

No. 855,436.

PATENTED MAY 28, 1907.

J. STUMPF.
LOCOMOTIVE WITH STEAM TURBINE DRIVE.
APPLICATION FILED OCT. 6, 1904.

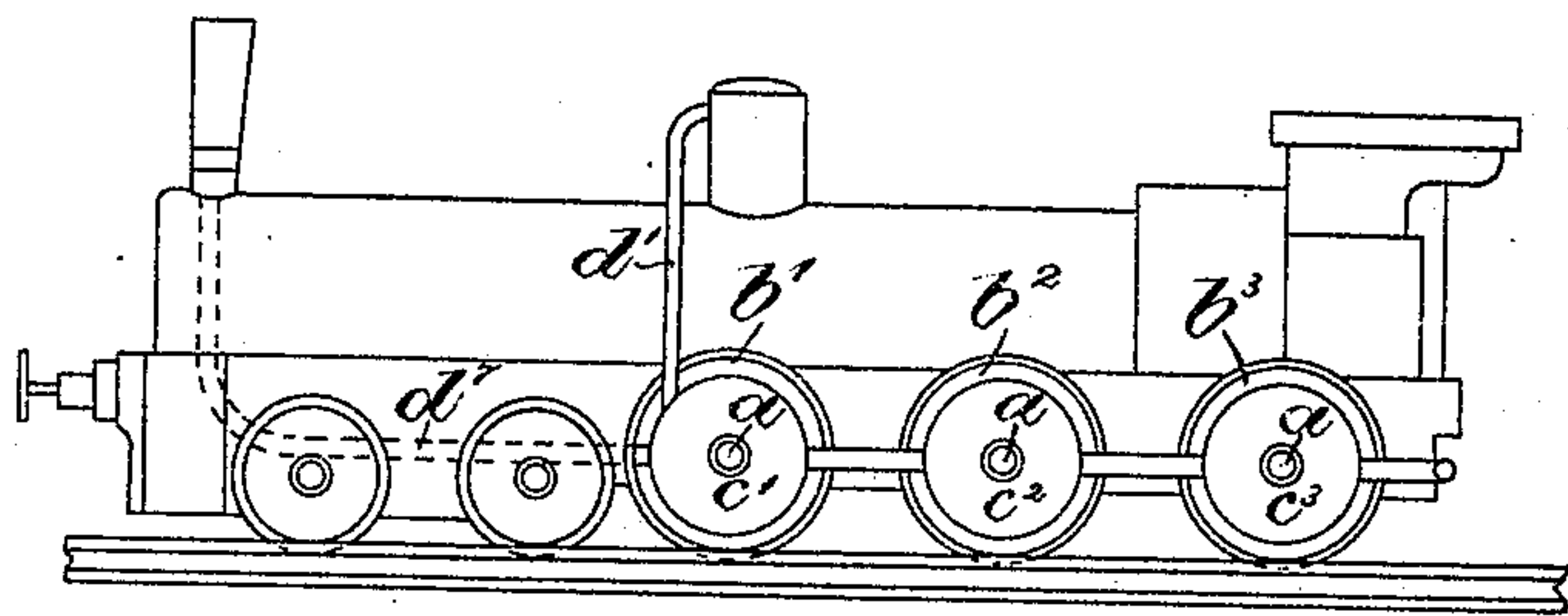
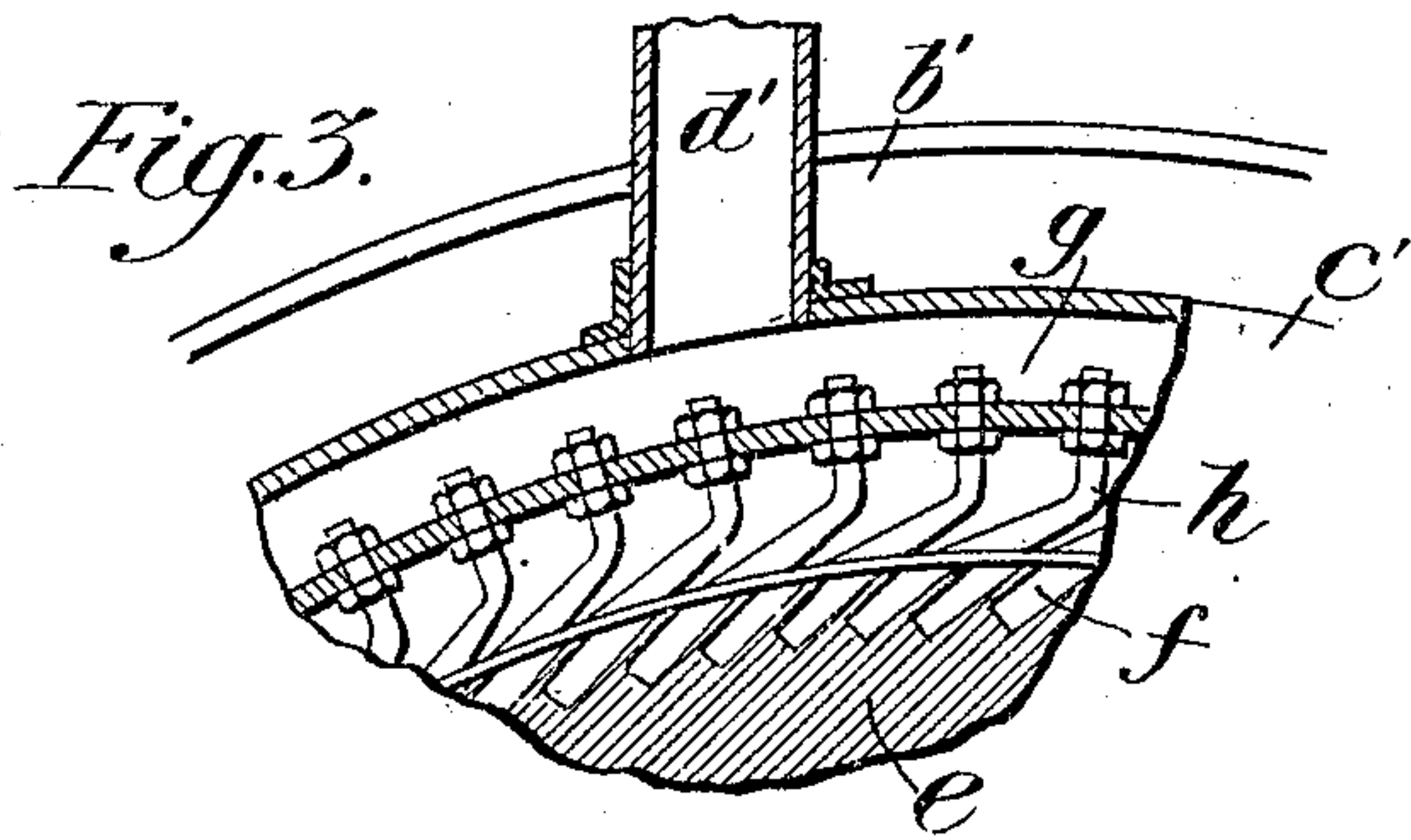


Fig. 1.

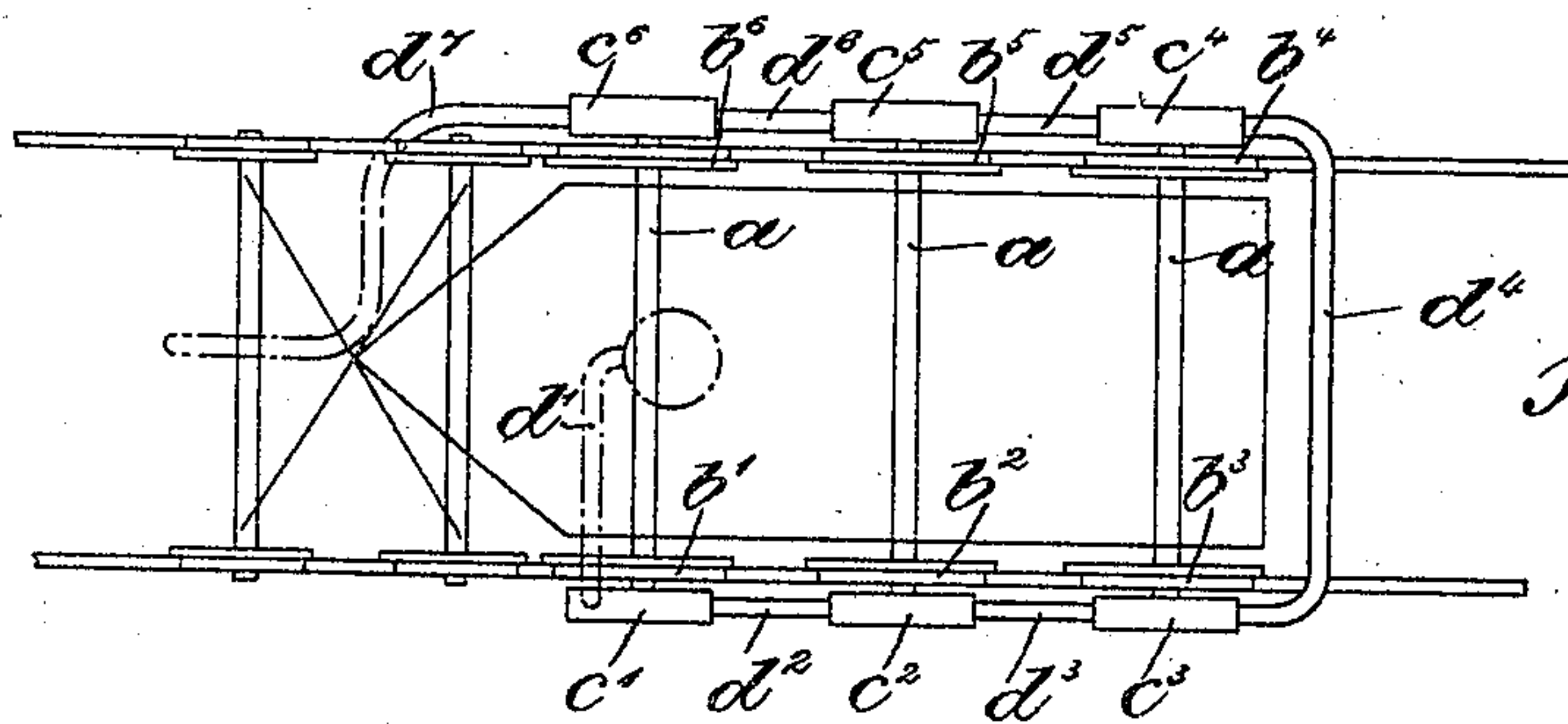


Fig. 2.

Waukinger }
Mickelen. } Witnesses.

Johann Stumpf
Inventor

UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF CHARLOTTENBURG, GERMANY.

LOCOMOTIVE WITH STEAM-TURBINE DRIVE.

No. 855,436.

Specification of Letters Patent.

Patented May 28, 1907.

Application filed October 6, 1904. Serial No. 227,367.

To all whom it may concern:

Be it known that I, JOHANN STUMPF, a subject of the German Emperor, residing at Charlottenburg, near Berlin, in the Empire of Germany, have invented certain new and useful Improvements in Locomotives with Steam-Turbine Drive, of which the following is a specification.

The present invention enables locomotives to be fitted with steam-turbine drive, without the necessity for having gear-wheels between the turbine and the driving wheels of the locomotive.

As is well-known the chief difficulty hitherto in the way of driving locomotives by turbines has been the fact that the high boiler pressure at comparatively low rate of revolution of the engine-wheels necessitated turbines either occupying such a large amount of space that they could not be fitted to locomotives, or in which the speed of the turbine would be so high that it could not be used for working the driving-wheels without reduction gear.

By means of the present invention the difficulty is overcome by dividing up the steam pressure available between the admission- and exhaust-pipes into as many steps as there are driving-wheels. In a locomotive with three driving axles there are six driving wheels available, and the steps in the steam pressure can therefore be made six in number.

Whereas, so far, the proposals have been mostly directed to the application of one turbine, or several turbines working in parallel, in which the unavoidably high speed was reduced to the speed of the locomotive-wheels by means of gearing, in the present invention the speed reduction is effected by subdivision of the steam pressure for each driving wheel. In contrast therefore to the first case it is now not only necessary to choose driving wheels of not too large diameter, but it is really an advantage to have the smallest possible driving wheels.

In the practical carrying out of the invention a still further number of steps in the pressure can be used by having on the shafts of the separate turbines several blade rims which will utilize the steam of the individual steps in a proportionate number of steam speeds. Several pressure steps can also be arranged for one subsidiary drive.

The example shown in the drawing represents a locomotive with three driving axles,

but the principle is equally applicable to locomotives with a greater or smaller number of driving axles.

Figure 1 shows the arrangement in elevation; Fig. 2 in plan, for a three-axle locomotive, and Fig. 3 is a detail sectional view of a portion of one of the turbines.

The wheels on the axle *a* are shown marked *b*₁ *b*₂ . . . *b*₆. On the same axle of each wheel is fitted a turbine which is shown marked *c*₁ *c*₂ . . . *c*₆. These turbines are fixed on the frame of the locomotive and are suitably coupled to the respective wheels. For instance, the coupling may be effected by means of a flexible crank arrangement which will permit of the necessary play between the turbines rigidly fixed on the frame work and the locomotive wheels driven by them. The first turbine *c*₁ obtains its steam from the boiler through a pipe shown marked *d*₁. From the first turbine the steam goes right through the connections *d*₂ *d*₃ of each of the turbine steps. From the last component turbine *c*₆, a pipe *d*₇ leads to the exhaust- or blast- pipe.

Referring to Fig. 3, *e* represents a wheel of one of the turbines having one or more rows of U-shaped or other buckets *f* carried on its periphery. Suitably arranged with respect to the buckets and supported by the wall of the steam chest or chamber *g*, are nozzles *h* which discharge steam or other elastic fluid against the buckets at the proper angle. These nozzles may be and preferably are of the expanding type, as shown.

As mentioned already the single turbine steps can be divided further into subsidiary steps on the principle of steam speed gradation, each of the subsidiary steps working on one shaft. It is also possible to have separate pressure steps working in parallel where such an arrangement in a multiple driving-axle locomotive is feasible. The manner in which the turbines of the separate steps are brought to work on the wheels is of no importance in the invention, the turbine itself for instance can be arranged on the axle of the driving wheels, and it is also possible to have several pressure steps working in common on one driving wheel or one driving axle.

It is to be noted that in the present arrangement the driving wheels of the locomotive are driven independently. For this reason the several turbines or stages must be designed so as to drive the wheels synchro-

nously and also to develop a substantially uniform tractive effort at each wheel.

What I claim as new and desire to secure by Letters Patent of the United States, is—

5 1. A locomotive comprising an axle, driving wheels mounted on the axle, independent elastic fluid turbines for the wheels co-operating to drive them in the same direction and with substantially equal torque, and con-
10 duits for supplying elastic fluid to the turbines.

2. A locomotive comprising an axle, and driving wheels mounted thereon, in combination with elastic fluid turbines directly connected to the ends of the axle, one constituting a high pressure and another a low pressure turbine operating simultaneously and driving in the same direction.

3. A locomotive comprising axles, and driving wheels mounted thereon, in combination with a plurality of elastic fluid turbines for each axle, said turbines being adapted to successively abstract energy from the motive fluid and designed and arranged to produce
25 substantially the same torque at each wheel.

4. A locomotive comprising axles, and driving wheels mounted thereon, in combination with a plurality of elastic fluid turbines directly connected to each axle, and conduits
30 connecting the turbines in series.

5. A locomotive comprising axles, driving wheels mounted thereon, and a frame supported on the axles, in combination with a high speed turbine adjacent each wheel and
35 connected with its axle, and an independent casing for each turbine mounted on the frame.

6. A locomotive comprising axles, driving wheels mounted on the ends of the axles, a

turbine adjacent each wheel, means for passing motive fluid in series through the turbines on one side of the locomotive, and means for passing motive fluid in series in the opposite direction through the turbines on the other side of the locomotive so that the
45 pairs of driving wheels are uniformly driven by a pair of turbines connected with the axle of each pair of wheels and receiving motive fluid at different pressures.

7. A locomotive comprising axles, and driving wheels mounted thereon, in combination with elastic fluid turbines arranged one at each end of each axle, and conduits connecting the turbines in series.

8. A locomotive comprising axles, and driving wheels mounted thereon, in combination with turbines for driving the wheels which are arranged in line with the axles and located adjacent to the outer sides of the
60 wheels.

9. A locomotive comprising axles and wheels mounted thereon, a series of wheel-driving turbines on one side of the locomotive, a series of wheel-driving turbines on the other side of the locomotive, conduits joining
65 the turbines of each series, and a conduit joining the end of one series with the beginning of the other to pass motive fluid in opposite directions through the two series of turbines.

In testimony, that I claim the foregoing as my invention I have signed my name in presence of two witnesses, this twenty-third day of September 1904.

JOHANN STUMPF.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.