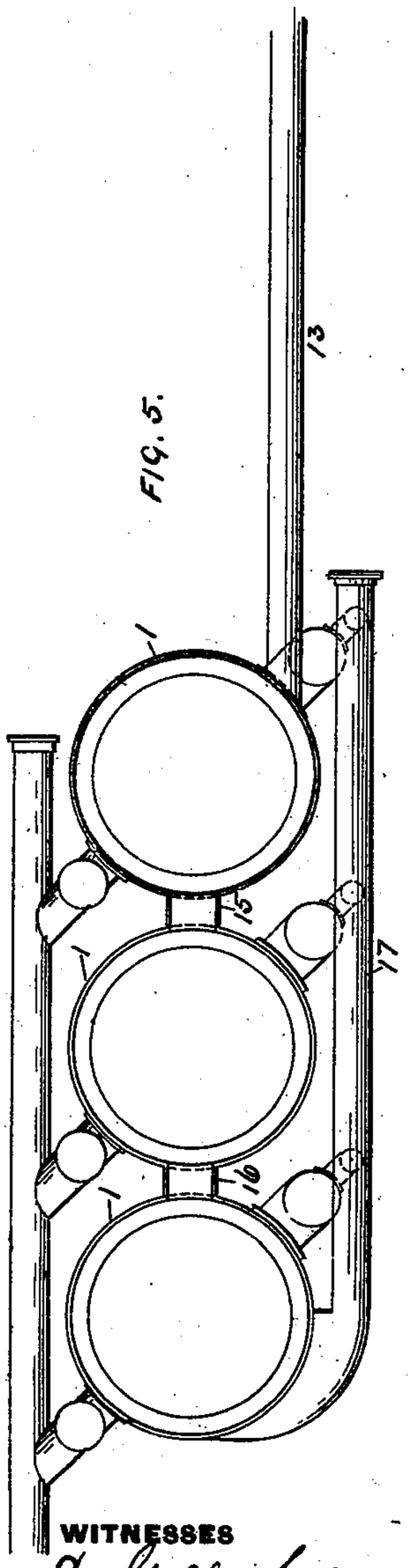
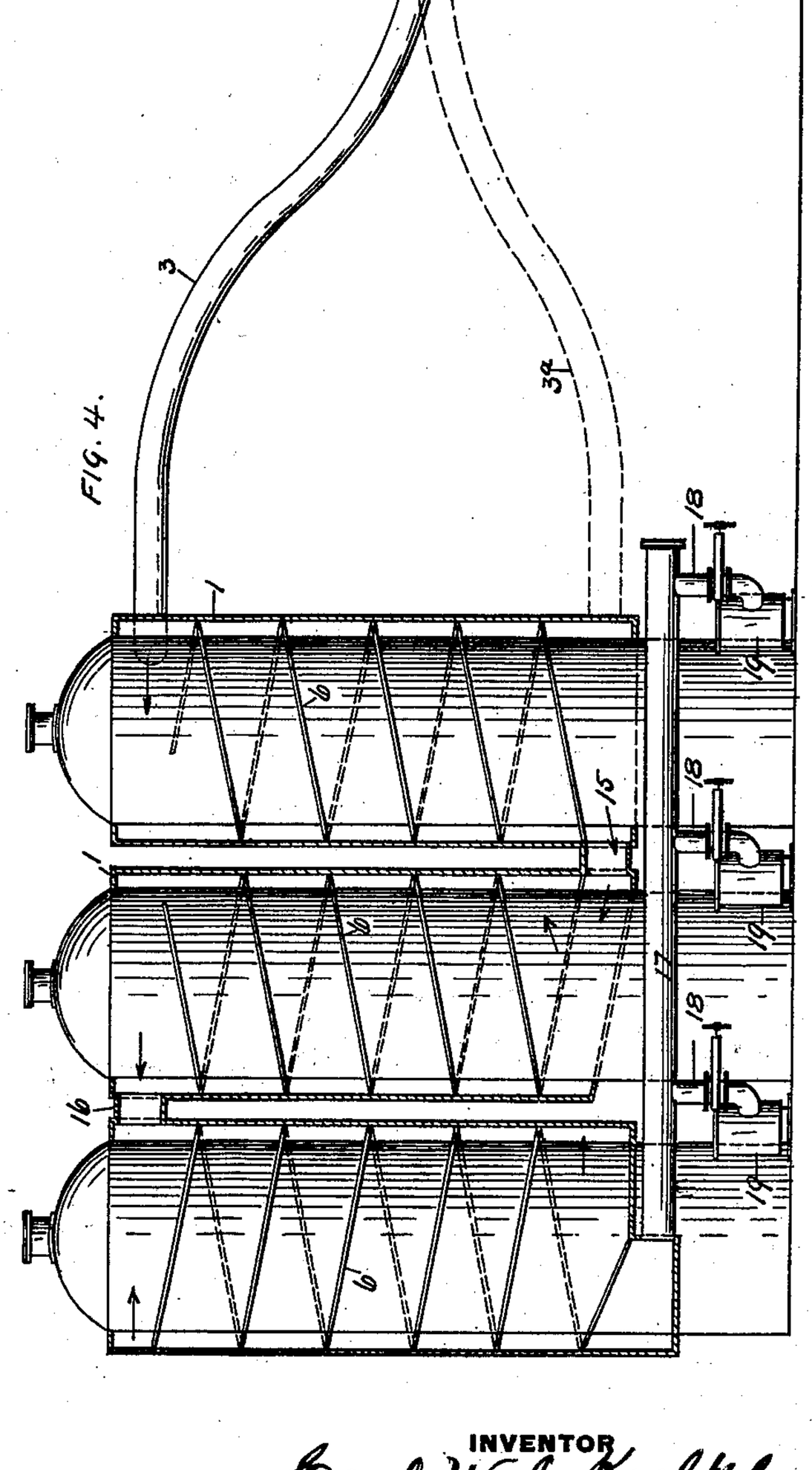


FIG. 4.



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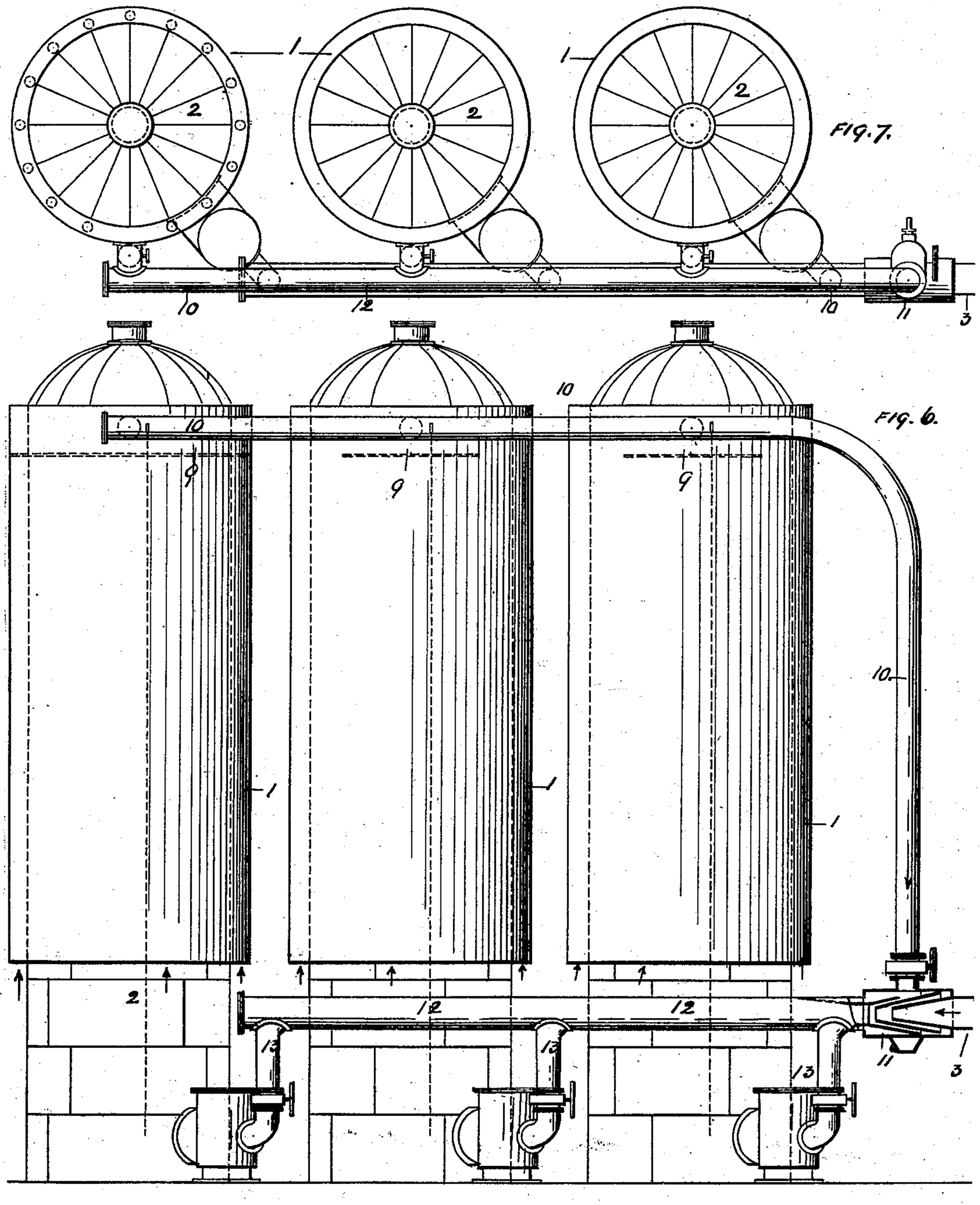

FIG. 7.

FIG. 6.

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UNITED STATES PATENT OFFICE.

CARL W. A. KOELKEBECK, OF PITTSBURG, PENNSYLVANIA.

HOT-BLAST STOVE.

SPECIFICATION forming part of Letters Patent No. 692,678, dated February 4, 1902.

Application filed October 28, 1897. Serial No. 656,646. (No model.)

To all whom it may concern:

Be it known that I, CARL W. A. KOELKEBECK, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Hot-Blast Stoves, of which improvement the following is a specification.

The object of my invention is to provide an improvement in hot-blast stoves for blast-furnaces; and to this end my invention consists in means whereby heat which has heretofore been wasted may be utilized, the chilling action of the air on the interior of the stove may be avoided, higher temperatures of the air-blast may be obtained without any increase in fuel, and a general improvement in the efficiency of the hot-blast stove and of the blast-furnace may be effected; and my invention further consists in certain combinations and features of construction, as hereinafter set forth.

In the accompanying drawings, which illustrate applications of my invention, Figures 1, 2, and 3 are views showing hot-blast stoves provided with my improvement. In Figs. 1 and 2 stoves of forms commonly employed are shown in elevation with my improvement applied thereto and shown in section. Fig. 3 shows another form of stove with my improvement applied thereto and shown in elevation. Fig. 4 shows a set of three stoves with my improvement applied thereto and connected with a blowing-engine. Fig. 5 is a plan view of the construction shown in Fig. 4; Fig. 6, an elevation showing three hot-blast stoves with a modification of my improvement applied thereto, and Fig. 7 a plan view of the construction shown in Fig. 6.

My invention relates to improvements in hot-blast stoves such as are usually employed for heating the air-blast before its admission to the blast-furnace; and by means of my invention the efficiency and durability of the hot-blast stove are increased and the efficiency of the blast-furnace and of the plant as a whole is improved.

My improvement provides means for heating the air supplied to the hot-blast stove before its admission to the interior of the stove, and thereby avoids such injurious chilling action on the interior of the stove as has heretofore been due to the admission of cold air. This is an important feature of my invention.

In accordance with my improvement the air for the blast is, before entering the stove, supplied with heat which would otherwise be wasted by radiation from the stove, and the utilization of that otherwise wasted heat for preliminarily heating the air is another important feature of my improvement.

In Figs. 1 and 2 of the drawings my improvement is shown applied to what is known as a "Cowper" hot-blast stove; but the form of the stove is immaterial, as my improvement is equally applicable to any form of stove.

In the embodiment of my improvement as shown in Fig. 1 of the drawings, I provide a closed jacket 1 around the stove 2 and connect thereto the air-pipe 3 from the blowing-engine. The air which is admitted to the jacket from the pipe 3 is prevented from rising directly upward by the deflecting-plate 4, which extends partly around the stove in the space between the stove and the jacket and causes a distribution of the air around the whole of the circumference of the stove before permitting it to rise upward. The upper end of the jacket is connected by a pipe 4 with a valve 5, through which the air after passing through the jacket is admitted to the interior of the stove to be further heated in the usual manner before passing to the blast-furnace. By means of this construction the outer metallic shell of the stove, which presents an enormous radiating-surface, is covered by an air-jacket, the air in which absorbs the heat which would otherwise be wasted by radiation into space, and the material of the shell of the stove is maintained at a lower temperature than it would have if no current of air were passing over it, so that the injurious effects of the higher temperatures on the shell are obviated. Any attempt to prevent radiation from the shell by covering it with any solid insulating material would be expensive and troublesome and would cause such overheating of the shell as to materially shorten the life of the stove. The air in passing from the pipe 3 through the jacket will be sufficiently heated to prevent any injurious action on or disintegration of the checker-work

within the stove, such as occurs when cold air is admitted immediately after the interior of the stove has been heated.

The construction shown in Fig. 1 of the drawings is specially applicable to old stoves or stoves which have been erected without my improvement, as it will require but slight changes in the connections. The jacket does not extend to the bottom of the stove, but surrounds the top and upper portion, where the heating effect will be greater. In Fig. 2 the jacket 1 extends downward to the bottom of the stove 2, and the air which enters the jacket from the blowing-engine through the pipe 3 passes upward and around the shell of the stove through the passage formed by the helix 6 of thin flat material, which winds around the stove and fits between the stove and the jacket 1. The air from the top of the jacket 1 passes downward through the pipe 4 and is admitted to the lower part of the stove 2.

In Fig. 2 of the drawings I have shown an inwardly-opening flap-valve 7 near the lower end of the jacket and an inwardly-opening check-valve 8 near the upper end of the jacket. When air under pressure is supplied to the jacket, the valves 7 and 8 will be automatically closed by the pressure in the jacket, and there will be no outlet for the air except through the pipe 4, through which it passes to the interior of the stove. In case of a cessation of the blast for any length of time it may be desirable, in order to prevent overheating of the shell, to secure a circulation of cool air through the jacket, and it is for this purpose that the valves 7 and 8 are employed. When the blast from the blowing-engine through the pipe 3 ceases, the pressure within the jacket will fall, and when the pressure gets low enough the valves 7 and 8 will open automatically under the action of gravity, thereby permitting a circulation of air through the jacket from the bottom to the top and preventing overheating of the shell.

In Fig. 3 of the drawings my improvement is shown applied to another form of stove. The air for the blast enters the jacket 1 through the pipe 3, which leads from the blowing-engine, and the air after passing through the jacket passes through the pipe 4 to the interior of the stove.

In Figs. 4 and 5 of the drawings I have shown a set or group of three stoves with my improvement applied thereto. The air from the blowing-engine 14 passes through the pipe 3 to the upper end of the jacket 1, surrounding one of the stoves, and then passes downward and around the stove through the passage formed by the helical strip, guide, or baffle-plate 6 to the bottom of the jacket, from which it passes out through the pipe or passage 15 into the lower end of the jacket 1 of the second or middle stove. It then passes upward in a spiral path, as before, being guided by the strip 6 to the upper part of the jacket, from which it passes through the pipe or passage 16 into the upper part of the jacket of the third stove, and then downward through the spiral or helical passage to the lower end of the third stove and into the pipe 17. From the pipe 17 the air may be admitted to the interior of any of the stoves at will through the pipe 18 and valves 19. By means of this construction the jackets are connected by short and direct connections, and the air before passing into the interior of a stove has absorbed heat from the shells of the three stoves. While this construction is convenient, inexpensive, and efficient, it may be varied in part or to any extent desired, so far as the connections and relative arrangement of the stoves, jackets, and connections are concerned, without departing from the broad principles of my invention. For example, if preferred, the pipe from the blowing-engine may connect with the lower portion of the jacket, as indicated by the dotted lines, showing the pipe 3^a in Fig. 4, and other similar and corresponding variations may be made.

In the construction shown in Figs. 6 and 7 the jackets 1 of the stoves 2 are open to the atmosphere at their lower ends, and the air enters the jackets at their lower ends, as indicated by the arrows. Baffle-plates 9 (shown in dotted lines in Fig. 6) may be arranged inside the jacket below the connections to the pipe 10 in order to prevent too direct a flow of air upward through the jackets to the outlet connection. These baffle-plates extend only a part of the way around the circumference of the stove, so as to leave a sufficiently large passage for the escape of the air.

The pipe 10 in Figs. 6 and 7, into which the air passes from the upper end of the jackets, is connected to an injector 11, into which air is delivered from the blowing-engine through the pipe 3. The action in the injector is such that the air from the jacket will be drawn into the injector from the pipe 10, and, together with the air from the blowing-engine, will be forced into the pipe 12 and through the branch pipes 13 into the stoves.

In order to prevent loss of heat by radiation from the jacket, the jacket may be wholly or partly formed of insulating material, or it may be covered with insulating material, as shown in Fig. 2, the outer thickness of material (shown in section) representing the insulating-covering.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. The combination, with a set or group of hot-blast stoves for furnaces, which are provided with air-jackets surrounding the stoves for heating air before its admission to the interior of a stove, of connecting means whereby air may be supplied from any of the jackets to the interior of any one or more of the stoves at will, substantially as set forth.

2. The combination, with a hot-blast stove

for furnaces, of an air-jacket on the outside of the stove, an air-blast inlet and outlet for the jacket, and means constructed and arranged to be operated by the air-blast to admit cooling-air to the jacket, substantially as set forth.

3. The combination, with a hot-blast stove, of a jacket on the outside of the stove, means for supplying air under pressure to the interior of the jacket, an outlet for the air from the stove, and valves for air leading into and out of the jacket, said valves arranged to be actuated by variations of the air-pressure within the jacket, substantially as set forth.

4. The combination, with a hot-blast stove, for furnaces, of an air-jacket on the outside of the stove, an air-blast inlet and outlet for said jacket, independent openings for admitting cooling-air to the jacket and gravity-valves controlling said openings and arranged to be lifted and closed by the air-blast, substantially as set forth.

5. The combination, with a set or group of hot-blast stoves for furnaces, which are provided with air-jackets for heating air before its admission to the interior of a stove, of a blowing-engine, a connection from the blowing-engine to an air-jacket, and connecting means whereby air may be supplied from the air-jackets to the interior of any one or more of the stoves at will, substantially as set forth.

In testimony whereof I have hereunto set my hand.

CARL W. A. KOELKEBECK.

Witnesses:
HENRY D. ATWOOD,
E. GALLAGHER.