

No. 888,375.

PATENTED MAY 19, 1908.

G. E. WILSON & W. J. FRAWLEY.

INTERCEPTING VALVE.

APPLICATION FILED FEB. 6, 1906.

2 SHEETS—SHEET 1.

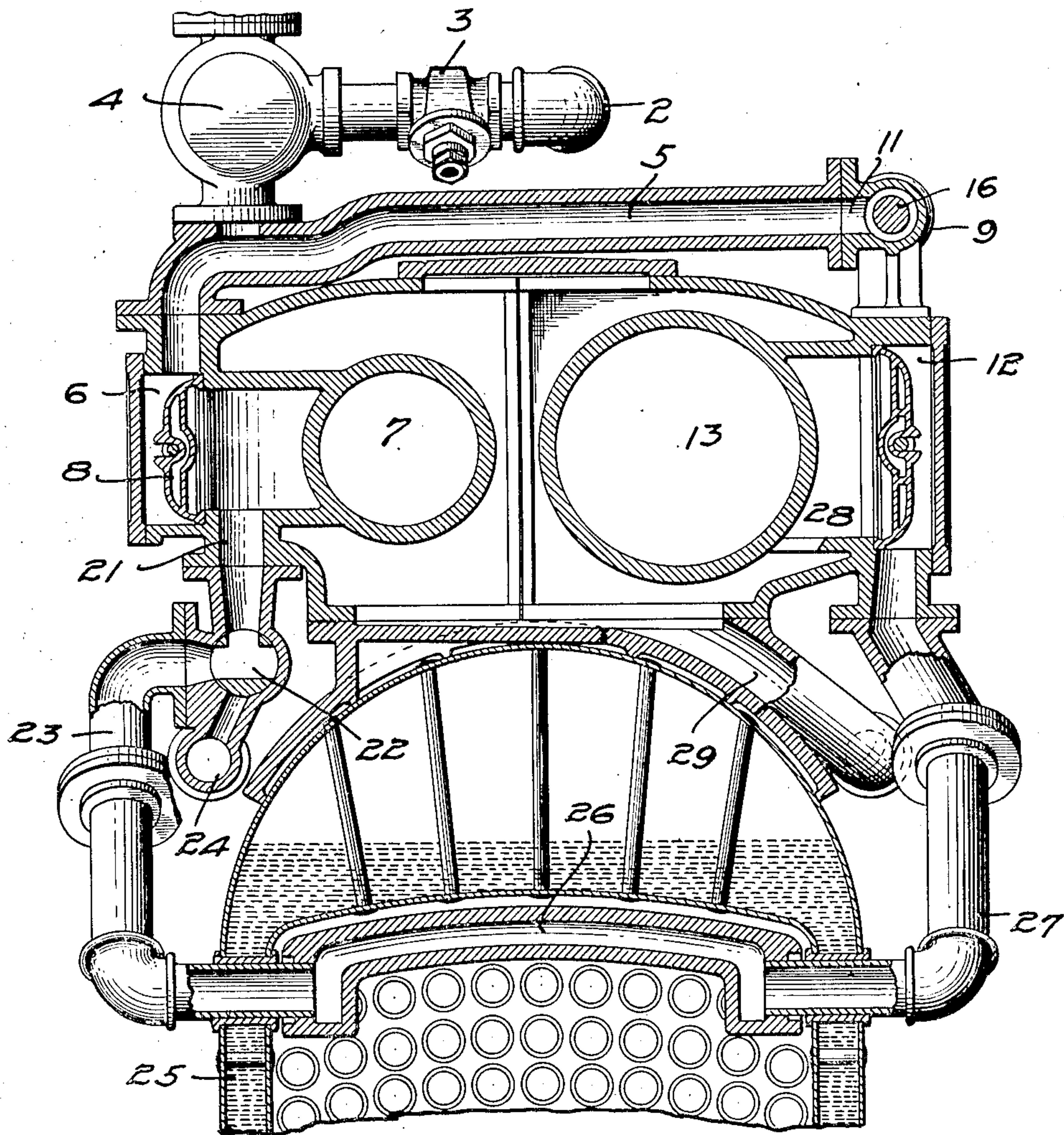


FIG. 1.

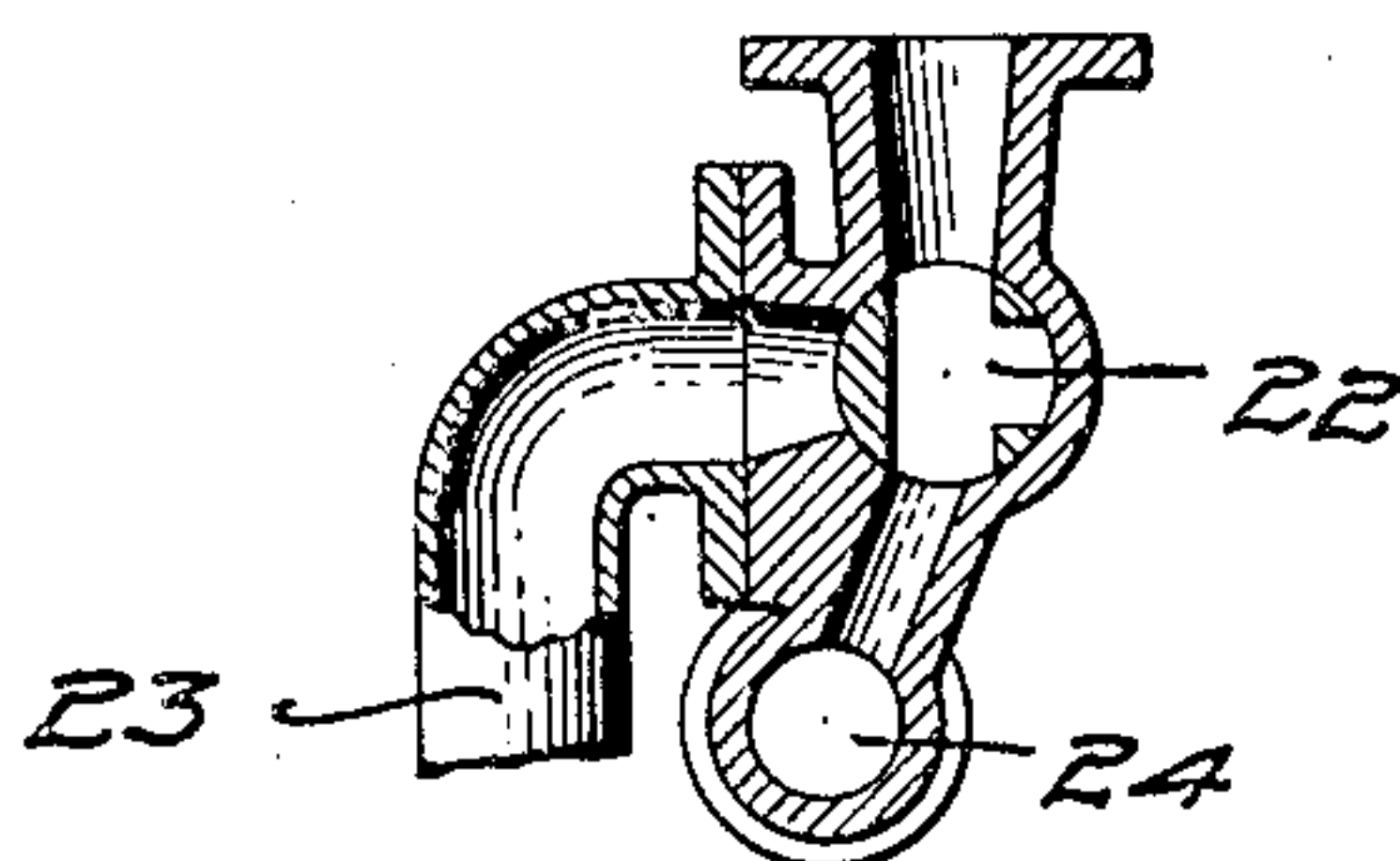


FIG. 5.

WITNESSES
M. M. Linn
C. M. Mammara

INVENTORS
GEORGE E. WILSON
WILLIAM J. FRAWLEY
BY
Paul & Paul
THEIR ATTORNEYS

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2 SHEETS—SHEET 2.

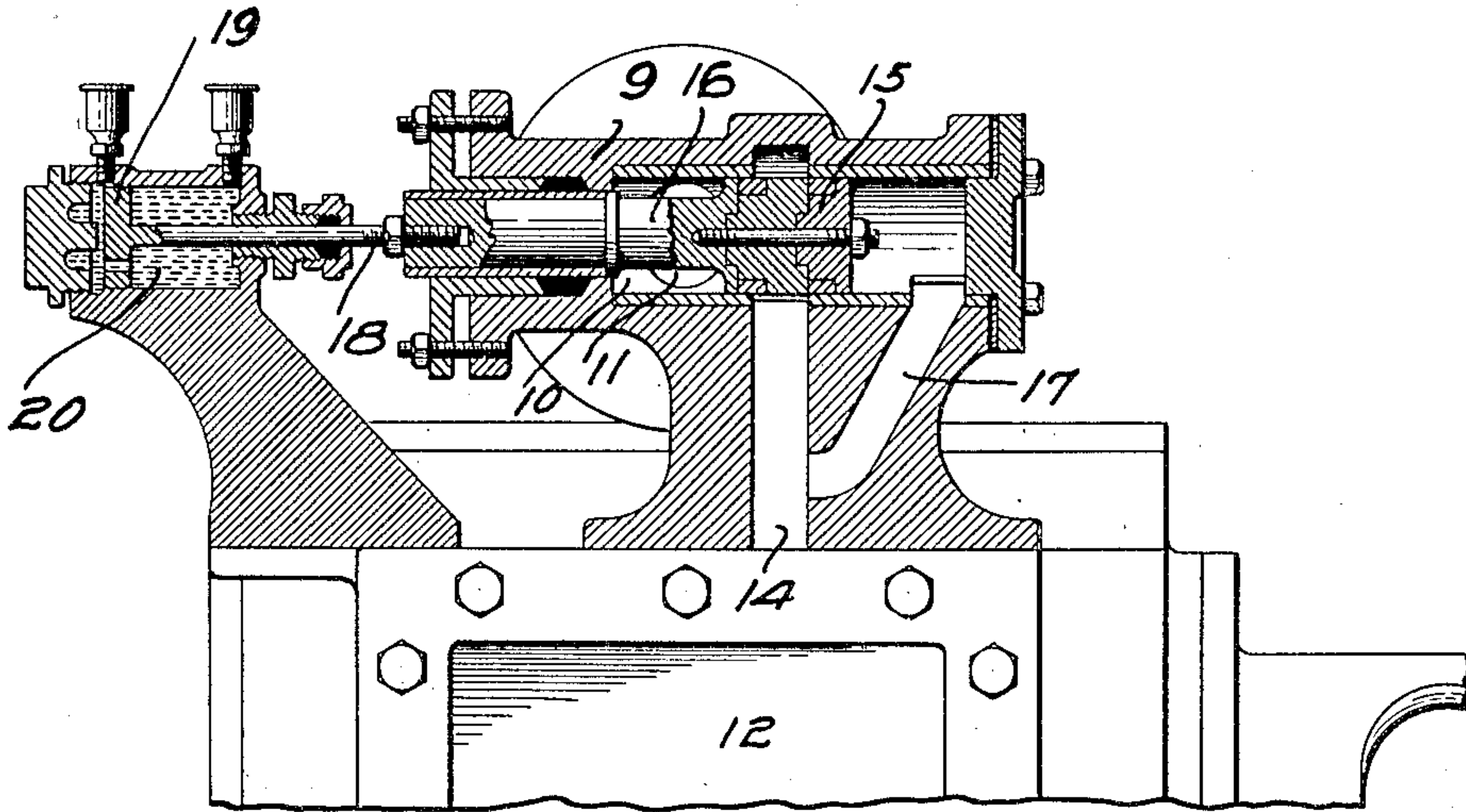


FIG. 4.

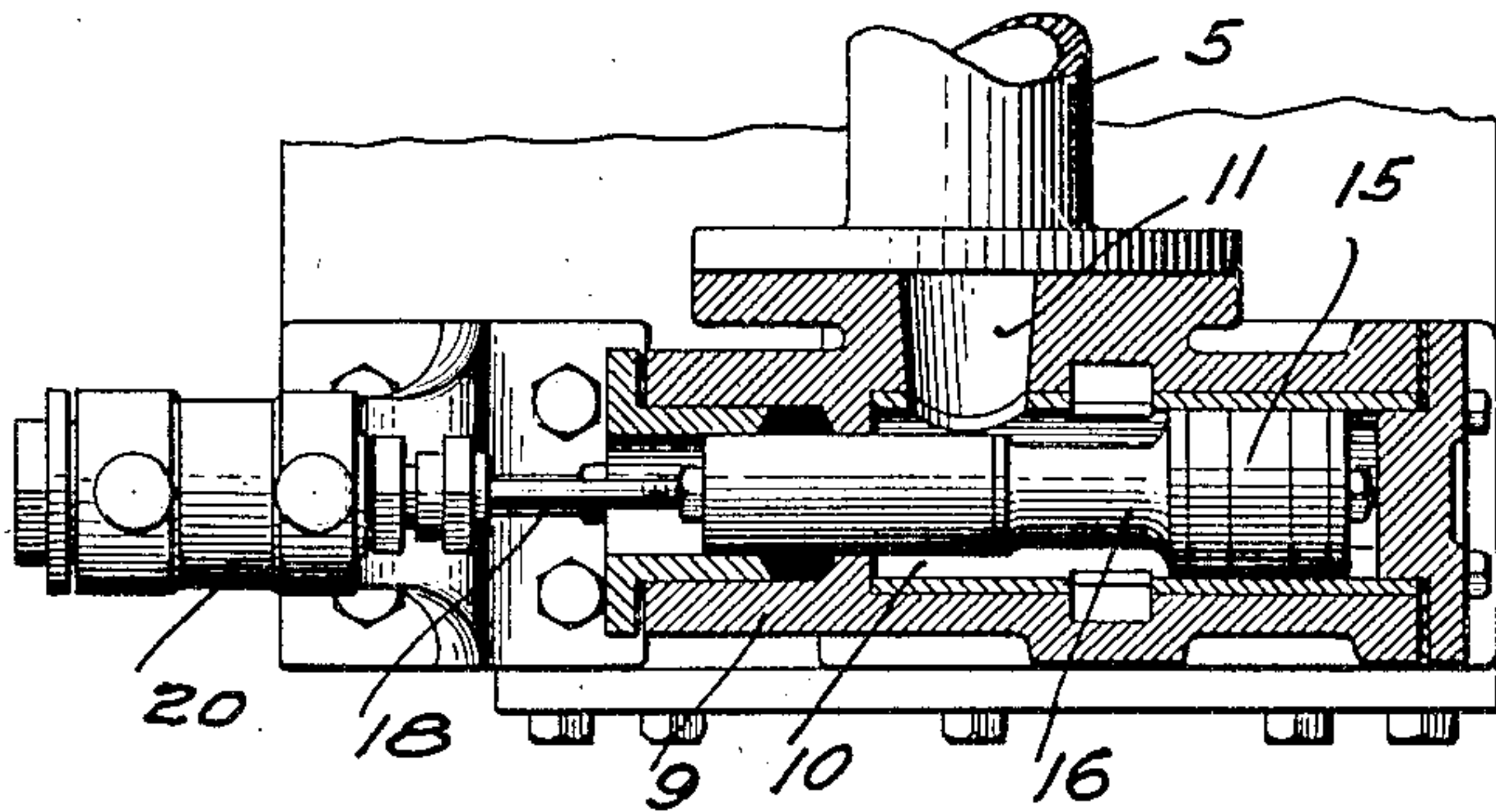
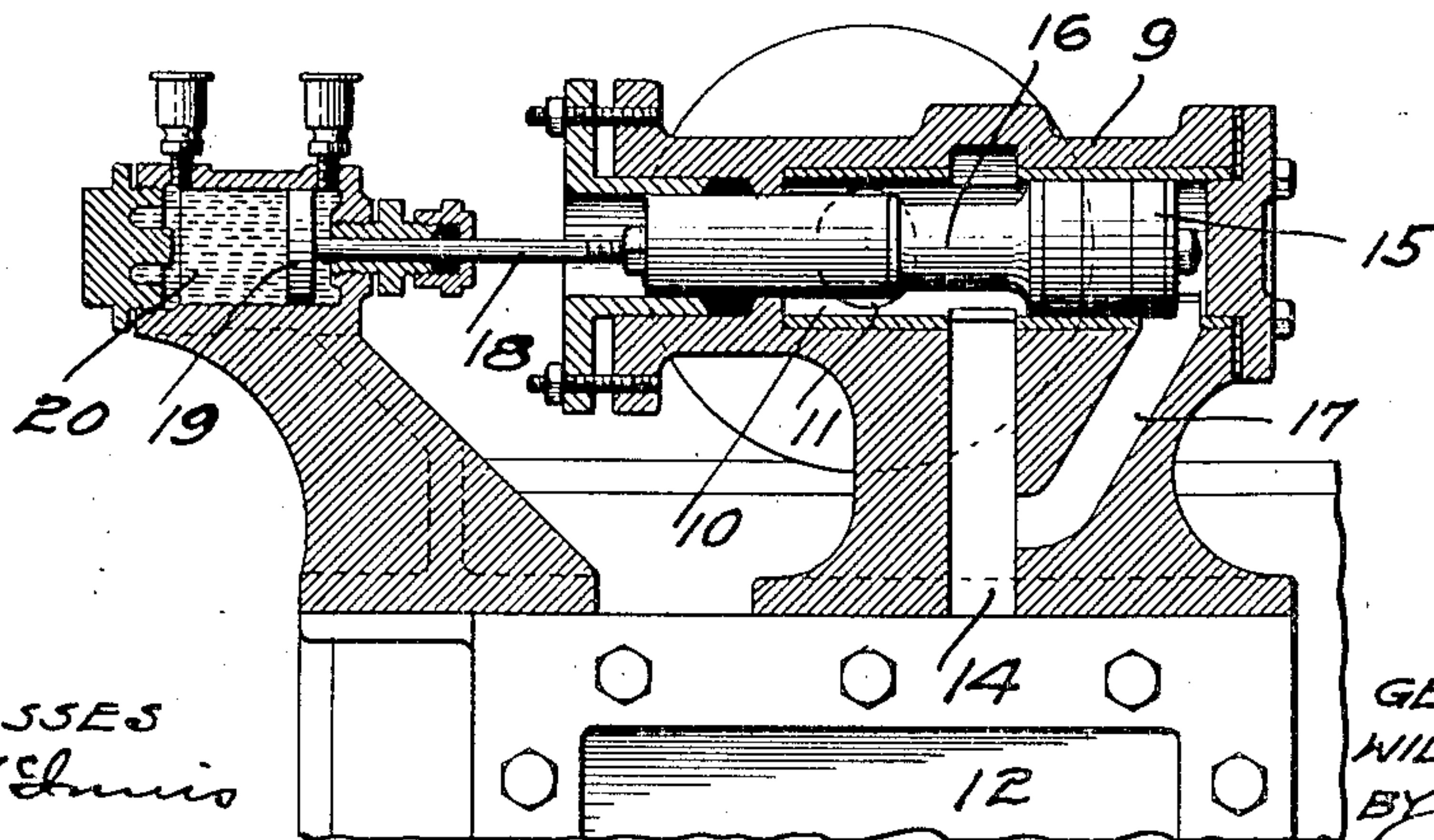


FIG. 3.



WITNESSES
M. M. Linn
C. M. M. M.

FIG. 2

INVENTORS
GEORGE E. WILSON
WILLIAM J. FRAWLEY
BY
Paul & Paul
THEIR ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE E. WILSON AND WILLIAM J. FRAWLEY, OF STILLWATER, MINNESOTA.

INTERCEPTING-VALVE.

No. 888,375.

Specification of Letters Patent.

Patented May 19, 1908.

Application filed February 6, 1906. Serial No. 299,801.

To all whom it may concern:

Be it known that we, GEORGE E. WILSON and WILLIAM J. FRAWLEY, of Stillwater, Washington county, Minnesota, have invented certain new and useful Improvements in Intercepting-Valves for Cross-Compound Traction-Engines, of which the following is a specification.

Our invention relates to traction engines, and particularly to those of the cross-compound type, and the object of the invention is to provide a compound traction engine which will be economical of fuel and water, have a greater power in proportion to its weight than the ordinary traction engine, and be capable of exerting an even, steady pull on the load as compared with the uneven jerky pull of a simple engine.

A further object is to provide a cross-compound traction engine of simple, but strong and durable, construction, and one which can be easily operated and controlled, and will be exceedingly efficient for the purpose designed.

The invention consists, generally, in providing a cross-compound engine having an intercepting valve, by means of which the engine is automatically changed from a double-simple to a compound engine in starting; that is, the engine starts as a double-simple, and without any attention on the part of the operator is almost instantly changed to a compound.

Further, the invention consists in various constructions and combinations, all as hereinafter described and particularly pointed out in the claims.

In the accompanying drawings forming part of this specification, Figure 1 is a transverse vertical sectional view of a cross-compound traction engine and boiler embodying our invention. Fig. 2 is a detail sectional view illustrating the intercepting valve in position to admit live steam to the low pressure cylinder. Fig. 3 is a plan section showing the valve in the same position. Fig. 4 is a sectional view corresponding to Fig. 2 showing the position assumed by a valve when the pressure in the steam chest of the low pressure cylinder is one-third that of the boiler pressure. Fig. 5 is a detail sectional view showing the valve which controls the exhaust from the high pressure cylinder in position to direct the exhaust to the stack.

In the drawing, 2 represents a live steam pipe having a suitable throttle valve 3 op-

erated by a mechanism (not shown) within convenient reach of the operator, and a governor 4 through which the steam is conducted to a transversely arranged pipe 5. One end of this pipe 5 is connected with the steam chest 6 of the high pressure cylinder 7, the entrance of steam to said cylinder being controlled by the usual slide valve 8. The opposite end of the pipe 5 is connected with a casing 9 having a chamber 10, which communicates with the pipe 5 through a passage 11 and with the steam chest 12 of the low pressure cylinder 13 through a passage 14. The areas of these cylinders are in the ratio approximately of one to three. A valve 15 is provided within the chamber 10, having a stem 16 at one end of less diameter than the main portion of the valve, and located, when the valve is open, between the passages 11 and 14 to permit the live steam to flow there-through into the low pressure steam chest and cylinder. A branch passage 17 leads from the passage 14 to a point near the end wall of the chamber 10 to conduct the steam into the space between said end wall and the valve 15. The area of the valve end contiguous to said wall is in this case about three times that of the opposite end of the valve with the cross sectional area of the stem deducted, or, in other words, the end surfaces of the valve exposed to the steam are in the ratio of three to one, corresponding substantially to the difference in area of the low and high pressure cylinders. When, therefore, the pressure in the steam chest of the low pressure cylinder is about one-third that of the boiler pressure, the intercepting valve will be moved by the pressure on its larger end toward the left and cut off the passage of live steam to the low pressure cylinder; this movement being due to the difference in area of the exposed ends of the valve 15 and the entrance of the steam into the branch passage and its contact with the larger area. If the ratio between the areas of the ends of the valve is greater or less than noted above, as it may be in different engines, then there will be a corresponding change in the time of movement of the valve.

We prefer to connect the valve stem with a rod 18 of a piston 19, which is adapted to slide in a cylinder 20 containing a supply of oil, or other fluid, and forming a cataract cylinder to regulate the travel of the valve 15 and prevent the noise and possible damage due to the sudden stopping of the same.

The steam chest of the high pressure cylinder communicates with a passage 21 leading to a three-way valve 22, which is connected with pipes 23 and 24, the latter extending forward to the stack, and the former being turned downwardly and carried through the wall of the fire box 25 and connected to one end of a super-heater 26 located above the grates, and which forms the subject matter of a companion application for U. S. Letters Patent of even date herewith Serial No. 299,803. This super-heater consists of a hollow casting arranged transversely of the fire box, and connected at its opposite end from the pipes 23 with a similar pipe 27, which also extends through the wall of the fire box, and is connected with the steam chest 12 of the low pressure cylinder. This steam chest communicates through ports similar to those leading to the high pressure cylinder, with a passage 28 leading to a pipe 29 which extends forward to the boiler stack.

The three-way valve 22 is shown in Fig. 1 in its normal position, and when the throttle valve is opened and steam admitted to the pipe 5 it will flow down into the high pressure cylinder and across the engine to the chamber 10 and the intercepting valve, and through the passage 14 to the low pressure chest and cylinder; and the engine in starting will be a double-simple, and thereby the full power of both cylinders can be utilized on the initial movement. As soon, however, as the pressure in the low pressure cylinder chest is equal to one-third the boiler pressure, the intercepting valve will be automatically moved from the position shown in Figs. 2 and 3 to the position shown in Fig. 4, the pressure of the steam on the end of the valve 15 exposed to the branch passage 17, and the steam in the low pressure steam chest having overcome the pressure of the steam on the opposite end, which is exposed to the steam in the live steam pipe. As soon as this valve has been moved across the passage 14 and shut off the flow of live steam to the low pressure cylinder, the exhaust from the high pressure cylinder will flow down through the pipe 23 and across the fire box to the steam chest of the low pressure cylinder; and the engine will then operate as a compound, being automatically changed from a double-simple without any effort or attention on the part of the operator. This change from a double-simple to compound will take place almost instantly after the starting of the engine. The intercepting valve will remain closed to the live steam, and the engine will operate as a compound as long as the pressure in the steam chest of the low pressure cylinder does not fall below one-third of the boiler pressure.

In the practical operation of the engine the valve will be closed nearly all of the time.

In case, however, the pressure in the low pressure cylinder steam chest falls below one-third boiler pressure, the intercepting valve will instantly open and admit live steam enough to raise the pressure to the required ratio, and then instantly close again. The valve thus automatically adjusts itself without any attention to the variations of steam pressure, and maintains a constant fixed ratio between the pressure in the high and low pressure cylinders. When it is desired to increase the draft for the purpose of quickening the fire, or for any other reason, the three-way valve 22 may be operated to close the exhaust leading to the low pressure cylinder and open the passage to the pipe 24 and the stack. When this is done the engine becomes a double-simple instead of a compound, and may be operated that way if preferred. Generally, however, the valve 22 will be in the position shown in Fig. 1, the pipe to the stack being closed and the engine used as a double-simple for a moment only in starting, and then automatically changed to a compound. The intercepting valve enables the full power of both cylinders to be utilized in starting, and then automatically shuts off the live steam from the low pressure cylinder as soon as it is not needed. It allows the engine to be operated as a double-simple instead of a compound, and by automatically regulating the pressure in the low pressure cylinder prevents unequal distribution of the load on the two cranks. It also insures sufficient pressure in the low pressure cylinder whenever running as a compound. The valve is absolutely automatic, and no attention is required on the part of the operator in running the engine, except to open and close the throttle.

We have shown the exhaust pipe from the high pressure cylinder carried through the fire box to the low pressure steam chest, but do not wish to confine ourselves to this arrangement, as the intercepting valve will perform all of its functions if the pipe connection between the cylinders is located outside of the fire box. In other ways the detail construction of the apparatus may be modified without departing from our invention.

We claim as our invention:

1. In a cross-compound traction engine, the combination, with a live steam pipe having a throttle valve, of high and low pressure cylinders having a steam passage 14, an intercepting valve located between said live steam pipe and said low pressure chest and passage 14 and normally admitting live steam to said chest simultaneously with its admission to said high pressure steam chest, said valve having surfaces of different areas, the smaller surface being normally exposed to the live steam entering from said pipe and said passage 14 having a by-pass 17 leading

to said larger surface, whereby upon the entrance of live steam to said passage 14 and said low pressure steam chest, said intercepting valve will be instantly and automatically operated to close the live steam passage through said valve to said low pressure chest, and the exhaust of said high pressure cylinder having a pipe communicating with the low pressure steam chest, whereby upon the closing of said valve after the initial operation of the engine, the high pressure cylinder exhaust will be conducted to the low pressure cylinder, substantially as described.

2. The combination, with a traction engine boiler, of high and low pressure cylinders mounted thereon and having steam chests and valves therefor, a pipe extending transversely of said cylinders and above the same and communicating at one end with said high pressure steam chest and at its opposite end with said low pressure steam chest, a live steam pipe having a throttle valve communicating with said transverse pipe, an intercepting valve located in the passage leading from said transverse pipe to said low pressure steam chest and normally admitting live steam to said low pressure steam chest simultaneously with its admission to said

high pressure steam chest, said valve having surfaces of different area exposed when the valve is open to the live steam pressure and whereby the said valve will be automatically closed when the pressure in the low pressure steam chest equals a predetermined ratio of the boiler pressure and said high pressure steam chest having an exhaust opening and a pipe communicating therewith and extending transversely of said boiler and leading into said low pressure steam chest, and a second pipe also communicating with said high pressure exhaust and extending forward to the engine stack, and a three-way valve located between said high pressure exhaust opening and said pipes and arranged to direct the exhaust from said high pressure cylinder into one or the other of said pipes, whereby the engine can be operated continuously as a compound or as a double simple, substantially as described.

In witness whereof, we have hereunto set our hands this 30th day of January 1906.

GEORGE E. WILSON.

WILLIAM J. FRAWLEY.

Witnesses:

S. BLAIR McBEATH,

T. J. TAZENDIN.