A. SUNDH.

COMPOUND BRAKE.

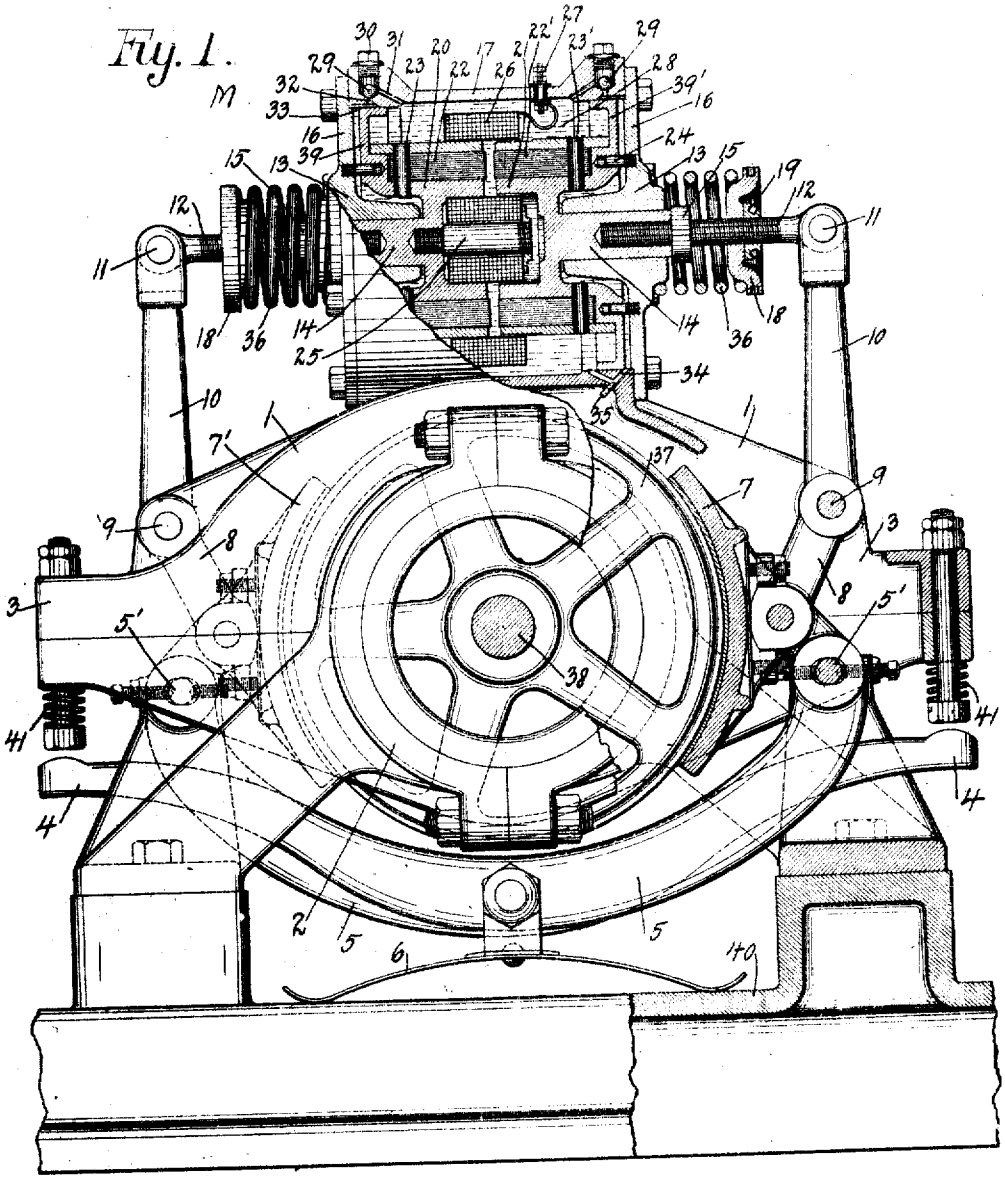
APPLICATION FILED JUNE 24, 1907.

1,011,661.

Patented Dec. 12, 1911.

4 SHEETS-SHEET 1.

Fig. 1.



WITNESSES:

Ernest L. Gale Jr.

James G. Bathell

INVENTOR.

August Sundh

BY

C. M. Nissen

ATTORNEY

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4 SHEETS—SHEET 2.

Fig. 2.

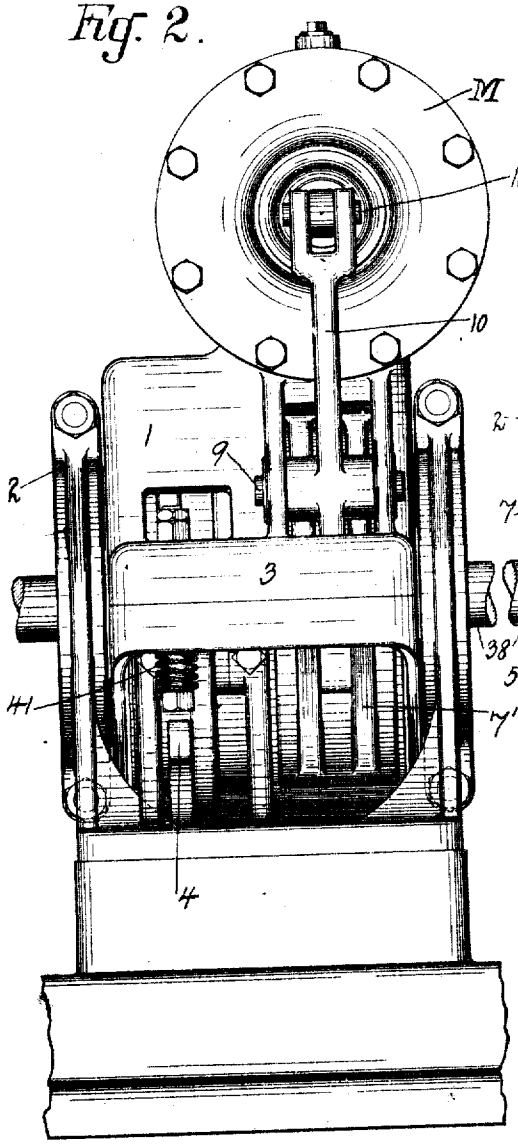
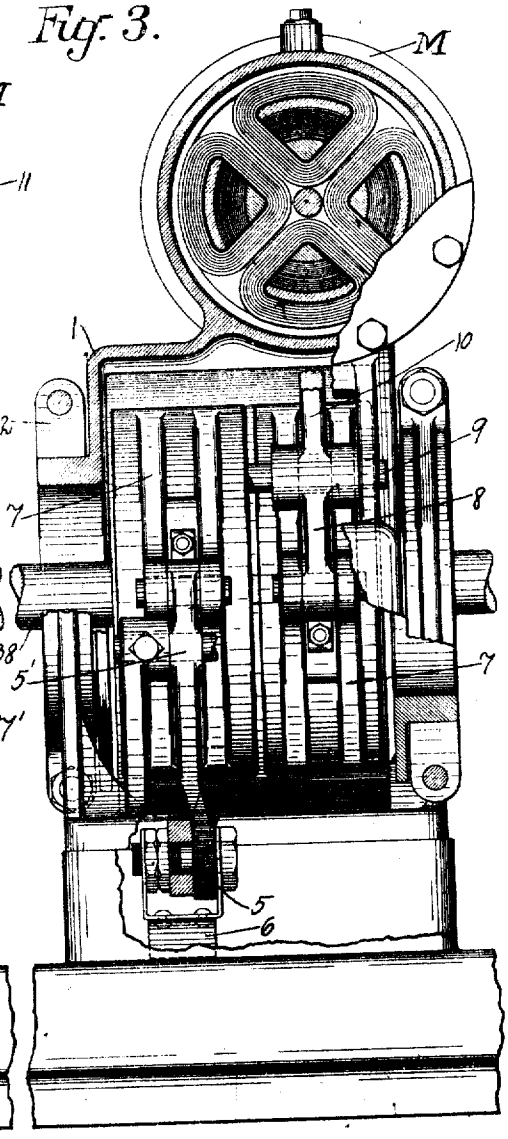


Fig. 3.



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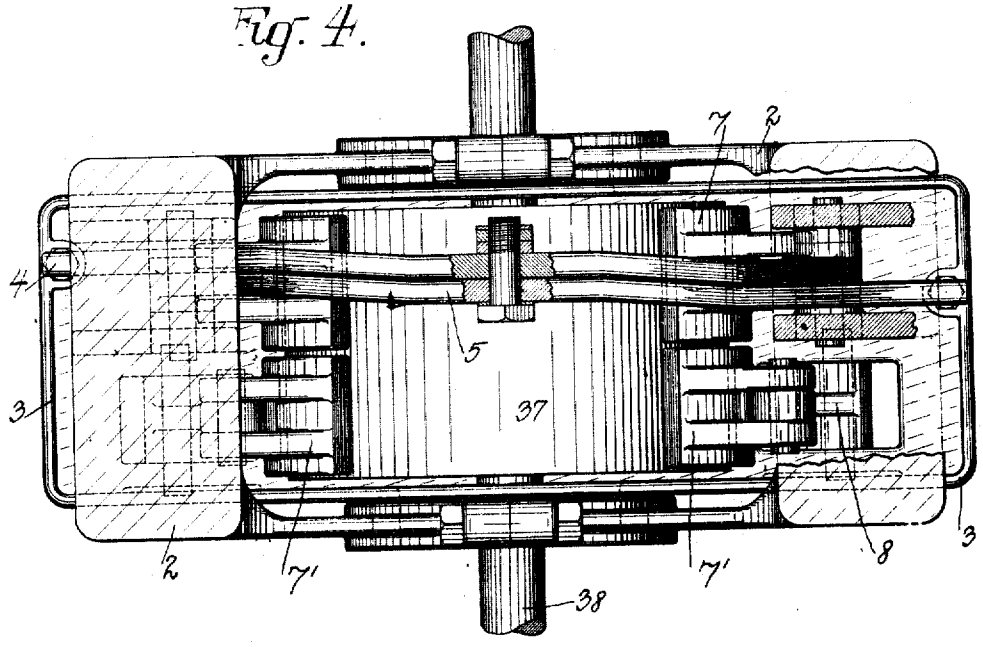
4 SHEETS—SHEET 3.

Fig. 4.



WITNESSES:

Ernest L. Gale Jr.

James G. Bethell

INVENTOR

August Sundh

BY

C. M. Nissen

ATTORNEY

A. SUNDH.

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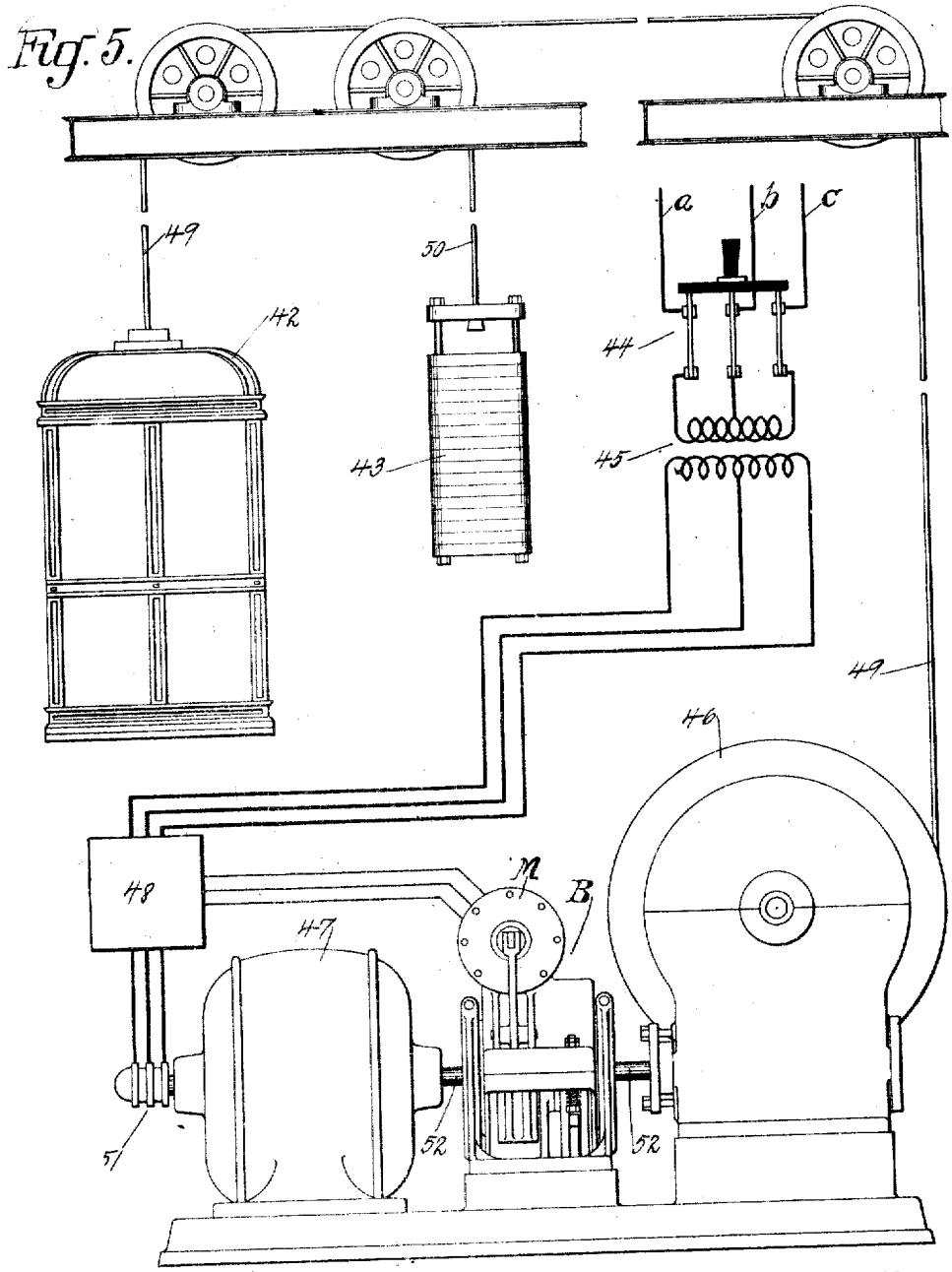
4 SHEETS—SHEET 4.

Fig. 5.



WITNESSES:

Walter C. Strang

James G. Bethell

INVENTOR

August Sundh

BY

C. M. Nissen

ATTORNEY

UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF YONKERS, NEW YORK, ASSIGNOR TO OTIS ELEVATOR COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

COMPOUND BRAKE.

1,011,661. Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed June 24, 1907. Serial No. 380,427.

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented a new and useful Improvement in Compound Brakes, of which the following is a specification.

My invention relates to brake apparatus and more particularly to a compound brake operated by an alternating current magnet.

One object of my invention is to provide a brake of the character described which is very efficient in its operation.

A further object of the present invention is to provide a compound braking apparatus adapted to alternating current releasing means.

Other objects of my invention will appear more fully hereinafter, the novel combinations of elements being pointed out in the appended claims.

A preferred form of my invention is illustrated in the accompanying drawings in which—

Figure 1 shows in part sectional elevation, my improved alternating current compound brake mechanism; Fig. 2 is a side elevation; Fig. 3 is a side elevation in part section; Fig. 4 is a bottom plan view, parts being broken away; and Fig. 5 illustrates an alternating current electric elevator system embodying my invention.

Like characters of reference denote similar parts throughout the various drawings.

I do not claim the specific construction of the alternating current electro-magnet, *per se*, designated by the character M, as that forms the subject-matter of a pending application by David L. Lindquist, Serial No. 331,196, filed August 18, 1906, and it is fully described in said pending application. A brief description of the aforesaid alternating current magnet will be given, however, in order that the essential features of construction and mode of operation may be readily understood in the present application.

The alternating current magnet M is mounted on a movable frame 1 which in turn is mounted in the bearings 2.

3, 3 designate lateral arms projecting from the rotatable frame 1, and adapted to engage the outer ends 4, 4, respectively, of the brake levers 5, 5 which are suitably pivoted at 5′, 5′, in fixed supports and carry at their inner ends the brake shoes 7, 7 associated with the outside surface of the brake pulley 37, which is fixed to the driving shaft 38 of a motor, for example. Opposite the brake shoes 7, 7 are an additional set of brake shoes 7′, 7′ pivoted to the brake arms 8, 8 which in turn are pivoted at 9, 9 to the rotatable frame 1. Rigidly connected with the arms 8, 8 are the substantially vertical arms 10, 10 which are pivoted at 11, 11 to the screw threaded rods 12, 12. The inner ends of the screw threaded rods 12, 12 pass into screw-threaded openings in the extensions 14, 14 of the movable portions 20, 21 of the electro-magnet M. The projections 14, 14 fit snugly within the bearings 13, 13 of the end plates 16, 16 of the casing which incloses the electro-magnet and armatures. The distances of the electro-magnet and its armatures from the pivotal points 11, 11 may be adjusted by reason of the screw-threaded connections, and the parts then locked together by means of the nuts 15, 15. On the rods 12, 12 are also mounted the compression brake springs 36, 36, the tension of which may be varied by means of the nuts 18, 18, which latter are locked in position by means of the smaller nuts 19. The outer faces of the plates 16, 16 adjacent the bearings 13, 13 and the inner faces of the nuts 18, 18 are suitably formed to receive the springs 36, 36 and hold the same in proper position.

The electro-magnet M preferably comprises a plurality of poles each of which comprises laminations 22 held in position by dowel pins 23. The armature 21 comprises projections corresponding to the poles of the magnet, and comprising also laminations 22′ held in position by the dowel pins 23′. The solenoids 26 of the electro-magnet may be held in fixed position relative to the casing 17, but in this instance they are fixed to the electro-magnet 20 by means of the bolt 25.

27 designates an insulated terminal for the solenoids 26, but it should be understood that there may be a plurality of such terminals.

It is particularly noticeable in the operation of the ordinary type of alternating current magnets that the action of the parts upon closing the circuit leading thereto is of a very violent character. The magnet which is illustrated is designated to eliminate this objectionable feature. As shown in the drawings, the solenoids 26 are so connected to the polar projections of the magnet

20 that they leave recesses for the reception of the corresponding projections of the armature 21, and when in normal position said solenoids surround all of the poles of the magnet and the projections of the armature. In order to offset the violent action of the electro-magnet M in its operation, the casing is filled with insulating liquid such as oil, which immerses the entire electro-magnet and its armatures.

Around each piston 39, 39′ is a passageway 34 at a suitable point in the casing 17. This passageway is made adjustable by means of the adjusting screw 35 so as to restrict the flow of liquid from one side of a piston to the other. Additional passages 31, 31 and 32, 32 which are normally closed by means of check valves 29, 29, prevent the flow of insulating liquid in one direction but allow the liquid to flow readily in a reverse direction.

The operation of the entire construction as illustrated in the drawing, is as follows: Upon sending current into the solenoid 26, both the electro-magnet and armature are energized, and each tends to move toward the other with a sudden movement, particularly if the magnet is a multiphase alternating current magnet. By reason of the position of the check valves, however, the liquid which is confined in the casing 17, must pass through the restricted passages 34, and by varying the size of the restricted passage, such movement may be regulated as desired. Now when the electro-magnet is energized and the armature projections brought into engagement with the poles of the electro-magnet, the brake springs 36, 36 will be compressed and the primary brake shoes 7′, 7′ released from the brake pulley so that the motor may drive the shaft 38. The spring 6 bearing against the bed plate 40 and connected to the secondary brake levers 5, 5, normally maintains the secondary brake shoes 7, 7 out of contact with the brake pulley 37. Upon the deënergization of the electro-magnet, the springs 36, 36 will apply the primary brake shoes to the pulley 37, whereupon the momentum of the rotating parts will rotate the frame 1, primary brake, and the entire electro-magnetic device M. One of the arms 3 of the frame 1 will strike one of the brake levers 5 at its outer end 4 and thus apply the corresponding secondary brake shoes 7, 7 with sufficient force to bring the driven shaft 38 to rest. As soon as the shaft 38 has been brought to rest one of the springs 41 will tend to center the electro-magnet M. The spring 6 also tends toward this same result.

In Fig. 5 I have shown my alternating current compound brake apparatus applied to an electric elevator system. 42 designates the usual elevator car suspended by the hoisting cable 49, and counterweight cable 50. 43 designates a counterweight, and 46 a hoisting drum. An electric motor 47 of any desired phase or type is connected to the hoisting drum 46 by the usual shaft 52, and worm gearing to effect the hoisting and lowering of the elevator car 42 in any desired manner. 48 designates a controller which governs the admission of current to the motor 47 at the collector rings 51. 44 designates a main line switch which serves to connect the main line wires *a*, *b*, *c* with the transformer 45 which latter is represented in the usual diagrammatical way, and which is also connected to the motor controller 48. The mains *a*, *b* *c* indicate conductors from a source of three-phase alternating current supply. This number of phases is chosen merely for the purpose of illustration, and may be single phase or two-phase or more than three-phase if desired, the principle of operation being substantially the same in every instance. The compound brake apparatus as a whole is designated by the letter B and is shown in Fig. 5 between the electric motor 47 and the hoisting apparatus 46. This brake apparatus may, however, be placed in any other desired position upon the shaft 52 or any extension thereof.

It should be particularly noted that compound brake apparatus is desired especially with induction motors which have heavy rotors, and therefore acquire a large amount of momentum. That is, when it is desired to stop the motor, a large amount of momentum of the rotating part thereof, especially in alternating current motors of the induction type, must be overcome, and this force is taken advantage of in a very efficient manner by the use of compound brake apparatus, the primary brake tending to retard the rotating part, but acting principally as a clutch device for throwing in the more powerful secondary brake in a manner already explained. To secure good results an especial arrangement of the brake levers has been made so as to permit the use of an alternating current electro-magnet therewith as already explained.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of my invention, and I desire therefore not to be limited to the precise construction herein disclosed.

What I claim and desire to have protected by Letters Patent of the United States is:—

1. In combination with a rotary element, two movable members, each carrying a brake, means to apply one of the brakes to the rotary element and cause the movement of its carrying member, the second member having an engaging portion in the path of movement of the first member, and movable to apply the second brake upon the movement of the first member.

2. In combination with a rotary element, a movable member, a brake carried thereby, means to apply said brake to the rotary element and cause the movement of its carrying member, a second movable member having an engaging portion in the path of movement of the first member, a brake carried by said second member in position to engage the rotary element upon the movement of the second member, whereby the application of the first brake will operate through said members to apply the second brake.

3. In combination with a rotary element, a movable frame, a brake carried thereby, means to apply the brake to the rotary element and cause the movement of said frame, a stationary frame, a lever pivoted thereto projecting into the path of movement of the movable frame, a brake carried by said lever in position to engage the rotary element when said lever is moved, whereby the application of the first brake will operate through the frame and lever to apply the second brake.

4. In combination with a rotary member, a stationary frame, a movable frame pivoted to the stationary frame for movement about the axis of the rotary member, levers pivoted to the movable frame, brake shoes carried by said levers in position to engage the rotary member on opposite sides thereof, means to apply said brake shoes to the rotary member, and cause a movement of the movable frame about its axis, levers pivoted to the stationary frame, one of said levers extending into the path of movement in one direction of the pivoted frame, another of said levers extending into the path of movement in the other direction of said frame, and a brake shoe carried by each lever in position to engage the rotary member when its lever is operated.

5. In combination with a rotary member, a stationary frame, levers pivoted to the frame on opposite sides of the rotary member and crossing each other, brakes carried by the levers, means for engaging the outer ends of the levers to move them about their axes and apply the brakes, and a connection between the levers at the crossing point, whereby the operation of one lever will operate the other lever to apply both brakes.

6. In combination with a rotary element, a movable member, a brake carried thereby in position to engage the rotary element, a second movable member carrying a brake, and positioned to be engaged and operated by the first member, and means for effecting a yielding engagement between said members.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST SUNDH.

Witnesses:

CHAS. M. NISSEN,

JAMES G. BETHELL.