No. 676,380. Patented June 11, 1901.

E. BALBACH, JR.

CONDENSER FOR FUMES OF METALLURGICAL FURNACES.

(Application filed Mar. 15, 1901.)

(No Model.) 2 Sheets—Sheet 1.

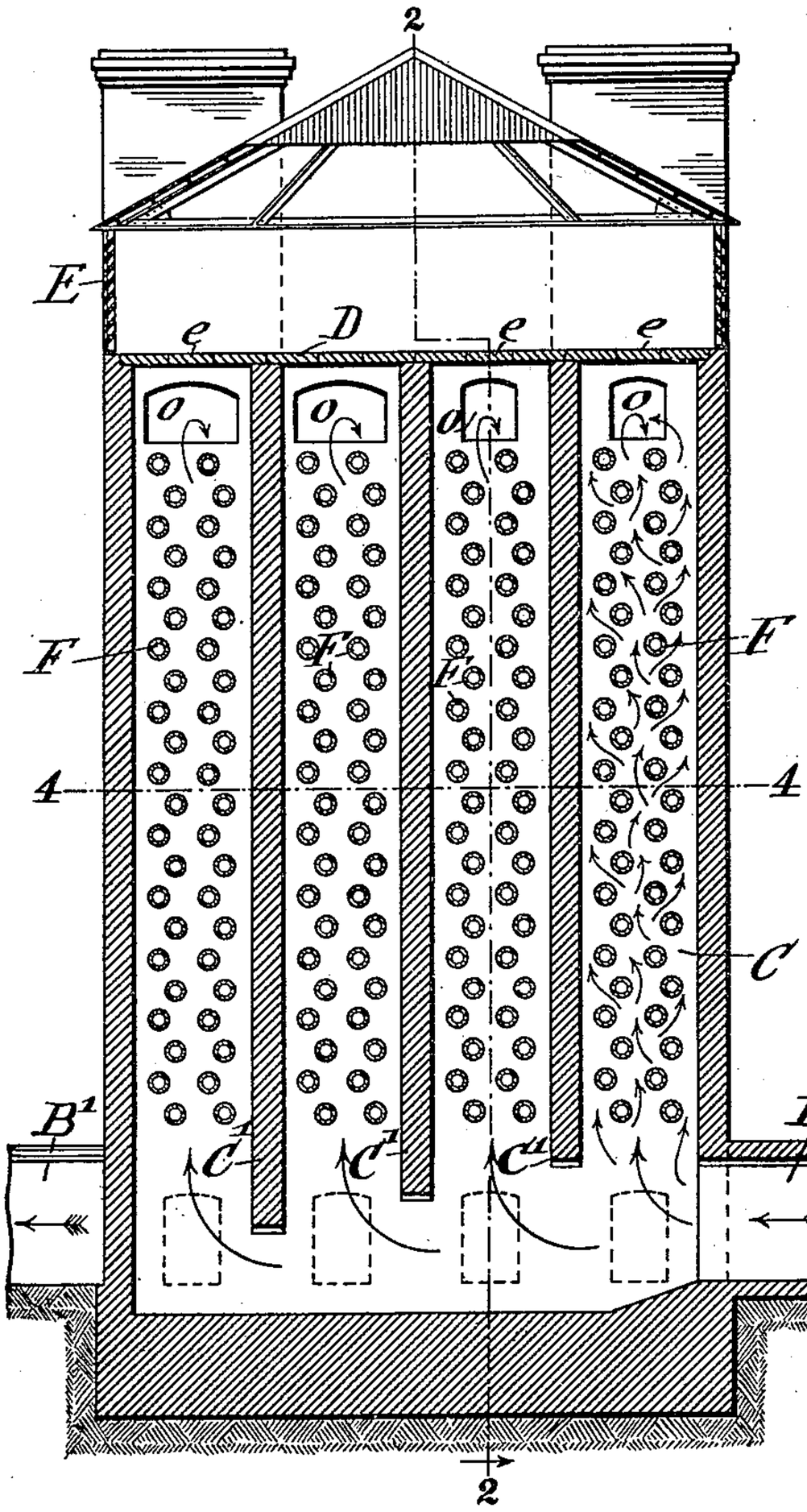

Fig: 1.

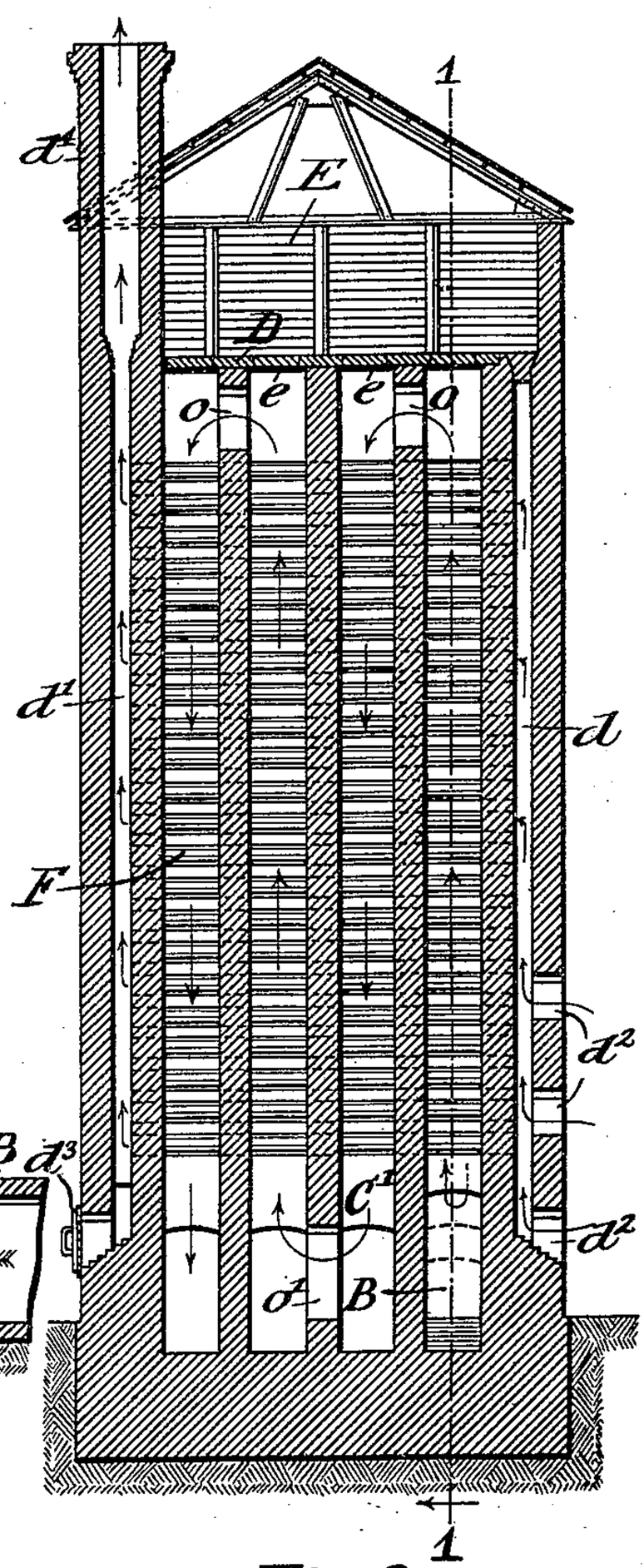

Fig: 2.

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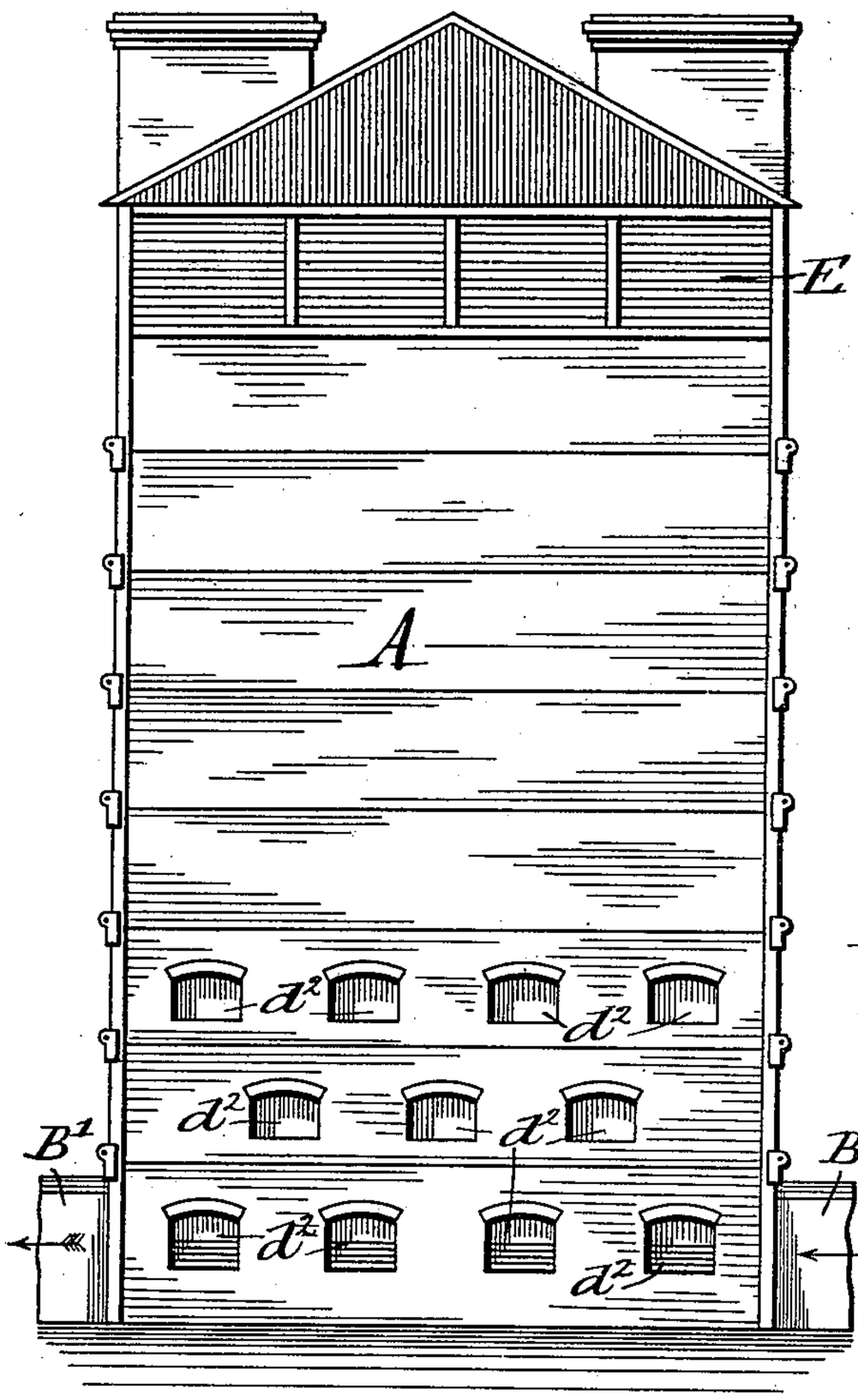

Fig: 3.

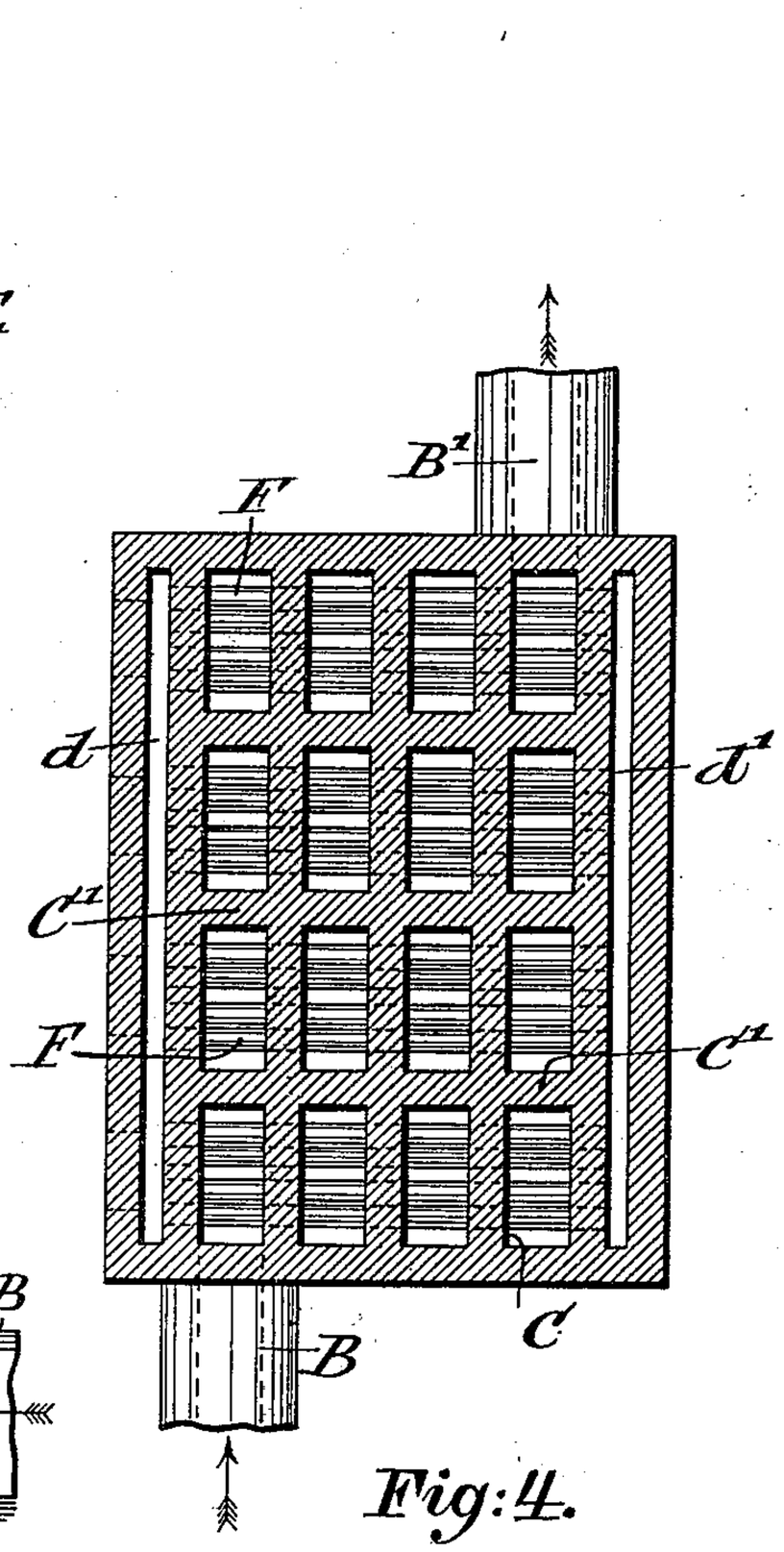

Fig: 4.

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CONDENSER FOR FUMES OF METALLURGICAL FURNACES.

SPECIFICATION forming part of Letters Patent No. 676,380, dated June 11, 1901.

Application filed March 15, 1901. Serial No. 51,230. (No model.)

To all whom it may concern:

Be it known that I, EDWARD BALBACH, Jr., a citizen of the United States, residing in Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Condensers for the Fumes of Metallurgical Furnaces, of which the following is a specification.

This invention relates to an improved condenser for the fumes of metallurgical furnaces, and more especially for regaining the flue-dust containing metal in chemical combination held in suspension in the fumes from metallurgical operations carried on in blast or reverberatory furnaces, and the invention is more particularly designed with the view to recovery of lead-dust from the fumes or smoke carrying the same.

Heretofore the fumes were conducted through long flues which extended over considerable distances, often of many thousand feet, for the purpose of cooling the fumes and causing the metallic particles contained therein to be deposited in the form of the so-called "flue-dust."

The object of the invention is to substitute a condenser in the form of a tower for collecting this dust carried along by the fumes. For this purpose the invention consists of a tower of masonry or other suitable material provided with longitudinal and transverse partitions and with inlet and outlet flues, the inlet-flue being connected with the furnace and the outlet-opening with the stack. The tower is provided in its opposite walls with air-spaces running up to its full height, one of these spaces being connected at the bottom of the tower with the outside air by a series of openings, while it is closed at the top air-tight by a suitable covering. The air-space at the opposite side is closed at the bottom and open at the top and preferably extended as a chimney. The air-spaces of the opposite walls are connected through the partition-walls of the tower by means of horizontal or slightly-inclined pipes, preferably of metal, which are tightly cemented to the partition-walls, so that a current of air is created from one air-space to the other by means of the connecting system of pipes. The fumes are carried alternately in upward and downward direction through the flues formed by the partitions and finally conducted off. The partition-walls are provided alternately at the bottom and top with openings for the fumes for permitting the fumes to ascend and descend in their course.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of my improved condenser for the fumes of metallurgical furnaces, taken on line 1 1, Fig. 2. Fig. 2 is a vertical transverse section on line 2 2, Fig. 1. Fig. 3 is a side elevation; and Fig. 4 is a horizontal section on line 4 4, Fig. 1.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A indicates the condenser, which is in the shape of a tower, built of masonry or other suitable material. The tower A is connected at the lower end with the furnaces by a flue B and at the opposite end by an outlet-flue B′ with the stack. The tower is divided by longitudinal and transverse partitions C C′, respectively, into a series of vertical flues, the longitudinal partitions nearer the inlet-flue being arranged at a greater distance from the bottom of the tower than the following partitions, which extend farther in downward direction, as shown in Fig. 1, so as to intercept the fumes that are delivered from the inlet-flue and conduct the same then in upward direction through the vertical flue between the longitudinal and transverse partitions. The fumes pass through openings *o* at the upper end of the first transverse partition-wall into the next series of flues, then through the openings *o′* in the next partition-wall at the lower end to the next flue, and so on alternately through all the vertical flues of the tower, as indicated in Fig. 2. The openings *o* diminish in size in the successive partitions, as shown in Fig. 1, so that equalization of the pressure is obtained. The condenser is provided at the two opposite longer walls with air-spaces *d d′*, which run through the full height of the walls, the air-space *d* being connected near the bottom of the tower with the outside air by a series of openings d^2, as shown in Figs. 2 and 3. The tower is closed air-tight at the top by a suitable roof D and a slatted structure E above the same, so as to

permit the cooling action of the air passing therethrough. The air-space d' at the opposite side of the tower is closed air-tight at the bottom, but provided with removable plugs d^3 for cleaning the same of any sediment that settles in the lower part of the same. It is open at the top and preferably made in the form of a chimney d^4. There is no communication between the air-spaces and the interior of the tower, but the air-spaces are connected with each other by a large number of horizontal or slightly-inclined metallic or other pipes F, which are arranged in staggering vertical rows, as shown in Fig. 1. The air-pipes are tightly cemented in the corresponding openings of the walls and in the inner walls, so that the current of air is created from one air-space to the other through the connecting system of air-pipes E.

The tower is divided by the longitudinal and transverse partitions into a number of flues, through which the fumes are conducted, alternately ascending and descending in the same. The inlet-flue B is at one corner of the condenser and the outlet B' at the opposite diagonal corner, as shown in plan view in Fig. 4. The fumes upon entering from the comparatively narrow flue B into the larger flues of the tower have their velocity greatly reduced in such manner that the respective velocity of the fumes in the flue B and the tower are inversely proportional to their sections. This reduced velocity causes the slower travel of the fumes and gives sufficient time to the particles of flue-dust to settle more completely than in flues of even dimensions. The operation of settling is considerably aided by the cooling effect of the large air-cooled surface of the metallic or other pipes F, exposed to close contact with the fumes by the system of pipes traversing the vertical flues of the tower. Compressed air may also be liberated in the pipe system for quicker cooling through the larger volume and greater velocity thereby obtainable. The flue-dust is precipitated at the bottom of the tower and is there collected and removed from time to time. This is assisted by openings in the top or roof D of the condenser, which are closed by doors *e* (indicated by dotted lines in Figs. 1 and 2) and through which an attendant can be lowered, so as to clean the pipes from the adhering flue-dust.

The advantages of my improved condenser are that in a comparatively small space and in close proximity to the furnaces and stack the flue-dust can be collected in a very effective manner, that with the long overground system of flues heretofore in use requiring for ventilation by natural draft, stacks of considerable height, besides forming an extremely-cumbersome part of a well-arranged metallurgical plant.

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

1. A condenser for the fumes of metallurgical furnaces, consisting of a tower-shaped structure, provided with longitudinal and transverse partition-walls, an inlet-flue at one side, an outlet-flue at the opposite side of said tower, openings arranged alternately at the upper end and lower ends of the longitudinal partitions, air-spaces arranged in the opposite walls of the tower, pipes passing through the longitudinal partitions and connecting said air-spaces, air-inlet openings into the air-space in one end wall and an air-outlet at the upper end of the air-space of the opposite wall, substantially as set forth.

2. A condenser for the fumes of metallurgical furnaces, consisting of a tower provided with longitudinal and transverse partition-walls, an inlet-flue at one side of the same, an outlet-flue at the opposite side of the same, said transverse walls having inlet-openings at their lower ends, connecting-openings arranged alternately in the upper and lower ends of the longitudinal walls, said inlet-openings diminishing gradually in size from the inlet-flue toward the outlet-flue, and the said connecting-openings diminishing in size from the outlet-flue toward the inlet-flue, air-spaces in opposite walls of the tower, pipes connecting said air-spaces and passing through the vertical flues formed by the longitudinal and transverse partition-walls, air-openings at the lower part of one wall into the air-space of the same, and an outlet at the upper end of the air-space of the opposite wall, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

EDWARD BALBACH, JR.

Witnesses:
EDWARD RANDOLPH,
SIMON MAYER.