J. HORNOF.

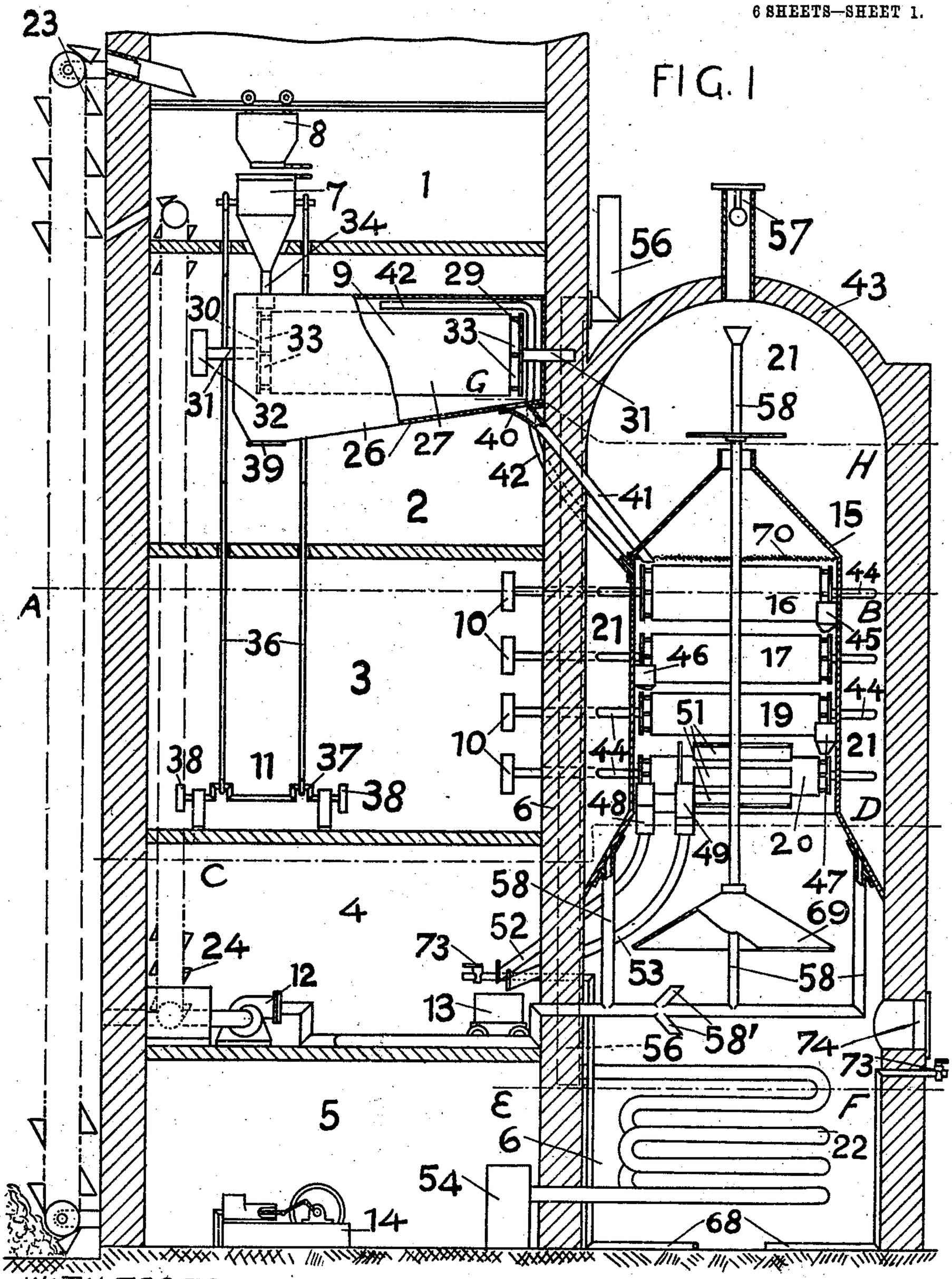
MALT KILN.

APPLICATION FILED NOV. 11, 1904.

929,435. **Patented July 27, 1909.**

6 SHEETS—SHEET 1.

FIG. 1



WITNESSES:

Richard von Tibbleitner

Fritz Döring

INVENTOR:

Jaromir Hornof.

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS. WASHINGTON, D. C.

J. HORNOF.

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6 SHEETS—SHEET 2.

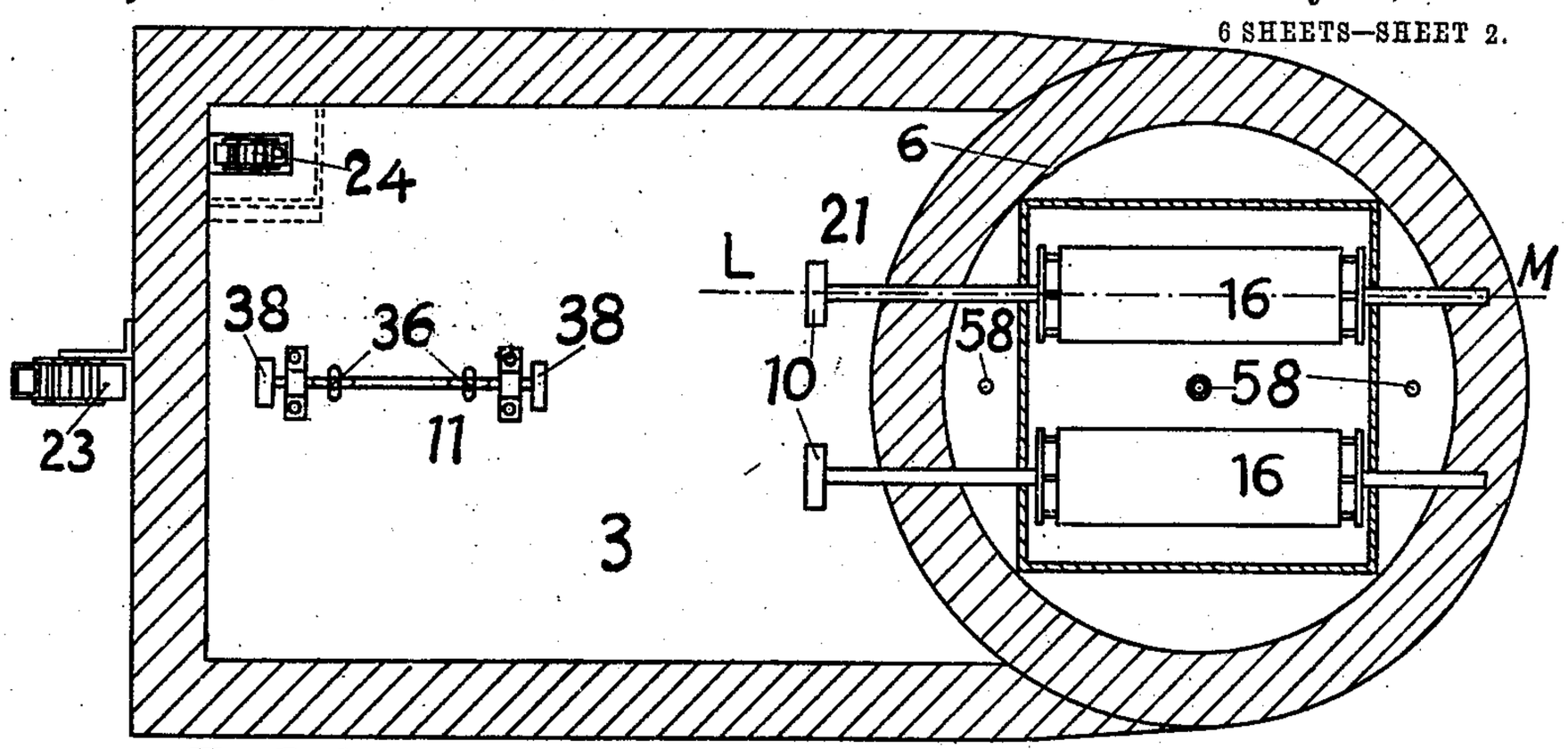

FIG. 2

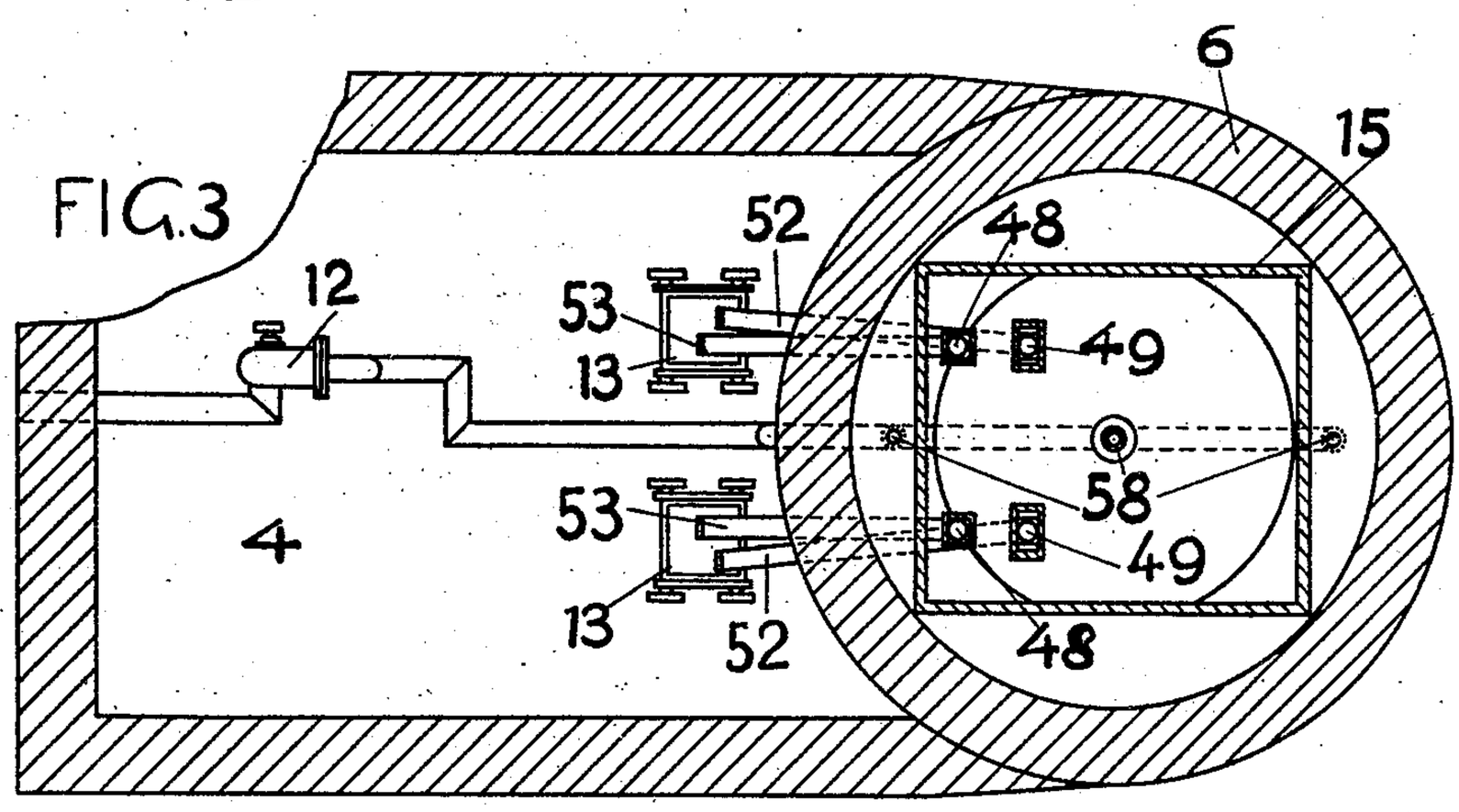

FIG. 3

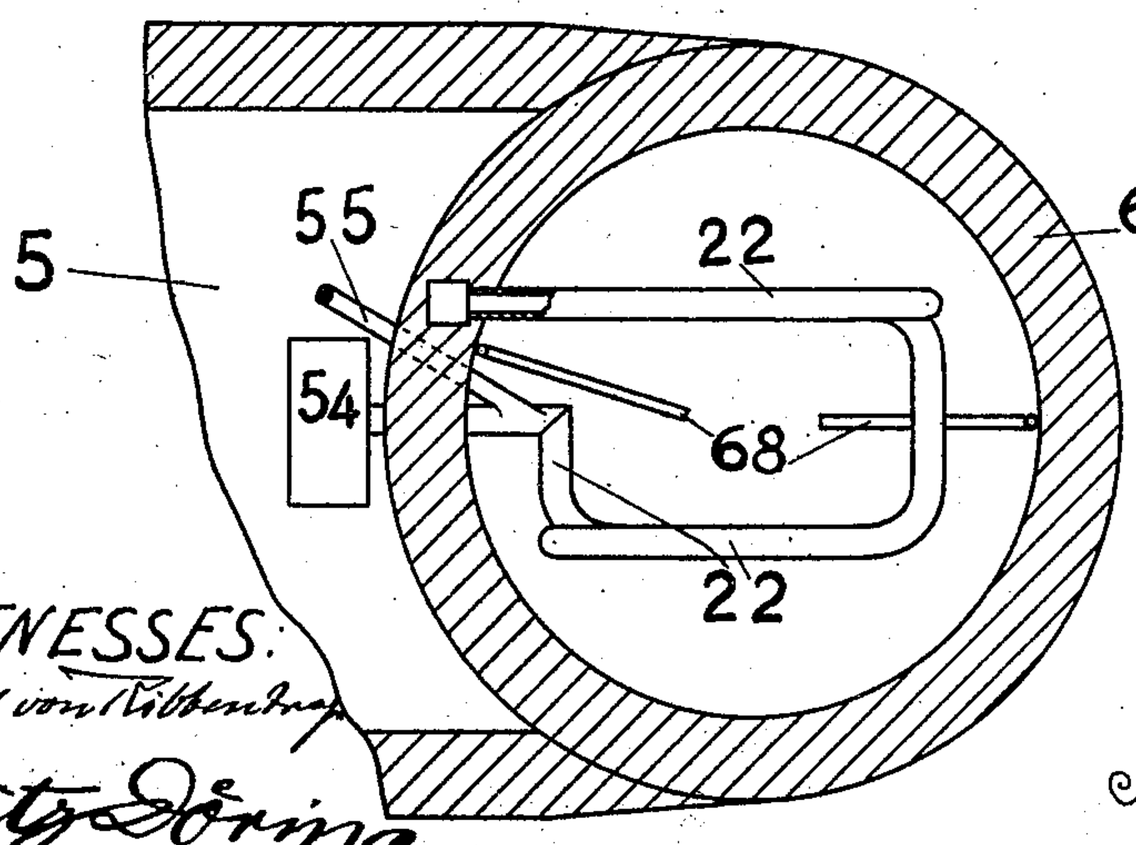

FIG. 4

WITNESSES:

Friedr. von Tibbenbrock

Fritz Döring.

INVENTOR:

Jaromir Hornof.

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

J. HORNOF.

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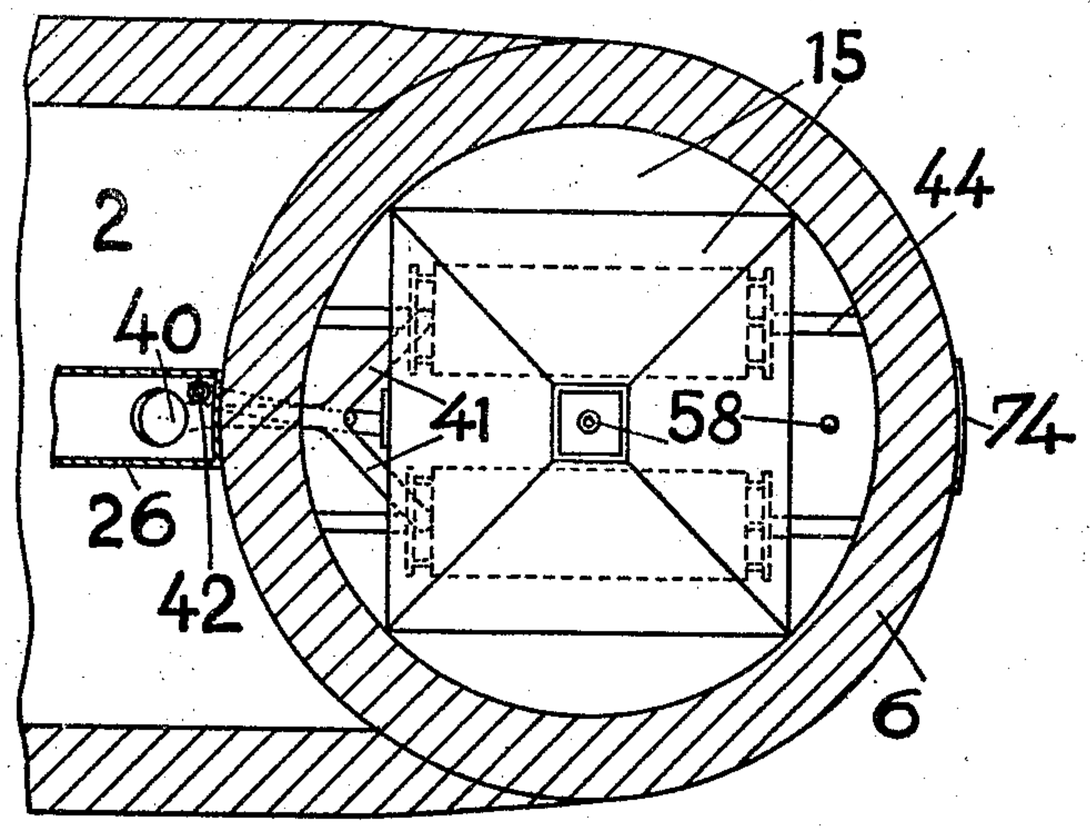
6 SHEETS—SHEET 3.

FIG. 5



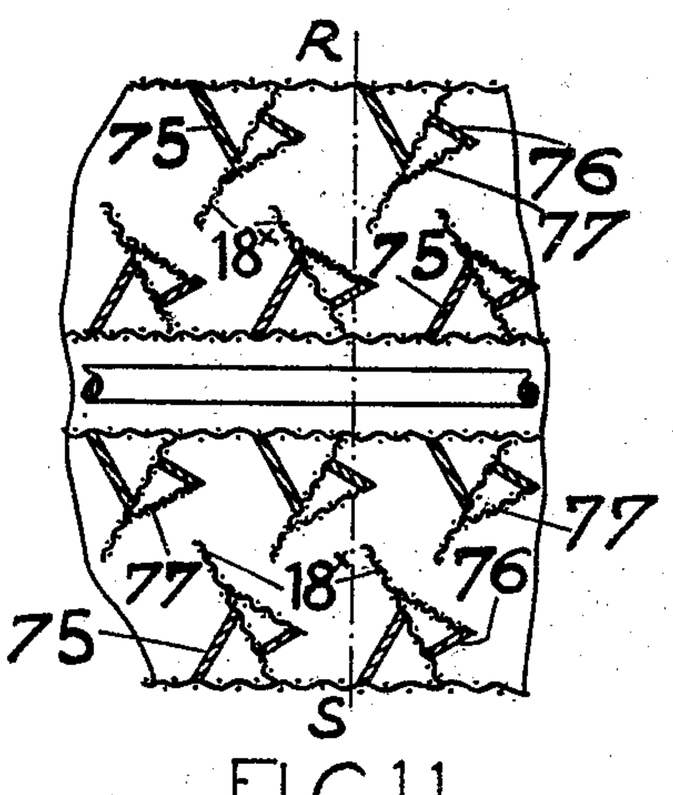


FIG. 11

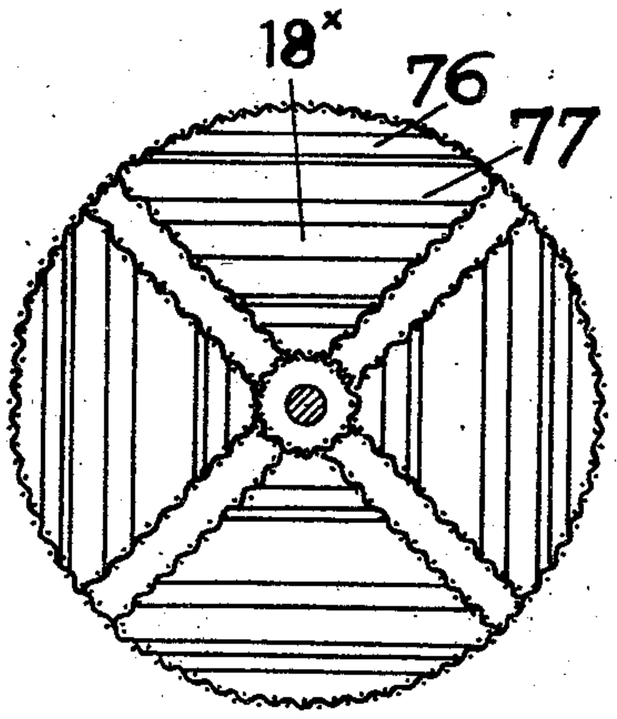


FIG. 12

WITNESSES:

Richard von Tobbeltitz

Fritz Döring

INVENTOR:

Jaromir Hornof

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS. WASHINGTON, D. C.

J. HORNOF.

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APPLICATION FILED NOV. 11, 1904.

929,435.

Patented July 27, 1909.

6 SHEETS—SHEET 4.

FIG. 6

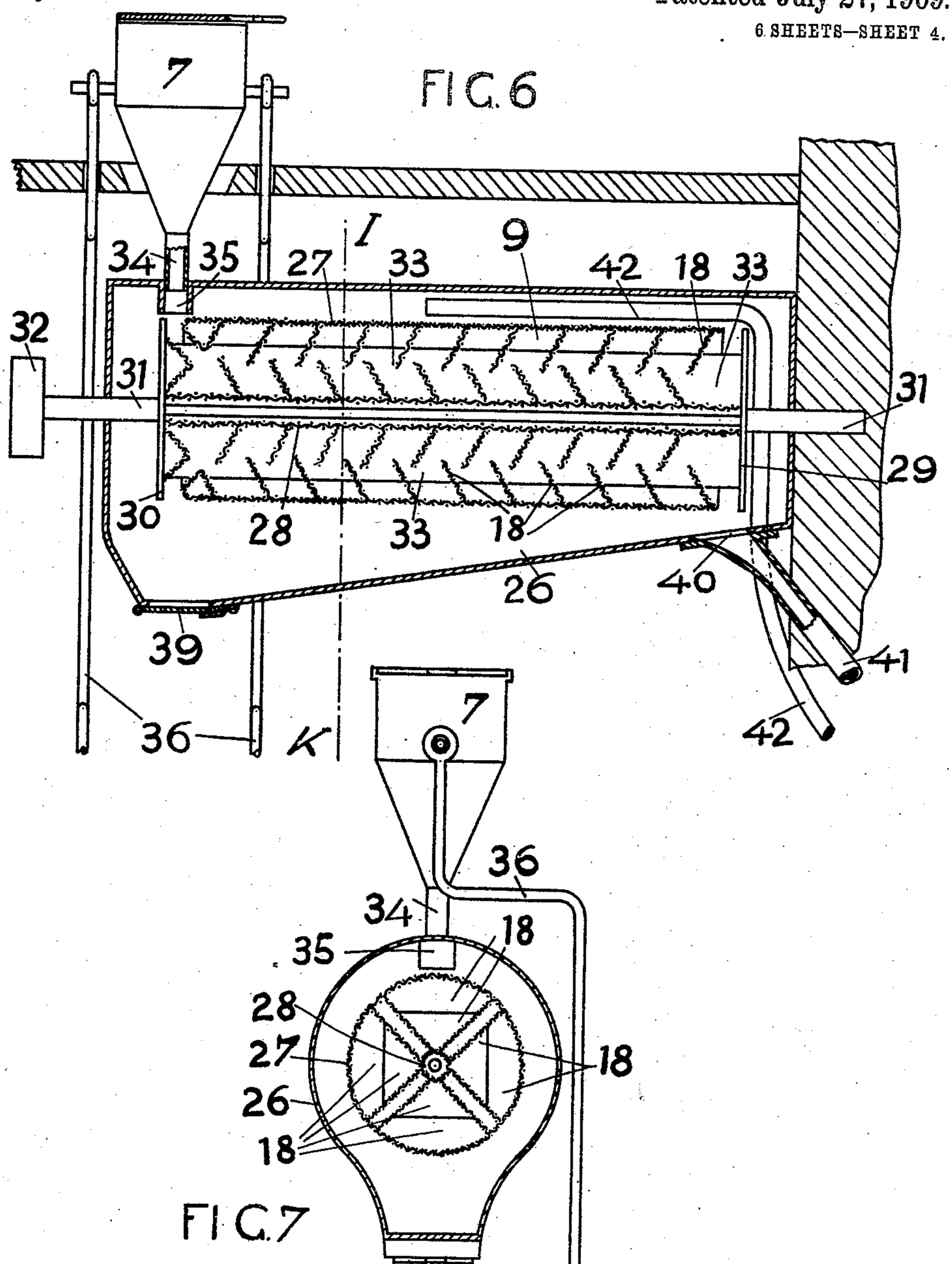

FIG. 7

WITNESSES:

Richard von Ribbentrop

Fritz Döring

INVENTOR:

Jaromír Hornof

J. HORNOF.

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6 SHEETS—SHEET 5.

FIG. 8

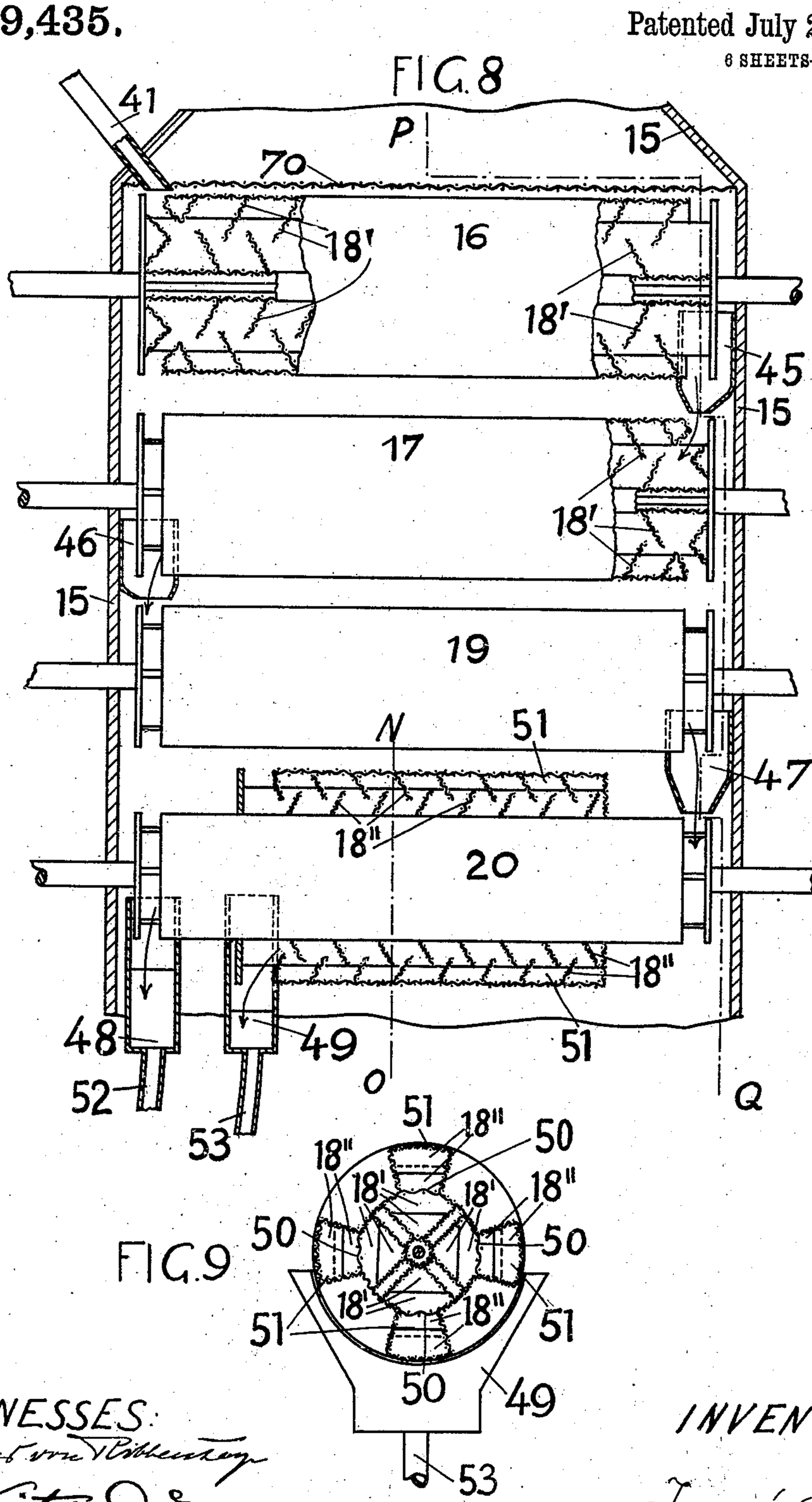

FIG. 9

WITNESSES:

Richard Von Pittkiewicz

Fritz Döring.

INVENTOR:

Jaromir Hornof.

J. HORNOF.

MALT KILN.

APPLICATION FILED NOV. 11, 1904.

929,435. Patented July 27, 1909.

6 SHEETS—SHEET 6.

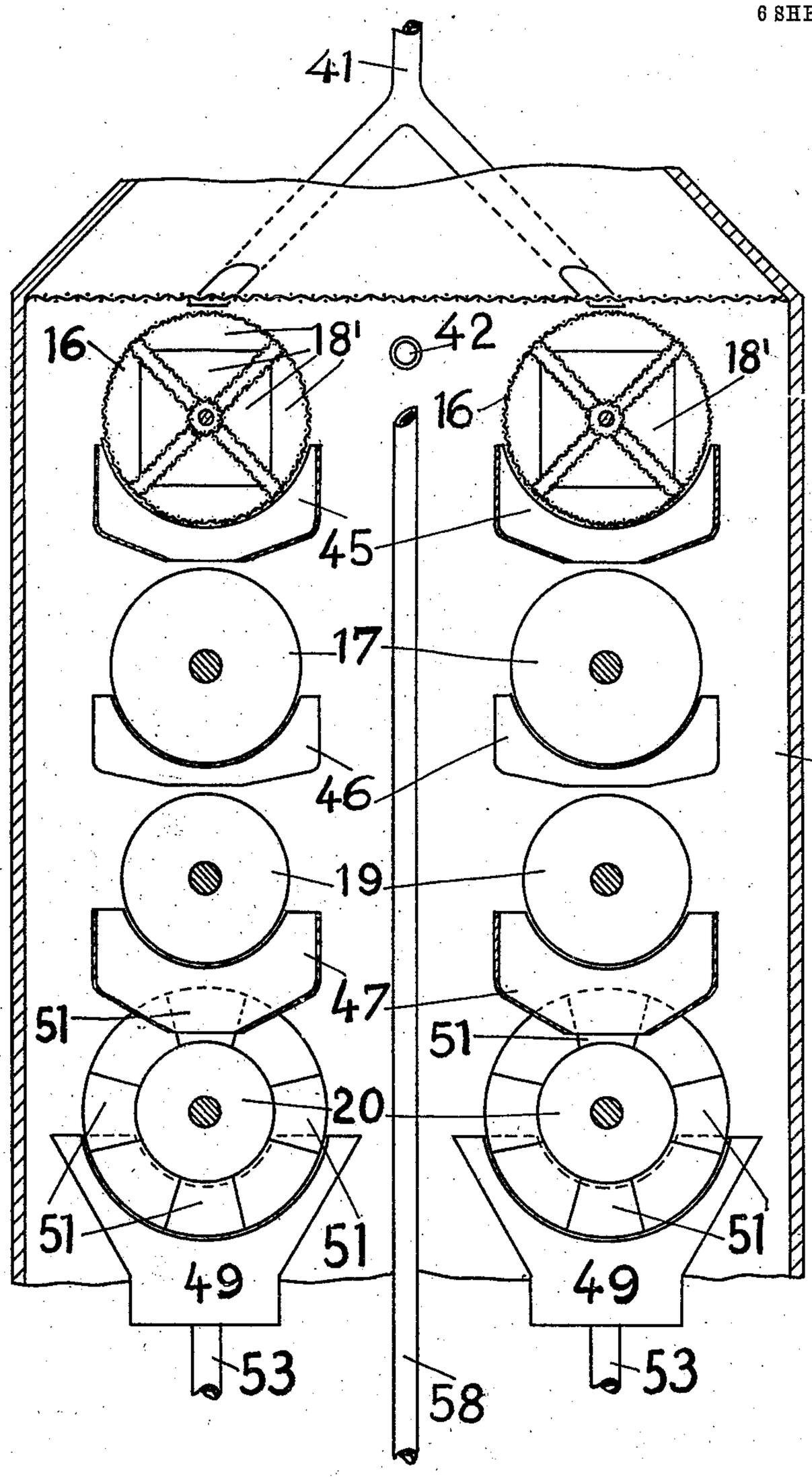

FIG. 10

WITNESSES:

Richard von Ribbentrop

Fritz Döring

INVENTOR:

Jaromír Hornof

UNITED STATES PATENT OFFICE.

JAROMIR HORNOF, OF HOLEŠOV, AUSTRIA-HUNGARY.

MALT-KILN.

No. 929,435. Specification of Letters Patent. Patented July 27, 1909.

Application filed November 11, 1904. Serial No. 232,296.

To all whom it may concern:

Be it known that I, JAROMIR HORNOF, officer of justice, a subject of the Emperor of Austria-Hungary, and resident of Holešov, a small city in the Kingdom of Moravia, Empire of Austria-Hungary, have invented certain new and useful Improvements in Malt-Kilns, of which the following is a specification.

The subject of my invention is a malt-kiln by means of which malt of uniform-sized grains can be cleanly and uninterruptedly produced.

The green malt in the top floor is first fed through a drum for the purpose of removing the dust and breaking up any "lumps" of grain. It is then passed into the kiln proper, mechanically conveyed through a number of further drying drums, in which it remains for any desired length of time, until the malt is uniformly dry. The vapors arising during the process are removed by means of an air pump. The lowermost drum in the drying-room has large perforations, which allow the malt-germs to pass through, so that pure malt leaves the apparatus.

Th apparatus is shown in the accompanying drawing, in which—

Figure 1 is a longitudinal section through the entire drying apparatus, Fig. 2 a horizontal section on the line A B of Fig. 1, Fig. 3 a like section, following the line C D of Fig. 1, Fig. 4 a similar view, the section being on the line E F of Fig. 1, Fig 5 a horizontal section on the line G H of Fig. 1, Fig. 6 is a sectional detail illustrating the internal arrangement of a drying drum forming part of this invention, Fig. 7 is a transverse section thereof on the line I K of Fig. 6, Fig. 8 a sectional detail, the section following the line L M of Fig. 2, Fig. 9 a cross section on the line N O of Fig. 8, Fig. 10 a section on the line P Q of Fig. 8, Fig. 11 a sectional detail, illustrating a slight modification of the drying drums, and Fig. 12 a transverse section on the line R S of Fig. 11.

The improved malt kiln comprises a building 1—5 (Fig. 1) on the top floor 1 of which is the hopper 7 of the cleaning and conveying drum 9 located below the top floor, in the room 2. Above the hopper 7 is a suitable truck or the like 8 for transporting the green malt. In the room 3 is the driving gear 10 for the drying drums, the latter being particularly referred to hereinafter, and driving gear 11 for the hopper 7; and in room 4 are the air pump 12 and wicker or basket trucks 13 for wheeling off the ready malt and germs. In the bottom room 5 is the steam engine 14. The building 1—5 adjoins the main building 6 in which is the actual malt-kiln.

15 is a sheet metal construction containing superposed sets of drying drums 16, 17, 19, 20, each set in the case represented comprising two drums.

21 is an insulating chamber, fully referred to hereafter. At the bottom of the building is the heating apparatus 22, either for coal-firing or exhaust steam. Two elevators are located at the wall of the building 1—5, the one 23 being for green malt and the other 24 for dried malt.

The drum 9 is contained in a stationary metal casing 26 and consists of two sheet-metal cylinders 27, 28, secured to the shaft 31 by means of the end-plates 29, 30, and driven by a pulley 32. The space between the two cylinders 27, 28 is divided into four compartments by means of double radial partitions 33, and in these compartments a number of inclined walls 18 are located. All the walls, like the cylinders, are of woven material, or the like, which is so fine that neither malt nor germs can fall through. The narrow end 34 of the feed-hopper 7 fits into the tubular aperture 35 of the casing 26, and to prevent the part getting choked with green malt the hopper is shaken by rods 36 connected to the crank shaft 37 of the driving-gear 11, driven by pulleys 38 connected with a suitable source of power not shown.

The method of employing the plant is as follows. The green malt 25 is raised by the elevator 23 to the floor 1 and conveyed say every hour in the truck 8 to the hopper 7 of the cleaning drum 9. The green malt falling into the drum 9 will by the rotation of the latter and owing to the inclined walls 18 be advanced toward the other end of the drum until it falls through the aperture 40 and pipe 41 into the actual malt kiln fully described hereinafter. At the same time the lumps of grain will be broken up into separate grains because they are thrown against the said walls 18. The dust remains lying in the casing and must be removed from time to time after opening the lid or cover 39.

The hot air from the kiln enters the casing 26 through the pipe 41, and penetrates all the perforated walls of the cleaning drum, whereby the malt is dried and the lumps of grain rendered easier to distribute. The malt vapors which arise, together with the hot-air, are drawn off by means of an air pump through the pipe 42 into the casing 15, as will appear hereafter.

The malt kiln proper into which the cleaned green malt is thus fed, consists of the rectangular casing 15 which is fixed in the tower-shaped building 6 having a dome 43. The casing 15 contains the four superposed sets of four pairs of drying drums 16, 17, 19, 20 before mentioned, the shafts 44 of which pass through the casing 15 and brickwork 6, and are driven by pulleys 10 keyed to their ends located in the adjacent building. The internal arrangement of these drying drums is the same as that of the cleaning-drums, partitions 18′ being provided so as to advance the malt from one end of each drum to the other. The lower of these drums may be of a smaller diameter than the upper ones, since the malt in passing the upper drums has become drier and so occupies much less space. The walls of the drying drums 20 are provided at 50 with larger holes, so that the malt-germs can fall through, externally projecting compartments 51 being provided to catch them, the said compartments being likewise of woven material or the like. The malt germs cannot, however, fall through the latter perforated walls. These compartments are furnished with partitions 18″ of the same kind as the drying drums.

The cleaned green malt passes through the branched pipe 41 (see also Figs. 5 and 9) into the drums of the top set 16, and in consequence of the rotation and the inclined position of the walls 18′, it is conveyed to the other end of the drums, and by stationary hoppers 45 into the next set of drums 17, through which it travels in the reverse direction, when hoppers 46 conduct it into the drums 19. In a like manner the malt travels through the sets of drums 19 and 20 which communicate by means of the hoppers 47. In the lowermost drums 20 the malt germs pass through the larger holes at 50 into the compartments 51, so that only clean malt remains in the interior of the drums. This malt then falls through the hoppers 48, while the germs pass out through the hoppers 49. Both hoppers 48, 49 terminate in pipes 52, 53, in the room 4, where they discharge into the trucks 13, which receive the malt and germs separately for conveyance to the elevator 24.

The drying apparatus is heated from below by heating-coils 22 of well-known construction. These coils are heated either by the hot gases from the kiln 54 or by exhaust steam, which may be conducted through a pipe 55. After the heating gases have passed through the coil 22 they escape through the chimney 56. The air heated by the coils rises and passes through the rotating drums, the temperature decreasing during the ascent, from 75° to 30° centigrade. The hot air thus passing through all the drying drums is mixed with the malt vapors, and for the purpose of better draft, the mixture is withdrawn from the casing 15, and space 21, by means of an air pump 12, through pipes 58 which communicate with the space 21 and by the intermediary of integral tubes 58′ also with the interior of the casing 15. All the apertures through which outside air may get access to the casings 15 and 26 may be kept permanently closed. The hopper 7, pipes 52, 53 and truck 13 are therefore provided with sliding covers.

For regulating the temperature there may be provided pipes 68 (Fig. 1) through which cold air can be conducted into the building 6, such pipes being provided with cocks 73 which at the same time enable the air pressure within the building 6 to be regulated. Furthermore a hood 69 may be provided in the casing 15 to promote uniform temperature above and below the drums. A sieve 70 or a number thereof may likewise be provided to retard the hot ascending gases for a short interval for the purpose of better utilization in the casing 15, while the vapors pass through rapidly. Should the steam pressure increase above one atmosphere the safety valve 57 will open automatically.

The kiln may be entered through the door 74; windows are dispensed with.

It may be advantageous to arrange the inclined walls which in the case of the drum 9 are denoted by the reference numeral 18, in the case of the drums 16, 17, 19, 20 by 18′, and in the case of the compartments 51 by 18″, in the manner shown in Figs. 11 and 12. Here such inclined walls, denoted in a general way by 18×, are secured in their position by plates or the like 75 and carry plates 77 of woven or like material disposed inclined to the walls 18× by means of plates 76 projecting from the said walls.

It is to be understood that the present invention is in no wise restricted in scope to the particular construction illustrated but that the scope is indicated by the appended claims.

Having now particularly described and ascertained that nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. In a malt-kiln heated below, a number of drying drums, a casing for the latter, a building containing such casing, a heating device in the lower part of such building, this lower part communicating with

the interior of the said casing, a partition separating the said lower part of the building from the upper part thereof, the latter part surrounding the said casing, pipes establishing communication between the two said parts of the said building, and an air pump connected to such pipes, as set forth.

2. In a malt drying drum, divided by radial walls into compartments, two series of inclined partitions located in each compartment so that the partitions of one series form an angle with those of the other and that each partition extends into the space between two partitions of the opposing series, substantially as described.

3. In a malt drying drum divided by radial walls into compartments perforated chambers having inclined partitions, located on the outside wall of the drum, the portions of the drum wall forming the bottom of such chambers being perforated with larger holes, whereby the malt germs can pass into the said peripheral chambers, substantially as described.

In witness whereof I have hereunto signed my name this 20th day of August, 1904, in the presence of two subscribing witnesses.

JAROMIR HORNOF.

Witnesses:
PAUL MAX,
CARL KREHAIN.