E. P. COLE.

FURNACE.

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Fig. 1.

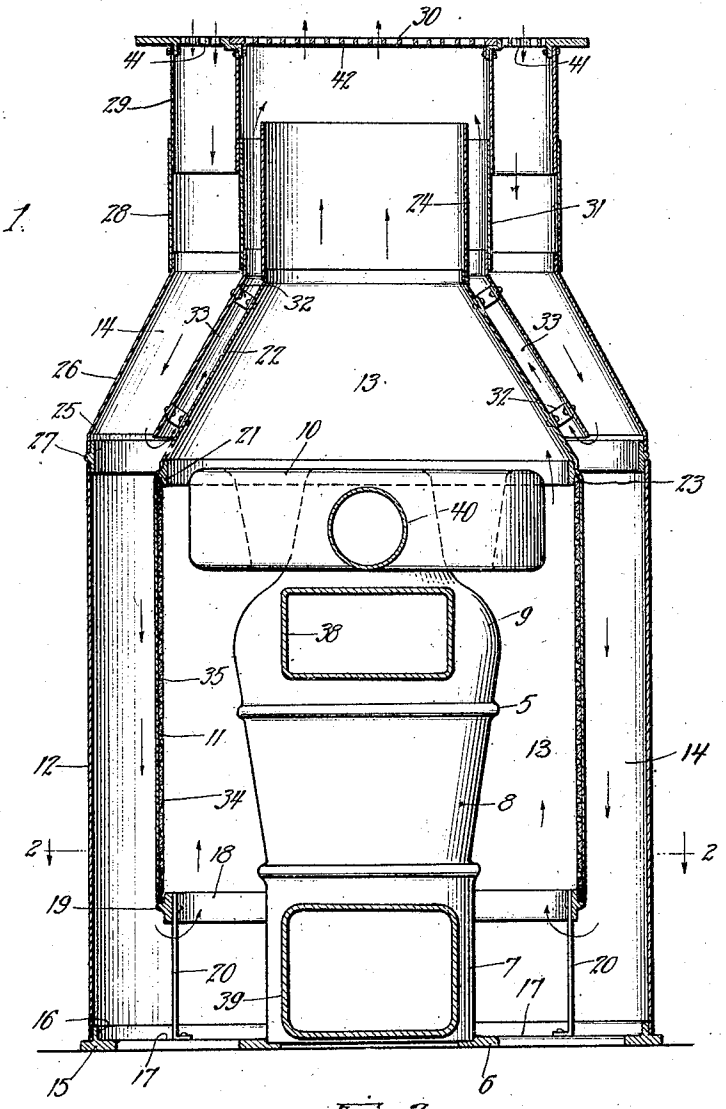
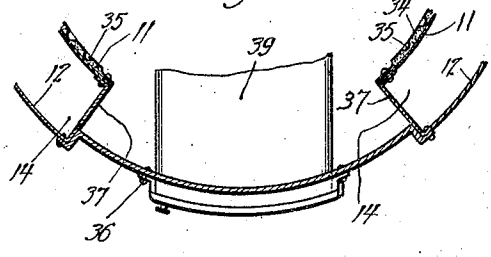


Fig. 2.



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FURNACE.

1,405,187. Specification of Letters Patent. **Patented Jan. 31, 1922.**

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To all whom it may concern:

Be it known that I, EDWARD P. COLE, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

The present invention relates to hot-air furnaces and particularly to the so-called "single-register" or "pipeless" type comprising a heater and inner and outer casings providing an outer, down-draft, cold air passage between the casings and an inner, up-draft, hot-air passage about the heater, and which passages communicate with each other at the furnace base and with a register in the floor above the furnace.

To prevent the transfer of heat to the descending cold air from interfering with the effective circulation of air through the furnace, the inner casing is usually provided with a double wall providing a relatively narrow insulating space open at the lower end adjacent the base of the furnace and communicating at the upper end with the upper portion of the hot air passage. In theory, a small portion of the air from the lower end of the descending cold-air passage circulates upwardly through this narrow insulating space, but because of its great length and restricted cross sectional area and because of the suction produced by the heater in the main hot air passage, it is found in practice that there is little or no circulation through the insulating space.

Again, expedients now in use do not effectively insulate the inwardly projecting portion or cone section of the inner casing above the heater radiator. The ascending hot air and the descending cold air strike against this section of the inner casing so that it becomes highly heated and sets up counter currents and eddies that check the flow of air, particularly in the cold-air passage, over this portion of the inner casing. For these reasons, as careful tests have shown, it is highly important to guard against the transfer of heat to the descending cold air at this point.

The present invention seeks to overcome the difficulties above noted and to provide a simplified and improved casing construction which will insure the effective circulation of air and thereby increase the efficiency of the furnace. The invention consists in the features of improvement hereinafter set forth, illustrated in the preferred form in the accompanying drawing and particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is a vertical section of the furnace, and

Fig. 2 is a detail longitudinal section on the line 2—2 of Fig. 1.

Referring to the drawings, the furnace is provided with the usual combustion heater 5 of any suitable type. This heater is mounted on an annular base 6 and includes an ash pit 7, a fire box 8, a combustion chamber 9, and a heat radiator 10 superposed, as usual, one above the other.

The heater is surrounded by spaced casings 11 and 12. The inner casing 11 provides an up-draft, hot-air passage 13 about the heater. A down-draft, cold-air passage 14 is formed between the inner and the outer casings and communications with the hot-air passage at the base of the furnace. The main vertical section of the outer casing 12 rests on a ring 15 at the base of the furnace and fits about the rib 16 on this ring. Radial arms 17 connect this ring with the base 6. The main vertical section of the inner casing 11 fits about the ring 18 and rests on the rib 19 projecting laterally therefrom. This ring is supported by legs 20 resting on the arms 17 so that the lower end of the inner casing is located a short distance above the base of the furnace and substantially at or slightly below the level of the lower end of the fire-pot 8.

A ring 21 similar to the ring 18 fits within the upper end of the main section of the inner casing. A tapered or conical section 22 of the inner casing or shell likewise fits about this ring 21 and rests on the rib 23 thereon. An upper, vertical, section 24 opens at the top fits over the cone section 22. A ring 25 similar to the ring 21 fits within the top of the main vertical section of the outer casing or shell and a tapered or conical section 26, forming part of the outer shell, fits about this ring and rests on the rib 27 thereon. An upper vertical section 28 fits over the top of the cone 26 and forms part of the outer shell. A corresponding section 29 telescopes with

the section 28 and is suspended from the register 30 seated in the floor of the room immediately above the furnace.

Means is provided for forming a relatively short, up-draft, air circulating and insulating space about the upper portion of the inner casing above the heater, and which insulating space communicates at its lower inlet end directly with the down-draft cold-air passage 14. As shown, the upper section 24 of the main inner casing terminates a slight distance below the register 30 and the air insulating space is formed by a supplemental inner or jacketing casing 31 which extends downwardly from the register 30 about the upper portion of the main inner casing and in spaced relation therewith and terminates, at its lower end, above the level of the fire-pot 8 of the heater. In accordance with the preferred embodiment of the invention, the supplemental inner casing comprises an upper portion formed of telescoping sections and a tapering or conical section extending over the corresponding section of the main inner casing and supported thereon in spaced relation by straps 32 or other suitable means. The upper portion of the main inner casing and the supplemental inner casing thus form an up-draft air circulating and insulating space, which communicates at its lower inlet end directly with the down-draft cold-air passage at a point adjacent the junction of the lower section and the tapering or conical section of the main inner casing. At its upper end the insulating space communicates with the upper end of the main up-draft air passage. With this arrangement the supplemental air insulating space does not, as in the prior structure referred to, communicate at its lower end with the down-draft cold-air passage at substantially the same level as the main up-draft hot-air passage, but at a substantially higher level.

In order to prevent any radiation of heat from the lower vertical section of the casing 11, I have found it advantageous to provide an inner lining 34 having a reflecting surface, such as bright tin, preferably spaced slightly from the inner wall of this casing. Bosses 35 or any other suitable means may be used to maintain this spaced relationship. The space between the casing and its lining is closed and, if desired, asbestos or other suitable insulating material may be placed therein.

A cast iron front 36 is secured to the rings 15 and 25 and has flanges at its side edges to which the lower main section of the outer casing 12 is secured by bolts or other suitable means, and vertical channel irons 37 connected to the front edges of the lower main sections of the inner and outer casings and connected together at their upper ends form a closure for the cold air passage. These channel irons 37 are spaced from the feed and ash pit snouts 38 and 39, in the manner indicated in Fig. 2 of the drawing. Means, well known in the art are also preferably provided for spacing the cold-air passages from the cleanout passage 40 of the front of the radiator and from the usual smoke flue that projects from the rear portion of the radiator.

When the furnace is in use, cold air enters the passage 14 through the outer portion 41 of the register and passes downwardly to the base of the furnace and beneath the lower end of the inner wall 11 into the hot air passage 13. The heated air rises in the passage 13 and is discharged through the central portion 42 of the register.

The cold air passing downwardly in the passage 14 likewise enters the air passage 33 between the supplementary inner casing 31 and the main casing 11 and passes upwardly over the conical and upper vertical sections of the main inner casing and is conducted upwardly through this passage to the upper edge of this casing, where it enters the upper end of the main hot air passage.

Air from the passage 14 is admitted to the relatively short insulating space or passage 33 before it has had an opportunity to become heated, but heat imparted thereto by the conical section 22 of the main inner casing causes it to rise rapidly within this passage. This circulation is also aided by the suction effect of hot-air discharged from the upper section 24 of the main inner casing. Thus, while the conical section 22 acts as a baffle against which highly heated ascending air strikes and becomes very hot, the heat radiated therefrom is carried off by the relatively cool air which is maintained in effective circulation through the passage 33, and the conical section of supplemental inner casing against which the descending cold air strikes, remains cool and does not impart heat to the descending cold air in the passage 14. The lower or main vertical section of the inner casing does not become highly heated and the downward movement of the cold air in the lower vertical portion of the passage 14 is rapid. Moreover, the lining 34 which forms an insulating space and has a radiant heat reflecting surface, prevents any material radiation of heat into the cold-air passage.

Obviously, changes may be made from the details set forth without departure from the essentials of the invention as set forth in the claims.

I claim as my invention:—

1. In a hot air furnace, the combination with a combustion heater and a superposed register, of outer and inner casings having substantially vertical sections about said heater and intermediate tapering sections and substantially vertical upper sections above

the heater, said casings providing main down and up-draft air circulating passages communicating at their upper ends with said register, and means providing an up-draft air insulating passage about the upper portion of said inner casing, both of said up-draft air passages communicating directly at their lower inlet ends with said down-draft air passages, the main up-draft air passage communicating with the down-draft passage at the base of the furnace and the supplemental up-draft air passage communicating therewith at a substantially higher level.

2. In a hot-air furnace, the combination with a cumbustion heater having a radiator at its upper end and with a superposed register, of outer and inner casings about and extending above said heater and providing an outer, down-draft, cold-air passage and an inner, up-draft, hot-air passage in communication at their lower ends and communicating at their upper ends with said register, said inner casing having a conical section above said radiator, and a jacket forming with said conical section an up-draft air passage communicating with said cold air passage at a point substantially at the base of said conical section.

3. In a hot-air furnace, the combination with a combustion heater comprising an ash-pit, fire-pot, combustion chamber and radiator in superposed relation, of outer and inner casings about and extending above said heater and providing an outer, down-draft, cold-air passage and an inner, up-draft, hot-air passage in communication at their lower ends below the level of the fire-pot, said casings having substantially vertical upper and lower sections and intermediate conical sections above said radiator, and a jacketing casing extending over the conical section of said inner casing and providing an up-draft air passage and insulating space communicating at its lower inlet end with said cold-air passage at a point above the level of the fire-pot.

4. In a hot-air furnace, the combination with a combustion heater having a radiator at its upper end and with a superposed register, of outer and inner casings about and extending above said heater and providing an outer, down-draft, cold-air passage and an inner, up-draft, hot-air passage in communication at their lower ends and communicating with said register at their upper ends, said casings having lower main and reduced upper sections and intermediate connecting sections, and a jacket forming with the intermediate section of said inner casing an air passage and insulating space having its inlet communicating with said cold-air passage at a point adjacent the upper end of the main section of said inner casing.

5. In a hot air furnace, a combustion heater having a radiator at its upper end, a superposed register, an outer casing extending from the register to the furnace base, a main inner casing terminating at its lower end slightly above the furnace base and having an inwardly extending upper section above said radiator, and a second inner casing extending downwardly from the register around the upper portion of said main inner casing and terminating a substantial distance above the lower end thereof, said casings being in spaced relation and providing main down and up-draft air circulating passages in communication at the base of the furnace, and a substantially shorter, up-draft air passage or insulating space between the portions of said main air passages above the heater and communicating directly at its lower inlet end with said main down-draft air passage.

6. In a hot air furnace, a combustion heater comprising an ash-pit, fire-pot, combustion chamber and radiator in superposed relation, a register above said heater, an outer casing, a main inner casing and a supplemental inner casing in spaced relation to form air circulating passages and having conical sections above the upper portion of said heater, said outer casing extending from the register to the furnace base, said main inner casing terminating at its upper end below said register and at its lower end slightly above the furnace base, and said supplemental inner casing extending downwardly from said register about the upper portion of said inner casing and terminating above the level of the fire-pot.

7. In a hot-air furnace, a combustion heater having a radiator at its upper end, a superposed register, an outer casing extending from the register to the furnace base, a main inner casing terminating at its lower end slightly above the furnace base and at its upper end slightly below said register, said casings having upper and lower substantially vertical sections and intermediate conical sections, and a second inner casing extending from said register downwardly about the upper vertical and conical sections of said main inner casing and terminating adjacent the upper end of the lower vertical section thereof, said casings being in spaced relation to provide main down and up-draft air circulating passages and an intermediate up-draft air circulating and insulating space about the upper portion of said main inner casing.

8. In a single-register hot-air furnace, a combustion heater, and outer and inner casings surrounding said heater and having reduced portions extending above the same, said casings being in spaced relation and providing main down and up-draft air circulating passages communicating at the furnace base and a substantially shorter inter-

mediate up-draft air circulating and insulating space arranged between the portions of said passages above the heater and having its lower inlet end in direct communication with said down-draft air passage.

9. In a hot air furnace, a combustion heater, a superposed register, outer and inner casings surrounding said heater and having reduced portions extending above the same, said casings being in spaced relation and providing down and up-draft air circulating passages in communication at their lower ends and communicating with said register at their upper ends, the section of the inner casing immediately surrounding the heater having a non-air-circulating, insulating jacket and the section of the inner casing above the heater having an outer jacket spaced therefrom to provide an up-draft air circulating and insulating space having its lower inlet end communicating with said down-draft air passage substantially at the level of the upper end of said heater.

EDWARD P. COLE.