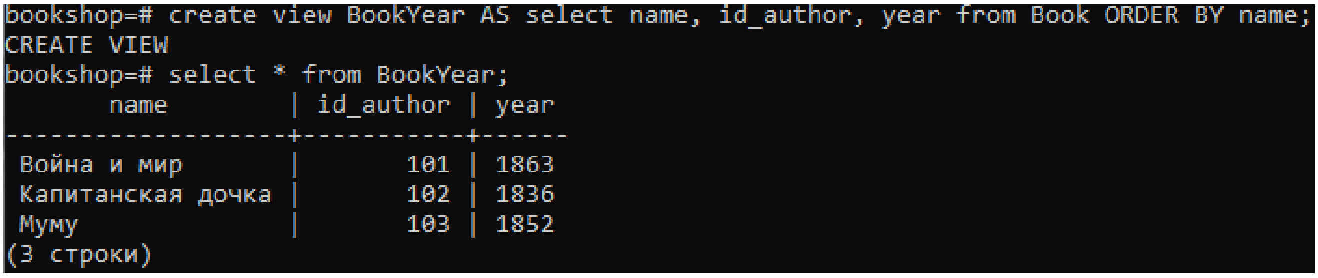
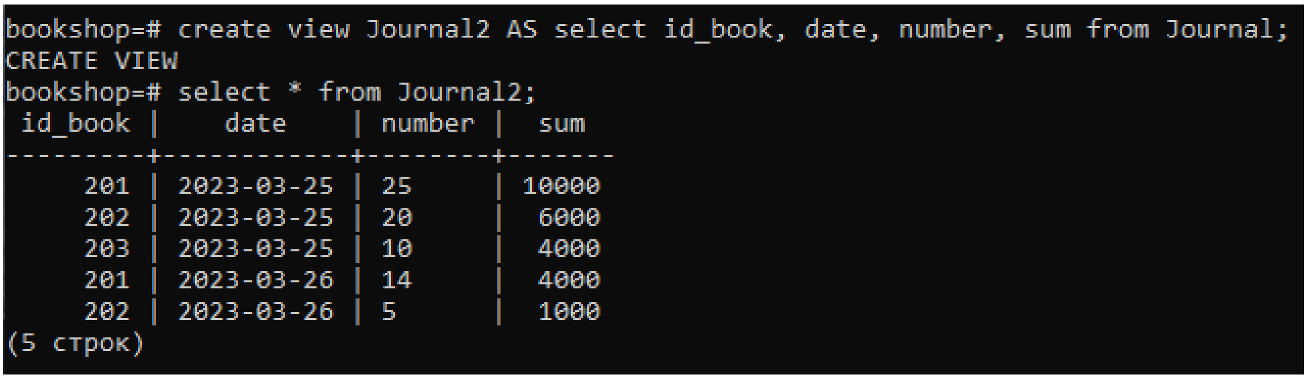
SQL-представления.

Использование представлений для скрытия столбцов.

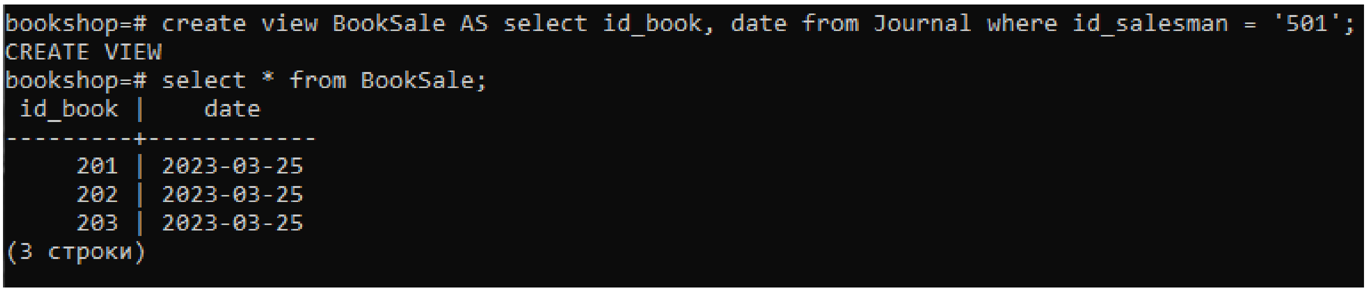


```
bookshop=# create view BookYear AS select name, id_author, year from Book ORDER BY name;
CREATE VIEW
bookshop=# select * from BookYear;
       name        | id_author | year
-------------------+-----------+------
 Война и мир       |       101 | 1863
 Капитанская дочка |       102 | 1836
 Муму              |       103 | 1852
(3 строки)
```



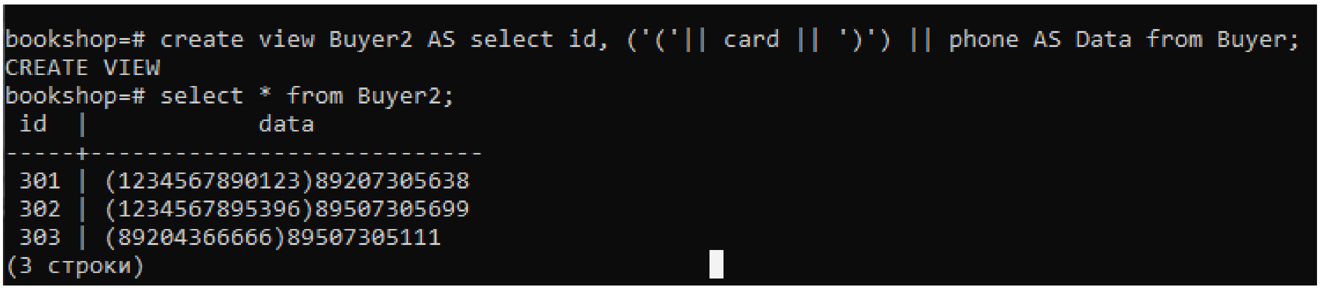
```
bookshop=# create view Journal2 AS select id_book, date, number, sum from Journal;
CREATE VIEW
bookshop=# select * from Journal2;
 id_book |    date    | number |  sum
---------+------------+--------+-------
     201 | 2023-03-25 | 25     | 10000
     202 | 2023-03-25 | 20     |  6000
     203 | 2023-03-25 | 10     |  4000
     201 | 2023-03-26 | 14     |  4000
     202 | 2023-03-26 | 5      |  1000
(5 строк)
```

Следующий оператор определяет представление, содержащее дату покупки только тех книг, которые купил покупатель 501.



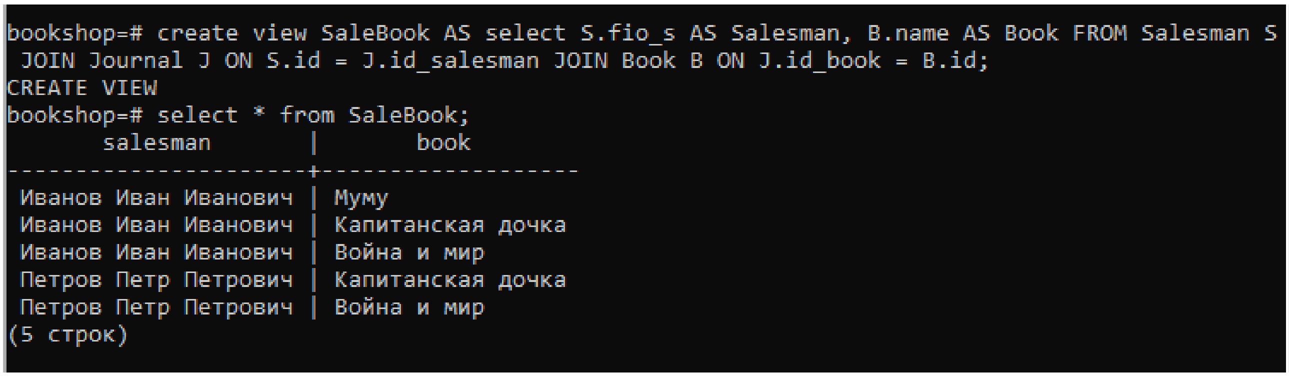
```
bookshop=# create view BookSale AS select id_book, date from Journal where id_salesman = '501';
CREATE VIEW
bookshop=# select * from BookSale;
 id_book |    date
---------+------------
     201 | 2023-03-25
     202 | 2023-03-25
     203 | 2023-03-25
(3 строки)
```

Использование представления для отображения вычисляемых столбцов.



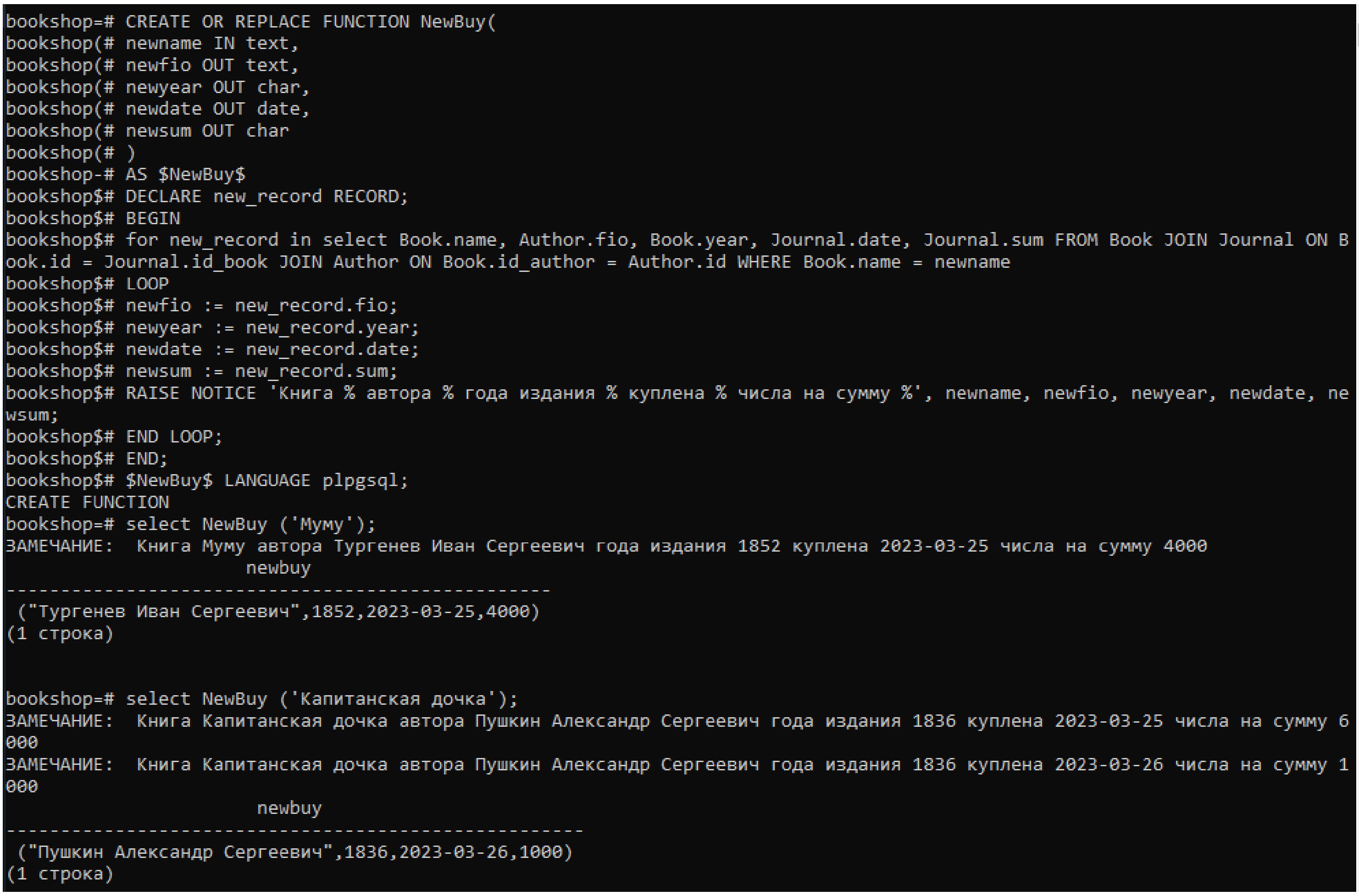
```
bookshop=# create view Buyer2 AS select id, ('('|| card || ')') || phone AS Data from Buyer;
CREATE VIEW
bookshop=# select * from Buyer2;
 id  |            data
-----+----------------------------
 301 | (1234567890123)89207305638
 302 | (1234567895396)89507305699
 303 | (89204366666)89507305111
(3 строки)
```

Использование представления для скрытия сложного синтаксиса.



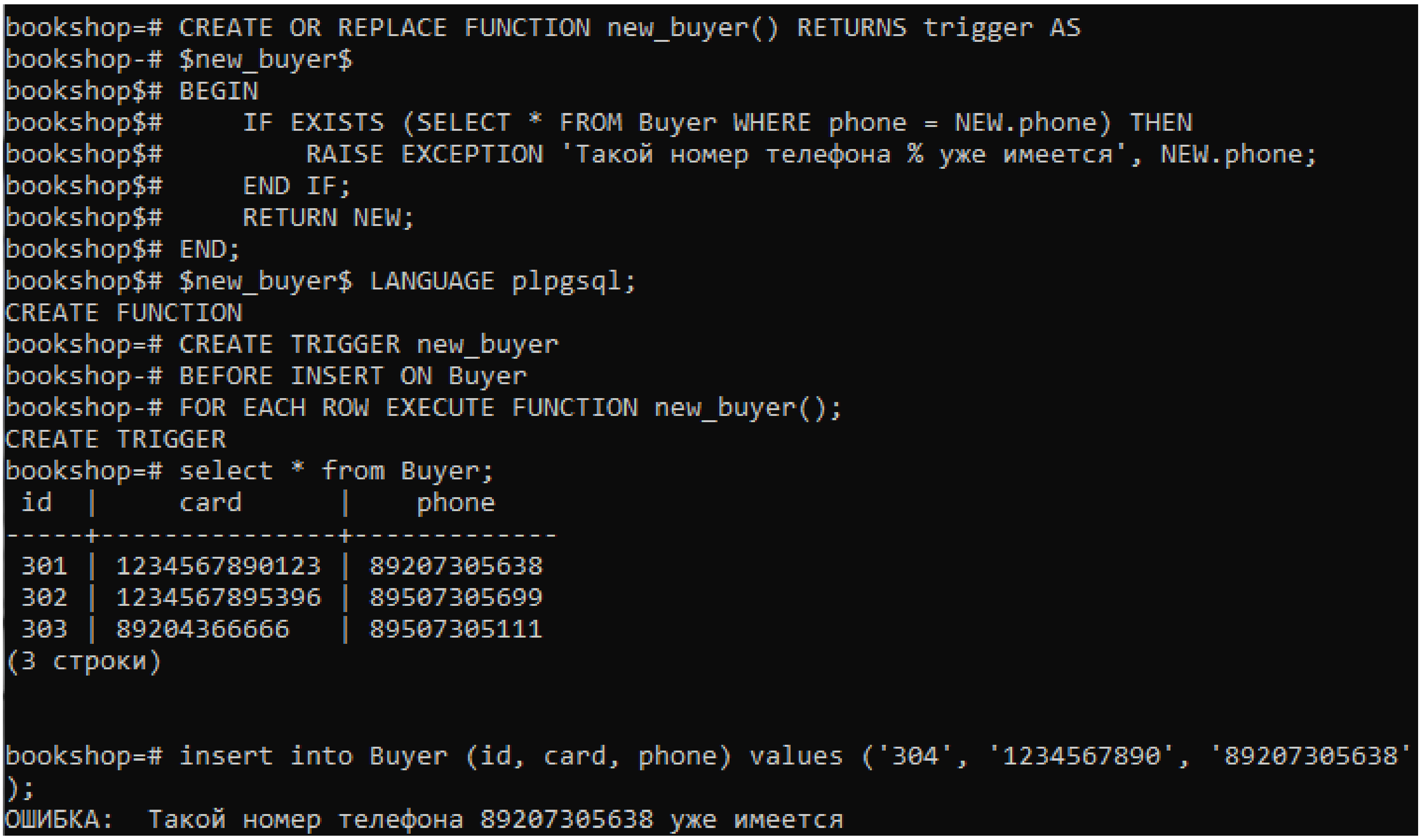
```
bookshop=# create view SaleBook AS select S.fio_s AS Salesman, B.name AS Book FROM Salesman S
 JOIN Journal J ON S.id = J.id_salesman JOIN Book B ON J.id_book = B.id;
CREATE VIEW
bookshop=# select * from SaleBook;
       salesman       |       book
----------------------+-------------------
 Иванов Иван Иванович | Муму
 Иванов Иван Иванович | Капитанская дочка
 Иванов Иван Иванович | Война и мир
 Петров Петр Петрович | Капитанская дочка
 Петров Петр Петрович | Война и мир
(5 строк)
```

Хранимая процедура.



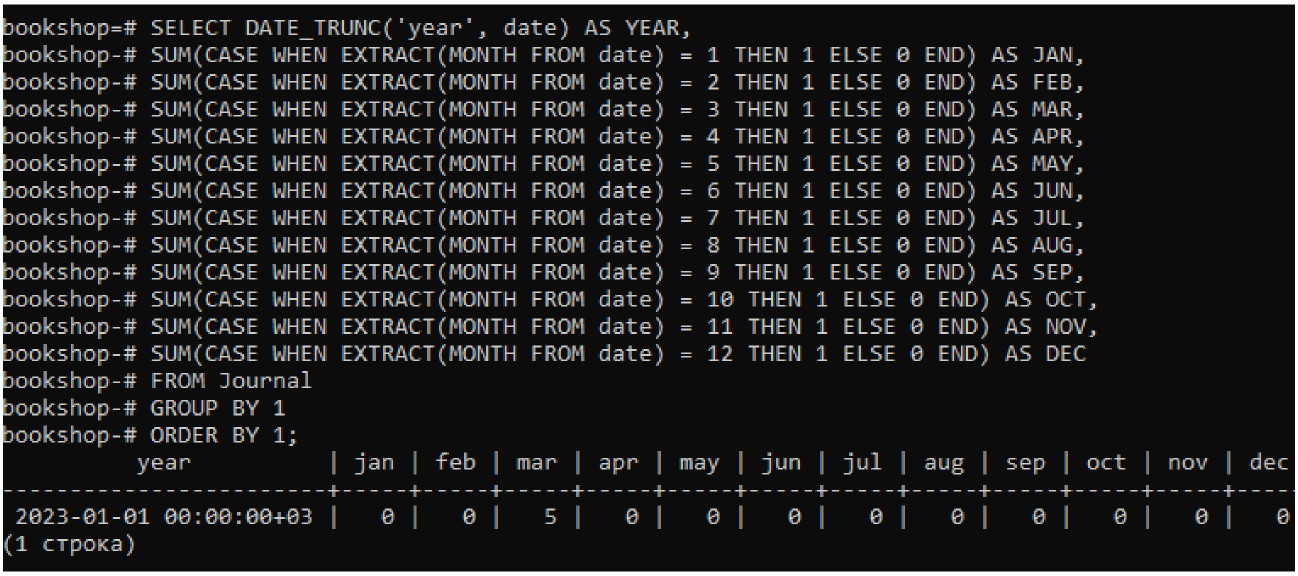
```
bookshop=# CREATE OR REPLACE FUNCTION NewBuy(
bookshop(# newname IN text,
bookshop(# newfio OUT text,
bookshop(# newyear OUT char,
bookshop(# newdate OUT date,
bookshop(# newsum OUT char
bookshop(# )
bookshop-# AS $NewBuy$
bookshop$# DECLARE new_record RECORD;
bookshop$# BEGIN
bookshop$# for new_record in select Book.name, Author.fio, Book.year, Journal.date, Journal.sum FROM Book JOIN Journal ON B
ook.id = Journal.id_book JOIN Author ON Book.id_author = Author.id WHERE Book.name = newname
bookshop$# LOOP
bookshop$# newfio := new_record.fio;
bookshop$# newyear := new_record.year;
bookshop$# newdate := new_record.date;
bookshop$# newsum := new_record.sum;
bookshop$# RAISE NOTICE 'Книга % автора % года издания % куплена % числа на сумму %', newname, newfio, newyear, newdate, ne
wsum;
bookshop$# END LOOP;
bookshop$# END;
bookshop$# $NewBuy$ LANGUAGE plpgsql;
CREATE FUNCTION
bookshop=# select NewBuy ('Муму');
ЗАМЕЧАНИЕ:  Книга Муму автора Тургенев Иван Сергеевич года издания 1852 куплена 2023-03-25 числа на сумму 4000
                    newbuy
--------------------------------------------------
 ("Тургенев Иван Сергеевич",1852,2023-03-25,4000)
(1 строка)


bookshop=# select NewBuy ('Капитанская дочка');
ЗАМЕЧАНИЕ:  Книга Капитанская дочка автора Пушкин Александр Сергеевич года издания 1836 куплена 2023-03-25 числа на сумму 6
000
ЗАМЕЧАНИЕ:  Книга Капитанская дочка автора Пушкин Александр Сергеевич года издания 1836 куплена 2023-03-26 числа на сумму 1
000
                       newbuy
-----------------------------------------------------
 ("Пушкин Александр Сергеевич",1836,2023-03-26,1000)
(1 строка)
```

Использование триггеров для проверки допустимости вводимых данных.



```
bookshop=# CREATE OR REPLACE FUNCTION new_buyer() RETURNS trigger AS
bookshop-# $new_buyer$
bookshop$# BEGIN
bookshop$#     IF EXISTS (SELECT * FROM Buyer WHERE phone = NEW.phone) THEN
bookshop$#         RAISE EXCEPTION 'Такой номер телефона % уже имеется', NEW.phone;
bookshop$#     END IF;
bookshop$#     RETURN NEW;
bookshop$# END;
bookshop$# $new_buyer$ LANGUAGE plpgsql;
CREATE FUNCTION
bookshop=# CREATE TRIGGER new_buyer
bookshop-# BEFORE INSERT ON Buyer
bookshop-# FOR EACH ROW EXECUTE FUNCTION new_buyer();
CREATE TRIGGER
bookshop=# select * from Buyer;
 id  |     card      |    phone
-----+---------------+-------------
 301 | 1234567890123 | 89207305638
 302 | 1234567895396 | 89507305699
 303 | 89204366666   | 89507305111
(3 строки)


bookshop=# insert into Buyer (id, card, phone) values ('304', '1234567890', '89207305638'
);
ОШИБКА:  Такой номер телефона 89207305638 уже имеется
```

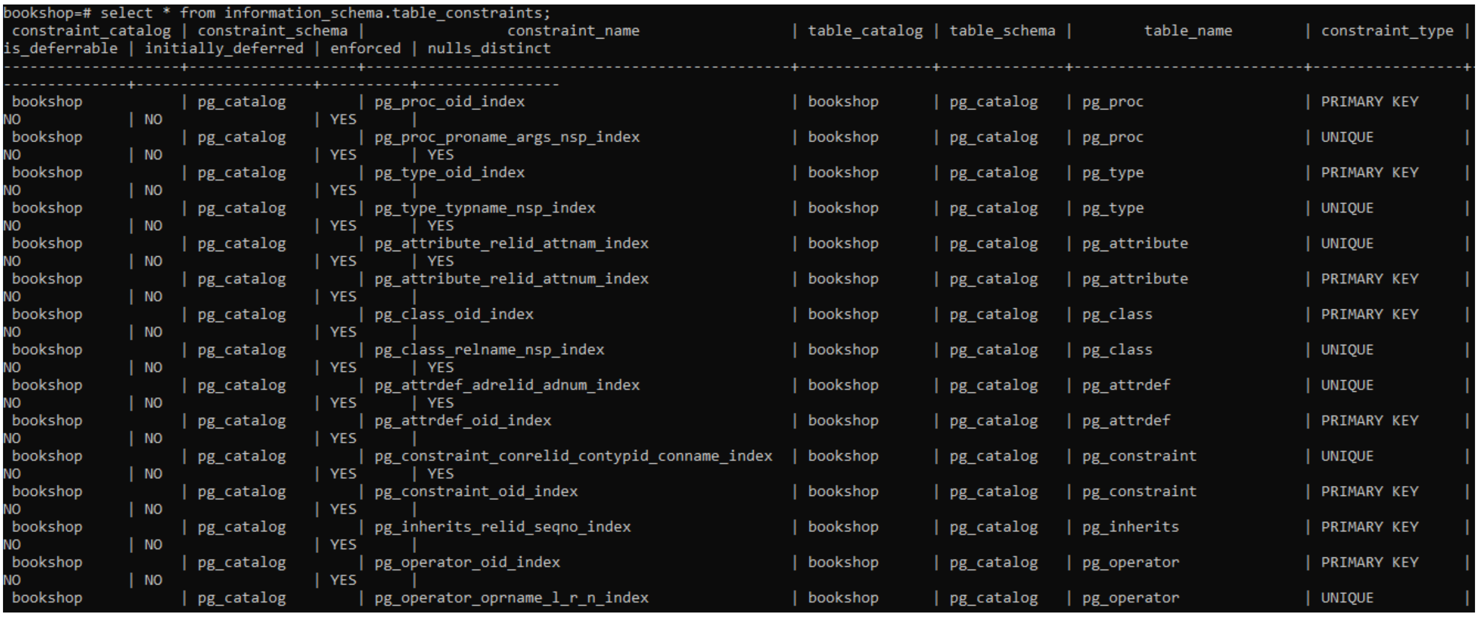
Сводная таблица.



```
bookshop=# SELECT DATE_TRUNC('year', date) AS YEAR,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 1 THEN 1 ELSE 0 END) AS JAN,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 2 THEN 1 ELSE 0 END) AS FEB,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 3 THEN 1 ELSE 0 END) AS MAR,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 4 THEN 1 ELSE 0 END) AS APR,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 5 THEN 1 ELSE 0 END) AS MAY,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 6 THEN 1 ELSE 0 END) AS JUN,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 7 THEN 1 ELSE 0 END) AS JUL,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 8 THEN 1 ELSE 0 END) AS AUG,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 9 THEN 1 ELSE 0 END) AS SEP,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 10 THEN 1 ELSE 0 END) AS OCT,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 11 THEN 1 ELSE 0 END) AS NOV,
bookshop-# SUM(CASE WHEN EXTRACT(MONTH FROM date) = 12 THEN 1 ELSE 0 END) AS DEC
bookshop-# FROM Journal
bookshop-# GROUP BY 1
bookshop-# ORDER BY 1;
          year          | jan | feb | mar | apr | may | jun | jul | aug | sep | oct | nov | dec
------------------------+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+----
 2023-01-01 00:00:00+03 |   0 |   0 |   5 |   0 |   0 |   0 |   0 |   0 |   0 |   0 |   0 |   0
(1 строка)
```

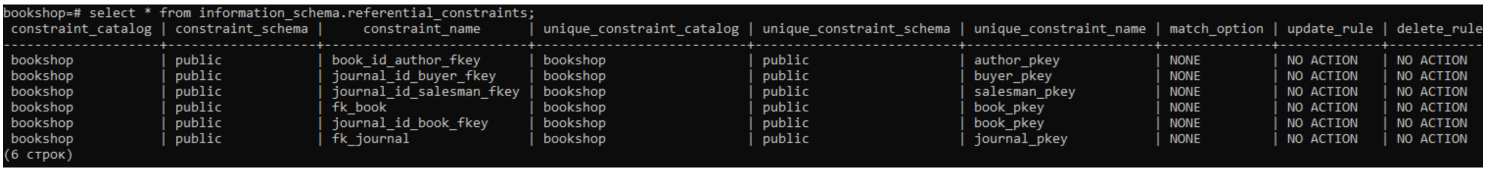
Словарь метаданных.

Получим список ограничений.



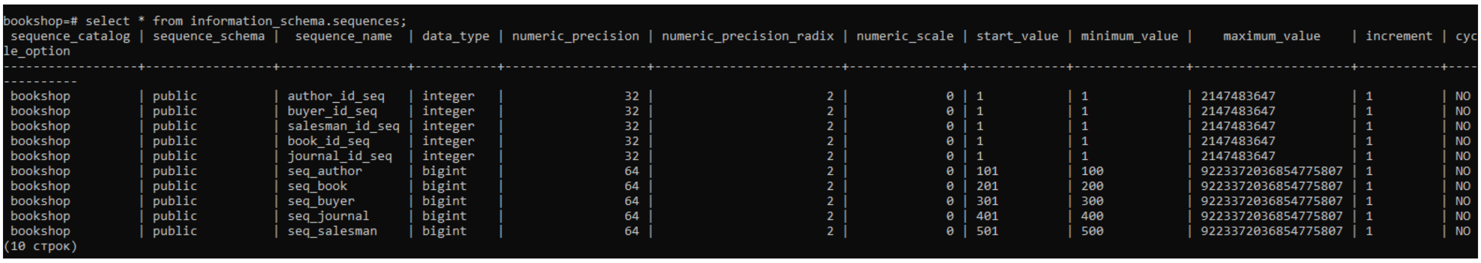
```
bookshop=# select * from information_schema.table_constraints;
 constraint_catalog | constraint_schema |                constraint_name                 | table_catalog | table_schema |       table_name        | constraint_type |
is_deferrable | initially_deferred | enforced | nulls_distinct
--------------------+-------------------+------------------------------------------------+---------------+--------------+-------------------------+-----------------+
--------------+--------------------+----------+----------------
 bookshop           | pg_catalog        | pg_proc_oid_index                              | bookshop      | pg_catalog   | pg_proc                 | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_proc_proname_args_nsp_index                 | bookshop      | pg_catalog   | pg_proc                 | UNIQUE          |
NO            | NO                 | YES      | YES
 bookshop           | pg_catalog        | pg_type_oid_index                              | bookshop      | pg_catalog   | pg_type                 | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_type_typname_nsp_index                      | bookshop      | pg_catalog   | pg_type                 | UNIQUE          |
NO            | NO                 | YES      | YES
 bookshop           | pg_catalog        | pg_attribute_relid_attnam_index                | bookshop      | pg_catalog   | pg_attribute            | UNIQUE          |
NO            | NO                 | YES      | YES
 bookshop           | pg_catalog        | pg_attribute_relid_attnum_index                | bookshop      | pg_catalog   | pg_attribute            | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_class_oid_index                             | bookshop      | pg_catalog   | pg_class                | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_class_relname_nsp_index                     | bookshop      | pg_catalog   | pg_class                | UNIQUE          |
NO            | NO                 | YES      | YES
 bookshop           | pg_catalog        | pg_attrdef_adrelid_adnum_index                 | bookshop      | pg_catalog   | pg_attrdef              | UNIQUE          |
NO            | NO                 | YES      | YES
 bookshop           | pg_catalog        | pg_attrdef_oid_index                           | bookshop      | pg_catalog   | pg_attrdef              | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_constraint_conrelid_contypid_conname_index  | bookshop      | pg_catalog   | pg_constraint           | UNIQUE          |
NO            | NO                 | YES      | YES
 bookshop           | pg_catalog        | pg_constraint_oid_index                        | bookshop      | pg_catalog   | pg_constraint           | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_inherits_relid_seqno_index                  | bookshop      | pg_catalog   | pg_inherits             | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_operator_oid_index                          | bookshop      | pg_catalog   | pg_operator             | PRIMARY KEY     |
NO            | NO                 | YES      |
 bookshop           | pg_catalog        | pg_operator_oprname_l_r_n_index                | bookshop      | pg_catalog   | pg_operator             | UNIQUE          |
```

Получим список внешних ключей



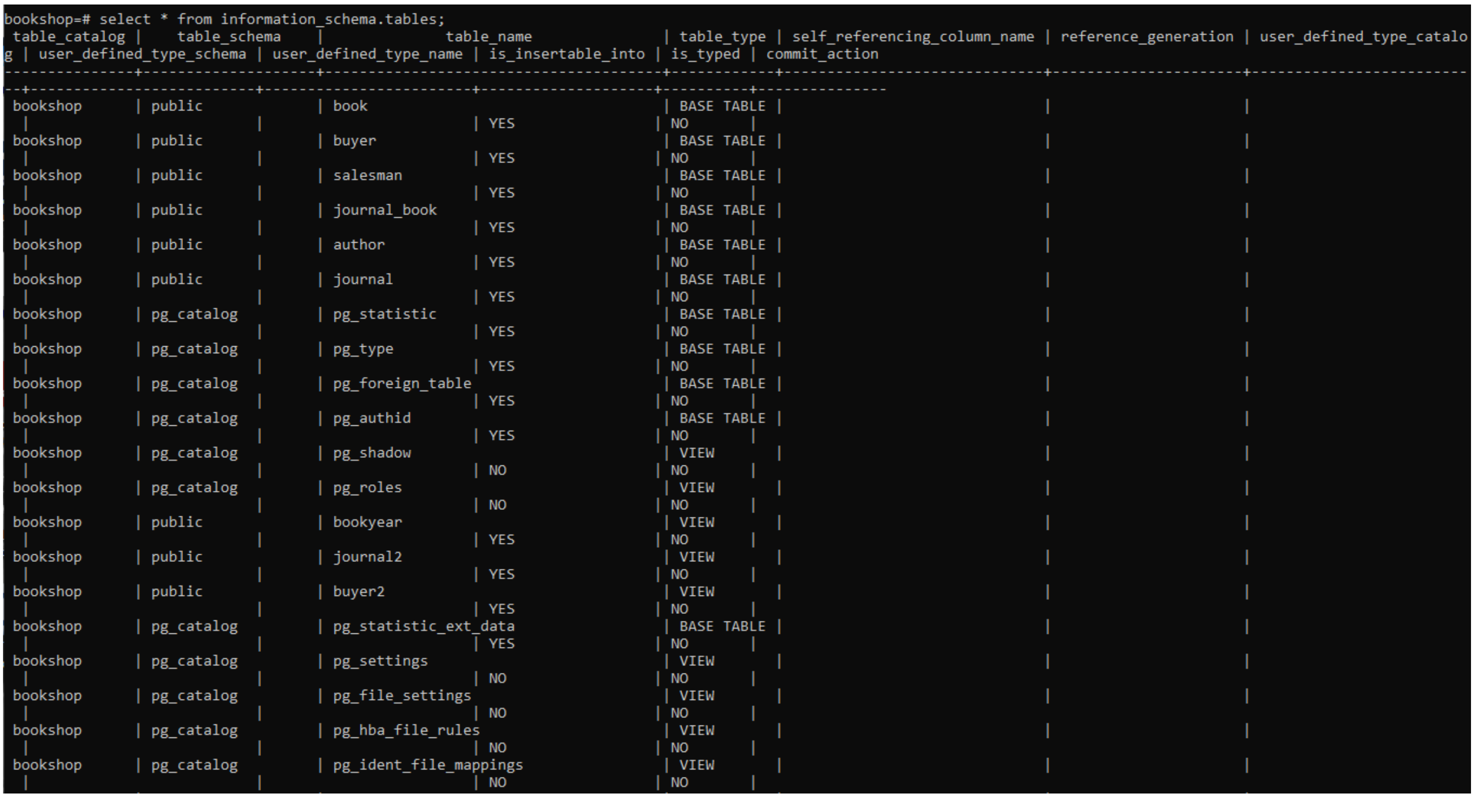
```
bookshop=# select * from information_schema.referential_constraints;
 constraint_catalog | constraint_schema |     constraint_name      | unique_constraint_catalog | unique_constraint_schema | unique_constraint_name | match_option | update_rule | delete_rule
--------------------+-------------------+--------------------------+---------------------------+--------------------------+------------------------+--------------+-------------+------------
 bookshop           | public            | book_id_author_fkey      | bookshop                  | public                   | author_pkey            | NONE         | NO ACTION   | NO ACTION
 bookshop           | public            | journal_id_buyer_fkey    | bookshop                  | public                   | buyer_pkey             | NONE         | NO ACTION   | NO ACTION
 bookshop           | public            | journal_id_salesman_fkey | bookshop                  | public                   | salesman_pkey          | NONE         | NO ACTION   | NO ACTION
 bookshop           | public            | fk_book                  | bookshop                  | public                   | book_pkey              | NONE         | NO ACTION   | NO ACTION
 bookshop           | public            | journal_id_book_fkey     | bookshop                  | public                   | book_pkey              | NONE         | NO ACTION   | NO ACTION
 bookshop           | public            | fk_journal               | bookshop                  | public                   | journal_pkey           | NONE         | NO ACTION   | NO ACTION
(6 строк)
```

Получим список последовательностей.



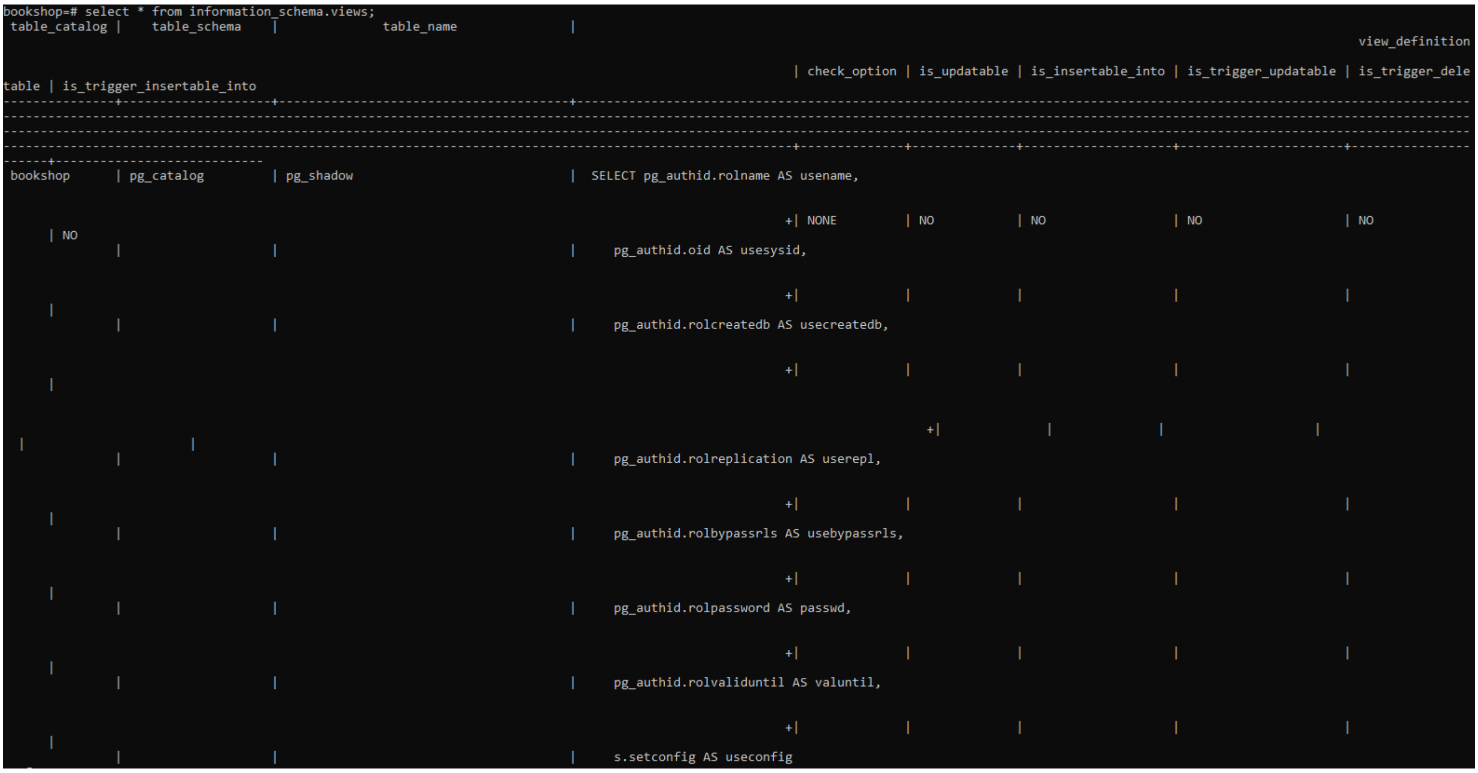
```
bookshop=# select * from information_schema.sequences;
 sequence_catalog | sequence_schema |  sequence_name  | data_type | numeric_precision | numeric_precision_radix | numeric_scale | start_value | minimum_value |    maximum_value     | increment | cyc
le_option
------------------+-----------------+-----------------+-----------+-------------------+-------------------------+---------------+-------------+---------------+----------------------+-----------+----
----------
 bookshop         | public          | author_id_seq   | integer   |                32 |                       2 |             0 | 1           | 1             | 2147483647           | 1         | NO
 bookshop         | public          | buyer_id_seq    | integer   |                32 |                       2 |             0 | 1           | 1             | 2147483647           | 1         | NO
 bookshop         | public          | salesman_id_seq | integer   |                32 |                       2 |             0 | 1           | 1             | 2147483647           | 1         | NO
 bookshop         | public          | book_id_seq     | integer   |                32 |                       2 |             0 | 1           | 1             | 2147483647           | 1         | NO
 bookshop         | public          | journal_id_seq  | integer   |                32 |                       2 |             0 | 1           | 1             | 2147483647           | 1         | NO
 bookshop         | public          | seq_author      | bigint    |                64 |                       2 |             0 | 101         | 100           | 9223372036854775807  | 1         | NO
 bookshop         | public          | seq_book        | bigint    |                64 |                       2 |             0 | 201         | 200           | 9223372036854775807  | 1         | NO
 bookshop         | public          | seq_buyer       | bigint    |                64 |                       2 |             0 | 301         | 300           | 9223372036854775807  | 1         | NO
 bookshop         | public          | seq_journal     | bigint    |                64 |                       2 |             0 | 401         | 400           | 9223372036854775807  | 1         | NO
 bookshop         | public          | seq_salesman    | bigint    |                64 |                       2 |             0 | 501         | 500           | 9223372036854775807  | 1         | NO
(10 строк)
```

Получим список таблиц.



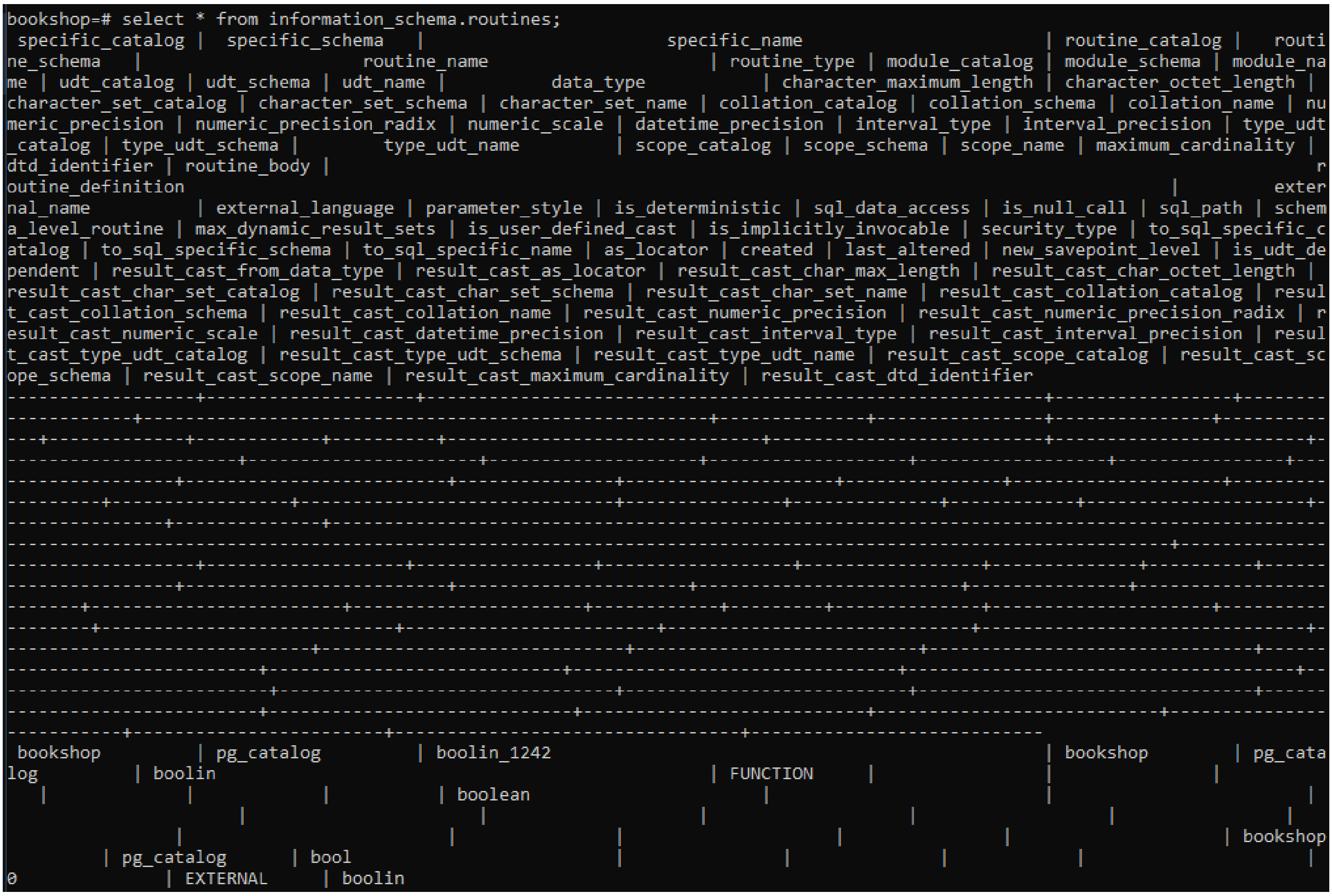
```
bookshop=# select * from information_schema.tables;
 table_catalog |    table_schema    |               table_name              | table_type | self_referencing_column_name | reference_generation | user_defined_type_catalo
g | user_defined_type_schema | user_defined_type_name | is_insertable_into | is_typed | commit_action
---------------+--------------------+---------------------------------------+------------+------------------------------+----------------------+-------------------------
--+--------------------------+------------------------+--------------------+----------+---------------
 bookshop      | public             | book                                  | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | buyer                                 | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | salesman                              | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | journal_book                          | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | author                                | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | journal                               | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_statistic                          | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_type                               | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_foreign_table                      | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_authid                             | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_shadow                             | VIEW       |                              |                      |
  |                          |                        | NO                 | NO       |
 bookshop      | pg_catalog         | pg_roles                              | VIEW       |                              |                      |
  |                          |                        | NO                 | NO       |
 bookshop      | public             | bookyear                              | VIEW       |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | journal2                              | VIEW       |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | public             | buyer2                                | VIEW       |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_statistic_ext_data                 | BASE TABLE |                              |                      |
  |                          |                        | YES                | NO       |
 bookshop      | pg_catalog         | pg_settings                           | VIEW       |                              |                      |
  |                          |                        | NO                 | NO       |
 bookshop      | pg_catalog         | pg_file_settings                      | VIEW       |                              |                      |
  |                          |                        | NO                 | NO       |
 bookshop      | pg_catalog         | pg_hba_file_rules                     | VIEW       |                              |                      |
  |                          |                        | NO                 | NO       |
 bookshop      | pg_catalog         | pg_ident_file_mappings                | VIEW       |                              |                      |
  |                          |                        | NO                 | NO       |
```

Получим список представлений.



```
bookshop=# select * from information_schema.views;
 table_catalog |    table_schema    |               table_name               |
                                                                                                                                                                          view_definition

                                                                                                          | check_option | is_updatable | is_insertable_into | is_trigger_updatable | is_trigger_dele
table | is_trigger_insertable_into
---------------+--------------------+----------------------------------------+------------------------------------------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
----------------------------------------------------------------------------------------------------------+--------------+--------------+--------------------+----------------------+----------------
------+---------------------------
 bookshop      | pg_catalog         | pg_shadow                              |  SELECT pg_authid.rolname AS usename,

                                                                                                         +| NONE         | NO           | NO                 | NO                   | NO
      | NO
               |                    |                                        |     pg_authid.oid AS usesysid,

                                                                                                         +|              |              |                    |                      |
      |
               |                    |                                        |     pg_authid.rolcreatedb AS usecreatedb,

                                                                                                         +|              |              |                    |                      |
      |


                                                                                                                            +|              |              |                    |
  |            |
               |                    |                                        |     pg_authid.rolreplication AS userepl,

                                                                                                         +|              |              |                    |                      |
      |
               |                    |                                        |     pg_authid.rolbypassrls AS usebypassrls,

                                                                                                         +|              |              |                    |                      |
      |
               |                    |                                        |     pg_authid.rolpassword AS passwd,

                                                                                                         +|              |              |                    |                      |
      |
               |                    |                                        |     pg_authid.rolvaliduntil AS valuntil,

                                                                                                         +|              |              |                    |                      |
      |
               |                    |                                        |     s.setconfig AS useconfig
```

Получим список хранимых процедур.



```
bookshop=# select * from information_schema.routines;
 specific_catalog |  specific_schema   |                       specific_name                       | routine_catalog |   routi
ne_schema   |                     routine_name                     | routine_type | module_catalog | module_schema | module_na
me | udt_catalog | udt_schema | udt_name |          data_type           | character_maximum_length | character_octet_length |
character_set_catalog | character_set_schema | character_set_name | collation_catalog | collation_schema | collation_name | nu
meric_precision | numeric_precision_radix | numeric_scale | datetime_precision | interval_type | interval_precision | type_udt
_catalog | type_udt_schema |        type_udt_name         | scope_catalog | scope_schema | scope_name | maximum_cardinality |
dtd_identifier | routine_body |                                                                                              r
outine_definition                                                                                              |         exter
nal_name          | external_language | parameter_style | is_deterministic | sql_data_access | is_null_call | sql_path | schem
a_level_routine | max_dynamic_result_sets | is_user_defined_cast | is_implicitly_invocable | security_type | to_sql_specific_c
atalog | to_sql_specific_schema | to_sql_specific_name | as_locator | created | last_altered | new_savepoint_level | is_udt_de
pendent | result_cast_from_data_type | result_cast_as_locator | result_cast_char_max_length | result_cast_char_octet_length |
result_cast_char_set_catalog | result_cast_char_set_schema | result_cast_char_set_name | result_cast_collation_catalog | resul
t_cast_collation_schema | result_cast_collation_name | result_cast_numeric_precision | result_cast_numeric_precision_radix | r
esult_cast_numeric_scale | result_cast_datetime_precision | result_cast_interval_type | result_cast_interval_precision | resul
t_cast_type_udt_catalog | result_cast_type_udt_schema | result_cast_type_udt_name | result_cast_scope_catalog | result_cast_sc
ope_schema | result_cast_scope_name | result_cast_maximum_cardinality | result_cast_dtd_identifier
------------------+--------------------+-----------------------------------------------------------+-----------------+--------
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------------------------+-----------------------------+---------------------------+---------------------------+---------------
-----------+------------------------+---------------------------------+----------------------------
 bookshop         | pg_catalog         | boolin_1242                                               | bookshop        | pg_cata
log         | boolin                                               | FUNCTION     |                |               |
   |             |            |          | boolean                      |                          |                        |
                      |                      |                    |                   |                  |                |
                |                         |               |                    |               |                    | bookshop
         | pg_catalog      | bool                         |               |              |            |                     |
0              | EXTERNAL     | boolin
```
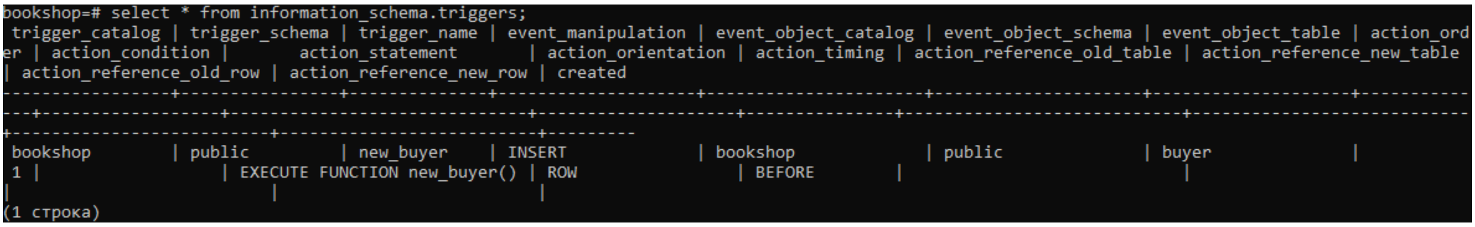

Получим список триггеров.



```
bookshop=# select * from information_schema.triggers;
 trigger_catalog | trigger_schema | trigger_name | event_manipulation | event_object_catalog | event_object_schema | event_object_table | action_ord
er | action_condition |       action_statement       | action_orientation | action_timing | action_reference_old_table | action_reference_new_table
| action_reference_old_row | action_reference_new_row | created
-----------------+----------------+--------------+--------------------+----------------------+---------------------+--------------------+-----------
---+------------------+------------------------------+--------------------+---------------+----------------------------+----------------------------
+--------------------------+--------------------------+---------
 bookshop        | public         | new_buyer    | INSERT             | bookshop             | public              | buyer              |
 1 |                  | EXECUTE FUNCTION new_buyer() | ROW                | BEFORE        |                            |
|                          |                          |
(1 строка)
```